Sydney Adventist Hospital

Environmental Assessment- Staged Alteration and Additions - Response

Report No	S.SAN-0102-R003 RevB
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engineering sustainable environments

REPORT AUTHORISATION

PROJECT: **SYDNEY ADVENTIST HOSPITAL
ENVIRONMENTAL ASSESSMENT- STAGED ALTERATION AND ADDITIONS - RESPONSE**

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1 INTRODUCTION

This document provide a detailed response to the KU-RING-GAI Council environmental Assessment Staged Alteration and additions submission for the Building Engineering Services of the Sydney Adventist Hospital (SAN).

2 MECHANICAL SERVICES

2.1 General

A detailed assessment of the optimal the plant and plant room locations was undertaken during the master planning stage of the project. The following is a summary of that investigation:

2.2 Plant Rooms Location in Building

There are a number of services that require distribution throughout the building. These include; hot and chilled water, Medical Gases, pneumatic tube system and air conditioning and ventilation ductwork.

The location of plant rooms in a building have a major impact on the project, including:

- Building cost
- Services cost
- Building Aesthetics
- Building usage efficiency
- Energy consumption

From the investigation, it was identified that there were three types of plant for the site:

- Plant that required regular deliveries and on grade servicing
- Plant that distributed throughout the building, requiring large riser space.
- Plant that required separation and vertical discharge.

2.2.1 Loading Dock Plant Room

The Medical gases for the site require a ventilated room that can be accessible for delivery of large quantities of gas bottles for use in the clinical services areas of the building and the wards.

The existing medical gases room does not have sufficient size to house the increase in bottles required and the deliver access has been altered, making delivery of bottle impractical.

Locating this plant room in the loading dock area, rather than the basement, allows for ease of bottle delivery, at a designated delivery area.

The external location of the plant room will allow the space to be naturally ventilated, saving energy within the building.

2.2.2 Main Mechanical Plant room

The air conditioning and air handling systems require the greatest plant space within the building and are the most difficult to accommodate within the building due to their requirement for outside air to be ducted to them.

In terms of function for the mechanical systems, the building is divided vertically:

- The clinical services area - requiring specialised ventilation systems to maintain pressures regimes and achieve infection control requirements
- The Ward Tower – requiring high quality comfort control, smoke hazard management and infection control requirements.

Vertical Duct risers have a large cross sectional areas, requiring vertical stacking. By locating the plantroom on the basement level, the ducts serving the wards will require to penetrate through the clinical services levels, greatly reducing the net area of the building and the functional flexibility of the clinical services spaces.

Therefore, level 6 was identified, as it provides the optimal location for distributing ductwork up to the ward areas and down to the clinical services areas.

It also optimised the costs and energy consumption, including;

- Reduced ductwork runs;
- Flexible ventilation penetrations to the outside of the building;
- Reduced pollutant intake, as ventilation intakes are above the street level;
- Linked into the existing level 6 plant room for greater efficiency and redundancy of plant;
- Minimises roof mounted plant;
- Reduced energy consumption through fan and pump static pressures; and
- Greater access for maintenance and reduced OHS risk in servicing of equipment.

The use of basement plant rooms for air conditioning systems is prohibitive, due to the lack of air intake availability and the increased riser space required through the clinical services floors.

2.2.3 Roof Plant

As an overriding philosophy for the project, roof mounted plant has been minimised.

There are two systems which are required to be on the roof to operate safely, efficiently and meet statutory requirements. These are the smoke hazard management system and the heat rejection plant (cooling towers).

2.2.4 Vertical Risers

Vertical riser have been co-ordinated to be in the centre of the ward race track layout. This is intended to maximise the available façade for patient comfort and indoor environment quality.

2.3 OXYGEN TANKS LOCATION

There has been considerable investigation of the possible location for the Oxygen Vessel. As it is an essential service of the hospital it cannot be located in the Bush fire exclusion areas and therefore must be in the font half of the site.

The proposed location, co-locates the new Oxygen Vessel with the existing backup Oxygen Vessel and meets all of the requirement for fire separation and delivery of the oxygen to site. The location is screened from the street and is accessed by the rear service roads.

The sighting of the vessel and Oxygen delivery is highly regulated, due to the risk of fire and explosion during filling. Oxygen vessels cannot be located inside buildings under statutory requirement due to the risks associated with it.

3 ELECTRICAL SERVICES

3.1 SUBSTATION

The site is currently served by a series of pad-mount substations in various locations, with an incomplete ring main serving these substations.

The hospitals philosophy over recent years has been to use pad mounted substations and have been installing additional substations to augment their HV power supply. This project is intended to fit within the overall High Voltage master plan for the site, which will develop a system that is inherently redundant and will allow for the development of a site energy centre.

The placement of the substation was carefully considered, to minimise the visual impact of the sub stations and have been located in back of house service areas.

The area with the substations was chosen for its location suitable for connection to a site electrical ring main and future HV central energy system.

3.2 ELECTRICAL PLANT

There is electrical plant in numerous locations throughout the building.

The Main Switch Board Room is proposed to be located in the basement area.

From this point risers extend through the internal cores to the upper floors. These risers serve distribution boards that are situated in the internal cores.

The Generator Plant is located adjacent to the loading dock on grade level. This is the location of the existing generator plant that is being extended to meet the new load. This location is ideal for the generator as it provides direct air intake to the units, it is easily accessible from the back of house area and it helps provide additional generator back up for the existing CSB building.

4 ENVIROMENTAL SUSTAINABLE DESIGN, ESD

4.1 NSW HEALTH TS11 GUIDELINES

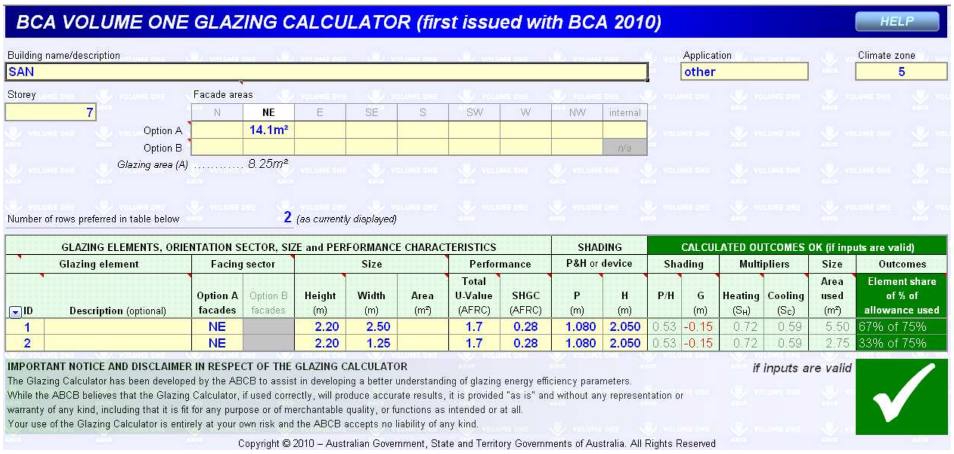
The TS11 – Engineering Services and Sustainable Development Guidelines have been developed to address the strategies of the NSW Government, and generically outlines the consideration that should be given for passive design, indoor environment quality, energy conservation, water conservation and the responsible selection of environmentally-sound materials. This project will meet the requirements of TS11.

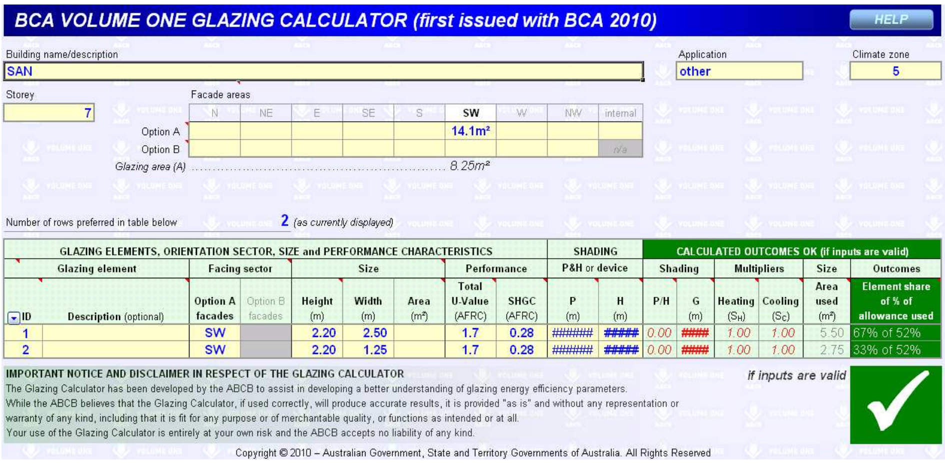
The proposal directly addresses these key sustainability aims by benchmarking the Green Star Healthcare tool, which inherently incorporates and weights these aims into the various credits. Whole categories within the Green Star Healthcare tool are dedicated to ensuring superior indoor environment quality for the occupants, reducing energy and water consumption, and environmental materials.

4.1.1 Section J requirements

As identified in the proposal, the specific TS11 requirement that the minimum Section J provisions are exceeded will be incorporated into the building fabric design through enhanced thermal resistance targets.

Currently the building design is expected to exceed the requirements of section J by 25-30%, through significantly exceeding the Deemed to Satisfy requirements. An example of this is the glazing (refer below) which utilises approximately 65% of its allowance.





To date preliminary energy modelling has been undertaken to demonstrate that the proposed building is capable of achieving the nominated energy targets. However, as specifically mentioned within the TS11 guidelines, detailed energy modelling, will be undertaken when the design is sufficiently developed.

It intended that this will demonstrate the significant effect this passive approach has on the thermal performance of the proposed building. This directly reduces energy by the mechanical services, due to the reduced demand for energy-intensive heating and cooling.

4.2 SYDNEY ADVENTIST HOSPITAL

While sustainability is generally used in construction terms, as reduced environmental impact, through initiative to reduce energy and the like, this can create a very narrow view, which generates a tick the box mentality.

However, sustainability is the potential for long-term maintenance of well being, which has environmental, economic, and social dimensions. In term of the Sydney Adventist hospital, their mission is for sustainable healthcare, as summarised from their website below:

As a not-for-profit organisation, caring for our patients needs is our first priority. This spirit of caring is reflected in our mission, “Christianity in Action – caring for the body, mind and spirit of our patients, colleagues, community and ourselves”, and we are committed to living this mission through everything we do. We aim to care for individuals in a holistic manner, promoting healthy living, providing healing treatments and touching people’s lives through our compassionate and expert care.

Therefore, this project has developed a primary focus of providing a holistically healthy building, for the Sydney Adventist hospital to sustain their healing mission. While minimising their impact on the greater environment.

This commitment to healing and healthy living is evidenced clearly by the high percentage of points sort by the project within the Indoor Environment Quality category of the Green Star Healthcare tool. Indoor Environment Qualities initiatives includes superior outside air provision, minimisation of internal noise levels, low-VOC and formaldehyde pollutant levels, electric lighting levels etc.

The use of environmentally-sound materials that limit impact on the environment is ensured through the production of a Sustainable Procurement Guide, which will stipulate the criteria for the specification of materials such as flooring, joinery, loose furniture etc. so as to ensure the priority for sustainable products and manufacturers.

Following this primary focus, the main focus of the project is to reduce its impact on the greater environment, through the reduction of green house gas emissions and the consumption of resources.

4.3 GREEN STAR FRAMEWORK

The Green Star framework will be utilised in the design of the proposed development. The Green Star Healthcare tool is a newly created design rating tool, created to aid in the incorporation of sustainability initiatives in healthcare-associated developments. It involves a strictly comprehensive design, documentation and assessment process that, to date, has not been achieved by any healthcare project in Australia.

The Green Star framework is intended to provide a holistic snapshot of the plethora of ESD options available for projects. It does this by describing a set of best-practice guidelines for each principle, thereby encouraging the design team to select what is relevant for that project's specific conditions. Accordingly, achieving 100% of specific categories would be impossible and undermine the weighting of points in the Green Star Tools. Arbitrarily focusing on specific areas of Green star, will reduce the actual sustainability of the project, as it will drive solution only to get points rather than long term viability.

Benchmarked against the multi-billion dollar hospital developments occurring in Queensland, Adelaide and Western Australia, assessing against 4-star Green Star Healthcare is current best practice in Australia. This practice is also in line with, in line with current NSW state health procedures for projects of similar size.

The point tally provided in the application was an exercise of preliminary identification of the design features that are readily implemented in this early stage of the design. The points labelled 'to-be-confirmed' identify the points that will require detailed modelling and design and cost analysis, which can only be performed during the future stages of the design.

The noted concerns of the project only claiming points under the 'Management' and 'Indoor Environment Quality' categories is due to their importance of these at this early planning stage. As they address the primary focus of the hospital and dictate design processes. The philosophy in assessing the project has been not to claim the points until they are assessed and confirmed through the design.

Together, the total identified credits amount to approximately 60 points. This is considered to be best practice for achieving 4 stars, as it provides a total of 15 points in contingency.

4.4 ON-SITE POWER GENERATION

Energy conservation and the associated reduction in greenhouse gas emissions is among the main ESD priorities for the project design team, have been considered and will be implemented in accordance with both the Green Star requirements and current best practice.

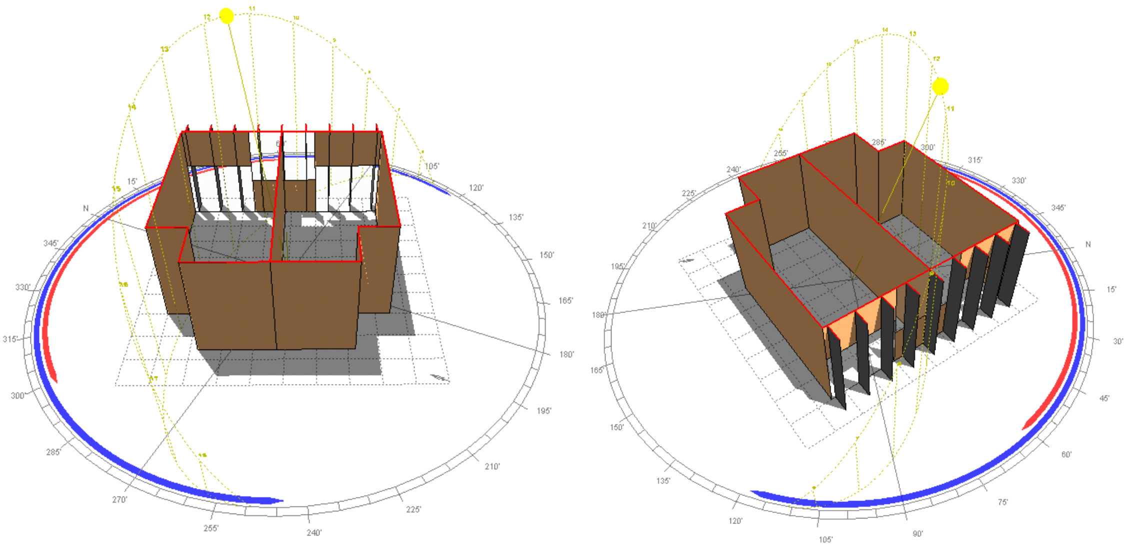
On-site power generation through trigeneration systems, was investigated for this project. However, as this is an extension of an existing building it was not considered to be practical. The primary driver for this, is that, it would necessitate significant upgrade and disruption to the existing operational part of the building, which is critical for the operation of the hospital and for patient safety and care.

With the greater master plan in mind the electrical services infrastructure has been designed for the integration of a central HV energy centre to provide trigeneration for the entire site, rather than one small portion.

4.5 FAÇADE DESIGN

Due to the inherent site orientation, the major east-west façades of the building will employ a vertical arrangement of fins to minimise the direct solar heat penetration into the space. This has been modelled to optimise the size, location and angle of the fins.

The investment into vertical fins for the prominent facades, has been developed and optimised through computer simulation solar performance modelling.



Typical two-ward model simulated

The analysis undertaken demonstrated that vertical louvers have a significant impact on the amount of solar gain transmitted through to the patient ward. The table below highlights the effect of vertical shading:

Description	Percentage of shaded glass during solar exposed hours	Reduction in direct solar heat transmitted through glazing (Peak Summer Day)	Total reduction across glazing
Eastern Façade	18 %	Reduction in direct solar heat gain from 102 W/m^2 to 88 W/m^2	14 W/m^2
Western Façade	14%	Reduction in direct solar heat gain from 141 W/m^2 to 106 W/m^2	35 W/m^2

In addition, the façade has been designed for high thermal performance, including a double glazed low ‘e’ window systems which will improve the result to an average reduction in direct solar heat gain of 19%.

Ward Rooms have been designed with clear glazing, specifically intended to reduce internal reflection and the feeling of claustrophobia associated with the reduced vision to the outside.

4.6 LANDSCAPE AND SEWER MINING

The holistic landscape design and the associated extent of irrigation will be determined in line with water reduction and reuse strategies for the entire site.

Similarly, based on the hospitals selection of equipment. Generally it will be recommended that equipment not use single pass water cooling. However, where this cannot be avoided, non-potable (rain) water will be used.

The use of sewer mining for this project was not considered practical, as it is an extension of an existing building.

The use of a central waste water recycling system will be considered as part of the master plan for the site. The project will be designed for connection to a future non-potable water system.