CIC BIM Competition 2024 – HKMU BIM Team

Location Plan 1:2000

About the Project Development

Design Concept:
In this competition, we are tasked with designing a new multi-purpose hub in the original area of Zero Carbon Park. This hub will provide diverse educational spaces for traditional and experiential learning, fostering a culture of creativity and collaboration among students, teachers, and experts.
The proposal aims to foster innovation by creating a hub for interdisciplinary knowledge exchange in, not limited to Smart City and IoT Technology, AI and Robotics, and Carbon Neutrality.

Building Form:
Hexagon is the key component in the design concept. The source of inspiration is from the Sai Kung Volcanic Rock Geopark. We want a signature nature landscape in Hong Kong that could be migrated in the center of this concrete jungle, Hong Kong.
The original underground area will undergo minimal changes. The Biodiesel Tri-Generator and Adsorption Chiller will remain in their current locations, as they are the major sources of carbon reduction in Zero Carbon Park.

Spatial Arrangement:
We put the heavier loading areas in the lower level as the structure consideration. Lifts and stairs are built in the middle to ensures easy access and efficient navigation for individuals. Path on both sides of the entrance were open to increase pedestrian convenience and accessibility.

Connectivity:
Two 10-passenger lifts and a 2.5m staircase are installed in the middle of the designed building to provide an effective way for students and teachers to travel between different levels.
Serval back doors are installed in different rooms of the designed building to provide a convenient path for evacuation and emergency exit.
The paths for pedestrians and vehicles are separated to prevent accidents.

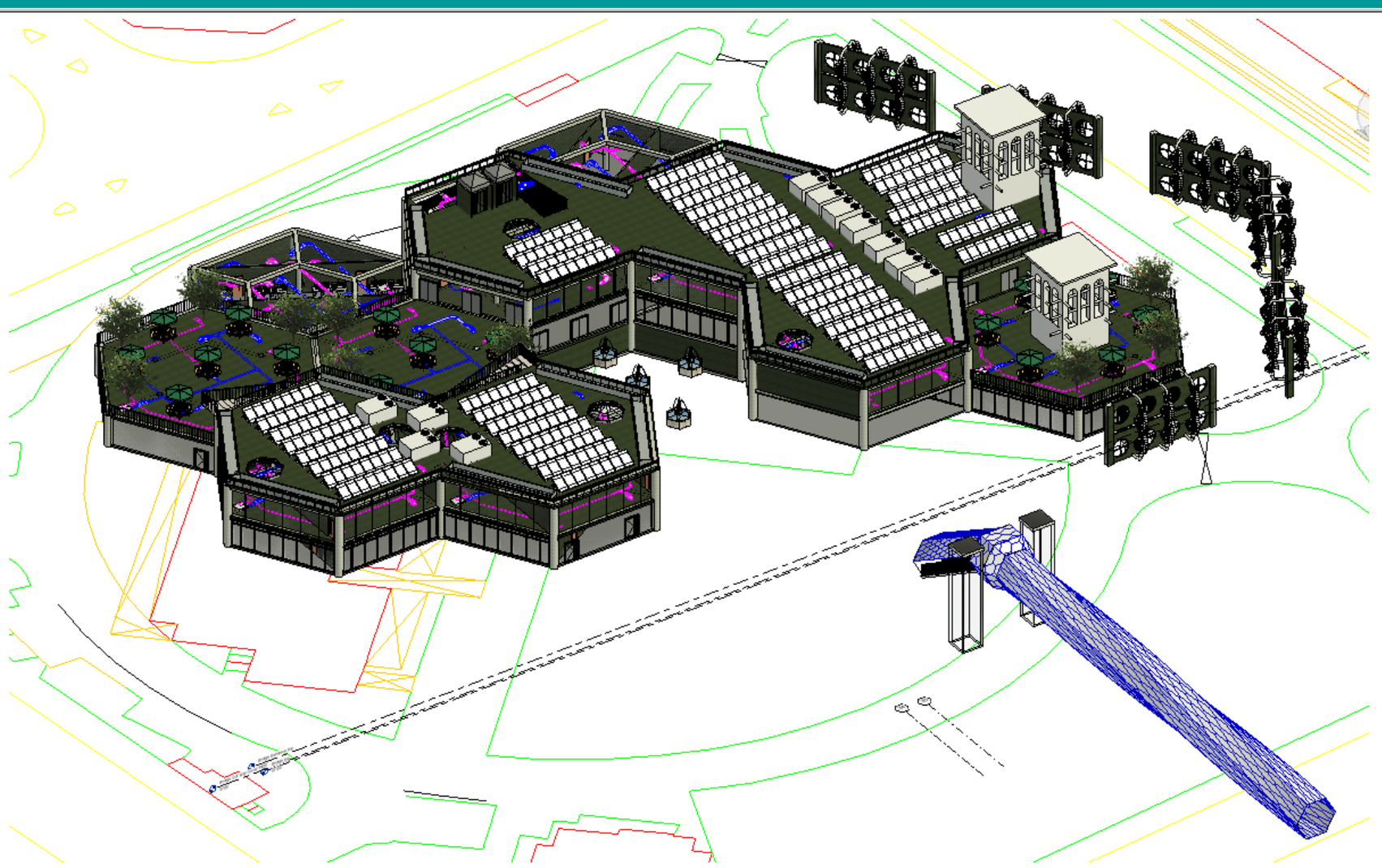
BIM Uses in Design, Coordination, Engineering, Analysis and Optimisation:
AutoCAD and Revit were primarily used in our project. We create sketches and calculate floor plans using AutoCAD because it is a two-dimensional drafting application, making it easier to revise drafts in the early stages. The model documents were shared via Autodesk360, which provides a convenient coordination cloud that saves us significant time. This platform not only includes building modeling but also safety management, cost management, time management, and more. We also shared some of the information and references on Google Drive as it is easy to access.

BIM Collaboration Approach:
Autodesk360 was used to share the Revit file of the BIM model among colleagues.
Google Drive was used to share Excel, PowerPoint, and Word files among colleagues.
IN Revit and AutoCAD, files and updates were synchronized to the central storage system and shared between colleagues.

Sustainability:
Sustainable design aims to build a ecological sustainable area by minimizing the energy usage in the building to improve the health and comfort of guests. The designed building uses passive and active technology design to reduce energy use in constant temperature system and illumination.
Green roof and double-glazing curtain walls and windows are used to reduce indoor temperature in the summer while warming the environment by retaining heat in the winter through conduction. In the lower ground area, adjustable sun visors are implemented to control brightness of sunlight reflection for indoor illumination and heat transfer.

Constructability:
Construction auxiliary equipment, such as wearable human augmentation, construction robots and carbon neutral building materials, can be put into use while construction to reduce construction damage to laborer while shorten the construction time.
AutoCAD and Revit are used as the analytical tool to create the accurate virtual model while foresee the potential issues that may happpen in the simulated environment. MiC and DfMA has been used to build part of the construction to reduce construction cost and time, decrease waste and assure quality.

Summary:
With the aid of BIM, engineers can work on shared digital files through centralized information. Able to make informed decisions, optimize designs, and identify potential issues early in the process.
The Revit ‘s functions of carbon calculation, sun path and solar radiation study, temperature, and wind rose study helps in the overall process of the project through the reality visualization.



Overall Bird Eye view: The designed building will be located in the Zero Carbon Park (ZCP) at 8 Sheung Yuet Road, Kowloon Bay, Hong Kong. As one of the signature natural features of Hong Kong, the outcropped rhyolitic volcanic hexagonal rock columns of Sai Kung Volcanic Rock Geopark has inspired us to create a building with hexagon components of different heights.

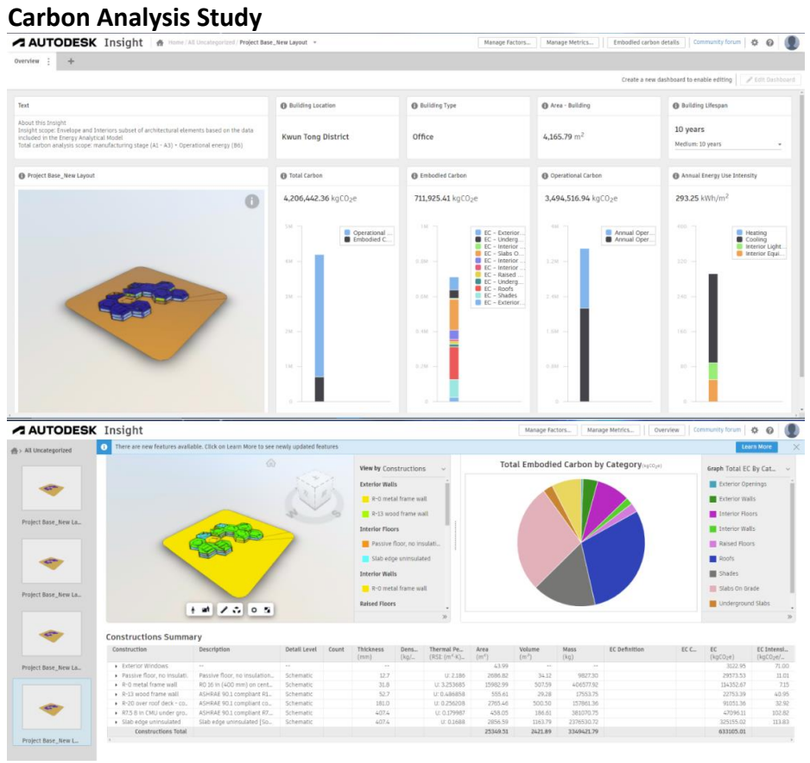
Elevation draw, section diagram

<Schedule of Accommodation>

A	B
Name	Area
IT Lab 2	104 m²
IT Lab 1	101 m²
Studio 1	154 m²
Studio 2	156 m²
Training Workshop 2	155 m²
Training Workshop 1	155 m²
IT Lab 4	100 m²
IT Lab 3	103 m²
Cafe	51 m²
Administrative Office	315 m²
Resource Center	259 m²
Library	260 m²
Meeting and Learning Space	796 m²
Exhibition Gallary	262 m²
Performance Space	259 m²
Conference Hall and Arena	261 m²
Classroom 4	104 m²
Classroom 3	104 m²
Classroom 1	102 m²
Classroom 2	103 m²
Entrance	248 m²
Cafe	55 m²

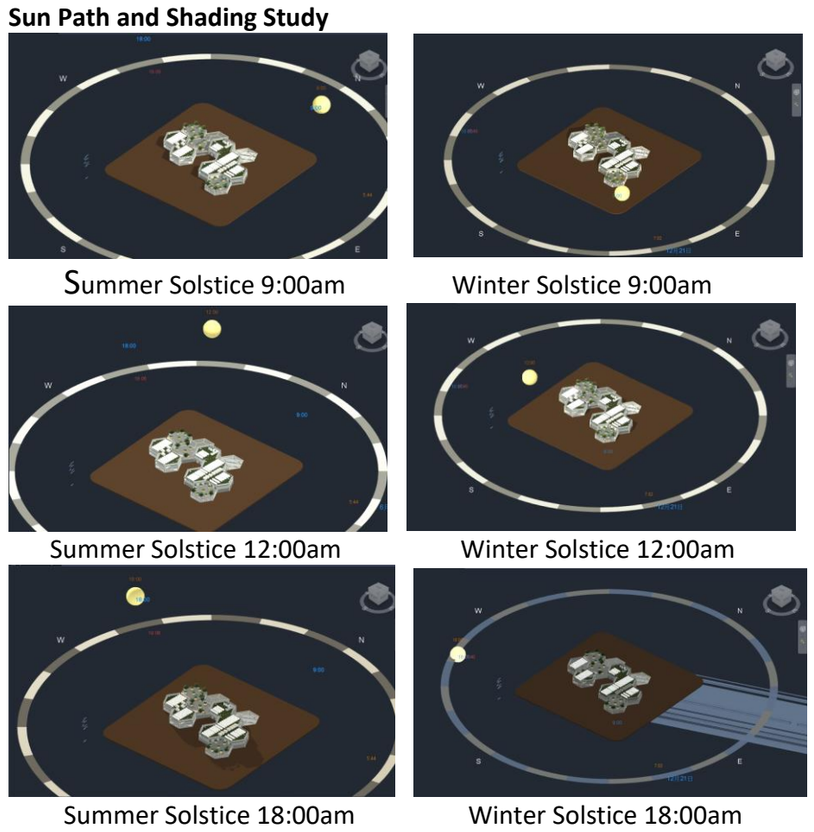
Building Form and Space: The areas with heavier loading or often used will be set on the ground floor for structural consideration and users’ convenience. Areas open to the public with lighter loading will be placed in lower ground and first floor.

Carbon Analysis Study



Quality: With the aid of Revit, a realistic 3D model of the building can be built and previewed on the computer. The Spatial Arrangement, pipelines, HVAC, and sun path modification are able to simulate and demonstrate.

Sun Path and Shading Study



Summer Solstice 9:00am
Winter Solstice 9:00am
Summer Solstice 12:00am
Winter Solstice 12:00am
Summer Solstice 18:00am
Winter Solstice 18:00am

Sustainability: With the consideration of maximizing the usage of natural lighting resources while minimizing the thermal energy transmission to indoor, studies of sun path, sun shading, sunlight hours, and solar radiation in Hong Kong are considered in our design.

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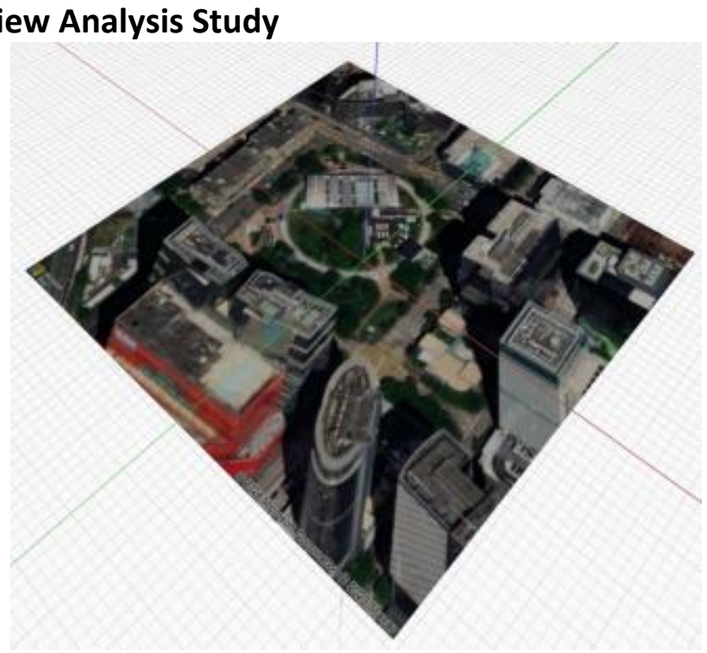
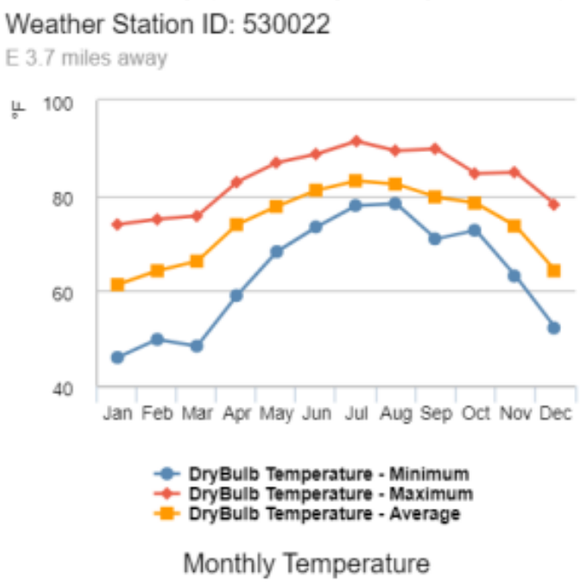
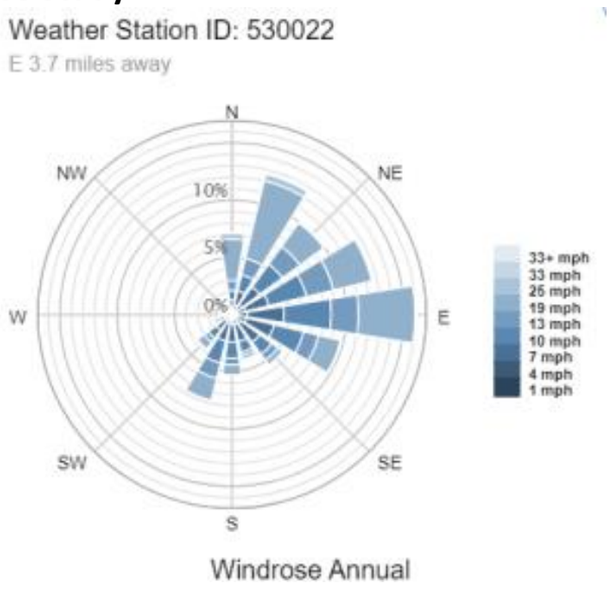
View Analysis Study



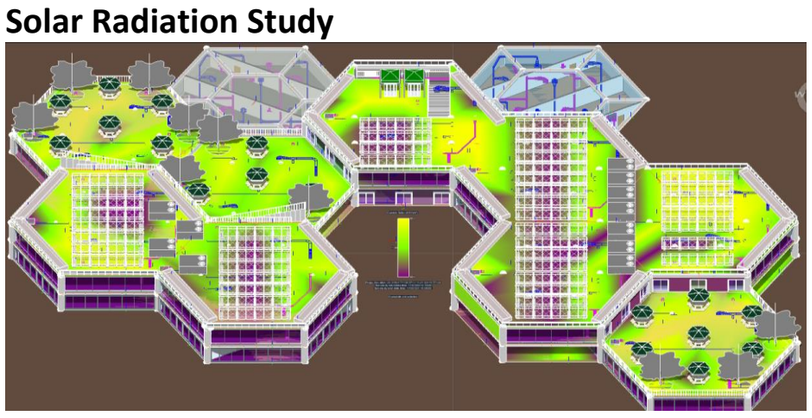
Temperature Study (Monthly Temperature)



Wind Rose Study



Solar Radiation Study



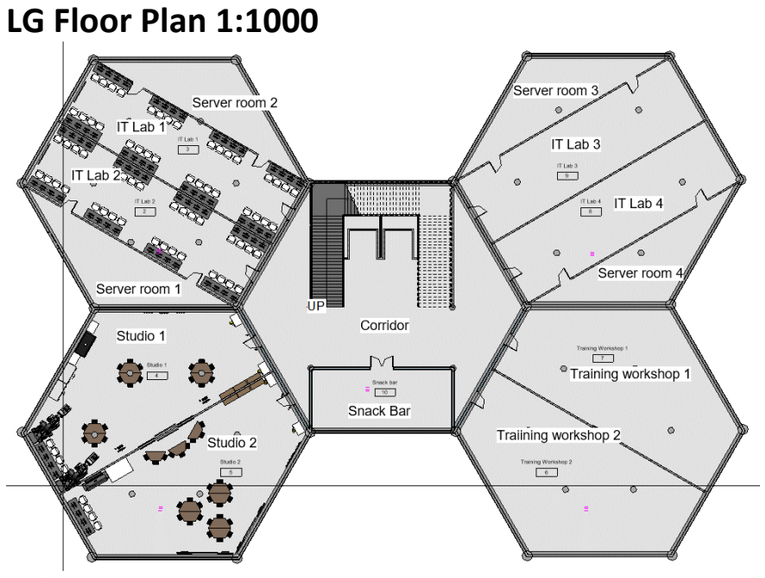
Computational Design: Guests can learn about the environmentally friendly and sustainable design while walking through entrance. Lifts and stairs are in the middle of the buildings towards different areas, providing an effective way for students and teachers to travel between different levels.

Considering the loading of the area, the administrative office is used daily while the classroom is only being used when guests come, therefore it is better to put the heavier loading on a lower level.

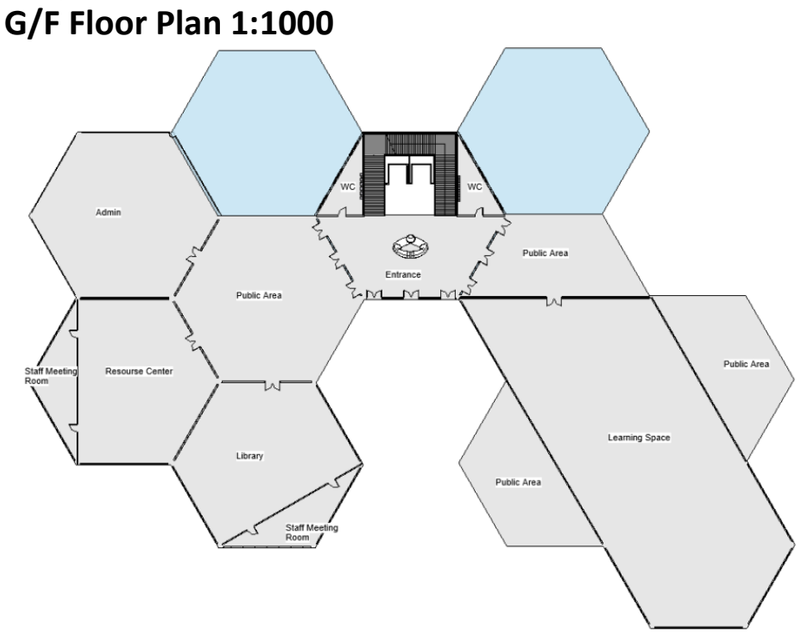
In order to increase pedestrian convenience, the paths on both sides of the entrance are opened so that pedestrians can get into the building from different directions or pass through the middle of the building as a shortcut.

Perspective View: To maximize the usage of natural lighting and improve the air circulation, double glazing glass curtain walls will be installed in most of the exterior walls and a tunnel-like platform is constructed in

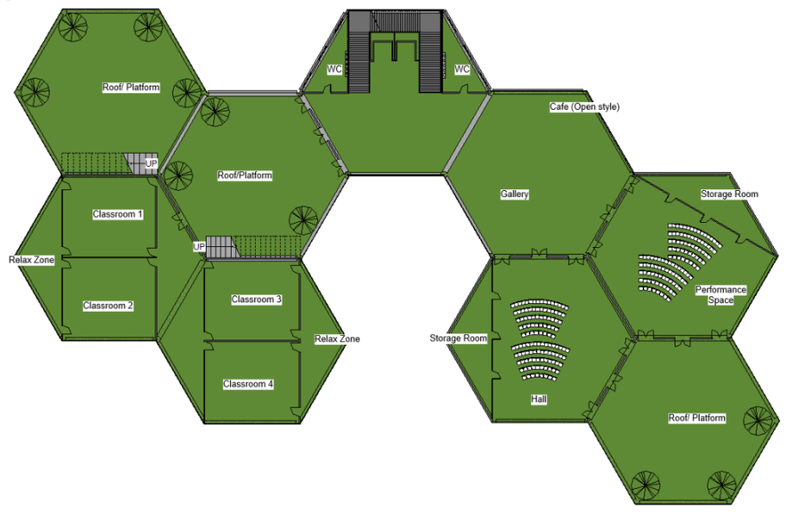
LG Floor Plan 1:1000



G/F Floor Plan 1:1000



1/F Floor Plan 1:1000

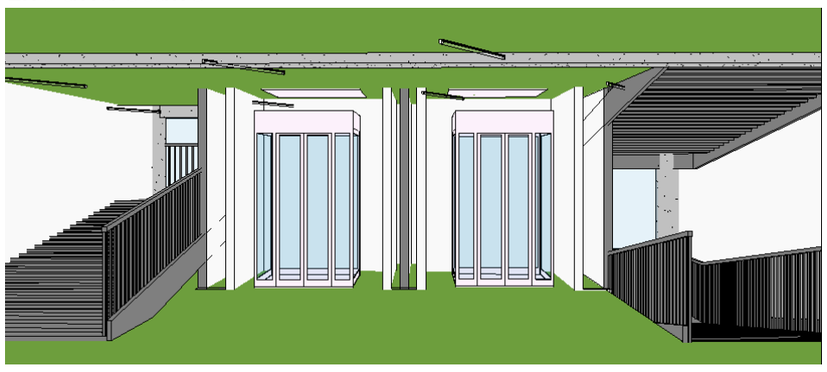


Internal Perspective 1:1000

Front Door

Back to Left View

Lift and stairs



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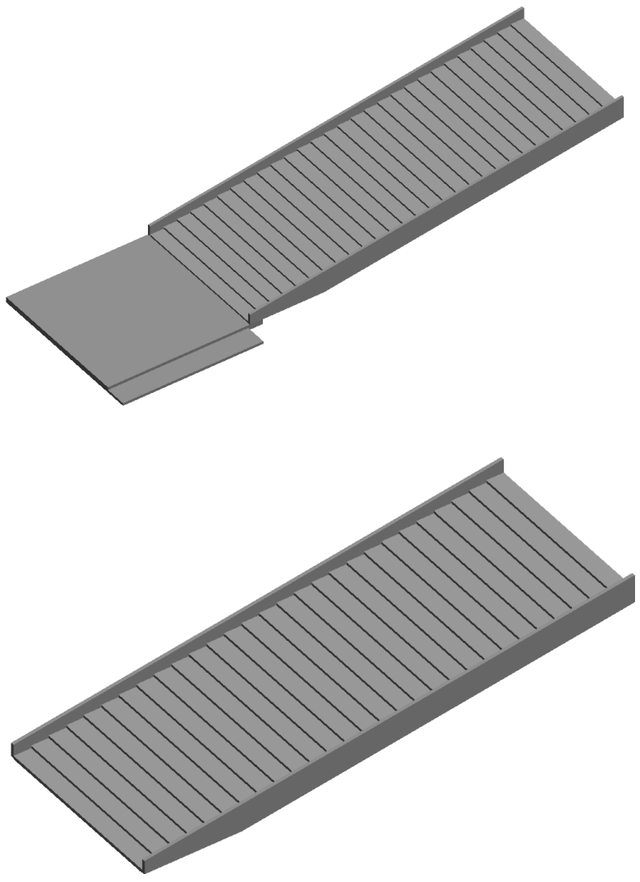
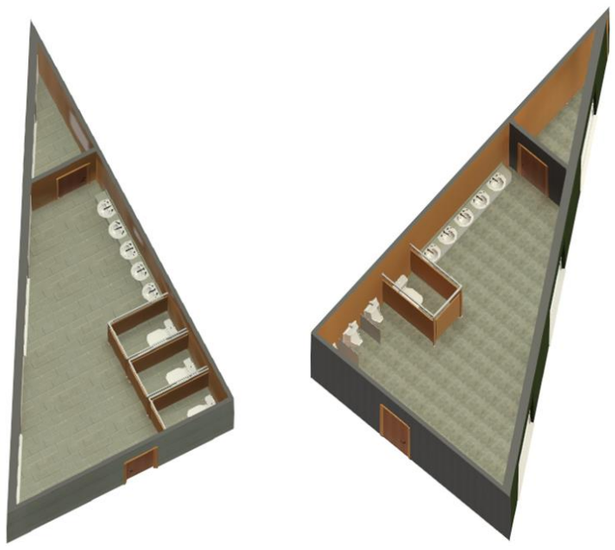
DfMA of Stairs



MiC of Toilet

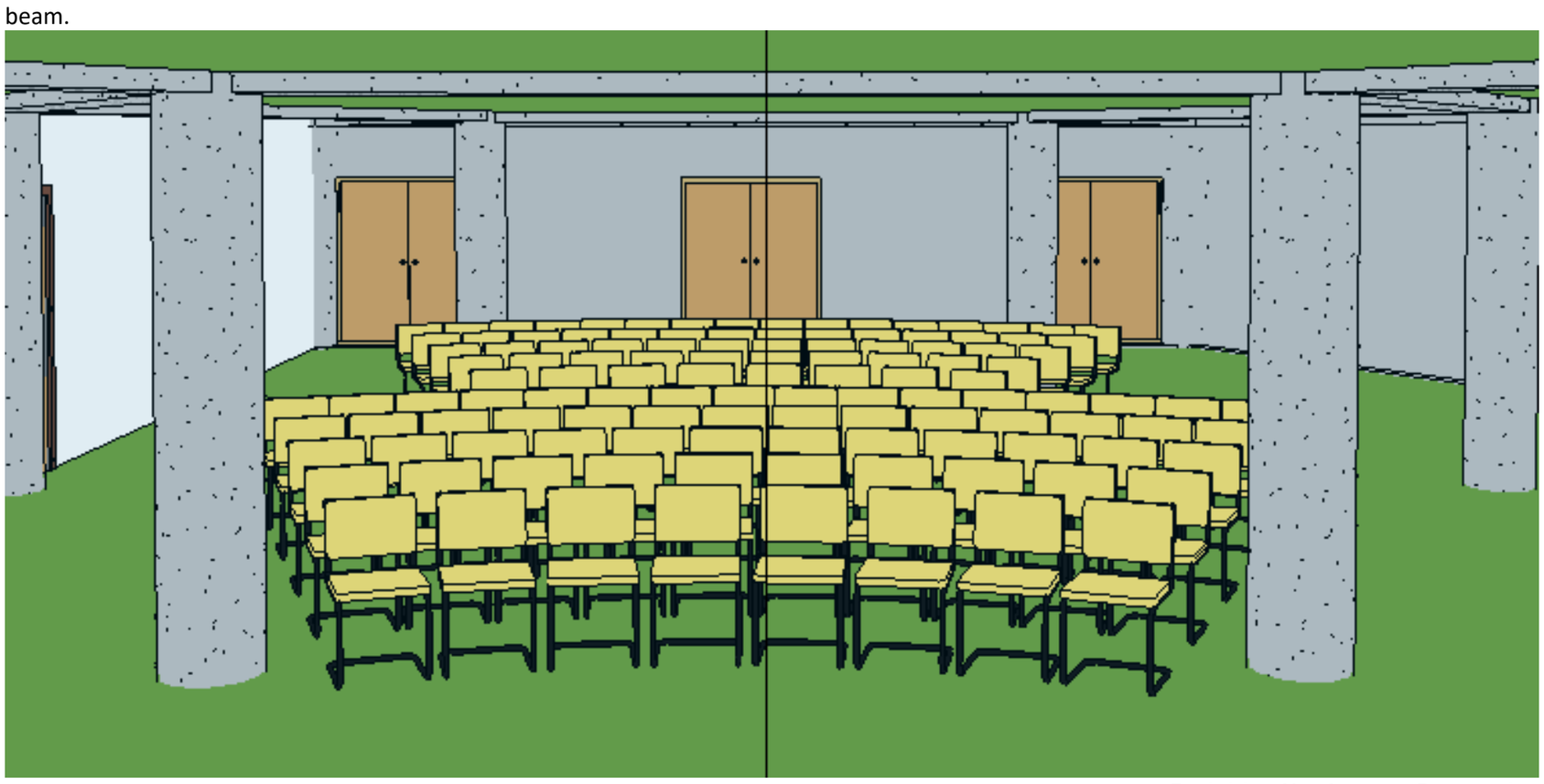
Left(Female) Right(Male)



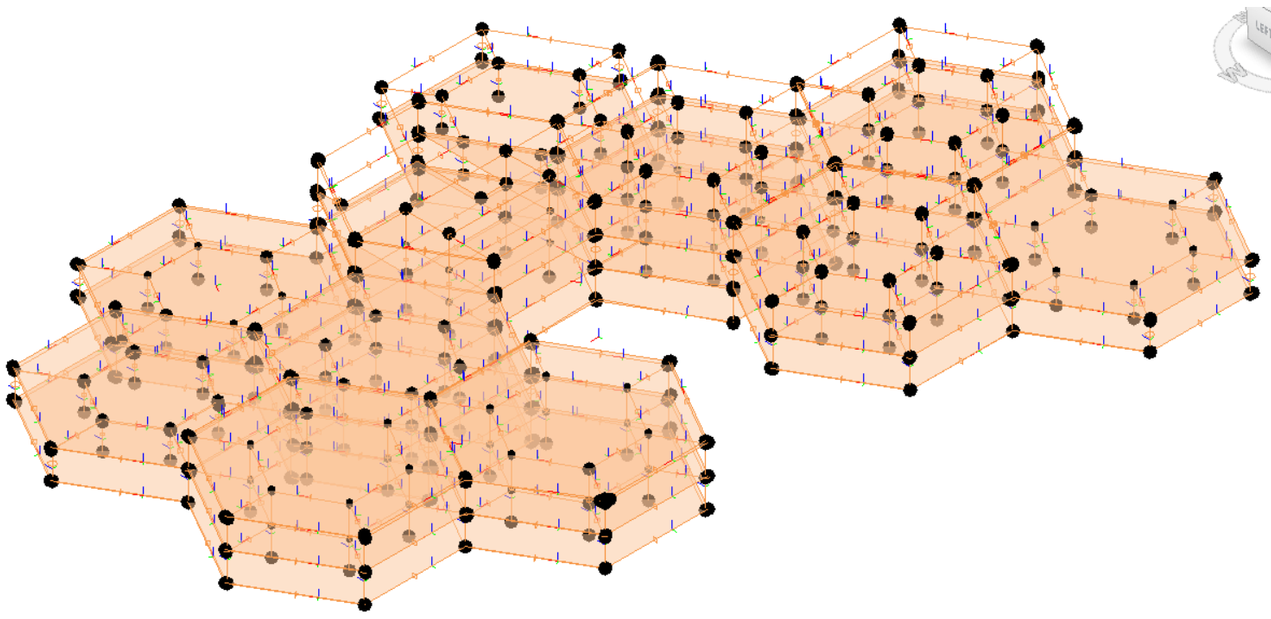
Innovation Technologies: MiC and DfMA are used to manufacture identical building blocks and components off-situ, including washrooms and stairs, in the construction process. It optimizes the construction cost, components quality and time consumed.

Information Technology Lab and Studio (Stream Room) Internal Perspective

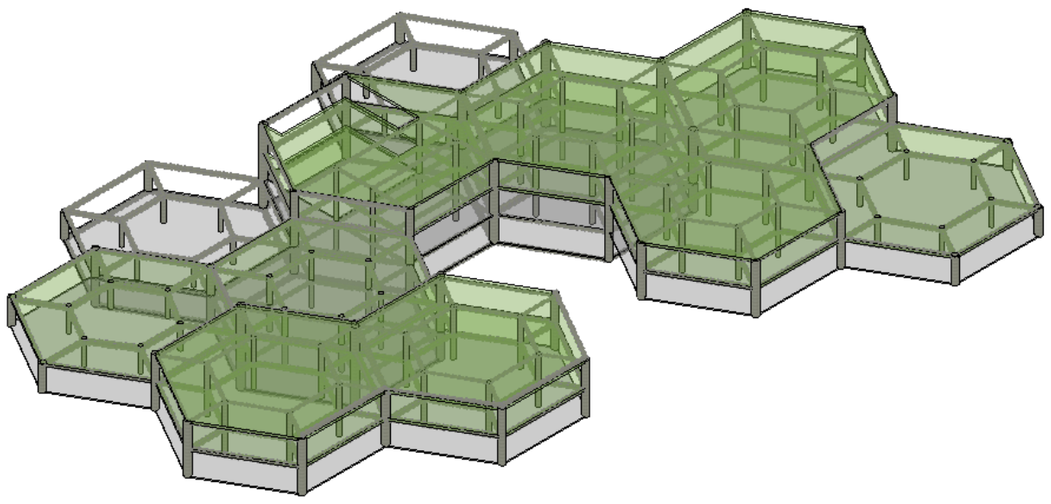
Perspective View: Due to the hexagon shaped design, cylinder columns are primarily used to provide supports and connect non-perpendicular beam.



Exhibition Hall Internal Perspective



Sectional Perspective



Sectional Perspective

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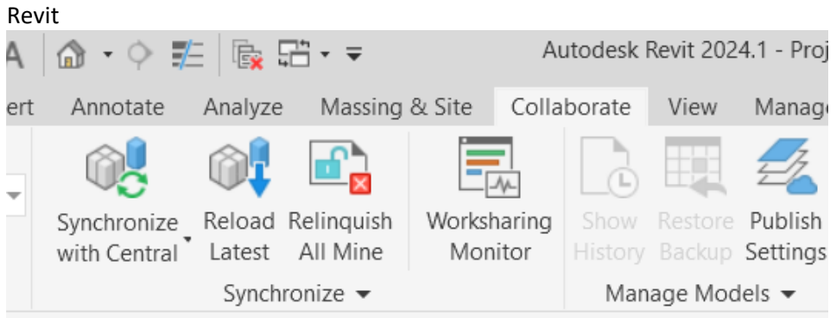
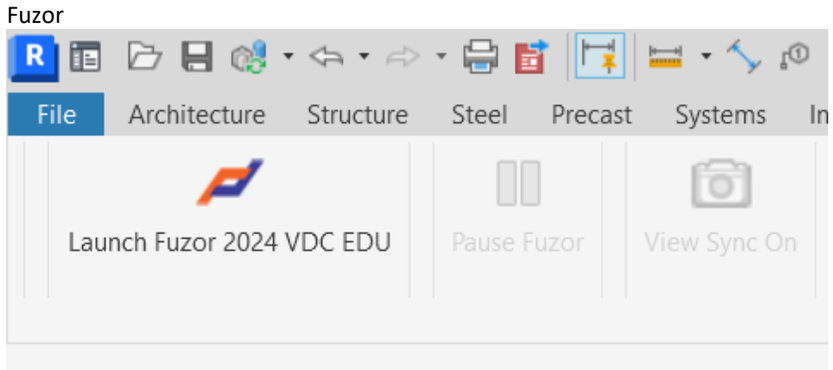
CDE

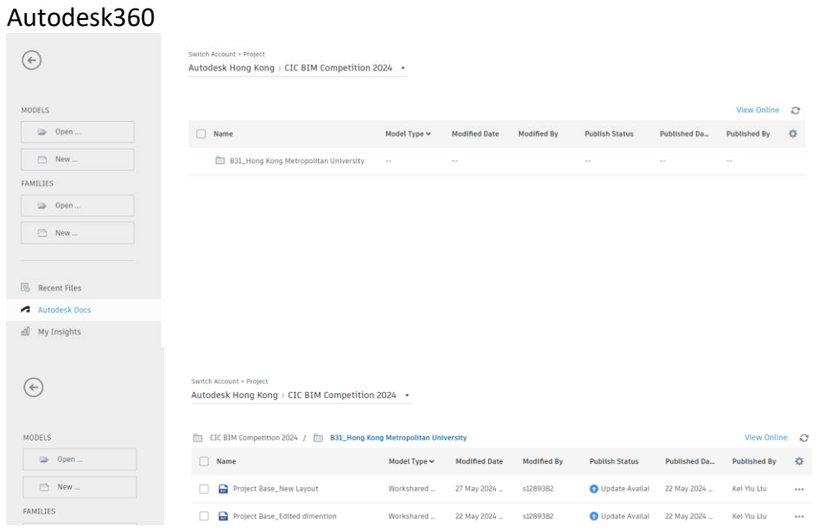
Revit



Fuzor



Autodesk360



Software Used in Design Process

AUTODESK Revit

AUTODESK

AutoCAD

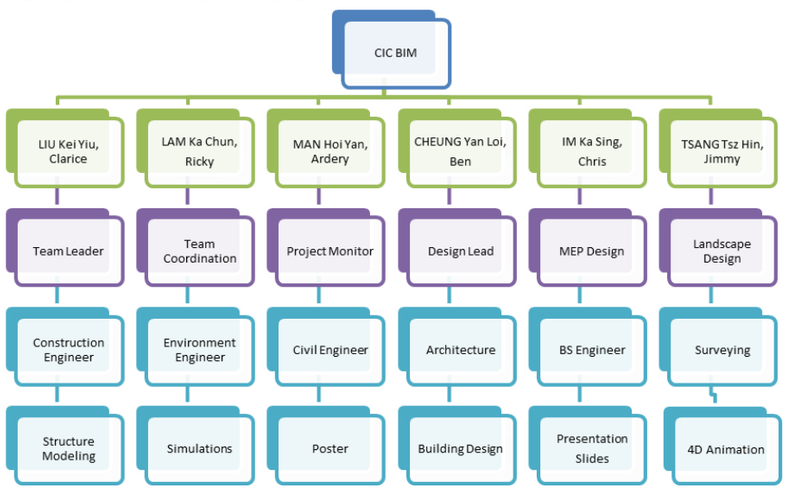
SketchUp

AUTODESK® INSIGHT 360™

Fuzor

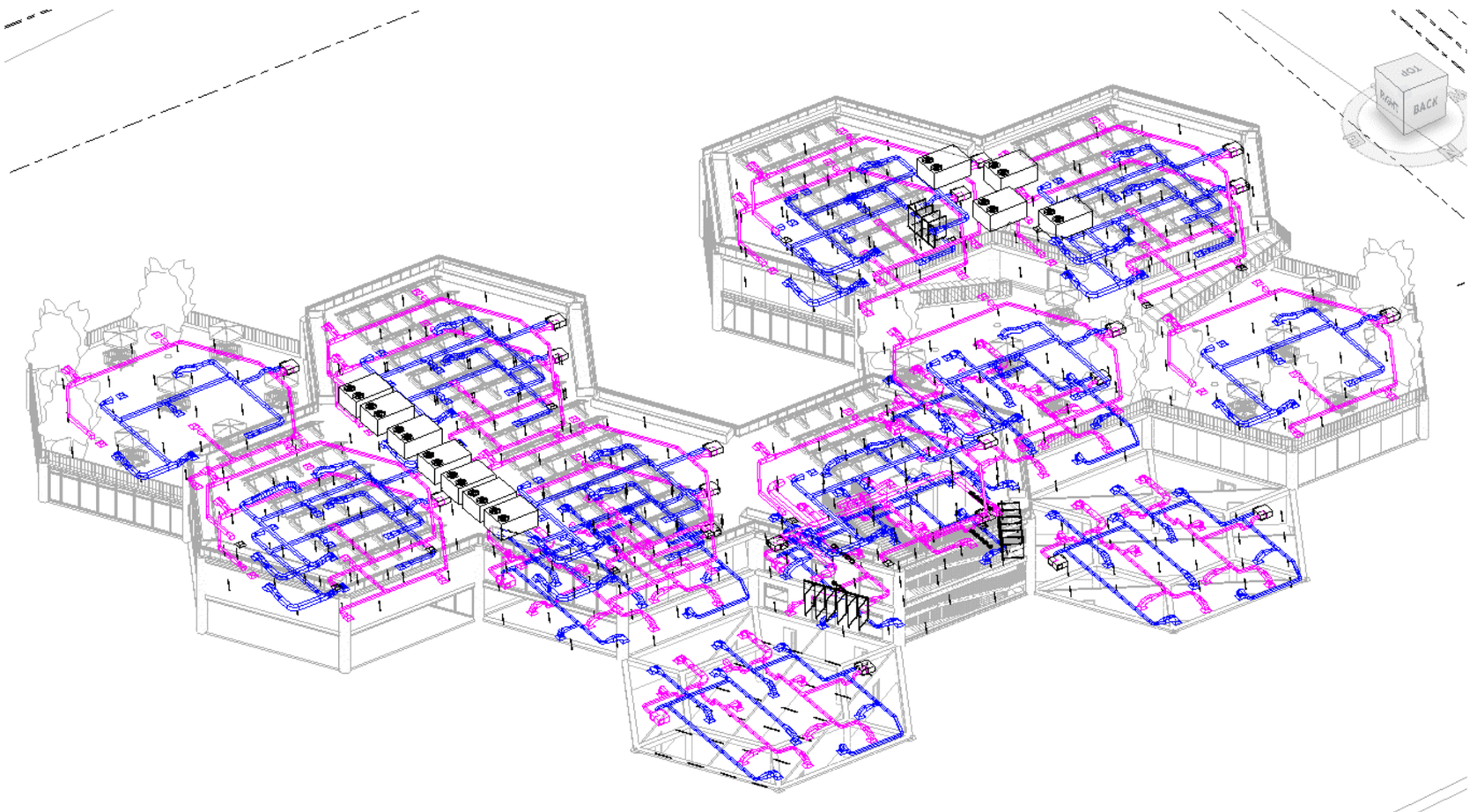
blender

Work Breakdown Structure



Project Team Collaboration: In the beginning of designing phase, Blender and Sketch up were used to design the general appearance of the building. AutoCAD and Revit were used to further detailed the floor plan and create the BIM model.

Perspective View: The building services facilities in the proposed design have been designed to optimize the environmental sustainability, energy efficiency, and functionality.



HVAC Distribution