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northern beaches council

ESD REPORT - SUSTAINABILITY INITIATIVES

WARRIEWOOD VALLEY COMMUNITY CENTRE

STAGE 1 - CONCEPTS & CONSULTATION

JUNE 2, 2020

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TERROIR atelier ten

CONTENTS

EXECUTIVE SUMMARY

The Warriewood Community Centre is a proposal for a replacement of the current facility at the corner of Pittwater Rd and Jacksons Rd. The design for the new facility has reached concept stage and in doing so has been subject to consultation with key stakeholder groups and a pre-DA meeting with Northern Beaches Council. The project is currently awaiting progression to design development and the submission of the Development Application.

The current design for the Warriewood Community Centre assumes “good practice” design approaches for core sustainability measures that can be assumed as part of contemporary industry standards. This includes large areas of north facing façade, integration with the landscape, natural light to interior spaces, equal access, rainwater collection and so on. Further, the current design has been developed such that it is possible to be constructed from cross laminated timber (CLT) and the use of CLT for the central foyer areas is included in the current cost estimates.

The following report outlines a series of additional sustainability measures to be considered for the Warriewood Community centre at this time. These options stretch current industry standards but are understood as new benchmarks that should be considered to ensure industry best practice.

The measures have been organised in six major categories as follows:

1. Resilient & Future Ready

2. Health & Wellness

3. Zero Carbon

4. Water Sensitive & Regenerative Landscape

5. Lifecycle & Materials

6. Quality Assurance & Value Delivery

Each category contains a number of options, a list that has been compiled in collaboration with leading sustainability consultants, Atelier Ten. We have then divided this list into those options or elements already included in the design, and those that would be additional to the current scope. Each additional option is described in terms of scope, similar examples, cost, and a short comment on the cost-benefit analysis of each.

It is hoped that this information might support the consideration of an increased presence of sustainability measures in the building and encourage the adoption of those that best address the ambitions of the brief and which present a positive cost-benefit outcome for Council and for all future users of this vital community building.

Graphic Representation, Warriewood Community Centre Concept Design

1 RESILIENT & FUTURE READY

A forward looking public building should be resilient to disruptions, robustly mitigating foreseen risks like power outages, bushfire smoke, and heat waves. If needed, it should provide a place of refuge during such times to the community. It should be adaptable to the consequences of the changing climate and flexible to advancements in technologies and changes in use over time. And it should provide venues that supports diverse community groups which in turn nurture community resilience.

1.1 Principles

- Resilient to short term shocks (extreme weather, utility failures).
- Adaptable to long term stresses (climate change, increasing energy costs).
- Flexible to changing community needs and program uses.

1.2 Targets

- Thermal Autonomy, keeping occupants comfortable without active heating and cooling for 85% of occupied hours.
- Demonstrate ability to maintain indoor environments under future climate scenarios.
- Demonstrate flexibility to accommodate changing occupant needs.
- Operate autonomously from grid power during daytime.
- Provide a place of refuge for community during crises.

1.3 Design responses

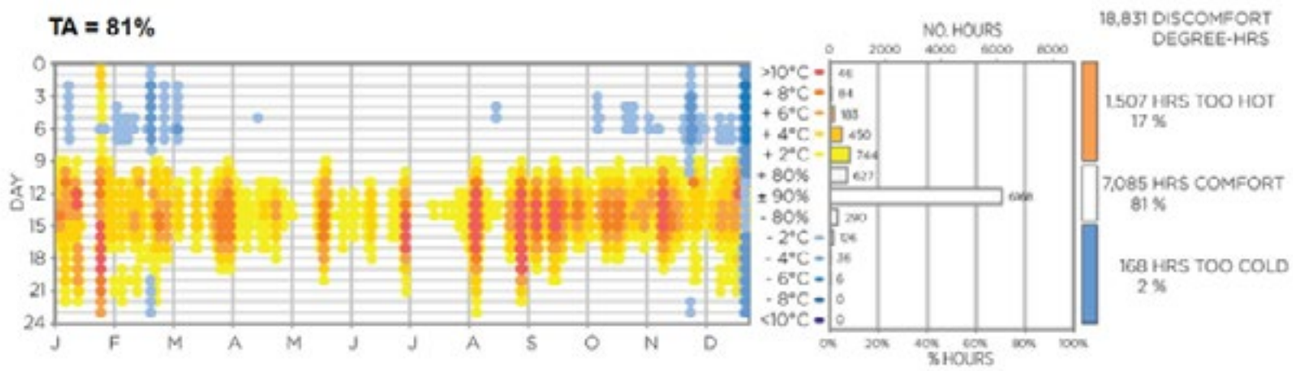
ALREADY INCLUDED:

- Utilise a climate responsive design approach, optimise building envelope for passive climate control.
- Continuously insulated, air-tight, and thermal bridge-free building envelope.
- Enable natural cross ventilation of all major spaces.
- Gas free operation to ensure critical systems can run on solar power from roof
- Open plan and flexible layout allow for reconfiguration of the spaces
- Locate above Probable Maximum Flood levels all critical equipment and services (electrical equipment and switch gear, emergency power equipment, major HVAC plant).
- Design all structure below PMF to survive flooding

ADDITIONAL MEASURES:

- **1A PV PANELS** Provide rooftop solar PV array sized to run all major building systems during the day.
- **1B VENTILATION** Centralised ventilation system with closable outdoor air dampers and removable outdoor air filters to prevent bushfire smoke from impacting day-to-day energy efficiency.

Diagram of the evolution of buildings. Source: Albert, Righter & Tittmann Architects)



Thermal Autonomy Graph. Source: *B. Levitt et al, Loisos + Ubbelohde, Alameda, California, USA*

1 RESILIENT & FUTURE READY

DESIGN RESPONSES:

ADDITIONAL MEASURES:

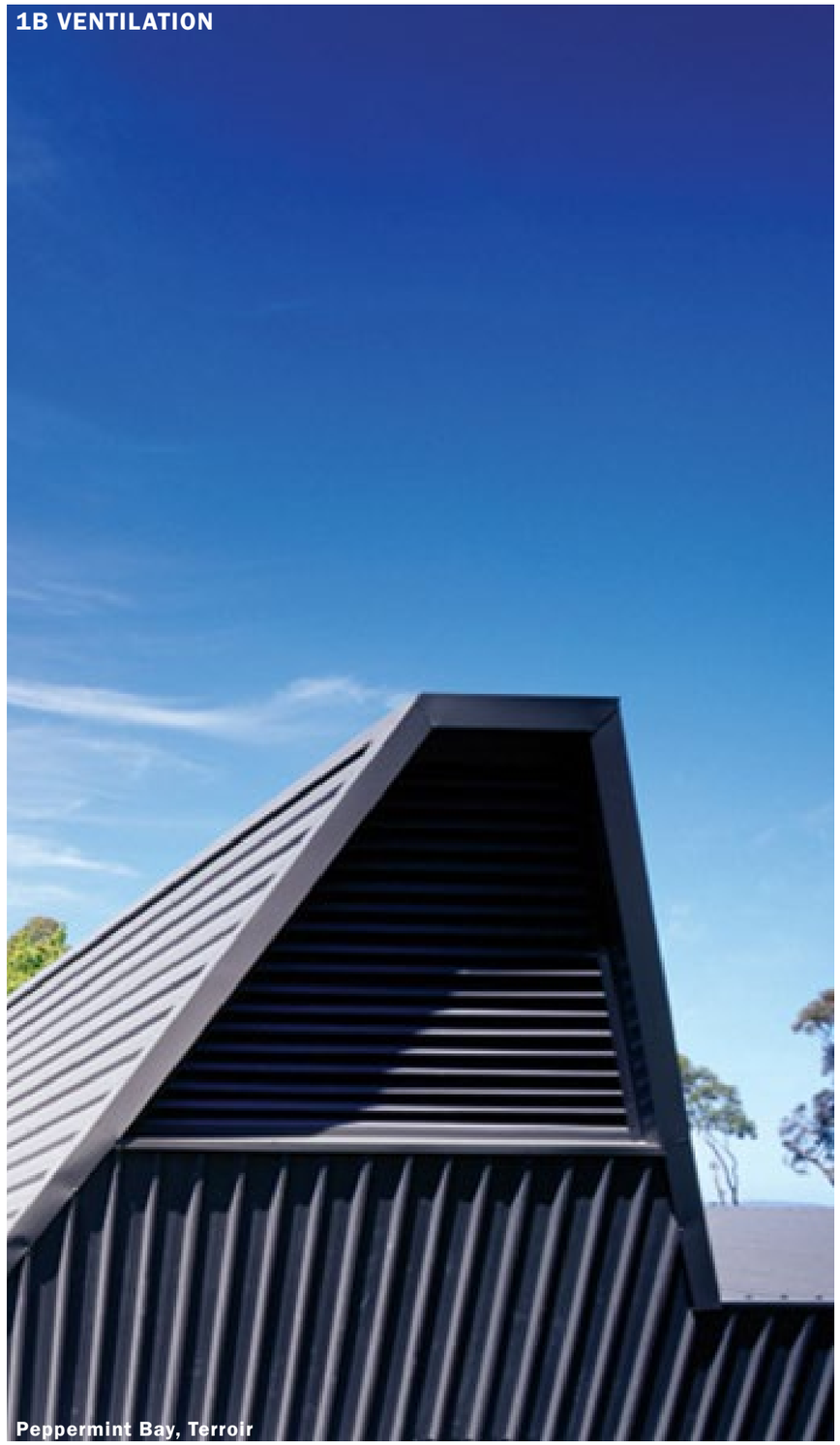
- **1A PV PANELS**
  Provide rooftop solar PV array sized to run all major building systems during the day.

- **1B VENTILATION**
  Centralised ventilation system with closeable outdoor air dampers and removeable outdoor air filters to prevent bushfire smoke from impacting day-to-day energy efficiency.

1A PV PANEL ARRAY

Apple HQ, Foster & Partners

1B VENTILATION



Peppermint Bay, Terroir

1A PV PANELS

PROVIDE ROOFTOP SOLAR PV ARRAY SIZED TO RUN ALL MAJOR BUILDING SYSTEMS DURING THE DAY.

COST BENEFIT ANALYSIS:

- Typically a single storey building with solar on the roof should be able to produce enough power to cover its energy needs offsetting the cost of the panels against the saving on power bills for the life of the building
- Solar typically pays itself back in 10-15 years
- The most straightforward system would be to put excess energy into the grid
- Battery storage is probably not worth the cost unless the space want to be used as a refuge during power outage / other natural disaster events, for this reason, it is not included in the estimate below

Potential zone for solar PV array

COST ESTIMATE: $250,000 - $500,000

- Assuming a 200kw system to approx 85% of roof space (the scale of kw and thus the budget may be able to be reduced during design development, if the benchmark is limited to covering its own energy needs). - Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall


Apple HQ, Foster & Partners


Branson School Student Commons, Turnbull Griffin Haesloop


Endesa Pavilion, IAAC

1B VENTILATION

CENTRALISED VENTILATION SYSTEM WITH CLOSEABLE AIR DAMPERS AND REMOVABLE OUTDOOR AIR FITTERS TO PREVENT BUSHFIRE SMOKE FROM IMPACTING ENERGY EFFICIENCY

COST BENEFIT ANALYSIS:

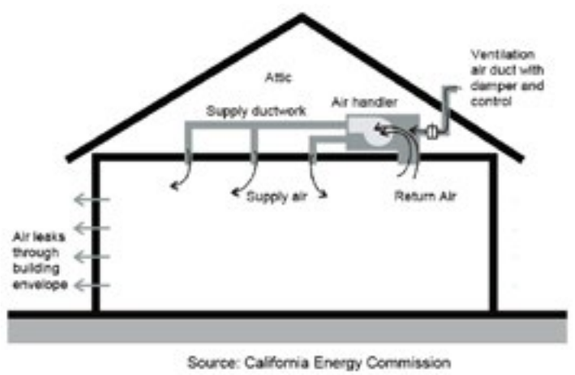
- Allows comfortable spaces during bushfire season
- Non interrupted operation of all function spaces when air quality is low outside
- Allows for the space to be used as a refuge during bushfire season - continuing its key function as a community living room
- Prevention of adverse effects on energy efficiency of systems during these events

Indicative Vent Positioning

COST ESTIMATE: $60,000

- Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall

Peppermint Bay, Terroir



Source: California Energy Commission

Ventilation System Diagram

Roof Top Ventilation, Providence Portland Medical Center

2 HEALTH AND WELLNESS

This community centre can provide an exceptional environment which not just supports, but enriches the health and wellness of its visitors. The building should be shaped to optimise daylight, acoustic control, air quality and comfort. The systems should be easy and affordable to operate. The architecture will re-engage people with the craft and workmanship of high quality natural materials that are healthy, evoke nature, and enhance the experience of the place.

2.1 Principles

- Create healthy, high quality environments which enrich life.
- Provide a high-performance building which offers comfort & wellness with minimal energy and user input.
- Facilitate human-centred environments which prioritise air quality, acoustic control, natural lighting & comfort.
- Celebrate the craft of quality materials and construction.
- Eliminate direct polluting product and materials, and eliminate those that generate toxic pollutants through the manufacturing or off-gassing process.
- Maximise biophilic benefits of natural materials.

2.2 Targets

- Achieve a Useful Daylight Index (UDI) for all regularly occupied indoor spaces.
- Achieve indoor thermal comfort aligned with the Green Star standards (relative humidity between 40-60% & ambient temperature between 18-25'C for 95% of year)
- Provide balanced ventilation with fresh air supply throughout the building (no less than 30m3/h/person to habitable rooms)
- Maintain indoor CO2 levels at no greater than 200 ppm higher than coincident outdoor air conditions.

2.3 Design responses

ALREADY INCLUDED:

- Celebrate natural materials through biophilic design
- Provide skylights that allow for useful daylight and reduce artificial lighting demand

ADDITIONAL MEASURES:

- **2A FILTRATION** Air handlers equipped with capacity for additional filtration to be installed as needed to exclude bushfire smoke.
- **2B MOISTURE CONTROL** Prevent moisture build up / transfer through building envelope through elimination of thermal bridges & specification of intelligent vapour permeable membranes
- **2C VOC FREE** Specify low or no VOC emitting finish materials and products.

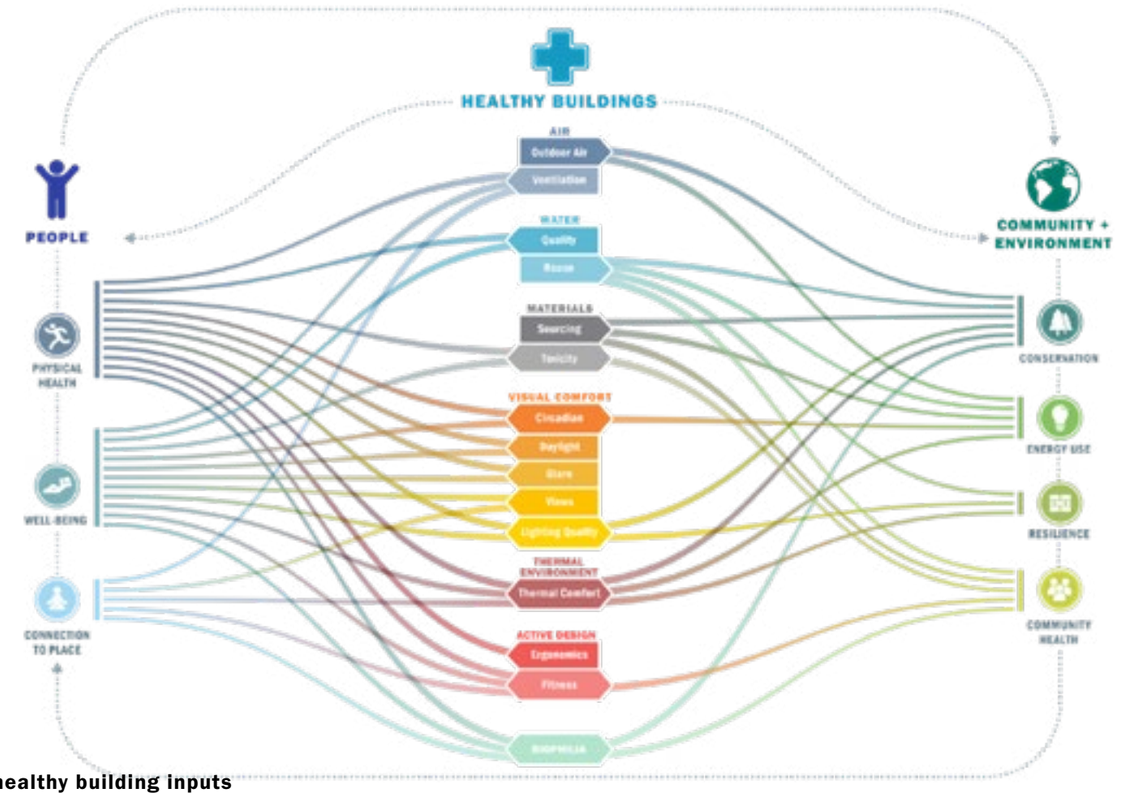


Diagram of healthy building inputs

Daylighting a single-storey community hall

2 HEALTH AND WELLNESS

DESIGN RESPONSES:

ADDITIONAL MEASURES:

- **2A FILTRATION**
  Air handlers equipped with capacity for additional filtration to be installed as needed to exclude bushfire smoke.

- **2B MOISTURE CONTROL**
  Prevent moisture build up / transfer through building envelope through elimination of thermal bridges & specification of intelligent vapour permeable membranes

- **2C VOC FREE**
  Specify low or no VOC emitting finish materials and products.

Wellness Communities, Andria Mongia

2A FILTRATION

AIR HANDLERS EQUIPPED WITH CAPACITY FOR ADDITIONAL FILTRATION TO BE INSTALLED AS NEEDED TO EXCLUDE BUSHFIRE SMOKE

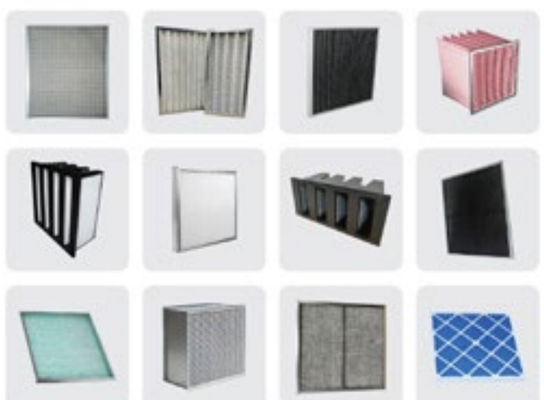
COST BENEFIT ANALYSIS:

- Allows comfortable spaces during bushfire season
- Non interrupted operation of all function spaces when air quality is low outside
- Allows for the space to be used as a refuge during bushfire season - continuing its key function as a community living room
- Prevention of adverse effects on energy efficiency of systems during these events

Indicative Vent Positioning

COST ESTIMATE: inc. in 1B

- Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall



Air Filters

Air handler with Filter

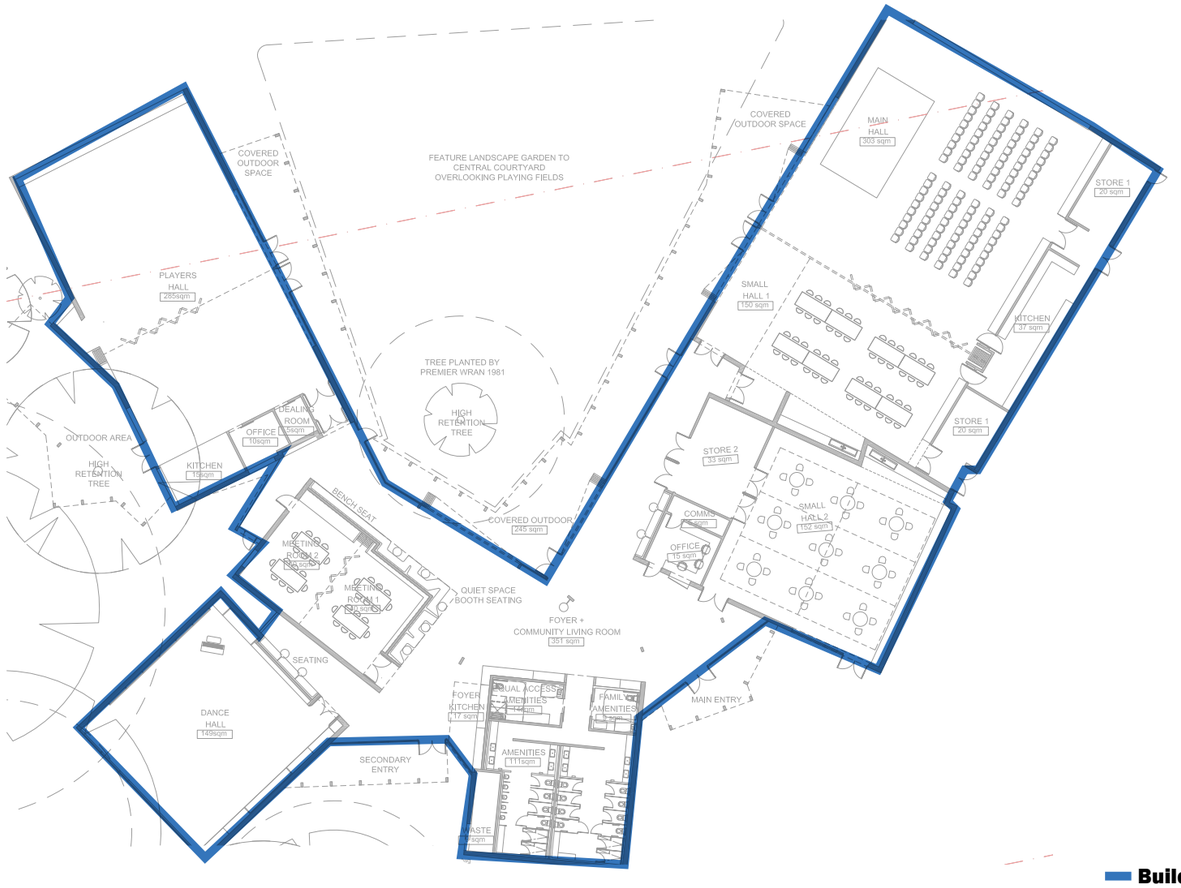
Bushfire Smoke in Sydney City

2B MOISTURE CONTROL

PREVENT MOISTURE BUILD UP / TRANSFER THROUGH BUILDING ENVELOPE THROUGH ELIMINATION OF THERMAL BRIDGES AND SPECIFICATION OF INTELLIGENT VAPOR PERMEABLE MEMBRANES

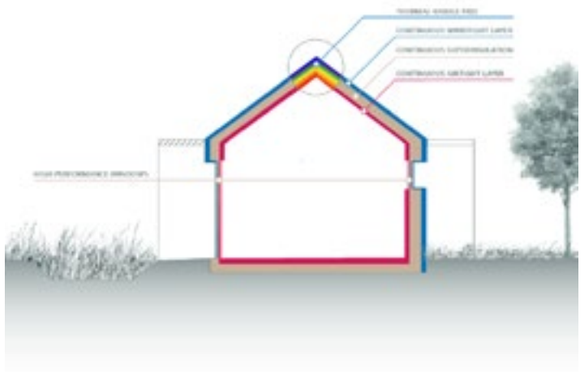
COST BENEFIT ANALYSIS:

- Less loss of heat in winter - spaces stay cooler in summer
- Improves performance and comfort of space
- Allows other systems - solar, heat pump etc to work more efficiently

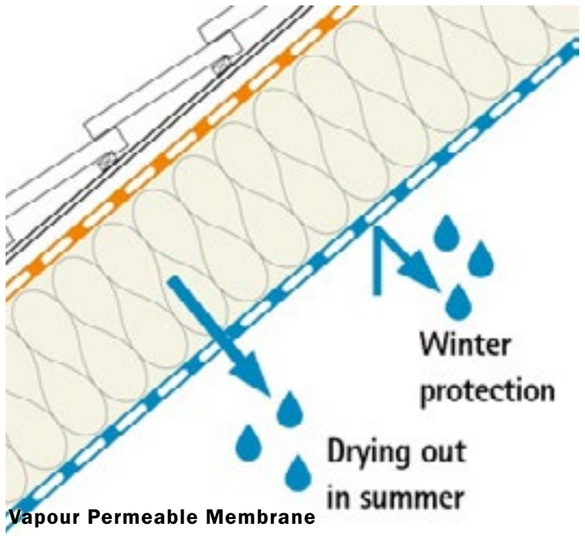


COST ESTIMATE: $20,000

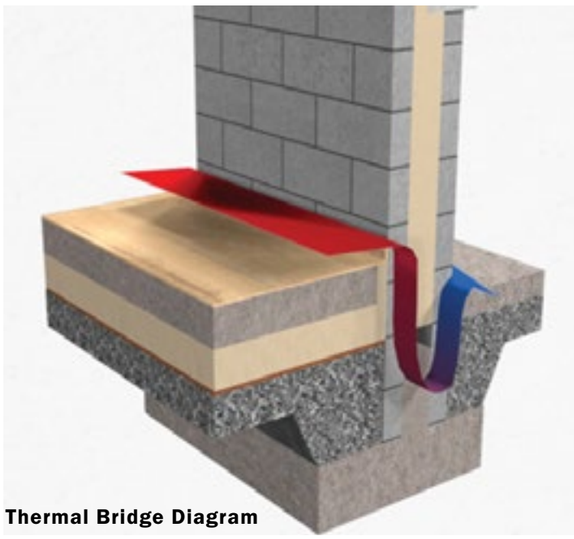
- Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall



Thermal Comfort Diagram



Vapour Permeable Membrane



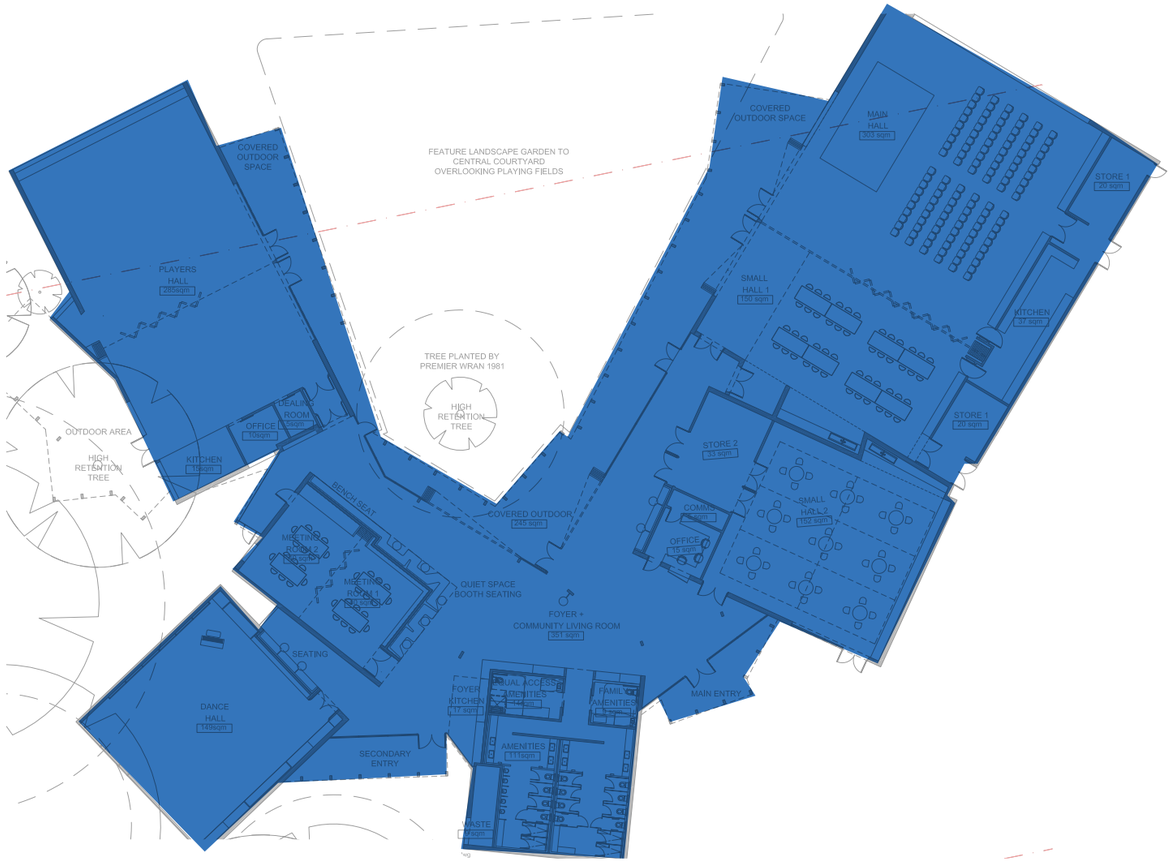
Thermal Bridge Diagram

2C VOC FREE

SPECIFY LOW OR NO VOC EMITTING
FINISH MATERIALS AND PRODUCTS

COST BENEFIT ANALYSIS:

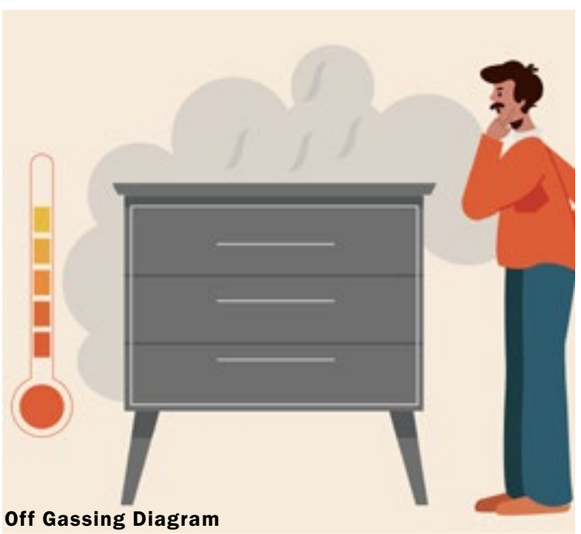
- Avoids “off gassing” the release of airborne particulates or chemicals, known as, volatile organic compounds (VOCs), from building materials and finishes, Potential sources of off-gassing range from construction materials to carpeting, cabinetry, furniture, paint, solvents and other finishes
- Better for the health and wellbeing of the building occupants



COST ESTIMATE: $35,000

- Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall

Low or No VOC solvents and wood finishes


Off Gassing Diagram

3 ZERO CARBON

As the world transitions to a zero carbon future, public buildings have been at the vanguard of effective carbon reduction. This project is at the right stage to take advantage of a careful & considered approach to carbon reduction. Both embodied & operational carbon can be addressed through the careful design and construction processes.

3.1 Principles

- Minimise operational energy through climate responsive design.
- Guarantee & verify operational energy efficiency through building performance tuning.
- Minimise embedded (upfront) greenhouse gas emissions in construction materials and processes.
- Eliminate fossil fuel use and associated emissions.
- Provide all typical operational energy needs by on-site renewable energy sources.

3.2 Targets

- Achieve a 20% improvement upon NCC Section J building envelope related energy performance baseline.
- Achieve a whole-building (including building systems) operational energy savings of 30% relative to NCC Section J performance baseline.
- Generate sufficient energy on site to achieve net zero energy import.
- Procure all remaining operating energy from renewable sources.
- Reduce embedded (upfront) emissions relative to business as usual by at least 20%.
- Minimise refrigerant volumes, use refrigerants with a Global Warming Potential (GWP) of 10 or lower.
- Offset upfront and any residual operational GHG emissions.

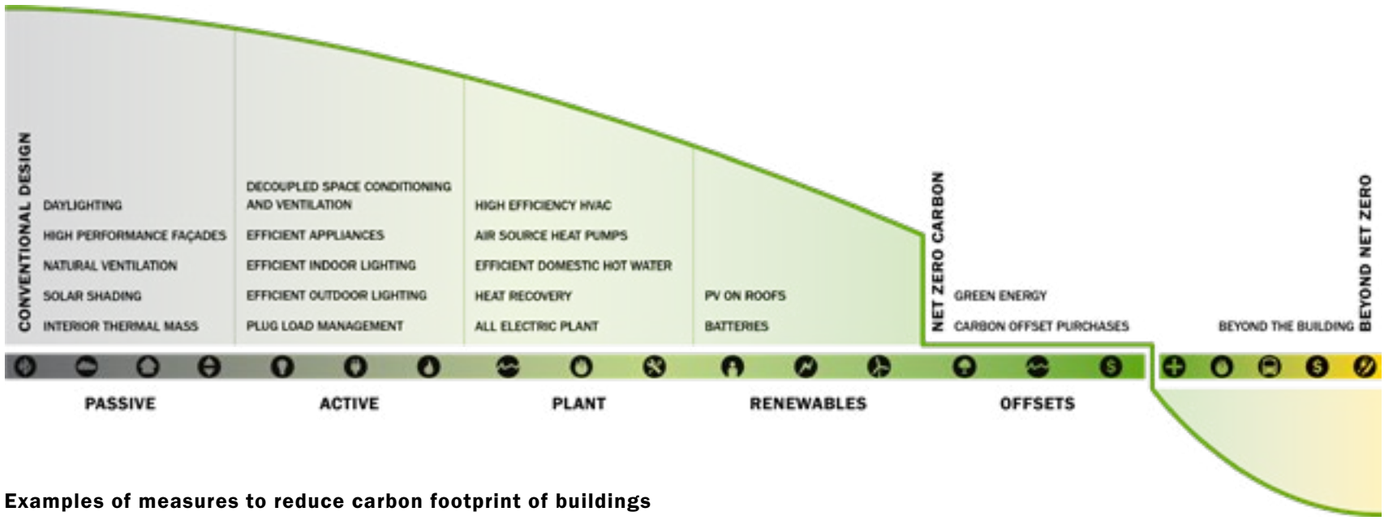
3.3 Design responses

ALREADY INCLUDED:

- Achieve more with less - decrease reliance on mechanical & technological systems to free up usable space and maximise valuable GFA.
- Optimise all facades to shade glazing to reduce cooling energy use yet provide high quality daylighting
- Maximise the free cooling provided by outdoor air through design for cross ventilation & night purging.
- Prioritise timber and other plant-based building materials that sequester carbon in their growth.

ADDITIONAL MEASURES:

- **3A MATERIALS** Choose low embodied carbon materials and products for major building systems (structure, cladding, foundations, etc)
- **3B LIGHTING** Use energy efficient LED lighting



Examples of measures to reduce carbon footprint of buildings

3 ZERO CARBON

DESIGN RESPONSES:

ADDITIONAL MEASURES:

- **3A MATERIALS**
  Choose low embodied carbon materials and products for major building systems (structure, cladding, foundations, etc).

- **3B LIGHTING**
  Use Energy Efficient LED lighting systems

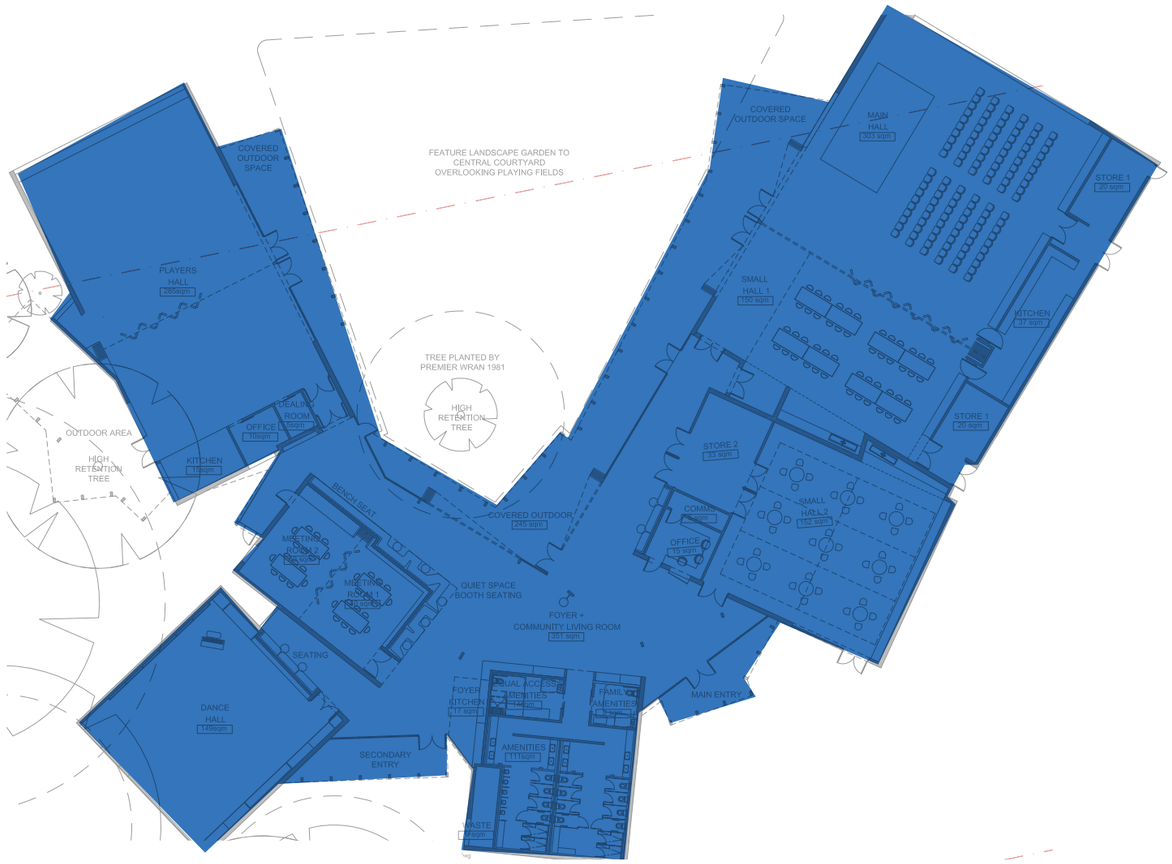
Carbon Reduction Diagrams

3A MATERIALS

CHOOSE LOW EMBODIED MATERIALS AND PRODUCTS FOR MAJOR BUILDING SYSTEMS (STRUCTURE, CLADDING, FOUNDATIONS ETC)

COST BENEFIT ANALYSIS:

- Reduces embodied energy in construction of building (buildings carbon footprint)
- Holistic approach to building materials and lifecycle



COST ESTIMATE: $35,000

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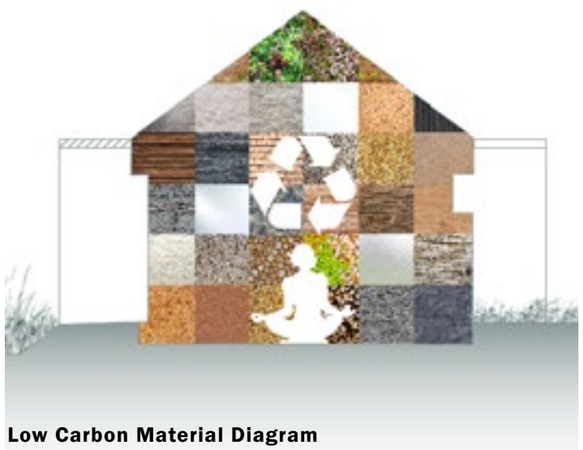
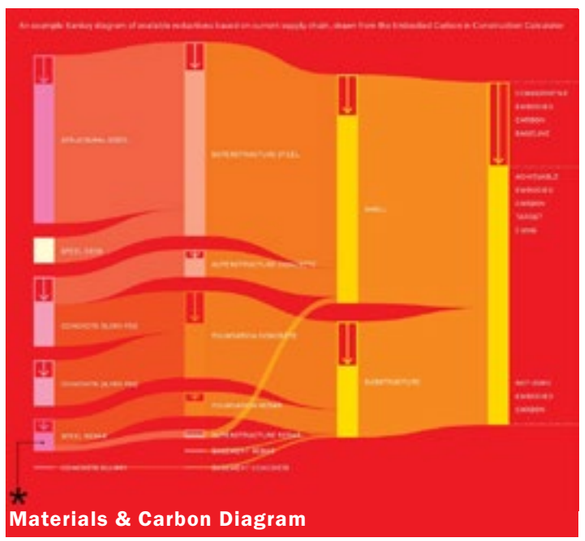


Low Carbon Material Diagram



Materials & Carbon Diagram

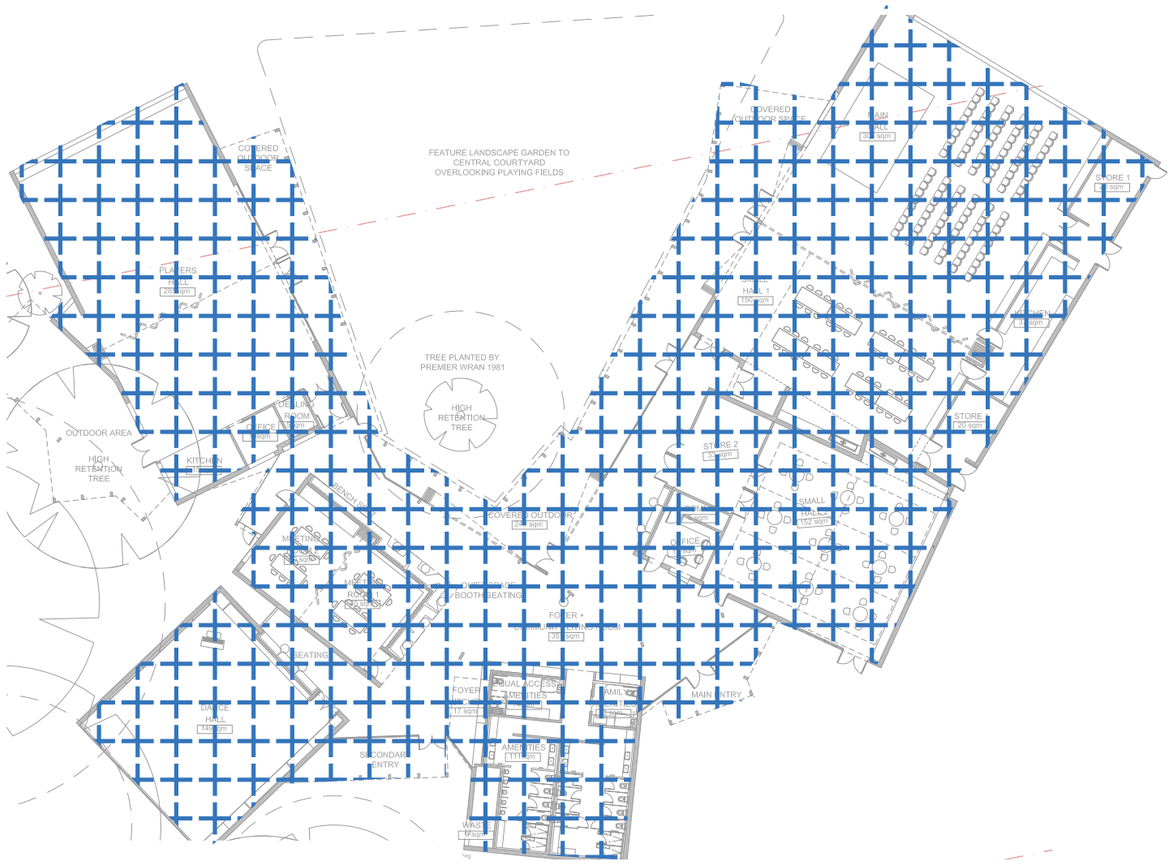
CROSS LAMINATED TIMBER

3B LIGHTING

ENERGY EFFICIENT LED LIGHTING SYSTEMS

COST BENEFIT ANALYSIS:

- Reduced running cost of lighting
- Allows lighting levels to adjust based on changes in natural lighting levels
- Dedicated control + overrides for each space



COST ESTIMATE: $25,000

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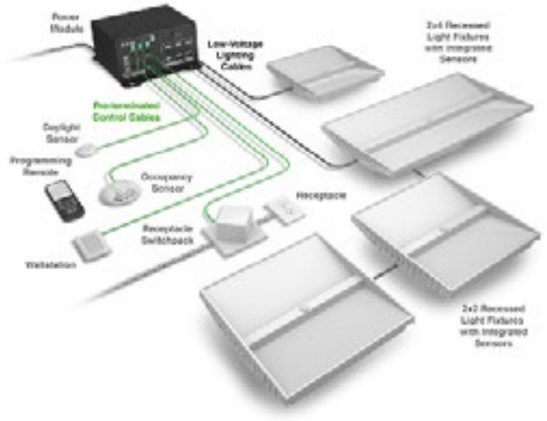
Smart Lighting Systems

Typical Light Globe Types



Lighting Control System and Sensors

4 WATER SENSITIVE AND REGENERATIVE LANDSCAPE

Celebrate precious water resources through a well- worn hierarchy of reduction, efficiency, capture and reuse.

1.1 Principles

- Maximise water efficiency
- Minimise use of water
- Capture and store rainwater on site
- Reuse water where practical
- Divert stormwater for landscape irrigation
- Provide a regenerative landscape

1.2 Targets

- Capture rainwater from all roof surfaces
- Reuse harvested rainwater for landscape irrigation
- Reduce demand on potable water
- Enable diversion & reuse greywater as a stretch goal
- Enable diversion & management of stormwater across site through landscaping & permeable ground finishes.
- Provide habitat for targeted endemic or endangered species

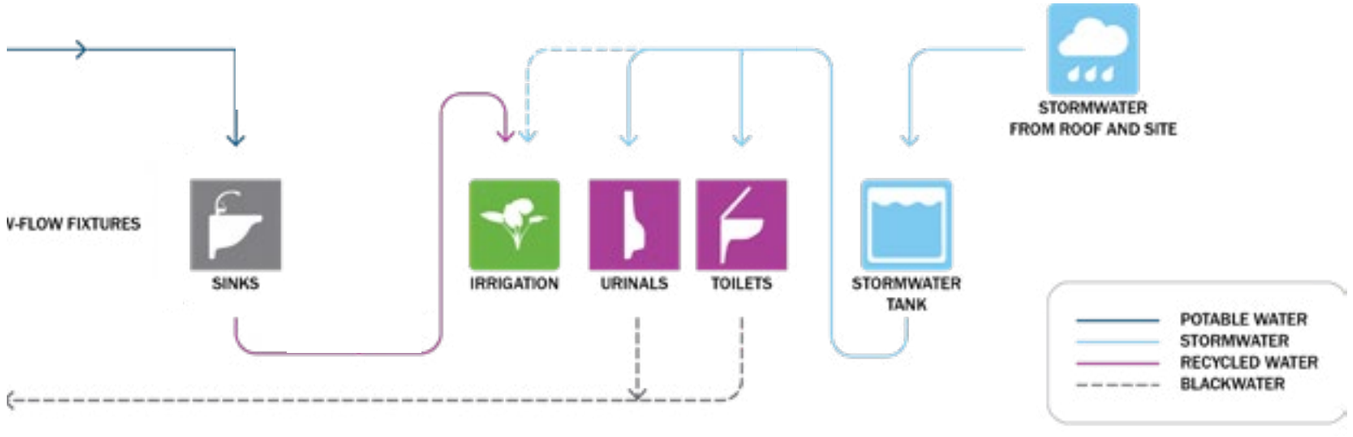
1.3 Design responses

ALREADY INCLUDED:

- Water sensitive urban design (WSUD) including permeable surfaces and rain gardens to maximise local infiltration and reduce run off.
- Low maintenance native vegetation for landscape that provides habitat for endangered or endemic species.
- Install rainwater capture tank sized to retain a substantial volume of water for irrigation.

ADDITIONAL MEASURES:

- **4A FIXTURES** Use high efficiency, high WELS rated water fixtures



Examples of integrative water cycle diagram incorporating water capture and recycling

Examples of fixture ratings, landscaping and harvesting

4 WATER SENSITIVE AND REGENERATIVE LANDSCAPE

DESIGN RESPONSES:

ADDITIONAL MEASURES:

- **4A FIXTURES**
  Use high efficiency, high WELS rated water fixtures

INCLUDED IN CURRENT DESIGN:
- water tank to collection rainwater off roof for irrigation of garden and flushing for toilets.

4A FIXTURES

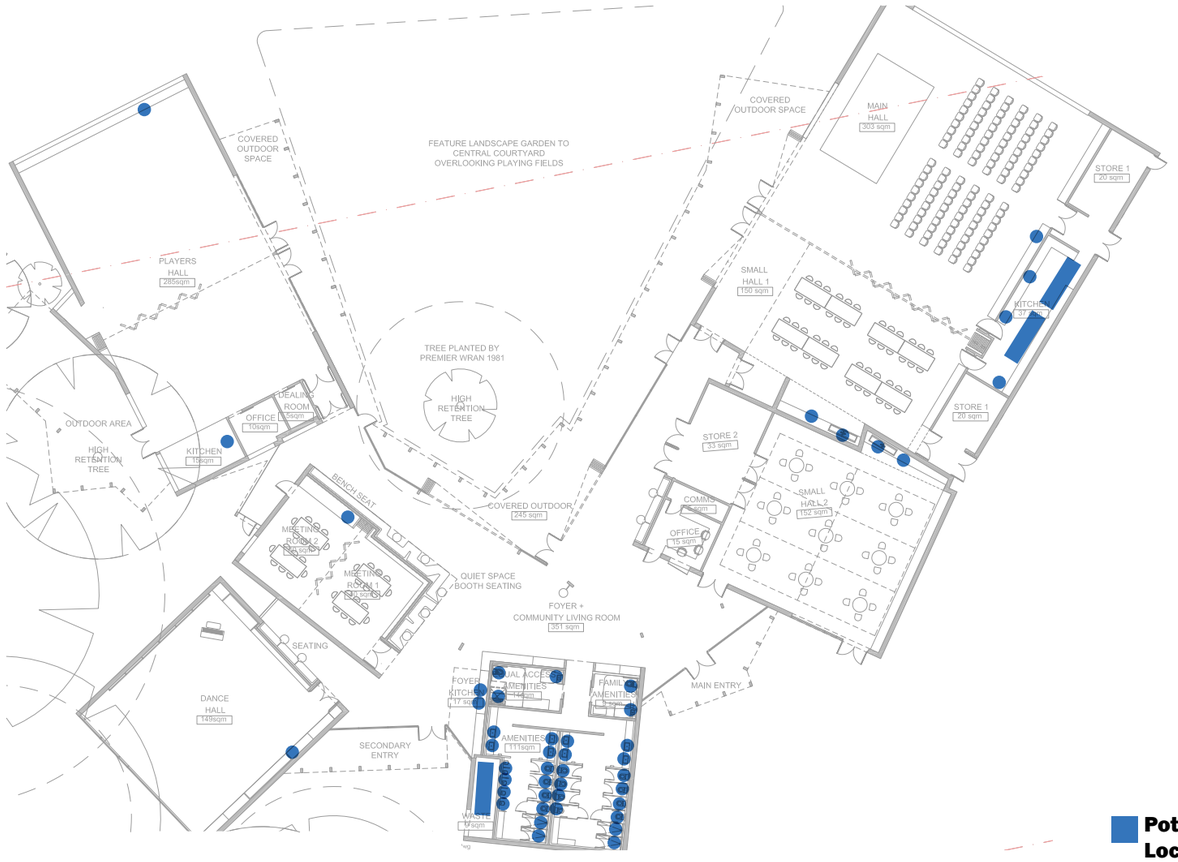
WATER RATING SYSTEM

4A FIXTURES

USE HIGH EFFICIENT, HIGH WELS RATED WATER FIXTURES

COST BENEFIT ANALYSIS:

- Significant reductions in overall water usage over life of building
- Pairs with water sensitive landscape design
- Relatively low initial outlay / cost



COST ESTIMATE: $15,000

- Refer to Appendix 01 “Warriewood Valley CC - Stage 1C ESD Initiatives May 2020” costing prepared by Rider Levett Bucknall

Water Efficiency Diagram

Water Rating System

Water Efficient Fixtures

5 LIFECYLE AND MATERIALS

The community centre will demonstrate its commitment to sustainability principles through the selection of materials that are sustainably sourced and can be reused or easily recycled. The life cycles of all materials and processes will be well considered and will embed the same legacy of design and community integrity.

5.1 Principles

- Extend life cycles through robustness and adaptability.
- Prioritise ethical supply chains. Support local economy.
- Reinforce meaning through craftsmanship.
- Use recycled and reclaimed materials in construction, enable the building or its parts to be reused.

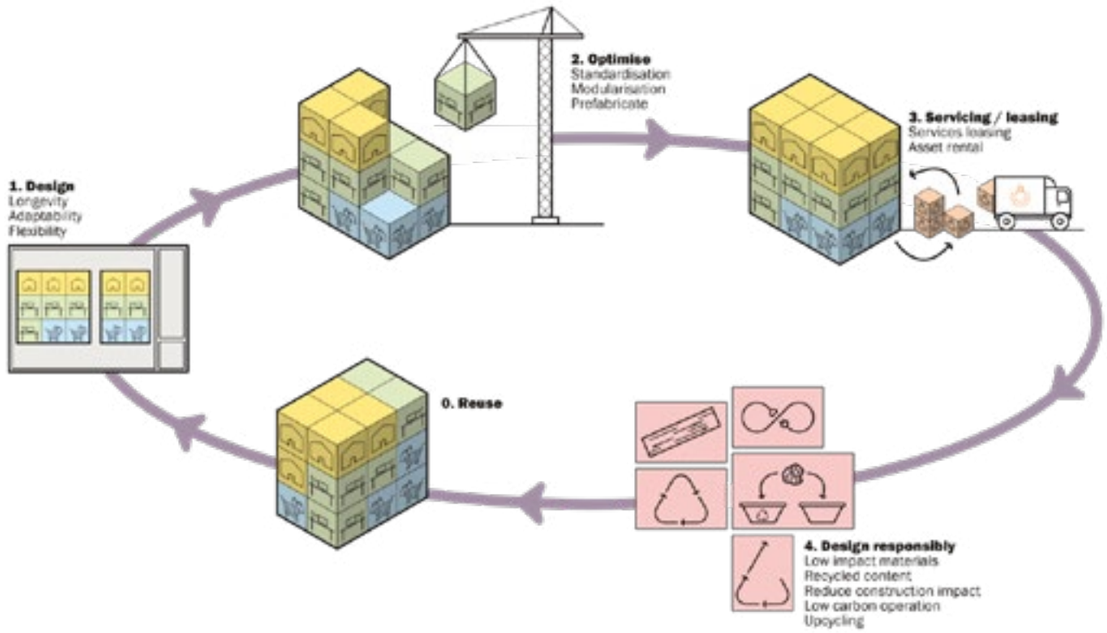
5.2 Targets

- Minimise imported materials
- Maximise local fabrication & hand-craftsmanship
- Optimise all building systems for transport
- Increase modularity of system for economical construction
- Only use FSC certified timber from a certified Chain of Custody
- Minimise impact on local ecosystems & heritage

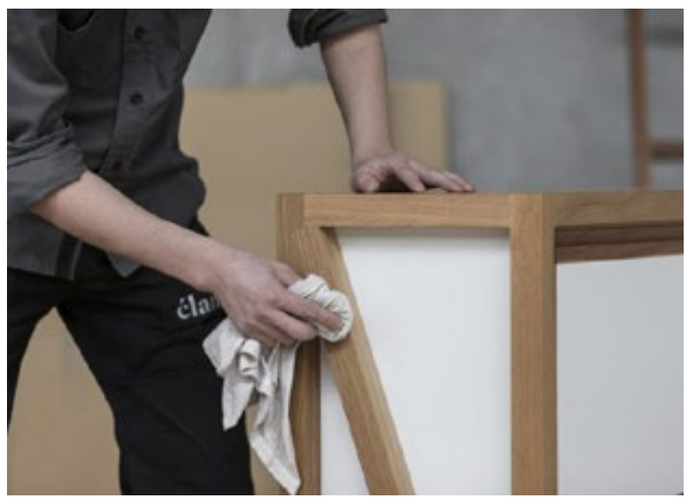
5.3 Design responses

ALREADY INCLUDED:

- Locate building and its pavilions to preserve high value site elements (trees, landscape features).
- Select materials & components specified which can be easily reused and recycled.
- Select materials & components which are locally made / sourced
- Offsite construction systems optimised for installation onsite
- Buildings designed for longevity with robust materials & construction systems
- Spaces designed for flexibility of use.
- Construction systems developed to enable relocation and/or design for disassembly at end of life
- Consider plug-and-play services design to speed reconfiguration and reduced material waste over building lifetime.



Example of a circular building lifecycle



Materials being produced in factories

5 LIFECYLE AND MATERIALS

DESIGN RESPONSES:

ALREADY INCLUDED:

- Locate building and its pavilions to preserve high value site elements (trees, landscape features).
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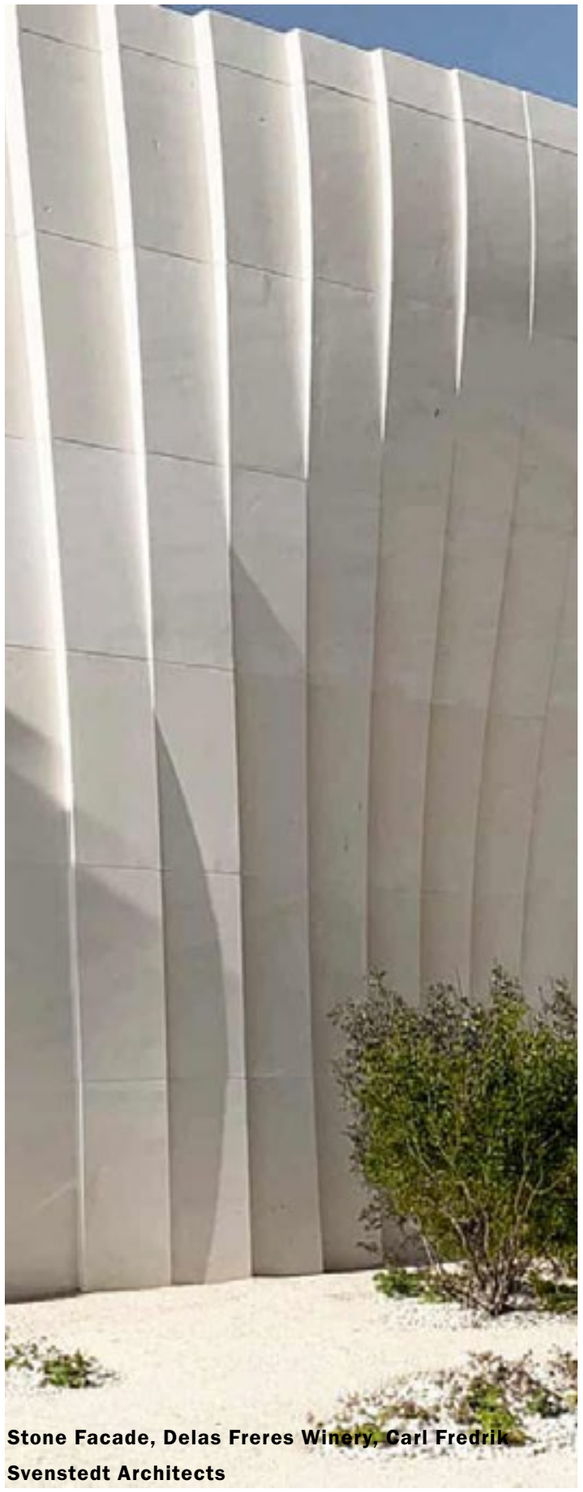

Stone Facade, Delas Freres Winery, Carl Fredrik Svenstedt Architects

Cross Laminated Timber, In the Factory

Cross Laminated Timber, Under Construction, Unknow Project

6 QUALITY ASSURANCE & VALUE DELIVERY

Green building certification offers a third party verification process that provides transparent quality assurance and aids in the communicating sustainability achievement to stakeholders.

6.1 Principles

-
- Use the benchmarking process as a Quality Assurance process for implementing and delivering sustainability measures.
- Use benchmarking process to drive innovation & market transformation in sustainable building practices
- Use the third party verification as a tool for communicating the building performance to stakeholders

6.2 Targets

- Identify & pursue green building certification standards that align with project objectives. Possibly relevant ones include:
  - Green Star Design & As Built
  - WELL Building Standard
  - The Sustainable SITES Initiative
  - The ReLI Resilience Standard

6.3 Design responses

ADDITIONAL MEASURES:

- Select & pursue the benchmarking standard that most appropriately tracks the project's aspirations and qualities (probably Green Star for Buildings, due for release in later 2020).
- Link key design features to sustainability outcomes and track their reliable delivery using a certification tool.
- Use the certification system as a communication tool.
- Select a benchmarking scheme which is tried and tested, yet will encourage local market transformation towards higher resilience & sustainability standards in the industry.

Figure 1.1 Alternative benchmaking & rating schemes - Living Future Institute, International WELL Building Institute, & Green Building Council Australia

6 QUALITY ASSURANCE & VALUE DELIVERY

DESIGN RESPONSES:

ADDITIONAL MEASURES:

- Select & pursue the benchmarking standard that most appropriately tracks the project's aspirations and qualities (probably Green Star for Buildings, due for release in later 2020).
- Link key design features to sustainability outcomes and track their reliable delivery using a certification tool.
- Use the certification system as a communication tool.
- Select a benchmarking scheme which is tried and tested, yet will encourage local market transformation towards higher resilience & sustainability standards in the industry.

COST ESTIMATE: $175,000

- Refer to Appendix 01 "Warriewood Valley CC - Stage 1C ESD Initiatives May 2020" costing prepared by Rider Levett Bucknall