If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

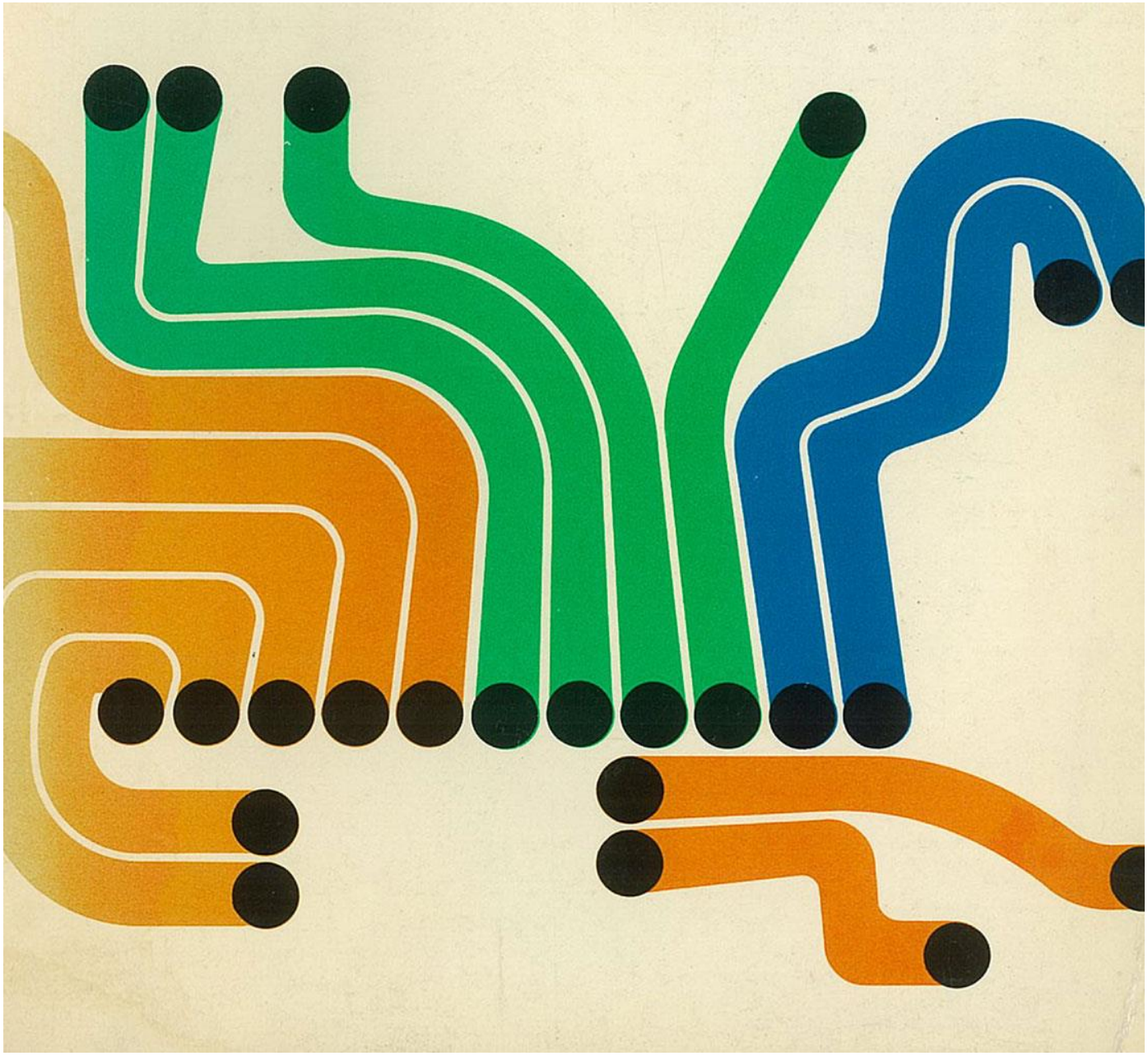
Copenhagen
London
Sydney
Canberra
Hong Kong
New York

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t: +61 / 2 9967 2200
e: info@steensenvarming.com

SUSTAINABLE DESIGN

STEENSEN VARMING

Campbelltown Arts Centre Expansion
ESD Report for SSDA Submission



Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t: +61 / 2 9967 2200
e: info@steensenvarming.com

STEENSEN VARMING

Document Revision and Status

Date	Rev	Issue	Notes	Checked	Approved
12-12-2025	00	Draft	For Comment	DV	DV
17-02-2026	01	DD	For Comments	DV	DV
03-03-2026	02	DD	For Comments	DV	DV
04-03-2026	03	DD	For Comments	DV	DV
09-03-2026	04	DD	For Comments	DV	DV

Sydney March 09th, 2026
Ref No: 247205-S04

Gagandeep Jadhav
Sustainability Consultant

gagandeep.jadhav@steensenvarming.com
+61 0299672200

Diksha Vijapur
Associate

diksha.vijapur@steensenvarming.com
+61 0299672200

Level 8, 9 Castlereagh Street
Sydney, NSW, 2000, Australia
ABN 50 001 189 037
t: +61 / 2 9967 2200
e: info@steensenvarming.com

Table of Contents

1.0 Introduction

This ESD Report prepared by Steensen Varming on behalf of Campbelltown City Council is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) for the expansion of the existing Campbelltown Arts Centre (CAC) on land at 1 Art Gallery Road, Campbelltown (the site).

This SSDA seeks approval for:

- Demolition of parts of the existing buildings and structures on site.
- Expansion and redesign of the existing CAC, including the following elements:
    - Reorientation of the building towards Queen Street in the north to create a more substantial, welcoming and visible connection to the City Centre.
    - Addition of a new 350 seat theatre with back of house facilities.
    - Providing rehearsal spaces, creative and educational workshop areas, and community facilities.
    - Provision of ancillary artists' residences.
    - Provision of commercial spaces including a café/restaurant, retail, and conference facilities.
    - Provision of expanded gallery spaces for the exhibition of artists' collections and dedicated storage for loaned artworks and collections.
- Landscaping works including provision of feature planting and paving.
- Expansion and reconfiguration of at grade car parking.
- Extension and augmentation of services and infrastructure as required.

For a further detailed project description, please refer to the Environmental Impact Statement prepared by Colliers Urban Planning, the Architectural Drawings prepared by fjcstudio, and the other accompanying technical documents that form part of the State Significant Development Application.

Additionally, in line with the SEARS requirements, the following documents have been prepared for the project and included as an appendix to this report:

- A NABERS Embodied Emissions Materials Form

1.1 The Site

The site is located at 1 Art Gallery Road, Campbelltown and is legally identified as Lot 500 DP777387, Lot B DP157318, Lot 1 DP1038779, Lot 2 DP259807 and Lot 3 DP259807, as illustrated in the Site Aerial at **Figure 1**. It is situated within the Campbelltown local government area (LGA) immediately southwest of the Campbelltown City Centre and railway station. The existing development on site consists of the current Campbelltown Arts Centre, characterised by a double storey-built form with open space and an at-grade carpark.

The site is bounded by Art Gallery Road to the west, Narellan Road to the south, Oxley Street to the east and Camden Road to the north. The northern part of the site

is separated from the southern portion by Art Gallery Road as shown in **Figure 1**. The site comprises a total site area of approximately 18,877m^2.

Figure 1 Site Aerial

Source: Nearmap / Colliers Urban Planning

1.2 Relevant SEAR to this report

This ESD Report has been prepared in response to the Secretary's Environmental Assessment Requirements (SEARs) for the proposed development dated 7 August 2024 for SSD-74509208. Specifically, this report has been prepared to respond to those SEARs outlined in **Table 1** below.

Table 1 Secretary's Environmental Assessment Requirements relevant to this Report

SEAR	SEAR description	Section of report where response is provided
9.Ecologically Sustainable Development (ESD)	■ Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development.	Section 2.0
	■ Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.	Section 2.1
	■ Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	Section 2.3, Section 2.4, Section 2.5, Section 2.6, Section 2.7, Section 2.8
	■ If Chapter 3 of SEPP (Sustainable Buildings) 2022 applies:	
	▪ demonstrate how the development has been designed to address the provisions set out in Chapter 3.2(1).	Section 1.3
	▪ Provide a NABERS Embodied Emissions Material Form to disclose the amount of embodied emissions attributable to the development in accordance with section 35BA of the EP&A Regulation.	Appendix-A
	▪ Provide a net zero statement (as defined in section 35C of the EP&A Regulation) that includes: o evidence of how the development will	Section 3.0

	either be fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035. o details of any renewable energy generation and storage infrastructure implemented and any passive and technical design features that minimise energy consumption. o estimations of annual energy consumption for the building and amount of emissions relating to energy use in the building (if information is available).	
	■ In addition, if the development includes large commercial development types (offices with a net lettable area of at least 1000m2, hotel or motel with at least 100 rooms, or serviced apartments of at least 100 apartments) include: a NABERS Agreement to Rate or Commitment Agreement	Not applicable to the CAC project.

1.3 Sustainable Buildings SEPP 2022

The SEPP (Sustainable Buildings) was released in 2022 and comprises requirements for residential and non-residential building typologies. For non-residential typologies, the policy consists of three segments:

- Chapter 3.2 General sustainability
- Chapter 3.3 for Large commercial developments
- Chapter 3.4 for State Significant Development Applications (SSDA).

This section has been prepared to state the relevant development consent requirements outlined in Chapter 3.2 (non-residential development) and 3.4 (SSDA) of the State Environmental Planning Policy (Sustainable Buildings) 2022.

The CAC facility is classified as a non-residential building typology. The project budget is estimated to be over $10 M approximately. The project is seeking approval via an SSDA planning pathway. As such Section 3.2 and 3.4 of the SEPP (Sustainable Buildings) is applicable to the project. It has been determined that sections 3.3 is not applicable to the CAC project as it is not classified as a Commercial building.

As such, the following Sustainable Buildings SEPP Chapter 3.2 measures apply to the project, as tabulated below:

Table 2: SEPP Sustainable Buildings 2022 Requirements

The following table summarises the requirements of Section 3.2 of the SEPP (Sustainable Buildings):

Clause No.	**SEPP SB (2022) Chapter 3.2 Requirement**	**Section of report where response is provided**
3.2 (1)	(a) the minimisation of waste from associated demolition and construction, including by the choice and reuse of building materials,	This section addresses this item. Refer to Section 2.1 below and to the Waste Management plan prepared for the project.
3.2 (1)	(b) a reduction in peak demand for electricity, including through the use of energy efficient technology,	This section addresses this item. Refer to Section 2.2 below.
3.2 (1)	(c) a reduction in the reliance on artificial lighting and mechanical heating and cooling through passive design,	This section addresses this item. Refer to Section 2.3 below.
3.2 (1)	(d) the generation and storage of renewable energy,	This section addresses this item. Refer to Section 2.4 below.
3.2 (1)	(e) the metering and monitoring of energy consumption,	This section addresses this item. Refer to Section 2.5 below.
3.2 (1)	(f) the minimisation of the consumption of potable water.	This section addresses this item. Refer to Section 2.6 below.
3.2 (2)	The embodied emissions attributable to the development have been quantified.	Separate NABERS Embodied Emissions material form addresses this item, refers to Section 2.7 and Appendix A below.

From Section 3.4 'Other considerations for certain State significant development' – the following requirements are applicable to the project:

Clause No.	SEPP SB (2022) Chapter 3.4 Requirement	Section of report where response is provided
3.4 (1)	(1) This section applies to non-residential development that is declared to be State significant development by *State Environmental Planning Policy (Planning Systems) 2021*, section 2.6(1) and specified in that policy, Schedule 1, sections 13–15.	Noted.
3.4 (2)	(2) In deciding whether to grant development consent to development to which this section applies, the consent authority must consider whether the development will minimise the use of on-site fossil fuels, as part of the goal of achieving net zero emissions in New South Wales by 2050.	Section 3.0

Relevant design documentation and reports to support these strategies are being developed by the design team to address the requirements during the design phase and subsequent construction stage, where it will be the responsibility of the contractor to implement the targeted strategies.

2.0 Sustainability approach

The Campbelltown City Council's sustainability aspiration is to achieve an environmentally sensitive and highly sustainable design outcome. To achieve this outcome, the Council's Sustainability Vision is comprised of the following key principles:

1. Sustainability is to be a central part of a functional, whole-of-life design, rather than an optional add-on.
2. Project must integrate sustainability practices in the design, construction and refurbishment of buildings to minimise energy use, greenhouse gas emissions, water consumption and ongoing operational costs wherever possible including:
    a. achieving sustainability targets in our Sustainable buildings policy
    b. responding to local climate conditions and using passive design principles to minimise the use of energy and water
    c. selecting energy and water-efficient equipment, devices and systems considering longevity, life-cycle costs, cleaning, maintenance and upkeep
    d. using low embodied emissions and robust construction materials where possible ensuring a building can be modified and adjusted to change of use or new conditions
    e. incorporating green infrastructure such as tree canopy, open space and waterways
    f. facilitating sustainable transportation such as walking, cycling and public transport.

The ESD initiatives proposed for the project aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building. For addressing the ecologically sustainable development a holistic and integrated design approach, with emphasis on avoiding, then reducing the use of energy, water, waste and materials has been developed and implemented.

This approach, builds on the awareness of climate, site, form, function, and also addresses a broad range of sustainability considerations. The outcome of the resource hierarchy approach is to ensure the project aligns with the ecological sustainable development principles of Section 193 of the Environmental Planning and Assessment Regulation 2021.

The proposed hierarchical approach to optimise the sustainability and resource conservation of the project is illustrated below:

Figure 2 Resource hierarchy approach

Each hierarchy methodology has the reduction of resource consumption as its priority and then seeks to meet the remaining demands by the most efficient means available, before the inclusion of strategies such as renewable energy or waste or water recycling.

2.1 ESD Framework

The Campbelltown Arts Centre Expansion is guided by a Bespoke ESD Framework, which acts as the overarching driver for sustainability outcomes across the design, construction and operational phases of the project. The ESD Framework establishes mandatory performance targets that are embedded within the project brief, ensuring sustainability principles are integrated from early design through to delivery and operation. The bespoke sustainability framework has been developed by Steensen Varming for the project, in consultation with the project stakeholders, to guide the design team towards integrating the sustainability strategies into the core design.

Unlike a conventional Green Star rating pathway of formal certification, which targets a specific star outcome, the project's bespoke ESD Framework adopts a broader and more rigorous approach. The framework has been developed by drawing upon

recognised industry benchmarks including LEED, WELL and Green Star, in addition to incorporating gallery-specific sustainability strategies relevant to the operational and environmental requirements of an arts facility. As all items within the framework are mandatory, the approach functions as a return brief rather than an aspirational rating target.

ESD Framework -

NO.	ESD OBJECTIVE	NO.	ESD STRATEGY
1	Design for Net Zero operational emissions	1.1	All electric building
		1.2	Zero Carbon Action Plan
		1.3	Renewable Electricity
		1.4	Zero-ready EV charging
		1.5	Demand reduction via passive design
		1.6	Whole-building energy demand reduction
		1.7	Air-tightness
2	Designing for resilience and adaptation	2.1	Climate change resilience
		2.2	Operations resilience
		2.3	Heat resilience
		2.4	Adaptation Plan
3	Design for water efficiency	3.1	Efficient fixtures
		3.2	Rain water harvesting
		3.3	Reduced water demand
NO.	**ESD OBJECTIVE**	**NO.**	**ESD STRATEGY**
4	Waste management	4.1	Pre-building audit
		4.2	Responsible construction
		4.3	Responsible Resource Management
		4.4	Implement an operational Waste Management Plan
5	Materials	5.1	Upfront Carbon Emissions
		5.2	Circularity
		5.3	Other Carbon Emissions
		5.4	Sustainable timber
		5.5	Select products with certified raw materials
		5.6	Responsible Procurement
6	Moisture Management	6.1	Design Interiors for Moisture Management - Via condensation management
		6.2	Design Interiors for Moisture Management - Via water leaks
		6.3	Implement Mold and Moisture Management Plan
		6.4	Conduct quarterly leak and mold inspections
7	Transport	7.1	Bicycle parking and end of trip facilities

		7.2	Sustainable Transport Plan
		7.3	EV infrastructure
8	Social sustainability	8.1	Amenity and Comfort
		8.2	Culture, Heritage and Identity
		8.3	Inclusive Construction Practices
		8.4	Design for Inclusion
		8.5	Indigenous Inclusion

NO.	ESD OBJECTIVE	NO.	ESD STRATEGY
9	Health and wellbeing	9.1	Light quality
		9.2	Glare control
		9.3	Acoustic comfort
		9.4	Indoor air quality
		9.5	Restrict VOC Emissions from Furniture, Architectural and Interior Products
		9.6	Low Formaldehyde emissions
		9.7	Views
		9.8	Water quality
		9.9	Ensure Drinking Water Access
10	Nature	10.1	Impacts to nature
		10.2	Connection to nature
		10.3	Biodiversity enhancement
		10.4	Bird collision
		10.5	Nature connectivity
		10.6	Waterway protection

The following sub-sections present the key sustainable design strategy considerations for the proposed CAC facility, encompassing various aspects of sustainability.

2.2 Minimisation of waste

Waste minimisation is a key objective for the project, across the phases of demolition, construction and operation.

Operational Waste:

The project has been designed for the collection of separate waste streams, and the design will ensure safe and efficient access to waste and storage areas for both occupants and waste collection contractors.

- Staff and common areas are provided with waste stream bins to enable waste segregation and collection. The design will cater to a minimum of five waste streams, including food and organics as one of the streams.
- An Operational Waste Management Plan (OWMP) will be prepared for the project, focusing on secured bulk waste storage and waste segregation to identify recyclable streams.

In addition to the above, the project is targeting the following waste-related ESD strategies for the contractor to implement during construction:

Construction Waste:

- As the site consists of existing infrastructure, the Contractor will complete a pre-building audit that inventories available materials and assemblies for reuse or donation.
- The builder or head contractor will have an environmental management system in place to manage its environmental impacts on site.
- The builder or head contractor has an environmental management plan to cover the scope of construction activities.
- The builder or head contractor must report construction and demolition waste diversion with the target of that at least 80% of construction and demolition waste being diverted from landfill.

2.3 Reduction in peak demand for electricity and minimising GHG emissions

The following energy-efficient design features are being considered in the current design, to reduce peak demand for electricity.

- The project will target to incorporate active and passive design principles to minimise peak energy demand. These strategies include:
  - Building envelope's thermal performance to be designed to achieve an improvement over NCC 2022 Section-J minimum deemed-to-satisfy (DTS) reference.
- Overall building energy efficiency improvement of 20% above NCC Section J without relying on onsite renewables (i.e. via design efficiency).
- The building will be designed for air-tightness. Testing to be conducted in accordance with the ATTMA Technical Standard-L2 (TSL2) guidelines
- The Campbelltown Council has committed for 100% renewable power purchase agreement and will be incorporated for the project.
- The project has an existing PV array allocation for more than 40% of the available roof space for on-site renewable energy generation (95kW system).
- Low energy demand LEDs lighting fixtures are proposed as per IEEE 1789-2015

In addition to reducing peak electricity demand, the above strategies will directly contribute to the minimisation of greenhouse gas (GHG) emissions associated with building operations. By improving the building envelope performance, increasing overall energy efficiency beyond NCC Section J requirements, enhancing air-tightness, and incorporating on-site renewable energy generation, the project will reduce reliance on grid-supplied electricity, which is predominantly generated from

fossil fuel sources. Lower cooling loads achieved through passive design measures will further decrease energy consumption during peak periods, when grid emissions intensity is typically highest. Collectively, these measures will result in a measurable reduction in operational carbon emissions over the building's lifecycle, supporting broader decarbonisation objectives and aligning with best-practice environmentally sustainable design outcomes.

Passive strategies detailed in Section 2.3 will also contribute towards reducing peak demand and minimising greenhouse gas emissions, as cooling loads will be lower.

2.4 Passive Design

The following passive design initiatives have been considered for the project, which also contribute towards minimising greenhouse gas and achieving alignment with the ESD Framework setup for the project.

The project team will aim to implement passive design principles to the building façade where applicable, to reduce the solar ingress.

- External shading devices will be optimised to mitigate unwanted solar gains. (Design effectiveness to be tested for summer solstice (December 21st), Winter solstice (December 21st) and Equinox (Mar 21st)
- In coordination with the architecture team, a detailed shading study was conducted to optimise the shading strategy to block the summer sun, thus reducing heat gain impacts from glazing elements. Even for the existing parts of the building that are being retained, new shading devices are proposed to mitigate heat gain and glare impacts.
- The project has targeted to improve the building envelope performance by providing high roof insulation to the roof and ceilings to reduce solar heat gain.
- Feasibility for natural ventilation is being evaluated for non-sensitive / non-gallery spaces. Currently, louvres have been provided at a high level for the Ground floor level for natural ventilation.
- Design for air-tightness- Airtightness in buildings delivers greater comfort, lower energy use, better moisture control, and improved durability. The project is targeting air-tightness testing to be conducted in accordance with the ATTMA Technical Standard-L2 (TSL2) guidelines, to verify against the targets for each functional space type:
  - Galleries - Less than 1.0 m3/hr/m2 @ 50 Pascals)
  - Offices - Less than 4.0 m3/hr/m2 @ 50 Pascals)
  - Transition spaces - Less than 4.0 m3/hr/m2 @ 50 Pascals)
- To reduce Urban heat island impacts- The project is targeting at least 75% of the whole site area to comprise one or a combination of strategies that reduce the heat island effect, such as cool roof, paved areas with a high SRI and shaded external areas.

2.5 Generation and Storage of Renewable Energy

The following initiatives are being considered for the project's energy generation and storage capabilities.

- A PV Assessment will be conducted to investigate the feasibility of incorporating a roof mounted PV System, over at least 40% of the available roof space. (Note: A review of the existing system will be conducted to determine if any of it can be reused, otherwise to allow 100% new).
- Project to utilise 100% renewable electricity, via a combination of on-site solar generation plus procurement of Green Power for the remaining electricity demand.
- Appropriate allowance of inverters and electrical infrastructure will be incorporated in the design.
- The main switchboard will be designed in accordance with NCC 2022 Section-J requirements, to allow for future battery installation.

2.6 Metering and Monitoring of Energy Consumption

The following initiatives are being considered, to enable metering and monitoring of energy consumption of the project.

- A BMS system as per NCC requirements will be included in the project.
- The project will sub meter significant energy uses via the proposed BMS to understand energy usage and distribution.
- The project will be providing monitoring displays for building performance data.

2.7 Minimise Potable Water Consumption

The following initiatives are being considered in the current design, to minimise the project's demand for potable water by 30% by 2030 compared to a business-as-usual reference case.

- Water efficient fixtures and fittings, such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the WELS rating scheme will be specified for the project.
    - Taps (hand wash basins) - 5 star
    - Taps (kitchen or laundry sink) - 4 star
    - Urinals - 5 star
    - Toilets - 4 star
    - Showers - 3 star
- Efficient water management through a water meter monitoring system.
- Incorporate rainwater harvesting. A rainwater tank has been proposed for rainwater harvesting, and captured water would be reused for landscape irrigation.
- Selection of low-water-demand plant species to reduce dependency on water demand and also mitigate future climate risk impacts.

Following water-sensitive urban design principles have also been incorporated within the design.

- To treat the water flows from the site OSD tanks, swales and filtration devices have been implemented on the project.
- GPT/Filtration devices are proposed, which aid in reducing stormwater pollution targets.
    - Reduction in annual total suspended solids (TSS) export load by 80%
    - Reduction in average annual total phosphorus (TP) export load by 45%
    - Reduction in average annual total nitrogen (TN) export load by 45%
    - Reduction in the average gross pollutants (GP) export load by 90%

2.8 Embodied Emissions Reporting

A NABERS Embodied Emissions Material form is prepared (Appendix A) by the Quantity Surveyor for the project and will be submitted to accompany the SSDA submission.

The NABERS embodied emissions material form discloses the quantities and types of materials proposed for the project to inform on the amount of embodied emissions attributable to the development.

To support a reduction in the embodied emissions for the project, the following strategies are being considered:

- Sourcing of local products to reduce transport-related emissions and support regional supply chains.
- Substitution of raw materials with recycled or reclaimed alternatives, where feasible, reducing the carbon intensity associated with raw material extraction and processing.
- Design for disassembly & repurposing of demolition waste, enabling future repurposing of building components and minimising demolition waste sent off-site.
- Retention of selected portions of the existing building, reducing the need for demolition and reconstruction, thereby lowering embodied carbon associated with new structural works.
- Optimisation of the structural grid, to minimise cantilevers and reduce material demand in roof and floor systems, acknowledging that structural elements typically contribute significantly to embodied emissions.
- Facade material efficiency, including the use of large-format glazing panels to reduce the quantity of aluminium mullions required, thereby lowering emissions associated with high-carbon aluminium production.
- Specification of low-carbon concrete mixes, particularly for reinforced suspended slabs on ground and piles, incorporating higher cement replacement (e.g., SCMs) to reduce the overall carbon intensity of concrete.

At a later design stage, when the design is finalised and finalised material quantities and specifications are provided, an upfront carbon assessment would be undertaken to determine the amount of reduction in upfront carbon emissions that is achieved. Currently, the project is aiming to target 10% upfront carbon emissions reduction.

3.0 Net Zero Energy Statement

This Net Zero Energy Statement has been prepared to address the relevant requirements under the NSW Sustainable Buildings State Environmental Planning Policies (SB SEPP) Section 3.4, and describes the all-electric design solutions provided for the proposed development.

This statement addresses the Environmental Assessment Requirements for the project, notably:

Ref. No.	SB SEPP Requirement	Section of Statement where response is provided
3.4	If Chapter 3 of SEPP (Sustainable Buildings) 2022 applies:	
	- provide a net zero statement (as defined in section 35C of the EP&A Regulation) that includes:	- This Net Zero Energy Statement addresses this item
	- evidence of how the development will either be fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035.	- This Net Zero Energy Statement addresses this item
	- details of any renewable energy generation and storage infrastructure implemented and any passive and technical design features that minimise energy consumption.	- The Campbelltown Council has committed for 100% renewable power purchase agreement and will be incorporated for the project. - The project has an existing PV array allocation for more than 40% of the available roof space for on-site renewable energy generation (95kW system).
	- estimations of annual energy consumption for the building (if available)	- Energy modelling has not been completed at this stage of the design and will be undertaken during later design stages.

While the mechanical and electrical services will be designed to be fossil fuel-free by way of being all-electric systems, it remains the responsibility of Campbelltown City Council to procure 100% renewable electricity in enabling a net zero emissions operation. This is in accordance to the Campbelltown City Council's commitment to sustainability and net zero emissions in operation as per their "Transitioning to Net Zero" Policy.

The initiatives presented below have been included in the design at the current stage; however, it remains the responsibility of the design team in the subsequent stages and the appointed contractor to ensure these initiatives are designed in detail and implemented during the construction phase.

On-site Fossil Fuel Usage

The mechanical and electrical services strategy for the proposed activity will be designed to be all-electric for all new building works from day 1 of its operation. For the existing building services/systems using fossil fuels, the project will develop a 'Zero Carbon Action Plan' to transition towards 100% electric operation by 2040.

The proposed activity will be utilising 100% renewable electricity through a combination of the following initiatives:

- Maximise on-site renewable energy generation via at least 40% of the available roof space.
- Procurement of Green Power for the remaining electricity demand.

The proposed activity will be designed to be 'Zero-ready' through provision of installing electric vehicle charging stations on the site, in compliance with NCC 2022 as follows:

- The building will have EV charging capabilities for at least 10% of the staff parking (or as per NCC 2022, whichever is greater).
- Transport options that reduce the need for private fossil fuel-powered vehicles are prioritised including bicycle parking spaces and end-of-trip facilities.

These design solutions will allow the project to be capable of operating at net zero emissions, in line with the requirements of the Sustainable Buildings SEPP.

Minimising GHG emissions-

Achieving a high-performance building envelope is one of the key aspirations of the proposed project, to ensure its contribution towards minimising GHG emissions, reduction of overall building energy consumption and operational carbon emissions, as well as improving the building's capacity in terms of climate-change and operational resilience. The following strategies are being considered in the current design:

- Building fabric's thermal performance has been designed to achieve an elemental improvement of at least 10% over NCC 2022 Section-J minimum deemed-to-satisfy (DTS) reference.
- Design for air-tightness with targets for each functional space type as follows:
    - Galleries - Less than 1.0 m3/hr/m2 @ 50 Pascals)

  - Offices - Less than 4.0 m3/hr/m2 @ 50 Pascals)
  - Transition spaces - Less than 4.0 m3/hr/m2 @ 50 Pascals)
- The façade has been designed with considerations of providing abundant daylight to all non-sensitive spaces to improve visual comfort and minimise the use of artificial lighting. For gallery spaces, the lighting design would be in accordance with the conservation requirements.
- The shading strategy has been developed in respect to the buildings' orientation and to minimise energy consumption and glare risk, while maximising daylight ingress and as a result reducing the use of artificial lighting, use of cooling, and these systems' energy consumption.

Active Design Features

The following technical design features have been integrated into the building services design in order to minimise energy consumption.

- Gallery spaces will be positively pressurised compared to the surrounding non-gallery spaces to ensure efficient zoning between critical and non-critical conditioned spaces.
- Provision of air-cooled multi-functional heat pumps. The units comprise of a heat recovery system, providing free-heating during periods with simultaneous cooling and heating demand, such as dehumidification processes for the gallery spaces.
- Zoning of air conditioning will allow set-back or isolation of unoccupied spaces.
- The mechanical ventilation system will apply CO_2 monitoring in the majority of spaces to activate the fans upon exceedance of the CO_2 threshold.
- An Energy Monitoring System (EMS) will be applied to monitor the energy usage across the project. The energy and water usage data are available to staff and can be used to inform the occupancy patterns thereby assisting in their understanding of their consumption patterns, leading to an improved, more resource conscious user behaviour.
- In suitable spaces the air-conditioning systems utilise push-buttons with a run-on timer for activation and de-activation of the air-conditioning in all spaces. This ensures that the air-conditioning is only activated when desired by the users and the run-on timer ensures the system deactivates after a set period (typically 2 hours).
- The lighting fixtures are highly efficient LED (Light Emitting Diode) technology with spectrum and colour tuneable programming to support the display of varying artworks and to support the building occupant's wellbeing.
- The Bluetooth Low Energy (BLE) wireless Casambi system will be implemented as the intelligent lighting control system, with photosensors and programmable timer functions as integral components of an intelligent lighting control strategy. Motion sensors will also be considered as an energy-efficiency measure, in order to increase the light output at certain times after it may have dimmed or turned off.
- The lighting control system will be linked the BMS for remote monitoring and control.
- The existing BMS system will be upgraded to its newest version, and then expanded to cover new services including mechanical, electrical, fire, hydraulics, lifts etc.

Renewable Energy Generation and Storage

The following initiatives have been implemented for the project's energy generation and storage capabilities.

- At least 40% of the available roof space is dedicated to installation of solar panels.
- The main switchboard will be designed to allow for future battery installation in compliance with NCC 2022.

Estimated Energy Consumption & GHG Emissions
Estimated energy consumption is not yet available for the project. Detailed energy modelling shall be undertaken by responsible parties as the design progresses, to help inform the design, as well as verify the design for regulatory compliance. This will include an estimation of PV-solar electrical contribution to the site and an estimation of grid-purchased electricity and associated direct and indirect emissions.

Chris Arkins
Director
BEng Mechanical, FIEAust, EngExec, CPEng, NER, APEC Engineer, IntPE(Aus), FCIBSE

3.1 Evidence

The following evidence has been provided to demonstrate electricity as the fuel source for mechanical services.

Document Reference Number	Description
Campbelltown Arts Centre Expansion Building Services Return Brief	Excerpt from Mechanical Design Report outlining the HVAC system description, as being all-electric. No gas usage.

Excerpt from the Mechanical System Descriptions report.
Reference: 'Campbelltown Arts Centre Expansion
Building Services Return Brief'
Date: 01/10/2025
Revision: 01

5.9 Proposed Mechanical Systems

The following bullet points highlight key areas for consideration when designing critical gallery and art storage air conditioning systems:

- The use of a constant air volume system which constantly circulates air at full volume rather than VAV systems in critical spaces is preferred. VAV systems (that deliver cooled or heated air in proportion to the heating or cooling needed in a specific zone) may be considered in non-critical areas (admin etc.) however it is essential to note that, while this approach saves energy costs, it does so by placing the maintenance of a stable humidity at risk. Such systems may also result in filtration issues and issues with maintaining sufficient air flow to avoid stagnant air pockets at low flow.
- Critical areas should not use outside air economy cycles, which introduce large amounts of outside air for "free" cooling and heating as these systems make it difficult to maintain stable relative humidity;
- It may be considered to allow for current systems to enable economy cycle at a later stage, should internal conditions be relaxed;
- In critical areas, temperature and humidity are now considered equally important. Rate of change of these two properties remains the driving issue for HVAC control in gallery spaces and full consideration must be given to these criteria in the design;
- Location of sensors in the critical spaces close to where the collection is to be located, not in the return ductwork.
- High accuracy sensors, located in the area that artwork is to be located in order to give true representation of conditions (rather than in return air ducts) shall be provided in critical areas. Consideration shall be given to ongoing calibration of sensors and the impact this can have on control should calibration issues occur.
- The use of pre-filters and final high efficiency filters, with each bank monitored by a manometer.
- Constant operation of the HVAC system to ensure adequate environmental controls and eliminate sharp spikes and excess fluctuations of temperature and relative humidity.
- Ensure all plant and equipment specified and installed is supported locally.

Central Plant

The major heat rejection system selection and design will have a major impact on the functionality, energy efficiency, reliability, and success of the project. Given the location and understood usage of the building we have looked towards selecting a system with the following characteristics:

- Low energy consumption;
- Low capital cost;
- Minimal maintenance;
- Reliability;
- Redundancy.

Based on the above, two air-cooled multi-functional heat pumps are being proposed:
Each heat pump will be able to provide independent cooling, independent heating and simultaneous cooling and heating. Each unit will be sized to accommodate 60% of the maximum load, meaning if a single unit is in fault, the remaining unit will be able to cover 60% of the maximum cooling load (on an ambient design day).

This will be sufficient to provide cooling to the Galleries and Art Storage on an ambient design day, provided the remaining units (non-critical spaces) be turned off during this period of shutdown. Outside ambient design days (i.e. days with moderate temperatures) it is likely that all spaces will be able to operate on a single heat pump unit.

The project is currently in the Design Development stage, at the completion of this design phase the building services drawings will be available to support the information described above in relation to the project's fully electrified solution.

4.0 Conclusion

This report confirms that the Campbelltown Arts Centre Expansion is guided by a Bespoke ESD Framework, which acts as the overarching driver for sustainability outcomes across the design, construction and operational phases of the project. The ESD Framework establishes mandatory performance targets that are embedded within the project brief, ensuring sustainability principles are integrated from early design through to delivery and operation.

Unlike a conventional Green Star rating pathway, which targets a specific star outcome, the project's bespoke ESD Framework adopts a broader and more rigorous approach. The framework has been developed by drawing upon recognised industry benchmarks including LEED, WELL and Green Star, in addition to incorporating gallery-specific sustainability strategies relevant to the operational and environmental requirements of an arts facility. As all items within the framework are mandatory, the approach functions as a return brief rather than an aspirational rating target.

The sustainability strategies outlined in this report establish a clear and achievable pathway for the project to deliver improved environmental performance relative to minimum regulatory requirements. Further design development shall be undertaken to finalise the following sustainability targets;

- Coordination with QS to ensure any cost impact from required strategies is included within the cost plan and within the procurement requirements.
- Coordination with QS for final material quantities for Upfront Carbon Assessment.
- Detailed mechanical design inputs and facade material selections will be required to demonstrate via energy modelling that overall building energy efficiency improvement of 20% above NCC Section J without relying on onsite renewables (i.e. via design efficiency) is achieved.

In conclusion, based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed activity, it is determined that:

- The extent and nature of potential sustainability impacts are low and will not have significant impact on the locality, community and/or the environment.
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal impact on the locality, community and/or the environment.

5.0 Appendix A- NABERS Embodied Emissions Declaration

This section presents an embodied emissions quantification for the project based on the material quantities input provided by the Quantity Surveyor using the NABERS Embodied Emissions Form.

At a later design stage, once the design is finalised and confirmed material quantities and specifications are available, a detailed upfront carbon assessment will be undertaken to quantify the reduction in upfront embodied carbon emissions achieved relative to the reference case. At this stage, the project is targeting a minimum 10% reduction in upfront embodied carbon emissions.

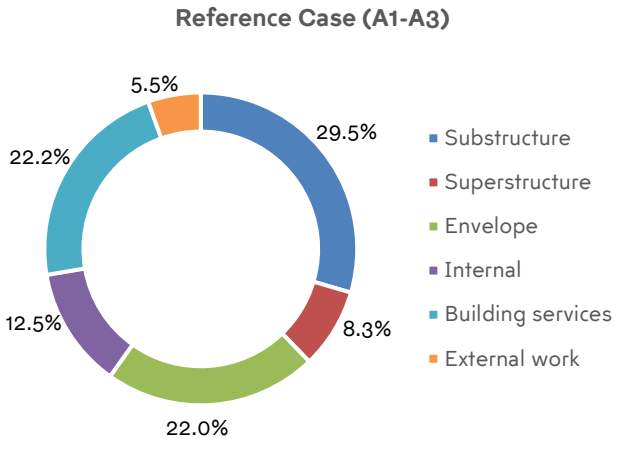
Summary of NABERS Embodied Emission Materials form - Reference case

Emissions per life cycle module

Module	Reference Emissions	
	$t\ CO_2e$	$kg\ CO_2e/m^2$
Materials, A1-A3	3,647.35	516.33
Transport, A4	-	-
Construction, A5	383.90	54.35
A5 - Energy		
A5 - Waste		
A5 - Land use and land use change		
Total emissions, A1-A5		**570.68**

Emissions per building section (A1-A3)

Section	Reference Emissions	
	$t\ CO_2e$	$kg\ CO_2e/m^2$
Site preparation	-	-
Substructure	1,076.35	152.37
Superstructure	302.52	42.83
Envelope	803.99	113.81
Internal	455.65	64.50
Building services	809.73	114.63
External work	199.10	28.18
Total emissions, A1-A3	**3,647.35**	**516.33**



5.1 NABERS Embodied Emission Materials Form

NABERS

Upfront Embodied Carbon Calculator

Material quantities

Enter all material quantities in this tab. Where product-specific emission factors are available, a new material category must be added to the '**Product specific EFs**' tab before it can be selected here.
You can create groups of materials that are consistently used for curtain walls, windows, or doors in the '**Custom assemblies**' tab, which you can then select under the 'Custom assembly' material type.

Cell colour key:

Required
Optional
For reference
Error

Required columns are also marked with an asterisk *

Would you like to add an explanation for anything in this table?

Click the + button to the left to view a worked example

Materials (bill of quantities)

Provide a list of all the materials used in the building. See NABERS EC Rules section 7.3 for guidance on what materials to include in the rating.

														End of life rates				← Inputs Outputs →							Material emissions, A1-A3		
Building section*	Material description and notes*	Material type*	Material category*	Material quantity*	Material unit*	Material conversion notes	Source location*	Is quantity estimated?*	Is waste included?*	Waste rate (%)	Recycle (%)	Energy recovery (%)	Landfill (%)	Sustainable forest certified	Quantity [database]	Material unit [database]	Quantity (tonne)	Material category [max in type]	Emission factor (kg CO_2e/unit) [max in type]	Emission factor (kg CO_2e/unit)	Storage (kg CO_2e/unit)	Material emissions, A1-A3 (kg CO_2e)	Material emissions stored (kg CO_2e)
Substructure	Concrete - Piles	Concrete in-situ	>40 MPa to ≤50 MPa	528.00	m^3			Yes	Yes						517.65	m^3	1,242.35	>80 MPa +	561.00	354.00	0	183,247.06	0
Substructure	Concrete	Concrete in-situ	>40 MPa to ≤50 MPa	1,325.00	m^3			Yes	Yes						1,299.02	m^3	3,117.65	>80 MPa +	561.00	354.00	0	459,852.94	0
Substructure	Steel reinforcing - Piles	Reinforcing steel	Bar & mesh reinforcing steel	132,000.00	kg			Yes	Yes						125.71	tonne	125.71	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	201,142.86	0
Substructure	Steel reinforcing	Reinforcing steel	Bar & mesh reinforcing steel	152,323.00	kg			Yes	Yes						145.07	tonne	145.07	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	232,111.24	0
Envelope	Roof sheeting	Steel cladding/roofing	Steel sheeting - metallic coat	4,109.00	m^2			Yes	Yes						4,068.32	m^2	24.61	Steel sheeting - metallic coat	19.10	19.10	0	77,704.85	0
Envelope	Lift shaft roof	Concrete in-situ	>40 MPa to ≤50 MPa	2.00	m^3			Yes	Yes						1.96	m^3	4.71	>80 MPa +	561.00	354.00	0	694.12	0
Envelope	Lift shaft roof - Reinforcement	Reinforcing steel	Bar & mesh reinforcing steel	155.00	kg			Yes	Yes						0.15	tonne	0.15	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	236.19	0
Envelope	Timber soffit	Timber cladding	Plywood	45.00	m^3			Yes	Yes						40.91	m^3	20.82	Particleboard	650.00	498.00	841.00	20,372.73	0
Envelope	Structural steel	Structural steel	Structural sections steel (welded beam, columns, angles, plates	100.92	tonne			Yes	Yes						99.92	tonne	99.92	Structural formwork and decking steel (cold rolled - light weight)	3,010.00	2,270.00	0	226,820.20	0
Envelope	GRC Concrete	Concrete precast panel	Precast concrete panel (inc. reinforcing)	392.00	tonne			Yes	Yes						392.00	tonne	392.00	Hollow core - precast concrete (inc. reinforcing)	339.00	233.00	0	91,336.00	0
Envelope	Precast Concrete panels	Concrete precast panel	Precast concrete panel (inc. reinforcing)	1,137.00	tonne			Yes	Yes						1,137.00	tonne	1,137.00	Hollow core - precast concrete (inc. reinforcing)	339.00	233.00	0	264,921.00	0
Envelope	Blockwork Retaining wall	Concrete block	Concrete block (exc. core fill or reinforcing)	20,900.00	kg			Yes	Yes						19.90	tonne	19.90	Solid AAC (no fill or reinforcing)	190.00	159.00	0	3,164.86	0
Envelope	Façade glazing	Windows & doors	Window - aluminium frame - generic	401.00	m^2			Yes	Yes						397.03	m^2	9.13	Revolving door - glass, aluminium, steel - generic	1,010.00	159.00	0	63,127.72	0
Envelope	Roller shutter	Roller doors	Roller doors	40.00	m^2			Yes	Yes						39.60	m^2	1.03	Roller doors	103.00	103.00	0	4,079.21	0
Envelope	Solidcore doors	Windows & doors	Door - timber solid - generic	24.00	m^2			Yes	Yes						23.76	m^2	1.47	Revolving door - glass, aluminium, steel - generic	1,010.00	82.80	68.80	1,967.52	0
Envelope	Fire rated doors	Windows & doors	Door - steel solid - generic	5.00	m^2			Yes	Yes						4.95	m^2	0.49	Revolving door - glass, aluminium, steel - generic	1,010.00	299.00	0	1,480.20	0
Envelope	Glazed doors	Windows & doors	Door - aluminium with glazing - generic	54.00	m^2			Yes	Yes						53.47	m^2	1.56	Revolving door - glass, aluminium, steel - generic	1,010.00	245.00	0	13,099.01	0
Superstructure	Concrete Superstructure Elements	Concrete in-situ	>40 MPa to ≤50 MPa	572.00	m^3			Yes	Yes						560.78	m^3	1,345.88	>80 MPa +	561.00	354.00	0	198,517.65	0
Superstructure	Concrete Superstructure Reo	Reinforcing steel	Bar & mesh reinforcing steel	68,254.00	kg			Yes	Yes						65.00	tonne	65.00	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	104,006.10	0
Internal	Interior walls - Blockwork walls	Concrete block	Concrete block (exc. core fill or reinforcing)	121,824.00	kg			Yes	Yes						116.02	tonne	116.02	Solid AAC (no fill or reinforcing)	190.00	159.00	0	18,447.63	0
Internal	Concrete internal walls	Concrete in-situ	>40 MPa to ≤50 MPa	346.00	m^3			Yes	Yes						339.22	m^3	814.12	>80 MPa +	561.00	354.00	0	120,082.35	0
Internal	Steel reinforcing - Internal concrete walls	Reinforcing steel	Bar & mesh reinforcing steel	68,184.00	kg			Yes	Yes						64.94	tonne	64.94	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	103,899.43	0
Internal	Plasterboard lining only	Ceilings & walls	Plasterboard	3,282.00	m^2			Yes	Yes						2,853.91	m^2	31.68	Steel frame	3,010.00	3.37	0.39	9,617.69	0
Internal	Internal Solidcore doors	Windows & doors	Door - timber solid - generic	207.00	m^2			Yes	Yes						204.95	m^2	12.71	Revolving door - glass, aluminium, steel - generic	1,010.00	82.80	68.80	16,969.90	0
Internal	Internal Fire rated doors	Windows & doors	Door - steel solid - generic	35.00	m^2			Yes	Yes						34.65	m^2	3.40	Revolving door - glass, aluminium, steel - generic	1,010.00	299.00	0	10,361.39	0
Internal	Internal glazed doors	Windows & doors	Door - aluminium with glazing - generic	72.00	m^2			Yes	Yes						71.29	m^2	2.07	Revolving door - glass, aluminium, steel - generic	1,010.00	245.00	0	17,465.35	0
Internal	Internal roller shutters	Roller doors	Roller doors	74.00	m^2			Yes	Yes						73.27	m^2	1.90	Roller doors	103.00	103.00	0	7,546.53	0
Internal	Interior walls - Plasterboard lined walls	Ceilings & walls	Wall system steel frame - 1 side plasterboard (92mm stud)	2,333.00	m^2			Yes	Yes						2,028.70	m^2	29.82	Steel frame	3,010.00	10.60	0.50	21,504.17	0
Internal	Interior walls - Double plasterboard lined walls	Ceilings & walls	Wall system steel frame - 2 sides plasterboard (92mm stud)	765.00	m^2			Yes	Yes						665.22	m^2	18.03	Steel frame	3,010.00	14.30	0.99	9,512.61	0
Internal	Wall tiles	Pavers/tiles	Ceramic paver/tile	14,535.00	kg			Yes	Yes						13,842.86	kg	13.84	Stone paver/tile	239.00	0.55	0	7,585.89	0
Internal	Floor tiles	Pavers/tiles	Ceramic paver/tile	18,735.00	kg			Yes	Yes						17,842.86	kg	17.84	Stone paver/tile	239.00	0.55	0	9,777.89	0
Internal	Vinyl flooring	Floors	Vinyl flooring	482.00	m^2			Yes	Yes						438.18	m^2	2.23	Timber flooring	347.00	15.90	0	6,967.09	0
Internal	Carpet flooring	Floors	Carpet flooring	1,100.00	m^2			Yes	Yes						1,000.00	m^2	3.21	Timber flooring	347.00	13.30	0	13,300.00	0
Internal	Timber flooring	Timber	Hardwood	124.00	m^3			Yes	Yes						112.73	m^3	83.87	Hardwood	347.00	347.00	1,170.00	39,116.36	0
Internal	Plasterboard ceiling	Ceilings & walls	Ceiling system steel frame suspended (plasterboard)	5,506.00	m^2			Yes	Yes						4,787.83	m^2	65.11	Steel frame	3,010.00	7.39	0.50	35,382.03	0
Building services	Lift services	Lifts	Category 1, 2 for low rise buildings (<4 floors)	2.00	#			Yes	Yes						2.00	#	9.48	Category 5, 6 for high rise buildings (>10 floors)	167,000.00	14,200.00	0	28,400.00	0
Building services	Building Services	Mechanical, electrical, and plun	Low or mid rise office, hotel or retail building (≤10 floors)	7,065.00	m^2			Yes	Yes						7,065.00	m^2	132.82	Hospital or high services intensity building	66.00	55.30	0	390,694.50	0
External work	Stone pavers	Pavers/tiles	Concrete paver/tile	24,980.00	kg			Yes	Yes						23.79	tonne	23.79	Stone paver/tile	239.00	159.00	0	3,782.69	0
External work	Reinforced concrete slab	Concrete in-situ	>32 MPa to ≤40 MPa	331.00	m^3			Yes	Yes						324.51	m^3	778.82	>80 MPa +	561.00	305.00	0	98,975.49	0
External work	Reinforced concrete slab Reo	Reinforcing steel	Bar & mesh reinforcing steel	39,531.00	kg			Yes	Yes						37.65	tonne	37.65	Bar & mesh reinforcing steel	1,600.00	1,600.00	0	60,237.71	0
External work	Timber decking	Timber	Hardwood	28.00	m^3			Yes	Yes						25.45	m^3	18.94	Hardwood	347.00	347.00	1,170.00	8,832.73	0
External work	Carpark asphalt	Asphalt	Asphalt	401.00	tonne			Yes	Yes						381.90	tonne	381.90	Asphalt	71.40	71.40	0	27,268.00	0
Envelope	Skylight	Windows & doors	Window - aluminium frame - generic	29.00	m^2			Yes	Yes						28.71	m^2	0.66	Revolving door - glass, aluminium, steel - generic	1,010.00	159.00	0	4,565.35	0
Envelope	Wall Cladding	Aluminium cladding/roofing	Aluminium sheeting	1.14	tonne	Al sheet m2 to tonne - 0.0054		Yes	Yes						1,128.12	kg	1.13	Aluminium sheeting	11.80	11.80	0	13,311.80	0
Envelope	Cat walk	Structural steel	Galvanised structural sections steel (welded beam, columns, ar	7.13	tonne	Steel frame suspended m2 to tonne 0.022									7.13	tonne	7.13	Structural formwork and decking steel (cold rolled - light weight)	3,010.00	2,400.00	0	17,107.20	0
Internal	Internal Wall	Ceilings & walls	Fibre cement sheet	61.00	m^2			Yes	Yes						53.04	m^2	0.75	Steel frame	3,010.00	12.60	0.025	668.35	0
Internal	Operable Wall	Ceilings & walls	Timber frame	42.00	m^3	Material type not provided. Assumed Timber frame for		Yes	Yes						38.18	m^3	19.63	Steel frame	3,010.00	188.00	857.00	7,178.18	0
Internal	Floor tiles	Pavers/tiles	Ceramic paver/tile	491.00	kg	Paver ceramic 15mm - m2 to kg 34.6		Yes	Yes						467.62	kg	0.47	Stone paver/tile	239.00	0.55	0	256.26	0
Internal	Stone floor	Pavers/tiles	Stone paver/tile	65.40	kg	Paver Stone 30mm - m2 to kg 0.083		Yes	Yes						0.062	tonne	0.062	Stone paver/tile	239.00	239.00	0	14.89	0
Building services	Building Services	Mechanical, electrical, and plun	Low or mid rise office, hotel or retail building (≤10 floors)	7,064.00	m^2	Based on FECA		Yes	Yes						7,064.00	m^2	132.80	Hospital or high services intensity building	66.00	55.30	0	390,639.20	0