ARCHITECTURE STUDENT CONTEST

Warsaw 2022

17th edition

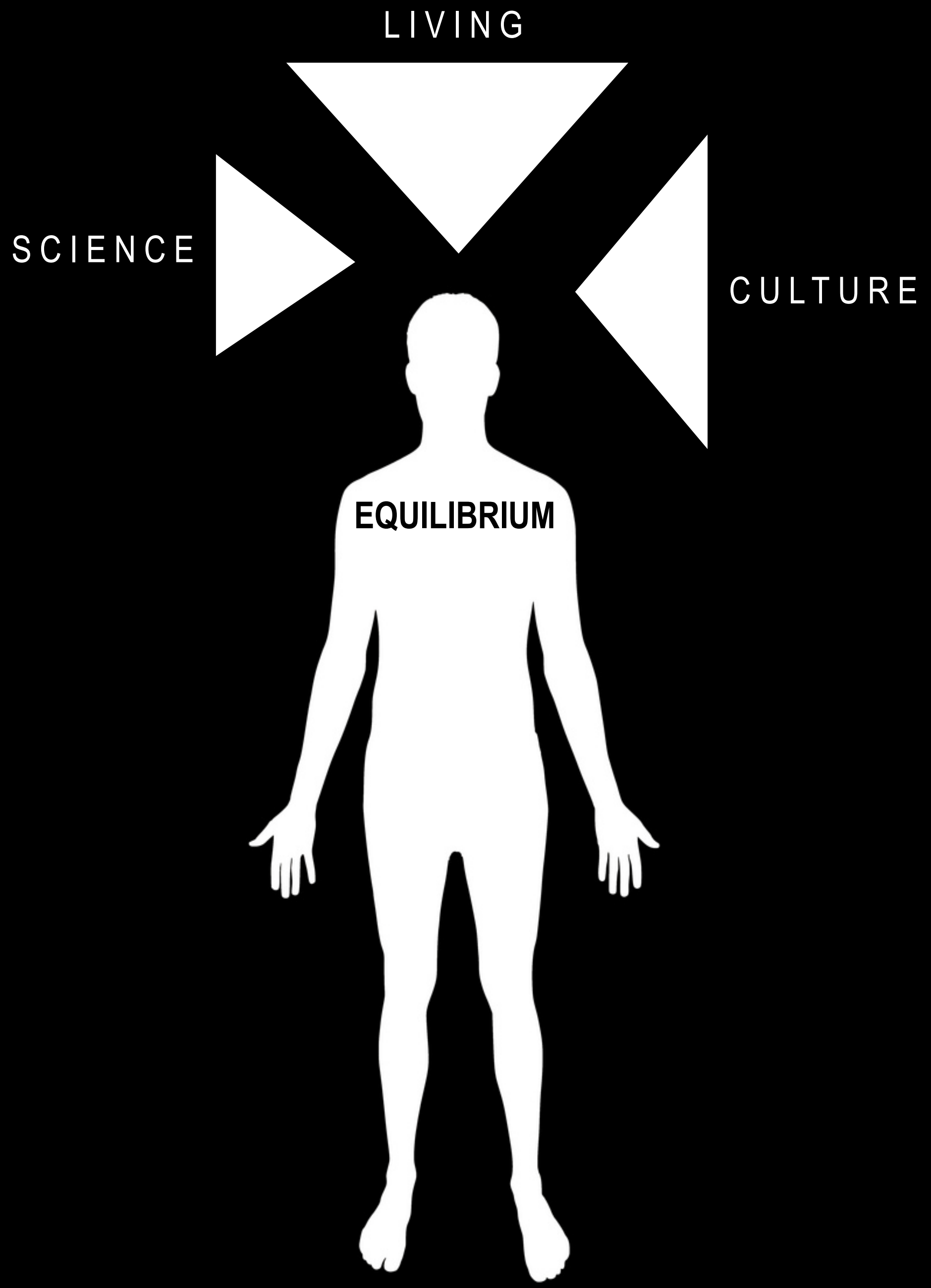
SAINT-GOBAIN

WARSAW

EQUILIBRIUM

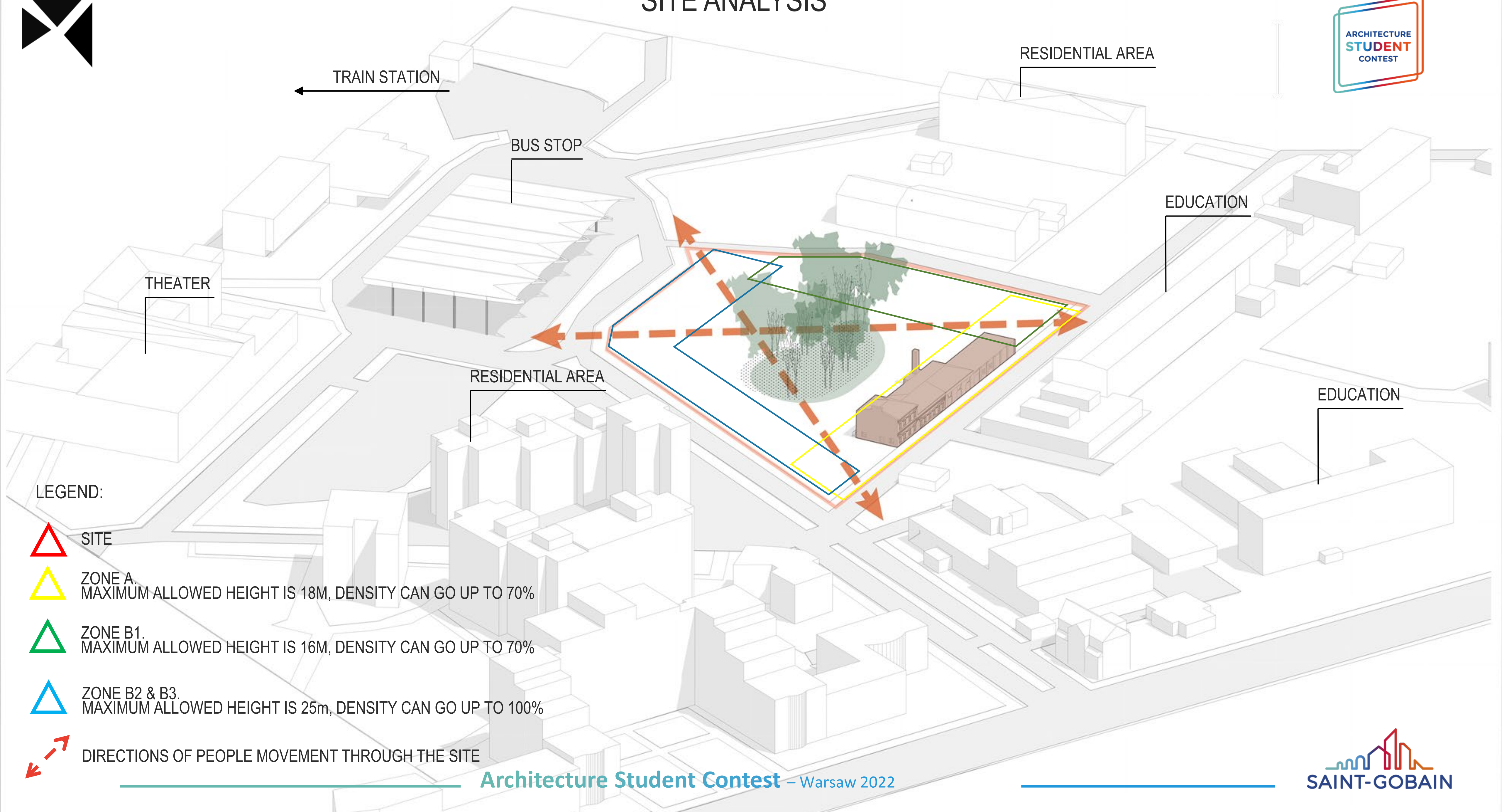
VILNIUS ACADEMY OF ARTS
KAUNAS FACULTY

34 (Team 1) STUDENT GABRIELĖ IBĖNAITĖ, PROFFESOR JONAS AUDĖJAITIS



,,THE PERSON WHO IS DEVELOPING FREELY AND NATURALLY ARRIVES AT A SPIRITUAL EQUILIBRIUM IN WHICH HE IS MASTER OF HIS ACTIONS, JUST AS ONE WHO HAS ACQUIRED PHYSICAL POISE CAN MOVE FREELY''
-MARIA MONTESSORI

SITE ANALYSIS



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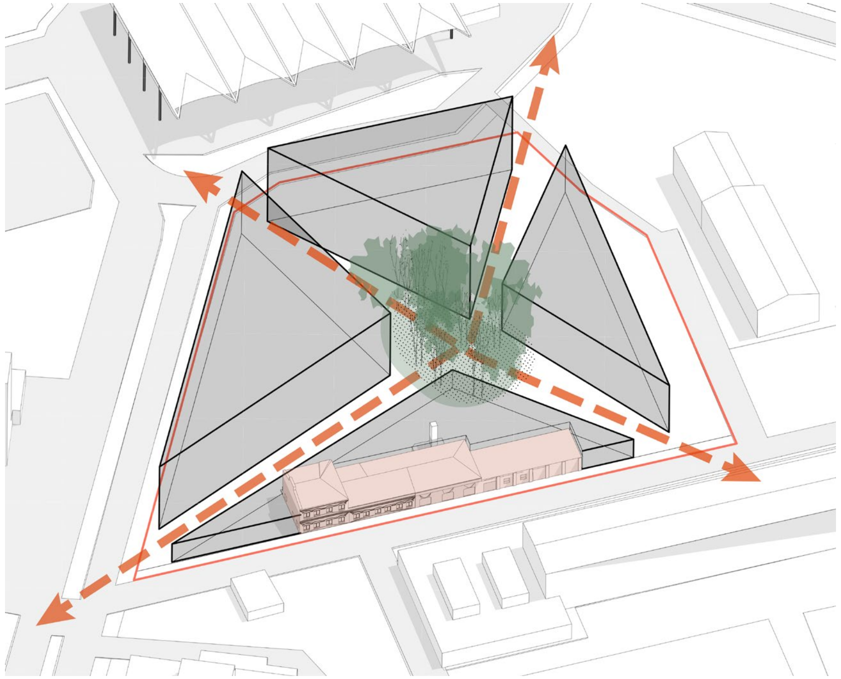
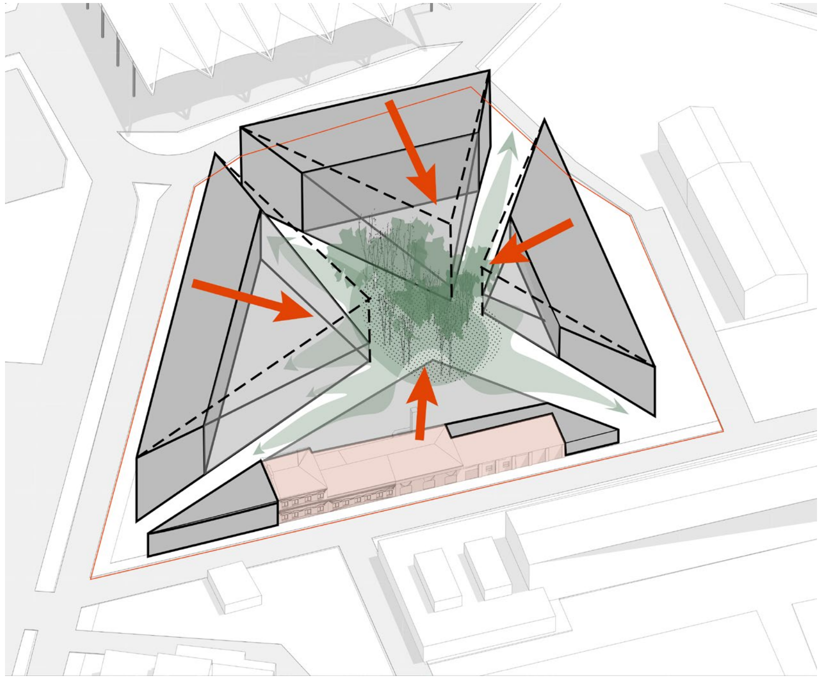
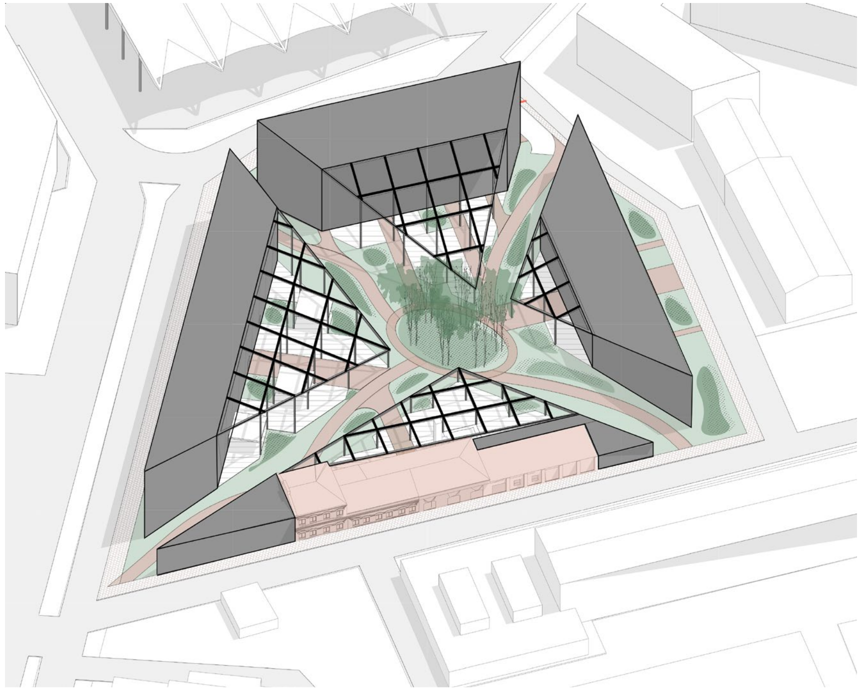
MAIN IDEA



According to the directions of people moving through the site we formed three new volumes and one annex volume next to the old factory building.



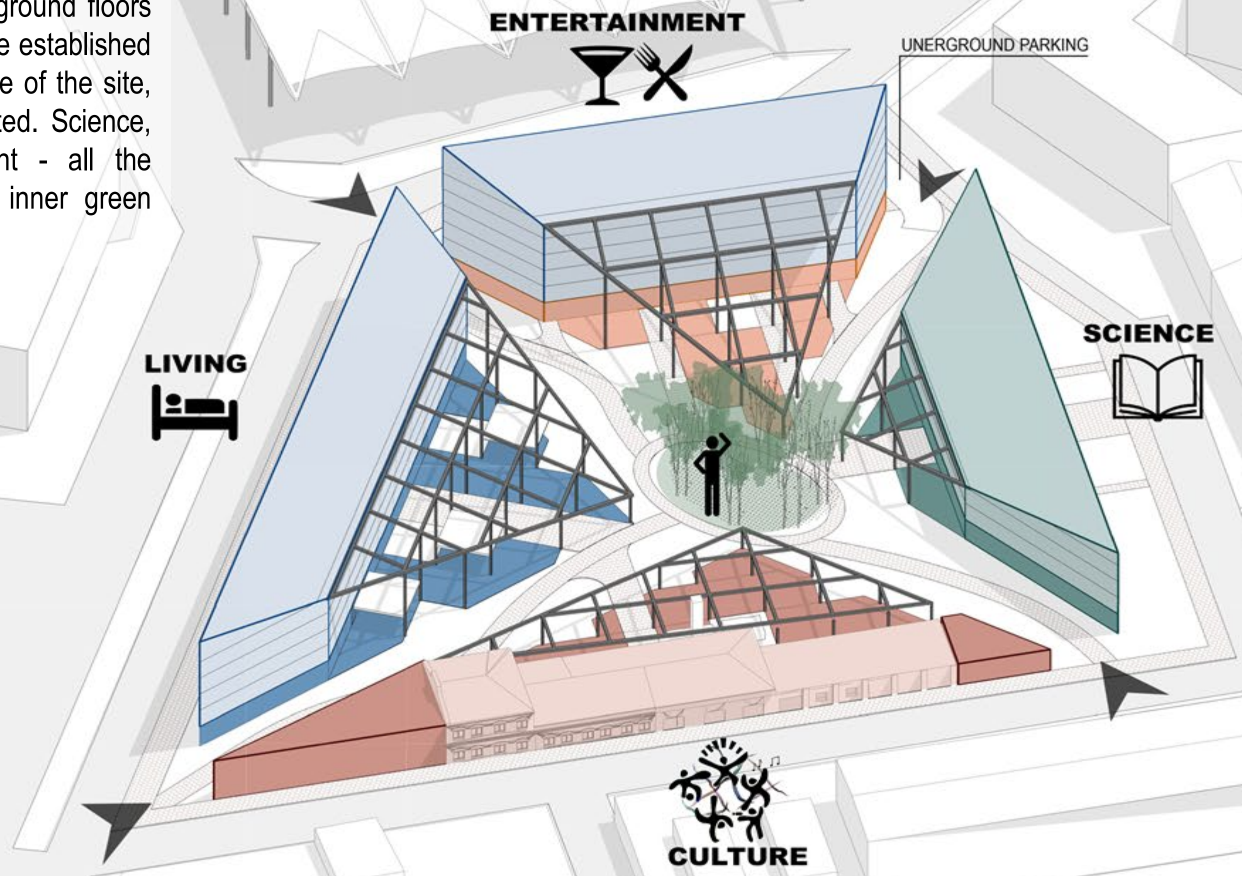
We are saving green area in the site in which way it flows into the architecture, so the inner sides of the buildings naturally forms into outdoor terraces.



Three buildings with sloping roofs and industrial character fill the site perimeter and open corners with three differently decorated terraces allow you to admire architectural heritage – historical factory.

FUNCTIONAL ZONING

The differently decorated terraces of the ground floors of the buildings where various functions are established merge into one common part in the middle of the site, where a central path intersection is created. Science, culture, living, leisure and entertainment - all the activities interconnect organically in the inner green area.



ZONE A: Exhibition space near the old factory building

ZONE A: Meeting center in the old factory building

ZONE B1 ground floor: Library

ZONE B1: Multi – family housing

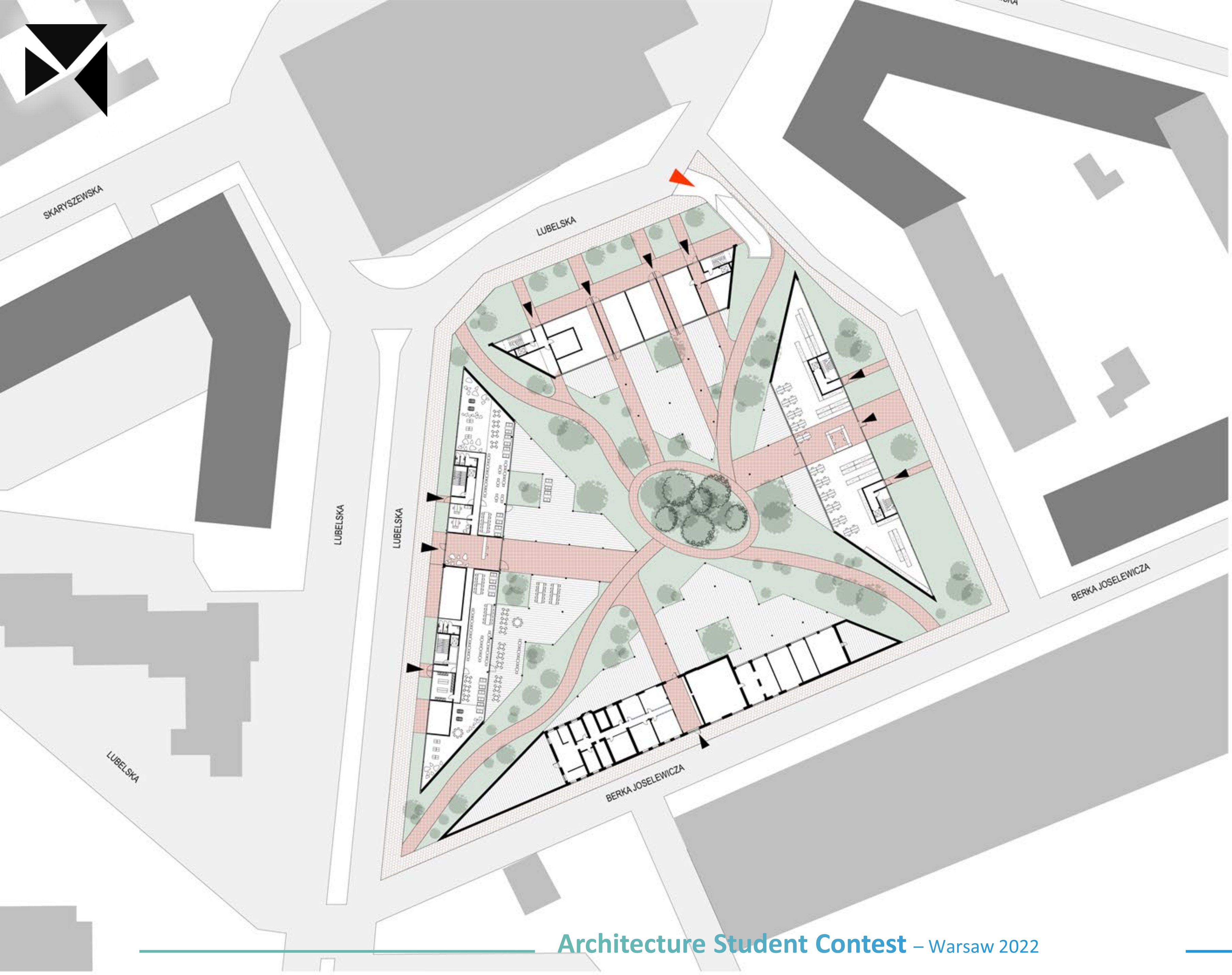
ZONE B2 & B3: Student dormitory rooms

ZONE B2 ground floor: Food zones

ZONE B3 ground floor: Student dormitory shared spaces


EQUILIBRIUM


EQUILIBRIUM



SITE PLAN

ARCHITECTURE STUDENT CONTEST

LEGEND:

- OFFERED BUILDING ARRANGEMENT
- EXISTING SURROUNDINGS
- SITE LIMIT
- ACCESS TO UNDERGROUND PARKING
- ACCESS TO BUILDING
- OUTDOOR TERRACES
- PEDESTRIAN AND BICYCLE TRAILS
- RECREATIONAL ZONE LAWN

GENERAL SITE PLOT - 14500 m2

TOTAL AREA OF ALL BUILDINGS - 11673 m2

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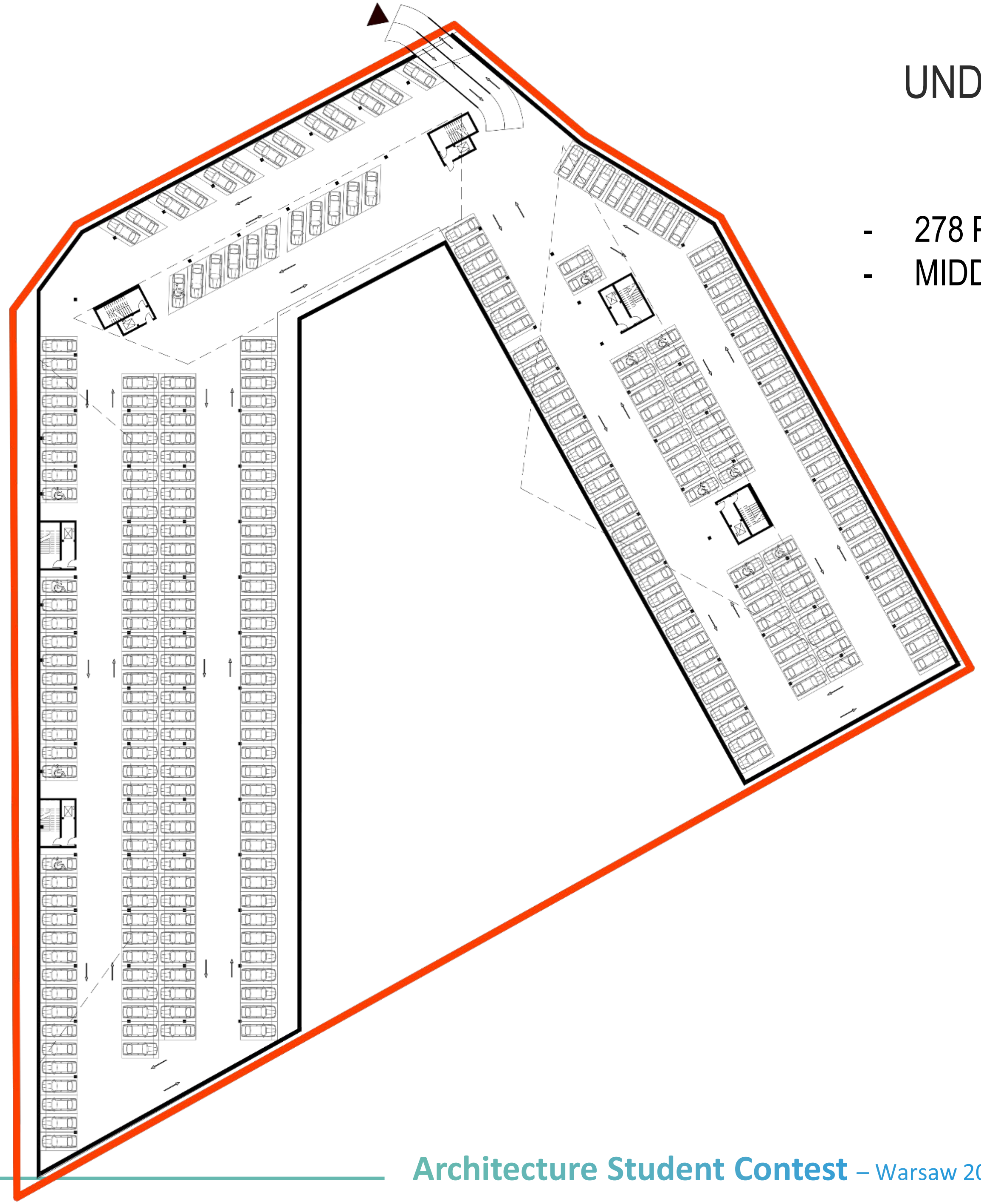
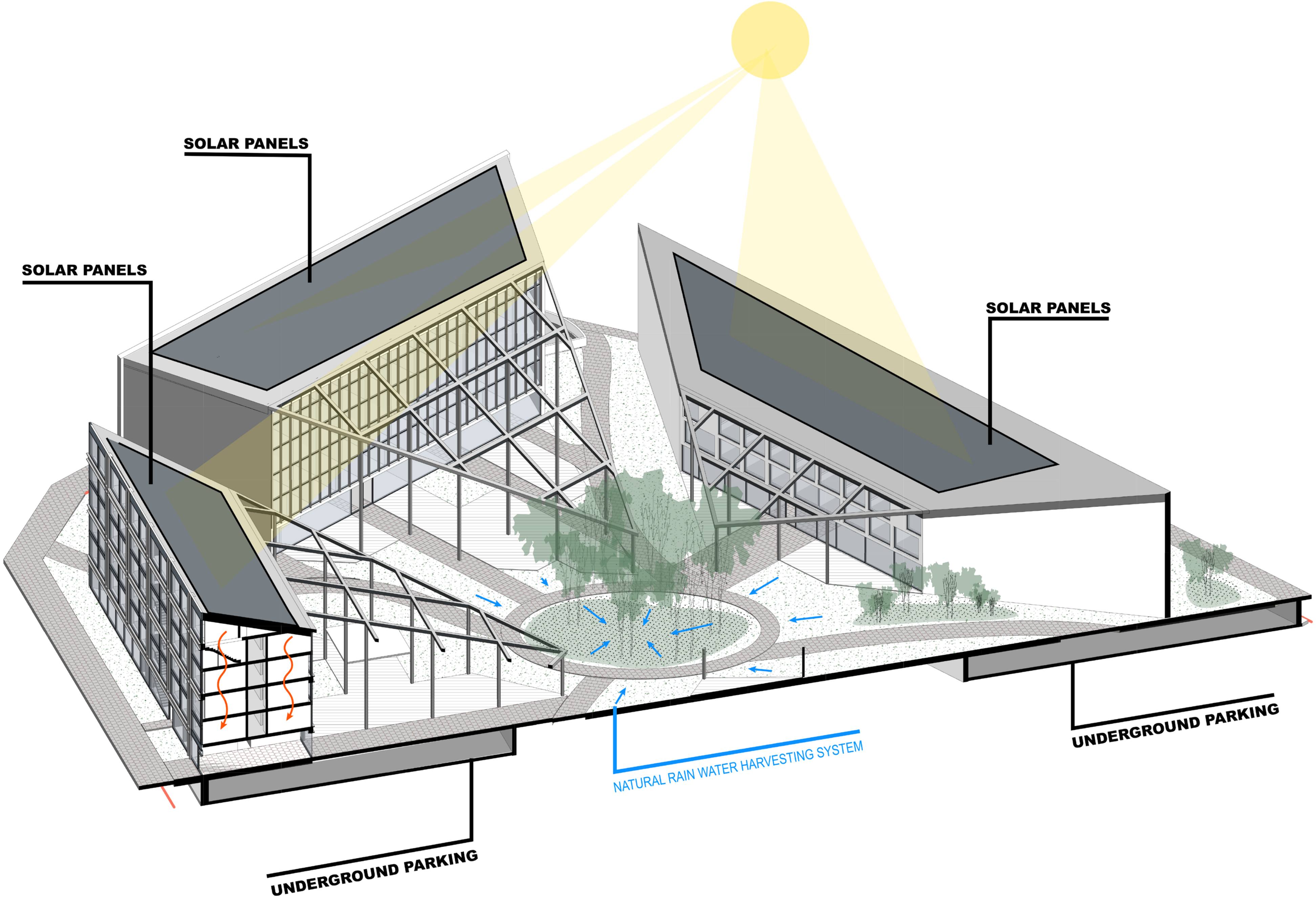
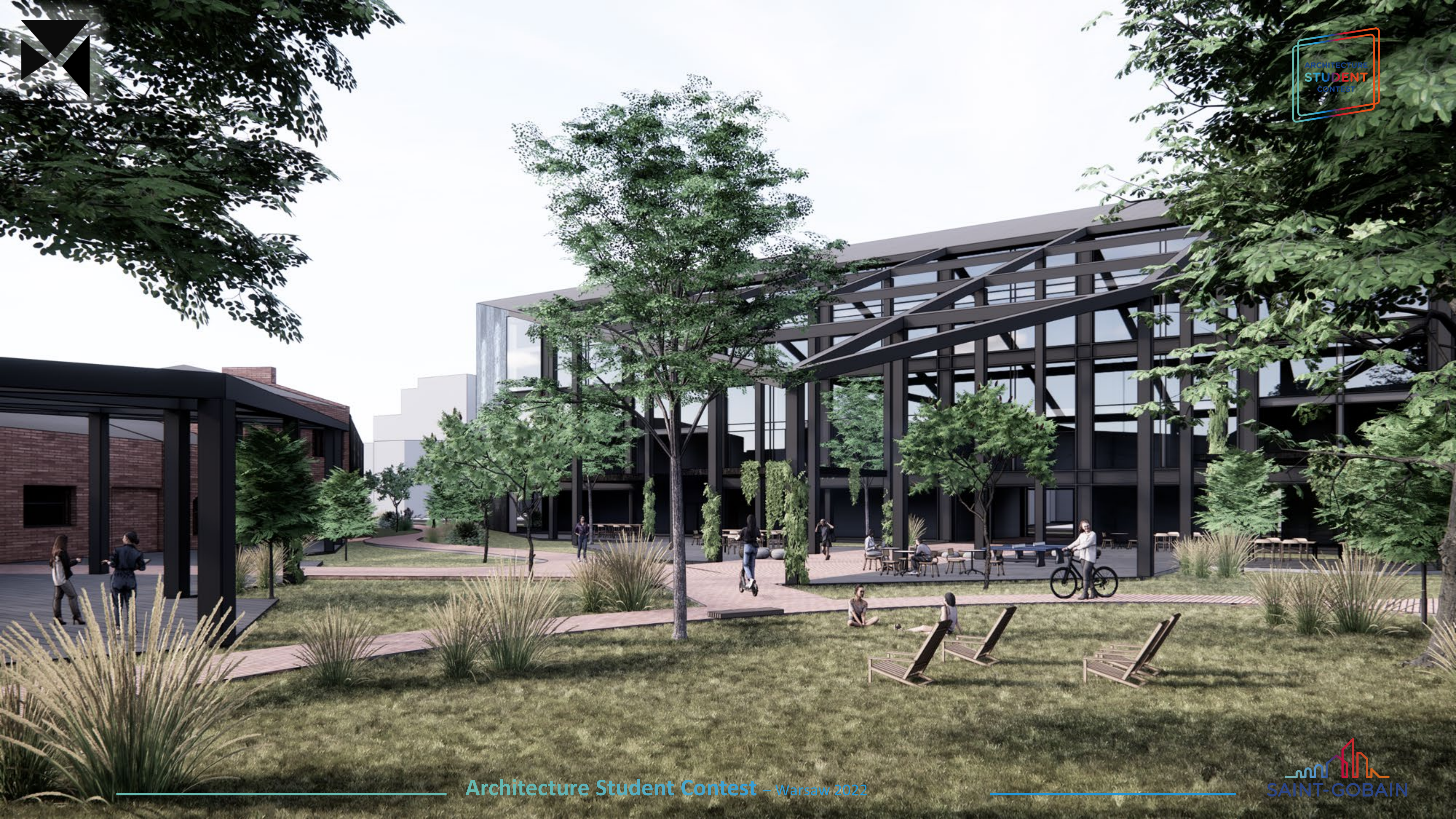
UNDERGROUND PARKING



- 278 PARKING PLACES;
- MIDDLE AREA ARE SAVED FOR OLD TREES GROWING IN SITE


SOLAR PANELS
SOLAR PANELS
SOLAR PANELS
NATURAL RAIN WATER HARVESTING SYSTEM
UNDERGROUND PARKING
UNDERGROUND PARKING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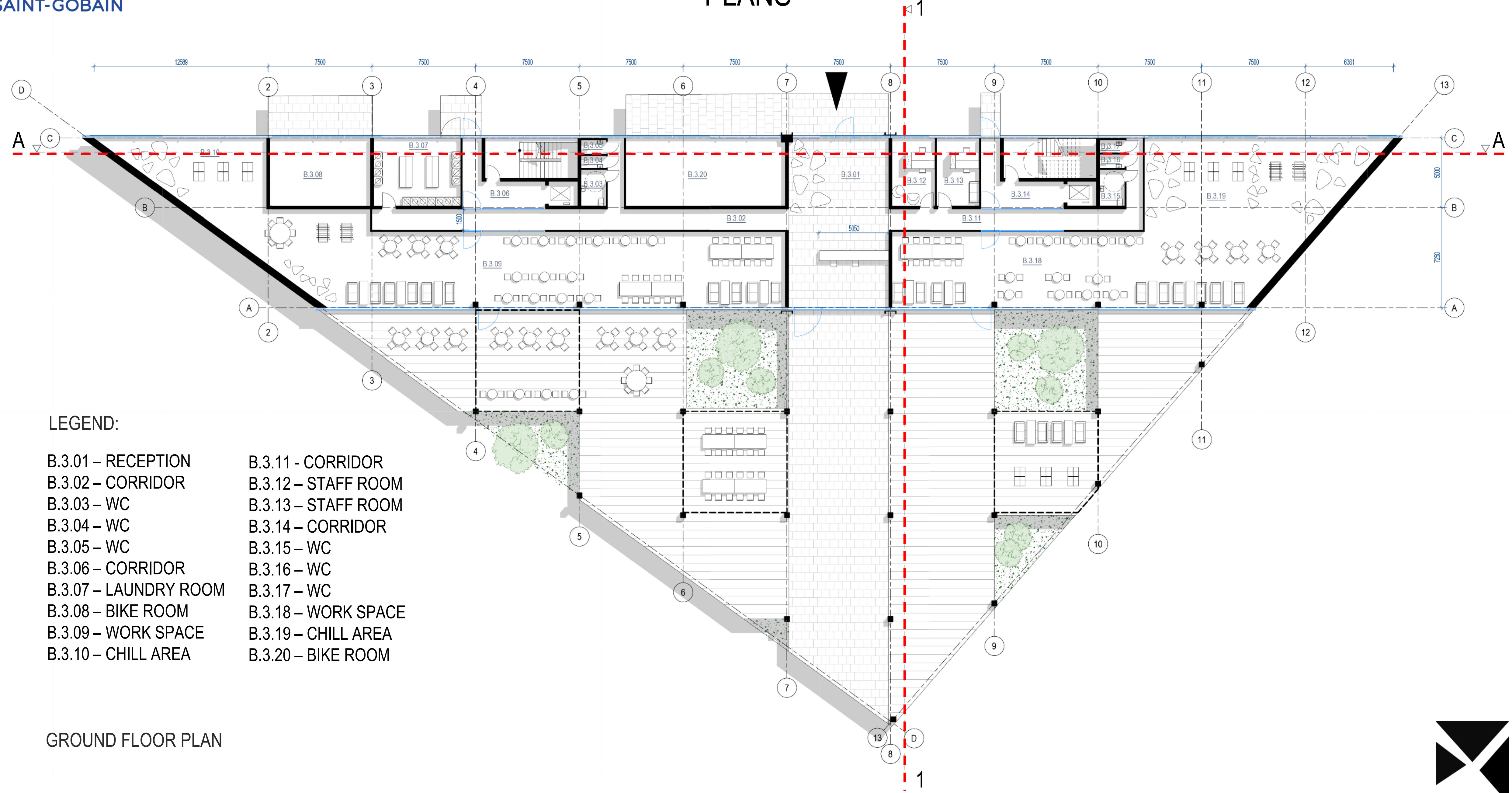
BUILDING IN ZONE B.3 DETALIZATION

PLANS

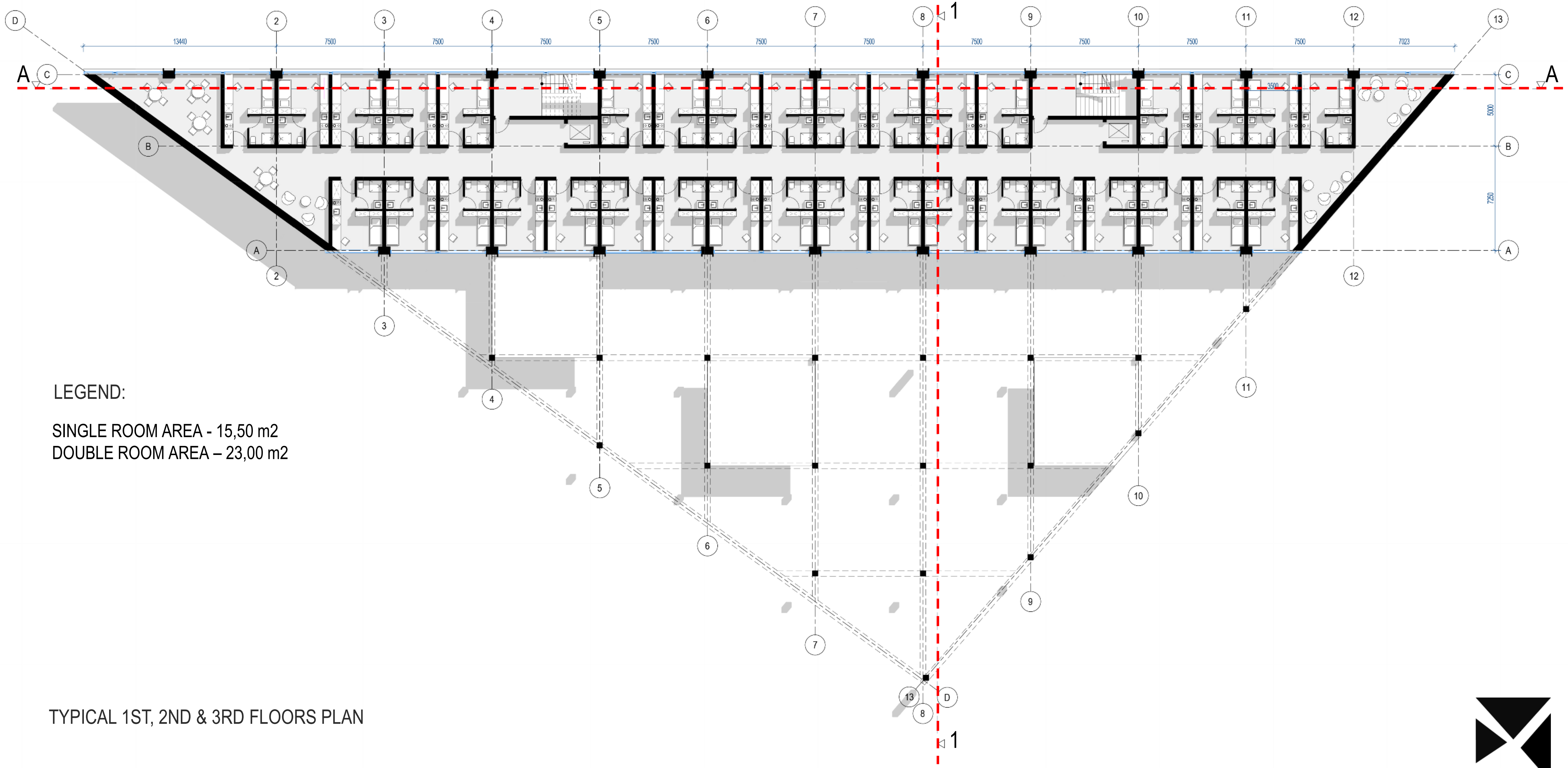


LEGEND:

B.3.01 – RECEPTION
B.3.02 – CORRIDOR
B.3.03 – WC
B.3.04 – WC
B.3.05 – WC
B.3.06 – CORRIDOR
B.3.07 – LAUNDRY ROOM
B.3.08 – BIKE ROOM
B.3.09 – WORK SPACE
B.3.10 – CHILL AREA
B.3.11 - CORRIDOR
B.3.12 – STAFF ROOM
B.3.13 – STAFF ROOM
B.3.14 – CORRIDOR
B.3.15 – WC
B.3.16 – WC
B.3.17 – WC
B.3.18 – WORK SPACE
B.3.19 – CHILL AREA
B.3.20 – BIKE ROOM

GROUND FLOOR PLAN

PLANS

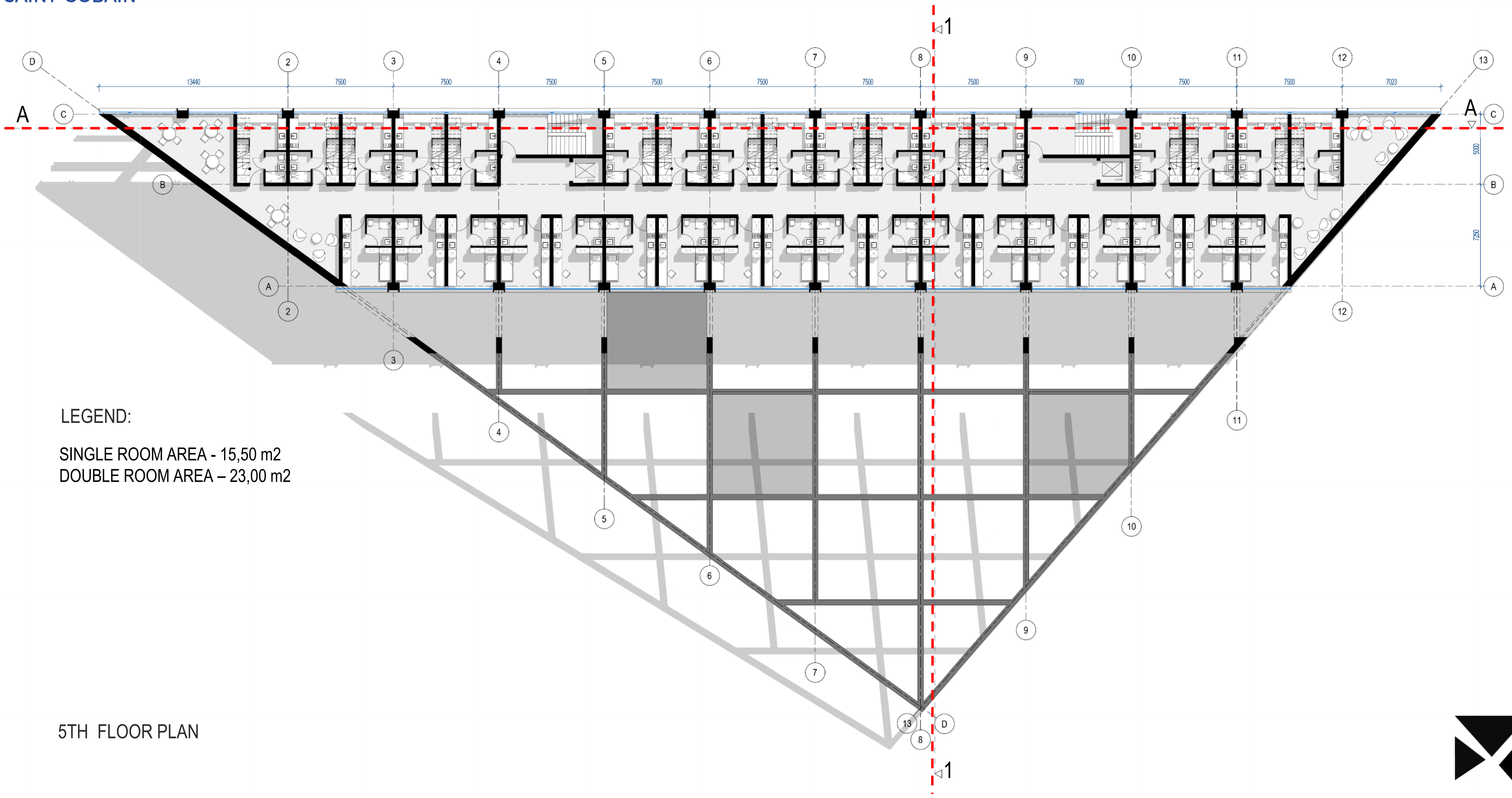


LEGEND:

SINGLE ROOM AREA - 15,50 m2
DOUBLE ROOM AREA – 23,00 m2

TYPICAL 1ST, 2ND & 3RD FLOORS PLAN

PLANS

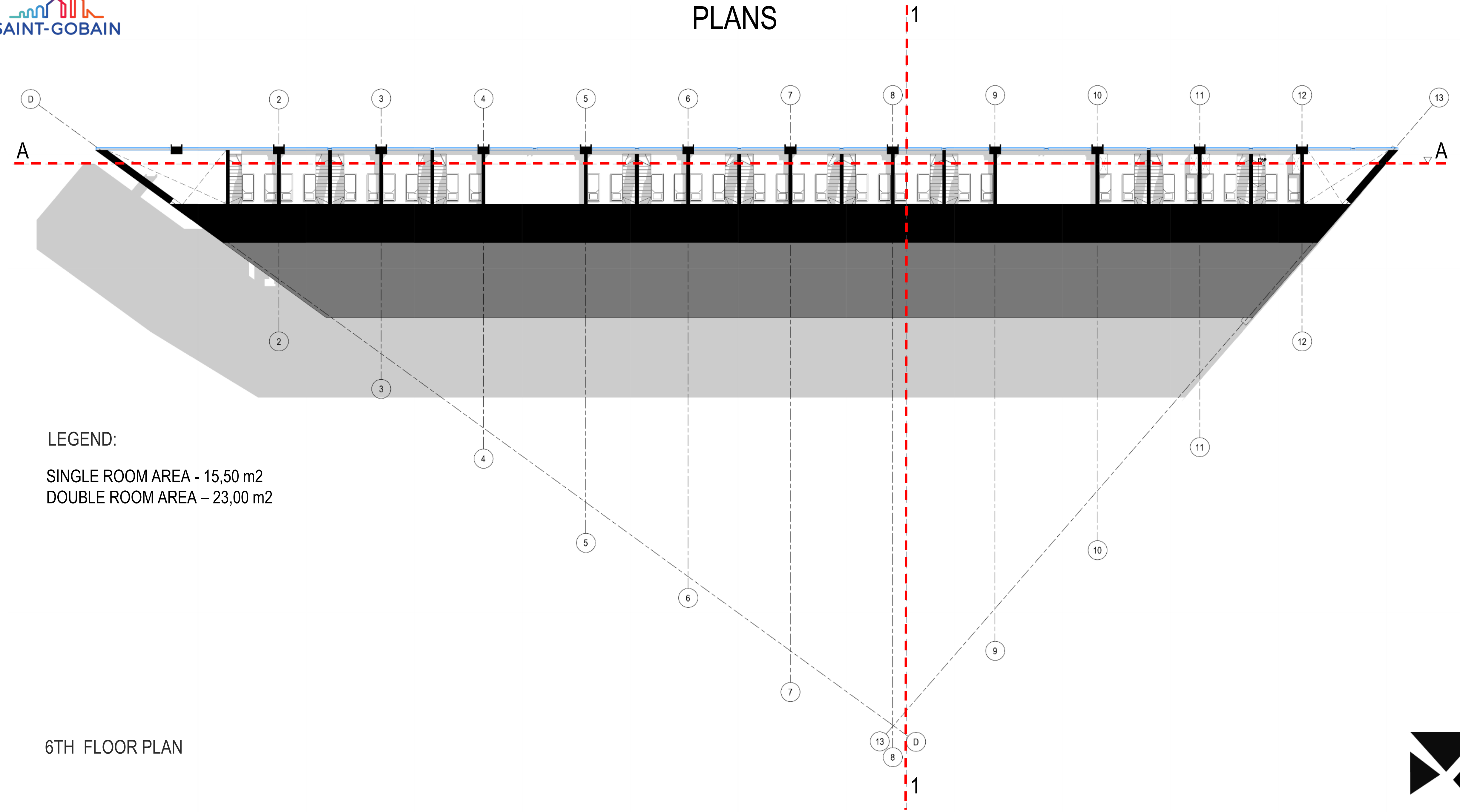


LEGEND:

SINGLE ROOM AREA - 15,50 m2
DOUBLE ROOM AREA – 23,00 m2

5TH FLOOR PLAN

PLANS

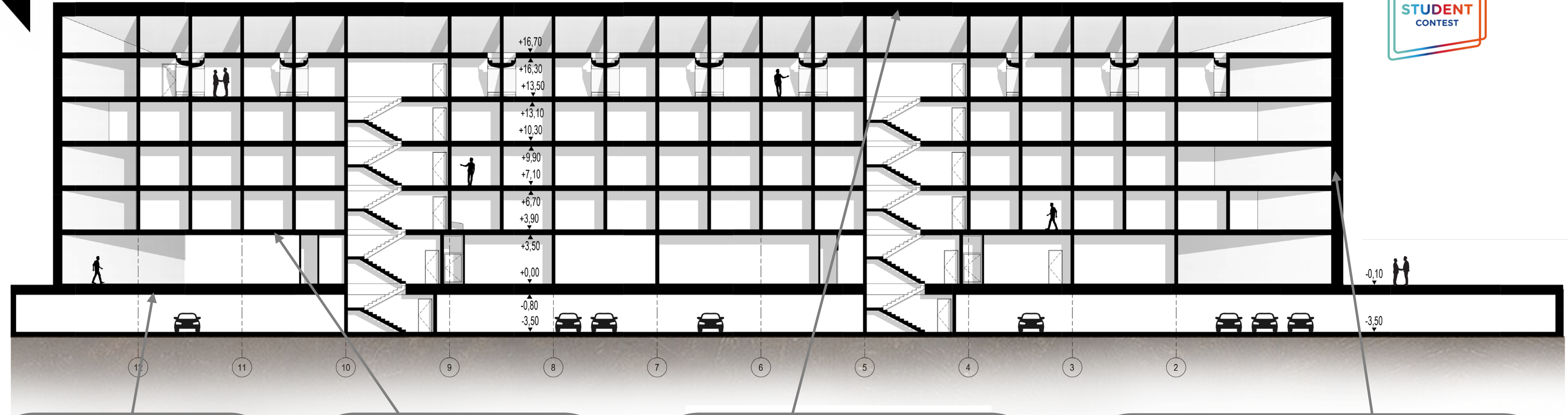


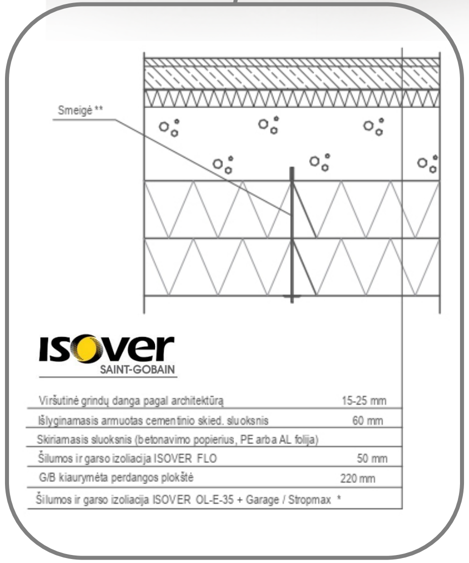
LEGEND:

SINGLE ROOM AREA - 15,50 m2
DOUBLE ROOM AREA – 23,00 m2

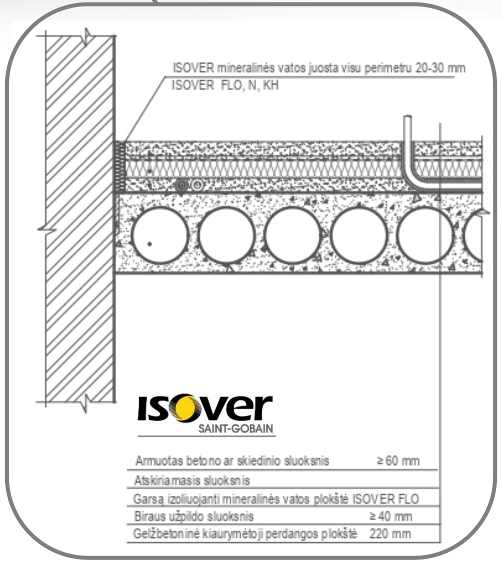
6TH FLOOR PLAN

LONGITUDINAL SECTION A-A WITH DETAILS

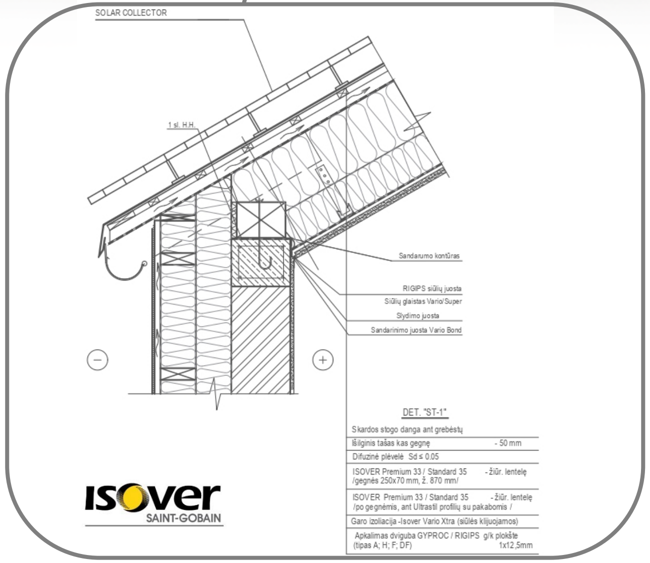




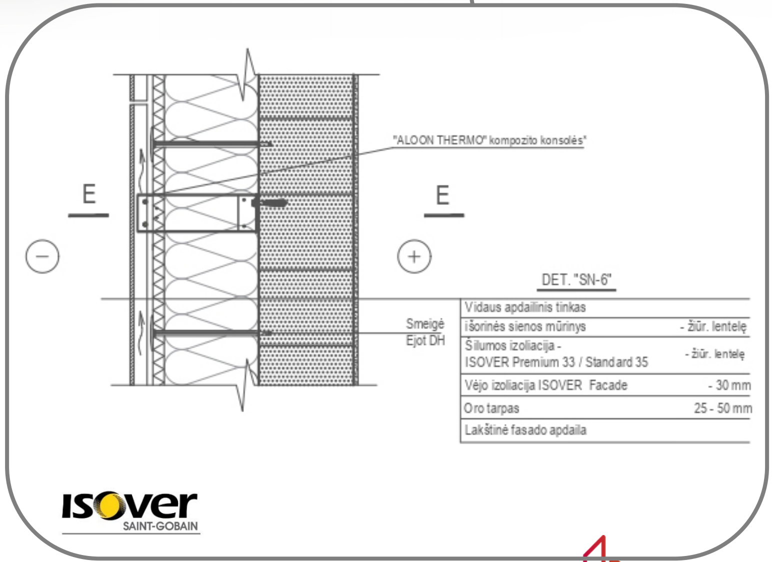
SLAB AGAINST UNHEATED CELLAR DETAIL



SLAB AGAINST HEATED ZONE DETAIL

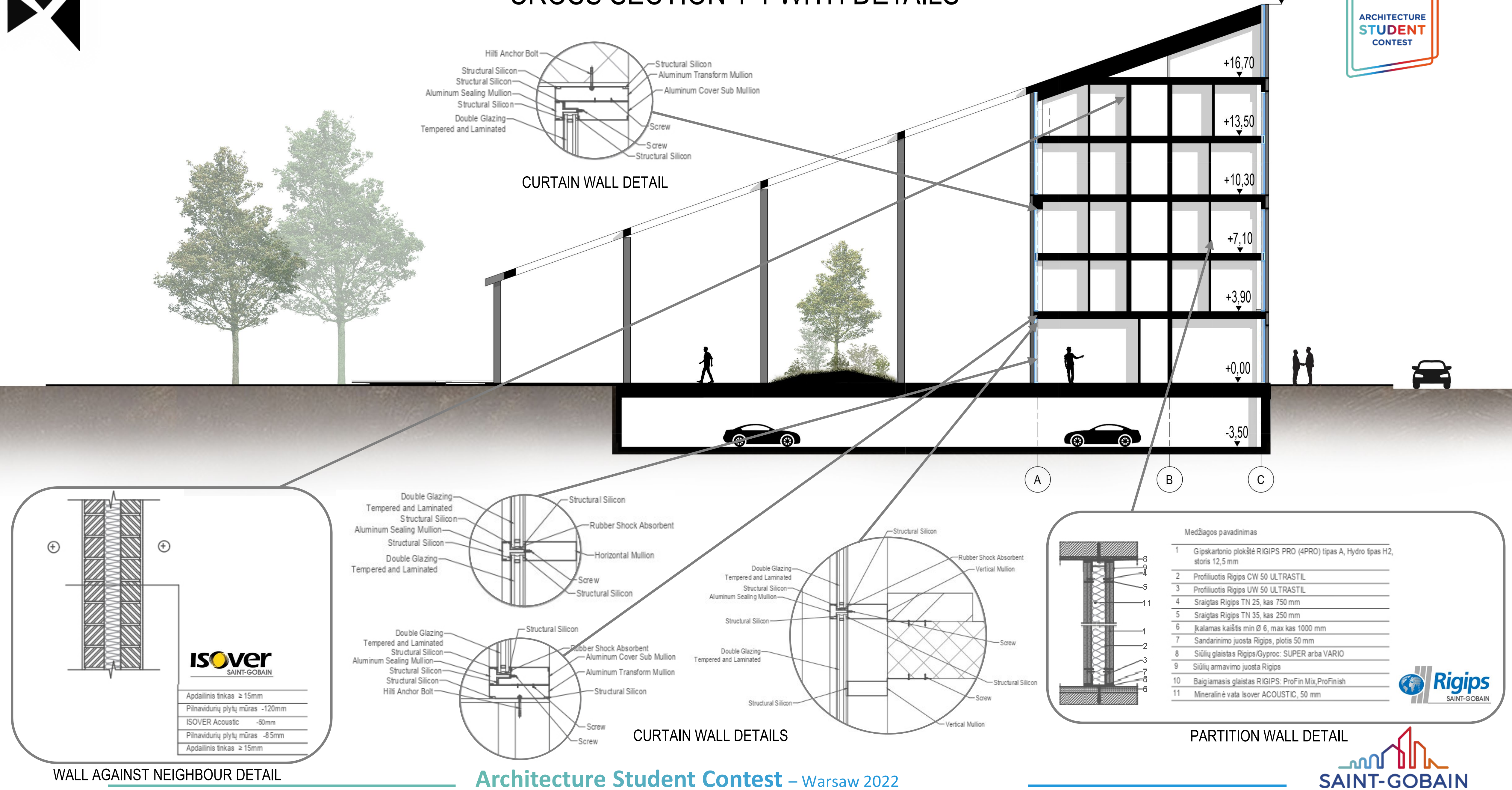


ROOF WITH SOLAR COLLECTOR DETAIL



WALL AGAINST AIR DETAIL

CROSS SECTION 1-1 WITH DETAILS



Apdailinis tinkas ≥ 15mm
Pilnavidurių plytų mūras -120mm
ISOVER Acoustic -50mm
Pilnavidurių plytų mūras -85mm
Apdailinis tinkas ≥ 15mm

	Medžiagos pavadinimas
1	Gipskartonio plokštė RIGIPS PRO (4PRO) tipas A, Hydro tipas H2, storis 12,5 mm
2	Profiliuotis Rigips CW 50 ULTRASTIL
3	Profiliuotis Rigips UW 50 ULTRASTIL
4	Sraigtas Rigips TN 25, kas 750 mm
5	Sraigtas Rigips TN 35, kas 250 mm
6	Įkalamas kaištis min Ø 6, max kas 1000 mm
7	Sandarinimo juosta Rigips, plotis 50 mm
8	Siūlių glaistas Rigips/Gyproc: SUPER arba VARIO
9	Siūlių armavimo juosta Rigips
10	Baigiamasis glaistas RIGIPS: ProFin Mix,ProFinish
11	Mineralinė vata Isover ACOUSTIC, 50 mm

ENERGY EFFICIENCY CALCULATIONS

AREAS
SOLID COMPONENTS

- PICHED ROOF/MONO PITCHED

Id: RS01
Length: 886.00 m.
Height: 1.00 m.
Area: 886.00 m2
U – value: 0.12 W/(m2K)

- SLAB AGAINST GROUND

Id: GS01
Length: 886.00 m.
Height: 1.00 m.
Area: 886.00 m2
U – value: 0.10 W/(m2K)

- WALL AGAINST AIR

Id: EW13
Length: 21.50 m.
Height: 17.90 m.
Area: 384.85 m2
U – value: 0.11 W/(m2K)

- WALL AGAINST AIR

Id: EW11
Length: 16.80 m.
Height: 17.90 m.
Area: 300.72 m2
U – value: 0.11 W/(m2K)

- WALL AGAINST AIR

Id: EW12
Length: 67.50 m.
Height: 16.20 m.
Area: 360.41 m2
U – value: 0.11 W/(m2K)

- WALL AGAINST AIR

Id: EW14
Length: 95.90 m.
Height: 20.70 m.
Area: 1041.49 m2
U – value: 0.11 W/(m2K)

AREAS
TRANSPARENT COMPONENTS

- WINDOW

Id: WI56
Length: 3.00 m.
Height: 3.10 m.
Area: 204.60 m2
U – value: 0.73 W/(m2K)

- DOOR

Id: DO03
Length: 0.98 m.
Height: 3.10 m.
Area: 6.08 m2
U – value: 0.80 W/(m2K)

- WINDOW

Id: WI58
Length: 2.30 m.
Height: 3.10 m.
Area: 926.90 m2
U – value: 0.73 W/(m2K)

- DOOR

Id: DO04
Length: 0.73 m.
Height: 3.10 m.
Area: 9.05 m2
U – value: 0.80 W/(m2K)

- WINDOW

Id: WI38
Length: 2.30 m.
Height: 3.10 m.
Area: 513.36 m2
U – value: 0.73 W/(m2K)

- DOOR

Id: DO05
Length: 1.35 m.
Height: 3.10 m.
Area: 16.74 m2
U – value: 0.80 W/(m2K)

QUALITY
AIRTIGHTNESS

AIRTIGHTNESS RATE: 1.50

QUALITY
THERMAL BRIDGES

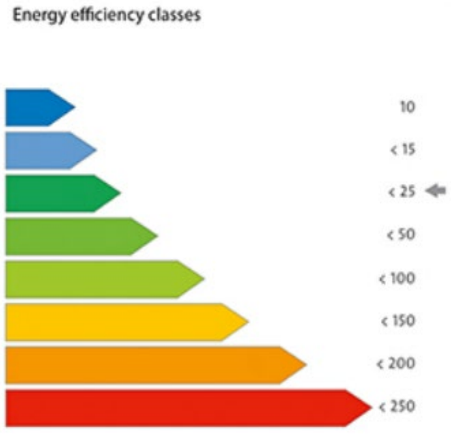
THERMAL BRIDGE – FREE: YES

QUALITY
SHADING

HORIZONTAL° : 0.70
45° : 0.70
135° : 0.70
225° : 0.70
315° : 0.70

CALCULATIONS
SPECIFIC HEAT DEMAND

Transmission Heat Losses: 147343.56 kWh/a
Ventilation Heat Losses: 113909.85 kWh/a
Total Heat Losses: 261253.40 kWh/a
Internal Heat Gains: 56836.79 kWh/a
Solar Heat Gains: 97238.32 kWh/a
Total Heat Gains: 149367.52 kWh/a
Annual Heat Demand: 111885.89 kWh/a
Specific Heat Demand: 21.63 kWh/(m2a)

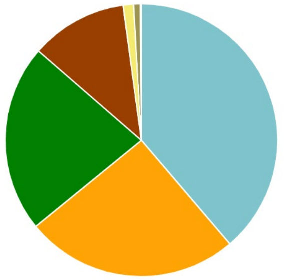


CALCULATIONS
OVERHEATING

Exterior Thermal Transmittance: 1562.18 W/K
Ground Thermal Transmittance: 44.30 W/K
Ventilation Transmittion Ambient: 2446.14 W/K
Ventilation Transmission Ground: 0.00 W/K
Solar Aperture: 614.69 m2
Frequency of Overheating: 31.28 %

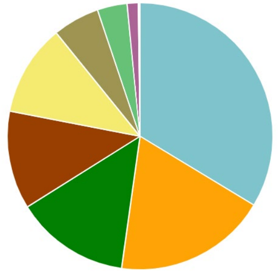
A WHOLE LIFE CARBON CALCULATIONS

Global warming t CO2e - Classifications

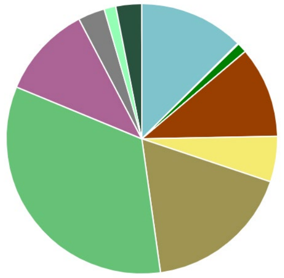


Global warming t CO2e - Resource types

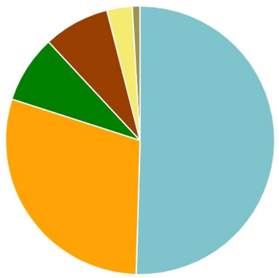
This is a drilldown chart. Click on the chart to view details



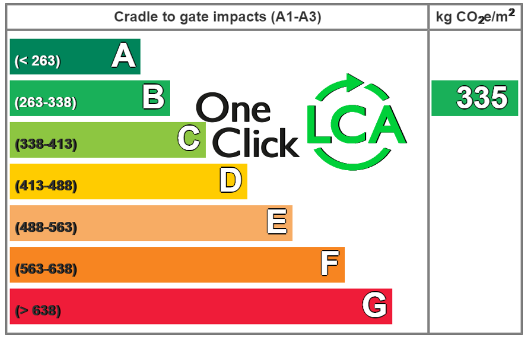
Global warming t CO2e - Life-cycle stages

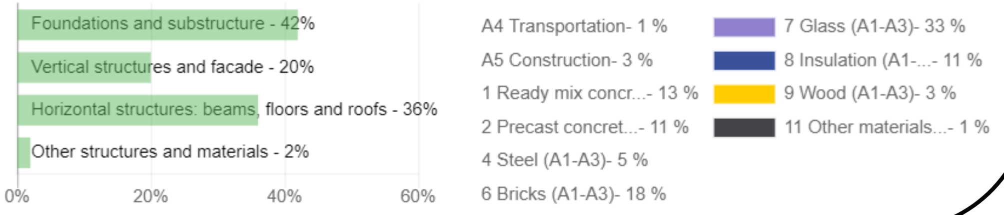


Mass kg - Classifications



A whole life carbon calculation is made using the OneClick'LCA tool. We achieved cradle to gate impact B. Foundations, substructure and horizontal structure had similar embodied carbon. Glass material had most impact on embodied carbon by life-cycle stage because of curtain wall area in our buildings. Pie charts represent our complex situation in a context of life-cycle of global warming.





On purpose to reduce CO2 emissions as much as possible we have chosen to reuse all materials which are suitable for reusing or have recycled components in its composition. We select trusted and responsible companies and manufacturers who are dependable on eco-friendly low-carbon emission constructions and materials. To optimize resource efficiency and minimize construction waste we are taking up strategy of using local production from local companies and manufacturers – it is reducing transportation CO2 emissions. All students single and double units are modular elements therefore there are options to apply more prefabricated constructions and economize energy and material consumption.

DESCRIPTION OF THE DESIGN CONCEPT

Design concept and functional solution

The building complex consists of three main residential buildings and an existing architectural heritage building - a historic factory. It is important to create a new functional and comfortable architecture, preserving and emphasizing the old building reminiscent of the past and the existing trees, so the courtyard of the complex is formed as the main axis. The perimeter building fills the site, but open corners are formed in the inner yard - the terraces allow you to see the old factory from all sides as a road destination. The differently decorated terraces and the first floors of the buildings merge into one common part in the middle of the site, where a central square is created. Different functions are established on the ground floors: science, culture, living, leisure and entertainment - they merge into a central green area where existing trees are preserved.
The architectural idea of the complex stems from the industrial character of Kamionek district and the abundance of green areas in the surrounding territory, so two main aspects ought to be distinguished. Firstly, the architecture is shaped by industrial character: U-shaped metal beams are used, the network and structure of the clearly separated room modules and columns, the perimeter construction and high height fits to the landscape of the surrounding apartment buildings and create a strict urban atmosphere. Another aspect that needs to be emphasized is the harmony of nature and architecture and the merging of the "old-new" into a whole: going deep into the territory, the new architecture merges with the existing greenery, thus blurring the clear line between history and the present.
It is important to emphasize that all three buildings of the complex with sloping roofs, rotating according to the global compass of the world and the boundary of the site, allow efficient use of the solar collectors installed in the roofs, which produce most of the energy consumed by the buildings.

Low carbon energy supply

Low carbon energy supply strategy is completed by installing solar thermal collectors on pitched roofs of all three complex buildings. Solar energy efficiency is obtained by orientation of roofs of the houses – they are sloping on the courtyard, gaining solar power from S, SW, SE, E and W sides. We are expecting that photovoltaic solar thermal collectors are enough for overall energy need of the building. For water and whole heating and cooling of the buildings we have chosen heat pumps which gain natural energy from the ground, the ground water or the air, processes it through a thermodynamic cycle and distributes the result to systems.

Strategy to achieve low embodied carbon construction

To achieve low embodied carbon construction, we are reusing all materials which are suitable for reusing – remelted metal, red bricks for staircases. We choose trusted and responsible companies and manufacturers who are dependable on eco-friendly low-carbon emission constructions and materials which are used in a whole process of production. Some building constructions can be adjusted when the needs are changing and all systems are convienient to repair, maintain and replace when needed.

Strategy to optimize resource efficiency and minimize construction waste

To optimize resource efficiency and minimize construction waste we are taking up strategy of using local production from local companies and manufacturers – it is reducing transportation energy loss. For some construction such as slabs we use prefabricated elements. All students single and double units are modular elements therefore there are options to apply more prefabricated constructions and economize energy consumption. As mentioned before, we choose reusable construction materials where possible, along with eco-friendly options. Waste which accumulates on building site will be recycled and reused again. For example, concrete can be broken down and recycled as base course for building driveways and footpaths; asphalt paving is crushed and recycled back into new asphalt for paved roads; plywood, flooring, and molding can be reused directly and metal can be melted down and reformed into new metal products.

Strategy to achieve thermal comfort

Thermal comfort is ensured by high-level airtightness and choosing of high-efficiency insulation materials. We use HVAC system which combines heating, cooling, ventilation and many other functions into one scheme, which is easy to use and there is a significant reduction in operating costs in air circulation systems. The warm air in the ceiling is returned to the system. The use of a central irrigation system reduces costs by up to 15%, as increasing the humidity can reduce the room temperature without losing energy. The system has a programmable controller that allows you to set different temperatures at certain times of the day and week. You can quickly change the operating settings of the system. Another advantage is that HVAC system does not interfere with the installation of the interior. Instead of space-consuming heaters - radiators that do not decorate, often block windows, accumulate dust, small, aesthetic air-permeable grilles are installed on the floor and walls or ceiling.

Windows (curtain walls) are installed with polarized film to reduce heat on hot sunny days and blinds with heat protection layer is set up in the interior side of the building thus cooling energy consumption is drastically reduced. In addition, we want to emphasize that air conditioning system is not installed in our buildings as rules do not allow so.

Strategy to achieve acoustic comfort

Acoustic comfort is achieved by making walls against rooms and slabs slightly thicker and installing high-efficiency acoustic materials from reliable manufacturers. We select materials with high Rw values and try to achieve sufficient acoustic comfort level between the rooms of the same flat and neighbor flats. Partition walls are designed in line with requirement of Polish standard on acoustic classes for dwellings, consequently recommended AQ-2 level is achieved. Walls between units and ceiling between floors meets ≥ 56 dB requirements. Taking into consideration that train and bus station is just outside the complex, we chose tight and noise reducing windows in order to insulate the external noise.

Strategy for social comfort, privacy in terms of space and rooms layout, given the pandemic context

Our goal is to ensure high social comfort and privacy in single rooms and double rooms so layout is aware of these problems: every student have their own space to work and rest comfortably in private room with private bathroom and kitchenette. In pandemic context – students can isolate comfortably in their rooms. In addition, there are many common zones to work, spend free time and rest where everyone can choose to socialize or to be alone and concentrate.