

# CONCEPT DESIGN REPORT

## WADJEMUP MODULAR WAVE APARTMENTS



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**SITE 1**  
Peddle & Flipper  
Bedford Ave.

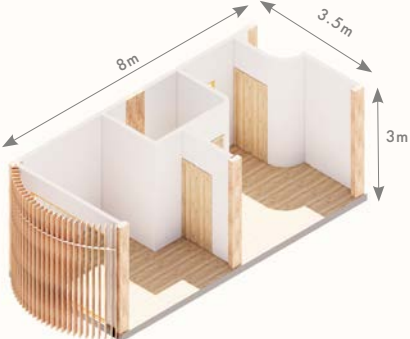
**SITE 2**  
Housing site  
Parker Point Road



WADJEMUP / ROTTNEST ISLAND,  
WESTERN AUSTRALIA

# CONCEPT

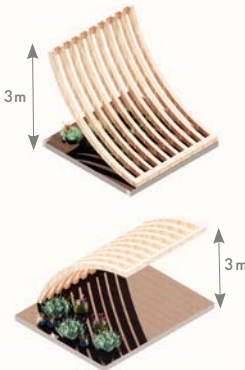
## MODULE DESIGN



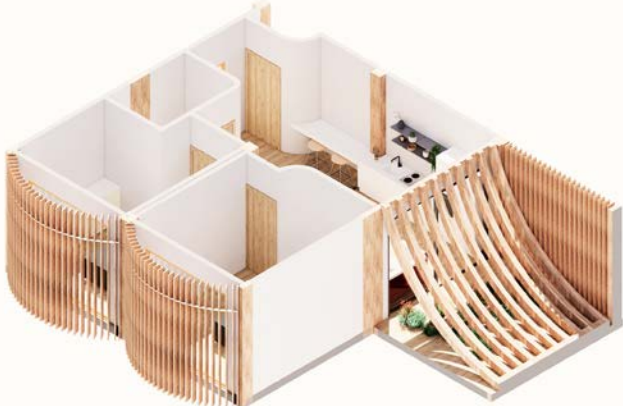
BEDROOM & BATHROOM MODULE



CONNECTING 2 MODULES



STEAM-BENT TIMBER WAVE SHADES



DIFFERENT APARTMENT SIZE OPTIONS

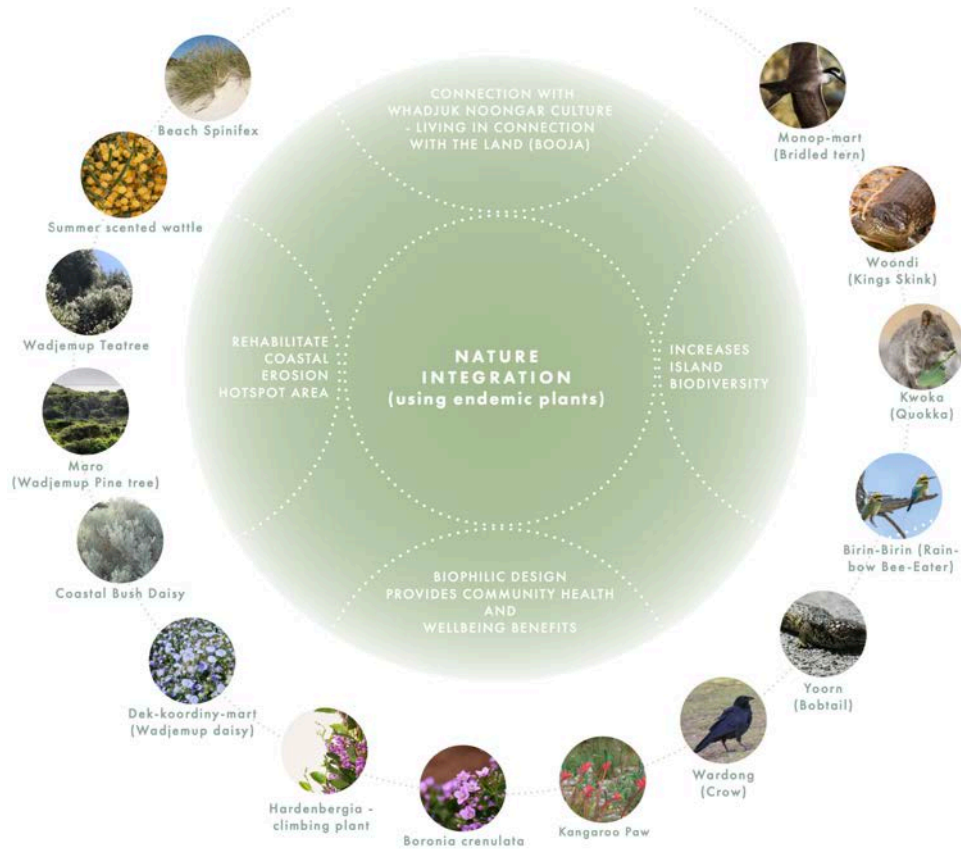


## SECTIONAL PERSPECTIVE

- Timber screen with gardens
- Push bikes Storage
- Screened Walkways to apartment
- Electric bikes storage (Right)
- Bike hire Lane
- Timber screen with gardens
- Bike return Lane
- Timber shades over communal gardenS
- Cafe
- Cafe Outdoor dining

# CONCEPT SITE RESPONSE

## ENVIRONMENT AND COMMUNITY DESIGN SYNERGY



### Coastal Erosion Hotspot Area

The sites are located with an area where coastal erosion is highly likely to impact on public and private physical assets and require management and adaptation action within 25 years. (DPLH, 2019. Coastal Erosion Hotspots in Western Australia.)

### Wadjemup is a Class A reserve

The RIA Rottnest Island Authority has a strong focus on preserving its natural environment and rehabilitating its biodiversity. The site is surrounded by tall trees that provide a soft enclosure to the spaces and provide shade to the north and south of the plot.

THE WAVE FORM OF THE MODULAR HOUSING IS INSPIRED BY THE UNIQUE VIEWS OF THE OCEAN AND THE TOPOGRAPHY OF THE ISLAND. THE DESIGN IS INTEGRATED WITHIN ITS SURROUNDINGS TO DEMONSTRATE HOW MODULAR DESIGN DOESN'T HAVE TO BE BOXES LACKING IN CHARACTER AND A STRONG IDENTITY



## DESIGN DRIVERS

### 1. CONNECTION WITH UNIQUE SITE

The design creates direct visual connection with the site through views to the unique trees and native vegetation on the site.

Integrating the colours and textures present on the island and local sites into the material palette. And shaping the building form around the trees on the site to immerse them with views and experiences of the site.

Morphing the shape of the housing on the second site with the shape of the dune to connect with the site and allow for maximised views of the unique ocean site.

### 3. PROTECT NATURAL ENVIRONMENT

It is important to the Rottnest Island council to protect its natural environment and ecosystems to take care for the place and to restore its biodiversity. Restoring the ecosystems of the dunes if important to prevent erosion. Protecting the trees on the site is the most effective design solution for sustainability, being net-positive.

The practice of living with the ecological systems of the land is practice that the Custodians of the land - the Whadjuk Noongar people carried out.

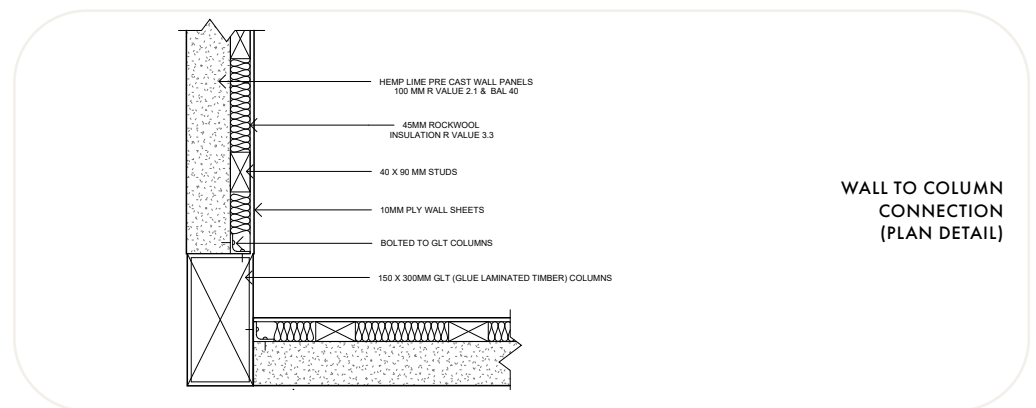
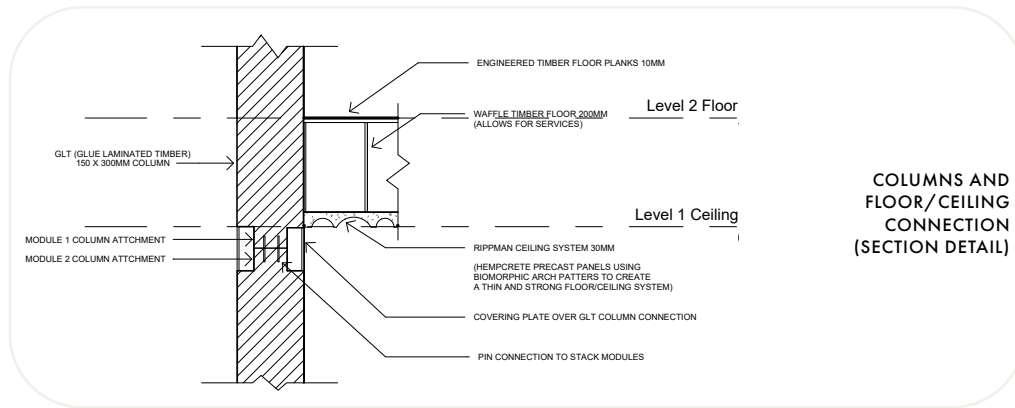
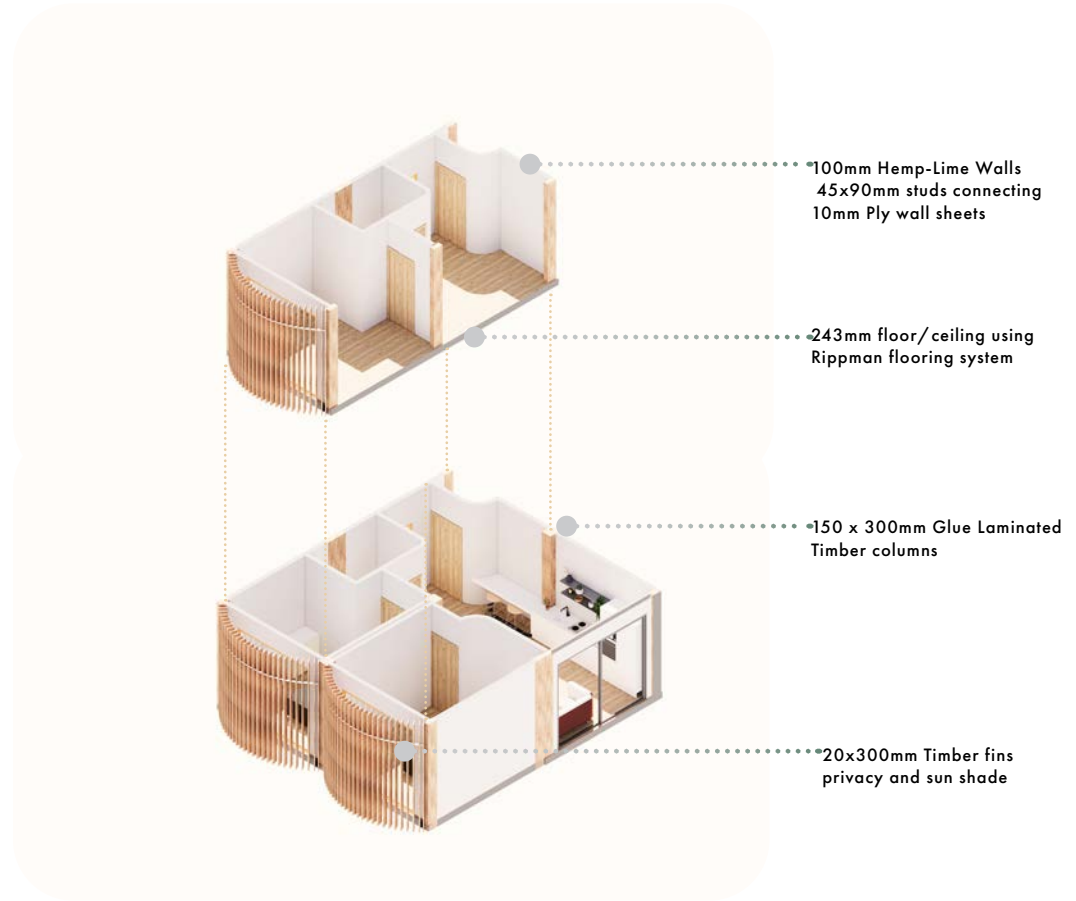
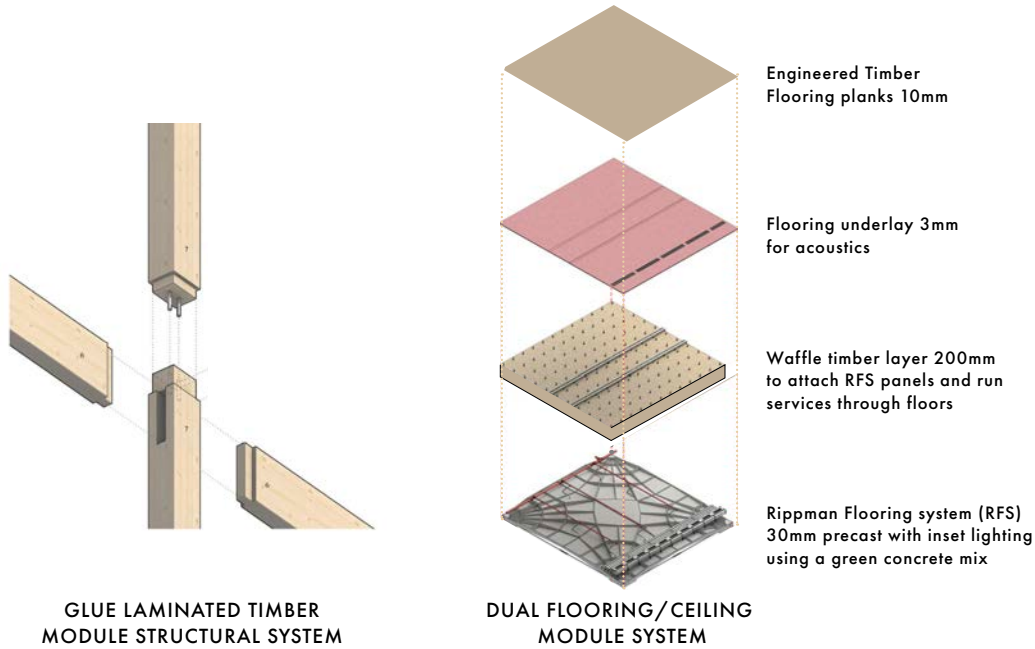
### 2. COMMUNITY SPACES

The buildings form and its surrounding spaces will offer spaces for gathering and interaction in the aim to grow a sense of community.

Community strength and human connection is a goal in response to the sites history of isolation through imprisonment, attempting to create joy in a space that was once filled with pain.

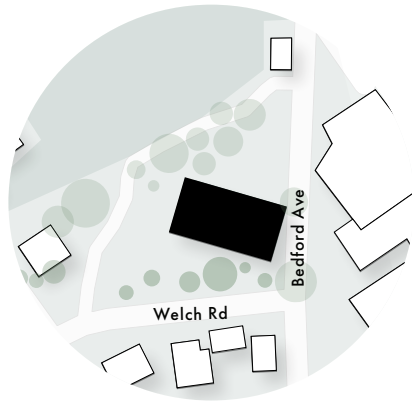
# MODULE CONNECTIONS

Designed for disassembly and maximised configurations through simple modules size 8m x 3.5m using a Glue Laminated Timber (GLT) structural interlocking system and prefabricated Rippman floor/ceiling panels (RFS), and hemp-lime walls.



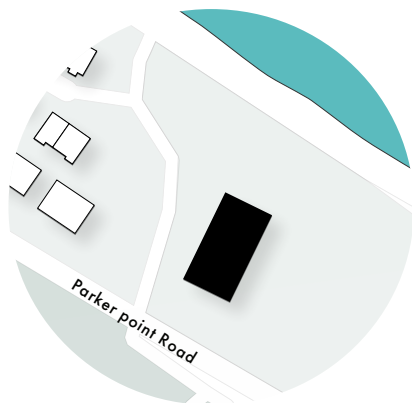
# RECONFIGURATION

SITE 1



500M DISTANCE BETWEEN SITE 1 AND 2  
TRANSPORT MODULES BY TRUCK AND  
CRANE TO SITE 2 FOR RECONFIGURATION

SITE 2



**SITE 1: PEDDLE & FLIPPER  
ISLAND BICYCLE HIRE**



AXONOMETRIC PERSPECTIVE  
Corner of Bedford Ave and Welch Rd

THE DESIGN SITS ABOVE THE PEDDLE AND FLIP-  
PER BICYCLE HIRE SHOP. IT WEAVES AROUND THE  
EXISTING NATIVE TREES & VEGETATION.

**SITE 2: COASTAL HOUSING**

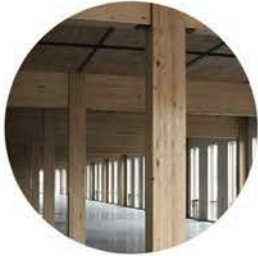


AXONOMETRIC PERSPECTIVE  
Corner of Parker Point Road and Entry road

THE DESIGN MORPHS WITH FORM OF THE SAND  
DUNES TO CONNECT WITH THE UNIQUE SITE.

# INNOVATION AND RESEARCH

## MATERIALITY



### 1 GLUE LAMINATED TIMBER (GLT) STRUCTURE

- + Low carbon building material
- + 3x stronger than steel
- + Healthy building material
- + 100+ year life expectancy
- + Reusable after deconstruction



### 2 RIPPAN FLOORING SYSTEM (RFS)

- + Lower embodied carbon per m2 than typical slabs or steel & CLT systems
- + 3D printed or cast system to fit module sizes
- + Strength through its patterns requires no tensing
- + Biomorphic patterns benefit user wellbeing



### 3 HEMPCRETE BIOCOMPOSITE WALLS

- + Made with Hemp hurd, lime binder, water
- + Carbon negative material
- + 7x stronger and 3x more elastic than concrete
- + Thermally insulative
- + Non combustible
- + Water proof
- + Acoustic insulation



### 4 RECYCLED TIMBER FLOORING

- + Recyclable in full form
- + 40+ Yrs life capacity
- + Thermally efficient material
- + Timber improves mental wellbeing



### 5 TIMBER SCREENS & STEAM BENT SHADES

- + Fire resistant BAL 12.5, 15, 19 and 29
- + 40+ years life span
- + BCA C1.10a satisfied
- + Low embodied energy in production
- + Sustainable forestry
- + Timber improves mental wellbeing



### 6 SCALLOPED CERAMIC FACADE TILES

- + Local buildings are white/cream
- + Soft white to mimic sand
- + Shape mimics coastline rock shapes
- + One of the most sustainable cladding
- + Acoustic insulation
- + Thermal insulation
- + Non combustible.



### 7 NATIVE GARDEN ROOFS

- + Collects water
- + Cools the building
- + Reduces urban heat island
- + Increases biodiversity
- + Improves human health

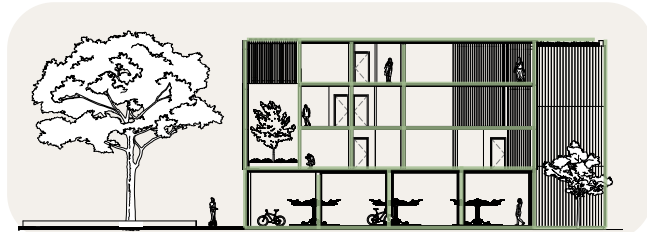


### 8 WESTERN RED CEDAR FRAMES

- + More thermal efficiency than aluminium
- + Low conductivity prevents solar heat gain
- + Sustainable forestry

# NET ZERO CONSIDERATIONS

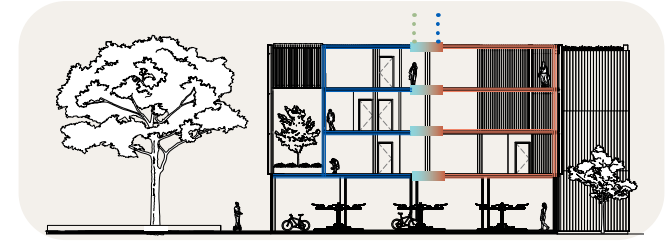
REDUCING ENERGY CONSUMPTION  
& CREATING NEW RECOURSES



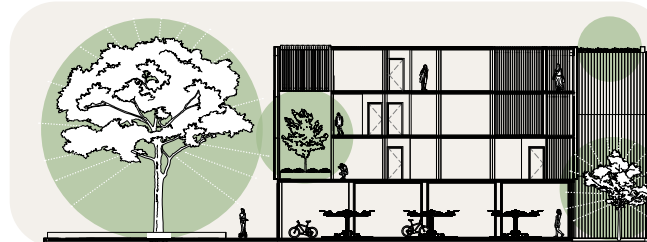
LOW CARBON AND CARBON NEGATIVE BUILDING MATERIALS



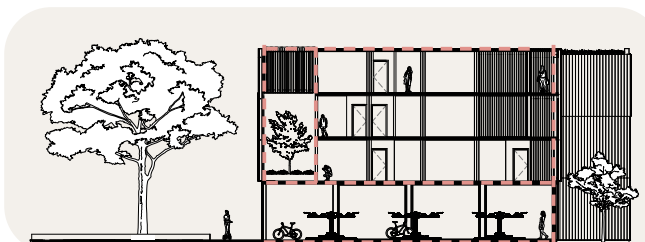
REDUCE GLARE & EXCESS HEAT GAIN WITH TIMBER SCREEN FACADE



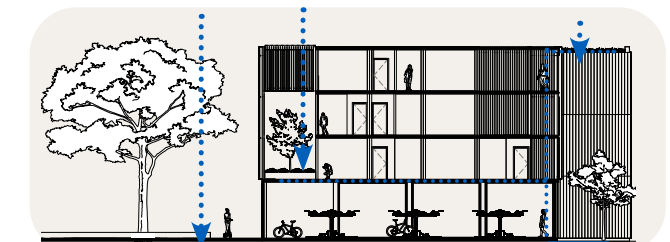
HEAT RECOVERY AIR SYSTEM



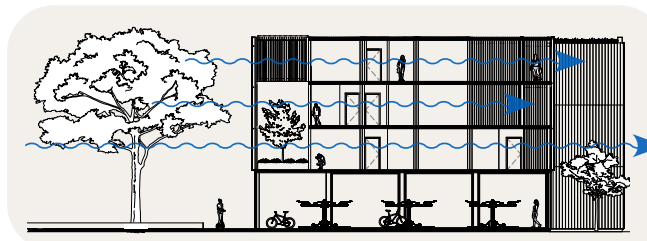
SAVING TREES TO SEQUESTER CARBON & PRODUCE OXYGEN



THERMAL COMFORT WITH HEMPCRETE WALLS & ROCKWOOL INSULATION



RAINWATER COLLECTION & PERMEABLE URBAN SURFACES



PASSIVE COOLING WITH CROSS VENTILATION & GARDENS



PASSIVE DAYLIGHT FOR THERMAL COMFORT, & SOLAR ENERGY



COMMUNAL SPACES AND APARTMENTS CONNECTED TO NATURE



# BUILDING COMPLIANCE

## SECTION A | A6 Building Classification

Peddle and Flipper Ground floor: Class 2  
Floor 1- 3 apartments: Class 6

## SECTION B | B1 Structure Classification

Class A - 6A

A Class 6 building is a shop or other building used for the sale of goods by retail or the supply of services direct to the public

## SECTION C | Fire Resistance

The building requires professional certification from a certified fire engineer to ensure it meets the safety needs. The building safeguards people from illness or injury due to a fire in a building with access to fire isolated stairs and lifts with sufficient exits. The Hempcrete walls avoid the spread of fire between buildings due to their non-combustible quality and BAL 40 rating.

## SECTION D | Access and Egress / Provision for Escape / Construction of Exits / Universal Access

The building provides people with safe, equitable and dignified access to the services and facilities within a building; and safeguards occupants from illness or injury while evacuating in an emergency.

- **D1P1 Access for people with a disability**

Access is provided to approach the building from the road boundary and approach the building from any accessible associated building. There is access to work and public spaces, accommodation and bathrooms; with easy identification of accessways.

- **D1P2 Safe movement to and within a building**

All walking surfaces have safe flat gradients, all stairs have handrails and slip-resistant surfaces, the stairs have suitable landings to avoid fatigue.

- **D1P3 Fall prevention barriers**

Barriers are provided where people could fall at a height of 1 m or more and are constructed to prevent falling through.

- **D2D3 Number of exits required**

The building has 2 exits from every level, and multiple exits on the ground floor.

- **D2D5 Exit travel distance**

The Class 2 building has entrance doorways to sole-occupancy units within 6 m from an exit or from a point from which travel in different directions to 2 exits is available; or 20 m from a single exit serving the storey at the level of egress to a road or open space.

## SECTION E | Fire-fighting equipment

The building is rated BAL 12. It is to be provided with fire-fighting equipment to safeguard against fire spread to allow occupants time to evacuate safely without being overcome by the effects of fire; and so that occupants may undertake initial attack on a fire; and so that the fire brigade have the necessary equipment to undertake search, rescue and fire-fighting operations.



## SECTION F | F3 Rooms heights / F4 light and ventilation / F5 Sound transmission

The building safeguard occupants from injury, illness or loss of amenity due as it allows for constant connection with natural light, with artificial lighting when necessary; all living spaces have access to fresh air through windows and timber screens in walkways to safeguard occupants from illness or loss of amenity. All apartments have insulative materials to reduce sound transmission such as the hempcrete walls and uses of timber for acoustics.

- **F6P1 Natural lighting**

Sufficient openings must be provided and distributed in a building, appropriate to the function or use of that part of the building so that natural light, when available, provides an average daylight factor of not less than 2%.

- **F6P3 Outdoor air supply**

The spaces used by occupants are provided with means of ventilation through operable windows to maintain adequate air quality. The building has and maintains native gardens to improve air quality.

- **F6D7 Natural ventilation**

All living spaces have openings, windows, doors to ventilate the rooms. The apartments all have access to open verandahs adjoining living rooms and a large communal open garden space.

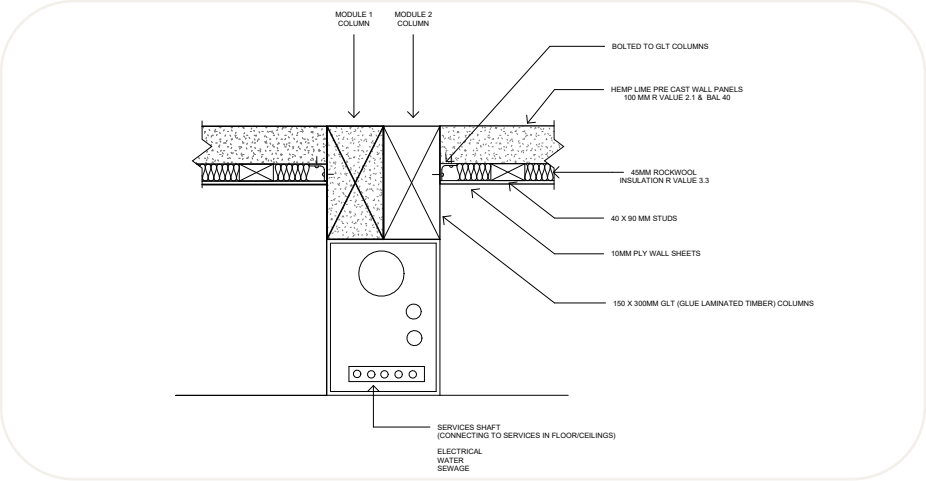
## SECTION J1 | Energy efficiency

The building reduces energy consumption and energy peak demand with passive daylighting, and reduces greenhouse gas emissions with thermal insulation with highly effective materials such as timber and hempcrete with insulation to prevent excess heat gain and loss, allowing for user comfort to improve occupant health and amenity.

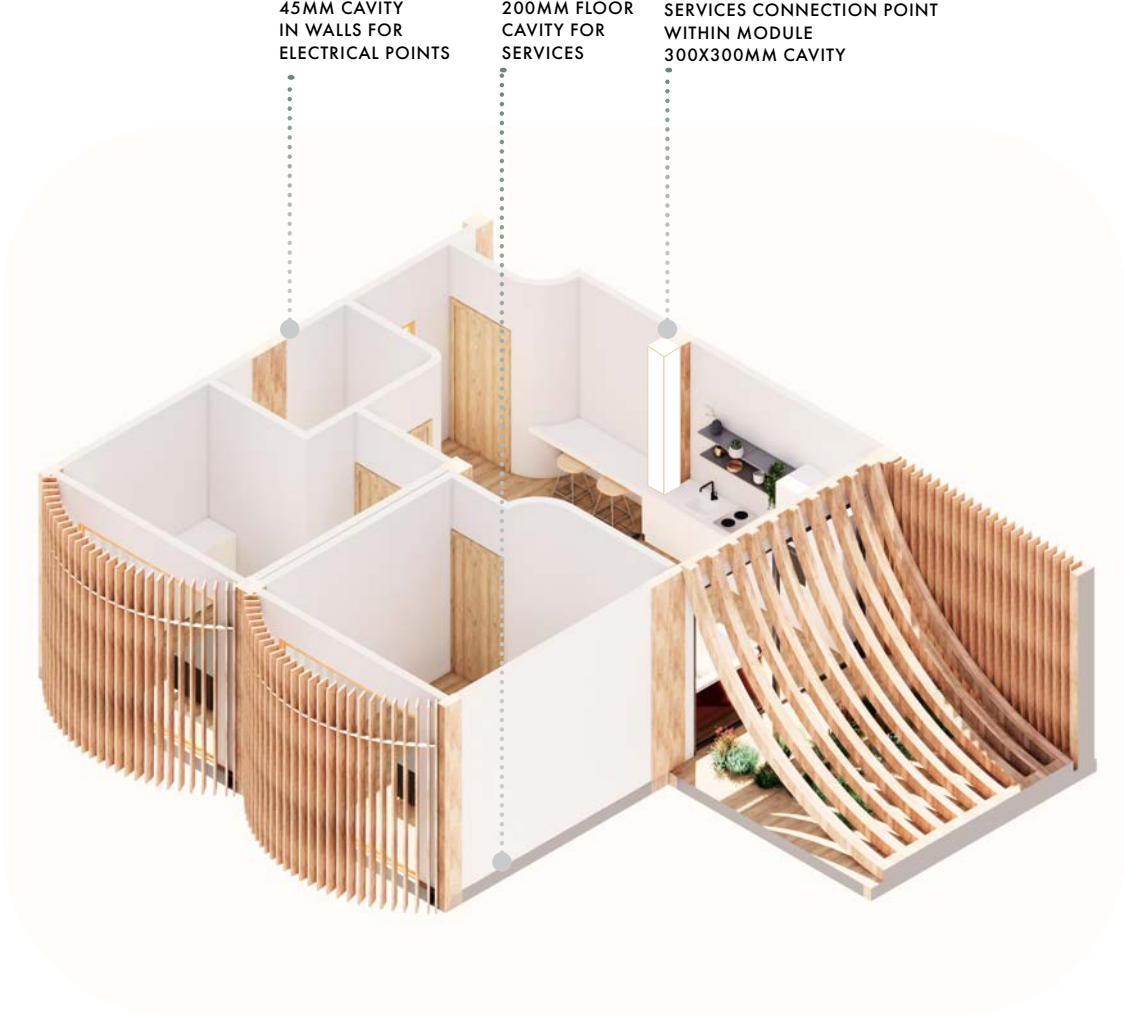
### FIRE ISOLATED STAIRS AND FIRE FIGHTING EQUIPMENT



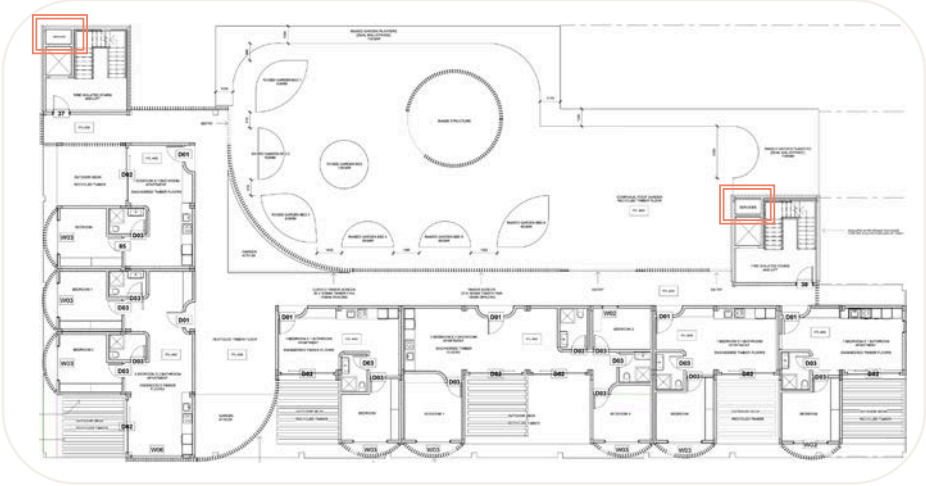
# SERVICES



APARTMENT SERVICES CONNECTION (PLAN DETAIL)



2 BEDROOM 1 BATHROOM MODULAR APARTMENT TYPE



BUILDING SERVICES SHAFTS (FIRST FLOOR PLAN)

# ENGINEERS REPORT

## DETAILED COSTING ESTIMATE

Summary			
Schedule No. 1 - WORK UNDER CONTRACT			
CLASS A4 - PROVISIONAL SUMS	\$	42,812.00	
CLASS A - GENERAL ITEMS	\$	509,734.72	\$ 552,546.72
CLASS B - GROUND INVESTIGATION	\$	12,000.00	
CLASS D - DEMOLITION AND SITE CLEARANCE	\$	3,285.00	
CLASS E - EARTHWORKS	\$	12,877.00	
CLASS F - INSITU CONCRETE	\$	21,725.00	
CLASS G - CONCRETE ANCILLERIES	\$	5,027.40	
CLASS M - STRUCTURAL METALWORK	\$	801,131.91	
CLASS N - MISCELLANEOUS METALWORK	\$	154,540.00	
CLASS O - TIMBER	\$	2,098.75	
CLASS W - WATERPROOFING	\$	24,896.00	
CLASS X - MISCELLANEOUS WORK	\$	49,647.56	
CLASS Z - SIMPLE BUILDING WORKS	\$	971,041.18	
ADDITIONAL COST	\$	651,200.00	
GST EXCLUSIVE AMOUNT	\$		3,262,016.51
Adjustment from Rawlinson 2022 to 2023 @ 10%	\$		3,588,218.16
ESTIMATED GST PAYABLE (10%)	\$		3,947,039.98
TOTAL OF COST	\$		3,947,039.98

\*All Bill of Quantities prepared in accordance with Civil Engineering Standard Method of Measurement 4. (Institute of Civil Engineers)

## S CURVE

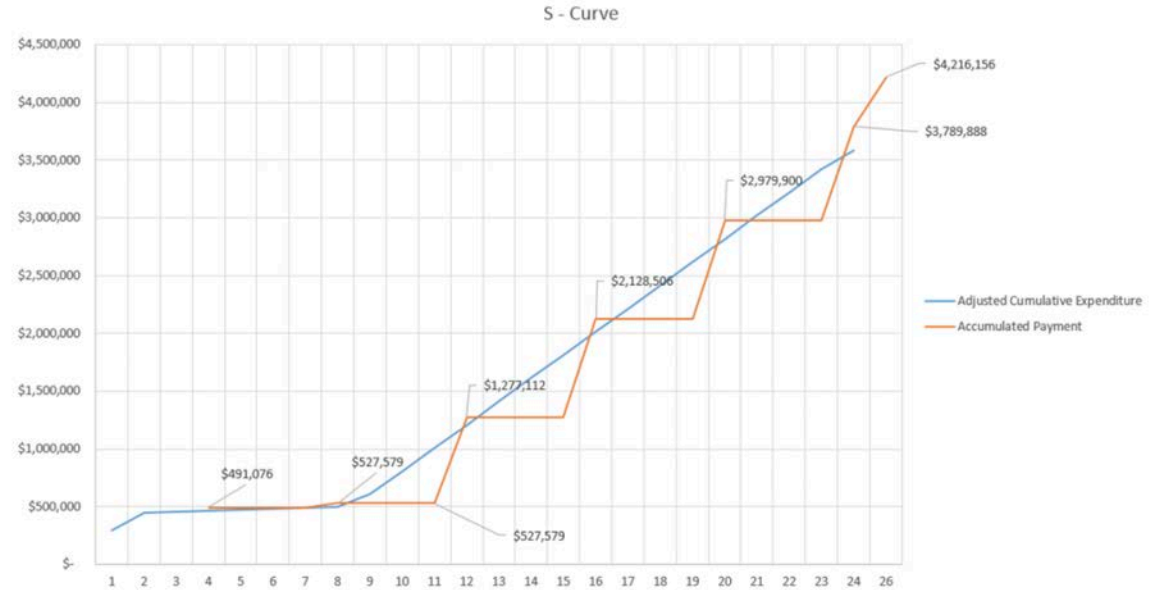


Figure 8: S - Curve

Tasks	Activity	Duration (wks)	Total cost	Weekly cost	Weight
A - barge	General items & Site Establishment	1.5	\$ 402,547	\$ 268,364	12.34%
B-G	Footing Construction	7	\$ 54,914	\$ 7,845	1.68%
M - Z + Barge +	Installation of Services	1.8	\$ 329,359	\$ 182,977	10.10%
Additional cost -	Ground Floor Installation	5.5	\$ 1,006,376	\$ 182,977	30.85%
\$5,000	Module Installation	8	\$ 1,463,820	\$ 182,977	44.87%
\$5000	Demobilisation and Handover	1	\$ 5,000	\$ 5,000	0.15%
Project Cost			\$ 3,262,017		
Adjustment from 2022 to 2023 @ 10%			\$ 3,588,218.16	Weekly expenditure	
Markup & Contingency @17.5%			\$ 4,216,156.34	Cumulative expenditure	
GST 10%			\$ 421,615.63	Adjusted from 2022 to 2023 @ 10%	
Total Price			\$ 4,637,771.97	Adjusted Cumulative Expenditure	
Income assume				17.5%	
Cumulative income					
Retention				10%	
Net Payment					
Accumulated payment					

- \$3.95 million for the building, excluding contingency, markup, and overhead.

- A contingency factor of 2.5% and a markup of 15% was used by JIC consultants.

- The inclusion of these factors resulted in a final price of \$4.65 million (10% GST included).

- The detailed cost estimates for all tasks involved in the project were compiled into a payment prediction schedule representing potential payments for work planned.

# ENGINEERS REPORT

## SCHEDULE PROJECT TIME FRAME

Task	Days
Site possession	1
Removal of debris and vegetation	1
Site clearing and levelling	0.5
Installation of temporary facilities (sire office, ablutions, etc.)	5
Excavation for foundations and services	7
Installation of formwork and reinforcement	3
Pouring of concrete	2
Curing of concrete	23
Connection of ground floor columns to foundation	13.5
Connection of beams and bracing to columns - ground floor	6
Transportation of modules to site	8
Placement and stacking of modules using a crane (time inclusive of bolting)	32
Site clean up and waste disposal	1
Landscaping and final touches	2
Pedal and Flipper in operation. Handover to client for maintenance, inclusive of site inspections	1
<b>TOTAL</b>	<b>106 days</b>

## GANTT CHART

