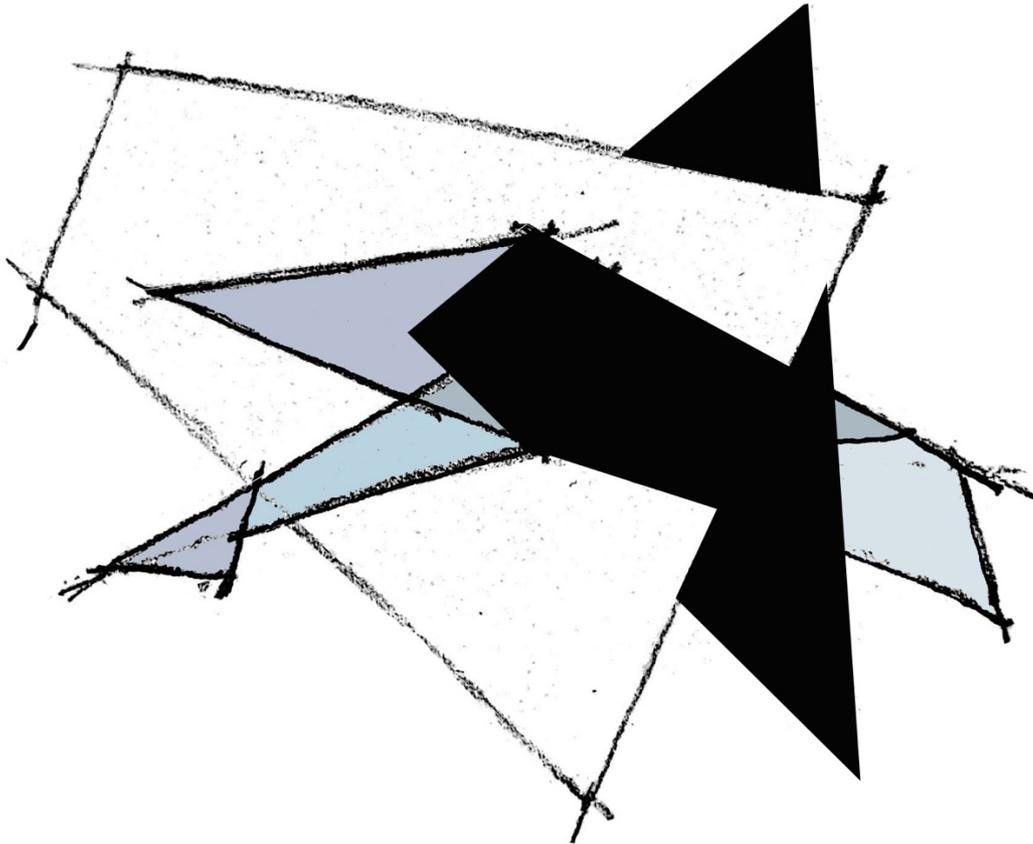


# Merging urban layers

## Budafok Community Gathering



## Construction Management

Budapest University of Technology and Economics

Diploma – Department of Urban Planning and Design

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Budapest, 15/06/2020

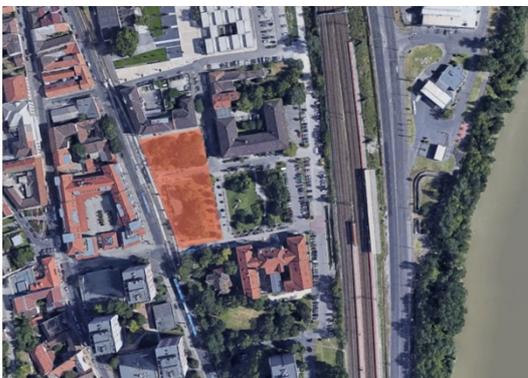
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## 1. General information about the plot:

The plot used for this urban and architectural proposition is located in the XXII district, in the Városház Square, located between the buildings of the Hungarian Post Office - Budafok, the former mayor's house, the Police of the XXI district and the City Hall. This can be considered an important civic center for the region, in addition, this is also a central hub from the perspective of traffic and public transport lines. The square is bounded on the left by Mária Terézia street and on the right by two important connecting axes: the train line and highway number 6.

geographically, the area is located in a narrow position, between the high relief and the Danube river and is cut by important lines of urban mobility. From a social and historical perspective, this area has relevant importance, especially in relation to the production of wine. Many family businesses focused on this economic activity are still located in Budafok. The surroundings of the Városház Square are currently an area of intense trade and high flow of people.



Top view from the plot



View from the plot

## 2. Climate and microclimate

The climate of Hungary is considered European continental, with warm and dry summers and relatively cold winters. The average temperature in Hungary is 8°C to 11 °C, however the average temperatures can go from -4°C in January to 28°C in July - Based on weather reports collected during 1985–2015.

It is important to emphasize that the local microclimate is influenced by the physical conditions of the surroundings. This is not a densely built area, although it is an area of urban centrality, which influences energy gain and heat buildup, a relevant factor

especially in the summer. The building is also in a special situation, since it is located in the right in middle of a medium scale public square, surrounded by green areas.

The urban characteristic is predominantly uni-residencial with a high percentage of green and permeable areas. Typically, the largest part of the buildings are houses with lateral and frontal spacing, however, there are also modern residential buildings in the immediate surrounds, with height and occupational density much above the average in the area.

Thus, the urban setting is predominantly composed by low-rise buildings (one to three stories high), which allows good quality ventilation and the existing vegetation helps to minimize heat gain and generate shade in public areas during certain months of the year.

In relation to the sun exposure, the building was designed in order to obtain the greatest illumination surface, especially in the coffee house and community room areas, in order to guarantee the quality of use of internal spaces and the highest possible heat gain, for heating energy saving during the winter.

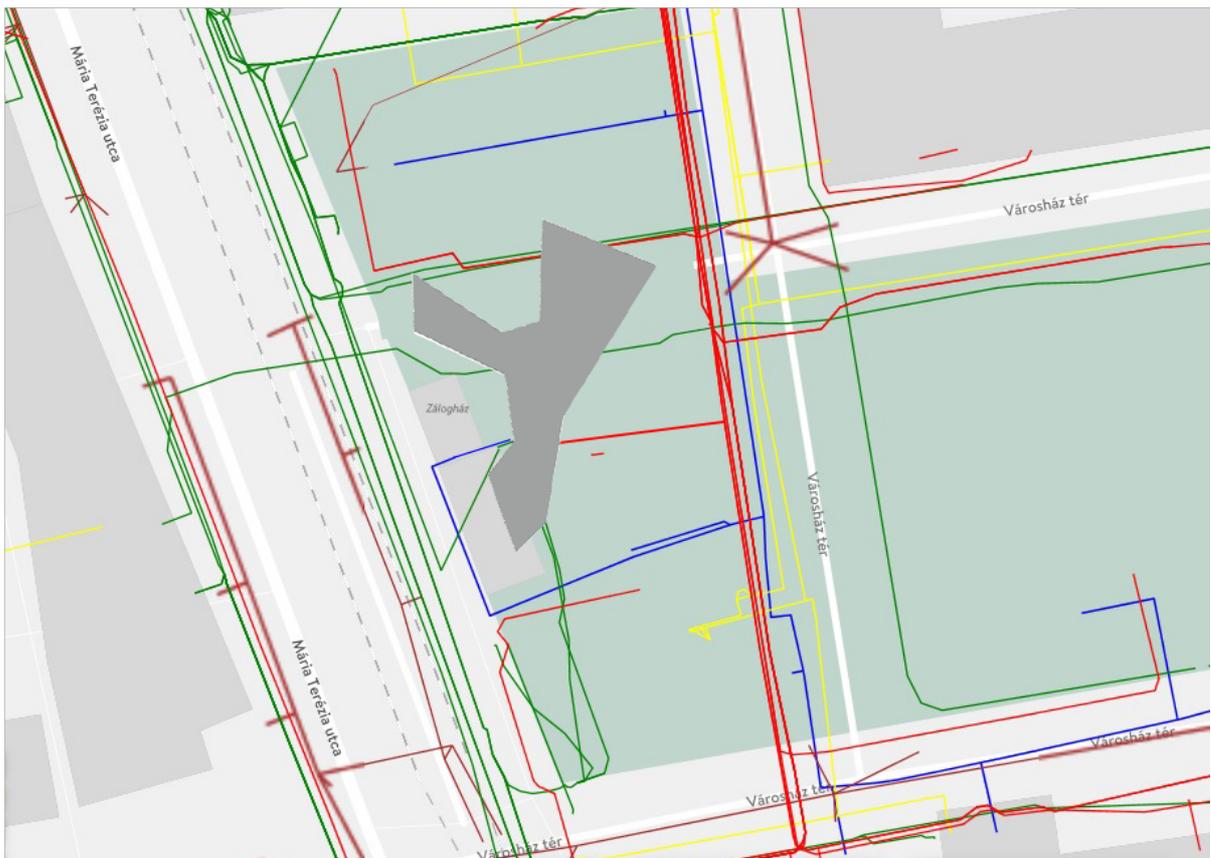


Solar exposure in the site. Reference: SunEarth



Photos from the area by author

### 3. Building Utilities and Services



- |   |  |
|---|--|
|  Communication (telephone, internet) |  Electricity Supply |
|  Hydrocarbon (Gas supply)            |  Water Supply       |
|  District Heating                    |  Sewage             |



- **Site description:**

- Plot size: 3.637,71m<sup>2</sup>
- Build up area: 690,68m<sup>2</sup>
- Topography: flat
- Vegetation: five large trees and nine small / medium size trees - all of them will be kept in place
- Soil Mechanics for Budafok central area
  - 0 – 1,4 m heterogeneous backfill ( $\phi = 28^\circ$ ,  $c = 10$  kPa,  $\gamma = 18$  kN/m<sup>3</sup>,  $E_s = 7$  MPa)
  - 1,4 – 1,9m silt-sand soil ( $\phi = 24^\circ$ ,  $c = 20$  kPa,  $\gamma = 19,5$  kN/m<sup>3</sup>,  $E_s = 9,2$  MPa)
  - 1,9 – 3,2m silt-sand soil with stone rubble ( $\phi = 24^\circ$ ,  $c = 25$  kPa,  $\gamma = 19,8$  kN/m<sup>3</sup>,  $E_s = 12,2$  MPa)
  - 3,2 – 3,5m silt- soil with stone rubble ( $\phi = 23^\circ$ ,  $c = 30$  kPa,  $\gamma = 19,8$  kN/m<sup>3</sup>,  $E_s = 11$  MPa)
  - 3,5 – 4,8m silt- with gravel ( $\phi = 24^\circ$ ,  $c = 33$  kPa,  $\gamma = 20,3$  kN/m<sup>3</sup>,  $E_s = 12,1$  MPa)
  - 4,8 – 5,5m silt-sand soil ( $\phi = 25^\circ$ ,  $c = 10$  kPa,  $\gamma = 21$  kN/m<sup>3</sup>,  $E_s = 11,1$  MPa)
- Groundwater at approx. 9-11 m depth from ground

## 2. Design Overview

The proposal for requalification for the Városház square is based on a broad intervention project designed for the Budafok region. This network of new buildings has been carefully designed according to the scale, needs and characteristic flow of the place. A system of shared sidewalks and other elements of public infrastructure will connect the entire intervention, prioritizing the pedestrian experience and the reorganization of traffic, especially with regard to public transportation lines.

The proposed building for this Diploma project is a key element for the spatial organization of the region. This square is currently the core of services and transportation and is therefore cut by the main axis of connectors in the area.

A significant change in traffic planned for the area directly impacts the design decisions for Városház tér: Kossuth Lajos Street will become a major promenade for pedestrians, while the traffic will be concentrated on Mária Terézia Street, whatever motivated the tram stop design as well - also in aesthetic harmony with the proposed building. Furthermore, taking into account an existing project to emphasize the connection between the Városház square

and the Budafoki Szomszédok Piaca, this street was also especially included in the general considerations in the urban context.

The idea is to demolish the building currently existing on the site and give a new meaning to it, maintaining and increasing its program. Basically, the new building will serve three main functions: an office for the public transport company BKK, a room for community use and a coffee shop (since the short-term food trade is perfectly suited to the local situation of high flow of people in a short space of time).

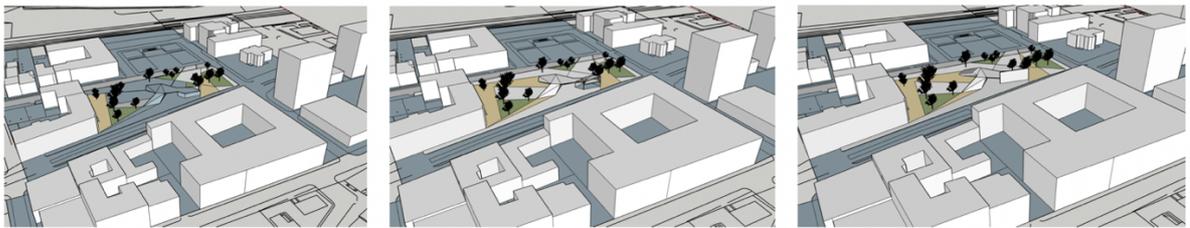
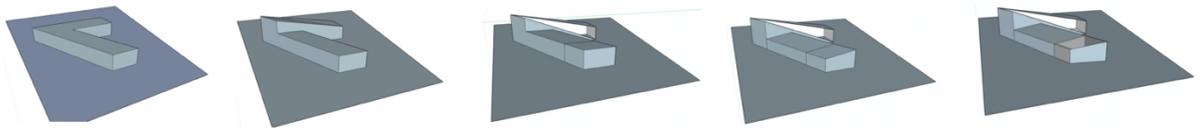
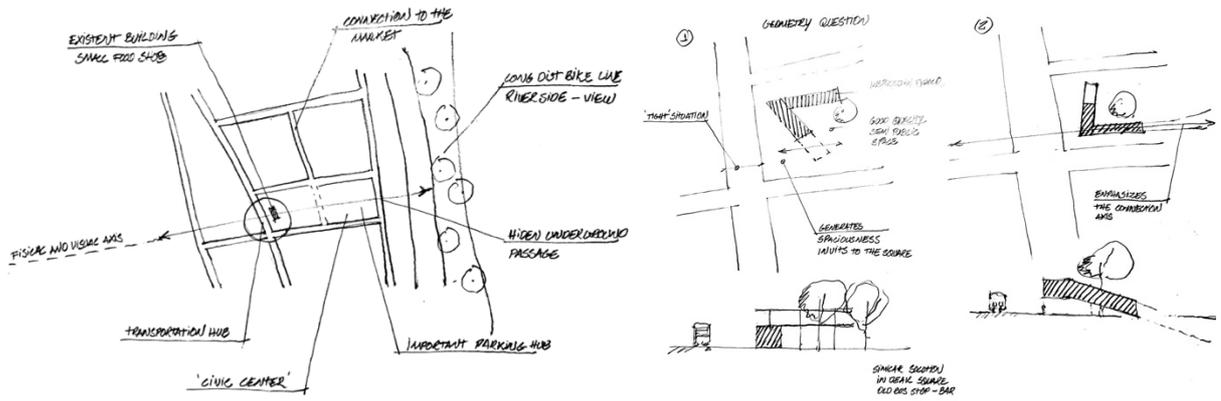
the functions are separated into three well-defined nuclei - which is reflected directly in the spatial articulation of the building conceptually and structurally. Symbolically, the building has the important function of representing a gateway to the axis that connects the Danube to the interior of the district, in addition to being a prominent element in the landscape, strategically positioned in the heart of this civic center, in front of imposing public buildings.

The building's design goes beyond the spatial organization considerations of its immediate surroundings, but in reality, the context is the main modeling element of it. Aesthetically, the architectural elements in the horizontal plane were designed to give the idea of continuity, while the nuclei where the functions are contained, are beacons of the natural flow in the area.

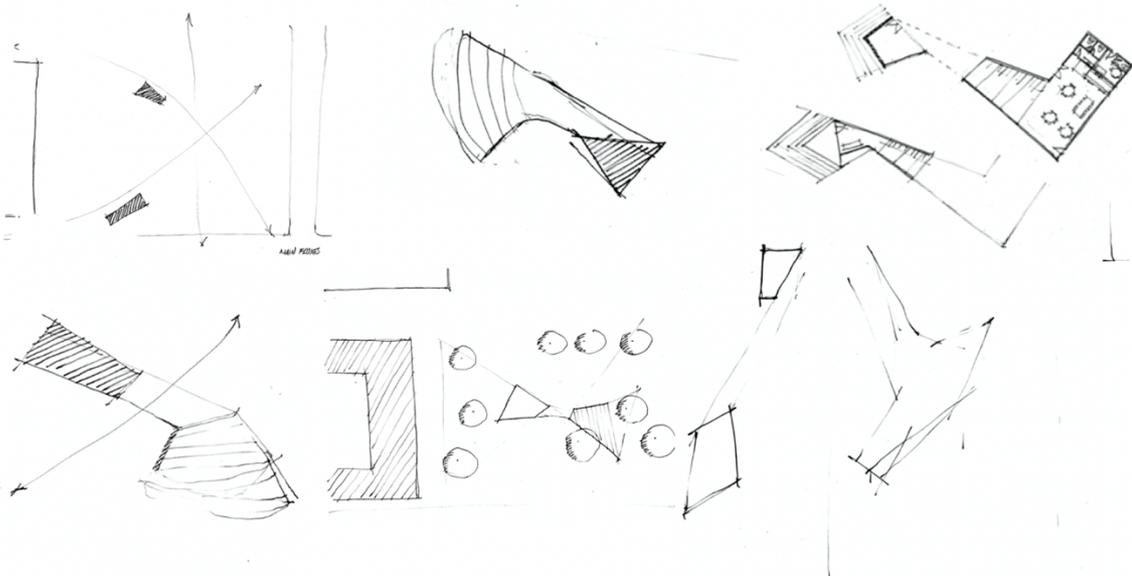
Although it does not function structurally as a shell, conceptually this analogy can be adopted, since the idea is to promote visual continuity, shelter internal activities and create different layers of use for the building, including on its public terrace at different levels.

The materiality of the building is in alignment with the general concept, and in this way, it aims to accentuate the notion of continuity and promote the formal unity of the building. The ramp covered by grass is an extension of the garden that surrounds the building. The pavement has the objective of demarcating the different areas of use of the square, mainly delimiting the areas of main, secondary and permanence flow (rest, leisure and stage areas).

Spatially, the organization created was able to clearly define the areas of proven use (nuclei), semi-public (between) and public (above and around).



Design process models

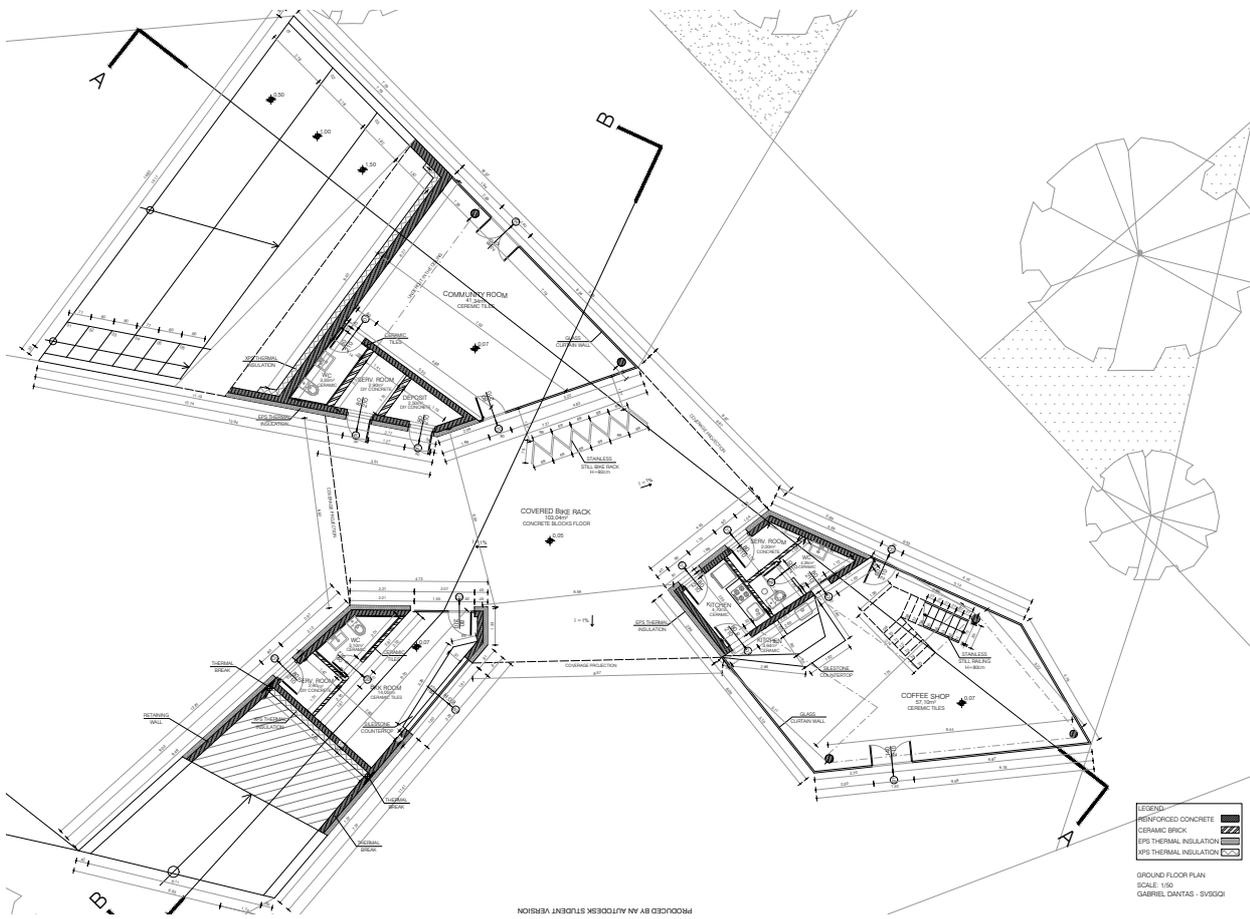


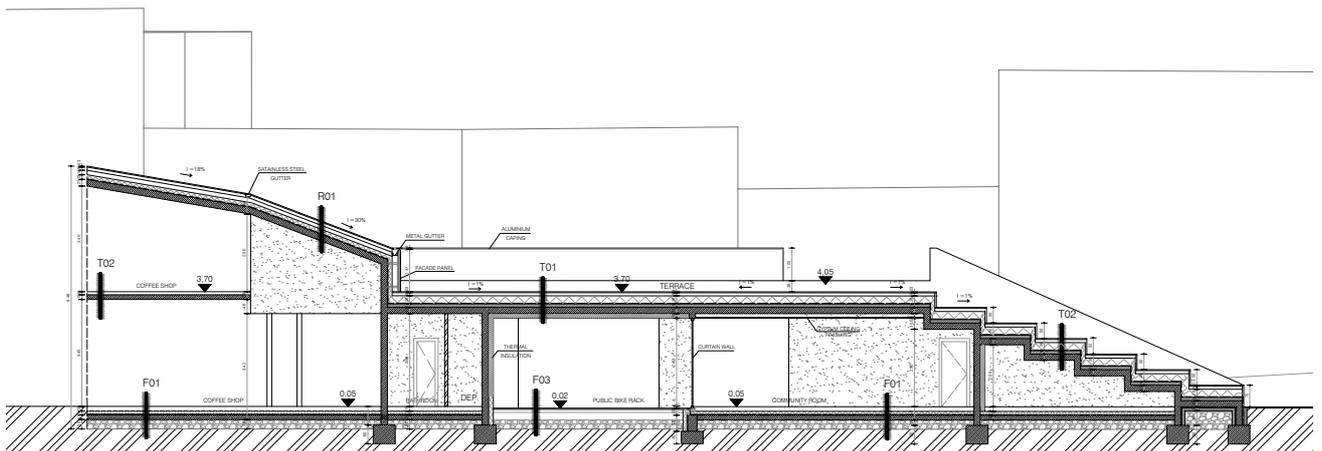
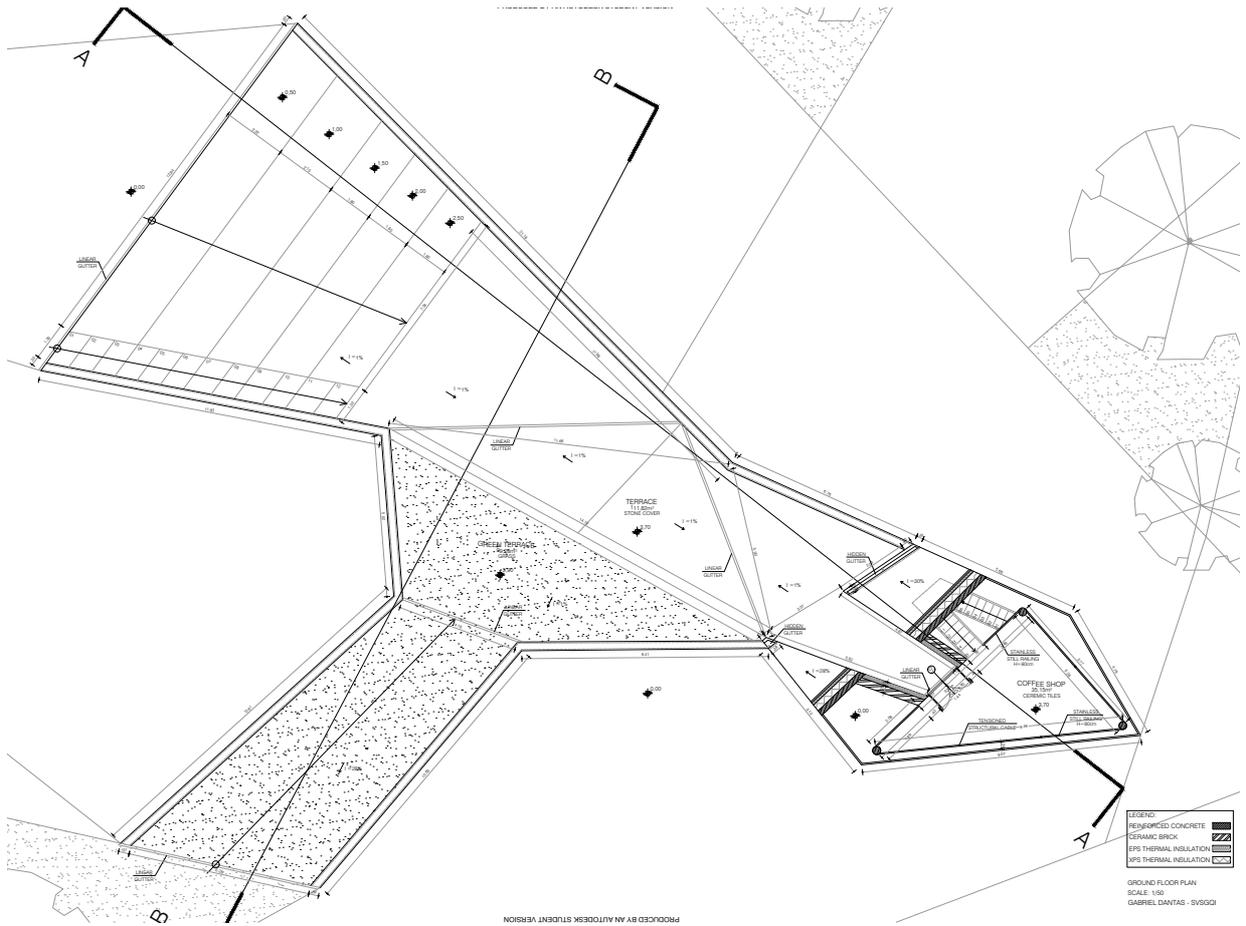
Design process sketches



Materiality - pictures by author

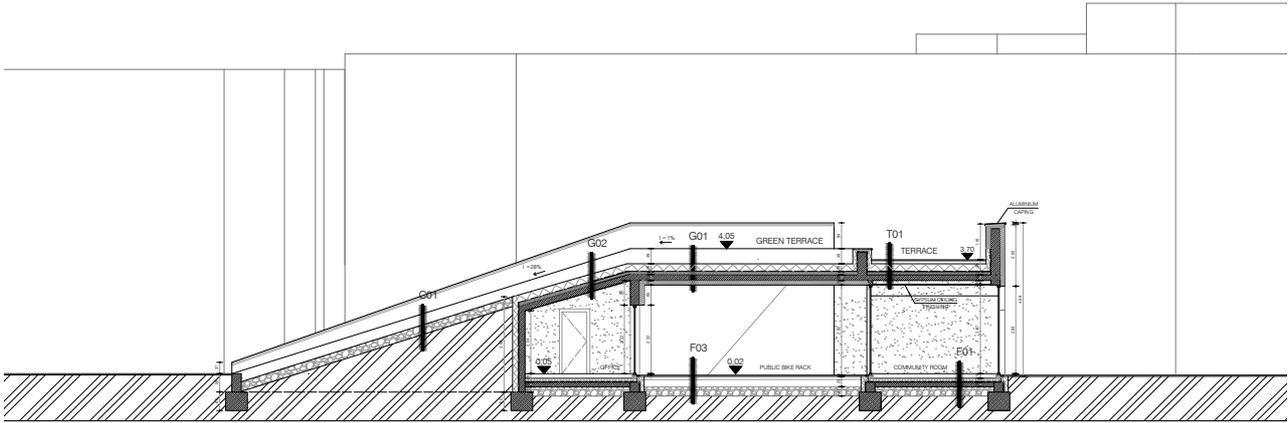
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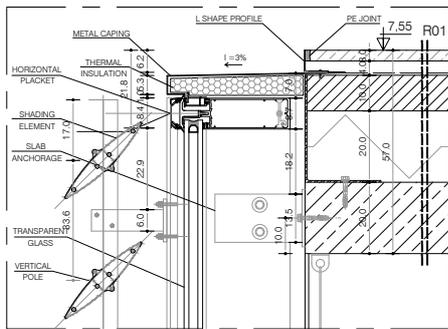
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|---|---|--|--|--|---|--|---|---|--|
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|---|---|--|--|--|---|--|---|---|--|

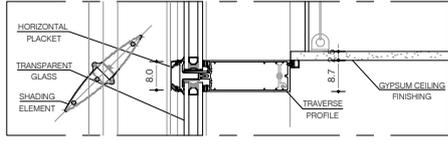


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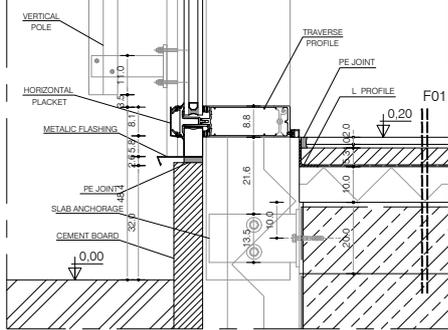
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10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU R.C. SLAB  
15cm XPS THERMAL INSULATION  
PLASTERING
- T02 3m STONE PAVING  
10cm CONCRETE SCREED  
10cm DRAINING LAYER  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU R.C. SLAB  
PLASTERING
- G01 3m VEGETATION  
20cm SOIL  
1 LAYER FILTER  
2cm DRAIN SHEET + WATER STORAGE  
1 LAYER ROOT PROTECTION  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20cm IN-SITU R.C. SLAB  
15cm XPS THERMAL INSULATION  
PLASTERING
- G02 3m VEGETATION  
20cm SOIL  
1 LAYER FILTER  
2cm DRAIN SHEET + WATER STORAGE  
1 LAYER ROOT PROTECTION  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU R.C. SLAB  
PLASTERING
- R01 3m STONE PAVING  
10cm CONCRETE SCREED  
10cm DRAINING LAYER  
26cm EPS THERMAL INSULATION  
1 LAYER WATERPROOFING  
20 cm IN-SITU R.C. SLAB  
PLASTERING
- F01 2cm FLOORING  
1cm MORTAR  
10cm CONCRETE SCREED  
1 LAYER PE FOL  
10cm THERMAL INSULATION (XPS)  
1 LAYER PVC WATERPROOFING  
16cm CONCRETE SCREED  
30cm GRAVEL BED
- F03 4cm CONCRETE BLOCKS FLOORING  
10cm SAND BED  
30 cm GRT LAYER  
30 cm GRAVEL BED
- F02 2cm FLOORING  
1cm MORTAR  
10 cm CONCRETE SCREED  
20cm R.C. SLAB  
PLASTERING
- S01 2cm FLOORING  
1cm MORTAR  
10cm CONCRETE SCREED  
20cm REINFORCED CONCRETE SLAB  
1cm PLASTERING
- C01 3m VEGETATION  
20cm SOIL  
30 cm GRAVEL BED



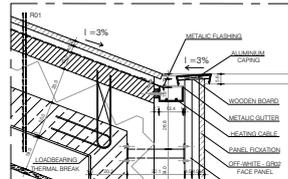
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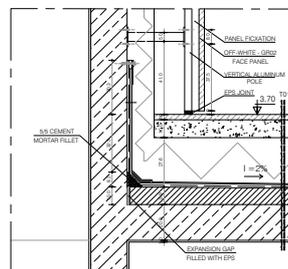
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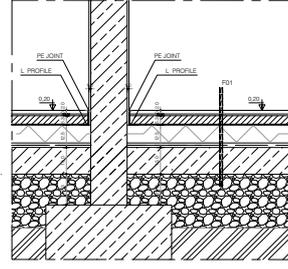
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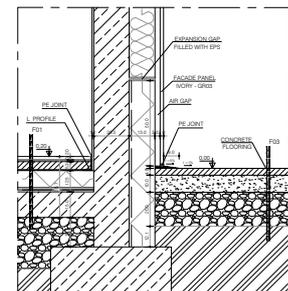
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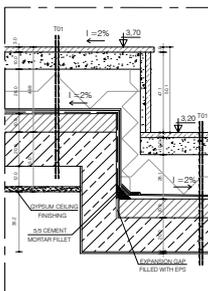
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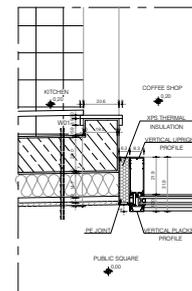
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DETAIL 07  
SCALE: 1/10

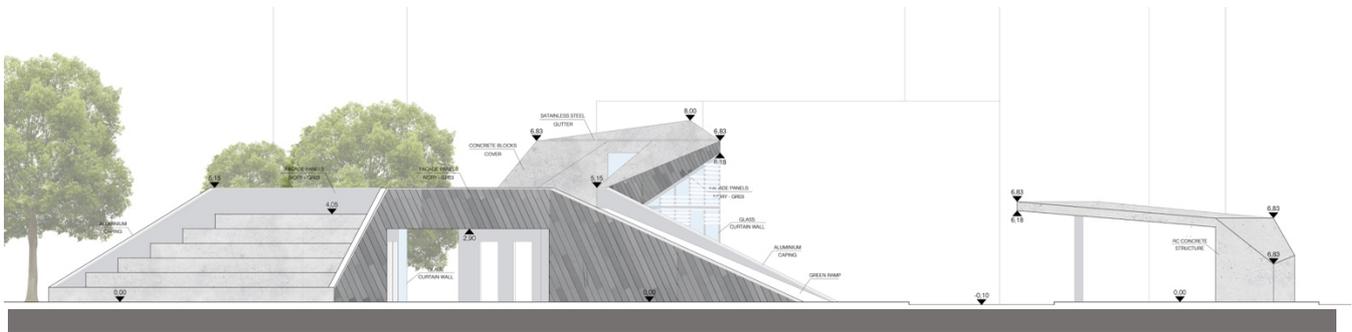


DETAIL 08  
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DETAIL 09  
SCALE: 1/10

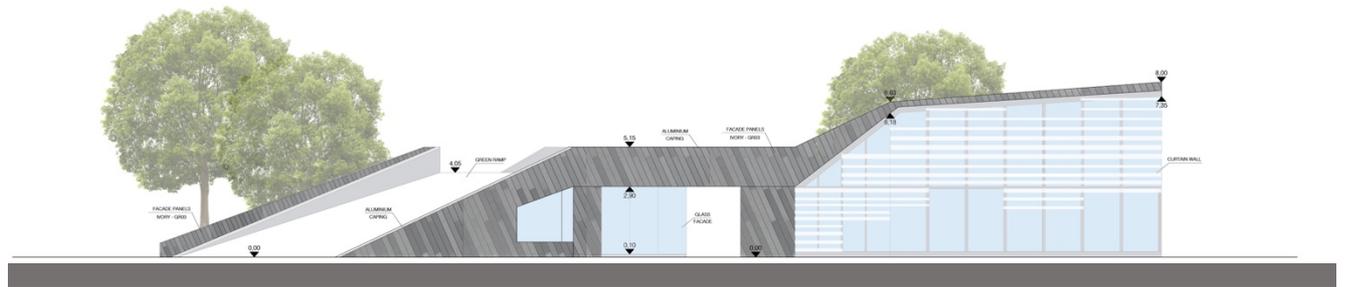
- LEGEND
- REINFORCED CONCRETE
  - CERAMIC BRICK 12x15
  - CERAMIC BRICK 25x30
  - EPS THERMAL INSULATION
  - XPS THERMAL INSULATION
- GABRIEL DANTAS - SVS/GOI



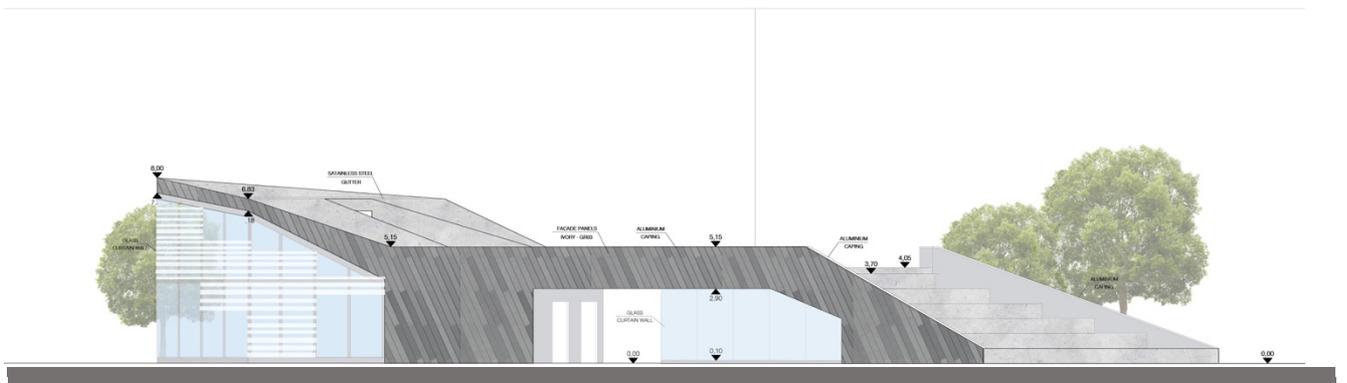
North facade



South facade

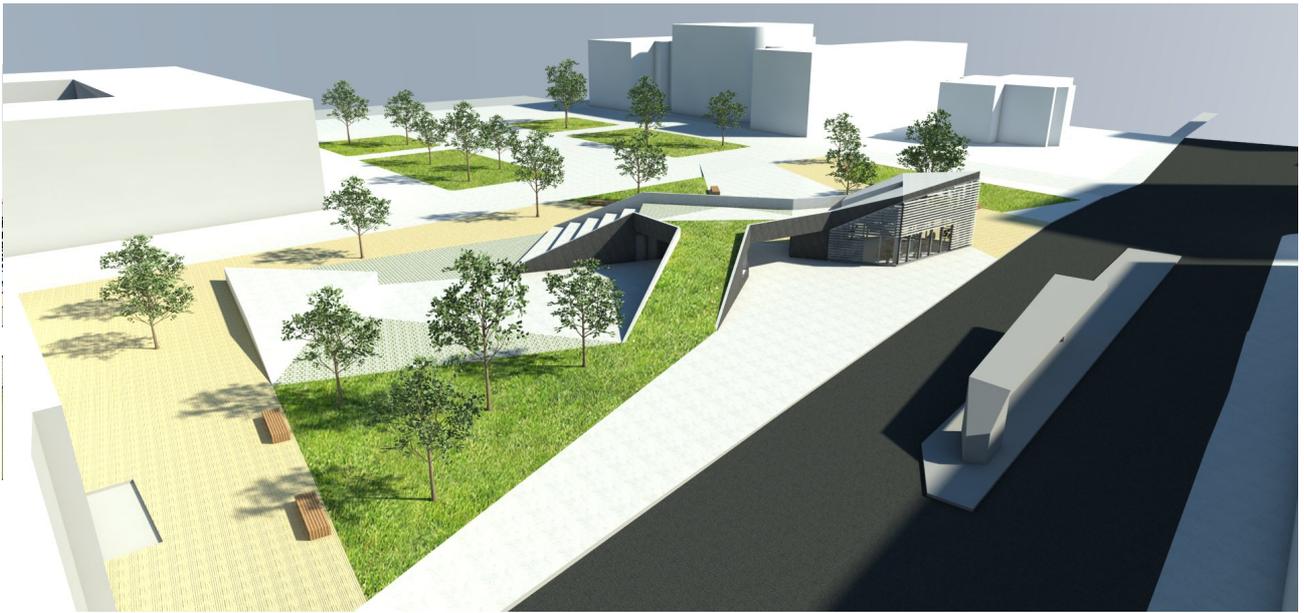


west facade



East facade

3D views



### 3. Structural analysis

The concept of visual fluidity and different layers of use has posed interesting structural challenges in order to make this an achievable idea. The building does not have a traditional mesh of pillars and beams, but a set of structural solutions that together make its viability possible.

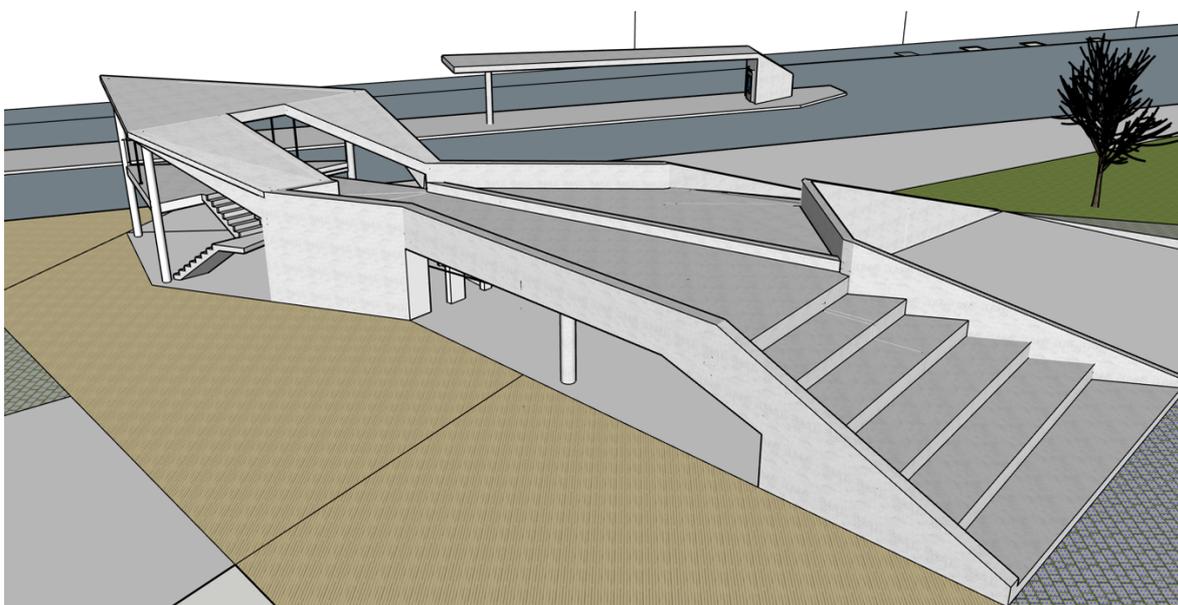
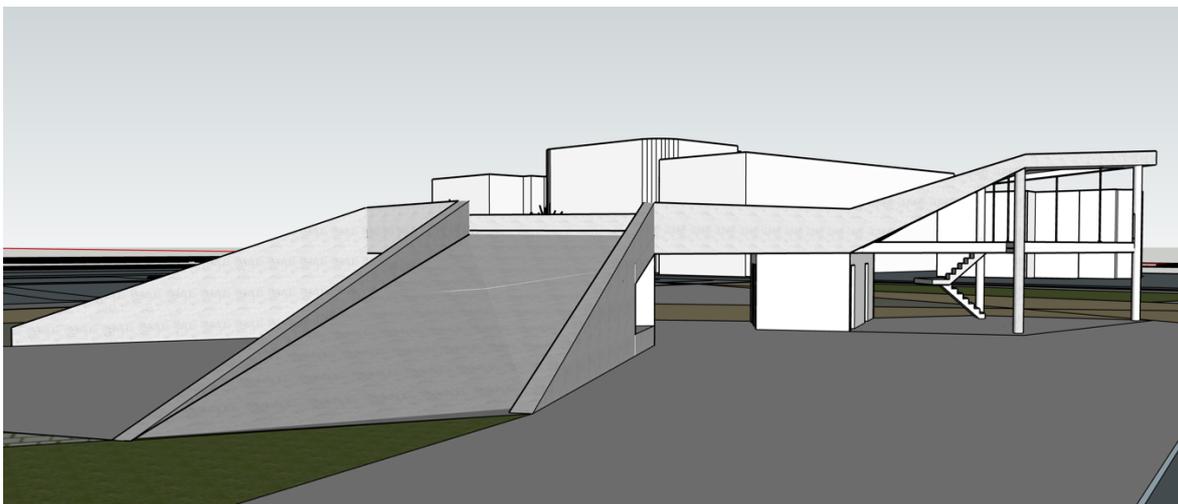
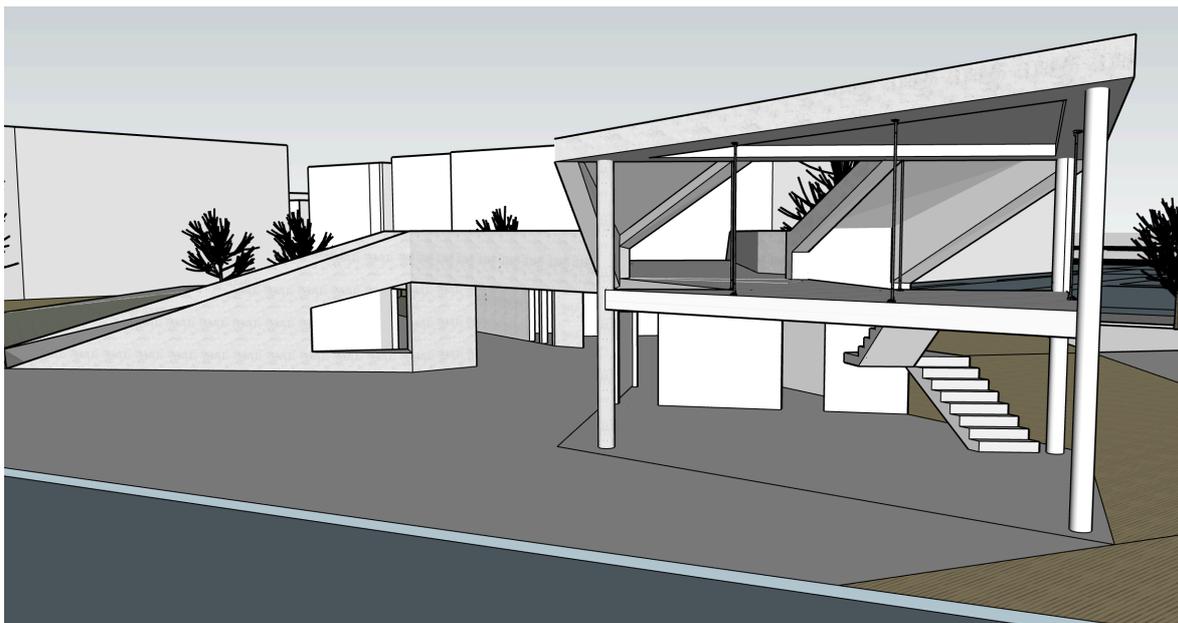
Basically, the building is divided into three different user centers (coffee shop, Budapest Public Transport Company office and community use room), all separated by an open covered space for public use. This roof, although it does not function structurally as a shell, conceptually this is the role it plays, unifying the building both functionally and aesthetically.

This roof is also walkable and has different types of paving. A beam was specially positioned in the largest span of this roof, supporting a large part of the dead forces of the structure and the weight of the green roof that covers part of the building. This beam also has a strategic function in separating the layers from the roof, facilitating and simplifying the construction details of the building.

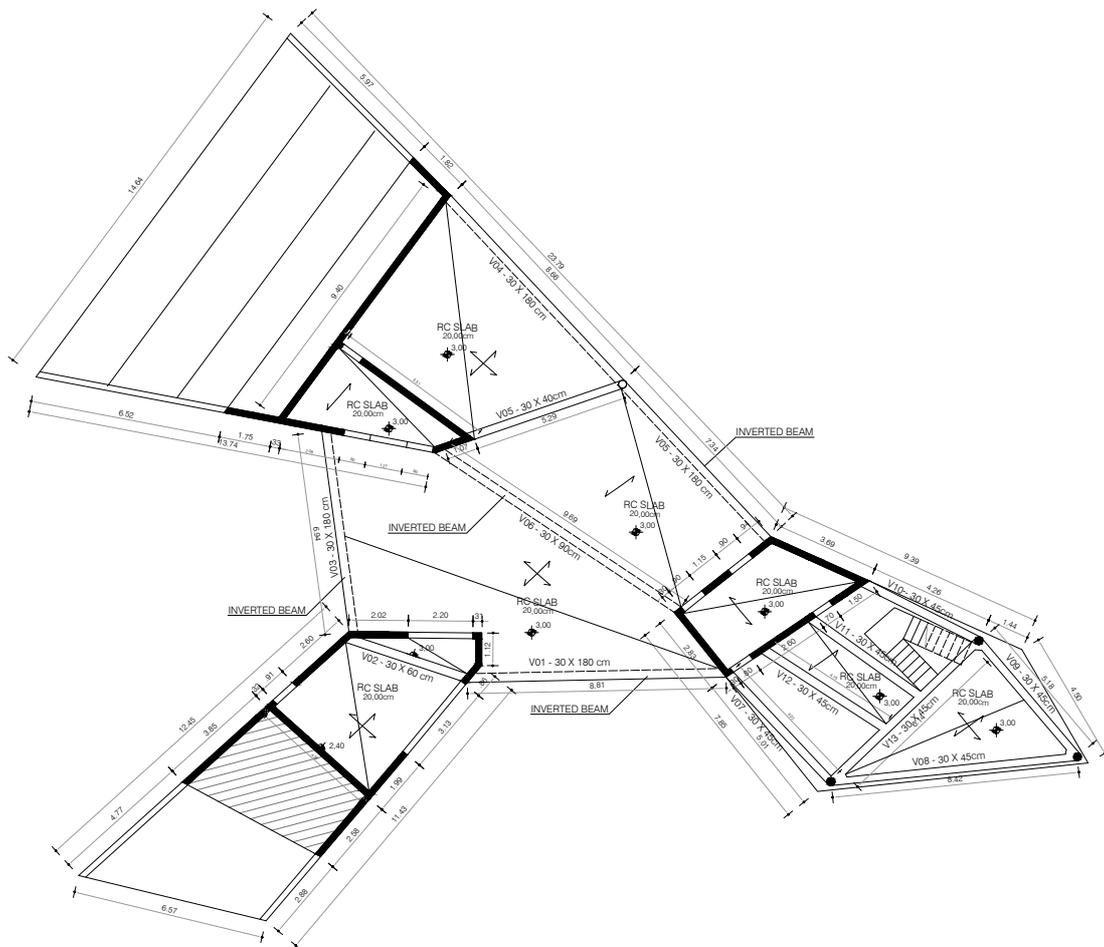
The external walls will be made of reinforced concrete, in order to support the weight of the structure more efficiently, allowing for larger spans. The concrete wall that borders the access ramp to the first floor also functions as a retaining wall, since part of the ramp will be filled with soil. The partition walls will not have a structural function. Based on this, the best option for foundation is the strip.

The slab on the first floor of the coffee shop has a triangular shape and is supported by pillars only in its vertex, which is also structurally challenging. Thus, the solution adopted to make the architectural decision viable, without negatively impacting the appearance and the wide atmosphere of this environment, was to hoist the "rods" of this triangular slab with structural cables attached to the beams above it.

The public area located on the ground floor, between the private use areas, will have a permeable type pavement, without reinforced concrete slab, which will reduce the cost of construction, facilitate the drainage of rainwater and reinforce the idea of visual continuity, since this way it is possible to use the same materials and technology thought for the rest of the square



Structural scheme - 3D visualization made by author



Structural scheme  
Floor plan

## 1. Participants and tasks

Considering that it is a commercial building, but also with of social interest, founded by the Budapest Public Transport Company (BKK), there are specific procedures that must be followed in order to meet the demands required. Thus, as far as it is also a project a that will benefit the community of Budafok, the local prefecture will also be involved, donating the land and collaborating with the construction of the square around the building. Understanding this background, the participants involved are:

- **Competition:**

- Organizer**

- Defining aim and type of competition
    - Ensuring the financial background
    - Invitation of the jury
    - Defining the assignment of the competition
    - Making the competition announcement
    - Organizing the competition
    - Announcing the results, offering awards
    - Utilization of the plans

- Jury**

- Selection of the most valuable plans (according to the aim of the competition)
    - Evaluation with justification
    - Opening the „envelops” of the awarded plans
    - Recommendations for the future design phases

- Participants**

- Submission of the plans

- **Client**

- Provide financial background, liquidity of the project
  - Dispose with the construction site
  - Procure the rights to build (attain building consent)
  - Establish contract with the architect, consultant, contractor, etc.
  - Share rights and risks
  - Attain permission of use

- **Designer - architect**

- Help the client in professional way to attain building permit

- Prepare documentations according the national/international standards and legal prescriptions
- Coordinate the work of the co-operative designers and professionals

- **Cooperative designers and professionals**

Tasks and duties:

- Prepare documentations according the national/international standards and legal prescriptions
- Continuous co-operation and communication with the designer architect

- **Project Manager or PM team**

Tasks and duties:

- Depend on their contract - coordination

- **Consultants**

Tasks and duties:

- Depends on their contract

- **Contractor**

Tasks and duties:

- Participate in the tendering process
- Contract with the client and with sub-contractors
- Construct the building according the national/international standards and legal prescriptions
- Co-operation and communication with the designer team, the authority and the client/PM

- **Quality surveyor**

Tasks and duties:

- Control the plans in accordance with the standards and the legal prescriptions

- Control the assignment of the building
- Ensure the prosecution of the prescribed tests (e.g. soil mechanics)
- Control the construction: the construction logbook, hidden structures, quality, used materials, the volume of the completed work
- Inform the client if the completed work is according to the contract

- **Authorities**

Tasks and duties:

- Provide building permit
- Provide permission of use
- Give consent for the plans, for the technical solutions, etc., according to the legal prescriptions

- **Public utilities, public services**

Tasks and duties:

- Give a consent for the plans (capacity, standards, etc.)
- Verify the finished work

- **Financing institute**

- Consider the requests for credit
- Grant credit by schedule for the project
- Control the use of money
- plans

## 2. Cost estimation

The plot will be donated by the local municipality, for this reason, it will not be added to costs. In addition, it is important to mention that the construction of the square that surrounds the building is also included in

the construction process, thus, some cost groups have been adapted for this situation.

Cost groups		Esmation	Cost
100	Plot*	0%	0
200	Infrastructure	10%	HUF 10.660.228,08
300	Building construction	100%	HUF 52.509.750,00
400	Construction of building installations and electrical		HUF 19.815.000,00
500	Outdoor constructions	10%	HUF 10.660.228,08
600	Installations and artwork	3%	HUF 2.663.136,00
700	Additional expenses	10%	HUF 57.725.200,00
Total		122%	HUF 109.265.416,80

Cost groups		Estimated percent	Estimated cost
310	Earthwork	2,2 %	HUF 1.575.292,00
320	Foundation	11,8%	HUF 8.401.560,00
330	External walls	16,3%	HUF 11.552.145,00
340	Interior walls	2,23%	HUF 1.575.292,00
350	Floors (slabs)	13,85%	HUF 10.501.950,00
360	Roof	16,3%	HUF 11.552.145,00
370	Built-in appliances	8,9%	HUF 6.301.170,00
380	Others	1,4%	HUF 1.050.195,00
Total			HUF 52.509.749,00

Cost Goups		Estimation	Type	Cost
410	Water, sewage, gas	4,8%	offices	HUF 4.161.150,00
420	Heating	9,2%	offices	HUF 6.538.950,00
430	Ventilation and AC	9%	offices	HUF 990.750,00
440+450	Electricity, Telecommunication and IT	5,2%	Offices	HUF 6.538.950,00
460	Transportation equipment (elevator)	0%		HUF 0
Total				HUF 18.229.800,00

### 3. Technical description of the planned construction

- **Preparation of the site**

As a first step before the construction starts we should prepare a geotechnical report, in order to certify the site conditions. Afterwards, before the construction properly starts, the site cleaning should be provided.

We should locate the gate and place 2.0 m height of fences all around the plot. The idea is to divide the construction in two phases: the building construction and the square construction afterwards. In this way, the fenced area for the building construction would be only the required in order to provide space for the necessary equipment and installations.

After this first step, it will be necessary to prepare the temporary services as the electricity supply, in order to provide the necessary infrastructure to the start of the works. It is also important to provide containers for the workers. In the containers (2.5m x 6m) there should be allocated:

1. Office
2. Changing rooms
3. Storages for materials
4. Storage for formworks

On the site there should also be installed temporary WC and guard (control) cabins. Considering that the building will occupy only around 15 % of the total area of the site, it will not be necessary to extend the site to the public space. Storages for the construction materials will be also placed on the construction site.

- **Neighboring buildings**

Considering that this will be a construction carried out in the middle of an important and busy area, it is especially necessary to be careful with the times of loading and unloading materials and safety at the construction site.

Most of the neighboring buildings house public functions, such as the town hall, the headquarters of the local police and the post office building. Taking this into account, it is necessary to think of ways to reduce noise during working hours during the week and to design traffic to avoid traffic jams.

- **Excavation**

First of all, the exact border of the building should be demarked in order to start the excavation for the future execution of the foundation (considering that the building does not have a basement floor). For the excavation we will need a loader. The excavation will be made in only one step, considering that the site is plane and the water level is below the lower level of the foundation, in -1m depth.

The excavated material should be loaded into truck and will be send to the appropriated destination. As soon as the excavation of the soil is concluded, the foundation works can start.

- **Installation of the crane**

Although this is not a relatively tall building, the most suitable technical solution for the construction of this building is to use one tower crane, taking in consideration that the size of the plot and the location of the building in relation to the storage areas. It will be placed on the border of the building and will have the radius of 20.00 m. Crane will be installed before foundation work. At the end of the load-bearing constructions the tower crane will be also useful in the process

of caring the scaffolding to the different areas of the building and back to the storage place. As far as space limitation is not an issue in this construction site, the crane does not need to be mounted inside the building area. The core of the tower crane will be located five meters away from the building boundaries. The tower crane should be disassembled after the conclusion of the load-bearing structure.

- **Foundation**

For this building a system of strip foundation has been chosen. For its construction we have to transport concrete by concrete mixer to the exact place required and with the help of tower crane it will be poured. Steps of the construction process:

- Earth works – compaction of the project site
- Preparation of the site, laying the gravel
- Placing the formworks
- Protection mesh - Placing reinforcement
- Pouring concrete, flattening and vibrating
- Foundation should be watered for the curing of the concrete
- Waterproofing layer placement

- **Superstructure**

The structure of the building consists basically of the following elements: pillars and beams, RC walls, and slabs, all made of reinforced concrete. This structural solution allowed greater flexibility of space usage, considering that this would require a technology that would allow larger spans. The elements exposed to the outside will be properly enveloped with thermal insulation to avoid thermal bridges.

The internal walls have no structural function, so they will be executed in 12cm thick brick. All the walls that have this function will be constructed of clay bricks and mortar.

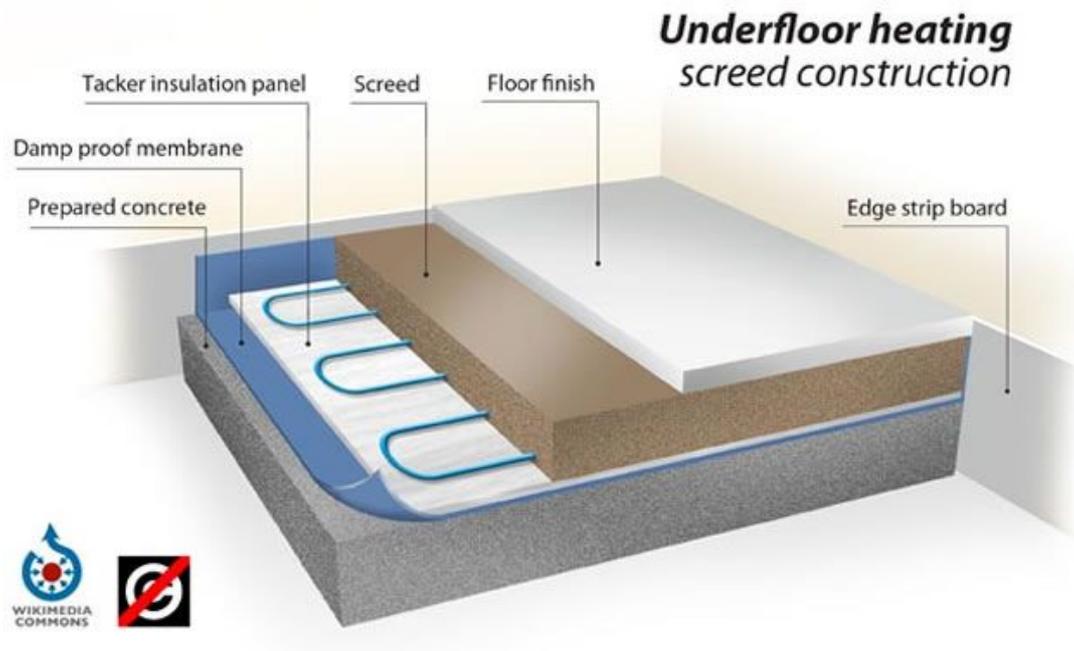
- RC walls  
these walls will be responsible for absorbing vertical and horizontal loads.

They are made of RC 20cm. In order to guarantee structural integrity and increase the efficiency of these walls, the openings in them will be limited to the minimum possible.

- **Slabs and flooring**

In this building there are different types of slabs, as there are four types of technical solutions needed to make architectural planning feasible. The categories differ according to the type of use, which will determine its constitution. It can be an internal slab, terrace, green terrace or roof slab. The RC slab has the same thickness in all circumstances, varying only the other layers needed above. In the most general situation, the slab components are:

- Concrete Base - concrete is made from cement, aggregate, and water, mixed in a 3:2:1 ratio. Ingredients are blended to form a fluid mixture, which can be easily applied over different areas. - Damp Proof Membranes (DPMs) - are used to prevent residual moisture from affecting the screed and final floor. Made of polyethylene, these membranes are placed on top of the concrete base to stop dampness, especially when impermeable floor finishes, which impede the natural dispersion of moisture, are used.
- Sound Insulation - Celotex insulation board, delivers the best way to sounds spread.
- Concrete screed - free-flowing, self-leveling, fast-drying, or structural screed, it plays a major role in enhancing the durability of the entire sub floor and extending the life of the final floor. For a perfect floor, screeds must be fully dry before laying the floor finish. Finishing will be made from another layer of the fine concrete.
- Interior flooring - the floor covering differs according to the usage of the rooms, however the dry areas will have Portobello gray porcelain tiles, as this is a floor suitable for areas with a high flow of people and is also consistent with the aesthetics of the project. The heating system is included in the concrete screed, as in the image below:



- **Insulation works**

Keeping the building envelope constant is one of the architectural challenges for this building, as the three different areas of use are separated by an unheated public space (the covered bike rack). Based on this technical circumstance, these were the construction layers defined for the different areas of the building.

T01 | 3m STONE PAVING  
10cm CONCRETE SCREED  
1 DRAINING LAYER  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU RC. SLAB  
15cm XPS THERMAL INSULATION  
PLASTERING

T02 | 3m STONE PAVING  
10cm CONCRETE SCREED  
1 DRAINING LAYER  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU RC. SLAB  
PLASTERING

G01 | 3m VEGETATION  
20cm SOIL  
1 LAYER FILTER  
2cm DRAIN SHEET + WATER STORAGE  
1 LAYER ROOT PROTECTION  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU RC. SLAB  
15cm XPS THERMAL INSULATION  
PLASTERING

G01 | 3m VEGETATION  
20cm SOIL  
1 LAYER FILTER  
2cm DRAIN SHEET + WATER STORAGE  
1 LAYER ROOT PROTECTION  
26cm EPS THERMAL INSULATION  
1 LAYER SEPARATION POLYESTER  
10cm CONCRETE SCREED  
1 LAYER GEOTEXTILE  
20 cm IN-SITU RC. SLAB  
PLASTERING

R01 | 3m FACADE/ROOF PANEL  
10cm CONCRETE SCREED  
1 DRAINING LAYER  
26cm EPS THERMAL INSULATION  
1 LAYER WATERPROOFING  
20 cm IN-SITU RC. SLAB  
PLASTERING

F01 | 2cm FLORING  
1cm MORTAR  
10 cm CONCRETE SCREED  
1 LAYER PE FOIL  
10cm THERMAL INSULATION (XPS)  
1 LAYER PVC WATERPROOFING  
15cm CONCRETE SCREED  
30cm GRAVEL BED

F03	4cm CONCRETE BLOCKS FLOORING 10cm SAND BED 30 cm GRIT LAYER 30 cm GRAVEL BED	S01	2cm FLORING 1cm MORTAR 10 cm CONCRETE SCREED 20cm REINFORCED CONCRETE SLAB 1cm PLASTERING
F02	2cm FLORING 1cm MORTAR 10 cm CONCRETE SCREED 20cm RC SLAB PLASTERING	C01	3m VEGETATION 20cm SOIL 30 cm GRAVEL BED

## • Lighting

Due to the commercial function of the building, It is important to guarantee the highest energy efficiency, aiming to reduce expenses and increase sustainability, since these will be spaces used for long periods and with high energy demand. Considering the technologies currently available, it is understood that the lighting should follow the sustainability guidelines and, therefore, LED lights are indicated, as well as those that will be used in common areas.

## • Terraces

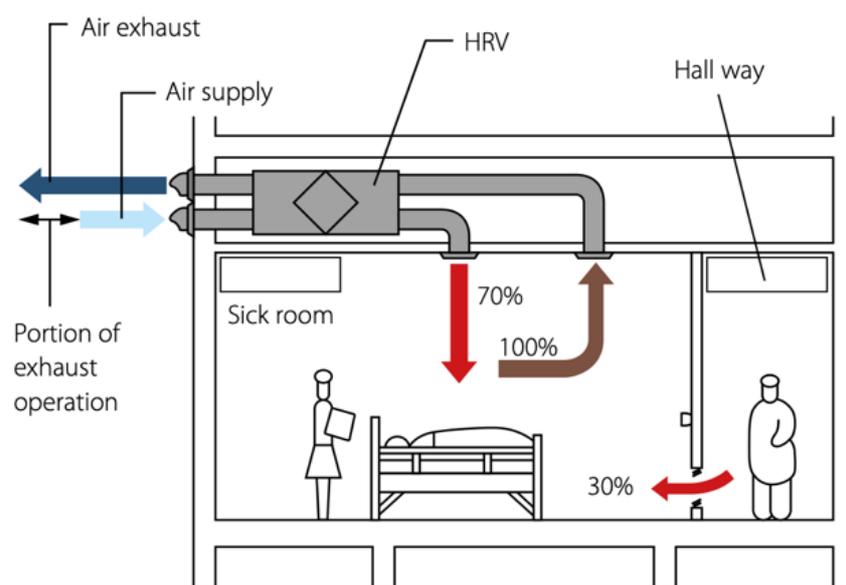
Walkable roof terraces cover around 70 % of the total area of the roof in this building, this is an important part of the building conception. It is important to maintain the physical integrity of the thermal envelope and especially the continuity of the waterproof layer to ensure the durability and functionality of this technology. The layer's arrangement of this technical solution is:

- 3cm façade/roof panel
- Metallic uprights for fixation of the panels
- 1 layer 4 mm modified bitumen waterproofing membrane (polyester fiber reinforced), fully bonded by torch applied welding
- 1 layer 4 mm modified bitumen waterproofing membrane (glass fiber reinforced), fully bonded - layer cold bitumen patching compound (about 300 g/m<sup>2</sup>)
- 10cm concrete screed
- 20 cm extruded polystyrene foam (XPS) thermal insulation, with staggered joints
- 20 cm monolithic reinforced concrete slab.



- **Building services**

Considering that this building small scale building , it will be taken in consideration that commercial ventilation units (Vair < 600 m<sup>3</sup>/h) can be mounted on walls or installed in kitchen cabinets or in cupboards. It will not be necessary to provide a dedicated ventilation room. Ventilation tubes connecting the unit with the exterior (having 160-200 mm tube diameter) will be provided



Taking into account the special feature of the building, which is divided into 3 “use cores”, the design decision adopted to solve the energy equipment was to separate the installations for each of the three units. Therefore, there are three separate technical rooms for the equipment needed for heating, cooling and energy meters.

Thus, considering that the building has commercial use with a total area of less than 1000m<sup>2</sup>, the total heating demand is 80Kw. However, this demand will be divided between the three zones of use. This solution reduces the energy loss that could exist if the heating system was centralized and distributed among the different modules.

The building will have three heat pump unities. The system chosen is the Daikin Altherma "Air to water – hybrid heat Pump" with 32kw capacity. This system is capable to provide hot water, heating and cooling for the building with a compact equipment that will be installed in individual rooms.

EHYHBH(X)-AV3(2)+ EVLQ-CV3

## Daikin Altherma hybrid heat pump

Hybrid technology combining gas and air to water heat pump for heating and hot water

- › Daikin Altherma hybrid heat pump combines air-to-water heat pump technology with gas condensing technology
- › Depending on outdoor temperature, energy prices and internal heat load, Daikin Altherma hybrid heat pump always selects the most economical mode to operate
- › Low investment cost: no need to replace the existing radiators (up to 80°C) and pipe work
- › Provides sufficient heat in renovation applications as all heat loads are covered up to 32kW
- › Easy and fast installation thanks to the compact dimensions and quick interconnections
- › Online controller (optional): control your indoor from any location with an app, via your local network or internet and keep an overview on your energy consumption
- › Possible to connect to photovoltaic solar panels to provide energy for your heat pump (optional)

**DAIKIN**  
altherma

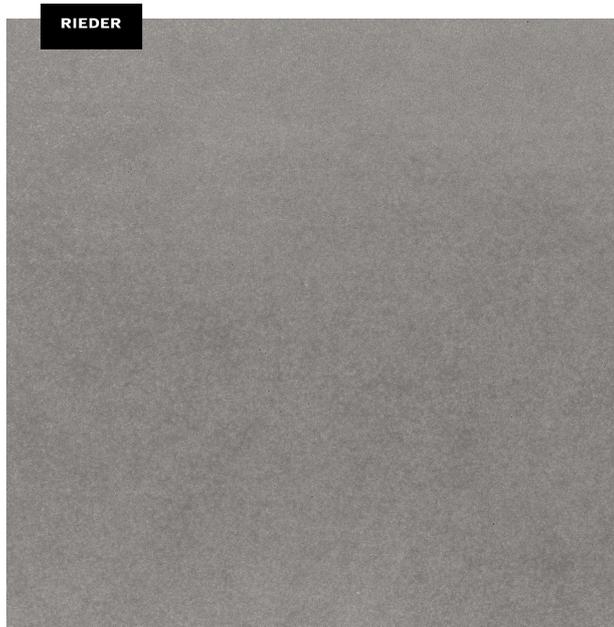


### • Facade

in order to achieve the concept of visual continuity, the materiality of the building must refer to the aesthetic characteristics also adopted for the square around it, in this way some sections of the facade will be covered with plaster and painted in order to simulate the exposed reinforced concrete (as this is an effective, inexpensive and easy to maintain solution), while other sections will have a

ventilated facade with the application of panels produced by the company Rieder, with off-white color - GR02, also simulating concrete.

However, most of the facade will be composed of curtain wall, as indicated in details 01.02 3 03. This technological solution allows creating environments with great interaction with the exterior landscape, generating the desired fluidity between public and private spaces.



**PRODUCT** [concrete skin, öko skin, formparts.fab](#)  
**COLOUR** silvergrey  
**TEXTURE** standard  
**SURFACE** matt

**concrete skin**  
 Width: 1200 mm; 1500 mm on request  
 Length: 2500, 3100, 3600 mm; 5000, 7000 mm on request

**öko skin**  
 Width: 70 – 302 mm  
 Length: 700 – 2500 mm

**formparts.fab**  
 Width: max. unrolling width 2000 mm  
 Length: max. 5000 mm

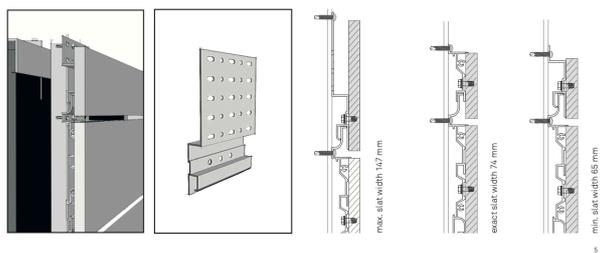
For further information please contact us.

> **SAMPLE ORDER**

SHARE   

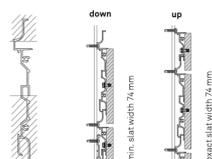


off-white - GR02



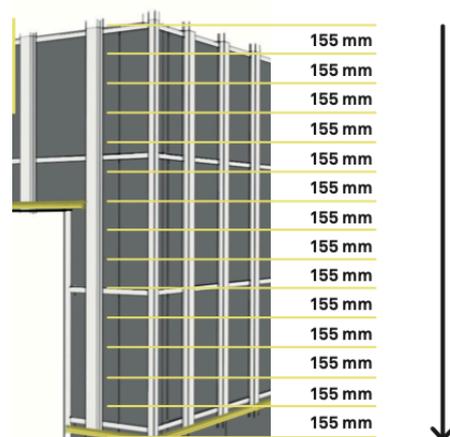
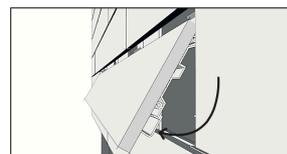
**Installation fitted slats with trimmed back clips**

In order to ensure flexibility in the design of the facade, narrower slats can also be used for connections at the bottom, at the top and in doors and windows. For this purpose, the back clip may be shortened at the points marked with a line.



**Replacement of öko skin slats**

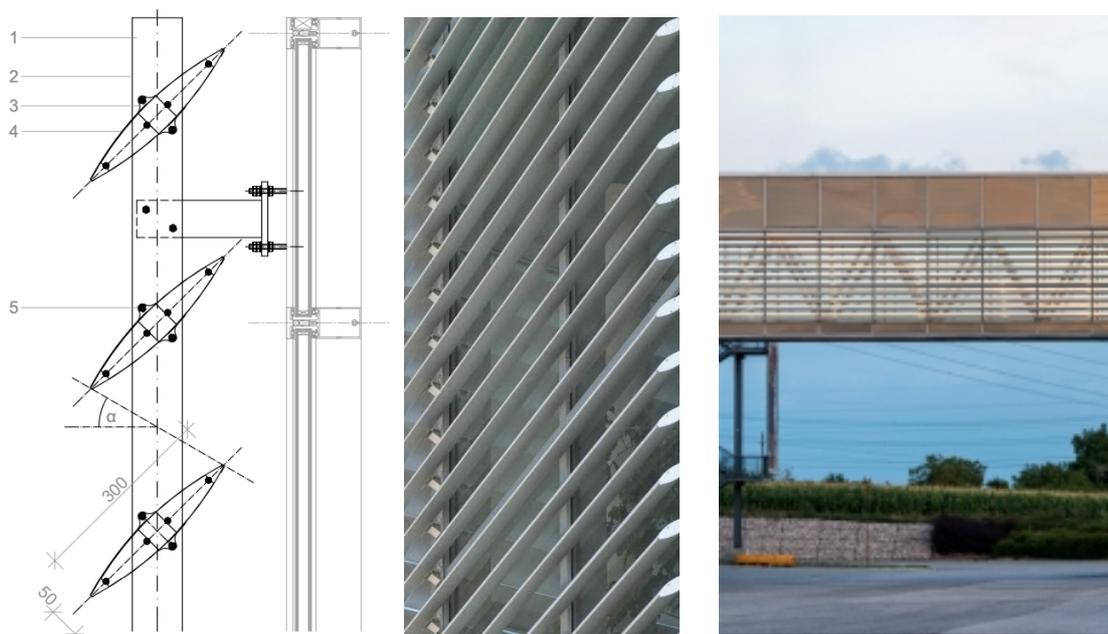
Individual damaged slats may easily be replaced by the specified joint height of 8 mm, even in the middle of the field. To do this, loosen the screws on all back clips of the slat and slightly push the slat up and lift it out downwards. To replace the bottom slat, the slat above needs to be removed.



- Shading elements: concerning the South glass facade, and the high energy gain caused by the continuous insolation on the glass surface, it was necessary to install shading elements that partially block the entry of sun in the coffee shop area, in addition to being also part of the aesthetic composition of the facade. The elements are produced by KRÜLLUNG, as they offer the desired technical solution, besides being a local manufacturer. This is the technical specification of the product:

**KRÜLLUNG SOLONIA AL-1000 AF-80**  
(100/120/145/150/190/200/250/300/350/400/450) H-V

External shader in vertical position with stationary (unmoving) double-skinned horizontal aerofoil fins with 80 mm (100/120/145/150/190/200/250/300/350/400/450 mm) width. Counter-rails with double flat / *rectangular* / *round shaped* cross-section (made of extruded aluminium). With extruded aluminium / *stainless steel* mounting brackets. Both butt-edges of the aerofoil fins are covered by high-pressure water cut endcaps. These endcaps are fixed to the fins with 'D' headed stainless steel screws. Usually the fin's shadow angle is  $\alpha=20-45^\circ$ , their angle of incidence is  $\beta= 0-45^\circ$ . The special plastic sliding bearing at the edge of the fin's axel prevents damage caused by linear expansions. All of the visible aluminium surfaces are powder-coated (standard RAL) / *anodised matt silver*. Stainless steel fastening fixtures.



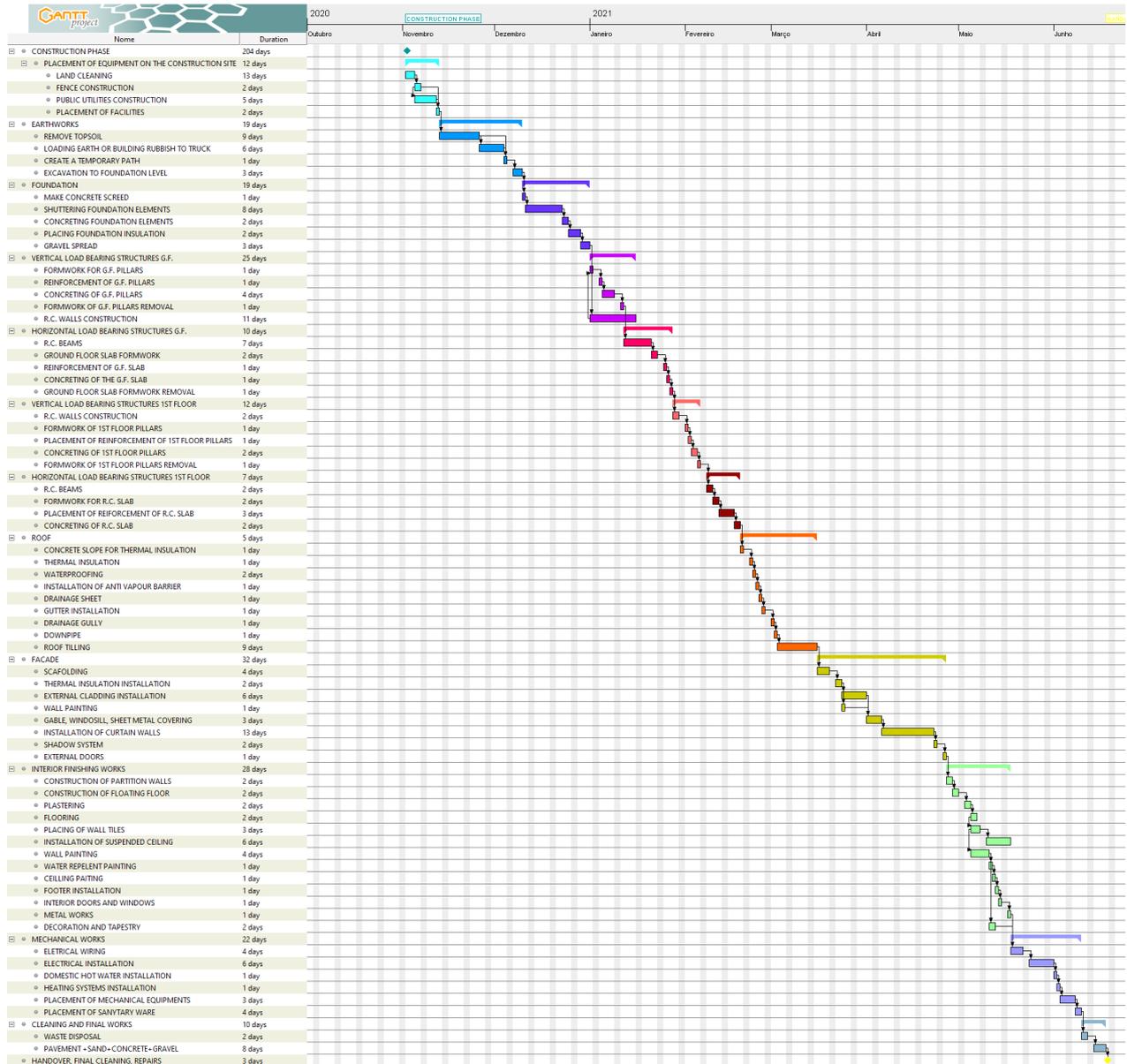
## 8. Table of cost estimation

LIST OF ACTIVITIES	QUANTITY	CONSTRUCTION STANDARD	TIME (hours)	RESOURCES (workers)	TIME (days)	SPECIFIC NET CONSTRUCTION COST	COST
<b>Placement of equipments on the construction site</b>					<b>12</b>		<b>2.510.420 Ft</b>
Fence construction	217 m	0,15 h/m	32 h	4	2	3000 Ft/m <sup>3</sup>	649.770 Ft
Placement of facilities					2		
Public utilities construction					5		
Land cleaning	2189 m <sup>2</sup>	0,30 h/m <sup>2</sup>	66 h	4	3	850 Ft/m <sup>2</sup>	1.860.650 Ft
<b>Earthworks</b>					<b>19</b>		<b>7.487.460 Ft</b>
Remove top soil	2189 m <sup>2</sup>	0,12 h/m <sup>2</sup>	263 h	4	9	3000 Ft/m <sup>2</sup>	6.567.000 Ft
Excavation to foundation level	200 m <sup>3</sup>	0,46 h/m <sup>3</sup>	92 h	4	3	2100 Ft/m <sup>3</sup>	420.210 Ft
Loading earth or building rubbish to truck	200 m <sup>3</sup>	0,92 h/m <sup>3</sup>	184 h	4	6	2500 Ft/m <sup>3</sup>	500.250 Ft
Create a temporary path	208 m <sup>2</sup>	1,50 h/ 10m <sup>2</sup>	31 h	4	1		
<b>Foundation</b>					<b>19</b>		<b>12.121.400 Ft</b>
shuttering foundation elements	317 m <sup>2</sup>	0,80 h/m <sup>2</sup>	254 h	4	8	150 Ft/m <sup>2</sup> /nap	380.400 Ft
Concreting foundation elements	57 m <sup>3</sup>	1,00 h/m <sup>3</sup>	57 h	4	2	50000 Ft/m <sup>3</sup>	2.835.000 Ft
Formwork of foundation elements	317 m <sup>2</sup>	0,27 h/m <sup>3</sup>	85 h	4	3		
removal							
Placing foundation insulation	114 m <sup>2</sup>	0,47 h/m <sup>2</sup>	54 h	4	2	5000 Ft/m <sup>3</sup>	570.000 Ft
Gravel spread	48 m <sup>3</sup>	2,26 h/m <sup>3</sup>	108 h	6	3	7000 Ft/m <sup>3</sup>	336.000 Ft
Make concrete screed	160 m <sup>2</sup>	0,14 h/m <sup>2</sup>	22 h	4	1	50000 Ft/m <sup>3</sup>	8.000.000 Ft
<b>Vertical load-bearing structures</b>			<b>349 h</b>		<b>25</b>		<b>2.705.100 Ft</b>
RC walls construction	39 m <sup>3</sup>	6,78 h/m <sup>3</sup>	263 h	3	11	9000 Ft/m <sup>2</sup>	1.163.100 Ft
Pillars					7		771.000 Ft
Reinforcement of ground floor pillars	0,20 t	63,90 h/t	12 h	2	1	300000 Ft/t	58.500 Ft
Formwork for ground floor pillars	11 m <sup>2</sup>	1,00 h/m <sup>2</sup>	11 h	2	1	3500 Ft/db	10.500 Ft
Concreting of ground floor pillars	13 m <sup>3</sup>	4,50 h/m <sup>3</sup>	59 h	2	4	54000 Ft/m <sup>3</sup>	702.000 Ft
Formwork of ground floor pillars	13 m <sup>2</sup>	0,33 h/m <sup>2</sup>	4 h	1	1		
removal							
<b>Horizontal load-bearing structures</b>			<b>138 h</b>		<b>10</b>		<b>1.183.182 Ft</b>
RC beams	24 m <sup>3</sup>	6,78 h/m <sup>3</sup>	161 h	3	7	9000 Ft/m <sup>2</sup>	712.800 Ft
Slab construction					5		1.158.360 Ft
Ground floor slab formwork	83 m <sup>2</sup>	0,84 h/m <sup>2</sup>	70 h	6	2	150 Ft/m <sup>2</sup> /nap	24.822 Ft
Reinforcement of ground floor slab	0,41 t	63,90 h/t	26 h	6	1	300000 Ft/t	124.110 Ft
Concreting of the ground floor slab	21 m <sup>3</sup>	0,90 h/m <sup>3</sup>	19 h	6	1	50000 Ft/m <sup>3</sup>	1.034.250 Ft
Ground floor slab formwork removal	83 m <sup>2</sup>	0,28 h/m <sup>2</sup>	23 h	6	1		

<b>Vertical load-bearing structures 1st floor</b>			<b>111 h</b>		<b>12</b>		<b>7.191.000 Ft</b>
RC walls construction	7 m <sup>3</sup>	6,78	47 h	3	2	9000 Ft/m <sup>2</sup>	6.000.000 Ft
<b>Construction of 1st floor pillars</b>					<b>5</b>		<b>595.500 Ft</b>
Placement of reinforcement of 1st floor pillars	0,15 t	63,90 h/t	10 h	3	1	300000 Ft/t	45.000 Ft
Formwork for 1st floor pillars	7 m <sup>2</sup>	1,00 h/m <sup>2</sup>	7 h	3	1	3500 Ft/db	10.500 Ft
Concreting of first floor pillars	10 m <sup>3</sup>	4,50 h/m <sup>3</sup>	45 h	3	2	54000 Ft/m <sup>3</sup>	540.000 Ft
Formwork for 1st floor pillars removal	7 m <sup>2</sup>	0,33 h/m <sup>2</sup>	2 h	3	1		
<b>Horizontal load-bearing structures 1st floor</b>					<b>7</b>		<b>8.880.080 Ft</b>
RC beams	4 m <sup>3</sup>	6,78 h/m <sup>3</sup>	24 h	3	2	9000 Ft/m <sup>2</sup>	106.500 Ft
Formwork for RC slab	51 m <sup>2</sup>	0,84 h/m <sup>2</sup>	43 h	4	2	10000 Ft/m <sup>2</sup>	6.000.000 Ft
Placement of reinforcement of RC slab	1,03 t	63,90 h/t	66 h	4	3	300000 Ft/t	308.580 Ft
Concreting of RC slab	51 m <sup>2</sup>	0,9 h/m <sup>3</sup>	46 h	4	2	50000 Ft/m <sup>3</sup>	2.571.500 Ft
<b>Roof</b>					<b>5</b>		<b>1.555.200 Ft</b>
Installation of anti-vapour barrier	162 m <sup>2</sup>	0,12 h/m <sup>2</sup>	19 h	3	1	2000 Ft/m <sup>2</sup>	324.000 Ft
Thermal insulation	162 m <sup>2</sup>	0,46 h/m <sup>2</sup>	1 h	3	1	2800 Ft/m <sup>2</sup>	453.600 Ft
Concrete slope from thermal insulation	162 m <sup>2</sup>	0,58 h/m <sup>2</sup>	1 h	3	1	2800 Ft/m <sup>2</sup>	453.600 Ft
Waterproofing	162 m <sup>2</sup>	0,28 h/m <sup>2</sup>	45 h	3	2	2000 Ft/m <sup>2</sup>	324.000 Ft
Drainage sheet	162 m <sup>2</sup>	0,08 h/m <sup>2</sup>	13 h	3	1	2900 Ft/m <sup>2</sup>	469.800 Ft
Gutter installation	10 m	0,20 h/m	2 h	1	1	8500 Ft/m <sup>2</sup>	85.000 Ft
Downpipe installation	7 m	0,20 h/m	1 h	1	1	9500 Ft/m <sup>2</sup>	66.500 Ft
Drainage gully	27 m	0,86 h/m	23 h	3	1	14000 Ft/m <sup>2</sup>	378.000 Ft
Roof tiling (various according to the type - concrete tile to complicated beavertail covering)	162 m <sup>2</sup>	1,20 h/m <sup>2</sup>	194 h	3	9	9000 Ft/m <sup>2</sup>	1.458.000 Ft
<b>Facade</b>					<b>32</b>		<b>50.577.216 Ft</b>
Scaffolding	261 m <sup>2</sup>	0,21 h/m <sup>2</sup>	55 h	2	4	45 Ft/m <sup>2</sup>	46.980 Ft
Wall painting	24 m <sup>2</sup>	0,17 h/m <sup>2</sup>	4 h	2	1	3600 Ft/m <sup>2</sup>	85.536 Ft
Gaable, Windowssill, sheet metal covering	77 m	0,47 h/m	36 h	2	3	10700 Ft/m <sup>2</sup>	2.471.700 Ft
Installation of curtain walls	158 m <sup>2</sup>	1,30 h/m <sup>2</sup>	205 h	2	13	205000 Ft/m <sup>2</sup>	32.390.000 Ft
Thermal insulation	103 m <sup>2</sup>	0,45 h/m <sup>2</sup>	46 h	3	2	11000 Ft/m <sup>2</sup>	1.133.000 Ft
Exterior cladding	103 m <sup>2</sup>	1,20 h/m <sup>2</sup>	124 h	3	6	50000 Ft/m <sup>2</sup>	5.150.000 Ft
External doors and windows	9 db	1,0 h/db	9 h	2	1	100000 Ft/db	900.000 Ft
Shadow system	105 m <sup>2</sup>	2,4 h/db	24 h	2	2	80000 Ft/m <sup>2</sup>	8.400.000 Ft
<b>Interior finishing works</b>			<b>394 h</b>		<b>28</b>		<b>5.147.120 Ft</b>
construction of Floating floor	36 m <sup>2</sup>	1,60 h/m <sup>2</sup>	23 h	2	2	5000 Ft/m <sup>2</sup>	180.000 Ft

construction of partition walls	47 m <sup>2</sup>	0,61 h/m <sup>2</sup>	29 h	2	2	8500 Ft/m <sup>2</sup>	399.500 Ft
Internal plastering	248 m <sup>2</sup>	0,10 h/m <sup>2</sup>	25 h	2	2	2500 Ft/m <sup>2</sup>	620.000 Ft
Wall painting	248 m <sup>2</sup>	0,22 h/m <sup>2</sup>	55 h	2	4	1800 Ft/m <sup>2</sup>	446.400 Ft
Ceiling painting	95 m <sup>2</sup>	0,15 h/m <sup>2</sup>	14 h	2	1	1800 Ft/m <sup>2</sup>	171.000 Ft
Making water-repellent painting	25 m <sup>2</sup>	0,11 h/m <sup>2</sup>	3 h	3	1	2000 Ft/m <sup>2</sup>	50.000 Ft
Placing wall tiles	41 m <sup>2</sup>	1,53 h/m <sup>2</sup>	63 h	3	3	6000 Ft/m <sup>2</sup>	248.220 Ft
Flooring	112 m <sup>2</sup>	0,30 h/m <sup>2</sup>	34 h	2	2	7000 Ft/m <sup>2</sup>	784.000 Ft
Footer	67 m	0,30 h/m	20 h	4	1	8000 Ft/m <sup>2</sup>	536.000 Ft
suspended ceiling	71 m <sup>2</sup>	1,28 h/m <sup>2</sup>	91 h	2	6	16000 Ft/m <sup>2</sup>	1.136.000 Ft
Metal works	6 db	0,4 h/db	2 h	2	1	4000 Ft/db	24.000 Ft
Decoration and tapestry	12 db	2,40 h/m <sup>2</sup>	29 h	2	2	6000 Ft/m <sup>2</sup>	72.000 Ft
Interior doors and windows	6 db	1,0 h/db	6 h	2	1	80000 Ft/db	480.000 Ft
<b>Mechanical works</b>			<b>129 h</b>		<b>22</b>		<b>11.520.000 Ft</b>
Domestic hot water installation	3 db	3,8 h/db	11 h	3	1		
Heating system installation	8 db	1,8 h/db	14 h	3	1	80000 Ft/db	640.000 Ft
Placement of mechanical equipments					3		
Photovoltaic panels installation	104 db	1,0 h/db	104 h	6	3	70000 Ft/db	7.280.000 Ft
Electrical Wiring					4		
Electrical installation					6		
Placement of sanitary ware	8 db				4	450000 Ft/db	3.600.000 Ft
<b>Cleaning and final works</b>			<b>243 h</b>		<b>10</b>		<b>30.435.000 Ft</b>
Waste disposal pavement + sand + concrete + gravel	2029 m <sup>2</sup>	0,12 h/m <sup>2</sup>	243 h	4	2	15000 Ft/m <sup>2</sup>	30.435.000 Ft
<b>Handover, final cleaning, repairs</b>					<b>3</b>		
<b>TOTAL</b>					<b>201 n</b>		<b>141.313.178 Ft</b>

## 9. MPM network



### 13. References

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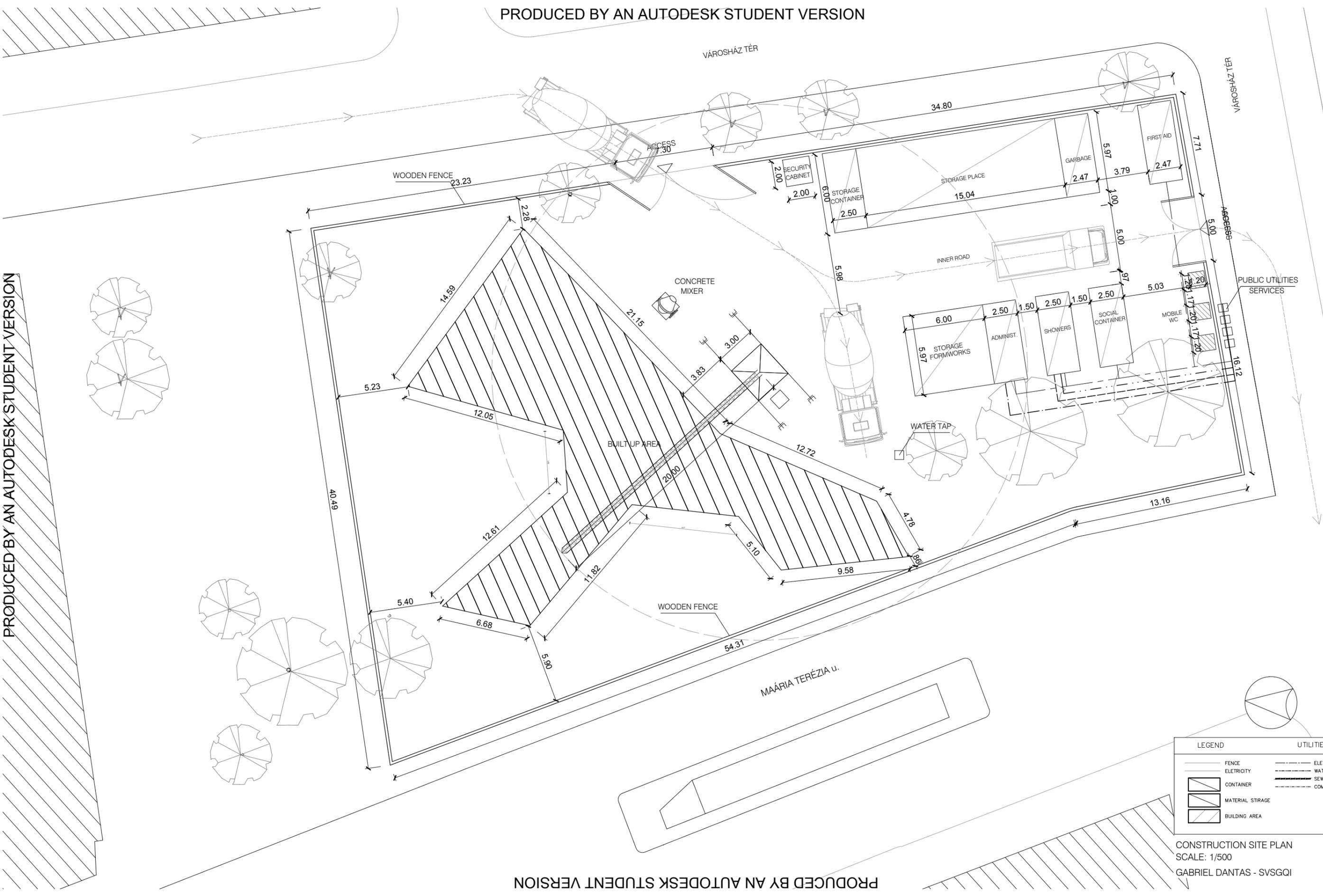
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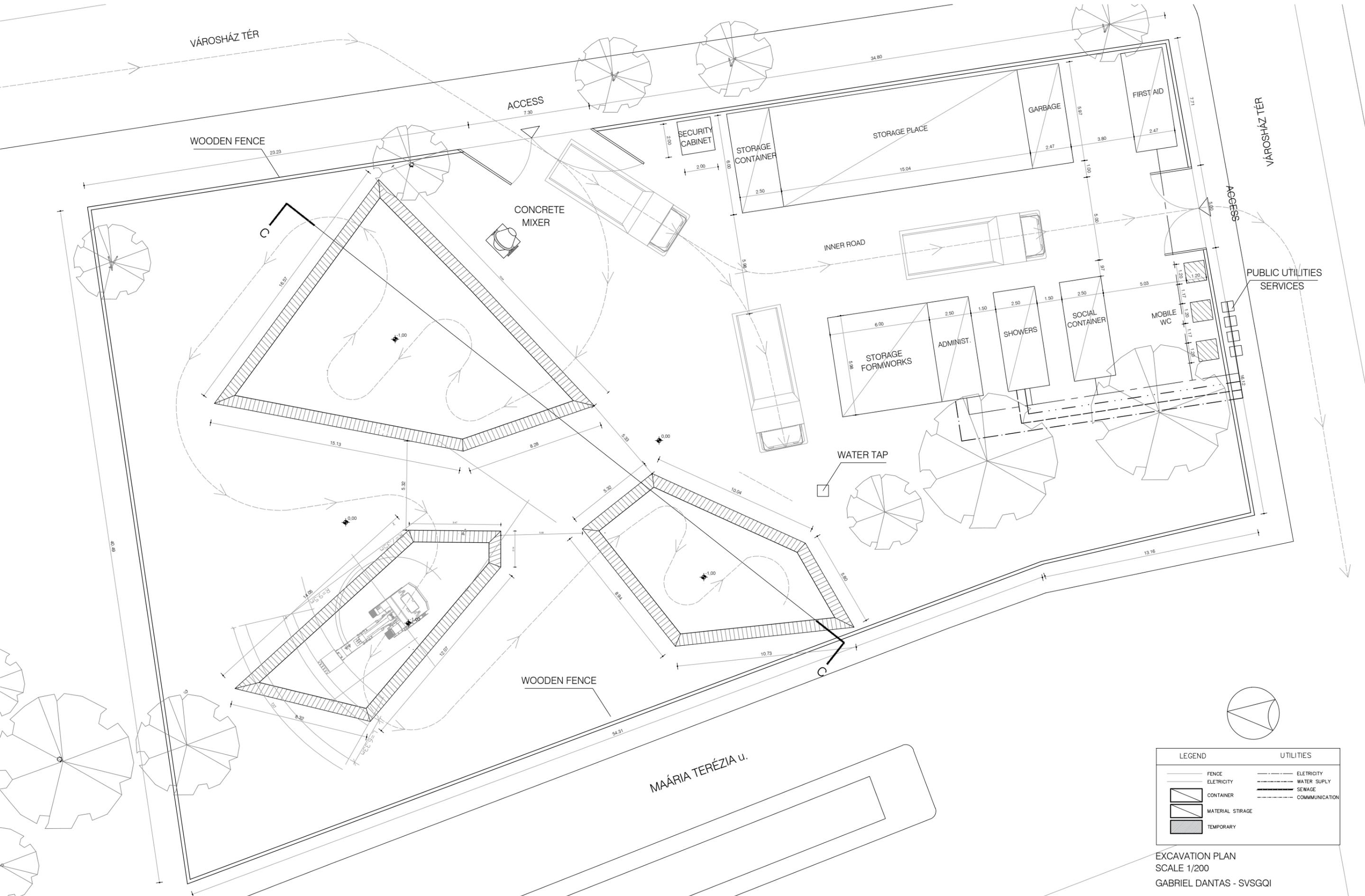
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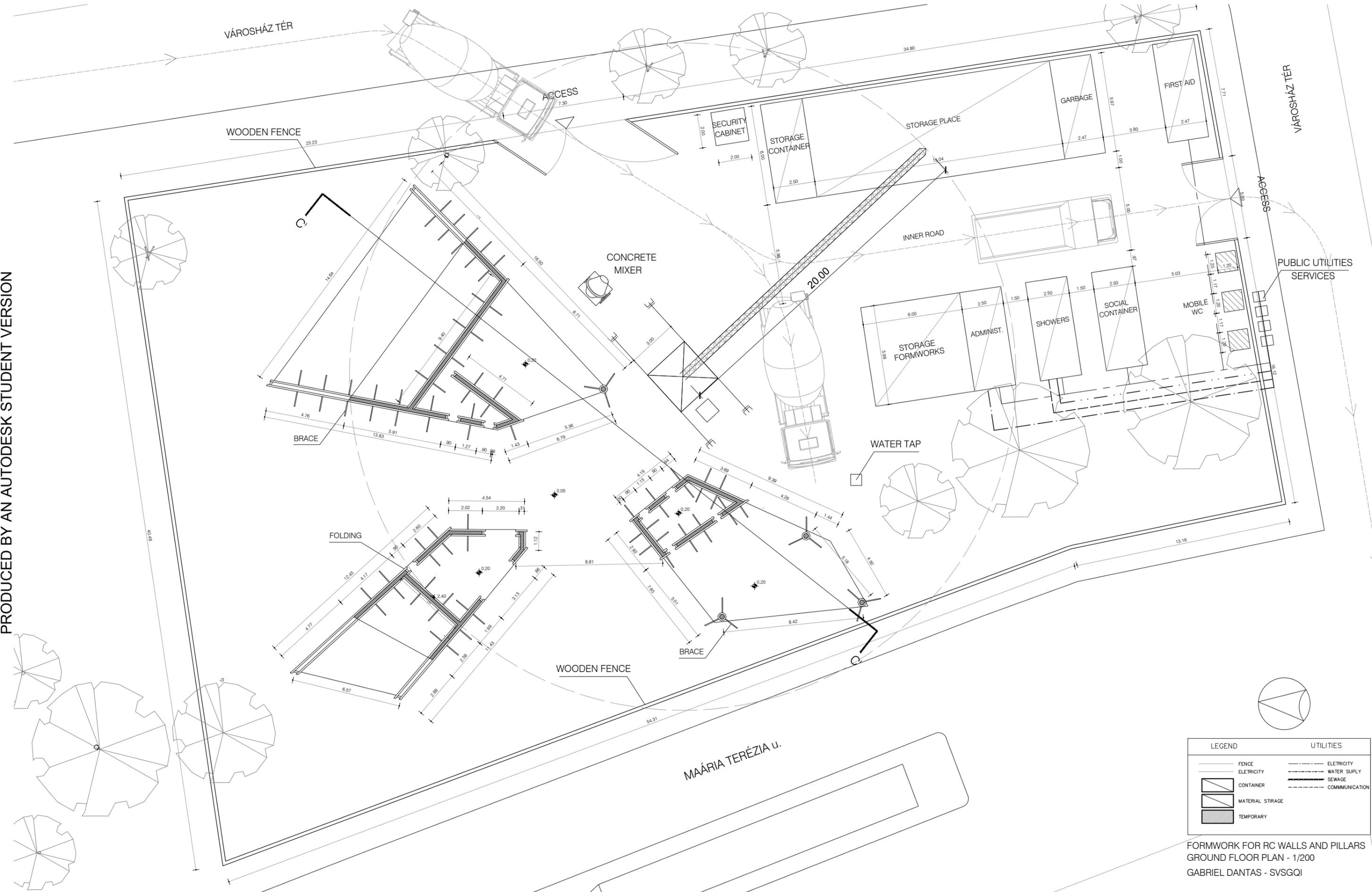
LEGEND		UTILITIES	
	FENCE		ELETRICITY
	ELETRICITY		WATER SUPPLY
	CONTAINER		SEWAGE
	MATERIAL STRAGE		COMMUNICATION
	BUILDING AREA		

CONSTRUCTION SITE PLAN  
 SCALE: 1/500  
 GABRIEL DANTAS - SVSGQI



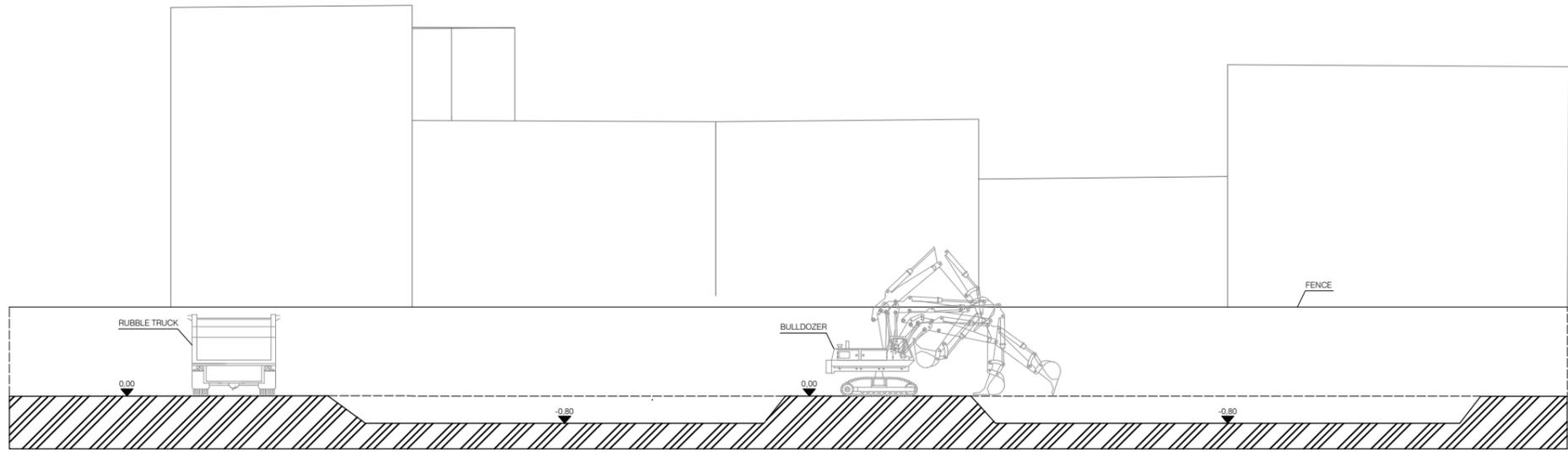
LEGEND		UTILITIES	
	FENCE		ELETRICITY
	ELETRICITY		WATER SUPPLY
	CONTAINER		SEWAGE
	MATERIAL STRAGE		COMMUNICATION
	TEMPORARY		

EXCAVATION PLAN  
 SCALE 1/200  
 GABRIEL DANTAS - SVSGQI

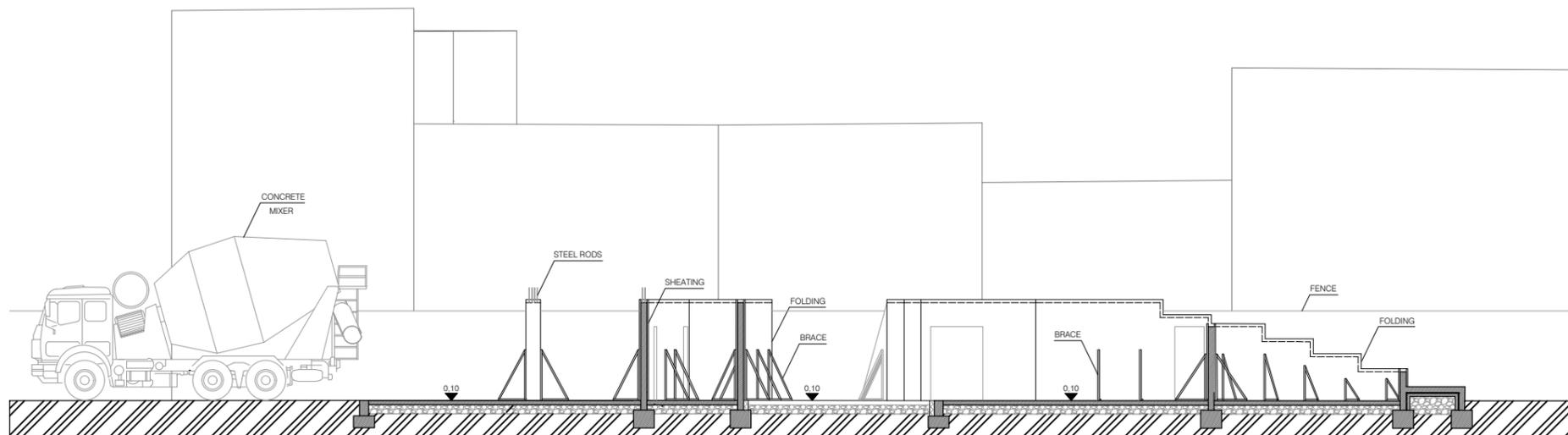


LEGEND		UTILITIES	
	FENCE		ELETRICITY
	ELETRICITY		WATER SUPPLY
	CONTAINER		SEWAGE
	MATERIAL STORAGE		COMMUNICATION
	TEMPORARY		

FORMWORK FOR RC WALLS AND PILLARS  
 GROUND FLOOR PLAN - 1/200  
 GABRIEL DANTAS - SVSGQI



SECTION CC - EXCAVATION  
SCALE 1/200



SECTION C'C' - FORMWORKS  
SCALE 1/200

LEGEND		UTILITIES	
	FENCE		ELETRICITY
	ELETRICITY		WATER SUPPLY
	CONTAINER		SEWAGE
	MATERIAL STORAGE		COMMUNICATION
	TEMPORARY		

SECTIONS C-C AND C'-C'  
SCALE 1/200

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