

Sustainable Design Report

Australian Institute of Nanoscience

University of Sydney

Prepared for

Lend Lease Project Management &
Construction (Australia) Pty Limited

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1. Executive Summary

This report has been prepared to demonstrate consideration of the Director General Requirements identified for the proposed design of the Australian Institute of Nanoscience project and identifies the variations between this Sustainability approach to the original Sustainable Design Report provided by Steensen Varming provided at Development Application. This document identifies the proposed Sustainable Design targets and initiatives to be incorporated into the design and has been prepared on behalf of Lend Lease Project Management & Construction (Australia) Pty Limited for submission to the University of Sydney.

Project Targets

The project is targeting the incorporation of a number of sustainable design initiatives that are in alignment with the University of Sydney Sustainability Framework. These initiatives cover energy and water efficiency, efficient building operation and measurement, materials minimisation and evaluation, commissioning, alternative transportation, campus connectivity and site scaping. Some of these initiatives are highlighted in Section 4 of this report. These initiatives satisfy the objectives as defined Director General Requirements (DGR) for the project.

The project is to complete a self-evaluation of the design documentation in reference to the Green Star Education v1 tool. This meets the criteria as identified in the Director General Requirements (DGR) for consideration and adoption of Green Star Education v1 tool as part of the design.

No formal certification with the Green Building Council of Australia (GBCA) is proposed for the project.

The project is targeting energy efficiency improvement in reference to Building Code of Australia Part J Energy Efficiency verification benchmark. This is considered the most appropriate standard to apply as this methodology is capable of evaluating projects with differing process loads to typical Education facilities.

2. Introduction

2.1 Purpose of Document

This document details the Sustainable Design objectives that form part of the Australian Institute of Nanoscience project which aligns with the Director General Requirements as identified in response dated 1st February 2012. This report has been prepared to identify any changes to the proposed ESD approach for the development in reference to the original document provided by Steensen Varming ESD Report revision 01 at the Development Application stage.

This document has been prepared on behalf of Lend Lease Project Management & Construction (Australia) Pty Limited for submission to the University of Sydney.

2.2 Project Description

The project involves the establishment of new Education facility that will incorporate specialised laboratory, teaching and office spaces within the University of Sydney Camperdown campus. The building is to be known as the Australian Institute of Nanoscience and is located adjacent to the existing Physics building and will include two bridge connections between the buildings to connect this new building to the existing campus. The building main elevation is along the north and south and building is sunken into the existing site along the south elevation at level 1.

2.3 Director General Requirements

The Director General Requirements dated 1 February 2012 for ESD items Section 4 were noted as follows:

- o Detail how 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, construction and ongoing operation phasis of the development [Item 1]
- o Demonstrate the targets and commitments of ESD [Item 2]
- o In relation to ESD principles, demonstrate how the following will be incorporated into the detailed design of the building:
 - The Green Building Council Australia, Green Star - Education v1 rating tool should be used as a minimum on the planning of the development [Item 3]
 - If co-generation, greywater recycling, stormwater or rainwater harvesting is proposed, the requirements of any licences from the Office of Environment and Heritage (OEH) and/or i-PART should be addressed [Item 4]
 - If co-generation is proposed, details in relation to air quality [Item 5]
 - If rainwater re-use is proposed, details on the proposed end uses and consideration of any associated health risks. The requirements of any licensing requirements under Section 68 licences under the *Local Government Act 1993* should also be addressed [Item 6]
 - City of Sydney Council's *Sustainable Sydney 2020 plan*. [Item 7]

The above requirements are the DGR elements that are referenced in this report.

2.4 Reference Documents

The following documents have been referenced in preparation of this document:

Document Reference	Description	Revision	Party
DGR 5088-2011	DGR for Science Research	1 February 2012	NSW Government Planning and Infrastructure
DA 1000	Level 1 General Arrangement Plan	02	Architectus
DA 1001	Level 2 General Arrangement Plan	01	
DA 1002	Level 3 General Arrangement Plan	01	
AD 1003	Level 4 General Arrangement Plan	01	
	ESD Report - Part 4 Submission	01 November 2012	Steensen Varming

3. Sustainable Design

3.1 Project Response to DGR

The AIN project has provided ESD Design responses to each of the Director General Requirements

Item 1 - Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000
The University of Sydney addressed these provisions in the Development Application in 2012.

Item 2 - ESD targets and commitments

This is demonstrated in Section 3.3 and 4 of this document.

Item 3 - Green Building Council Australia, Green Star - Education v1 rating tool

This is demonstrated in Section 4.6 of this document.

Item 4 - Co-generation, greywater recycling, stormwater or rainwater harvesting

Co-generation and greywater recycling is not proposed for this project. Stormwater management is proposed in alignment with current University of Sydney and Sydney Water standards however harvesting of this stormwater is not proposed. Rainwater harvesting is being considered and under review for the project.

At this stage of the project it is considered that licences from the Office of Environment and Heritage (OEH) and/or i-PART are required for the proposed works on this project.

Item 5 - Co-generation

Co-generation is not proposed for this project therefore no air quality standards and management procedures are applicable.

Item 6 - Rainwater re-use

Any rainwater re-use that may be adopted for the project will consider the associated health risks through appropriate signage to all plant and equipment, within indoor spaces for occupants and appropriate filtration and UV treatment systems that conform to Australian Standards.

Item 7 - City of Sydney Council's *Sustainable Sydney 2020 plan*

The University of Sydney Sustainability Framework identifies the appropriate elements of sustainability from this plan that are applicable to developments on this site. The project team has adopted a number of these initiatives into the design of the building where possible.

3.2 Project Review to Original ESD Report

The Steensen Varming ESD Report Revision 01 identified a number of key aspirational ESD initiatives for consideration as follows:

- | | |
|-----------------------------|--|
| o Use of low VOC materials | o Use of skylights |
| o Shading | o Mixed Mode Ventilation Systems |
| o Night Purging | o Water Efficient fixtures |
| o Natural daylighting | o Solar Hot Water |
| o Rainwater Harvesting | o Cyclist facilities and access |
| o Passive Stack Ventilation | o Adoption of Green Star education v1 tool in design |
| o Central Courtyards | |

These initiatives have been incorporated into the proposed design where considered feasible however it was noted in the Steensen Varming ESD report that some of these initiatives were being put forward for consideration rather than committed at that time of the Development Application. This was due to the early planning stage of project and budget constraints.

Initiative	Project Response
Use of low VOC materials	The project has agreed to adopt this initiative for the building materials of flooring, paints and adhesives and sealants
Solar Shading	The use of solar shading to the building has been incorporated along the north and west elevations of the building and has been tailored to glazing systems where the extent of glazing is extensive. Where no solar shading is provided window sizes have been tailored to the expected space uses behind and appropriate VLT specification of the glass in lieu of providing shading that would result in greater materials consumption
Night Purging	This system is not considered appropriate from management and operational issue of the building and expected occupation of the building.
Natural daylighting	Has been incorporated into spaces where feasible and suitable to the space uses within the building. Circulation spaces include glazed areas to promote natural daylighting and offices have been located along perimeter of the building to promote daylighting of these spaces
Rainwater Harvesting	Currently under review
Passive Stack Ventilation	Not adopted for the project except for non-conditioned circulation spaces
Central Courtyards	Central atrium spaces have been adopted for student meeting spaces
Use of skylights	Use of glazed facades and bridges has been adopted in lieu of skylights
Mixed Mode Ventilation Systems	Not adopted for the project due to the expected uses of the building, however the common spaces will incorporate spill air from adjacent spaces where appropriate
Water Efficient fixtures	Water fixtures specifications included in the building
Solar Hot Water	Currently under review
Cyclist facilities and access	Bicycle parking, showers and lockers have been adopted for staff
Adoption of Green Star education v1 tool in design	The project has adopted this tool and provided evaluation in Section 4
Lighting Control & Design	Appropriate lighting design and controls have been adopted
Metering	Appropriate water and energy meters shall be adopted to evaluate building uses

3.3 Sustainability Goals

The following sustainability goals have been identified for the project in reference to the University of Sydney Sustainability Framework, Director General Requirements and industry green building standards:

1. Assessment against Green Building Council of Australia Green Star Education v1 tool
2. Energy efficiency through implementation of energy saving initiatives which includes improvement of greater than 15% above benchmark
3. Materials minimisation and measurement
4. Indoor environment spaces that are comfortable
5. Minimisation of operational emissions
6. Water efficiency
7. Minimisation of waste production

The following measures have been identified for the project to demonstrate the measure of sustainability for the development:

Goals	Element	Measure
Energy Efficiency	Energy savings	kg CO ₂ per annum
Materials minimisation	Embodied energy & carbon	MJ / m ²
Indoor environment improvement	Indoor emissions	Toxicity levels
Operational emissions	Energy emissions Waste consumption Wastewater discharge	kg CO ₂ per annum kg landfill per annum ML per annum
Water Efficiency	Water reuse and efficient fixtures	ML per annum
Waste reduction	Operation waste management & Construction waste landfill reductions	kg recyclables per month kg general wastes per month Tonnes sent to landfill

It is anticipated through the design development stage of the project that the project environmental savings will be identified.

4. Sustainable Design Initiatives

4.1 Energy Efficiency

The following is a summary of the energy efficiency initiatives to be adopted in the design of the building to address DGR Items 2, 6 and 7:

Spaces that offer Natural Daylighting

Natural daylighting within a building offers improvement to the internal environment of a building and can result in reductions in energy consumption associated with artificial lighting. The design incorporates glazing to specific areas of the building and long floorplate that promotes natural daylighting to ideal spaces such as offices, break-out spaces and teaching spaces. This will reduce artificial lighting during daylight hours and aids in improving indoor comfort of occupants.

Lighting Specification and Design

Lighting efficiency is important in maintaining low energy consumption for reuse projects. Lighting consumption for a facility such as this could account between 25-40% of the estimated energy use of the facility. To satisfy these requirements all teaching spaces and offices areas are to be fitted with efficient fixtures (minimum T5 fluorescent) to reduce the ongoing energy consumption. Reduced lighting densities are to be targeted for the relevant spaces to improve energy efficiency in operation and LED lighting is being considered to improve efficiency.

Automated Lighting Control System for Functional Spaces

Lighting controls (time switches) allow lights to be turned off when areas are unoccupied or when daylighting provides sufficient light to the space. Lighting controls are to be adopted for the building to switch off when spaces are unoccupied. This will ensure that no interior lights are operating when not required. Lighting controls will be zoned to maximum of 500m², or each functional space where possible and the functional brief of the spaces permits. This will enable areas can be lit according to needs of occupants and building management requirements.

Services and Space Management

Mechanical services shall be designed to suit the occupancy and functional operation of the spaces served. The circulation spaces shall be designed to efficiently condition only areas where occupied zones are expected and this conditioning is expected to filter to other circulation zones at lower levels; spill air from the air conditioning systems on the higher levels shall provide some tempering to the lower levels. This will reduce the overall electricity demand and energy consumption of the building.

Monitoring & reporting

The use of sub-metering to record and measure the electricity consumption of different energy uses within the facility is to be integrated into the Building Management Control System (BMCS). Metering will allow the facility manager to monitor energy usage attributed to the different fuels within the building with the goal to measure up to 90% of all energy uses within the building.

Ongoing reporting will allow the University facility management to set goals for energy consumption reductions and attributed energy costs to particular uses. By monitoring energy, losses and wastage can be identified, therefore improving the overall performance of the building in operation. This initiative is subject to further design development and review. The final details of the metering and reporting systems is to be defined during the detailed design stage of the project.

4.2 Water Efficiency

The following is a summary of the water efficiency initiatives to be adopted in the design of the building to address DGR Items 4, 6 and 7:

Specification of Fixtures & Potable Water consumption

Potable water usage for the site will be attributed to showers, toilets, laboratories, basins in toilet areas, kitchen sinks and some external works for irrigation. To reduce the overall demand attributed from these uses, fixtures are to be specified with high WELS ratings of:

Water Closets - 4 star WELS

Basin Taps - 5 star WELS

Laboratory Taps - 4 star WELS

Urinals - 6 star WELS

Showers - 3 star WELS maximum flow rate 7.5L/min

The specification of the laboratory fixtures are to meet minimum code requirements in lieu of water efficiency fixture specifications to ensure that they are fit for purpose.

Water Meters

Water meters are to be installed to the building for all major water uses which include cooling towers, bathroom water use, irrigation, hot water systems, rainwater re-use (if proposed) and fire test water systems. Meters will not be installed to leased areas within the building as these are not known at this stage. Metering systems are to be compliant with University of Sydney requirements.

4.3 Indoor Comfort

The following is a summary of the indoor environment initiatives to be adopted in the design of the building to address DGR Items 2, 6 and 7:

Thermal Comfort Assessment

The project will assess the functional spaces of the project in reference to the ASHRAE 55-2004 thermal comfort with the target to achieve majority of the building area with a Predicted Mean Vote (PMV) measure of plus or minus 1. This will provide a measure of comfort expected by the University in full occupation mode of the building.

Lighting Design

The lighting design to the building will incorporate electronic ballasts as standard to all fluorescent light fittings to reduce the extent of flicker and improve indoor comfort to occupants.

CO₂ Monitoring

The mechanical design will incorporate carbon dioxide (CO₂) monitoring and control system with a minimum of one sensor per return air duct on each floor to facilitate continuous monitoring and adjustment of outside air rates as required to the floors. This will allow for the appropriate management of ventilation rates to the floors in accordance with AS1668.2-2002 and improve indoor comfort for occupants. This system shall be operated and managed by the Building Management Control System.

Ventilation Rates

For all generally occupied spaces and non-technical spaces other than unconditioned circulation, 50% improvement in outside air rates above AS1668.2 rates shall be supplied to these spaces to improve the indoor comfort of occupants. This allowance shall be balanced with the CO₂ monitoring and controls system.

Internal Noise Levels

The building shall be designed to manage indoor noise levels to acceptable standards. This will include appropriate specification of acoustic treatments to the facade, partition systems and plant and equipment to reduce the impacts on internal and external noise on adjoining spaces.

4.4 Materials

The following is a summary of the materials initiatives to be adopted in the design of the building to address DGR Items 2, 6 and 7:

Construction Management

The project is targeting minimum 80% (by weight) of recycling of all construction wastes and where appropriate and part of the contracted works demolition wastes. This is to exclude any hazardous materials or excavation volumes. Prior to construction commencing a Waste Management Plan will be prepared by the Head Contractor and subcontractors will be inducted into this plan. This plan will be maintained throughout the duration of the project and regular reporting of the construction wastes recycled / reused and sent to landfill is to be reported to the University.

Materials Evaluation

The project team will undertake a carbon footprint analysis of the main structure that will include the assessment of concrete, structural steel, reinforcing steel, aluminium and glass products to be installed on the project. This assessment will be a simplified lifecycle impact assessment in terms of carbon equivalent measure where standard figures will be adopted for these items. The assessment will define the impact of the new building in construction however will not assess plant and equipment, furniture items. The benefit of this assessment will be to provide the University with a basis for estimating the lifecycle costs of the structure in comparison to the ongoing operation of the facility.

Specification of appropriate materials and furniture

Interior finishes will consider the concentration of Volatile Organic Compounds with products for adhesives, paints, carpets and floor sealants. The project team will work with suppliers and contractors to identify opportunities to reduce the level of VOC's within products and finishes to reduce the extent of volatiles in the indoor environment on occupation.

All furniture and flooring materials are to be selected with consideration of supplier environmental management systems, manufacturing emissions, ease of re-use and re-conditioning at the end of the products life. This is to reduce the overall environmental impacts of the selection of furniture within the building where feasible. The project team is to work with suppliers to identify opportunities to reduce the impact of finishes and promote reuse where feasible. Where furniture is to be purchased directly by the University these items will not be assessed for environmental impact.

Composite timber products are to be specified to have a low formaldehyde content to reduce the extent of emissions on occupation and this apply to all permanently installed composite timber products such as joinery, doors, partitions, flooring and feature panels. The emissions limit to be set for composite timber products is to be 1mg/L generally when tested to Australian Standards of AS2098.11 and AS4266.16.

4.5 Operation & Handover

The following is a summary of the operational initiatives to be adopted in the design of the building to address DGR Items 2, 6 and 7:

Commissioning

The project will undertake a comprehensive commissioning strategy for the building that is to consider the staging of the works including temporary services. As part of the commissioning strategy pre-commissioning, detailed commissioning and post commissioning reviews are to be undertaken and an independent consultant is to be engaged to review the results throughout the staged delivery of the works. All testing data is to be consolidated into a report for review by University of Sydney and integration into the Building Users' Guide and Building Maintenance Guides.

Building Users Guide

A simple Building Users Guide is to be developed for the project to provide Facilities Management (building manager) with the details of the building that outline ideal operational and maintenance procedures. The document will include:

- o Energy and Environmental Strategy
- o Monitoring and Targeting
- o Building Services
- o Transport Facilities
- o Materials management
- o Waste management
- o Expansions and refit considerations including staging considerations

The Guide is to be produced in association with all consultants on the project and will be reviewed by University of Sydney Facilities Management throughout the relevant stages of the project to ensure that the approach is reasonable. This guide will form the basis of the Building Maintenance Guide for ongoing management of the facility.

Alternative Transportation Access

The project will provide bicycle parking that will provide minimum of 10% staff with access to racks, shower and lockers to provide alternative transportation options. The project is located within easy walking distance to local bus networks to the north and south access points on the campus that will encourage students and staff to use these facilities and reduce dependence on car travel.

4.6 Green Star Evaluation

The project has adopted the Green Stare Education v1 tool in the development of the design and will produce a self-assessment evaluation of the project against this tool for the University of Sydney on completion of the detailed design stage of the project. This package of documents will summarise the initiatives adopted and incorporated in the design documents and will include evaluation of the building in reference to the energy efficiency in operation against appropriate energy benchmarks of similar building types.

The Green Star benchmarks will be adopted where appropriate to the building use however it is anticipated that there may be some variations to the initiatives incorporated in the final building design where there is conflict with the University of Sydney Principal Project Requirement documents and University of Sydney Sustainability Framework parameters.