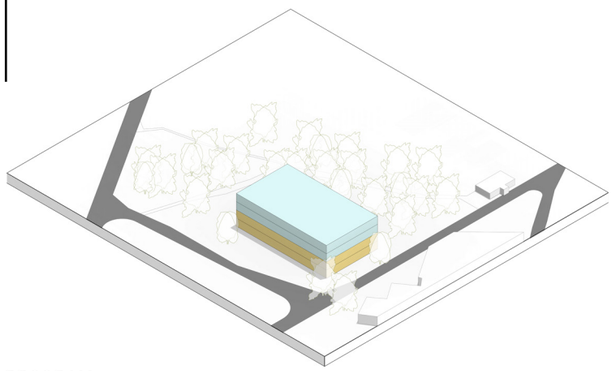
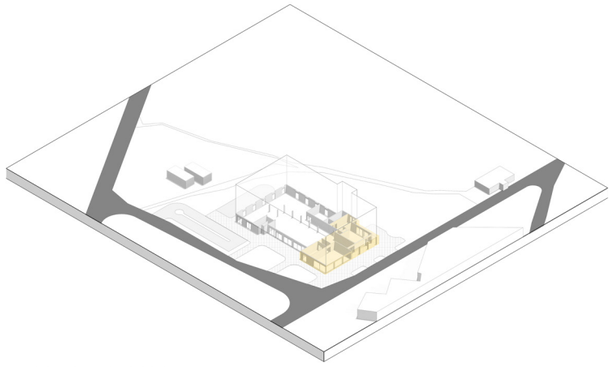
01

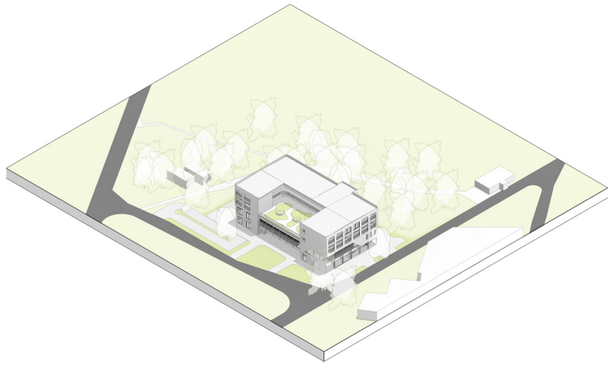
DESIGN STRATEGIES



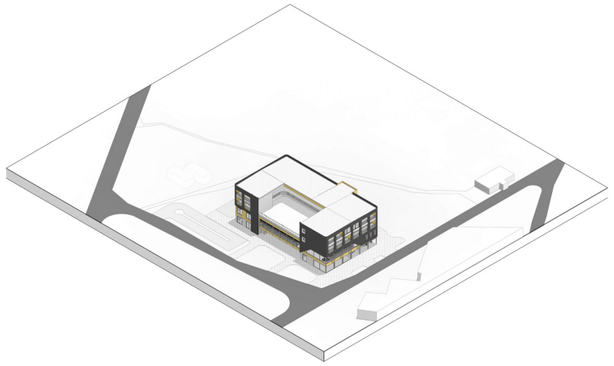
PROGRAM
The ground floor and first floor consist of Pedal & Flipper facilities along with café amenities and the seocnd and third floor will be residential. The site does not require any setbacks and the built form is designed with a focus on maintaining the natural landscape by limiting unnecessary felling on the site and ensuring a harmonious relationship with the neighbouring buildings.



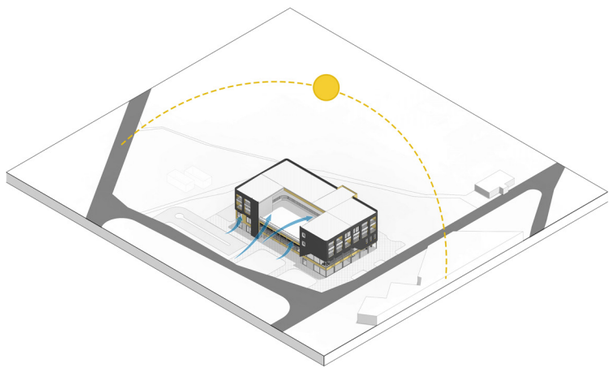
INTERACTIVE CORE
All the main entrances are situated towards the eastern side to activate a network of community spaces. The design aims to enhance the pedestrian experience and create a greater sense of visual security for both visitors and residential users. This is achieved through the incorporation of interactive uses of spaces such as café and outdoor dining areas..



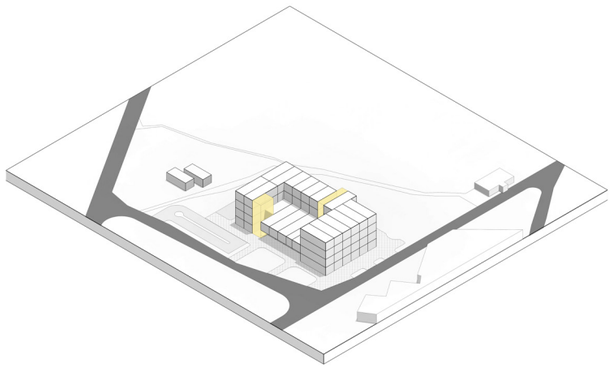
INTEGRATED GREENERY
Integrating greenery into the southern courtyard aid in maximizing natural light exposure and enhance well-being and comfortable living environments for the occupants. The design features a native garden courtyard and landscaping of the site. The integration of greenery supports biodiversity and fosters a close connection with the natifve flora and fauna and contributes to the ecological balance of Rottnest.



FACADE ADDITION
The utilisation of charred timber facades that are seamlessly wrapped around the building along with the timber and stone cladding harmoniously merges the visual articulation of the building design along with the use of materials that is a common theme in the island. The façade creates an appealing and modern landmark for visitors that effortlessly balances the native contrast and heritage sites.



ORIENTATION & VENTILATION
The apartments are oriented to maximize natural light into the bedrooms, enhancing both the well-being of occupants and the energy efficiency of the building. Furthermore, the incorporation of operable windows throughout the structure facilitates cross ventilation, promoting a refreshing airflow and maintaining a comfortable living environment.



MODULE CONFIGURATION
Each module is a self-contained unit that serves a particular function, such as a residential unit, offices and storages. The modules are vertically stacked on top of each other and arranged in U-shaped courtyard configuration. This configuration creates a courtyard or open area within the building, which can be utilized for various purposes, such as communal or gathering spaces.

PLANNING & BUILDING COMPLIANCE

DEVELOPMENT GUIDELINES
The site does not require any setbacks and the design provides adequate separation distance of public & private spaces. Ensure that overshadowing of adjacent buildings and public areas is minimized.

ROOF
According to the guidelines for the roof, flat roofs are deemed acceptable. The proposed design incorporates flat roofs and parapet walls that are intentionally harmonized with the surrounding buildings.

BALCONIES & PRIVATE OPEN SPACES
The design meets the requirements of the guidelines, which state that balconies and terraces are to have a minimum area of 10 square metres and be accessed from an internal living area.

BICYCLE STORAGE
The proposed bicycle storage solution for the project will utilize the E3DT-GP Double Tier Bike Rack for 2 Bikes system, which is compliant with AS 2890.3.

AESTHETICS
The design responds to the RIA visual board. RIA requested that the design of the building features openness , transparency, spacious and welcoming.

BUILDING CHARACTERISTICS
The building structures and materials responds to the Island's unique character and generally comprise of limestone and natural timber.

LANDSCAPING
The design propose landscaping in-response to Rottenest Island ecosystem. The majority of the vegetation species used in the landscaped area are native to Rottnest island.

RENEWABLE ENERGY
The design demonstrate an approach to energy conservation with the objective of minimising energy demands by applying renewable energy sources within a development that will contribute to reducing Rottnest Island's carbon footprint.

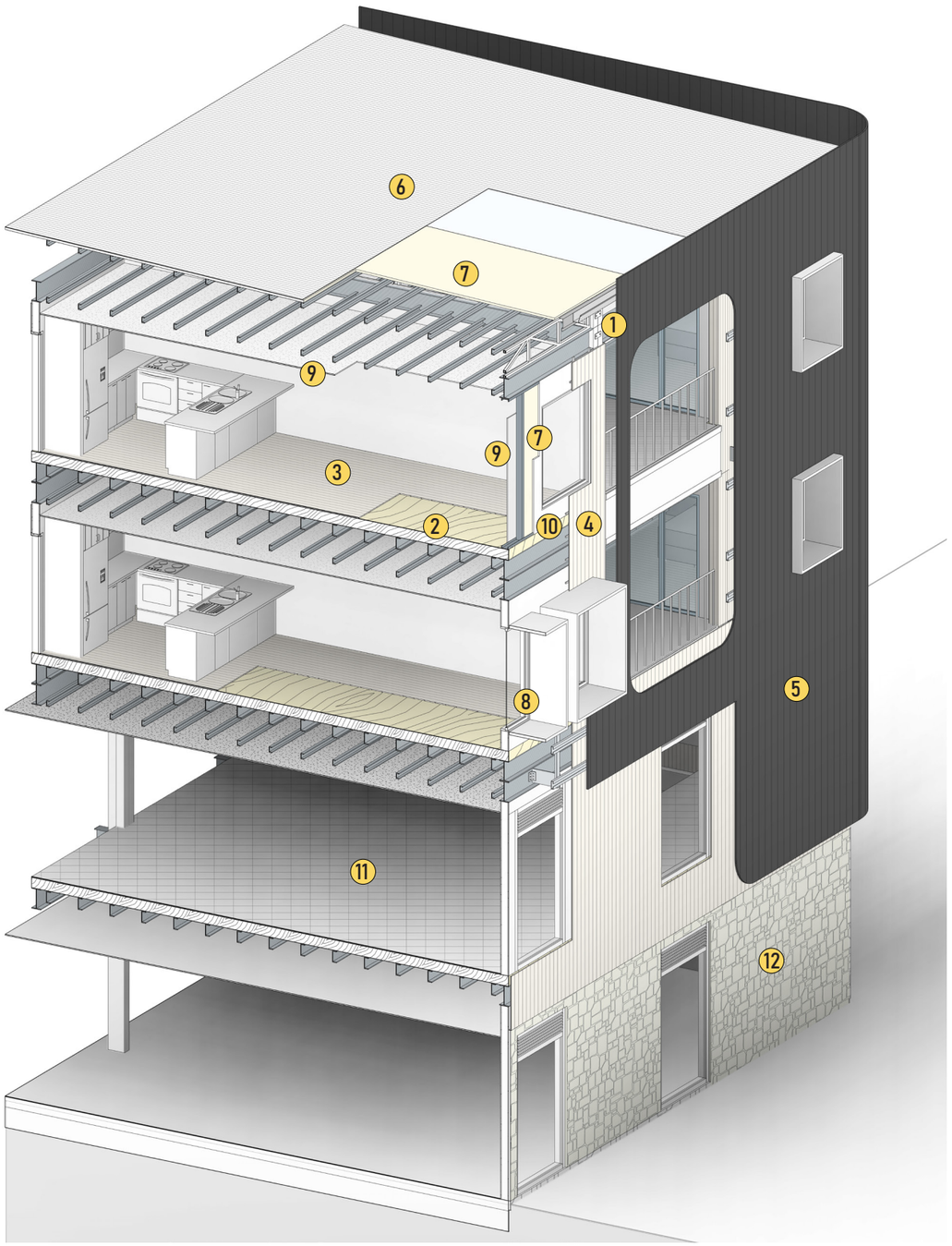
NON COMBUSTIBLE BUILDING ELEMENTS (NCC C1P1)
Performance requirement recommended for a class 2 building concerns the spread of fire. The spread of fire has been addressed by the implementation of Non-combustible building elements as per the specifications.

FIRE-ISOLATED EXIT (D2D3)
Two fire-isolated stairway are provided for safe evacuation of the bulding in accordance to BCA, Class 2 and Class 6 buildings.

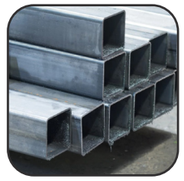
EXIT TRAVEL DISTANCE (D2D5)
Two fire isolated exits are provided for the residential allowing safe travel distance of under 6 meters away from an exit door or a point where there are two available paths leading to separate exits.

PROVISION OF NATURAL LIGHT (F6D2)
The building complies with Section F6D2 of the NCC which outlies all habitable rooms must be provided with natural lighting.

02 DESIGN INNOVATIONS: MATERIALITY



1 **LOAD BEARING STRUCTURES**
150X150 SHS RECYCLED STEEL COLUMNS
100% RECYCLABLE
100+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL



2 **FLOORING SYSTEM**
XLAM CLT FLOORING
100% RECYCLABLE
50+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

3 **INTERNAL FLOORING**
WA BLACKBUTT TIMBER FLOORING
100% RECYCLABLE
40+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

4 **EXTERNAL WALL CLADDING**
RECYCLED TIMBER CLADDING
100% RECYCLABLE
50+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

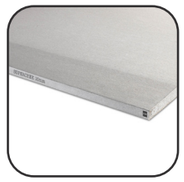
5 **FACADE**
MODINEX CHARRED TIMBER CLADDING
100% RECYCLABLE
50+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

6 **ROOFING**
COLORBOND ROOF SHEETING
100% RECYCLABLE
70+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

7 **INSULATION TYPE (WALLS/ROOF)**
ROCKWOOL INSULATION
100% RECYCLABLE
100+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

8 **AERGOEL INSULATED DOUBLE-GLAZED WINDOWS**
HIGH THERMAL PERFORMANCE
100% RECYCLABLE
50 YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

9 **INERNAL WALL/ CEILING FINISH**
SUPERCHECK GYPROCK
PLASTERBOARD
100% RECYCLABLE
50+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL



10 **EXTERNAL WALL FINISH**
HARDIE FIBRE CEMENT
PLASTERBOARD
100% RECYCLABLE
50+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

11 **INTERNAL FLOORING**
TECHNICAL PORCELAIN TILES
100% RECYCLABLE
60+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

12 **EXTERNAL WALL CLADDING**
JINDERA DRY STONE CLADDING
100% RECYCLABLE
75+ YEARS LIFESPAN
ECO-FRIENDLY MATERIAL

03 NETZERO ENERGY DESIGN| TECHNOLOGICAL INNOVATIONS

BUILDING INTEGRATED PHOTOVOLTAICS ROOF

Building-integrated photovoltaics are integrated seamlessly into the roof surface, maximizing the use of available space without the need for additional mounting structures or dedicated areas for solar panels. BIPV systems will be coupled with battery storage located outside the building to store excess electricity.

EFFICIENT BUILDING ENVELOPE

Insulation will be applied to the walls, ceilings, floors, and roof throughout the entire building. This will essentially result in improved energy efficiency, reduced reliance on mechanical systems, enhanced thermal comfort, and lower energy costs.

RAINWATER HARVEST & STORAGE SYSTEM

A symphony rainwater collection system is implemented to collect and discharge the storm water runoff. All water will be collected through downpipes and sent into a stormwater collection system. Additionally, Implementing a rainwater harvesting system will be a cost-effective technique of conserving water for the apartments while also reducing storm water discharge.

SUSTAINABLE BUILDING MATERIALS

CLT flooring systems can significantly improve a building's energy efficiency and environmental performance, which both contribute significantly to the path to zero-net-energy usage. Being constructed entirely from renewable resources, CLT serves as a carbon-neutral solution, making a positive impact on sustainable construction practices.

CROSS VENTILATION & AIR QUALITY

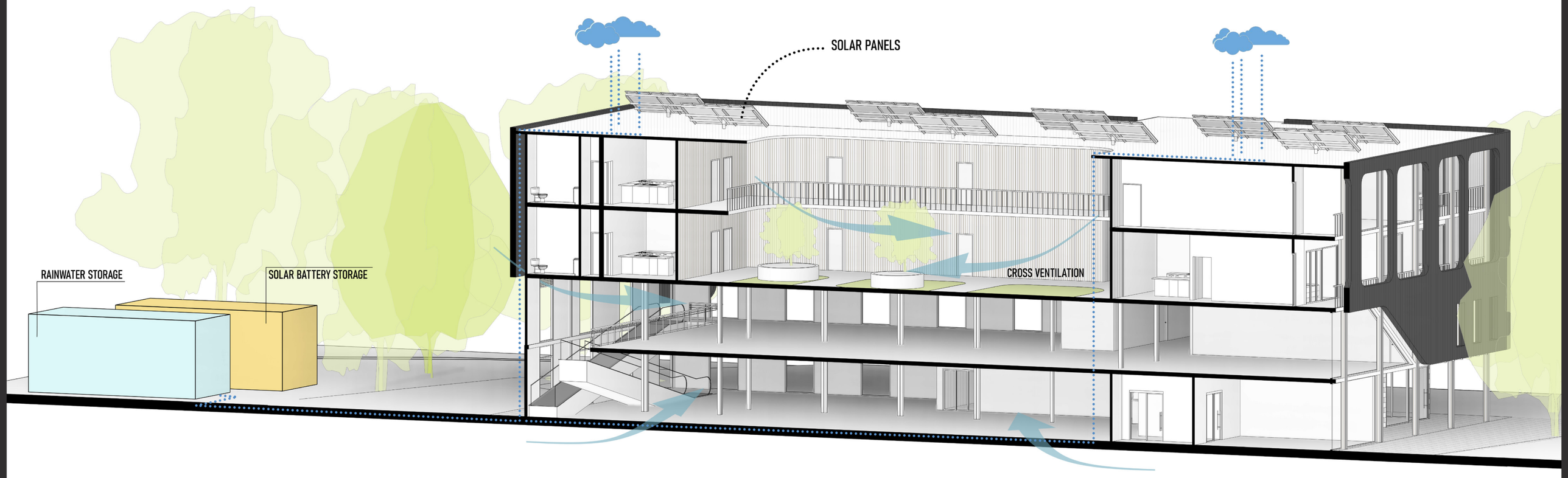
Operable windows are utilized to achieve effective cross ventilation throughout the building, promoting a continuous flow of fresh air and maintaining a comfortable indoor environment. The design of th building prioritizes access to natural ventilation year-round, ensuring a continuous flow of fresh air for a comfortable and healthy living environment.

DOUBLE GLAZED WINDOW SYSTEM

The incorporation of aerogel insulation in a double-glazed window system enhances thermal comfort by minimizing heat transfer, providing superior insulation, and creating a more comfortable indoor environment.

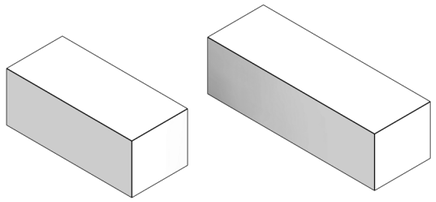
LOW ENERGY HVAC SYSTEMS

Variable Refrigerant Flow (VRF) Systems are utilized to minimize energy consumption and minimize environmental impact, while maintaining optimal indoor comfort. VRF systems use advanced heat pump technology to provide efficient heating and cooling to different zones or rooms. They can adjust the amount of refrigerant flow based on individual zone requirements, optimizing energy usage.



04 DESIGN FOR ASSEMBLY & DISASSEMBLY

RESIDENTIAL MODULE SIZES



TYPE 1: 4X9m
3.5m height

TYPE 2: 4X12m
3.5m height

UNIT TYPES

TYPE 1

ONE BED & ONE BATH
75m2

TYPE 2

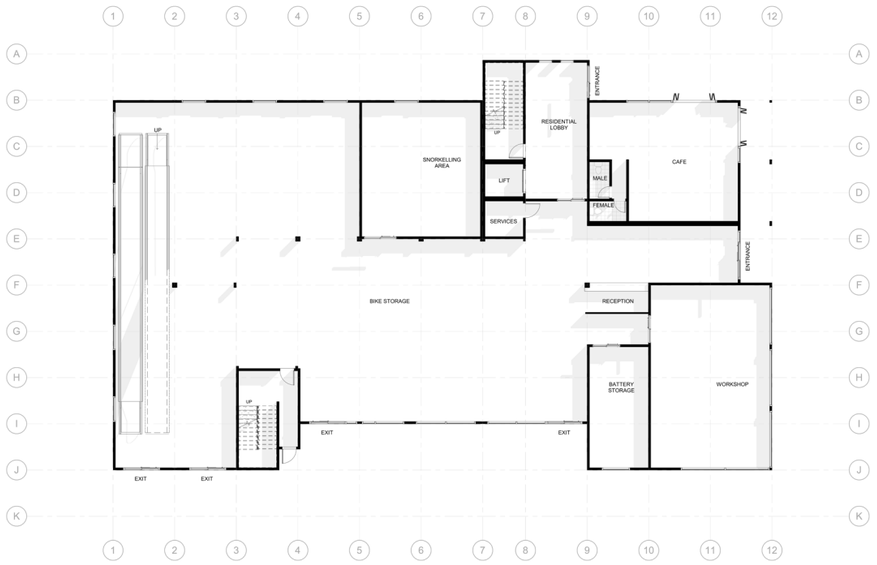
TWO BEDS & ONE BATH
100m2

TYPE 3

TWO BEDS & TWO BATHS
100m2

TYPE 4

THREE BEDS & TWO BATHS
150m2



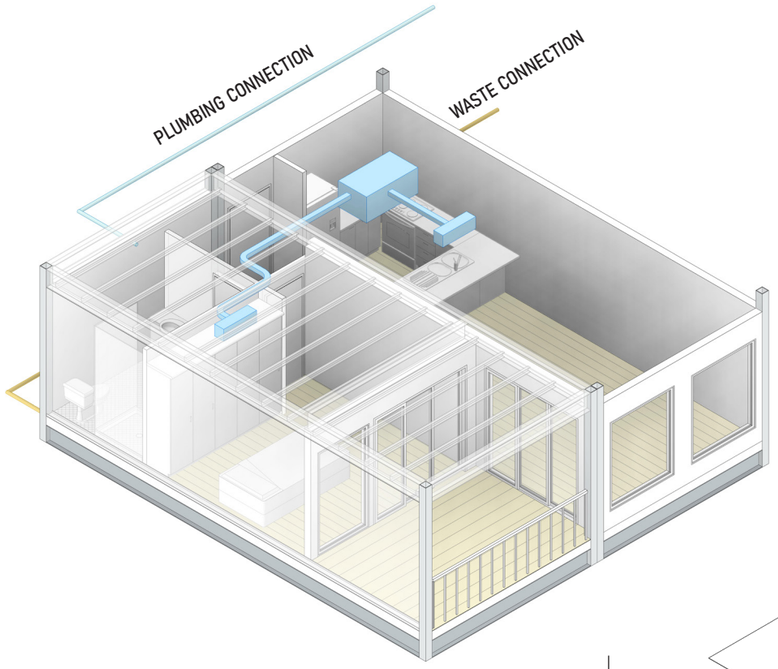
GROUND FLOOR

LEVEL 1

LEVEL 2

LEVEL 3

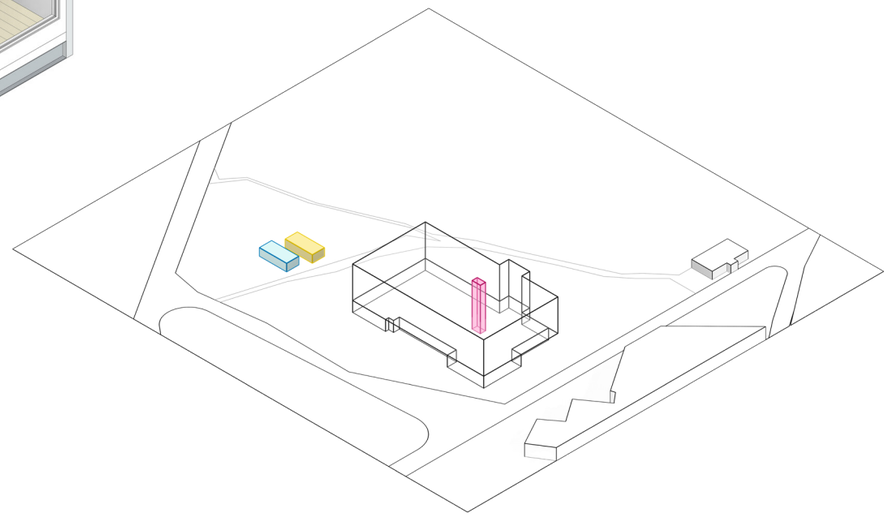
05 SERVICES



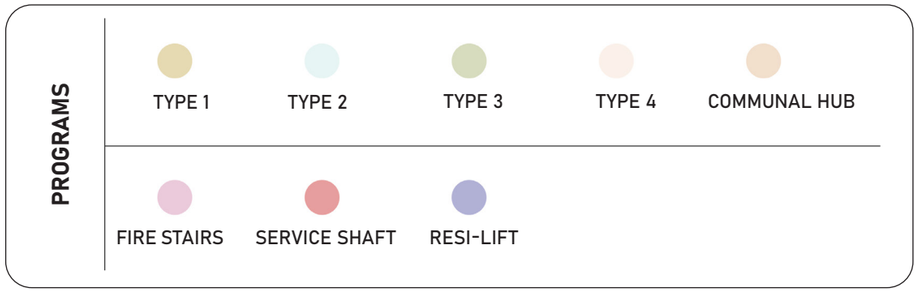
A minimum 450mm service space is designated for the service fit-out. This includes pre-installed electrical, mechanical, water, and draining pipes within the modules. To seamlessly integrate these modules with the building's service infrastructure, openings or penetrations are incorporated into the ceilings of each module.

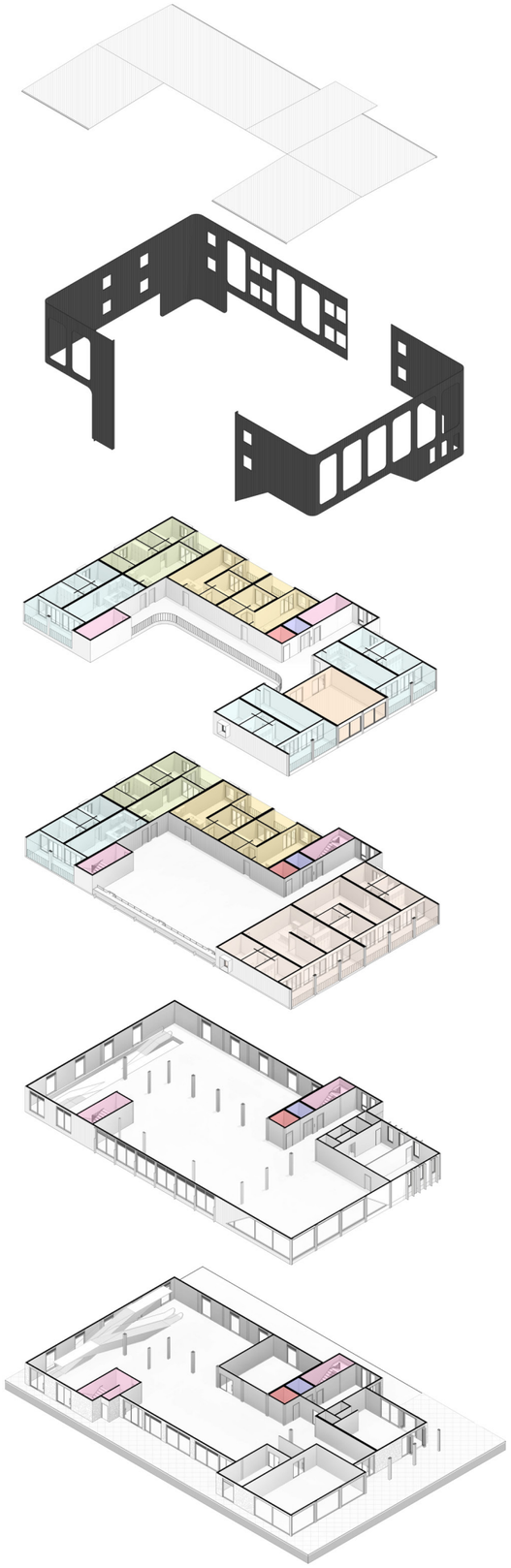
Once the modular units are transported to the construction site and securely installed, the designated service space within the ceiling is then fitted with the service ducts. The service components, such as electrical cables, water pipes, drainage, are then routed through the service shafts, connecting the service space in the ceiling.

Electrical cables and wiring, as well as water pipes, are divided through each unit and travel horizontally from the floor and then converge at the service shaft which are then vertically routed downwards to the substations.



MODULES SUBSTATIONS
The building features two distinct modular substations that are positioned outside of the building, allowing for any potential alterations that may be required in the future. The substations are comprised of pump rooms and water storage tanks, while the electrical substation houses battery storage for solar electricity.



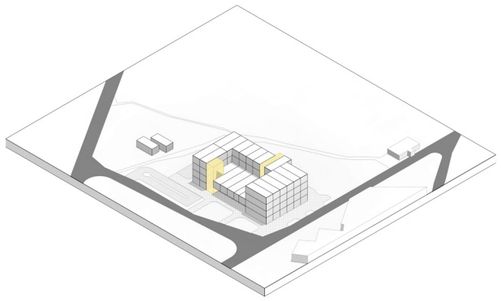


06 RECONFIGURATION | DESIGN FOR DISSASSEMBLY

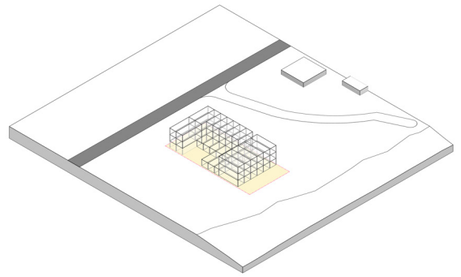
RECONFIGURATIONS FOR SECOND SITE

The proposed housing modules designed for Pedal and Flipper can be disassembled, reconfigured, and transported to the second site efficiently allowing for greater flexibility and adaptability for future needs and allowing for a more sustainable approach.

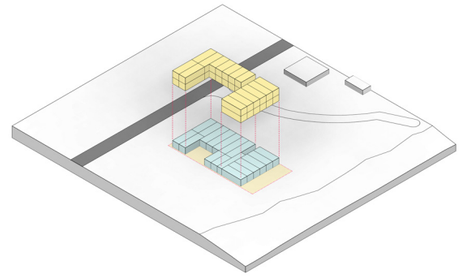
The proposed site will necessitate the addition of new functionalities, such as cafés, restaurants, communal courtyard, terraces and outdoor seating areas. Additional modules of 4x9m, 4x12m and 4x15m will be developed to complement the apartment modules.



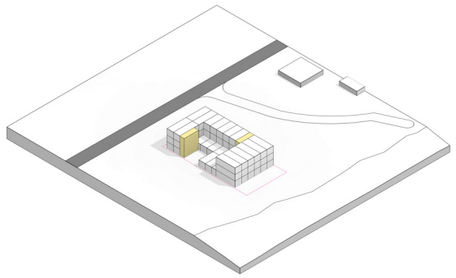
DISASSAMBLY OF RESIDENTIAL MODULES
Disconnect existing roof and residential modules from the existing site including services such as plumbing and electrical, etc (frames will be unbolted and removed via cranes and transported to new site)



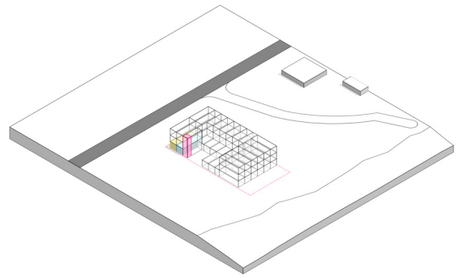
BASE FRAMEWORK
The new site will have a total area of 1000m². The modules frame will utilise the same grid system as the pedal & flipper site. The plug-in devices, which will be fitted to the upper structural columns, allows for easy and secure connections between the different modular components.



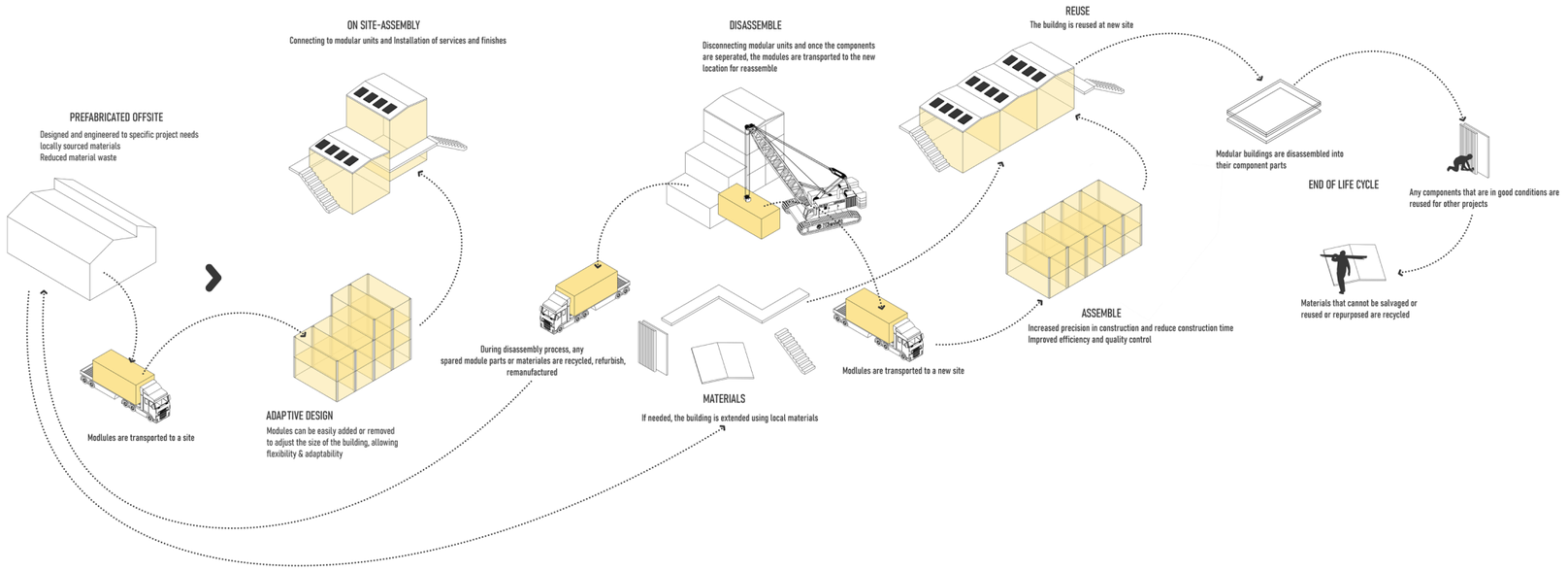
MODULES ADDITION
Additional modules on the ground level will be fabricated off-site and customized to seamlessly integrate with the existing residential modules. The overall module framework is designed to provide flexibiity and versatility to accomodate any future site reconfigurations.



FIRE STAIRS
Once the modular units are transported to the construction site and installed, the on-site installation of the fire-isolated stairs takes place. Pre-fabricated fire stairs are securely connected and assembled ensuring structural integrity and compliance with safety standards.



SERVICES
The ground floor is prepared with suitable foundations to support the substation modules located on the west side. Shafts are constructed to serve as vertical passages for service connections, where all the services will be reconnected.

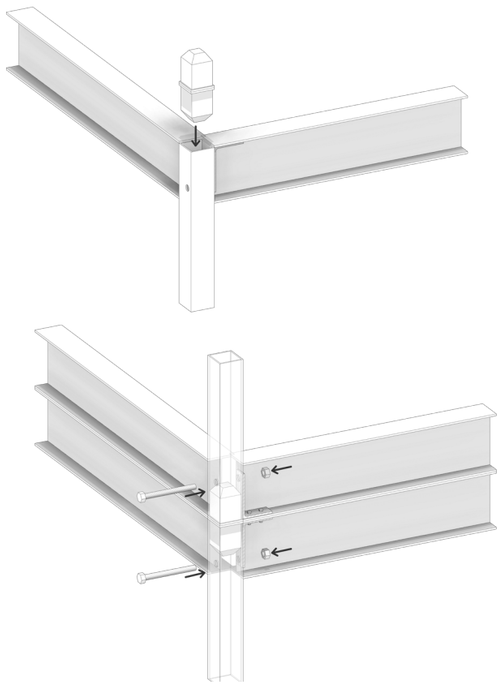


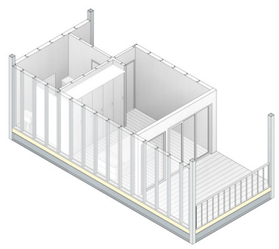
07 STRUCTURAL ANALYSIS

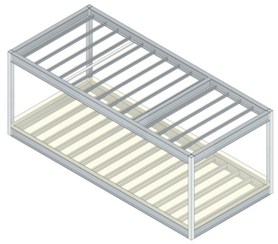
The overall structure of the modular units are made of steel structures. Steel is selected as the material of choice due to its high sustainability and durability, providing modular structures with an extended lifespan. It offers an exceptional strength-to-weight ratio, enabling them to withstand a wide range of environmental conditions such as high winds, earthquakes, and heavy loads.

MODULE CONNECTION

The modules consist of 4x9m & 4x12m units that is prefabricated off-site. Each module unit has been designed to enable sliding of plug-in device within the structural columns, ensuring a secure fit. To further enhance stability, structural bolts and welded angle seats are used to secure the columns of both the module below and adjacent modules. This comprehensive approach ensures a robust and reliable connection between the modules, contributing to the overall structural integrity of the modular construction. The Plug-in intermodule connections are designed to offer unparalleled flexibility and effortless fitting during the assembly and disassembly of modules. The plug-in nature of these connections allows for swift and hassle-free integration, facilitating the quick replacement or addition of modules if needed. This design feature enhances the adaptability and scalability of systems, enabling easy customization and upgrades without significant disruption or downtime.







ROOF

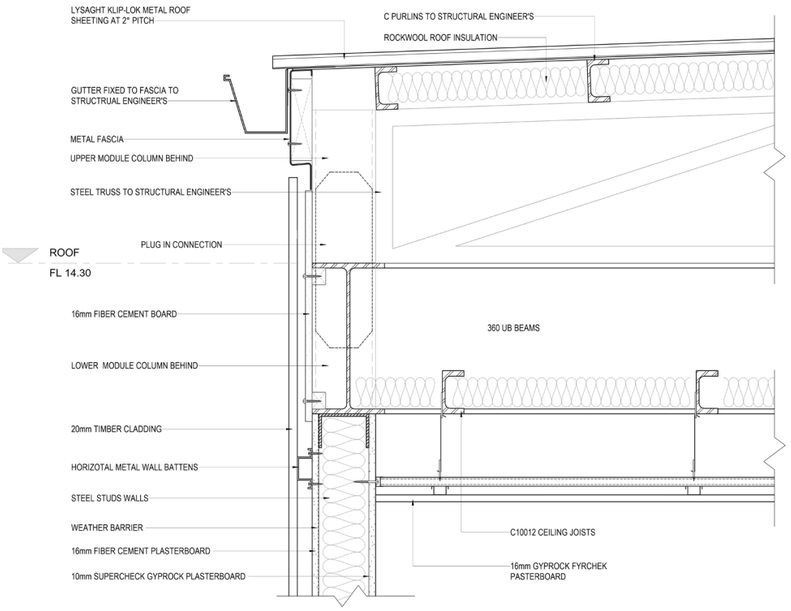
To expedite construction times and also maintain ease of fabrication and construction, it was decided that framing members of the roof are to be the same as that of the modules. This would ensure uniformity with connections and how the structure is to be assembled. The overall profile of the roof is a flat deck roof, that maintains a slope of 2° from the highest point to the lowest point. The corrugation of the roof run along the structures shortest span.

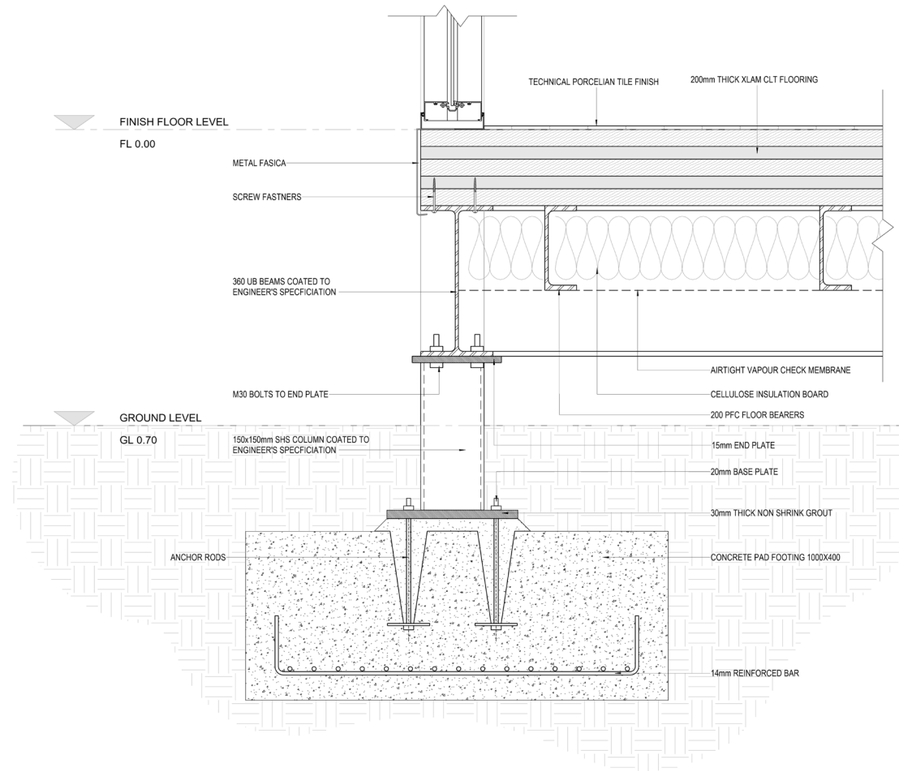
FLOORING

Cross laminated timber is the nominated choice of material for the flooring of the residential modules. The floor system to be used is XLAM's CL5/200 flooring system. This method of construction is similar to that of concrete, in that it does not require joists, unlike other methods of timber flooring, where joists would be required at spacings of no more than 600mm.

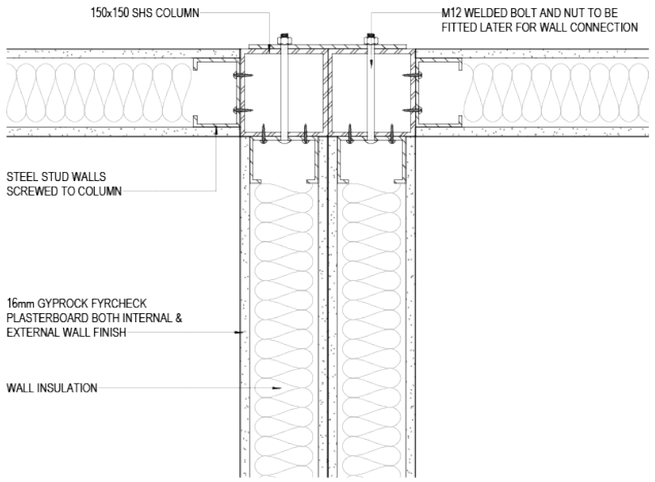
FOOTING

Rectangle pad footings are chosen to provide essential support for modular units by transferring the loads from the structure to the foundation.The base plate is situated at the bottom of the structure where the columns on the ground floor meet the pedestal of the pad footing. The 150SHS steel column is to be connected to the pad footing via a 20mm base plate that is to be SP welded to the end of the column. The baseplate will be fastened to the footing via 8 20mmx100mm sleeve anchors. An anchoring epoxy will also be used to facilitate the anchoring of the bolts.

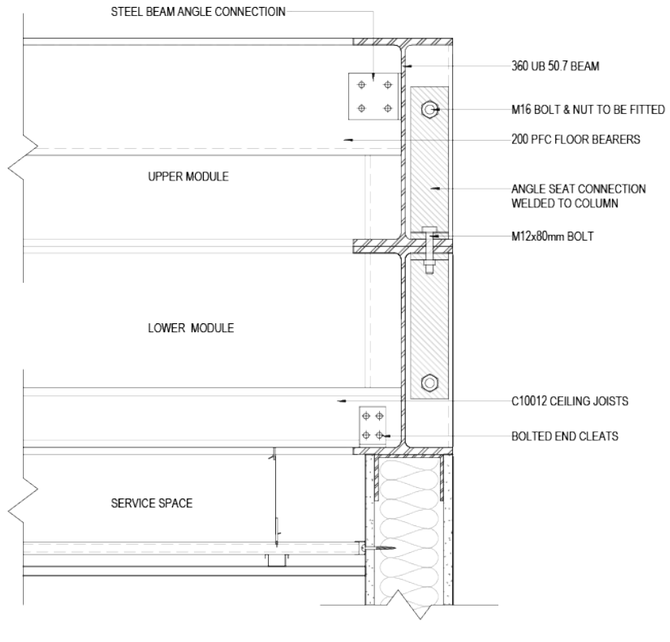




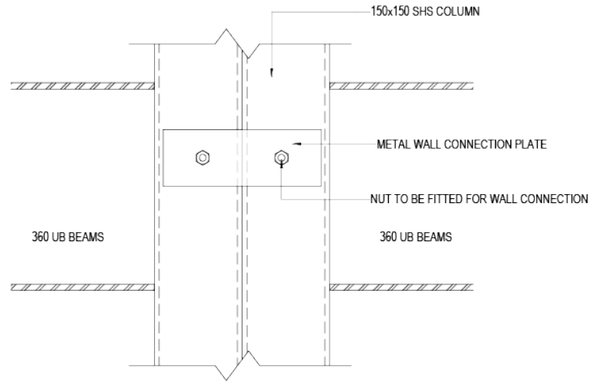
08 STRUCTURAL BREAKDOWN| DETAILED DRAWINGS



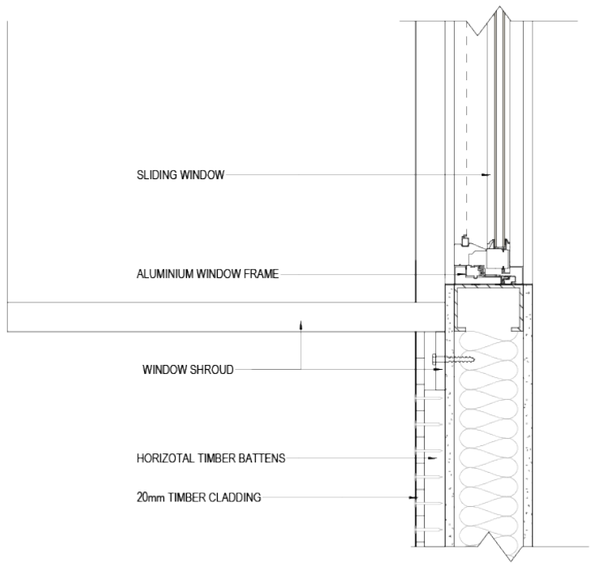
1 A13 **PLAN DETAIL 1**
SCALE: 1 : 5



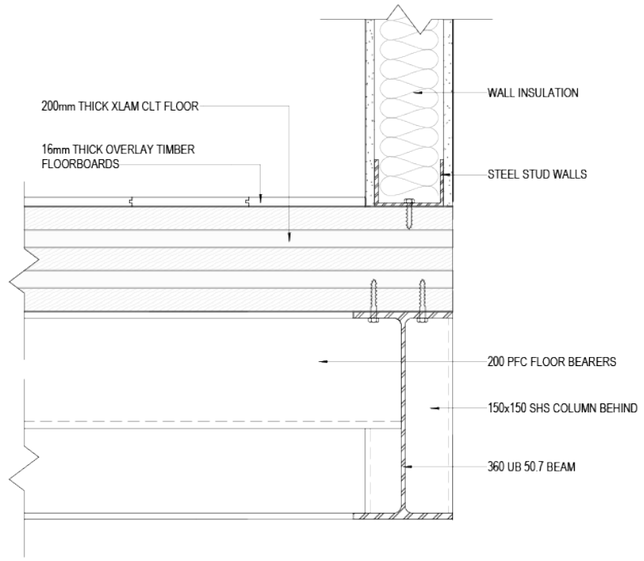
3 A13 **SECTION DETAIL 1**
SCALE: 1 : 5



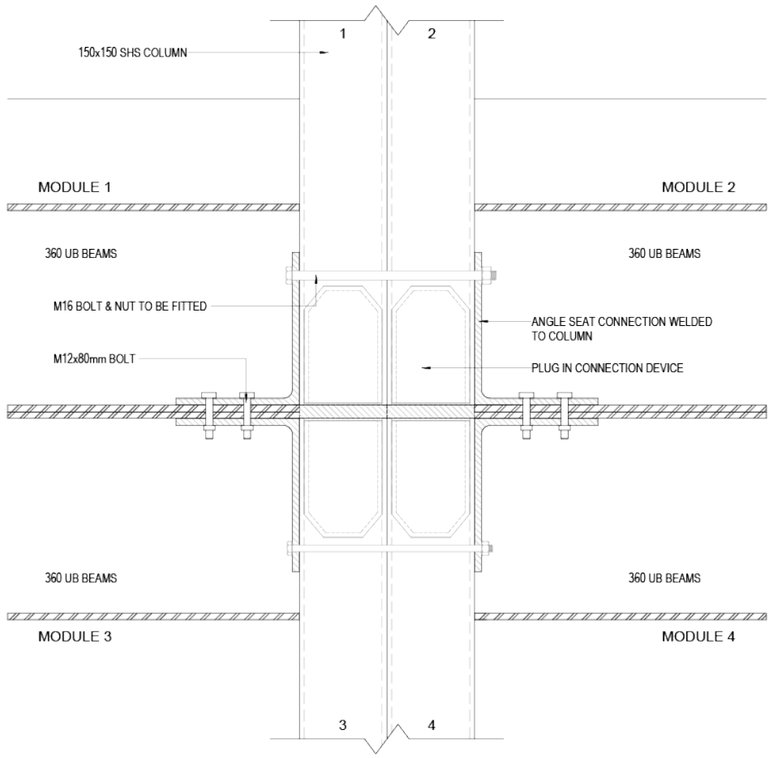
5 A13 **MODULE WALL CONNECTION (ELEVATION VIEW)**
SCALE: 1 : 5



2 A13 **PLAN DETAIL 2**
SCALE: 1 : 5



4 A13 **SECTION DETAIL 2**
SCALE: 1 : 5



6 A13 **MODULES CONNECTION (ELEVATION VIEW)**
SCALE: 1 : 5

ENGINEERS REPORT

Member Summary	
Section	**Member size**
Columns (bottom two levels) *3.9m Height*	150x150x8 SHS grade C450
Columns (top two levels) *3.5m Height*	150x150x8 SHS grade C450
Beams	360UB50.7
Ceiling joists	C10012
Floor bearers	200 PFC Grade 300
Balcony supports	200 PFC Grade 300
Bracings	75x5EA
Flooring	CL5/200

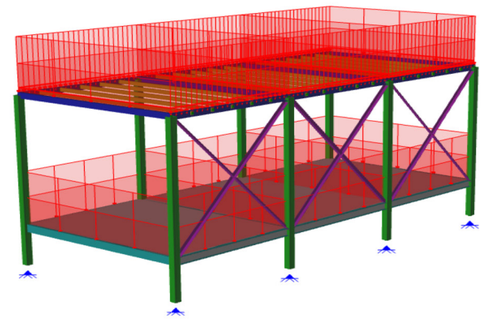


Figure 1. Critical load combination on module (1.2G + 1.5Q)

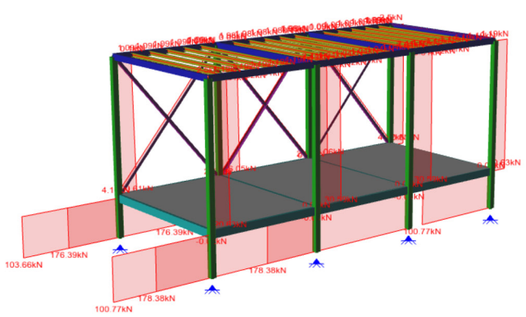


Figure 2. Axial force diagram on module (1.2G + 1.5Q)

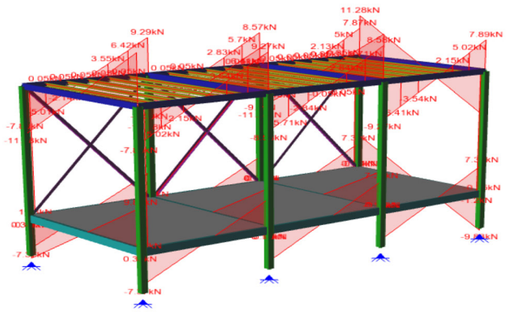


Figure 3. Shear force diagram on module (1.2G + 1.5Q)

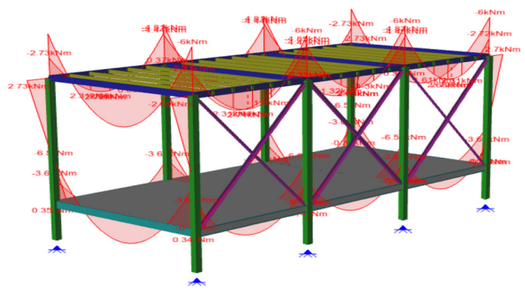
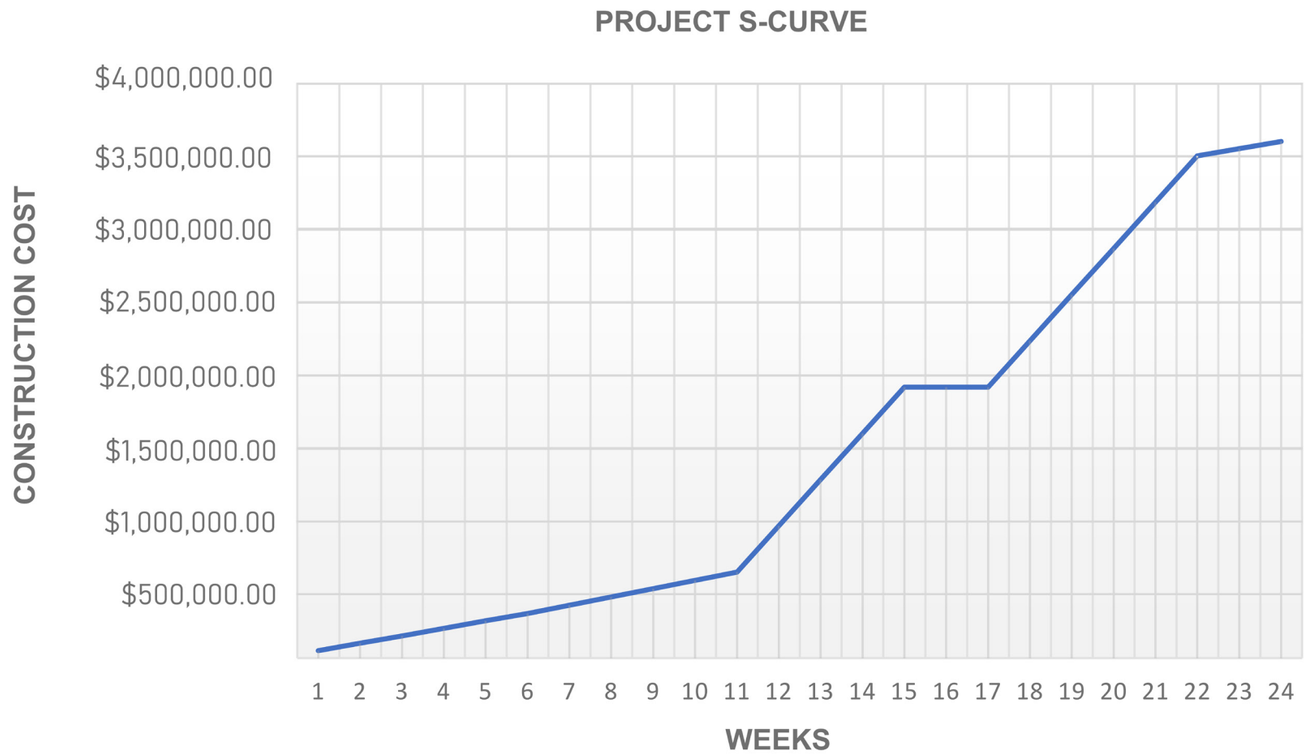


Figure 4. Moment diagram on module (1.2G + 1.5Q)

Based on SpaceGass analysis, 1.2G + 1.5Q is the critical load combination case for the modules.

Superstructure	
Columns	
Max axial force N*	450.8 KN
Max shear force V*	33.08KN
Max bending moment M*	64.1KNm
Allowed deflection=11.67mm	Actual=9.78mm
Beams and bearers	
Max axial force N*	60.66 KN
Max shear force V*	54.22 KN
Max bending moment M*	111.47 KNm
Allowed deflection=11.11mm	Actual=1.49mm
Ceiling Joists	
Max bending moment M*	0.54KNm
Max shear force V*	0.54KN
Allowed deflection=17mm	Actual= 12.75mm
Module	
Columns	
Max axial force N*	178.4 KN
Max shear force V*	1.2 KN
Max bending moment M*	2.73 KNm
Allowed deflection=11.67mm	Actual=0.96mm
Ceiling Beams & bearers	
Max axial force N*	2.34 KN
Max shear force V*	10.53KN
Max bending moment M*	5.6 KNm
Allowed deflection=11mm	Actual=1.1mm
Floor Beams & bearers	
Max axial force N*	0 KN
Max shear force V*	9.83 KN
Max bending moment M*	6.54 KNm
Allowed deflection=11mm	Actual=0.79mm



CLASSIFICATION	DESCRIPTION	COST ($)
Class A	General Items	$ 237,060.00
Class D	Site Clearance & Demolition	$ 7,219.00
Class E	Earthworks	$ 1,115.11
Class F	In-Situ Concrete	$ 13,043.62
Class M	Metalworks (Structural)	$1,778,012.58
Class N	Metalworks (Miscellaneous)	$17,100.00
Class O	Timber	$297,721.00
Class Z	Simple Building works	$1,027,159.64
Construction Cost		$ 3,378,430.96
Contingency Allowance		$ 3,378,430.96
Profit Allowance and Overhead		$422,303.87
GST		$417,236.22
Total construction Cost		$4,589,598.46