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ESD SSDA REPORT ADDENDUM REPORT

PROJECT NAME:	New Primary School in Edmondson Park
PROJECT NUMBER:	210104
ATTENTION:	Daniel Vidovic
FROM:	Gary Tang

This ESD SSDA Report Addendum Report is prepared for the proposed new educational buildings in Edmondson Park and to provide additional design information supporting *ESD SSDA Report Rev A dated 21/05/2021*.

The need for this addendum report arose because the project has proposed alternative façade shading strategy after SSDA submission. This addendum report confirms that the associated changes have no implication to the ESD requirements outlined in the original ESD report. The outcomes of the original ESD report remain unchanged in the context of the amendment.

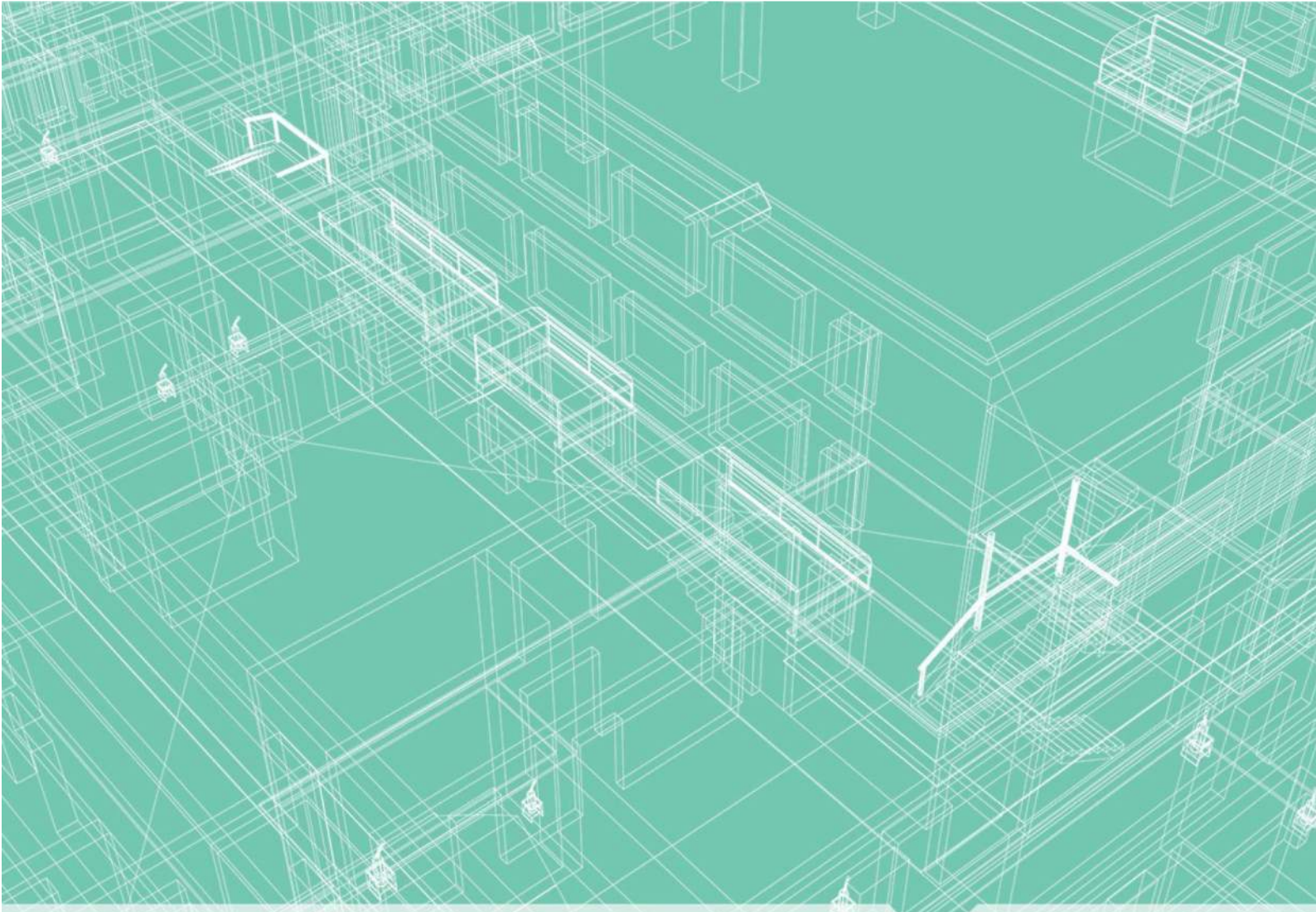
In addition, JHA has carried out JV3 modelling confirming Section J compliance with the new façade shading strategy.

The SSDA submission report *ESD SSDA Report Rev A dated 21/05/2021* and the outcomes of the JV3 modelling is attached at the end of this addendum report.

Yours sincerely,

Gary Tang

APPENDIX A: ESD SSDA REPORT REV A DATED 21/05/2021



ESD SSDA REPORT

NEW PRIMARY SCHOOL IN EDMONDSON PARK

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DOCUMENT CONTROL SHEET

Project Number	210104
Project Name	New Primary School in Edmondson Park
Description	Ecologically Sustainable Design SSDA Report
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Revision History

Issued To	Revision and Date								
Richard Crookes Constructions	REV	Draft	Draft 2	Rev A					
	DATE	01/04/2021	30/04/2021	21/05/2021					
	REV								
	DATE								
	REV								
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CONTENTS

EXECUTIVE SUMMARY

This report has been prepared by JHA to identify and summarise the Ecologically Sustainable Design (ESD) initiatives which have been considered in the design of the proposed new primary school located within Edmondson Park, NSW 2174.

This report demonstrates compliance with the Secretary's Environmental Assessment Requirements (SEARs) that apply to the project and has been prepared to accompany a State Significant Development (SSD) application to the NSW Department of Planning, Industry and Environment (DPIE). This report should be read in conjunction with the architectural design drawings and other consultant design reports submitted as part of the application.

The ESD objectives of this project is to encourage a balanced approach to designing new facilities for the project; to be resource-efficient, cost-effective in construction and operation; and to deliver enhanced sustainability benefits with respect to impacts on the environment and on the health and well-being of students, staff, and visitors whilst providing the best possible facilities for a constructive environment.

The proposed key ESD commitments for the development are listed below:

- Sufficient exposure to daylight
- Appropriate construction and glazing selection
- Energy-efficient air-conditioning systems with control strategy and thermal comfort tuning
- Efficient water fixtures
- Rainwater capture and reuse
- Reduced car parking spaces
- Design for Manufacturing and Assembly (DfMA) initiatives

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposed development of new primary school in Edmondson Park will support high-quality educational outcomes to meet the current and future need for additional public education facilities in Western Sydney Region.

The proposed development for a new core 35 primary school accommodating 1,012 students at Buchan Avenue, Edmondson Park will entail:

- Site preparation and excavation;
- Land use for the purpose of a new primary school;
- Construction of new buildings including:
- A three storey building on the western portion of the site primarily addressing Faulkner Way comprising 36 homebases, 4 special support unit teaching spaces, staff room, administration office at the ground floor and library at the first floor addressing the corner of Buchan Avenue and Faulkner Way, and student amenities;
- A coldshell of a single storey preschool for educational programs for children the year before they commence kindergarten, accommodating 40 places, connected at the southern end of the three storey building to be operated by Liverpool City Council; and
- A single storey building on the eastern portion of the site comprising a communal hall, out of school hours care, 8 homebases and covered outdoor learning area.
- Landscaping and public domains works including tree planting, a sports court and creation of various assembly, play and learning zones;
- A drop-off and pick-up zone, and bus zone on Buchan Avenue;
- An at-grade staff carpark at the south of the site with ingress and egress provided off Faulkner Way at the south-west corner of the site;
- Primary pedestrian entrance from Buchan Avenue and an additional entrance on Faulkner Way for the ground floor support unit; and
- Other ancillary infrastructure and utilities works and digital signage.

1.2 SITE LOCATION

The subject site is located between Buchan Ave and Faulkner Way, within the suburbs of Edmondson Park NSW 2174 and surrounded by residential development. Existing development in the locality includes existing residential development to the west and north west, vacant land (future residential) to the north and north east, railway line to the south and vacant land (possible future school) to the east.

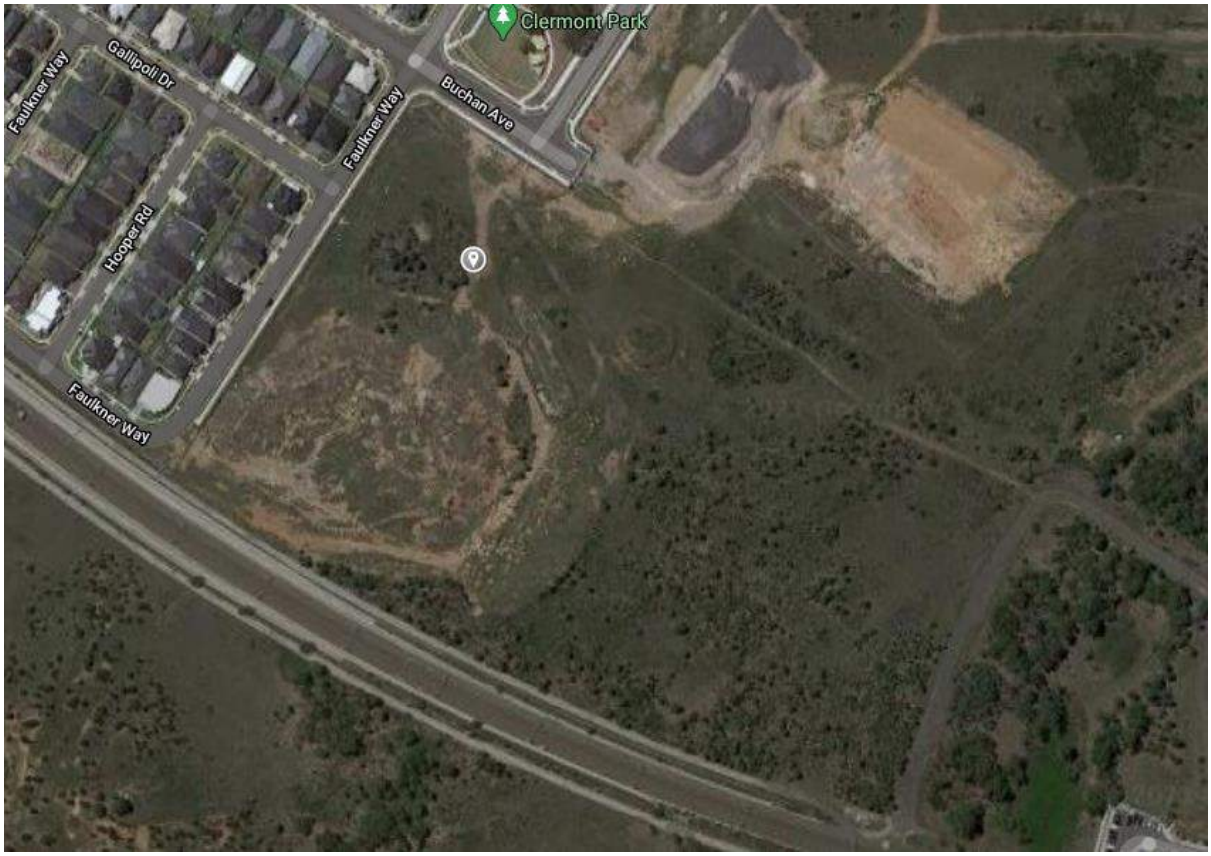


Figure 1 – Aerial photo of site

1.3 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARS)

The Secretary's Environmental Assessment Requirements (SEARs) for the development were issued on 10 December 2020 setting out the documentary and reporting requirements for the preparation of the EIS / SSDA. This report acknowledges the SEARs prepared by the Secretary which notes the followings in Section 7 of the document:

7. Ecologically Sustainable Development (ESD)

- *"Detail:*
  - *How the ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the development.*
  - *Proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy.*
  - *How the future development would be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.*
  - *How environmental design will be achieved in accordance with the GA NSW Environmental Design in School Manual (GANSW, 2018)*
- *Include:*
  - *An assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.*
  - *A statement regarding how the design of the future development is responsive to the NARCliM projected impacts of climate change.*
  - *An Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design."*
- *Relevant Policies and Guidelines:*
  - *NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.*

In accordance with the above SEARS requirements, the development will implement a holistic and integrated approach to ESD, maximising passive opportunities with the selective application of modern technology where appropriate. Initiatives will be chosen with due regard to whole of lifecycle cost benefits to the new primary school building.

The ESD initiatives outlined within this document have been compiled based on the following regulation, design tools, design guidelines:

- National Construction Code (NCC) 2019 Section J – Energy Efficiency;
- Green Star Design & As-built v1.3
- GA NSW Environmental Design in School Manual;
- Principles of the Educational Facilities Standards and Guidelines (EFSG);

The items listed above of the SEARS requirements are addressed in sections 2, 3, 4, 5, 6, 7 and Appendices of this report.

2. PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The principles as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 have been incorporated into the design and on-going operation phases of the development as follows:

2.1 THE PRECAUTIONARY PRINCIPLE

Namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and;
(ii) An assessment of the risk-weighted consequences of various options.

PROJECT RESPONSE:

This development is being designed in accordance with a wide range of ESD goals that pertain to the design, construction and operational stages. The development team will ensure that the building minimises the impact on the environment in the areas of energy, water and materials. The design will incorporate with external high performance glazing and shading devices, together with energy efficiency favoured passive design features to minimise severe or irreversible environmental damages.

In addition to the above, a Risk Management Plan (RMP, as part of Climate Adaptation Plan) has been undertaken to include the assessment of natural and urban hazards (e.g. flood, storm, heatwaves, bush fires, extreme storm and other weather events). Increasing resilience to natural hazards have been considered in the development so that associated costs are budgeted. (EFSG, DG02.08) With considering the NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections, there will be no significant temperature change for the proposed site with comparing the temperature of 1990 – 2009 to 2020-2079. Details of this assessment in addressed in Climate Adaptation Plan (attached as Appendix C).

2.2 INTER-GENERATIONAL EQUITY

Namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

PROJECT RESPONSE:

This development will not cause any significant impact on the health, diversity and productivity of the environment and will provide a community benefit in the form of increased student, employee capacity, upgraded teaching, learning, and working facilities. The project will contribute to a lively community environment and add architectural interest to the surrounding area.

Refer to Appendix C - Climate Adaptation Plan for the details of climate risks identified for this project and the relative responses, actions and responsibilities for high and extreme risks identified. (EFSG, DG02.08 and AS5334:2013)

2.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

Namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration

PROJECT RESPONSE:

An assessment of biodiversity values of the site, and the impact of the proposed development on these values has been carried out. The assessment find that the site is a vacate land and has no vegetated cover other than grass. The proposed development will not impact significant, threatened or endangered species. The site has been granted with a biodiversity certification. The project design will incorporate the requirements outlined in in EFSG DG90.06 and EFSG DG02.06.

2.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

Namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

PROJECT RESPONSE:

The project team has assessed the project against the Green Star Design & As-Built v1.3 Rating System. The design of this development has employed lifecycle costing to determine the optimum strategy with regards to major items of plant, with decisions being made based on whole of life costs rather than capital expenditure only.

The Whole of Life cost considerations will be followed along with consideration of: long-term maintenance, access, quality, life-span, multi-service integration and interface, innovation, future improvement, value of money and sustainability, ESD & Green Star. (EFSG, DG01.03)

Waste management plan will be implemented to cover the construction and demolition waste and operational waste. (EFSG, DG02.07)

3. SUSTAINABLE DESIGN FRAMEWORK

3.1 FRAMEWORK

The sustainable design framework for this development aims to incorporate the best practice design initiatives and ESD principles in new primary school building to the development. The ESD initiatives and targets outlined within this framework have been compiled based on the following:

- National Construction Code (NCC) Section J
- Green Star Design and As-Built Submission Guidelines v1.3;
- GANSW Environmental Design in Schools Manual.
- Principles of the Educational Facilities Standards and Guidelines (EFSG);

3.2 BUILDING ENVELOPE

Intelligent design and material selection ensure that thermal comfort is not entirely achieved by a mechanical means. Passive design initiatives such as performance glazing, shading and use of insulation will reduce demand on the mechanical air conditioning systems resulting in a reduction of energy consumption and greenhouse gas emissions.

3.2.1 BUILDING ENVELOPE PERFORMANCE

The building fabric will be designed to meet or exceed the NCC 2019 Section J requirements for building envelope. Thermal breaks will be incorporated into walls, floors and roofs where appropriate to ensure a continuous thermal barrier on the building envelope, reducing the flow of thermal energy between conductive materials.

A preliminary review under the Deemed-to-Satisfy pathway to show compliance has been carried out during the schematic design stage of the project. The indicative results on total construction R-value requirements demonstrating compliance with NCC 2019 Section J are provided below. The detailed assessment will be carried out in the detailed design stage and a Section J statement of compliance will be provided for Construction Certificate.

3.2.1.1 BUILDING FABRIC

The preliminary minimum performance requirements obtained under Section J Deem-to-Satisfy provision, coupled with allowance for Green Star compliance for the development (Class 9b) at the proposed location (Climate Zone 6) as per the NCC 2019 Section J - Energy Efficiency are:

Building Elements	Indicative NCC 2019 Requirements
Envelope Roof/Ceiling	Total R-Value of 3.6 (Downwards, Solar absorptance of the upper surface of a roof must be not more than 0.40)
External Envelope Walls	Total R-Value of 1.6
Internal Envelope Walls	Total R-Value of 1.6
Envelope Floors	Total R-Value of 2.2 (Downwards)

Note: The impact of thermal bridging must be considered within total R-value calculation under NCC2019.

This will necessitate the use of insulation in the walls, floor and roof for the building fabrics. Insulation reduces heat flow and consequent heat loss in winter and heat gain in summer. This minimises the heating and cooling load demand on the air conditioning systems. Light coloured roof material with a low solar absorptance (SA) is recommended to be used to isolate more sunlight and reduce summer heat gain. It also has an effect of reducing elevated localised temperatures (the heat island effect) and potentially can improve the efficiency of solar PV panels (if any) as they perform more efficiently in reduced temperatures.

3.2.1.2 GLAZING

Glazing is a major source of unwanted heat gain in the summer and can cause significant heat loss in the winter due to its low insulation performance. It is thus recommended that windows will be high performance glazing systems. Performance glazing substantially reduces heat transmission. This particularly reduces heat loss in winter; therefore, internal heat gain from equipment, lighting and people are better contained. Also, performance glazing absorbs the infrared portion of sunlight and reduces the amount of heat transferred into the conditioned space. This will correspond to a reduction of both heating and cooling loads.

The building will comply with NCC 2019 Section J Energy Efficiency. The detailed assessment will be carried out in the detailed design stage and a Section J statement of compliance will be provided for Construction Certificate. The indicative values below are based on previous similar scale projects within the same climate zone.

New Primary School	Window Assembly (Glass & Frame)		Description
	Total U-value	Total SHGC	
External Vertical Envelope Glazing	2.0-3.9	0.3-0.6	Double Glazed Performance Glazing (Subject to detailed design)

3.3 SHADING AND DAYLIGHTING

Solar access can enhance indoor environmental quality through access to daylighting and reduce lighting energy consumption. However, excessive solar access and hence, direct solar radiation heat can increase HVAC energy demand and can also cause thermal discomfort. Passive solar heating principle which aims to prevent solar heat gain in the summer and harvest it in the winter for free source of heating, and Passive cooling principle which prevents heat from entering the building during the summer months, are strategies which can conveniently take advantage of the site specific solar access for optimised indoor environmental quality and reduction of HVAC energy demand through use of tailored shadings.

The proposed buildings have been designed to make the best use of the sun by using external high performance horizontal eave shading to prevent the high summer sun from entering the building whilst allowing the low winter sun to enter the building for passive heating.

These passive design features allow for enriched daylighting and greater access to external views for occupants. Additional daylighting reduces the reliance on artificial light and benefits alertness, mood and productivity. External views provide a connection to nature and the building and also help to create an environment encouraging constructive experience.

3.4 NATURAL VENTILATION

Adequate natural air movement makes an important contribution in creating a comfortable indoor environment and reducing the need for mechanical ventilation by carrying accumulated heat out and replacing it with cooler external air. This is important during the summer months where heat build-up within spaces can be quickly removed with the availability of suitable breeze at the site.

The design team proposed to utilise natural ventilation and air circulation through operable windows.

3.5 ENERGY EFFICIENCY

Each climate zone under the Building Code has different design and conditioning requirements to minimise energy use for heating and cooling. Good balance of heating and cooling reduction techniques are required to create an energy efficient development.

3.5.1 HEATING, COOLING AND VENTILATION SYSTEMS

The air-conditioning and ventilation systems shall be designed to comply or exceed the minimum requirements of NCC 2019 Section J5 as well as driven by Green Star requirement.

The air conditioning system to the school building will be VRV/VRF (variable refrigerant volume/flow) System, which can provide simultaneous operation of cooling and heating to each individual space. Each system will comprise of indoor fan coil units (wall-mounted, ceiling cassette or ceiling ducted). The control of air conditioning system shall be designed to minimise energy consumption with a system such as an after hour push button for adjustable timer controller and/or motion detector controls. Further, high efficiency equipment for the HVAC system will be selected to further assist with energy conservation of the building.

All bathroom, storage, and general exhaust are to be naturally ventilated where possible, with mechanical ventilation required where necessary and provided with time controls (time switches or run-on timers as appropriate).

Ductwork systems will be designed to reduce system pressure losses to reduce fan motor power. This includes the selection of equipment for reduced coil and fittings drops and being generous with ductwork sizes to reduce friction losses.

Further, a centralised control system will also be provided to monitor and control all mechanical services with the building. The system will allow building management to interrogate system usage, allow for programming of AC systems (for example time scheduling, and temperature settings), notification on maintenance requirements and system diagnostics. It is proposed to provide remote access to the centralised controller via the internet.

These initiatives will provide significant savings in energy use.

3.5.2 LIGHTING

Lighting will be designed to comply with or exceed the minimum requirements of NCC 2019 Section J6 as well as driven by Green Star requirement.

Fittings incorporating the latest lamp technologies will be installed to minimise energy use and provide efficient artificial lighting systems.

The proposed development shall be illuminated using LED fittings and be controlled via automatic control system with timer controls, PIR occupancy sensors and microwave occupancy sensors.

Lighting in each learning space shall be provided with a daylight sensor to reduce light output or turn off lights when sufficient daylight is provided within the space. For large spaces, perimeter lightings shall be designated on a separate zone to make maximum use of the daylight.

3.5.3 CONTROLS

All lighting and HVAC installed shall be controlled by time switch or motion sensor for energy conservation. Closed spaces such as storage rooms and cleaner's cupboards are to also have a wall switch. Voltage control (dimming) should be provided where appropriate.

3.5.4 ELECTRICITY METERING

Electricity metering and sub-metering shall be specified in accordance with the Section J and Green Star requirement to monitor and manage electricity consumption in the building.

3.5.5 PHOTOVOLTAICS

Collecting solar energy has been chosen as a key ESD strategy for the project, with an aspirational goal of reducing the building's energy consumption and greenhouse gas emissions from a renewable source via the provision of a roof-mounted photovoltaic system.

The EFSG requirements stipulates PV system sizes depending on the category of "cores" of the school (the size of a primary school based on the number of Homebases); the project in concern belongs to the 35 core category and hence, requires a minimum of total 70 kW solar PV system. The project proposed 70kW of on-site solar PV system to meet the requirements.

3.5.6 ENERGY EFFICIENT APPLIANCES AND EQUIPMENT

Energy consumption shall be reduced by installing energy efficient appliances. Appliances with higher energy stars will provide a return in saving energy and decrease greenhouse gas emission. Appliances shall be selected within 1 star of the highest energy efficiency rating available on the market.

3.5.7 VERTICAL TRANSPORT

The use of lifts within the development will be discouraged by providing visually prominent staircases for all floors.

3.6 INDOOR AIR QUALITY (IAQ)

The quality of indoor air has a significant impact on our health and environment. Poor indoor air quality resulting in adverse health effect such as allergy, asthma, etc. The outdoor air ventilation rates shall be at a rate of 100% greater than the minimum required by AS 1668.2:2012 or CO2 concentrations are maintained below 700ppm for mechanically ventilated spaces. The ventilation system shall be designed to minimise the entry of outdoor pollutant as per ASHRAE Standard 62.1:2013.

3.7 WATER CONSERVATION

The following initiatives are proposed to ensure that significant water saving is achieved.

3.7.1 FITTINGS AND FIXTURES

Water consumption shall be reduced by incorporating water efficient fixtures and fittings in accordance with the Australian Government's Water Efficiency Labelling Scheme (WELS). The fixtures and fittings are to have the following minimum WELS Rating. In addition, flow restrictors or taps with timed flows can be used to minimise water usage.

Water Fittings / fixtures	Minimum WELS Rating	Highest Available Rating (AS/NZS 6400-2016)
Showerhead rating	3 (>4.5, but <= 6L/min)	4
Toilet and urinals rating	4	6
Taps and flow controllers	6	6
Dishwashers	5	6
Washing machines (if any)	4.5	6

3.8 SUSTAINABLE MATERIALS

3.8.1 LOW VOC / LOW FORMALDEHYDE MATERIALS

Adhesives, sealants, flooring and paint products will be selected to contain low or no Volatile Organic Compounds (VOCs) and all engineered timber products used in exposed or concealed applications are specified to contain low or no formaldehyde to avoid harmful emissions that can cause illness and discomfort for occupants.

3.8.2 SUSTAINABLE PRODUCTS

A proportion of all materials used in the project will meet the transparency and sustainability requirements under one of the following initiatives:

- Reused Product;
- Recycled Content Products;
- Environmental Product Declarations;
- Third Party Certifications; or
- Stewardship Programs

A rate of at least 3% of Project Sustainability Value (PSV) over Project Contract Value (PCV) will be targeted, subject to project monitoring and calculation using Green Star Sustainable Products Calculator.

3.9 ECOLOGICAL CONSERVATION

The current school building design have been designed to bring nature and the buildings together by optimising the use of outdoor space with provision of sensible separation of uses, such as active play, quiet learning and gathering space, and flexible spaces of varying form and function for outdoor environmental learning, whilst ensuring connectivity throughout the site between main school area and oval.

3.10 WASTE

Waste collection and disposal plays an important role in the protection of the environment and the health of the population in the modern world. A waste management plan will be prepared to assess and monitor the waste management process during construction and demolition, as well as waste produced during occupation within the development. The waste management plan shall incorporate how to minimise the amount of waste generated, maximise the reuse, recycling and reprocessing construction waste materials and minimise the volume of materials disposed to landfill.

3.11 WATER SENSITIVE URBAN DESIGN

External area design will implement best practices of water sensitive urban design, including indigenous low water usage plants to increase stormwater retention, decrease total suspended solids and mitigate the urban heat island effect. The carbon sequestration of the plants will also combat climate change contributions. Detailed Integrated Water Management (IWM) Plan including Water Sensitive Urban Design (WSUD) will be completed by Civil/Stormwater consultant.

4. EFSG Sustainability DESIGN RESPONSES

4.1 OVERVIEW

The Educational Facilities Standards and Guidelines (EFSG) have been developed by the NSW Department of Education, to assist the management, planning, design, construction and maintenance of new and refurbished school facilities. The EFSG is to be treated as a reference guide that provides a starting point to allow for a consistent standard of delivery across various types of school developments.

The EFSG Design Guide considers a framework incorporating several aspects of design including extensive Ecologically Sustainable Development (DG02) requirements. The following categories are covered within the EFSG DG02 Design Guide:

- NSW Government Resource Efficiency Policy
- Energy Conservation
- Water conservation
- Sustainable Materials
- Ecological Conservation
- Waste Management
- Climate Change Adaptation
- Sustainability Benchmarking
- Views

The proceeding sections outline how the project addresses each of the requirements of the EFSG DG02 Design guideline.

4.2 NSW GOVERNMENT RESOURCE EFFICIENCY POLICY

The purpose of the *NSW Government Resource Efficiency Policy* is to reduce NSW government agency operating costs by implementing resource efficiency measures, and its implementation is mandatory for all NSW Government agencies, including the Department of Education. The proposed project is targeting a 5 star Green Star Design & As-Built certified rating.

4.3 ENERGY CONSERVATION

In accordance with the *NSW Government Resource Efficiency Policy* all new facilities must be designed and built so that energy consumption is predicted to be at least 10% lower than if built to minimum compliance with National Construction Code requirements. The energy consumption reduction must be achieved without including renewable energy generation in the calculation.

4.3.1 LIGHTING

Lighting will be designed to comply with or exceed the minimum requirements of NCC 2019 Section J6 as well as driven by Green Star requirement.

Fittings incorporating the latest lamp technologies will be installed to minimise energy use and provide efficient artificial lighting systems.

The proposed development shall be illuminated using LED fittings and be controlled via automatic control system with timer controls, PIR occupancy sensors and microwave occupancy sensors.

Lighting in each learning space shall be provided with a daylight sensor to reduce light output or turn off lights when sufficient daylight is provided within the space. For large spaces, perimeter lightings shall be designated on a separate zone to make maximum use of the daylight.

4.3.2 LIGHTING AND HVAC CONTROLS

All new lighting and HVAC systems installed in schools must have timed or sensor feedback functionality for energy conservation.

4.3.3 ENERGY EFFICIENT APPLIANCES AND EQUIPMENT

In accordance with the *NSW Government Resource Efficiency Policy*, all new electrical equipment for the proposed project will be at least 0.5 stars above the market average star rating. In categories where no star ratings are available, equipment purchased should be recognised as high efficiency either by being ENERGY STAR® accredited, in a high efficiency band under Australian Standards or being above-average efficiency of Greenhouse and Energy Minimum Standards (GEMS) registered products.

4.3.4 RENEWABLE ENERGY GENERATION

Collecting solar energy has been chosen as a key ESD strategy for the project, with an aspirational goal of reducing the building's energy consumption and greenhouse gas emissions from a renewable source via the provision of a roof-mounted photovoltaic system.

See also Section 3.5.5 PHOTOVOLTAICS

4.4 WATER CONSERVATION

4.4.1 WATER EFFICIENT APPLIANCES

It is an EFSG requirement that all water fittings and fixtures such as showerheads, water tap outlets and toilet cisterns must have or exceed the following Australian Government's Water Efficiency Labelling Scheme (WELS) star ratings.

Water Fittings / Fixtures	Minimum WELS Rating
Showerhead rating	3 (>4.5, but <= 6L/min)
Toilet and urinals rating	4
Taps and flow controllers	6
Dishwashers	5
Washing machines (if any)	4.5

In addition:

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

See also Section 3.7.1 FITTINGS AND FIXTURES

4.4.2 ROOF WATER HARVESTING AND TANK STORAGE

Rainwater tanks will be installed on the site to reduce the demand on drinking water supplies, and will be connect to locally identified end use such as irrigation or toilet flushing system.

To manage the risk of contamination, tanks for drinking and non-drinking water use are to be designed and installed in accordance with HB 230 Rainwater Tank Design and Installation Handbook, Managing Urban Stormwater Harvesting and Reuse AS3500.

4.4.3 STORMWATER MANAGEMENT

Stormwater management will be designed and aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes.

Refer to relevant local regulations for Stormwater pollution reduction targets.

Refer to DG95 Stormwater for further requirements on system design.

4.5 SUSTAINABLE MATERIALS

4.5.1 TIMBER

No rainforest timbers, or timbers from high conservation forests, are to be used for the proposed development. Use only recycled timber, engineered and glued timber composite products, or timber from plantations or from sustainably managed regrowth forests that is FSC, AFS or PEFC certified.

4.5.2 LOW VOC

Adhesives, sealants, flooring and paint products will be selected to contain low or no Volatile Organic Compounds (VOCs) and all engineered wood products used in exposed or concealed applications are specified to contain low or no formaldehyde to avoid harmful emissions that can cause illness and discomfort for occupants.

See also Section 3.8.1 LOW VOC/LOW FORMALDEHYDE MATERIALS

4.5.3 PESTICIDES

It is proposed that no chemical pesticides and termiticide are to be used on site and this will be included in project Environmental Management Plan.

4.6 ECOLOGICAL CONSERVATION

An assessment of biodiversity values of the site, and the impact of the proposed development on these values has been carried out. The assessment find that the site is a vacate land and has no vegetated cover other than grass. The proposed development will not impact significant, threatened or endangered species. The site has been granted with a biodiversity certification.

4.7 WASTE MANAGEMENT

Waste collection and disposal plays an important role in the protection of the environment and the health of the population in urban areas. A waste management plan will be prepared in accordance with the EFSG requirements so that to assess and monitor the waste management process during construction and demolition, as well as waste produced during occupation within the development. The waste management plan has incorporate how to minimise the amount of waste generated, maximise the reuse, recycling and reprocessing construction waste materials and minimise the volume to materials disposed to landfill.

4.8 CLIMATE CHANGE ADAPTATION

This development will not cause any significant impact on the health, diversity and productivity of the environment and will provide a community benefit in the form of upgraded teaching, learning and working facilities. The project will contribute to a lively community environment and add architectural interest to the surrounding area.

Refer Appendix C – Climate Adaptation Plan for the details of climate risks identified for this project and the relative responses, actions and responsibilities for high and extreme risks identified. (EFSG, DG02.08)

4.9 SUSTAINABILITY BENCHMARKING

A Sustainable Development Plan including ESD principles meeting EFSG and 5 Star Green Star Design & As-built rating requirements has been prepared for this project. A Green Star Accredited Professional (GSAP) is engaged on the project at the concept design stage to provide ongoing advice across all project elements.

See also Section 6 GREEN STAR RATING SCHEME, Appendix A GREEN STAR SCORECARD & Appendix B EFSG SCHEDULE.

4.10 VIEWS

Building design will ensure at least 60% of primary occupied spaces have a clear line of sight to high quality internal and external views. The space must be within 8m from the view.

5. GANSW ENVIRONMENTAL DESIGN IN SCHOOLS MANUAL

The GANSW Environmental Design in Schools Manual provides the guidance on new school developments and major upgrades in NSW and incorporates the scope of State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 (the Education SEPP).

With the assistance of the GANSW Design Guide, the project is to demonstrate the adoption of the following seven design quality principles outlining under Education SEPP and how school developments can apply design considerations and strategies to improve their learning spaces, education building, and school campus.

- Context, built form and landscape
- Sustainable, efficient and durable
- Accessible and inclusive
- Health and safety
- Amenity
- Whole of life, flexible and adaptive
- Aesthetics

The principles under Design Guide for Schools and Environmental Manual applies to the school building. The Design Verification Statement (DVS) addressing the development has been coupled with the above Education SEPP design quality principles is to be completed by the architect.

6. GREEN STAR RATING SCHEME

The project is pursuing a formal Green Star rating through the certification procedures of the Green Building Council Australia (GBCA). The proposed development is targeting a 5 Star Green Star Design & As-built rating.

A Green Star Scorecard has been prepared (attached as *Appendix A),* which lists the sustainability initiatives targeted for the project. Below table summarises the outcomes of the high level Green Star Gap Assessment. Points are calculated as per the official Green Star Design and As-Built v1.3 Scorecard.

Category	Total Points Targeted
Management	14
Indoor Environment Quality	15
Energy	8
Transport	10
Water	5
Materials	8
Land Use & Ecology	2
Emissions	4
Total Targeted Point	66
Total Available Points	99
Total Score without Innovation	66.7
Innovation	10
Total Score with Innovation	76.7

7. IMPACTS OF CLIMATE CHANGE

For the design responses for the impact of climate change, please refer to Appendix C - Climate Adaptation Plan

APPENDIX A: GREEN STAR SCORECARD

Green Star - Design & As Built Scorecard v1.3

Project: 210104 New Primary School in Edmondson Park DRAFT

Targeted Rating: 5 Star - Australian Excellence. Min 60% of available points

Final Score	Total Score (without Innovation)	Points Available	Points Targeted (without Innovation)	Innovation
76.7	66.7	99	66	10

Category/Credit	Code	Credit Criteria	Points Available	Points Targeted	Responsibility
Management			14	14	
Green Star Accredited Professional	1.1	Accredited Professional	1	1	ESD
Commissioning and Tuning	2.0	Environmental Performance Targets	Complies (Mandatory)		All services consultants
	2.1	Services and Maintainability Review	1	1	
	2.2	Building Commissioning	1	1	
	2.3	Building Systems Tuning	1	1	
	2.4	Independent Commissioning Agent	1	1	Owner
Adaptation and Resilience	3.1	Implementation of a Climate Adaptation Plan	2	2	All services consultants, Architect
Building Information	4.1	Building Information	1	1	Head Contractor
Commitment to Performance	5.1	Environmental Building Performance	1	1	Owner, Architect
	5.2	End of Life Waste Performance	1	1	
Metering and Monitoring	6.0	Metering	Complies (Mandatory)		Mechanical , Electrical & Hydraulic
	6.1	Monitoring Systems	1	1	
Responsible Building Practices	7.0	Enviromental Management Plan	Complies (Mandatory)		Head Contractor
	7.1	Formalised Enviromental Management System	1	1	
	7.2	High Quality Staff Support	1	1	
Operational Waste	8B	Prescriptive Pathway: Facilities	1	1	Architect
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	
Indoor Environment Quality			17	15	
Indoor Air Quality	9.1	Ventilation System Attributes	1	1	Mechanical
	9.2	Provision of Outdoor Air	2	2	Mechanical
	9.3	Exhaust or Elimination of Pollutants	1	1	Mechanical
Acoustic Comfort	10.1	Internal Noise Levels	1	1	Acoustic
	10.2	Reverberation	1	1	
	10.3	Acoustic Separation	1	1	
Lighting Comfort	11.0	Minimum Lighting Comfort	Complies (Mandatory)		Electrical
	11.1	General Illuminance and Glare Reduction	1	1	
	11.2	Surface Illuminance	1	1	Architect & ESD
	11.3	Localised Lighting Control	1	1	Electrical
Visual Comfort	12.0	Glare Reduction	Complies (Mandatory)		Architect & ESD
	12.1	Daylight	2	1	
	12.2	Views	1	1	Architect
Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	1	1	Architect & Services Consultants
	13.2	Engineered Wood Products	1	1	
Thermal Comfort	14.1	Thermal Comfort	1	1	Mechanical & ESD
	14.2	Advanced Thermal Comfort	1	-	
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Energy			22	8	
Greenhouse Gas Emissions	15E.0	Conditional Requirement: Reference Building Pathway	Complies (Mandatory)		ESD, Service Consultant & Architects
	15E.1	GHG Emissions Reduction: Building Fabric	4	1	
	15E.2	GHG Emission Reduction: Services/Systems	16	4	
	15E.7	Fuel Switching	2	2	
Peak Electricity Demand Reduction	16A	Prescriptive Pathway - On-site Energy Generation	1	1	Architect, Electrical, Owner
	16B	Modelled Performance Pathway - Reference Building	2	-	
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Transport			10	10	
Sustainable Transport	17.0	Performance Pathway using SINSW Schools Transport Assessment	10	10	Traffic Consultant, Owner & Architect
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Water			11	5	
Potable Water	18B.1	Sanitary Fixture Efficiency	1	1	Architect, Hydraulic
	18B.2	Rainwater Reuse	1	1	Architect, Hydraulic
	18B.3	Heat Rejection	2	2	Mechanical, Architect
	18B.4	Landscape Irrigation	1	1	Architect, Hydraulic
	18B.5	Fire Protection System Test Water	1	-	
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Materials			14	8	
Life Cycle Assessment (LCA)	19A.1	Comparative Life Cycle Assessment	6	-	ESD, Architect, Head Contractor & Structural
	19A.2	Additional Life Cycle Impact Reporting	4	-	
Life Cycle Impacts	19B.1	Concrete	3	2	Head Contractor & Structural
	19B.2	Steel	1	1	
	19B.3	Building Reuse	4	-	
	19B.4	Structural Timber	4	-	
Responsible Building Materials	20.1	Structural and Reinforcing Steel	1	1	Head Contractor, Structural
	20.2	Timber Products	1	1	Head ContractorArchitect
	20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	All
Sustainable Products	21.1	Product Transparency and Sustainability	3	1	Architect, Owner
Construction and Demolition Waste	22.0	Reporting Accuracy	Complies (Mandatory)		Head contractor
	22A	Fixed Benchmark	1	1	
	22B	Percentage Benchmark			
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Land Use & Ecology			6	2	
Ecological Value	23.0	Endangered, Threatened or Vulnerable Species	-		Landscape
	23.1	Ecological Value	3	1	Landscape
Sustainable Sites	24.0	Conditional Requirement	Complies (Mandatory)		Owner
	24.1	Reuse of Land	1	-	
	24.2	Contamination and Hazardous Materials	1	-	
Heat Island Effect	25.0	Heat Island Effect Reduction	1	1	Architect & Landscape
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Emissions			5	4	
Stormwater	26.1	Stormwater Peak Discharge	1	1	Civil & Hydraulic
	26.2	Stormwater Pollution Targets	1	1	Civil & Hydraulic
Light Pollution	27.0	Light Pollution to Neighbouring Bodies	Complies (Mandatory)		Electrical
	27.1	Light Pollution to Night Sky	1	1	
Microbial Control	28.0	Legionella Impacts from Cooling Systems	1	1	Mechanical
Refrigerant Impacts	29.0	Refrigerant Impacts	1	-	
Category/Credit	**Code**	**Credit Criteria**	**Points Available**	**Points Targeted**	**Responsibility**
Innovation			10	10	
Improving on Green Star Benchmarks	30C	Stormwater	2	1	Civil & Hydraulic
Innovation Challenge	30D	Community Benefits	1	1	Architect, Project Manager, Owner
		Integrating Healthy Environments	1	1	Architect, Project Manager, Owner
		Reconciliation Action Plan	1	1	Architect, Project Manager, Owner
		Universal Design	1	1	Architect, Project Manager, Owner
		Powered by Renewables	3	1	Architect, Project Manager, Owner

		Design for Manufacture and Assembly (DfMA)	1	1	Architect, Project Manager, Owner
Global Sustainability	30E	Amenity Space	1	1	Architect, Project Manager, Owner
		Digital Infrastructure	1	1	Architect, Project Manager, Owner
		Green Cleaning	1	1	Architect, Project Manager, Owner
		Global Sustainability	1	-	Architect, Project Manager, Owner

APPENDIX B: EFSG SCHEDULE

PROJECT:	210104	New Primary School in Edmondson Park	It is the consultant's responsibilty to check the level of compliance in the EFSG of each DG. If there is a conflict between the ESD Schedul		
Theme	Indicator	Sustainability initiatives / requirements from the EFSG This is an extract only from the relevant EFSG. For full requirements refer to https://efsg.det.nsw.edu.au/welcome	EFSG	Crossover with Green Star	Standard evidence to demonstrate compliance
Energy & carbon	EC1: Energy efficiency	**Improvement over NCC** All new facilities must be designed and built so that energy consumption is predicted to be at least 10% lower than if build to minimum compliance with National Construction Code requirements.The energy consumption reduction must be achieved without including renewable energy generation in the calculation.	DG02.03	DAB c15E.0 GHG Emissions Reduction - Conditional Requirement	1. Energy modelling report / Predictive energy modelling and thermal comfort assessment. Report needs to show at least 10% improvement of building over minimum NCC requirements; and 2. As-built evidence that model is an accurate representation of the building, e.g. drawings; and 3. Specifications / calculations supporting modelling inputs, e.g. window energy rating scheme certificates, calculated R-values of walls, roofs, etc. 4. As an alternative to 2 and 3 above, a Statement by energy modeller confirming that the moel accurately represents the building.
Energy & carbon	EC1: Energy efficiency	**Energy conservation** Design and construct all school buildings within the parameters specified in the: - NSW Public Works Energy Manual for Buildings - Building Code of Australia (BCA) Section J for Energy Efficiency The NSW Public Energy Manual for Buildings provides an energy-saving strategy by identifying aspects of the building and services where reductions in operating and maintenance costs can be made through proper selection of: - Building fabric - Insulation materials - Shading and ventilation - Services and control It also requires the formulation of an energy impact statement.	DG65.02	DAB c15 GHG Emissions Reduction	1) Section J report 2) Energy impact statement
Energy & carbon	EC1: Energy efficiency	**Daylighting** - Designers must seek to maximise natural daylight in all learning and administration spaces to reduce energy usage through windows and skylights - Including daylight sensors in rooms to reduce light output or turn off light when sufficient daylight is provided within the space - When the space is large and perimeter lighting is adjacent to windows, perimeter lighting is on a separate zone to make maximum use of daylight	DG2.3.1 DG12	DAB c15 GHG Emissions Reduction	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and 2. As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and 3. Specifications supporting inputs used in modelling (e.g. skylights and glass specs)
Energy & carbon	EC1: Energy efficiency	**Shading devices** On exposed facades subject to direct sunlight, external window shading has been considered as part of the building design	DG2.3.1	DAB c15 GHG Emissions Reduction	1. As built drawings
Energy & carbon	EC1: Energy efficiency	**Lighting energy conservation** Lighting system must have timed or sensor feedback functionality for energy conservation	DG2.3.2	DAB c15 GHG Emissions Reduction	1. As built mechanical drawings / statement from head contractor
Energy & carbon	EC1: Energy efficiency	**Energy efficient lighting** - LED lighting must be installed - The design of the lighting systems and the selection of fittings is to be undertaken based on a Whole of Life approach - System must support sustainable design principles including reducing energy consumption - Use light sources lamps and control gear with a long life	DG2.3.1 SG63.01	DAB c15 GHG Emissions Reduction	1. As built electrical drawings
Energy & carbon	EC1: Energy efficiency	**Maximum illumination power densities** Section J part 6 of the National Construction Code provides tables that define the maximum illumination power density that is acceptable in various locations. This, and all other elements of Section J part 6 should be applied appropriately.	DG63.05.01	DAB c15 GHG Emissions Reduction	1) Lighting drawings 2) Lighting specifications / schedules 3) Lighting modelling report showing compliant power densities
Energy & carbon	EC1: Energy efficiency	**Lighting control** The required communication protocol for the luminaires is DALI. The following systems for the control of luminaires fitted with DALI control gear are considered acceptable: - Diginet Rapix suite of products. - Clipsal C-bus suite of products - Philips Dynalite suite of products - KNX based systems Systems must be designed to be as simple as possible. This simplicity must extend from the topography to ease of use. It is a specific requirement that programming of any control system must be relatively simple and not limited to costly specialist consultants. Allowances should be made in system design specifications for user group training of control systems and for the programming of the system as part of the commissioning and hand over process. All equipment and manuals necessary to operate and maintain the system must be provided to the school and Asset Management	DG63.06.01	DAB c15 GHG Emissions Reduction DAB c4 Building Information	1) Commissioning report 2) Confirmation from AMU that all relevant manuals have been handed over
Energy & carbon	EC1: Energy efficiency	**Constant light output / Daylighting** -Constant Light Output (CLO) systems consisting of dimming luminaires and light level sensors are highly recommended as they are effective in maintaining the required illuminance values. CLO systems ensure that the lit environment remains compliant at the lowest possible Watts per square metre for the reasonable operating life of the luminaires. Maintained illuminance values required for design compliance will result in areas being over-lit for a large proportion of their operating life without a CLO system. - Sensors can be fitted to each luminaire or by utilising sensors that control groups of luminaires. - Once in operation a CLO system delivers compliant light levels over the life of a system by reducing the light through dimming and ramping the levels up over the lifespan of the luminaire. These systems should be seamless and invisible in operation to users of the locations. - Daylight Harvesting can be delivered as a component of a CLO system and requires no additional hardware above and beyond that required for a CLO to operate. - Daylight harvesting is recommended in areas where there is a rapid transition from natural day light to a dark environment, such as when entering a multi deck or underground car park from a street in full daylight, or in a classroom where daylight from windows is within the field of view.	DG63.06.02 DG63.06.03	DAB c15 GHG Emissions Reduction	1) Lighting drawings 2) Lighting modelling report showing compliant power densities
Energy & carbon	EC1: Energy efficiency	**Switching strategy** - Local switching should be provided where it is identified that the users can benefit from manual operation of the lighting and other lighting automation technology is considered cost prohibitive. The switching should be clearly marked and robust. - Achieve energy efficient switching in Schools by: The use of multiple switching groups Automatic control of these groups to operate as follows: Controlled luminaires are to automatically turn-off nominally 3 minutes after the bell sounds. Turn-off is to be in two steps other than in small rooms, one step after 3 minutes and the second group 2 minutes later (5 min). If the lighting is required for the next period, occupants of that room can prevent the lights turning off by pressing the ON switch/es after the bell sounds. The luminaires in each room can be turned off at any time by pressing the OFF switch/es. The off signal is to be capable of transmission at the end of normal school hours or at other selected times without the bells sounding, with the lighting turning off in two steps (other than in small rooms).	DG63.07 DG65.03.01	DAB c15 GHG Emissions Reduction	1) Electrical & lighting drawings showing switching groups and automatic controls

Energy & carbon	EC1: Energy efficiency	**Energy efficient HVAC system** HVAC system must have timed or sensor feedback functionality for energy conservation Systems shall be designed to minimise energy consumption. System design / equipment selection is to be based on whole of life cost analysis. Specifically air conditioning equipment should: - support sustainable design principles including reducing energy consumption; and - be easily accessible and serviceable – easy to maintain with minimal impact on school operations / activities when maintenance is being performed. All new school buildings are to be designed to meet or exceed the requirements of building regulations for conditioned spaces	DG2.3.2 DG55 DG16.09	DAB c15 GHG Emissions Reduction	1. As built mechanical drawings / statement from head contractor; 2. Whole of life cost analysis demonstrating systems were selected based on WOL performance.
Energy & carbon	EC1: Energy efficiency	**Energy efficient appliances & equipment** Electrical equipment must be at least 0.5 stars above the market average star rating or comply with high efficiency standards specified in the GREP	DG2.3.3	DAB c15 GHG Emissions Reduction	1. Schedule of appliances and equipment with their star ratings or performance standards, signed by head contractor or architect. All appliances and equipment required in the GREP must be listed, incl air conditioning equipment, electric motors, transformers, etc.
Energy & carbon	EC1: Energy efficiency	**Heat loss/gain** Building/HVAC design must consider: - Climate/ micro-climate: This data must come from the current AIRAH handbook and where a specific area is not referenced in the handbook, the Bureau of Meteorology statistics must 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 must be used to determine heating and cooling loads as part of the Whole of Life analysis that must be undertaken. (i.e. Camel or Carrier).	DG04.01	DAB c15 GHG Emissions Reduction	1. Thermal modelling report 2. As built evidence demonstrating that model is an accurate representation of the building 3. Specifications/ calculations supporting modelling inputs
Energy & carbon	EC1: Energy efficiency	**Passive design** The need for active cooling and heating shall be minimised by employing passive / sustainable design principles. Windows: The size and proportions of windows need to be carefully considered in the design to provide maximum efficiency and a balance between the ESD factors such as; maximising daylight in rooms but avoiding unnecessary solar heat gain and thermal loss etc. Roofing: The colour selected will have an impact on the thermal performance. Light colours will reflect more of the sun's heat and darker colours absorb more of the sun's heat, which will be transferred into the roof structure. Unless prevented by glare issues to surrounding development, light colours must be selected to reduce the thermal load from solar heating and contribute to heat island effect mitigation. Orientation (as close to True North as possible). With appropriate shading, this will provide a balanced approach to reducing summer heat ingress and encouraging solar warmth during winter. Appropriate glazing/ shading strategy (related to orientation and local environment), Depending on the climate, windows would be minimised on southern, eastern & western elevations with external shading on western and eastern facades). Use of thermal mass (to stabilise internal temperatures). Insulation: maximise insulation	DG55 DG06.02 DG27.12	DAB c15 GHG Emissions Reduction	1. Thermal modelling report 2. As built evidence demonstrating measures implemented to reduce need for active cooling / heating 3. Passive design report by Architect listing all passive design initiatives implemented
Energy & carbon	EC1: Energy efficiency	**Ventilation strategy** A ventilation strategy must be developed to ensure that sufficient ventilation is provided to all spaces to meet the requirements of the BCA/NCC and associated standards. Specifically ventilation equipment must be designed from a whole-of-life perspective and: - Enable healthy learning environments with indoor air quality (IAQ) that supports learning and teaching (i.e. IAQ that is fit for purpose for schools) - Support sustainable design principles including reducing energy consumption - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	DG57.01	DAB c15 GHG Emissions Reduction	1) Cooling system strategy including WOL analysis 2) Concept plans 3) Construction drawings 4) Trade-based specification 5) As built drawings
Energy & carbon	EC1: Energy efficiency	**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.	DG05.01	DAB c15 GHG Emissions Reduction	As built drawings demonstrating windows have been installed as required.
Energy & carbon	EC1: Energy efficiency	**Mechanically assisted cross-ventilation** In two storey blocks where cross flow ventilation is not possible to the lower floor, mechanically assisted cross ventilation is to be provided to the lower floor learning spaces nominated in the EFSG. The ventilation system is to be sized to provide at least 7 air changes per hour. The system is to be thermostatically controlled to activate when room temperature exceeds 28 deg C and is to run continuously until the room temperature drops below 27 deg C. Additionally the system is not to be activated unless the outdoor temperature is lower than the indoor temperature and is to be immediately de-activated as soon as the outdoor temperature exceeds indoor air temperature. Provide programmable seven-day time clock and 0-2 hrs adjustable after-hour timer to control each mechanically assisted exhaust ventilation system.	DG57.18	DAB c15 GHG Emissions Reduction	As built mechanical drawings and specifications Extracts from commissioning report
Energy & carbon	EC1: Energy efficiency	**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. - The size and number of ventilators to be included will depend upon the volume and use of the individual rooms and the local climatic conditions to provide suitable air changes and room cross ventilation. - Provide a minimum of two roof ventilators to each Secondary General Learning Space or a Primary Home Base unless otherwise directed, or other number recommended by the manufacturer for the size of the space (whichever is the greater). - Ventilator throat diameter to be no less than 400mm.	DG05.02 DG37	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.
Energy & carbon	EC1: Energy efficiency	**Roof ventilator control** Provide controls for the operation of the motorised dampers on the roof ventilators. Generally one switch is required for each space within the school where roof ventilators are installed	DG65.16	DAB c15 GHG Emissions Reduction	Mechanical / electrical drawings showing controls
Energy & carbon	EC1: Energy efficiency	**Wind powered roof ventilators** School buildings can use wind powered roof ventilators with dampers to provide effective summer ventilation. Design to suit local ambient climatic conditions to ensure correct sizes, locations and numbers are provided for each particular application. Co-ordinate the locations of ventilators with the ceiling fans to achieve effective air movement. Fan assisted ventilators should also be considered on days of low wind Provide a wall mounted switch to open /close the damper.	DG57.14	DAB c15 GHG Emissions Reduction	As built mechanical drawings showing location of roof ventilators if installed

Energy & carbon	EC1: Energy efficiency	**Ventilation in sanitary spaces** - Greater air circulation than that required by building regulations is required, with sufficient natural ventilation or mechanical ventilation, to disperse odours and /or humidity. - Cross ventilation is to be used where possible. - Provide mechanical ventilation to all Disabled Toilets. - Operate the system by time control equipment (time switches or run-on timers as appropriate).	DG05.04 DG57.16	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.
Energy & carbon	EC1: Energy efficiency	**Ventilation in storage spaces** - Permanent air ventilation openings are to be provided (without compromising security), to prevent concentration of odours.	DG05.05	DAB c15 GHG Emissions Reduction	As built mechanical drawings demonstrating ventilation has been installed as required.
Energy & carbon	EC1: Energy efficiency	**Ventilation in permanent learning spaces and libraries** Where feasible / practical: - Ceiling fans shall be installed where ceiling height is equal to or greater than 2,700mm. - Wall fans shall be installed where ceiling heights are less than 2,700mm	DG55	DAB c15 GHG Emissions Reduction	As built drawings demonstrating ceiling/wall fans have been installed as required.
Energy & carbon	EC1: Energy efficiency	**Indoor environment controls** - Both the thermal comfort and indoor air quality shall be controlled automatically within specified parameters. - Controls shall be simple and intuitive to use. - A prominent green light shall highlight to occupants when conditions are suited to opening windows and doors to utilise natural ventilation. - A prominent blue light shall highlight to occupants when the air conditioning is operating. - The lights shall be clearly labelled with traffic light labels as follows: + Green light – "External conditions are suited to opening windows and doors" + Blue light – "Air conditioning is operating. Windows and doors should be closed" - Temperature and CO2 sensors are to be installed within the space and be readily accessible for maintenance. - Sensors must be located so as to accurately record the actual room temperature and indoor air quality (CO2). - Controls shall be designed to minimise energy consumption – e.g.: by minimising over cooling and heating and automatically switching off when the space is unoccupied. - Controls shall be designed so that the system/s will shut down automatically if a room is unoccupied for greater than 10 minutes (except in specific cases such as designated computer rooms). - Controls shall be properly labelled and suitably located in the space (preferably near the light switch) and incorporate: + a key operated auto / manual / off switch; and + a push on / push off adjustable hour run timer. The run timer shall be adjustable from 1 to 4 hours and initially be set at 2 hours	DG55	DAB c15 GHG Emissions Reduction	1) As built evidence demonstrating controls have been installed as required. 2) Commissioning report / statement by head contractor confirming controls have been set as required
Energy & carbon	EC1: Energy efficiency	**Access for maintenance** All systems and equipment that is installed within a school is to be provided with suitable access to ensure that this equipment is safely and efficiently maintainable. In order to ensure that maintenance is available, on the completion of all buildings, drawings are to be provided showing the completed (As Built) building including all equipment and equipment access arrangements. **Communication services** DoE requires a 4 hour on-site training session for up to four persons on the use of the SCS. Training is to be accompanied by appropriate documentation and a video that demonstrates operation of the system and its components, including patching, cable management for voice, video and data of the SCS installed on site. Include explanation of detailed drawings left on site. The video / CD ROM may be generated from the on-site training for future use by DoE school staff. The Project Manager will, in consultation with the School Principal, nominate the timing of this session together with the number of attendees. Manuals are to be handed to the school during the training session. Include in copies of all cabling test reports and the (minimum) 20-year warranty certificate the manual. As built documentation and manufacturers warranty and test results are required **Building user's guide** Produce a Building User's Guide to enable the client to understand the building systems and operate systems to maximise efficiency. This must: - Clearly and concisely describe the operation of building and its services - Detail a reasonable maintenance program - Advise the user of the most suitable replacements for consumables	DG16.10 DG64.10 DG65.02	DAB c4 Building Information	1) As built drawings including all equipment access arrangements for maintenance 2) Training records 3) Operation manuals 4) Manufacturers warranties and cabling test reports 5) Building user's guide
Energy & carbon	EC2: Scope 1 & 2 emissions	**Renewable energy** A grid connected solar PV system must be installed in line with DG66 requirements Where feasible, PV systems shall be installed to offset as much of the electricity consumed by the school as is practicable	DG2.3.4 DG55	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	1) As installed drawings of PV system 2) Energy modelling report showing renewable energy generation
Energy & carbon	EC2: Scope 1 & 2 emissions	**Battery Energy Storage System** A battery energy storage system shall only be designed in consultation with SINSW Sustainability sustainability.enquiries@det.nsw.edu.au	DG66.8.3	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	1) As installed drawings of battery storage system
Energy & carbon	EC2: Scope 1 & 2 emissions	**Heaters** Electric heating must be preferred over gas heating. Where gas heating is considered, it must be approved by SINSW Sustainability Heating equipment must be designed from a whole-of life perspective and: - Support sustainable design principles including reducing energy consumption and carbon emissions - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	DG56	DAB c15 GHG Emissions Reduction	1) If reverse cycle air conditioning is installed, confirmation that gas heaters are not installed, OR 2) Evidence that the gas heaters installed are energy efficient
Energy & carbon	EC2: Scope 1 & 2 emissions	**Water heaters** - Hot water and tempered water generation for schools must be carefully considered to ensure that a Whole of Life assessment is undertaken to minimise life cycle costs and carbon emissions - Environmentally friendly options such as solar heating (if vandal resistant) and heat pumps are preferred energy sources to minimise energy consumption.	DG53.09	DAB c15 GHG Emissions Reduction	1. WOL cost assessment for hot water systems 2. Hydraulic drawings/schematics showing installed DHW systems

Energy & carbon	EC3: Scope 3 emissions	Transport plan	N/A	DAB c17 Sustainable Transport	
Energy & carbon	EC3: Scope 3 emissions	**Bicycle storage** Provide 1 space for every 20 students to AS2890.3 standard	SG552 4.36	DAB c17 Sustainable Transport	
Water	W1: Water use efficiency	**Potable water conservation** WATER CONSERVATION STRATEGIES must be implemented on school sites, including: Manual Flush Urinal Systems : New and replacement urinals must use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative. Water Conserving Taps : Use metal flow control valves and /or push down taps with pre set flow limits. All new water-using appliances must be at least 0.5 stars above the average Water Efficiency Labelling and Standards (WELS) star rating by product type, except toilets and urinals, which must be purchased at the average WELS star rating. Refer to DG53.02 for specific rating requirements. Harvest Rainwater : Where practical, harvest roof water and connect to a pumped rainwater supply system to authorities' requirements for landscaped areas and toilet flushing	DG53	DAB c18 Potable Water	1. Schedule of fixtures and fittings showing type of urinals and taps installed are as required
Water	W1: Water use efficiency	**Fixture efficiency** All products must be rated to AS 6400 to the following minimum WELS ratings: - Tapware to 5 star flow rating requirements - Showers to have 3 star flow rating requirements - Water Closet Pans to 4 star flow rating requirements - Flow restrictors can be used to minimise water usage and wastage for staff amenities - Taps with timed flow can be used to minimise water usage and wastage in student amenities. In any case, all new water-using appliances must be at least 0.5 stars above the average WELS star rating by product type, except toilets and urinals, which must be purchased at the average WELS star rating. Where WELS rating is not available, use the alternative WaterMark rating scheme.	DG53.02 DG2.4.1	DAB c18B.1 Potable Water - Sanitary Fixture Efficiency	1. Schedules of materials, fixtures, fittings and equipment with WELS/WaterMark ratings, demonstrating compliance and identifying those with flow restrictors and timed flow.
Water	W1: Water use efficiency	**Hydraulic services** Hydraulic services should: - Support sustainable design principles including reducing water consumption and waste production. - Appropriately treat any trade waste to ensure minimal environmental impact - Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed - Use products with a long life span – many hydraulic services are concealed so durability is essential	DG51.01	DAB c18 Potable Water	1) Hydraulic report showing sustainability initiatives implemented to reduce potable water consumption 2) As built drawings showing trade waste arrestors
Water	W1: Water use efficiency	**Water sub-metering** In addition to the main water meter for the site provide sub meters for the following: - Mixed irrigation systems - Laboratory buildings - Amenities blocks - Canteens - Any other major water use on the site	DG53.04		1) As built hydraulic drawings
Water	W2 – Proportion of potable vs non-potable water	**Rainwater collection** It is DoE policy to include roof water harvesting and tank storage in new schools and to encourage it where practical in existing schools, to reduce the demand on drinking water supplies. Tank water can connect to drip irrigation systems for adjacent landscape/gardens with the major preference being for gravity fed supply to minimise ongoing maintenance.	DG53.14 DG2.4.2 DG53.01	DAB c18B.2 Rainwater Reuse	1) As built hydraulic drawings showing tank connection to end uses and capacity
Water	W2 – Proportion of potable vs non-potable water	**Fire system water reuse** Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system must be installed to capture and reuse fire systems testing and maintenance water, or by useing an alternative non-potable water source.	DG2.4.2	DAB c18B.5 Fire System Test Water	Fire engineering report
Water	W2 – Proportion of potable vs non-potable water	**Ground water** Where ground water is available for use for irrigation purposes in drought affected locations, enquiries must be undertaken with the Department of Planning, Industry and Environment to determine the suitability of a ground water system.	DG53.03	DAB c18 Potable Water	1. Relevant due diligence report / investigation
Water	W3 – Responsible water discharge	**Stormwater management** Must aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes. Due diligence for flooding must be done early to inform building and landscaping design	DG2.4.3	DAB c26 Stormwater	Stormwater modelling report showing stormwater pollution and flows. Civil / Hydraulic drawings showing management measures. Water sensitive urban design report (if WSUD was use4)
Water	W3 – Responsible water discharge	**Trade waste** Arrestors for acid, grease, plaster and clay of adequate capacity must be installed to treat wastewater from science laboratories, kitchens, art rooms and canteens as required in DG52.	DG52	Not covered in Green Star	1) As built drawings showing trade waste arrestors or 2) Letter by Hydraulic Engineer confirming arrestor have been installed as required
Waste & materials	WM1: Materials selection and use	**Life cycle assessment (environmental)** Environmental impacts of products and materials has been assessed and inform material selection	DG01.03	DAB c19A - Life cycle assessment	Life cycle assessment report
Waste & materials	WM1: Materials selection and use	**Whole of life costing (WOL)** Total cost of ownership (TCO) assessment / Analysis of direct and indirect costs and benefits / Life cycle costing analysis When calculating the whole of life cost for the different materials / building elements or systems, the following must be considered: - the total initial capital cost of the system/s – including design, project management, builder and building services works in connections etc. - resources (energy and where applicable water) consumption. - Maintenance. - the replacement of component parts. - disposal costs - ecological sustainable options - durability - vandalism - safety The whole of life cost shall be calculated over the estimated life of the asset/s.	DG01 All design guides for selection of materials and building systems	GSC c20 - Return on Investment	Life cycle costing report for relevant system
Waste & materials	WM1: Materials selection and use	**Sustainable materials** Construction materials must be selected based on the following: - Adequately and economically perform their intended functions, and also have lower adverse environmental impacts throughout their life cycle (refer to DG 3) - Contain reduced or no hazardous substances (e.g. low VOC) to ensure effective indoor environmental quality. Reduce the demand for rare or non-renewable resources. - Have low embodied energy and water. - Are made from or contain recycled materials or can be reused or recycled at the end of their useful life.	DG02.05	DAB c21 Sustainable Products	Environmental Product Declarations of products / materials used; Product certificates (like GECA, FSC, et3) Suppliers' declarations confirming recycled contents in products Bill of quantities

Waste & materials	WM1: Materials selection and use	**Sustainable timber** - No rainforest timbers, or timbers from high conservation forests, are to be used unless plantation grown. Use only recycled timber, engineered and glued timber composite products, or timber from plantations or from sustainably managed regrowth forests that is FSC, AFS or PEFC certified - All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard level.	DG2.5.1 DG21.05.01	DAB c20.2 Responsible Building Materials - Timber	1. Evidence of chain of custody 2. Bill of quantities
Waste & materials	WM1: Materials selection and use	**Built for disassembly** Consider the use of building materials which are able to be disassembled for re-use, in conjunction with considerations for the addition and removal of accommodation over time.	DG02.07		
Waste & materials	WM1: Materials selection and use	**Concrete** - Use materials complying with AS based on the Whole of Life approach to materials selection. - Do not use breccia or dolerite in concrete mixes. - Fly ash is a manufacturing bi-product that can be used as a cement replacement but should limited to a maximum of 20% by weight of cement content.	DG21.02	DAB c19B.1	Structural specifications and drawings Structural Engineer's report showing %cement replacement
Waste & materials	WM2 – Resource efficient school operations	**Operational waste** A waste storage area must be included in all new school sites. The provision of space must include source separation including bin stations and appropriate signage of waste and receptacles for multiple waste streams, including: - Organics - Comingled containers - Paper & cardboard - Container deposit scheme - Soft plastic - General waste Designers must refer to AS 4123.7 Mobile waste containers - Colours, markings, and designation requirements for further guidance on bin colour, waste stream and waste type. Safe methods for vehicle access and the transfer of waste must also be considered. For new and refurbished schools, an operational waste management plan (OWMP) must be developed to establish operational waste targets, identify opportunities for reuse and recycling in the operation of the facilities and make adequate provision for the facilities to accommodate for the OWMP. The OWMP must address all requirements from DG 2.7.2	DG02.07	DAB c8 Operational Waste	Operational waste management plan Operational waste reports showing diversion rates
Waste & materials	WM2 – Resource efficient school operations	**Building flexibility** Position structural members considering the future flexibility of the structure. Avoid ad hoc placing of columns internally, giving preference to uniformity in layout. Design all internal walls as non-load bearing to enable future flexibility.	DG21.1.16	Not covered in Green Star	As built drawings or statement by relevant professional
Waste & materials	WM3 – Responsible management of waste	**Construction waste** Consider opportunities for re-use and recycling of materials in the construction phase	DG02.07	DAB c22 Construction and Demolition Waste	Construction waste reports showing percentage of waste re-used and recycled (diverted from landfill)
Waste & materials	WM3 – Responsible management of waste	**Operational waste** A waste storage area must be included in all new school sites, with the provision of space for the separation of waste and receptacles for multiple waste streams, including: - general rubbish, - co-mingled recycling, - paper and cardboard, - secure waste, and - green waste. Safe methods for vehicle access and the transfer of waste must also be considered.	DG02.07	DAB c8 Operational Waste	As-built drawings showing location of waste storage area
Place	P1 – Green infrastructure	**Environmental conservation education** The design of the facilities provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community.	DG02.06		Statement / Report by qualified ecologist
Place	P1 – Green infrastructure	**Productive landscape** Consider including opportunities for development of community garden within the site and relationships with community groups for this to occur.	DG02.06	GSC c14.2 Local Food Production	Site plan demonstrating location and size of community garden
Place	P1 – Green infrastructure	**Drinking water catchment protection** For developments within drinking water catchment areas, a water cycle management study is to be included with the Development Application for Education Facility developments involving: - Agriculture facilities - Biosolids and effluent re-use schemes - Sewerage systems or works (including package sewerage treatment plants) - Stormwater or works involving the disposal of untreated runoff	DG51.07	GSC c24 Integrated Water Cycle	1. Water cycle management study 2. Evidence that recommendations in the study have been followed / implemented
Place	P2 – Community & heritage connections	**Site investigations for place making / community connections** The following detailed reports/ surveys/ information should be considered in developing the business case: - Local environment/ character - Climate and microclimate - Heritage significance / impact - Appraisal of physical and visual factors affecting site development - Available transport/ road infrastructure servicing the site - Geo-technical and Soil reports will be required for each site to investigate the suitability of the topsoil and anticipated sub-grade materials for horticultural purposes. - Testing for toxic residues must be undertaken in all areas identified as being a possible risk - i.e. filled or dumped ground.	DG03.02	GSC c12 Culture, Heritage and Identity DAB 24.2 Contamination and Hazardous Materials	1) Relevant reports/surveys developed (these ideally include recommendations for further development stages) 2) Evidence demonstrating recommendations / best practice solutions have been implemented/addressed.
Place	P2 – Community & heritage connections	**Sense of place** The following design principles to every landscape zone of the school. - A healthy and safe landscape - A sense of place - A sustainable landscape - A low maintenance landscape	DG90.04	Not covered in Green Star	1) Landscape design report 2) Landscape drawings
Place	P2 – Community & heritage connections	**Community use of facilities** Some school facilities are used out of hours for activities such as weekend church groups, sport events and public meetings. Liaise with the Project Director to gain an understanding of any shared use, or community use arrangements that are being considered for the site. New schools should be designed so that direct access to the open play space, fields , hall and gym can be achieved without the public gaining access to the buildings.	DG16.08	DAB c30B Community Benefits	1. Confirmation by the Architect that direct access has been provided to open space and any other facilities that could be shared with the community. 2) A list of community engagement activities undertaken to develop a community benefits strategy. 3) Plans clearly outlining how the outcomes from the community benefits strategy have been implemented in the project 4) Joint-use or lease agreements where already in place
Place	P2 – Community & heritage connections	Reconciliation action plan	N/A	DAB c30D Reconciliation Action Plan	1) DoE's Reconciliation Action Plan 2) Evidence of the project's relationship with the RAP, e.g. actions implemented in line with RAP, etc.

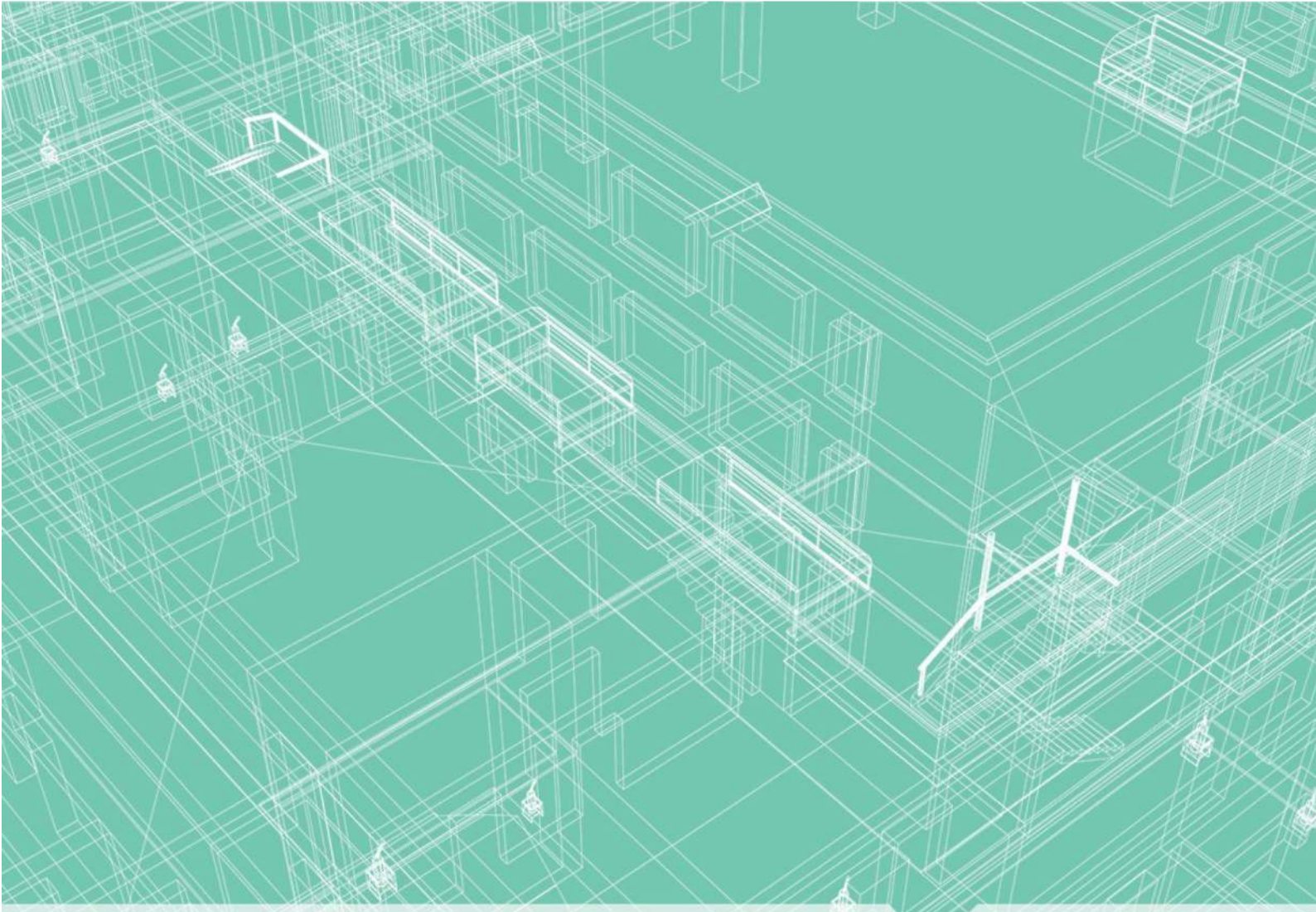
Place	P3 – Welcoming learning spaces	**Daylighting** Maximise natural daylight in all habitable spaces to improve indoor amenity and create a pleasant environment.	DG2.3.1	DAB c12 Visual Comfort	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and 2. As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and 3. Specifications supporting inputs used in modelling (e.g. skylights and glass specs)
Place	P3 – Welcoming learning spaces	**Daylight glare control** Discomforting glare and brightness contrasts must be avoided. Designers must seek to: - Exclude direct sunlight from all learning spaces, libraries, administrative offices and staff studies for the period of 9.00am to 3.30pm including Eastern Daylight Saving Time between 21st September to 21st March (equinoxes). - Exclude direct sunlight from desk level in all learning spaces between 9am and 3:30pm. Sun exclusion and glare control can be achieved by the use of elements such as; Sun shades, eave extensions, vertical blades and the like. Glare must only be controlled by blinds as a last resort. Designers must prepare sun diagrams in the design phase as a minimum requirement.	DG12 DG07.01	DAB c12.0 Glare Reduction	1. Daylight glare modelling report / sun diagrams showing direct sunlight has been excluded as required. 2. Drawings supporting inputs of model, showing location of blinds and any other glare control device
Place	P3 – Welcoming learning spaces	**Lighting comfort** - Consider the furniture layouts to determine the orientation of luminaires. Especially when positioning luminaires in Materials Technology spaces to ensure adequate illumination on machines and work surfaces; - avoid potential stroboscopic effects and avoid shadows from ductwork - Mount luminaires as high as possible, but generally no higher than 4000mm AFFL (excluding Gymnasiums and Halls), to improve luminance uniformity and reduce direct glare in the direction of normal view - The standard lamp colour temperature is 4,000°K, except in certain toilet areas where the Design Guide requires the use of blue colours - Compliance with the uniformity requirements of the applicable standard should be demonstrated by the presentation of the output from lighting design software. - Unified Glare Rating (UGR) must be calculated using design software and compliant with the maximum recommended in AS/NZS 1680.1:2006	DG63.03 DG63.03.05	DAB c11 Lighting Comfort	1) Lighting drawings 2) Architectural drawings 3) Lighting specifications / schedules 4) Product data sheets 5) Isolux plot drawings 6) Lighting modelling report showing compliant uniformity and UGRs
Place	P3 – Welcoming learning spaces	**Lighting modelling** Lighting designs should be carried out utilising industry standard lighting design software such as AGI32, Dialux or Relux. Modelling must provide output that clearly demonstrates that the proposed design is compliant with the standards including but not limited to the following parameters: - Maintained illuminance values (average, maximum and minimum) on horizontal surfaces such as floors or working planes as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Maintained illuminance values (average, maximum and minimum) on vertical surfaces such as walls, shelves or racks as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Unified Glare Rating (UGR) as defined by AS/NZS1680, - Uniformity as defined by the applicable standard for indoor or outdoor illumination, - Lighting power density in System Watts/m2	DG63.03.02	DAB c11.1 General Illuminance and Glare Reduction	Lighting modelling report confirming compliance with required standards and parameters
Place	P3 – Welcoming learning spaces	**External access lighting** External Access Lighting shall be provided to illuminate building entrances, footpaths, sheltered walkways, roadways and car park. External Access Lighting must: - Be minimal and designed to prevent glare to pedestrians, nearby residents and to motorists. Evidence of compliance with AS4282, AS/NZS 1158 and other applicable Australian Standards must be provided by the designer. - Be located so as to link various sources of illumination such as street lighting (for carpark and roadways) and internal security lighting (for footpaths, walkways and entrances). - Illuminate building entry doors. - Highlight 'accident-prone' areas such as changes in level, stairs and ramps. - Provide vertical illumination.	DG63.08.01	DAB c27.0 Light Pollution to Neighbouring Bodies	1) As built drawings indicating the location of all external luminaires 2) Letter by lighting designer describing glare prevention measures
Place	P3 – Welcoming learning spaces	**Thermal comfort** The inclusion of active cooling within school facilities is directed by the Department's Air Cooling policy: 2.1 Schools with a long term average mean maximum January temperature of 33 oC and above: Generally, air conditioning is to be provided to all school buildings. 2.2 Schools with a long term average mean maximum January temperature of below 33oC: Air conditioning is to be installed in all permanent learning spaces and libraries forming part of each projects scope. - Thermal modelling is undertaken to demonstrate that learning spaces and libraries have been designed to achieve a predicted mean vote (PMV) of +/- 0.5 for 95% of occupied hours	DG06.03 DG55.01 DG55.02	DAB c14 Thermal Comfort	1) Mechanical drawings showing HVAC systems installed, or 2) Confirmation from sub-contractors that services have been installed and commissioned as required; and 3) Modelling report showing required PMV is achieved. Modelling report to be done in line with methodology described in Draft thermal comfort and indoor air quality interim performance brief for DG55
Place	P3 – Welcoming learning spaces	**Background noise levels** - HVAC systems shall be designed in accordance with the recommended internal noise levels noted in table 1 of DG55.02. The noise levels are the result from the cumulative contribution of traffic noise (via the façade) PLUS the building air-conditioning /ventilation systems. The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107. Noise measurement must account for all internal and external noise including noise arising from building services equipment, noise emission from outdoor sources such as traffic, and (where known) noise from industrial process. Occupancy noise is excluded. Compliance shall be demonstrated through measurement, and the measurements shall be conducted in at least 10% of the spaces in the nominated area. The selection of representative spaces must be justified and must consider how the spaces are considered to be the most conservative with respect to both internal, and external noise sources. The range of measurement locations shall be representative of all spaces available within the nominated area. All relevant building systems must be in operation at the time of measurement. Projects less than 500m2 Gross Floor Area (GFA) must account for measurements conducted in at least 95% of spaces within the nominated area. - Enclosed circulation areas should be acoustically absorptive	DG55.02 DG08.06	DAB c10.1 Internal Noise Levels	1. Road, rail, aircraft, industrial and rain noise assessment as per DG11.02 2. Report by qualified acoustics consultant demonstrating noise measurements are compliant.
Place	P3 – Welcoming learning spaces	**Room-to-room noise control** The following elements have prescriptive acoustic performance or construction requirements: - Operable walls (between general learning areas, all schools): Rw 45 - Entry doors to occupied teaching, music, drama and sports spaces: Solid core, minimum 35 mm thick with acoustic weather (where external) seals on all rebated closing faces. Gap at floor to be minimized. - Internal glazed sections in walls and vision panels in or adjacent to internal doors: minimum 10.38 mm laminated glass. In some situations acoustic windows may be needed for satisfactory noise separation. - Construction separating wastewater pipework from occupied spaces: Rw 40 - Where adjacent to an occupied space (and not serving that space), hydraulic supply pipework and wastewater pipework shall be separated from the adjacent occupied space. Construction between the adjacent spaces in this instance shall be a 'staggered stud' arrangement or otherwise discontinuous.	DG11.05	DAB c10.3 Acoustic Separation	1. Detailed drawings including the acoustic design specification of operable walls, entry doors, internal glazed sections, etc. OR 2. Statement by a qualified acoustics consultant confirming compliance

Place	P3 – Welcoming learning spaces	**Noise emission (to the environment)** Generally noise emission to the environment from mechanical services noise sources (such as air conditioners) are the subject of a development consent conditions. In NSW the development consent conditions will refer to the Industrial Noise Policy (INP) or Local Council requirement. Where no condition regarding noise sources exists for a school development, noise emission from such sources should be designed, in-principle, to satisfy the requirements of the Industrial Noise Policy.	DG11.04	Not covered in Green Star	
Place	P3 – Welcoming learning spaces	**Acoustic post-occupancy evaluation** Post Occupancy evaluations are often undertaken to assess the performance of recently completed or existing facilities. Where a Post Occupancy Evaluation is to be undertaken it should be conducted by the project team or acoustic engineer and should be undertaken of selected acoustic parameters only. Evaluation may include: - Internal noise levels, - Room acoustics, - Noise emission, - Room-to-room acoustics performance	DG11.07	GSP c13 Internal Noise Levels	1. Commitment by SI to conduct acoustic post-occupancy evaluation
Place	P3 – Welcoming learning spaces	**Low VOC-emitting materials** All surface coatings, and other volatile organic compound (VOC) emitting products including adhesives, sealants, carpets, carpet tiles, and carpet underlays, must be made from low-VOC emission materials. Paints must meet the limits stipulated in the Australian Paint Approval Scheme's (APAS) VOC limits for low VOC paints. Adhesives and sealants must not exceed the maximum VOC limits stipulated in Table 13.1.1B of the Green Star – Design & As Built v1.3 tool. Carpets must not exceed the total VOC limits stipulated in Table 13.1.2B of the Green Star – Design & As Built v1.3 tool.	DG2.5.2	DAB c13 Indoor Pollutants	Product specifications, certificates, safety datasheets that demonstrate low-VOC contents Bill of quantities
Place	P3 – Welcoming learning spaces	**Low formaldehyde-emitting materials** Only low formaldehyde-emitting engineered wood products should be used, such as those that meet the Australian Standards for formaldehyde emission limit E1 (NICNAS classification) or lower.	DG2.5.2	DAB c13 Indoor Pollutants	Product specifications, certificates, safety datasheets that demonstrate low-formaldehyde contents Bill of quantities
Place	P3 – Welcoming learning spaces	**Ventilation in printing rooms** The ventilation system is to be designed to serve the whole room and is not intended to provide localised exhaust at equipment. - Discharge air from the ventilation unit to the outside of the building via a vermin proofed louvre. - Draw make-up air from inside the building through wall or door grilles. - Locate the inlet/s and exhaust to achieve good airflow across the room in plan and elevation to pick up all machine emissions. -Ensure the airflow doesn't draw equipment emissions across operator's face. -Note that the room door in many schools may be left open in normal daily operation. Allow for this when locating the exhaust fan so that cross ventilation is achieved with make-up air drawn through the door opening. - Required speed range: minimum of 6 air changes per hour and maximum of 15 air changes per hour.	DG57.07	DAB c9.3 Exhaust or Elimination of Pollutants	1. Mechanical drawings and specifications showing compliant printing room ventilation
Place	P3 – Welcoming learning spaces	**Chemical store ventilation** - Provide mechanical exhaust system with high and low level exhaust points to all chemical stores, with a minimum of 15 air changes per hour flow rate. - Discharge air according to the requirements of BCA. The discharge outlet is to be fitted with bird wire mesh. - Provide make up air to all chemical stores, (to replace exhausted air) through openings in an external wall, fitted with weatherproof louvres. All grilles and louvres are to be fitted with vandal proof bars and be fitted with vermin mesh. - For security and fire rating reasons do not use windows/doors or door grilles for air intake. - The chemical stores ventilation systems are to run continuously.	DG57.09	Not covered in Green Star	
Place	P3 – Welcoming learning spaces	**Pesticide free environments** Schools must be designed, constructed and maintained, without using chemicals for termite and other pest control. No chemical pesticides and termicide to be used. Preventive treatments to be by physical means and careful design to minimise risk	DG2.5.3	Not covered in Green Star	Statement by head contractor that no pesticides or termites have been used.
Place	P3 – Welcoming learning spaces	**Green cleaning**	N/A	GSP c6 Green Cleaning	1) WEB Clean School User Guide 2) Green Cleaning specifications
Place	P3 – Welcoming learning spaces	**Fly free indoors** Fly screening must be provided in all schools to the doors, windows and other openings in food preparation, biology, and non-water-closet toilet spaces or where specifically nominated in the EFSG. Schools in localities where fly incidence constitutes a health hazard (especially trachoma or other nuisance) will require fly screens to all opening sashes.	DG31.01	Not covered in Green Star	As-built drawings showing fly screening has been provided as required
Place	P3 – Welcoming learning spaces	**Indoor CO2 levels** For mechanically ventilated spaces: 1. Outdoor air ventilation rates are in accordance with requirements of AS 1668.2. 2. Mechanical ventilation systems shall be linked to CO2 sensors to provide demand-controlled ventilation within each space to ensure that CO2 levels are maintained below the required CO2 threshold. 3. Mechanical ventilation systems shall be designed to provide adequate access for maintenance and cleaning. 4. Ventilation systems are designed to maintain an average daily CO2 concentration as per the latest NCC code, and so that the maximum concentration does not exceed 1,500ppm for more than 20 consecutive minutes in each day. 5. The required outdoor air ventilation rates and CO2 concentrations shall be maintained without the need for any human intervention e.g. the opening of windows or external louvres. 6. Ventilation systems shall be designed minimise the entry of outdoor pollutants through ensuring that the ventilation system design is in accordance with the relevant parts of AS 1668.2. and ASHRAE Standard 62.1. 7. Where local sources of pollutants are present e.g. photocopiers, minimum exhaust ventilation flow rates should be provided in accordance with AS1668.2: Table B1.	DG55.02	DAB c9 Indoor Air Quality	Mechanical drawings and specifications Extracts from commissioning report

Place	P3 – Welcoming learning spaces	**Ecological conservation** Schools sites must conserve for future generations, the biological diversity of genetic materials, species and ecosystems on that site and consider the surrounding natural environment. The design of the facilities must provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community. Schools must model best practice design, material use, systems and operational methodology, demonstrating human's connections to nature and the operation of natural cycles of sun, wind, rain and the four seasons. Schools must connect with nature and incorporate biophilic design principles. Open space must allow for exploration, and biodiversity and earth education to enhance the site's outdoor learning potential. New and refurbished schools must: Preserve or re-establish native flora (unless it poses a safety risk or cannot be designed around) and create new landscapes through liaising with local government authorities, Landcare and environmental groups, and the use of native low water use plants. Consider opportunities for development of community garden within the site and relationships with community groups for this to occur. Adequate due diligence must be conducted where biodiversity or high ecological value is identified on the site. For more details see DG90 Landscape Design	DG02.06	DAB c23 Ecological Value GSC c29 Ecological Value (incl Biodiversity Enhancement)	1) Biodiversity or ecological assessment / local flora and fauna survey 2) Biodiversity management plan describing measures for the conservation and protection of threatened species or communities, biodiversity enhancement, tree protection, etc. 3) Evidence demonstrating measures have been implemented to protect and enhance endangered species / ecological communities identified; to preserve or re-establish native flora; etc.
Place	P3 – Welcoming learning spaces	**Accessibility** -All new facilities must meet current DTS provisions of the NCC and the associated standards. Generally AS 1428.1 is the minimum design standard for access and mobility. However, it is DoE's policy that any enhanced requirements noted in AS 1428.2 be incorporated in any new design. -Additionally, DoE have enhanced circulation requirements as noted in DG / CIRCULATION - Provide hearing augmentation system for areas that have amplification, generally within Gymnasium, libraries, movement studios and Communal Halls, provide a system to assist the aurally challenged to hear music and speech within the main auditorium and on the stage - Provide the International Symbol for Deafness to indicate that an assistive hearing device is installed.	DG19.01 DG65.14	DAB 30D Universal design	1) Accessibility plan 2) As-built drawings or other evidence demonstrating that minimum and enhanced accessibility requirements have been provided for walkways, corridors, ramps, etc. 3) Photographic or other evidence of signage installed
Place	P3 – Welcoming learning spaces	**Weather protection** Circulation areas provided between administrative, staff and all student spaces (except Agriculture), should be protected from sun, rain and unfavourable winds.	DG08.05	Not covered in Green Star	As built drawings showing circulation areas are protected as required
Place	P3 – Welcoming learning spaces	**Open play space** Open play space must be provided for students to access during recess, lunch breaks and for outdoor learning. Open play space can be comprised of - Paved and grassed areas - Rooftops and terraces - Covered outdoor areas The designated open play space must be easily monitored and managed by school staff. Where a joint use agreement can be negotiated with a local council or land owner, the required play space can be located off-site, providing the facilities are - In close proximity to the school - Easily accessible - Safe and secure Designs must aim to achieve a minimum of 10m2 per student. Where this figure is not achievable the proposed m2 per student of the completed project must not be less than the existing m2 per student currently on the site.	DG10.03	Not covered in Green Star	Plan view drawings showing provision of open space
Place	P3 – Welcoming learning spaces	**Staff room**	N/A	GSI c Amenity Space	1) Extracts from the EFSG requirements for staff rooms 2) Evidence of staff room delivered accordingly
Place	P3 – Welcoming learning spaces	**Healthy canteen policy**	N/A	DAB c30D Integrating Healthy Environments	1) Research report behind Healthy Canteen Policy 2) Evidence that policy initiative has been incorporated into the school under assessment.
Place	P3 – Welcoming learning spaces	**Safety by design** - The Work Health and Safety Act and the Department of Education principles of student safety and welfare mandate the avoidance of accidents through careful design of facilities - The designer must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to minimise risks to the health and safety of all parties who will work on a site connected with its design as well as the end users of the facility. - An important part of the Safety by Design principle is recording the risk assessments that are conducted during the design and providing to the client, owners, any users/occupiers of the facilities and those who will be building or maintaining the facilities, details of risks and hazards identified. - The design of facilities should not only be inherently safe but visually and pragmatically safe and not tempt students or the general public into unsafe practice. Examples: Glazing: The safety of occupants is paramount where glass is being used, especially in areas subject to human impact. All glazing types and thickness are to comply with the relevant AS as a minimum. Hot water: To minimise scalding risk all hand basins, showers and the kitchen sink in practical activities areas serving IO/IS classes, require "warm" rather than "hot" water provided at a specified temperature, by mixing hot and cold water through a Thermostatic Mixing Valve. (Note: Tempering Valves are not permitted in schools) Drinking water tanks : Ensure rainwater is not collected from areas containing lead materials. All coating materials used inside the reservoir must be suitable for drinking water and guaranteed against liner leakage for a period of 20 years. A filtering and UV system to be provided where drinking water tanks are present.	DG14.02 DG31.03 DG53.11 DG53.16 DG53.17	Not covered in Green Star	1. Safety risk assessments 2. Short report identifying safety-by-design principles incorporated / Sign off by head contractor confirming all mandatory requirements in DG14 have been addressed. 3. Manufacturer's certificate to AS/NZS 4020 for tanks
Place	P3 – Welcoming learning spaces	**Microbial control** As a measure to prevent legionella, heated water to hand basins, showers etc. shall be stored at temperature above 65 C. Thermostatic mixing valves are to be used for tempered water generation at each point of use. Valves need to comply with microbe disinfection requirements - "Code of Practice for Thermostatic Mixing Valves NSW" as approved by the NSW Health Department.	DG51.09 DG53.11	DAB c28 Microbial Control	1. Letter by hydraulic engineer confirming hot water is stored above 65 deg and that valves comply with code of practice.
Place	P3 – Welcoming learning spaces	**Security** Safety in Design and Crime Prevention Through Environmental Design (CPTED) principles are to be implemented in project planning stage. Advice on the electronic surveillance systems can be sought early in the design phase. CCTV systems are required in several locations where indicated in the Rooms and Spaces Technical Data table, including: - Secondary clinic - Primary sick bay - Library	DG14.10 DG65.08 DG65.10	GSC c15 Safe Places	1) Crime risk assessment or equivalent 2) Evidence of designing out crime principles implemented 3) Security services plans, schedules and forms by School Security Unit (SSU) 4) SSU specification and evidence of input on project specification

Place	P3 – Welcoming learning spaces	**Hazardous materials** Where a new school is to be developed a Hazardous materials study is to be conducted, including: - Asbestos Containing Materials (ACM) - Synthetic Mineral Fibres (SMF) - Polychlorinated Biphenyl's (PCB) - Lead Paint - Ozone Depleting Substances Any existing structures and all parts of the site should be examined in order to determine the presence of hazardous materials before commencement of any renovation or demolition. Inspection should be conducted by organisations with the National Association of Testing Authorities (NATA) accreditation complying with the requirements of AS/NZS ISO.IEC 17020 for the inspection of hazardous materials (HazMat) including asbestos. Hazardous Materials inspection reports should be produced in accordance with the requirements of the various Safe Work Australia "Codes of Practice" for the management and control of hazardous substances. Where hazardous materials are found a Hazardous Materials Management Plan should be prepared	DG48.01	DAB 24.2 Contamination and Hazardous Materials	1. Hazardous materials study / site inspection report / survey 2. Management plans for hazardous materials identified 3. Remediation strategies implemented 4. Environmental auditor certificates / clearance certificates
Place	P3 – Welcoming learning spaces	**Digital infrastructure** New buildings and refurbishments are required to provide a common wireless solution compatible across the school, providing a consistent user experience and support mechanism. This involves the replacement of existing legacy wireless equipment, such as wireless access points and site switches	DG64.12.02	GSC c22.2 Digital Infrastructure	1) Contracts describing the network infrastructure specification and operational requirements
Place	P3 – Welcoming learning spaces	**Sustainability benchmarking** Ecologically Sustainable Development principles must be included in any new school buildings to a level that the building could be benchmarked to achieve a 5 Star Green Star rating if located in Sydney, Newcastle, or Wollongong metropolitan areas or a 4 star Green Star rating if located elsewhere in NSW. Benchmarking must be undertaken against the Green Star credits using the edition of the Green Star scorecard current at the time of the assessment. The filled out scorecard must demonstrate the project can achieve enough points for the required rating. Formal Green Star certification is not mandatory	DG02.09	All credits	1) Green Star scorecard demonstrated the final desing is benchmarked to the required rating (by a Green Star Accredited Professional)
Resilience	R1 – Preparation for shocks	**Site investigations for resilience** The following detailed reports/ surveys/ information should be considered in developing the business case: - Slope, drainage and erosion issues including flood risks (if any) - Geotechnical and soil conditions - Airborne pollutants - Bushfire risks - Appraisal of available services infrastructure - Climate change risk assessment must be undertaken considering at least two different climate change scenarios An environmental risk report will be required for developments proposed within sensitive natural environments or sites subject to natural risks (i.e. flood prone sites, bush fire areas).	DG03.02	DAB c3 Adaptation and Resilience	1) Detailed reports or surveys developed 2) Environmental risk report 3) Evidence demonstrating recommendations have been implemented and risks addressed through design responses.
Resilience	R1 – Preparation for shocks	**Bushfire protection** Development applications on bush fire prone land must be accompanied by a Bush Fire Assessment Report demonstrating compliance with the aim and objectives of Planning for Bush Fire Protection and the specific objectives and performance criteria for the land use proposed. Local Authorities and the Rural Fire Service can provide advice on the design of buildings in bush fire prone areas. The Building Code of Australia and AS3959 "Construction of buildings in bushfire-prone areas" set out the requirements for buildings which are within close proximity to a defined bush fire zone. Mandatory landscape management strategies: - Keep the amount of fuel (leaves, twigs, logs, dead grass) in the vicinity of buildings to a minimum. - Ensure trees are located at away from buildings to avoid branches overhanging and leaves collecting on roofs. - Do not plant shrubs against buildings. - The crowns of trees planted on the hazard side of the development should not be contiguous. - Plant fire resistant trees and shrubs on the hazard side of the development to reduce the potential impact of wind, fire intensity, radiant heat, and rate of spread as well as intercepting burning embers. - Avoid combustible fencing materials. - Provide irrigation and garden sprinklers to water areas near the buildings (subject to water authority approval).	DG13.01	DAB c3 Adaptation and Resilience	1) Bush fire assessment report 2) Statement by Architect / fire consultant outlining building strategies implemented in line with BCA and AS3959. 3) Bush fire management plan outlining management strategies implemented 4) Landscape plans detailing bush fire management measures implemented
Resilience	R2 – Preparation for stresses	**Climate change adaptation** Sites and school communities must be able to withstand natural and urban hazards and adaptively respond to climate change over time, especially for projects involving vulnerable communities e.g. climate generating exacerbated flood, storm surge, inundation, heatwaves, bush fires, extreme storm and other weather events. School facilities must be able to withstand natural hazards and adapt to shocks and stresses to avoid social and economic costs of interrupted operation and repairing or replacing damaged assets. To achieve this, increasing resilience to natural hazards must be considered in the business case development so that associated costs are budgeted. An initial assessment of natural hazards and project vulnerability must be carried out, in consultation with resilience experts, to inform the business case and identify hazards where further analysis is required. Where significant risks are identified in the initial assessment, a comprehensive climate change risk assessment must be undertaken. Any high or extreme risks identified must be addressed through design measures.	DG02.08	DAB c3 Adaptation and Resilience	1) Climate risk assessment, and 2) Climate adaptation plan 3) Emergency management plan

APPENDIX C: CLIMATE ADAPTATION PLAN



CLIMATE RISK ASSESSMENT REPORT

NEW PRIMARY SCHOOL IN EDMONDSON PARK

CLIMATE ADAPTATION PLAN

ESD SERVICES

JHA

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DOCUMENT CONTROL SHEET

Project Number	210104
Project Name	New Primary School in Edmondson Park
Description	Climate Adaptation Plan
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Revision History

Issued To	Revision and Date								
Richard Crookes Constructions	REV	Draft	Rev A						
	DATE	30/04/2021	20/05/2021						
	REV								
	DATE								
	REV								
	DATE								

CONTENTS

EXECUTIVE SUMMARY

A Climate Adaptation Plan (CAP) report has been prepared for the proposed new primary school development at Buchan Avenue, Edmondson Park.

The impacts of climate change were assessed across two time scales (2030 & 2070) and two Representative Concentration Pathways (RCP4.5 & RCP 8.5). Climate Futures matrices were used to determine the key climate projections based on multiple climate variables for this risk assessment. The key climate projections were used to inform the climate risk assessment.

The risk priority levels of the climate risks identified pre- and post-adaptation are summarised below:

Risk rating	2030 Pre-adaptation	2030 Post-adaptation	2070 Pre-adaptation	2070 Post-adaptation
Low	2	3	0	2
Medium	3	2	3	3
High	0	0	2	0
Extreme	0	0	0	0

The results of the climate risk assessment identified two high risks items pre-adaptation. These high risks were mitigated to medium risks by the proposed adaptation actions. The responses to high risks are summarised as follows:

1. Higher average surface temperature and less rainfall conditions causing an increase in the frequency and/or severity of bushfire events directly damaging the building. This risk is mitigated by ensuring non-combustible building elements are used in the fabric of the building and by implementing good management practice to remove potential fuel source around the building once the building is in operation.
2. Higher maximum daily temperature and lower humidity conditions resulting in higher frequency and/or duration of heatwaves resulting in insufficient capacity of the HVAC system to maintain thermal comfort. This risk is mitigated by the incorporation of passive thermal principles such as appropriate external shades and thermal insulation and by upgrading the capacity of the HVAC system once the current system has reached the end of its service life.

In summary all risk items identified as 'high' or 'extreme' are addressed by specific design responses in addition to at least two risks items identified in the risk assessment being addressed by specific design responses.

1 INTRODUCTION

This CAP report has been prepared for the proposed new primary school development at Buchan Avenue, Edmondson Park.

In accordance with Green Star – Design & As-Built v1.3 Credit 3 "Adaptation and Resilience" and EFSG DG02.08 "Climate Change Adaptation" the purpose of the CAP is to provide:

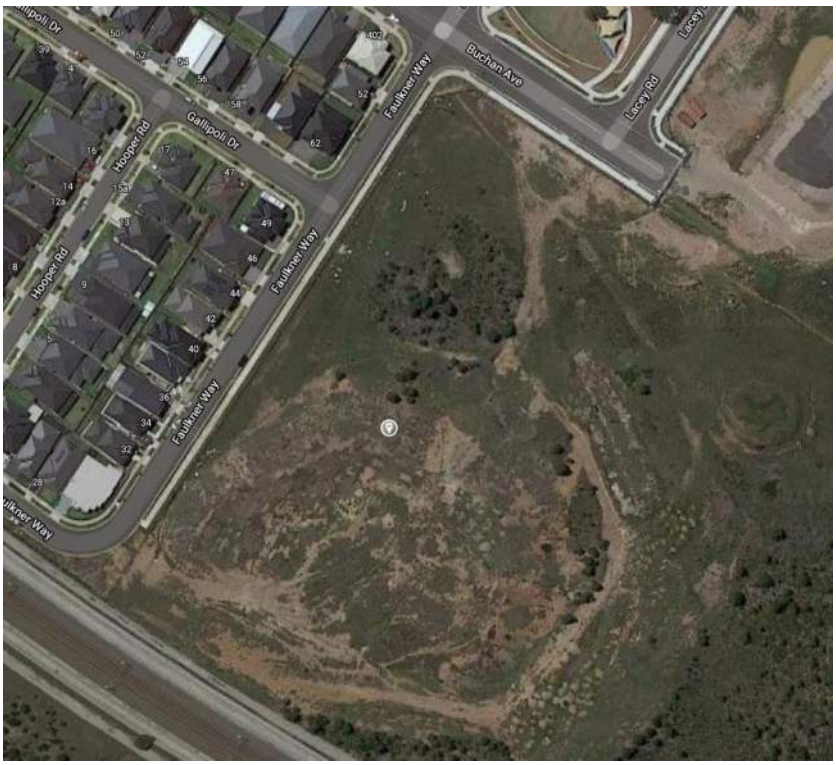
- Details of stakeholder consultation that was undertaken during plan preparation, incorporating their responses (see Section 1.3)
- Summary of the project's characteristics (site, location, climatic characteristics) (see Section 2)
- Assessment of climate change scenarios and impacts on the project using two time scale relevant to the project anticipated lifespan (see Section 3)
- Summary of potential direct and indirect climate change impacts (environmental, social and economic) (see Section 4)
- Identification of the potential risks for the project and people based on recognised standard (see Section 4)
- A list of actions and responsibilities for 'high' and 'extreme' risks identified (see Section 4)

1.1 PROJECT DESCRIPTION

The proposed development for a new core 35 primary school accommodating 1,012 students at Buchan Avenue, Edmondson Park will entail:

- Site preparation and excavation;
- Land use for the purpose of a new primary school;
- Construction of new buildings including:
- A three storey building on the western portion of the site primarily addressing Faulkner Way comprising 36 homebases, 4 special support unit teaching spaces, staff room, administration office at the ground floor and library at the first floor addressing the corner of Buchan Avenue and Faulkner Way, and student amenities;
- A coldshell of a single storey preschool for educational programs for children the year before they commence kindergarten, accommodating 40 places, connected at the southern end of the three storey building to be operated by Liverpool City Council; and
- A single storey building on the eastern portion of the site comprising a communal hall, out of school hours care, 8 homebases and covered outdoor learning area.
- Landscaping and public domains works including tree planting, a sports court and creation of various assembly, play and learning zones;
- A drop-off and pick-up zone, and bus zone on Buchan Avenue;
- An at-grade staff carpark at the south of the site with ingress and egress provided off Faulkner Way at the south-west corner of the site;
- Primary pedestrian entrance from Buchan Avenue and an additional entrance on Faulkner Way for the ground floor support unit; and
- Other ancillary infrastructure and utilities works and digital signage.

The new primary school can be seen from both Buchan Ave and Faulkner Way.



Aerial photo of site

1.2 REFERENCE DOCUMENTS AND STANDARDS

This CAP will assess potential risks and propose mitigation strategies as necessary in accordance with the following documents and standards:

- Green Star Design and As-Built v1.3 Submission Guidelines
- AS 5334:2013 Climate Change Adaptation for Settlement and Infrastructure
- EFSG DG02.06 Ecological Conservation
- ISO 31000-2009 – Risk Management – Principles and Guidance (adopted in Australia and New Zealand as AS/NZS ISO 31000:2009)
- The AGO's Climate Change Risks and Impacts: A Guide for Government and Business
- NSW and ACT Regional Climate Modelling (NARCliM) climate change projections

1.3 STAKEHOLDERS CONSULTATION

As a part of the CAP development process, the stakeholders consulted are listed below.

Stakeholder	Role
Richard Crookes Constructions – Anthony Mayo	Head Contractor
Tanner Kibble Denton Architects – Alex Kibble, Anna Harris, Heiron Chan	Architect
Northrop Consulting Engineers – Rory Dale, Matthew Burke, James Gilligan	Structural & Civil Engineer
JHA Consulting Engineers - Alex Troyak, Patrick Ilagan, Chris Hadjiyiannis, Marc Estimada, John Stefani, Mike Peh, Alex Frew, George Petropoulos, Mathew McGrory, Lawrence Yu, Gary Tang, Benjamin Li	Mechanical, Hydraulic, Fire Services, Electrical, AV, VT, Acoustic, ESD & Level 3 Engineer

2 PROJECT'S CLIMATIC CHARACTERISTICS

Edmondson Park is located in NCC Climate Zone 6, which is described as mild temperate.

As part of the Greater Sydney region, Edmondson Park enjoys a sunny climate with mild winters and warm summers.

2.1 BASELINE CLIMATIC CONDITIONS

The baseline climatic conditions for Edmondson Park are taken from the closest weather station data available from the Bureau of Meteorology. The closest weather station is Bankstown Airport AWS NSW which is approx. 11.9 km away from the building location.

Weather station details:

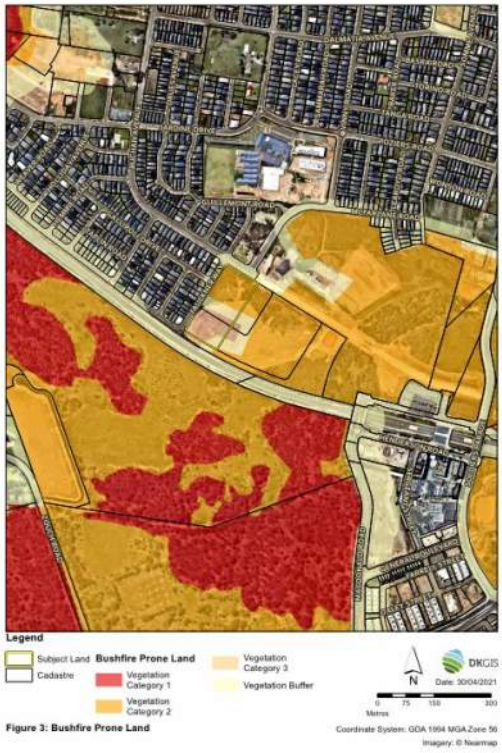
- Site name: BANKSTOWN AIRPORT AWS)
- Site number: 066137
- Latitude: 33.92 °S Longitude: 150.98 °E
- Elevation: 7 m
- Commenced: 1968
- Status: Open
- Last updated: 22 April 2021

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An.
Maximum temperature													
Mean maximum temperature (Degrees C)	28.5	27.9	26.3	23.8	20.6	17.8	17.4	19.0	21.7	24.0	25.5	27.5	23.3
Highest temperature (Degrees C)	47.0	45.3	41.3	36.9	28.8	25.4	26.8	30.2	35.6	39.7	43.1	44.9	47.0
Mean number of days >= 35 Degrees C	3.0	1.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.4	1.5	2.6	10.0
Minimum temperature													
Mean minimum temperature (Degrees C)	18.3	18.2	16.3	12.8	9.4	6.8	5.2	6.0	8.7	11.9	14.5	16.8	12.1
Lowest temperature (°C)	10.4	10.0	7.8	2.4	1.3	-1.9	-4.0	-0.7	0.0	4.4	6.8	6.3	-4.0
Mean number of days <= 2 Degrees C	0.0	0.0	0.0	0.0	0.1	1.5	4.4	2.0	0.0	0.0	0.0	0.0	8.0
Rainfall													
Mean rainfall (mm)	92.0	107.0	105.1	82.4	63.6	79.6	44.3	49.6	44.4	60.3	74.9	67.2	866.4
Highest rainfall (mm)	262.0	439.8	339.0	416.2	237.4	332.8	150.2	388.0	176.4	195.8	213.0	260.7	1397.8
Mean number of days of rain ≥ 25 mm	1.0	1.2	1.1	0.9	0.6	0.8	0.3	0.5	0.3	0.4	0.7	0.7	8.5
Solar & Cloudy Days													
Mean daily solar exposure (MJ/m2)	22.4	19.5	16.5	13.5	10.5	8.7	9.9	13.2	16.8	19.8	21.4	22.8	16.3
Mean number of cloudy days	12.1	10.7	10.1	7.8	8.4	8.4	6.1	5.2	6.3	9.4	9.5	9.7	103.7

2.2 PAST EXTREME EVENTS

Extreme events that have impacted a site in the past are indicative of possible extreme events that will impact the site in the future. The identification of past extreme events will help highlight the climate risks that should be the focuses of this risk assessment.

- Bushfire – In recent years there has been an increase in the number of high fire weather danger days, more severe fire weather and much longer fire seasons in NSW. Bush fire prone land (BFPL) is land that has been identified by NSW Rural Fire Service which can support a bush fire or is subject to bush fire attack. The NSW RFS Bush Fire Prone Land Map (below) [Source: Bushfire Assessment prepared by Peterson Bushfire dated on 12 May 2021] shows the proposed development site is identified as bushfire prone land. The bushfire prone vegetation consists of woodland to the south of the railway line and the potential for undeveloped lots to the east, including the subject land, to present an unmanaged grassland hazard.



Bush Fire Prone Land Map

- Heatwaves – A heatwave is defined as three or more days of high maximum and minimum temperatures that are unusual for that location. Over the period 1911–2013, heatwaves in parts of NSW have become longer, hotter and occur more often [Source: AdaptNSW Heatwaves Climate Change Impact Snapshot]. Hotter and more frequent heatwaves will contribute to the risk of bushfires. Research shows a link between excessive heat and childhood emergency department attendances for diseases such as asthma, fever, gastroenteritis, and electrolyte imbalances.

  Studies have also shown that learning performance can be impacted by higher temperatures. Warm buildings may decrease interest and alertness, distracting students and teachers and other staff workers. In hotter buildings, headaches and heat exhaustion symptoms may develop that can hinder academic performance. High temperatures may be accompanied by higher levels of humidity. Increased humidity can cause drowsiness in both students and staffs. Studies have shown concentration performance is lower in humid, hot environments. The NSW Heat Vulnerability Index (HVI) dataset identifies the site currently as low/medium vulnerability to the adverse effects of urban heat. [Source: https://climatechange.environment.nsw.gov.au/Impacts-of-climate-change/Heat/Urban-heat]

Heat Vulnerability Index Map Viewer

- Storms/Gustier Wind – Thunderstorms are the most common type of storms in New South Wales, causing more damage than any other short duration weather event. They are most likely to hit Sydney from October to March. They can last from 10 minutes to several hours, with very strong winds, heavy rain and hail causing flash flooding, power outages and damage to property. Historically, this area has experienced low rainfall intensity for 60minute 1:100yr Storm. Predicted to receive 61.1 mm, or up to 367 mm over 3 days. [Source: Bureau of Meteorology http://www.bom.gov.au/water/designRainfalls/]

- Floods/Extreme Rain – No known exposure to flood events. The development site is not within Flood Planning Area (below). The closest river to the proposed site is Georges River, Liverpool City Council's Floodplain Risk Management Study and Plan is as below[Source: https://www.liverpool.nsw.gov.au/environment/water-and-waterways/flood-management]

Flood Plan – NSW Planning Portal

- Extended drought periods – The site is identified as the "Non-Drought" area and no historical drought events have been found. [Source: NSW Combined Drought Indicator]

2.3 PROJECT SPECIFIC RISK STATEMENTS

Based on the project's baseline climatic characteristics and past extreme events, the following project specific climate risk statements are formulated:

1. Hotter and dryer conditions causing increase in the frequency and/or severity of bushfire and heatwave events.
2. Higher maximum temperatures and more humid conditions causing increase in frequency and/or duration of extreme heat days (over 35 °C) and heatwave events.

3 CLIMATE CHANGE SCENARIOS AND IMPACTS

3.1 REGIONAL OVERVIEW

The subject site is located within the East Coast South sub-cluster as defined by the CSIRO and Australian Government.

East Coast South sub-cluster

The East Coast south sub-cluster comprises Natural Resource Management (NRM) regions in the central part of the eastern seaboard of Australia. The area encompasses important headwater catchments for a high proportion of Australia's population.

The sub-cluster area has a predominantly sub-tropical climate, with regional variations such as some temperate influences in the south.

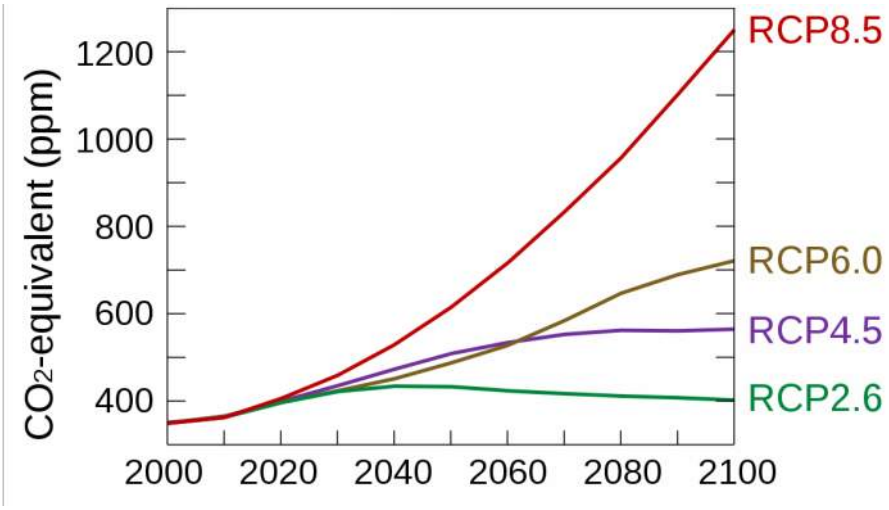
Key projection messages for this sub-cluster:

- Average temperatures will continue to increase in all seasons (very high confidence).
- More hot days and warm spells are projected with very high confidence. Fewer frosts are projected with high confidence.
- Temperatures have increased over the past century, with the rate of warming higher since 1960. Mean temperature increased between 1910 and 2013 by around 0.8°C. The recent decades have been the warmest on record for both daily minimum and daily maximum temperatures in the cluster.
- For near future (2030), the annual averaged warming across all emissions scenarios is projected to be around 0.5 to 1.3°C above the climate of 1986 – 2005.
- By late in the century (2090), for a high emission scenario (RCP8.5) and projected range of warming is 2.9 to 4.6°C. Under an intermediate scenario (RCP4.5) the projected warming is 1.3 to 2.5°C.
- Decreases in winter rainfall are projected with medium confidence. Other changes are possible but unclear.

- Increased intensity of extreme rainfall events is projected, with high confidence.
- Mean sea level will continue to rise and height of extreme sea-level events will also increase (very high confidence).
- A harsher fire-weather climate in the future (high confidence).
- On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.

3.2 REPRESENTATIVE CONCENTRATION PATHWAY

In order to source relevant climate projection, appropriate Representative Concentration Pathway (RCPs) based on the latest Intergovernmental Panel on Climate Change (IPCC) report are chosen. The RCPs provide plausible climate futures that may eventuate over the coming years. There are four pathways: RCP8.5, RCP6, RCP4.5, RCP2.6, where the numbers of each RCP refer to the amount of radiative forcing produced by greenhouse gases in 2100.



IPCC Representative Concentration Pathway

The RCP 8.5 scenario has been selected as one future climate projection for this assessment as it is the most conservative pathway and because current emissions are tracking close to RCP 8.5. RCP 8.5 reflects a future with less curbing of emissions and continued increase in fossil fuel use. It is the generally taken as the basis for worst-case climate change scenarios.

The RCP 4.5 is chosen to represent a stabilisation pathway in which lower emissions is achieved by application of some mitigation strategies and technologies. RCP 4.5 reflects a future where emissions peak around 2040, and the CO_2 concentration reaches 540 ppm by 2100.

3.3 PROJECTION TIME SCALE

The lifespan of the project components were considered to determine the appropriate projection time scale. Based on components design life of a school building, the time series that is selected to understand the future climate impacts across the project's life are 2030 and 2070.

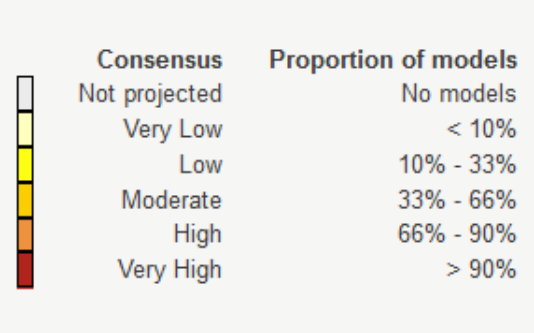
3.4 CLIMATE VARIABLES OF INTEREST

Based on the project's characteristics, the climate variables of interest for this site are:

Events	Variables	Key Cases
Bushfires	Mean surface temperature and rainfall (Summer)	"Best Case": Climate Future with the least increase in mean surface temperature and the least decrease (or most increase) in rainfall (shorthand: "coolest and wettest") "Worst Case": Climate Future with the greatest increase in mean surface temperature and the greatest decrease (or least increase) in rainfall (shorthand: "hottest and driest")
Heatwaves	Maximum daily temperature and humidity (Annual)	"Best Case": Climate Future with the least increase in maximum daily temperature and the least increase (or most decrease) in humidity (shorthand: "coolest and least humid") "Worst Case": Climate Future with the greatest increase in maximum daily temperature and the greatest increase (or least decrease) in humidity (shorthand: "hottest and most humid")

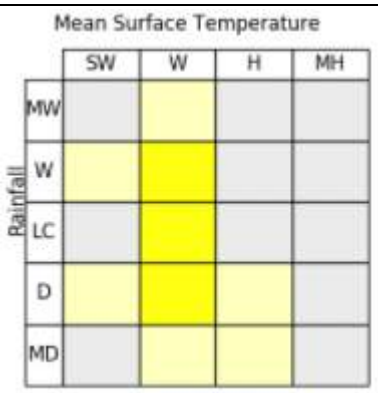
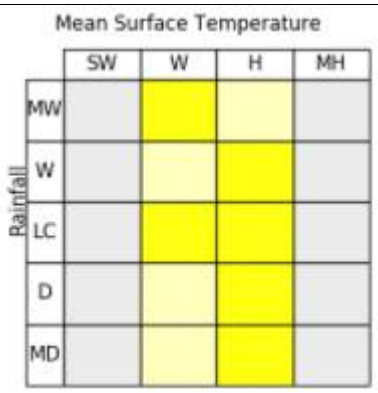
3.5 CLIMATE FUTURE PROJECTIONS

The series of climate futures matrices representing the combination of time periods and greenhouse gas scenarios and classified by the combined changes of the climate variables identified above are provided in table below. All climate future matrices are sourced from CSIRO and Bureau of Meteorology, Climate Change in Australia website - www.climatechangeinaustralia.gov.au, cited 23/04/2020.



Colour legend of climate future projection consensus levels

3.5.1 SUMMER MEAN SURFACE TEMPERATURE AND RAINFALL MATRICES (FOR BUSHFIRES)

<table>
<tr><td colspan="2" rowspan="2">East Coast Climate Futures</td><td colspan="2">Year</td></tr>
<tr><td>2030</td><td>2070</td></tr>
<tr><td rowspan="2">Emissions Scenarios</td><td>RCP 4.5</td><td> 
</td><td> 
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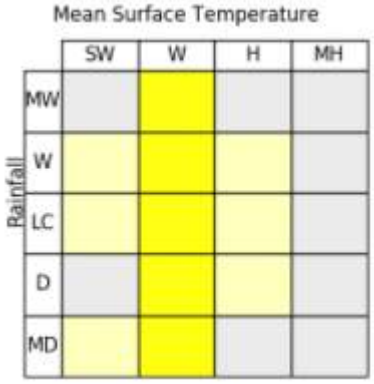
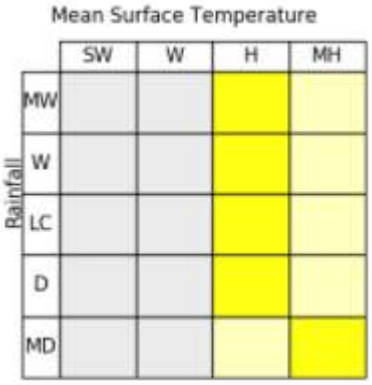
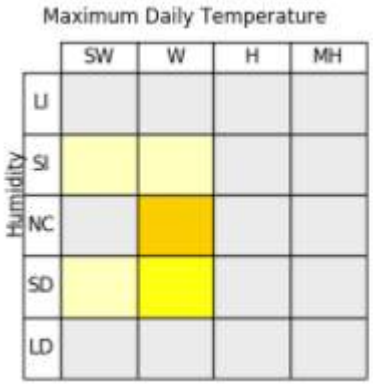
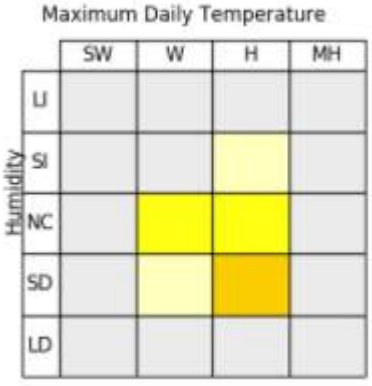
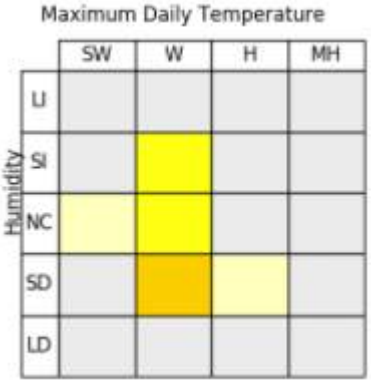
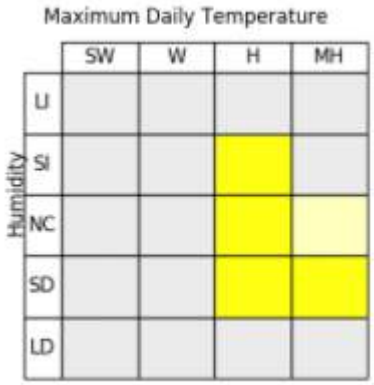
<tr><td>RCP 8.5</td><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Keys</td><td>Summer Mean Surface Temperature
SW Slightly Warmer < 0.50
W Warmer 0.50 to 1.50
H Hotter 1.50 to 3.00
MH Much Hotter > 3.00</td><td>Summer Rainfall
MW Much Wetter > 15.00
W Wetter 5.00 to 15.00
LC Little Change -5.00 to 5.00
D Drier -15.00 to -5.00
MD Much Drier < -15.00</td></tr>
</table>

3.5.2 PROJECTED CLIMATE SCENARIOS FOR BUSHFIRES

Case	2030 Climate Future		2070 Climate Future	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
"Best" Coolest and wettest	Warmer and much wetter, slightly warmer and wetter (Consensus: Very low)	Warmer and much wetter, slightly warmer and wetter (Consensus: Low and very low)	Warmer and much wetter (Consensus: Low)	Hotter and much wetter (Consensus: Low)
"Worst" Hottest and driest	Hotter and much drier (Consensus: Very low)	Hotter and drier (Consensus: Very low)	Hotter and much drier (Consensus: Low)	Much hotter and much drier (Consensus: Low)
"Maximum consensus"	Warmer and wetter to drier (Consensus: Low)	Warmer and much drier or little change, hotter and wetter to much drier (Consensus: Low)	Warmer and much wetter to much drier (Consensus: Low)	Hotter and much wetter to drier, much hotter and much drier (Consensus: Low)

The projected climate scenarios indicate a summer that will be warmer and hotter in the near future. There is no strong consensus whether rainfall will become wetter or drier in the near future but hotter temperature may impact on the risks of bushfire event.

3.5.3 ANNUAL MAXIMUM DAILY TEMPERATURE AND HUMIDITY MATRICES (FOR HEATWAVES)

<table>
<tr><td colspan="2" rowspan="2">East Coast Climate Futures</td><td colspan="2">Year</td></tr>
<tr><td>2030</td><td>2070</td></tr>
<tr><td rowspan="2">Emissions Scenarios</td><td>RCP 4.5</td><td> 
</td><td> 
</td></tr>
<tr><td>RCP 8.5</td><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Keys</td><td>Annual Maximum Daily Temperature
SW Slightly Warmer < 0.50
W Warmer 0.50 to 1.50
H Hotter 1.50 to 3.00
MH Much Hotter > 3.00</td><td>Annual Humidity
LI Large Increase > 10.00
SI Small Increase 1.00 to 10.00
NC No Change -1.00 to 1.00
SD Small Decrease -10.00 to -1.00
LD Large Decrease < -10.00</td></tr>
</table>

3.5.4 PROJECTED CLIMATE SCENARIOS FOR HEATWAVES

Case	2030 Climate Future		2070 Climate Future	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
"Best" Coolest and wettest	Slightly warmer and small increase (Consensus: Very low)	Warmer and small increase (Consensus: Low)	Hotter and small increase, warmer and no change (Consensus: Very low and low)	Hotter and small increase (Consensus: Low)
"Worst" Hottest and driest	Warmer and small decrease (Consensus: Low)	Hotter and small decrease (Consensus: Very low)	Hotter and small decrease (Consensus: Moderate)	Much hotter and small decrease (Consensus: Low)
"Maximum consensus"	Warmer and no change (Consensus: Moderate)	Warmer and small decrease (Consensus: Moderate)	Hotter and small decrease (Consensus: Moderate)	Hotter and small increase to small decrease, much hotter and small decrease (Consensus: Low)

The projected climate scenarios indicate the max daily temperature that will be hotter and warmer in the near future and the humidity has no change or small decrease. In these projected scenarios, the risk of heatwaves will be increased.

4 CLIMATE RISK ASSESSMENT

The qualitative descriptions used in the risk assessment to categorise risks as low, medium, high and extreme depending on the likelihood and consequence are in accordance with the AGO's Climate Change Risks and Impacts: A Guide for Government and Business. Details of the qualitative descriptions are provided in Appendix A.

4.1 RISK ASSESSMENT TABLE

Climate Variables and Risks	Climate Projections	Potential Climate Impacts	Pre-adaptation Actions						Proposed Adaptation Actions	Post-adaptation Actions						Summary of how measures reduce risk
			2030			2070				2030			2070			
			C	L	Rating	C	L	Rating		C	L	Rating	C	L	Rating	
Hotter and dryer conditions resulting in higher frequency and/or severity of bushfire events	The projected climate scenarios indicate a summer that will be warmer and hotter in the near future. There is no strong consensus whether rainfall will become wetter or drier in the near future but hotter temperature may impact on the risks of bushfire event.	DIRECT: Increased bushfires risk due to warmer to hotter conditions may cause direct damage to the facilities.	Major	Rare	Low	Major	possible	High	Investigate locations of vulnerability, remove potential fuel sources surrounding the building such as removing dead vegetation as part of ongoing landscaping/maintenance works. Use of non-combustible construction materials as per regulation. Put in place evacuation plan in case of fire threatening building.	Major	Rare	Low	Major	Unlikely	Medium	The risk and impact of bushfire on the building will be reduced if good management practice are implemented. A properly considered evacuation plan will minimise the risks to occupants of the building.
		DIIRECT: Increased bushfires risk due to warmer to hotter conditions may increase exposure to smoke and particulate for staff and visitors, impacting health.	Minor	Possible	Medium	Minor	Possible	Medium	Ensure building is well sealed to minimise risks of smoke infiltration. Consider pressurised staircase and Put in place smoke hazard management strategies.	Minor	Unlikely	Low	Minor	Unlikely	Low	The risk and impact of smoke on occupants will be reduced if good management practice are implemented.
		INDIRECT: Increased bushfires risk may damage power infrastructure, disrupting operation of facility.	Moderate	Possible	Medium	Moderate	Possible	Medium	Backup generator to provide power to safety critical services. On-site renewable energy to reduce the maximum demand from the grid. Ensure critical data and information can be accessed offline.	Minor	Possible	Medium	Minor	Possible	Medium	The alternative power supply and ability to access information offline will facilitate the ongoing operation of the facility.

Hotter and dryer conditions resulting in higher frequency and/or duration of heatwaves/ extreme heat-days (over 35 degree Celsius)	The projected climate scenarios indicate the max daily temperature that will be hotter and warmer in the near future and the humidity has no change or small decrease. In these projected scenarios, the risk of heatwaves will be increased.	DIRECT: Extreme heat will increase demand on HVAC system and may impact the ability of HVAC system to maintain thermal comfort of occupants due to capacity constraints.	Moderate	Possible	Medium	Moderate	Likely	High	Incorporate passive thermal design principles in the design and construction of the building such as appropriate levels of shading devices thermal insulation. Provide light coloured roofs to reduce heat gains via the roof and help mitigate urban heat island effect. Provide additional photovoltaic panels to provide renewable electricity to help offset the additional HVAC electricity demand. When replacing HVAC units at the end of service life, consider upsizing capacity of units in line with change in climatic conditions. Provide dedicated "Cool outdoor areas" where students and teachers can take shelter during extreme hot days when the power fails should be explored by the design team. This cool area should utilise passive design principals to moderate temperature during extreme days. Secondly, this cool area should consider ways to harness the cooling power of water to provide additional cooling. For example, provide shaded outdoor areas with drinking fountains as cool shelters during extreme heat event.	Moderate	Possible	Medium	Moderate	Possible	Medium	The incorporation of passive thermal design principles will help mitigate extreme heat risks in the near future. Appropriate upgrade of HVAC equipment at their end of their service life will help ensure system will be capable of handling more extreme temperatures in the far future.
		DIRECT: Extreme heat may impact the operation of electrical equipment and infrastructures due temperature to exceeding design limits.	Minor	Unlikely	Low	Minor	Possible	Medium	In the near future, current temperature ratings for electrical equipment should be able to cope with projected temperature increase relevant to the components design life. In the far future, equipment should be gradually upgraded as required to cope with more extreme conditions.	Minor	Unlikely	Low	Minor	Unlikely	Low	Appropriate upgrade of electrical equipment at their end of their service life will help ensure system will be capable of handling more extreme temperatures in the far future.

4.2 RESPONSES TO HIGH AND EXTREME RISKS

The risk assessment identified two high risks for the proposed development by 2070 (zero high risks by 2030). No extreme risks were identified. The responses to high risks are summarised as follows:

1. Higher average surface temperature and less rainfall conditions causing an increase in the frequency and/or severity of bushfire events directly damaging the building. This risk is mitigated by ensuring non-combustible building elements are used in the fabric of the building and by implementing good management practice to remove potential fuel source around the building once the building is in operation.
2. Higher maximum daily temperature and lower humidity conditions resulting in higher frequency and/or duration of heatwaves resulting in insufficient capacity of the HVAC system to maintain thermal comfort. This risk is mitigated by the incorporation of passive thermal principles such as appropriate external shades and thermal insulation and by upgrading the capacity of the HVAC system once the current system has reached the end of its service life.

4.3 RISKS SUMMARY

The table below shows all risk items identified as 'high' or 'extreme' are addressed by specific design responses and at least two risks items identified in the risk assessment are addressed by specific design responses.

Risk rating	2030 Pre-adaptation	2030 Post-adaptation	2070 Pre-adaptation	2070 Post-adaptation
Low	2	3	0	2
Medium	3	2	3	3
High	0	0	2	0
Extreme	0	0	0	0

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5 CONCLUSION

A Climate Adaptation Plan (CAP) report has been prepared for the proposed new primary school development at Buchan Avenue, Edmondson Park.

In particular, this CAP specifically addressed:

- The details of stakeholder consultation that was undertaken during plan preparation in Section 1.3;
- The project's characteristics in Section 2;
- The assessment of climate change scenarios and impacts on the project in see Section 3;
- The potential direct and indirect climate change impacts in Section 4;
- The potential risks for the project and people in Section 4; and
- The actions to reduce 'high' and 'extreme' risks identified in Section 4.

The impacts of climate change were assessed across two time scales (2030 & 2070) and two Representative Concentration Pathways (RCP4.5 & RCP 8.5). Climate Futures matrices were used to determine the key climate projections based on multiple climate variables for this risk assessment. The key climate projections were used to inform the climate risk assessment.

The results of the climate risk assessment identified two high risks items pre-adaptation. These high risks were mitigated to medium risks by the proposed adaptation actions.

APPENDIX A – RISK ASSESSMENT FRAMEWORK

The following risk assessment framework is used to determine consequence and likelihood ratings. Based on these ratings, the risk rating has been determined.

CONSEQUENCE CRITERIA

Consequence descriptor	Adaptive capacity (see Note 1)	Infrastructure, service	Social/cultural	Governance	Financial (see Note 2)	Environmental (see Note 3)	Economy (see Note 4)
Insignificant	No change to the adaptive capacity	No infrastructure damage, little change to service	No adverse human health effects	No changes to management required	Little financial loss or increase in operating expenses	No adverse effects on natural environment	No effects on the broader economy
Minor	Minor decrease to the adaptive capacity of the asset. Capacity easily restored	Localized infrastructure service disruption No permanent damage. Some minor restoration work required Early renewal of infrastructure by 10–20% Need for new/modified ancillary equipment	Short-term disruption to employees, customers or neighbours Slight adverse human health effects or general amenity issues	General concern raised by regulators requiring response action	Additional operational costs Financial loss small, <10%	Minimal effects on the natural environment	Minor effect on the broader economy due to disruption of service provided by the asset
Moderate	Some change in adaptive capacity. Renewal or repair may need new design to improve adaptive capacity	Limited infrastructure damage and loss of service Damage recoverable by maintenance and minor repair Early renewal of infrastructure by 20–50%	Frequent disruptions to employees, customers or neighbours. Adverse human health effects	Investigation by regulators Changes to management actions required	Moderate financial loss 10–50%	Some damage to the environment, including local ecosystems. Some remedial action may be required	High impact on the local economy, with some effect on the wider economy

(continued)

Consequence descriptor	Adaptive capacity (see Note 1)	Infrastructure, service	Social/cultural	Governance	Financial (see Note 2)	Environmental (see Note 3)	Economy (see Note 4)
Major	Major loss in adaptive capacity. Renewal or repair would need new design to improve adaptive capacity	Extensive infrastructure damage requiring major repair Major loss of infrastructure service Early renewal of infrastructure by 50–90%	Permanent physical injuries and fatalities may occur Severe disruptions to employees, customers or neighbours	Notices issued by regulators for corrective actions Changes required in management. Senior management responsibility questionable	Major financial loss 50–90%	Significant effect on the environment and local ecosystems. Remedial action likely to be required	Serious effect on the local economy spreading to the wider economy
Catastrophic	Capacity destroyed, redesign required when repairing or renewing asset	Significant permanent damage and/or complete loss of the infrastructure and the infrastructure service Loss of infrastructure support and translocation of service to other sites Early renewal of infrastructure by >90%	Severe adverse human health effects, leading to multiple events of total disability or fatalities Total disruptions to employees, customers or neighbours Emergency response at a major level	Major policy shifts Change to legislative requirements Full change of management control	Extreme financial loss >90%	Very significant loss to the environment. May include localized loss of species, habitats or ecosystems Extensive remedial action essential to prevent further degradation. Restoration likely to be required	Major effect on the local, regional and state economies

NOTES:

1 Adaptive capacity relates to the ability of the infrastructure element and/or organization to adapt/change/cope with change in the climate change variable.

2 Financial loss will be relative to the infrastructure element being considered (i.e. a single building, coastal town, rail system). Dollar values need to include replacement cost for the infrastructure item and financial loss/costs relating to the loss of the service provided by the infrastructure item.

3 While the term 'environment' can include both man-made and natural systems, in this Standard 'environment' is limited to the natural environment outside the asset being considered.

4 Economy refers to the local economy (e.g. town or region), the state economy, or the economy of Australia as a whole. Significance of this measure will depend on the asset being considered.

LIKELIHOOD CRITERIA

Rating	Descriptor	Recurrent or event risks	Long term risks
Almost certain	Could occur several times per year	Has happened several times in the past year and in each of the previous 5 years *or* Could occur several times per year	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated
Likely	May arise about once per year	Has happened at least once in the past year and in each of the previous 5 years *or* May arise about once per year	Has a 60–90% chance of occurring in the identified time period if the risk is not mitigated
Possible	Maybe a couple of times in a generation	Has happened during the past 5 years but not in every year *or* May arise once in 25 years	Has a 40–60% chance of occurring in the identified time period if the risk is not mitigated
Unlikely	Maybe once in a generation	May have occurred once in the last 5 years *or* May arise once in 25 to 50 years	Has a 10–30% chance of occurring in the future if the risk is not mitigated
Rare	Maybe once in a lifetime	Has not occurred in the past 5 years *or* Unlikely during the next 50 years	May occur in exceptional circumstances, i.e. less than 10% chance of occurring in the identified time period if the risk is not mitigated

RISK PRIORITY LEVELS

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	L	M	H	E	E
Likely	L	M	M	H	E
Moderate	L	L	M	H	E
Unlikely	L	L	M	M	H
Very unlikely	L	L	L	M	M

LEGEND:
E = Extreme risk, requiring immediate action.
H = High risk issue requiring detailed research and planning at senior management level.
M = Moderate risk issue requiring change to design standards and maintenance of assets.
L = Low risk issue requiring action through routine maintenance of assets.

APPENDIX B: NCC 2019 SECTION J PART J1 STATEMENT OF COMPLIANCE REV C

JHA

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12 October 2021

Richard Crookes Constructions
Level 3, 4 Broadcast Way,
Artarmon NSW 2064

Attention: D. Vidovic

Dear Daniel,

NCC 2019 Section J Part J1 Statement of Compliance

SUBJECT PREMISE: New Primary School in Edmondson Park, Western Sydney Region

This NCC 2019 Section J Part J1 statement has been prepared to demonstrate design compliance of the proposed new educational buildings of New Primary School in Edmondson Park located between Buchan Ave and Faulkner Way, within the suburb of Edmondson Park NSW 2174 against the requirements of the National Construction Code 2019 Volume One, Amendment 1 Section J Part J1 Building Fabric.

NCC Climate Zone	Zone 6
NCC Building Classification & Use	Class 9b
Architectural Drawings	TKD Architects Project No. 210002 Issued 11/10/2021

Title	Drawing No.	Revision
Site Plan	AR-W-DW-1001	F
Demolition Plan	AR-W-DW-1400	C
Campus Plan – Ground Floor Plan	AR-W-DW-2000	H
Campus Plan – First Floor Plan	AR-W-DW-2001	H
Campus Plan – Second Floor Plan	AR-W-DW-2002	H
Ground Floor Plan	AR-W-DW-2100	H
First Floor Plan	AR-W-DW-2101	H
Second Floor Plan	AR-W-DW-2102	H
Roof Plan	AR-W-DW-2103	G
External Building Elevations – Sheet 01	AR-W-DW-3100	F
External Building Elevations – Sheet 02	AR-W-DW-3101	F
Internal Building Elevations	AR-W-DW-3102	F
Building Cross Sections	AR-W-DW-3400	F
Building Long Sections	AR-W-DW-3401	F
Materials and Finishes	AR-W-DW-4300	B

As per the JV3 Verification Method Provisions of NCC 2019 Volume One, Amendment 1, compliance with Part J1 is met using the following specifications:

Building Fabric

Elements	Total Construction R-value
Envelope Roof/Ceiling – Type A	R3.6 (Downwards, Solar Absorptance of the upper surface of a roof must no more than 0.40)
Envelope Roof/Ceiling – Type B	R3.6 (Downwards, Solar Absorptance of the upper surface of a roof must no more than 0.69)
External Walls – Type A	R1.6
External Walls – Type B	R1.1
Envelope Floors	R2.2 (Downwards)

Note: The impacts of thermal bridge must be included in the total construction R-value calculations.

JV3 modelling results demonstrating compliance are attached as Attachment A. The tabulated PMV results demonstrating design compliance to the performance criteria are attached as Attachment B. Building fabric requirement markups showing insulation locations are attached as Attachment C.

Glazed Elements

Location – All Buildings	Window Assembly (Glass & Frame)		Description
	Total U-value	Total SHGC	
External Vertical Envelope Glazing – Casement, Louvre Type	5.4	0.40	Single Glazed Low-E Tinted or the like
External Vertical Envelope Glazing – Hall	5.4	0.40	Single Glazed Low-E Tinted or the like
External Vertical Envelope Glazing – Other Areas	3.6	0.40	Double Glazed Tinted or the like

JV3 modelling results demonstrating compliance are attached as Attachment A. The tabulated PMV results demonstrating design compliance to the performance criteria are attached as Attachment B.

JHA recommends any design changes to be reviewed and approved before documentation.

Additional Section J Compliance Notes

JHA recommend the following general construction requirements from Section J of the NCC2019 to be included to the architectural specification and drawings to ensure compliance.

Part J1 – Building Fabric

- J1.2 (a-e) Thermal Construction – general installation requirements for insulations

Full Name of Designer:	Gary Tang
Qualifications:	B.Eng, M.Eng.Sc
Address of Designer:	JHA Level 23, 101 Miller Street, NORTH SYDNEY NSW 2060
Business Telephone No:	(02) 9437 1000
Name of Employer:	JHA

Yours sincerely,

Gary Tang
Sustainability Engineer

* This report is prepared for the nominated recipient only and relates to the specific scope of work and agreement between JHA and the client (the recipient). It is not to be used or relied upon by any third party for any purpose.

Attachment A – JV3 Modelling Results:

Thermal modelling was undertaken using the modelling software, IES VE, to demonstrate the compliance with the Performance Requirement for JP1, Section J NCC 2019, Volume One, Amendment 1. Energy simulation was conducted in accordance with NCC 2019, Volume One, Amendment 1 JV3 requirements and the calculation method of the ABCB Protocol.

	North Wing	South Wing	Hall	East Wing
Annual Greenhouse Gas Emission	(kgCO2-e/m2.annum)			
Reference Building	44.57	48.44	48.60	44.89
Proposed Building JV3(a)(ii)	42.08	46.48	48.55	44.13

The Annual Greenhouse Gas Emission of the Proposed Building is less than Annual Greenhouse Gas Emission of Reference Building.

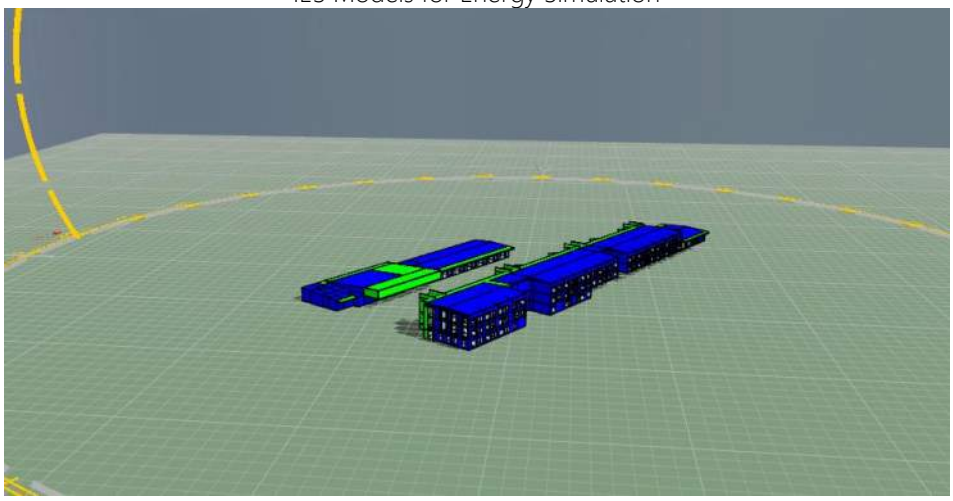
JV3 (a) (ii) requires that in the proposed building, a thermal comfort level of between a Predicted Mean Vote (PMV) of -1 to +1 is achieved across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building. The average percentage of occupied hours where a PMV of +/- 1 for each proposed block is shown below:

- North Wing – **99.52 %** of the occupied hours
- South Wing – **99.28 %** of the occupied hours
- Hall – **98.66 %** of the occupied hours
- East Wing – **99.33 %** of the occupied hours

The PMV modelling results demonstrate that the proposed blocks meet the above thermal comfort level requirement for 98% of occupied hours for individual zones.

Therefore, the Building Fabric and Glazing of the Proposed Building is compliant with JP1.

IES Models for Energy Simulation



MODELLING INPUTS

Elements (Total R-value)	Reference Building	Proposed Building
Envelope Roof/Ceiling – Type A	R3.2 (SA=0.45)	R3.6 (SA=0.40)
Envelope Roof/Ceiling – Type B	R3.2 (SA=0.45)	R3.6 (SA=0.69)
External Walls – Type A	R1.4	R1.6
External Walls – Type B	R1.4	R1.1
Envelope Floors	R2.0	R2.2

GLAZING INPUTS

Elements	Orientation	Reference Building		Proposed Building
		Total U-value	Total SHGC	
North Wing	N	1.0	0.37	External Vertical Envelope Glazing (Casement and Louvre Type) U=5.4 & SHGC=0.40 External Vertical Envelope Glazing (Other Types) U=3.6 & SHGC=0.40
	E	1.0	0.37	
	S	-	-	
	W	1.0	0.37	
South Wing	N	-	-	
	E	1.0	0.37	
	S	-	-	
	W	1.0	0.37	
Hall	N	-	-	
	E	1.0	0.37	
	S	1.0	0.37	
	W	1.0	0.37	
East Wing	N	-	-	
	E	1.0	0.37	
	S	-	-	
	W	1.0	0.37	

PMV SPACE CONDITIONING SET POINTS

Summer

Period	Conditioned Spaces	Set Point
Dec to Feb	North Wing	24.0°C
	South Wing	
	Hall	
	East Wing	

Autumn

Period	Conditioned Spaces	Set Point
Mar to May	North Wing	22.5°C
	South Wing	
	Hall	
	East Wing	

Winter

Period	Conditioned Spaces	Set Point
Jun to Aug	North Wing	21.0°C
	South Wing	
	Hall	
	East Wing	

Spring

Period	Conditioned Spaces	Set Point
Sep to Nov	North Wing	22.5°C
	South Wing	
	Hall	
	East Wing	

PMV INPUT COMFORT PARAMETERS

Summer

Comfort Parameters	Input Values	Description
Clothing Level (CLO)	CLO – 0.67	Light clothing
Activity Level (MET)	MET – 1.2	Seated, reading, relaxed, light work
Nominal Air Velocity (m/s)	0.15 (m/s)	-

Autumn

Comfort Parameters	Input Values	Description
Clothing Level (CLO)	CLO – 0.97	Warm clothing
Activity Level (MET)	MET – 1.2	Seated, reading, relaxed, light work
Nominal Air Velocity (m/s)	0.15 (m/s)	-

Winter

Comfort Parameters	Input Values	Description
Clothing Level (CLO)	CLO – 1.27	Winter clothing
Activity Level (MET)	MET – 1.2	Seated, reading, relaxed, light work
Nominal Air Velocity (m/s)	0.15 (m/s)	-

Spring

Comfort Parameters	Input Values	Description
Clothing Level (CLO)	CLO – 0.97	Warm clothing
Activity Level (MET)	MET – 1.2	Seated, reading, relaxed, light work
Nominal Air Velocity (m/s)	0.15 (m/s)	-

Please note: All comfort parameters suffice "ASHRAE Standard 55-2017.

JV3 MODELLING RESULTS

North Wing

Component	Calculated Annual Energy Consumption	
	Reference Building with DTS reference building fabric and services	JV3 (a)(ii) Building with proposed fabric and reference building services
Heating Energy	1.96 MWh	3.96 MWh
Cooling Energy	37.07 MWh	30.77 MWh
Lighting Energy	18.38 MWh	18.38 MWh
Equipment Energy	19.60 MWh	19.60 MWh
Total Energy	277.25 GJ	261.77 GJ
Total Conditioned Area		1592.52 m2
Greenhouse Gas Emission Factor		256 kgCO2-e/GJ
Annual Greenhouse Gas Emission	44.57 kgCO2-e/m2.annum	42.08 kgCO2-e/m2.annum

South Wing

Component	Calculated Annual Energy Consumption	
	Reference Building with DTS reference building fabric and services	JV3 (a)(ii) Building with proposed fabric and reference building services
Heating Energy	5.68 MWh	9.83 MWh
Cooling Energy	101.43 MWh	88.46 MWh
Lighting Energy	53.50 MWh	53.50 MWh
Equipment Energy	57.03 MWh	57.03 MWh
Total Energy	783.49 GJ	751.72 GJ
Total Conditioned Area		4140.33 m2
Greenhouse Gas Emission Factor		256 kgCO2-e/GJ
Annual Greenhouse Gas Emission	48.44 kgCO2-e/m2.annum	46.48 kgCO2-e/m2.annum

Hall

Component	Calculated Annual Energy Consumption	
	Reference Building with DTS reference building fabric and services	JV3 (a)(ii) Building with proposed fabric and reference building services
Heating Energy	2.91 MWh	3.32 MWh
Cooling Energy	12.71 MWh	12.27 MWh
Lighting Energy	6.75 MWh	6.75 MWh
Equipment Energy	7.19 MWh	7.19 MWh
Total Energy	106.43 GJ	106.33 GJ
Total Conditioned Area		560.65 m2
Greenhouse Gas Emission Factor		256 kgCO2-e/GJ
Annual Greenhouse Gas Emission	48.60 kgCO2-e/m2.annum	48.55 kgCO2-e/m2.annum

East Wing

Component	Calculated Annual Energy Consumption	
	Reference Building with DTS reference building fabric and services	JV3 (a)(ii) Building with proposed fabric and reference building services
Heating Energy	2.41 MWh	3.14 MWh
Cooling Energy	18.07 MWh	16.60 MWh
Lighting Energy	11.07 MWh	11.07 MWh
Equipment Energy	11.80 MWh	11.80 MWh
Total Energy	156.07 GJ	153.40 GJ
Total Conditioned Area		889.98 m2
Greenhouse Gas Emission Factor		256 kgCO2-e/GJ
Annual Greenhouse Gas Emission	44.89 kgCO2-e/m2.annum	44.13 kgCO2-e/m2.annum

PMV MODELLING RESULTS

The tabulated PMV results demonstrating design compliance to the performance criteria are attached as Attachment B

Attachment B – PMV Results

Predicted Mean Vote (% hours in range) - EPPS North Wing													
Period	Dec-Feb			Mar-May			Jun-Aug			Sep-Nov			
Location	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	
CLO	0.67			0.97			1.27			0.97			
MET	70			70			70			70			
Air Speed	0.15			0.15			0.15			0.15			
Temp	24.0C			22.5C			21.0C			22.5C			
NW_GF_Conditioned Deputy Principal	0	97.4	2.6	0.8	98.5	0.7	0.4	99.6	0	1.4	98	0.6	
NW_GF_Conditioned Int.	0	99.4	0.6	0.4	99.6	0	0.1	99.9	0	0.2	99.5	0.3	
NW_GF_Conditioned Entry	0	99	1	0.8	98.8	0.4	0.4	99.6	0	1.4	98	0.6	
NW_GF_Conditioned Int.Type 3	0	99.9	0.1	0.4	99.6	0	0	100	0	0.2	99.5	0.3	
NW_GF_Conditioned Int.	0	100	0	0	100	0	0	100	0	0	99.9	0.1	
NW_GF_Conditioned MCR	0	100	0	0	100	0	0	100	0	0	100	0	
NW_GF_Conditioned Bulk Storage	0	100	0	0.2	99.8	0	0	100	0	0	99.7	0.3	
NW_GF_Conditioned M.WC	0	100	0	0	100	0	0	100	0	0	100	0	
NW_GF_Conditioned Acc WC/Shower	0	99.7	0.3	0	100	0	0	100	0	0	99.8	0.2	
NW_GF_Conditioned F.WC	0	98.9	1.1	0.2	99.4	0.4	0	100	0	0	99.6	0.4	
NW_L1_Conditioned KLA Storage	0	100	0	0	100	0	0	100	0	0	99.9	0.1	
NW_L1_Conditioned Special Programs Storage	0	100	0	0	100	0	0	100	0	0	99.9	0.1	
NW_L1_Conditioned Special Programs	0	99.1	0.9	0.4	99.6	0	0	100	0	0	99.5	0.5	
NW_L1_Conditioned Special Programs	0	97.6	2.4	0.4	99	0.6	0	100	0	0	99.2	0.8	
NW_L1_Conditioned Special Programs	0	99.7	0.3	0	100	0	0	100	0	0	99.7	0.3	
NW_L2_Conditioned Homebase	0	98.6	1.4	0.2	99.5	0.4	0	100	0	0	99.5	0.5	
NW_L2_Conditioned Homebase	0	99.4	0.6	0.4	99.6	0	0	100	0	0	99.6	0.4	
NW_L2_Conditioned Withdraw	0	99.6	0.4	0	100	0	0	100	0	0	99.7	0.3	
NW_L2_Conditioned PAA	0	99	1	0.2	99.8	0	0	100	0	0	99.7	0.3	
NW_GF_Conditioned Principal	0	97.6	2.4	0.1	99.1	0.8	0	100	0	0	99.5	0.5	
NW_GF_Conditioned Storage	0	100	0	0	100	0	0	100	0	0	100	0	
NW_GF_Conditioned Sick Bay	0	100	0	0	100	0	0	100	0	0	100	0	
NW_GF_Conditioned Clerical	0	99.9	0.1	0	100	0	0	100	0	0	100	0	
NW_GF_Conditioned Deputy Principal	0	96.4	3.6	0.5	98.1	1.3	0.1	99.9	0	0.2	99.2	0.6	
NW_GF_Conditioned Deputy Principal	0	95.1	4.9	0.5	97.9	1.6	0.1	99.9	0	0.2	99	0.8	
NW_GF_Conditioned Staff Room	0	99.3	0.7	0.1	99.7	0.2	0	100	0	0	99.8	0.2	
NW_GF_Conditioned Staff Annexe	0	99.7	0.3	0.4	99.6	0	0	100	0	0	99.8	0.2	
NW_L1_Conditioned Shared Office/Workroom	0	97.8	2.2	0	99.5	0.5	0	100	0	0	99.3	0.7	
NW_L1_Conditioned Staff WC	0	99.4	0.6	0	100	0	0	100	0	0	99.7	0.3	
NW_L2_Conditioned Homebase	0	98.7	1.3	0.1	99.7	0.2	0	100	0	0	99.7	0.3	
NW_L2_Conditioned Homebase	0	99.6	0.4	0.4	99.6	0	0	100	0	0	99.7	0.3	
NW_L2_Conditioned Withdraw	0	99.9	0.1	0	100	0	0	100	0	0	100	0	
NW_L2_Conditioned Special Programs	0	98.3	1.7	0.7	98.8	0.4	0.1	99.9	0	0	99.2	0.8	
NW_L2_Conditioned Void	0	99.4	0.6	1.2	98.8	0	0.5	99.5	0	0.4	99.1	0.5	
NW_L1_Conditioned Library	0	98.9	1.1	0	99.6	0.4	0	100	0	0	99.5	0.5	AVG
Average	0.00	99.07	0.94	0.22	99.53	0.23	0.00	99.95	0.00	0.11	99.55	0.33	99.52

Predicted Mean Vote (% hours in range) - EPPS South Wing												
Period	Dec-Feb			Mar-May			Jun-Aug			Sep-Nov		
Location	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0	< -1.0	-1.0 ≤ & ≥1.0	> 1.0
CLO	0.67			0.97			1.27			0.97		
MET	70			70			70			70		
Air Speed	0.15			0.15			0.15			0.15		
Temp	24.0C			22.5C			21.0C			22.5C		
SW_GF_Conditioned SSU Homebase	0	97	3	0.1	99	0.9	0	100	0	0	99.3	0.7
SW_GF_Conditioned SSU Homebase	0	98.6	1.4	0.4	99.3	0.4	0	100	0	0	99.2	0.8
SW_GF_Conditioned Withdraw	0	99.1	0.9	0	100	0	0	100	0	0	99.7	0.3
SW_GF_Conditioned SSU Homebase	0	95.7	4.3	0.4	98.8	0.9	0	100	0	0	99.1	0.9
SW_GF_Conditioned SSU Homebase	0	98.6	1.4	0.5	99.1	0.4	0.1	99.9	0	0.1	99.1	0.8
SW_GF_Conditioned Withdraw	0	99.1	0.9	0.1	99.9	0	0	100	0	0	99.5	0.5
SW_GF_Conditioned WC	0	92.3	7.7	0.4	97.7	2	0	100	0	0	98.6	1.4
SW_GF_Conditioned Acc WC/Shower	0	96.1	3.9	0.5	98.4	1.1	0.1	99.9	0	0.1	99.1	0.8
SW_GF_Conditioned PAA	0	98.7	1.3	0.1	99.6	0.4	0	100	0	0	99.5	0.5
SW_L1_Conditioned PAA	0	96.4	3.6	0.4	98.8	0.8	0	100	0	0	99.2	0.8
SW_L1_Conditioned PAA	0	99.3	0.7	0	100	0	0	100	0	0	99.8	0.2
SW_L1_Conditioned PAA	0	96.3	3.7	0.4	98.8	0.9	0	100	0	0	99.2	0.8
SW_L1_Conditioned PAA	0	96.3	3.7	0.4	98.8	0.9	0	100	0	0	99.1	0.9
SW_L1_Conditioned Withdraw	0	98.7	1.3	0.1	99.8	0.1	0	100	0	0	99.6	0.4
SW_L1_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L1_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L1_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L1_Conditioned Withdraw	0	97.8	2.2	0.1	99.2	0.7	0	100	0	0	99.2	0.8
SW_L1_Conditioned Withdraw	0	99.1	0.9	0	99.9	0.1	0	100	0	0	99.7	0.3
SW_L1_Conditioned Withdraw	0	98.7	1.3	0.1	99.5	0.4	0	100	0	0	99.3	0.7
SW_L1_Conditioned Withdraw	0	99.4	0.6	0	100	0	0	100	0	0	99.7	0.3
SW_L1_Conditioned Homebase	0	98.6	1.4	0.6	99	0.4	0.1	99.9	0	0	99.2	0.8
SW_L1_Conditioned Homebase	0	99.9	0.1	0	99.6	0.4	0	100	0	0	99.5	0.5
SW_L1_Conditioned Homebase	0	99.9	0.1	0	100	0	0	100	0	0	99.7	0.3
SW_L1_Conditioned Homebase	0	99.3	0.7	0	99.6	0.4	0	100	0	0	99.5	0.5
SW_L1_Conditioned Homebase	0	99.9	0.1	0	100	0	0	100	0	0	99.7	0.3
SW_L1_Conditioned Homebase	0	92	8	0.4	97	2.6	0.1	99.9	0	0	98.5	1.5
SW_L1_Conditioned Homebase	0	98.9	1.1	0	99.3	0.7	0	100	0	0	99.4	0.6
SW_L1_Conditioned Homebase	0	99.3	0.7	0.2	99.8	0	0	100	0	0	99.4	0.6
SW_L1_Conditioned Homebase	0	97.1	2.9	0.6	98.7	0.7	0.1	99.9	0	0	99.1	0.9
SW_L1_Conditioned Homebase	0	96.7	3.3	0.4	97.7	2	0	100	0	0	99	1
SW_L1_Conditioned Homebase	0	98.4	1.6	0.5	99.1	0.4	0.1	99.9	0	0	99.1	0.9
SW_L1_Conditioned Homebase	0	98.3	1.7	0.4	98	1.6	0.1	99.9	0	0	98.9	1.1
SW_L1_Conditioned Homebase	0	97.7	2.3	0.6	98.7	0.7	0.1	99.9	0	0	99.1	0.9
SW_L1_Conditioned Homebase	0	98.6	1.4	0.4	98.3	1.3	0	100	0	0	99.1	0.9
SW_L1_Conditioned Homebase	0	98.6	1.4	0.5	99.1	0.4	0.1	99.9	0	0	99.2	0.8
SW_L1_Conditioned Homebase	0	95.4	4.6	0.4	97.8	1.9	0	100	0	0	99	1
SW_L1_Conditioned Pre-school	0	100	0	0.4	98	1.5	0	100	0	0	99.3	0.7
SW_L1_Conditioned Pre-school	0	100	0	1.4	93.6	5	1.7	98.3	0	1.3	92.9	5.9
SW_L1_Conditioned Pre-school	0	100	0	2.1	93.1	4.7	4.4	95.6	0	2.3	91.5	6.2
SW_L1_Conditioned Pre-school	0	100	0	0.8	98.9	0.3	0.4	99.6	0	0	99.4	0.6
SW_L1_Conditioned Pre-school	0	100	0	0.4	98.1	1.4	0.1	99.9	0	0	99.4	0.6
SW_L1_Conditioned Pre-school	0	100	0	0.3	98.3	1.4	0	100	0	0	99.4	0.6
SW_L1_Conditioned Pre-school	0	100	0	0.3	99.5	0.3	0	100	0	0	99.7	0.3
SW_L1_Conditioned Pre-school	0	100	0	1	98.3	0.7	1.2	98.8	0	0.5	98.6	0.8
SW_L1_Conditioned Pre-school	0	100	0	0.6	98.2	1.2	0.3	99.7	0	0	98.9	1.1
SW_L1_Conditioned Pre-school	0	100	0	0.6	97.8	1.6	0.1	99.9	0	0	99.3	0.7
SW_L1_Conditioned Pre-school	0	100	0	1.2	94.7	4.2	1.1	98.9	0	1	95.7	3.3
SW_L2_Conditioned PAA	0	99.9	0.1	0	100	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned PAA	0	99.9	0.1	0	100	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned PAA	0	99.9	0.1	0	100	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned PAA	0	99.9	0.1	0	100	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Withdraw	0	100	0	0	100	0	0	100	0	0	100	0
SW_L2_Conditioned Homebase	0	99.9	0.1	0.3	99.7	0	0	100	0	0	99.7	0.3
SW_L2_Conditioned Homebase	0	99.9	0.1	0.4	99.6	0	0	100	0	0	99.6	0.4
SW_L2_Conditioned Homebase	0	98.9	1.1	0.2	99.5	0.4	0	100	0	0	99.5	0.5
SW_L2_Conditioned Homebase	0	99.9	0.1	0	99.8	0.2	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.8	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.3	0.7	0	99.6	0.4	0	100	0	0	99.6	0.4
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.8	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.5	0.4	0	100	0	0	99.5	0.5
SW_L2_Conditioned Homebase	0	99.6	0.4	0.4	99.6	0	0	100	0	0	99.7	0.3
SW_L2_Conditioned Homebase	0	98.7	1.3	0.2	99.4	0.4	0	100	0	0	99.5	0.5
SW_L2_Conditioned Homebase	0	99.6	0.4	0.3	99.7	0	0	100	0	0	99.7	0.3
SW_L2_Conditioned Homebase	0	99.9	0.1	0	99.8	0.2	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.8	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.3	0.7	0	99.8	0.2	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.8	0	0	100	0	0	99.8	0.2
SW_L2_Conditioned Homebase	0	99.9	0.1	0.2	99.5	0.4	0	100	0	0	99.5	0.5
Average	0.00	98.93	1.07	0.28	99.09	0.65	0.00	99.86	0.00	0.07	99.25	0.68

AVG 99.28

Predicted Mean Vote (% hours in range) - EPPS Hall													
Period	Dec-Feb			Mar-May			Jun-Aug			Sep-Nov			
Location	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	
CLO	0.67			0.97			1.27			0.97			
MET	70			70			70			70			
Air Speed	0.15			0.15			0.15			0.15			
Temp	24.0C			22.5C			21.0C			22.5C			
Hall_GF_Conditioned Communal Hall	0	95.1	4.9	1.8	97.1	1.2	2.9	97.1	0	3.2	95.7	1.1	
Hall_GF_Conditioned PERF.ST.	0	96.6	3.4	0.6	98.2	1.2	0.4	99.6	0	0.4	98.6	1.1	
Hall_GF_Conditioned OSHC Office	0	98.1	1.9	0.4	98.8	0.9	0.2	99.8	0	0.1	98.9	1	
Hall_GF_Conditioned PE ST.	0	98.3	1.7	0.4	99.2	0.4	0.2	99.8	0	0.1	98.9	1	
Hall_GF_Conditioned Chair ST.	0	98.4	1.6	0.1	99.6	0.4	0	100	0	0.1	99.1	0.8	
Hall_GF_Conditioned Sports ST.	0	99.4	0.6	0.1	99.9	0	0	100	0	0	99.3	0.7	
Hall_GF_Conditioned OSHC ST.	0	98.4	1.6	0.1	99.5	0.4	0	100	0	0.1	98.9	1	
Hall_GF_Conditioned Kitchenette	0	98.1	1.9	0.1	99.1	0.8	0	100	0	0.1	98.9	1	
Hall_GF_Conditioned Entry	0	96	4	0.6	98.2	1.2	0.4	99.6	0	0.5	98.5	1.1	
Hall_GF_Conditioned Sound	0	98	2	0.4	98.9	0.7	0.2	99.8	0	0.2	98.8	1	AVG
Average	0.00	97.64	2.36	0.46	98.85	0.72	0.00	99.57	0.00	0.48	98.56	0.98	98.66

Predicted Mean Vote (% hours in range) - EPPS East Wing													
Period	Dec-Feb			Mar-May			Jun-Aug			Sep-Nov			
Location	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	< -1.0	-1.0≤ & ≥1.0	> 1.0	
CLO	0.67			0.97			1.27			0.97			
MET	70			70			70			70			
Air Speed	0.15			0.15			0.15			0.15			
Temp	24.0C			22.5C			21.0C			22.5C			
EW_GF_Conditioned Homebase	0	97.7	2.3	1	98.6	0.4	0.9	99.1	0	1.2	98.1	0.7	
EW_GF_Conditioned Homebase	0	99	1	0.8	99.2	0	0.5	99.5	0	1	98.6	0.5	
EW_GF_Conditioned Homebase	0	98.7	1.3	0.8	98.8	0.4	0.5	99.5	0	0.9	98.6	0.5	
EW_GF_Conditioned Homebase	0	99.6	0.4	0.6	99.4	0	0.3	99.7	0	0.3	99.5	0.3	
EW_GF_Conditioned Homebase	0	99.6	0.4	0.6	99.4	0	0.3	99.7	0	0.3	99.5	0.3	
EW_GF_Conditioned Homebase	0	98.7	1.3	0.8	98.8	0.4	0.5	99.5	0	0.9	98.6	0.5	
EW_GF_Conditioned Canteen	0	99.3	0.7	0.4	99.6	0	0.1	99.9	0	0	99.6	0.4	
EW_GF_Conditioned Office/ST.	0	99.4	0.6	0.3	99.7	0	0	100	0	0	99.9	0.1	
EW_GF_Conditioned PAA	0	99	1	0.8	99.1	0.1	0.5	99.5	0	0.8	98.8	0.4	
EW_GF_Conditioned PAA	0	98.9	1.1	0.8	99.1	0.1	0.5	99.5	0	1	98.6	0.5	
EW_GF_Conditioned Withdraw	0	99.1	0.9	0.5	99.5	0	0.2	99.8	0	0	99.6	0.4	
EW_GF_Conditioned Withdraw	0	99.9	0.1	0.4	99.6	0	0	100	0	0	99.9	0.1	
EW_GF_Conditioned Withdraw	0	99.9	0.1	0.4	99.6	0	0	100	0	0	99.9	0.1	
EW_GF_Conditioned Homebase	0	98.9	1.1	0.8	98.8	0.4	0.4	99.6	0	0.4	99.2	0.5	
EW_GF_Conditioned Homebase	0	99.3	0.7	0.6	99.4	0	0.4	99.6	0	0.4	99.4	0.3	
EW_GF_Conditioned Withdraw	0	99.6	0.4	0.4	99.6	0	0	100	0	0	99.8	0.2	AVG
Average	0.00	99.16	0.84	0.63	99.26	0.11	0.00	99.68	0.00	0.45	99.23	0.36	99.33

Attachment C – Building Fabric Requirement Markups

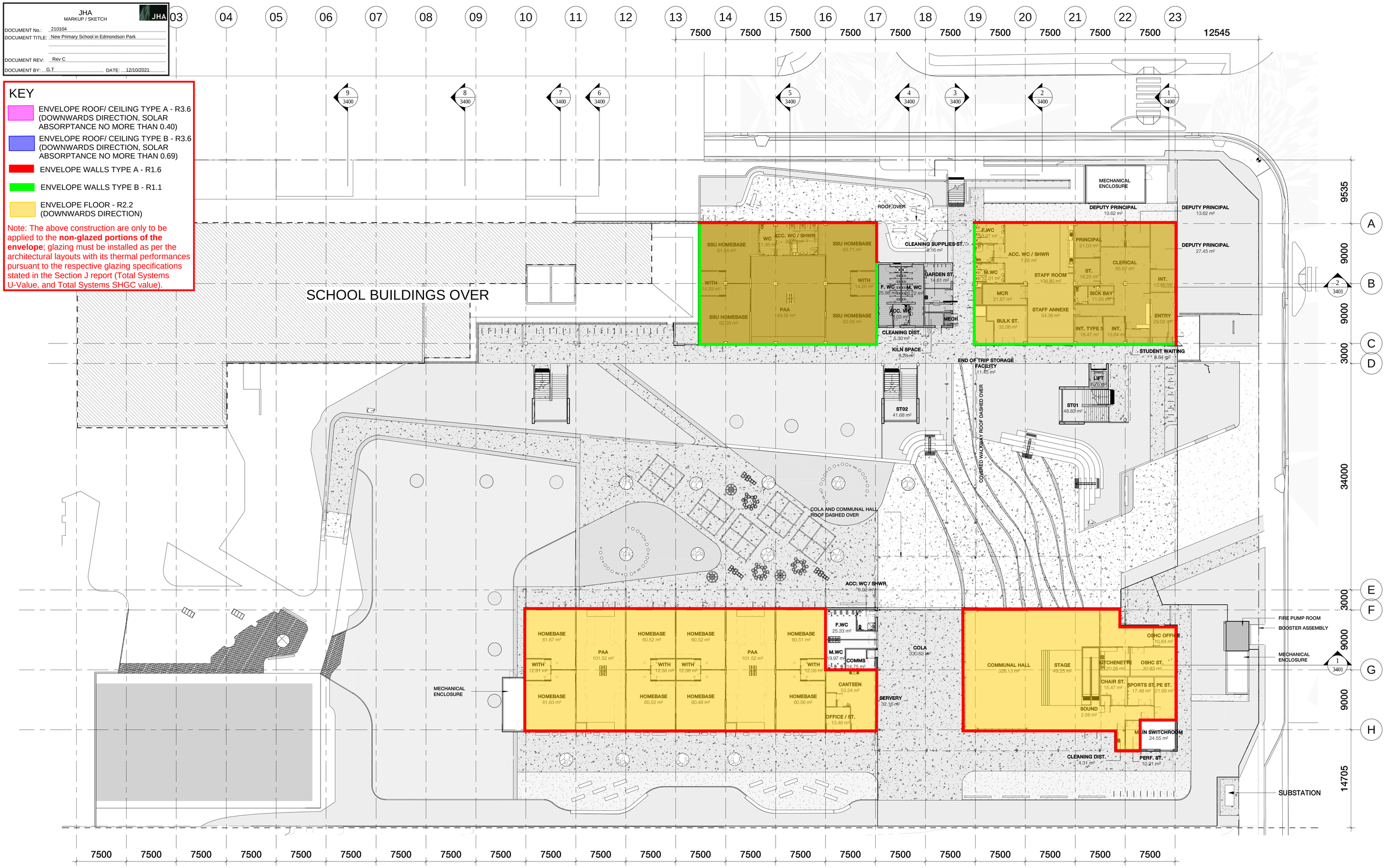
JHA
MARKUP / SKETCH

DOCUMENT No.: 210104
DOCUMENT TITLE: New Primary School in Edmondson Park
DOCUMENT REV: Rev C
DOCUMENT BY: G.T DATE: 12/10/2021

KEY

- ENVELOPE ROOF/ CEILING TYPE A - R3.6 (DOWNWARDS DIRECTION, SOLAR ABSORPTANCE NO MORE THAN 0.40)
- ENVELOPE ROOF/ CEILING TYPE B - R3.6 (DOWNWARDS DIRECTION, SOLAR ABSORPTANCE NO MORE THAN 0.69)
- ENVELOPE WALLS TYPE A - R1.6
- ENVELOPE WALLS TYPE B - R1.1
- ENVELOPE FLOOR - R2.2 (DOWNWARDS DIRECTION)

Note: The above construction are only to be applied to the **non-glazed portions of the envelope**; glazing must be installed as per the architectural layouts with its thermal performances pursuant to the respective glazing specifications stated in the Section J report (Total Systems U-Value, and Total Systems SHGC value).



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NSW Nominated Architects: Robert Denton Reg. No. 5782, Alex Kibble Reg. No. 6015
Do not scale drawings. Verify all dimensions on site. Notify architect of all discrepancies

Rev	Date	Description	Chkd	Auth
A	20.04.21	Issue for Coordination	HC	AK
B	20.04.21	Issue for TSG	HC	AK
C	29.04.21	Issue for Coordination	HC	AK
D	31.05.21	Issue for SSDA	HC	AK
E	10.06.21	Issue for SSDA	HC	AK
F	13.08.21	Draft RtS Issue	HC	AK
G	19.08.21	Response to Submissions	HC	AK
H	11.10.21	Response to Submissions	HC	AK

Project
NEW PRIMARY SCHOOL IN EDMONDSON PARK
BUCHAN AVE
EDMONDSON PARK

Drawing Title
GROUND FLOOR PLAN

Proj. Dir	Proj. Arch	Drawn	Sheet
AK	AH	HC	A1
Job No.	Date	Scale	
210002	11.10.21	1 : 250	

Drawing No. AR W- DW- 2100 Revision H

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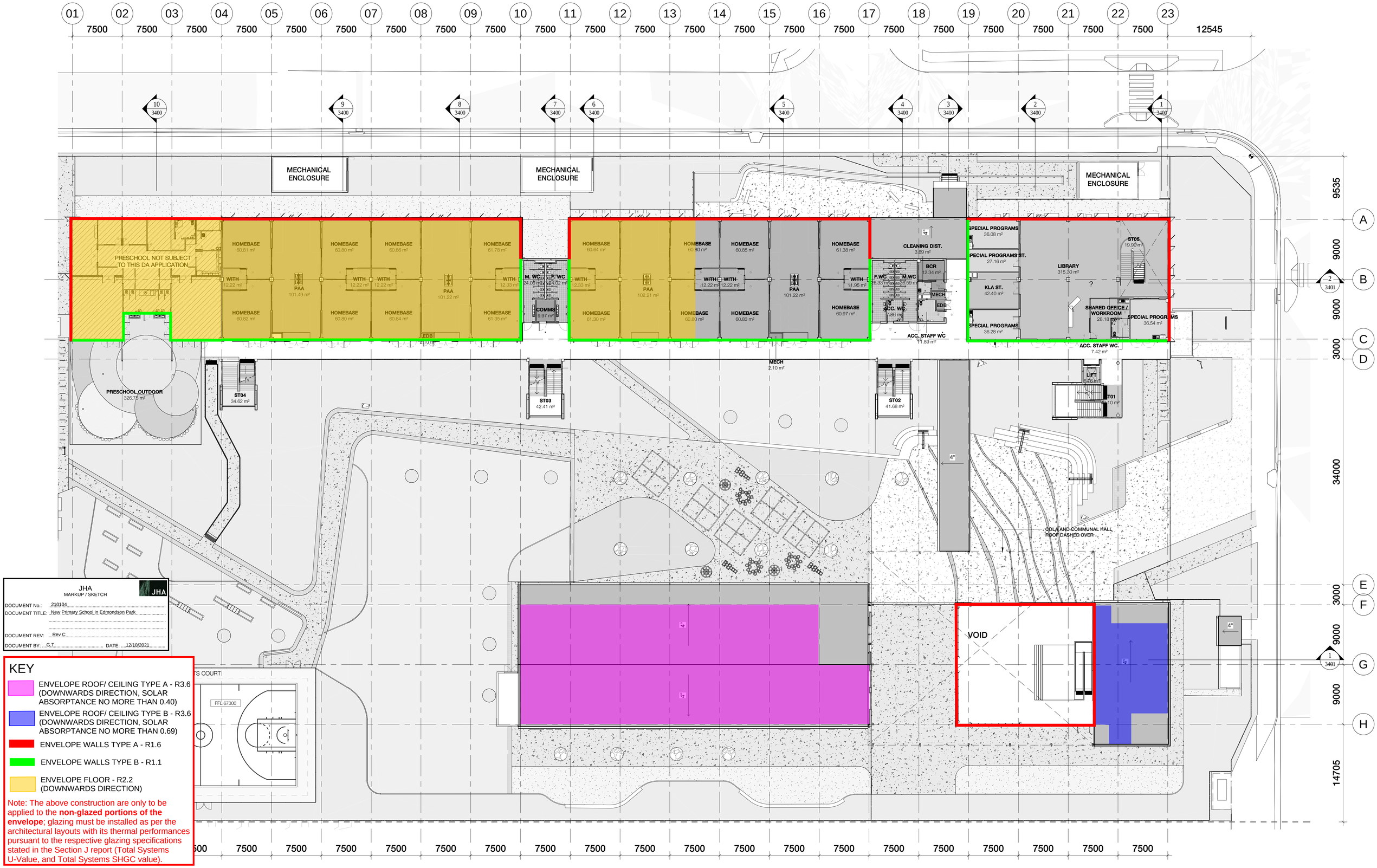

JHA
MARKUP / SKETCH

DOCUMENT No.: 210104
DOCUMENT TITLE: New Primary School in Edmondson Park
DOCUMENT REV: Rev C
DOCUMENT BY: G.T DATE: 12/10/2021

KEY

- ENVELOPE ROOF/ CEILING TYPE A - R3.6 (DOWNWARDS DIRECTION, SOLAR ABSORPTANCE NO MORE THAN 0.40)
- ENVELOPE ROOF/ CEILING TYPE B - R3.6 (DOWNWARDS DIRECTION, SOLAR ABSORPTANCE NO MORE THAN 0.69)
- ENVELOPE WALLS TYPE A - R1.6
- ENVELOPE WALLS TYPE B - R1.1
- ENVELOPE FLOOR - R2.2 (DOWNWARDS DIRECTION)

Note: The above construction are only to be applied to the **non-glazed portions of the envelope**; glazing must be installed as per the architectural layouts with its thermal performances pursuant to the respective glazing specifications stated in the Section J report (Total Systems U-Value, and Total Systems SHGC value).

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Project
NEW PRIMARY SCHOOL IN EDMONDSON PARK
BUCHAN AVE
EDMONDSON PARK

Drawing Title
FIRST FLOOR PLAN

Proj. Dir	Proj. Arch	Drawn	Sheet
AK	AH	HC	A1

Job No.	Date	Scale
210002	11.10.21	1 : 250

Drawing No. AR W- DW- 2101 Revision H

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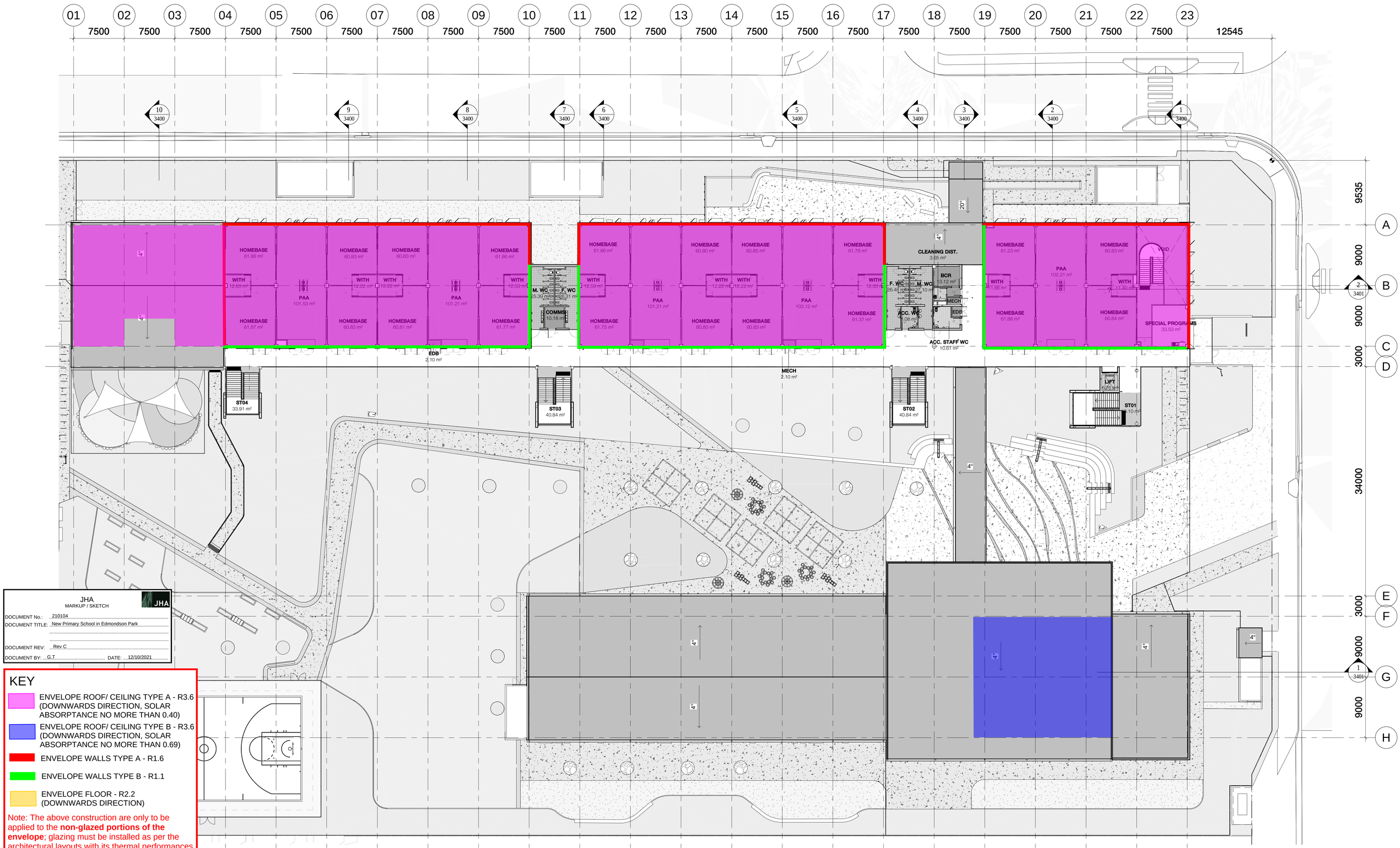

JHA
MARKUP / SKETCH

DOCUMENT No.: 210104
DOCUMENT TITLE: New Primary School in Edmondson Park
DOCUMENT REV: Rev C
DOCUMENT BY: G.T. DATE: 12/10/2021

KEY

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Project
NEW PRIMARY SCHOOL IN EDMONDSON PARK
BUCHAN AVE
EDMONDSON PARK

Drawing Title
SECOND FLOOR PLAN

Proj. Dir	Proj. Arch	Drawn	Sheet
AK	AH	HC	A1

Job No.	Date	Scale
210002	11.10.21	1 : 250

Drawing No. AR W- DW- 2102 Revision H

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