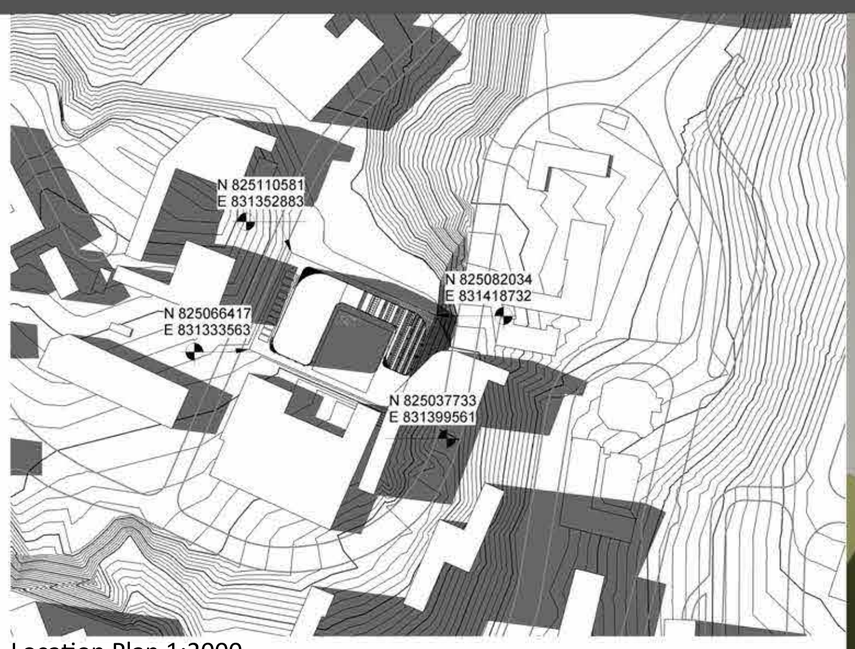
CIC BIM Competition 2020 – Space Fanatics



Location Plan 1:2000

Design Concept
Our design concept originates from the inspiration of being a solid mountain with the abstract interpretation of the fluidity in its overall massing. The architectural building is specifically designed for students to be sheltered from the elements of both physical and mental. Retreating into these man caves, they will still have access to open views towards either inner courtyard and mostly towards the city view below. Due to the presence of a park beside our site, our design also strives to visually connect the park with our inner courtyard for our students to enjoy the landscape with its borders blurred. Gathering, communication and social interaction is one of the most important issues in student hostel. These spaces provide many communal space for our students to enjoy their school life.

Building Form
The site is situated at a hilly area and bordered by park towards north-east and educational building towards south-west. Our architecture approach is to follow roughly the elevation of the hill to allow for natural ventilation flow, optimal sunlight, and pertain to our design concept. In addition, we would use terraces to provide more open views. There is a cave like opening on the ground floor connecting the park visually to our landscaped inner courtyard to expand on the greenery space.

Spatial Arrangement
On the ground floor, the building footprint creates an inner courtyard for landscape and outdoor communal area for relaxation. Since sports facility needs larger amount of space and requires ease of access for students to use for sports functions and other events, it will be located at the ground floor. Cafeteria also would need to cater to large amounts of students, staff, and visitors, so it would be located across from the gym. It also benefits from having an exclusive view to more views for people to enjoy their meals and conversations there. On every typical floor of dormitory, there will a hierarchy from public to private space, common areas to dormitory spaces.

Connectivity
The main entrance is facing the main road. Vehicular and pedestrian could access the building directly. The evacuation area is designated as the inner courtyard. Parking space is located just between the main road and the building facing the main road. The 2 cores are located on a main path for easy access.

BIM Uses in Design, Collaboration, Engineering, Analysis and Optimisation
Using Revit as BIM use has helped us to better understand how our conceptual idea can be realized in the creation of the massing model. It can be further be enhanced by the in-built sun path angles and other related site analysis. The placement of both architectural and engineering models could be achieved very accurately. Optimization can be made within Revit, which helps us to finalize the design to create the best version of our building.

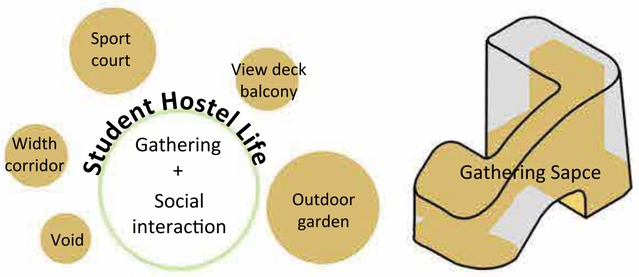
BIM Collaboration approach
We use Revit to create the massing which includes our design intent. After that, it is then placed onto the site where we test and revise several versions to achieve the required floor area enough for the requirement rooms. We then go on to adjust the massing to fit all the rooms, study the sun path, and add sun shading devices for sustainable theme.

Quality of Design
BIM could save our time to check the room sizes, improve our overall efficiencies in checking the plans, elevations, sections quite quickly to solve any design or technical problems. We could also have the software to do real-life analysis on solar studies and many other options. BIM also helps us give us a platform for collaborating with other people.

MIC/ DfMA
We have MIC in our design considerations for the typical student hostel rooms and also guest rooms. They will be lifted up at the site for the assembly and stacked vertically on top of each other before being wrapped by the curtain wall to seal the outside from the inside.

Constructability
An innovative constructability is the organic form that can be achieved. Unlike the usual practice currently that limits itself as a box shaped building due to its easier manufacturing methods, the form of our architecture is a direct response to its immediate environment and matches closely with our design intent and concept. The constructability of this architecture can be achieved by precision digital and manufacturing collaboration as well as the technologies that can be used to monitor the execution on site.

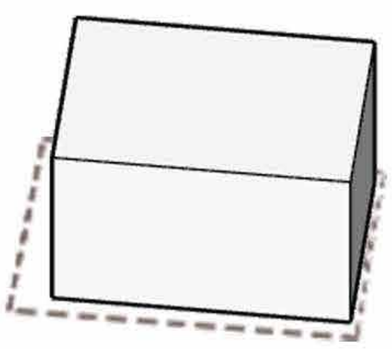
Summary
Overall, BIM is an essential asset for design, engineering, and collaboration due to its platform being capable to cater to the functions required at a very fluid workflow. The design can be first drawn up in the massing model space, which then can be transformed into floor slabs with every options to mold it to fit into the designer's intent. It will then have many variety of functions like rooms, staircase, liftcores, and so much more, that are integrated and can be changed that also change for the entire model. It can be viewed in 3D for visualization. It surpasses all the functionality and capabilities of using AutoCAD. The amount of effort and time saved by using Revit as a BIM software is incredible! Not only can it be used for 2D & 3D modeling and served as a platform in integrate design & engineering file together in one place, it can also be used for quick rendering to high detail rendering, plus it also has a huge library of furnitures, lights within Revit that is readily available for most projects. If not, there are also online libraries that can be downloaded for free to and put inside the BIM file. There is no denying that BIM is the future, and this future will only get brighter as the time saved due its high efficiencies will allow more time to develop better humanistic and sustainable design while helping users & clients understand in more real-time how decisions can have an impact on both design and engineering without seeing it near the end of the project.

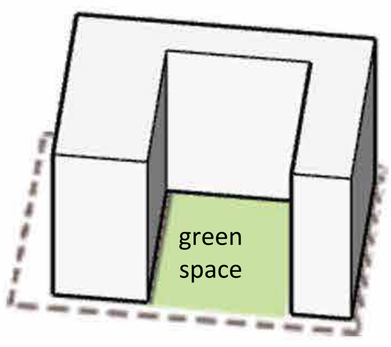


Building Form and Space
The Student Hostel Life is a theme for creating spaces that cater to gathering space and social interaction environments. This can be made due mainly to many various spaces.

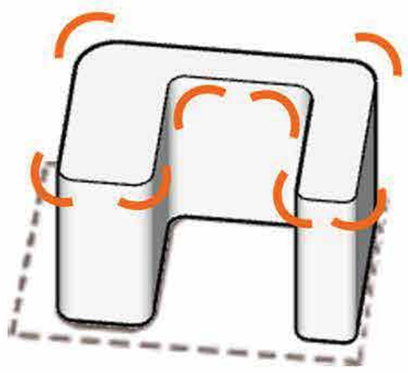

Overall Bird Eyeview

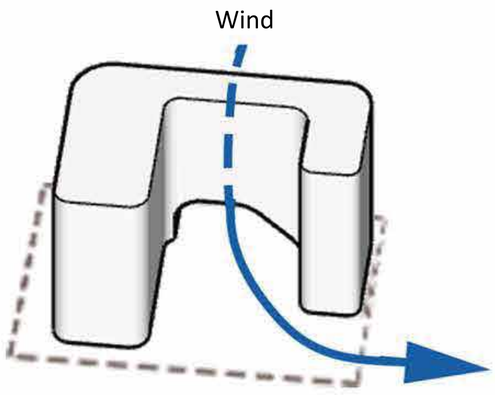
From this view, our architectural building can be seen as an expression as an abstract mountain with fluidity, which reflects on our design concept. Its location is on a hilly terrain, with an adjacent park that has a basketball court and a small playground. To the south side of the site is another institutional building.


Maximize the footprint of the building

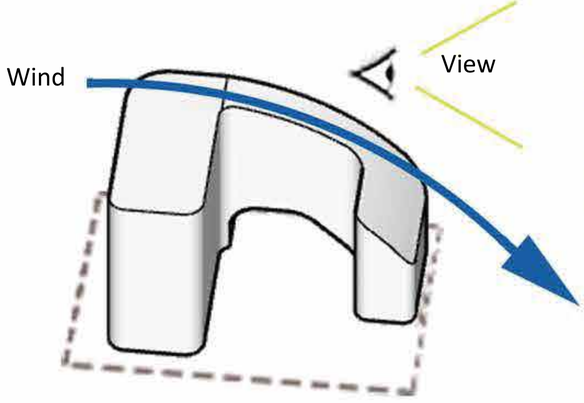


Increase visual connection to inner green space

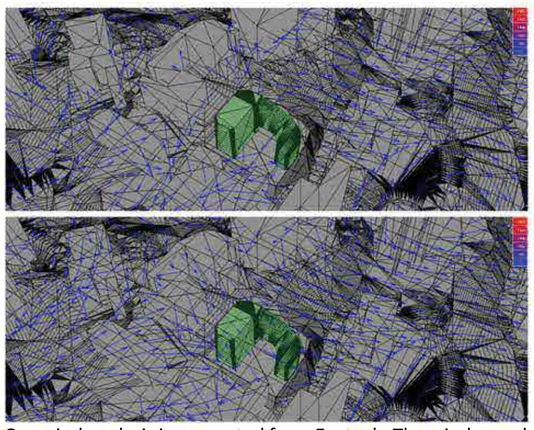

Round the edges to follow design intent



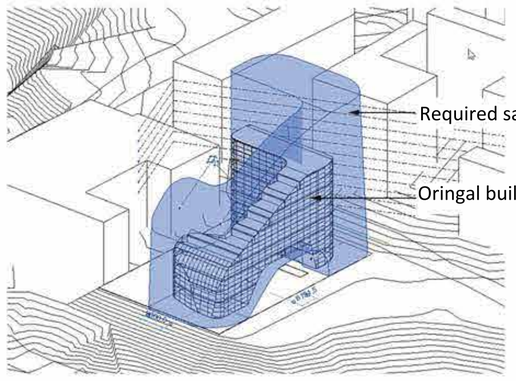
Create a cave-like void for wind and connection to park

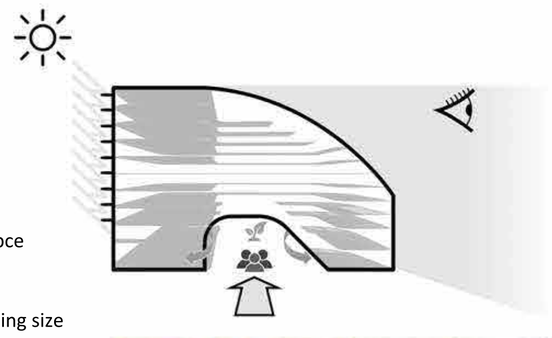


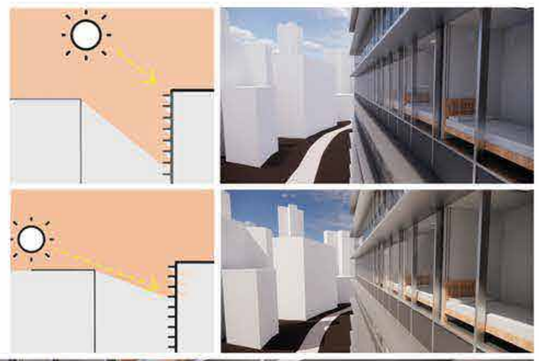
Stepping terrace for roof and balconies'viewand avoid wind obstruction by maintaining wind flow to the buildings above

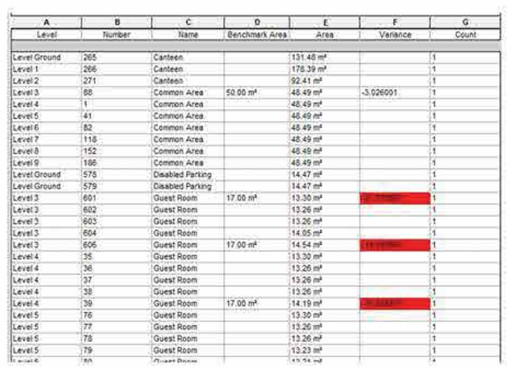

Our wind analysis is generated from Ecotech. The wind speed is 5m/s, indicated in blue. As shown, the wind remains unobstructed at higher levels. At lower levels (near ground floor), some winds will go inside our inner courtyard through the arch-shaped corridor.

Building Form and Space
The design of the overall building form is inspired by being a mountain while have fluidity for an abstract feel.



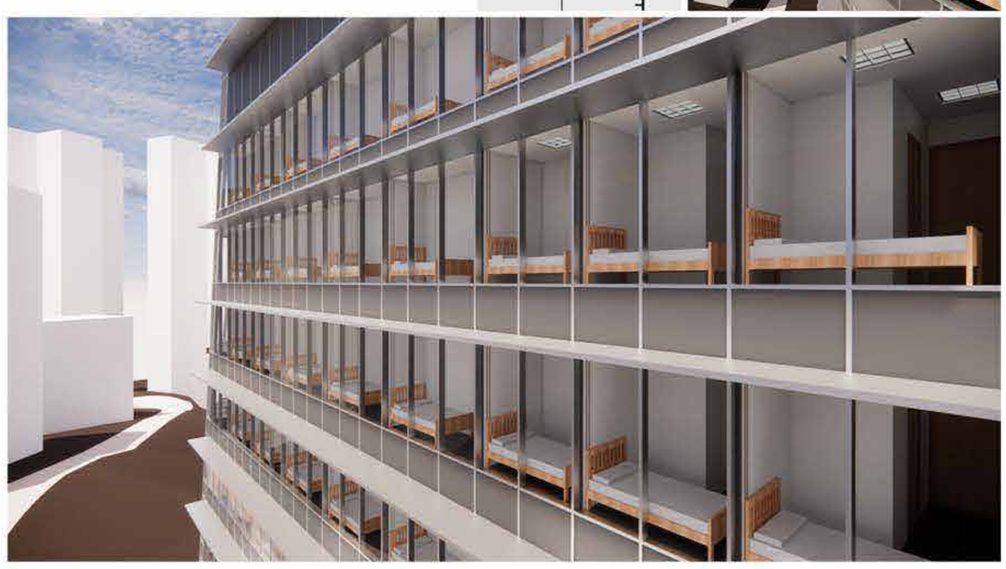






A	B	C	D	E	F	G
Level	Number	Name	Benchmark Area	Area	Variance	Count
Level Ground	265	Canteen		131.48 m²		1
Level 1	266	Canteen		178.39 m²		1
Level 2	271	Canteen		92.41 m²		1
Level 3	68	Common Area	50.00 m²	48.49 m²	-3.026001	1
Level 4	1	Common Area		48.49 m²		1
Level 5	41	Common Area		48.49 m²		1
Level 6	82	Common Area		48.49 m²		1
Level 7	118	Common Area		48.49 m²		1
Level 8	152	Common Area		48.49 m²		1
Level 9	186	Common Area		48.49 m²		1
Level Ground	575	Disabled Parking		14.47 m²		1
Level Ground	579	Disabled Parking		14.47 m²		1
Level 3	601	Guest Room	17.00 m²	13.30 m²	[redacted]	1
Level 3	602	Guest Room		13.26 m²		1
Level 3	603	Guest Room		13.26 m²		1
Level 3	604	Guest Room		14.65 m²		1
Level 3	606	Guest Room	17.00 m²	14.54 m²	[redacted]	1
Level 4	35	Guest Room		13.30 m²		1
Level 4	36	Guest Room		13.26 m²		1
Level 4	37	Guest Room		13.26 m²		1
Level 4	38	Guest Room		13.26 m²		1
Level 4	39	Guest Room	17.00 m²	14.19 m²	[redacted]	1
Level 5	76	Guest Room		13.30 m²		1
Level 5	77	Guest Room		13.26 m²		1
Level 5	78	Guest Room		13.26 m²		1
Level 5	79	Guest Room		13.23 m²		1

Quality
Checking the area, number of rooms are much easier to achieve and changing the overall total building size by volume and area.



Sustainability
The sustainable design incorporated is mainly the sun shading device and the overall massing to maintain wind flow. The sun shading devices are used to shield direct sunlight for 7 floors. The rest of lower floors do not receive as much.

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BIM for Design Collaboration

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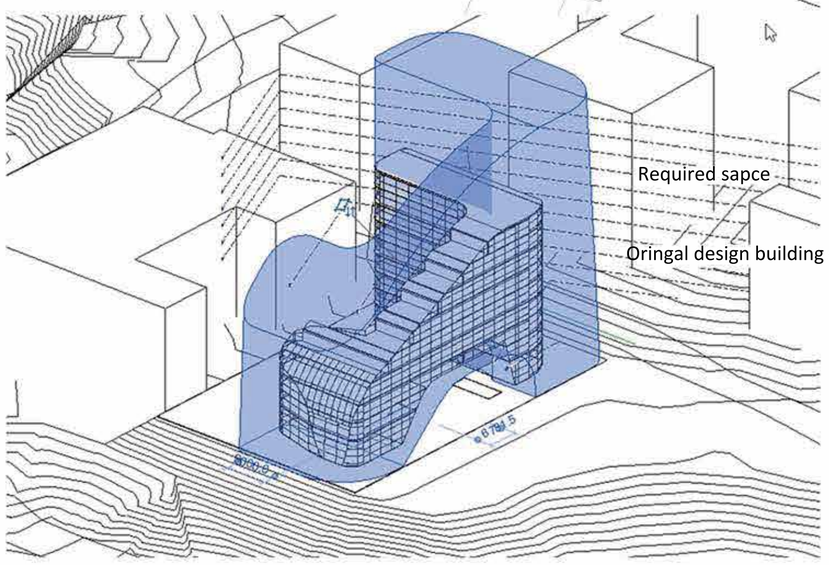
Site location Plan 1:1000

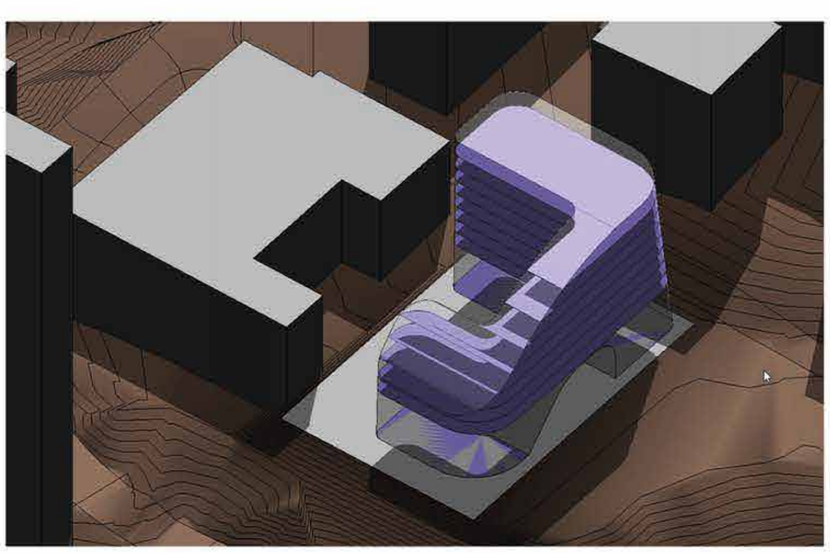
Perspective View

Basement Floor Plan 1:500

Ground Floor Plan 1:500

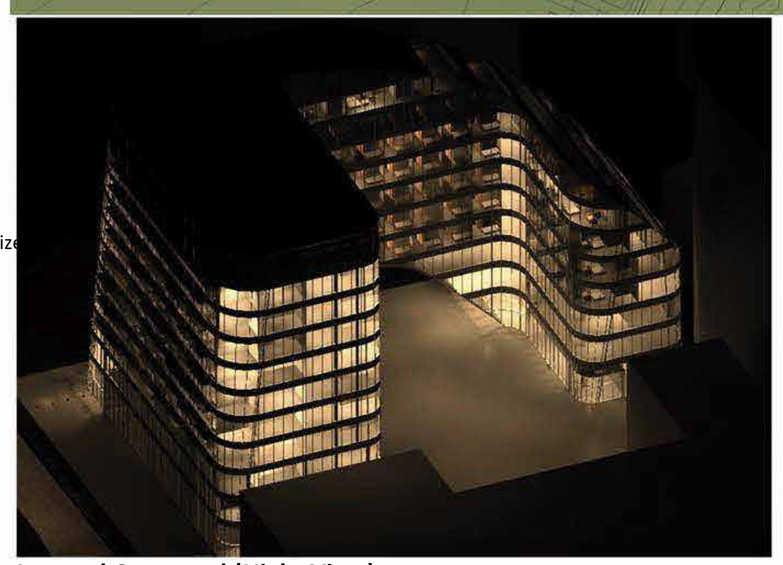
Typical Floor Plan 1:500





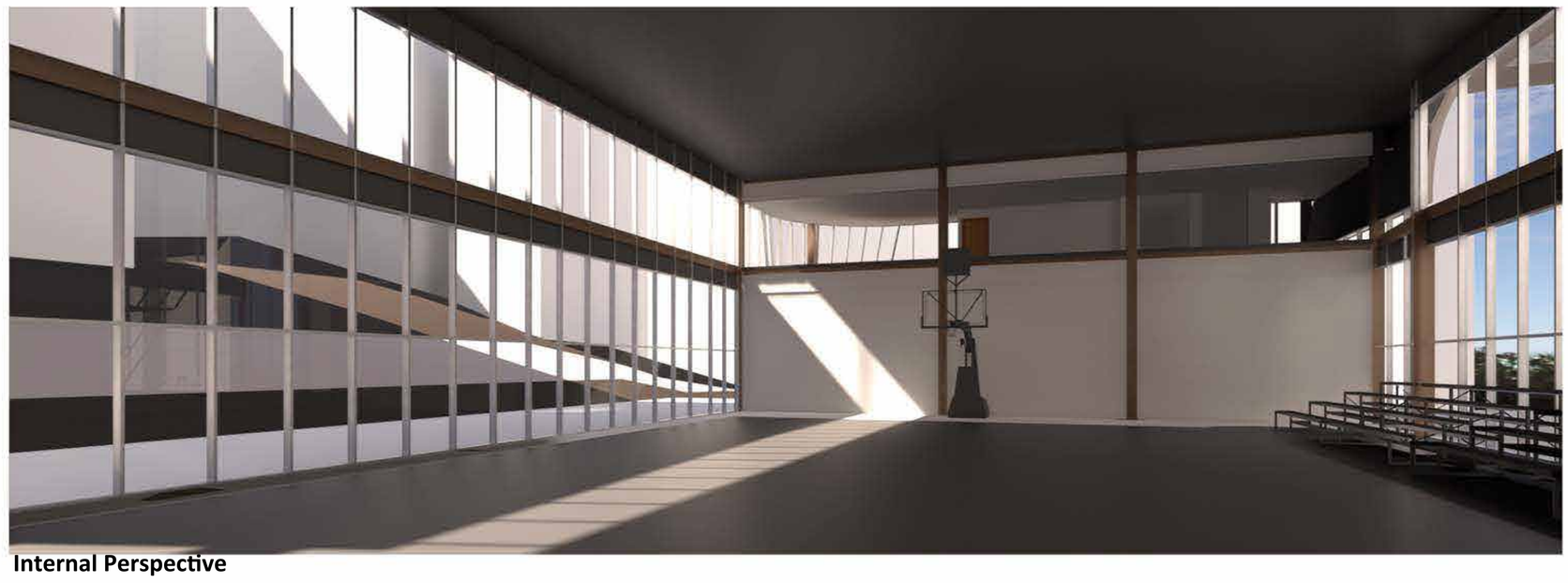
Computational Design

Checking the area, number of rooms are much easier to achieve and changing the overall total building size by volume and area.



Internal Courtyard (Night View)

Overall Bird Eye view (Night View)



Internal Perspective

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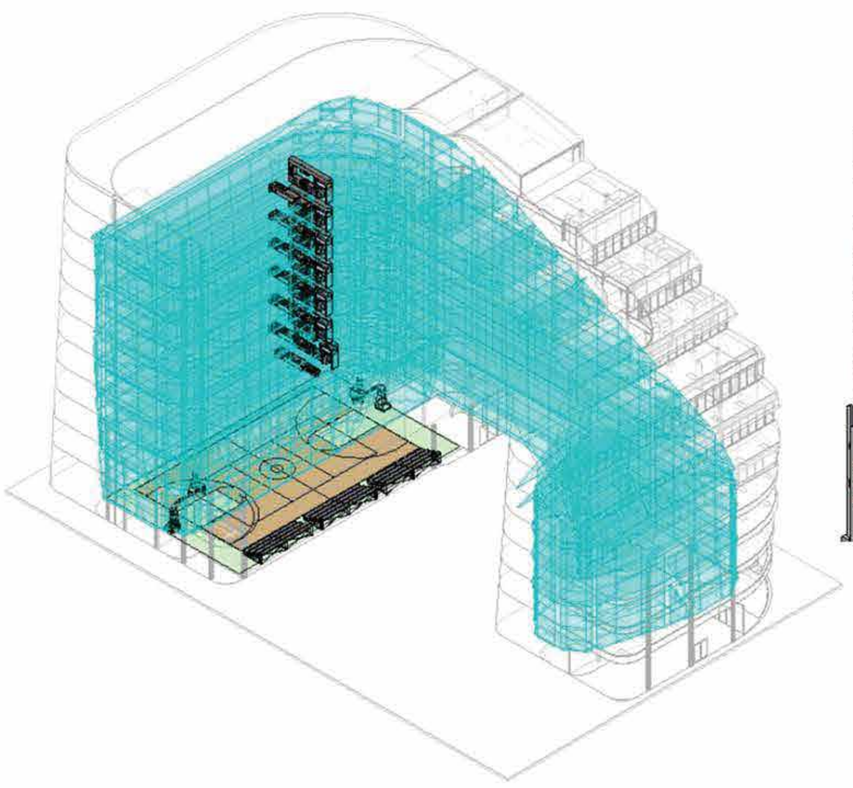
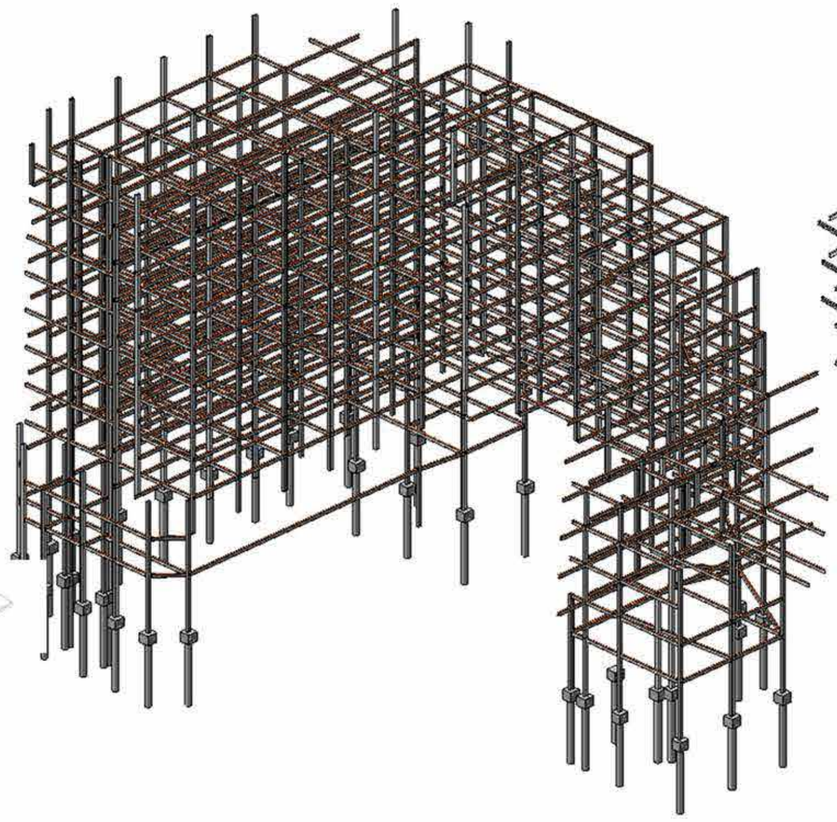
BIM for Design Collaboration



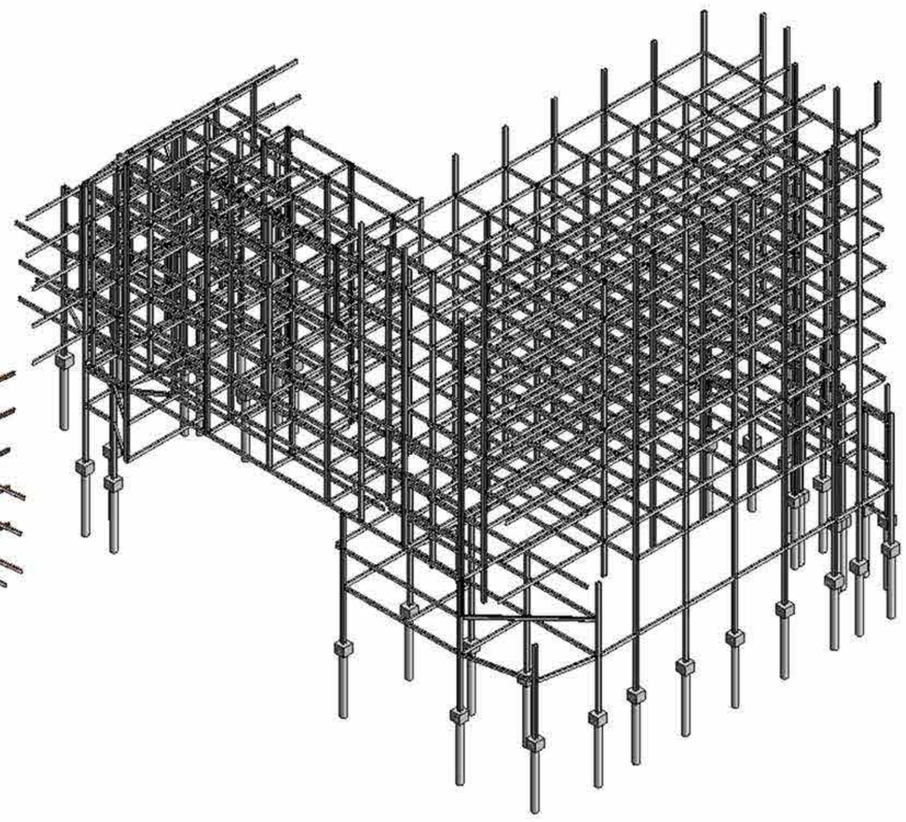
Conputational Design

From the computational design, we could conclude the structural analysis that the structural members are fully optimized as the highlighted in teal color. There are some areas with denser area with more structural beams and columns to support our architectural fluidity form.



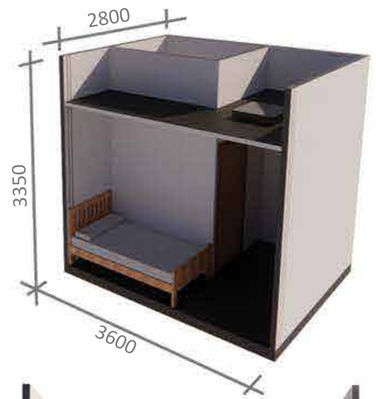
Perspective View of Structural element

The structural elements for our architectural building, viewing from south-east.
After some engineering analysis, the result of the stress and loading test can ensure the overall structural integrity. The stress test ranged from red to green, where the area highlighted in red represents the loading is being transferred and the area highlighted in yellow is slightly less loaded. The area highlighted in green are much less loaded.



The structural elements for our architectural building, viewing from north-west.
As the engineering analysis demonstrated some parts of the structural elements could be modified into smaller members and some areas require more dense structural columns and beams to give more rigidity. The final structural elements are fully optimized.

Internal Perspective (Structureal)



MIC Typical - Student Hostel Room

Internal Perspective (Partition Walls)

MIC

By adopting the concept of Modular Integrated Construction (MiC), identical rooms including their finishes and fixtures can be constructed in factory before delivering to the construction site.
Cost-Effective - The modular design and construction can be finished with no weather related delays, which adds to its affordability.
Speedy Construction - All the pieces arriving on site can be joined together in a matter of hours instead of weeks or months

View on Pedestrian Bridge Perspective

Overall Perspective (with new pedestrian bridge & lift core)

New Pedestrian Bridge and our site's Perspective

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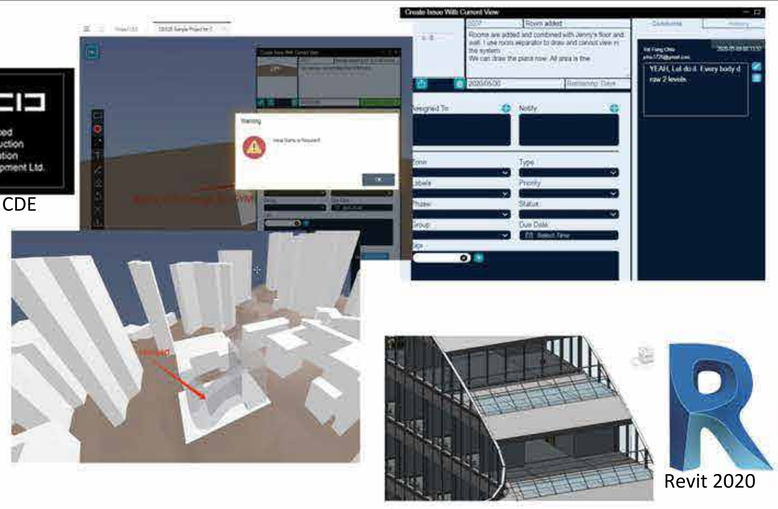
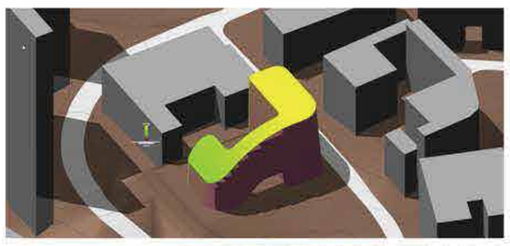
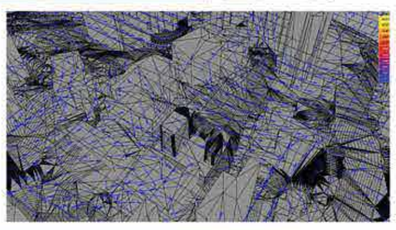
ACID - CDE



Revit 2020

Insight 2020



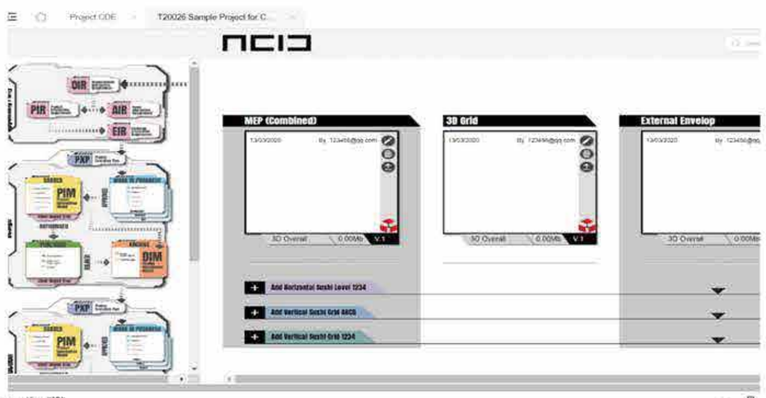


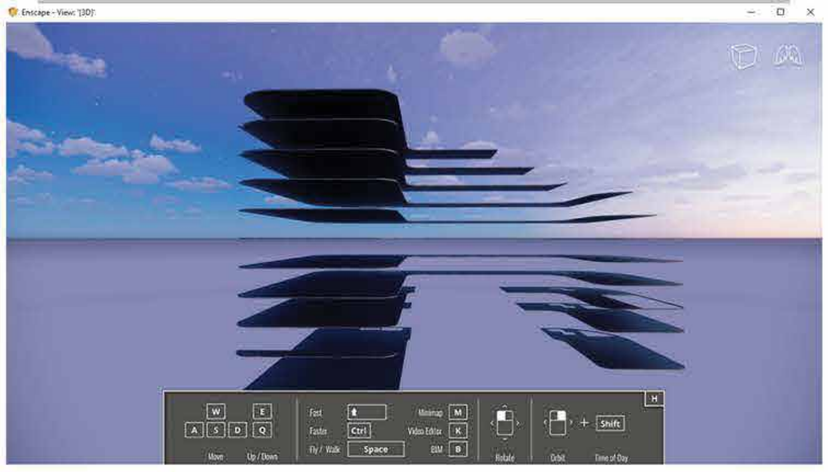
Ecotect 2011

Enscape 2.7

Design Coordination

From the computational design, we could conclude the lighting analysis to come to the lighting solution to be fully optimized. There are some areas with higher lux level like in the pantry and lower lux level in the hallway and outdoor garden.



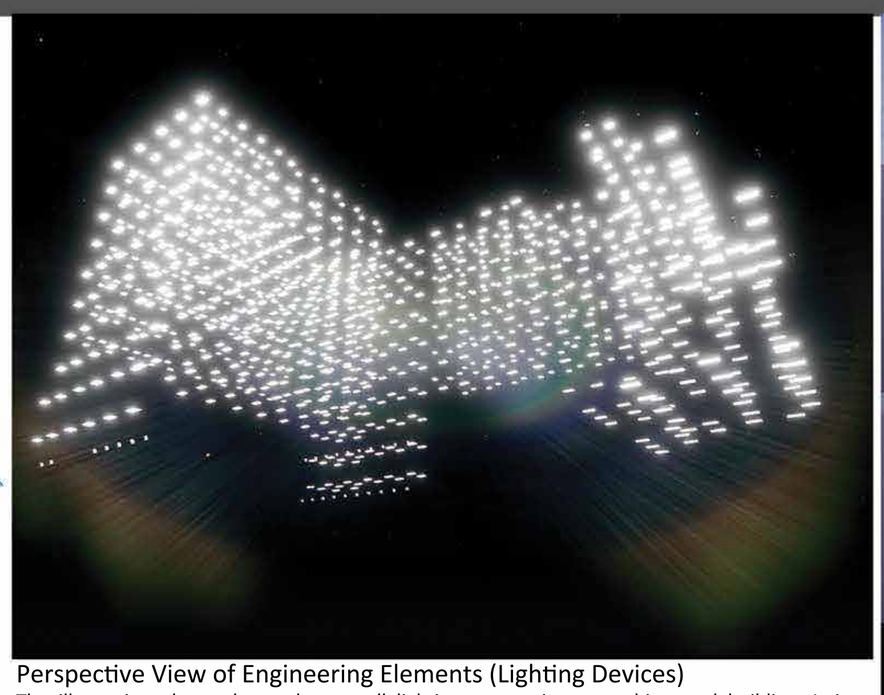


Project Team Collaboration

Our engineering team member proceeds to add the structural elements, namely, columns, beams, and bases. Combining the two files, one architectural and the other structural, onto another BIM software, called ACID-CDE. This CDE helps us marked up comments in 3D view and allows for more visual at the marked up for all our teammates to revise and exchange comments. We learned how to insert furnitures of all kinds from the family groups within Revit. As we are preparing the final panels and powerpoint slides, we began to export the drawings and also use another BIM software, Enscape, which is responsible for doing renders and video.

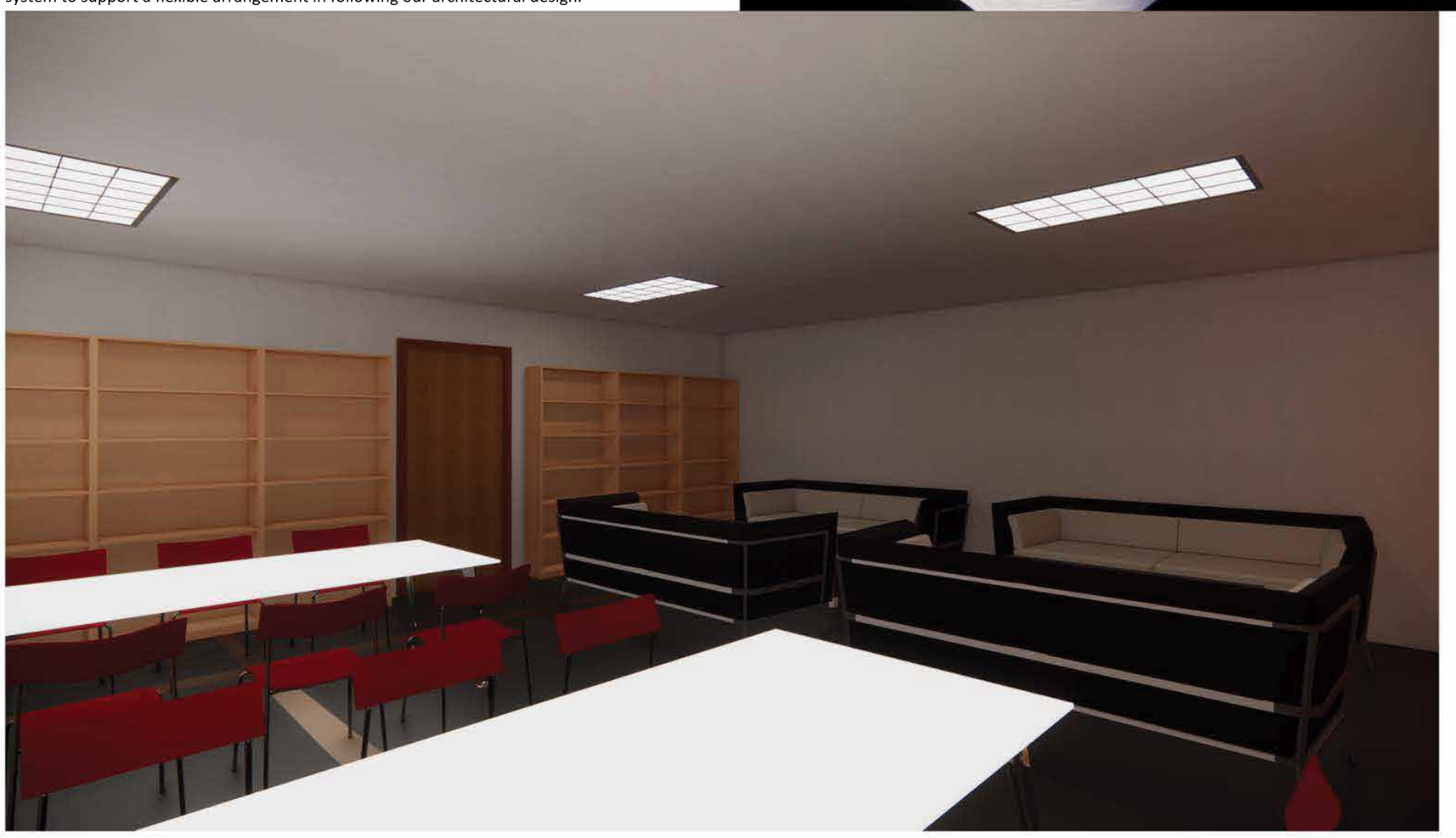
Computational Design

From the beginning, our hand sketch concept was translated into a massing model in Revit. We then modified the overall shape after a preliminary analysis on solar studies and other related environmental concerns such as wind and its overall height in relation to the hilly site and its surrounding context. One of the BIM software we used is Insight that helps provide solar study analysis for our facade and roof surfaces. We also adjusted the size of the massing to fit with the required programs, mainly focusing to fit the 200+ hostel rooms in a way that allows for MIC assembly by stacking.



Perspective View of Engineering Elements (Lighting Devices)

The illustration above shows the overall lighting system in our architectural building. It is simplified version without the circuits as these are our architectural team's advice on the lighting solution which we have tested to work quite well as shown in the rendering on the bottom right. For our structural strategy, we have decided to use mainly columns that are laid out in a grid like system to support a flexible arrangement in following our architectural design.



Internal Perspective (Engineering Elements - Lighting Device)

Sectional Perspective