CIC BIM Competition 2022 –
URBAN GROUND-BRICKING DWELLING FRAME

01

Location Plan

Overall Bird Eye View:

An axonometric photomontage of the design with the aerial site photo. The buildings blocks are positioned in relation to the sun and shadow analysis to maximize natural lighting exposure for the Dwelling units. At the same time various pocket spaces are formed for providing different leisure facilities and greenery spaces in which also the Emergency Vehicular Access (EVA) blended in with the whole landscaping.

About the New Transitional Modular Housing:

Design Concept:

Modular to the max.!! The design starts from modular thinking and making it the backbone for the whole scheme. Thus not only all the Dwelling units are modular based, the corridor, entrance foyer, staircase and even leisure facilities are modular designed with furniture and MEP utilities preinstalled and embedded. So everything built in this site can solely be relocated and reused at other site.

Building Form:

There are 6 individual blocks of 3 different building types in the design and the form are actually following the internal functions honestly. As to maximize the building parameter for each unit's outward facing window, corridor is designed at the middle between the opposite placed units. The overall positioning gesture of all the buildings is like the character 'S' for letting more units able to get more sunlight through the internal courtyards, and with a stepped building height of northern block taller and southern lower.

Spatial Arrangement:

The 3 taller building blocks with more units are interconnected by the Connector module, so the communal spaces and facilities can be shared by more residents. In particular the PV panels for acquiring solar energy are installed on their rooftop, so the maintenance across different blocks would be easier. While the roof of the 3 lower southern blocks are installed with leisure modules, i.e. slide for children.

Connectivity:

All the 6 building blocks are adequately serve by the central placed EVA with the staircases at two ends of each blocks, and there are 2 elevators built with the 3 taller northern blocks to serve as the Barrier Free Access, so residents with disability and babies can have a larger variety of unit choices. The EVA serves also as the vehicular access for the site with 2 ingress and egress points connected to the Fung Nam Road of lower traffic speed. For balancing the security and connectivity, there is one more resident entry gate at the corner of Tin Ping Road and Fung Nam Road beside the 2 located at the vehicular access points.

Use of BIM:

The whole design scheme was done and built with the BIM software from concept stage to documentation, even during the stage of massing study, as it was much easier to know the units amount as total number of 300 has to be achieved. With the spatial data and information from HK GeoData, precise topography and accurate surrounding context were available right from the beginning, thus the site analysis is reflecting the reality and that real time adjustments and optimisation can be done back and forth for testing different designs.

Collaboration Approach:

As with the standardization of information exchange within the BIM environment, different tasks can be done by individual members for various focus. Yet the result and corresponding digital files can still be merged and browsed on the related BIM platform. So members can first research on unique focus without bother by the difficulties of later collaboration.

Quality of Design:

Like what mentioned above, BIM environment can be as accurate as a digital clone of the real world, so all the design decisions can be made with bigger confident that is responding to the actual condition and reflecting the true outcome. In which the material used and construction procedure can also be tested and reviewed.

Sustainability:

Beside the full implementation of modular design for the various MiC units and the above mentioned overall building allocation for the sunlight, the Dwelling units and Connector modules were placed with passive cooling mindset, as there are spaces left on plan between some Dwellings and Connectors to allow wind and air ventilation even within the deepest part of the blocks across all the levels. Not to mention such opening would act also as the skylight for indirect sunlight penetration.

MiC / DfMA:

There are 3 types of unit in this design scheme: Studio, 1 Bedroom and 2 Bedrooms. However they are not simply form as their own MiC unit, as after our research and analysis such way of unitization would largely prohibited the spatial utilization within the module. Therefore all the unit types are constructed by connecting Modular Frame of a standard container size for easy road transport. And such Frame was designed to reserve the false ceiling section for MEP services installation, thus the DfMA of all the utilities would also be designed of the same Frame size for more flexible of layout design at different sites.

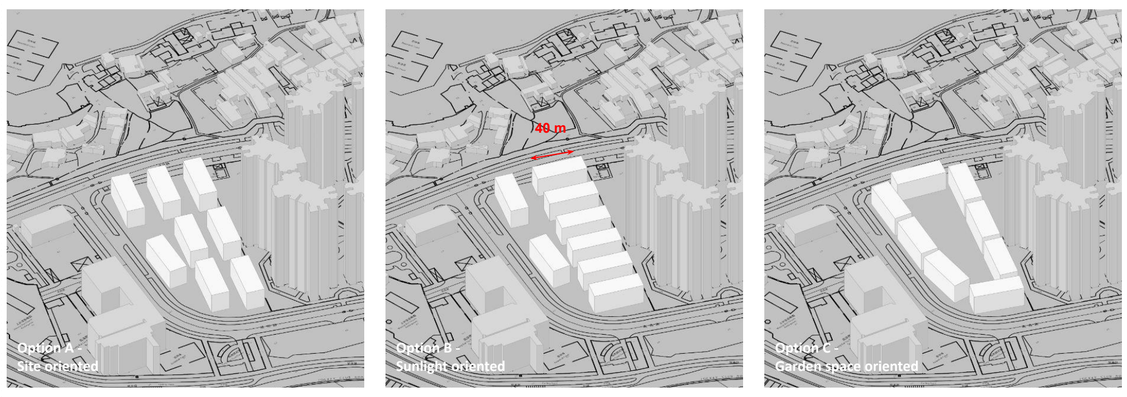
Constructability:

All the different modules are designed to have the same width of 2.5m, so they can be connected easily with high adaptability through dry fixing and simple knowhow that different modular units are actually interchangeable.

Summary:

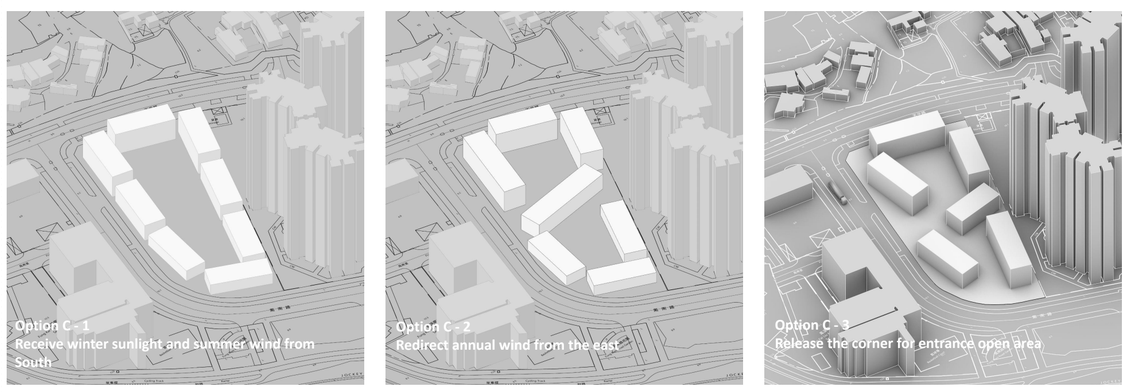
In short with the help of BIM, all the above mentioned aspects can be achieved to a higher degree of completeness and the whole process can then be done seamlessly.

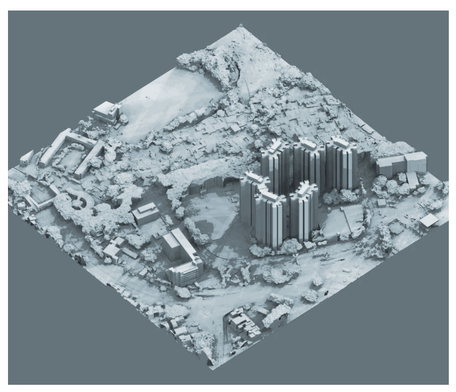
Master Layout Plan Consideration



Open spaces are planned to maximize the view and privacy of units, to form the central courtyard via standard block and for easy reposition in different sites.

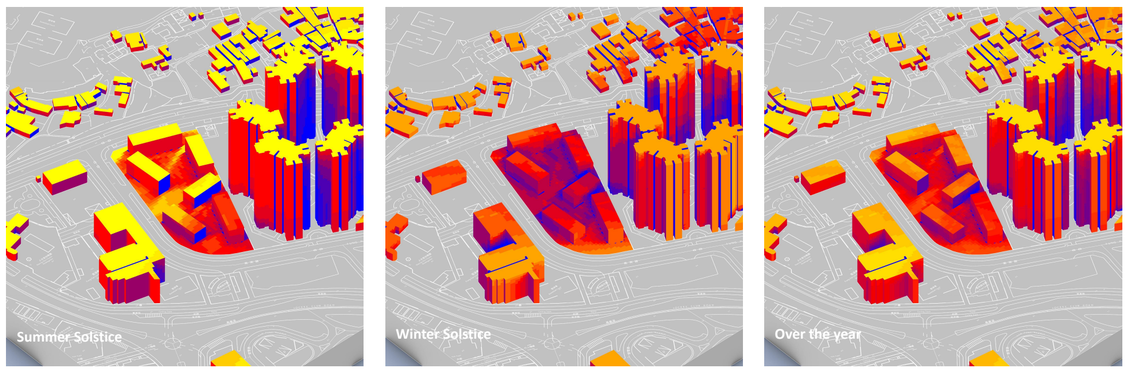
Master layout designed to base on open spaces planning and rearrange the massing blocks via BIM site sustainability analysis.





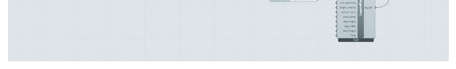
Site Context Analysis

Sustainability Strategies 1 - Sunlight Hour Analysis



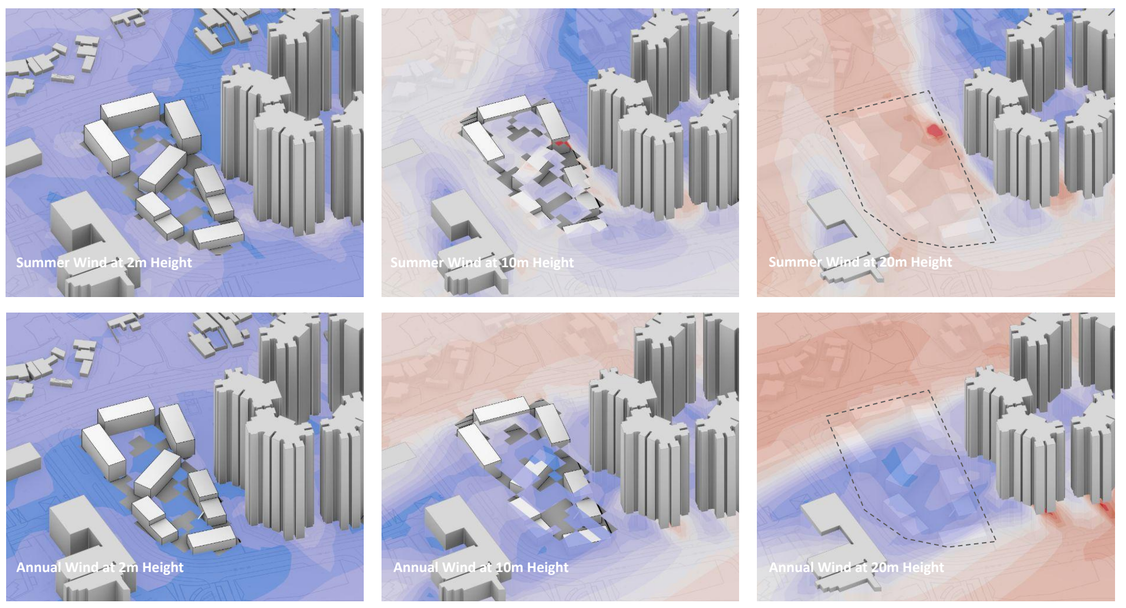
Northern blocks roof would suffer the solar radiation over the year, green roof or solar panels can help absorb the heat.

While the window area which would has maximum of over 4 hours sunlight during summer solstice will be protected by shading devices on the southern facade.

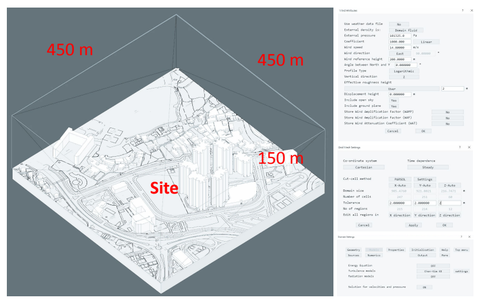


Ladybug in Grasshopper

Sustainability Strategies 2 - Wind Analysis



The two corners on the northern side are essential for urban ventilation and courtyard comfort.



CFD in Rhino

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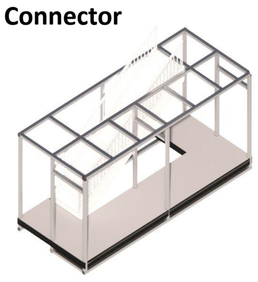
Shading devices are designed for reducing high angle sunlight and increase the redirect daylight at lower sun angle.

Courtyard as internal focal point and with greenery for playground and leisure space.

Photomontage:
Internal View of the central gardens between the building blocks.

Connector



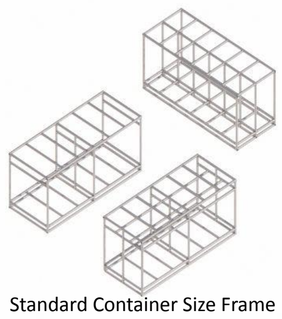
Staircase

Corridor

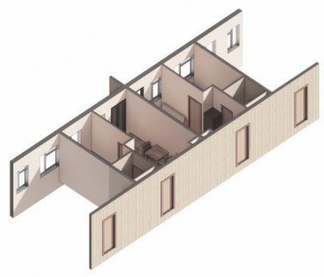
Entrance Foyer

Dwelling

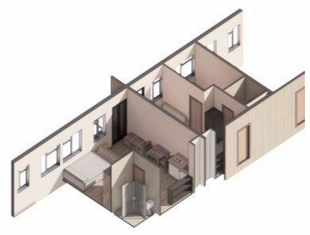
1 Bedroom Unit



Standard Container Size Frame

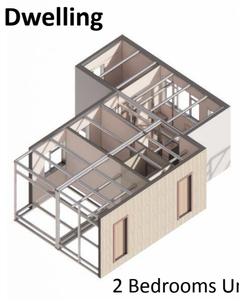


20 sqm. each

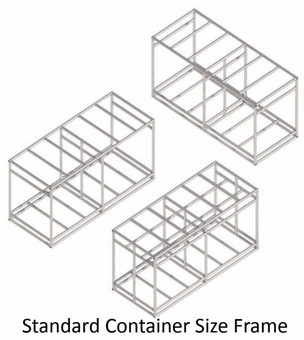


Pre-installed Internal Furnitures

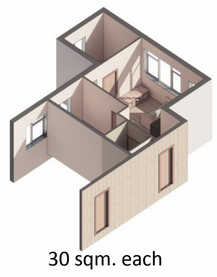
Dwelling



2 Bedrooms Unit

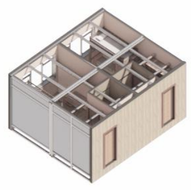


Standard Container Size Frame

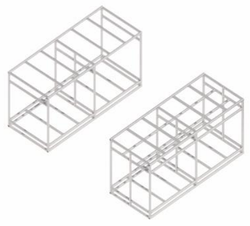


30 sqm. each

Dwelling



Studio Unit



Standard Container Size Frame

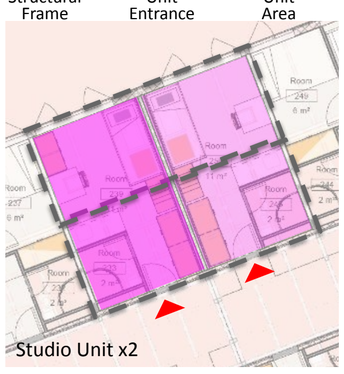
15 sqm. each

Pre-installed Internal Furnitures

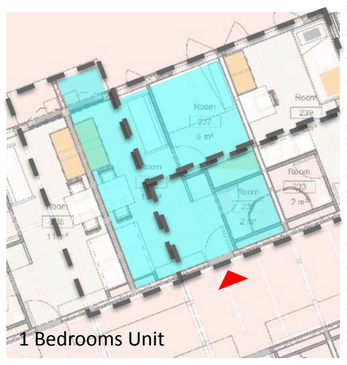
Standard Container Size Frame:

Width	< 2.5m
Height	< 3.5m
Length	< 7.5m
Laden Weight	< 80 ton

Structural Frame | Unit Entrance | Unit Area



Studio Unit x2

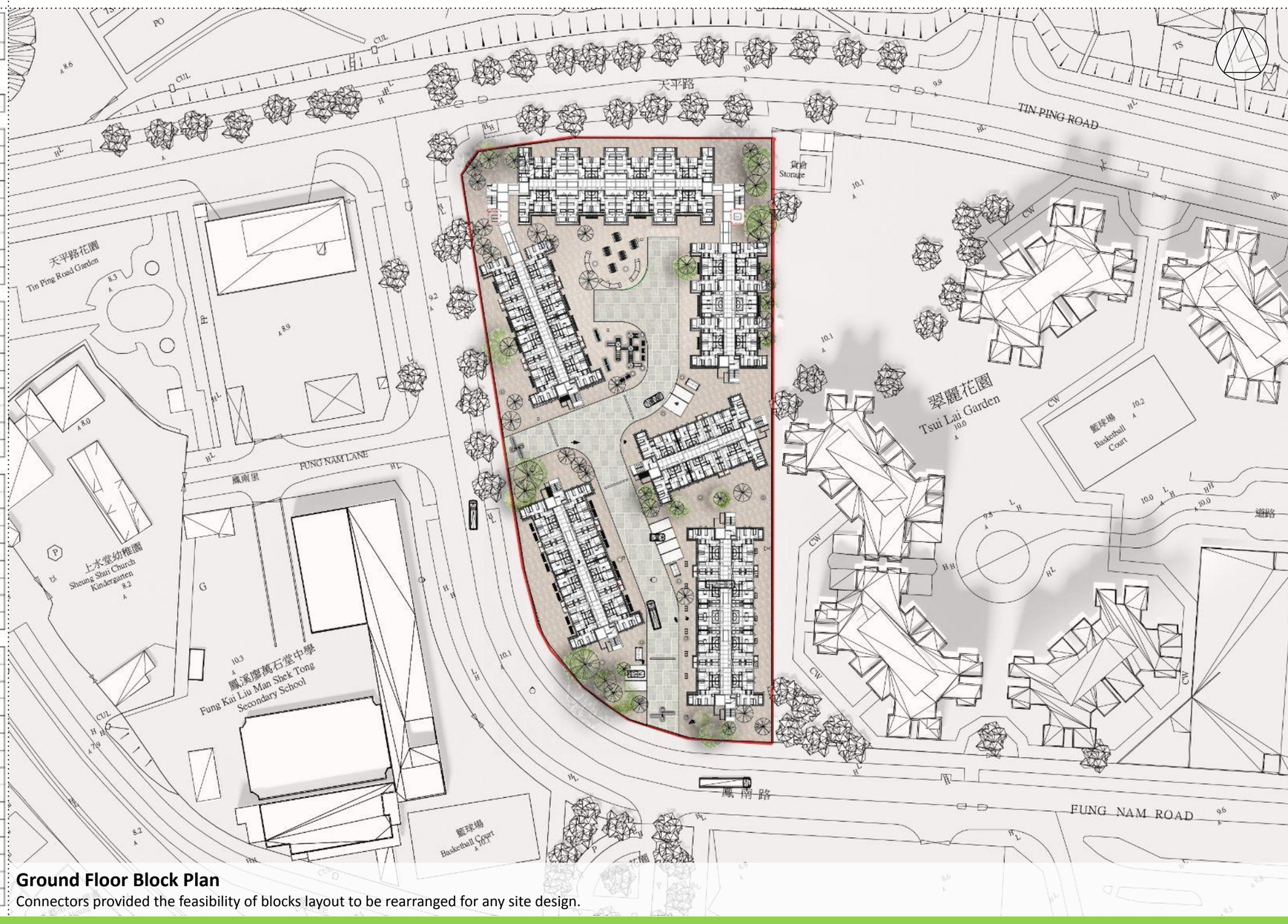


1 Bedrooms Unit

2 Bedrooms Unit

Schedule of Dwelling units generated by BIM software Autodesk Revit

Room Schedule 2				
Area	Count	Name	Number	Level
Not Placed				
Not Placed	2	Room	<varies>	Not Placed
Level 1				
0 m²	12	Room	<varies>	Level 1
1 m²	10	Room	<varies>	Level 1
2 m²	89	Room	<varies>	Level 1
3 m²	3	Room	<varies>	Level 1
4 m²	3	Room	<varies>	Level 1
5 m²	46	Room	<varies>	Level 1
6 m²	62	Room	<varies>	Level 1
11 m²	52	Room	<varies>	Level 1
14 m²	40	Room	<varies>	Level 1
Level 2				
0 m²	12	Room	<varies>	Level 2
1 m²	10	Room	<varies>	Level 2
2 m²	89	Room	<varies>	Level 2
3 m²	3	Room	<varies>	Level 2
4 m²	3	Room	<varies>	Level 2
5 m²	46	Room	<varies>	Level 2
6 m²	62	Room	<varies>	Level 2
11 m²	52	Room	<varies>	Level 2
14 m²	40	Room	<varies>	Level 2
Level 3				
0 m²	12	Room	<varies>	Level 3
1 m²	10	Room	<varies>	Level 3
2 m²	89	Room	<varies>	Level 3
3 m²	3	Room	<varies>	Level 3
4 m²	3	Room	<varies>	Level 3
5 m²	46	Room	<varies>	Level 3
6 m²	62	Room	<varies>	Level 3
11 m²	52	Room	<varies>	Level 3
14 m²	40	Room	<varies>	Level 3
Level 4				
0 m²	6	Room	<varies>	Level 4
1 m²	4	Room	<varies>	Level 4
2 m²	41	Room	<varies>	Level 4
3 m²	3	Room	<varies>	Level 4
4 m²	3	Room	<varies>	Level 4
5 m²	34	Room	<varies>	Level 4
6 m²	30	Room	<varies>	Level 4
11 m²	16	Room	<varies>	Level 4
14 m²	28	Room	<varies>	Level 4
43 m²	1	Room	392	Level 4
65 m²	1	Room	390	Level 4
79 m²	1	Room	391	Level 4
282 m²	1	Room	385	Level 4
370 m²	1	Room	382	Level 4
429 m²	1	Room	388	Level 4



Ground Floor Block Plan
Connectors provided the feasibility of blocks layout to be rearranged for any site design.

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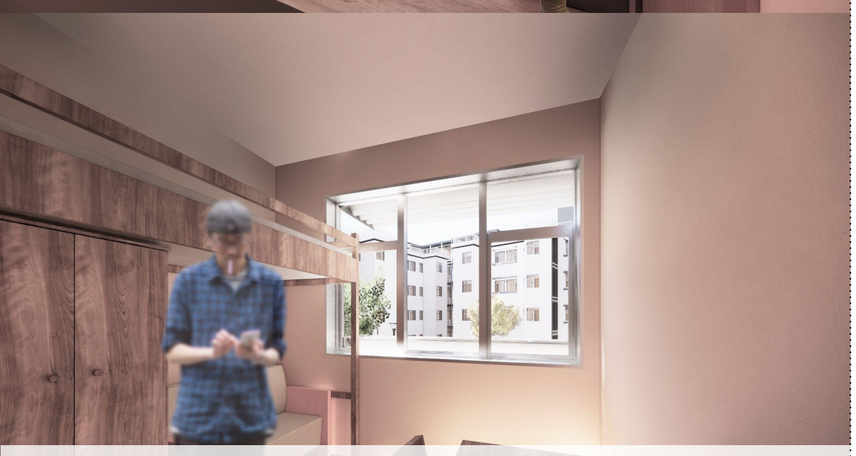
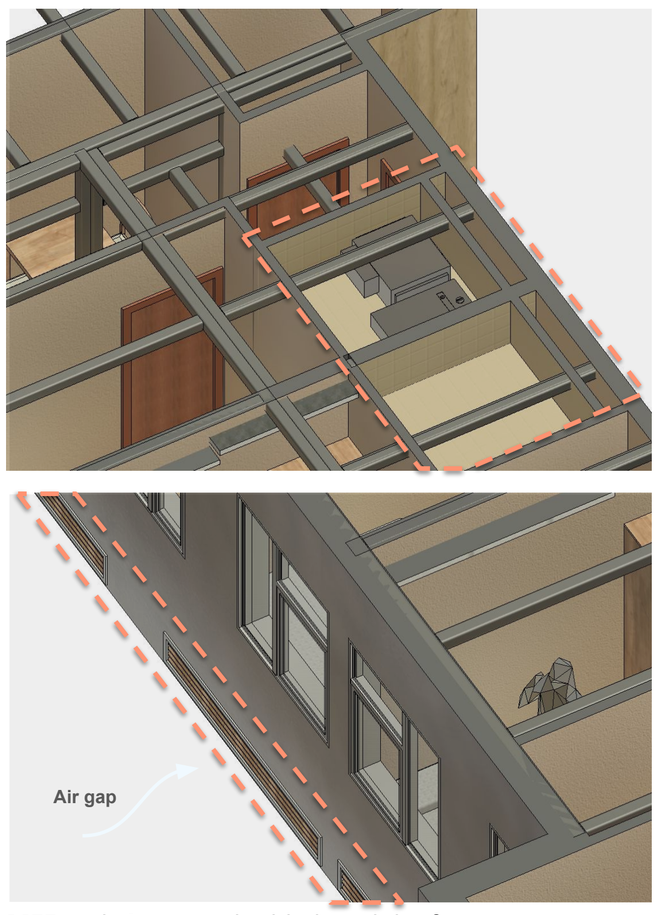
Dwelling Entrance Foyer Perspective



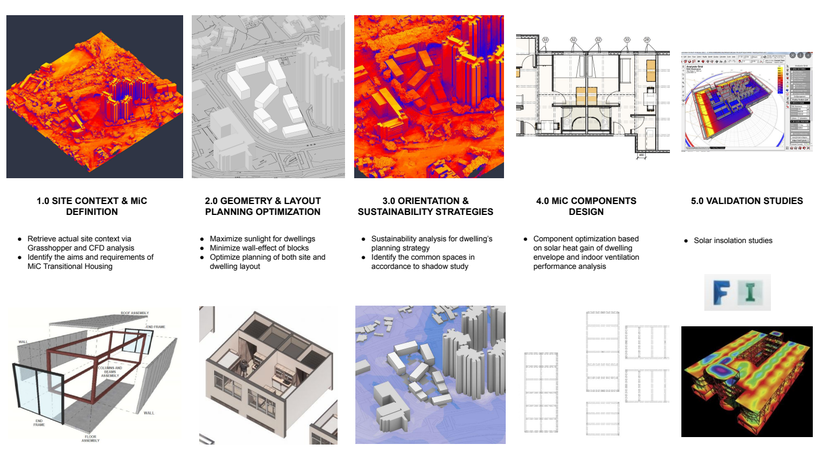
Dwelling Internal Perspective: 2 Bedroom, 1 Bedroom & Studio (From Top to Bottom)

Perspective View:
Corridor enlarged for natural lighting and ventilation to save energy and improve comfortness as semi private area and with the skylight above to provide natural sunlight as well as a rain shelter.



MEP and air gap embedded modular frame

Typical Dwelling Block Section



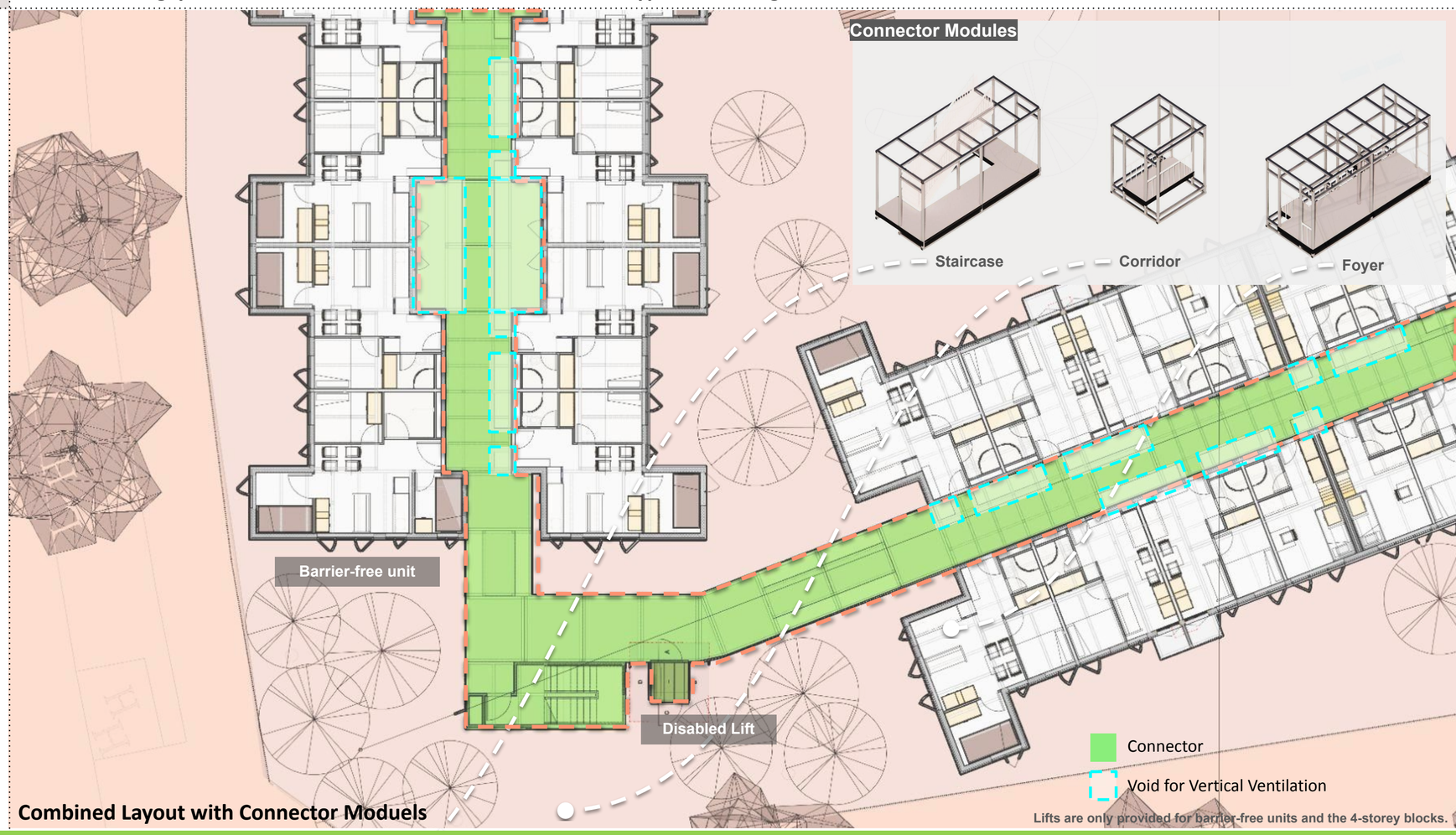
BIM Design Schedule and Analysis Strategy

Computational Design:

With BIM application, the digital building design can integrate with building services in terms of sizing, scheduling and planning. Our team specifically designed a specific typical wet module, which pre-installed all the typical equipments for the dwelling use, including the water heater, HVAC and AHU diffuser inside MEP utility section within the false ceiling space. With the BIM, these design can be connected, visualised and layouted by architects and engineers at the same time.

Project Team Collaboration:

The model was shared on CED cloud platform and interacted by the team members on different parts of modelling at the same time. Through applying the BIM products provided directly by the manufacturers, sanitary fitments and furnitures with information can be included to the design model and have the construction summary and schedules generated at any time regardless of any design change.



Combined Layout with Connector Moduels

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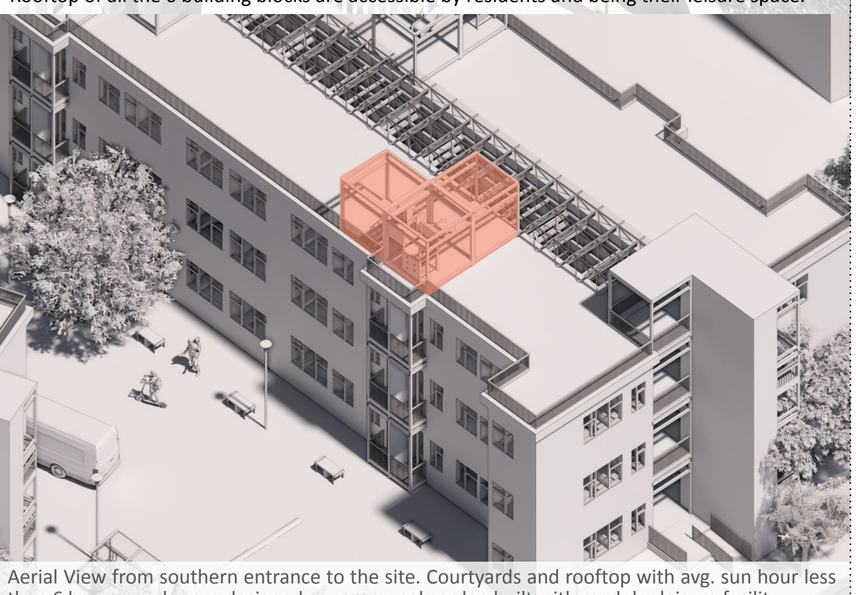
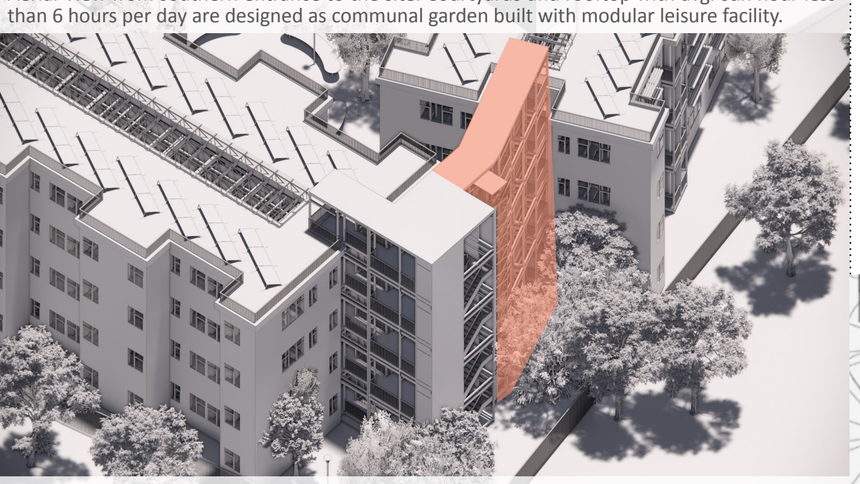
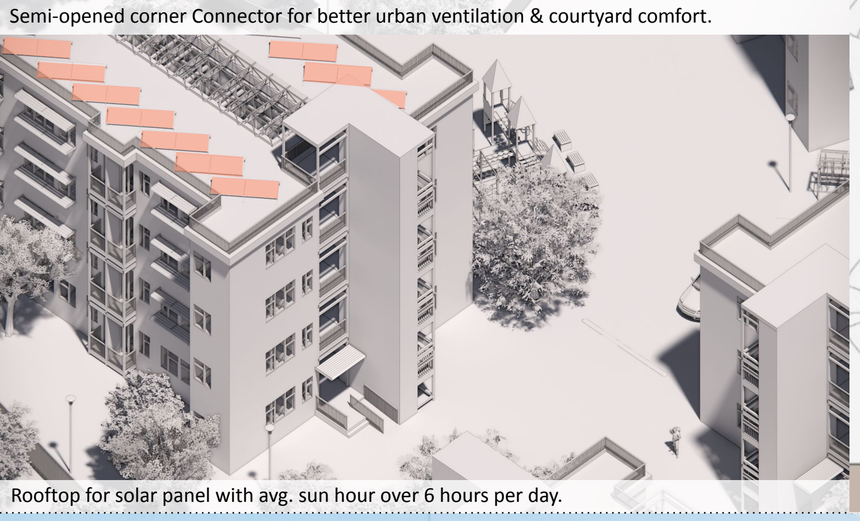
Rooftop of all the 6 building blocks are accessible by residents and being their leisure space.



Aerial View from southern entrance to the site. Courtyards and rooftop with avg. sun hour less than 6 hours per day are designed as communal garden built with modular leisure facility.

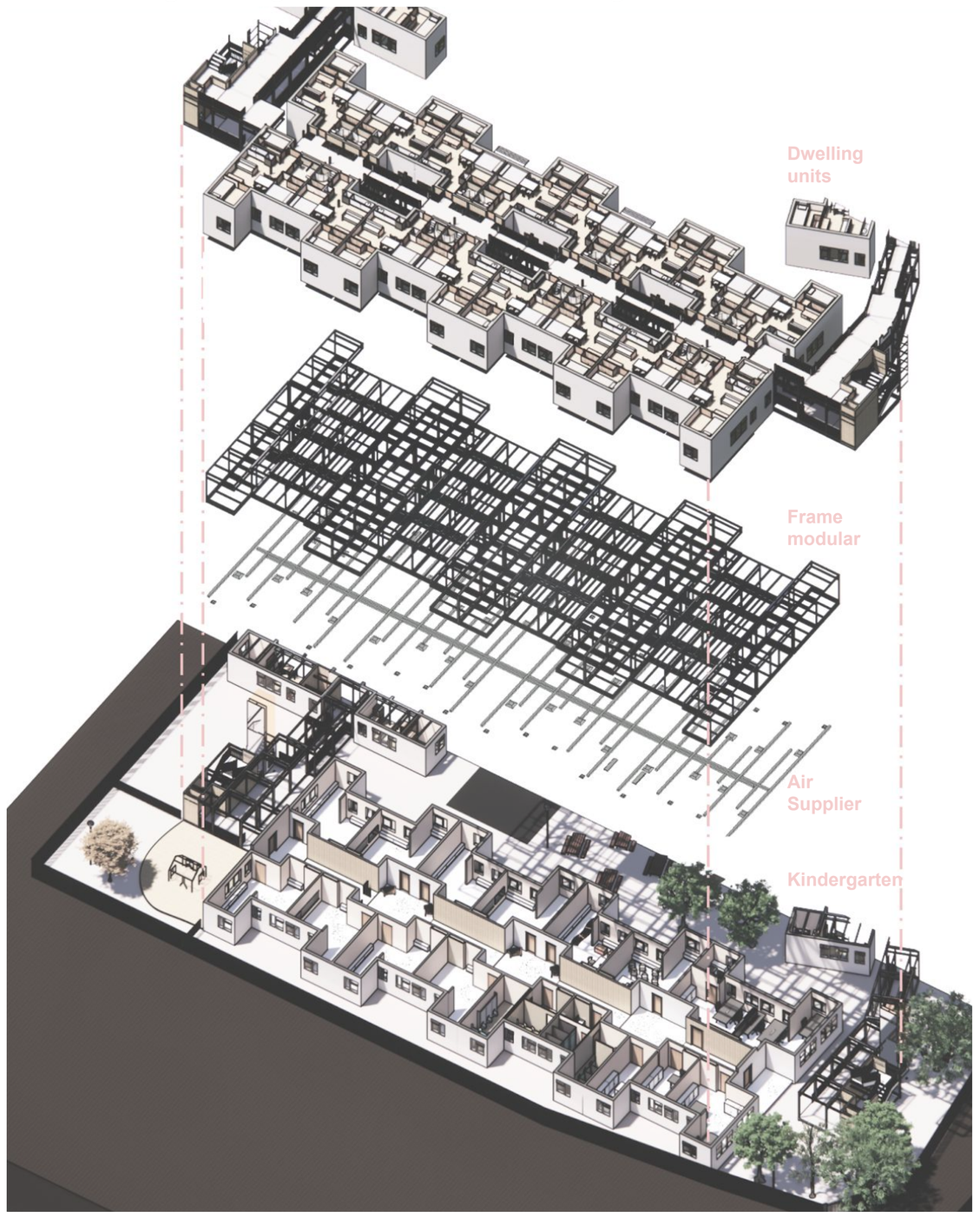


Semi-opened corner Connector for better urban ventilation & courtyard comfort.



Rooftop for solar panel with avg. sun hour over 6 hours per day.

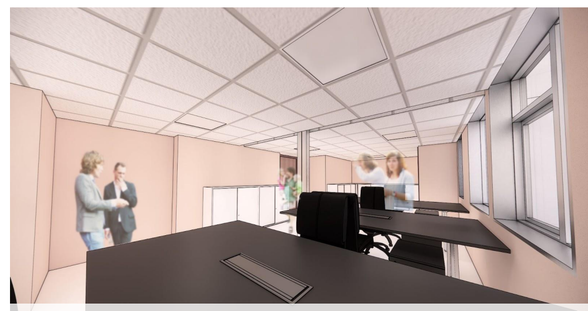
On-site Design Change: Introduction of Kindergarten



Fenced off playground for higher safety.

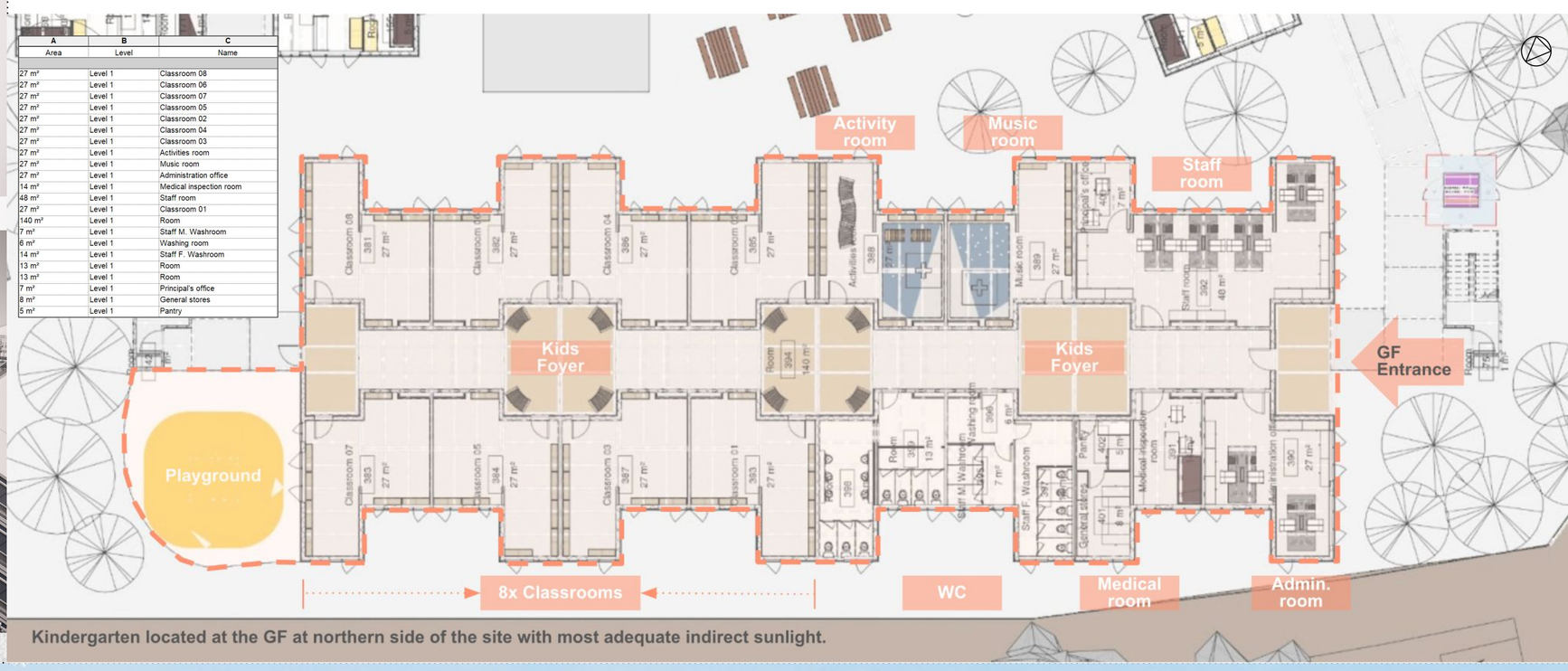
Outside classrooms are the Kids Foyer with connection above.

Classrooms are placed at location with more sunlight.



Administrative spaces are located altogether.

A	B	C
Area	Level	Name
27 m²	Level 1	Classroom 08
27 m²	Level 1	Classroom 06
27 m²	Level 1	Classroom 07
27 m²	Level 1	Classroom 05
27 m²	Level 1	Classroom 02
27 m²	Level 1	Classroom 04
27 m²	Level 1	Classroom 03
27 m²	Level 1	Activities room
27 m²	Level 1	Music room
27 m²	Level 1	Administration office
14 m²	Level 1	Medical inspection room
48 m²	Level 1	Staff room
27 m²	Level 1	Classroom 01
140 m²	Level 1	Room
7 m²	Level 1	Staff M. Washroom
6 m²	Level 1	Washing room
14 m²	Level 1	Staff F. Washroom
13 m²	Level 1	Room
13 m²	Level 1	Room
7 m²	Level 1	Principal's office
8 m²	Level 1	General stores
5 m²	Level 1	Pantry



Kindergarten located at the GF at northern side of the site with most adequate indirect sunlight.

Not only Dwelling units are modular designed, staircase and corridor space, the Connector are also module assembled.

Corridor Connector are not fully enclosed, so vertical air ventilation is possible for creating stack effect.

Leisure facilities like children playground are also all modular designed for easy installation and relocation.

Beside the embedded MEP services zone reserved within, all the Dwelling units are installed with gap between levels for cross ventilation in building blocks

Section

Combined site section showing the various passive design for maximizing the sustainability, human comfortness and energy use of the whole scheme.

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