NEXUS

SHAPING THE NEXT GENERATION OF COTTON

Mostafa Yasser - 1200279
Dr. Ingy El Baramelgy

PROBLEM STATEMENT

High water consumption for cotton.
Cotton uses a lot of water (8,000 to 20,000 liters / 1 kg) ; Tanta is in the Nile Delta where water is limited and climate change affects rainfall.

Water Stress
Tanta is experiencing increasing water stress due to rising demand, limited freshwater resources, and declining water quality, creating pressure on the city's ability to meet current and future water needs sustainably.

CONCEPT

Regenerating Egyptian Cotton from research on drought-resistant cells, sustainability, and water recycling, this expressed physically through overlapping, interlocking, and dynamic architectural forms, where every floor, terrace, and channel represents a stage in the research and the process.

KEYWORDS

- OVERLAPPING
- INTERLOCKING
- DYNAMIC
- CONNECTIVITY

PROGRAM ANALYSIS

Interactive learning spaces that educate visitors about cotton, its history, uses, and the challenges of water scarcity and climate change.

Controlled testing areas where cotton is studied under different environmental and irrigation conditions.

Restaurants, workshops, and exhibition areas designed to engage the community and connect the public with cotton innovation.

Two experimental towers: one uses freshwater, while the other uses recycled greywater to compare cotton growth and water efficiency.

Specialized labs focused on developing drought-resilient cotton and improving sustainable cultivation methods.

A closed-loop system that collects, treats, and pumps greywater to the towers for cotton agricultural experimentation.

TAREGET USERS

SCIENTISTS & RESEARCHERS

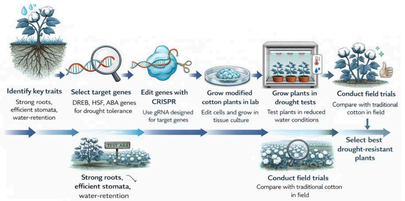
STUDENTS

CITIZENS AND LOCAL PEOPLE

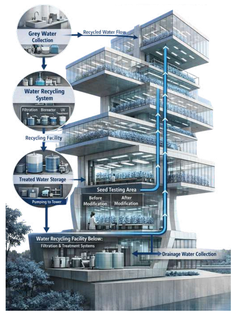
PROFESSORS

FARMERS

COTTON & GREY WATER PROCESS

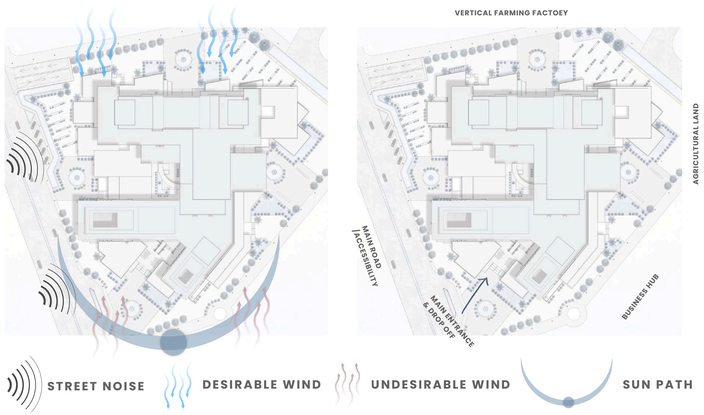


COTTON PROCESS FLOW

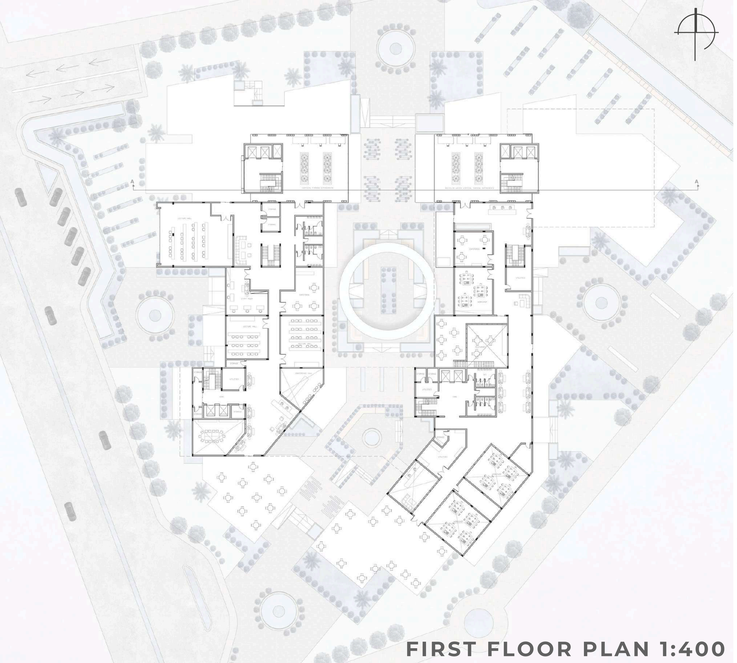


GREY WATER RECYCLE

SITE ANALYSIS

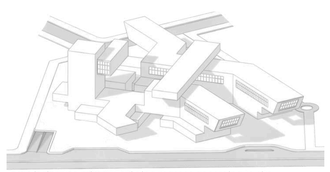


GROUND FLOOR PLAN 1:200

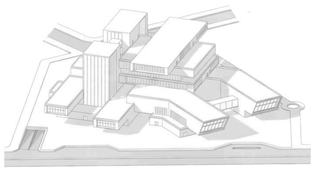


FIRST FLOOR PLAN 1:400

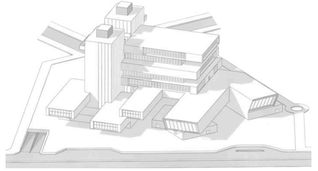
FORM GENERATION



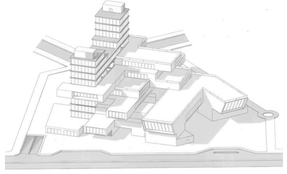
Establishing the primary building masses according to site boundaries, access points, circulation axes, and environmental orientation.



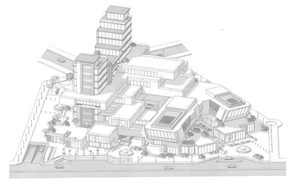
Organizing the main research functions into separate interconnected volumes to improve circulation, accessibility, and functional zoning.



Introducing vertical elements and central cores to accommodate administration, laboratories, and shared research facilities while enhancing spatial hierarchy.

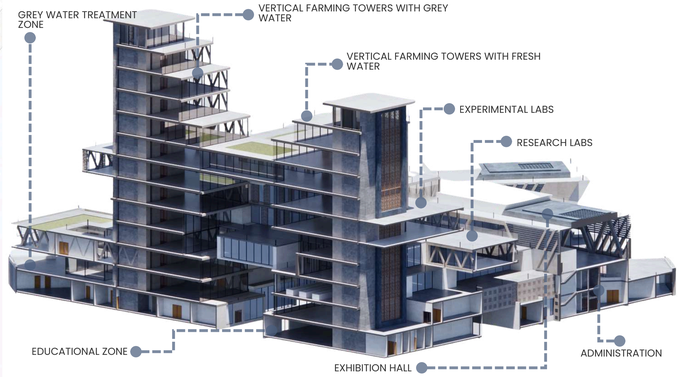


Stepping and articulating the masses to create shaded terraces, improve natural lighting and ventilation, and reduce visual bulk.



Integrating landscape, public spaces, circulation networks, and sustainable design strategies to achieve the final research centre form and identity.

3D ZONING



MATERIALS

EXPOSED CONCRETE expresses solidity and permanence while reinforcing the modern architectural identity of the research center. Its thermal properties also help regulate indoor temperatures in Tanta's climate.

GLASS CURTAIN WALLS
Extensive glass façades maximize daylight within laboratories and exhibition spaces, creating transparent and visually connected environments that showcase the research activities inside.

MASHRABIYA SCREENS
Inspired by traditional Egyptian architecture, the louvers maintain a contextual connection to Tanta while filtering sunlight, improving privacy, and creating dynamic façade patterns.

STONE CLADDING enhances the contemporary identity of the research center while adding durability, texture, and visual contrast with the lighter building masses.

MAIN LOUVRE STUDY

Primary Structural Preparation

Concrete façade opening and slab edges are completed to establish fixing points for the louvre support system.

Steel vertical support members are installed between floor slabs to create the primary structural framework.

Lateral restraint brackets are fixed to the building structure to reduce deflection and resist wind loads.

Secondary Framing Installation

Primary steel members are secured to the slab using anchored base plates and high-strength bolts.

Secondary horizontal members connected to the vertical structure to create a rigid support grid.

Additional support rails and connection points are installed to receive the decorative screen panels.

Louvre System Integration

Prefabricated perforated louvre panels are lifted into position and attached to the support frame.

Remaining louvre modules are installed sequentially to complete the façade composition.

Hidden fixing components secure the decorative screens while maintaining a clean architectural appearance.

Final Structural Fixing & Completion

Base connections transfer gravity and lateral loads from the louvre assembly into the primary structure.

Adjustable head connections accommodate construction tolerances and thermal movement.

Fully assembled louvre installation providing solar control, privacy screening, and architectural expression.

LAYOUT 1:700

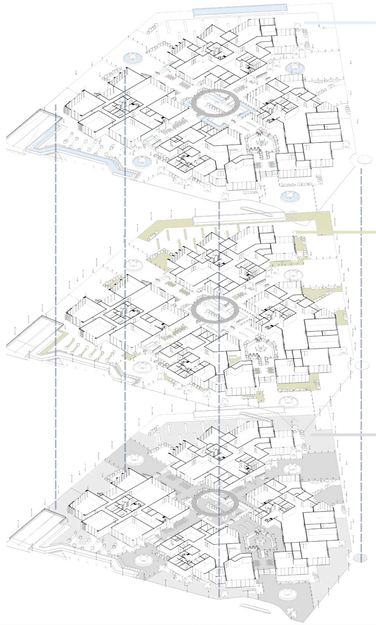
BIRD'S EYE VIEW

EXHIBITION EXTERIOR SHOT

SECTION A-A 1-200

ELEVATION A-A 1-200

LANDSCAPE ANALYSIS



WATER FEATURES

Integrated fountains and linear water elements enhance the sensory experience of the landscape, create a calming public atmosphere, and contribute to passive cooling within the outdoor gathering spaces of the research center.

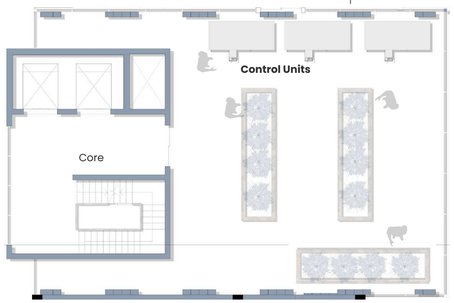
GREEN SPACES

Distributed landscape pockets and shaded planted zones improve microclimate conditions, enhance biodiversity, and create healthy outdoor environments that connect research, education, and public interaction.

OUTDOOR PLATFORMS AND PATHWAYS

A continuous network of outdoor terraces, shaded walkways, and public platforms connects the exhibition spaces, research facilities, and farming zones while guiding visitors through an interactive educational journey.

VERTICAL FARMING UNIT

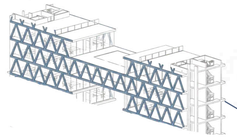


Cotton Experimental zone

STRUCTURAL ANALYSIS

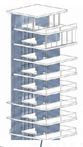
SKYBRIDGE

The skybridge is supported through steel space trusses connected to the primary tower structures. Loads generated by occupants and bridge self weight are transferred through the truss system into the reinforced concrete cores and diagrid frames of both towers.



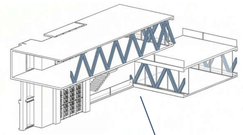
CORE SYSTEM

Reinforced concrete cores contain elevators, staircases, service shafts, and mechanical systems. The cores act as the primary vertical load-bearing and lateral resisting elements.



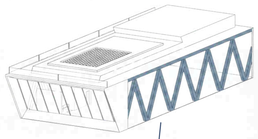
CANTILEVER ANALYSIS

These cantilevered sections are supported using steel transfer girders and deep truss members integrated within the floor structure.



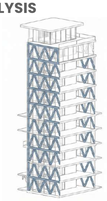
EXHIBITION HALL

The double-height exhibition hall is expressed as a cantilevered volume supported by an external steel diagrid system, enabling large column-free interior spaces while efficiently transferring structural loads back to the primary building frame.



TOWERS' ANALYSIS

The towers utilize a 3D space truss structural system that distributes loads through triangulated steel members working in axial forces, providing high rigidity, structural redundancy, and optimal performance under gravity and lateral loads.

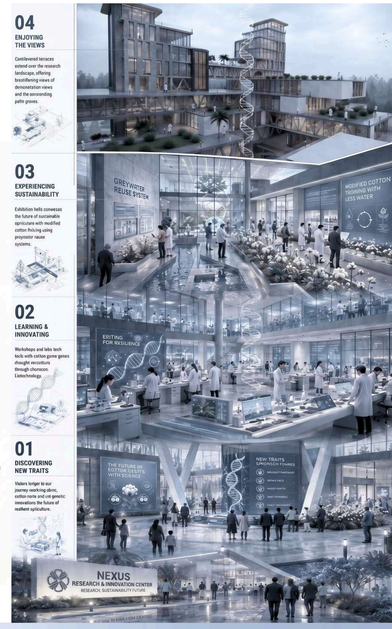


PODIUM FLOOR

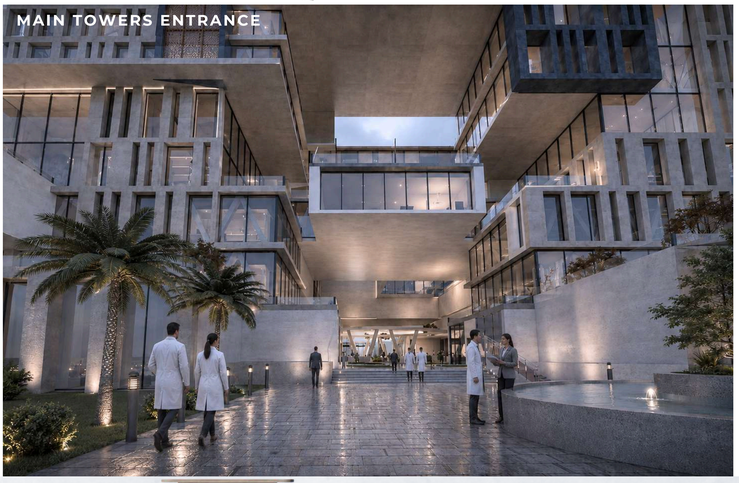
The ground floor and first floor utilize a conventional reinforced concrete beam-and-column structural system, providing a stable load-bearing framework for the podium levels.

3D-SECTION

USER EXPERIENCE



MAIN TOWERS ENTRANCE



EXHIBITION HALL INTERIOR SHOT

MAIN COURT SHOT

SECONDARY COURT SHOT

ELEVATION B-B 1-200

MAIN TOWERS SHOT

MAIN RESEARCH SHOT

CANTILEVERS SHOT

EXPERIMENTAL GREEN ROOFS

NEXUS

SHAPING THE NEXT GENERATION OF COTTON

Mostafa Yasser - 1200279

Dr. Ingy El Barameigy

PROBLEM STATEMENT

High water consumption for cotton.
Cotton uses a lot of water (5,000 to 20,000 liters / 1 kg) . Tanta is in the Nile Delta where water is limited and climate change affects rainfall.

Water Stress
Tanta is experiencing increasing water stress due to rising demand, limited freshwater resources, and declining water quality, creating pressure on the city's ability to meet current and future water needs sustainably.

CONCEPT

Regenerating Egyptian Cotton from research on drought-resistant cells, sustainability, and water recycling, this expressed physically through overlapping, interlocking, and dynamic architectural forms, where every floor, terrace, and channel represents a stage in the research and the process.

KEYWORDS

- OVERLAPPING
- INTERLOCKING
- DYNAMIC
- CONNECTIVITY

PROGRAM ANALYSIS

Interactive learning spaces that educate visitors about cotton, its history, uses, and the challenges of water scarcity and climate change.

Controlled testing areas where cotton is studied under different environmental and irrigation conditions.

Restaurants, workshops, and exhibition areas designed to engage the community and connect the public with cotton innovation.

Two experimental towers: one uses freshwater, while the other uses greywater to compare cotton growth and water efficiency.

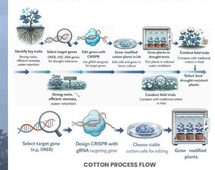
Specialized labs focused on developing drought-resistant cotton and improving sustainable cultivation methods.

A closed-loop system that collects, treats, and pumps greywater to the towers for cotton agricultural experimentation.

TAREGET USERS

SCIENTISTS & RESEARCHERS · STUDENTS · CITIZENS AND LOCAL PEOPLE · PROFESSORS · FARMERS

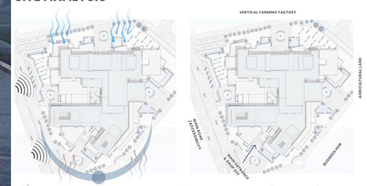
COTTON & GREY WATER PROCESS



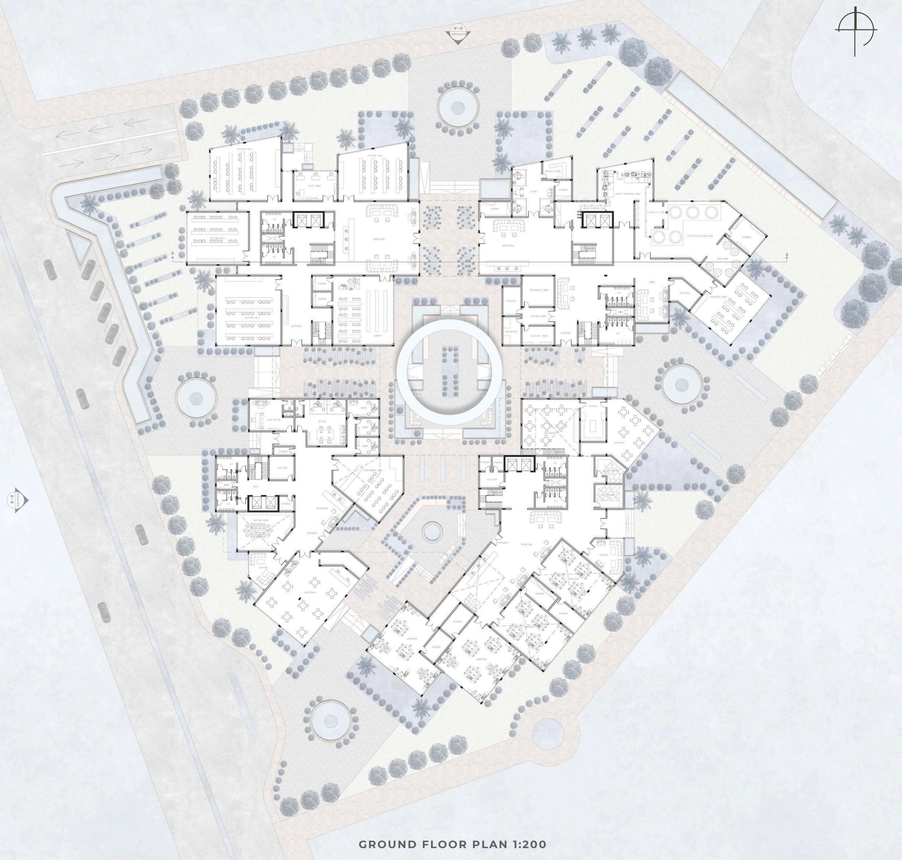
COTTON PROCESS FLOW

GREY WATER RECYCLE

SITE ANALYSIS

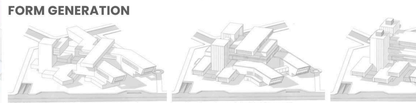


STREET NOISE · DESIRABLE WIND · UNDESIRABLE WIND · SUN PATH



GROUND FLOOR PLAN 1:200

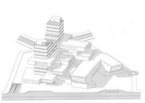
FORM GENERATION



Establishing the primary building masses according to site boundaries, access points, circulation axes, and environmental orientation.

Organizing the main research functions into separate, interconnected volumes to improve circulation, accessibility, and functional zoning.

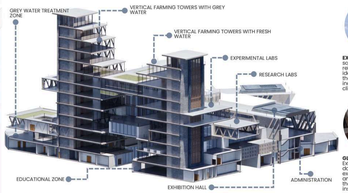
Introducing vertical elements and central cores to accommodate administration, laboratories, and shared research facilities while enhancing spatial hierarchy.



Stepping and articulating the masses to create shaded terraces, improve natural lighting and ventilation, and reduce visual bulk.

Integrating landscape, public spaces, circulation networks, and sustainable design strategies to achieve the final research centre form and identity.

3D ZONING



MATERIALS

EXPOSED CONCRETE expresses solidity and permanence while reinforcing the modern architectural identity of the research center. Its thermal mass helps stabilize indoor temperatures in Tanta's climate.

GLASS CURTAIN WALLS on the upper levels maximize daylight while laboratories and exhibition spaces, creating transparent and visually connected environments that showcase the research activities inside.

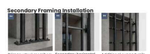
MASHRABIYA SCREENS inspired by traditional Egyptian architecture, the louvers maintain a constant connection to Tanta while filtering sunlight, improving ventilation, and creating dynamic facade patterns.

STONE CLADDING enhances the contemporary identity of the research center while adding durability, texture, and visual contrast with the lighter building masses.

MAIN LOUVRE STUDY

Primary Structural Preparation

Secondary Framing Installation



Louvre System Integration

Final Structural Fixing & Completion

LANDSCAPE ANALYSIS

WATER FEATURES

Integrated fountains and linear water elements enhance the sensory experience of the landscape, create a calming presence, and contribute to microclimatic passive cooling within the outdoor gathering spaces of the research center.

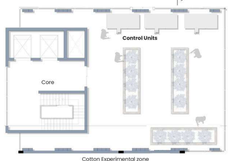
GREEN SPACES

Distributed landscape pockets and shaded planted zones improve microclimate conditions, support biodiversity, and create healthy outdoor environments that connect research, education, and public interaction.

OUTDOOR PLATFORMS AND PATHWAYS

A continuous network of outdoor terraces, shaded walkways, and public platforms connects research spaces, exhibition facilities, and farming zones, while guiding visitors through an interactive educational journey.

VERTICAL FARMING UNIT



STRUCTURAL ANALYSIS

SKYBRIDGE

The skybridge is supported through steel space trusses connected to the primary tower structure. Dead loads from the walkways and bridge self weight are transferred through the truss system into the reinforced concrete cores and diagrid frames of both towers.

CORE SYSTEM

Reinforced concrete cores contain elevators, staircases, service shafts, and mechanical systems. The cores act as the towers' primary gravity-bearing and lateral resisting elements.

CANTILEVER ANALYSIS

These cantilevered sections are supported using steel transfer girders and diagonal members integrated within the floor structure.

EXHIBITION HALL

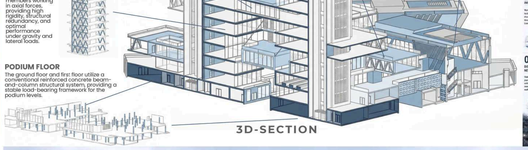
The double-height exhibition hall is expressed as a cantilevered volume supported by an internal steel truss system, allowing a column-free interior spaces while efficiently transferring structural loads back to the primary building frame.

TOWERS' ANALYSIS

The towers utilize a diagrid structural system that distributes loads through triangulated steel members working in axial forces, providing high stiffness, structural redundancy, and optimal performance under gravity and lateral loads.

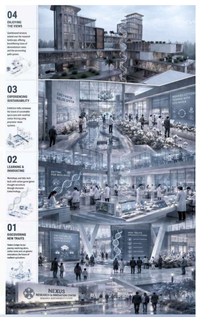
PODIUM FLOOR

The ground floor and first floor utilize a reinforced concrete flat-slab concrete beam-and-column structural system, providing a stable load-bearing framework for the podium levels.



3D-SECTION

USER EXPERIENCE

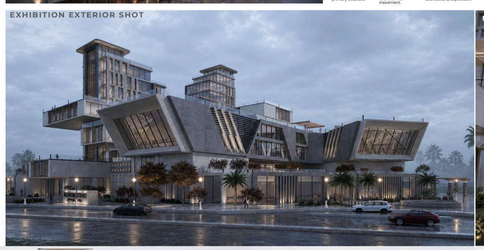


FIRST FLOOR PLAN 1:400

LAYOUT 1:700

BIRD'S EYE VIEW

EXHIBITION EXTERIOR SHOT



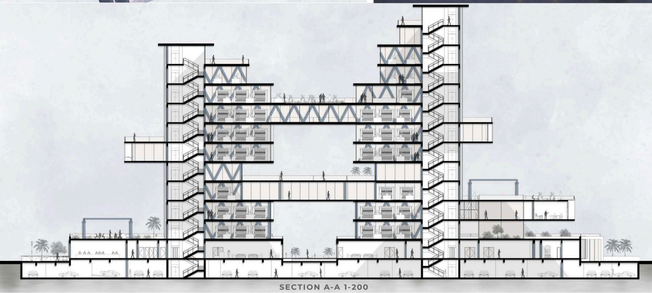
MAIN TOWERS ENTRANCE

EXHIBITION HALL INTERIOR SHOT

MAIN COURT SHOT

SECONDARY COURT SHOT

MAIN TOWERS SHOT



SECTION A-A 1-200

ELEVATION A-A 1-200

ELEVATION B-B 1-200

MAIN RESEARCH SHOT

CANTILEVERS SHOT

EXPERIMENTAL GREEN ROOFS