

Portfolio

Ruiqi(Eric) Ai

Selected Works



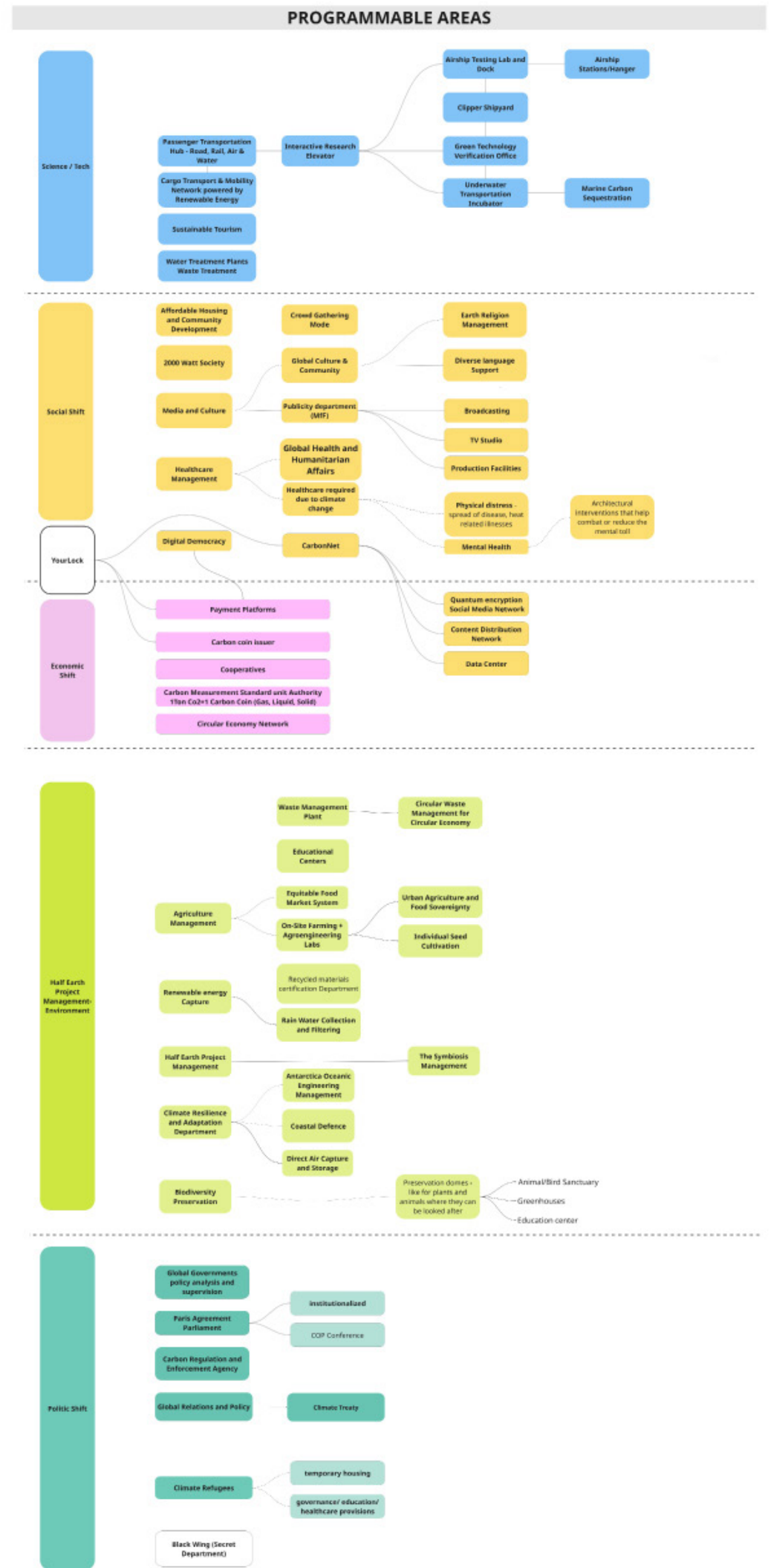
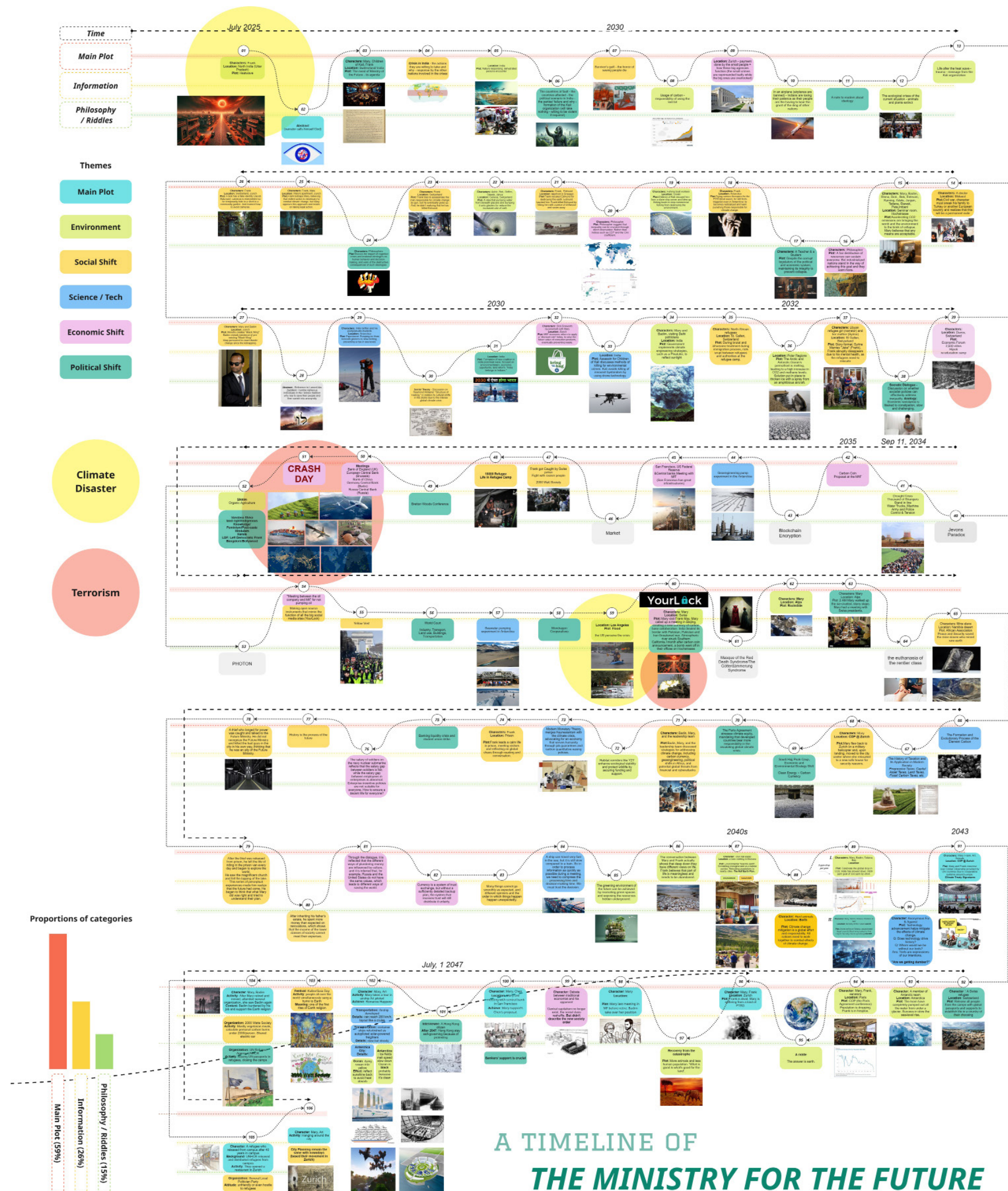
Concrete Sequester

The Energy Department - Office Building

2024

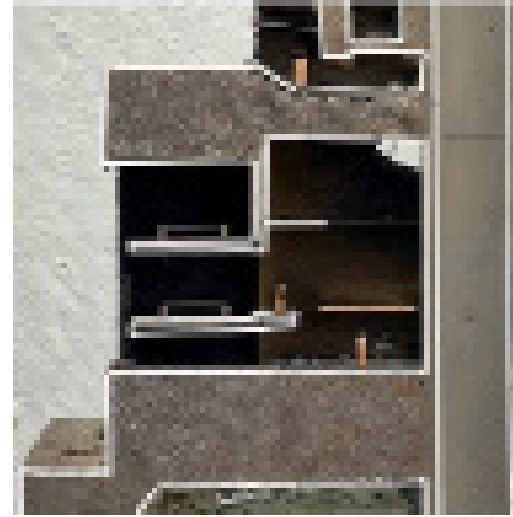
Instructor: Dan Wood

In the future, carbon-absorbing concrete will become the primary material of construction. Concrete using this technology reduces the carbon footprint of buildings and helps combat climate change by actively absorbing CO₂. This technology ensures a comfortable indoor climate and allows buildings to regulate temperature and improve air quality passively. In the design of the future Department of Energy, through the exploration and innovation of carbon-absorbing concrete technology, sustainability can be achieved by continuously relocating excavated concrete to rearrange the required indoor space. By combining these design concepts and technologies, the future Department of Energy Building will become a fully functional, environmentally friendly modern office building that can cope with future changes. It will fully embody the concept of sustainable development and innovative spirit.





Type of Space



Open Floor & Conference Room

The studios and offices are mainly surrounded by open floors in the lounge and meeting areas, forming a compact and functional working environment. These spaces provide a relaxed and concentrated working environment while facilitating interaction with other areas. Sound insulation materials are used on carbon-adsorbed concrete to improve work efficiency and comfort.



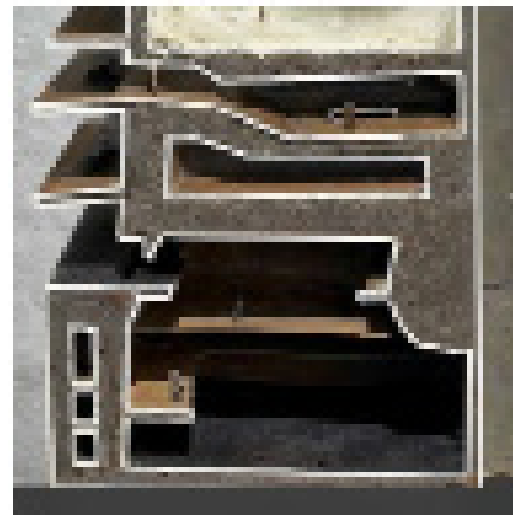
Open Floor & Mezzanines

Open Floors connect different work areas and offices through mezzanines. The mezzanine design promotes interaction and collaboration between various departments and teams and provides small rest and meeting spaces. The mezzanine can be flexibly transformed, excavated, and filled to cope with future changes.



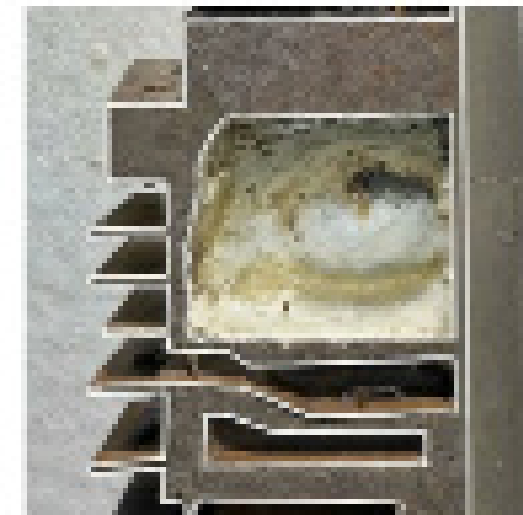
Open Floor & Box Room

Areas such as energy storage rooms, laboratories, and test areas exist in Box room Spaces, all in concrete structures. So, sustainable space changes can be made over time to cope with future needs.



Conference Room

Wood tones are used in large conference areas to provide a warm and natural feeling, suitable for team collaboration and formal meetings. The natural texture brought by wooden elements helps to create a comfortable and friendly environment.



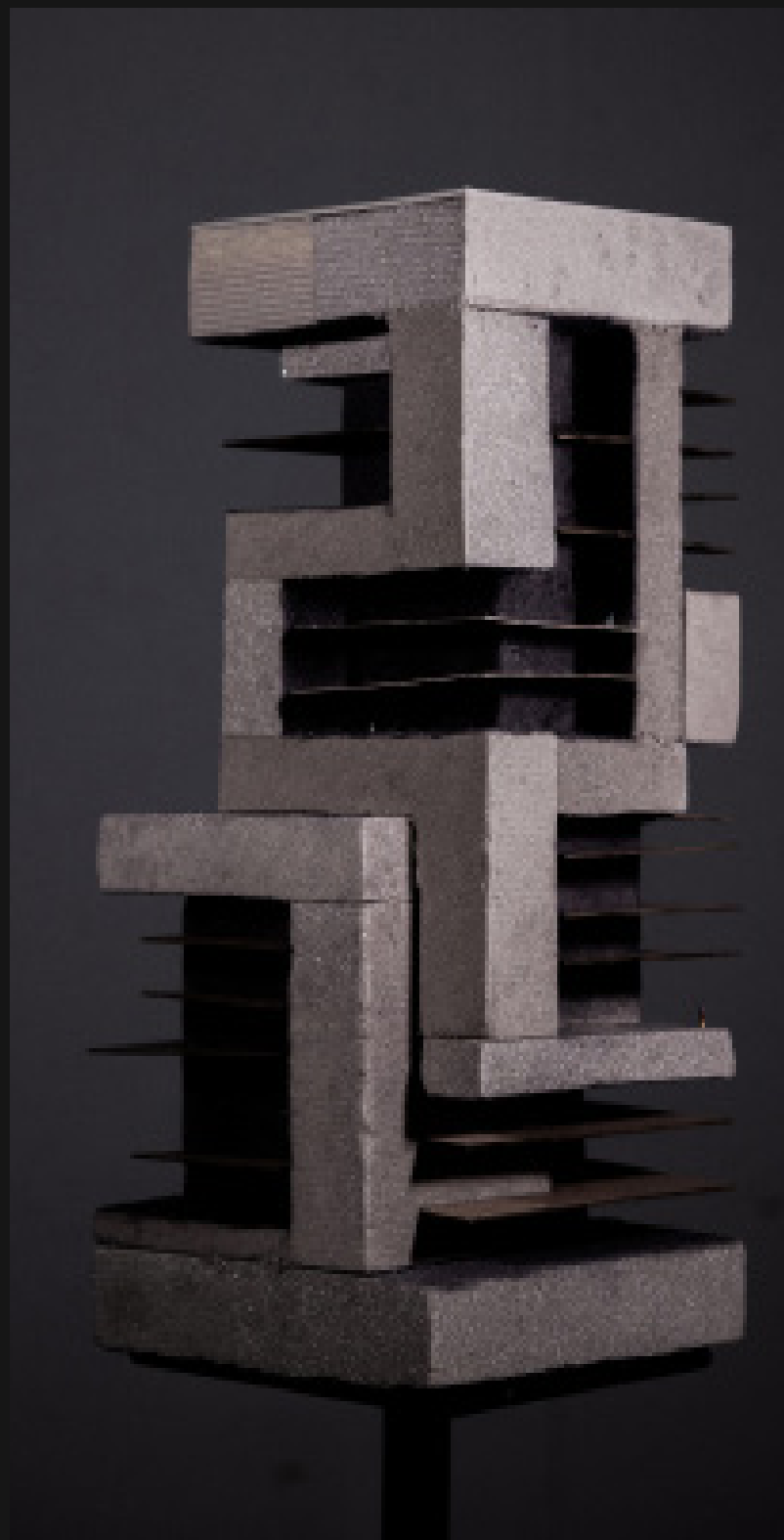
Recreation Room

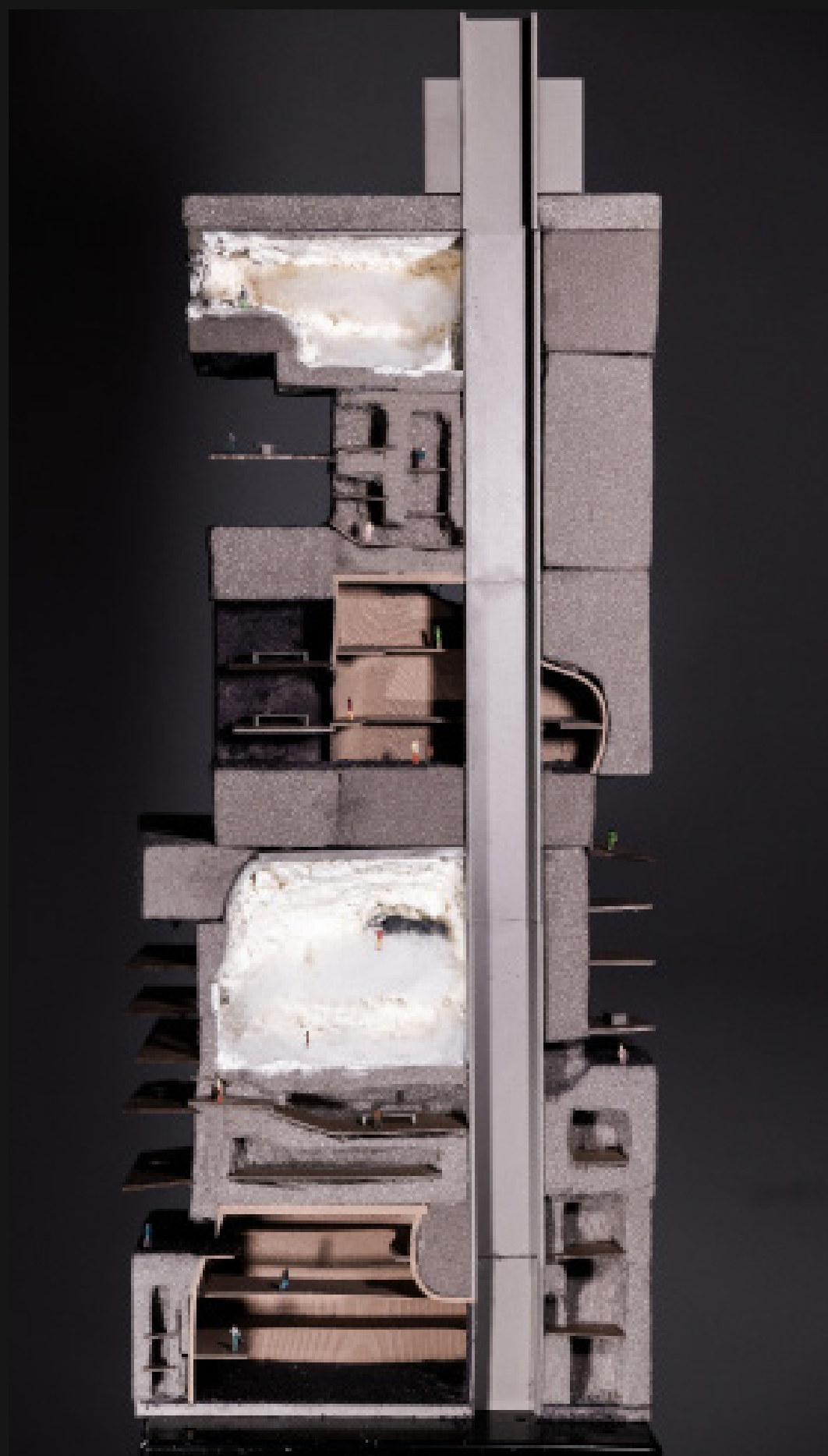
White-toned soft materials in the cave rest area create a bright and warm atmosphere. White not only reflects natural light but increases the brightness of the space and brings a fresh and relaxing feeling. The outdoor sunlight and air are introduced into the room through the openings.

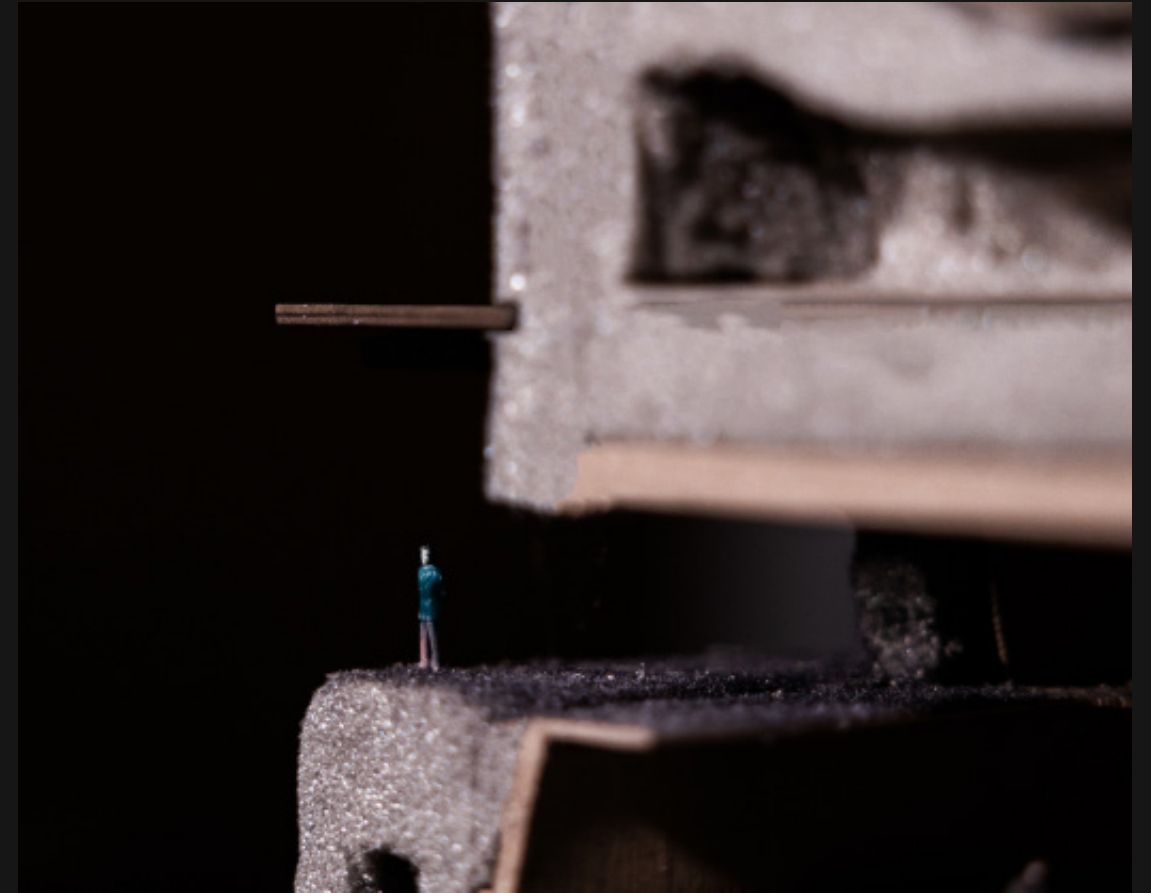


Vertical Core & Box Room

The vertical core contains an elevator transportation system to ensure efficient floor connections. The core area includes major pipelines and service facilities for centralized management and maintenance.











Paris 2100: Inhabiting the Heat

Renew Building - Thermal Capacity

2025

Instructor: Philippe Francois Rahm

To develop a resilient architectural model that enhances thermal capacity in urban housing blocks, enabling Parisian buildings to store nighttime coolness and release it during heatwaves, reducing dependence on mechanical cooling by 2100. The project reimagines the building envelope as a climatic buffer, using high thermal mass materials, adaptive facades, and integrated passive cooling strategies. It responds to rising temperatures and more frequent heat events by emphasizing thermal inertia, natural ventilation, and green infrastructure.

Key Strategies:

Thickened Walls: Stone, compressed earth, or concrete walls (30+ cm) delay daytime heat transfer and release stored coolness gradually.

Night Ventilation: Smart operable windows and vertical shafts optimize cool air intake and warm air expulsion.

Green Roofs & Facades: Vegetated surfaces reduce solar gain, cool the microclimate, and enhance biodiversity.

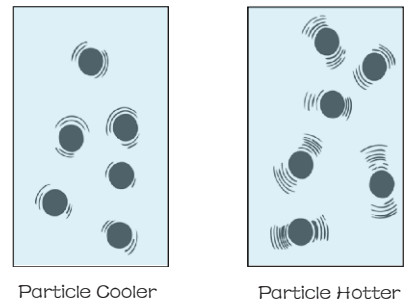
Water Systems: Rainwater harvesting, evaporative cooling, and misting contribute to passive thermal regulation.

Thermal Capacity

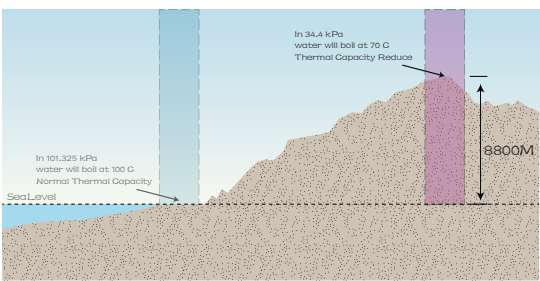
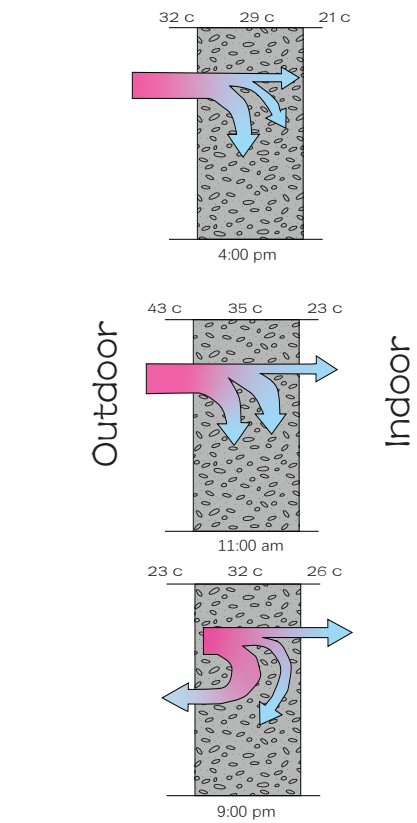
Thermal Capacity (symbol c), known as specific heat, is a physical quantity commonly used in thermodynamics. It indicates an object's ability to absorb or dissipate heat. It refers to the amount of heat absorbed or released by a unit mass of a substance when its temperature rises or drops by a unit. Its unit in the International System of Units is Joule per kilogram Kelvin [J/(kg · K)], which is the energy required to raise the temperature of 1 kilogram of a substance by 1 Kelvin.

Formula: $C = Q / m \Delta T$

Where Q is energy in joules (J). m is mass in kilograms (kg). ΔT is the temperature change in Kelvin (K).



At different temperatures, the specific heat capacity of a substance will be different, mainly because the pressure of the molecules is different. According to the kinetic theory of molecules, when the temperature increases, the molecules vibrate faster; when the temperature decreases, the molecules vibrate slower. This principle also means that the specific heat capacity of a substance is different under different pressures and phases. Taking temperature difference as an example, if you boil water in the summer, it will boil faster than in the winter because the temperature is higher.



Taking pressure as an example, at the horizontal level of the earth, the atmospheric pressure is 101.325 kPa, where water will boil at 100 degrees Celsius. On Mount Everest, about 8.8 kilometers above sea level, the atmospheric pressure is about 34.4 kPa, where water will boil at 70 degrees Celsius.

Coastal Air Flow:



Day time

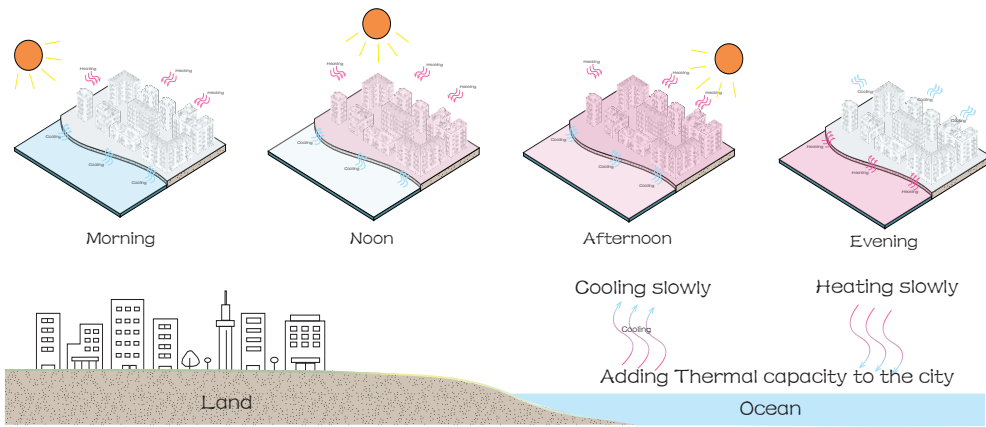
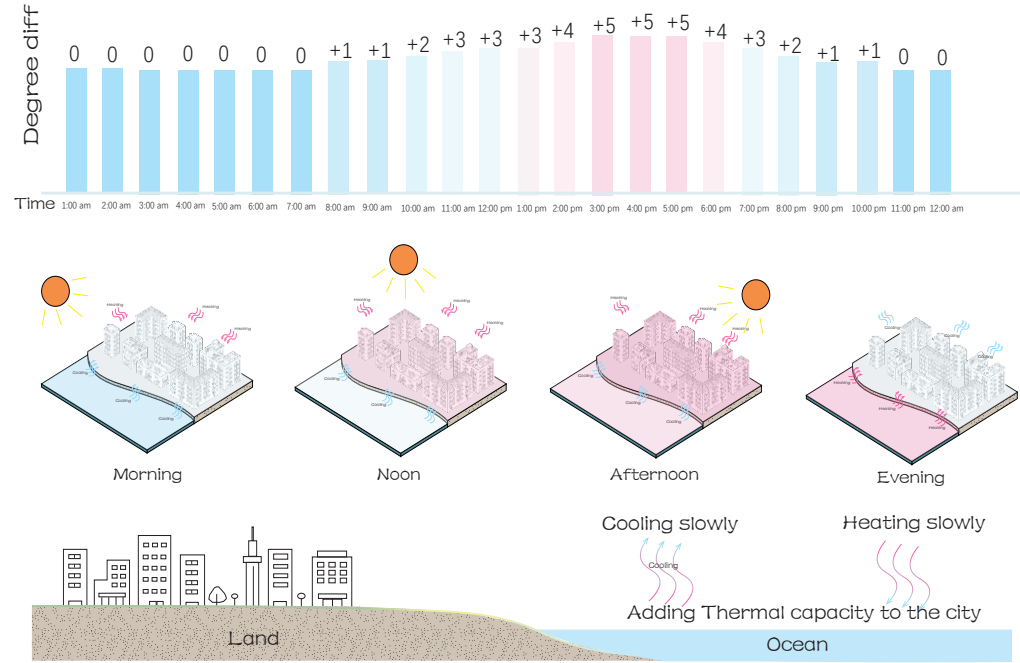


Night time

Water's specific heat capacity is much higher than that of most substances on land, which means that it can absorb or release a lot of heat without causing drastic temperature changes. This property significantly impacts the temperature of coastal cities. The ocean can regulate the temperature of the surrounding air and bring the heat of the water body to the coastal areas through the exchange of sea and land breezes. Therefore, during the day, the cool air of the ocean will flow to the land, and at night, warm sea breezes will blow to the coastal areas, making the temperature relatively stable.

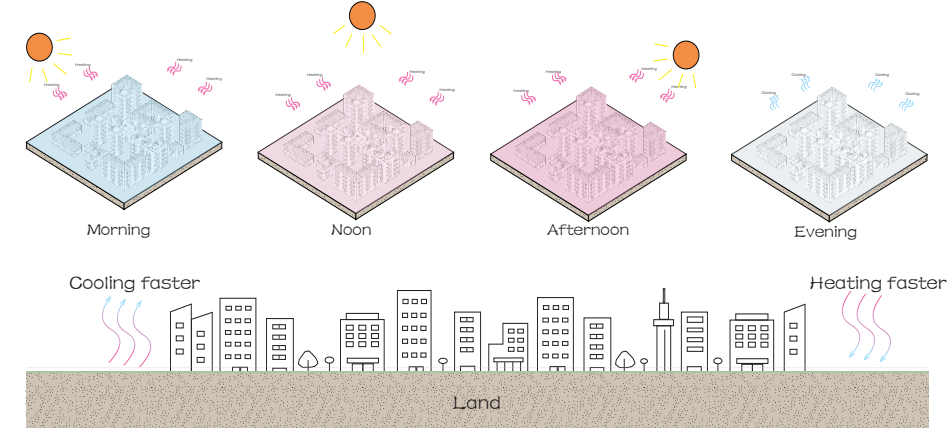
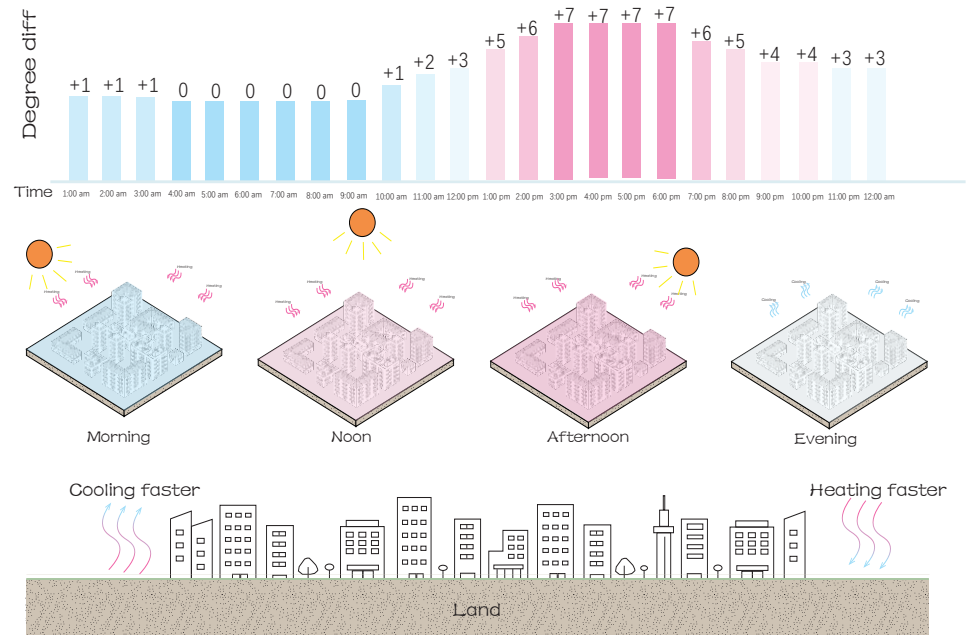
Coastal cities:

During the day, the temperature of coastal cities rises slowly because the ocean can absorb a lot of solar energy. At night, the ocean will gradually release the heat absorbed during the day, making the night temperature relatively high.



Inland cities:

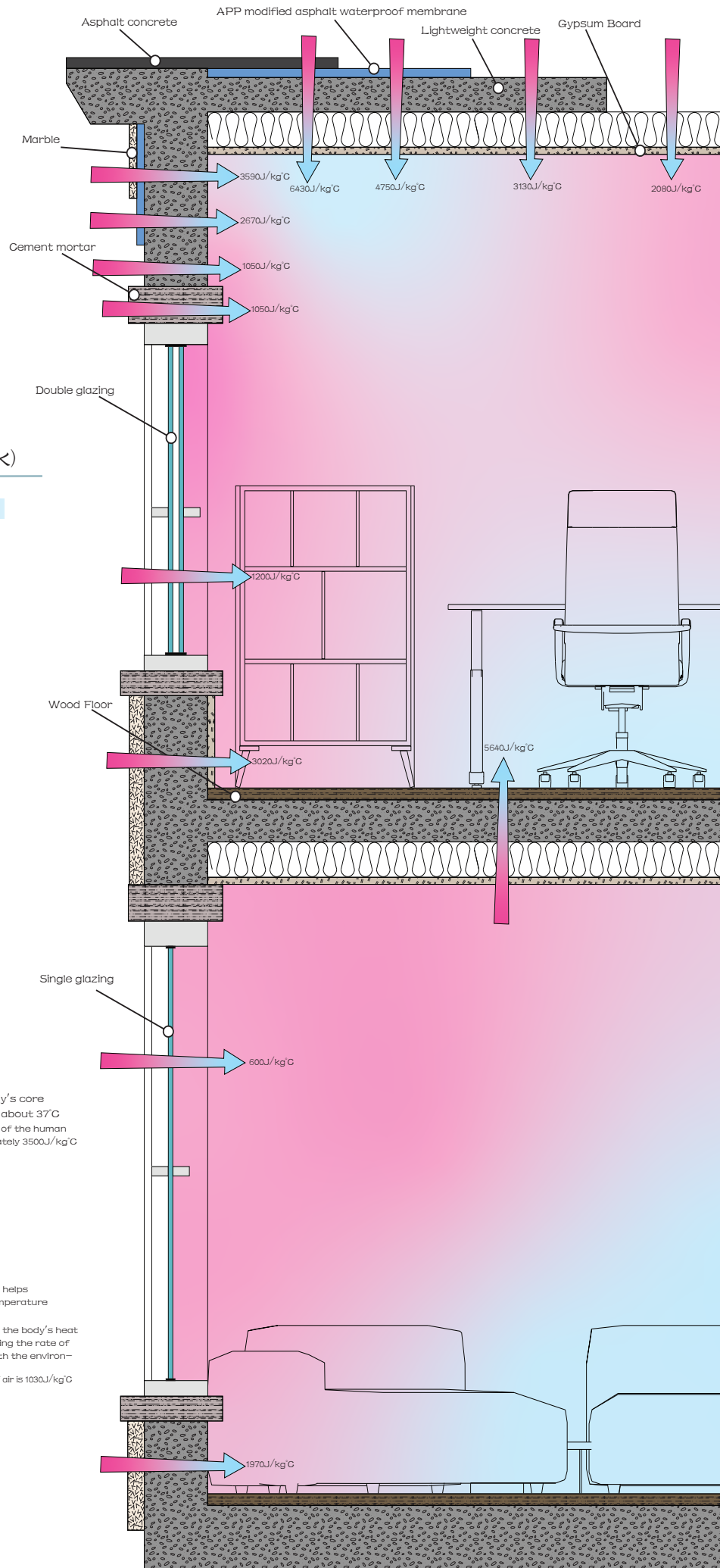
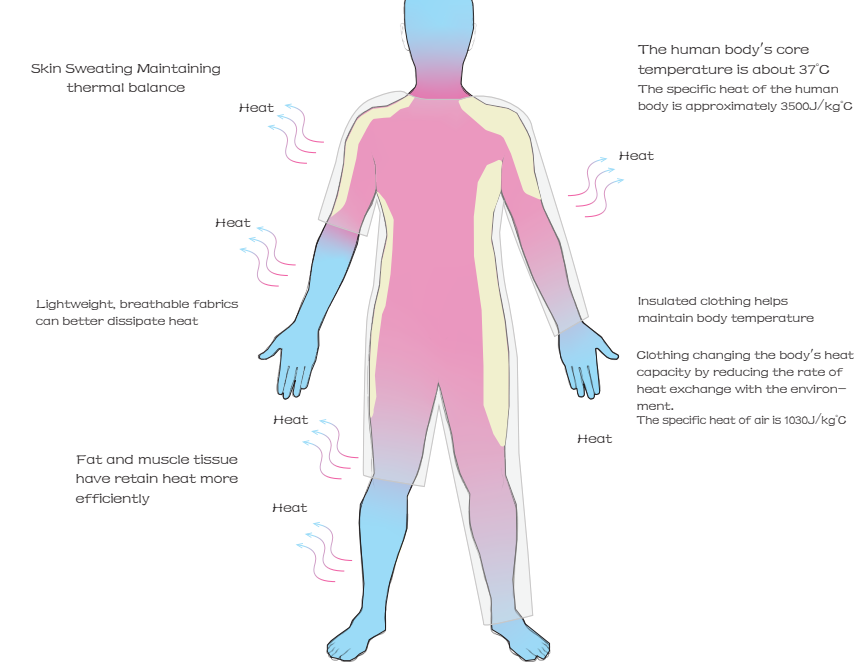
Inland cities, because there is no regulation by the ocean, the ground temperature changes more dramatically, rising rapidly during the day and cooling rapidly at night.



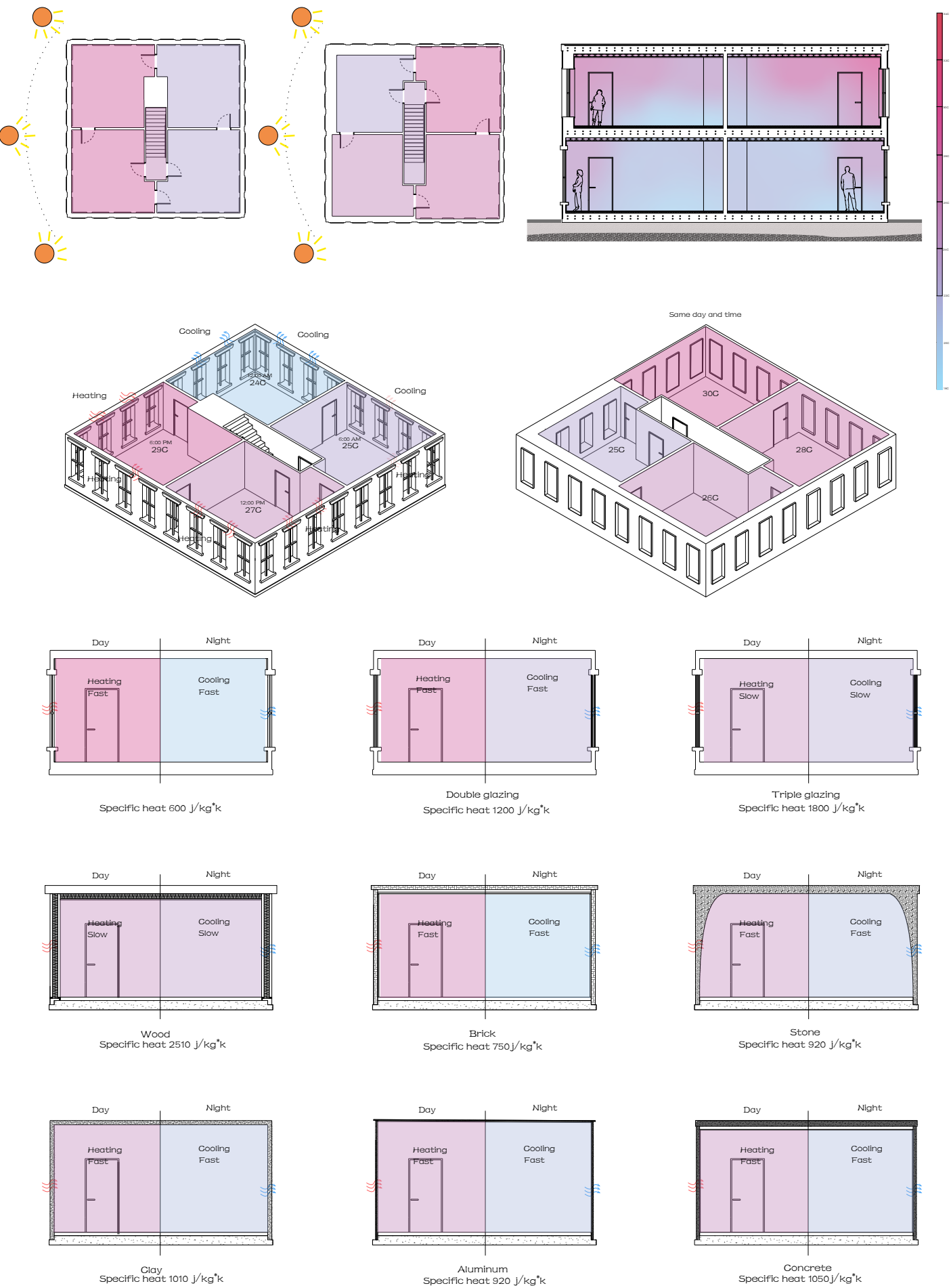
Thermal Capacity of building materials:

Material Name	Specific heat J/(kg · K)
Water vapor (water)	1850
Water	4200
Ice (solid water)	2100
Ceramics	837
Reinforced concrete	920
Crushed stone and pebble concrete	920
Asphalt concrete	1680
Lightweight concrete	1050
Cement mortar	1050
Brick	750
Autoclaved aerated concrete	1050
Cork board	2510
Fiberboard	1890
Gypsum Board	1050
Particle Board	2100
Rockwool board	1220
Wood	2510
Clay	1010
Granite, basalt	920
Marble	920
APP modified asphalt waterproof membrane	1620
PVC membrane	1140
Construction Steel	480
Aluminum	920
Glass	600

Body Thermal Capacity:



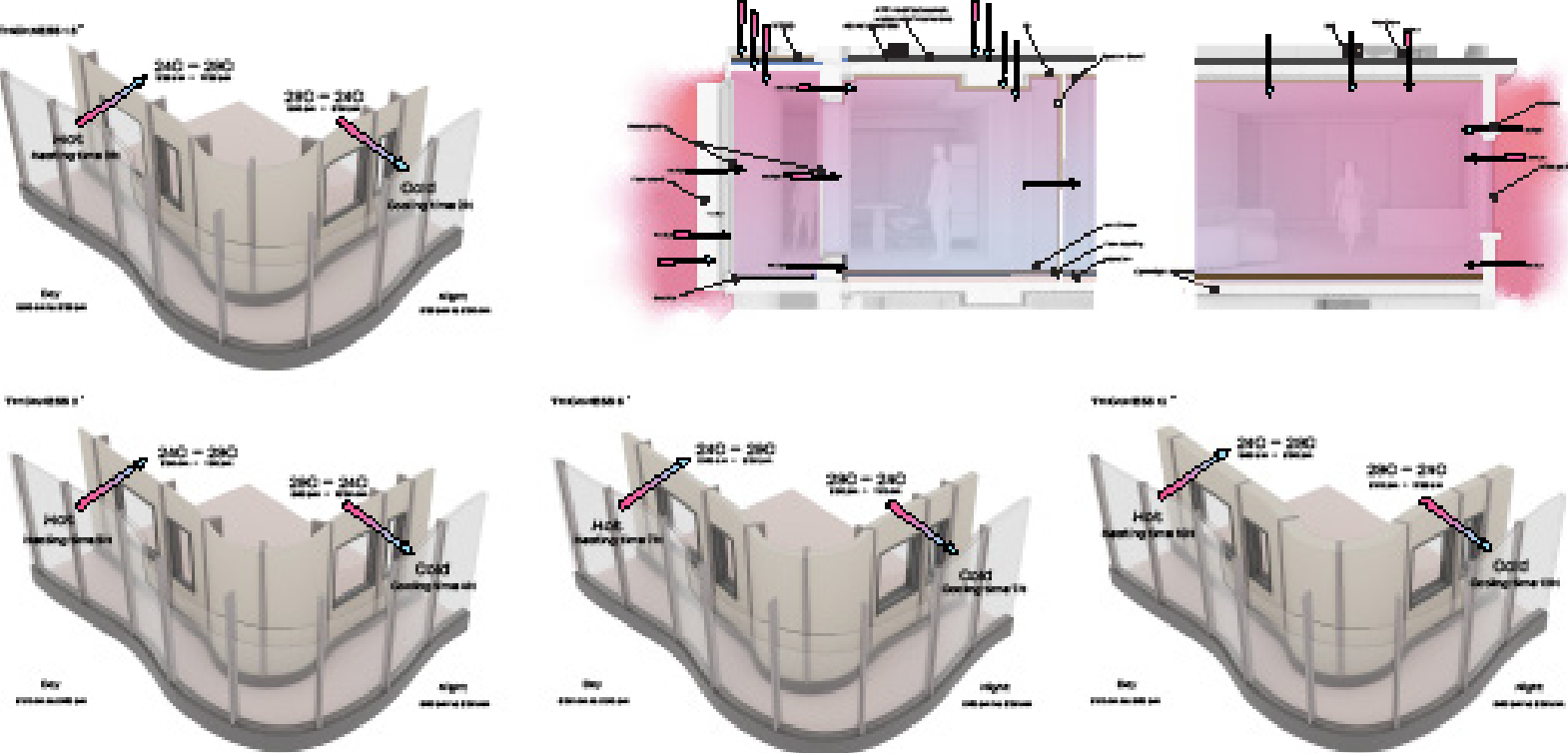
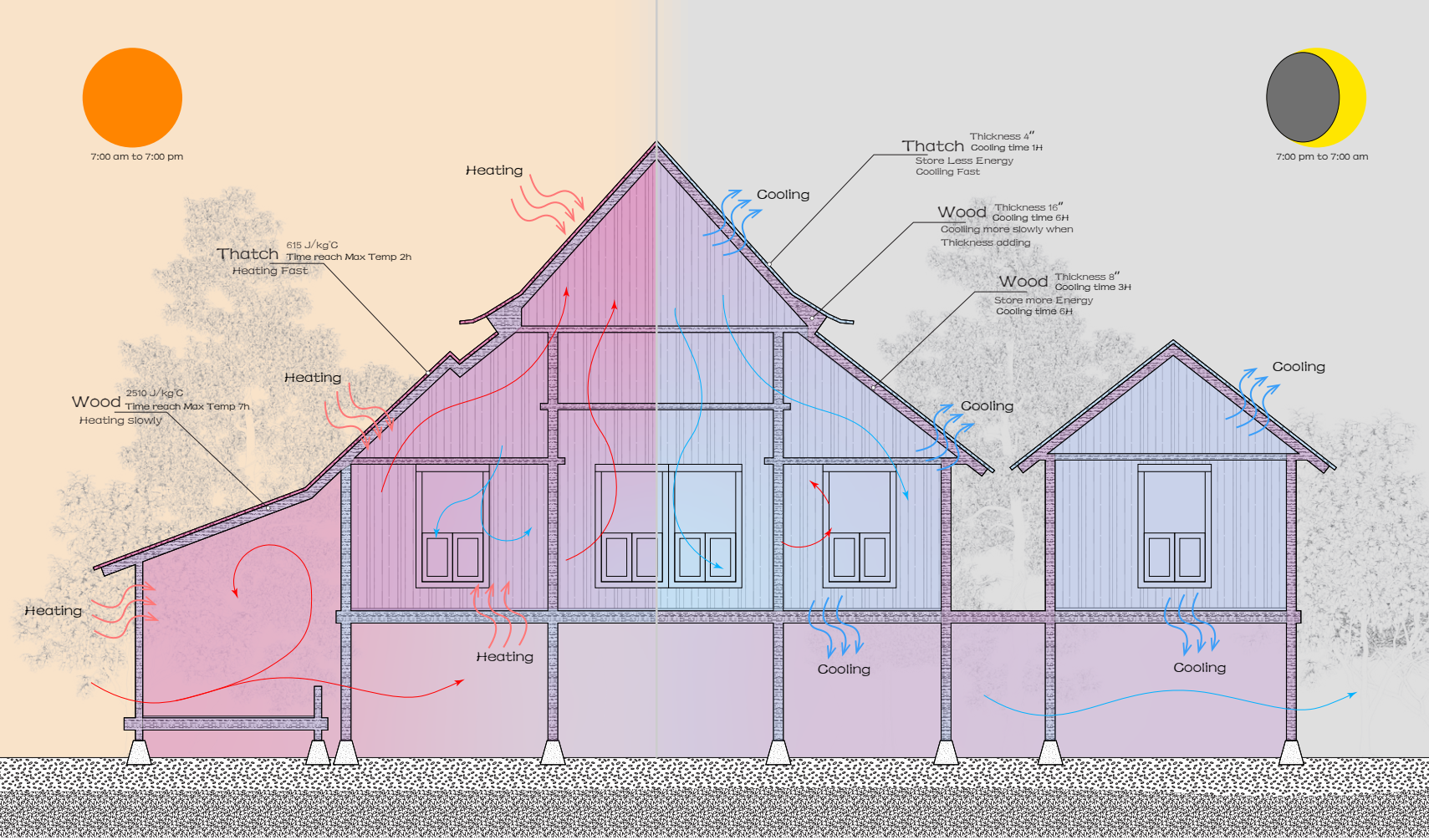
Phrase 2: Thermal Capacity



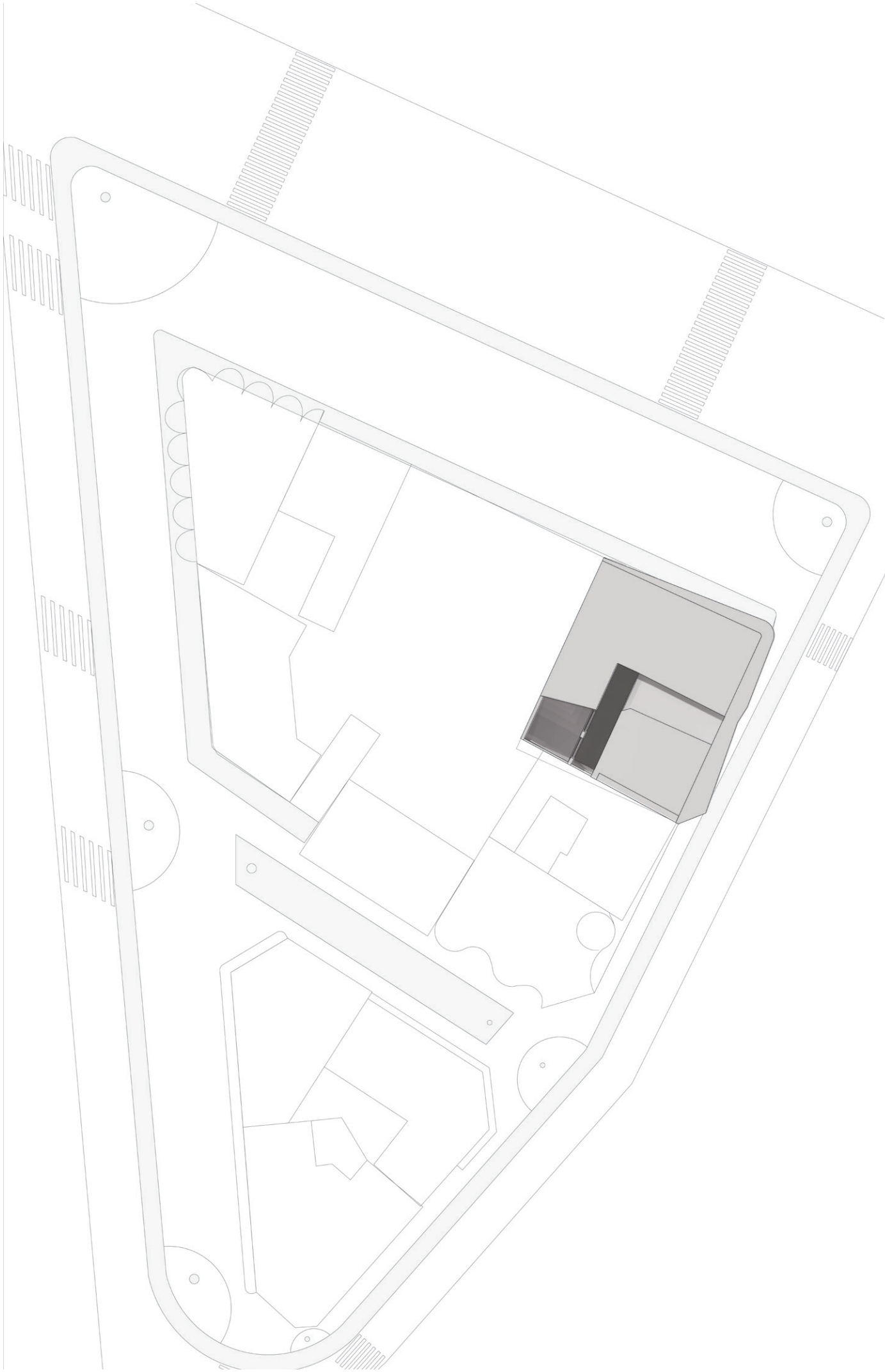
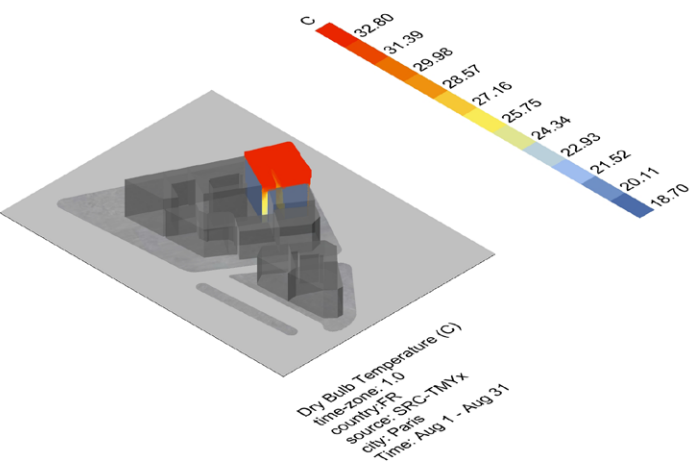
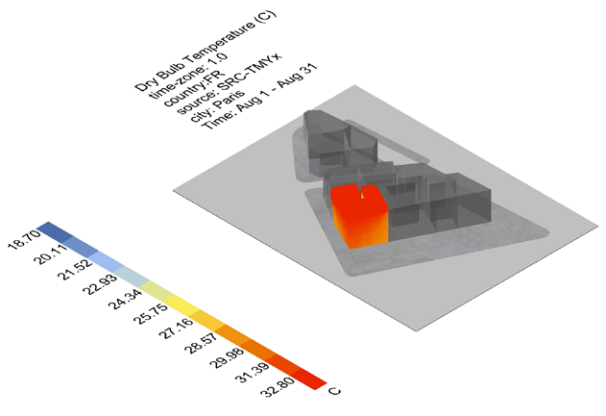
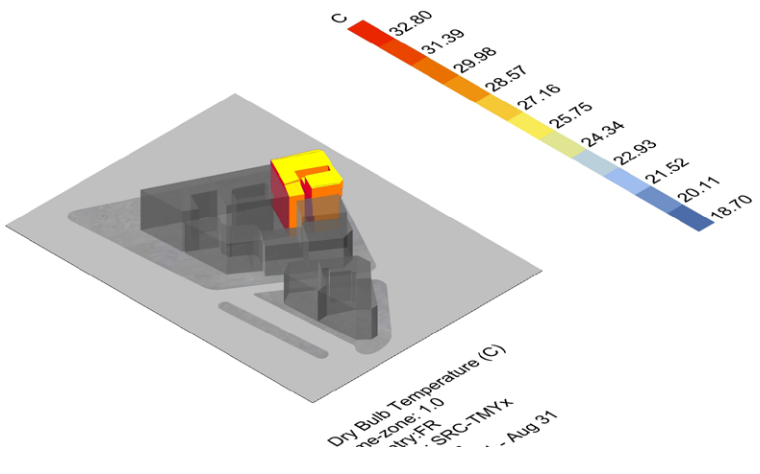
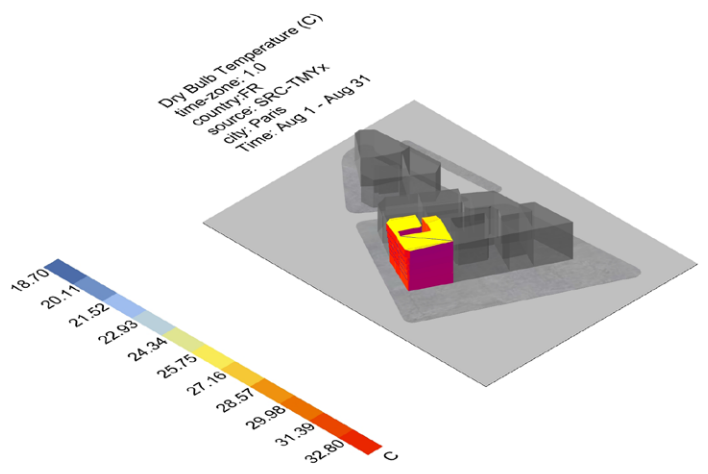
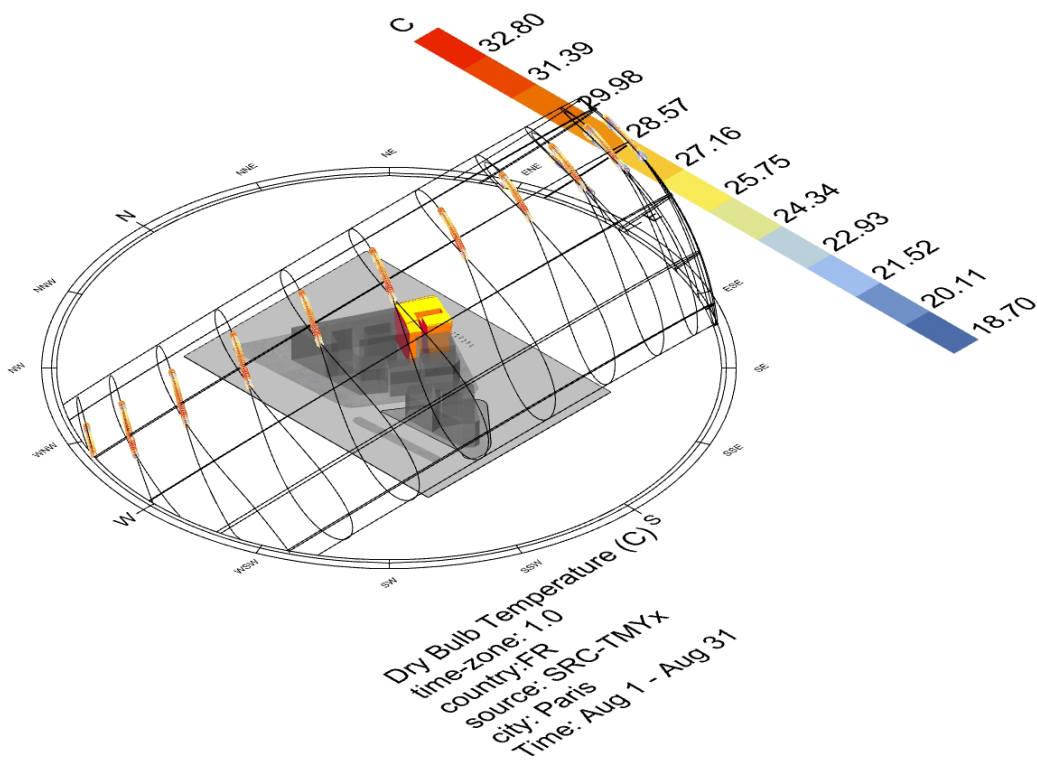
Phrase 3: Thermal Capacity

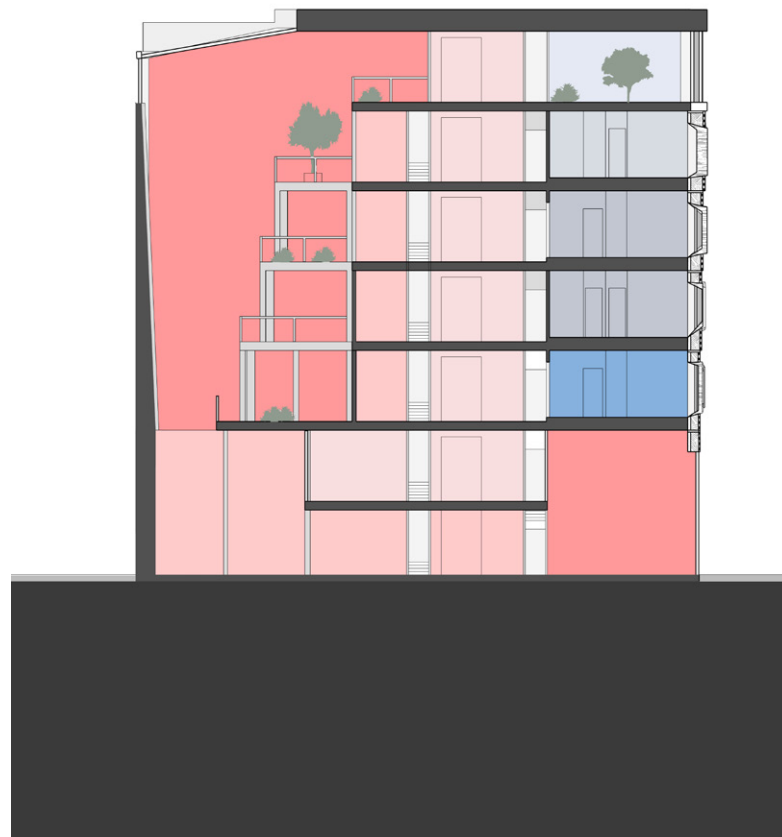
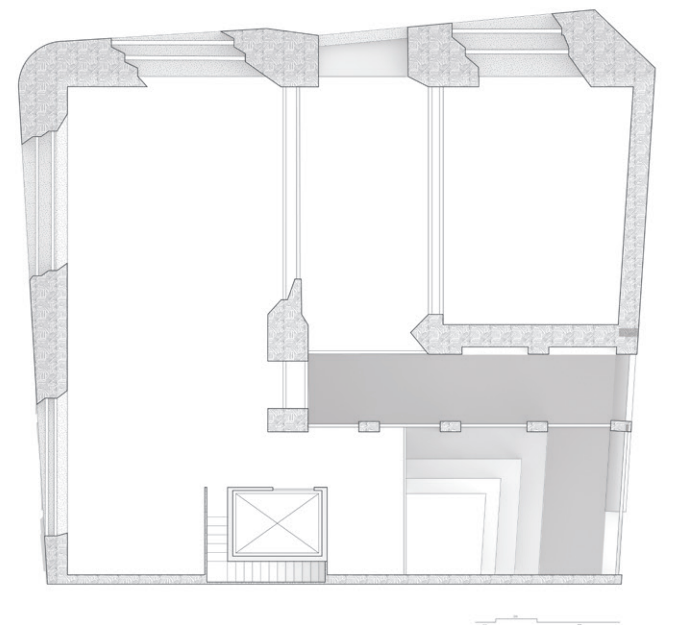
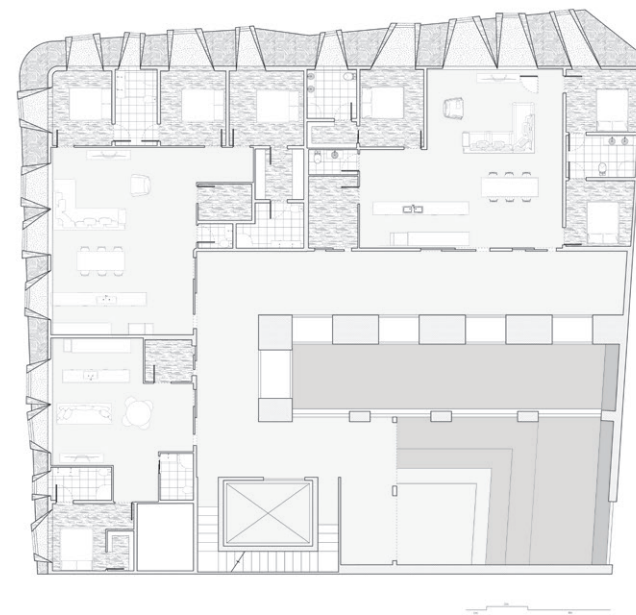
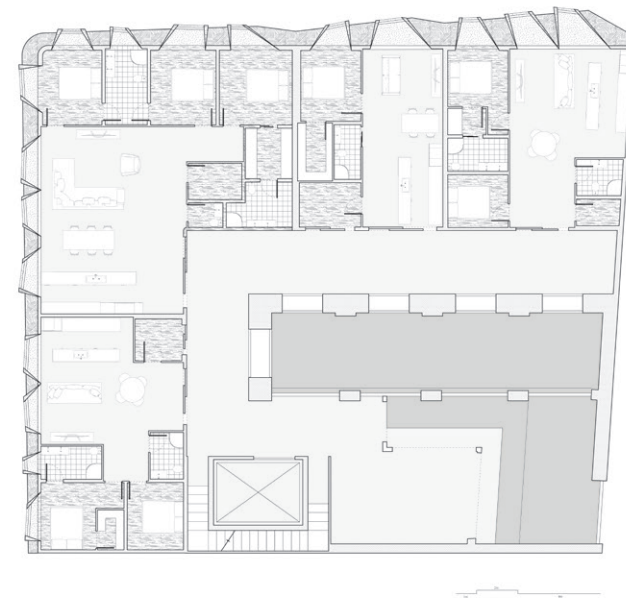
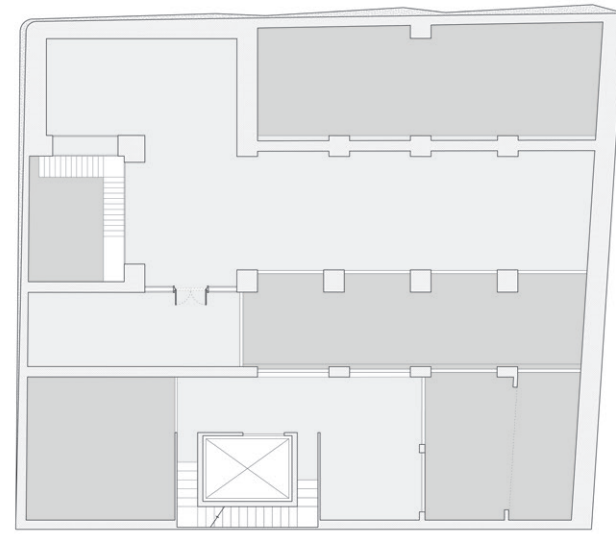
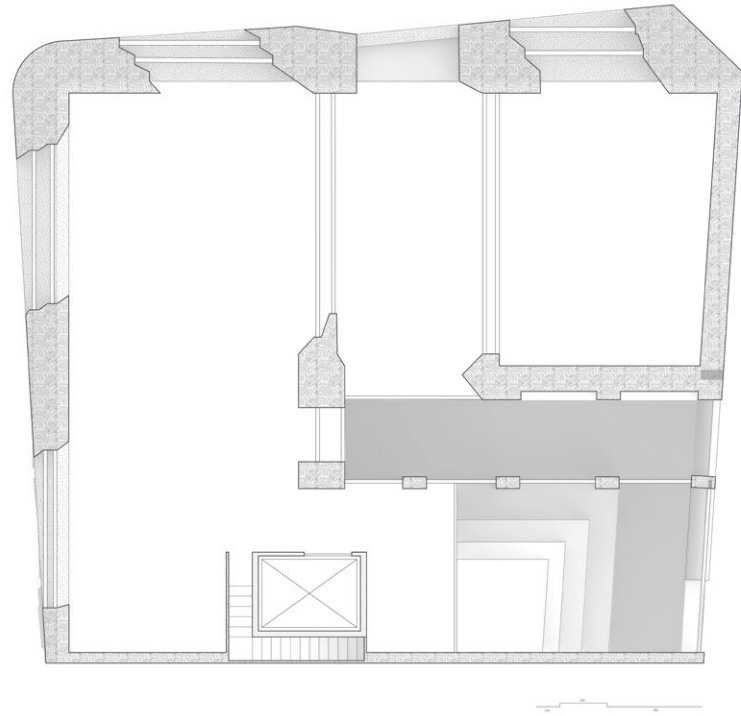
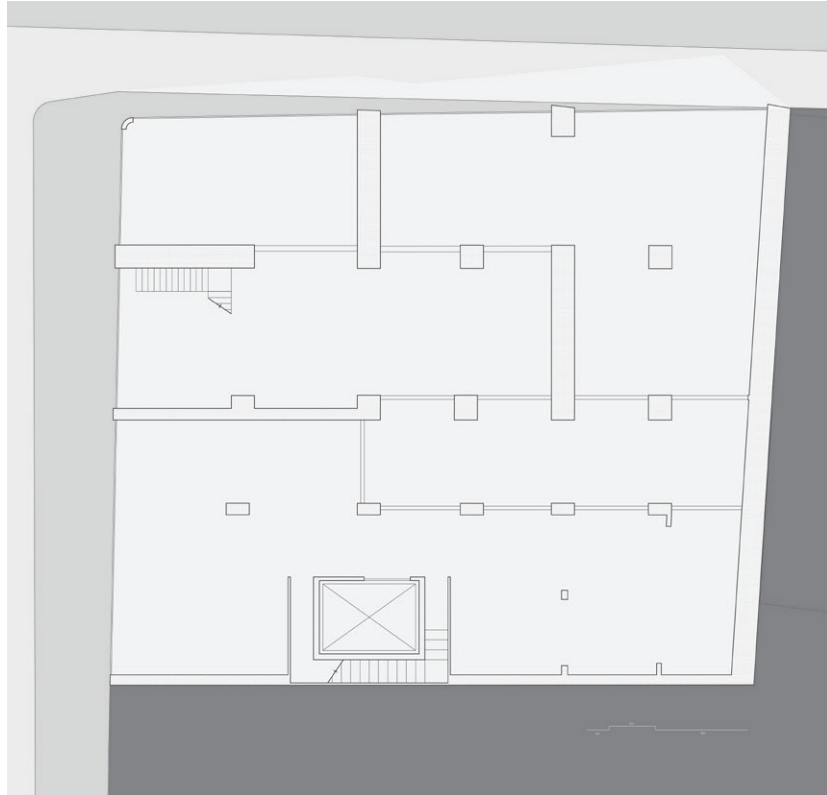
Malay Traditional Houses

Malay houses have wooden or bamboo walls and are topped with a sloping thatched roof. High stilts ensure minimal impact on the ground to avoid conflicts between people and animals. As daytime temperatures are usually higher in tropical areas, the ground space allows for temperature regulation, ventilation, and unobstructed air circulation.



Phase 4: Thermal Occupancy

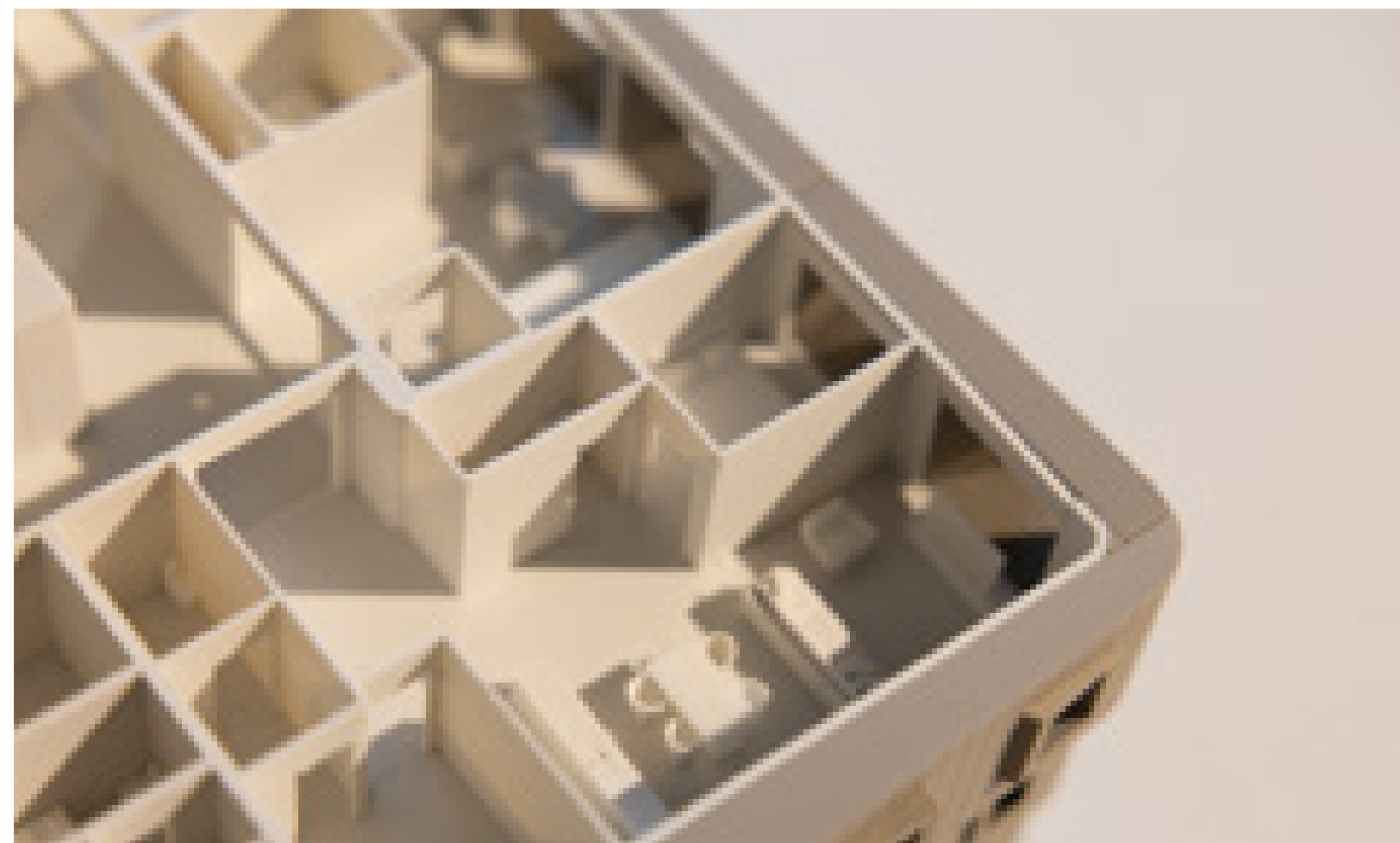


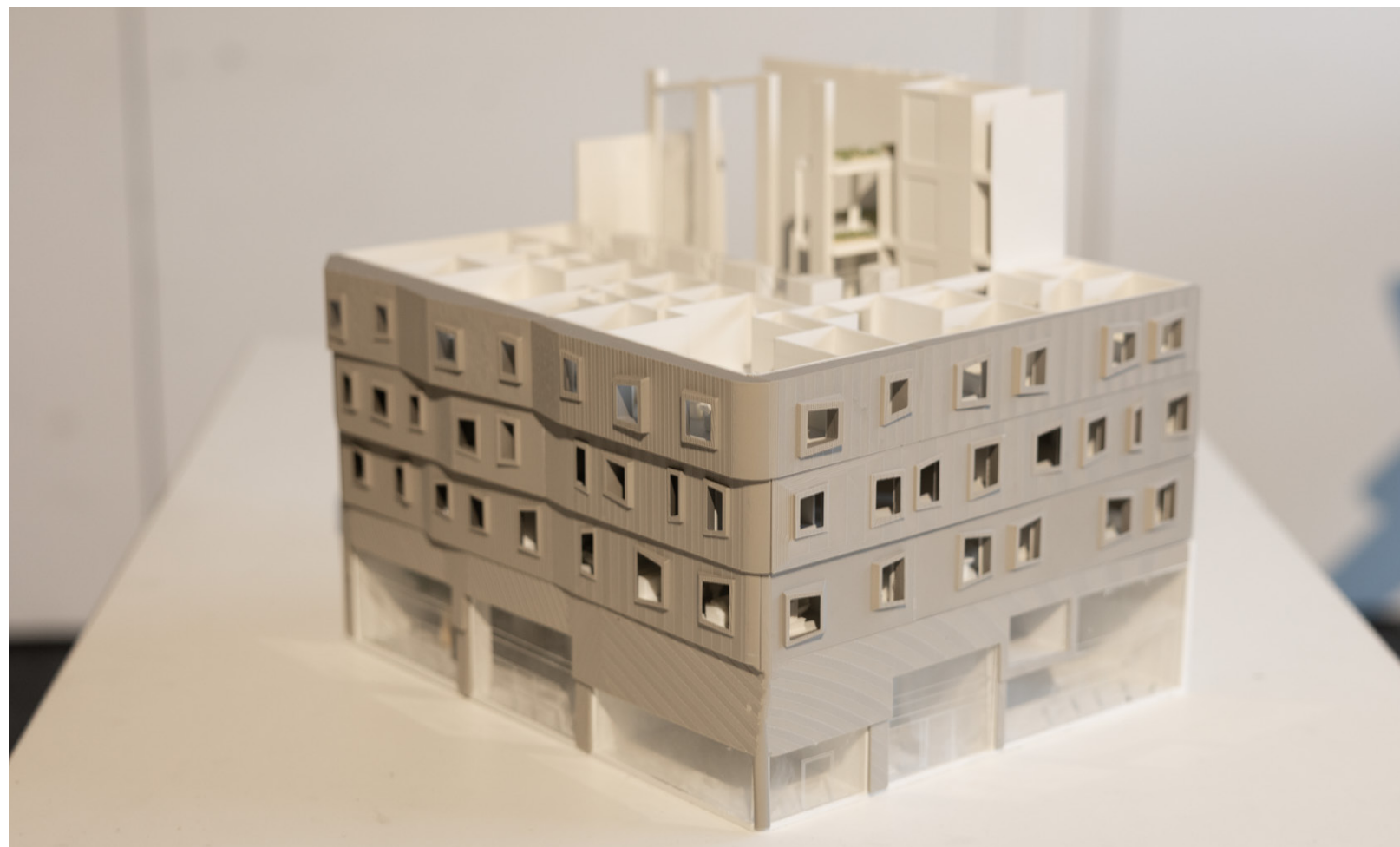
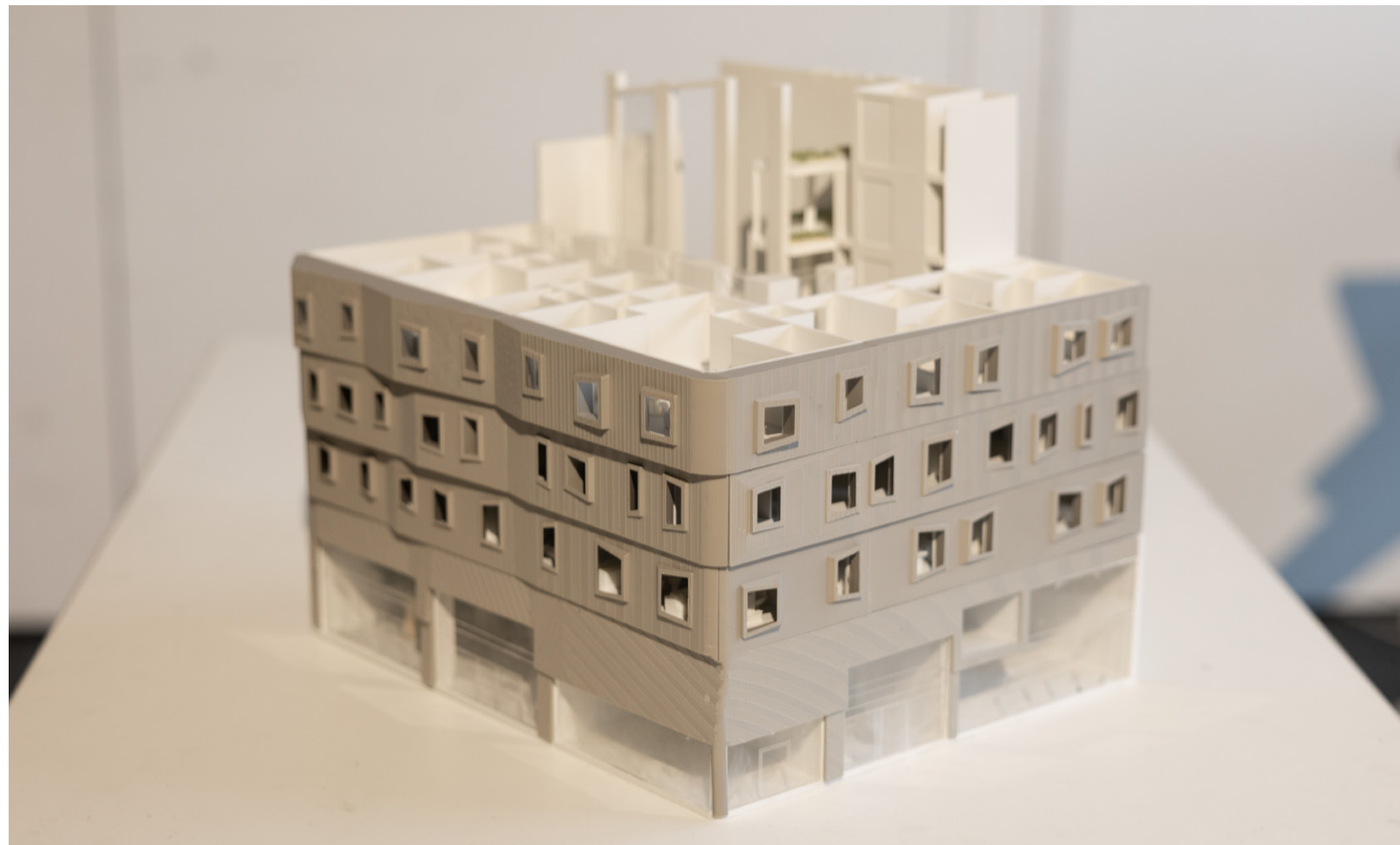


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Small Footprints

A Soft Architecture for Mental Wellness

2025

Instructor: Hilary Sample

This project reimagines the mental health clinic as a soft, walkable landscape—made not of corridors and waiting rooms, but of small garden rooms, scattered like storefronts across a quiet terrain. Instead of being told where to go, each visitor chooses their path. Healing begins by walking through trees, textures, and colors. The architecture is gentle. It listens more than it speaks. It invites you to pause, to sit, to feel. Gardens are not decorative—they are active spaces of care. Some people may come to talk; others just to tend a plant, or find a moment of peace. This is not just a clinic. It's a place for quiet, for community, and belonging.

Union Square



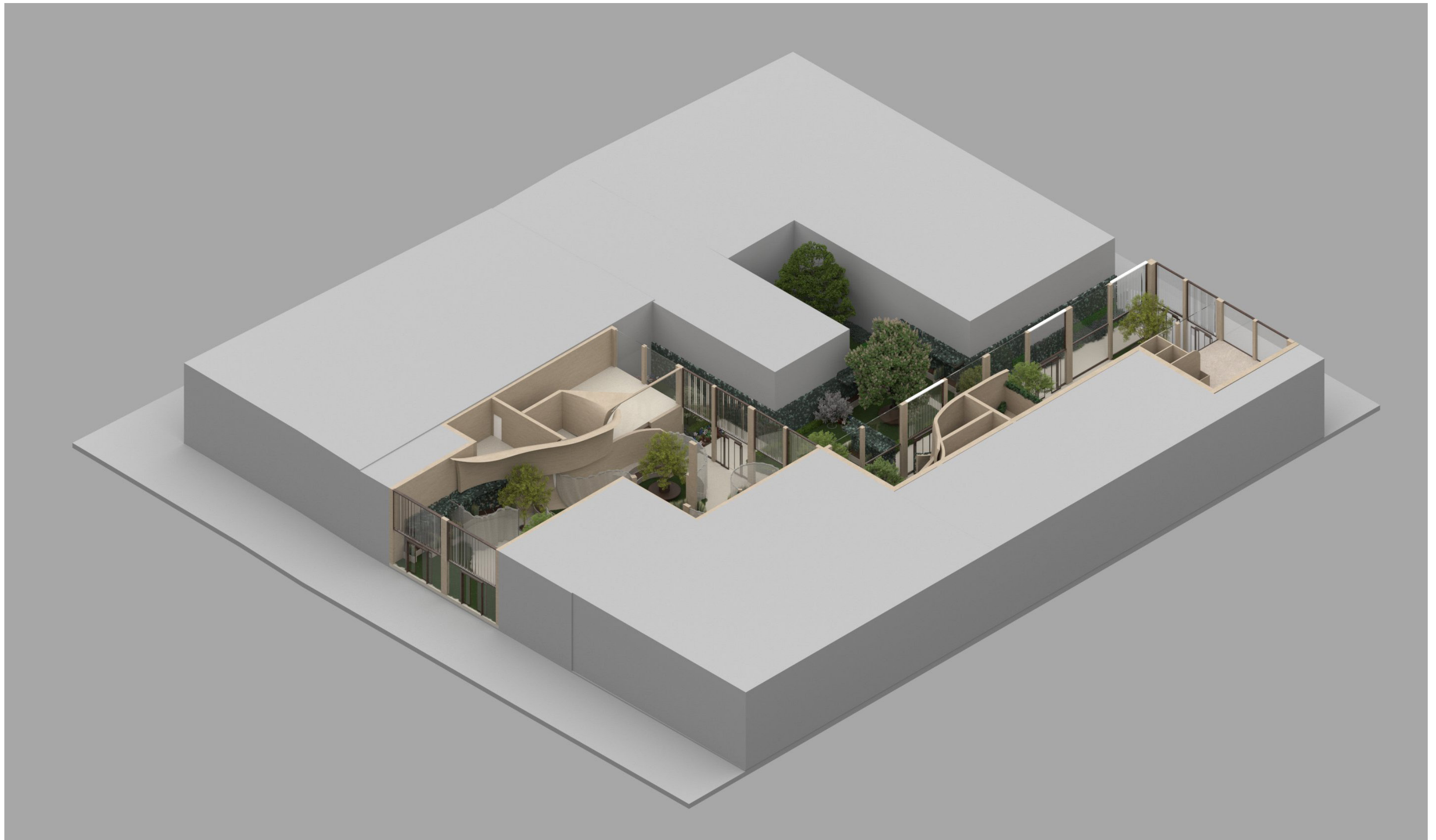
East 13th Street

East 14th Street

Union Square West







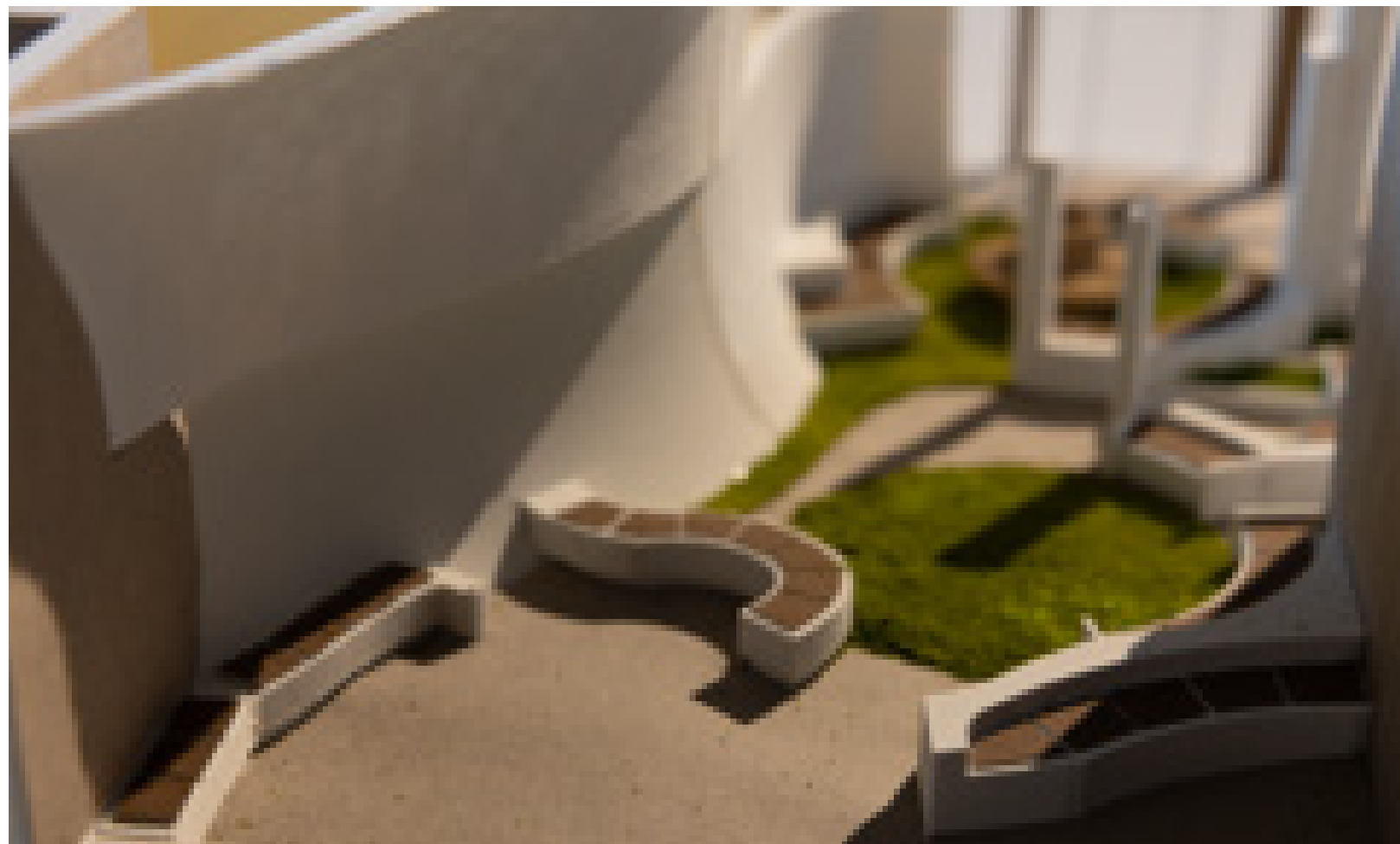














Architecture Photography

2024

Instructor: Michael Vahrenwald

