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
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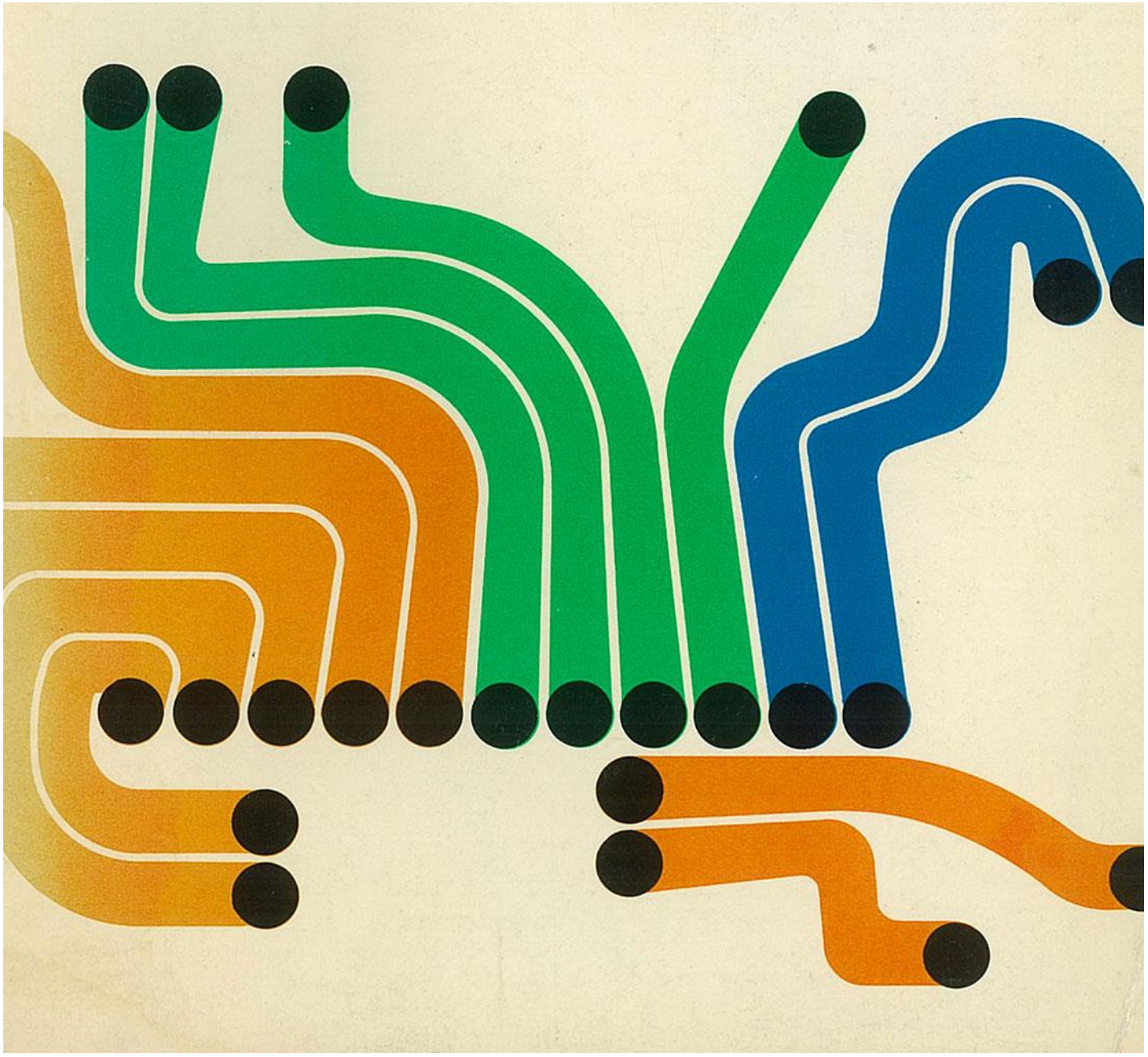
SUSTAINABLE DESIGN

STEENSEN VARMING

The Children's Hospital at Westmead
Multi Storey Car Park
ESD SEAR's Report



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1.0 Introduction

This report has been prepared by Steensen Varming for The Children's Hospital at Westmead Redevelopment (Stage 2) Multi Storey Car Park (MSCP).

The application seeks consent for the construction of a multi-storey car park, connections to the existing road work and associated landscaping.

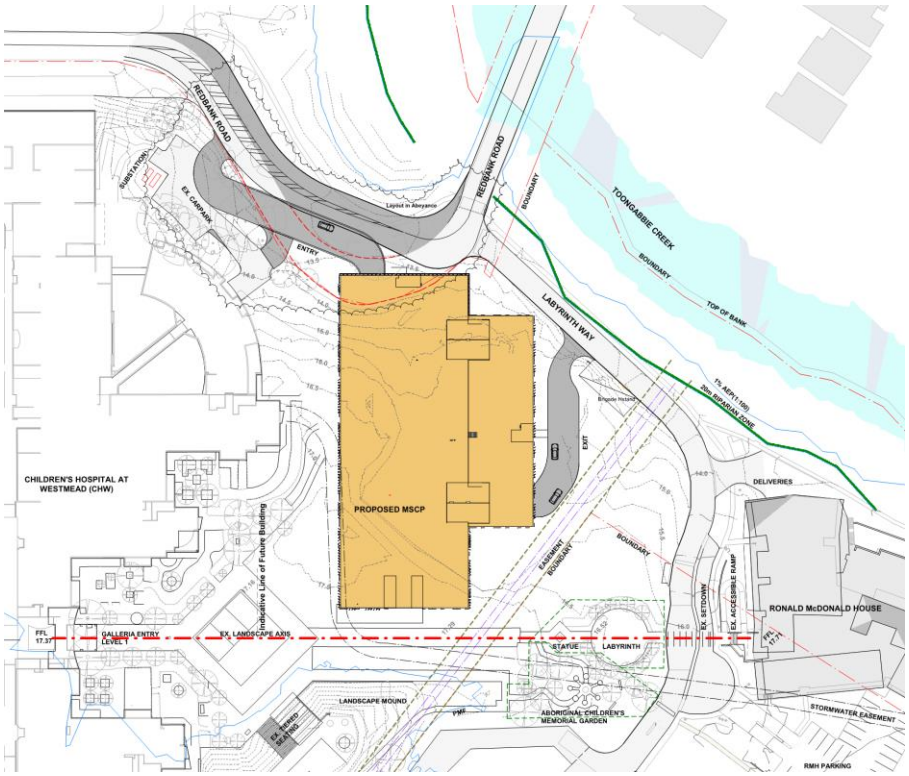

Figure 1: The Children's Hospital at Westmead Redevelopment Multi Storey Car Park

1.1 Project summary

The proposed development under this SSDA is a Multi Storey Car Park (MSCP) accommodating both staff and visitor car parking to be located on Labyrinth Way, on the site of The Lodge.

The scope of proposed works includes:

- Demolition of The Lodge
- Construction of a new MSCP to a maximum height of RL 42.10, approximately 8 car parking storeys, which is equivalent to the height of 5 storeys of the hospital.

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  - Facilitating up to around 992 car parking spaces for staff and visitors
  - Vehicular access from Labyrinth Way and / or Redbank Road
  - A split-level approach to the MSCP to respond to the natural ground level
- Ancillary retail facilities
- Road works:
  - Realignment of Redbank Road with vehicular access connection to MSCP
- Tree removal
- Associated landscape works

The MSCP is being designed to be constructed in a single stage yet car parking will be staged operationally to come on-line with parking demand across the Precinct:

- The first stage of car parking operation would provide replacement car parking for the demolished P17 car park. There would be no net increase of parking on site under this stage.
- The second stage of car parking operation to serve the growth in hospital activity associated with the future PSB (subject to a separate SSDA) would only come on-line operationally with the PSB SSDA consent becoming operational, specifically at occupation. This would provide growth of around 280 additional spaces in line with hospital activity projections until 2031.

1.2 Secretary's Environmental Assessment Requirements (SEARs) for State Significant Developments (SSD's)

The Department of Planning, Industry and Environment (DPIE) issued the SEARs for Westmead Hospital Multi Storey Car Park under SSD application number "SSD-10434896".

Table 1 - Secretary's Environmental Assessment Requirements

Item	SEARs	Project Response
1	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.	The ESD initiatives proposed for the car park aim to reduce the environmental impacts typically associated with the construction and ongoing operation of the car park. The ESD initiatives include passive and active design measures to reduce ongoing energy use. This approach aligns with the ecological sustainable development principles of Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. Refer to section 3.0 for the proposed ESD initiatives.
2	Include preliminary consideration of building performance and mitigation of climate change,	Due to the nature of the project (car park), it is not considered relevant to assess the project against a green rating system.

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Table 1 - Secretary's Environmental Assessment Requirements		
Item	**SEARs**	**Project Response**
	including consideration of Green Star Performance.	Furthermore, car parking is typically excluded from green rating systems. ESD strategies have been included in the project to address issues associated with energy efficiency, water conservation and emissions reductions. Refer to section 3.0 for the proposed ESD initiatives.
3	Include an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	Due to the nature of the project (car park), it is not considered relevant to assess the project against a green rating system. Furthermore, car parking is typically excluded from green rating systems. Refer to section 3.0 for the proposed ESD initiatives.
4	Include details in relation to energy efficiency, including practical opportunities to minimise energy consumption from non-renewable sources.	Refer to section 3.0 for the proposed ESD initiatives.
5	Include details in relation to water conservation, including practical opportunities to implement water sensitive urban design principles. **Relevant Policies and Guidelines:** ▪ NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.	Refer to Section 3.1 for strategies in response to the CSIRO projected impacts of climate change. Refer to sections 3.3 and 3.4 for Sustainable Design Initiatives related to Water Sensitive Urban Design (WSUD) and Water conservation. For further details relating to WSUD, refer to Civil and Stormwater system design.

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2.0 Sustainability Aspirations and Requirements

ESD requirements from the following policy documents have been considered where relevant to The Children's Hospital at Westmead Development Multi Storey Car Park (MSCP) design. These include:

- Health Infrastructure's Engineering Services Guidelines (ESG) (August 2016). See Section 2.2 within.
- National Construction Code (NCC) of Australia 2019 – Section J requirements. See Section 2.3 within.
- Parramatta Development Control Plan 2011 Part 3 – Development Principles. See Section 2.4 within.

The following sections provide an overview of each policy document and whether the requirements have been considered/addressed as part of the current car park design.

2.1 Hospital Car Park Design Guidelines

Heath Infrastructure (HI) provides guidance for hospital car park design, including general arrangement, elemental design requirements, signage and wayfinding, and equipment. The following guidance has been taken from HI guideline as they loosely relate to ESD.

- Light spill and noise to neighbouring properties – Light spill from external lighting has been designed to reduce the impact on local fauna;
- Onsite stormwater detention is to be designed in accordance with the council's requirements; and
- Naturally ventilated car parks – The façade must maintain a minimum 50% open area. The car park façade will be naturally ventilated and will meet or exceed the 50% open area.

2.2 Health Infrastructure Engineering Services Guidelines (ESG)

Health Infrastructure's Engineering Services Guidelines (ESG) (August 2016) is a performance-based guide used for design and development of health care facilities. 'Section 2.5.8 Sustainability and Energy Targets' with the ESG provides an overview of the sustainability targets, which include:

- Aspirational 4-star Green Star equivalency rating;
- Energy Targets;
- Water;
- Materials;

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- Maintenance and Logistics; and
- Emerging Technology;

The Children's Hospital at Westmead Redevelopment MSCP has included sustainable design initiatives addressing energy conservation and material reduction. Refer to Section 3.0 for further details.

Furthermore, due to the nature of the project (car park), it is not considered relevant to assess the project against an equivalent green star rating. Furthermore, car parking is typically excluded from green star ratings.

2.3 NCC Section J 2019

The specific requirements for Building Fabric under the NCC Section J are a Parts J1 Building Fabric, J2 Glazing and J3 Building Sealing. Parts J1 to J3 are applicable to 'conditioned' spaces. Any conditioned spaces will and services applicable to the NCC Section J must comply.

Parts J4 to J8 relate to Section J requirements for building services components. Refer to the relevant consultant's documentation for further applicability and compliance details.

2.4 Parramatta Development Control Plan 2011

The City of Parramatta Development Control Plan (DCP) provides an overview of its strategies to achieve excellence in urban design and development, supplementing the provisions of the Parramatta Local Environmental Plan 2011. The relevant sections of the DCP in relation to Sustainability have been extracted and included below. It is important to note that not all requirements are applicable to the project, however, have been included for completeness.

- 3.2 Building Elements (Energy Efficient Design)
- 3.3 Environmental Amenity (Landscaping, Visual, Acoustic, Solar Access, Cross Ventilation, Water Sensitive Urban Design, Waste Management)
- 3.4 Social Amenity (Culture and Public Art)
- 3.5 Heritage (Aboriginal Cultural Heritage)
- 3.6 Movement and Circulation (Sustainable Transport)

The Westmead Strategic Precinct is designated in the Parramatta DCP with a primary function of a regionally significant health and education hub, with further objectives and design principles (section 4.3.4).

2.5 Green Star

It is not considered relevant to assess the Children's Hospital at Westmead Development Multi Storey Car Park (MSCP) against a green star rating system, due to its nature of being a car park and numerous credits are not applicable. However,

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the project has considered measures that address the sustainability issues raised in the green star rating system. Refer to the section 3.0 for the sustainability measures considered in the design.

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3.0 Sustainable Design Approach

Sustainable building design involves a holistic and integrated design approach, which builds on an increased awareness of site opportunities, form and function, to encompass and target a broad range of sustainable design initiatives.

For the Children's Hospital at Westmead Development Multi Storey Car Park (MSCP), the key sustainability objectives are related to the scope of resources consumed, they are:

- Energy conservation;
- Emissions reduction; and
- Material consumption and selection.

The following sections outline the sustainable design strategies recommended for the Children's Hospital at Westmead Development MSCP, and have been categorised as follows:

- 3.1 Climate Change Impacts
- 3.2 Energy Conservation
- 3.3 Renewable Energy Opportunities
- 3.4 Stormwater Management (WSUD) Water-sensitive Urban Design
- 3.5 Water Conservation
- 3.6 Emission Reduction
- 3.7 Materials
- 3.8 Waste Management
- 3.9 Construction Management

Unlike habitable buildings, car parking buildings are used temporarily for short periods of time. Hence issues such as occupant comfort are considered of lesser concern.

3.1 Climate Change Impacts

At the current stage, the MSCP proposes the following strategies in response to the CSIRO projected impacts of climate change.

Hotter days and more frequent heatwave events:

- Passive building design features to reduce/dampen the effects of increasing temperature, such as façade and roof top solar shading.
- The MSCP is naturally ventilated. No air conditioning is proposed which will assist with reducing peak electricity demand across the hospital campus, as cooling demand increases due to temperature rise.
- Landscaping has also been proposed to reduce urban heat island effect.

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- Roof top solar shading will shade the top-level carpark deck, assisting with reducing urban heat island effect whilst also generating onsite renewable energy.
- Consideration of solar panels with greater operating temperature range

Extended drought periods:
- Consideration of native low water landscaping to reduce potable water consumption; and
- Consideration of rainwater reuse and low flow fixtures and fittings.

More extreme rainfall events:
- Consideration of increased drainage capacities to reduce flooding of roofs and hard surfaces; and
- Assessment of design of the building to address post development probable maximum flood (PMF) level.

Gustier wind conditions:
- Façade shading to assist with reducing the impact of gustier wind conditions. Façade shading will also consider gustier wind conditions in the fixing details.
- Solar panels fixing details will be considered against gustier winds.
- Landscaping to buffer strong winds to outdoor areas.

Material selection:
- Use of and façade materials to reduce damage caused by hail;
- Consideration for solar panels with impact resistance (against hail damage)

3.2 Energy Conservation

The main energy use in car parks is from artificial lighting, lifts, comms/security and sensors. The following initiatives seek to reduce the energy consumption associated with these services through passive measures and efficient systems.

The following energy hierarchy approach has been applied to the car park design in seeking to firstly reduce energy through passive design measures, and further improving energy efficiency using efficient systems.

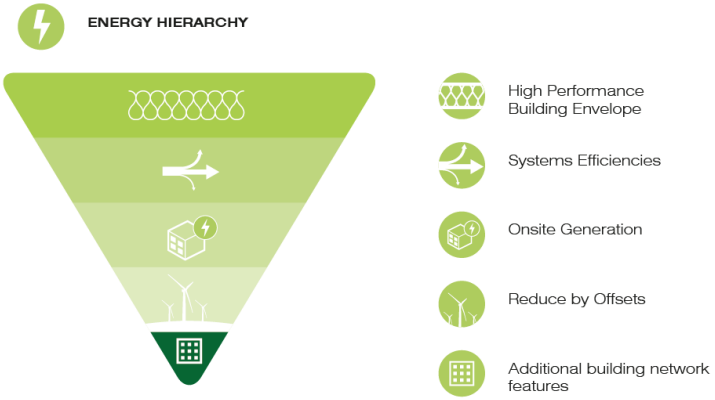

Figure 2 – Energy Hierarchy

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3.2.1 Passive Design Measures

The following passive design measures are being proposed to reduce energy consumption.

- The car park has no mechanical cooling/ventilation, other than a small air-conditioning unit to condition the COMMS rooms and switch room. The car park is naturally ventilated via the façade.
- Daylight penetration in carpark spaces is primarily used for highlighting to aid in circulation and orientation of users. Daylight will also be used to assist with energy associated with artificial lighting through means of maximised natural daylight.
- Lighter internal finishes to increase light bounce/reflectance for deeper daylight penetration.
- Promotion of stair use through design (reduce lift usage). Include bright colours and natural daylight to stairs to encourage the use of stairs as opposed to lifts.

3.2.2 Active Strategies

The following active design strategies have been considered to reduce energy consumption.

- Energy efficient Air Conditioning for the COMMS room, compliant with the Australian Government's Energy Rating Label;
- The air-conditioning unit for the lift shaft will be of air-cooled ducted system which is not applicable to the Energy Rating Label. However, economy cycle/free cooling is incorporated in the system design;
- Energy Efficient Lighting - LED lighting throughout;
- Occupancy sensors will be incorporated to turn lights on only when there are occupants. Lighting design will be designed to ensure compliance with regards to minimum illumination levels;
- Daylight sensors throughout the car park can reduce use of artificial lighting when natural daylight is sufficient;
- Metering and data gathering to evaluate energy usage of systems and facilitate further energy usage optimisation and reduction; and
- Regenerative breaks to car park lifts and standby modes/operation.

3.3 Renewable Energy

The following renewable energy strategy has been considered to provide clean on-site energy generation:

- Roof-top and Building Integrated Photovoltaic solar panels are being considered on two louvered facades of the Multi Storey Car Park, with energy being distributed to serve the MSCP and the main campus

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3.4 Stormwater Management (WSUD) Water-sensitive urban design

Water Sensitive Urban Design (WSUD) provides opportunities to control flows, filter stormwater to remove pollutants and integrate water cycle management from stormwater harvesting to treatment. The aim of WSUD is to minimise negative impacts on the natural water cycle. Car parks can have a large impact on the stormwater networks due to their large area of impervious material.

This project is considering the following strategies for stormwater retention and natural filtration.

- Surface stormwater will be directed into garden beds where practical, to provide passive irrigation, reduced stormwater outflow and moisture retention in the soil;
- Consideration of rainwater capture / harvesting tanks; and
- Oil interceptors, to filter oils from vehicles entering the stormwater system.

3.5 Water Conservation

The MSCP will have minimal water consumption. The car park will have taps for irrigation, cleaning and maintenance only. The following measures have been proposed to reduce potable water consumption.

- Plant species selection is primarily endemic and native, selected for low maintenance and low watering requirements;
- Consideration of low flow fixtures and fittings; and
- Consideration of rainwater capture / harvesting tanks.

The incorporation of low flow water fixtures and fittings are typically considered for habitable buildings. Low flow fixtures and fittings could be considered for wash-down taps, however due to the minimal use, and higher water volume/pressure required for cleaning, it would not be beneficial to incorporate low flow taps for this use.

3.6 Emissions Reduction

Reducing emissions from the carpark is also being targeted, with the following initiatives considered. Improved way finding will also reduce emissions from vehicles by reducing travel time.

- Electric car charging stations or future proofing for electric car charging;
- Consideration of parking spaces indicator at the entrance to indicate how many car spaces are available on each level (reduce travel time/emissions);
- Consideration of designated car parking spaces closer to the entry exit for low-emissions vehicles; and

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- Designate car parking spaces closer to the entry exit for car/ride sharing (more than 2 passengers);
- Signage to discourage vehicle idling; and
- Reducing light spill and pollution.

3.7 Materials

Carpark constructions utilise vast quantities of concrete and steel, which consists of high embodied energy. The following material initiatives have been considered;

- Concrete
  - Portland Cement Reduction;
  - Water Reduction; and
  - Aggregates Reduction.
- Steel Use
  - Reduced Use of Steel Reinforcement;
  - Reinforcing bar and mesh is produced using energy-reducing processed in its manufacture; and
  - Consideration of recycled steel use in the tensile metal mesh and façade elements.
- PVC reduction, alternatives and/or best practice PVC in permanent formwork, pipes and cables where appropriate.
- Select materials and products such as paints, adhesives, waterproofing material, antis-lip with high durability and low toxic properties i.e. Low VOC properties.

3.8 Waste Management

Car parks also generate operational waste from car park users. The car park design will include following strategies:

- Labelled and colour coded bins placed in ordered positions, including paper bins, recycling bins and garbage bins. Labelling will be incorporate to encourage visitors to throw their rubbish in a correct manner.

3.9 Construction Management

The following measures are developed to improve the environmental conditions during the construction phase of the Children's Hospital at Westmead Redevelopment MSCP.

- Environmental Management Plan (EMP) – The EMP can be developed and implemented for the construction stage, including demolition and excavation, to address environmental, worker health and safety and community risks. The EMP is a project specific plan and developed using State and Federal Guidelines and standards. The main contractor will

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implement an Environmental Management System certified to the ISO 14001 standard to ensure the objectives of the EMP are met.

- Noise and Vibration Controls – Machinery should not be operated if maintenance would affect its noise characteristic. All activities should comply with the EPA noise control guideline 12. Demolition works time is to be controlled.
- Dust Control – Contaminated water does not enter the storm water system from the land. Temporary fencing is covered with shade cloth where it is utilised. Disposal of contaminated site material must comply with the requirements of the Environment Protection Authority and the Environment Protection Act 1970.

- Site waste management plan. During the demolition and construction phases, a project-specific site waste management plan (WMP) can be developed and implemented while complying with the Waste Avoidance and Recovery Act 2001. This may include recycling areas, bins, plans of protection measures, disposal procedures and emergency plans and contingency plans.