SUSTAINABLE ARCHITECTURE DESIGN STUDIO BRUSSELS UNIVERSITY DISTRICT AND THE SOLBOSCH CAMPUS

DESIGN STUDIO, MA-1

BRUFACE - ULB + VUB - 2020/2021

SUSTAINABLE ARCHITECTURE DESIGN STUDIO – PROJECTS 2020–21

SUSTAINABLE ARCHITECTURE DESIGN STUDIO
REGENERATION OF THE ULB SOLBOSCH CAMPUS.

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PROJECTS:

THE GREEN GALLERY (BUILDING L)

STUDENT:
AMBER DEHAEN

01

CONCEPT

Building L - FOOD & EDUCATION HUB

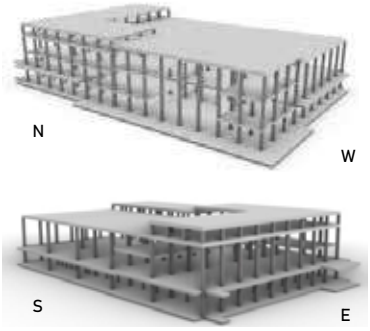
SOCIAL

Mixity	Food Urban farming	50%
	Education Research	50%
Post-covid	Intermediate spaces Meeting hub	

ECONOMIC

Retrofitting existing building

New facilities in old building



ENVIRONMENTAL

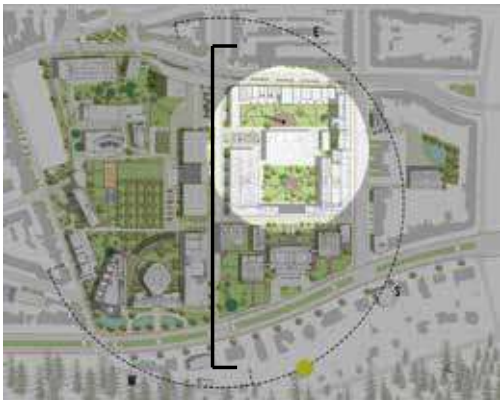
Water	Rainwater harvesting Irrigation greenhouse Reuse for other purposes
Energy	Geothermia Double facade (south) Building integrated photovoltaic panels Rooftop greenhouse
Materials	Wood Steel Glass Bio-based insulation
Daylight	Atrium Light wells (basement)

CONCEPT

Building L - FOOD & EDUCATION HUB

Open space framework / Urban context

Connectivity
Visibility (Greenhouse / Roof terrace)



View from the main street

CONCEPT

Building L - FOOD & EDUCATION HUB

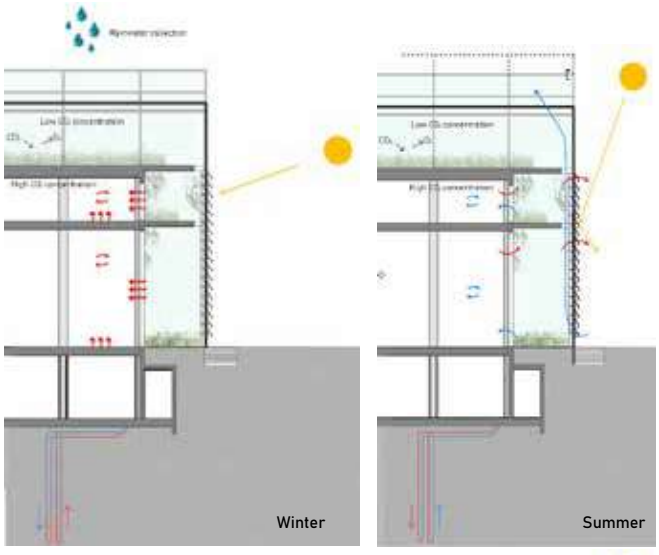
Sustainable strategies

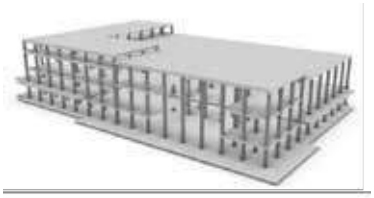
Double façade
- Loggia
- Insulation
- Shading devices (PV integrated) in façade

Integrated rooftop greenhouse
- Exchange of gases, water & energy
- Urban farming

Geothermia

Bio-based insulation





The Green Gallery' is a renovation project of the L building on the ULB Solbosch campus. The building will be retrofitted to become the new post-covid food and education hub of the campus. With its central location between the G square and chimney square, which will become the garden of the student housing, a new meeting space on the campus will be created. The central core of the building will act as a new street to connect the two squares. Further on, the view towards the L building from Avenue de l'Université is opened up to obtain a good visibility and connectivity with the main street of the campus. To design a sustainable project, both the program, economic and environmental aspect have been taken into account.

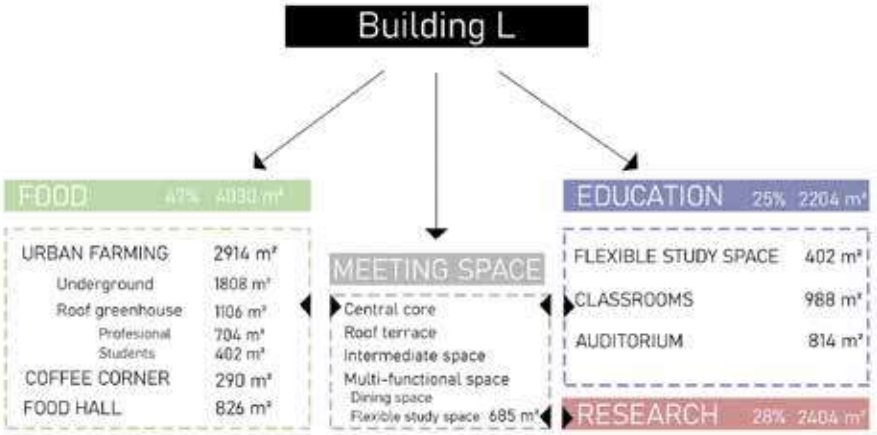
To create a university building of the future, mixity is key. Therefore, the program involves education, research and food. A 24/7 food hall along the main central street of the building is created as a space to eat and meet. Further on, a rooftop greenhouse and underground farming have been integrated to allow local food production on the campus. In addition, urban farming is combined with agricultural and biological research labs in the building. This way, an interesting mix and interaction between food and research will be introduced in the building. Besides that, learning is also present in the building by having flexible study spaces, classrooms and auditoria. Further on, multi-functional spaces are created to serve as an extra dining space or flexible study space. All spaces are very open and transparent towards the central core to allow visibility and connectivity in the building itself. To even enhance the openness of the central core, the rooftop greenhouse is opened up in the centre. This way, a lot of light is entering the main core of the building. Lastly, the open and transparent plan of the building allows flexibility towards the future for other purposes.

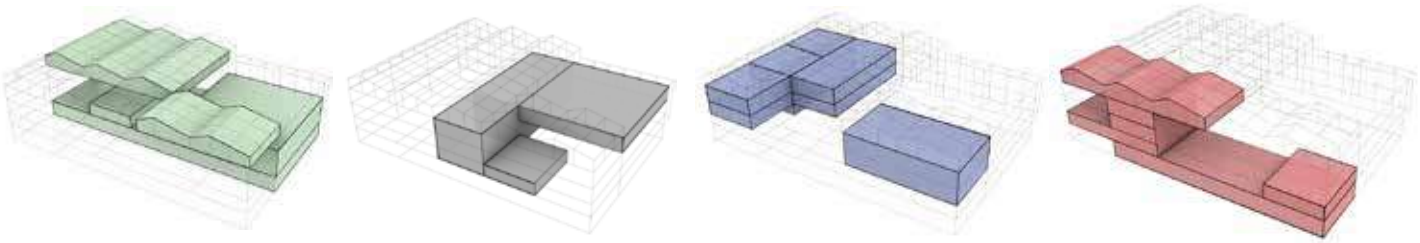
For the environmental aspect, water, energy and materials are key. To irrigate the plants in the rooftop greenhouse, water will be stored on the roof itself. Later, the water can be reused for other purposes in the building. To irrigate the plants of the underground farming, water will be stored in the two already existing underground rainwater tanks of the building. Besides reusing rainwater, grey water will also be reused in the building to save drinking water.

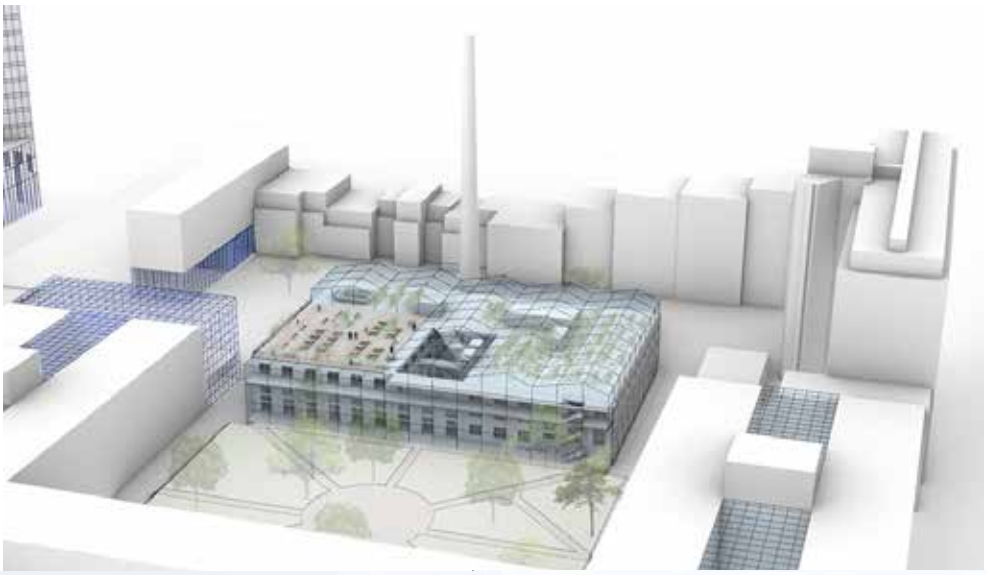
When looking at the energy aspect, the integrated rooftop greenhouse and double façade have an interesting added value for the building. First of all, there is an exchange of metabolic flows. The high CO2 concentration in the building can be absorbed by the greenhouse plants which reduces the CO2 concentration in the building. Further on, the temperature in the labs and classrooms can be regulated by the temperature in the greenhouse. At night, the greenhouse will be cold and thus heat from the indoor spaces can be used to heat up the greenhouse. On the other hand, in the day heat from the greenhouse can be reused to heat up the labs and classrooms. To reuse this heat, a waste heat recovery system will be integrated in the greenhouse. The droplet curtain will absorb the heat in the greenhouse and will convey it into the heating system with a heat pump. In addition, building integrated photovoltaic panels on the greenhouse and south façade and geothermia will be integrated. As a cooling strategy, shutters that can open up will be integrated in the double façade and rooftop greenhouse to allow ventilation through the building. This way, the building can act as a closed system in winter and an open system in summer.

To insulate the west, north and east façade, bio-based hemp insulation will be placed along the inside of the building, while the greenhouse and double façade insulate the roof and south façade. Further on, a lot of glass and steel will be needed for the greenhouse. Therefore, glass and steel from dismantled greenhouses will be reused. For the central staircases, wood is chosen to allow easy assembly and disassembly in the future. Lastly, the greenhouse will create an additional weight on the building. To assure a good stability, the concrete columns of the building can be reinforced with steel jacketing to allow additional weight on the structure.

PROGRAM

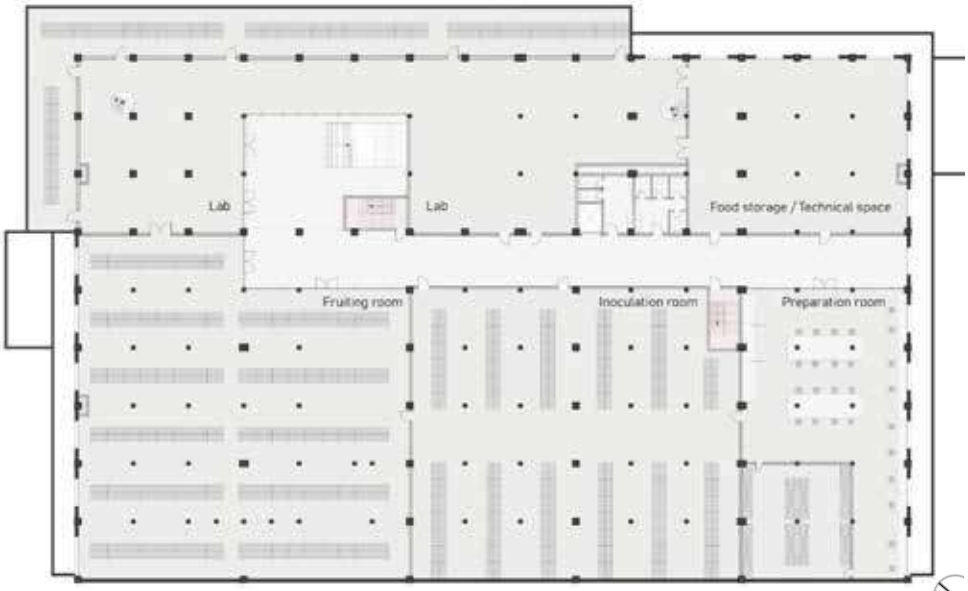

Building L
FOOD 47% 4030 m²
URBAN FARMING 2914 m²
Underground 1808 m²
Roof greenhouse 1106 m²
Profesional 704 m²
Students 402 m²
COFFEE CORNER 290 m²
FOOD HALL 826 m²
MEETING SPACE
Central core
Roof terrace
Intermediate space
Multi-functional space
Dining space
Flexible study space 685 m²
EDUCATION 25% 2204 m²
FLEXIBLE STUDY SPACE 402 m²
CLASSROOMS 988 m²
AUDITORIUM 814 m²
RESEARCH 28% 2404 m²





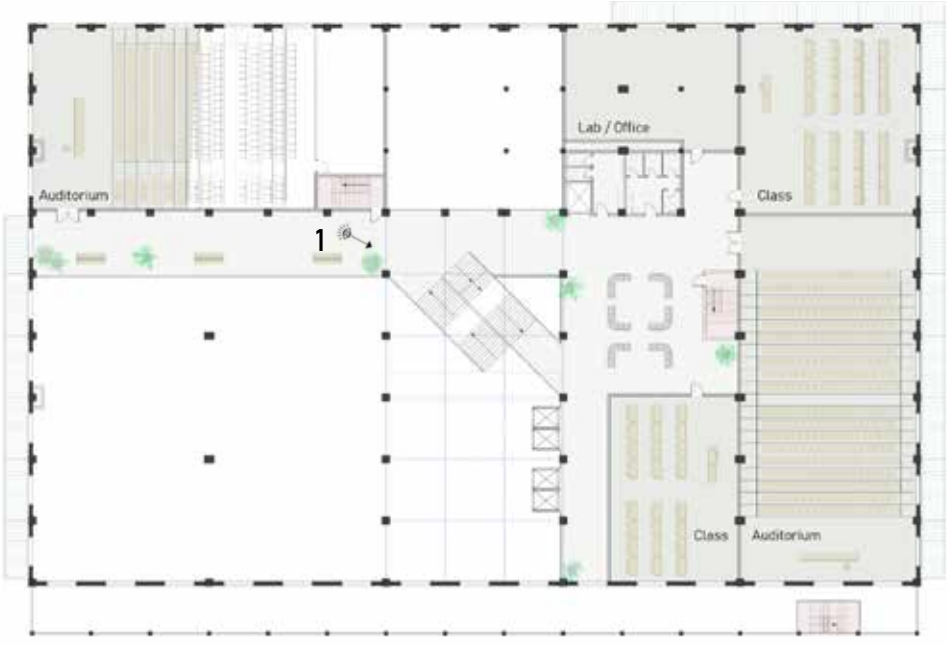

Lab
Lab
Coffee corner /
Lounge
Auditorium


E
S
W

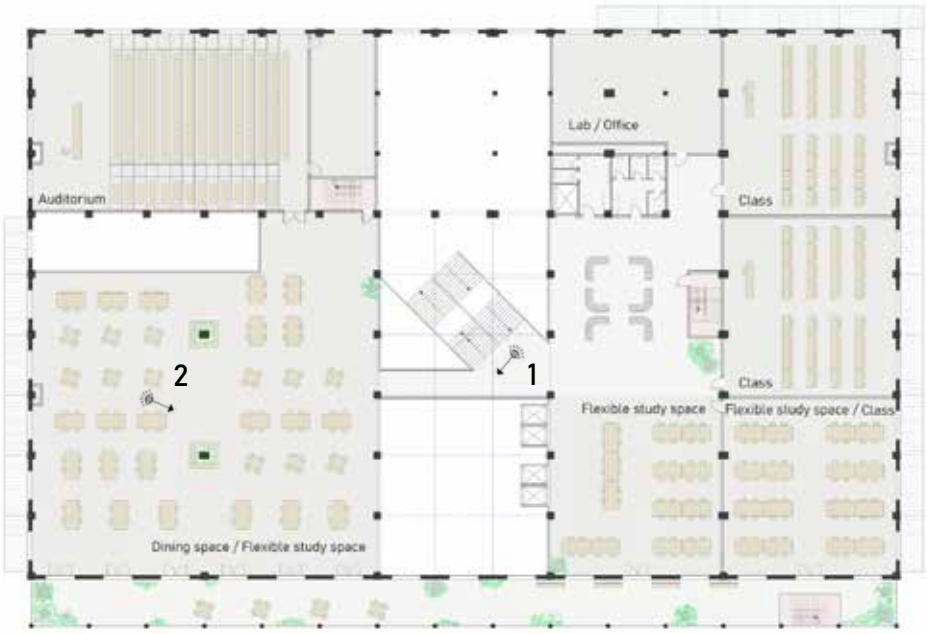


Floor level -1

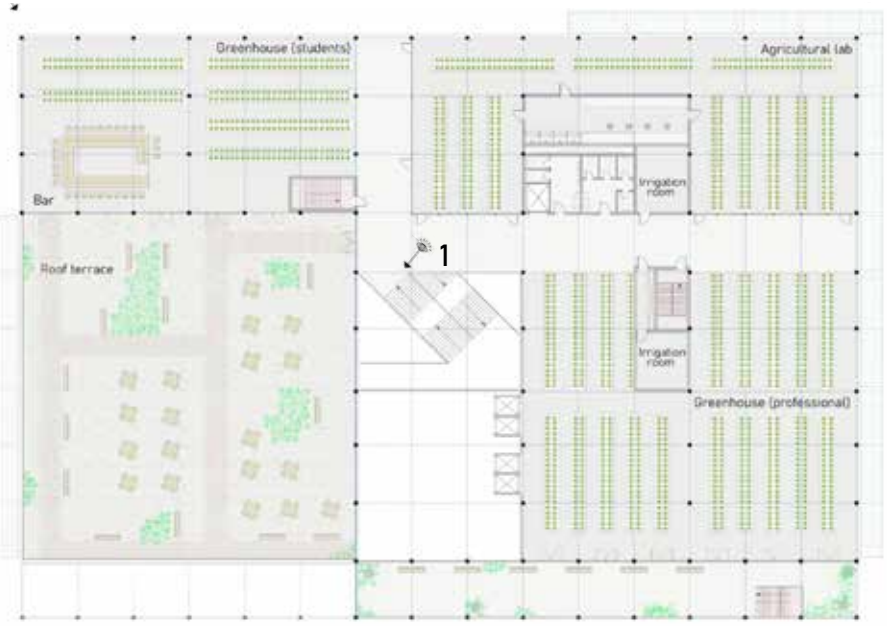
Ground floor level



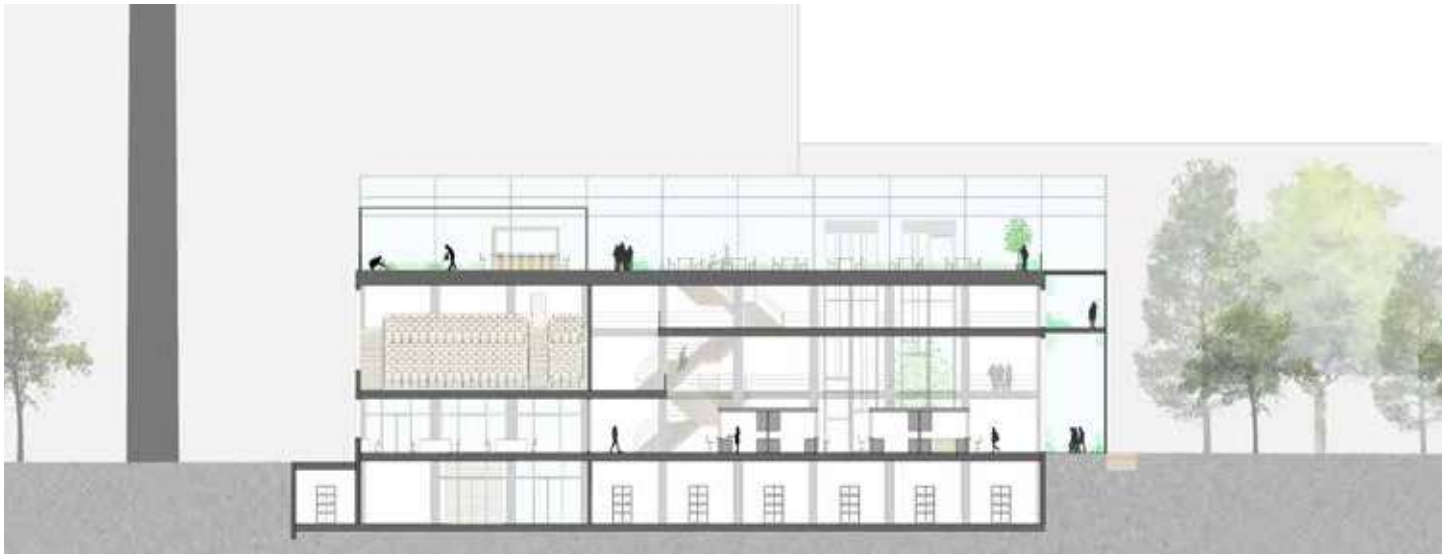
Floor level +1



Floor level +2

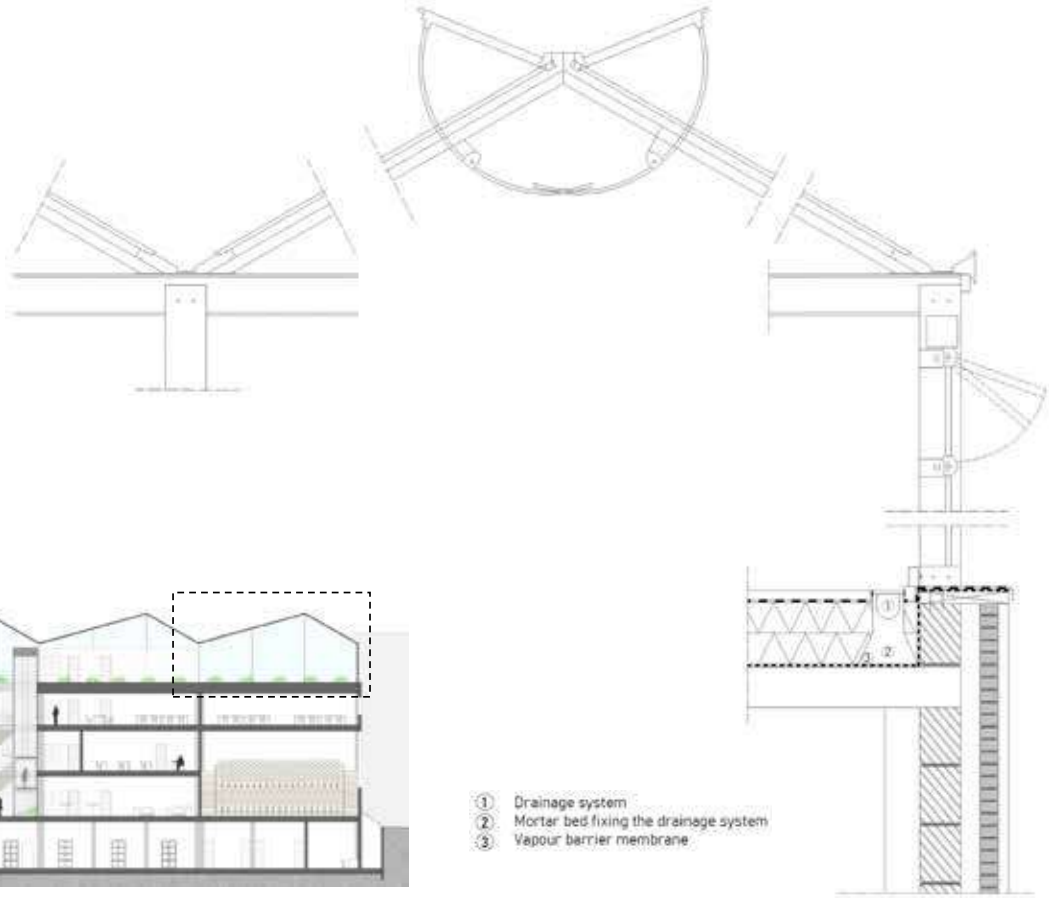


Floor level +3



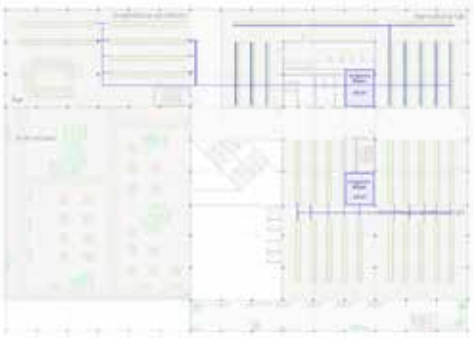
DETAILS _ ROOF GREENHOUSE

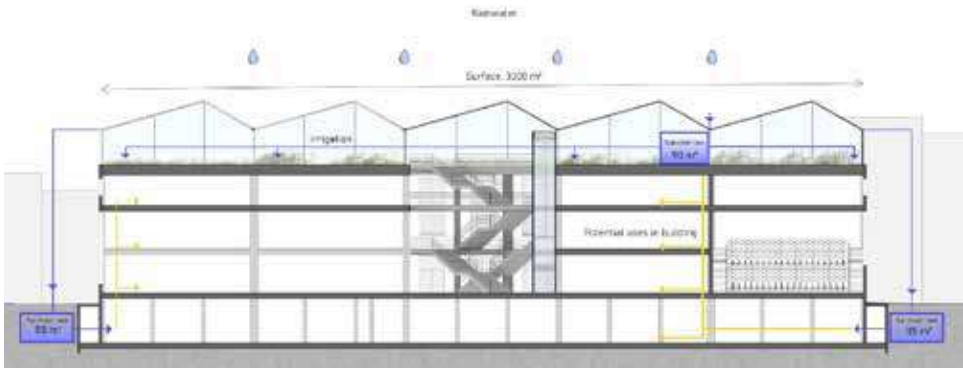
Greenhouse: ability to open up
Contributes to the ventilation
Limit the accumulation of heat



WATER

+3

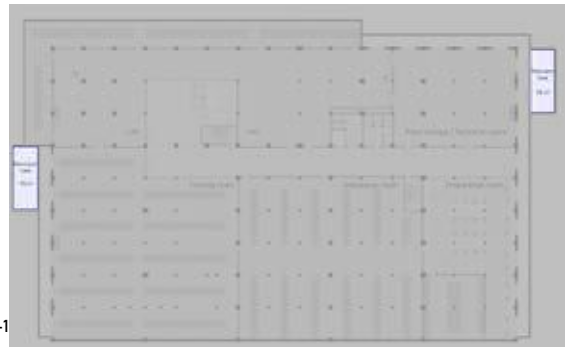




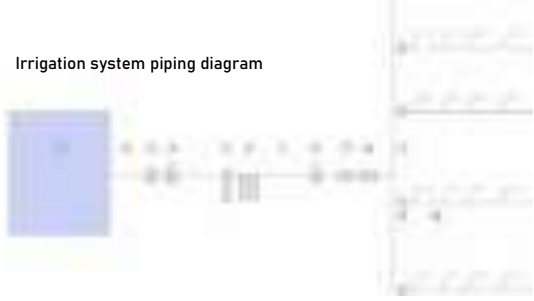
Save 37% in water consumption (rainwater, reuse of rainwater and greywater)

Current	10 971,11 m³ - 12 205,43 m³
New	6911,8 m³ - 7689,4 m³

-1

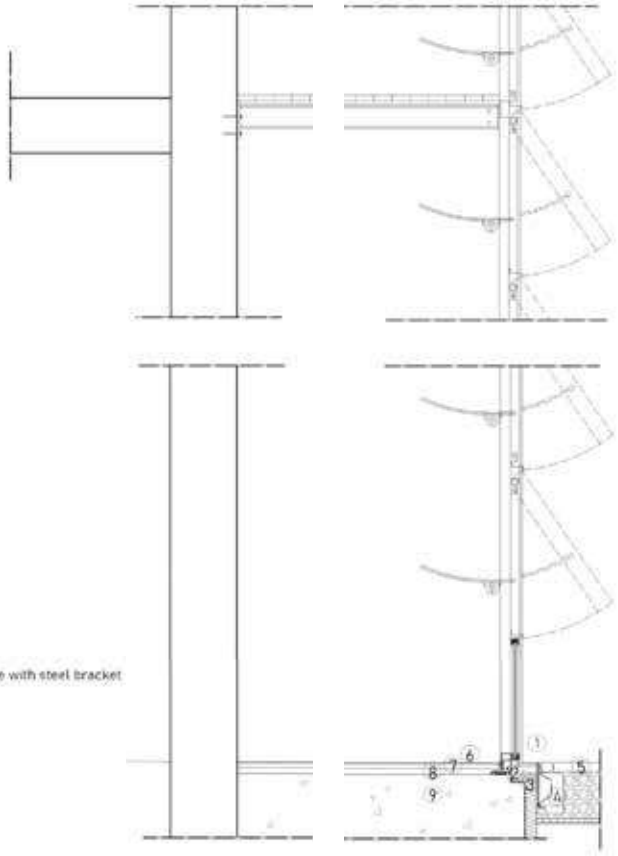


Irrigation system piping diagram



1. Water tank
2. Inlet water
3. Backflow preventer
4. Main shut-off valve
5. Main filter
6. Fertilizer injector
7. Main distribution line
8. Shut-off valve
9. Filter
10. Pressure regulator
11. Distribution pipe
12. Irrigation controller
13. Drip line

DETAILS _ DOUBLE FACADE



Shading devices (PV integrated) in façade (50%)

System that opens and closes
Regulate solar gain and ventilation

ICTA-ICP Building, Barcelona

1. Aluminium curtain wall profile fixed to ground profile with steel bracket
2. Insulation panel
3. Thermal floor slab Insulation
4. Gatric facede
5. Permeable paving
6. Floor covering
7. Lime mortar
8. Glaster screed
9. Concrete ground bearing slab

ENERGY

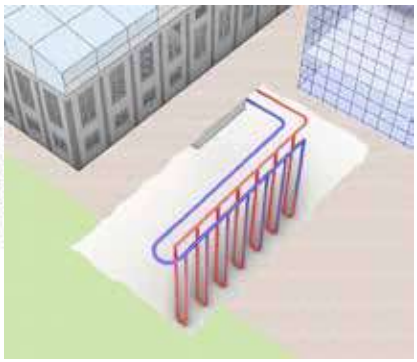
GEOTHERMIA

Heating and cooling
Generating electric power

Retrofit situation

Vertical system

Save 30-60% on heating and 20-50% on cooling

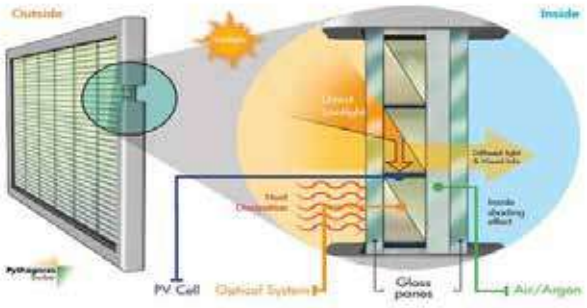


BUILDING INTEGRATED PHOTOVOLTAIC PANELS

Solar panels — South facade (50%)
Roof greenhouse

3272 m² — 490 800 kWh/y

ICTA-ICP Building, Barcelona

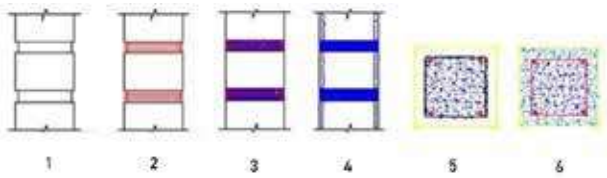


Pythagoras photovoltaic glass

MATERIALS

Staircases
Easy to assemble / disassemble

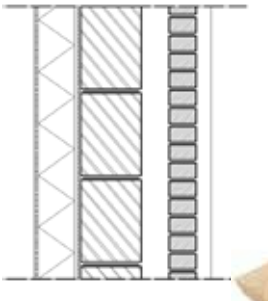
WOOD



Reinforcement of columns – STEEL JACKETING

CONCRETE

BIO-BASED INSULATION



HEMP FIBRE
Inside insulation
West – north – east facade

GLASS

Reuse glass from:
University
'60s – '70s office buildings Brussels

Building integrated photovoltaic glass

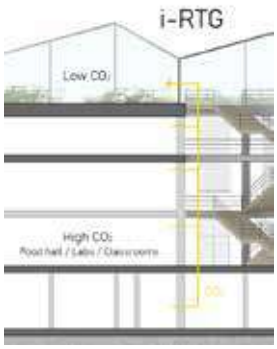
STEEL

OPALIS
- Dismantled greenhouses
- Create a new structure based on available parts

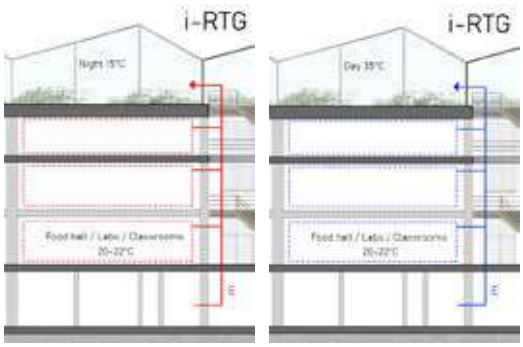
ENERGY

i-RTG

- Exchange of metabolic flows



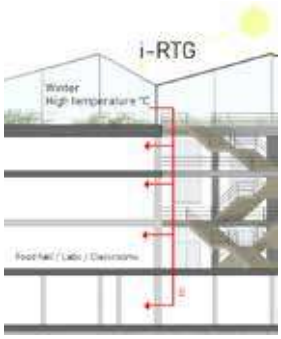
Gases



Temperature

Avoided CO_2 99,4 kg $CO_2/m^2/y$

- Waste heat recovery



Create additional heat or generate electrical / mechanical power

1. Droplet curtain
2. Basin
3. Heat pump
4. Boiler for storing energy
5. Controller of droplet curtain system and heat pump

Novarbo Finland

Save 30% in energy consumption

Electricity consumption:

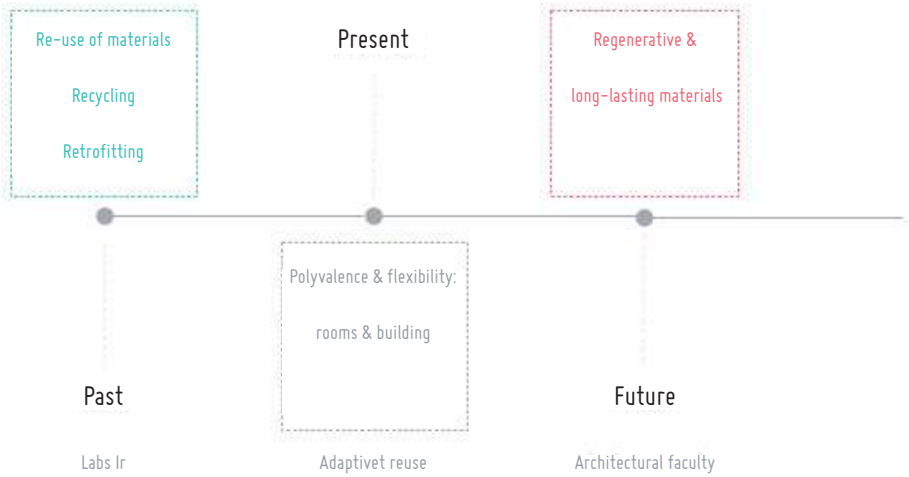
Current	150 kWh/m² 1 545 450 kWh
New	105 kWh/m² 1 081 815 kWh

ARCHILINK (BUILDING L)

STUDENT:
ELEONORA RUBINACCI


02

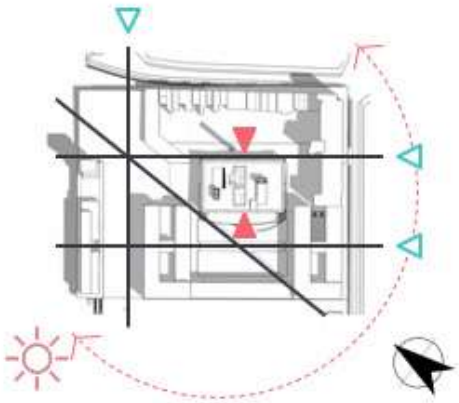
Concept - Longevity



Localisation

Rebirth

University as a regenerative metabolism

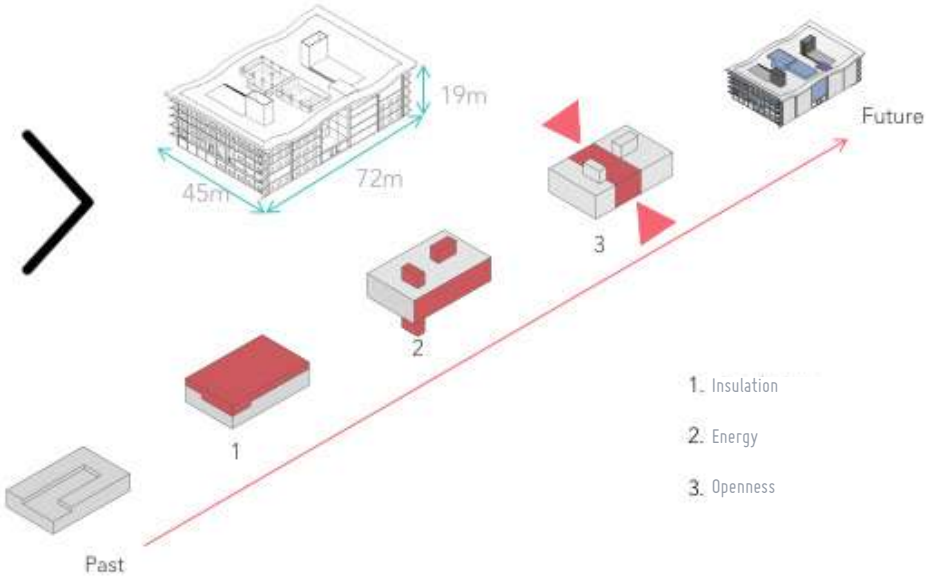


Campus entry

Building entry

Circulation axis

Dimensions and volumetry



Project archiLink consists in an adaptive reuse of the original Engineering Labs into the Architectural Faculty building. Located in the North-East quadrant of the Solbosch Campus, archiLink takes advantage of the current L building to its maximum while using regenerative materials for additions. The project focuses on creating flexible and well-lit spaces to foster innovation. Two green squares leading to the entries surround the building on either side.

The three-dimensional exhibition pathway is the backbone of the project. Linking the entries to the café-bar on the rooftop, it offers the users a 'promenade architecturale' through the building. This pathway is an immersion into the learning environment and an inspiring route for academic project exhibitions, bringing the creativity of the Faculty into light. Additionally, a secondary circulation provides shortcuts between the indoor spaces via footbridges and reused-steel staircases. A tertiary circulation with a lift and outdoors fire escapes completes the spaces' distribution.

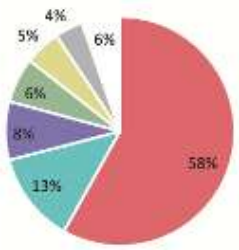
Promoting experimentation and learning is at the heart of the project. Counting almost 60% of studio spaces, archiLink also offers two 250-seat auditoria for its students. The roof's landscapes and the walls finish can be modified by the students over and over, ensuring the dynamism of the building in time. The structure and technical elements are purposefully visible, and the building's materials are available to students in a materials library furnishing four different workshops. The remodeled L building also counts a brand-new architectural Research Unit.

The brick façades are kept intact for patrimonial reasons as the L building is one of the oldest on Campus. The presence of outreaching concrete columns and beams gives texture to the walls. These are insulated from the inside with hemp blocks. The South façade is transformed into a trombe wall and is used to thermoregulate and ventilate the building, in combination with two solar chimneys and a geothermal energy system. Those chimneys, a large transversal atrium, large windows and high ceilings ensure that light reaches every room inside.

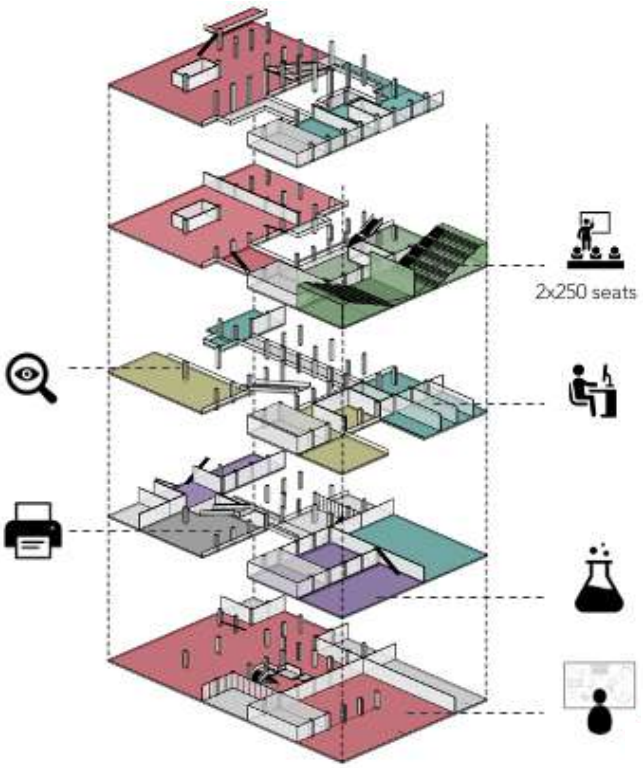
archiLink

Program

Faculty: 1365 people; 100 researchers
Localisations: Buildings U, L and 7 out of campus
--> archiLink: 8th research unit



Program	% of the building	Area [m²]
Studios	58%	5721
Profs. offices	13%	1261
Labs	8%	808
Auditoria	6%	627
PhD offices	5%	500
Copy shop	4%	388
Bioclimatic spaces	5%	532



Concept – circulation

Principal circulation

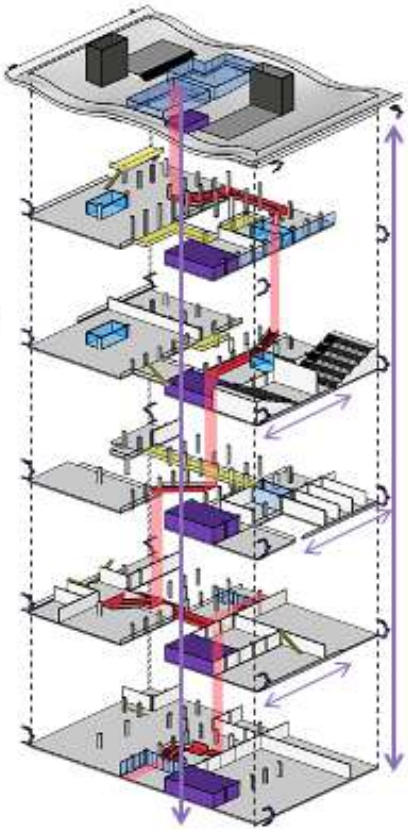
Concept - Circulation

Immersion in learning environment

Visual interaction with the building

Roof

3D exhibition pathway



Principal circulation

Secondary circulation

Pron

Secondary circulation

\+

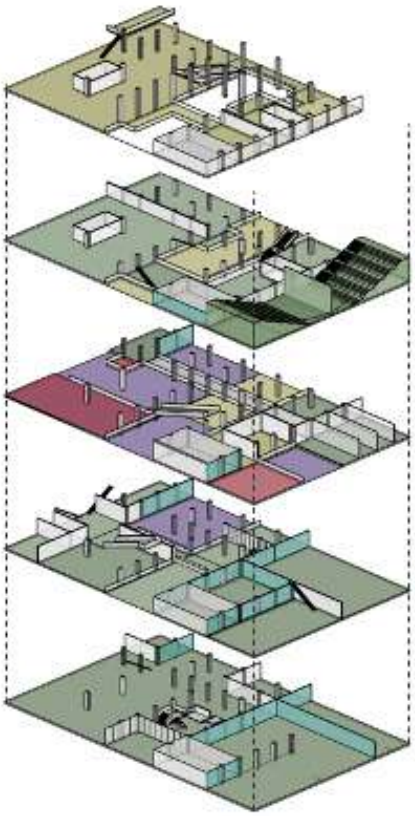
Tertiary circulation

Tertiary circ

\+ \+

3D exhibition pathway

Concept - Reuse of the L building



	L0	L+1	L+2	L+3	Total	Amount of saved
Floor's Volume [m³]						
Wall's volume [m³]	240	130	130	140	640	51 000 bricks

Concept – Reuse of the L building

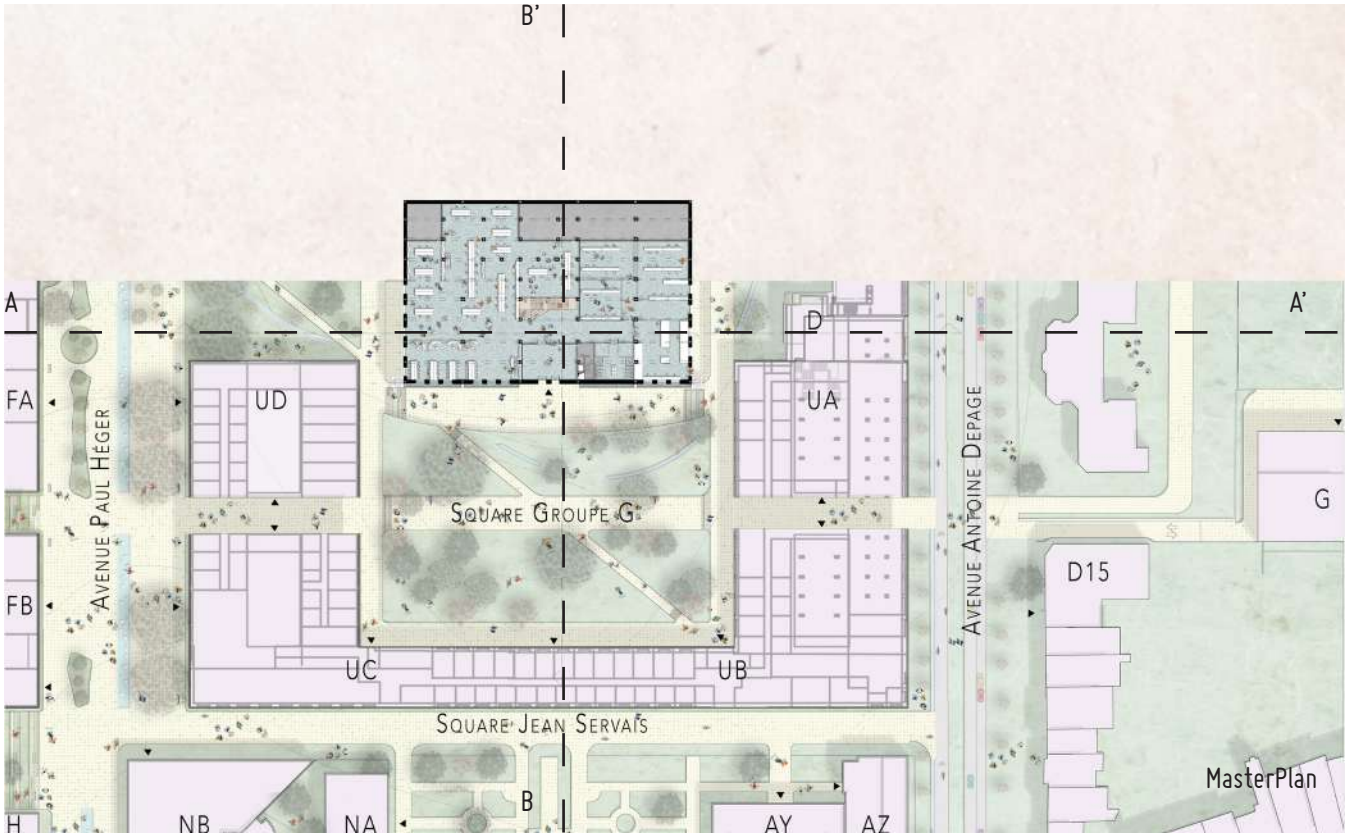
Kept floor
Kept opening

New floor
New opening

Kept wall

archiLink takes advantage of the L building to its maximum with limited modification of the interior walls and floors

archiLinkg takes advantage of the L building to its maximum with limited modification of the interior walls and floors


B'
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UC
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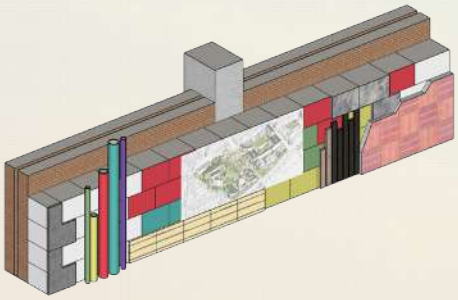
B
NB
NA
AY
AZ
H
Avenue Paul Héger
Square Groupe G
Avenue Antoine Depage
Square Jean Servais
MasterPlan

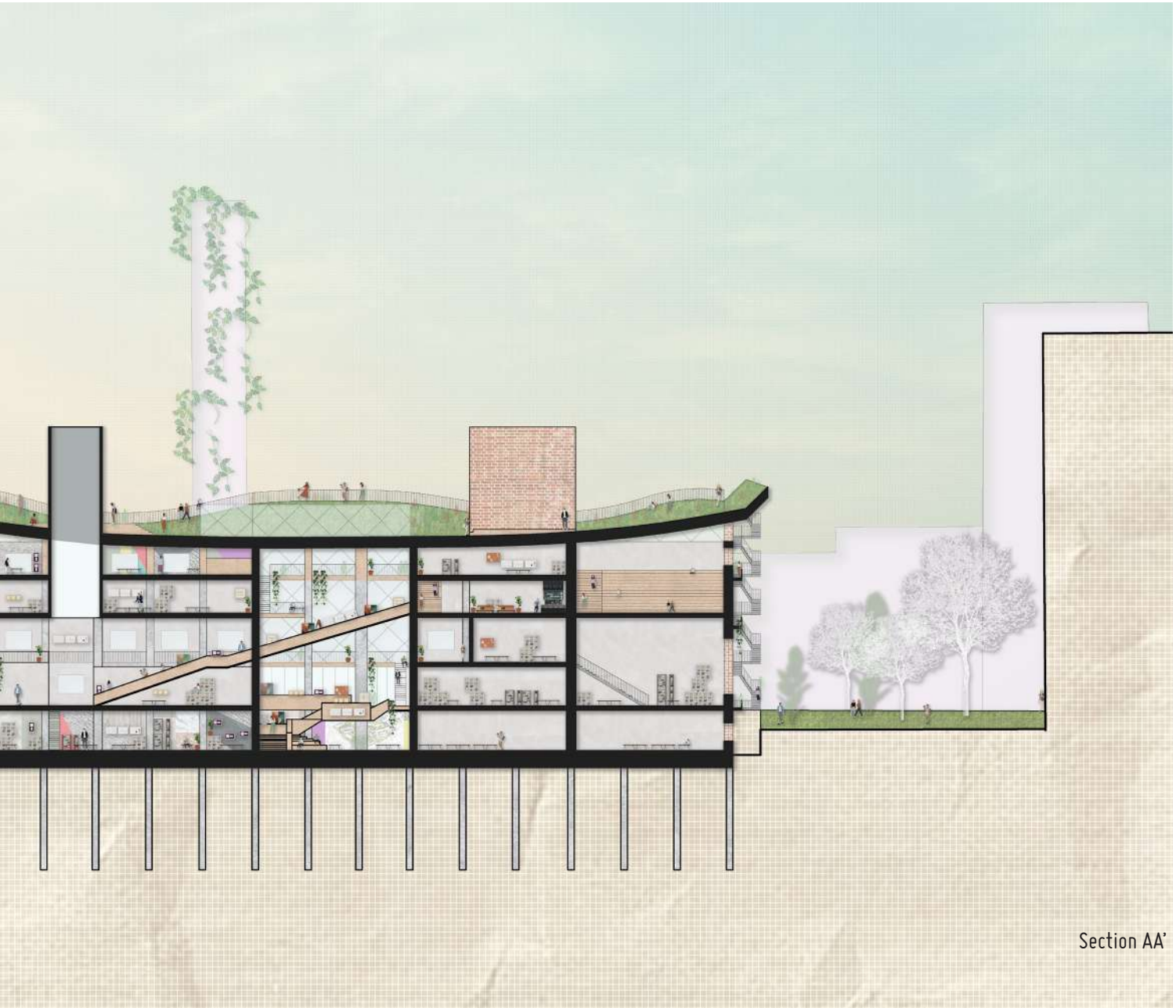

Section BB'

+4.4m

Exterior wall adaptiation: Hemp blocks insulation, visible technical elements and walls as blank canvas for students.



+ 12.9m

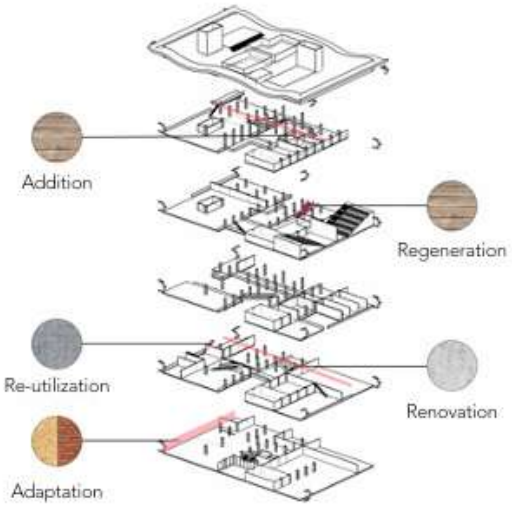


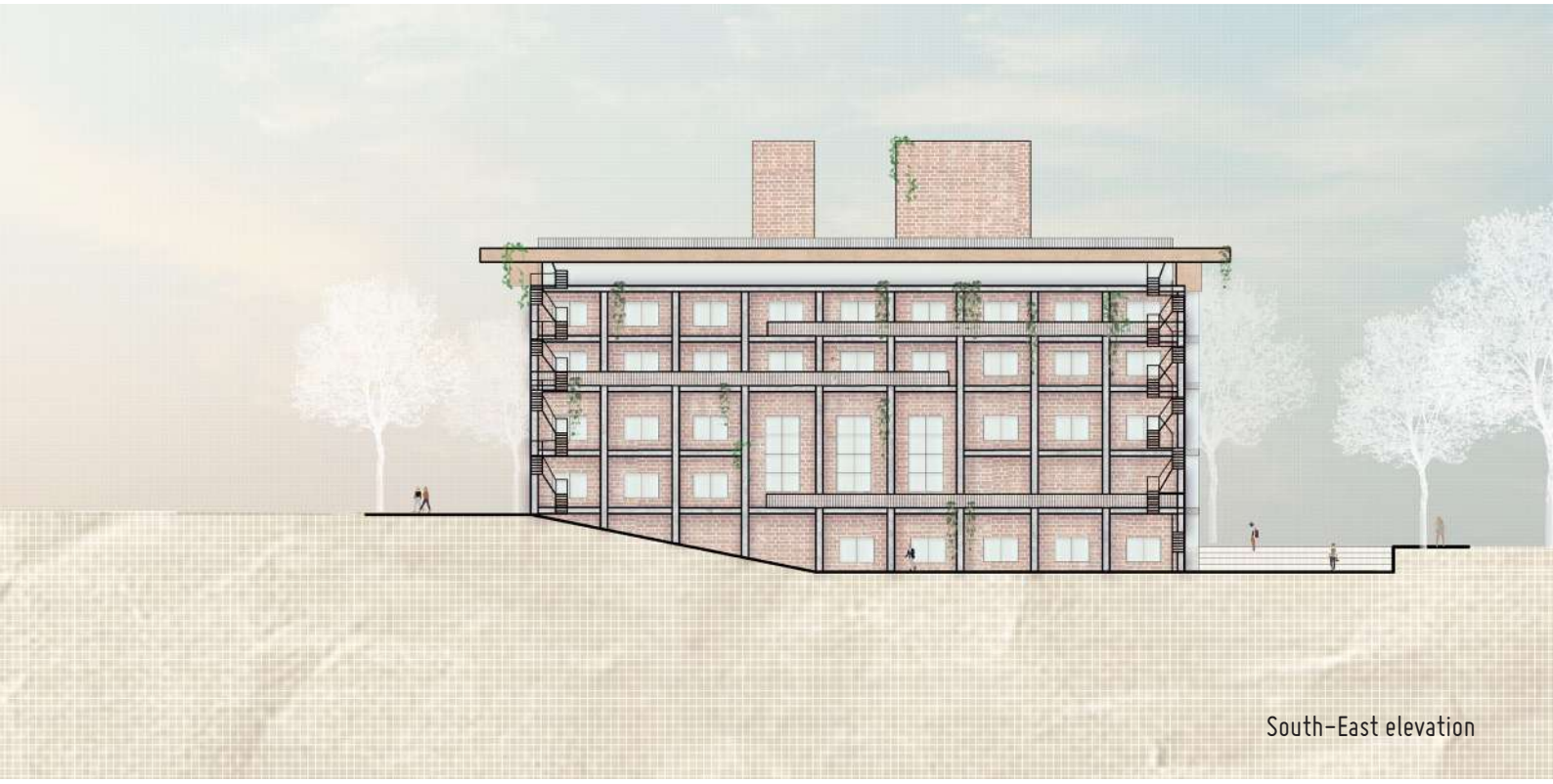
Section AA'

+ 16.3m

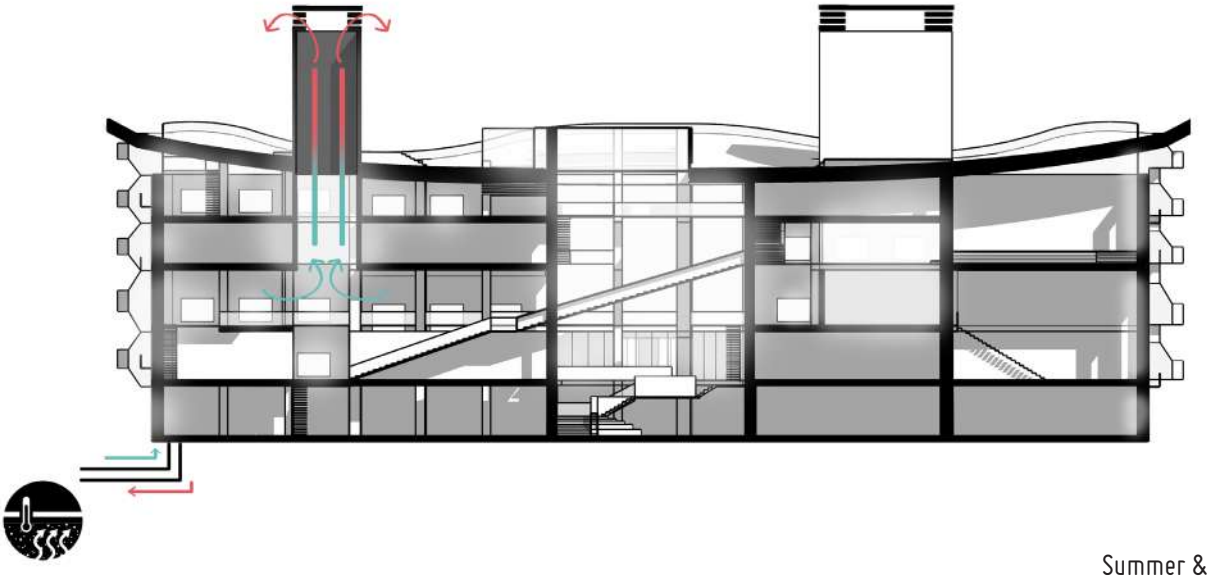
North-East elevation

Strategies – Materials

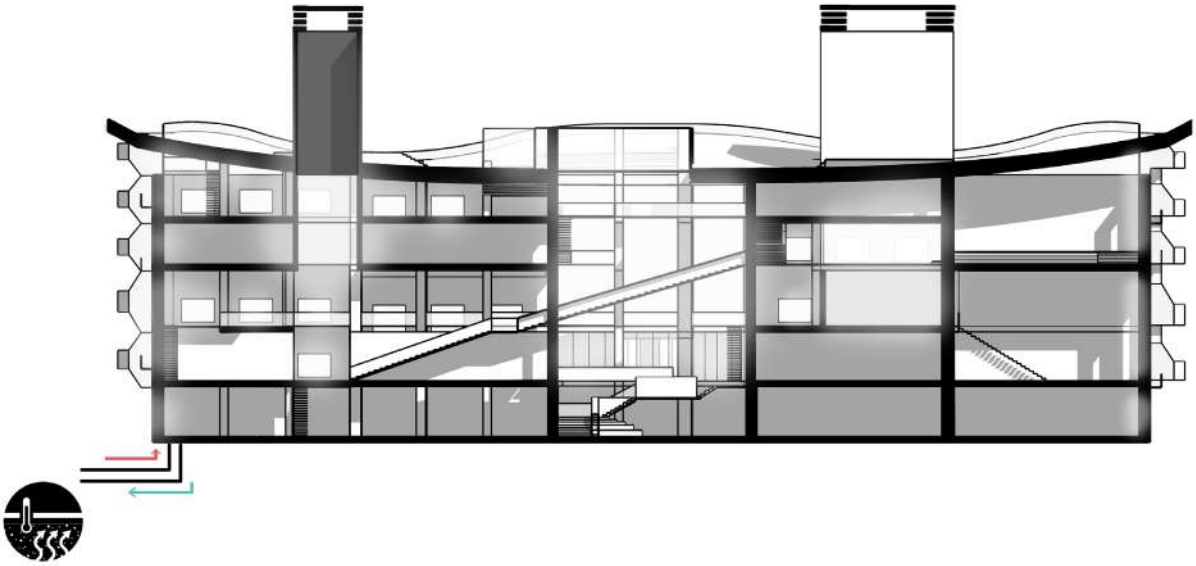




South-East elevation



Summer & mid-season

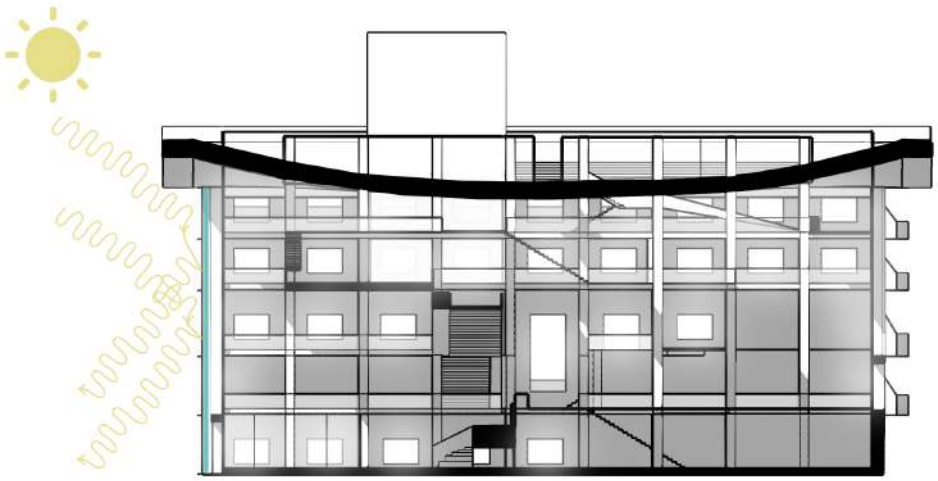


Winter

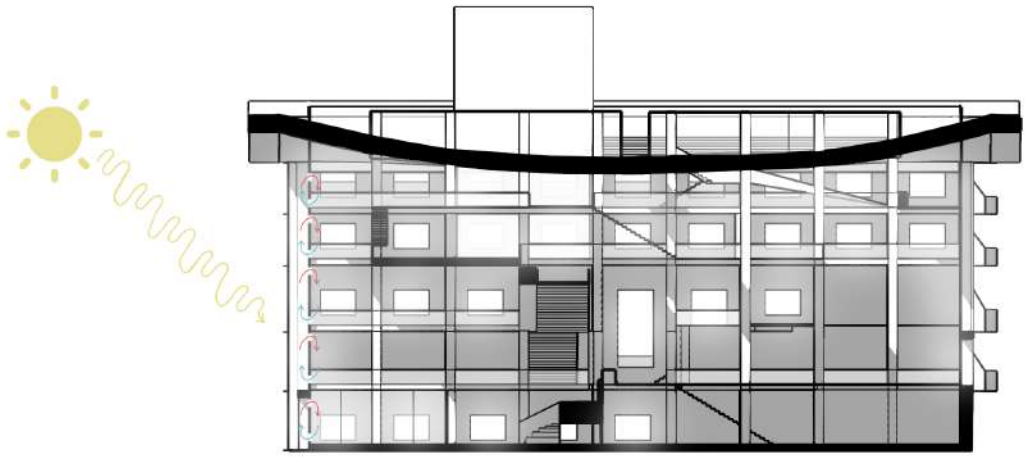
Hot air

Cold air

Solar chimneys &
Geothermal energy



Summer



Winter & mid-season

Sun rays

Hot air

Cold air

Blinds

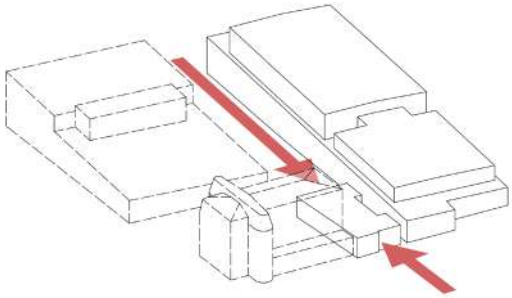
Trombe wall

ULB SPORTS COMPLEX (BUILDING E)

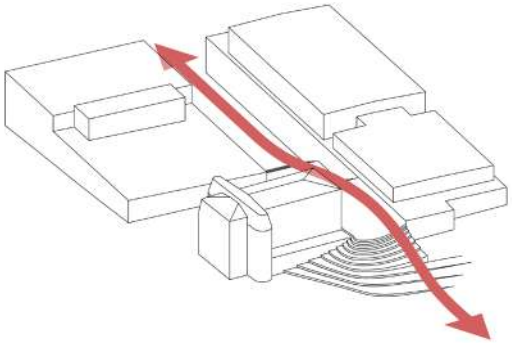
STUDENT:
WILLEM MEVIS

03

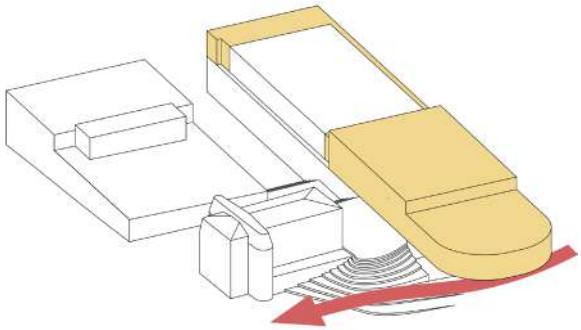
CONCEPT DESIGN



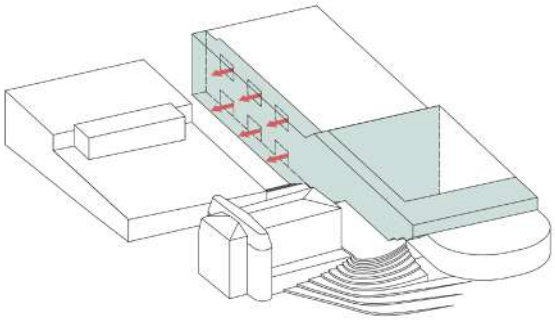
Problematic position of adjacent building blocking the passage and cramping the sports building.



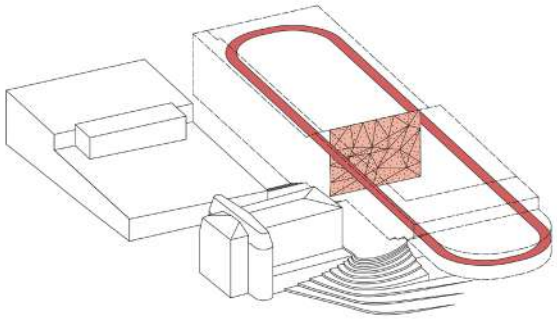
Creating passageway over recently renovated adjacent building, simultaniously providing an urban space.



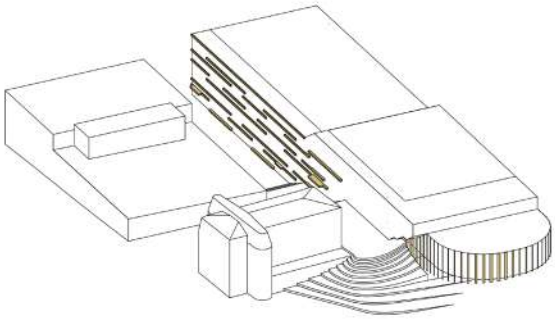
Expanding sports building by topping up a new sports hall volume to ensure passageway on groundfloor.



Designing a double facade to open up the building from the inside and an atrium to orientate the buildings program.



Interconnecting all the sports activities taking place through an indoor running track and a central climbing wall in the atrium.



Designing sustainable facade strategies.

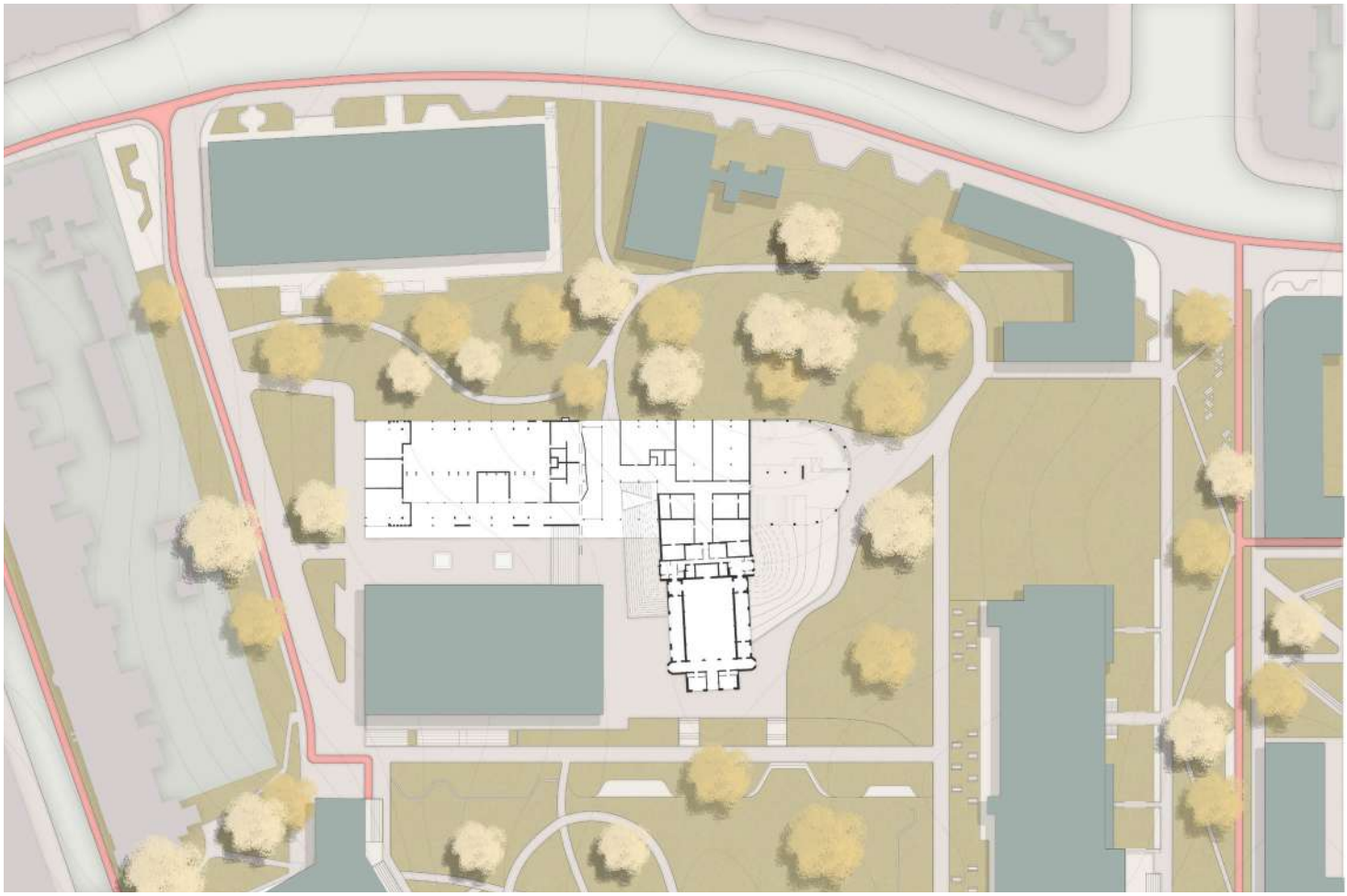
The base of the renovated sports complex is founded on the idea of opening up the sports building from the inside out. Since the current situation of the building is a really cramped one and there is more need to integrate sports infrastructure with the campus, this was a necessity for the building but also for the whole campus. The renovation design starts with the structure of the existing building and everything else goes from there.

Openness and connectivity is what this design is all about. On the inside this is achieved by the atrium space, to serve as a buffer for the inside to the outside. This buffer allows for the inside spaces to open up and conversate with each other. Multiple sports infrastructure elements, such as the running track and the climbing wall, lay base for this connectivity. The running track runs through the atrium, next to the old sports hall, inside the new sports hall. A runner can therefore experience all the sports productivity happing inside the sports complex, while going around. The climbing wall is really the head piece of the building, taking space inside the spacious atrium to be the centre of the whole building. So with these two elements: a clear binding boundary, being the running track, and an all-centred core, being the climbing wall, this design for the renovation stands on its own. The connectivity to the outside campus is achieved by opening up the façades and bringing out the inside qualities of the sports complex.

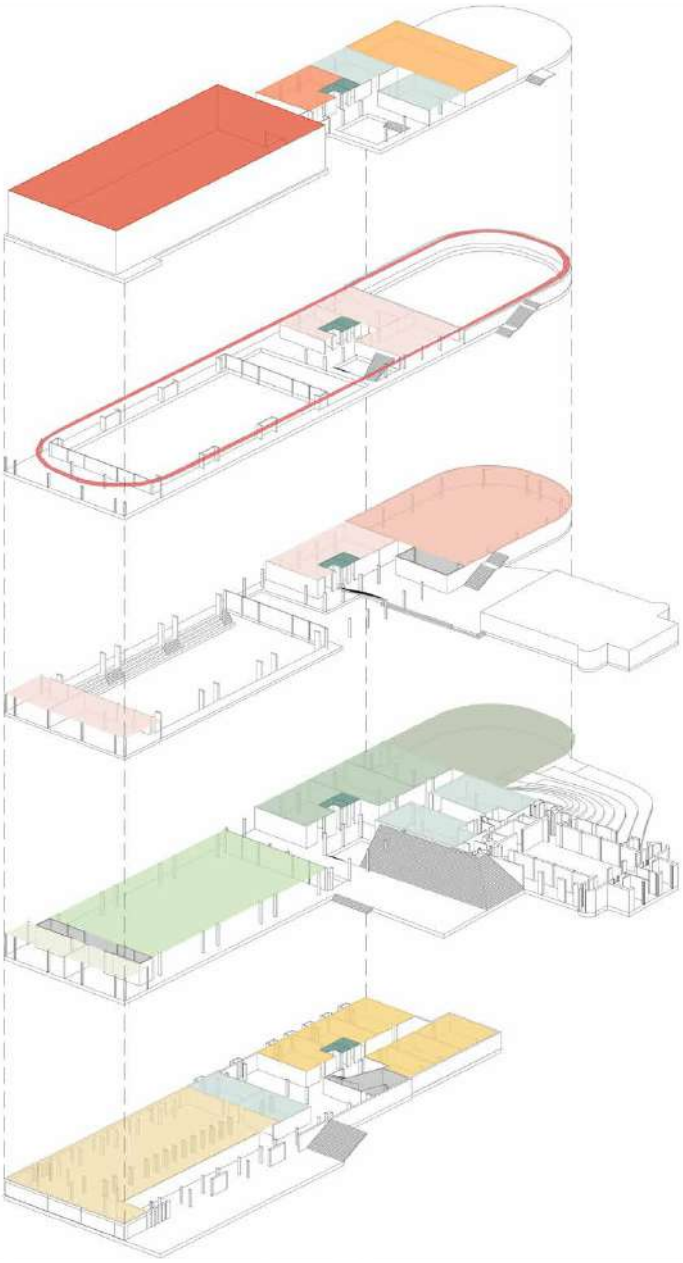
The urban steps, created to open up the corridor between the sports building and the adjacent buildings, and the double glass façade are the two main elements for this. The corridor, now opened up to the flow of the campus, provides a layeredness for the sports building to be activated on multiple levels. On the lower layer, situated to the north, the more public functions, such as a gym, and on the upper layers, situated to the south, the campus related functions. The connectivity therefore runs horizontally along the building, but also vertically.

The sustainable design strategies arise from the comfort of the sporters. A comfortable sporting environment means a good air quality and low hinder of direct sunlight. The first one is achieved with cross-ventilation, running through the big sports hall. Since the sports hall is opened up on all its sides and the building width isn't that large, this is a logical design choice. On top of that the air is freshened by the green façade on one side and the forestry area on the other. The second comfort aspect is tackled by a green façade for the big sports hall and a shading façade system for the new sports hall. This 'accordion-like' shading system closes on the places where there is direct sunlight and opens up for the indirect sunlight. A doppler-effect look is created making the new sports hall stand out in its environment to become a head piece in the middle of the campus.

MASTERPLAN



PROGRAM



5

- synthetic sports gield
- quiet space
- dressing rooms
- rooftop bar
- sanitary

4

- polyvalent rooms
- running track
- sanitary

3

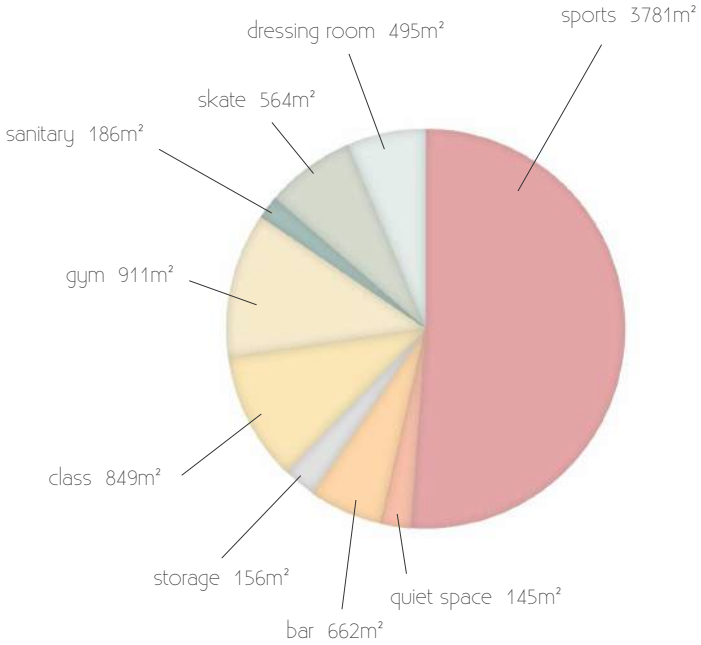
- polyvalent rooms
- sports hall
- sanitary

2

- polyvalent rooms
- sports hall
- classrooms
- dressing room
- outdooor skate area
- sanitary

1

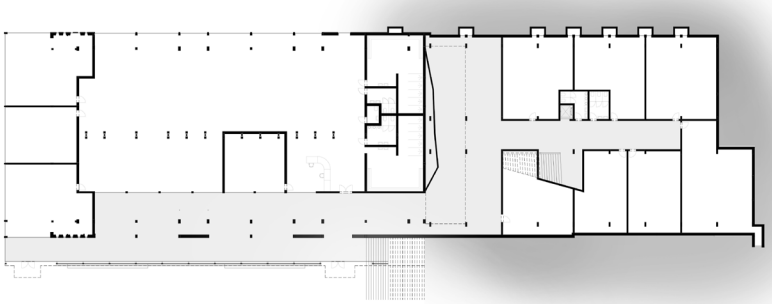
- public gym
- dressing rooms
- laboratory and fysiotherapy classes
- sanitary



PROJECT

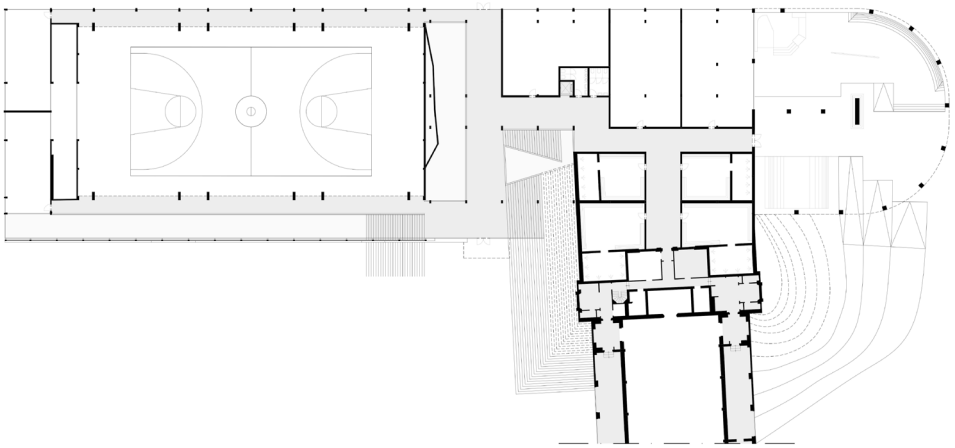
0

The lower ground floor is mainly devoted to a public gym, because it is easy accesible through the upper-north entrance. Centrally on this floor the start of the climbing wall is located. The undergorund-part of the floor is devoted to laboratory and fysiotherapy rooms since these aren't in need for a lot of light.

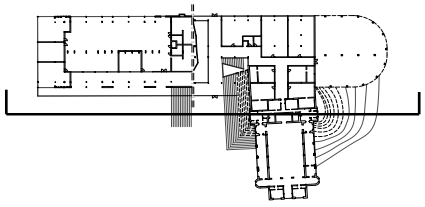


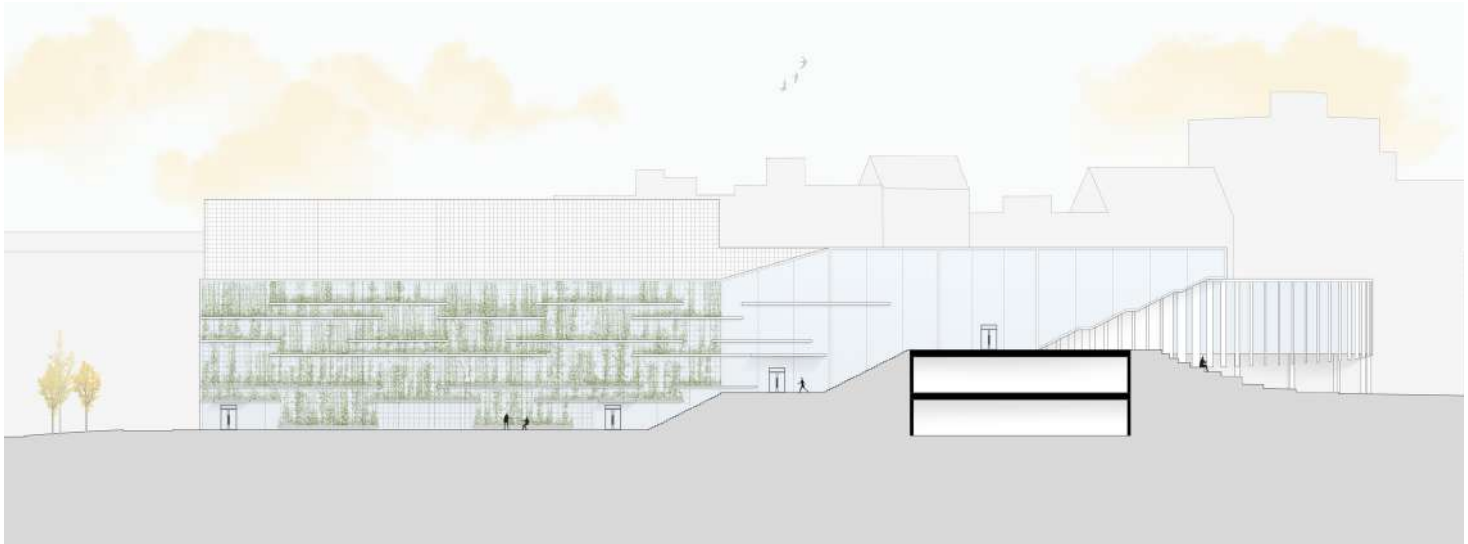
+1

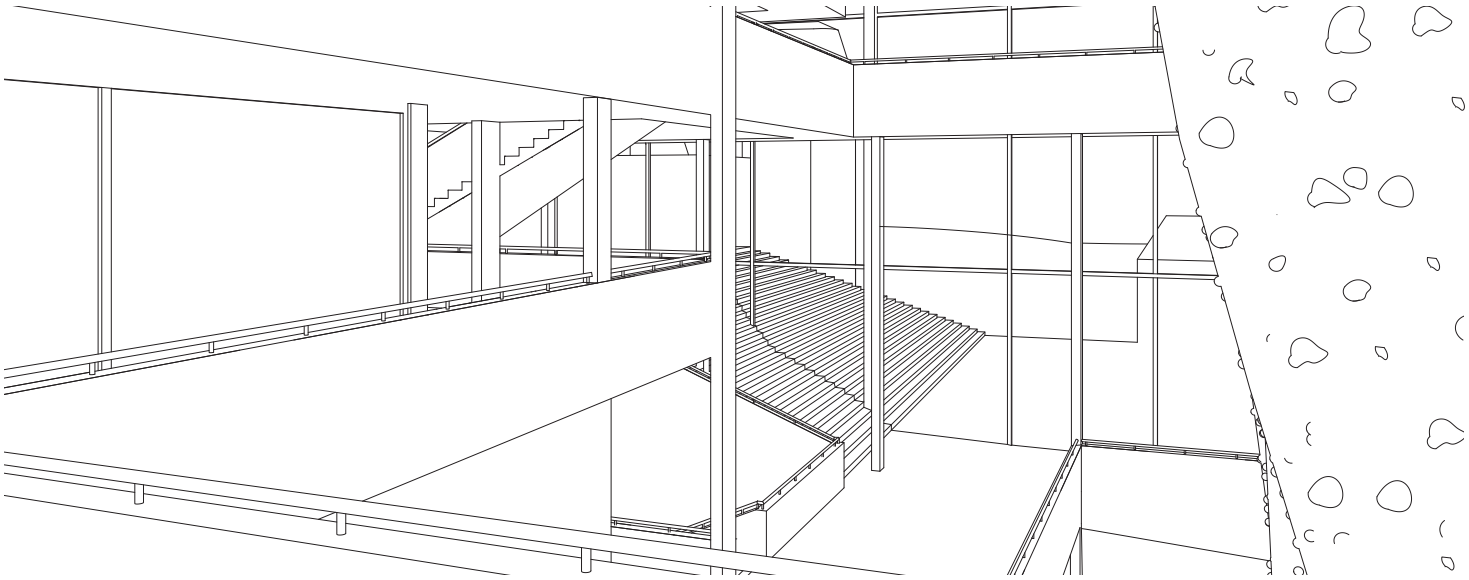
On this upper ground floor both sides of the building are connected through the atrium. On the upper side of the building, under the overhanging sports hall, an outdoor skate area is designed in connection with the rest of the campus.



One of the main aspects for the all-round connectivity of the sports building is the layeredness of the project. The passageway between the E building and the adjacent buildings, runs over three levels, connecting multiple spaces. Through the use of urban steps, the problem with the adjacent building -as can be seen on the first concept sketch- is tackled and a new open space is created along the sports building. The glass facade reflects this layeredness along the side of the building, with a green facade on the north side and a staircase to the rooftop bar on the south side.

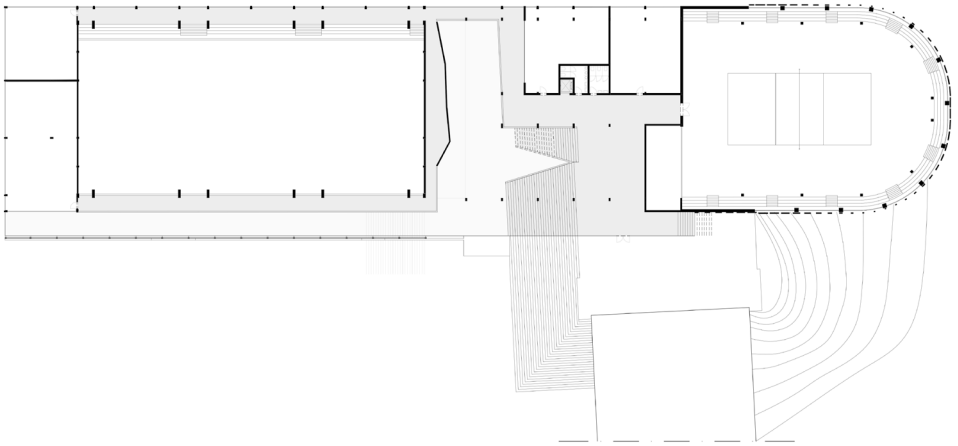




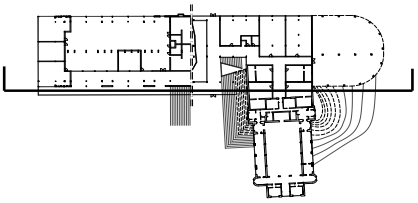


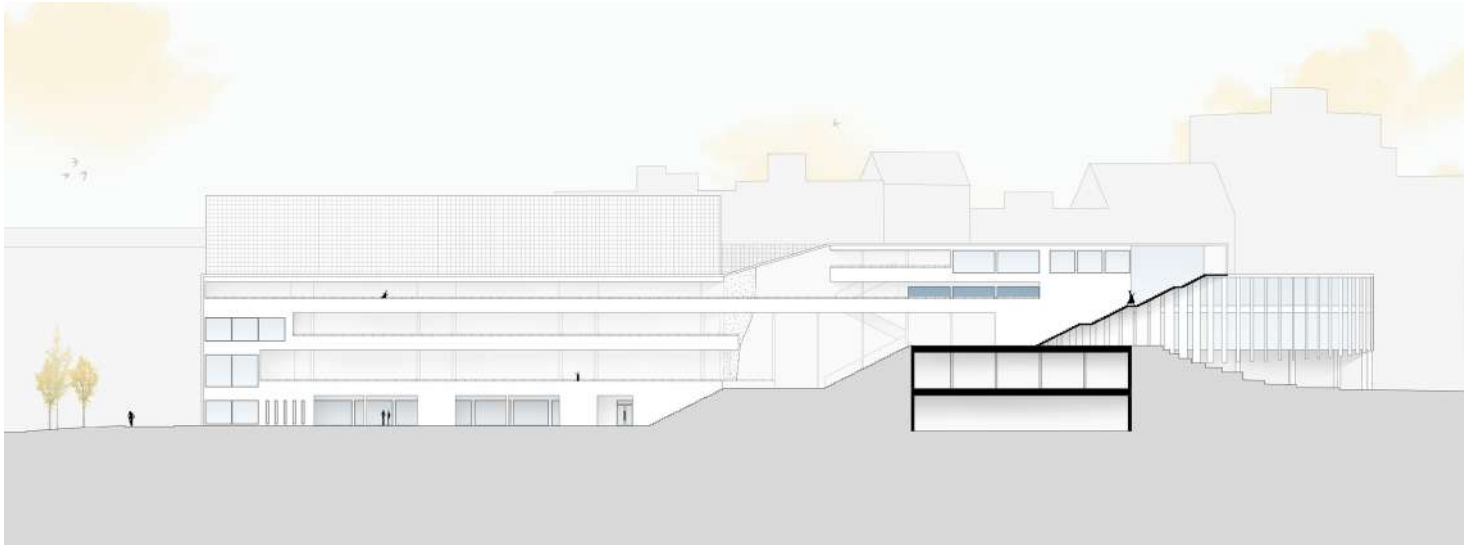
+2

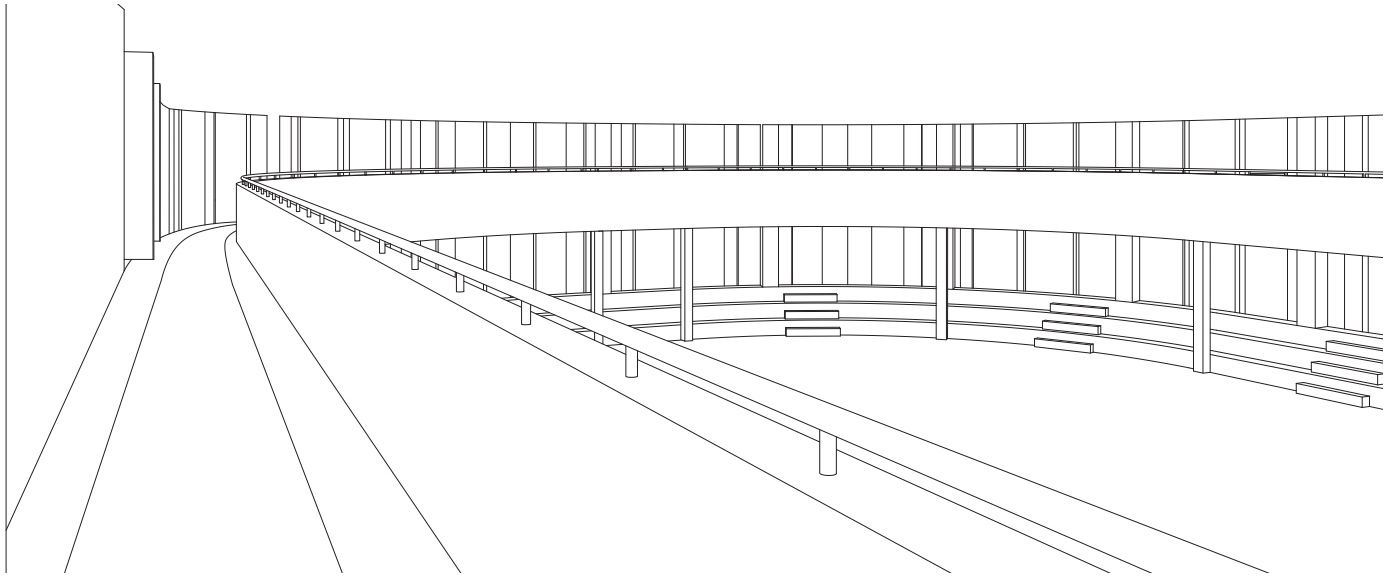
On boths sides of the big sports hall, corridors are running. This is the fact on all three floors over which the sports hall runs. Consequently the sports hall opens up to the building, providing good ventilation and a spacious feeling.



The open corridors running along the length of the sports building provide an openness of the indoor spaces. A person walking from one classroom to the next, can witness all the productivity taking place in the building. With a clear view on the big sports hall, the climbing wall and the polyvalent spaces, one can easily feel the sporty character of the building.

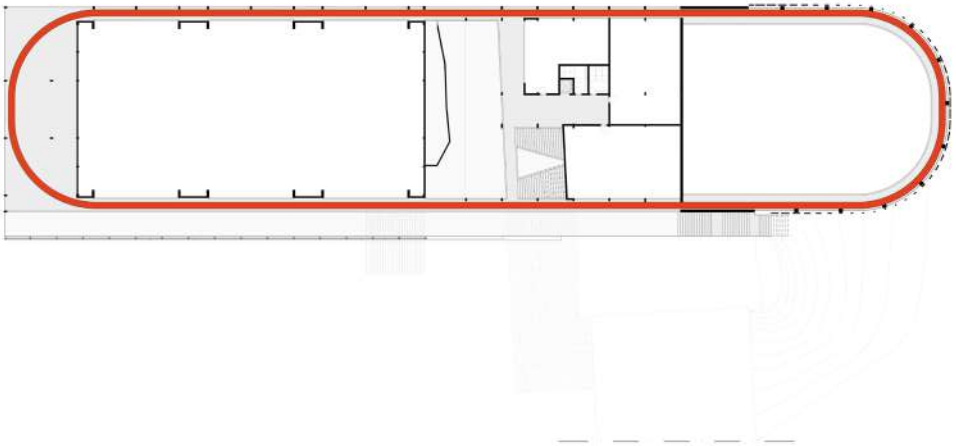




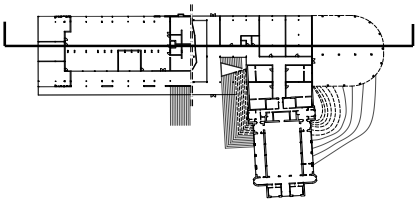


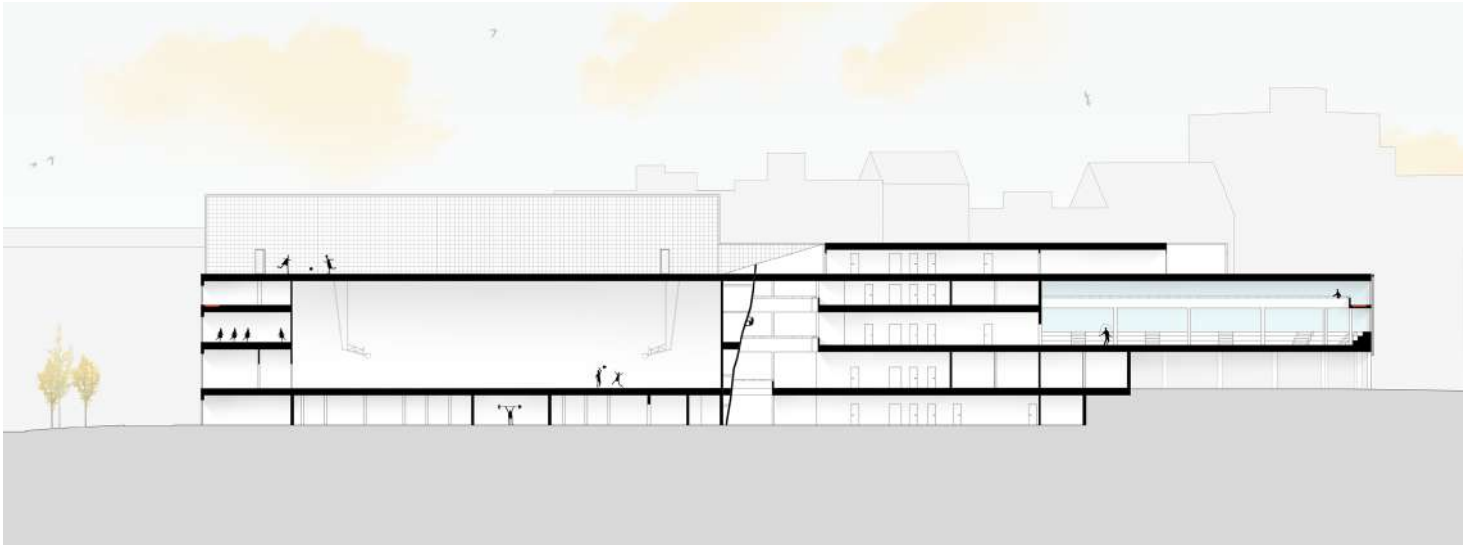
+3

The running track connects all the open spaces of the sports center. Passing the big sports hall, running through the atrium and inside the new sports hall. In addition to this windows are added to the polyvalent rooms to create a visual connection with the running track.



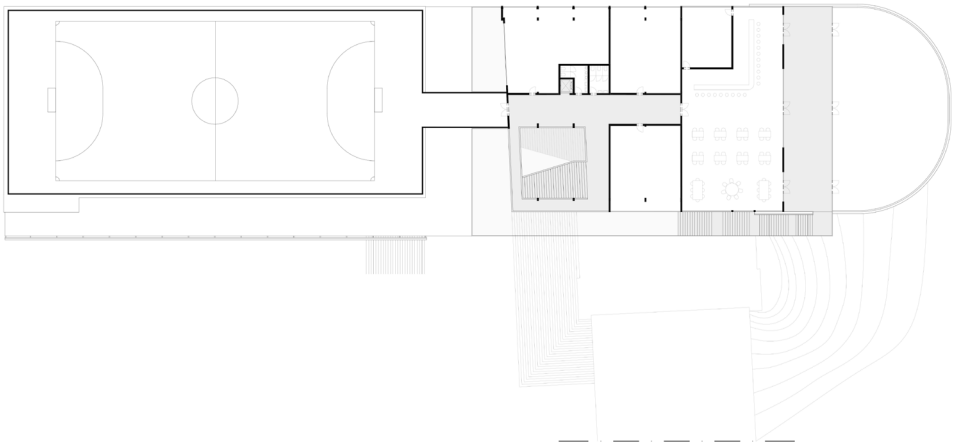
The atrium functions as a central hub. Containing the main entrances and a spacious stairway, everything comes together here. The climbing wall on its turn reflects the sporty character of the building, therefore functioning as the head piece of the sports center. On the third floor, the running track binds everything together as the outer rim of the building.



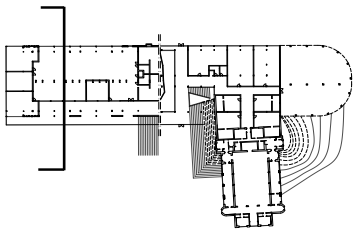


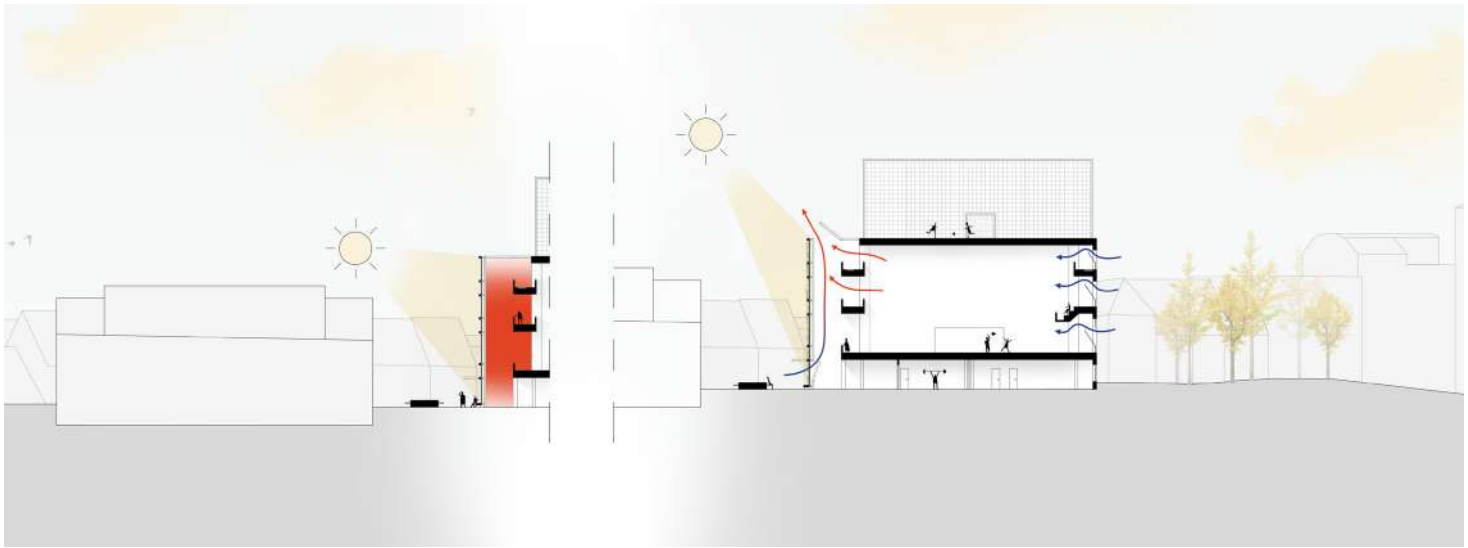
+4

The top floor is mainly devoted to sports with an outdoor, caged sports field on the roof. On top of the new sports hall a rooftop bar is located with a central view over the campus. It is accesible from the inside and through a stairway running along the buildingside.

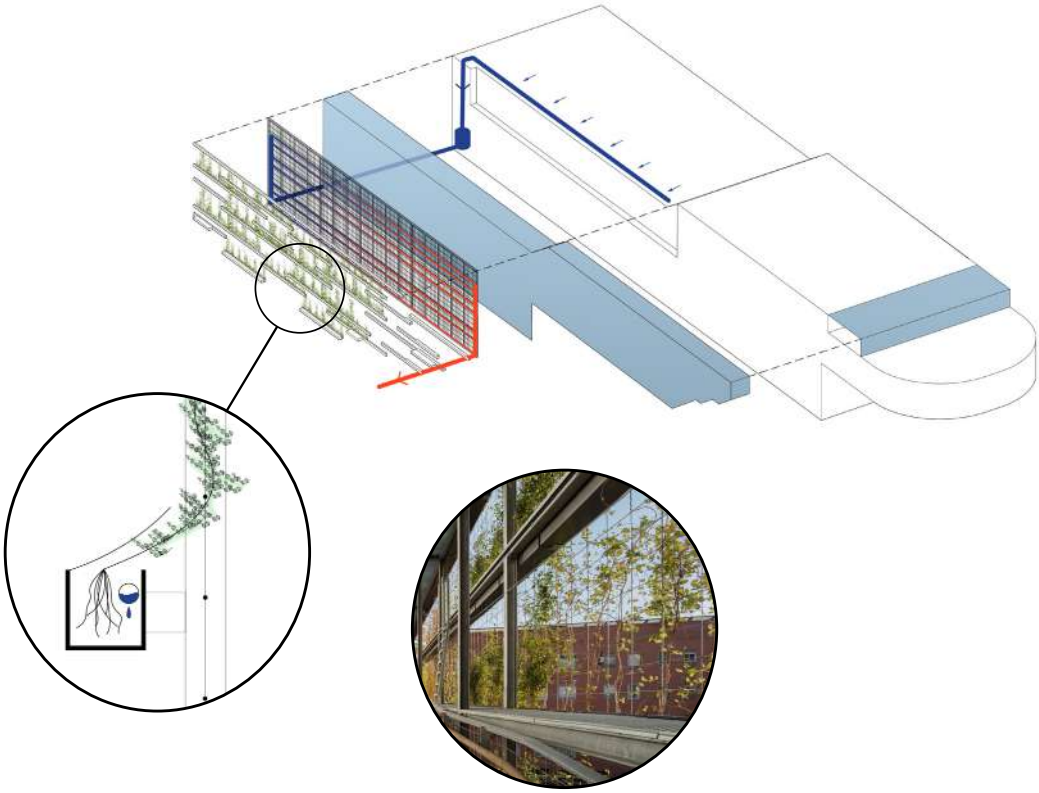


An environmental buffer is achieved by the double facade. In the winter it closes entirely and is naturally heated by the sun. In the summer the facade opens up and makes place for cross-ventilation to occur. Consequently fresh air, coming from the adjacent forresty area, is constantly supplied to the sports hall and warm, polluted air is excreted through the top opening of the facade. This good air quality is essentiel for a comfortable sporting environment.



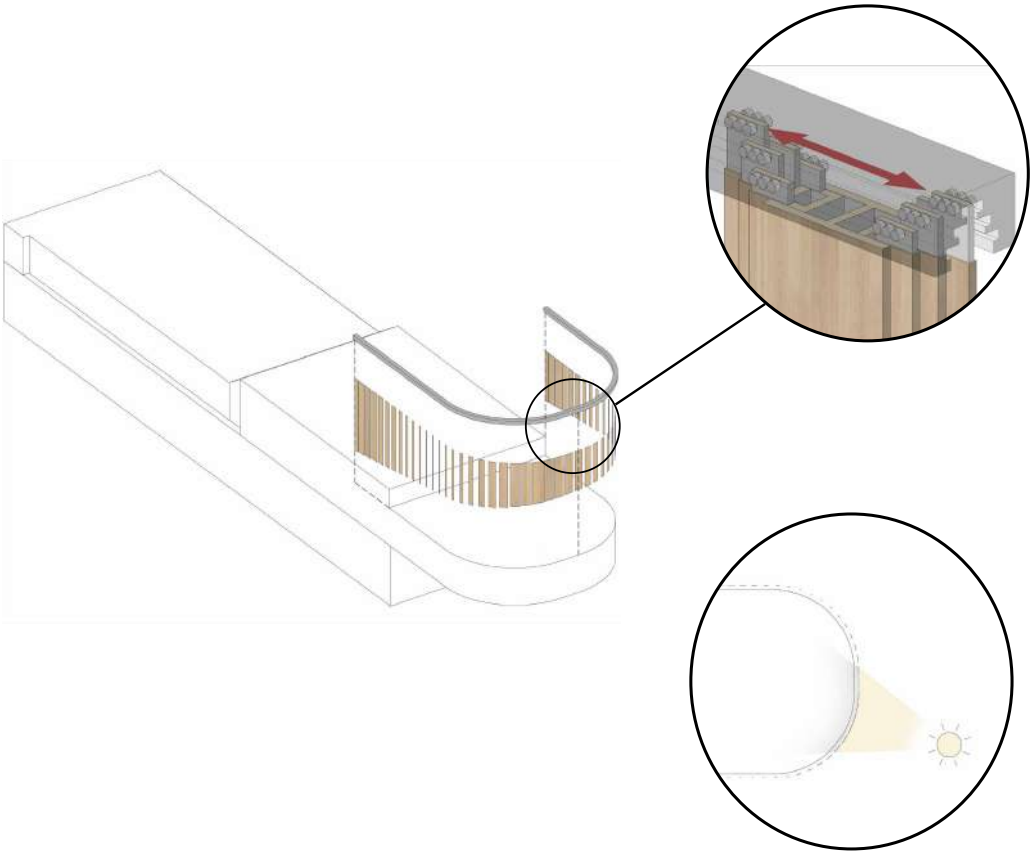


SUSTAINABLE STRATEGIES



A green facade is growed on top of the glazed double facade benefitting the shading of the sports hall and the freshness of the natural ventilated air. It consists of hydrophonic plants, chosen for its lightness, durability and capacity of water retention. The irrigation system is supported by rainwater collection on the roof, where the synthetic sports field is located. This is distributed to the plants thourgh a network of irrigation tubes.

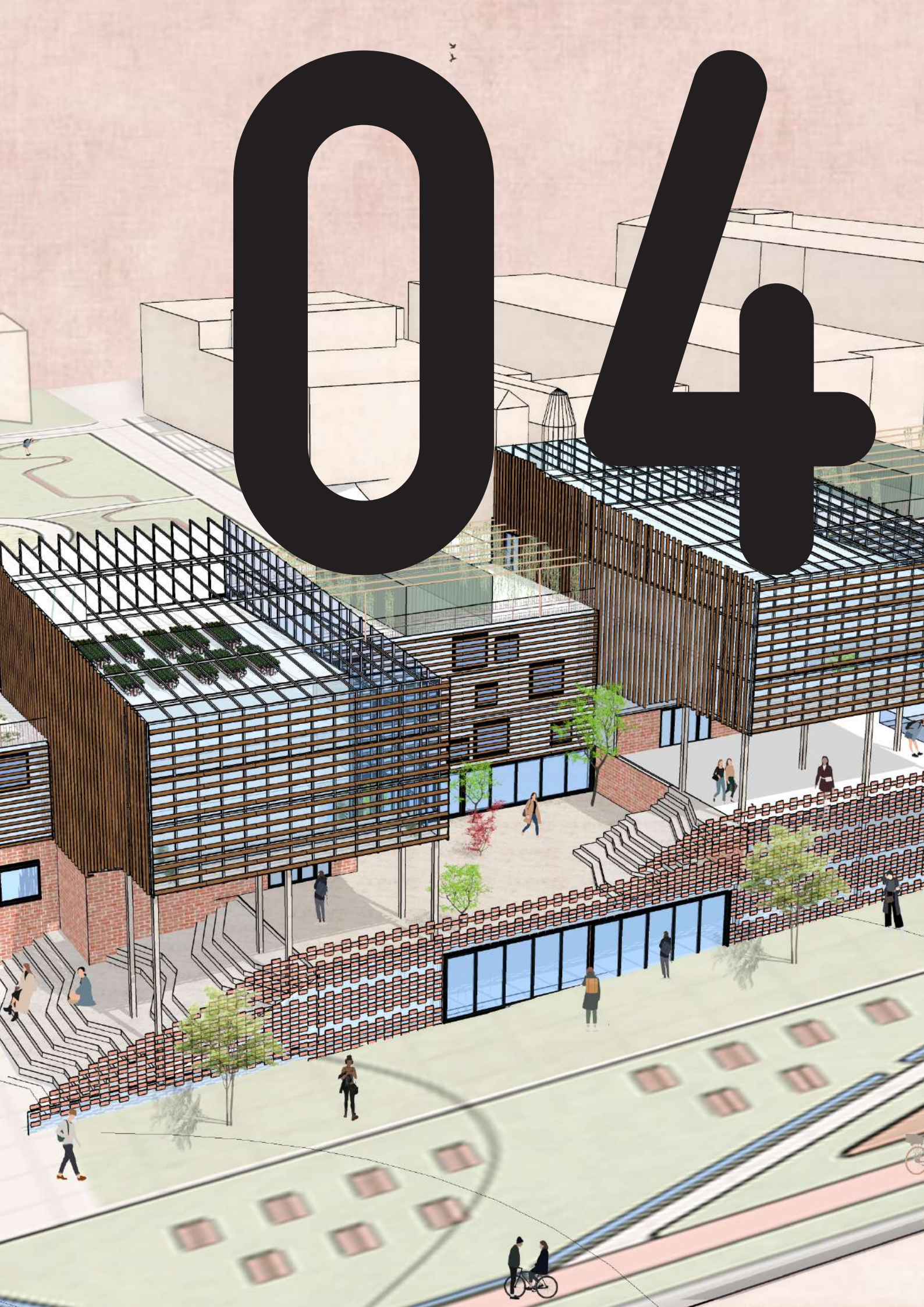
The new sports hall is equiped with a shading system to prevent direct sunlight from entering the sports hall benefiting the sporter's comfort. It is build out of multiple hanged accordeon-like elements that consist of wooden panels sliding over a rail to widen or narrow the accordeon. Depending on the location of the sun, different facade compositions exist.



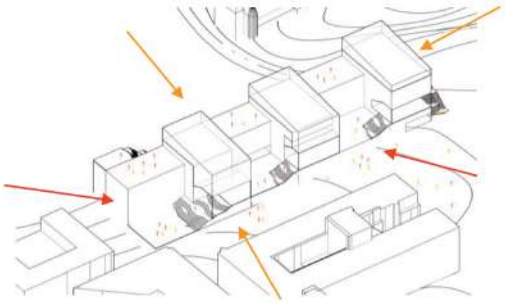
COHAESIO (BUILDING F)

STUDENT:
SARA OULD BOUYA

04

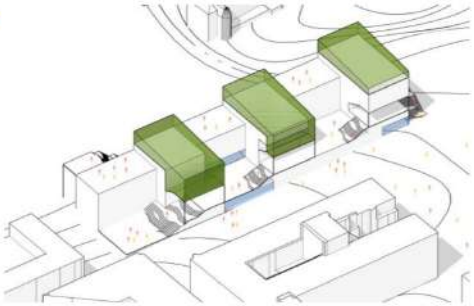


1. CONCEPT



Focus on community wellbeing

Students & Employees > Eat + Relax + Meet People



Social cohesion

Increasing participation of students and neighbors Activities organized on weekends/holidays (events, theatre, market...)

Participation on food production

Diversity

Point of Meeting of students coming from different faculties

Biologist, Bio-engineers come to explore/analyse plants > workshops

Different type of workshops: Art, Sculpture, Music, Act

= SOCIAL SUSTAINABILITY

Located in the heart of multi-national and academic district, Solbosch Campus has a rich potential to accomplish the characteristics of a futuristic university.

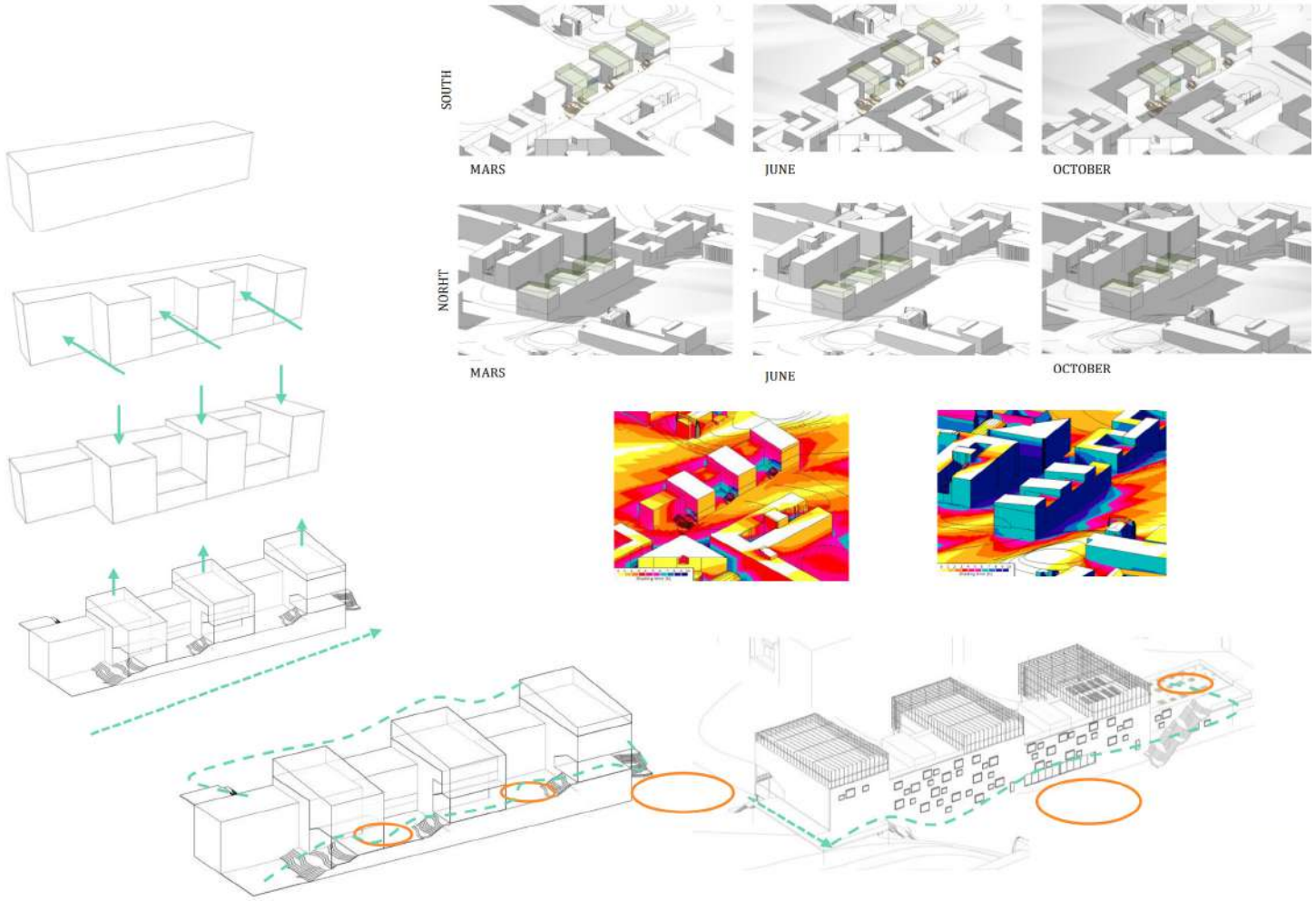
The aim of this project is to redesign a chosen building among the imagined masterplan of the first semester. COHAESIO is an adaptive reuse of the existing building F, itself situated at the heart of the campus. In fact, a part of the structure will be kept and the bricks facade will be reused.

The concept will be focused on social sustainability by emphasizing the community wellbeing, the social cohesion and the diversity. Indeed, COHAESIO is the meeting point of students and employees coming from different faculties and countries. Moreover, several activities and events will be proposed in this design in order to increase the participation of users in urban farming to raise their ecological awareness. The concept of diversity in this new building can first be seen through the biologist, botanist and bio-engineers labs. The main objective was to bring the students together to study and analyse the vegetation of the greenhouses. Secondly, two kinds of auditoriums were created, one closed for the theatre, and two open on the building hosting the acting and the relaxing spaces.

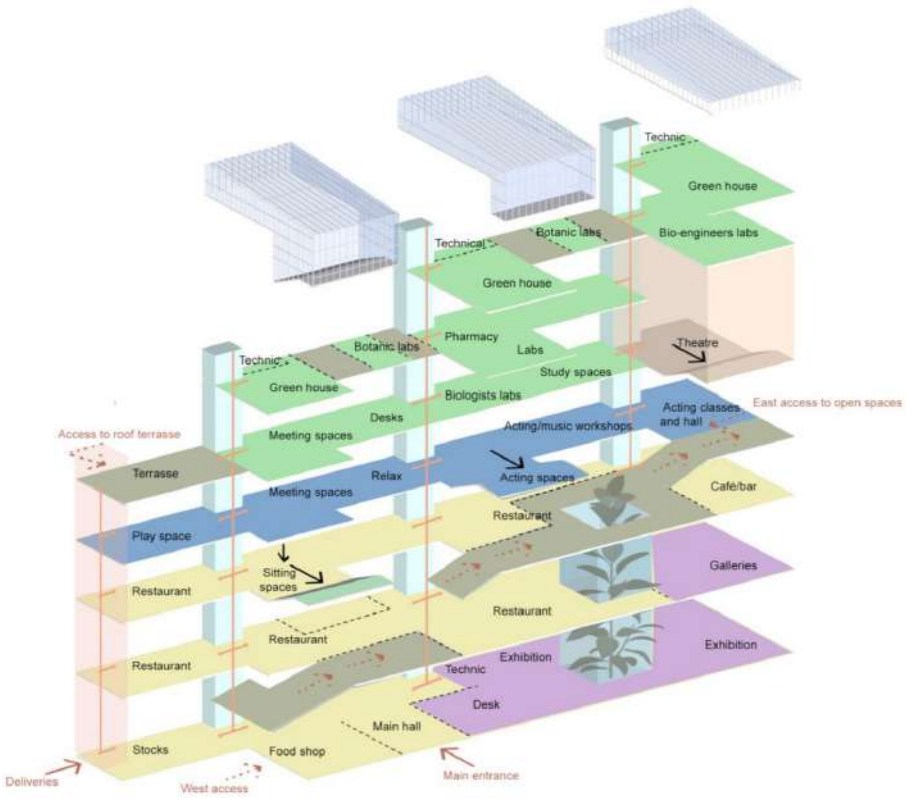
The typology was found by effectuating solar and shading analysis, which results on making several tranversal openings on the building. The diverse open public spaces were created to bring light, lightness and dynamism in the building. COHAESIO allows the users to walk around the building, creating a direct link beween Avenue Paul Héger and the "little Bois de La Cambre" at Janson. The existing slope of the site also provides a direct inside connection.

In conclusion, COHAESIO brings people together in a learning and eventful environment by highlighting the economic benefits of the local food production.

2. FORM & TYPOLOGY

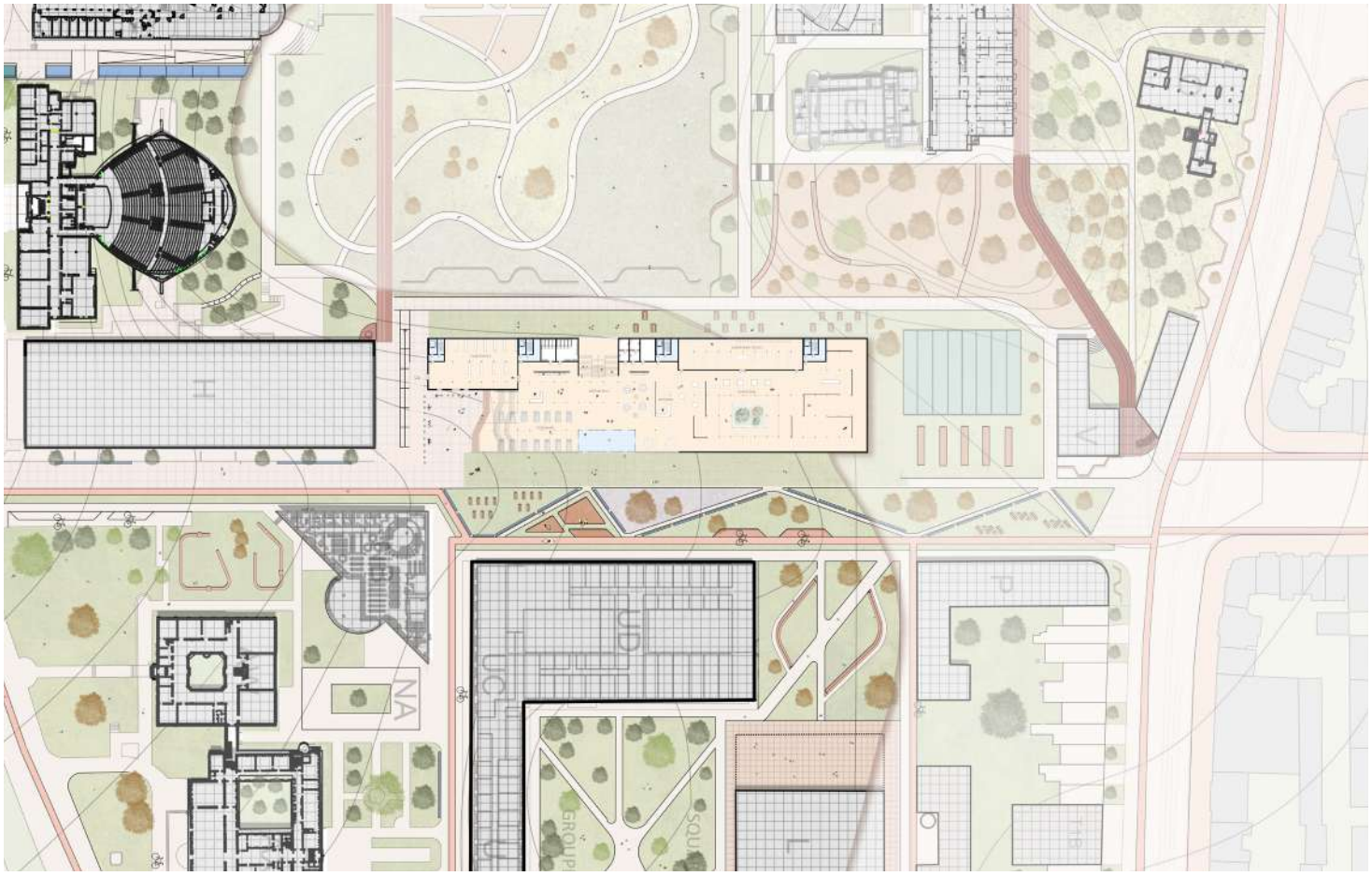


3. PROGRAM

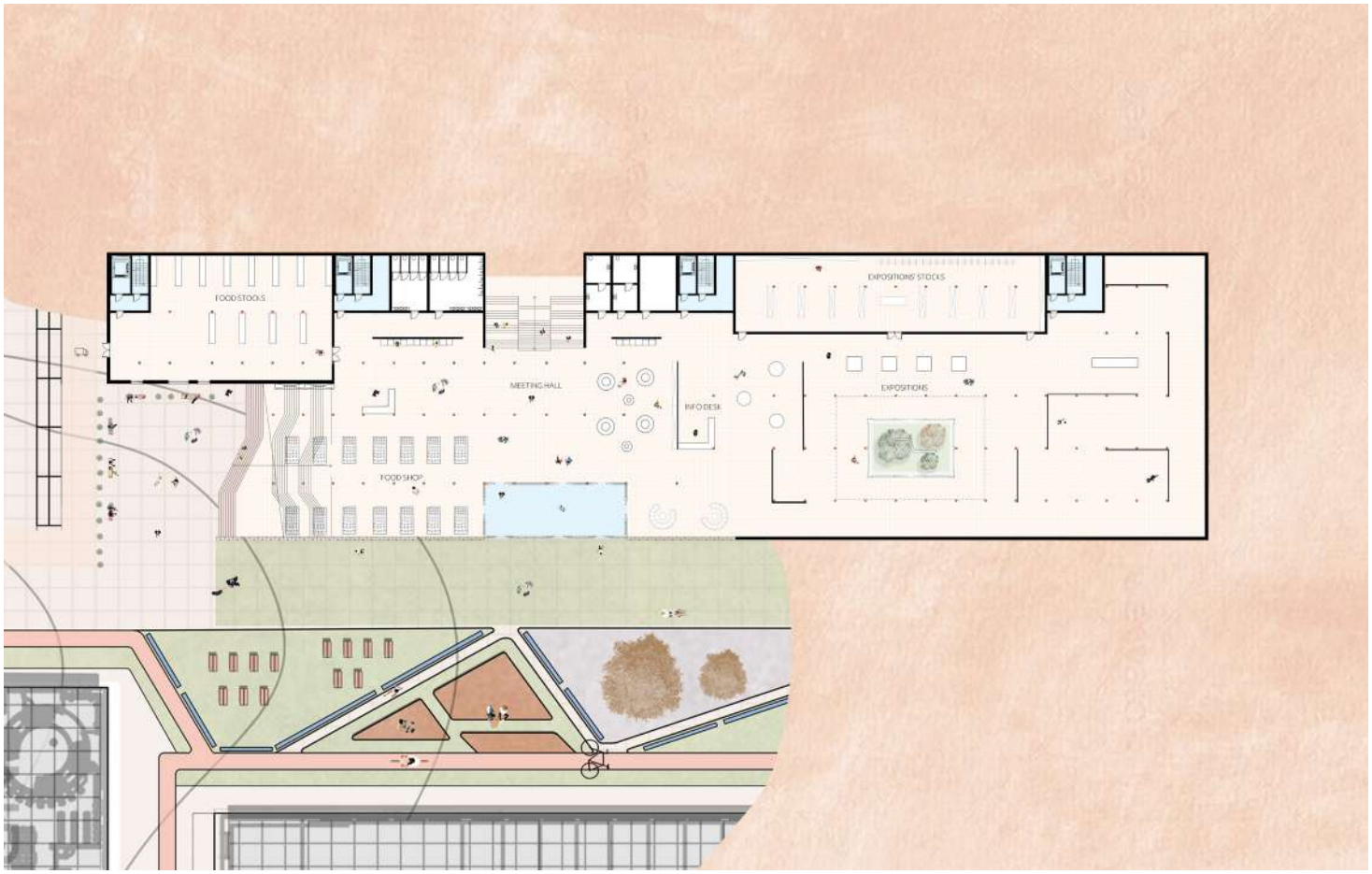


FUNCTIONS	Sqm m²	%
Expositions	1570	10%
Entrance & Hall	496	3%
Local food shop	966	6%
Delivery	415	3%
Restaurants	1520	9%
Galleries	820	5%
Bar/Café	995	6%
Acting/ music	888	6%
Theatre	995	6%
Relax spaces	708	4%
Meeting spaces	760	5%
Group/Study meetings	780	5%
Botanist labs	1450	6%
Bio-engineers & Biologists labs	1936	12%
Local food production	1750	11%

GROUNDFLOOR PLAN WITH SURROUNDINGS

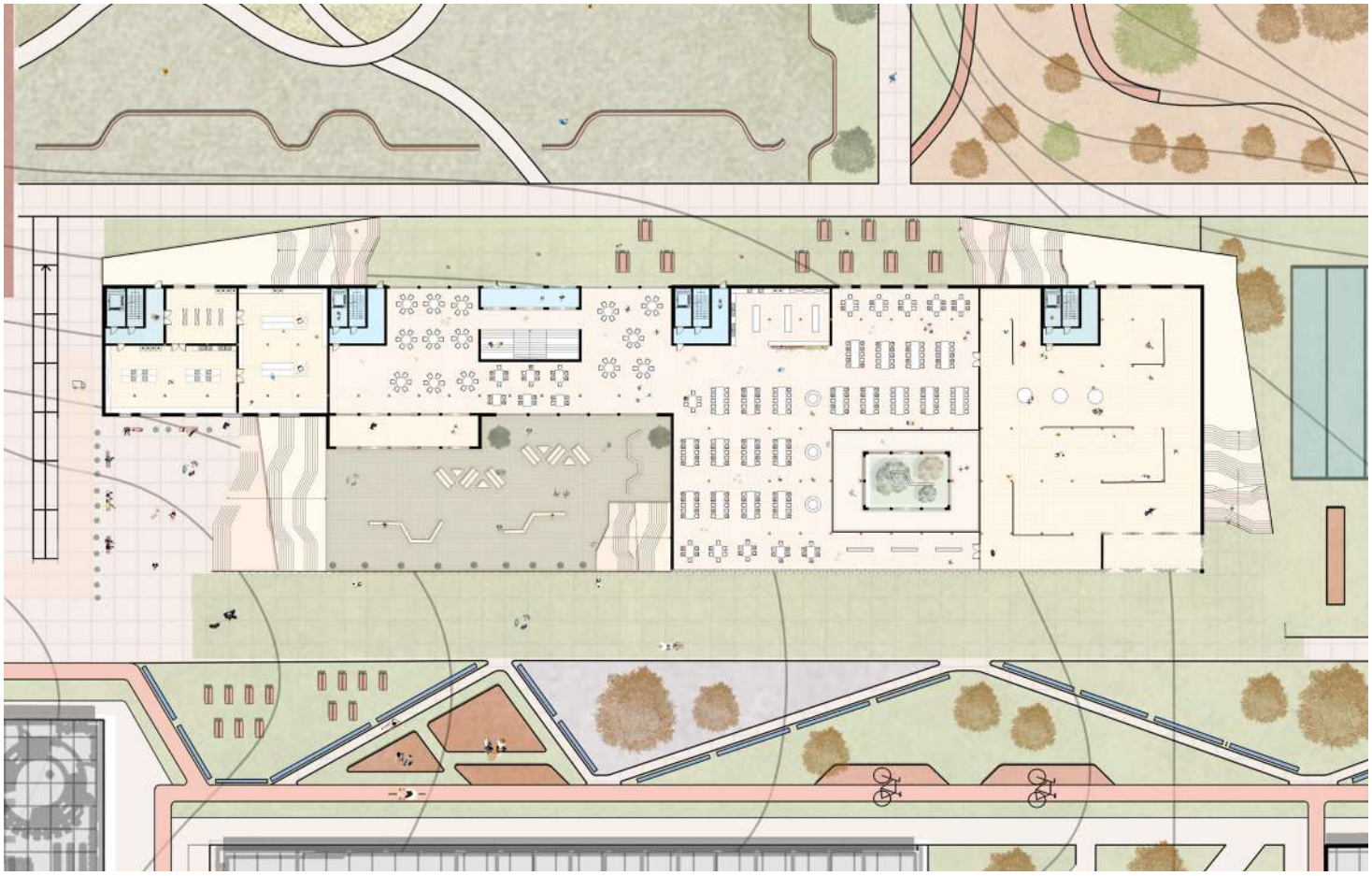


GROUNDFLOOR PLAN

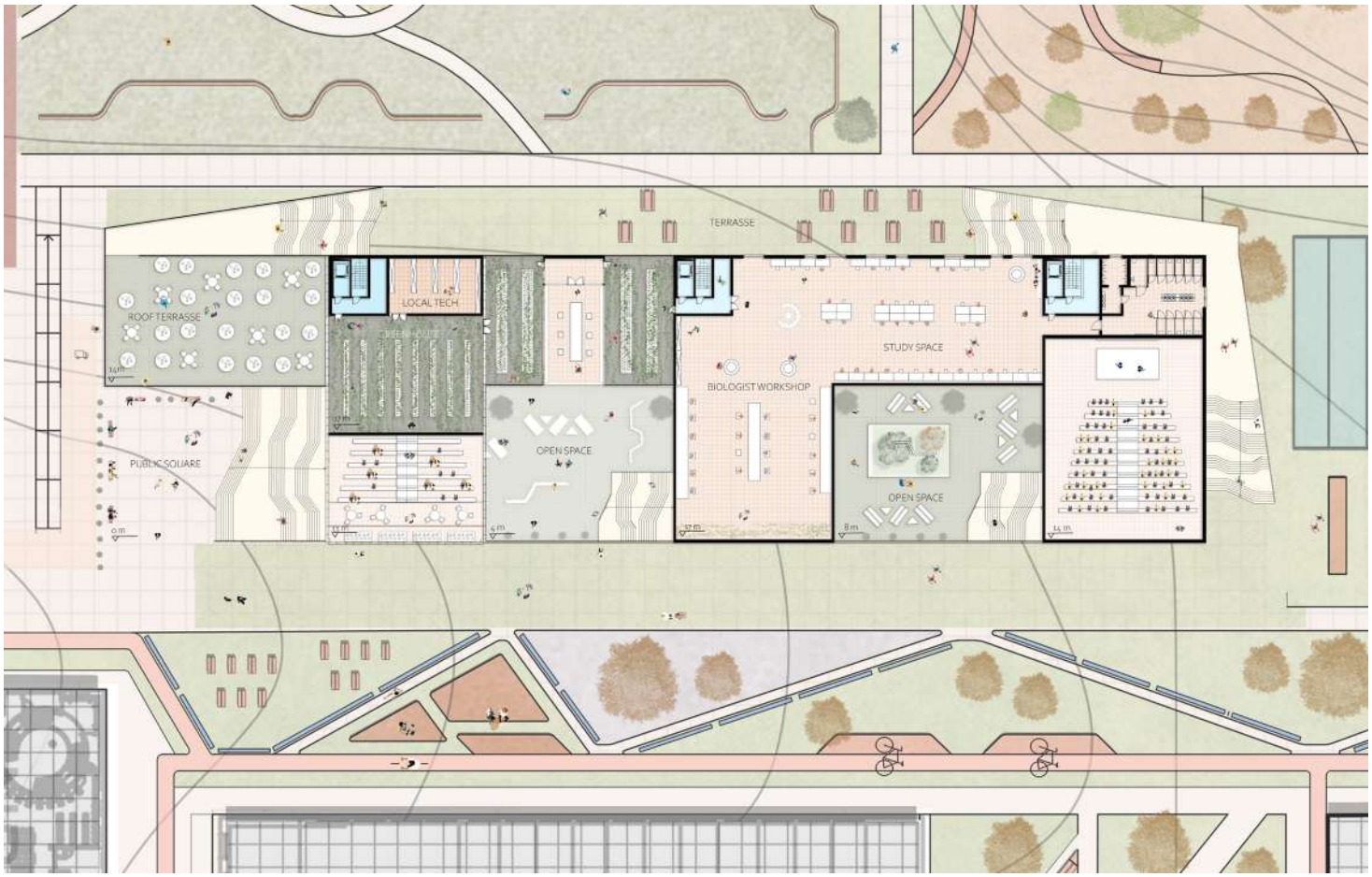


4. DESIGN

PLAN LEVEL 1

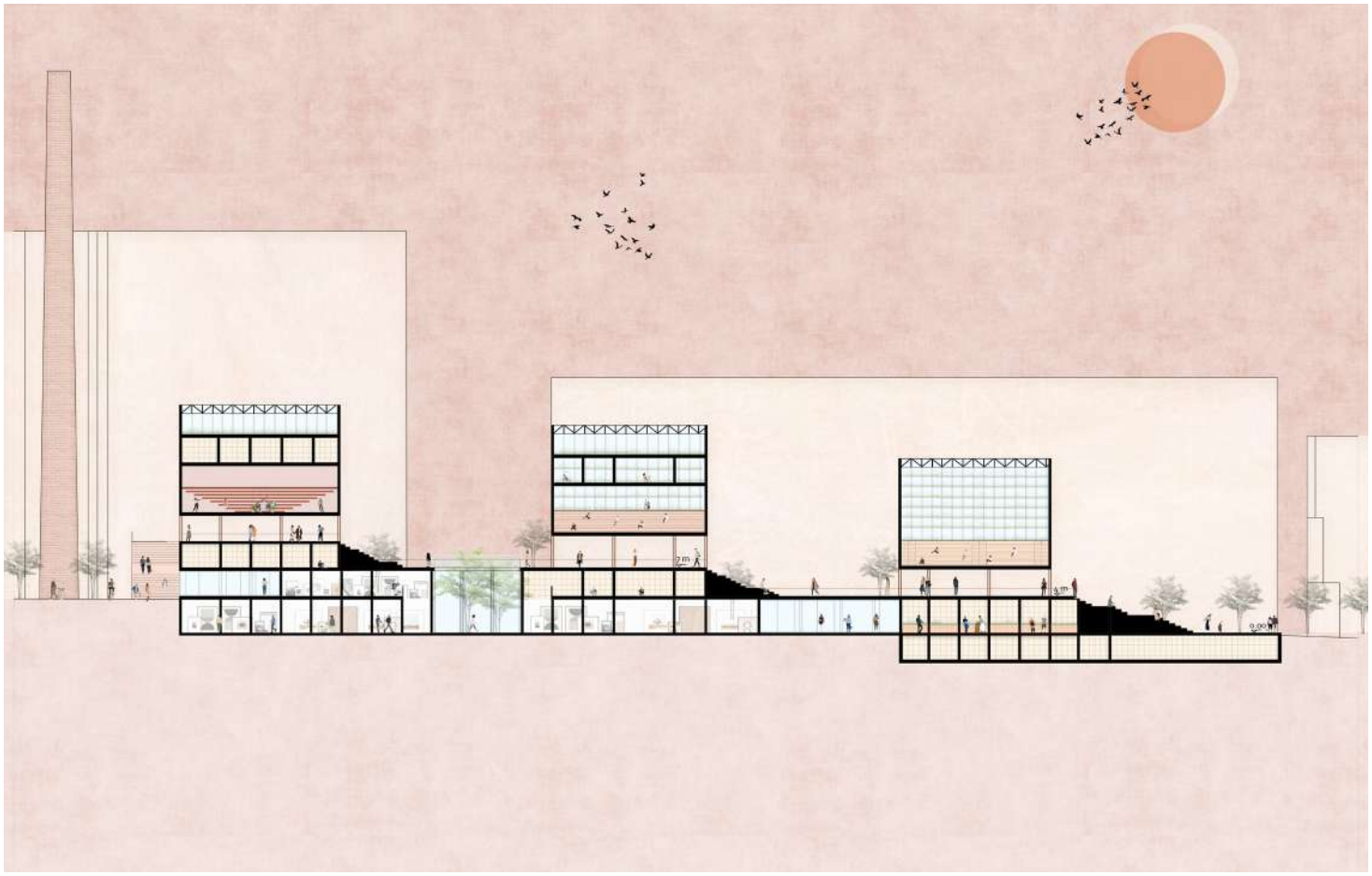


PLAN LEVEL 5

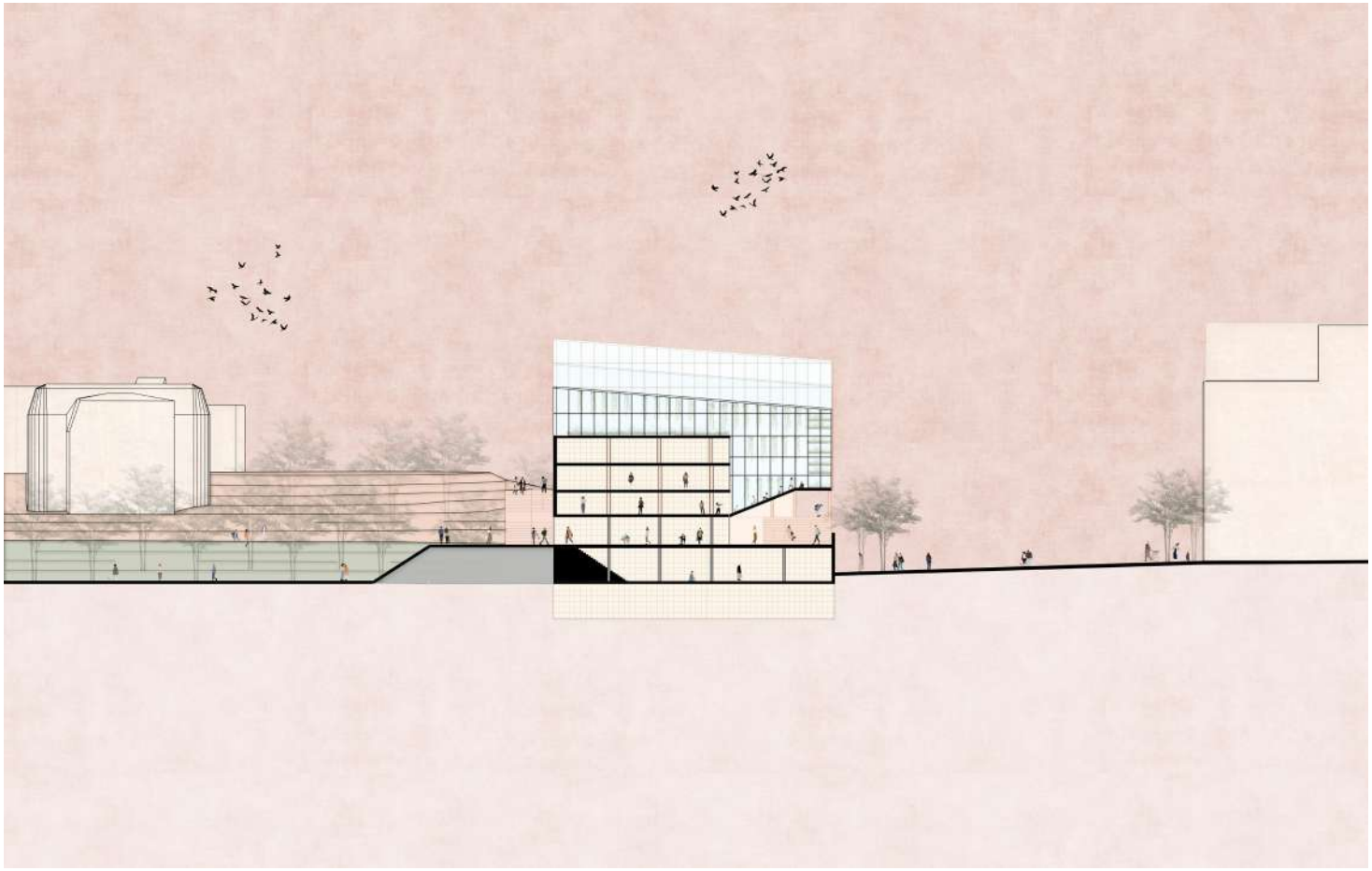


4. DESIGN

LONGITUDINAL SECTION

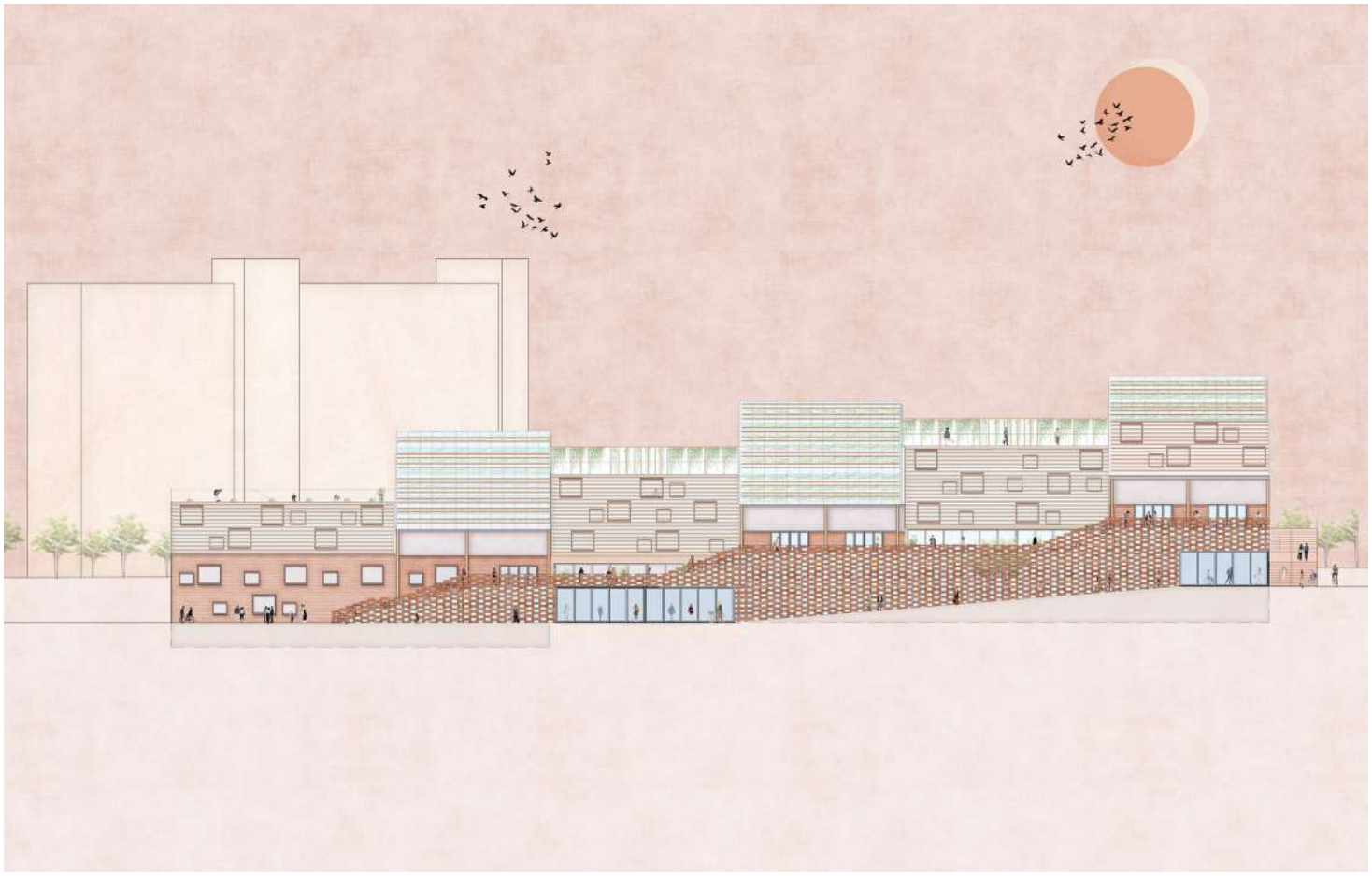


TRANSVERSAL SECTION

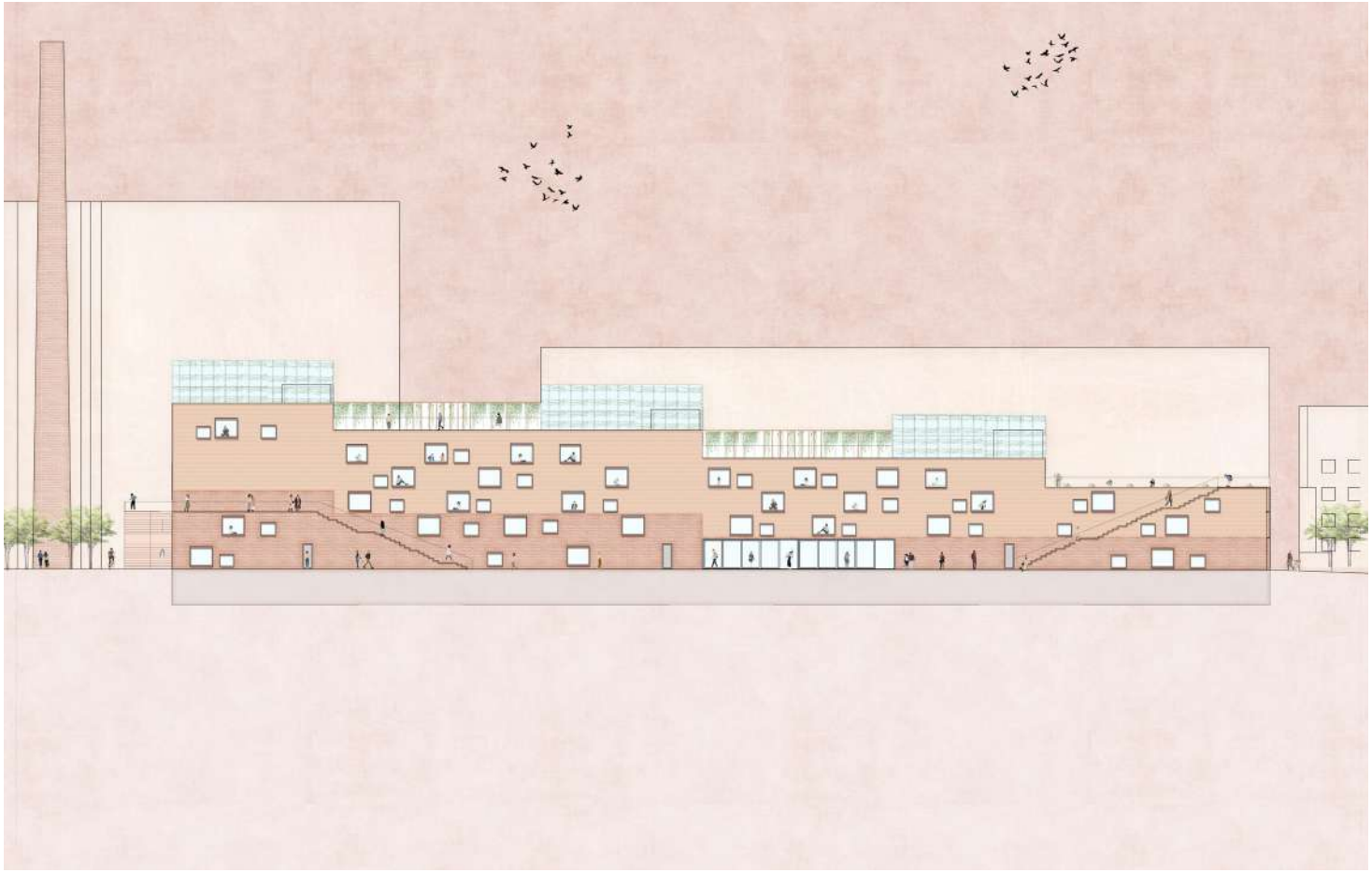


4. DESIGN

SOUTH ELEVATION



NORTH ELEVATION



5. 3D VIEWS

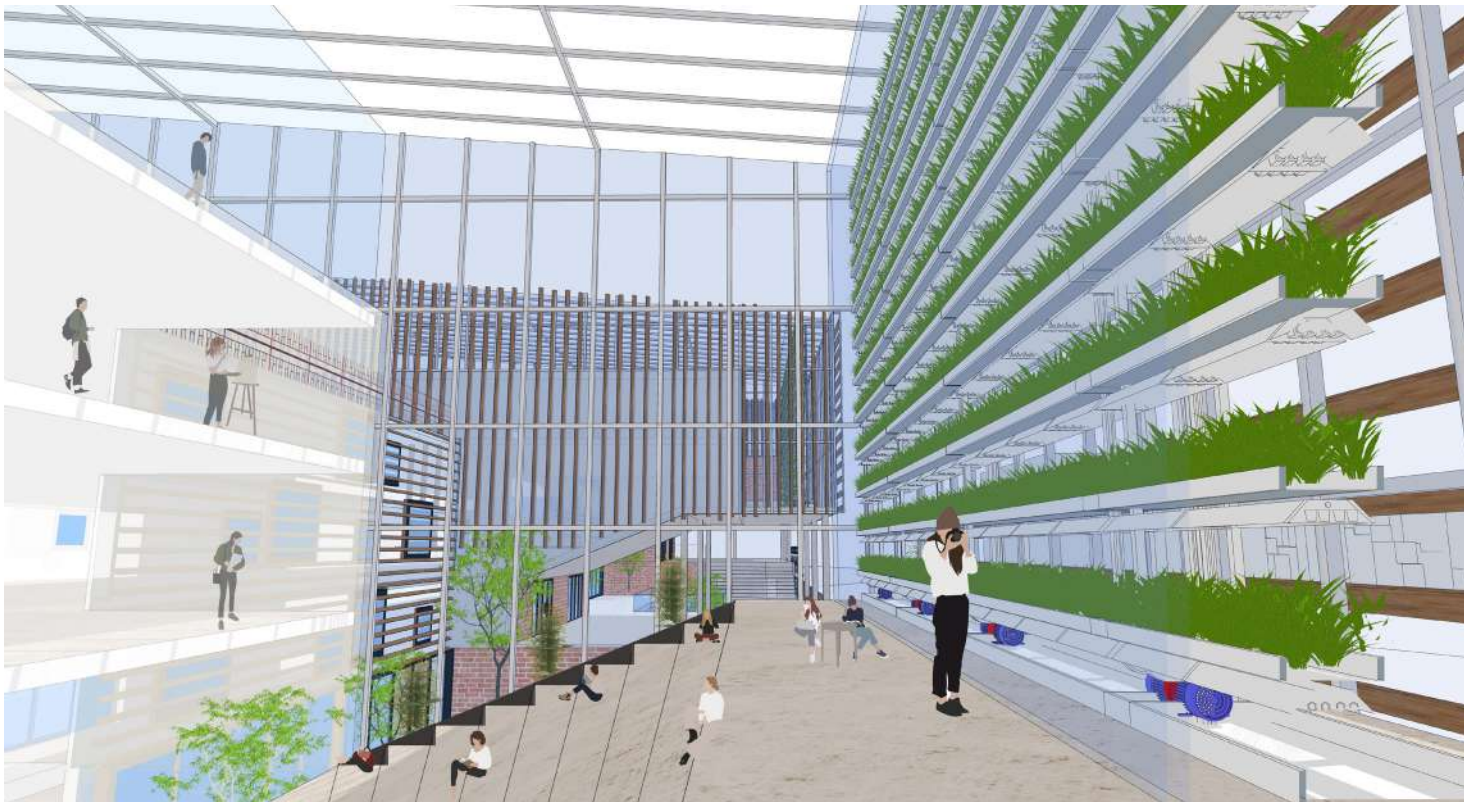
GENERAL PERSPECTIVE VIEW OF THE PROJECT

SEMI-OPEN SPACE VIEW - TWISTED SLAB

5. 3D VIEWS

INSIDE VIEW FROM THE PATIO

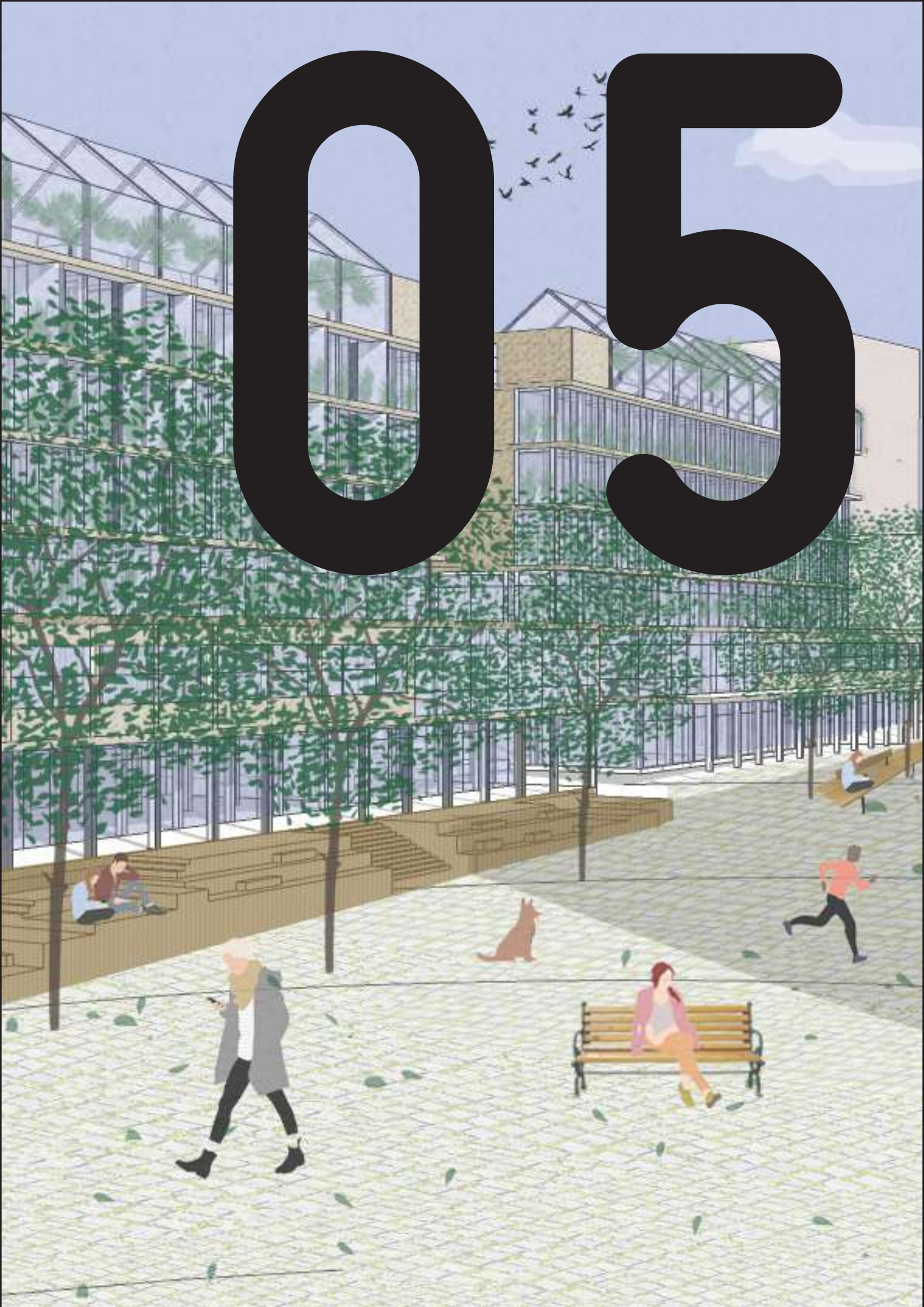
INSIDE VIEW FROM THE OPEN AUDITORIUM WITH VERTICAL FARMING & GREENHOUSE AT THE TOP



THE F VILLAGE (BUILDING F)

STUDENT:
SARAH TRENTIN

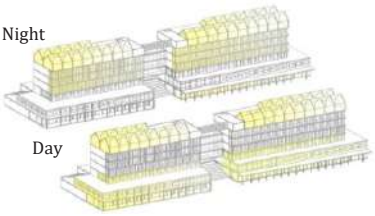
05



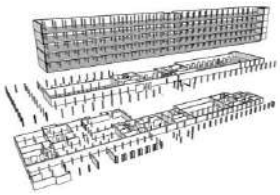
Concept - Creation of a "city" and community in the campus

Multifunctional building

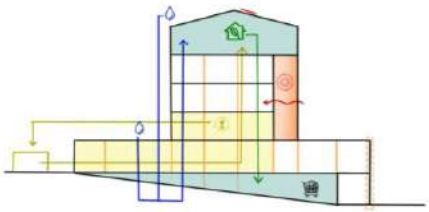
Used at any time



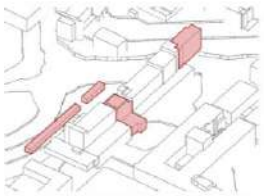
Valorization of the existing



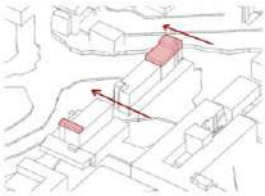
Management of the flow



Evolution of the volumetry



- Existing situation
- Long building
- Fragmented facade



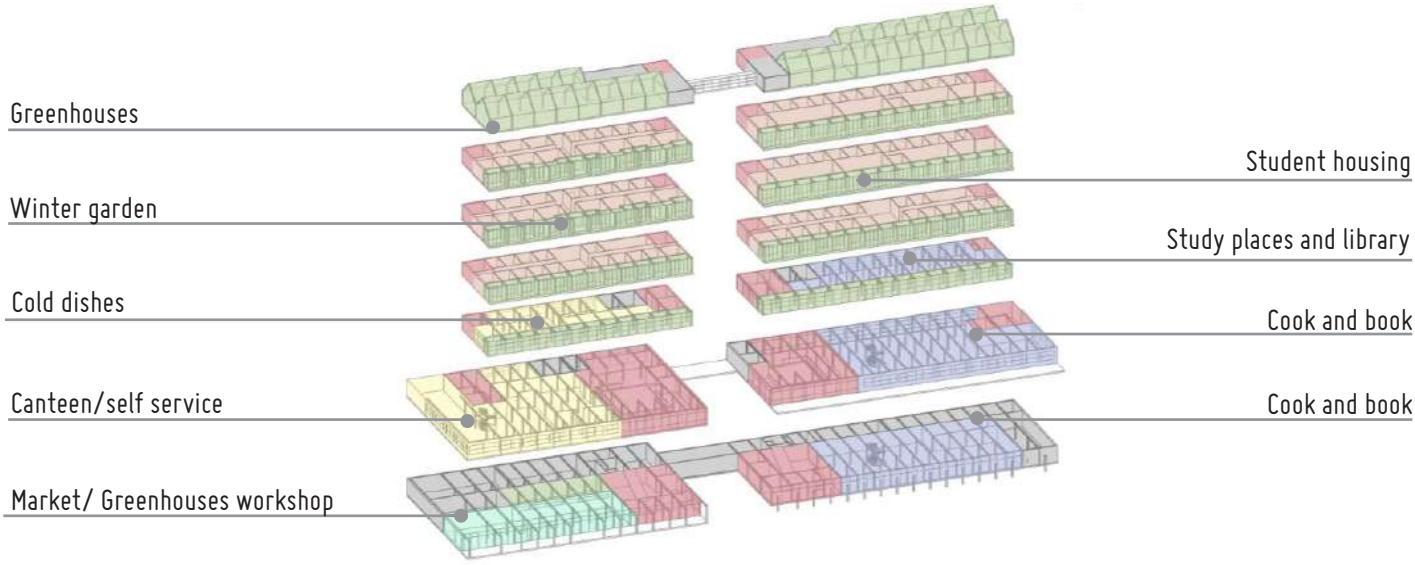
- Remove the centre
- Remove the prefabricated buildings

- Uniformity of the facade
- Addition of greenhouses

- Winter garden
- Terraces on the top of the first level
- Stepback of the facade

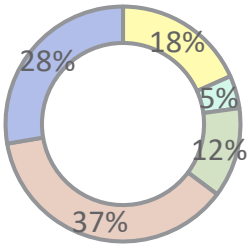
Implementation plan

Program



- Food : 1 630 sqm
- Shops : 400 sqm
- Mixed use : 2 460 sqm
- Student housing : 3 300 sqm
- Greenhouses : 1 100 sqm
- Circulation/hall
- Technical space

Distribution of functions



The F village is a retrofit of the F building. This project aims to create a "small city" and a space of community on the campus. The existing building is implemented in a key position on the Solbosch Campus due to its central situation and its frequented area. There will be four main strategies to develop the goal of the project. The first one will be to create a multifunctional and adaptable building which will include eating spots, study spaces, libraries, a market, student housing and greenhouses. The second strategy is to have a building that works not only during the class periods but all day and all year. The third one is the valorization of the existing building by keeping the current structure and part of the building. Finally, the management of flows will be integrated into the building including food, energy, waste, water and materials.

All these strategies have led to an evolution of the existing volumetry to improve the current situation. Since the F building has a quite long facade, the first step aims to divide the building into two connected parts while letting a passage on the ground floor to connect two main places of the campus, the Paul Héger avenue and the green open space. It will create a new passage to obtain better connection in the university. The second step will consist of modification of the facade to obtain a uniformity instead of the existing fragmented facade. The third step will tackle the energy flow by adding greenhouses on the roof and winter gardens on the south facade. The last step has for purpose to create terraces on the top of the first level to optimise the unused space. To obtain adaptation of the building, there will be three different typologies of student housing. The first one is similar to the existing accommodations which consist of having one room for one student with shared kitchens and bathrooms. The second one is also a room for one student but with an integrated bathroom and kitchen. The last typology is a creation of colocation for 6 to 8 students that will include common spaces with a double-height level.

Finally, sustainable strategies are established notably through the addition of greenhouses on the roof that will provide food for the market and will reduce CO2 emissions. Then, the organic waste of the market and restaurants will be used in compost which will serve the greenhouses. In addition to that, water will be collected and stored for the greenhouses and photovoltaic panels will be added to the roof of greenhouses to provide energy for the building. Concerning the materiality, the structure and floors will be kept as well as the upper façade. Regarding the rebuilt part, there will be covered by panels made with brick and concrete waste coming from the partial demolition.

Implemantation

Plans

Level 2

Level 1

Level 0

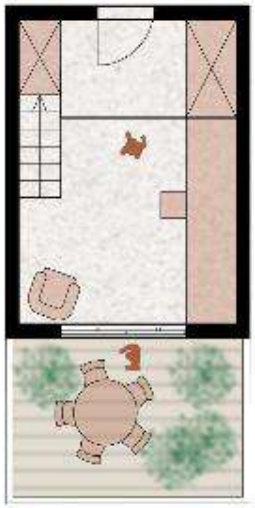
Student housing

Level 5

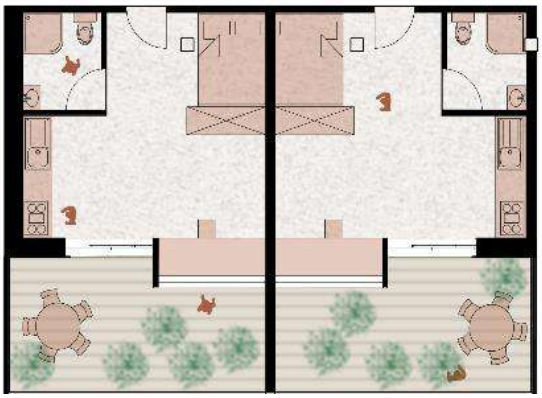
Level 4

Level 3

Typology 1

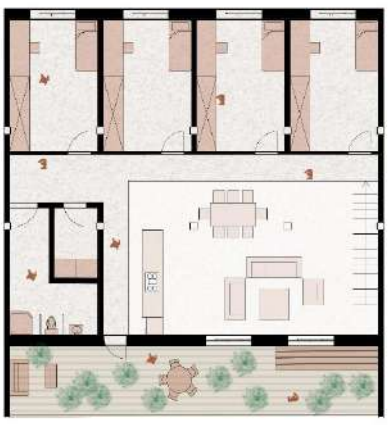


Typology 2



Typology 3

Level 4



Level 5

Elevations

North façade

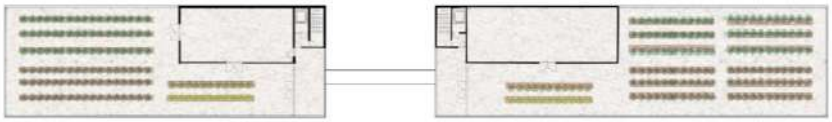
South façade

Sections

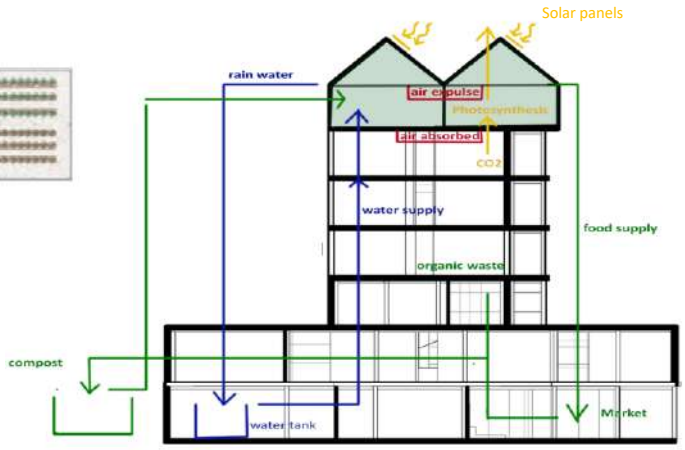
Transversal section

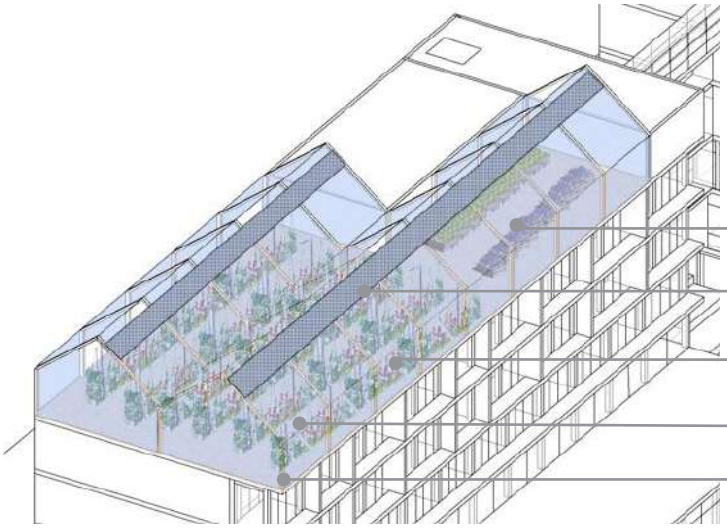
Longitudinal section

Greenhouses



Roof plan





Tray culture (Carrot, potatoes)

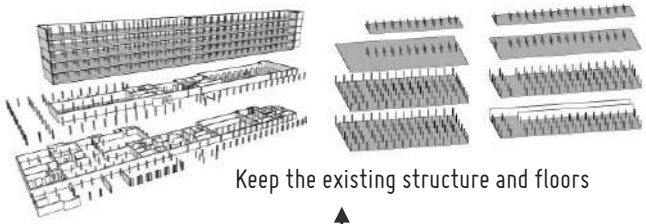
PV-Panels

Hydroponic culture (Tomatoes, lettuce, parsley, brocoli, bean)

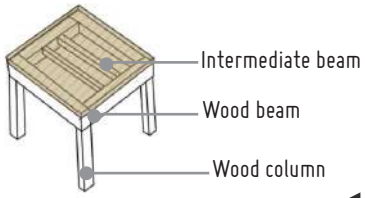
Tempered-glass

Aluminium

Materiality



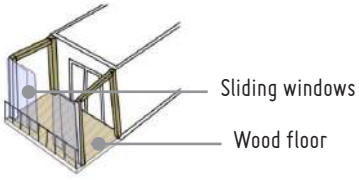
Keep the existing structure and floors



Intermediate beam

Wood beam

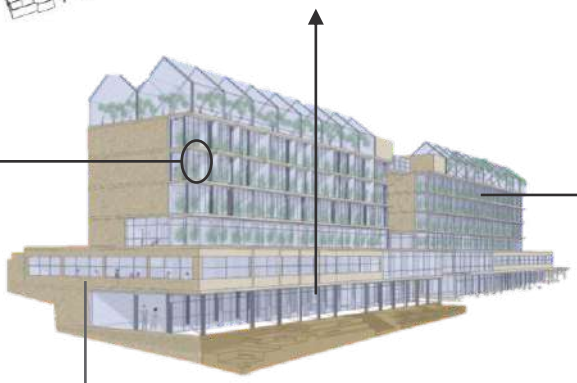
Wood column



Sliding windows

Wood floor

Additional wood structure



Existing façade
-> windows enlargement

Brick and concrete waste
from the partial demolition

Facade panels attached to
the façade of the renovated
building

Views

Open space

Paul Héger avenue

Connection between Paul Héger and the green open space

Inside stairs

Outside stairs

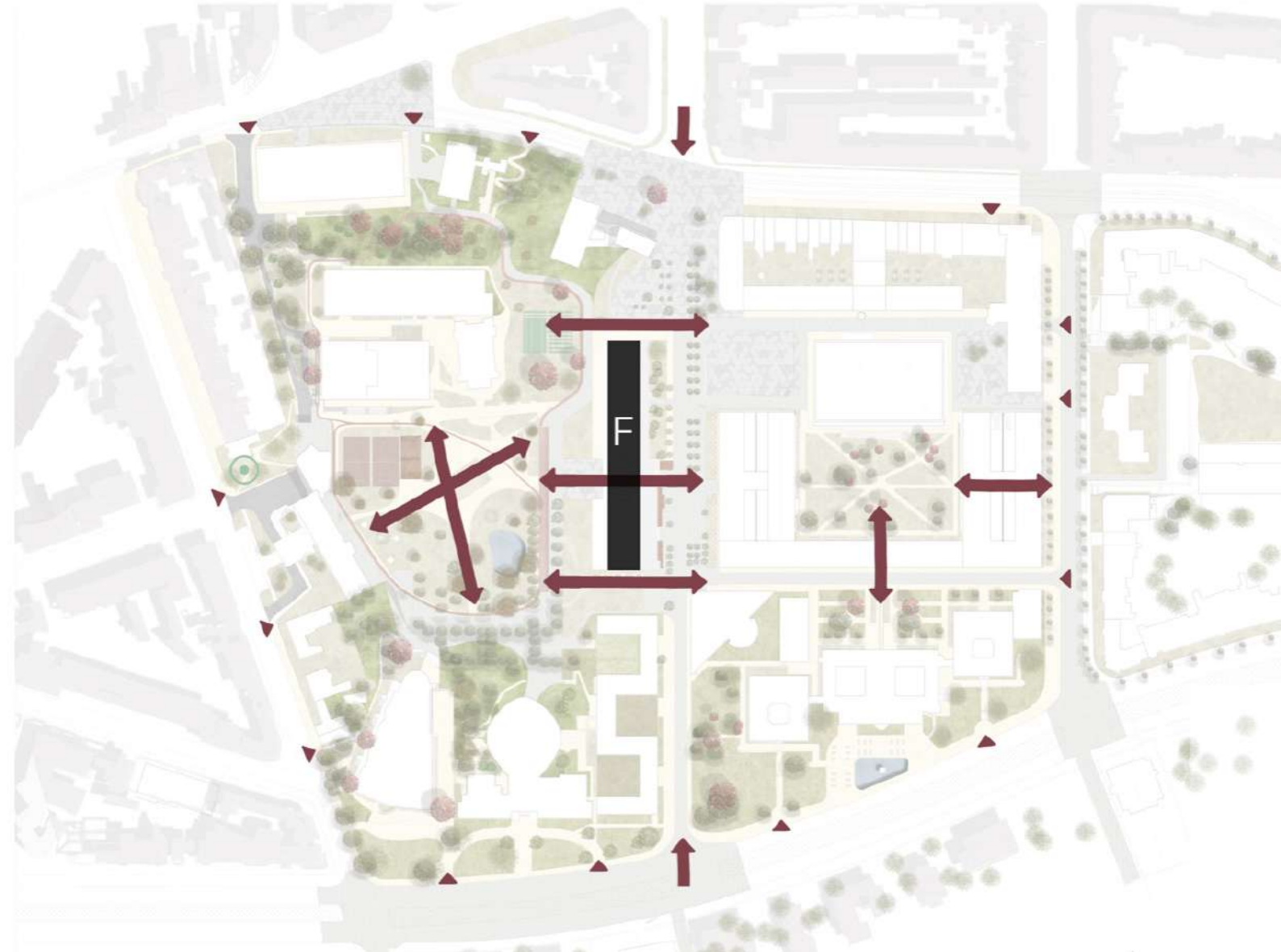
Terrace

Cantine

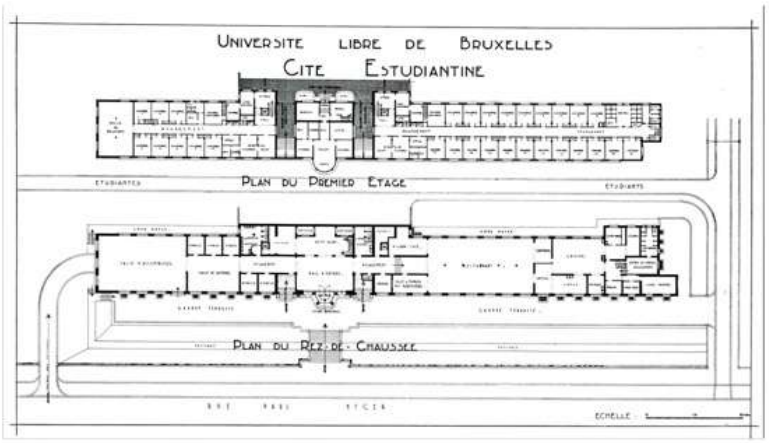
RETROFIT (BUILDING F)

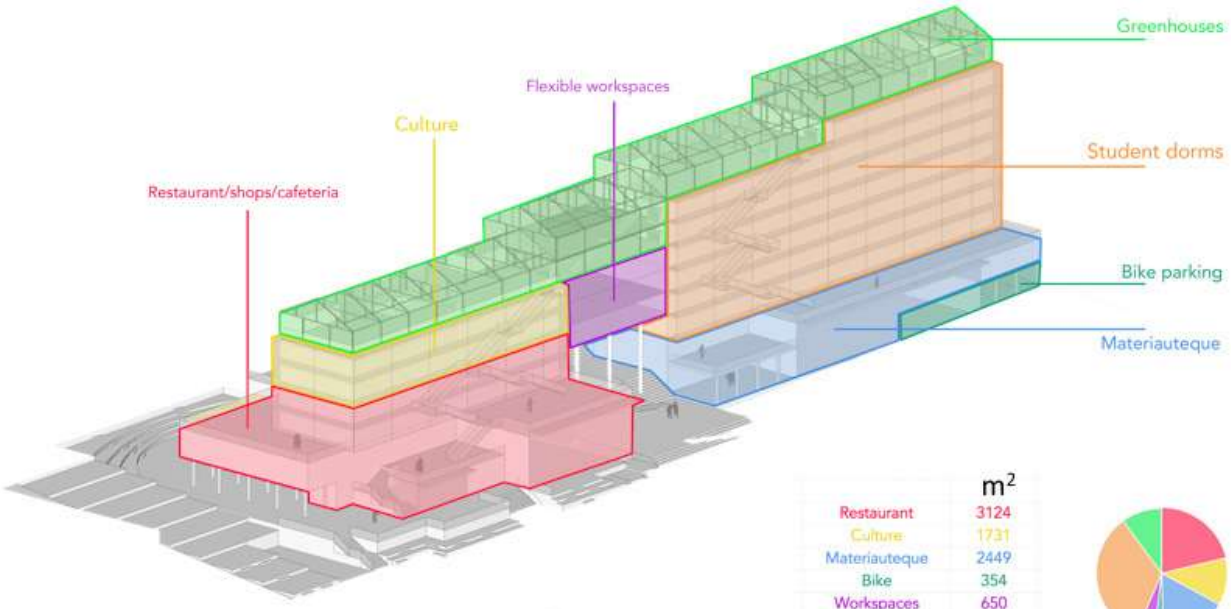
STUDENT:
PAULINE HAROU

06

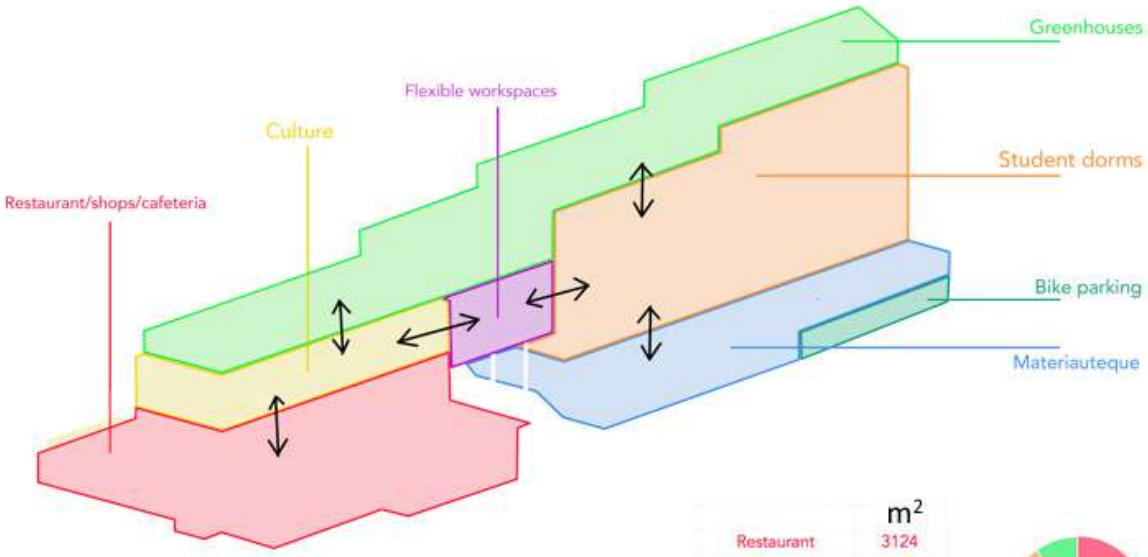


Since 1930





	m^2
Restaurant	3124
Culture	1731
Materiauteque	2449
Bike	354
Workspaces	650
Student dormitories	4947
Greenhouses	1487



	m^2
Restaurant	3124
Culture	1731
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Bike	354
Workspaces	650
Student dormitories	4947
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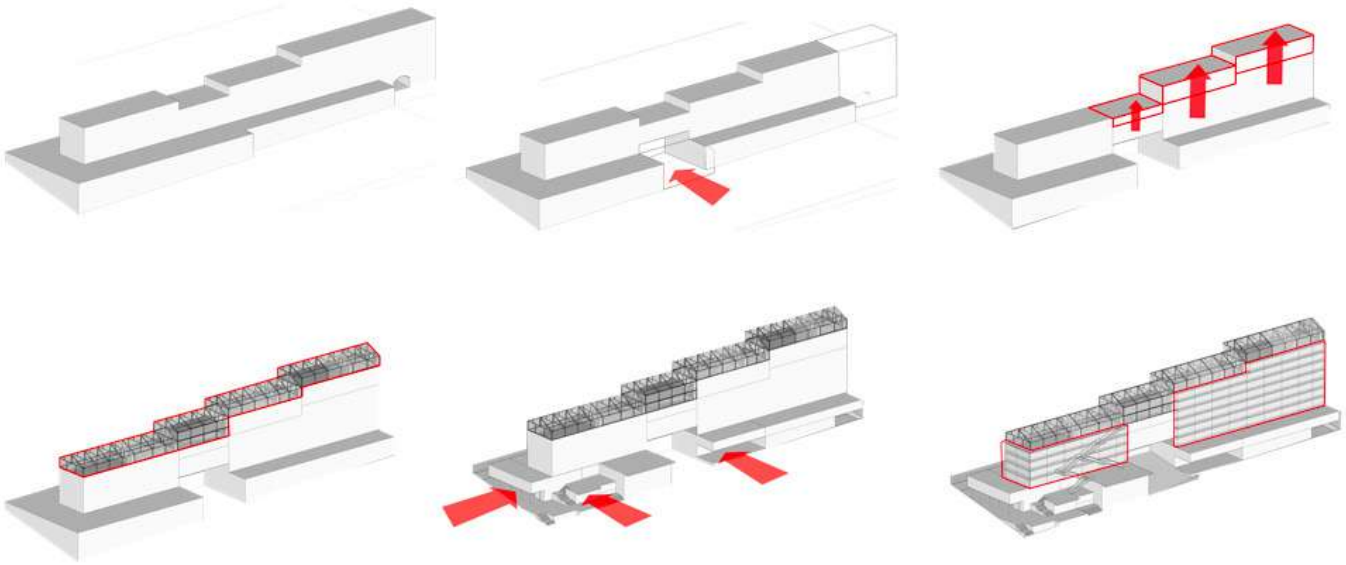
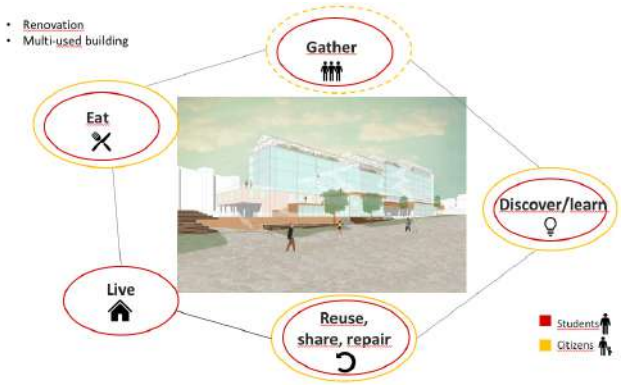
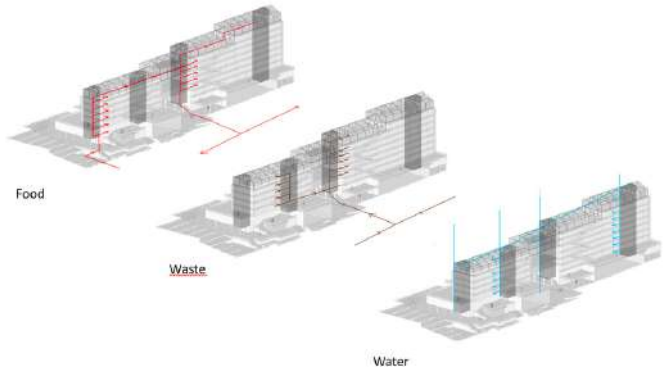


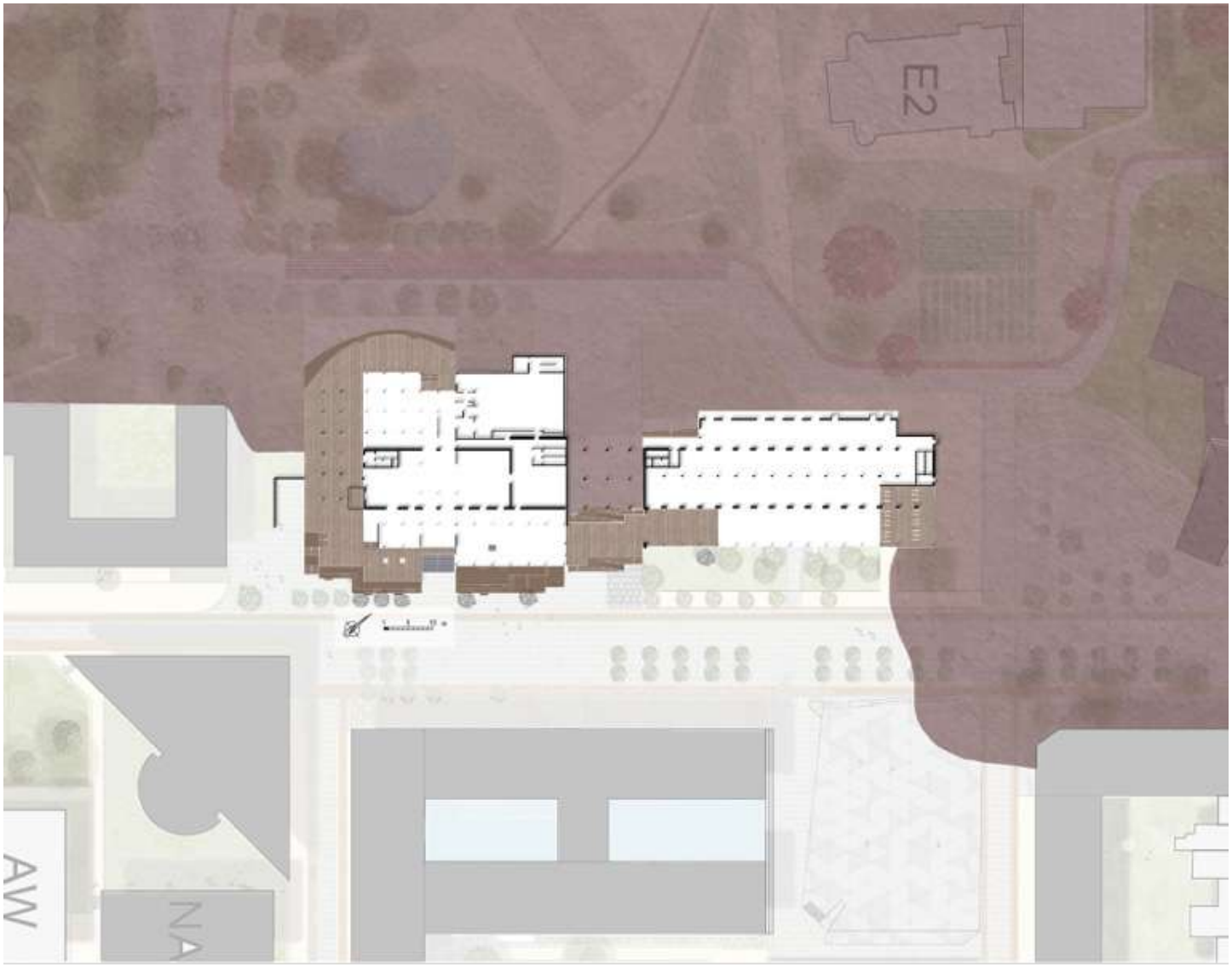
RetroFit is a retrofit of a building existing since 1930, standing in the middle of the Solbosch campus of the University of Brussels. The point is to keep the existing building but improve it by removing or adding some parts. The renovation will bring life in this central part of the campus, a connection with the city and a connection between the students of every faculty.

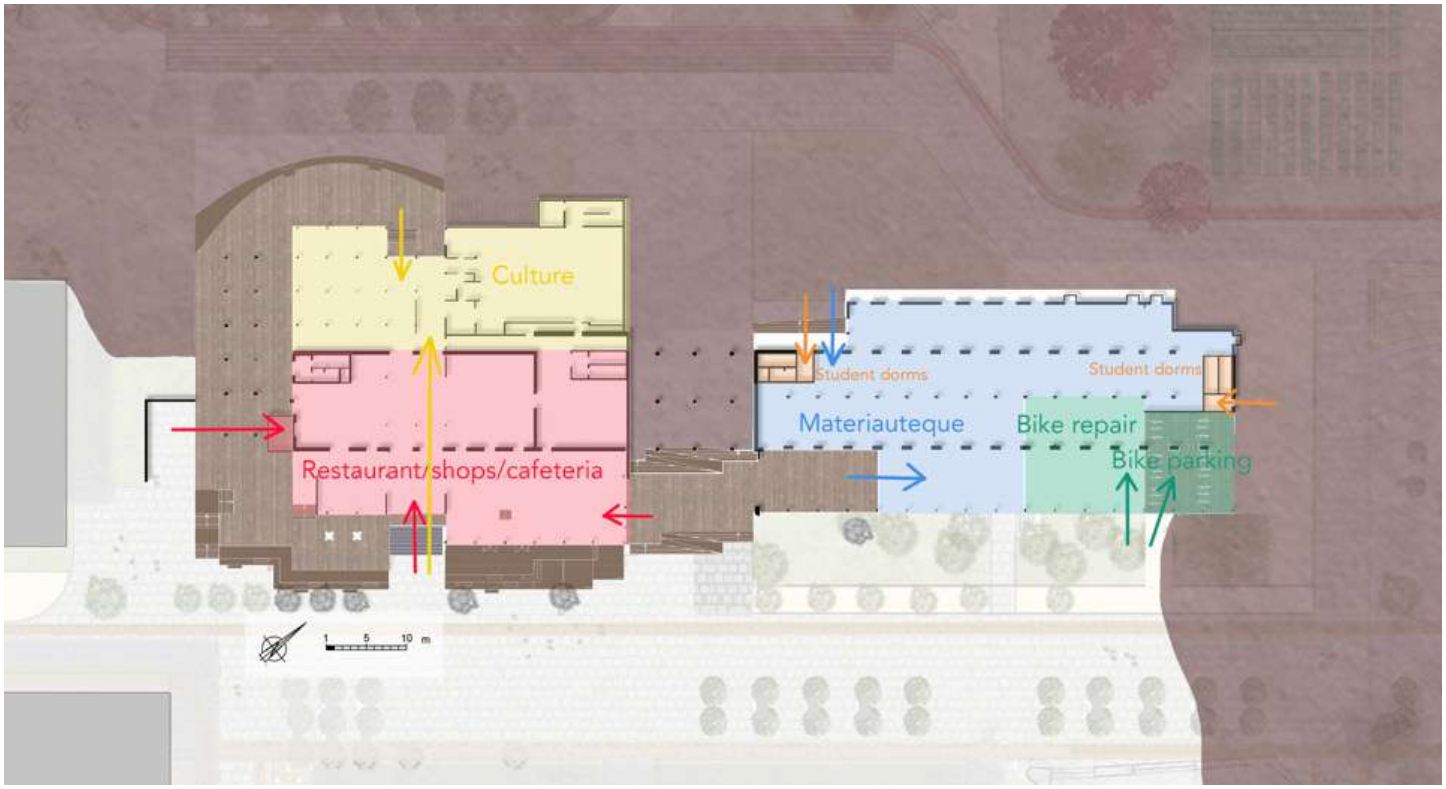
Today, the volume of the building is consisting of a larger base and a thinner linear rectangular 'box' on top of it. The base was added later in history and is quite imposing today. First, a hole is created in the middle part to connect better the two sides of the campus. Then, two levels are added at one part to extend the student dormitories. Then, some cuttings are done at specific locations in the ground and first floors in order to provide a more dynamic base for the building, more light for the restauration and a more generous public space with terraces. Finally, greenhouses mixed with public spaces are added on all roof surfaces to create an urban farm at the top, and a landmark to link the building to the city.

Moreover, the project is changed in a multi-used building that works well. The existing functions are rearranged and some new ones are added. The restaurants and cultural spaces are centralized in the left part while the right part is consisting of the student dormitories at the upper part and a materiauteque, bike parking and bike repair at the larger first level. In the middle, a flexible zone linking the two parts of the building is hosting open workspaces. All these functions are organized in a flexible way that enables the building to change in the future. The new F building is a real added value for the campus because in addition to creating new joyful places for the students and citizens, it creates a dynamic fabric generating food from the greenhouses and collecting waste in the materiauteque.

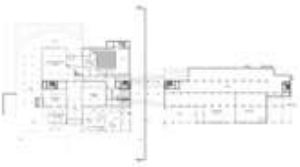


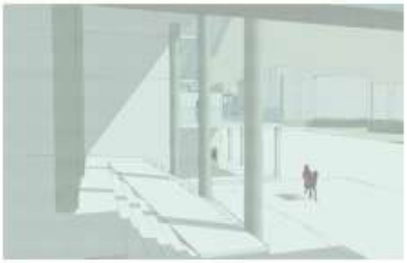



E2
AW
NA

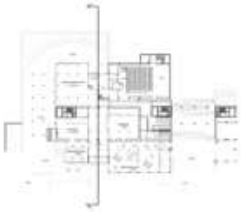

Culture
Restaurant/shops/cafeteria
Student dorms
Student dorms
Materiauteque
Bike repair
Bike parking

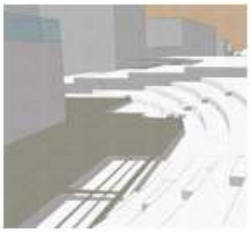

+27m
+23m
+10m
+6.3m
+2.6m

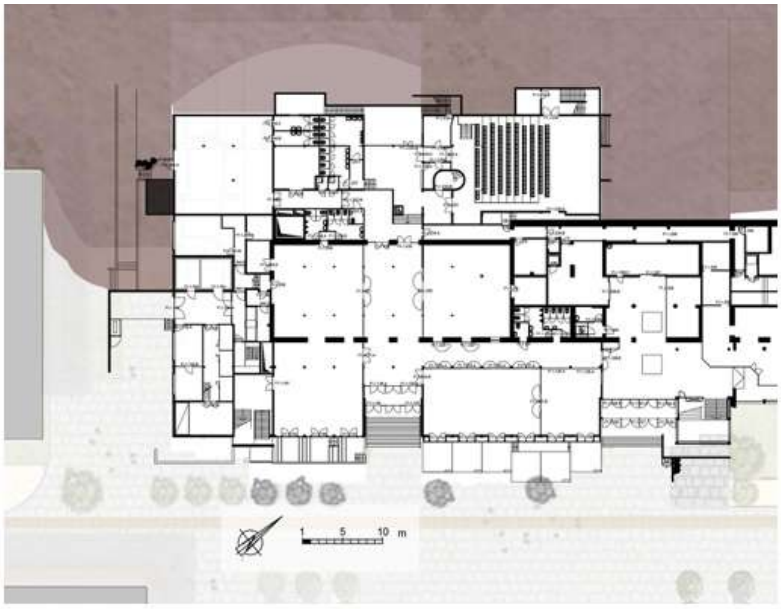




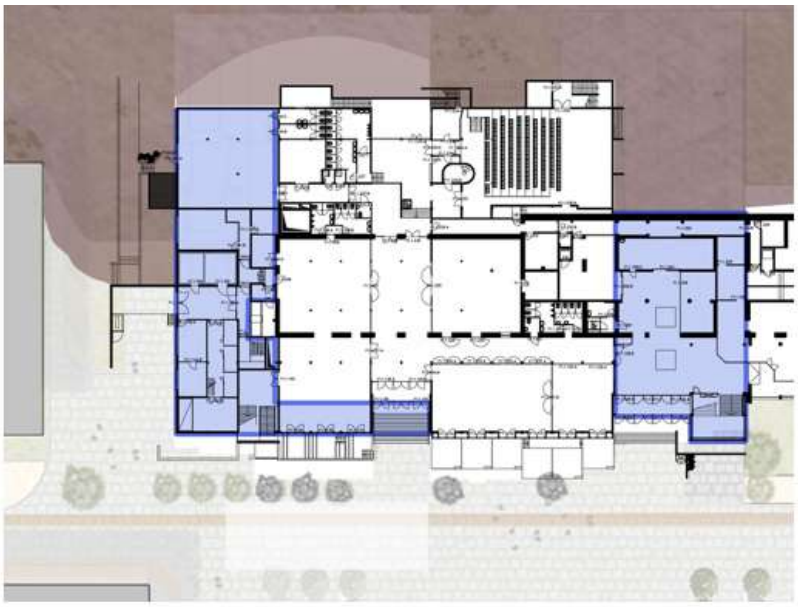

+27m
+23m
+10m
+6.3m
+2.6m
+1m
+2m

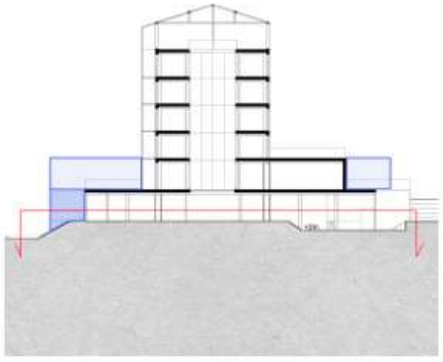




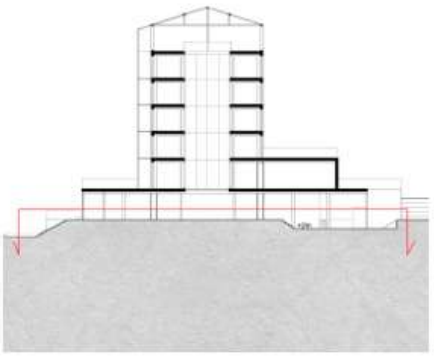


Existing first floor plan

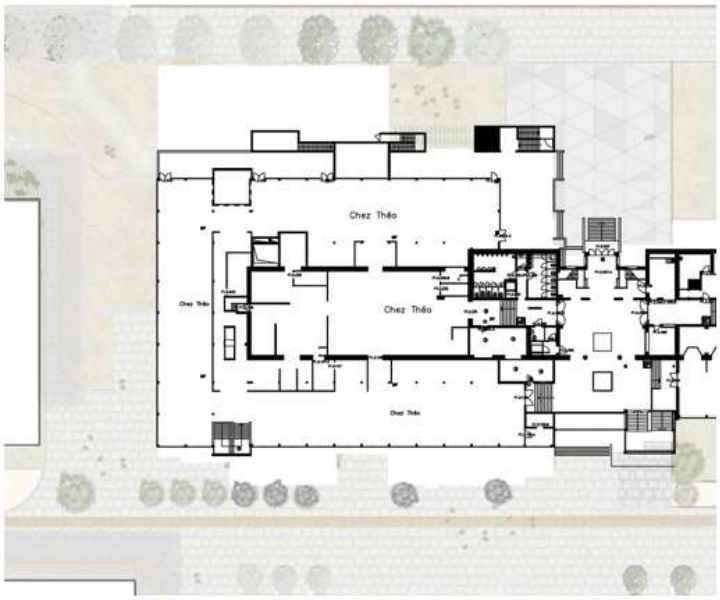


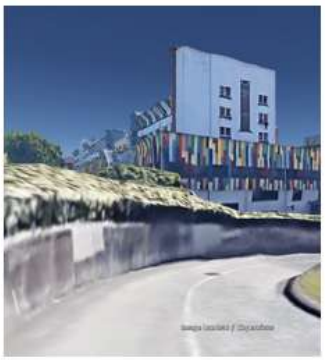


Existing first floor plan_removed spaces

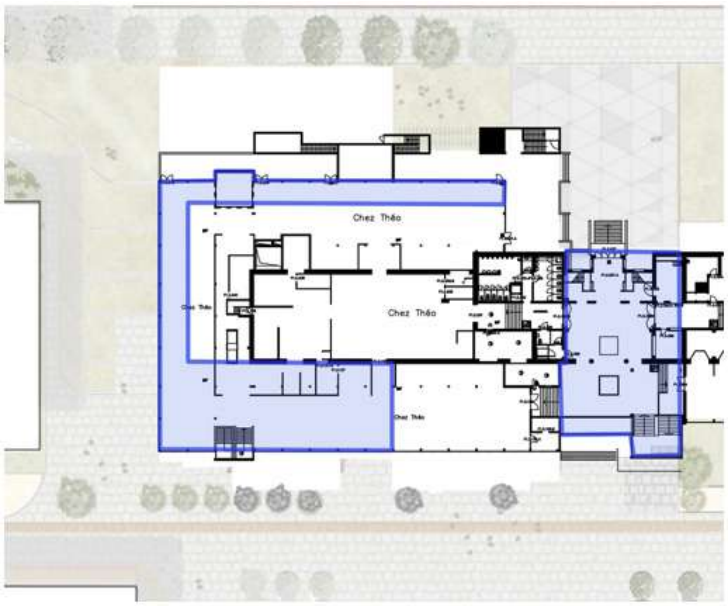


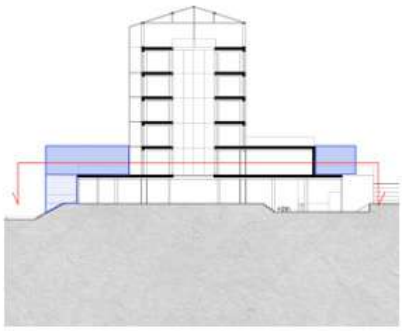
New first floor plan



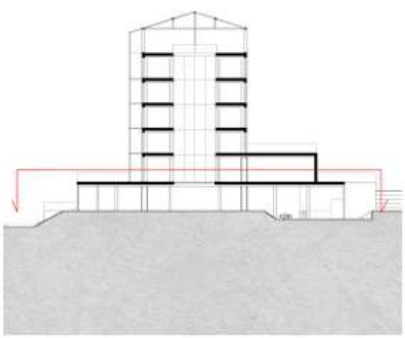


Existing second floor plan

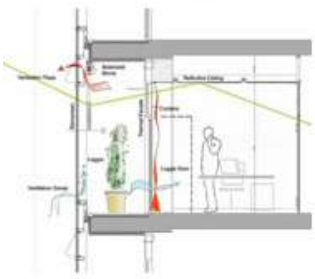


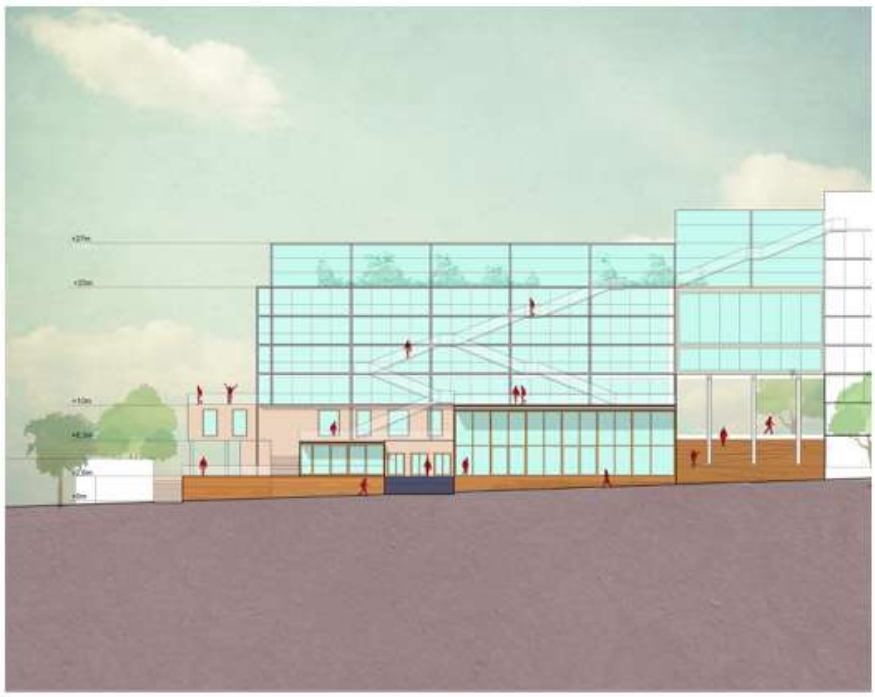


Existing second floor plan_removed spaces

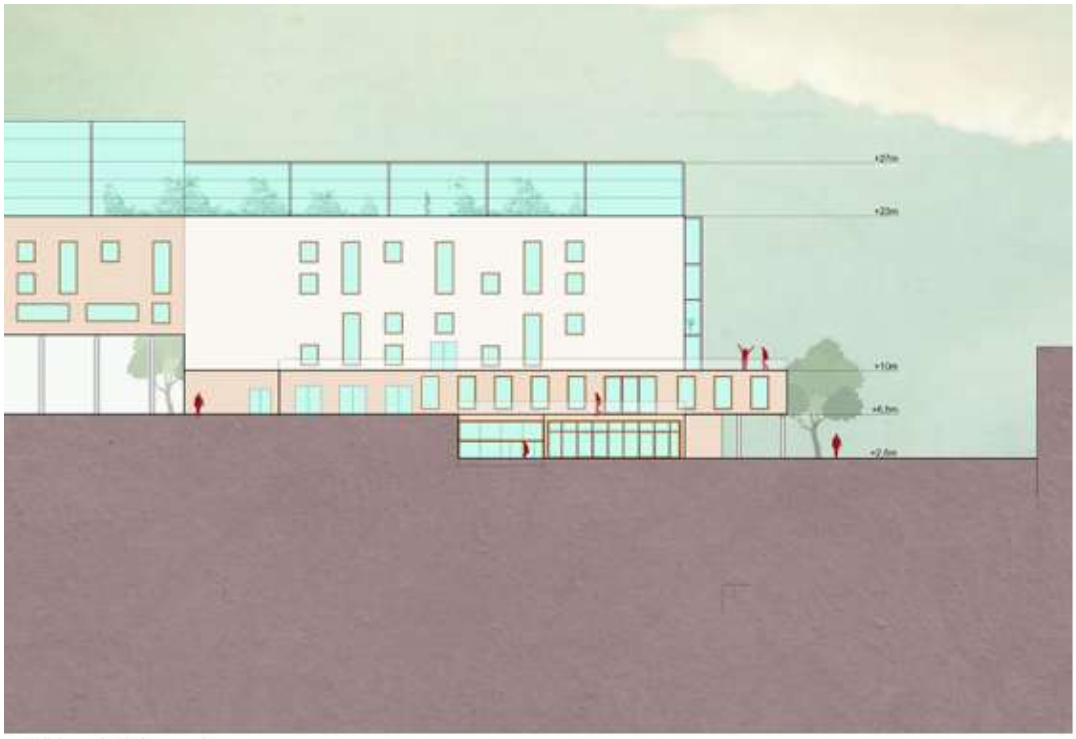


New second floor plan





South Elevation



North Elevation

THE GREEN LUNG (BUILDING V)

STUDENT:
ELLEN LEEMANS

07

THE GREEN LUNG

COCREATING

Meeting spaces

Fablab

Research labs

Offices for start- ups & spin-offs

CONNECTIVITY

Students & neighbourhood

Interacting floors

Interacting program

Nature

SUSTAINABILITY

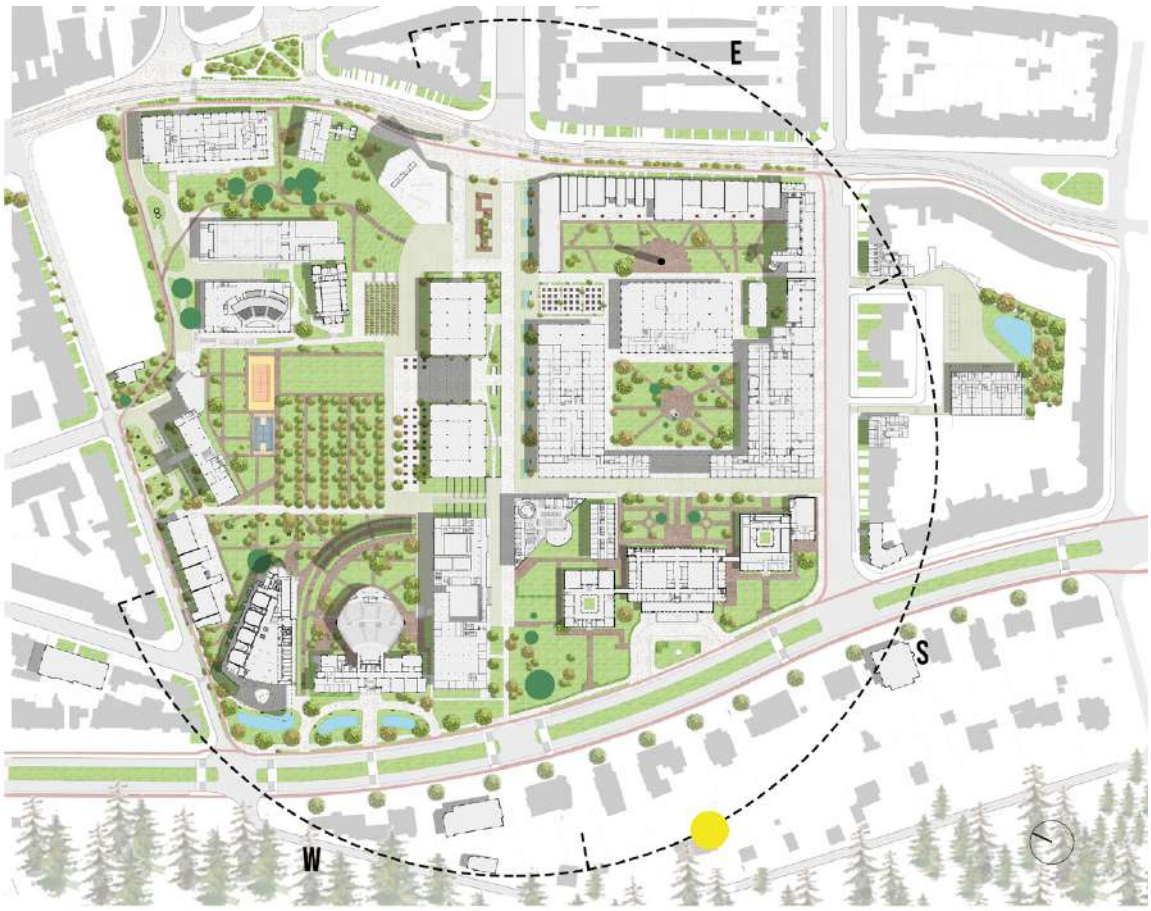
Green lung

Solar orientation

Solar panels

Shading

MASTERPLAN

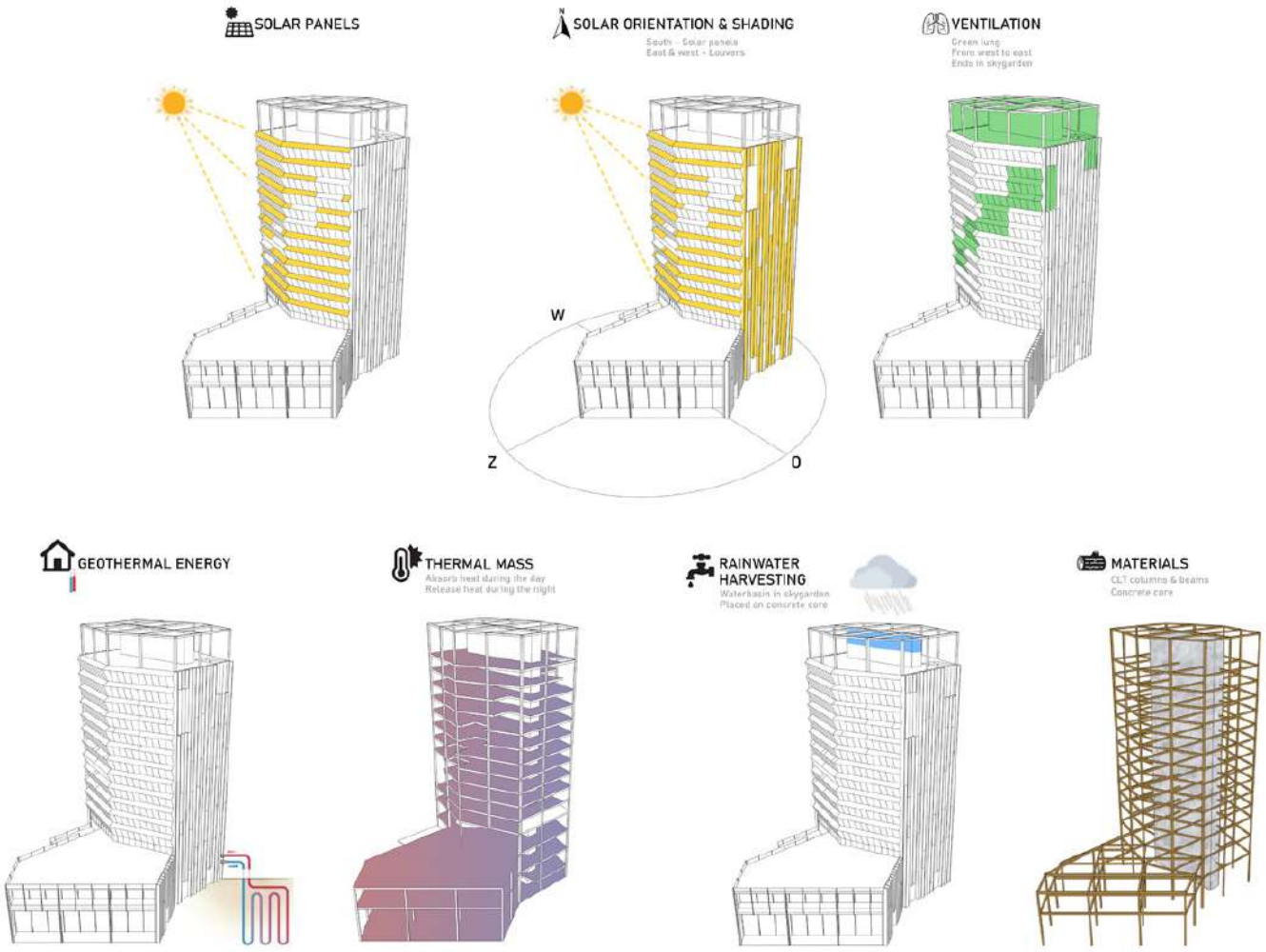


The green lung is an entrance building located at the crossroad of Avenue Buyl and Avenue Université. When designing this project I focused mainly on three topics, namely cocreating, connectivity and sustainability.

With this project I wanted to create a place where people could come together and work on joint projects, which translated itself into spaces such as the fablab, research labs, offices for start-ups and spin-offs and several other meeting spaces. This building would allow the students and the inhabitants of the neighbourhood to connect, by the implementation of an interacting program but also by interacting floors. When creating these interacting floors, there was an opportunity to also invite nature into the building. This resulted in a ventilation system which allowed fresh air to circulate throughout the building, and thus resulted in the creation of 'The Green Lung'. Other strategies that were applied are linked to the shape of the building. The Green Lung is placed in a way that the South façade and the North façade are maximized. On the south façade, solar panels are placed in such a manner that they also function as shading devices. The East and West façade are rather small, and by placement of louvers, overheating in these zones can be prevented.

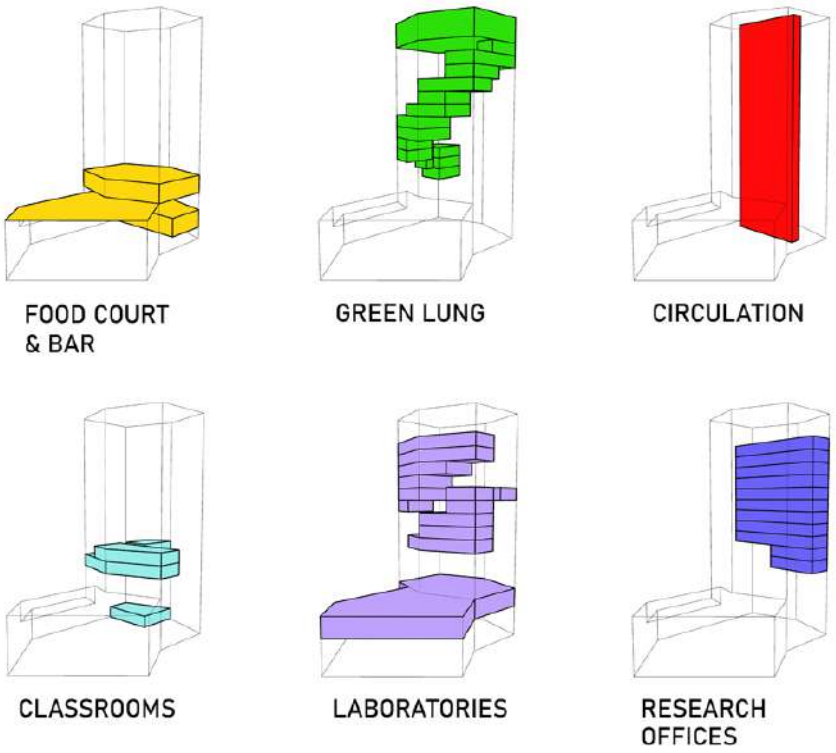
When entering the building, you can immediately find the first big gesture to cocreation, namely the large sitting stairs. These stairs are a continuation of the green stairs next to the building and a response to the challenging height differences in this zone. The big stairs lead us to an atrium, which creates a connection between all the floors of the base. At the end of this atrium the green lung starts at the west side of the building and flows eastwards towards the top of the tower to end in the sky garden, which gives a magnificent overview of the university district, while still allowing its visitor to be submerged in nature.

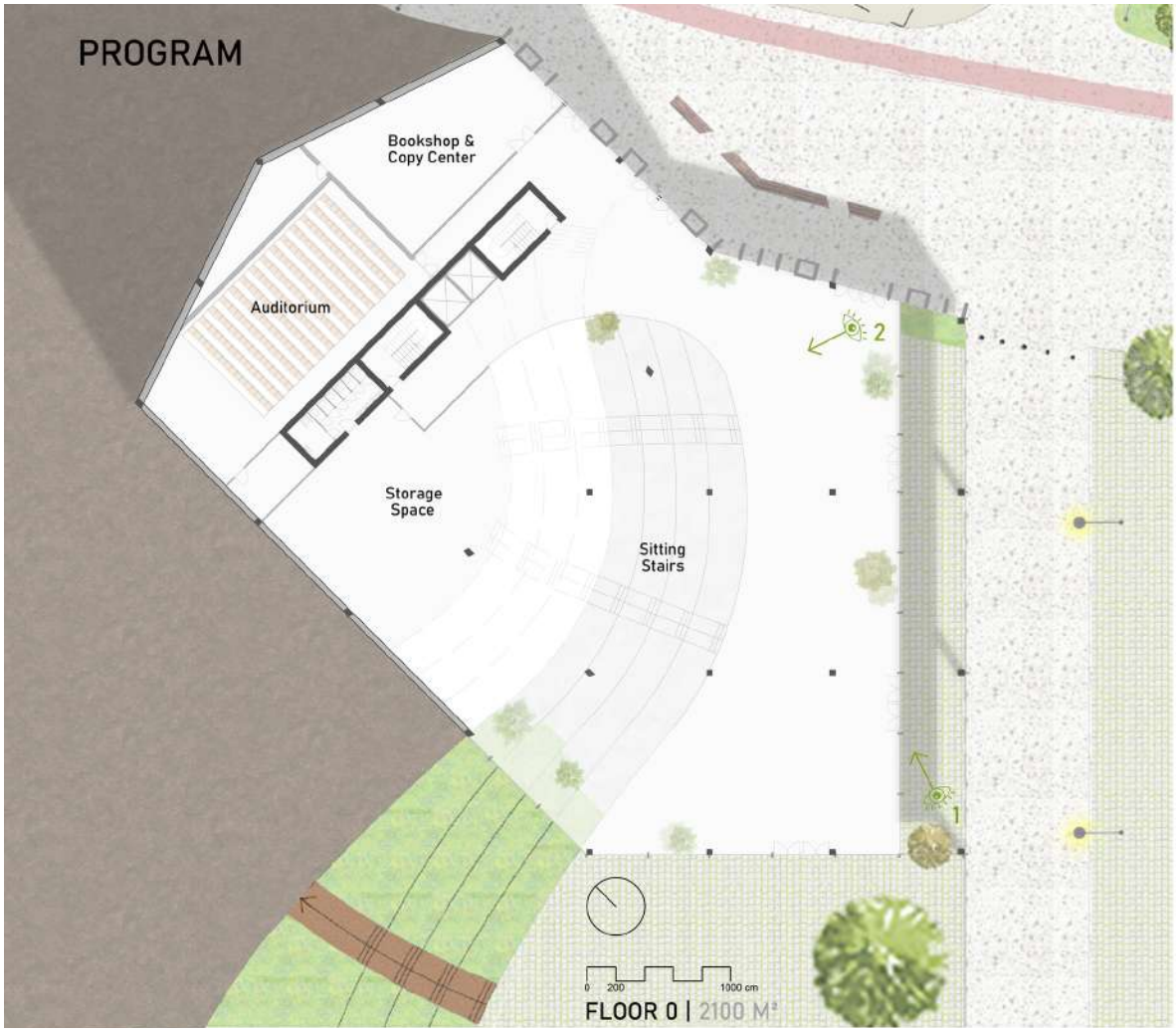
SUSTAINABILITY



PROGRAM

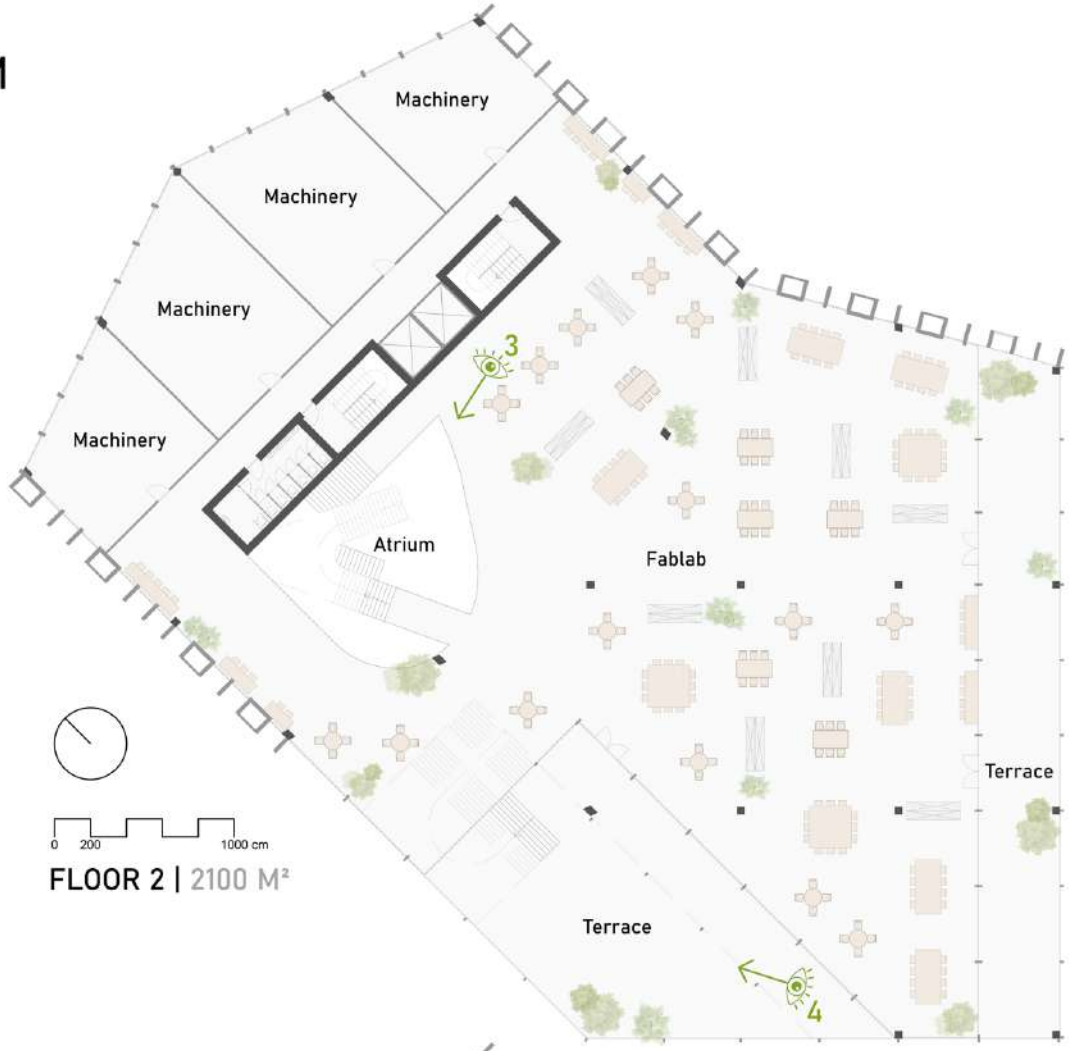
PROGRAM	FLOOR	M²	%
GREEN LUNG	ALL FLOORS	1 490	7,5
EXPOSITION SPACES	5 / 7 / 9 / 11 / 13	1 440	7,2
SKYGARDEN	15	880	4,4
ROOFTOP GARDEN	3	1 190	6
WORKSPACES			53,8
CLASSROOMS	0 / 4 - 5	990	5
FABLAB	2	1 570	7,9
LABORATORIES	6 - 14	4 080	20,5
OFFICES	4 - 14	2 640	13,3
MEETING SPACES	ALL FLOORS	1 300	6,5
BOOKSHOP & COPYCENTER	0	125	0,6
FOOD COURT/ BAR	1 / 3	1 350	6,8
CIRCULATION	ALL FLOORS	2 100	10,6
STORAGE SPACE/ TOILETS	ALL FLOORS	720	3,6
TOTAL		19 875	100




PROGRAM
Bookshop &
Copy Center
Auditorium
Storage
Space
Sitting
Stairs
2
1
0 200 1000 cm
FLOOR 0 | 2100 M²

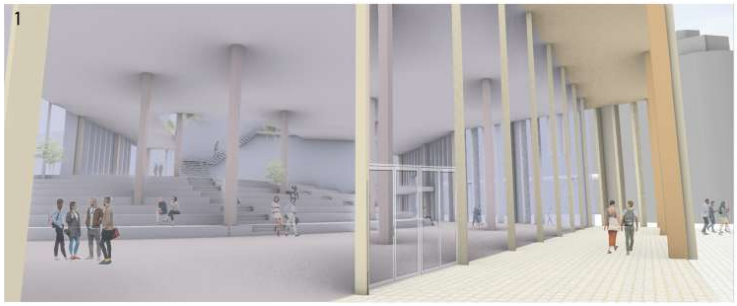

Foodbar
Sitting
Stairs
0 200 1000 cm
FLOOR 1 | 2100 M²

PROGRAM

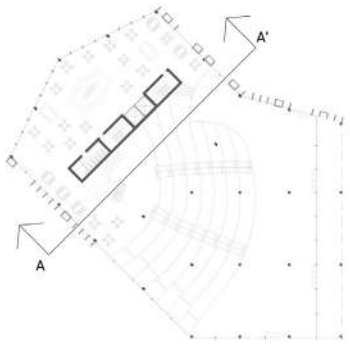


FLOOR 2 | 2100 M²

FLOOR 3 | 2100 M²



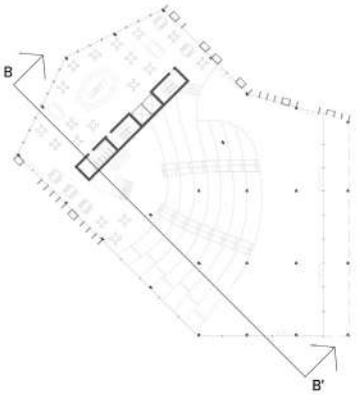
FLOOR 5 | 970 M²



SECTION AA'

WEST FACADE

SOUTH FACADE



SECTION BB'

EAST FACADE

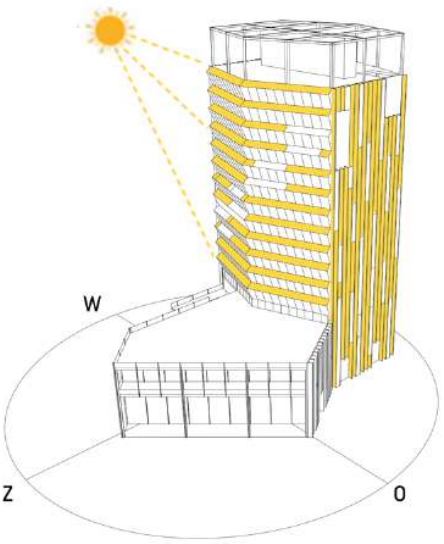
NORTH FACADE

VIEW FROM ENTRANCE SQUARE

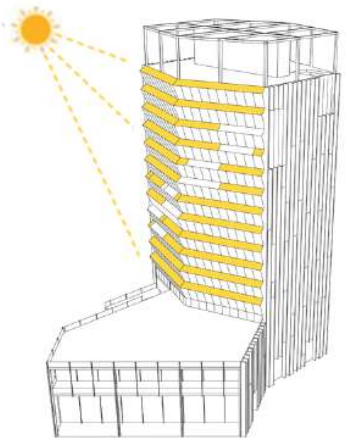
VIEW FROM AVENUE BUYL

VIEW FROM AVENUE BUYL

SOLAR ORIENTATION & SHADING

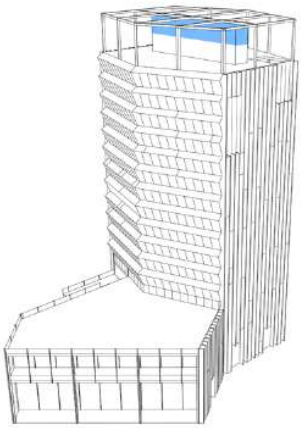


SOLAR PANELS



RAINWATER HARVESTING

Waterbasin in skygarden
Placed on concrete core

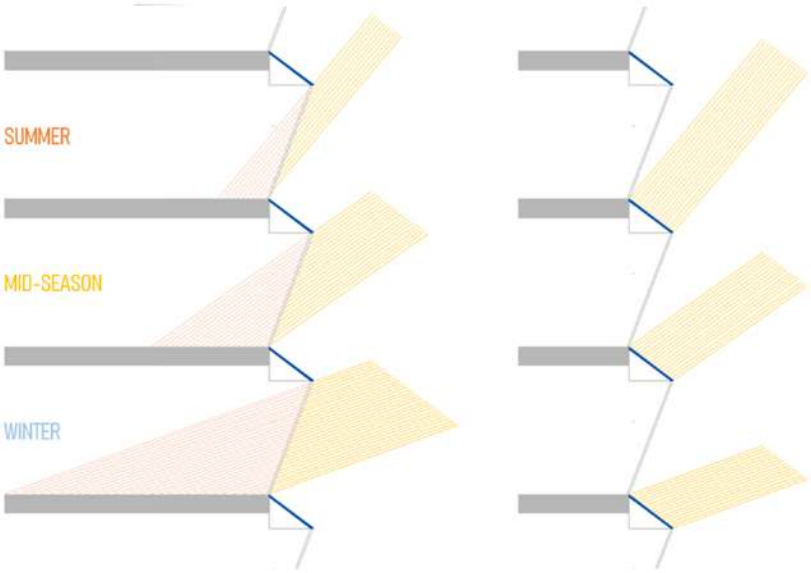


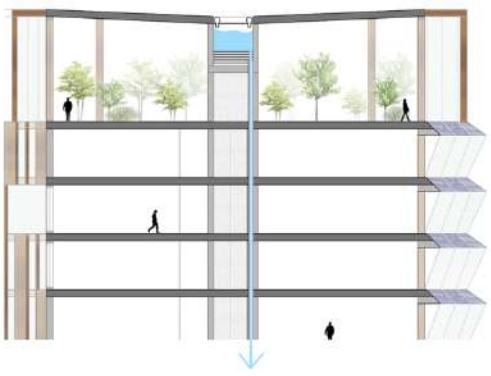
EAST FACADE
Louvers

WEST FACADE
Louvers

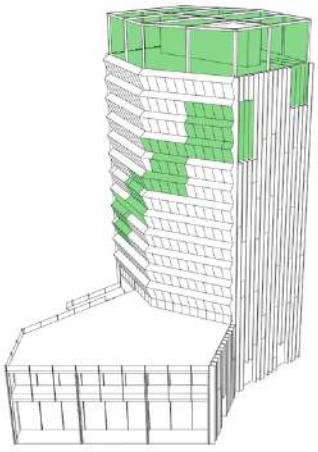
SOUTH FACADE
Solar panels

NORTH FACADE
Bigger openings
Avoid overheating





VENTILATION
Green lung
From west to east
Ends in skygarden



LIVING ORGANISM (building V)

STUDENT:
RAZAN ATWI


08

Energy

site ecology

demand for power

passive system

Workplace

innovation

organiza-tional space

fresh air and sunlight

Community

landmark

city context

street level activity

A Dynamic enviroment with a focus on students and their future work life

The living organism is a mixed used building in the ULB Solbosch campus, and specifically on the entrance of avenue Buyl (in place of the current building V).

The main goal is to create a dynamic working environment that has a focus on students and their future work life. With 3 focuses, less demand for Energy, A Better workplace, and being Part of the community architecturally and socially.

Where the building is divided into units, a base following the grid-line and the tower following the sun orientation, between a common public entrance on the ground floor with an activity pavilion that includes exhibitions, food court, and shops. Then two floors are dedicated to students, as classes, workshops and auditorium. A middle area of two rotated floors functions as the heart of the project where students meet with their working friends, companies and startups in an open restaurant that over looks both the campus and the city with a green terrace as well as an entertainment zone. The rest of the floors in the building are flexible offices, with winter gardens connecting different floors and creating a dynamic working space that is not foreseen as zoned, but rather as differentiated and flexible responding to their needs and activities (communicative, co-working, focus zones, meetings, resting). At the roof we end with a future garden that includes water collection, a solar chimney and seasonal plants, small trees and vertical farms, all covered by rotated PV panels to make sure they still get sunlight.

In terms of structure, the columns and beams are chosen to be in GLT (glued laminated timber), the floors as prefabricated concrete slabs, a concrete core, and all other panels and walls from CLT. The façade includes prefabricated CLT elements, recycled glass, PV panels on south side. Choosing CLT in this project is not only an environmental statement but also for its wide advantages from strength, durability, safety and structural weight compared to concrete.

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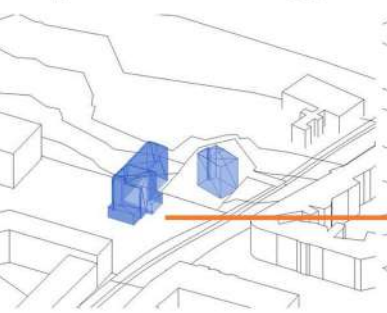
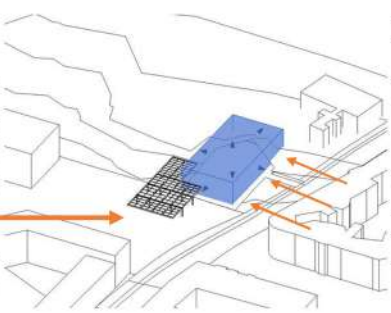
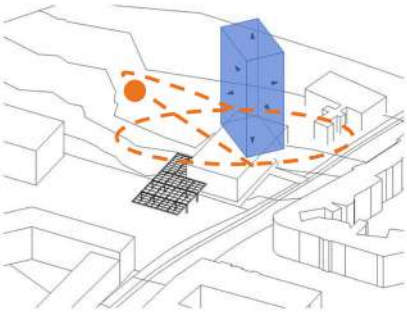
Spatial strategy



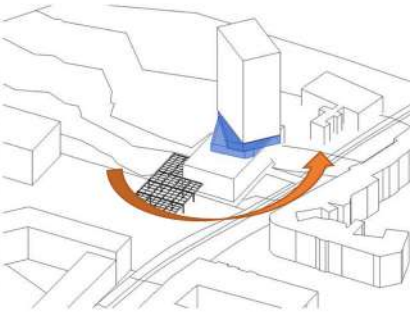
Footprint of V building



Base is shifted



Tower



Intermediate zone

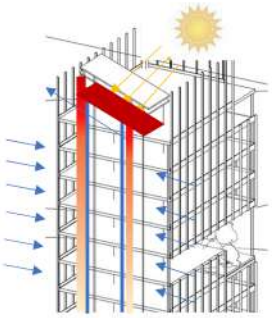
Active pavilion

Buffer from street

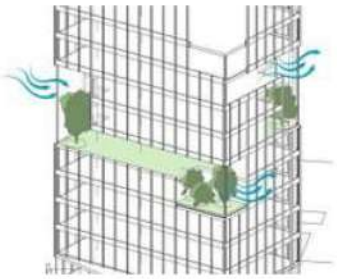
Following sun orientation

Rotating

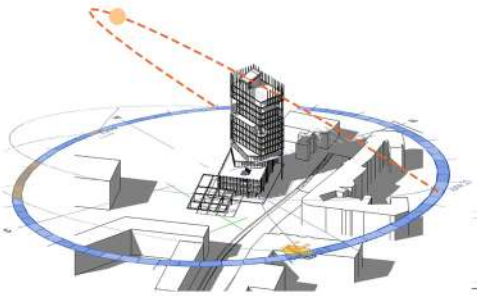
Sustainability



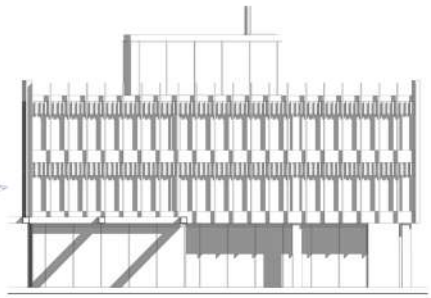
Solar chimney



Winter garden
(rotating, microclimates)



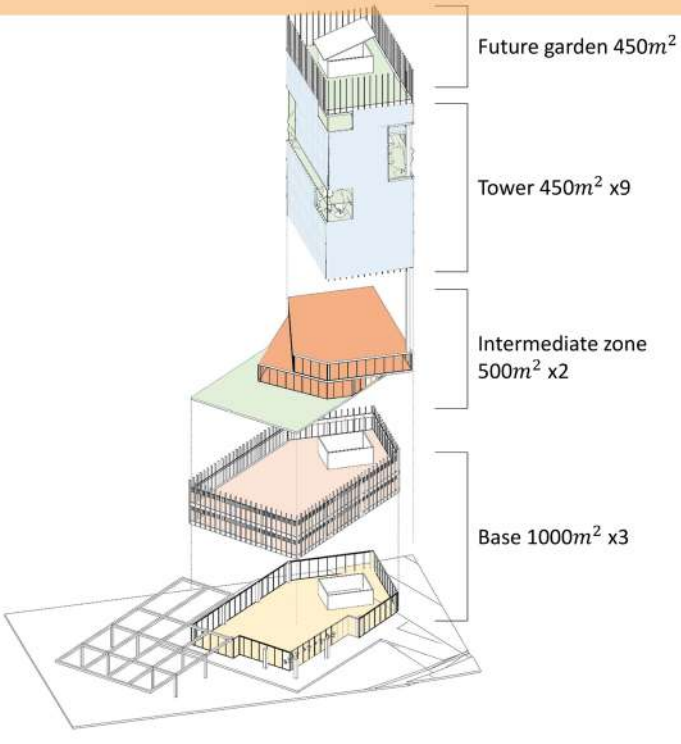
Orientation (shading and lighting)



Material wise (prefabricated/
environmentally friendly/
recyclable)

Program

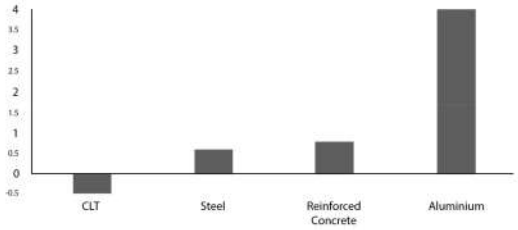
Program	area m2	floors	total
offices	450	9	4050
winter garden	variable	variable	400
future garden	450	1	450
public terrace	500	1	500
upper terrace	100	1	100
intermediate zone	500	2	1000
services	66	16	1056
classes	1000	2	2000
common space	1000	1	1000
auditorium	150	2	300
library	150	2	300
exhibition	200	1	200



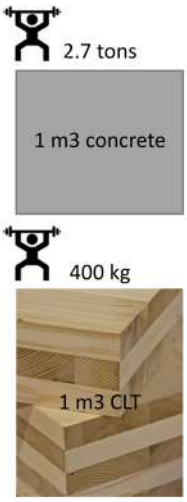
Why CLT

FAST-BUILD | CARBON STORAGE | AESTHETIC | FIRE-SAFE | LIGHT | STRONG

Environmentally

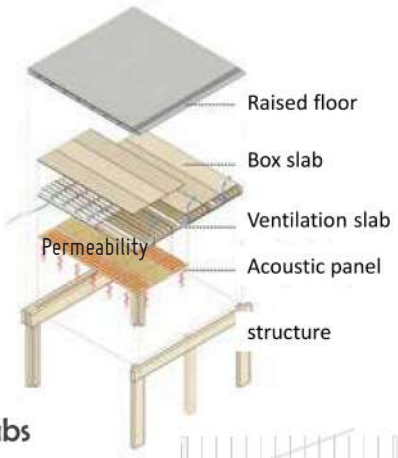


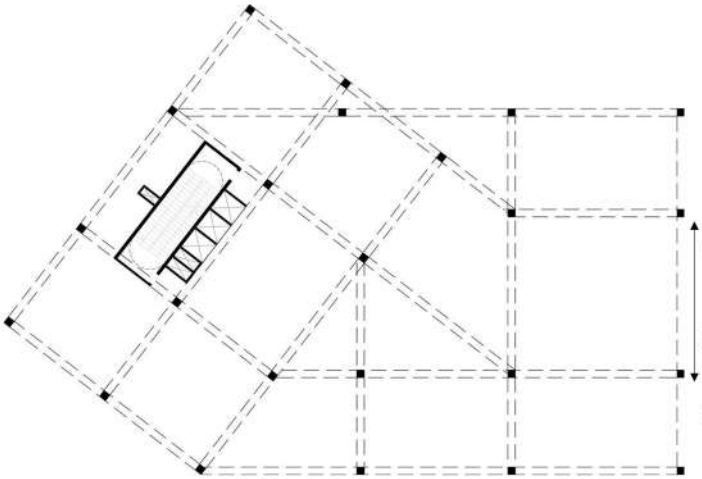
Structurally



Protection

- fittings, seals, joints
- Vegetable oils(indoor) and mineral paints(outdoor)
- once every 5 years



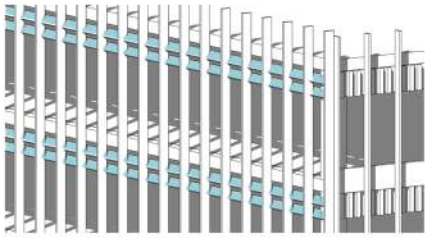


GLT columns and beams

11 m

Prefabricated concrete slabs

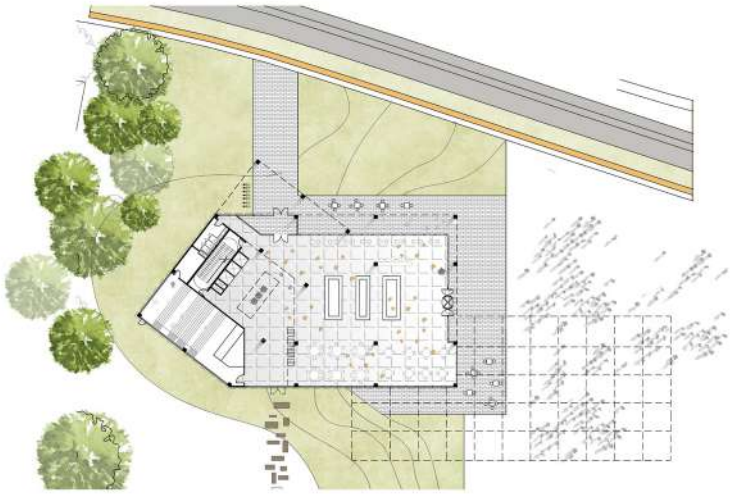
Concrete core

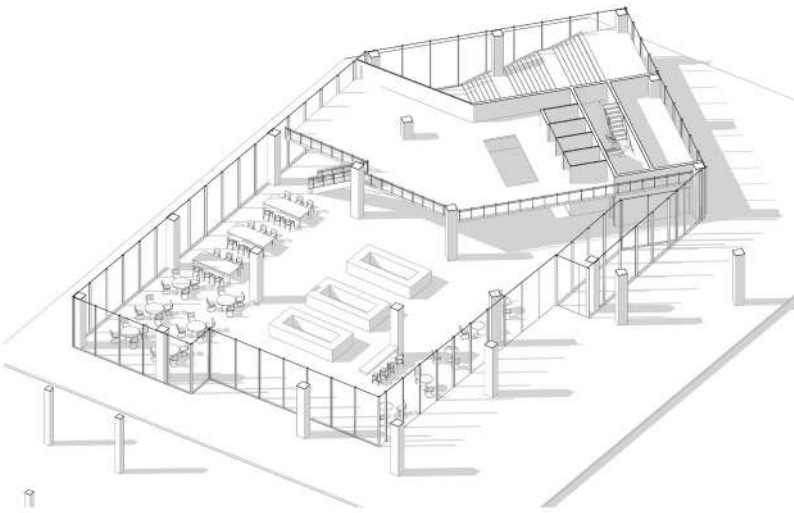


Prefabricated CLT elements

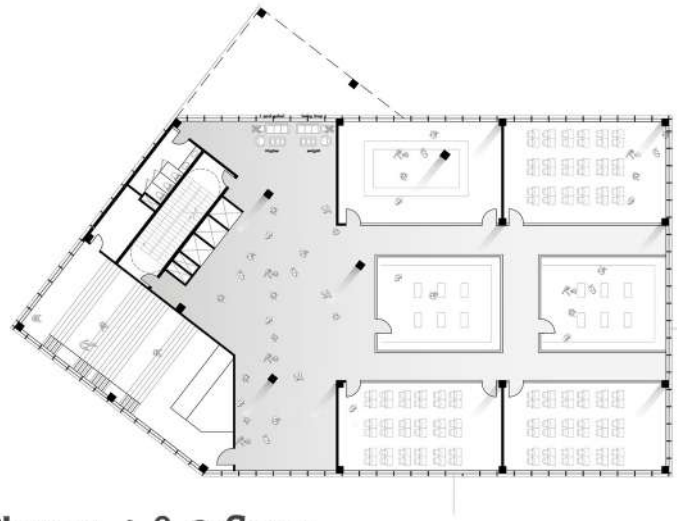
Recycled glass

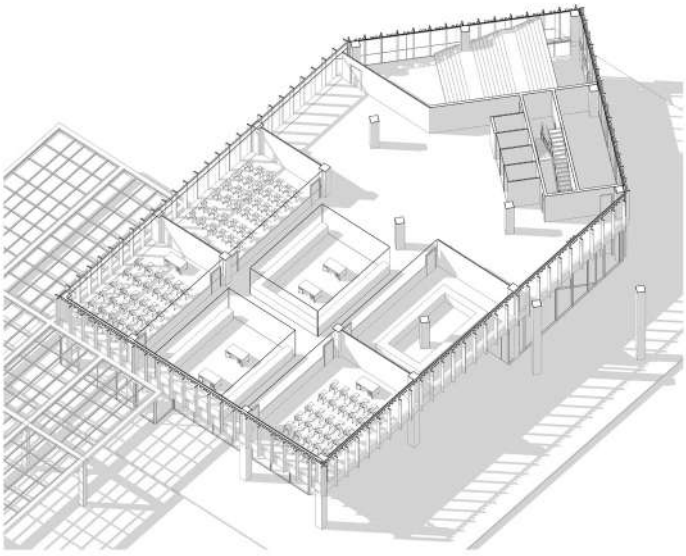
PV panels on south facade



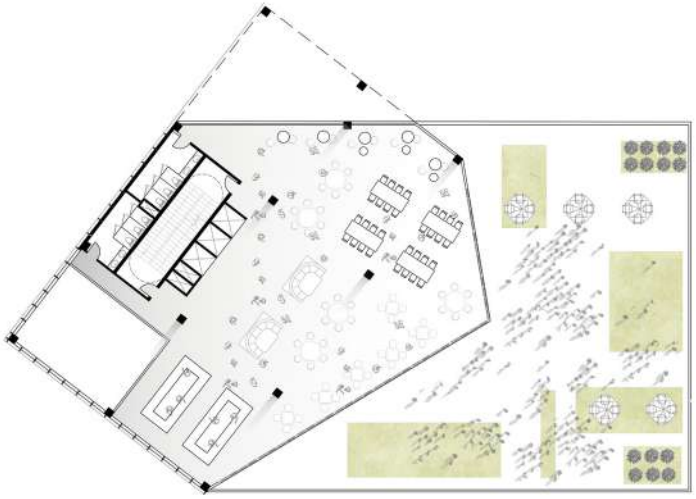


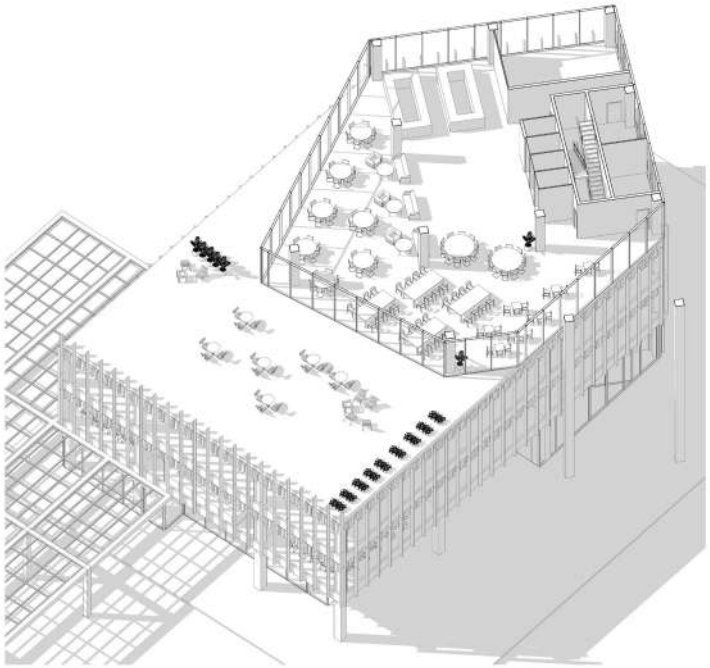
Ground floor





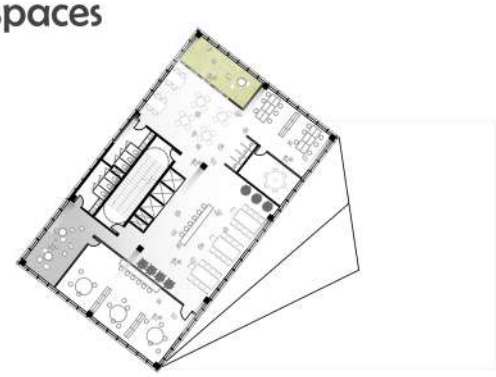
Classes 1 & 2 floor

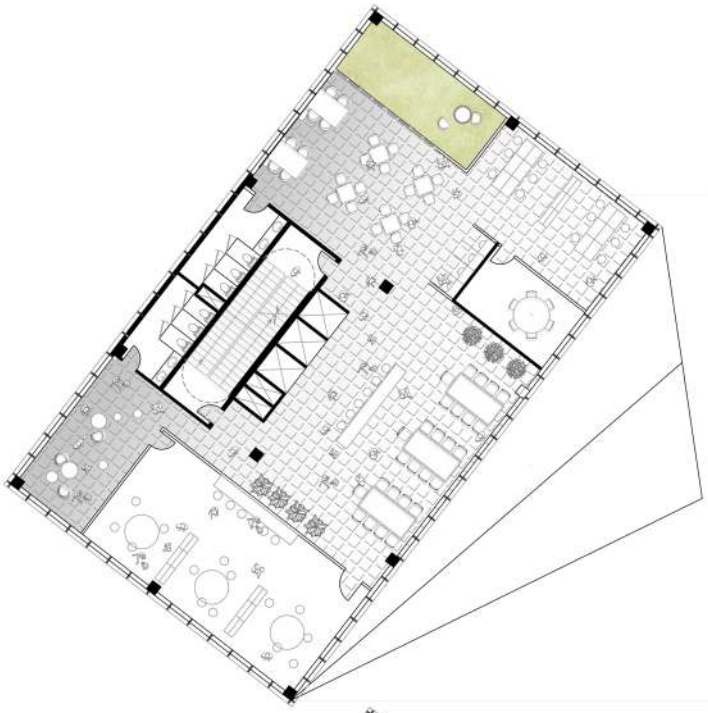


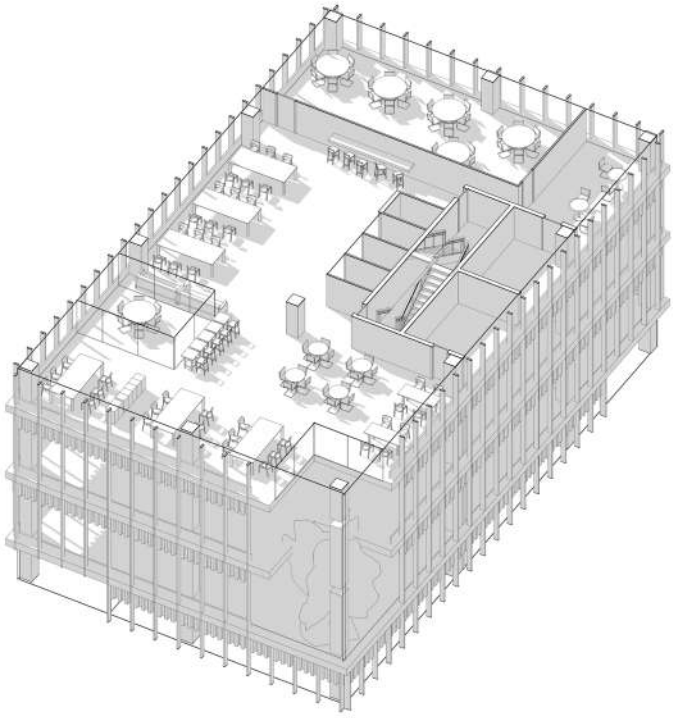


Entermediate zone 3 & 4 floor

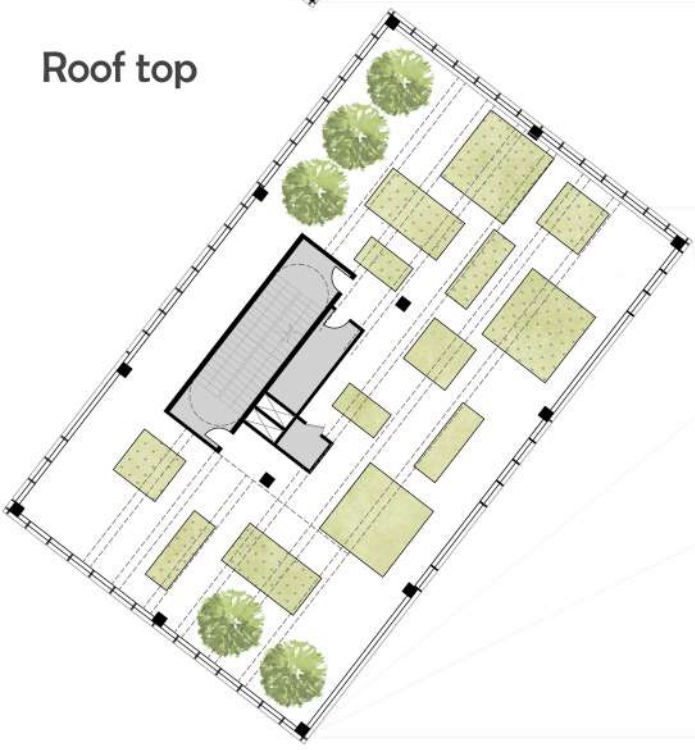
Office spaces are not foreseen as zoned, but rather as differentiated and flexible open spaces

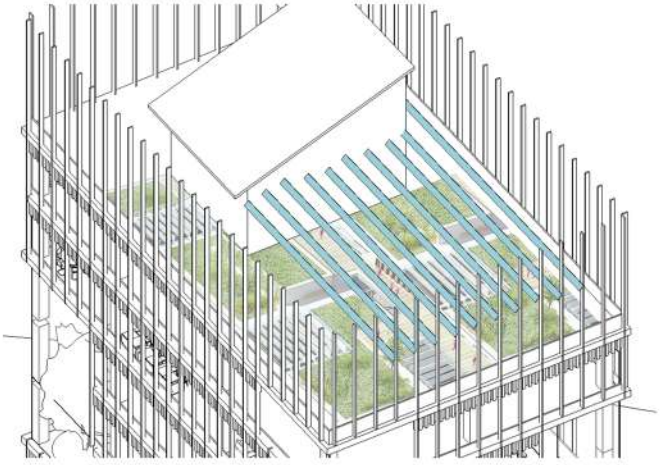


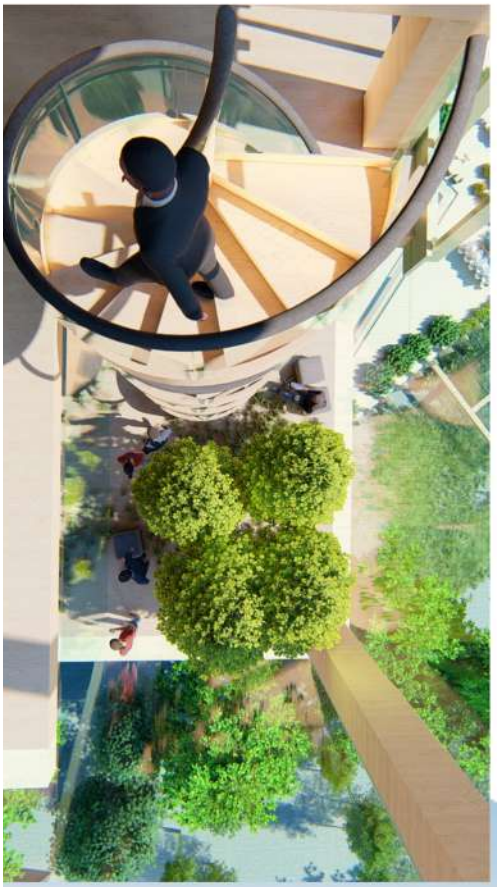




Roof top



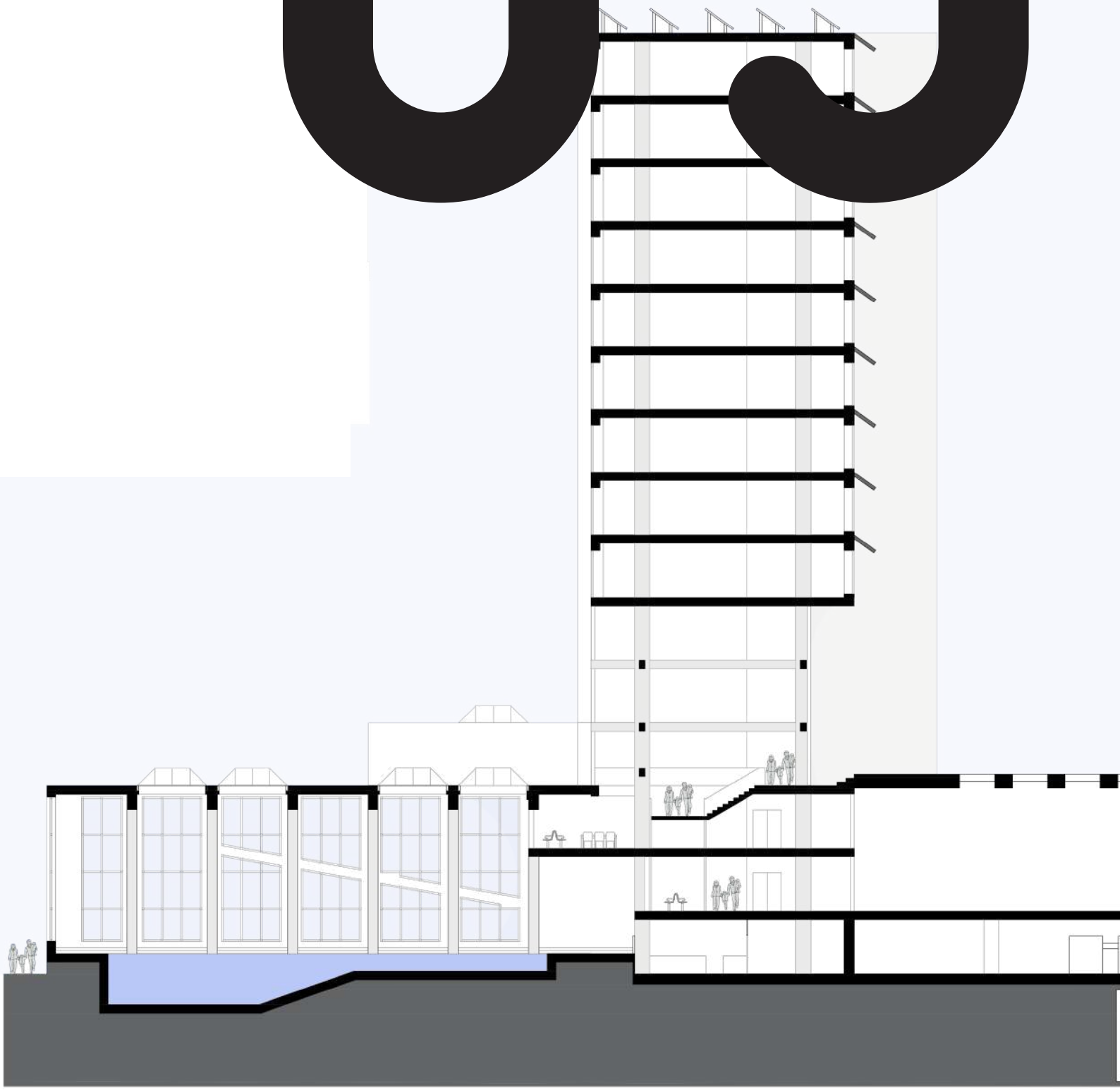




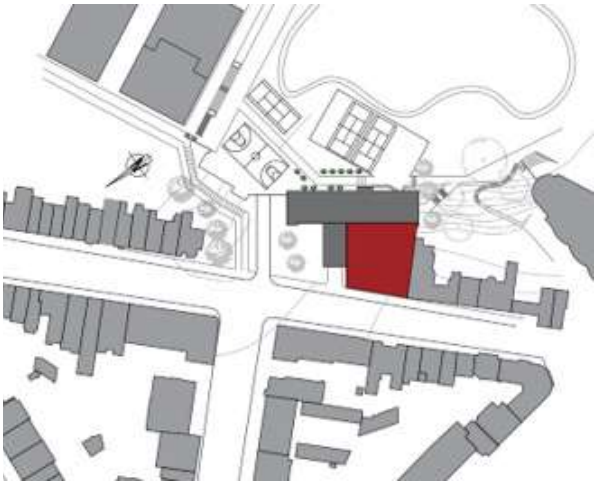
New sports complex for Solbosch campus (BUILDING S)

STUDENT:
KOEN VAN OVERSTRAETEN

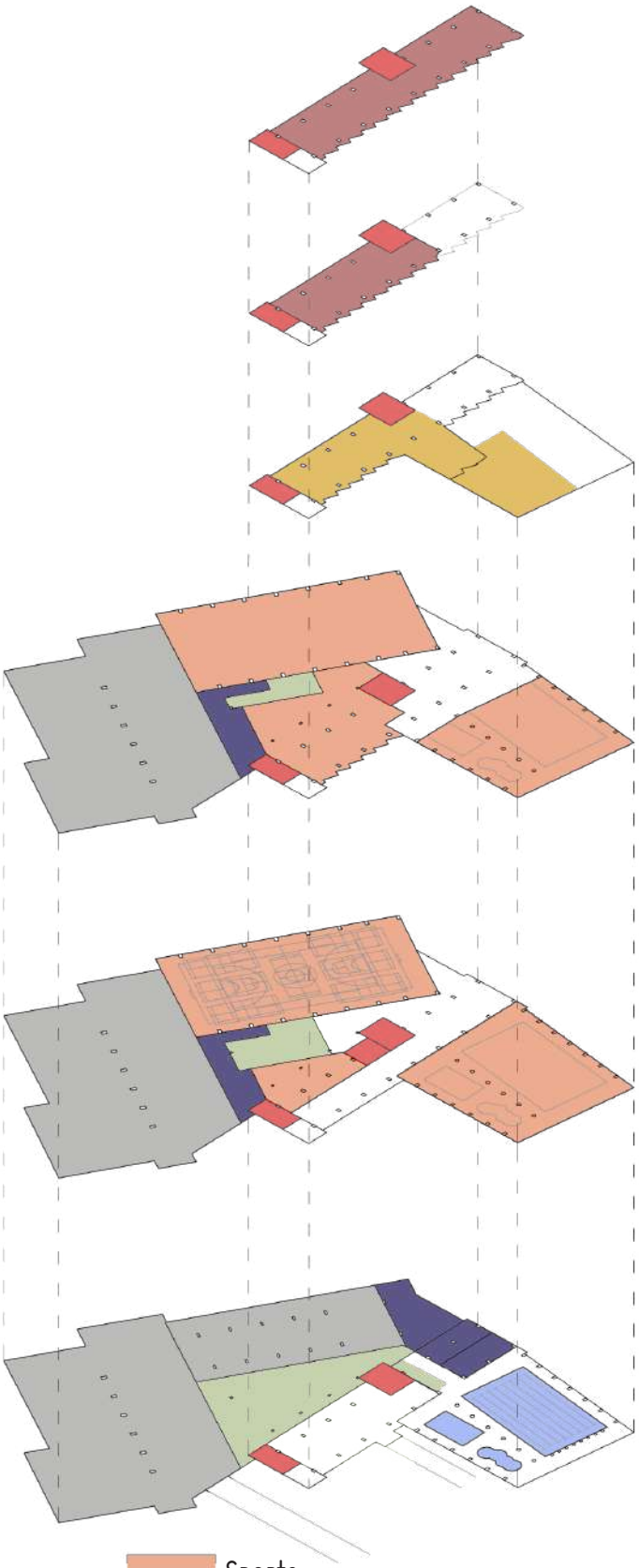
09



PROGRAM	
Function	**Surface**
Swimming pool	950m²
Sports hall	1210m²
Gym	570m²
Bar	404m²
Roof terrace	300m²
Storage	620m²
Classrooms/offices	6940m²
Parking	5700m²



Location: Building K at Avenue Jeanne



Sports

Changing rooms and sanitary

Bar, leisure

Classrooms, offices

Vertical circulation and fire exit

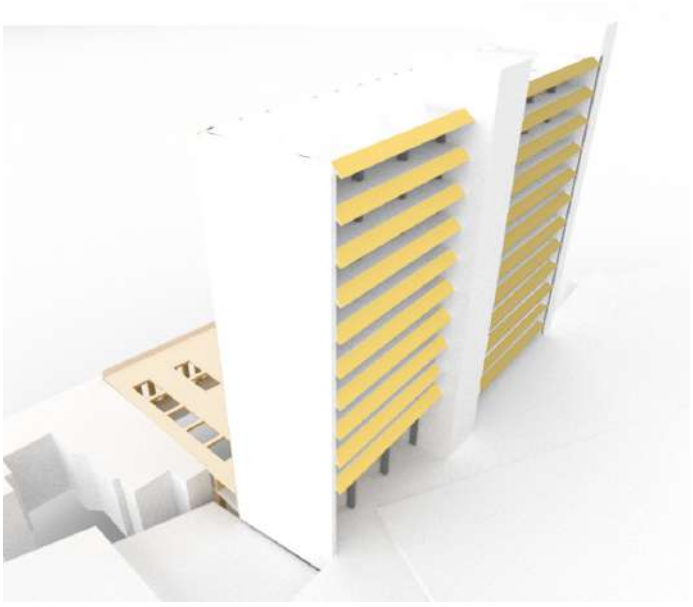
Storage space

Underground car parking

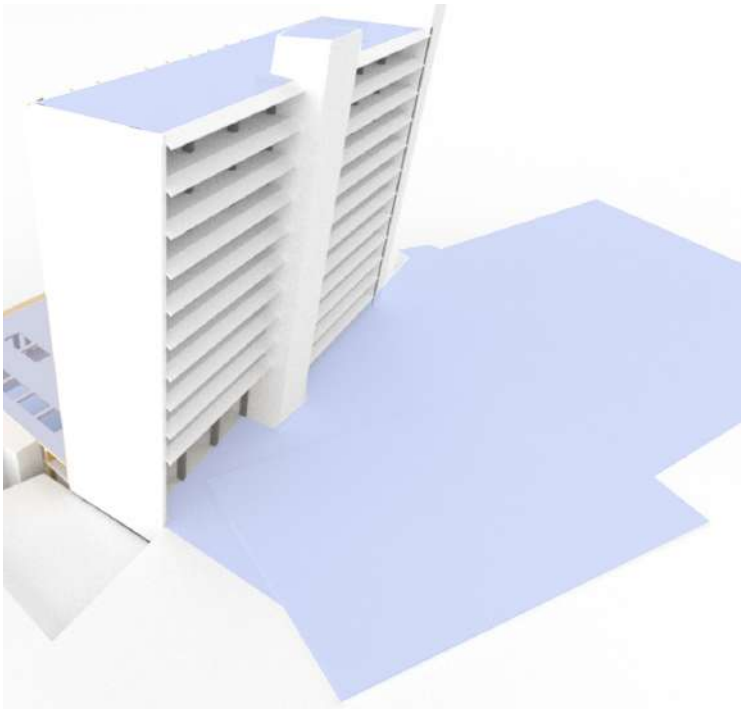
The S building from architect Puttemans on the Solbosch campus of the ULB is a somewhat closed location nowadays. In front of the front façade the space is used as car parking when there is already an underground one available. An axis from the General Jaques avenue to the campus leads directly to the entrance of the parking. The tower building is visible from the same avenue but isn't really a public, attractive location. Currently, offices and classrooms are present in the building which leads to the building being almost unused when the academic year is finished. Because of a height difference between the street side and the campus the connection between both sides isn't clear.

The design makes an attempt to solve these problems. There will be a programmatical reorganization of the building. Sport infrastructure will be implemented in and around the building: a swimming pool, sports hall, gym etc. Since sports is one of the best and healthiest leisure activities the location will become more attractive to the neighboring residents and students. A bar and roof terrace on top of the swimming pool will be added so people could stay in the building after their sports or courses(classrooms will still be there). The terrace will give a view on the street and gives passers by an indication of the program in the building. An opening will be made in the building to make a nice entrance space at the campus side and permit daylight to enter the building even better.

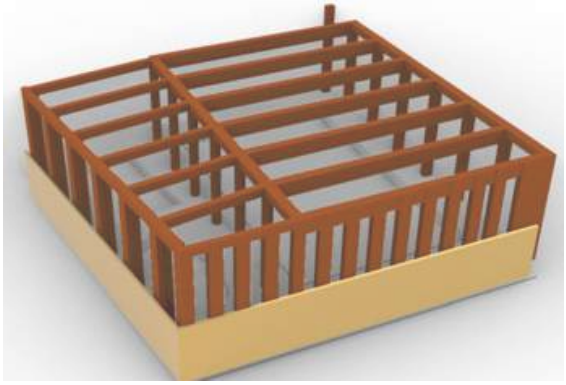
Continuous staircases will improve the connection between the street and the campus. When taking these stairs, the different sportive activities will be visible to show the people what's going on in the building. The staircases lead to the opening and the entrance hall were the users could go to the Janson square, the bar or their courses. If they didn't choose to do some sports. The renovation of the S building improves the quality of the location with it's new program and design. By considering solar orientation and technologies the building will become more sustainable as well.



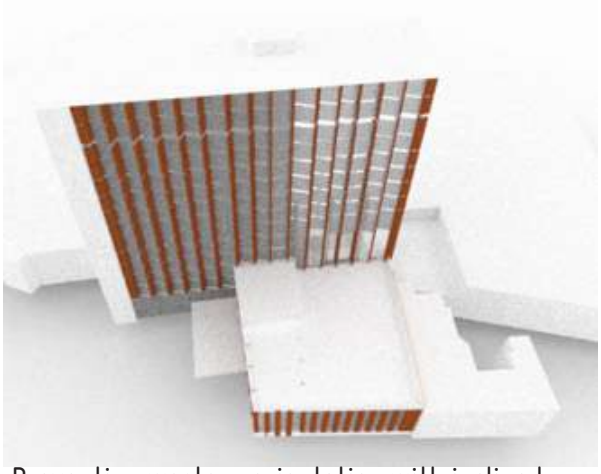
Solar heating and energy serving as shading at southern facade. Opening in the building for daylight to enter the pool building.



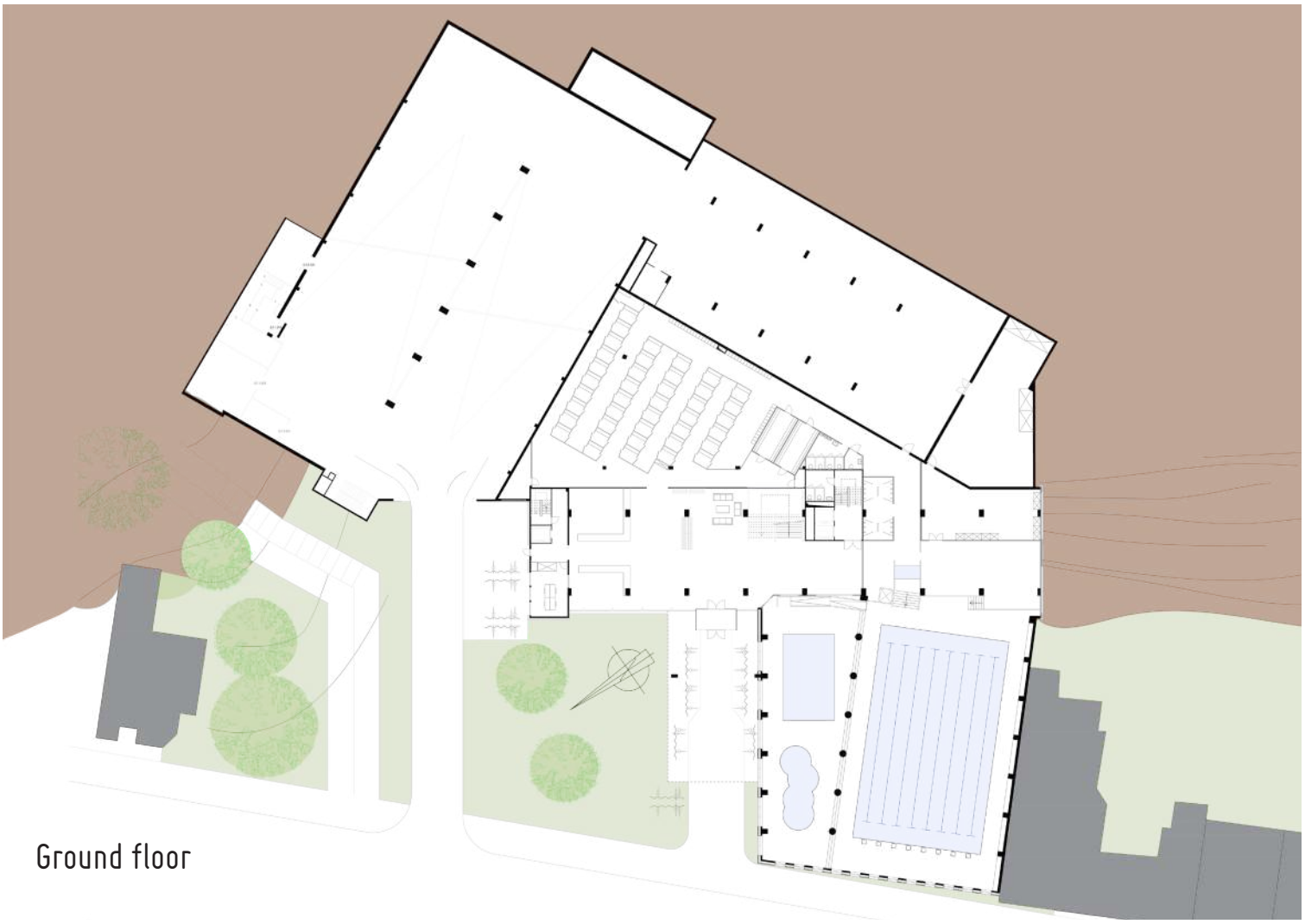
Harvesting rainwater from impermeable parking roof



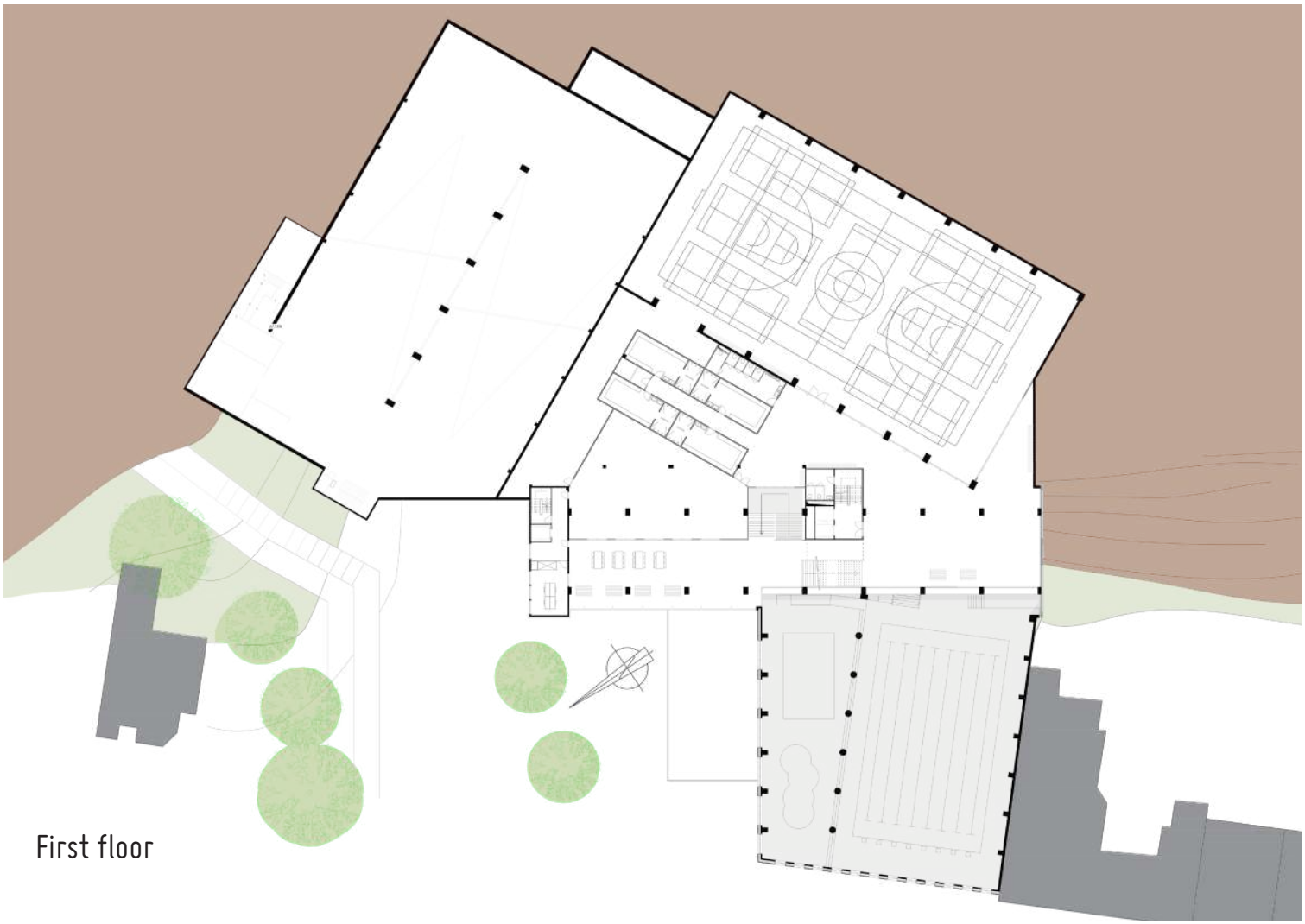
Renewable materials and good performancy in humid condition: Cork insulation and CLT structure



Preventing western orientation with inclined windowns

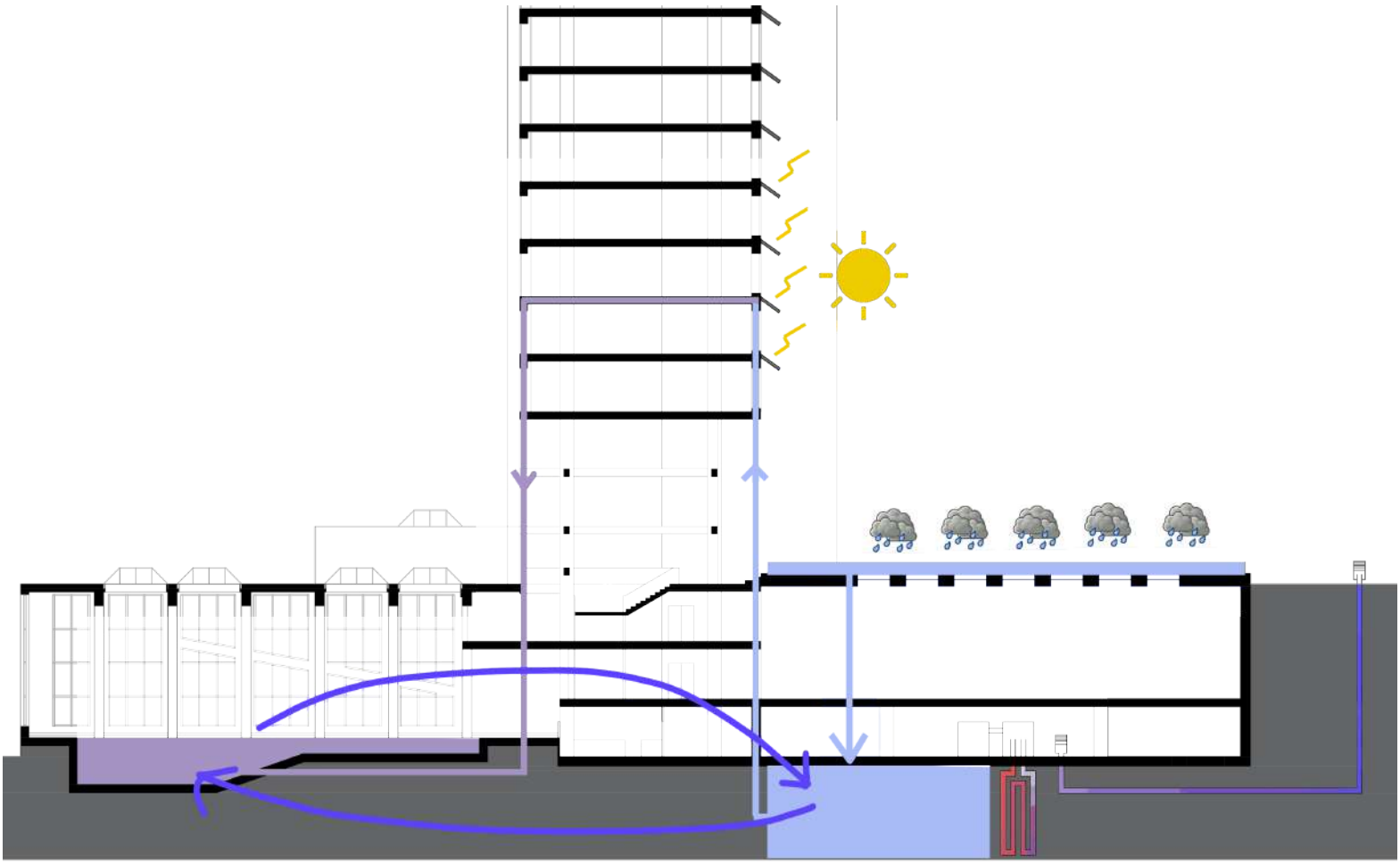


Ground floor

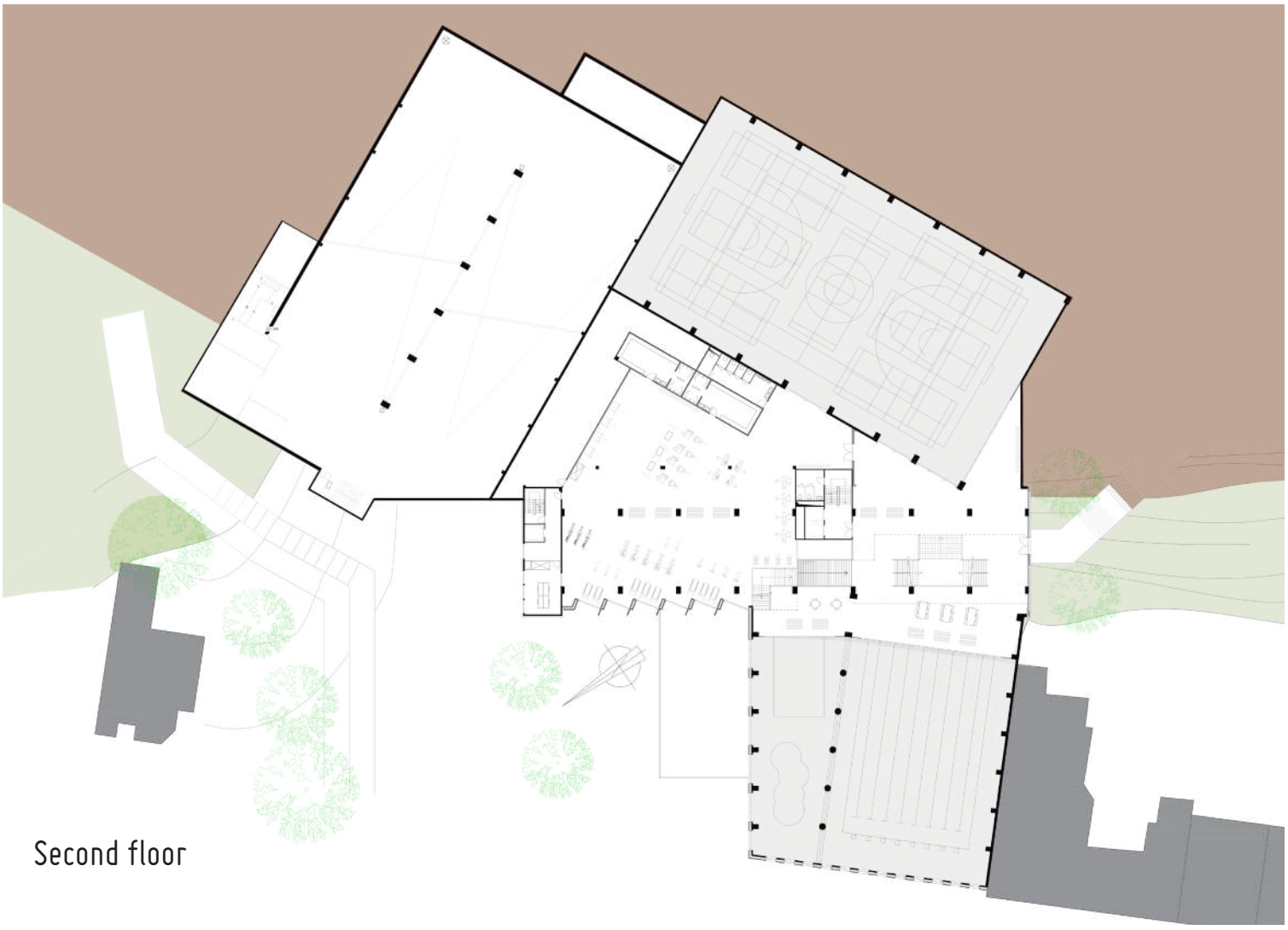


First floor

Top view

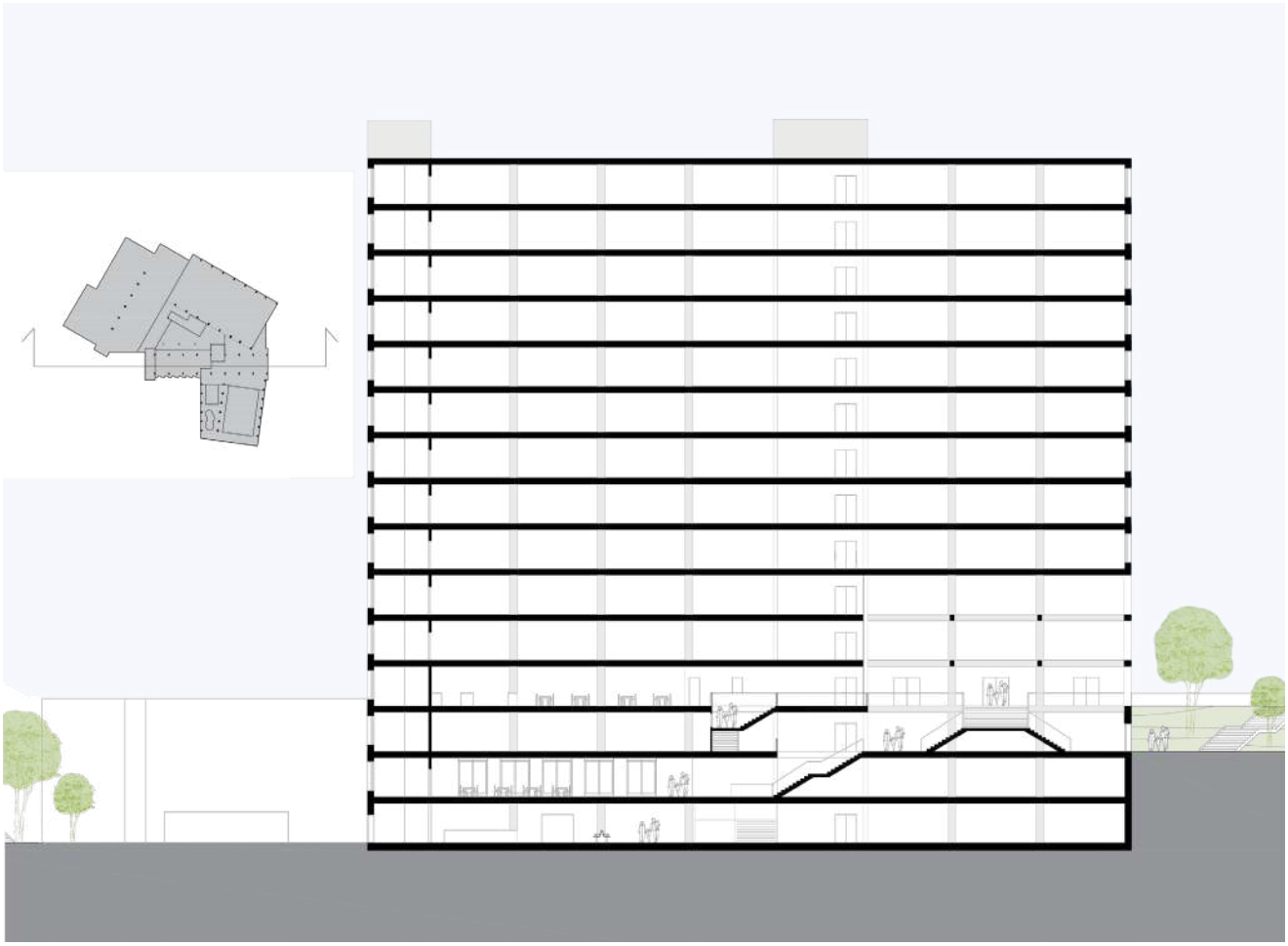


Water harvesting and heating for the swimming pool

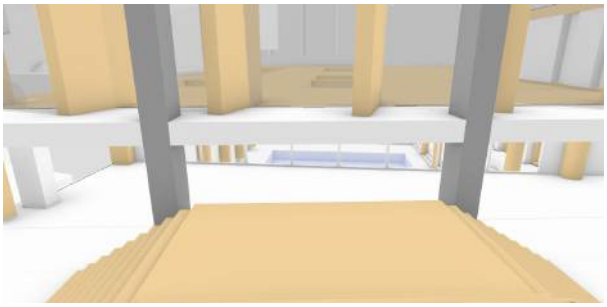


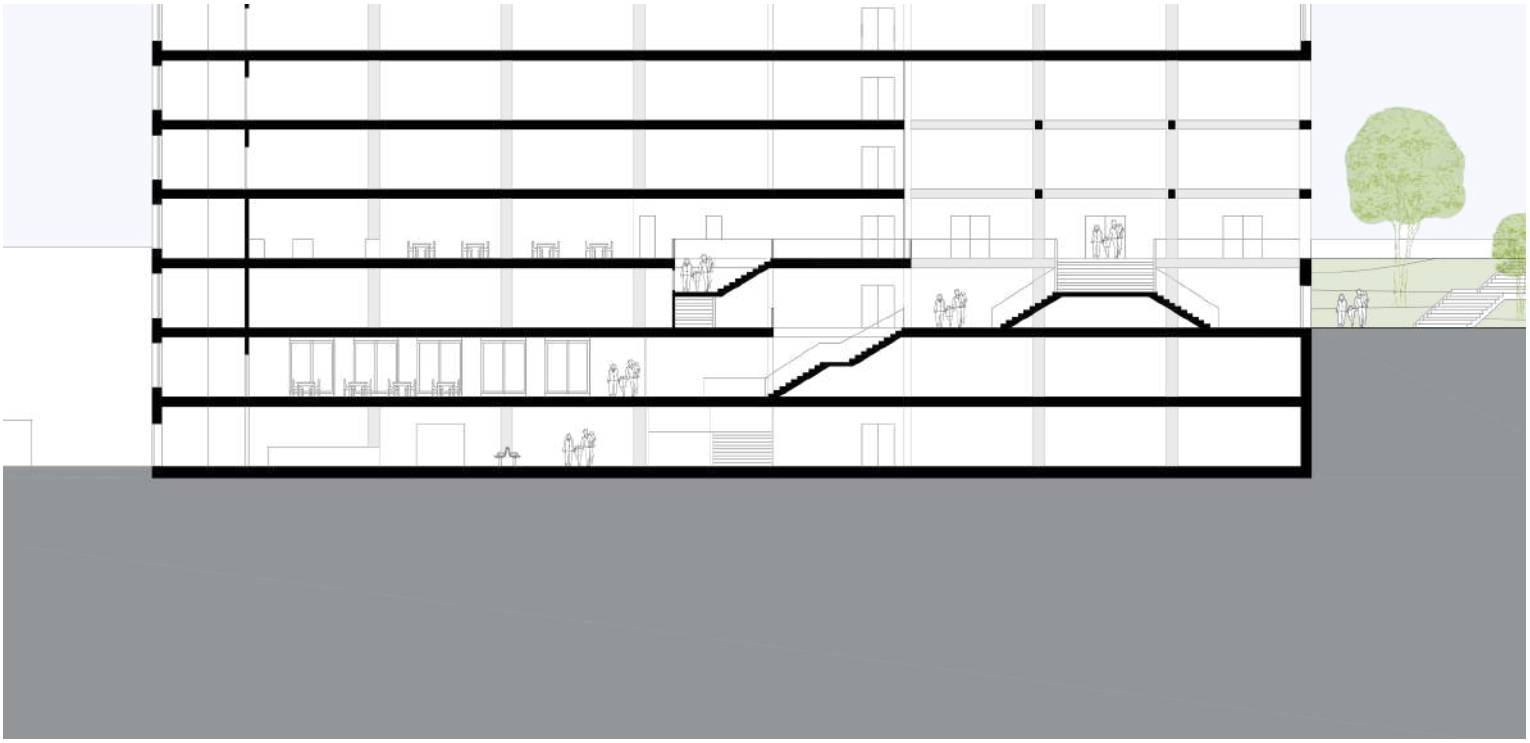
Second floor

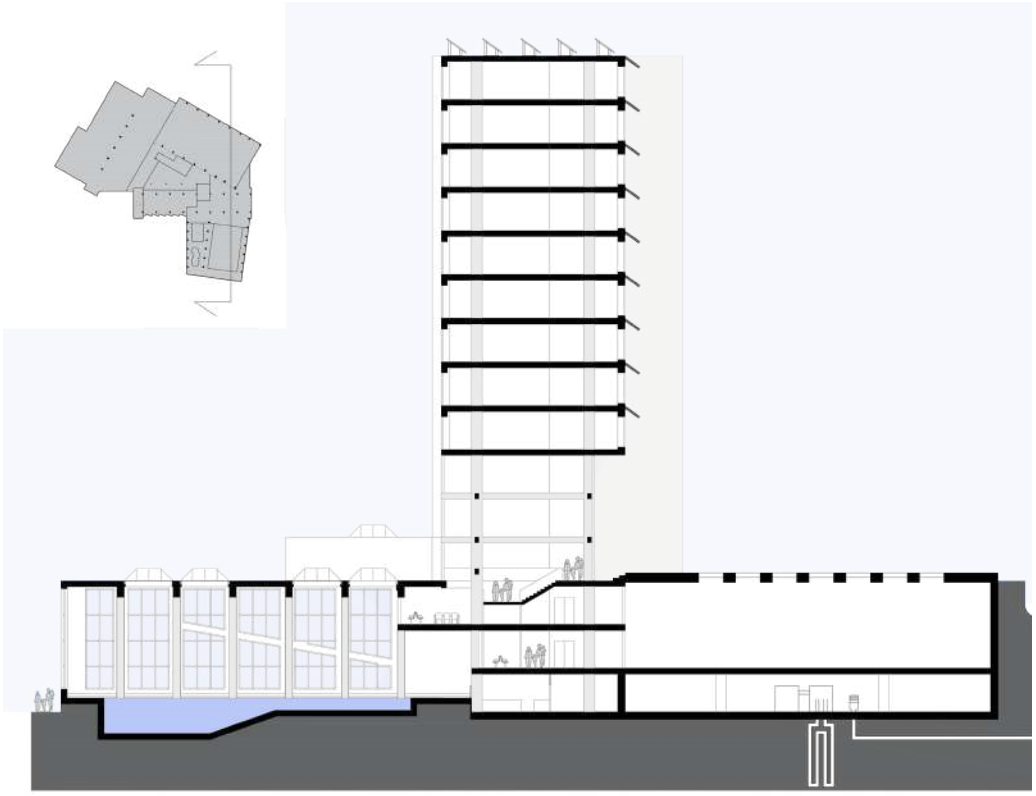
Third floor



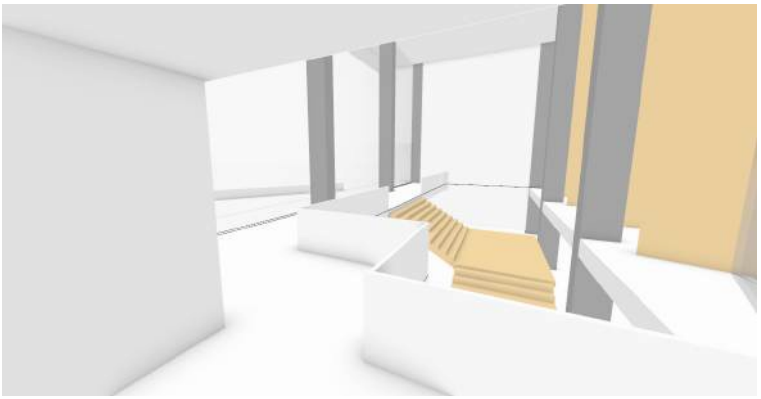
Longitudinal section through the tower

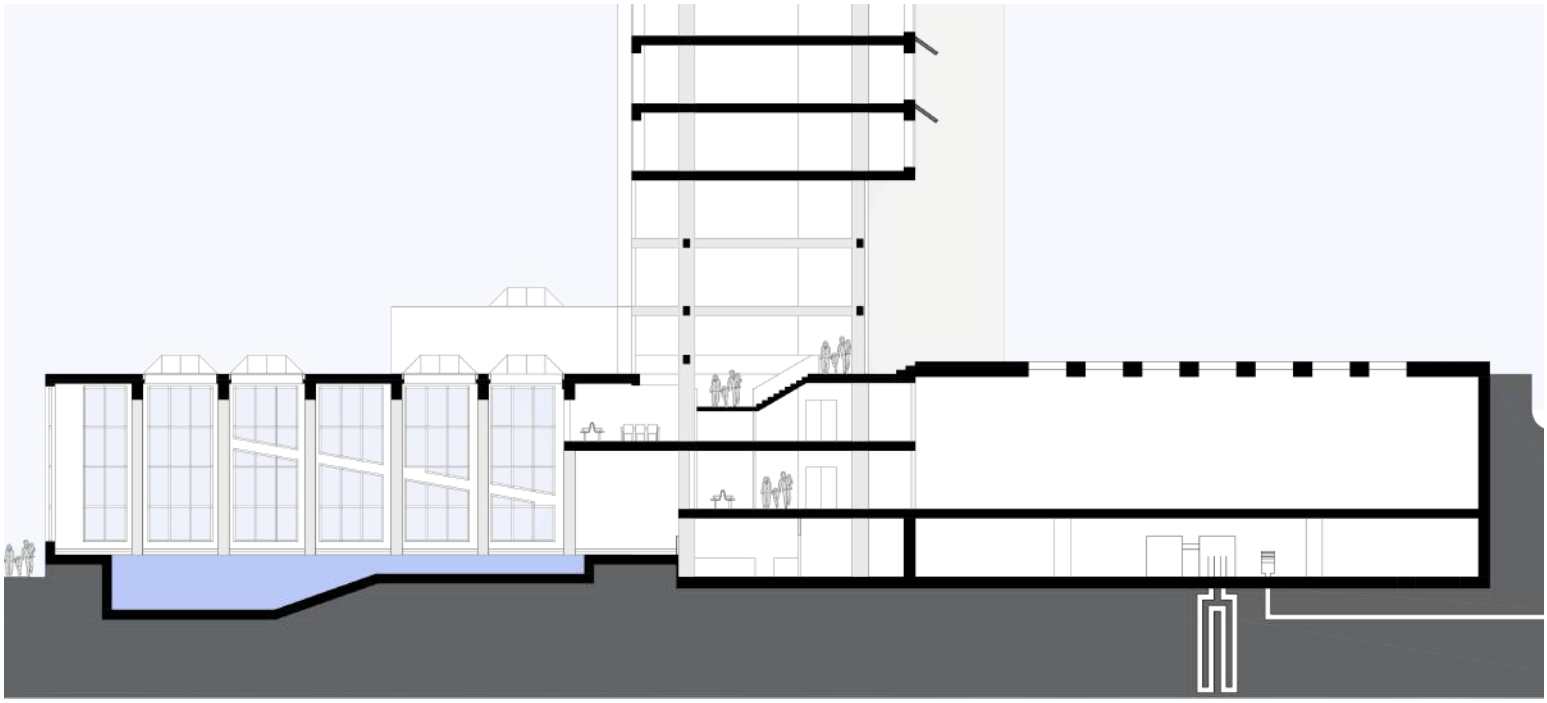


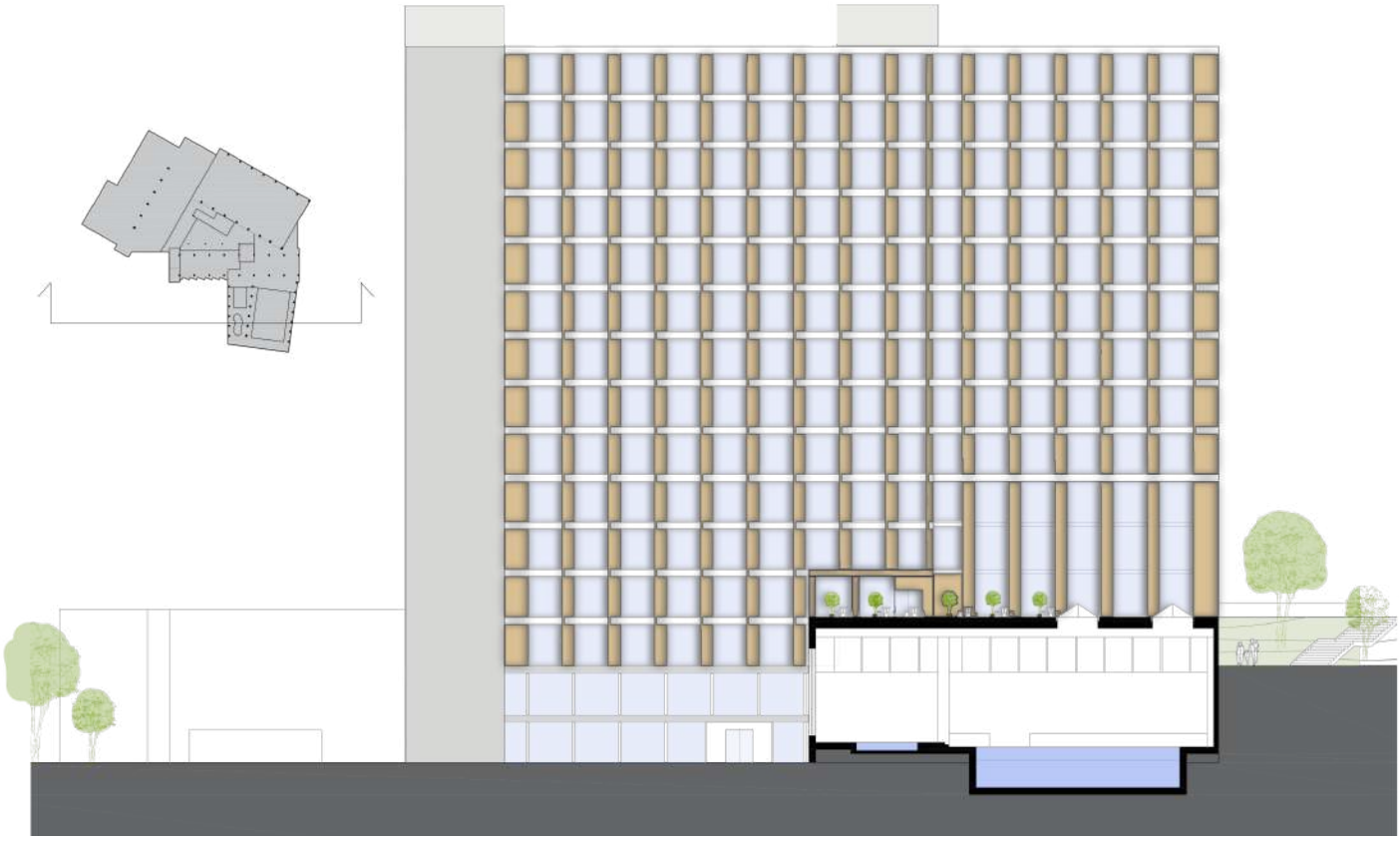




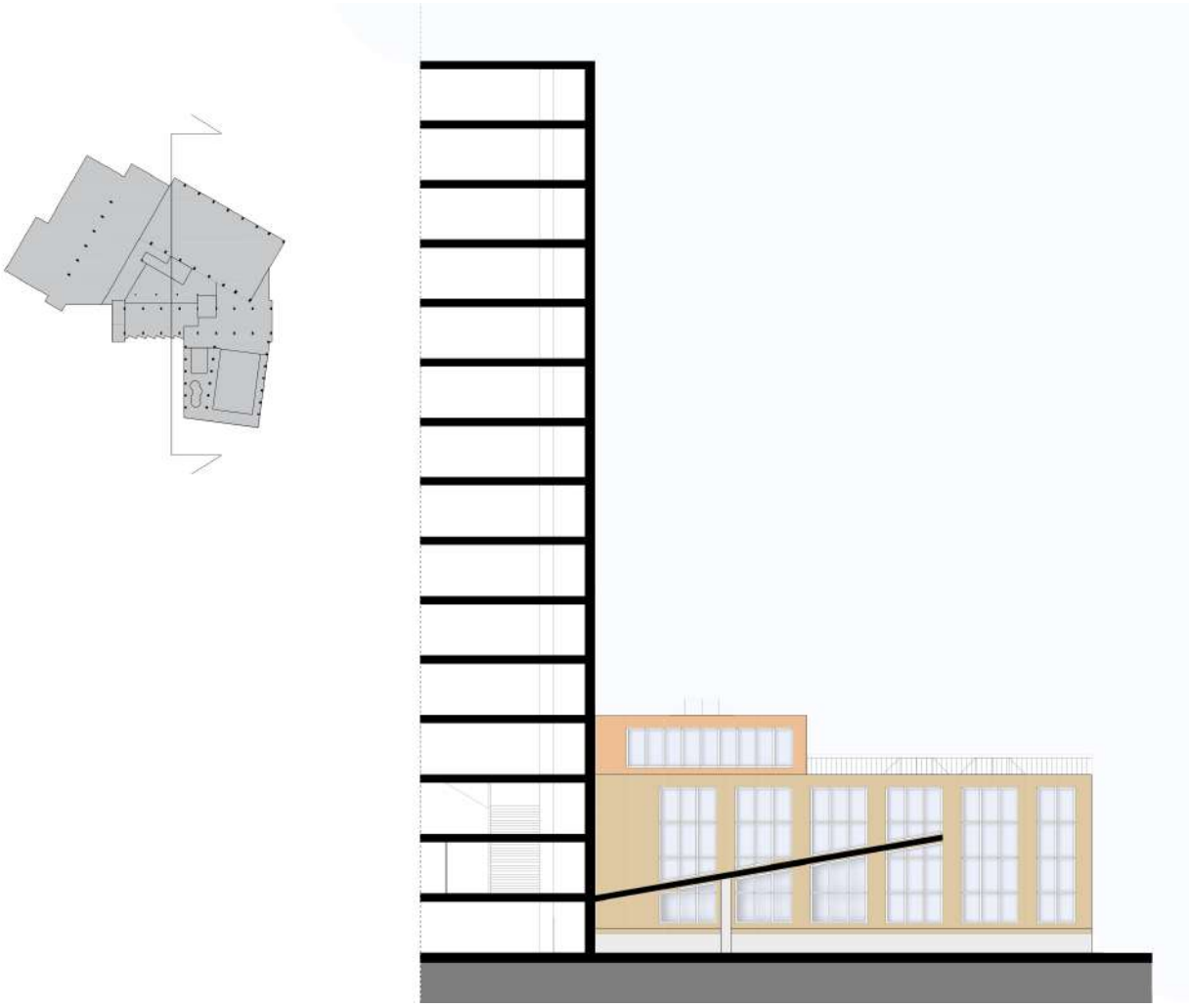
Section through pool and sports hall







Elevation of tower building



Elevation of tower building

SUSTAINABLE ARCHITETURE DESIGN STUDIO, MA-1

BRUFACE - ULB + VUB - 2020/2021