# President Private Hospital ESD Report

## For Imagescape Design Studios

| Revision | Date | Description | Author | Reviewer |
|---|---|---|---|---|
| 0 | 25/11/2020 | For DA | AS | JL |

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## Contents

# Executive Summary

This report supports a State Significant Development Application for the President Private Hospital (PPH) redevelopment project at 369 – 381 President Avenue, Kirrawee NSW 2232.

This report will address the following SEARS requirements:

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.
- Include a framework for how the future development will 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.
- Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.
- Include details of the initiatives that would enable the future developments to achieve a minimum of 4-Green Star rating in accordance with the rating system of the Green Building Council Australia.
- Include consideration of incorporating a Green Roof, Cool Roof and/or Green Wall into the design.
- Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically:
    - Hotter days and more frequent heatwave events
    - Extended drought periods
    - Gustier wind conditions
    - More extreme rainfall events
    - How these will inform landscape design, material selection and social equity aspects (respite/shelter areas).

This report summarised the sustainable design principles for the development. Reference and benchmarking are made to the following standard and best practice guidelines:

- Green Star Design & As-Built framework by the Green Building Council of Australia (GBCA)
- NSW Climate (NARCliM) projections by NSW Department of Planning, Industry and Environment

# Introduction

This report supports a State Significant Development Application for the President Private Hospital (PPH) redevelopment project at 369 – 381 President Avenue, Kirrawee NSW 2232.

In this development, while no Green Star formal certification is sought after at this stage, key sustainability (or ESD) design principles have been benchmarked in accordance to the following industry recognised best practise standard and framework:

- 4 star Green Star Design & As-Built rating (equivalent to Australian Best Practise)
- Climate responsive design in line with NSW climate projections for 2020 – 2039 and 2060 – 2070

In line with the SEARS requirements, the hospital building is benchmarked against 4 star Green Star equivalent ESD principles for site-wide application across the development throughout key project stages. The sustainability pathway of these ESD design principles is attached in Appendix A.

# Reference Documents

## Drawings

This report is based on the following architectural drawings received –

Architect: Imagescape Design Studios
Suite G10, 55 Miller St,
Pyrmont NSW 2009

The relevant documents and drawings used in compiling this report are as follows:

| Project Reference No. | Drawing No. | Rev. | Title |
|---|---|---|---|
| MacHealth-06 | A 001 | 54 | Title Sheet |
| MacHealth-06 | A 005 | 54 | Perspective 1 |
| MacHealth-06 | A 006 | 54 | Perspective 2 |
| MacHealth-06 | A 007 | 54 | Perspective 3 |
| MacHealth-06 | A 008 | 54 | Site Analysis |
| MacHealth-06 | A 009 | 54 | Site Analysis Diagrams 1 |
| MacHealth-06 | A 010 | 54 | Site Analysis Diagrams 2 |
| MacHealth-06 | A 011 | 54 | Transport Connections |
| MacHealth-06 | A 012 | 54 | Concrete Foot Paths |
| MacHealth-06 | A 013 | 54 | Site Wayfinding |
| MacHealth-06 | A 014 | 54 | Services Layout for Ground and First Floor |
| MacHealth-06 | A 016 | 54 | Construction Planning |
| MacHealth-06 | A 017 | 54 | Shadow Analysis – Winter Solstice 9AM |
| MacHealth-06 | A 018 | 54 | Shadow Analysis – Winter Solstice 12PM |
| MacHealth-06 | A 019 | 54 | Shadow Analysis – Winter Solstice 3PM |
| MacHealth-06 | A 024 | 54 | Existing Site Plan |
| MacHealth-06 | A 025 | 54 | Proposed Site Context Plan |
| MacHealth-06 | A 026 | 54 | Site Setout Plan |
| MacHealth-06 | A 100 | 54 | Existing Floor Plan |

| | | | |
|---|---|---|---|
| MacHealth-06 | A 102 | 54 | Basement Plan LVL 3 & 4 |
| MacHealth-06 | A 103 | 54 | Basement Plan LVL 1 & 2 |
| MacHealth-06 | A 104 | 54 | Ground Floor General Arrangement Plan |
| MacHealth-06 | A 105 | 54 | First Floor General Arrangement Plan |
| MacHealth-06 | A 107 | 54 | Second Floor General Arrangement Plan |
| MacHealth-06 | A 108 | 54 | Roof Plan General Arrangement Plan |
| MacHealth-06 | A 114 | 54 | Ground Floor Demolition Plan |
| MacHealth-06 | A 300 | 54 | South & East Elevations |
| MacHealth-06 | A 302 | 54 | North & West Elevations |
| MacHealth-06 | A 401 | 54 | East/ West Sections |
| MacHealth-06 | A 402 | 54 | North/ South Sections |

*Table 1: Reference documents*

# Requirements and Responses

## Environmental Planning & Assessment Regulation 2000

SEARS Requirements

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.

Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 states:

*a) 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.*

*b) **"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.*

*c) **"conservation of biological diversity and ecological integrity"**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

*d) **"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.*

### Precautionary Principle

There are no significant perceived threats of serious or irreversible environmental damage resulting from the development.

The CSIRO projected impacts of climate change relating to this site have been considered, with the highest risks being an increase in maximum temperatures, extended drought periods and the frequency of heatwave events.

The built form shall embrace sustainability principles and will be designed and arranged to maximise the passive performance of the building.

Natural daylight is introduced where possible particularly for ward areas to reduce reliance on artificial lighting while improving occupants' wellbeing and visual comfort.

Heat load control is managed by climate responsive façade design such as shading features, well insulated building fabric and glazing solutions that are customised to suit the needs of respective space These shall assist to reduce solar gain which in turn contribute to reducing greenhouse gas emissions of the building. Further optimisation will be carried out progressively throughout the design development.

Meanwhile, the large roof area provides potential opportunity for solar photovoltaic consideration. The rooftop solar photovoltaic will not only reduce the reliance on electricity grid but also serve as additional shading to the roof from direct solar gain.

The proposed use of the development is associated with low risks of environmental consequences, given that it has predominantly the same use as the current buildings on site. As such, it is anticipated that no serious or irreversible damage is expected from the operation of the proposed development.

## Inter-generational equity

To preserve or enhance the health, diversity and productivity of the environment for our future generations, the Indoor Environmental Quality as well as the proposed landscape design of the development will be considered as to ensure the health and well-being of its occupants as well as to encourage them to actively engage with their surroundings.

The proposed development is recommended to adopt the following passive design principles to maintain optimal occupant comfort and safety which in turn encourages and conserves inter-generational equity:

- Design of facades that respond to local climate including sun, wind and aspect;
- Natural daylight through windows and internal courtyards;
- Sunshades and high levels of thermal insulation;
- Robust and durable building materials;
- Usage of low total VOC paints, sealants, adhesives and floor coverings;
- Air conditioning system integrated with energy recovery ventilation to recover waste heat, temper outdoor air to indoor space and reduce energy consumption;
- Design for reduced internal noise levels and reverberation time for acoustic comfort.

## Conservation of biological diversity and ecological integrity

As this is a previously developed site, the construction of the development is considered redevelopment works on existing site. Therefore, it is anticipated that this redevelopment will have insignificant impact on the current level of biological diversity and ecological integrity.

## Improved valuation, pricing and incentive mechanisms

Sustainable strategy in line with 4 star Green Star pathways shall form part of the tender documents. This is to ensure that targeted sustainable initiatives are captured in design, reducing the risk from last minute design changes. Contractors shall be required to provide and abide by an Environmental Management Plan and Environmental Management System in accordance with NSW Environmental Management Systems Guidelines or equivalent standard.

# ESD Framework – Green Star rating

SEARS Requirements

- Include a framework for how the future development will 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.
- Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.
- Include details of the initiatives that would enable the future developments to achieve a minimum of 4-Green Star rating in accordance with the rating system of the Green Building Council Australia.
- Include consideration of incorporating a Green Roof, Cool Roof and/or Green Wall into the design.

## NCC 2019 Section J

The NCC 2019 Section J contains mandatory requirements for the design of building envelope and features to minimise energy use. The proposed development in this project will be designed to comply with the minimum requirements as specified under Section J, addressing the following:

- Building fabric
- Building sealing
- Air-conditioning and ventilation systems
- Artificial lighting and power
- Heated water supply
- Facilities for energy monitoring

## 4 Star Green Star Design & As-Built Rating Benchmark

For the purpose of benchmarking to industry best practise, the Green Star – Design & As Built v1.3 rating tool has been used for this project to guide the design towards achieving a standard of a 4 star Green Star rating equivalent to Australian Best Practice. The Green Star evaluates the sustainability initiatives of design, projects and/or buildings based on a number of criteria, including energy and water efficiency, indoor environmental quality and resource conservations.

**Green Star - Design & As Built Scorecard**

| | | Core Points Available | Total Score Targeted |
|---|---|---|---|
| **Project:** | **President Private Hospital** | | |
| **Targeted Rating:** | **4 Star - Best Practice** | **100** | **50.5** |

*Figure 1: 4 Star Green Star equivalence*

Table 2 to 10 outline the sustainability strategy and approach for the development based on the nine Green Star categories. A score card demonstrating 4 star Green Star pathways is also attached in Appendix A of this report.

## Management

The Management category aims to encourage the adoption of processes that encourage best practice sustainability outcomes. The initiatives are listed in Table 2.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Management | **Green Star Accredited Professional**<br>• Engage a Green Star Accredited Professional throughout all phases of the project to advise on sustainable initiatives. | 1 | Building owner/ GSAP |
| | **Commissioning and Tuning**<br>• Undertake a services and maintainability review during design and prior to construction stage to address the commissionability, controllability, maintainability, operability and safety of building systems and fabric design.<br>• Owner's commitment to form a building tuning team and incorporate tuning process with quarterly adjustment, measurement and review of manufacturers' warranties for nominated building systems for the first 12-month after receipt of occupancy certificate in accordance with O&M manuals and building tuning plan that was developed in accordance with approved standards and guidelines. | 1<br>1 | Head Contractor/ ICA/ Services consultants/ Building Owner |
| | **Building Information**<br>• Contractors to provide comprehensive Operations and Maintenance manual and Logbook to the facilities management team at Project Completion.<br>• A Building User Information (BUI) in digital format will be developed and made available to relevant stakeholders and building users to provide an easy to understand guidance for efficient day-to-day use. | 1 | Head contractor |
| | **Commitment to Performance**<br>• The building owner sets and commits to environmental targets. Measuring and reporting will be conducted at least on a quarterly basis.<br>• Owner's commitment to include as part of its policy or guideline to reduce demolition waste and extend the life of interior fitout and finishes to at least 10 years. | 1<br>1 | Building owner<br>Building owner |

| | | | |
|---|---|---|---|
| | **Metering**<br>• Separate energy sub-meters that is linked to Building Monitoring & Control System (BMCS) will be provided for areas with different usage pattern (e.g. offices, retail, meeting rooms)and all major item that exceeds 5% of total building energy use, or have rated load greater than 100kW or combined energy use of max. 10kVA.<br>• Meters and monitoring system to be commissioned in accordance to NABERS ratings protocol, continual and capable of producing alerts for any inaccuracies in metering network.<br>• Separate water sub-meters that is linked to Building Monitoring & Control System (BMCS) will be provided for common uses of water that consume 10% of overall water use e.g. irrigation, toilet flushing. | 1 | Services consultants |
| | **Responsible Building Practices**<br>• Contractor shall adopt formalised EMS ISO14001 certified Environmental Management Plan (EMP) or equivalent, report on all non-conformities and implement relevant corrective and preventive actions during construction.<br>• Contractor shall carry out needs analysis and address at least three distinct physical and mental health issues for site workers by implementing programs and policies (e.g. Headspace, Beyond Blue, Mates in Construction, Nutrition Organisation) to promote and health and wellbeing on-site.<br>• Contractor education on sustainability will be carried out during induction on-site to raise awareness among the site workers. This will include project specific targeted green star rating and pathways, the value of achieving each target, and how the site workers from each discipline can contribute to achieve the sustainability targets. | 1<br><br>1 | Head contractor<br><br>Head contractor |
| | **Operational Waste**<br>• Easily accessible bin center provision sized according City of Sydney Policy for Waste Minimisation or equivalent best practice guide to provide adequate space for separation and storage of at least general waste, recycling (paper and cardboards, glass and plastic) and one other waste stream (e.g. organics, e-waste, batteries) with clearly marked bins/ containers distributed throughout the building. | 1 | Waste consultant/ Architect |
| | **Total Management points** | **10** | |

*Table 2: Proposed ESD Initiatives under Green Star Management Category*

## Indoor Air Quality

The Indoor Environment category aims to improve occupants' experience of the space to encourage occupant well-being. The initiatives are listed in Table 3.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Indoor Environmental Quality | **Indoor Air Quality**<br>• Minimum separation distances between pollution sources and outdoor air intakes design in compliance to ASHRAE Standard 62.1:2003 to minimize entry of outdoor air pollutants.<br>• Mechanical ventilation systems are provided with adequate access for maintenance. All ductwork will be cleaned prior to occupation or all new ductwork will remain free of moisture and debris until occupation.<br>• Outside air rate shall be 50% greater than the minimum requirements in AS 1668.2:2012.<br>• Printers and photocopying equipment must be in an enclosed area and exhausted directly to the outside, or via a dedicated exhaust riser. Alternatively, printing and photocopying equipment shall be certified with ECMA-328, RAL-UZ 171, or GGPS.003. | 1<br><br>1<br><br>1 | Mechanical consultant<br><br>Mechanical consultant/ Head contractor<br><br>Mechanical consultant<br><br>Architect/ Building owner |
| | **Acoustic Comfort**<br>• Treatment of building façade and mechanical design to enable internal ambient noise levels to be no more than 5dB(A) above the lower figure range in Table 1 of AS/NZS2107:2016, and below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZS2107:2016. | 2 | Acoustic consultant |
| | **Lighting Comfort**<br>• Internal spaces shall be well lit through flicker-free luminaires and a minimum CRI of 80. General illuminance and uniformity of maintained illuminance shall meet the appropriate AS/NZS 1680 standards in accordance with the type of activity of the space. All bare light sources shall be fitted with diffusers, baffles, or louvers (or similar). | 1 | Electrical consultant |
| | **Visual Comfort**<br>• Blinds or screens with Visual Light Transmittance (VLT) not more than 10% and can be manually controlled by all affected occupants to reduce glare.<br>• At least 60% of occupied space have a clear view of high quality internal or external view. | 1 | Architect |

| | | | |
|---|---|---|---|
| | **Indoor Pollutants**<br>• At least 95% of all paints, adhesives, sealants and carpets shall have low VOC content in accordance with the limits in Table 13.1.1 and Section 13.1.2B of Green Star Design & As built v1.3. See Appendix B.<br>• At least 95% of all engineered wood products shall meet formaldehyde limits in accordance with the limits in Table 13.2B of Green Star Design & As built v1.3. See Appendix B. | 2 | Architect |
| | **Total Indoor Environment Quality points** | **9** | |

*Table 3: Proposed Sustainability Initiatives under Green Star Indoor Environment Quality Category*

## Energy

The Energy category aims to reduce the operational energy consumption of the buildings below that of a comparable standard-practice building. The initiatives are listed in Table 4.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Energy | **Building Envelope**<br>• The roof and ceiling design shall allow for 10% increase on the minimum required by J1.3 and J1.6.<br>• Roof upper surface solar absorptance shall allow for at least 0.05 less than maximum allowable value in Part J1.3;<br>• Where roof lights is installed, achieve a total system U-value of ≤ 3.3W/m$^2$K and a total system SHGC of ≤ 85% of the maximum allowable value in Part J1.4.<br><br>**Wall-Glazing Construction**<br>• Wall-glazing construction overall U-value (Specification J1.5a Method 2) is at least 10% less than the allowable total system U-value in Part J1.5;<br>• Wall glazing constructions have a combination of SHGC across all facades (Specification J1.5a Method 2) that achieve a calculated proposed representative air-conditioning energy value of ≤ 90% of the calculated reference representative air-condoning energy value as per Part J1.5;<br>• For wall exceed 80%, achieve 10% increase beyond J1.5 requirement;<br>• Where display glazing is installed, a total system U-value of ≤ 5.0 W/m$^2$K and a total system SHGC of ≤ 85% of the maximum allowable in Part J1.5. | 1<br><br>1 | Architect<br><br>Architect |
| | **Lighting**<br>• LED or energy efficient lighting design to achieve at least 10% reduction in lighting power density from the maximum allowable in Table J6.2a and be linked to automatic lighting control (e.g. occupant detection and daylight adjustments) with daylight adjustment to all areas.<br>• For office spaces, individually switched lighting zones to not exceed 100m$^2$. | 1 | Electrical consultant |
| | **Ventilation and Air-conditioning**<br>• Installed fan motor power and pump power is ≤ 15% than the maximum fan motor power and pump power in Specification J5.2a and Part J5, Table J5.2;<br>• Minimum energy efficient ratio (EER) for cooling ≥ 5% than the required minimum specified in Specification J5.2e. | 1 | Mechanical consultant |
| | **Domestic Hot Water Systems**<br>• Energy efficient solar hot water system (electric boosted) with heat pump (heat pump COP ≥ 3.5 under design conditions) | 1 | Hydraulic consultant |

| | | | |
|---|---|---|---|
| | **Vertical Transportation**<br>• Lift systems to comply with the following:<br>- Minimum lift energy efficiency is class A or B in accordance with ISO 25745-2;<br>- Lift idle and standby energy performance is 1 in accordance with ISO 25745-2. | 1 | Electrical consultant |
| | **Total Energy points** | **6** | |

*Table 4: Proposed Sustainability Initiatives under Green Star Energy Category*

## Transport

The Transport category aims to implement design and operational measures that reduce the carbon emissions arising from occupant travel to and from the project. The initiatives are listed in Table 5.

<table>
<tr><th>Green Star credit</th><th>Project initiative</th><th>Targeted Points</th><th>Design Responsibility</th></tr>
<tr><td rowspan="2">Transport</td><td>
Sustainable Transport
<ul>
<li>At least 5% of the people with Greater Capital City Statistical Area (GCCSA) can access the site by public transport within 45 minutes during peak hour, to be demonstrated via Access by Public Transport Calculator.</li>
<li>Parking for fuel-efficient vehicles: Provide ≥ 15% of dedicated parking spaces for fuel-efficient vehicles (i.e. vehicles with rated fuel efficiency of ≤ 5L/100km or ≤ 115gCO2/100km, hybrid cars, electric vehicles and motorcycles) with a maximum of 5% for motorcycle parking where the parking spaces must be clearly designated e.g. clearly marked with different colours and visible signage.</li>
<li>To encourage active transport for regular occupants, provide cycle facilities:
<ul>
<li>Secure bicycle parking in accordance with AS2890.3 with associated end-of-trip (EOT) facilities for 7.5% of total regular occupants;</li>
<li>Secure bicycle parking in accordance with AS2890.3 for 5% of peak visitors;<br>and</li>
</ul></li>
<li>Provide EOT (showers, changing amenities with appropriate drying space and lockers) facilities:
<ul>
<li>Easily accessible to regular occupants who use active mode of transportation;</li>
<li>Quantity of EOT facilities provided according to the number of regular building occupants as specified in the following table:</li>
</ul></li>
</ul>
<table>
<tr><th>Number of Regular Occupants</th><th>Showers</th><th>Lockers</th></tr>
<tr><td>0 -12</td><td>1 (unisex)</td><td>1.2 per bicycle space</td></tr>
<tr><td>13 - 49</td><td>2</td><td>1.2 per bicycle space</td></tr>
<tr><td>50 – 149</td><td>4</td><td>1.2 per bicycle space</td></tr>
<tr><td>150 – 299</td><td>6</td><td>1.2 per bicycle space</td></tr>
<tr><td>300 – 500</td><td>8</td><td>1.2 per bicycle space</td></tr>
<tr><td>> 500</td><td>Additional 2 per extra 250 occupants</td><td>1.2 per bicycle space</td></tr>
</table>
</td><td>1<br><br>1<br><br>1</td><td>GSAP<br><br>Architect<br><br>Architect</td></tr>
<tr><td colspan="2">Total Transport points</td><td>3</td><td></td></tr>
</table>

*Table 5: Proposed Sustainability Initiatives under Green Star Transport Category*

## Water

The Water category aims to reduce the consumption of potable water through measures such as the incorporation of water efficient fixtures and water re-use. The initiatives are listed in Table 6.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Water | **Potable Water**<br>• Bathrooms and kitchens will install fixtures with the following minimum WELS rating:<br>- Taps – 6 Star<br>- Urinals – 6 Star<br>- Toilets – 5 Star<br>- Showers – 3 Star (> 4.5 but ≤ 6.0)<br>- Clothing washing machines – 5 Star<br>- Dishwashers – 6 Star | 1 | Architect |
| | • No water used for heat rejection system. | 2 | Mechanical consultant |
| | • Fire protection system includes temporary storage for 80% of the routine fire protection system test water and maintenance drain-downs for reuse on-site calculated on the basis that any single zone is drained down annually, or no sprinkler system installed. | 1 | Fire protection consultant |
| | • Xeriscape garden or installation of drip irrigation system with moisture sensor override. | 1 | Architect/ Landscape architect |
| | • A rainwater tank of 100kL (based on ~10,000 GFA) to be provided to collect rain from the roofs, and be used for toilet flushing, general washing and irrigation. | 1 | Architect/ Hydraulic Consultant |
| | **Total Water points** | **6** | |

*Table 6: Proposed Sustainability Initiatives under Green Star Water Category*

## Materials

The Materials category aims to reduce the impact of resource consumption as a result of construction activities in relation to the project. The initiatives are listed in Table 7.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Materials | **Life Cycle Impacts** | | |
| | • At least 30% (by mass) of the Portland cement content is reduced by replacing it with supplementary cementitious materials. | 1 | Head contractor |
| | • At least 50% mix water is captured or reclaimed water for all concrete used in the project. | 0.5 | Head contractor |
| | **Responsible Building Materials** | | |
| | • At least 95% of structural and reinforcing steel is sourced from a Responsible Steel Maker, as defined in Green Star Design & As-Built v1.3 section 20.1.0. | Comply | Head contractor |
| | • If the building is steel framed, at least 60% of fabricated structural steelwork is sourced from fabricators/contractors accredited to Environmental Sustainability Charter of the Australian Steel Institute (ASI), or if the building is concrete framed, at last 60% by mass of all reinforcing bar and mesh is made using energy-reducing processes. | 1 | Head contractor |
| | • At least 90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables do not contain PVC or PVC used meet *GBCA's Best Practice Guidelines for PVC*. See Appendix B. | 1 | Head contractor |
| | **Sustainable Products** | | |
| | • At least 3% of all products by cost meet the transparency and sustainability requirements. The following initiatives are used to demonstrate product compliance: reused products, recycled content products, environmental product declarations, third-party certification, or stewardship programs. | 1 | Architect/ Head contractor |
| | **Construction and Demolition Waste** | | |
| | • At least 90% of construction and demolition waste is diverted from landfill (excluding hazardous waste). | 1 | Head contractor |
| | **Total Materials points** | **5.5** | |

*Table 7: Proposed Sustainability Initiatives under Green Star Materials Category*

## Land Use & Ecology

The Land Use & Ecology category aims to improve the site's ecological value. The initiatives are listed in Table 8.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Land Use & Ecology | **Sustainable Sites**<br>• The site does not have critically endangered, endangered or vulnerable species, or ecological communities.<br>• ≥ 75% of the site was previously developed land | Comply<br>1 | Building owner<br>Building owner |
| | **Heat Island Effect**<br>• ≥ 75% of the whole project site area (excluding area occupied by solar hot water and solar photovoltaic (PV) panels) when measured in plan view comprises of one or a combination of the following. This is to be coordinated with the Landscape and Electrical team, and other disciplines as required:<br>- Vegetation;<br>- Roofing materials, including shading structure having a Solar Reflectance Index (SRI) of:<br>- For roof pitched < 15°, a 3-year SRI of min. 64 or an initial SRI of min. 82;<br>- For roof pitched > 15°, a 3-year SRI of min. 34 or an initial SRI of min. 39.<br>- Unshaded hard-scaping (e.g. roads, paths, open carpark) with 3-years SRI of min. 34 or an initial SRI of 39;<br>- Hardscapes shaded by overhanging vegetation or roof structures/ canopy, including solar hot water panels and solar PV panels;<br>- Water bodies and/or water courses;<br>- Areas directly to the South of vertical building elements (including green walls);<br>- Areas shaded by vertical building elements (including green walls) during Summer Solstice (i.e. 21st or 22nd December). This can be supported with sunpath/overshadowing diagram submitted during DA submission. | 1 | Architect/ Landscape Architect |
| | **Total Land use and ecology points** | **2** | |

*Table 8: Proposed Sustainability Initiatives under Green Star Land Use & Ecology Category*

## Emissions

The Emissions category aims to address the 'point source' pollution generated by the development. The initiatives are listed in Table 9.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Emissions | **Stormwater Peak Discharge**<br>• The site shall achieve reduction of stormwater runoff, where the post-development peak Average Recurrence Interval (ARI) event discharge does not exceed the pre-development peak ARI event discharge. The specified design is for 1 year ARI and 5 year ARI. | 1 | Civil consultant |
| | **Stormwater Pollution Targets**<br>• Implement stormwater strategy to reduce pollutants entering the public stormwater in line with DCP and the following stormwater pollution reduction targets, whichever more stringent:<br>- Total Suspended Solids (TSS): 80%<br>- Gross Pollutants: 85%<br>- Total Nitrogen (TN): 30%<br>- Total Phosphorus: 30%<br>- Total Petroleum Hydrocarbons: 60%<br>- Free Oils: 90% | 1 | Civil consultant |
| | **Light Pollution to Neighbouring Bodies and Night Sky**<br>• Exterior and landscape lighting shall be carefully selected to ensure reduction in light pollution either by installing external light that achieve compliance with 5% upward light output ratio (ULOR) relative to its mounting orientation or by control of direct illuminance (0.1 lux to site boundary and 0.1 lux to 4.5 metres beyond the site into the night sky when calculated in accordance with AS4282:1997. | 1 | Electrical consultant |
| | **Microbial Control**<br>• Building cooling heat rejection systems do not use or contain water | 1 | Mechanical consultant |
| | **Total Emissions points** | **4** | |

*Table 9: Proposed Sustainability Initiatives under Green Star Land Use & Ecology Category*

## Innovation

The Innovation category aims to encourage innovative sustainability initiatives and those that exceed the regular Green Star requirements. The initiatives are listed in Table 10.

| Green Star credit | Project initiative | Targeted Points | Design Responsibility |
|---|---|---|---|
| Innovation | Innovation requirements should be driven by the vision of the development as it progresses through concept and detailed design. The following innovation credits are targeted: | | |
| | • Ultra low VOC paints – 50% of paints by volume have a maximum TVOC content of 5g/L | 1 | Architect/ Head contractor |
| | • At least 95% of all mattresses that are to be supplied to the building meet the GreenGuard emission criteria for bedding. | 1 | Building Owner |
| | • Financial transparency – Complete GBCA Financial Transparency Disclosure template with information relating to design, construction, documentation and other project costs. | 1 | Head contractor |
| | • 80% of services and skilled labour are employed within 50km of the site. | 1 | Head contractor |
| | • 80% of products and materials by volume are produced or manufactured in Australia. | 1 | Head contractor |
| | **Total Innovation points** | **5** | |

*Table 10: Proposed Sustainability Initiatives under Green Star Innovation Category*

# Climate Responsive Development

SEARS Requirements

- Provide a statement regarding how the design and asset life of the future development is responsive to the CSIRO projected impacts of climate change for the Sydney Metropolitan area, specifically:
    - Hotter days and more frequent heatwave events
    - Extended drought periods
    - More extreme rainfall events
    - Gustier wind conditions
    - How these will inform landscape design, material selection and social equity aspects (respite/shelter areas).

## NSW Climate (NARCliM) Projections for 2020 – 2039 and 2060 – 2070

Climate change projections for the development has been assessed based on the NARCliM projections map for year 2020 – 2039 and 2060 – 2070. The following outline the climate change projections for Kirrawee NSW 2232 and its proposed key design respond. Under NSW Climate projections, Kirrawee falls within the Metropolitan Sydney area:

| Climate Parameter | Projected Change for 2020 - 2039 | Key Design Initiatives |
|---|---|---|
| Temperature | By 2030 maximum temperatures are projected to rise by 0.7 °C and continue to rise by 2.1 °C by 2070. | The air-conditioning plant design shall cater for the temperature rise to ensure thermal comfort throughout the building operation. This allowance is also in line with HVAC lifespan of 20 – 25 years. |
| Heat | By 2030 Kirrawee is projected to experience an average of 4 more days above 35°C per year and continue to rise to 11 days per year by 2070. | |
| Rainfall | By 2030 rainfall is projected to increase by 9.7% during autumn across the region. By 2070 rainfall increases are projected for summer, autumn and most of the region during spring. | Stormwater design shall account for the increase of projected rainfall such that the post-development peak Average Recurrence Interval (ARI) event discharge from the site does not exceed the pre-development peak ARI event discharge. Management of peak flows may include strategies such as rainwater harvesting for reuse, reduce development hardscapes and maximise infiltration to native soils or equivalent. |

# Appendix A

# ESD Design Principles: 4 Star Green Star Sustainability Pathway

# Green Star - Design & As Built Scorecard

| | | | |
|---|---|---|---|
| **Project:** | President Private Hospital | **Round:** | Please select the round of assessment |
| **Targeted Rating:** | 4 Star - Best Practice | | |

| Core Points Available | Total Score Targeted |
|---|---|
| 100 | 50.5 |

| CATEGORY / CREDIT | AIM OF THE CREDIT / SELECTION | CODE | CREDIT CRITERIA | | POINTS AVAILABLE | POINTS TARGETED |
|---|---|---|---|---|---|---|
| **Management** | | | | | 14 | |
| Green Star Accredited Professional | To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended. | 1.1 | Accredited Professional | | 1 | 1 |
| Commissioning and Tuning | To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential. | 2.0 | Environmental Performance Targets | | - | Complies |
| | | 2.1 | Services and Maintainability Review | | 1 | 1 |
| | | 2.2 | Building Commissioning | | 1 | |
| | | 2.3 | Building Systems Tuning | | 1 | 1 |
| | | 2.4 | Independent Commissioning Agent | | 1 | |
| Adaptation and Resilience | To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters. | 3.1 | Implementation of a Climate Adaptation Plan | | 2 | |
| Building Information | To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance. | 4.1 | Building Information | | 1 | 1 |
| Commitment to Performance | To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way. | 5.1 | Environmental Building Performance | | 1 | 1 |
| | | 5.2 | End of Life Waste Performance | A. Contractual Agreements | 1 | 1 |
| Metering and Monitoring | To recognise the implementation of effective energy and water metering and monitoring systems. | 6.0 | Metering | | - | Complies |
| | | 6.1 | Monitoring Systems | | 1 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Responsible Construction Practices** | To reward projects that use best practice formal environmental management procedures during construction. | 7.0 | Environmental Management Plan | | - | Complies |
| | | 7.1 | Environmental Management System | | 1 | 1 |
| | | 7.2 | High Quality Staff Support | | 1 | 1 |
| **Operational Waste** | B. Prescriptive Pathway | 8A | Performance Pathway: Specialist Plan | | 0 | |
| | | 8B | Prescriptive Pathway: Facilities | | 1 | 1 |
| **Total** | | | | | **14** | **10** |

| Indoor Environment Quality | | | | | 17 | |
|---|---|---|---|---|---|---|
| Indoor Air Quality | To recognise projects that provide high air quality to occupants. | 9.1 | Ventilation System Attributes | | 1 | 1 |
| | | 9.2 | Provision of Outdoor Air | ☑ A. Comparison to Industry Standards<br>☐ B. Performance Based Approach<br>☐ C. Natural Ventilation | 2 | 1 |
| | | 9.3 | Exhaust or Elimination of Pollutants | ☑ A. Removing the Source of Pollutants<br>☐ B. Exhausting the Pollutants Directly to the Outside | 1 | 1 |
| Acoustic Comfort | To reward projects that provide appropriate and comfortable acoustic conditions for occupants. | 10.1 | Internal Noise Levels | | 1 | 1 |
| | | 10.2 | Reverberation | | 1 | 1 |
| | | 10.3 | Acoustic Separation | A. Sound Reduction | 1 | |
| Lighting Comfort | To encourage and recognise well-lit spaces that provide a high degree of comfort to users. | 11.0 | Minimum Lighting Comfort | | - | Complies |
| | | 11.1 General Illuminance and Glare Reduction | 11.1.1 General Illuminance | ☑ A. Non Residential Spaces<br>☐ B. Residential Spaces | 1 | 1 |
| | | | 11.1.2 Glare Reduction | ☑ A. Prescriptive Method 1<br>☑ B. Prescriptive Method 2<br>☐ C. Performance Method | | |
| | | 11.2 | Surface Illuminance | ☐ A. Prescriptive Method<br>☐ B. Performance Method<br>☐ C. Residential Spaces (Prescriptive Method) | 1 | |
| | | 11.3 | Localised Lighting Control | | 1 | |
| Visual Comfort | To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants. | 12.0 | Glare Reduction | ☑ A. Fixed Shading Devices<br>☑ B. Blinds or Screens<br>☐ C. Daylight Glare Model | - | Complies |
| | | 12.1 | Daylight | ☑ A. Prescriptive Methodology<br>☐ B. Compliance Using Daylight Factor<br>☐ C. Compliance Using Daylight Autonomy | 2 | |
| | | 12.2 | Views | | 1 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Indoor Pollutants** | To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels. | 13.1 Paints, Adhesives, Sealants and Carpets | 13.1.1 Paints, Adhesives and Sealants | ☐A. Product Certification<br>☐B. Laboratory Testing<br>☐C. No Paints, Adhesives or Sealants | 1 | 1 |
| | | | 13.1.2 Carpets | ☐A. Product Certification<br>☐B. Laboratory Testing<br>☐C. No Carpets | | |
| | | 13.2 | Engineered Wood Products | ☐A. Product Certification<br>☐B. Laboratory Testing | 1 | 1 |
| **Thermal Comfort** | To encourage and recognise projects that achieve high levels of thermal comfort. | 14.1 | Thermal Comfort | ☐A. Naturally Ventilated Spaces<br>☐B. Mechanically Ventilated Spaces<br>☐C. Residential Spaces | 1 | |
| | | 14.2 | Advanced Thermal Comfort | ☐A. Naturally Ventilated Spaces<br>☐B. Mechanically Ventilated Spaces<br>☐C. Residential Spaces | 1 | |
| **Total** | | | | | **17** | **9** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Energy** | | | | | **22** | |
| | | 15A.0 | Conditional Requirement: Prescriptive Pathway | | - | Complies |
| | | 15A.1 | Building Envelope | | 1 | 1 |
| | | 15A.2 | Wall-Glazing Construction and Retail Display Glazing | | 1 | 1 |
| | | 15A.3 | Lighting | | 1 | 1 |
| | | 15A.4 | Ventilation and Air Conditioning | | 1 | 1 |
| | | 15A.5 | Domestic Hot Water | | 1 | 1 |
| | | 15A.6 | Transition Plan | | 1 | |
| | | 15A.7 | Fuel Switching | | 1 | |
| | | 15A.8 | On-Site Storage | | 1 | |
| | | 15A.9 | Vertical Transportation | | 1 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Greenhouse Gas Emissions** | A. Prescriptive Pathway | 15A.10 | Off-Site Renewables | | 5 | |
| | | 15B.0 | Conditional Requirement: NatHERS Pathway | | - | |
| | | 15B.1 | Thermal and Energy Performance | | 0 | |
| | | 15B.2 Building Services and Appliances | 15B.2.1 Lighting | | 0 | |
| | | | 15B.2.2 Ventilation and Air Conditioning | ☐ A. Mechanically Conditioned Spaces<br>☐ B. Spaces With Mechanical Heating Only<br>☐ C. Naturally Ventilated Spaces | 0 | |
| | | | 15B.2.3 Domestic Hot Water | | 0 | |
| | | | 15B.2.4 Appliances & Equipment | | 0 | |
| | | | 15B.2.5 Fuel Switching | | 0 | |
| | | | 15B.2.6 On-Site Storage | | 0 | |
| | | | 15B.2.7 Vertical Transportation | | 0 | |
| | | | 15B.2.8 Passive Laundry Facilities | | 0 | |
| | | | 15B.2.9 Unoccupied Areas | | 0 | |
| | | | 15B.2.10 Off-Site Renewables | | 0 | |
| | | 15C.0 | Conditional Requirement: BASIX Pathway | | - | |
| | | 15C.1 | BASIX Greenhouse Gas Reductions | | 0 | |
| | | 15C.2 | Off-Site Renewables | | 0 | |
| | | 15D.0 | Conditional Requirement: NABERS Pathway | | - | |
| | | 15D.1 | NABERS Energy Greenhouse Gas Emissions Reduction | | 0 | |
| | | 15D.2 | Off-Site Renewables | | 0 | |
| | | 15D.3 Additional Measures | 15D.3.1 Transition Plan | | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 15D.3 Additional Prescriptive Measures | 15D.3.2 Fuel Switching | | 0 | |
| | | | 15D.3.3 On-Site Storage | | 0 | |
| | | 15E.0 | Conditional Requirement: Reference Building Pathway | | - | |
| | | 15E.1 | GHG Emissions Reduction: Building Fabric | | 0 | |
| | | 15E.2 | GHG Emissions Reduction | | 0 | |
| | | 15E.3 | Off-Site Renewables | | 0 | |
| | | 15E.4 | District Services | | 0 | |
| | | 15E.5 Additional Prescriptive Measures | 15E.5.1 Transition Plan | | 0 | |
| | | | 15E.5.2 Fuel Switching | | 0 | |
| | | | 15E.5.3 On-Site Storage | | 0 | |
| **Peak Electricity Demand Reduction** | A. Prescriptive Pathway | 16A | Prescriptive Pathway: On-Site Energy Generation | | 1 | |
| | | 16B | Modelled Performance Pathway: Reference Building | | 0 | |
| **Total** | | | | | **11** | **6** |

| **Transport** | | | | | **10** | |
|---|---|---|---|---|---|---|
| **Sustainable Transport** | B. Prescriptive Pathway | 17A | Performance Pathway | | 0 | |
| | | 17B.1 | Access by Public Transport | | 3 | 1 |
| | | 17B.2 | Reduced Car Parking Provision | | 1 | |
| | | 17B.3 | Low Emission Vehicle Infrastructure | A. Parking for Fuel-Efficient Vehicles | 1 | 1 |
| | | 17B.4 | Active Transport Facilities | | 1 | 1 |
| | | 17B.5 | Walkable Neighbourhoods | A. Proximity to Amenities | 1 | |
| **Total** | | | | | **7** | **3** |

| **Water** | | | | | **12** | |
|---|---|---|---|---|---|---|
| **Potable Water** | B. Prescriptive Pathway | 18A | Potable Water - Performance Pathway | | 0 | |
| | | 18B.1 | Sanitary Fixture Efficiency | | 1 | 1 |
| | | 18B.2 | Rainwater Reuse | | 1 | 1 |
| | | 18B.3 | Heat Rejection | | 2 | 2 |
| | | 18B.4 | Landscape Irrigation | | 1 | 1 |
| | | 18B.5 | Fire Protection System Test Water | | 1 | 1 |
| **Total** | | | | | **6** | **6** |

| Materials | | | | | 14 | |
|---|---|---|---|---|---|---|
| Life Cycle Impacts | B. Prescriptive Pathway - Life Cycle Impacts | 19A.1 | Comparative Life Cycle Assessment | | 0 | |
| | | 19A.2 | Additional Reporting | ☐A. Additional Life Cycle Impact Reporting<br>☐B. Material Selection Improvement<br>☐C. Construction Process Improvement<br>☐D. LCA Design Review | 0 | |
| | | 19B.1 Concrete | 19B.1.1 Portland Cement Reduction | | 2 | 1 |
| | | | 19B.1.2 Water Reduction | | 0.5 | 0.5 |
| | | | 19B.1.3 Aggregates Reduction | A. Course Aggregate Reduction | 0.5 | |
| | | 19B.2 Steel | A. Reduced Mass of Steel Framing | B. Reduction in Mass | 1 | |
| | | 19B.3 | Building Reuse | 19B.3.1 Façade Reuse | 2 | |
| | | | | 19B.3.2 Structure Reuse | 2 | |
| | | 19B.4 | Structural Timber | 19B.4.0 Responsible Sourcing | - | |
| | | | | 19B.4.1 Reduced Embodied Impacts | 3 | |
| Responsible Building Materials | To reward projects that include materials that are responsibly sourced or have a sustainable supply chain. | 20.1 | Structural and Reinforcing Steel | 20.1.0 Responsible Steel Maker | - | Complies |
| | | | | B. Energy-Reducing Processes in Steel Reinforcement Production | 1 | 1 |
| | | 20.2 | Timber | ☐A. Certified Timber<br>☐B. Reused Timber | 1 | |
| | | 20.3 | Permanent Formwork, Pipes, Flooring, Blinds and Cables | B. Best Practice Guidelines for PVC | 1 | 1 |
| Sustainable Products | To encourage sustainability and transparency in product specification. | 21.1 | Product Transparency and Sustainability | ☐A. Reused Products<br>☐B. Recycled Content Products<br>☐C. Environmental Product Declarations (EPDs)<br>☐D. Third Party Certification<br>☐E. Stewardship Programs | 3 | 1 |
| Construction and Demolition Waste | B. Percentage Benchmark | 22.0 | Reporting Accuracy | B. Disclosure Statement | - | Complies |
| | | 22A | Fixed Benchmark | | 0 | |
| | | 22B | Percentage Benchmark | | 1 | 1 |
| **Total** | | | | | **12** | **5.5** |

| Land Use & Ecology | | | | | 6 | |
|---|---|---|---|---|---|---|
| **Ecological Value** | To reward projects that improve the ecological value of their site. | 23.0 | Endangered, Threatened or Vulnerable Species | A. EPBC | - | |
| | | 23.1 | Ecological Value | | 3 | |
| **Sustainable Sites** | To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land. | 24.0 | Conditional Requirement | | - | Complies |
| | | 24.1 | Reuse of Land | A. Previously Developed Land | 1 | 1 |
| | | 24.2 | Contamination and Hazardous Materials | ☐ A. Site Contamination<br>☐ B. Hazardous Materials | 1 | |
| **Heat Island Effect** | To encourage and recognise projects that reduce the contribution of the project site to the heat island effect. | 25.1 | Heat Island Effect Reduction | | 1 | 1 |
| **Total** | | | | | **6** | **2** |

| Emissions | | | | | 5 | |
|---|---|---|---|---|---|---|
| **Stormwater** | To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure. | 26.1 | Stormwater Peak Discharge | | 1 | 1 |
| | | 26.2 | Stormwater Pollution Targets | | 1 | 1 |
| **Light Pollution** | To reward projects that minimise light pollution. | 27.0 | Light Pollution to Neighbouring Bodies | | - | Complies |
| | | 27.1 | Light Pollution to Night Sky | A. Control of Upward Light Output Ratio (ULOR) | 1 | 1 |
| **Microbial Control** | To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems. | 28 | Legionella Impacts from Cooling Systems | B. Waterless Heat Rejection Systems | 1 | 1 |
| **Refrigerant Impacts** | To encourage operational practices that minimise the environmental impacts of refrigeration equipment. | 29.1 | Refrigerants Impacts | A. Calculating TSDEI | 1 | |
| **Total** | | | | | **5** | **4** |

| Innovation | | | | | 10 | |
|---|---|---|---|---|---|---|
| **Innovative Technology or Process** | The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world. | 30A | Innovative Technology or Process | | 10 | |
| **Market Transformation** | The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world. | 30B | Market Transformation | | | |
| **Improving on Green Star Benchmarks** | The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points. | 30C | Improving on Green Star Benchmarks | | | 5 |
| **Innovation Challenge** | Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools. | 30D | Innovation Challenge | | | |
| **Global Sustainability** | Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tools. | 30E | Global Sustainability | | | |
| **Total** | | | | | **10** | **5** |

| TOTALS | AVAILABLE | TARGETED |
|---|---|---|
| CORE POINTS | 100 | 45.5 |
| CATEGORY PERCENTAGE SCORE | | 45.5 |
| INNOVATION POINTS | 10 | 5.0 |
| TOTAL SCORE TARGETED | | 50.5 |

# Appendix B – Green Star References

The following references the Green Star – Design and As Built v1.3 tool for indoor material emissions standards and high steel strength requirements.

### Paints, Adhesives, Sealants, Carpets & Engineered Wood

At least 95% of all internally applied paints, adhesives, sealants (by volume) or carpets (by area) meet the TVOC limits detailed in Table 13.1.1.

**Table 13.1.1: Maximum TVOC Limits for Paints, Adhesives and Sealants**

| Product Category | Max TVOC content in grams per litre (g/L) of ready to use product. |
|---|---|
| General purpose adhesives and sealants | 50 |
| Interior wall and ceiling paint, all sheen levels | 16 |
| Trim, varnishes and wood stains | 75 |
| Primers, sealers and prep coats | 65 |
| One and two pack performance coatings for floors | 140 |
| Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives | 250 |
| Structural glazing adhesive, wood flooring and laminate adhesives and sealants | 100 |

### Carpets

At least 95% of all carpet products comply with the Total VOC (TVOC) limits for a selected compliance options, specified in the tables below. Either option is acceptable.

The product is certified under a recognised Product Certification Scheme (listed on the GBCA website http://new.gbca.org.au/product-certification-schemes/) or other recognised standards.

The certificate must be current at the time of project registration or submission and list the relevant product name and model.

**Carpet Test Standards and TVOC Emissions Limits**

| Compliance option | Test protocol | Limit |
|---|---|---|
| ASTM D5116 | ASTM D5116 - Total VOC limit* | 0.5mg/m$^2$ per hour |
| | ASTM D5116 - 4-PC (4-Phenylcyclohexene)* | 0.05mg/m$^2$ per hour |
| ISO 16000 / EN 13419 | ISO 16000 / EN 13419 - TVOC at three days | 0.5 mg/m$^2$ per hour |
| ISO 10580 / ISO/TC 219 (Document N238) | ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours | 0.5mg/m$^2$ per hour |

*Both limits should be met when testing against ASTM D5116

### Engineered Wood Products

At least 95% of all new engineered wood products must meet the formaldehyde emission limits specified in Table 13.2B.

**Table 13.2B: Formaldehyde Emission Limit Values for Engineered Wood Products**

| Test Protocol | Emission Limit/ Unit of Measurement |
|---|---|
| AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood | ≤1mg/ L |
| AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16 | ≤1.5 mg/L |
| AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16 | ≤1mg/ L |
| AS/NZS 4357.4 - Laminated Veneer Lumber (LVL) | ≤1mg/ L |
| Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL | ≤1mg/ L |
| JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460 | ≤1mg/ L |
| JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460 | ≤1mg/ L |
| JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates) | ≤0.1 mg/m²hr* |
| ASTM D5116<br>(applicable to high pressure laminates and compact laminates) | ≤0.1 mg/m²hr |
| ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates | ≤0.1 mg/m²hr (at 3 days) |
| ASTM D6007 | ≤0.12mg/m³** |
| ASTM E1333 | ≤0.12mg/m³*** |
| EN 717-1 (also known as DIN EN 717-1) | ≤0.12mg/m³ |
| EN 717-2 (also known as DIN EN 717-2) | ≤3.5mg/m²hr |

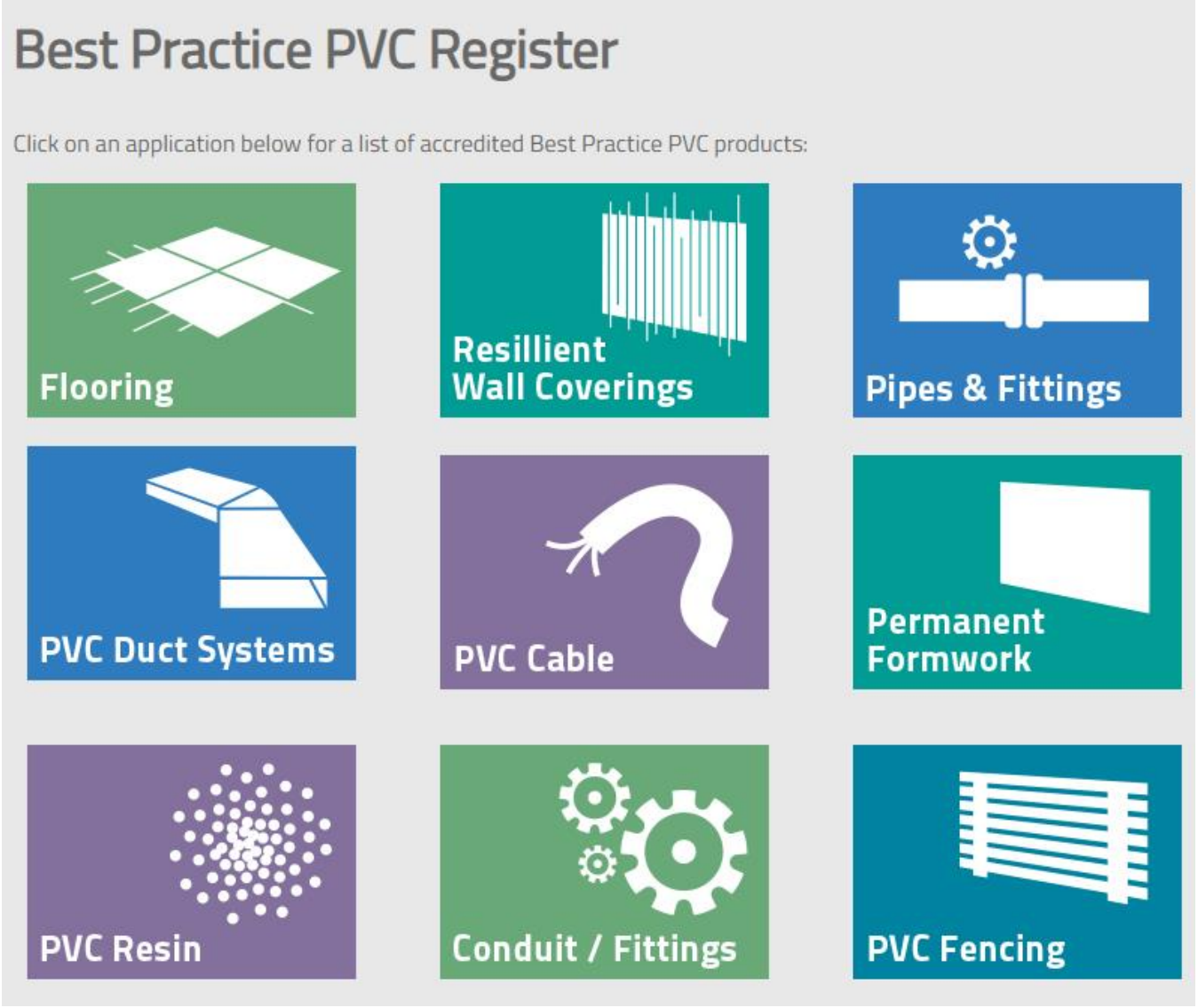
*mg/m²hr may also be represented as mg/m²/hr.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

### Best Practice PVC

All PVC used in the project should be registered under the Best Practice PVC Product Register managed by the Vinyl Councils Best Environmental Practice (BEP).




Available at: https://www.vinyl.org.au/in-greenstar/best-practice-pvc-product-register

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