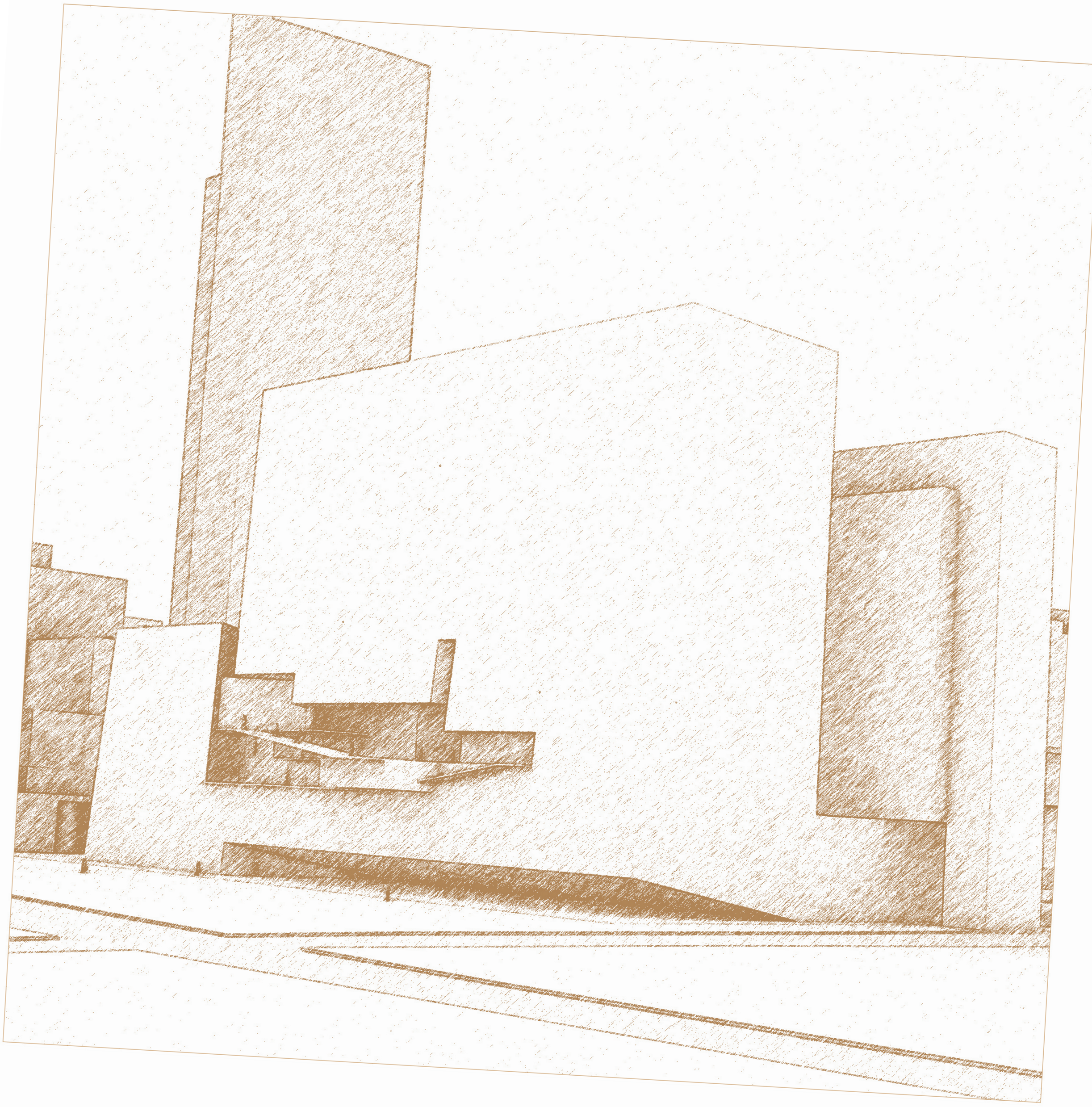
5689864 TU Delft



Multiverse Hub

Crafting Paths For A Diverse Co-Existing

Graduation Report
AR3AP100 Public Building Graduation Studio

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I

Introduction

Graduation project	
Title of the graduation project	Multiverse Hub: Crafting Paths for a diverse Co-existing
Goal	
Location	The central square of The Hague Central Station (on the northern-west side)
The posed problem	Rather than concentrating on the development of a single city, the Dutch government decided to focus on clustering connections among various sites in the Randstad network. Accommodate the anticipated influx of the growing population in the future from this network poses potential challenges and pressures for The Hague. When we look at the area around the central station, people utilise the infrastructural network for work and study. However, through the process of moving from one space to another, some requirements for the users' journey fail to be fulfilled. People occupy spaces without being fully present. This discontinuous space-use results in dissatisfaction in living quality. Advancements in digital technology do not discourage students from using on-campus spaces due to specific aspects that remain irreplaceable through virtual presence. Instead, compared to traditional use, the required functions of campus spaces have become more complex and changeable. Students require varied spaces, such as for working alone or within a group, on or off the campus, to work on a more efficient schedule. Campus design should fully support this flexible working style. Furthermore, the current approach of constructing more buildings to cope with the rising population has environmental impacts and is not a sustainable solution.

research questions	A. How can the design enhance the usage rate of the spaces around the Hague Central station to minimise the impact of the influx on the city by accommodating more people? B. In what ways can the design contribute to the enhancement of learning-efficiency and living quality for users? C. How can the design exemplify inward densification for the rising population, promoting sustainability by ensuring efficient space utilisation?
design assignment in which these result.	***Objective 1 (Contextual)*** Create an accessible campus close to the network, ensuring a short distance from the Hague Central station, and providing various programs efficiently. By shortening the movements from the station to the campus, the overall required space is minimised to decrease the impact of influx on the city. ***Objective 2 (Quantitative)*** Implement compact use in programmatic space featuring inward densification: emphasising more efficient utilisation of available spaces, focusing on the valid useful volume of spaces and the occupancy rate of these spaces. ***Objective 3 (Qualitative)*** Establish a multifunctional campus equipped with a variety of spaces and facilities to fulfil various needs on the daily paths of users, promoting more learning efficiency and a better quality.

Process

Method description

I. Design Concept and research on design Parameters

The design treats users' paths as central elements in achieving the intended objectives, aiming to seamless integrate these paths into the building structure. The overarching concept involves folding user paths within the building.

1. Contextual Parameters

Determination of the user paths is based on gathering flows from the Central Station. Pedestrian movement patterns around the site will be analysed, and connections to the building will be established. The mass and void of the structure will be shaped by an analysis of the urban contexts.

2. Quantitative parameters

Quantitative requirements for activities on user paths, such as user numbers, area per person, usage hours, occupancy rate, space dimensions, are studied and determined through data collection and stakeholder interviews. Programmatic strategies are developed, overlapping activities based on functions, user groups, and time. A comprehensive program list that incorporates overlapping activities will be established.

3. Qualitative parameters

Qualitative data influencing users' emotions and experiences, such as shapes, walking distances, sight lines, daylight preferences, privacy levels, and noise tolerance, is set. and strategies for each parameter are developed.

II. Design of Building Masses

The building masses will be determined by the urban contexts and the desired relationship of the three user groups defined from the last step.

III. Programmatic placement

Programs will be positioned within the building masses based on the researched quantitative and qualitative parameter along the user paths.

IV. Integration and Materialisation

This step involves the development of architectural strategies for space planning in the building's configuration. The aim is to meet functional qualities, such as structure, proper circulation patterns, climate schemes, facade detailing, and material use.

Schedule

P2 :Programming and Schematic Design phase

P3+P4: Design Development phase

Literature and general practical references

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II

On site research
(P1 results and group research)

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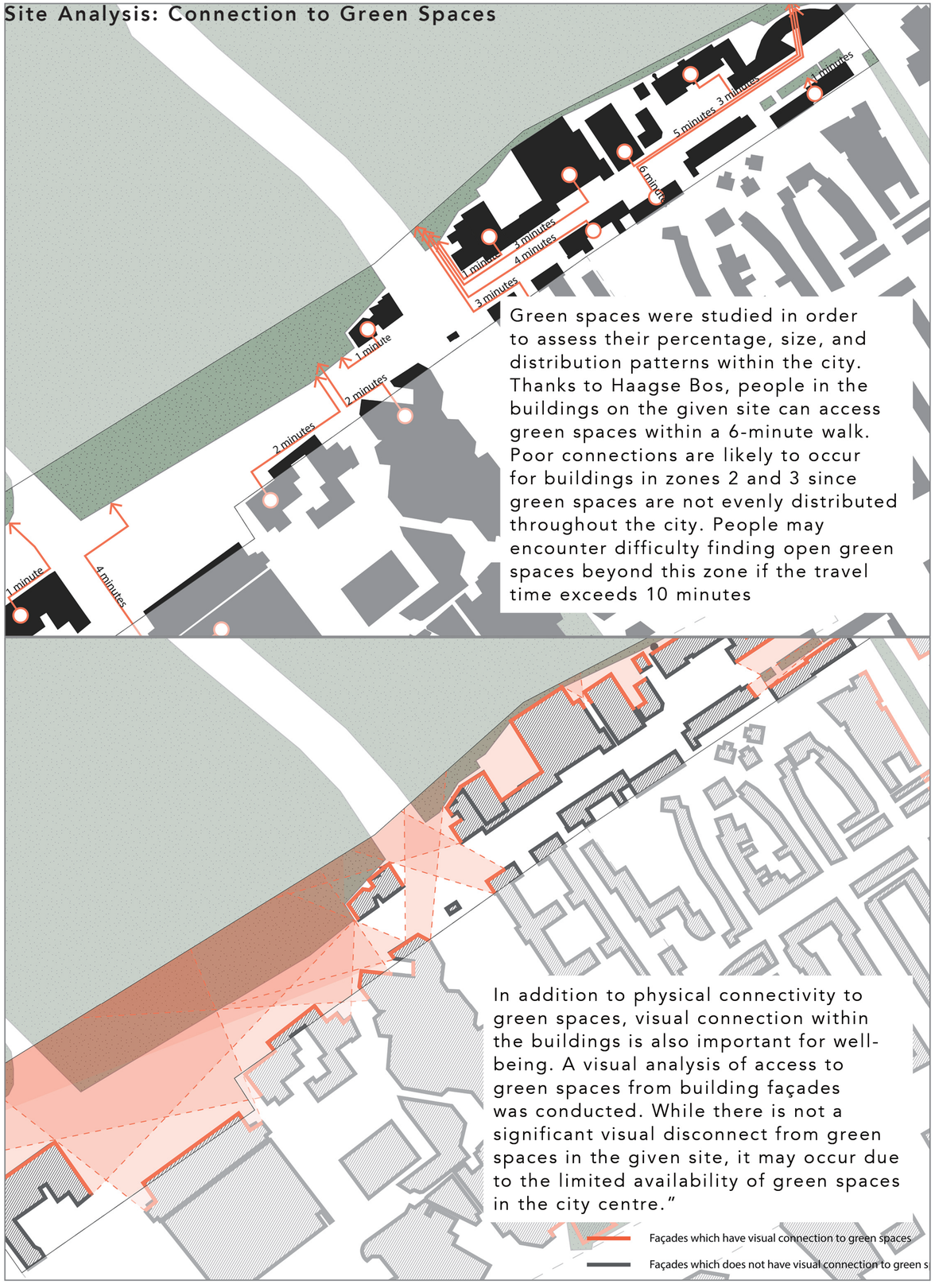
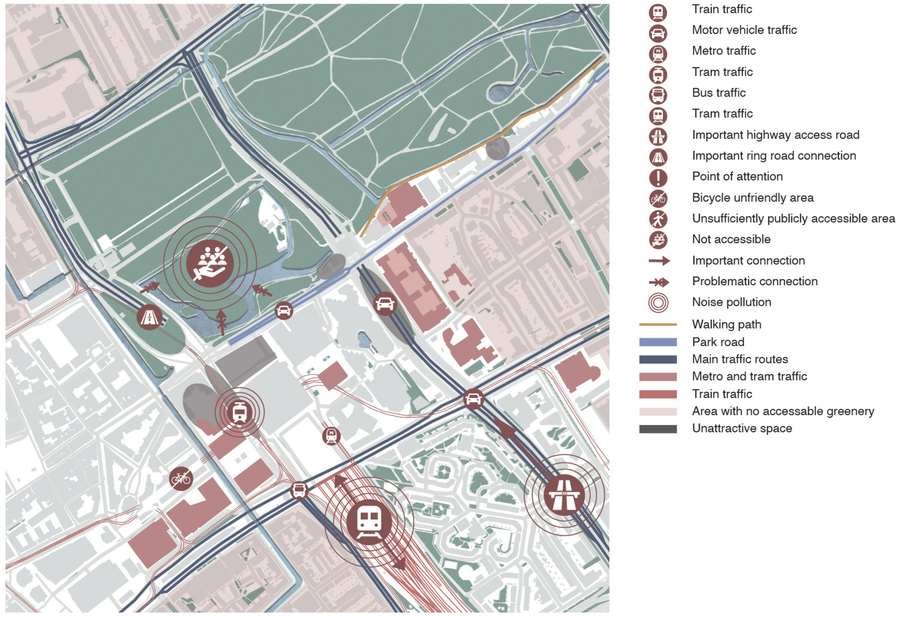
Site Analysis: Connection to Green Spaces

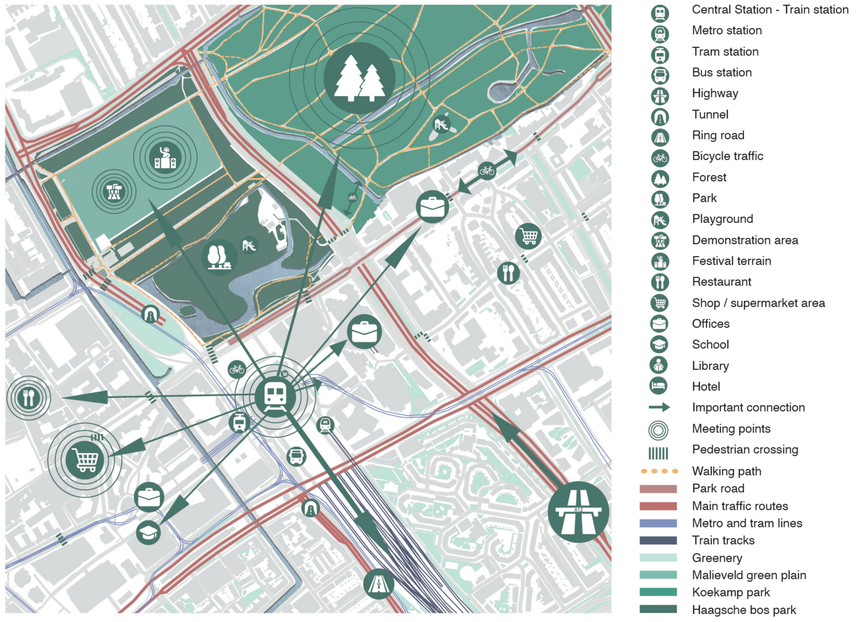


SWOT Analysis

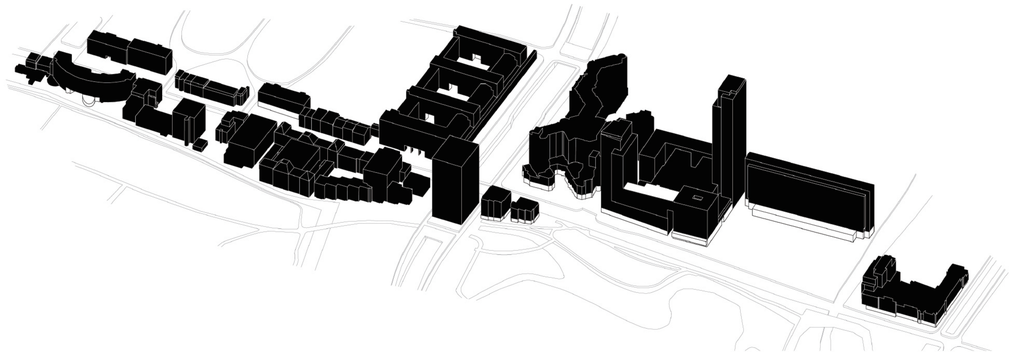
Weakness and Threats



Strengths & Opportunities

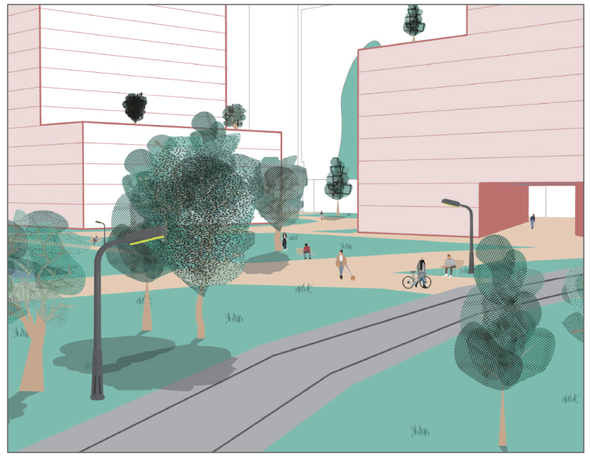


Site Analysis: Nollie Map





Capacity Plan









Capacity Plan





Cambridge University Study

As a group we each looked into an element that we personally thought really good be used to improve / change the classic college buidings of the Oxford University. All our so-called suggestions are made with text but are supported by photographs we each made during our visit to the city of Oxford and sketches / drawings we made to further support our ideas.



The Queens College and its vernacular classical architecture.
Source: Own photo by Group 1

Element I Image

A building's image can encompass various interpretations, but in this analysis, we will specifically examine two aspects: its symbolic significance and the way it is perceived by the public. These two dimensions can greatly differ across the different buildings in Oxford.

Within the historic section of the Oxford University campus, home to All Souls College and The Queen's College, there naturally exists a high symbolic value, not only for those who directly utilize these buildings but also for the broader community. The historical significance and the prestigious architectural design of these buildings contribute to the campus's esteemed reputation. This distinction is something that the newer university buildings may struggle to match, potentially affecting the overall unity of the campus. Faculties situated within the more prestigious section of the campus inherently acquire higher status due to their location.

It's worth noting that the public perception of a building doesn't always align with its symbolic value. For instance, the Florey building may hold significant symbolic value due to its strong influence by the Bauhaus movement, which revolutionized modern architecture at the time. However, the general public's perception of the building varies widely.

On the other hand, Exeter College represents a newer building that consciously preserves its symbolic value by retaining the old façade while simultaneously enhancing the building's public perception. This is achieved by replacing outdated parts of the structure with a modern design aimed at creating an optimal learning environment for students. Thus, the building maintains its symbolic value for the community while fostering a fresh image for its users.

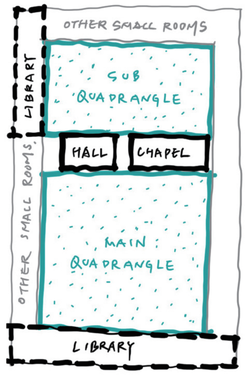


The Florey Building and its closed façade that fits the style of its timeframe. Source: Own photo by Group 1

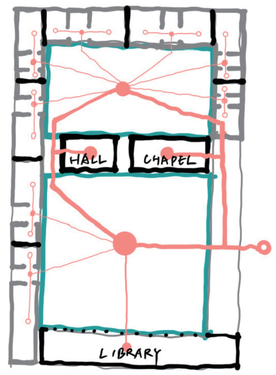


Exeter College and the way contemporary architecture and vernacular architecture interact in its façade.
Source: Own photo by Group 1

Element I Circulation patterns



Sketch of space configuration.
Source: Own work Group 1.



Sketch of circulation.
Source: Own work Group 1.

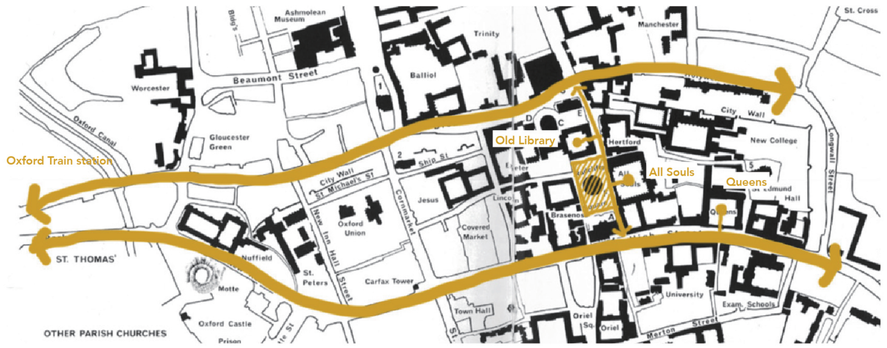


Circulation to the secondary quadrangle.
Source: Own photo taken by Group 1.

All Souls College and Queen's College provide good examples for studying space configuration and circulation patterns in the old Oxford campus. We observed that there are typically two quadrangles, a main one with a front entry, and a secondary one next to it. In between the two quadrangles, you usually find the chapel and a hall, while the college library could be located next to either of the quadrangles.

Regarding circulation patterns, the main entry of the building connects to the main quadrangle and then leads to the secondary one through two corridors, which also serve as entrances to the hall and the chapel. Unlike facing the main quadrangle, the main doors of the hall and the chapel open towards the secondary corridors, which are at a right angle to the direction of the quadrangle. At least two staircases, serving as vertical circulation, are located on each wing and also serve as entrances to the remaining rooms in the building. While the spaces may seem interconnected, they are actually isolated with separate entrances.

Element I Relationship with the urban fabric



Source: The Buildings of Oxford by Anthony F. Kersting and John Ashdown, 1980. Edited by Group 1.

When it comes to the relationship between All Souls College and Queen's College with the urban fabric, we examined the hierarchy of the streets in the old campus. A clearer relationship can then be found. Unlike most of the buildings at Oxford University in the old campus, including Queen's College, which have their entrances facing the main roads, High Street and Broad Street, All Souls College, initially used for University governing meetings, and the Bodleian Old Library have their entrances on Catte Street, which connects the two main streets. This road, with a spacious square that is open to the public, establishes itself as the heart of the campus with a discernible hierarchy.



The distinct features of the grand entrace of the All Souls College. Source: Own photo by Group 1

Element I Identity

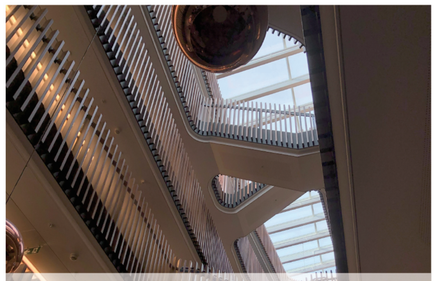
A building's identity encompasses a multitude of characteristics, including its historical significance, architectural design, and functionality.

All Souls College and The Queen's College both possess distinct historical features. All Souls College emits a church-like ambiance with its Gothic architecture and twin towers, imparting a sense of prestige. In contrast, The Queen's College adopts a (neo)classical style, displaying more modesty with a single, lower tower and less ornaments.

Exeter College combines vernacular and contemporary architecture, resulting in a building full of character. The interplay or fusion of these styles gives a unique quality to the structure. Inside, the building's interiors are custom-tailored, offering diverse spaces that each possesses its own distinct atmosphere.

The Beecroft Building offers an intriguing twist, as its interior holds greater significance than its unassuming exterior. While the building's façade is modest and lacks a distinctive architectural style, the interior unveils a grand atrium and a stunning staircase design, dramatically altering the building's identity upon entry.

The Oxford Library Group and the Florey Building draw their identities primarily from their shapes and compositions. The expansive staircase leading to the Library's entrance is a defining feature. Also the fact that the entrance is situated above ground level, makes it a unique public building. Meanwhile, the Florey Building's horseshoe shape and unconventional entrance at the original rear end create a distinct and somewhat isolated feeling. As a result, the building maintains an unusual link with its surroundings, contributing to its distinct identity.



Inside of the Beecroft Building where you can see the atrium with its staircase design. Source: Own photo by Group 1

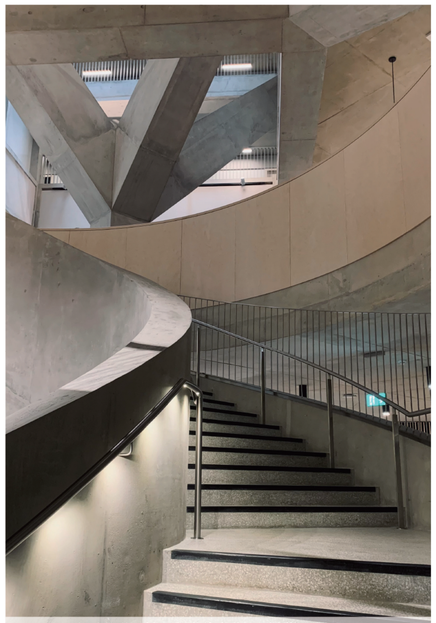


The Oxford University - Library Group features multiple entrances at different levels around the exterior of the building. Source: Own photo by Group 1

Element I Thresholds

For me personally, the element 'thresholds' is the most telling element. This was certainly noticeable during the trip to the college buildings of OU (Oxford University), but also noticeable at the buildings of the LSE (London School of Economics) and the UCL (University College London).

Despite all the above universities being accessible to a certain level, the difference between OU and the universities in London was clearly visible. In London it was possible for passers-by (in this case students, something that certainly counts) to enter all university buildings and to move freely through these buildings. However, some areas were closed, such as the university library.

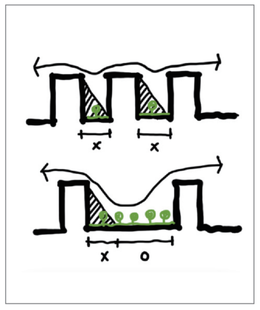


Inside the Marshall Building of LSE which was openly accesible to us during our visit to the building in London Source: Own photo by Group 1

Element I Nature



Diagram showing the proportion of the green space at two block in the old Oxford campus. Source: The Buildings of Oxford by Anthony F. Kersting and John Ashdown, 1980. Edited by Group 1.



Sketch showing the valid size of the green space. Source: Group 1.



Source: Own photo taken by Group 1.

When it comes to the subject of nature, we found that the urban plan of the old Oxford campus serves as a noteworthy example of a horizontal campus design. Firstly, we examined two blocks of the old Oxford campus and observed that the proportion of green space is approximately fifty percent on the 2D site plan. Secondly, in addition to the ratio, unlike the large park next to Den Haag station, the green space at Oxford is divided into fragments and interspersed with buildings, making it more accessible from working or studying spaces. The buildings are typically in rectangular form, creating courtyards where the green spaces are located. Thirdly, we also discovered that the size of the green spaces cannot be too small, as the surrounding buildings could block sunlight and diminish qualities such as brightness and fresh air.

III

Problem statement

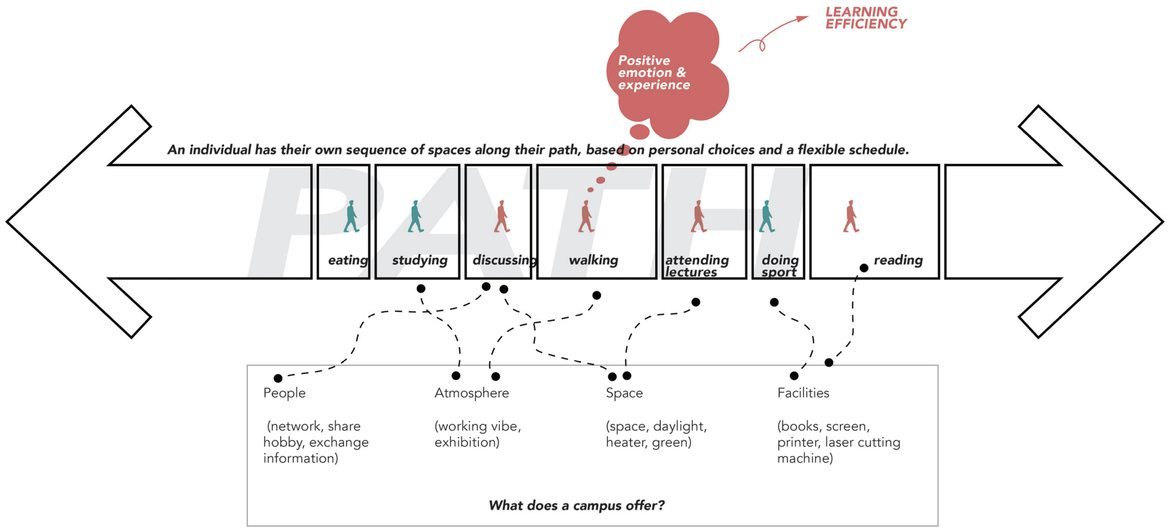
Incoming Pressure Through the Randstad Urban Network

The Hague

Utrecht

Rotterdam

Discontinuous Satisfying Journey









Global Population Increase



Design Objectives

Problem statement A	*Problem statement B*	*Problem statement C*
Under-utilised buildings in the surrounding area and ***Pressure on the city.***	More material use for accommodating the rising population, not a ***sustainable*** way to densify**.**	Lack of life quality/ balance = ***Less learning/ working efficiency*** (including people in the surroundings: office, Leiden campus, etc.).

to address

Objective1 ***(Contextual)***	*Objective 2* ***(Programmatic-Quantitative)***	*Objective 3* ***(Programmatic-Qualitative)***
Implement inward densification in the city**:** Create ***an accessible campus close to the network*** which ensure a short distance from the station and provide various programs efficiently.	Implement inward densification in the building: achieve ***compact use in programmatic space*** through effective strategies.	Establish ***a Multifunctional Campus*** which equipped with a variety of spaces and facilities to fulfill various needs on the daily path.

IV

Concept research

The Hague central station

Green

The Multiverse Hub

The existing office

The Hague central station

Office/ campus

City centre

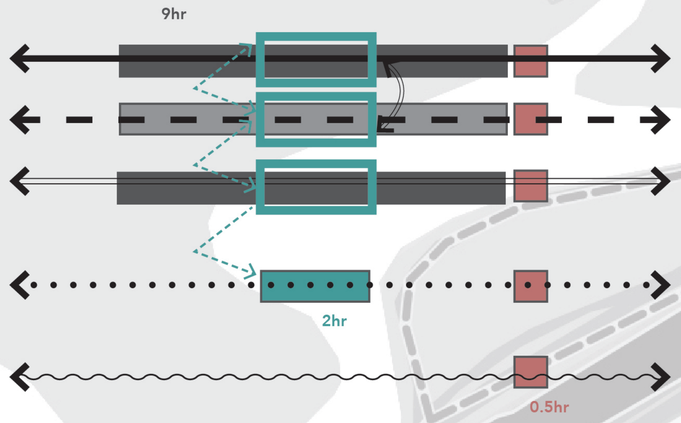
The Randstad Urban Network

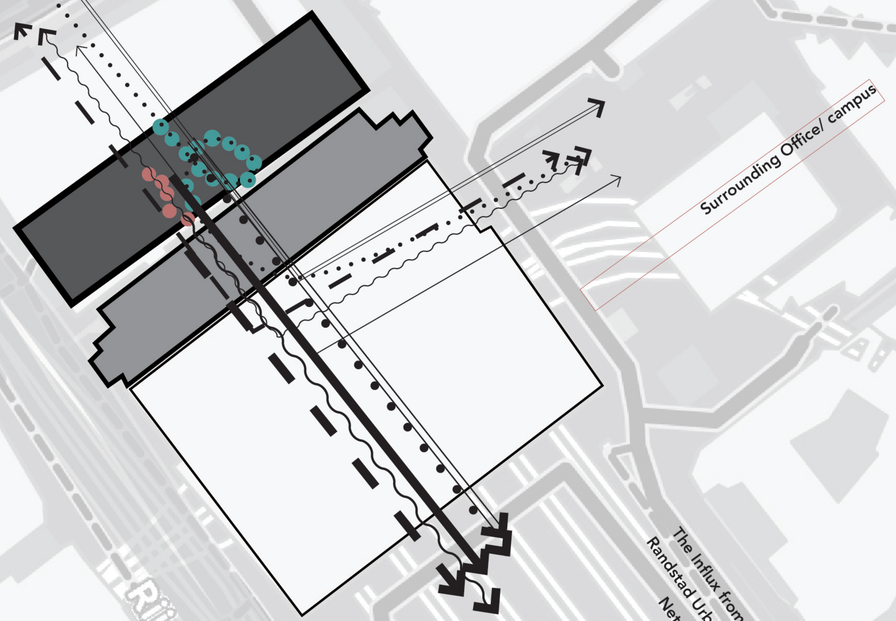
Bezuidenhoutseweg

Zwarteweg

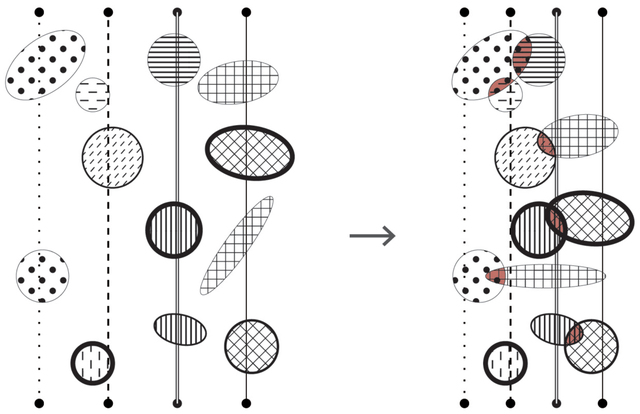
Rijnstraat

The User Groups





Compact Use in Programmatic Space



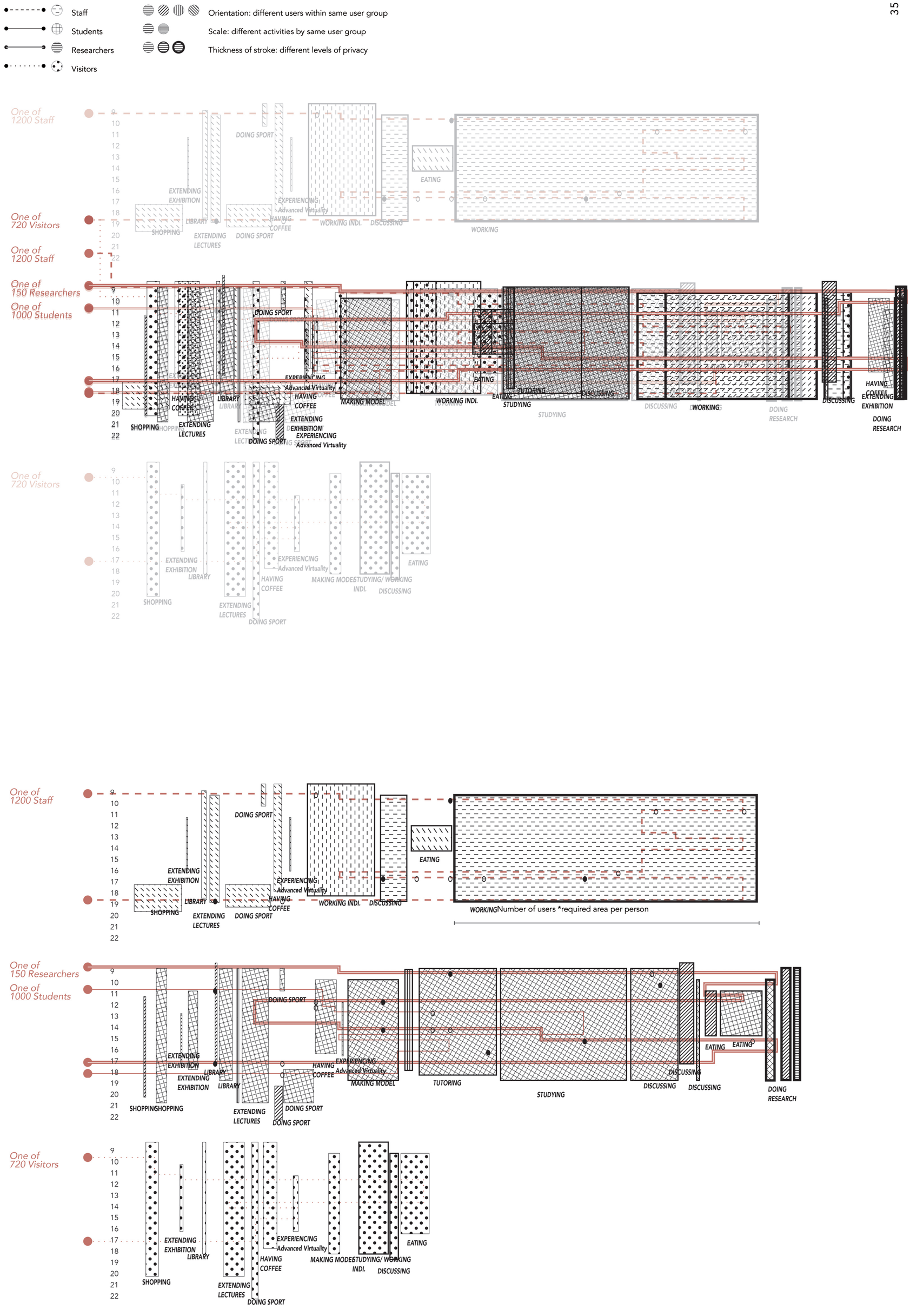




The model aims to illustrate the concept of efficient space utilization in both cities and buildings. It consists of six objects, each representing different activities or programs. Using the concept of 3D Tetris, the models demonstrate the importance of arranging space in a way that minimizes waste and optimize volume efficiency.

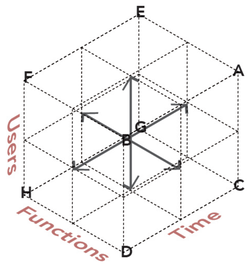
The ‘drawer’-like element seeks to showcase that the part of space within the objects is not fully utilised and offers the potential for sharing with other objects. The ‘spring’ element is intended to represent flexibility of space within the objects.

The model can be condensed from a 3x3x3 configuration to a 3x3x2 configuration under pressure, symbolizing the increasing population density in the city. The incorporation of the ‘drawer’ and ‘spring’ elements in the model serves to convey this concept. In conclusion, this model aims to demonstrate how my project will address these considerations and emphasizes the necessity for future building designs to accommodate the rising population.

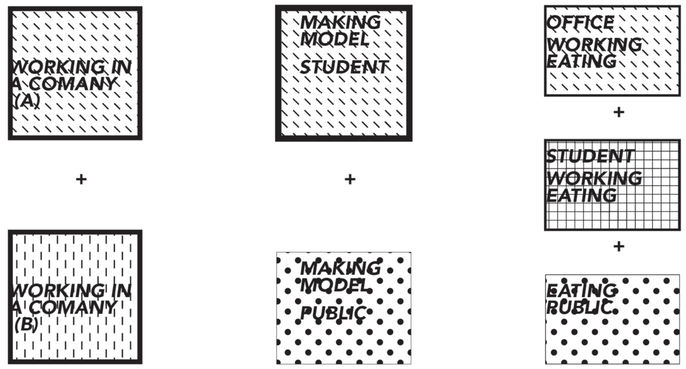

Staff
Students
Researchers
Visitors
Orientation: different users within same user group
Scale: different activities by same user group
Thickness of stroke: different levels of privacy
One of 1200 Staff
One of 720 Visitors
One of 150 Researchers
One of 1000 Students
SHOPPING
EXTENDING EXHIBITION
LIBRARY
EXTENDING LECTURES
DOING SPORT
EXPERIENCING Advanced Virtuality
HAVING COFFEE
MAKING MODEL
WORKING INDI.
DISCUSSING
EATING
WORKING
TUTORING
STUDYING
DOING RESEARCH
Number of users *required area per person

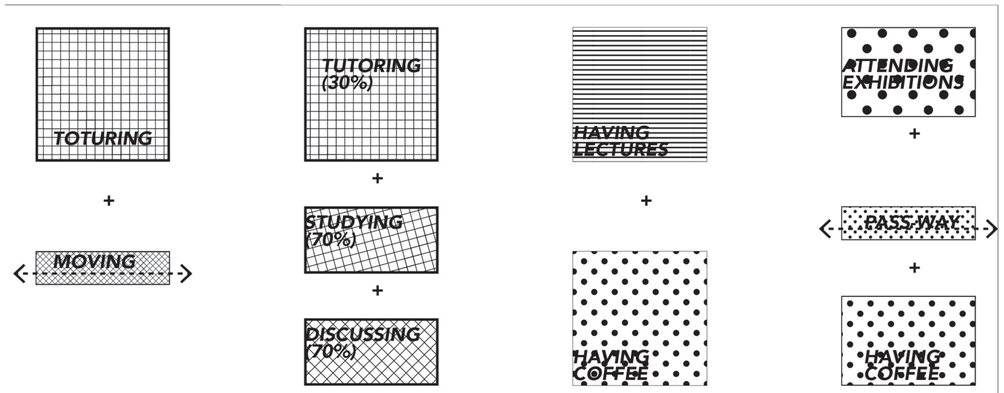
Staff
Students
Researchers
Visitors

Orientation: different users within same user group
Scale: different activities by same user group
Thickness of stroke: different levels of privacy



A (regular)
same function
same user group
same time







B
same function
same user group
different time

C
same function
different user group
same time

D
same function
different user group
different time

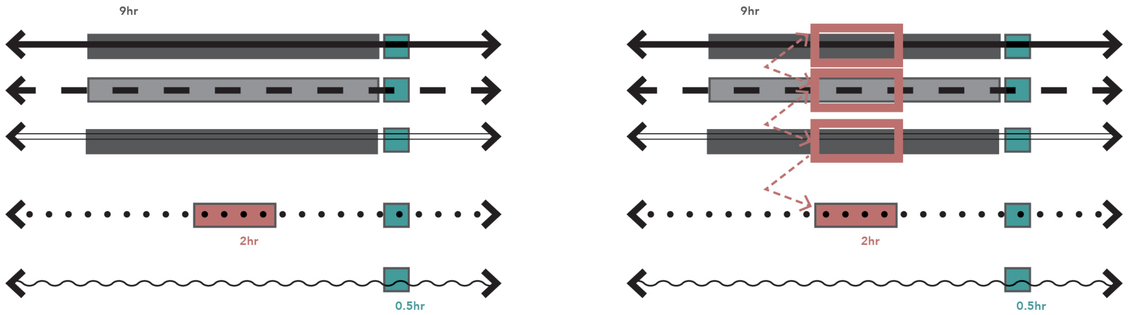
E
different function
same user group
same time

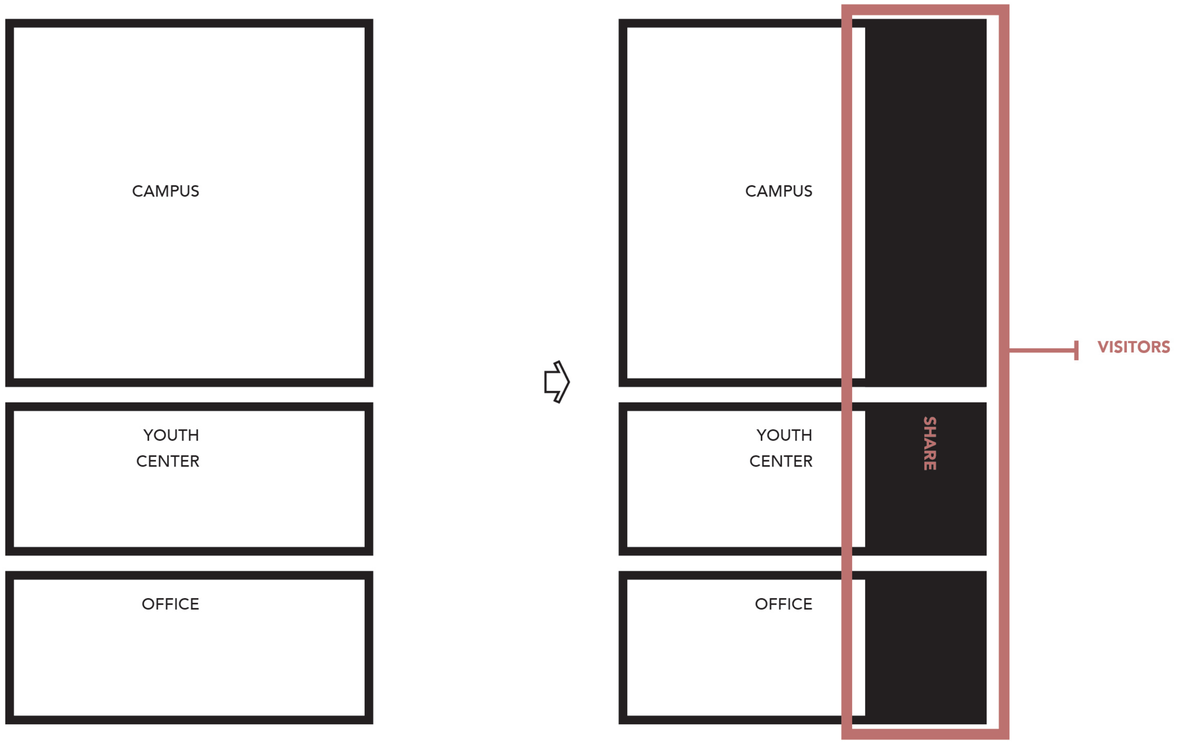
F
different function
same user group
different time

G
different function
different user group
same time

H
different function
different user group
different time

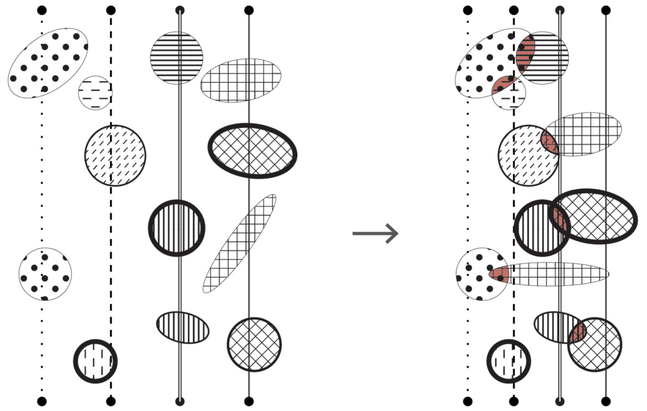
A Multifunctional Campus

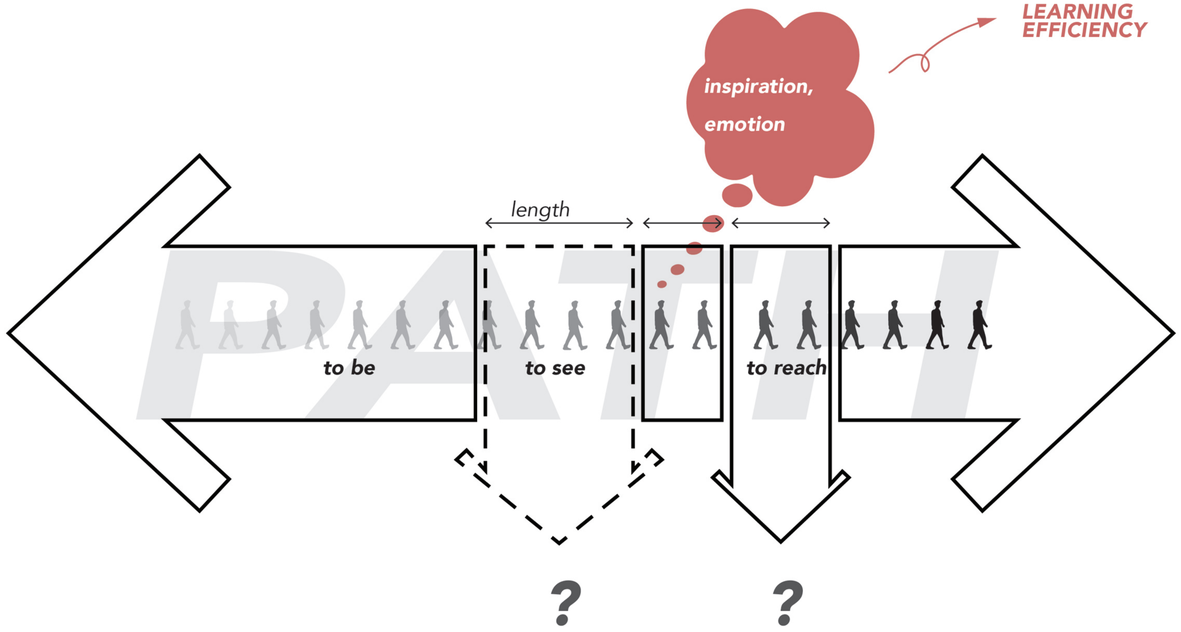


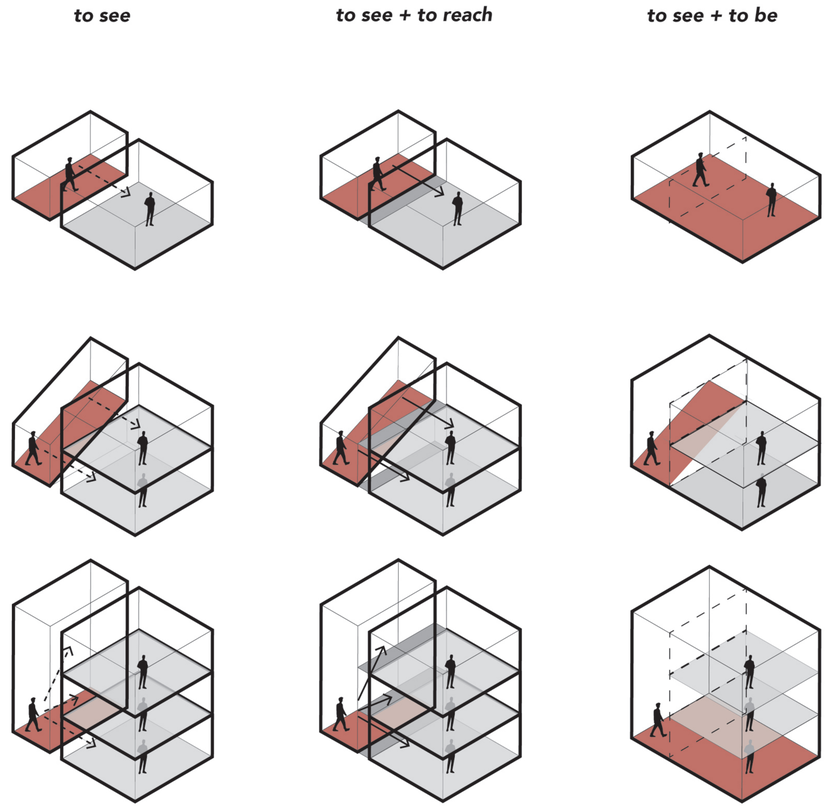


Separate access control for different usage spaces

Share with each User groups and open to registered public users





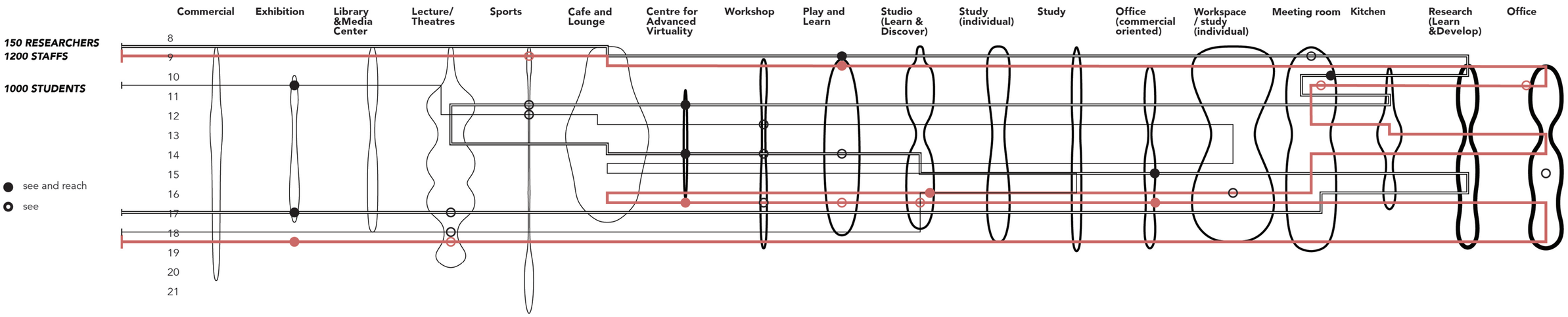


RAMP

to see a sequence of spaces

DOABLE/ TRIPLE HIGHTS

to see multiple spaces

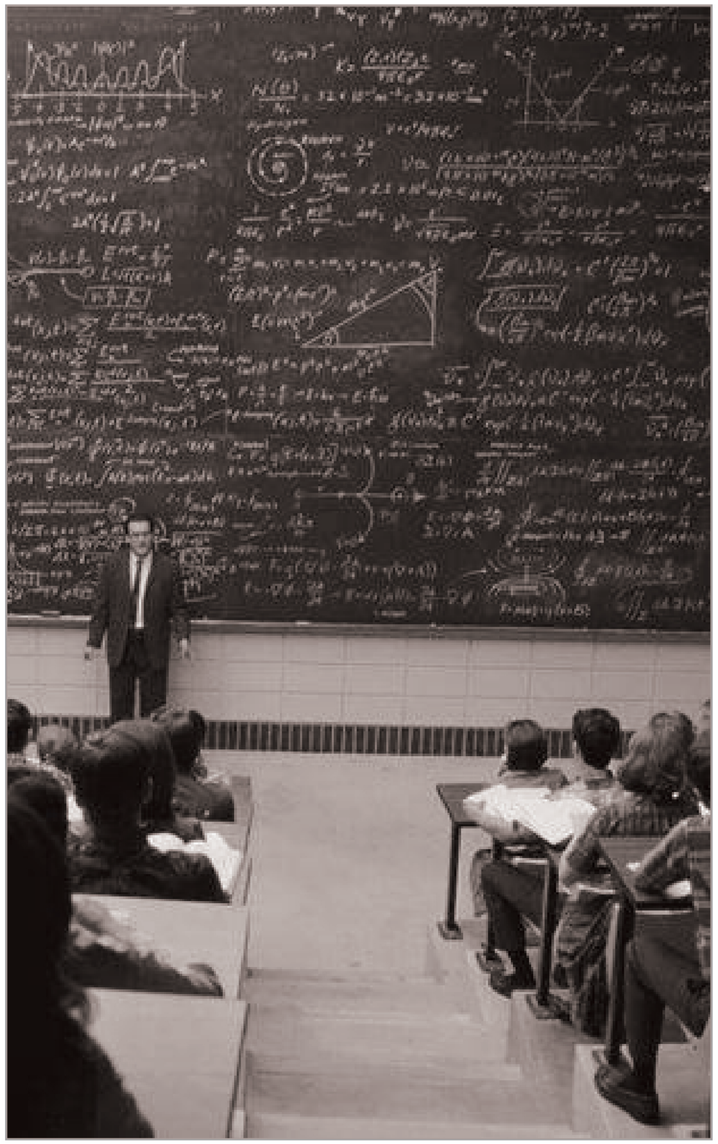


access control

architectural means



PRIVATE



SEMI-PUBLIC



PUBLIC

-https://www.cobe.dk/office
-Courtesy Harvard Graduate School of Design (https://www.archdaily.com/898971)
-https://www.physicsforums.com/threads/beautiful-math-and-physics-blackboards.704819/
-https://www.scandinaviastandard.com/a-guide-to-the-most-sustainable-buildings-in-copenhagen/

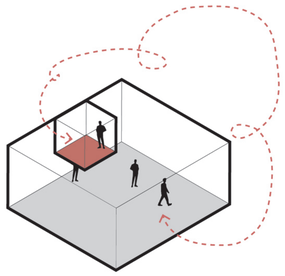
Total Length of route

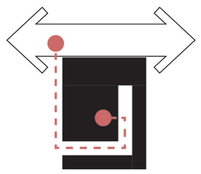
Numbers of turns of the route

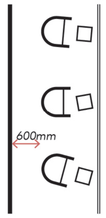
Width of the pathway

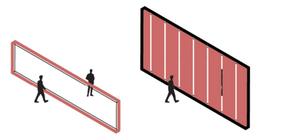
Visibility of the partition between path and space

More sense of PRIVACY



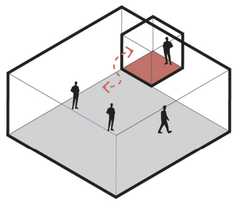


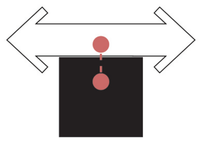


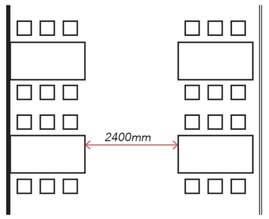


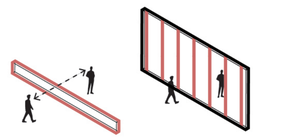
H>2.4m *less transparency*

More sense of PUBLIC









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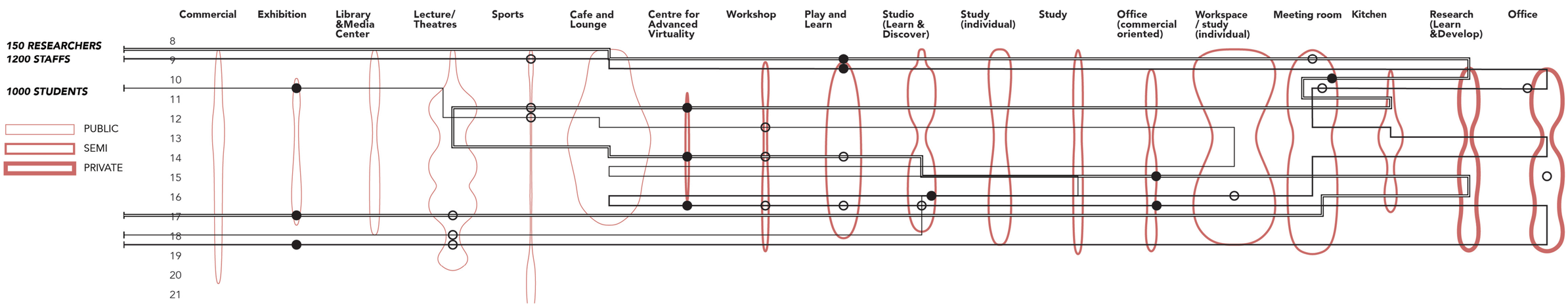


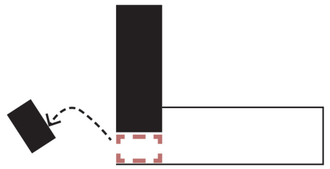
V

Massing & Programmatic Infill

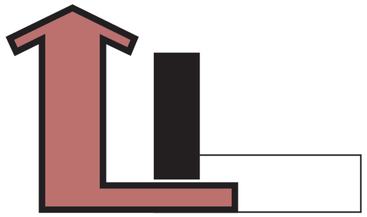
1. Gathering flows from the Hague central station



The existing office and the Hague central station.

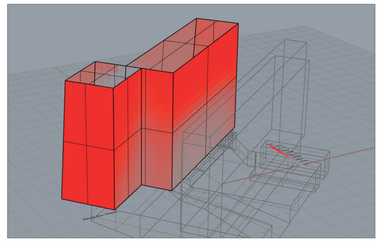


Demolish 3 levels from the bottom of the office.

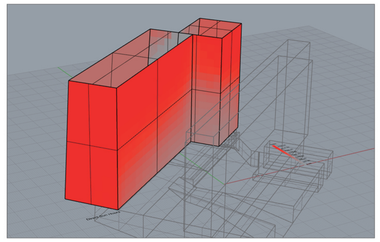


Add new building mass to gather flows.

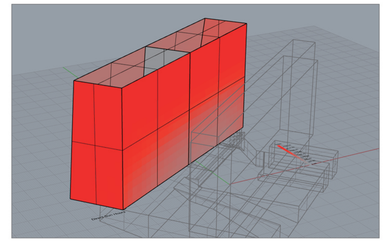
2. Gaining More Daylight



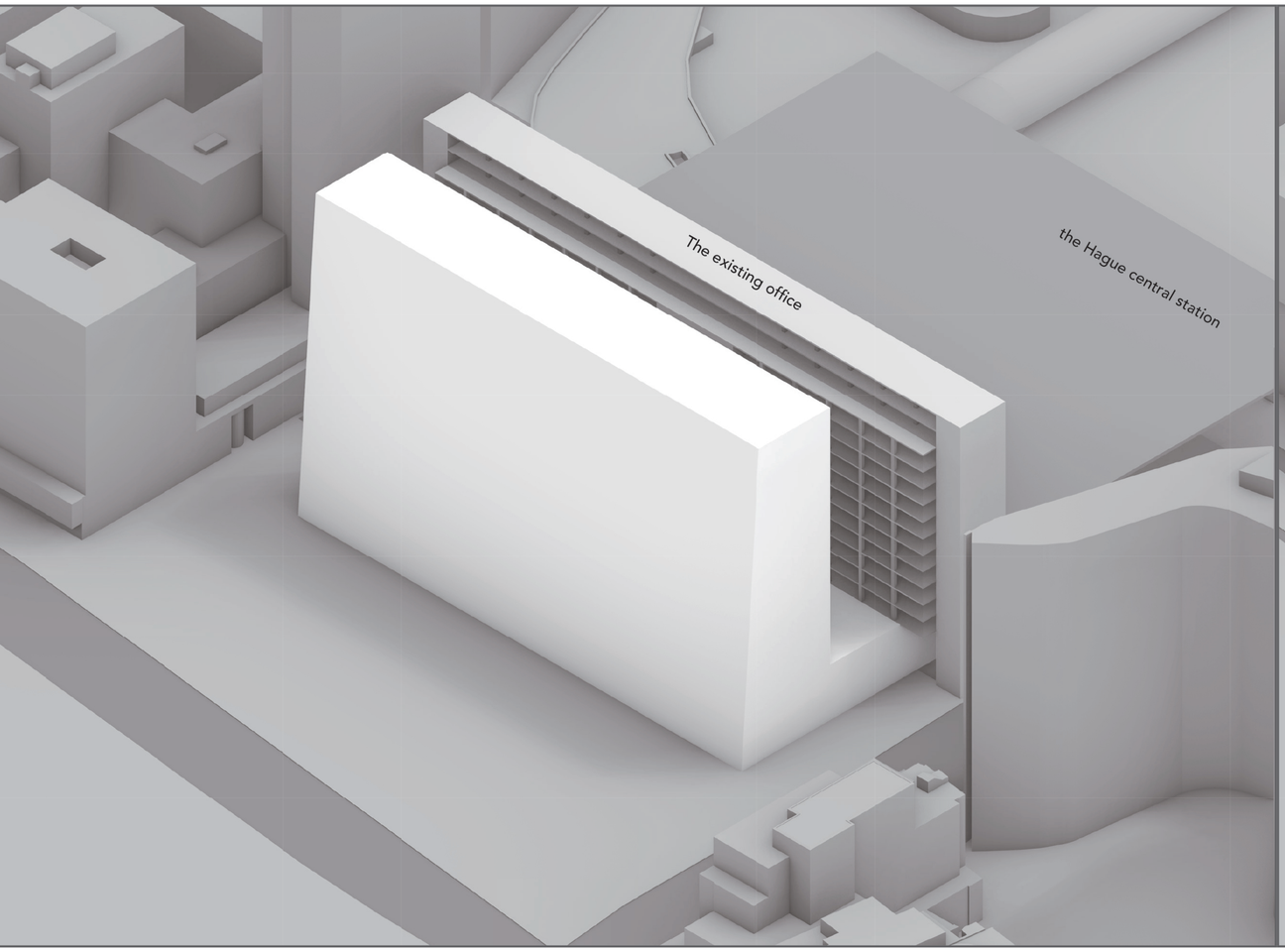
73% compared to no surroundings

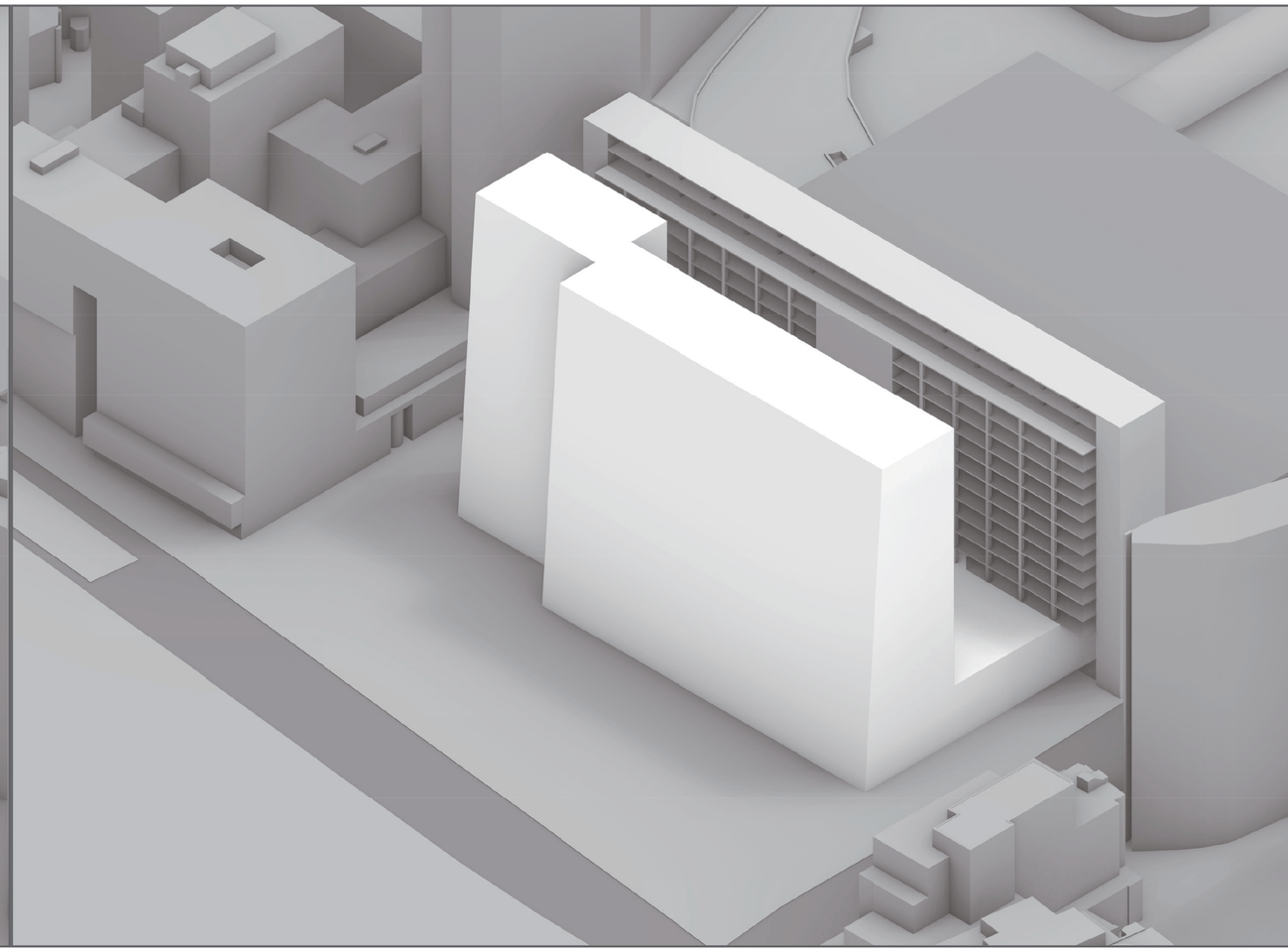


78% compared to no surroundings

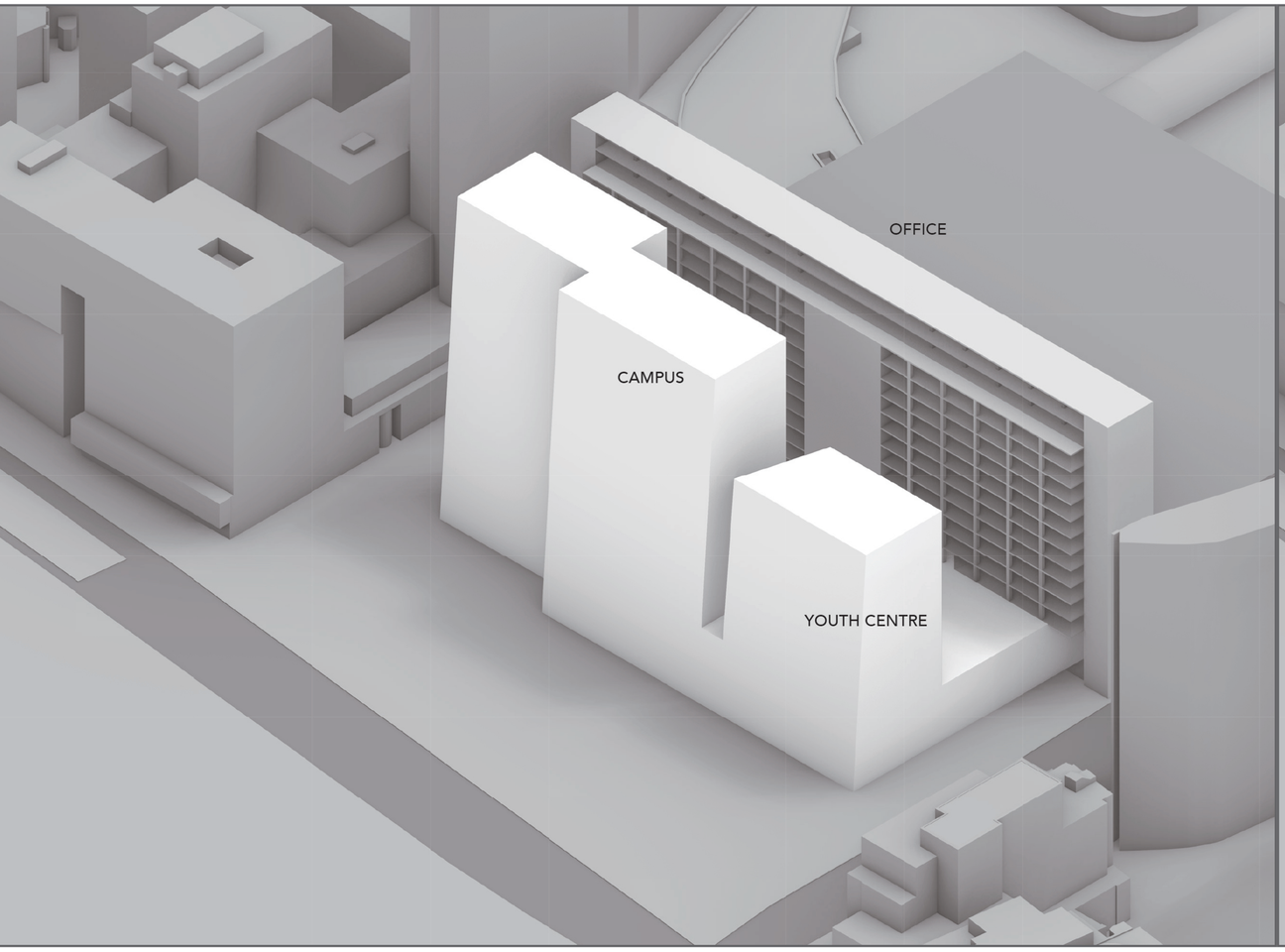


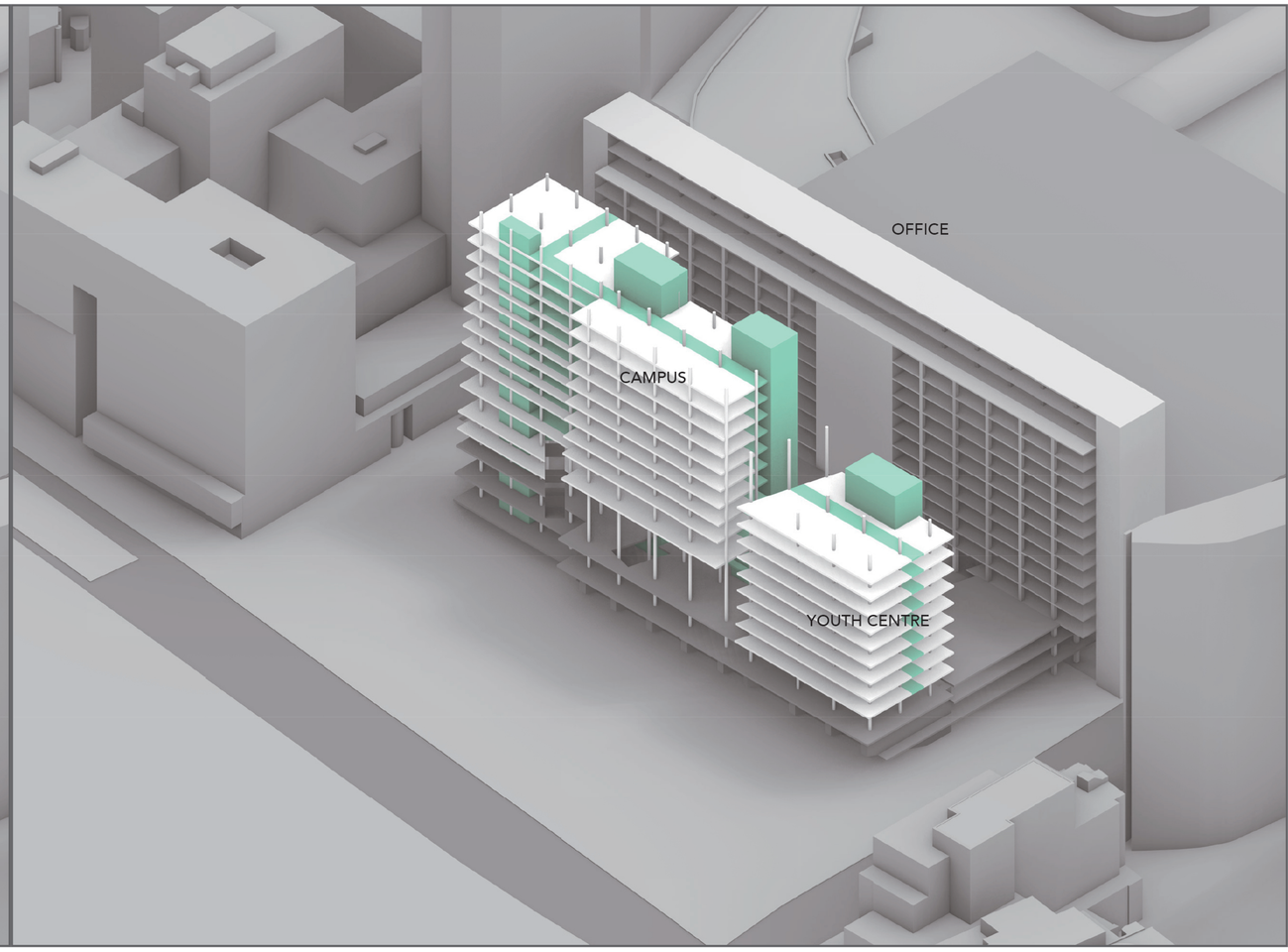
78% compared to no surroundings



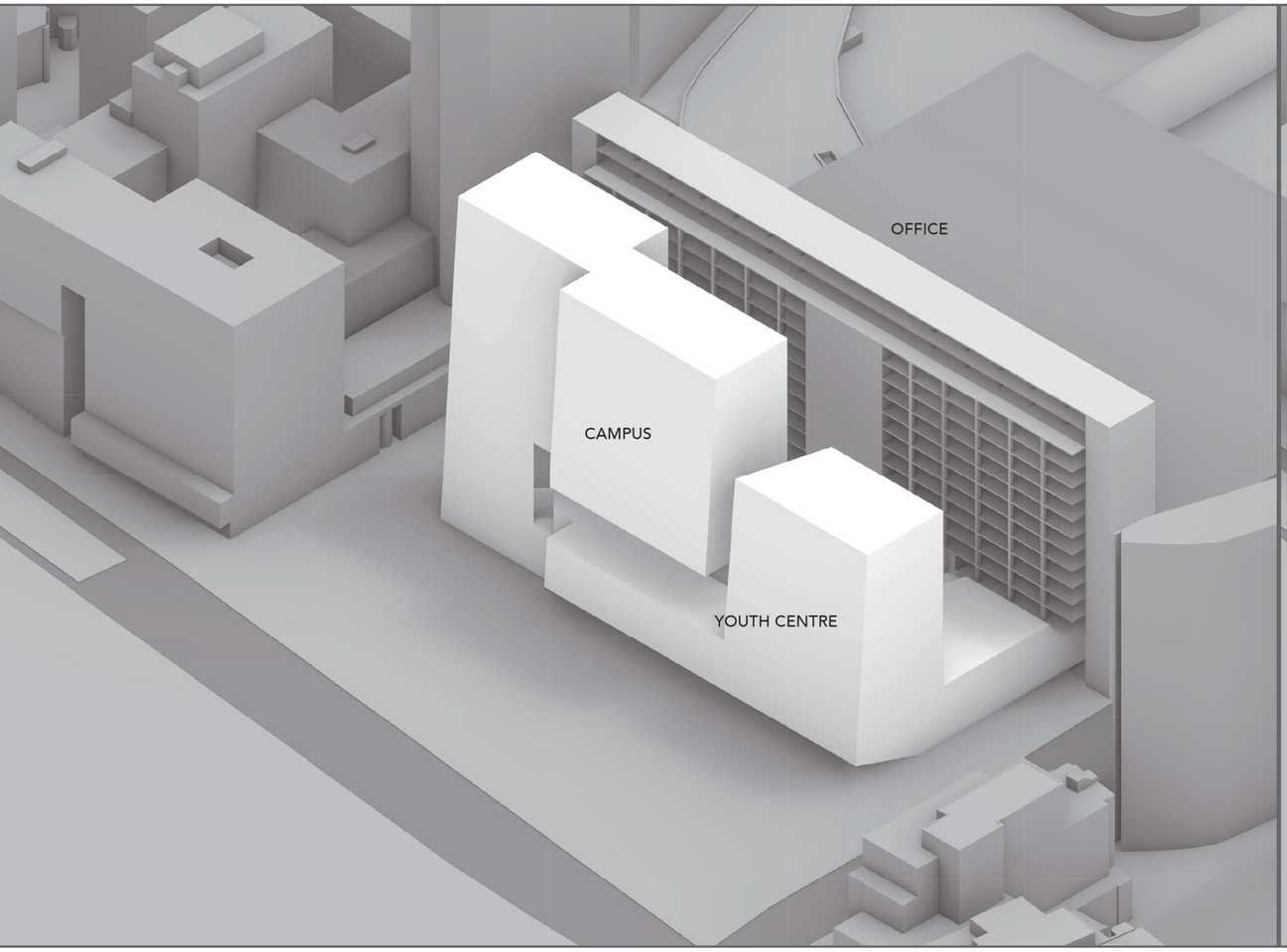


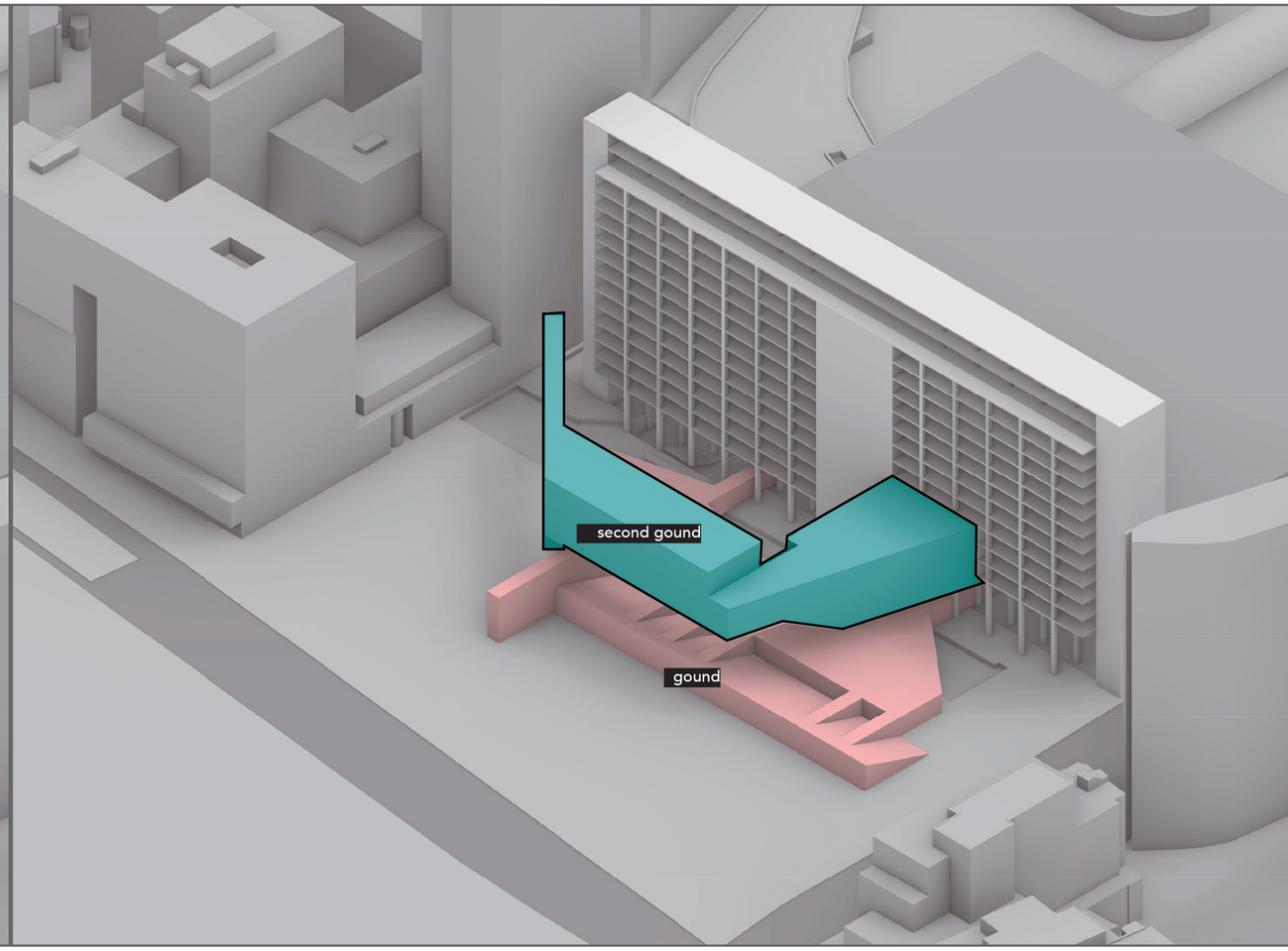
3. Dividing into 3 Functions



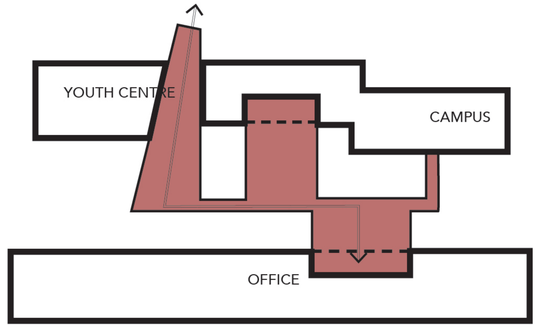


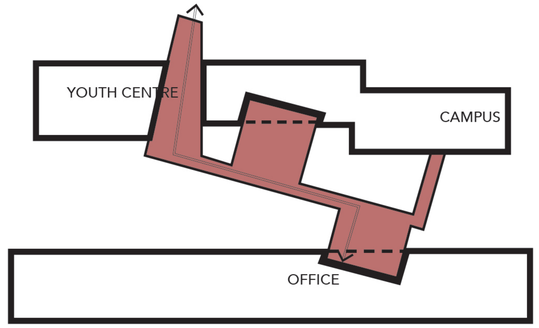
4. Carving Masses by the Public Pathways

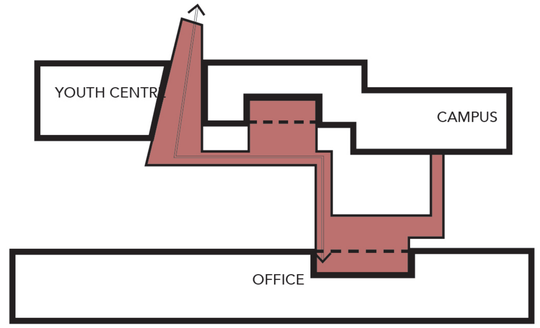


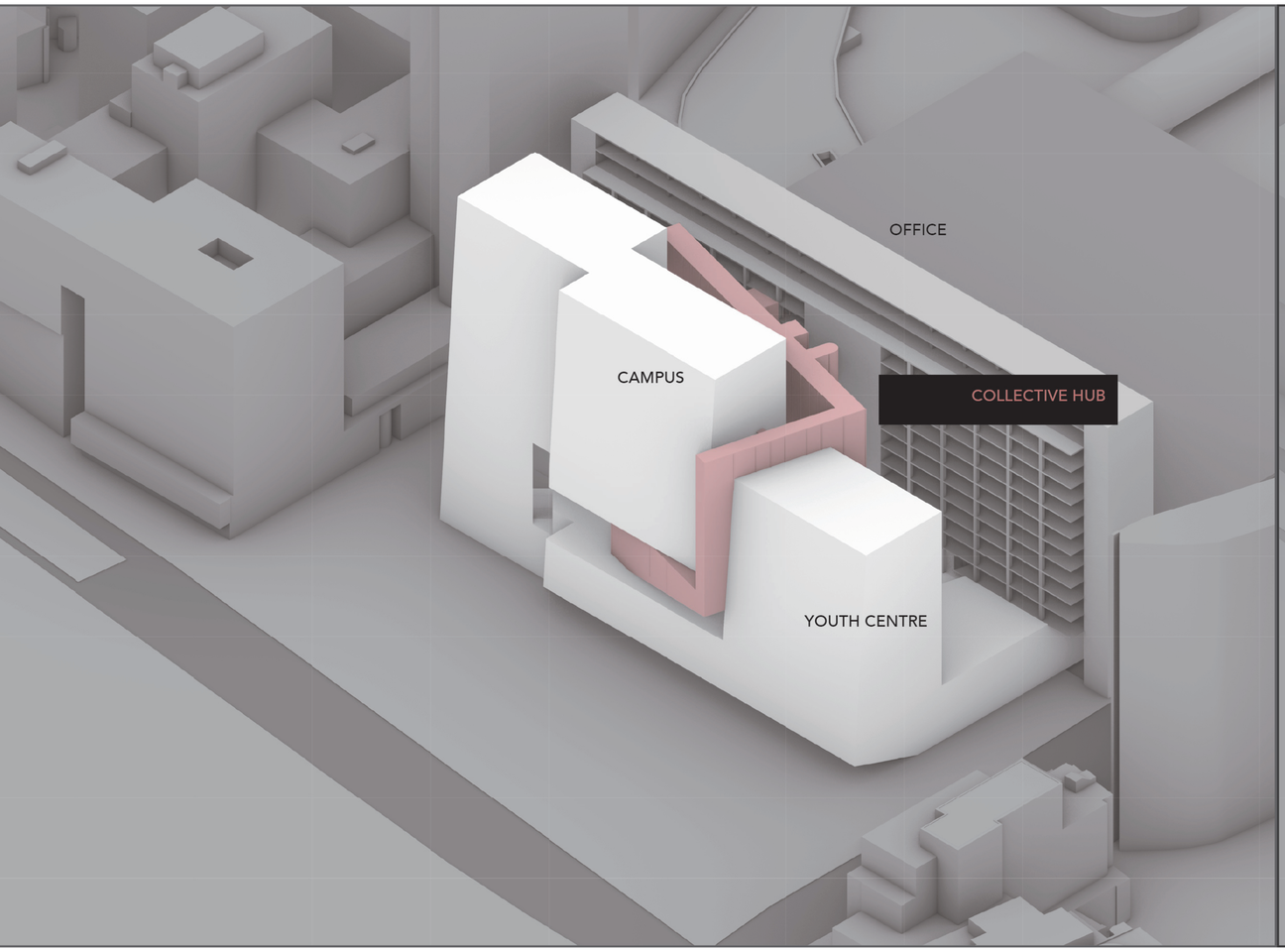


5. Collective hub connecting three buildings



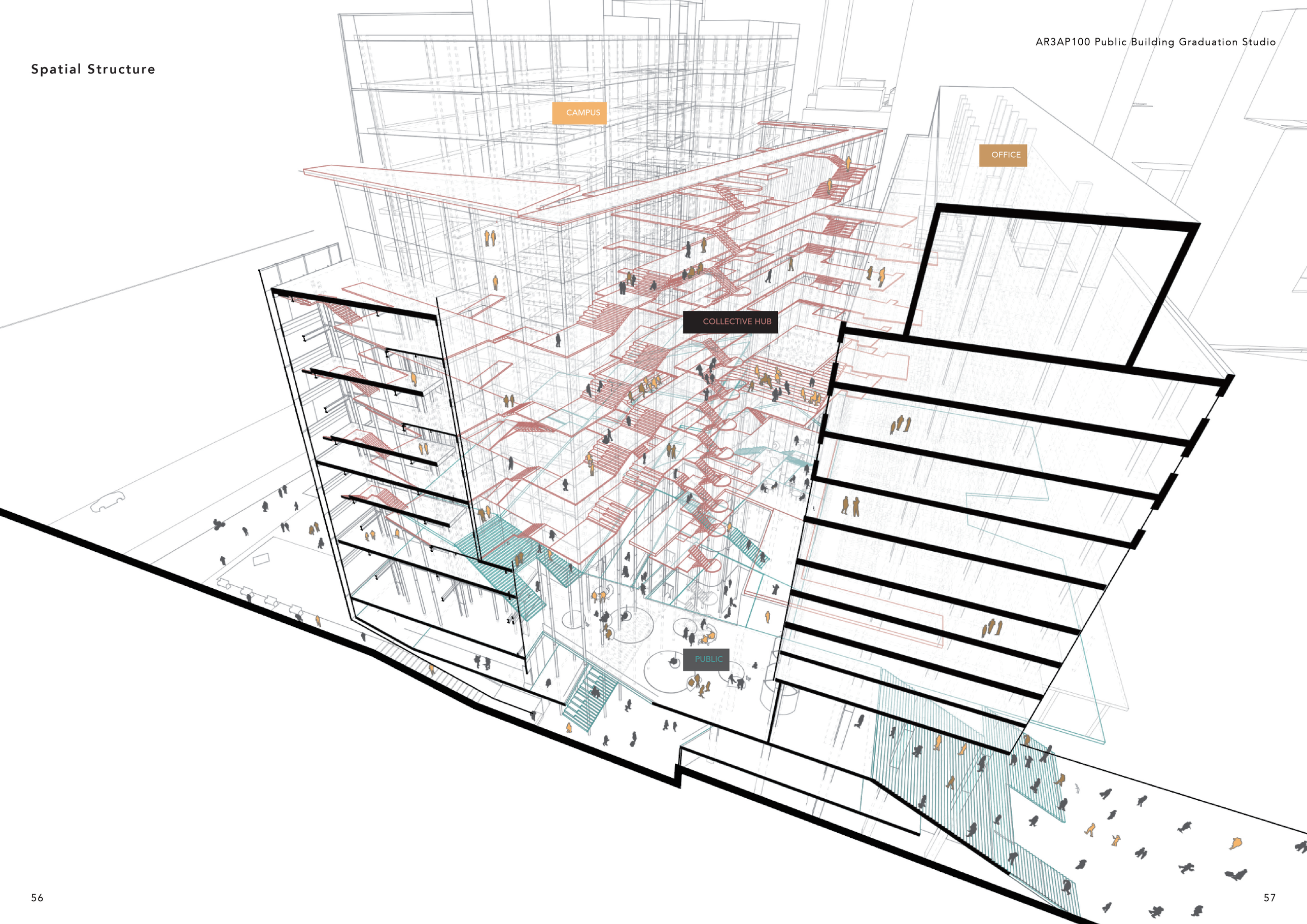




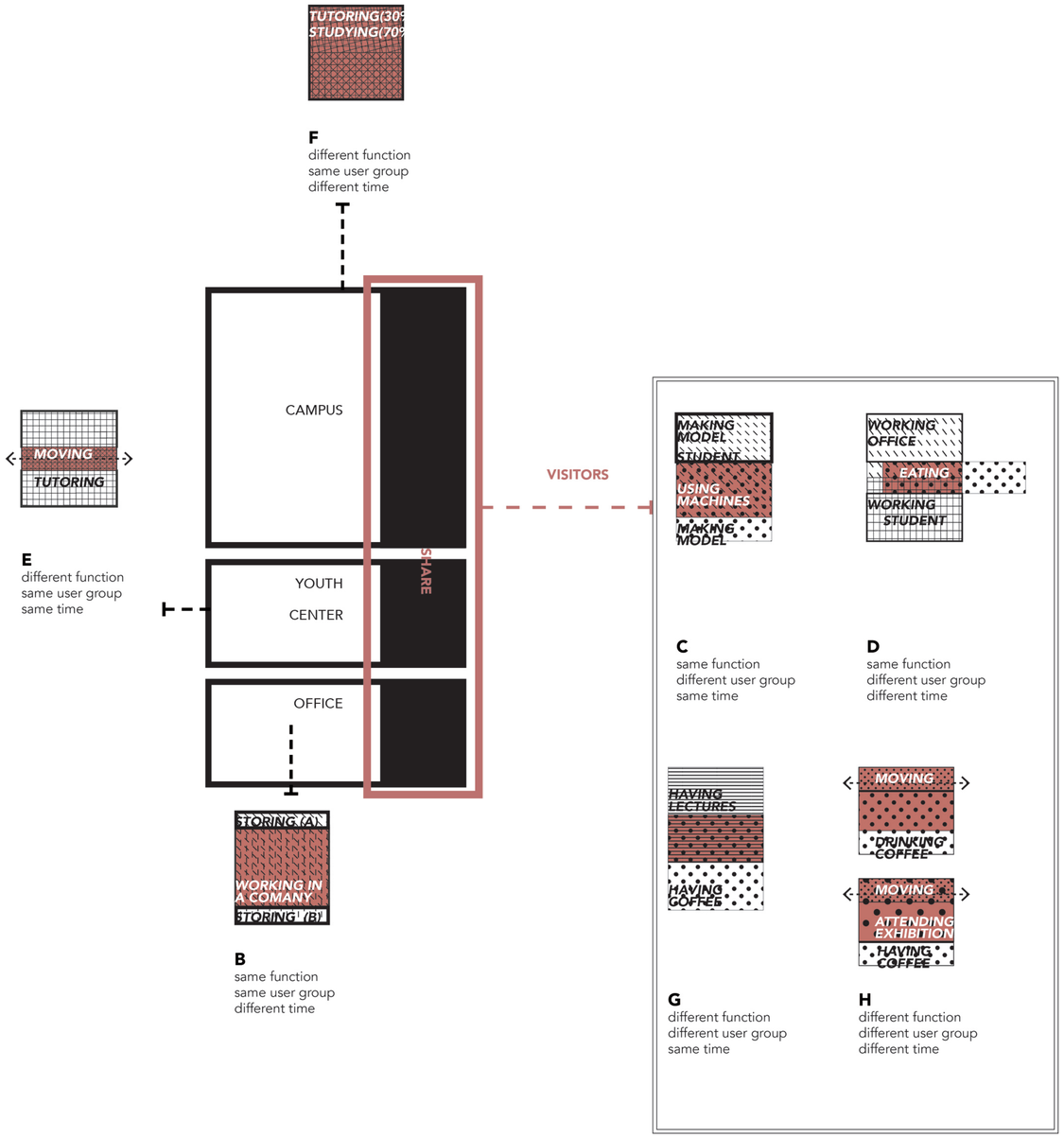


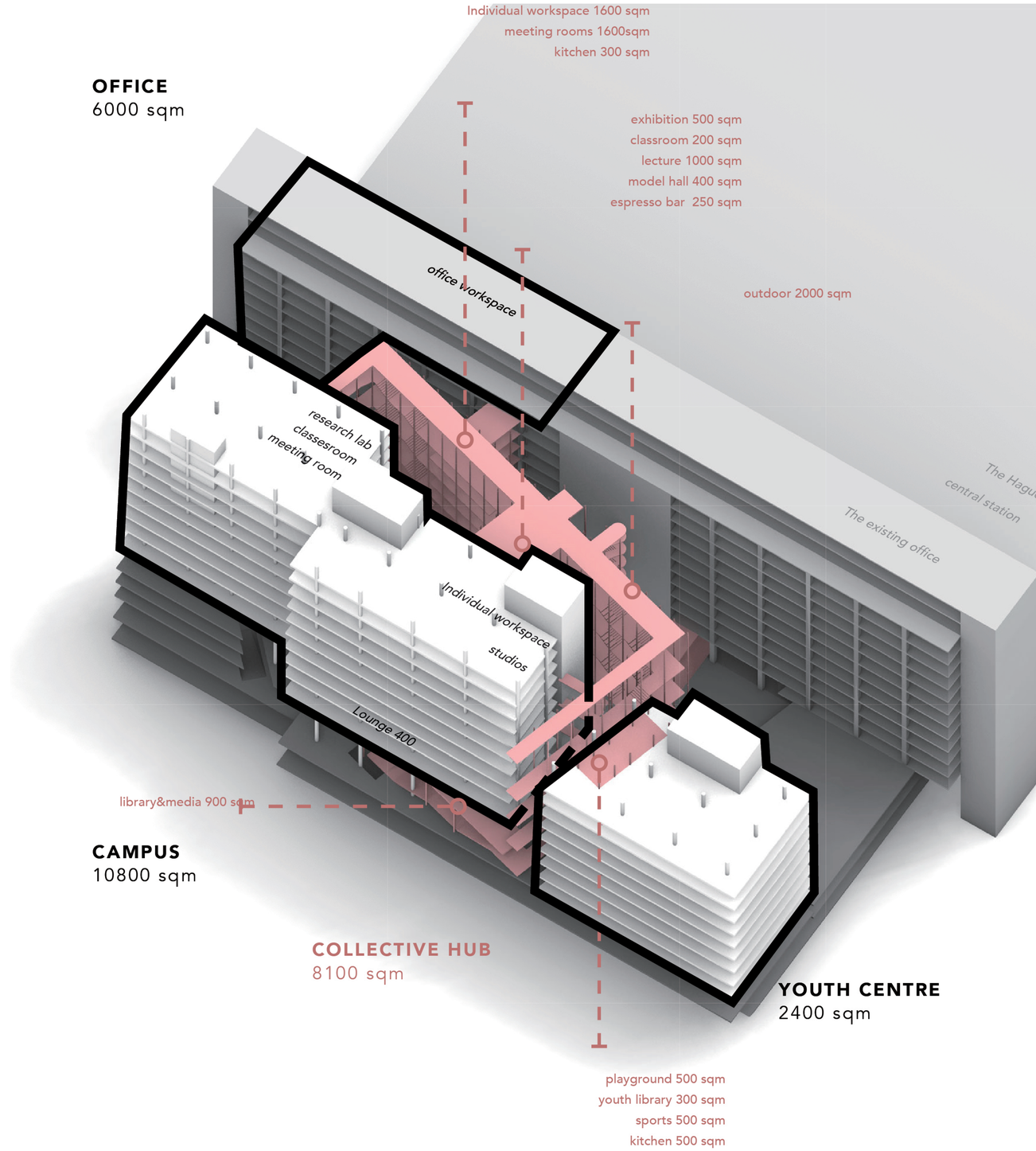


Spatial Structure



Design Vertical Brief

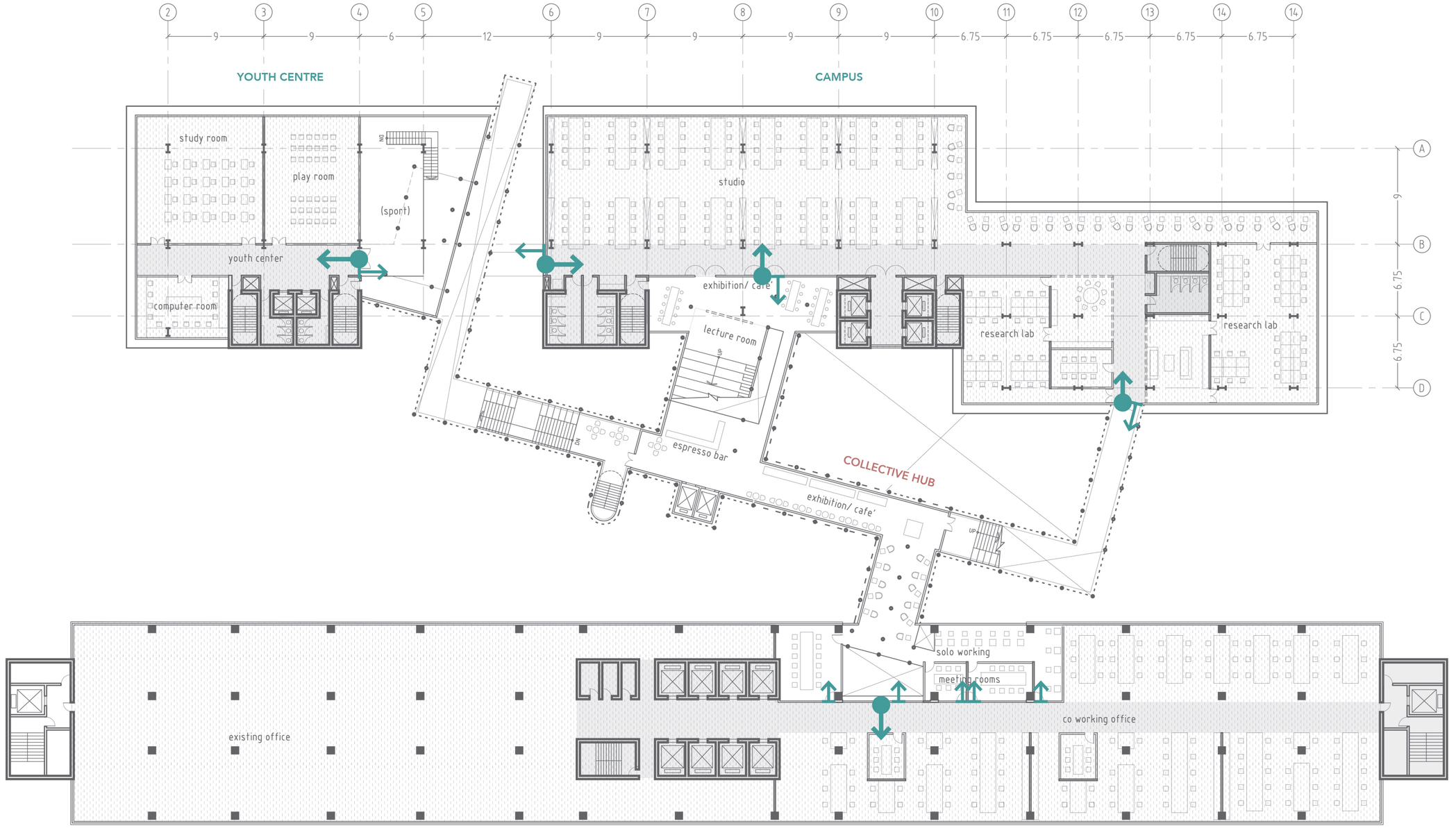




VI

Materialization

Pathways and Access Control



OFFICE (existing spaces)

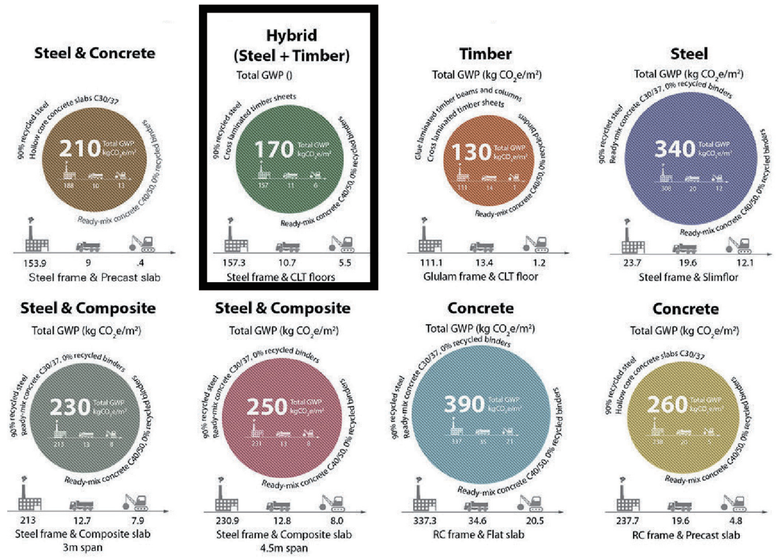
Access control points from Collective Hub

Access available only from one side

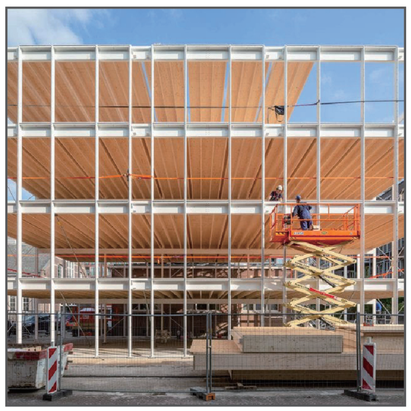
Structural Materials

Low co2 emission structural material

The project plans to apply the combination of recycled steel and timber for its structure in order to reduce the CO2 impact on the environment.

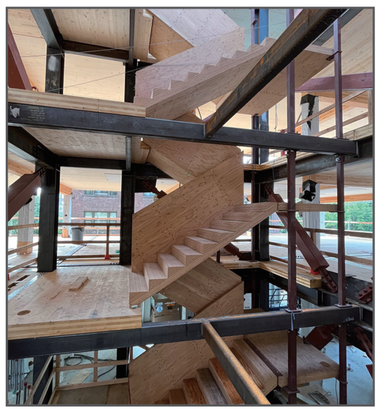


https://www.thorntontomasetti.com/sites/default/files/structural-framing.jpg



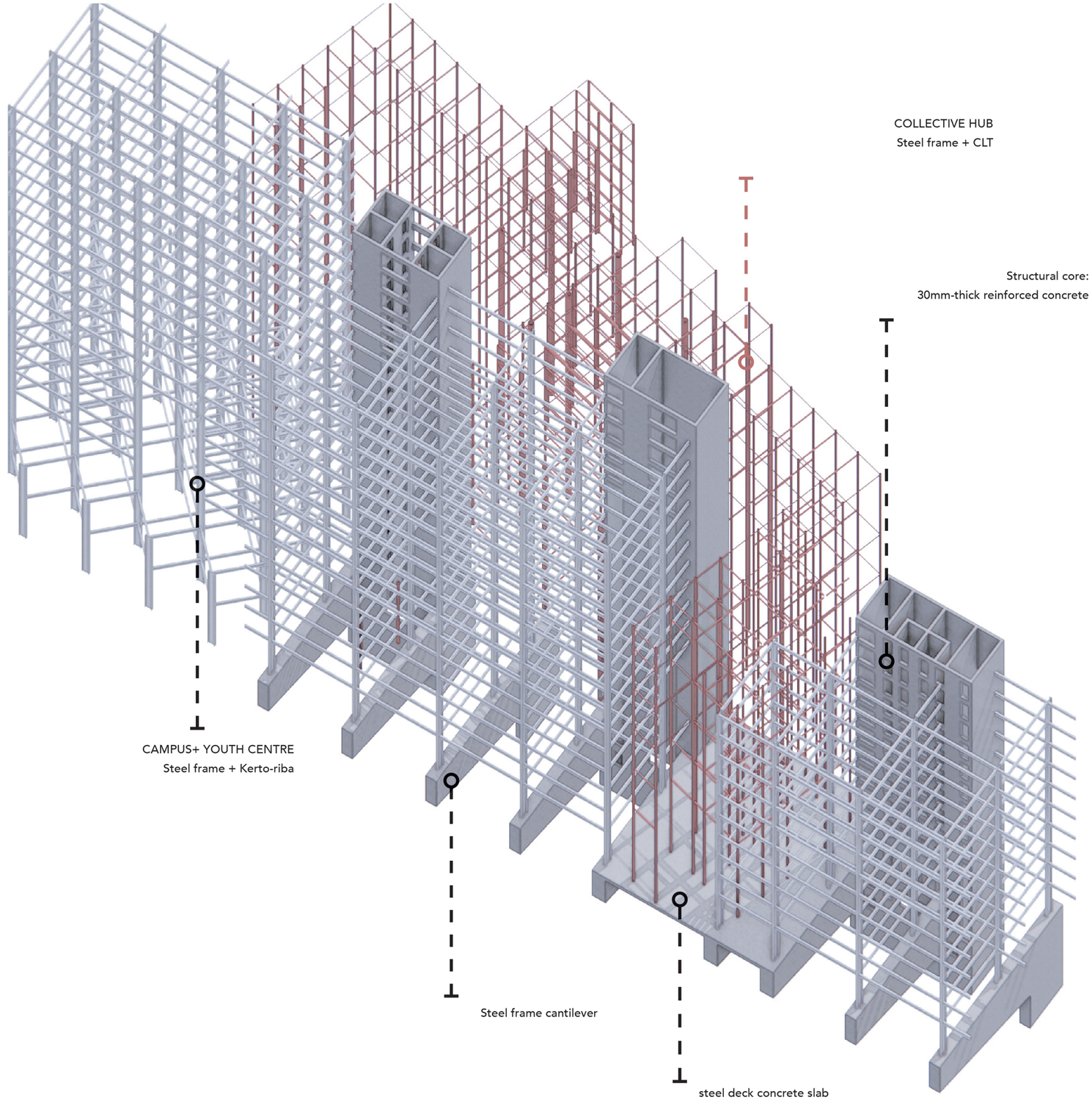
Steel rigid frame + Kerto-riba

https://www.cepezed.nl/en/news/bouwupdate-bouwdeel-demontabel/11769/

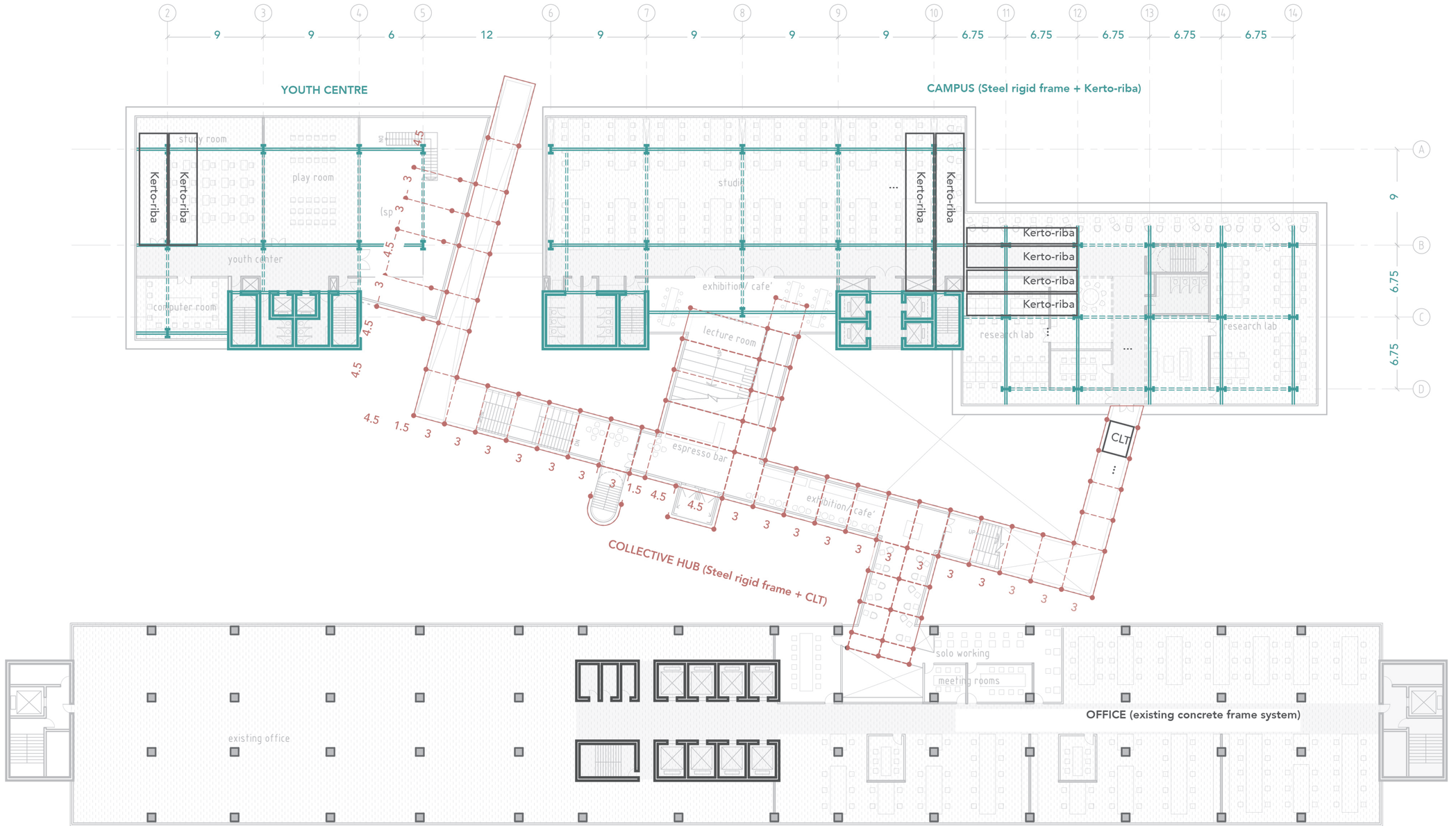


Steel rigid frame + CLT

https://archello.com/news/detail-atelierjones-completes-heartwood-the-first-tall-mass-timber-workforce-housing-building-in-the-us



Typical Structural Plan



Existing Concrete columns

Reinforced concrete shear walls : 300mm

HEB 700 (700*300*17)

Lower (supporting slab): IPE 450 Construction Beam (450*190*22*11.9)

Higher (same high as slab) : IPE 450 Construction Beam (450*190*22*11.9)

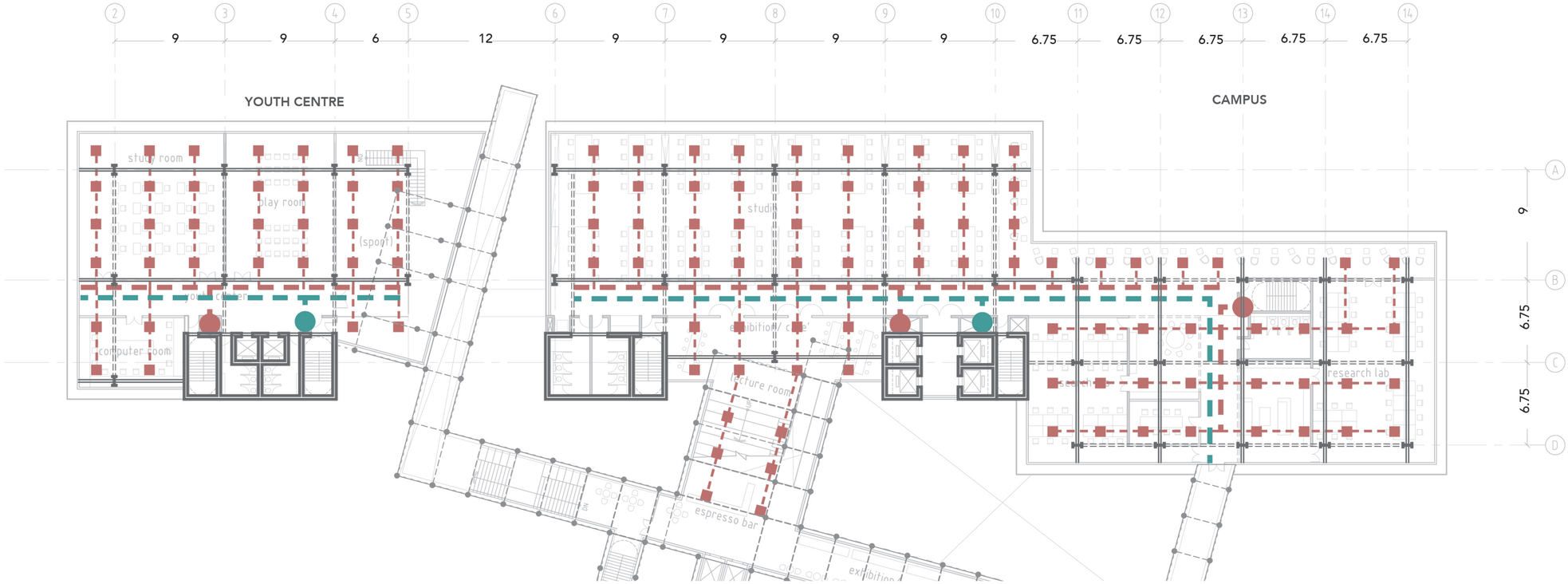
240mm Round Column Structural Profiles

IPE 200 Construction Beam (200*100*8.5*5.6)

IPE 200 Construction Beam (200*100*8.5*5.6), other floors

Extruded Steel Profile 20*120mm

Ventilation Scheme



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240mm Round Column Structural Profiles

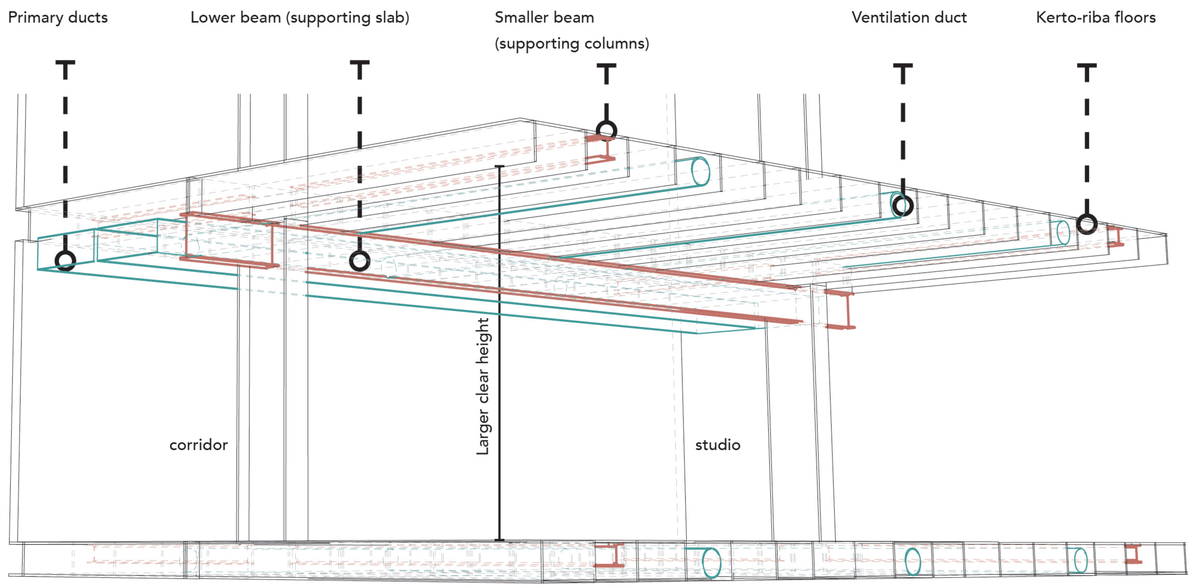
IPE 200 Construction Beam (200*100*8.5*5.6)

IPE 200 Construction Beam (200*100*8.5*5.6), other floors

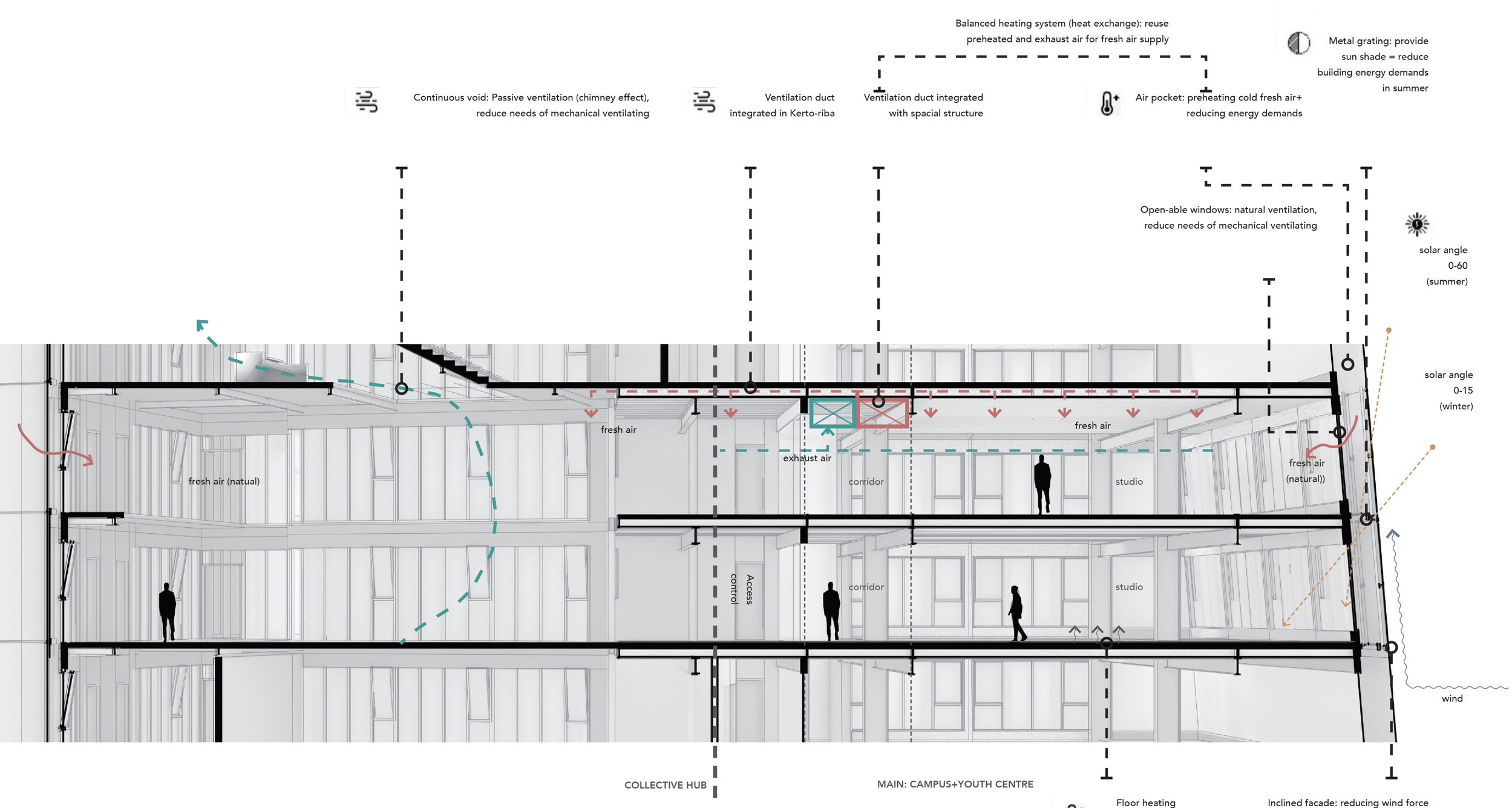
Extruded Steel Profile 20*120mm

Ventilation duct: fresh air

Ventilation duct: exhaust air



Environmental controls scheme

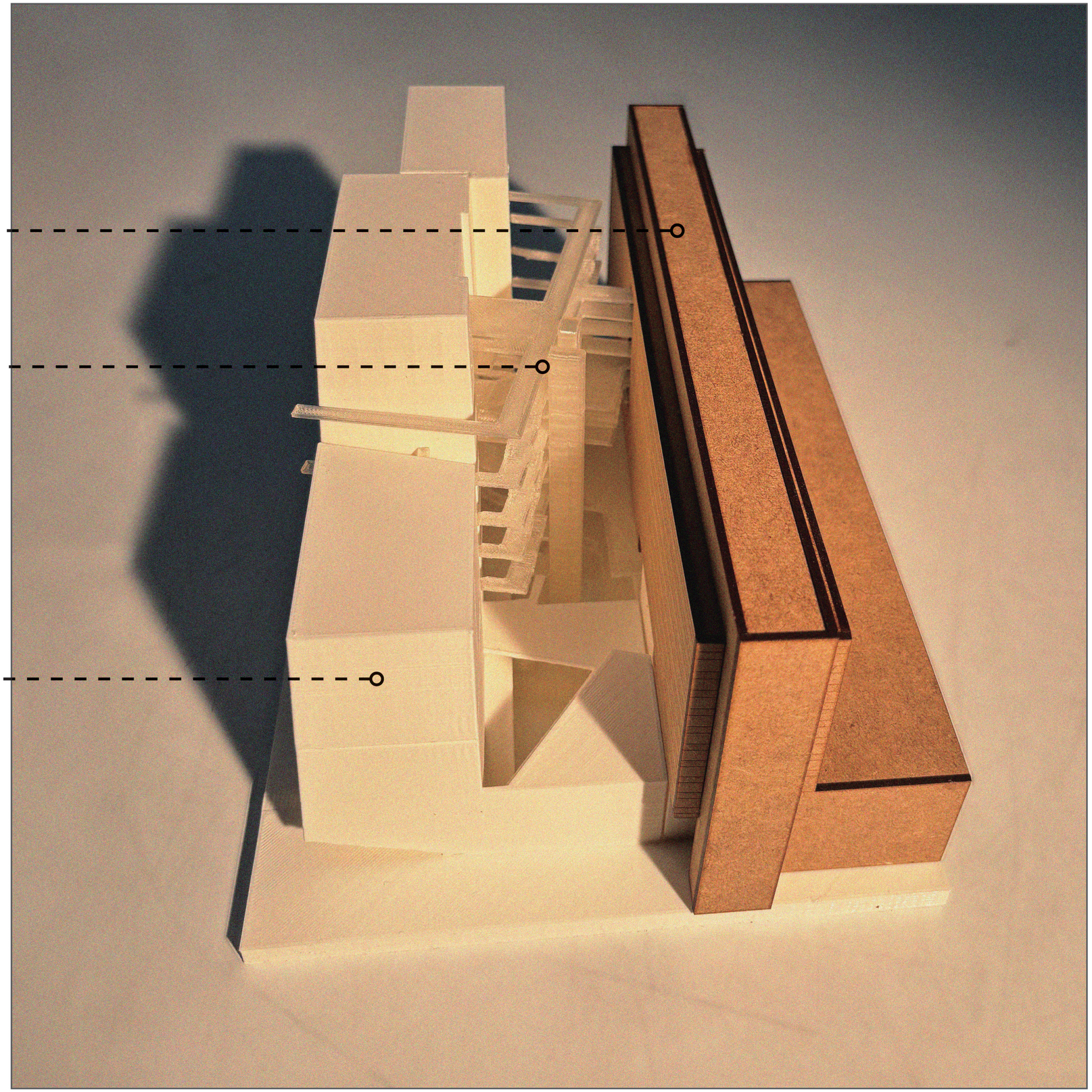


Building Envelop

Existing Office: Concrete

Collective Hub:
Architectual Mesh

Main: Campus+ Youth Centre:
Printed Laminated Ceramic Glass

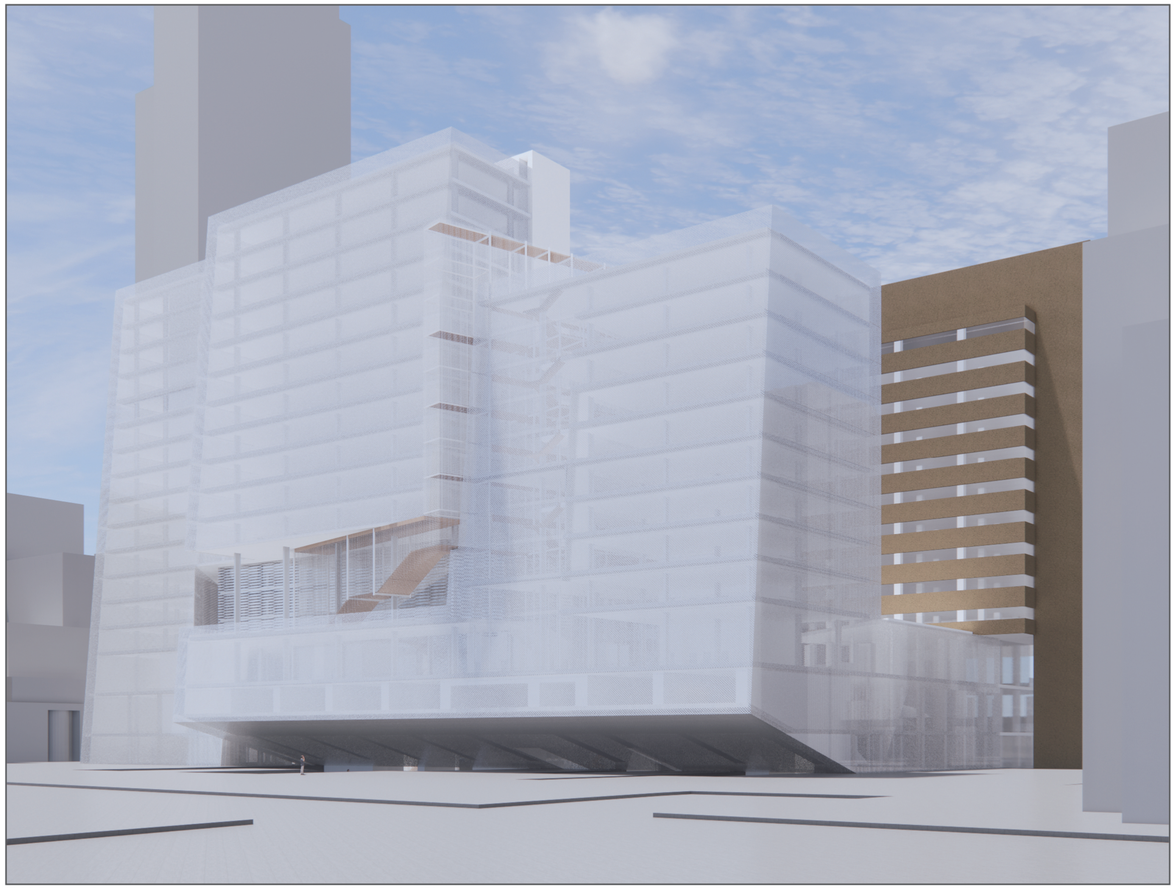


Building Envelop: Campus+ Youth Centre

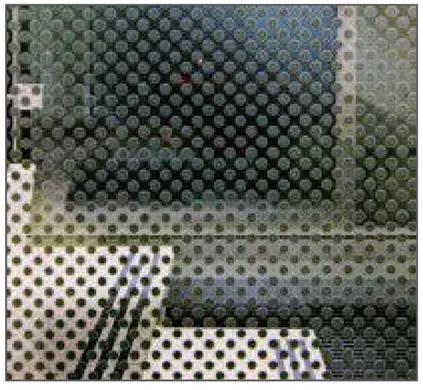
Daylight + Seeing-through



Building mass extended from the Central station







Fritted Ceramic Glass (with dots pattern)

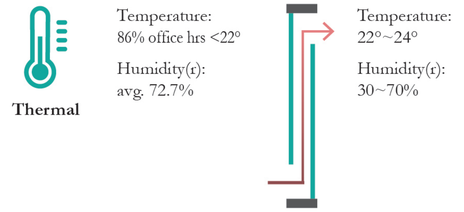
RECYCLE: the glass substrate can be recycled along with the ceramic frit coating
REDUCE: reducing solar heat gain and the need for cooling in summer (energy efficiency)
REDUCE: lamination layer enhance durability and resistance to damage, thus reducing material usage.

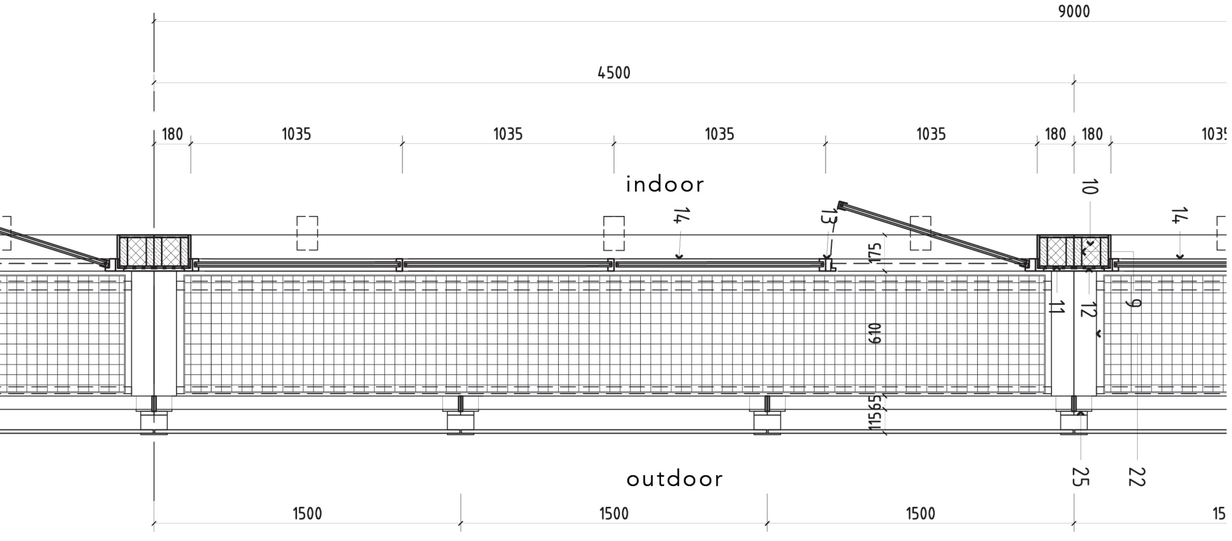
(left) https://www.architonic.com/en/project/saucier-perrotte-architectes-saint-laurent-sports-complex/5105298
(right) https://www.archiexpo.com/prod/arch-aluminum-glass-co-inc/product-58229-2123011.htm

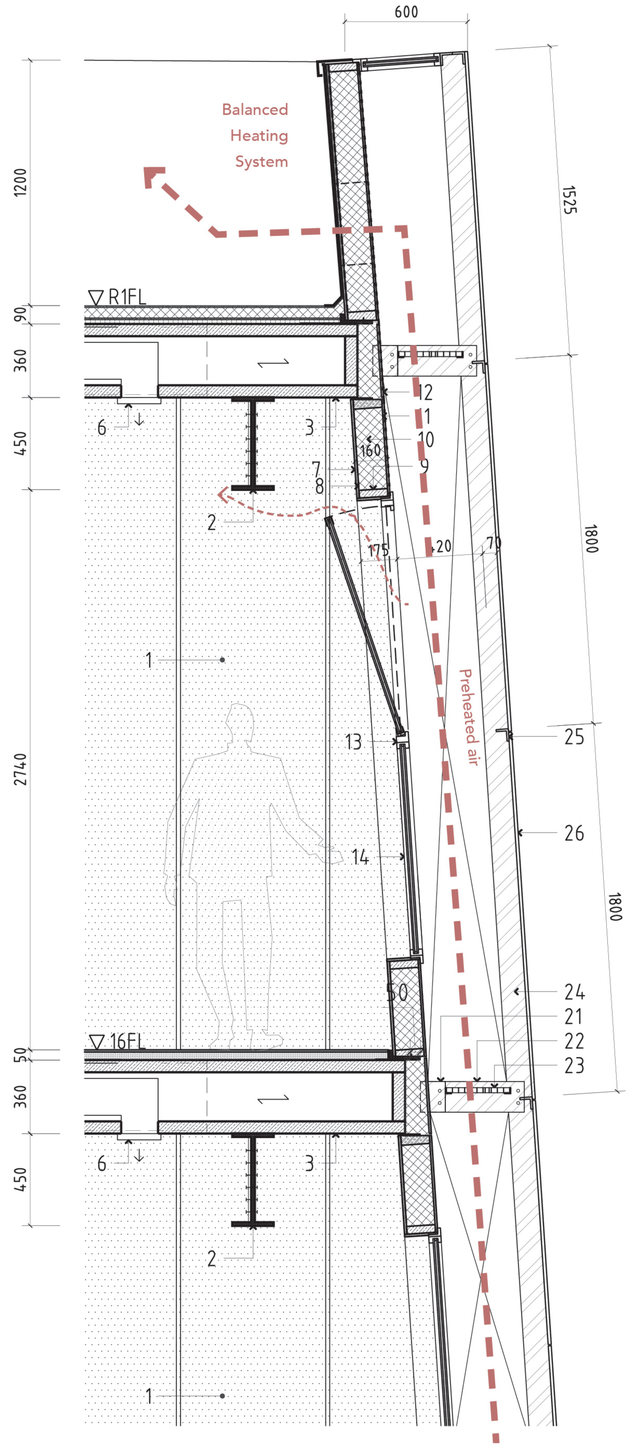
Building Envelop: Campus+ Youth Centre

Second skin

(a) Preheat air: preheating cold fresh air by solar heat gain in the air pocket, deducing the need for heating in winter (energy efficiency)
(b) Better insulation
(c) Noise barrier







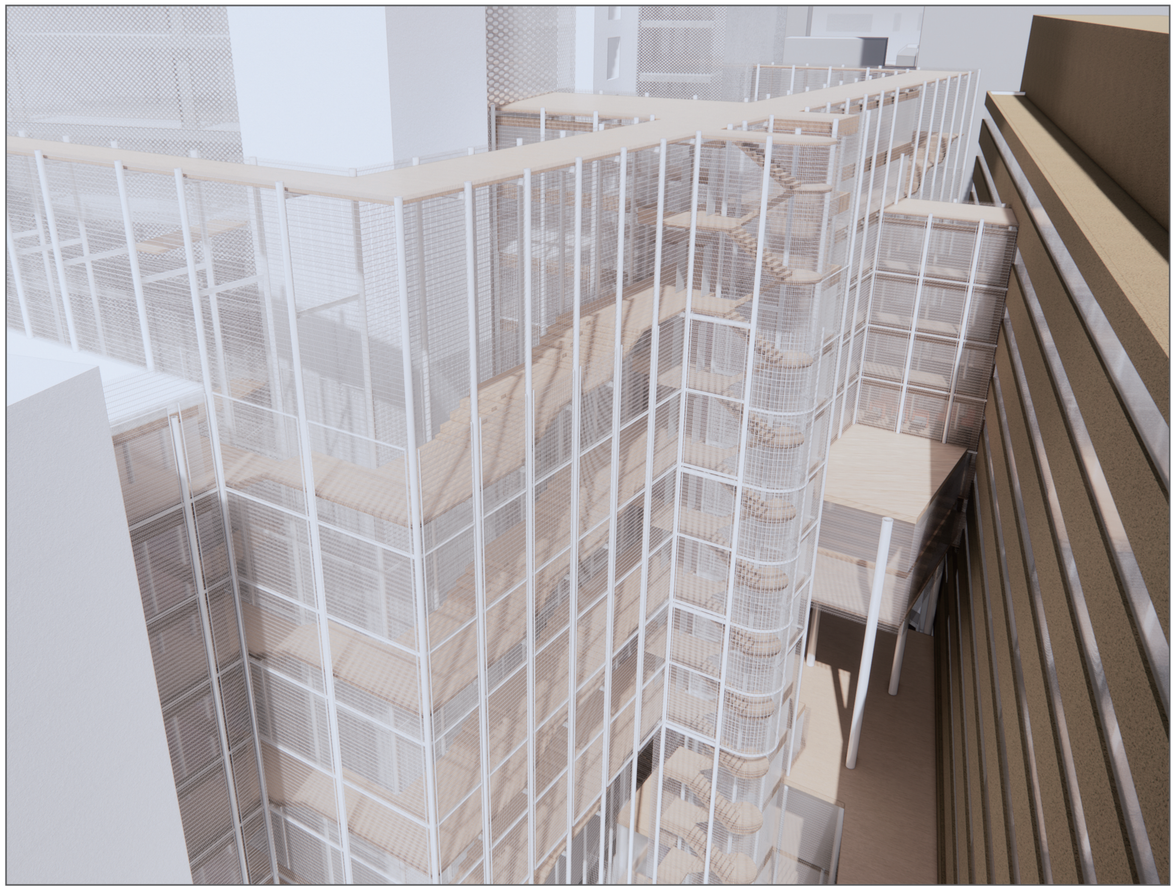
1 HEB 700 (700×300×17)
2 galvanised steel beam, IPE 450
3 Kerto-Ripa 36mm, 240×9000
4 angled steel profile
5 insulating glazing 6 + space between panes 22 + 5mm, TVIS=0.95
6 ventilation duct
7 12.5mm plaster board
8 vapor barrier layer
9 38×140 timber profile
10 mineral wool 140mm
11 10mm chipboard
12 black UV resistant waterproofing foil
13 aluminium gazing frame
14 glazing 6mm, TVIS=0.158
21 angled steel 150×150×20mm
22 bolted steel plate, TH=20mm
23 steel grating 50×50mm, TH=4mm
24 steel strip, TH=15mm
25 angled steel profile 60×60×3mm
26 laminated tempered glass with screen painting, 900×1800mm

Building Envelop: Collective Hub

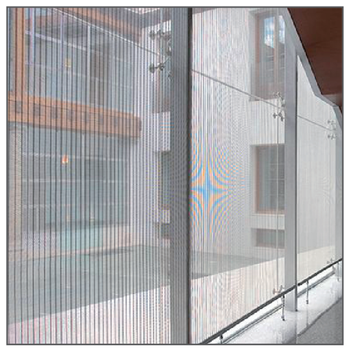
Outdoor space



Light material for light to pass thorough





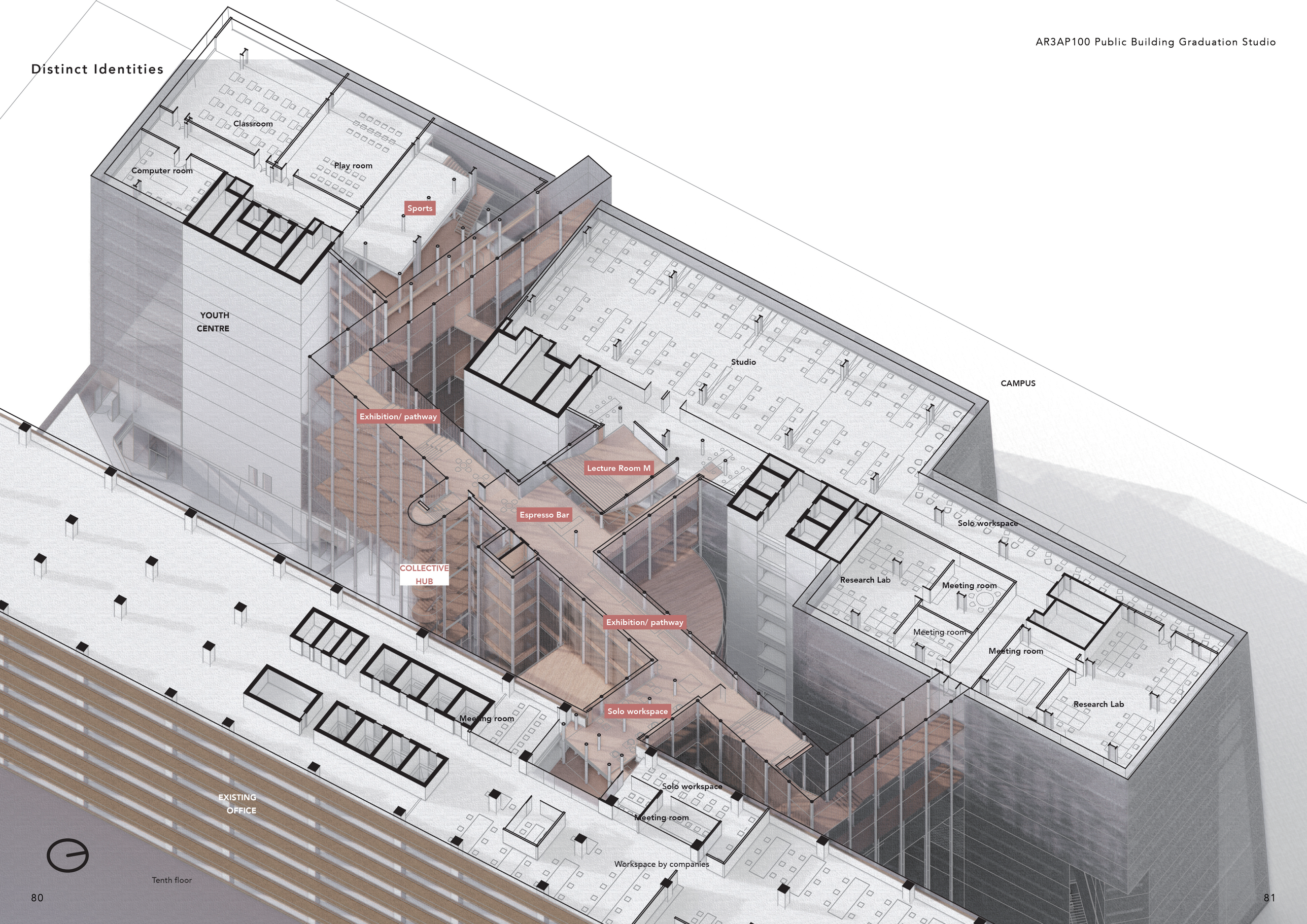


Architectual Mesh/ Metal mesh

RECYCLE & REUSE: a closed-loop recycling syste
REDUCE: durability reduces material usage

(left) https://www.haverboecker.com/en/product-solutions/architectural-wire-mesh/references/details/rehabilitacion-convento/
(right) https://www.metadecor.eu/projects/office-cda-in-seoul-south-korea/

Distinct Identities

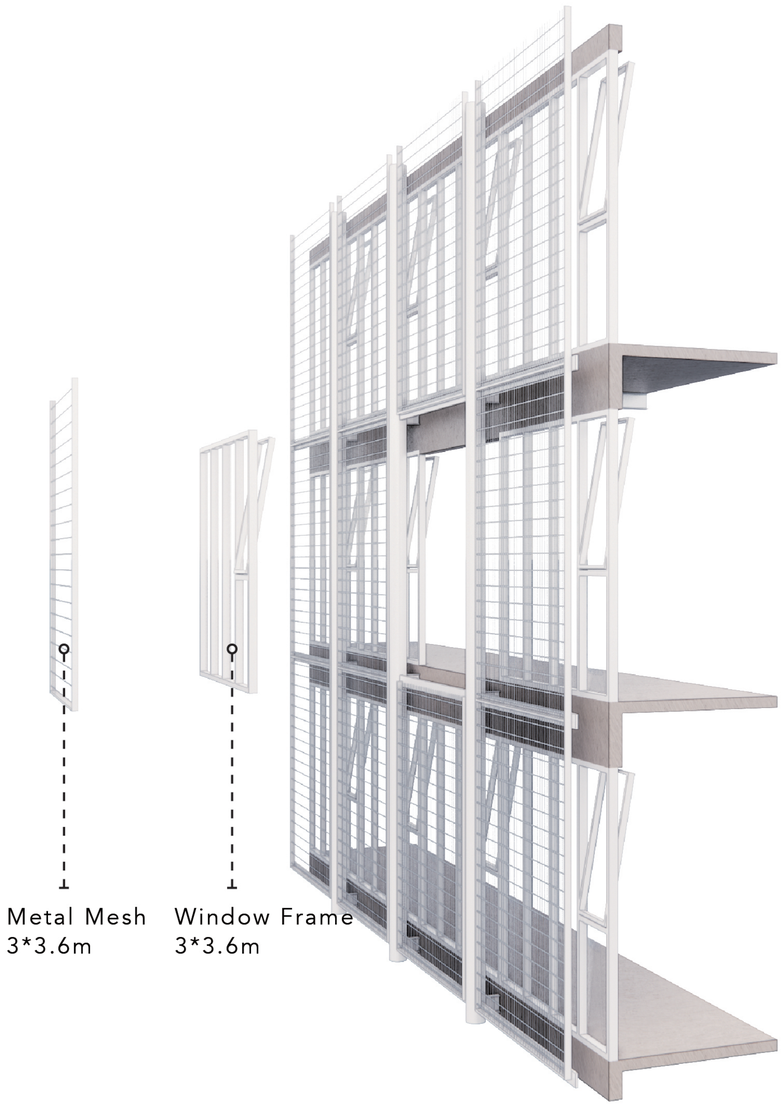


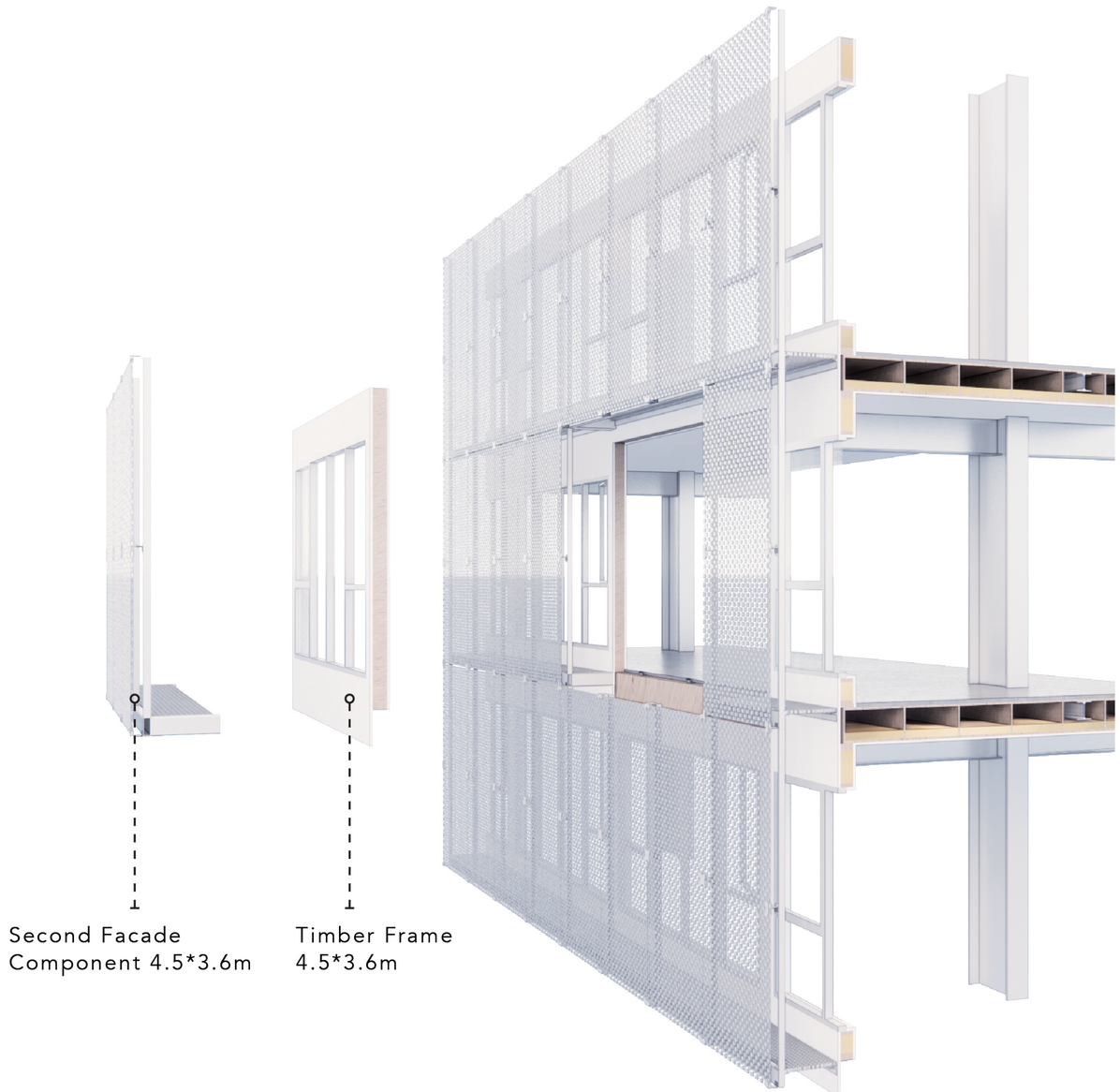
Main buildings: working, studying, reaserching, tutoring

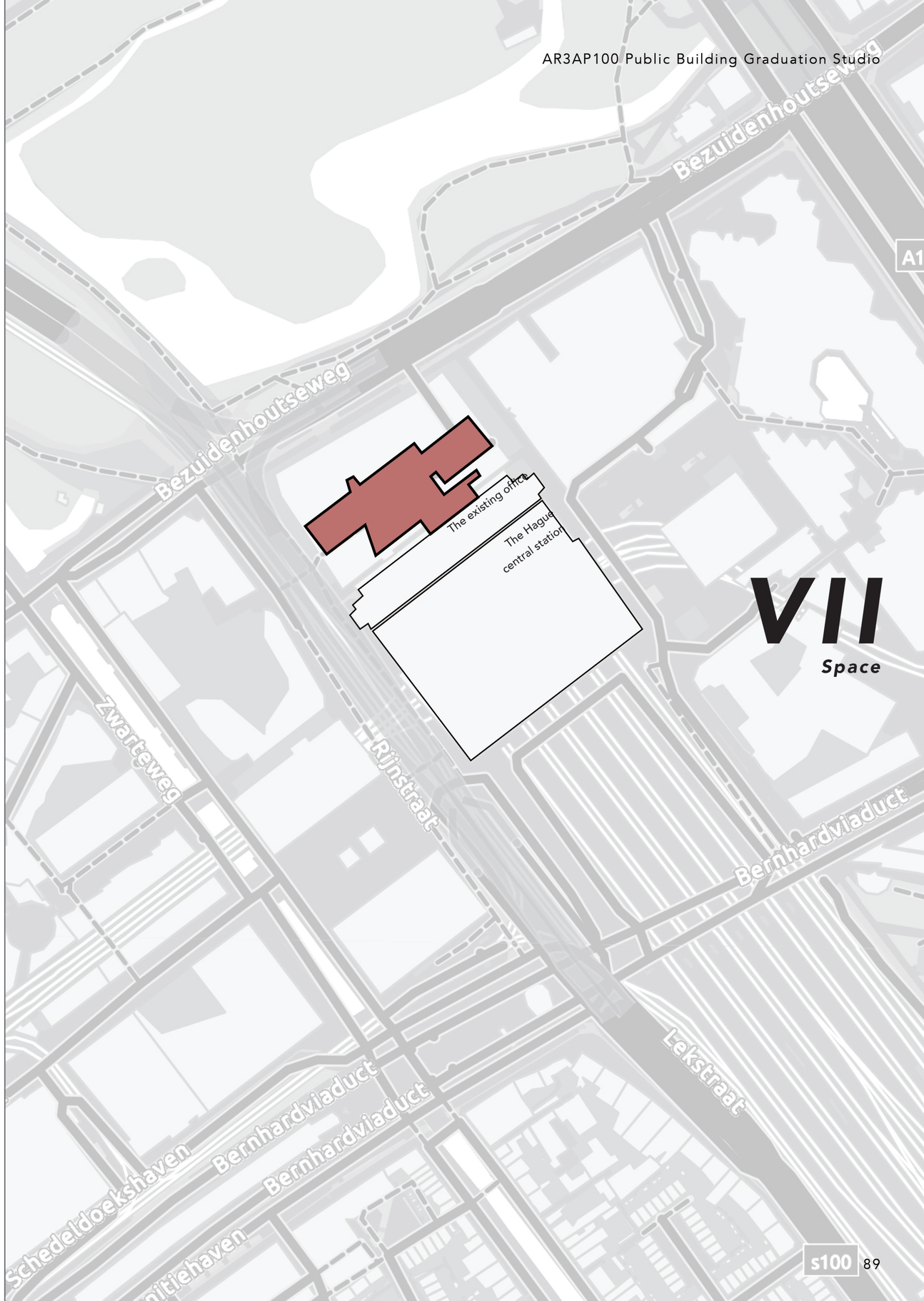


Collective Hub: chatting, resting, walking, lectures, exhibitions...

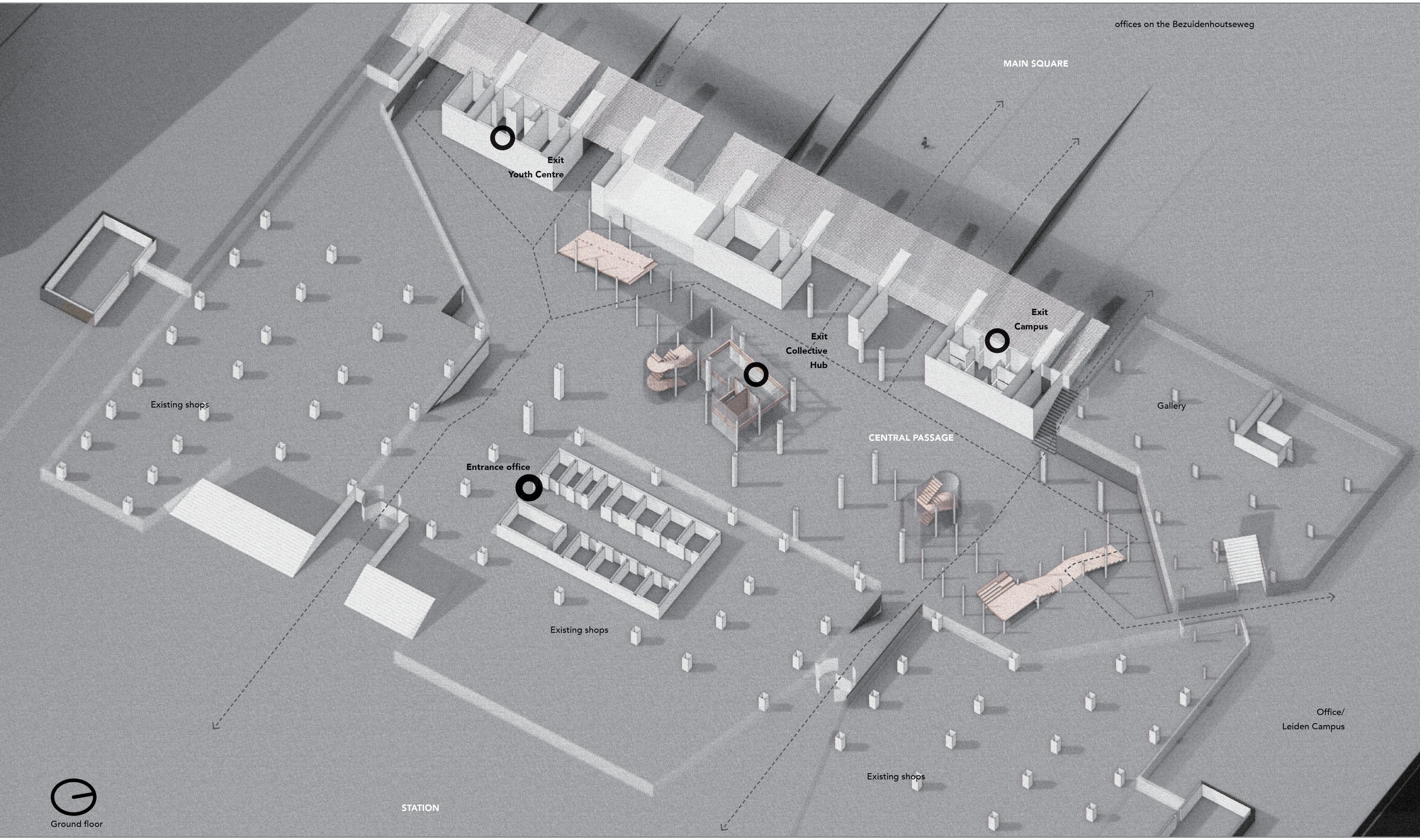



Metal Mesh
3*3.6m
Window Frame
3*3.6m

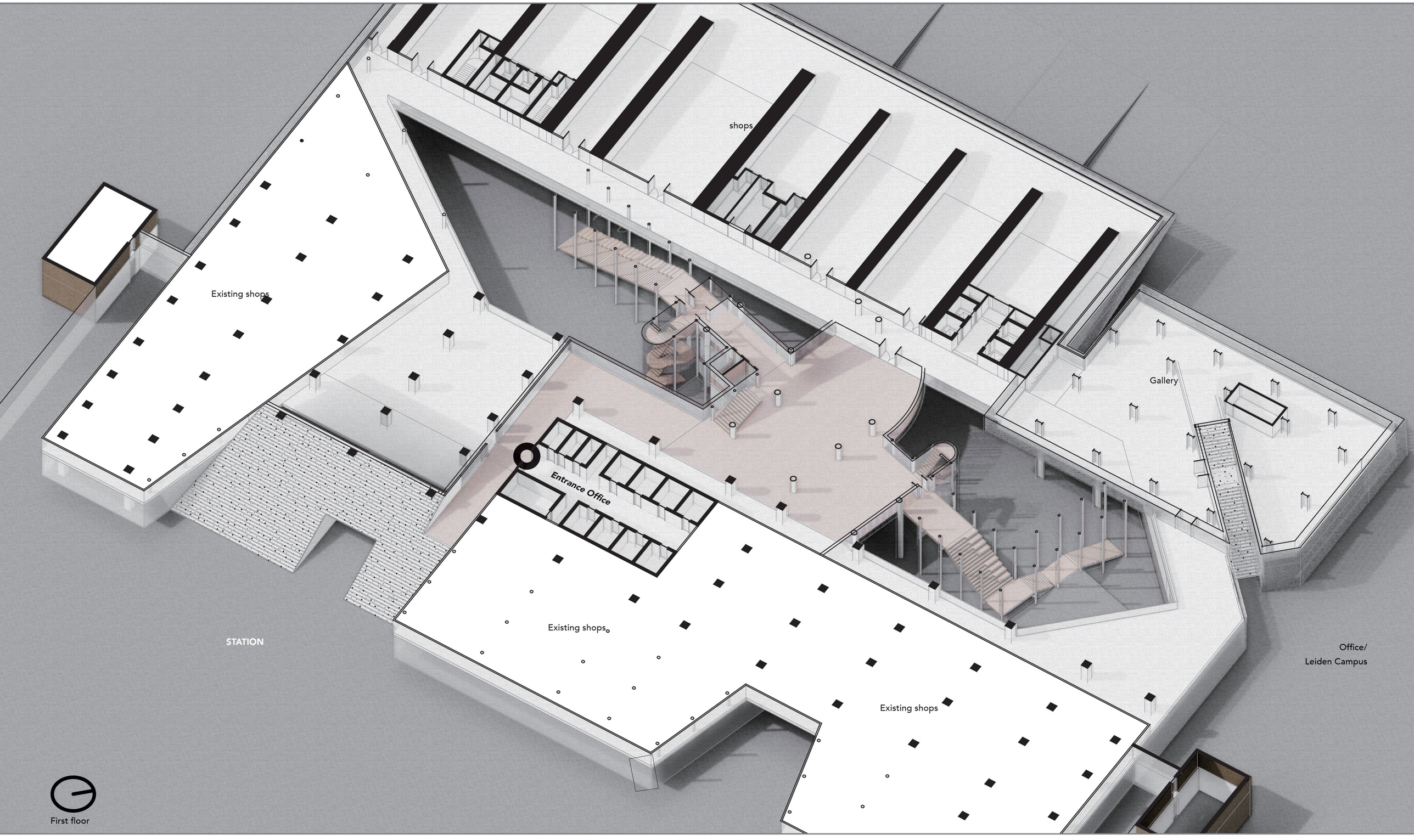

Second Facade
Component 4.5*3.6m
Timber Frame
4.5*3.6m


Bezuidenhoutseweg
Bezuidenhoutseweg
A1
The existing office
The Hague central station
VII
Space
Zwarteweg
't Rijnstraat
Bernhardviaduct
Bernhardviaduct
Bernhardviaduct
Lekstraat
Schedeldoekshaven

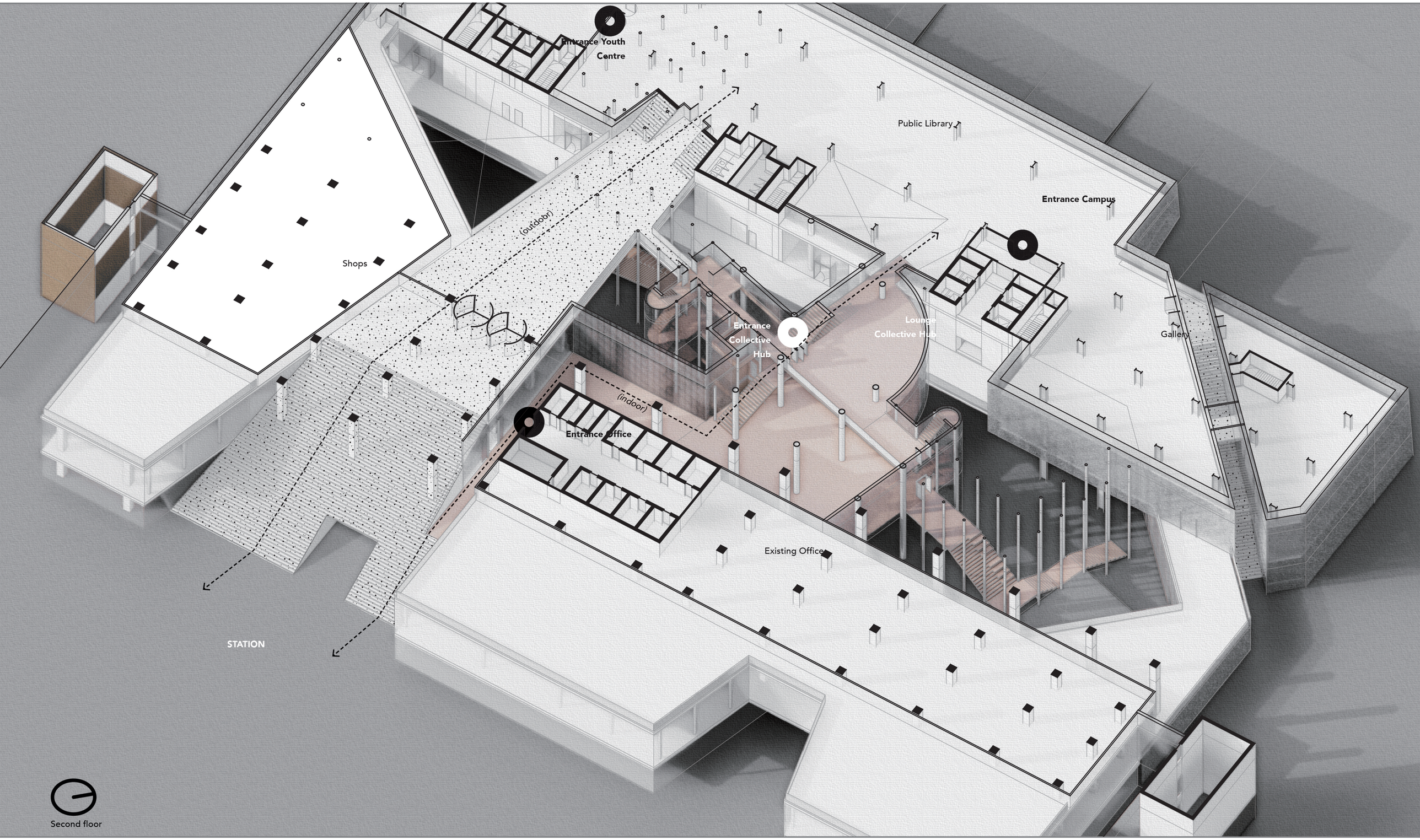
Converging Flows from the Main Square



Directing Movement from the Station and the surrounding area

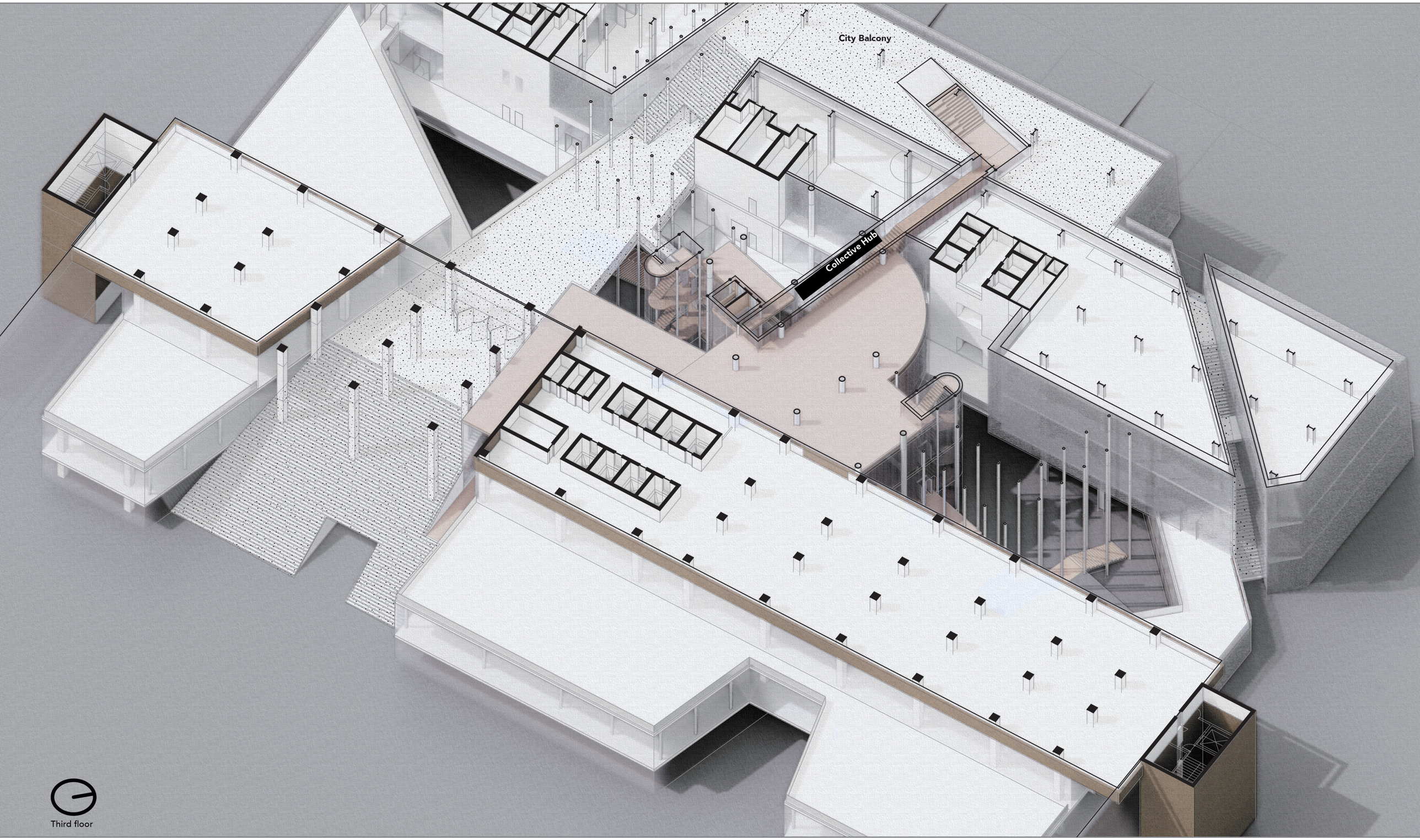


The Second Ground

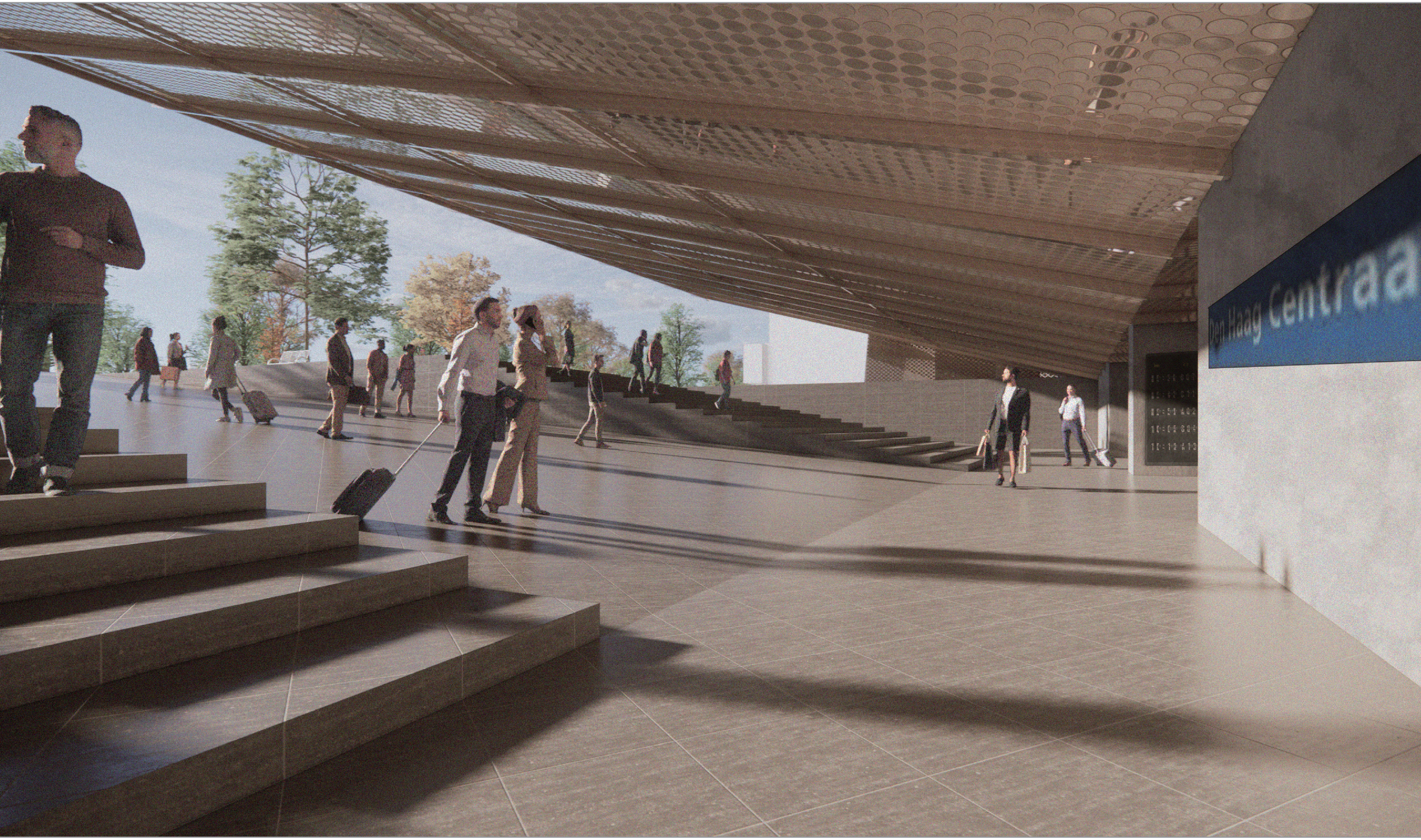


Second floor

Urban street Ambiance



Smooth Direction and Flow


Den Haag Centraal



MAIN SQUARE

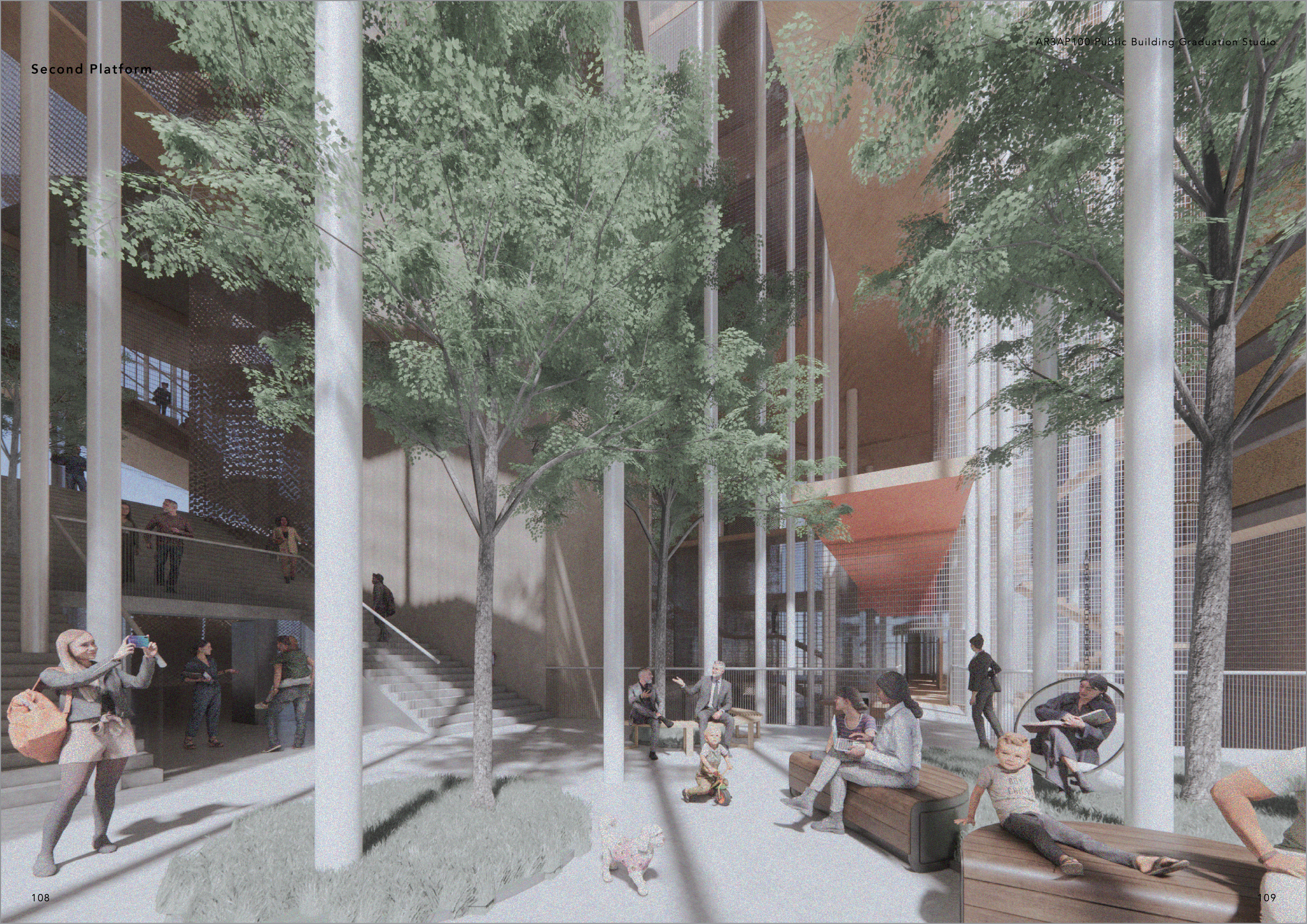
CENTRAL PASSAGE

STATION

Open Spaces

Large Stairs for Direct Access

Second Platform



Quality of Vertical Campus

YOUTH CENTRE

COLLECTIVE HUB

CAMPUS

Outdoor

Indoor

Outdoor

Individual Study

Individual Study

Lecture Room

Espresso Bar

Primary Levels (even)

Kitchen

Secondary Levels (odd)

Model Hall

Lecture Hall

Office Cafeteria

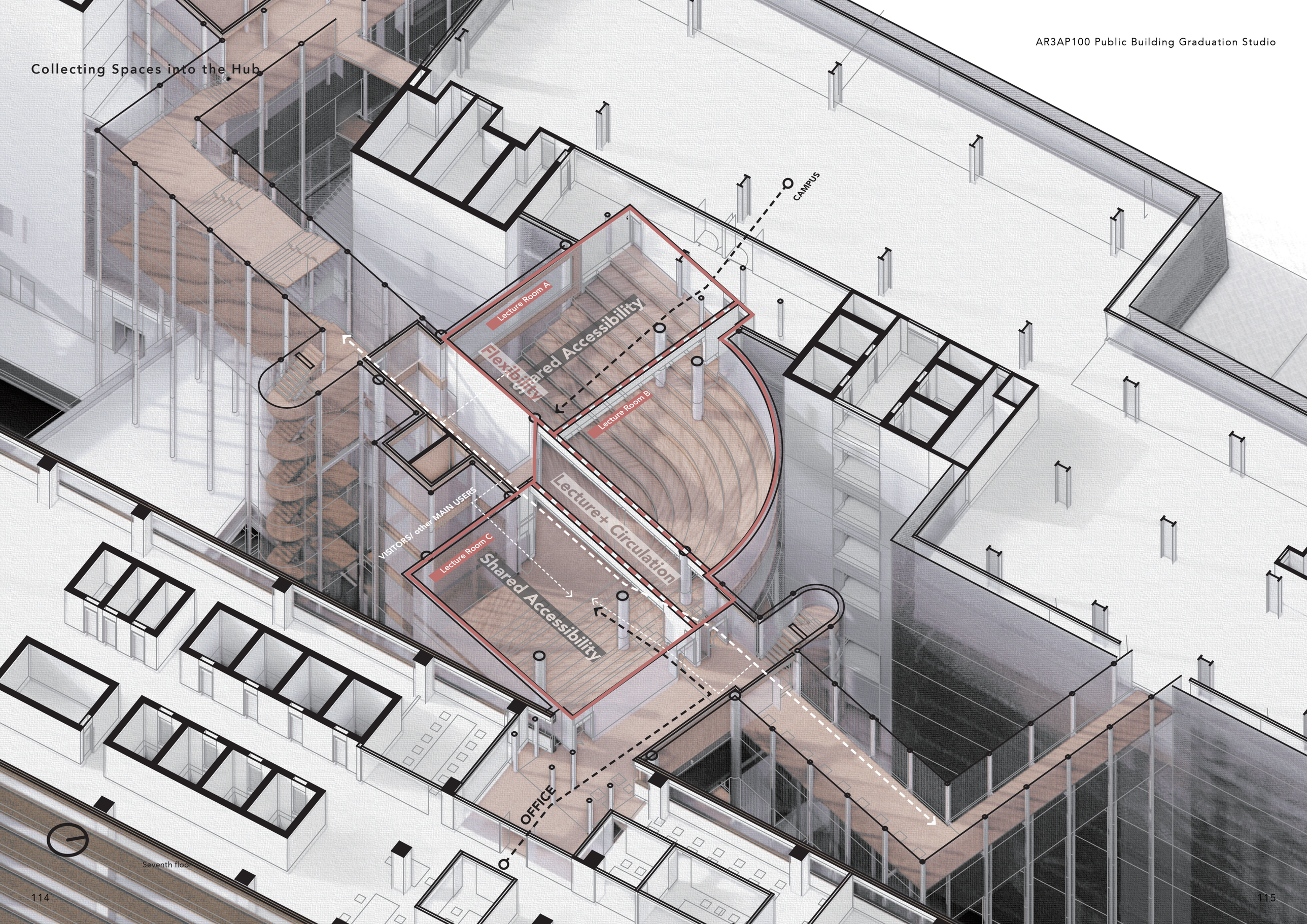
COLLECTIVE HUB

Lounge Collective Hub

Activities Across Levels



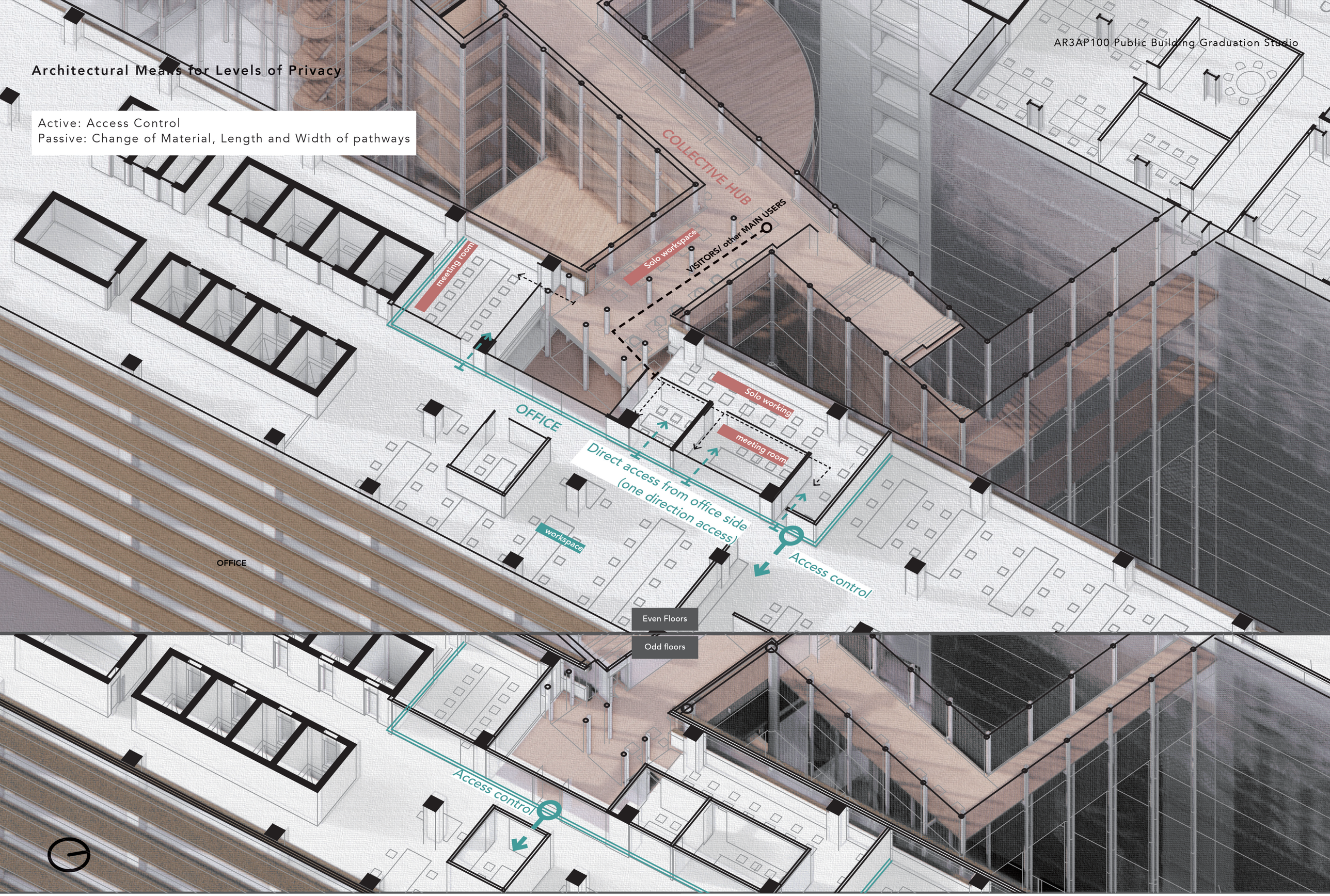
Collecting Spaces into the Hub



Seventh floor

Architectural Means for Levels of Privacy

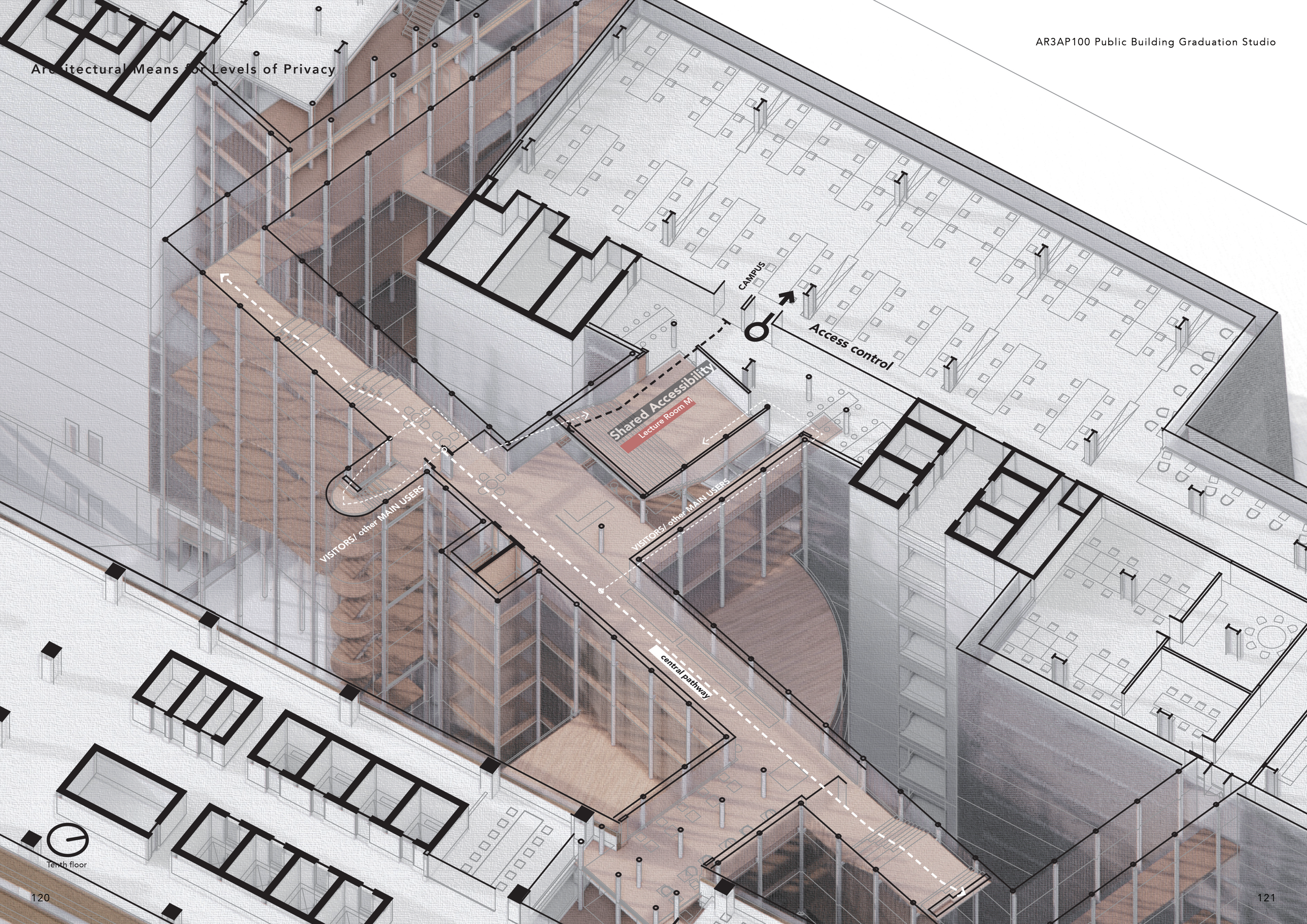
Active: Access Control
Passive: Change of Material, Length and Width of pathways







Architectural Means for Levels of Privacy





VIII

Final Reflection

Integration with the network infrastructure

The project integrates with the surrounding infrastructures, offering convenient access not only for users from the Randsted network but also for those from the nearby Leiden campus and offices. This inclusive approach provides quick and direct pathways for the main users from the Randsted network, reducing the overall footprint of activities in the city. Moreover, by addressing missing functions within the surroundings, the project aims to enhance community engagement.

Collective spaces enables Hybridity

The collective zone of the design connects the vertical campus continuously through horizontal and vertical circulations, enabling accessibility and views to different activities across levels. In addition, it provides the required outdoor space and facilitates work through out the day. It allows for two kinds of accessibility, direct and indirect, allowing the main users of the spaces to maintain a sense of priority.

Several spaces, notably lecture halls, model halls, and exhibition areas, which are both public and versatile in their usage and do not rely heavily on daylight, are transitioned to the collective zones from each primary user's buildings. This enables more utilisation at different times and enhances the overall space efficiency, emphasising sustainability.

Positive qualities of Hybridity includes fulfilling the requirements of each space. This is achieved by establishing two distinct identities between the main zone (campus, office, and youth centre) and the collective zone. Different material usage, structural systems, indoor/ outdoor spaces, proportions of spaces, and lighting conditions are manipulated to create these different identities. Additionally, this enhances wayfinding in the vertical campus.

Another positive qualities of Hybridity is the proper transition between these two zones. Active threshold elements, such as access control by identity card with door gates, and passive ones, such as changes in floor materials, structural systems, or width and lengths of routes/ pathways, are arranged. These elements result in different senses of transition when approaching the collective spaces from different sides, achieving the required varied levels of privacy and priorities.

In summery, the Hub blends efficiency and community in its integration, crafting pathways for diverse co-existence and Hybridity.