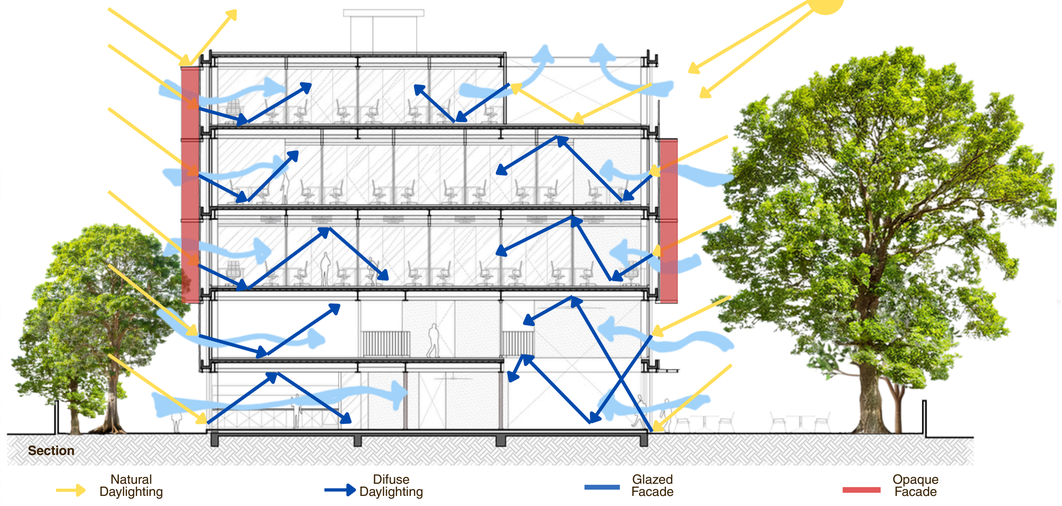
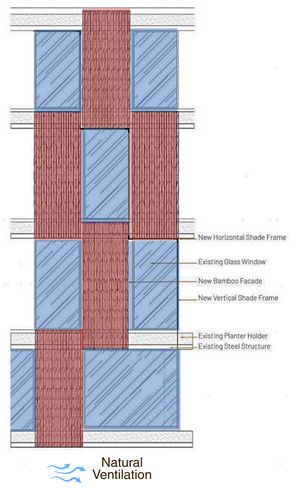
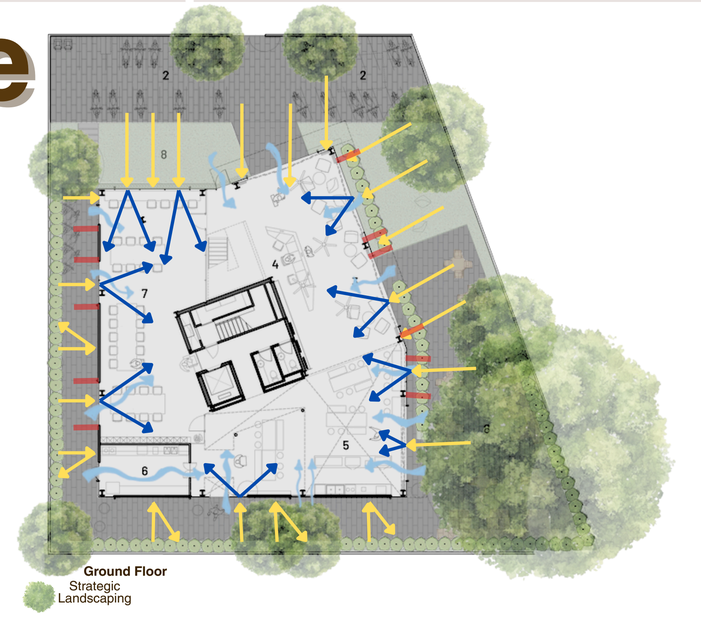
Bioclimatic Flexi-Office

Designed for Vietnam's tropical climate, this office embraces bioclimatic principles to reduce energy use while enhancing user comfort. It features open floor plans, operable facades, green walls, and shading systems that promote natural airflow, daylight diffusion, and thermal regulation. Integrated gardens and edible plants engage the senses, making the space not only adaptable and functional but also biophilic and health-focused.

Saigon, Vietnam







Comparison Between Bioclimatic Flexi-Office & The Kendeda Building

Soft, diffuse natural daylighting

Stable temperature throughout the structures

Gentle wind breeze from the tropical garden

The Flexi Office grading is used to increase the permeable surface around the structure allowing rainwater infiltration

The Kendeda Building grading is used to fit a cistern for greywater recycling and ADA access across the slope

The Flexi Office uses a double facade, clad in bamboo with fabric sunshades to reduce energy usage

The Kendeda Building have deep overhang roof, clerestories, light shelves, and venetian blinds to maximize daylighting

Glare free, diffuse, natural light throughout the structures

Reduced solar heat gains due to the Low-E glazing

Comfortable lighting in the interior

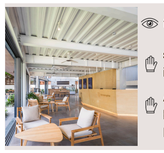
Comfortable daylighting and surrounding views

Reduced solar heat gains and temperature from direct sunlight

Warm and natural bamboo texture

The Flexi Office uses perforated bamboo screens, concrete, greenery to filter natural light inside

The Kendeda uses reclaimed wood, triple-glazed glass, insulated panels to control and reduce glare



fresh, natural airflow through

sensational air breeze outdoor and indoor

Acoustic comfort is also enhanced by vegetation and natural materials like bamboo, rattan, and terracotta

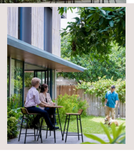
Lush greenery, flowering plants

Yellow Poinciana

Dappled shade, seating, vegetations

Tree Barks, concrete pavers

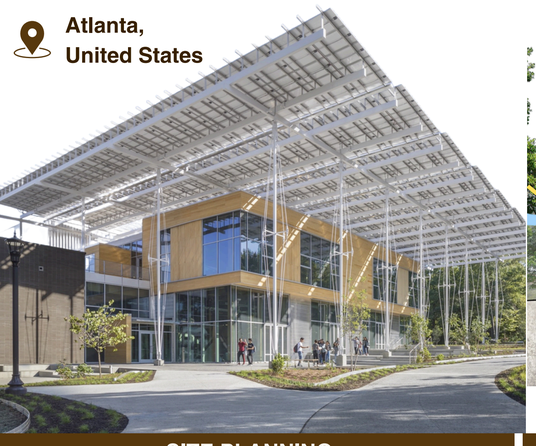
Leaves rustling, chitchatting



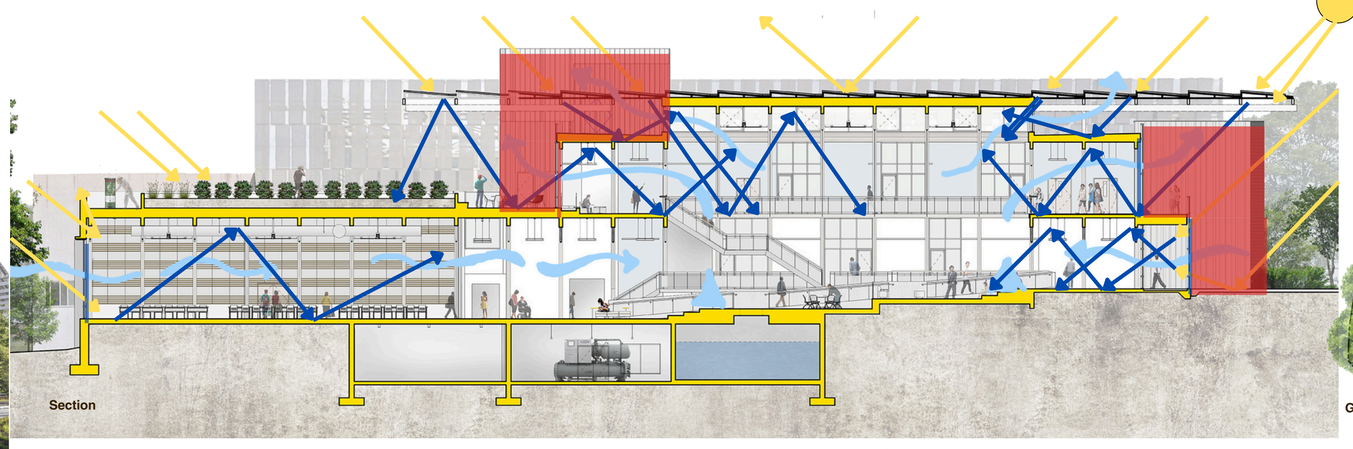
The Bioclimatic Flexi-Office and The Kendeda Building both showcase sustainable, climate-responsive design tailored to their local environments. The Flexi-Office focuses on passive cooling, permeable surfaces, and bamboo facades suited to Saigon's tropical climate. In contrast, the Kendeda Building uses reclaimed materials, advanced daylighting, and biodiversity-supporting landscaping for Atlanta's temperate conditions. Despite their differences, both prioritize energy efficiency, comfort, and environmental harmony, demonstrating how bioclimatic design adapts across regions.

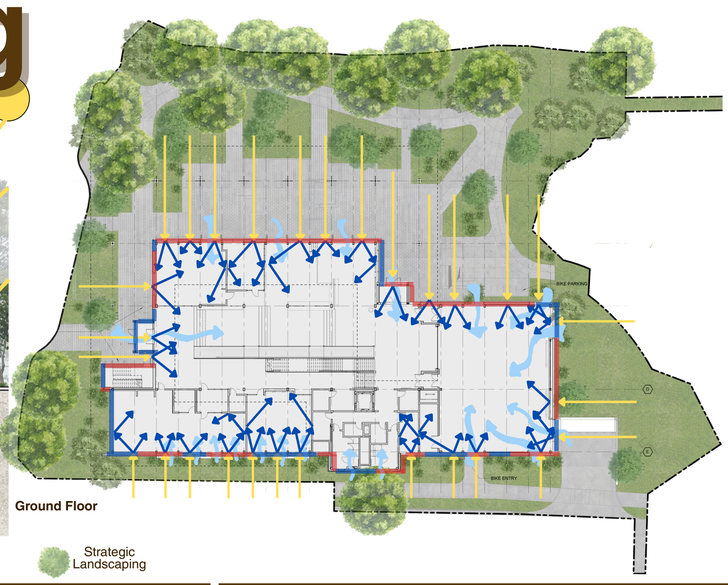
The Kendeda Building

Located at Georgia Tech, this net-positive energy building is a leading example of regenerative design. It incorporates passive strategies like optimized orientation, triple-glazed windows, rainwater harvesting, rooftop gardens, and natural ventilation. Every design element—from reclaimed materials to daylight-filled interiors—supports a sensory, human-centered experience while meeting the rigorous standards of the Living Building Challenge.



Atlanta, United States

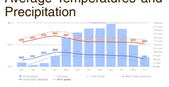




SITE PLANNING

Climate Analysis

Average Temperatures and Precipitation



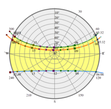
Maximum Temperature

Cloudy, Sunny, and Precipitation Days

Precipitation Amounts

Wind Diagram

Sunrise and Sunset Times



Site Selection & Building Layout

Orientation

- Longer facade oriented North-South to optimize daylight, by exposure to harsh east and west sun, and cross-ventilation

Layout

- flexible layout and zoning, allow to adapt overtime between office and residential functions

Fenestration

- repositioned openings promoting cross-ventilation and daylight, allow to modulate internal climate and light
- Large sliding doors and open floor zones encourages seamless transitions between indoor and outdoorspaces

Stormwater Management & Impervious Surface

Increased Permeable Surface

- Existing outdoor concrete slabs were broken and replaced with permeable natural soil
- Allow the rainwater infiltration, minimize flooding, and reduce reliance on urban drainage systems

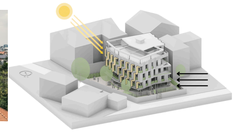
Landscape and Grading Consideration

Landscape

- The site is relatively flat and needed minimal grading, largely for manage water flow and create effective garden levels
- Helps direct stormwater, enhances site drainage, and prevents erosion and ponding

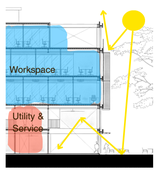
DAYLIGHTING

Daylighting Design



Urban Design Context

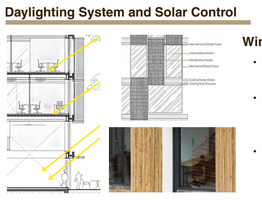
- Dense urban site: Designed to maximize daylight while preserving privacy
- Narrow setbacks: Allow for tropical gardens, enabling multi-directional daylight and using vegetation as natural light diffusers



Building and Room Design

- North-South orientation reduces harsh East-West sun exposure
- Long, narrow open plan allows daylight to reach deep inside
- Zoning by light needs:
  - Workspaces placed in areas with stable natural light
  - Service areas placed in lower-light zones
- Double-height spaces enhance vertical light penetration

Daylighting System and Solar Control



Windows Design & Visual Comfort

- Large operable windows on ground floor for daylight and cross-ventilation
- Recessed windows with overhangs/bamboo louvers reduce heat gain and glare
- Low-E glazing used on East/West; clear glazing on North/South for optimal light control

System Enhancing Natural Light

- Light-colored interior are used to reflect light further into the rooms
- Glass partitions and openings allow light to travel internally between rooms
- Artificial lightings are design to meet the WELL standard and use minimaly during daytime
- Vegetation and water features on the exterior create reflective surfaces that gently bounce daylight into shaded areas.

Shade

- Greenery along the perimeter provides a soft, responsive shade that adapts seasonally.
- The bamboo screens, vertical fines, and overhangs block high-angle midday sun and allow low-angle morning & evening sun to penetrate

FACADE DESIGN

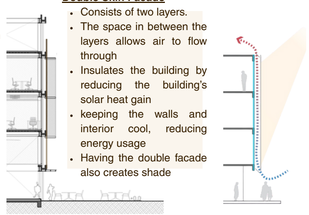
Characteristics of the Facade

Double Skin Facade
Acts as insulation and reduces solar heat gains

Sun Shading
Present on the South, West and East sides to reduce the amount of direct sunlight entering

Bamboo Cladding
Locally available and sourced bamboo cladding is used for the cladding

Large Windows
Large windows allow daylight to penetrate deep into the building



Double Skin Facade

- Consists of two layers.
- The space in between the layers allows air to flow through
- Insulates the building by reducing the building's solar heat gain
- keeping the walls and interior cool, reducing energy usage
- Having the double facade also creates shade

Green Strategies of the Facade

Reducing Energy Usage

- Reducing solar heat gains through the windows to reduce the amount of energy required to cool the building

Usage of Local Materials

- Sourcing materials locally from credible sources reduces carbon emissions from logistics and harvesting practices

Double Skin Facade
Reduces energy usage of building by:

- absorbing heat in the outer facade, keeping it away from the wall of the building
- creating a gap between the outer facade and building wall where cooler air can rise up and cool the building

Sun Shading

- The building has sun shading devices on the south, east and west but not on the north side
- This is because Hanoi is north of the Equator, so the sun's path is to the south of the building
- They retain the views from the interior while blocking out sunlight

Bamboo Cladding

- Bamboo is a readily available local material
- Bamboo is an insulator, reducing the solar heat gain of the building

Types of Facades

Balance Glazed and Opaque Facades

The Kendeda Building uses a **hybrid facade system**, which means it balances both glazed and opaque components to optimize energy efficiency, comfort, and sustainability.

Glazed Facade Components

High-Performance Glazing

- Triple-glazed, low-E windows with metal frames
- Enhance thermal efficiency and define the glazed facade

Opaque Facade Components

Thermal Insulation

- High R-value walls reduce heat loss in winter and heat gain in summer
- Helps maintain stable indoor temperatures, cutting down energy use

Materiality

Concrete (CMU)

- Foundation walls & some service facades
- Structural support; thermal mass for temperature stability

Triple-Glazed, Low-Emissivity (Low-E) Glass

- Lets in natural light while keeping interiors cool or warm, depending on season

Reclaimed Wood Siding

- Adds warmth and texture to the facade while being environmentally responsible

NATURAL VENTILATION

Ventilation Strategies

Double-Skin Façade & Shading

- Exterior shading system: Includes metal mesh, vegetation, and screens that form a ventilated layer

Cross Ventilation

- Openings on opposite sides of workspaces allow air to move across rooms

Stack Effect Ventilation

- Double-height spaces, open stairwells, and vertical voids support vertical air movement
- Warm air rises and exits through roof-level openings, drawing cooler air from shaded areas below

Less Mechanical Cooling Dependency

- The building is intentionally designed to avoid the use of air conditioners in most spaces

Porous Materials and Breathable Walls

Use of perforated blocks, louver systems, and open brick walls allows ventilation even when spaces are shaded or semi-enclosed

The building is oriented to take advantage of local wind patterns. The placement of windows, doors, and ventilation openings is optimized for natural airflow, with the building's layout aligned to the prevailing winds to maximize ventilation without the need for mechanical systems

Wind Analysis

- Majority of the wind come from Southeast and Southwest with speed of 10–20 km/h
- Moderate winds of 20–30 km/h occur in July-August, and light winds of 2–5 km/h in in October–February

STRATEGIC LANDSCAPING

Site Integration

The building is positioned to preserve mature tropical trees and existing greenery in Thao Dien, maintaining natural soil permeability to support rainwater absorption and enhance the local microclimate.

Elements of Softscape

Parakeet Flower

Bamboo

Yellow Poinciana

Manila Grass

Jackfruit Tree

Spider Plant

Dracaena Fragrans

Strategic Landscaping Features

Wind Corridor Alignment through Landscaping

- Open landscaped paths align with prevailing southwest breezes, while trees and shrubs are spaced to maintain airflow, enhancing thermal comfort without mechanical systems

Layered planting

- A layered combination of tall trees, mid-level shrubs, and low groundcovers enhances evapotranspiration, helping to keep the ground cool and maintain comfortable humidity levels around the building

SITE PLANNING

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Average Temperatures and Precipitation

Precipitation Amounts

Cloudy, Sunny, and Precipitation Days

Maximum Temperature

Wind Diagram

Sunrise and Sunset Times

Site Selection & Building Layout

Orientation

- Longer facade oriented East-West to maximize solar gain in winter and minimize overheating in summer with deep overhang and glazing on the south to reduce heat gain

Layout

- North-facing rooms provide soft, glare-free daylight—ideal for learning spaces.
- Site connects to bike/pedestrian paths—supports sustainable, car-free access.

Landscape

- Building follows natural slope to reduce earthwork (cut-and-fill).
- Roof garden and landscapes reduce heat through evapotranspiration.

Stormwater Management & Impervious Surface

Eco-Friendly Water Systems

- Comprehensive stormwater strategy using rainwater harvesting, bioswales, wetlands, and permeable surfaces to manage runoff, reduce erosion, and supply potable water sustainably

Landscape and Grading Consideration

Nature-Led Water Design

- Used natural slope and native plants for rainwater management with minimal grading and no irrigation

DAYLIGHTING

Daylighting Design

Urban Design Context

- Low surrounding building height: minimum shadow cast from neighboring buildings
- Surrounding landscape is open and low-profile: allowing full sunlight to reach into the building

Building and Room Design

- North-south orientation reduces glare and heat gain
- Slim floor plates and high ceilings allow deep daylight penetration
- Facade-facing rooms and open atrium ensure balanced, diffused natural light indoors

Daylighting System and Solar Control

Venetian Blinds

Light Shelves

Windows Design & Visual Comfort

- Large, strategically placed windows and clerestory on the north and south facades allow for consistent, low-glare daylight
- High performance Low-E glazing, which reduce solar heat gain while allowing ample visible light
- The rooftop solar canopy includes translucent panels that let lights in while still providing shades

System Enhancing Natural Light

- Light-colored interior (walls and polished concrete floors) are used to reflect daylight and reduces the need for artificial lighting
- Light shelves and venetian blinds to control and maximize the daylighting while minimizing solar heat gain
- Dimmable LED is integrated with daylight sensors to automatically adjust

Shade

- Vegetation and trellises contribute to seasonal shading of low windows
- Horizontal louvers and deep overhangs blocks the high summer sun while allowing low winter sunlight in

FACADE DESIGN

Characteristics of Facades

Deep Overhangs & Sunshades

- Minimize solar heat gain and glare during summer months
- Filter Sunlight

Operable Windows with Shading Devices

- Balance daylight and thermal comfort

Thick, Super-Insulated Walls

- Designed with insulation values well above code minimums
- Prevent heat loss in winter and heat gain in summer

Types of Facades

Balance Glazed and Opaque Facades

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Glazed Facade Components

High-Performance Glazing

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- Enhance thermal efficiency and define the glazed facade

Opaque Facade Components

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- Helps maintain stable indoor temperatures, cutting down energy use

Materiality

Concrete (CMU)

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Triple-Glazed, Low-Emissivity (Low-E) Glass

- Lets in natural light while keeping interiors cool or warm, depending on season

Reclaimed Wood Siding

- Adds warmth and texture to the facade while being environmentally responsible

NATURAL VENTILATION

Climate-Responsive Design

- Given Atlanta's hot-humid climate, natural ventilation is optimized for the shoulder seasons (spring/fall) and cooler evenings
- minimizes reliance on mechanical cooling without compromising comfort

Strategies Excecuted

Thermal Chimney

The design incorporates a thermal chimney, a vertical shaft that creates a stack effect. As warm air rises, it creates negative pressure, pulling cooler air into the building. This effect helps to cool the interior spaces naturally

Stack Effect and Airflow Design

The building is designed to take advantage of the stack effect, where warm air rises and escapes from higher points, pulling in cooler air from lower openings

Reducing Air Infiltration

Operable windows – with a system override – throughout the building is mechanically operated when outdoor temperature, humidity, and pollen count are within an acceptable range to maintain system balance

Wind Analysis

- Majority of the wind come from the Northwest and East with speed of 5–20 km/h
- Moderate winds of 20–30 km/h occur regularly, as well as light winds of 2–5 km/h
- Wind speeds are consistent throughout the year
- The natural ventilation strategy is customized for Atlanta's climate, where there are significant temperature fluctuations

STRATEGIC LANDSCAPING

Site Integration

As part of a strategic landscaping approach, The building sits at an urban corner to preserve green space, nestled among oaks with tiered floors following the natural slope.

Minimize Disturbance

Building on disturbed land avoids harming natural areas

Blend with Landscape

Design follows slope and nestles in trees to blend in

Shape Public Path

Public spaces along path encourage movement and greenery

Elements of Softscape

Sedges

Goldenrods

Pepperbush

Black Oak Trees

Water Oak Trees

Cardinal Flower

Pickerelweed

White Oak Trees

These plants enhance ecology by attracting pollinators, purifying water, absorbing stormwater, providing shade, and stabilizing soil to reduce erosion.

Lush greenery and vegetation

Natural, textured material

Wind breeze from natural ventilation

Bioswale, wetland, and rain garden

Soft, diffused natural light with minimal glare

Mental alertness and energized

Strong sense of space without feeling confined

Indoor experiences attuned with the circadian rhythm

Glare-free, consistent daylight enhances visual comfort

Natural, textured material

Stable indoor temperature

Calm, quiet interior environment conducive to learning and reflection

calm mind, open spaces, natural wind saving energy consumption.

Adaptable ventilation, adapts to seasons,thermal cooling, thermal heating.

fresh, comfortable air through operable windows and passive airflow,

light and shadow patterns from trees

open, green views, people

Flowers, bees, butterflies

Temperature change from warm to cold

Chirping of birds, chattering

Fragrant Plants

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