THE BUDAFOK L

URBAN DEPARTMENT

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JO49DF

1. PRELIMINARY STUDY:

- **1.1 Site Context:**

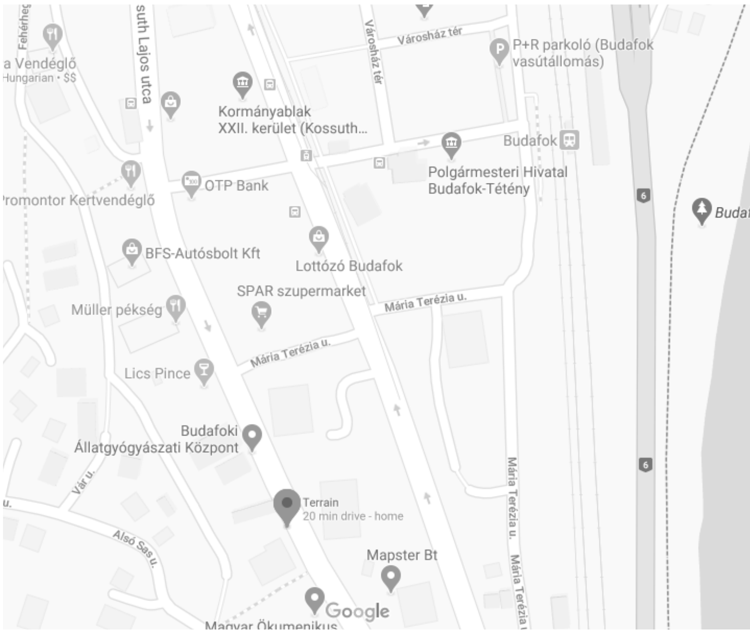
The location of the site is is Budafok XXII district in Budapest, Hungary. This district is known for its location of winery and cellars. It is an area where it is very developed with some empty sites. The access by public transportation is easily reachable to the city center around 30 min. The area contains a very heavy traffic on the railway to south, and also on Kossuth Lajos utca, where the building is located. This way, since the collected data this street will turn into a pedestrian way and it provides an aspect of small town combined with the concept of sustainability. The main potentials of this area are the historical heritage, since the Torley (wine) winery/factory is located. It is also attactive on its potential nature surrounding in a child and environment friendly.

Budafok Map – Google Maps

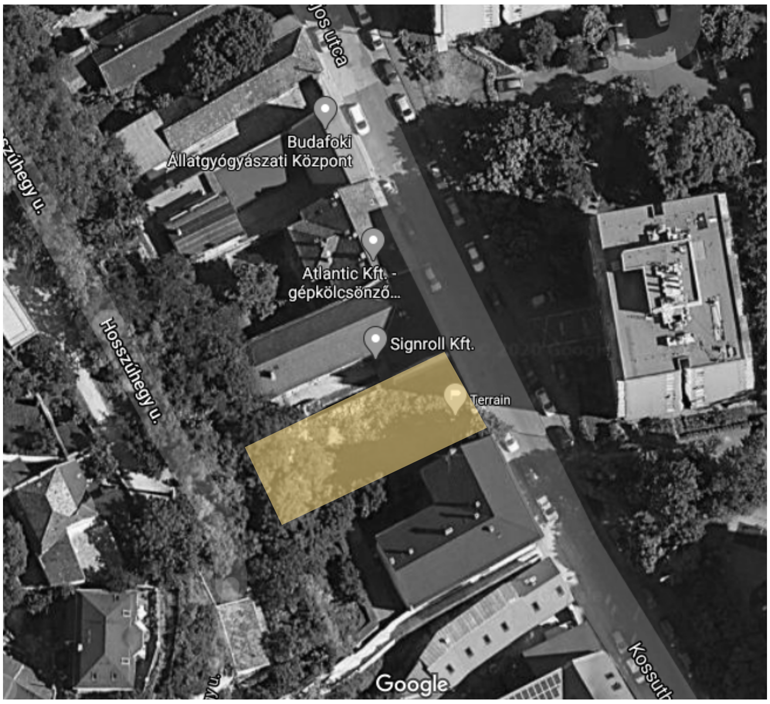
1.2. Site description:

Building Location and Potentials:

This site chosen is a pontential since the street Kossuth Lajos is turned into a pedestrian way, in the concept was also focused this idea of sustainability and walkable street. Where the building is located on the bottom of the hill and close to an access of a staircase on the neighboring building.



Site Location and Surrounding – Google Maps



Demarcation of site and its neighboring buildings – Google Maps

1.2 The characteristics of the neighboring buildings:

Arial View of Neighboring – Google Maps

Pitched roof. Left building contains basement and access to the hilly area via staircase.

Neighboring building and staircase – own pictures

2. SITE

2.1 Surrounding:

Surrounding Building on the Envelope:

Soil mechanics

Soil Mechanics for Budafok central area data:

0–1,4mheterogeneousbackfill(ϕ=28°,c=10kPa,γ = 18 kN/m3, Es = 7 MPa)

1,4–1,9msilt-sandsoil(ϕ=24°,c=20kPa,γ=19,5 kN/m3, Es = 9,2 MPa)

1,9 – 3,2m silt-sand soil with stone rubble (ϕ = 24°, c =25 kPa, γ = 19,8 kN/m3, Es = 12,2 MPa)

3,2 – 3,5m silt- soil with stone rubble (ϕ = 23°, c = 30 kPa, γ = 19,8 kN/m3, Es = 11 MPa)

3,5 – 4,8m silt- with gravel (ϕ = 24°, c = 33 kPa, γ = 20,3 kN/m3, Es = 12,1 MPa)

4,8 – 5,5m silt-sand soil (ϕ = 25°, c = 10 kPa, γ = 21 kN/m3, Es = 11,1 MPa)

Groundwater at approx. 9-11 m depth from ground. The temperature in Budapest (located with the pink dot in the following maps) have a big variation during all the year, for example, the temperature variates in February from -4°C to -6°C and in August from 22°C to 24°C, furthermore, how it was briefly analyzed, the green areas nearby the four blocks creates a proper microclimate, promoting spaces with more shadows in the summer lowing the maximum heat and increasing the humidity. With this data we can be sure that the thermal insulation for the building will be extremally necessary.

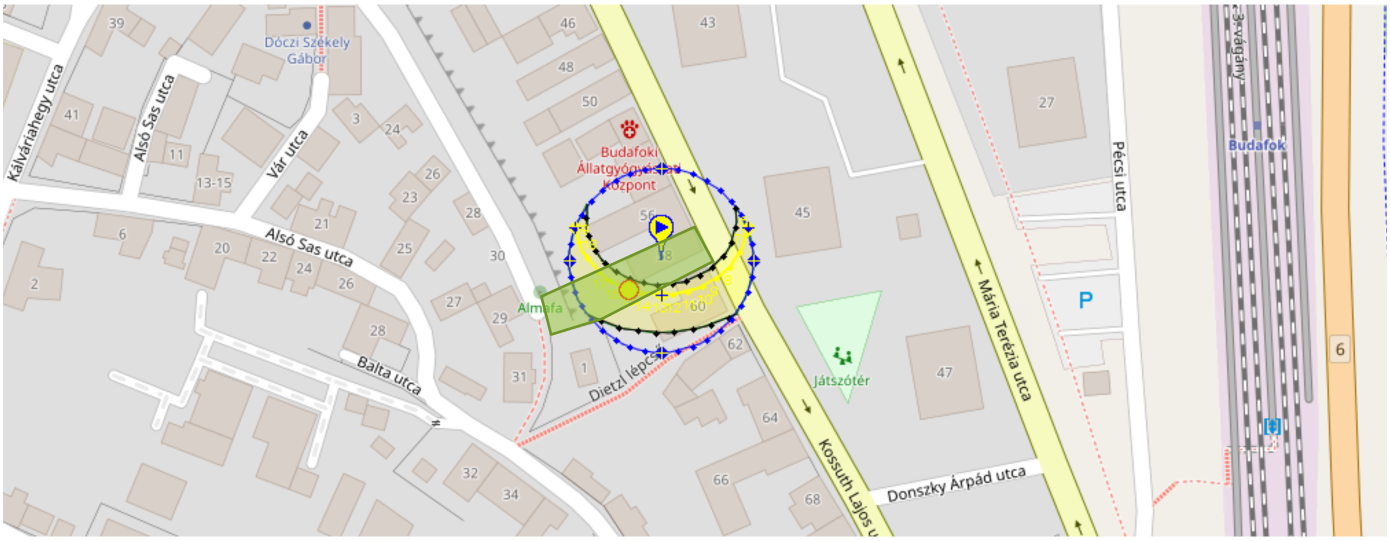
2. SITE PLAN


KOSSUTH LAJOS UTCA
MARIA TEREZIA UTCA
HOSSZUHEGY UTCA
DIETZL LEPCSO
ALSO SAS UTCA
DONSKY ARPAD UTCA

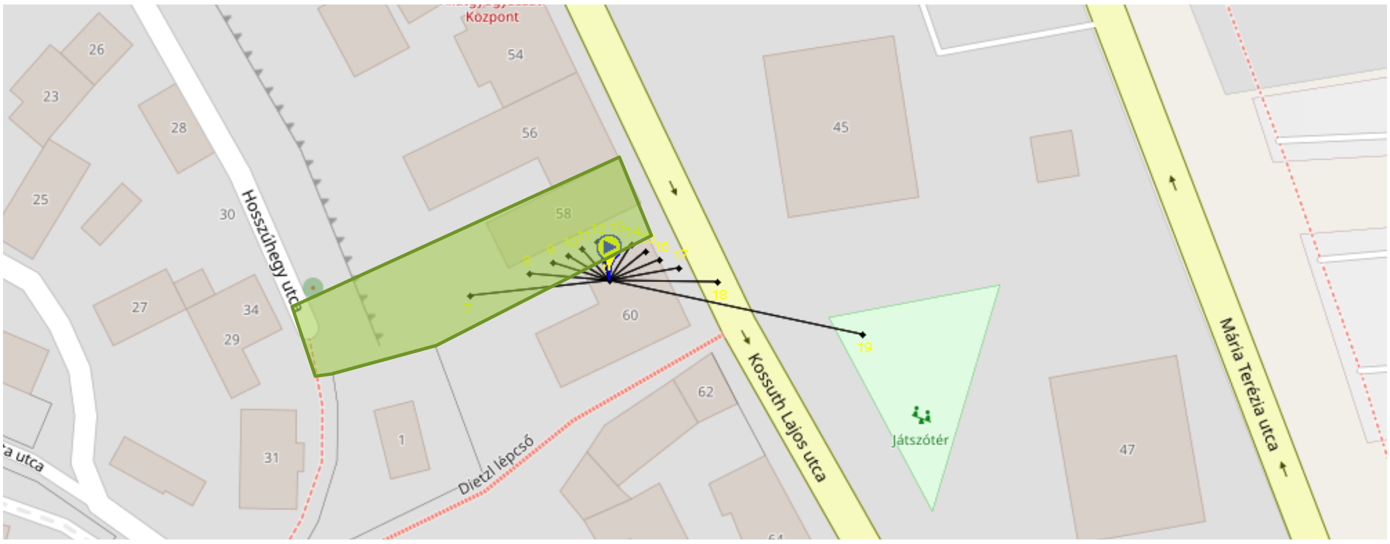
2.2 Solar Exposure on the site

The solar exposure on the precisely thought on the Project concept. Since it was one of the main decision on the shape to obtain as much lights as possible to provide an energy saving to the amount of lightning inside, providing to the offices as much natural lights and less use of artificial lights.

Lighthing



Shadowing



According to the Zoning area, the southern facade – the courtyard facade is the one that will receive the more insolation during the year, which was also one of the main topic for the design concept.

According to the Hungarian legislation, it is necessary that the building is able to provide 25% renewable energy power, this way the usage of solar panels is necessary and located on the roof area to guarantee the energy saving necessary. Nevertheless, where will also be the non walkable roof, as shown on the section.

2.3 Utilities and services:

Public services on the site

The site is provided with public utilities such as electricity, water, sewage and communication.

3. CONCEPT

The concept was decided on creating a comfort office building containing commercial facilities on the ground floor which and relate to nature in a sustainable construction, to provide a calm and nice atmosphere for the workers.

This way, the first ideas were to use the site in a way to get as much as possible of sun lights and utilize inside courtyards to refer the surrounding of the very peaceful and connected to the environment.

The project is divided into two parts:

The first is on the street elevation, which contains one rectangular building with two functions: on the ground floor café/bar area containing 60 sqm, and offices on 2 more levels that is going to be more detailed on the concept. And the second part which is the two square shape offices with ground and first floor. Where it also has a courtyard as an open space area with exclusive usage for the offices and bar.

3.1 Design limitations:

Limitations – Neighboring.

Use of sunlight – shadow from neighboring

Use vegetation *communicate with surrounding

transparency

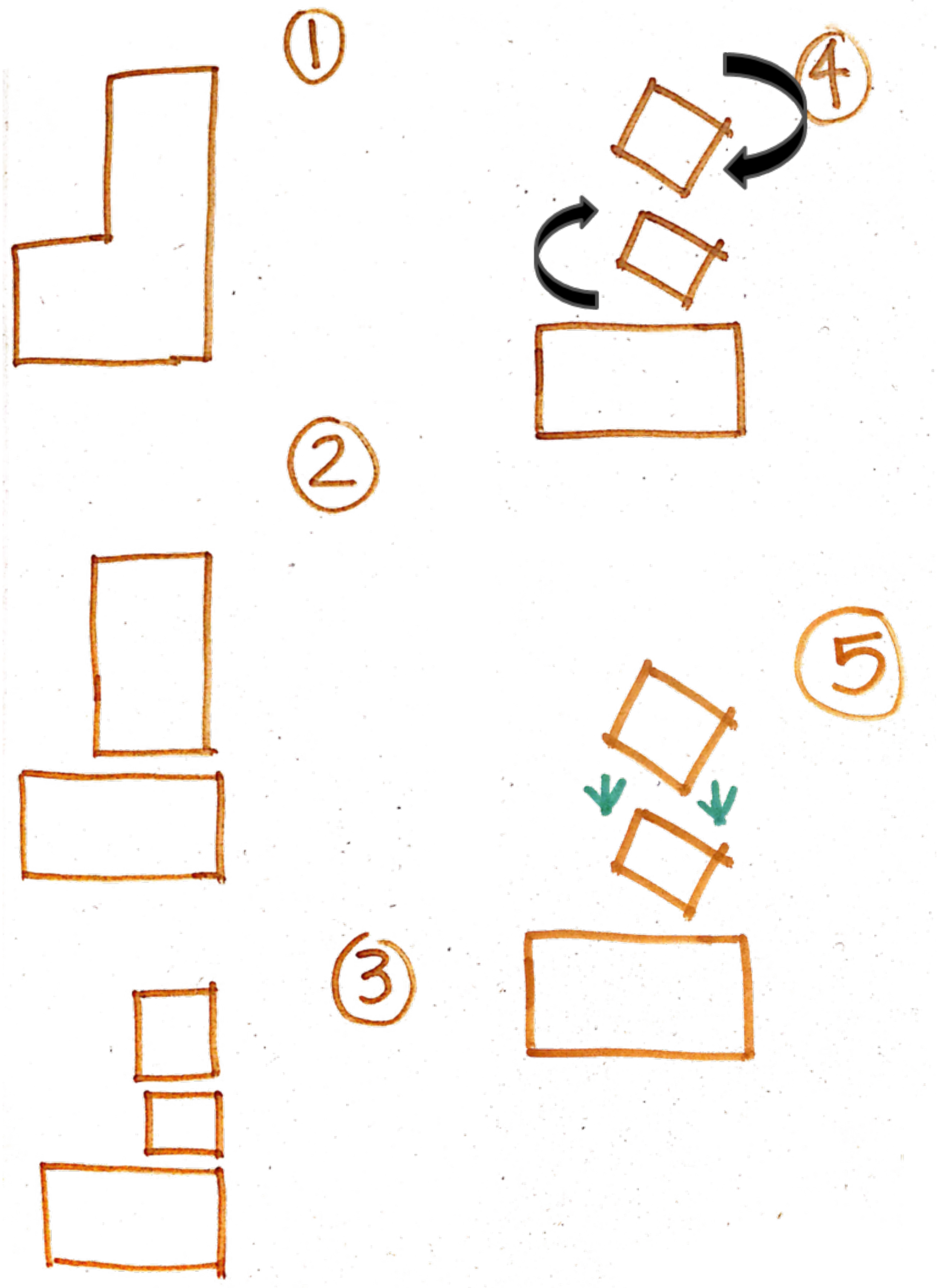
3.2 Description of the site:

Site Area: 474 sqm

Constructed area: 615 m2

Project date: DECEMBER, 2020

THE RETHINK OF "L" SHAPE



There are 2 typologies of offices:

+ One café/bar area also contains 60 sqm on the ground floor.

Typology - Office 1:

The office area is divided into 2 square shaped building with ground and 1st floor, which each one of them contains 82 sqm.

Typology - Office 2:

Containing 60sqm on the rectangular building, on the 1st and 2nd floor up to the café bar.

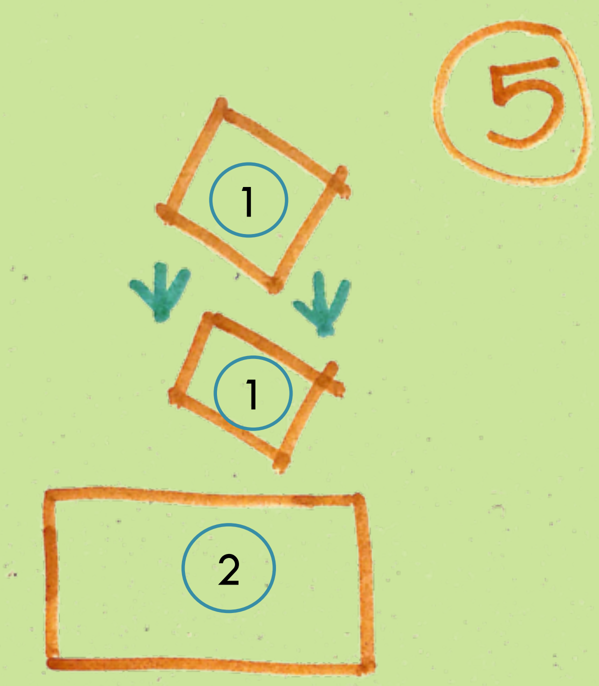
Each typology office 1 – was strongly thought in a has its balcony and on the corridor to access the flats with a small garden

To avoid the firewall view, the architectural decision was to cover this layer with a vertical Garden, because this is the main solar exposure comes from this area.

The commercial zone to the street elevation and typology office 1 were distributed on the ground floor to create a relation to the courtyards that can be accessed by both functions and used as a recreational area.

Using a distinct 2 accesses to the building, such one for all of the offices and the other one exclusively used to the bar area which connects to the courtyards which is used for both users.

The courtyard goes along with the rhythm of the building where it gets the space for the leisure activities and since the typology office 1, the ground area is uses more as a shared space and less required attention, this also creates a vibe of relaxed and friendly.



4.ARCHITECTURAL DECISIONS:

4.1 Sustainability:

Beyond the usage as the terrace as an another façade, since the building is located on the bottom of the hill and also in front of a tall residential building. It is also needed to also reduces the impact of the building, where the water can also be drained and creates a nice atmosphere on a sustainable way.

The idea of the project is to connect the open spaces and green areas to its building to create an integration between nature and construction.

As the streets: Kossuth Lajos utca is the main access to the site it was proposed to use the ground floor to an activity. This way, using this area of shops would create a path to get to the inner area of the site.

The layout of the offices is thought by the insolation utilizing the more sunlight as possible as the square shape building is rotated facing the south, and the courtyard, to integrate this as a solution to sustainability and energy saving. Accordingly, the building system is defined by the café/bar on the ground floor and some common activity to connect to the offices also.

4.2 **Program**

Office:
Relaxed area (less attention required)
Meeting area
Kitchenette with storage
Courtyard
Working zones (concentration area)
Printing and storage
Bike parking
Toilets

Café/Bar:
Storage
Counter area
Toilets
Changing zones for the services
Kitchen
Waste disposal
Eating Zone

5. TECHNICAL DESCRIPTION OF CONSTRUCTION ANALYSES

5.1 Architectural Solution Layers:

Thermal insulation, XPS on the facades.

Ventilated Facades to avoid frosting.

Cladding: Rieder Concrete Cladding #REF. Matt liquid Black

- Courtyard:

Layers to the grass walkable area.

Wooden Deck

Gypsum board suspended ceiling

Heating Envelope Area:

The circulation areas besides the vertical circulation are out of the heating envelope, that shows the main problem with the thermal envelope, which means that the main temperature difference are in these areas, and also considering the gardens in front of the corridors, where will need to consider the thermal break to avoid this main temperature difference.

Layers:

Partition wall: Drywall – Gypsum Board 10 cm

External Wall: Hollow Block 30 cm

External Wall 2 (Plot separation): Concrete Hollow block 30 cm

Special Technologies:

Double glazed wall

Gardening box on façade

Skylight

Solar panels part of the roof.

THE SURROUNDING

The neighborhood is a residential area, where there isn't a noisy area, considering the solar exposure on the site can be seen on the images above.

On Kossuth Lajos Street since it is considered as pedestrian way, the closest noise considered is from the Maria Terezia utca, which is 65 m straight line distant from the main façade which exposes not much of noise and since there are some vegetation which creates noise shadow and reduction around 15db.

The building on the left contains a basement and the one on the right doesn't, the two of them are covered with pitched roof.

There are parking lots on the surrounding, mostly for residential use. Some of them are also for public use. In the proposal there is also a parking lot plan for the workers. But the main proposal on the concept is to create the space for the locals, and to encourage the use of bicycles to decrease the CO2 emission.

6. LOAD BEARIND STRUCTURE SYSTEM

6.1 FOUNDATION SYSTEM:

Concrete Block Strip foundation

6.2 VERTICAL LOAD-BEARING SYSTEM:

Both buildings are Skeleton frame.

R.C Beam: 300 x 400 mm

R.C Columns: 300 x 300 mm / Metal columns 30 mm diameter

R.C Slab: 200 mm

6.3 HORIZONTAL LOAD-BEARING SYSTEM:

Reinforced concrete walls – Shear walls. Moment frame system

6.4 BRACING SYSTEM

The bracing system contains on the street façade building:
Stiffening heart system surrounding the staircase, which protects the area for fire and also the horizontal loads.

On The rotated buildings each one contains 2 moment frame which are shear and supports horizontal loads.

6.5 OTHER STRUCTURES

6.5.1 STAIRCASE

Monolithic R.C

7. VERTICAL LOADS SYSTEM.
7.1 FOUNDATION

The concrete block strip foundation are to be used for this project. The slab foundations will transfer the loads of the building to the soil. There is no basement underneath the building. The sizes of the loadbearing strip foundation are 60 x 60 cm.

The building plot has an incline on the bottom, where will be placed a retaining wall in order to contain the rainwater which comes from uphill inwards to the plot. The plot will be excavated, and horizontal anchors will be placed to hold the soil in place while the foundations walls are placed. In addition the drainage system would be installed.

A longitudinal R.C. wall goes down to the lowest level of the slab foundation. Where the connection joints will be made from the reinforcement to the concrete foundation blocks.

7. VERTICAL LOADS SYSTEM.
7.2 SLAB

20 cm thick, four way supported reinforced concrete slabs. There is a difference in level between the indoor floor layers and outdoor floor layers, therefore there is a jump in the slab to lower down the level of the outdoor floor layers.

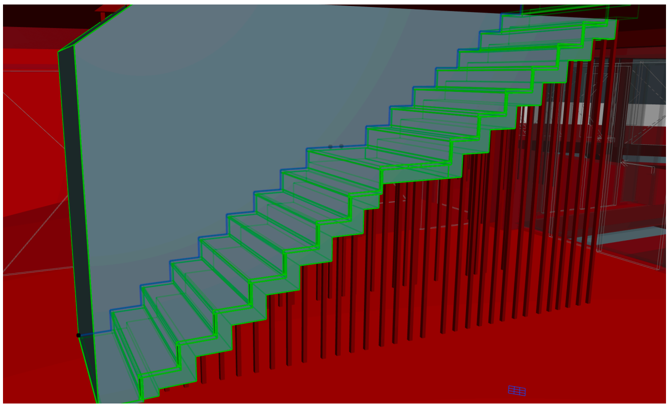
7.3 RETAINING WALL

Due to the sloped nature of the site, retaining walls are required to hold the soil and rainwater.

7. VERTICAL LOADS SYSTEM.
7.4 STAIRCASE

There street façade building have staircase staircases as the main vertical circulation which is envolved with a stifenning heat system for the horizontal loads, in the central space of the building. The staircase is partially loaded onto the loadbearing reinforced concrete wall.

To the rotated buildings, steel loadbearing columns are placed in order to support the R.C staircase. Hangers act as additional support for the staircase. They can also serve as handrails.



7. VERTICAL LOADS SYSTEM.
7.5 BEAM

Reinforced concrete beams are placed. 300mm x 400mm in order to support the loads upcoming from the non-loadbearing elements.

8. HORIZONTAL LOADS SYSTEM.
8.1 MOMENT FRAME

INCLUDE SEISMIC, WIND AND SERVICEABILITY

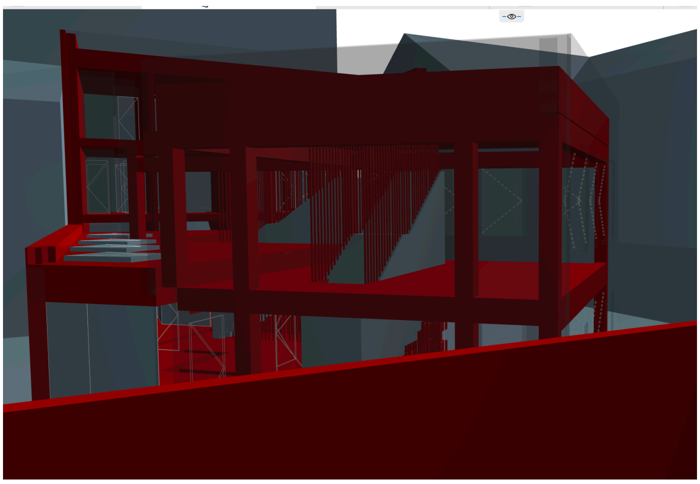
Input IBC 2012 or 2015 design data including Seismic, Wind and Serviceability parameters required.

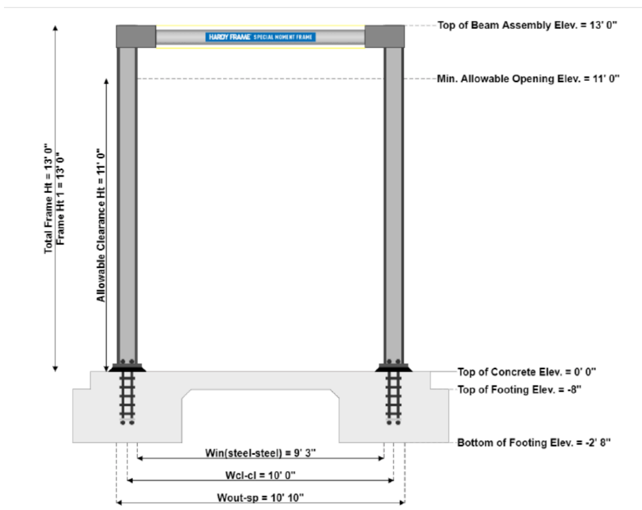
Design load input is also interactive and graphical.

Point, Joint and Uniform loading is supported by an easy-to-use interface.

Eight Load Patterns including Dead, Live, Seismic and Wind are supported.

Vertical, lateral and moment load types are allowed.

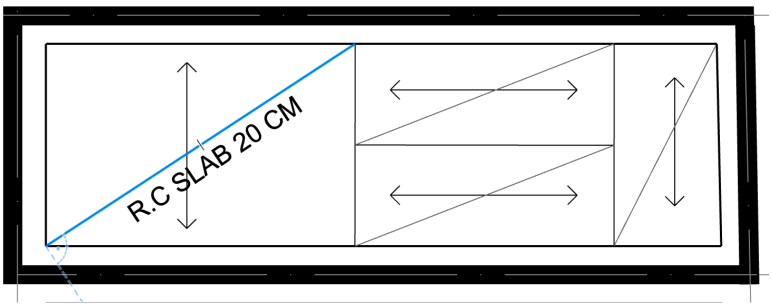




8. HORIZONTAL LOADS SYSTEM.
8.1 STIFFENING HEART - R.C WALLS

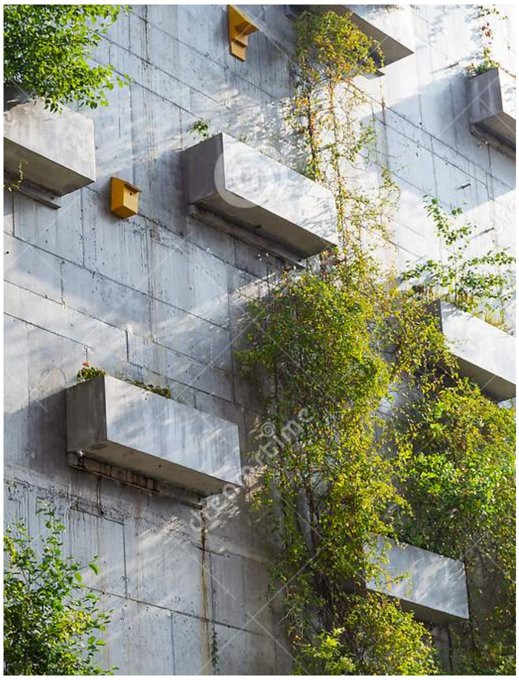
INCLUDE SEISMIC, WIND AND SERVICEABILITY

Eight Load Patterns including Dead, Live, Seismic and Wind are supported.



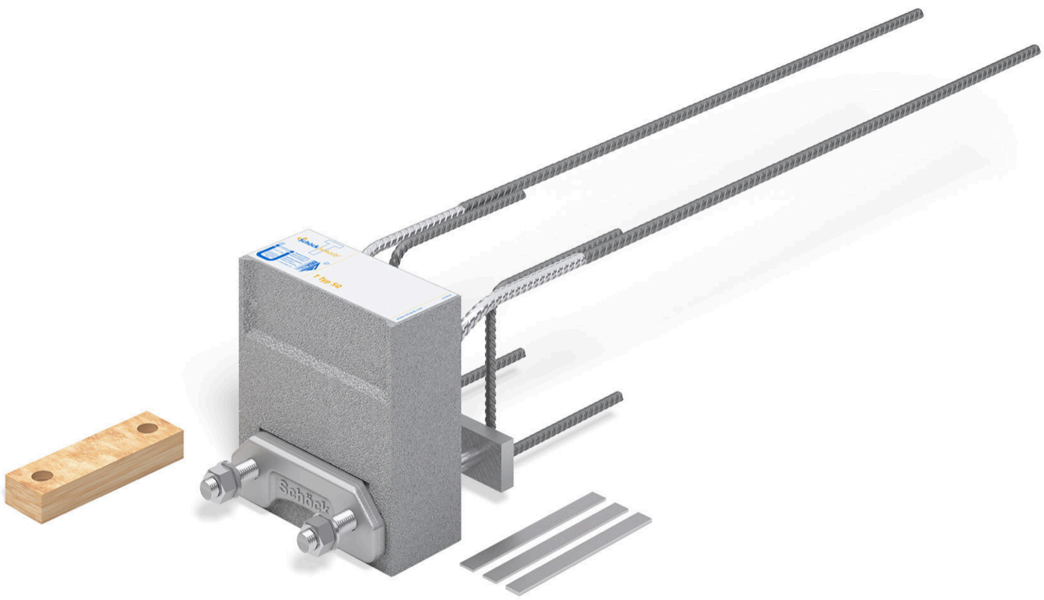
CONCRETE PLANT VASE WITH THERMAL BREAK

In order to provide some vegetation since the upper floors don't have much connection to the gardens, the pant vases are provided to create a visual barrier since the building in front of the street elevation. And aesthetically creates one more layer to the street façade.

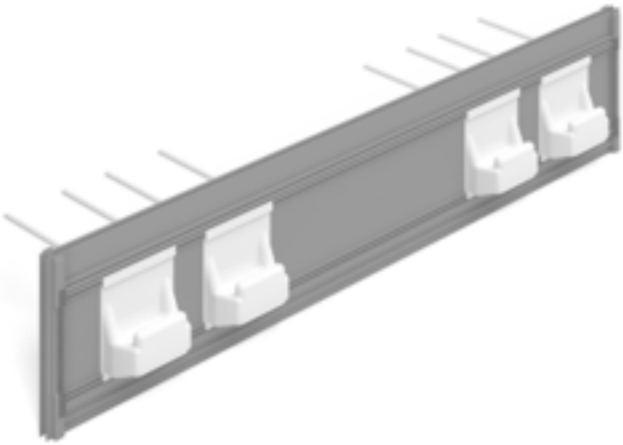


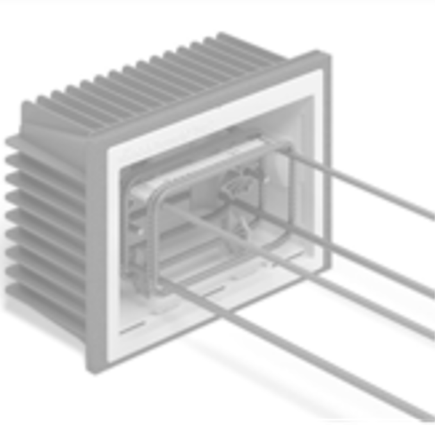
Schöck Isokorb® T type SQ

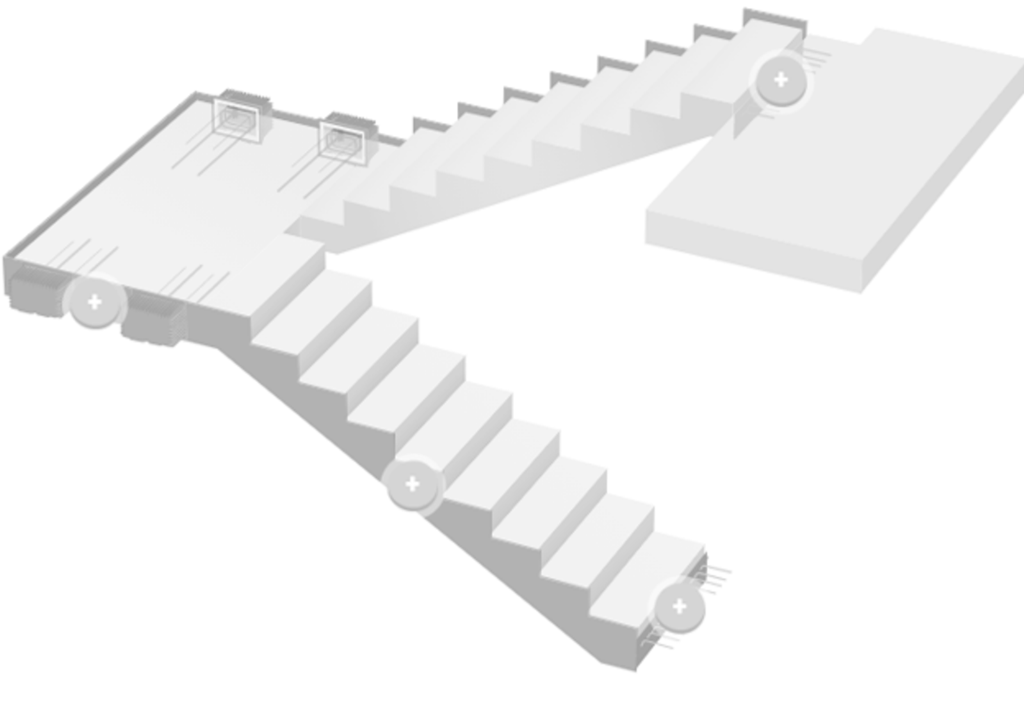
The Schöck Isokorb® T type SQ is a load-bearing thermal insulation element with 80 mm insulation thickness for connecting supported steel structures to reinforced concrete slabs. The Schöck Isokorb® T type SQ makes it easy to solve the technical and structural issues of designing modern balconies and facades.



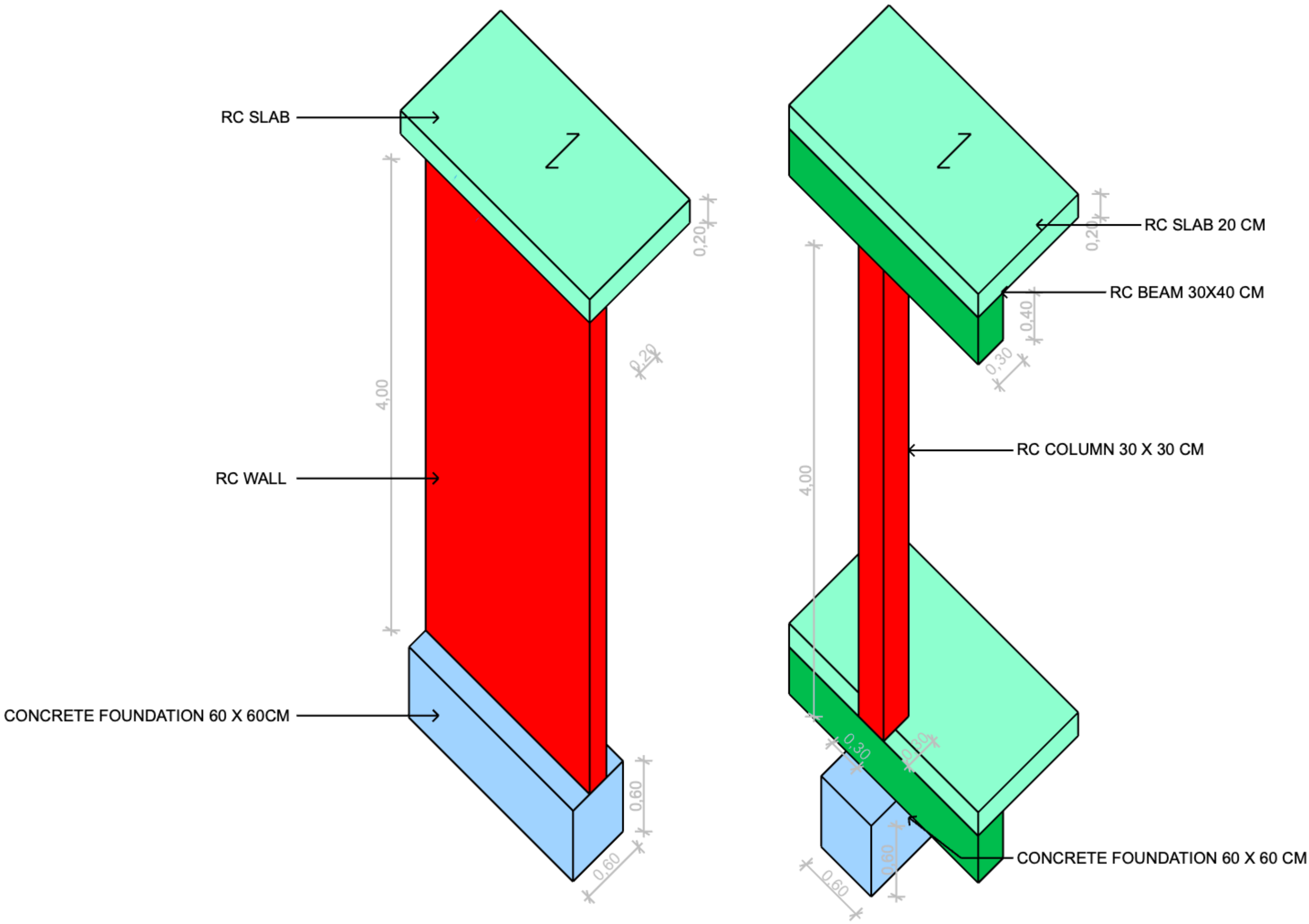
8. HORIZONTAL LOADS SYSTEM.
8.2 SHOLK ELEMENT







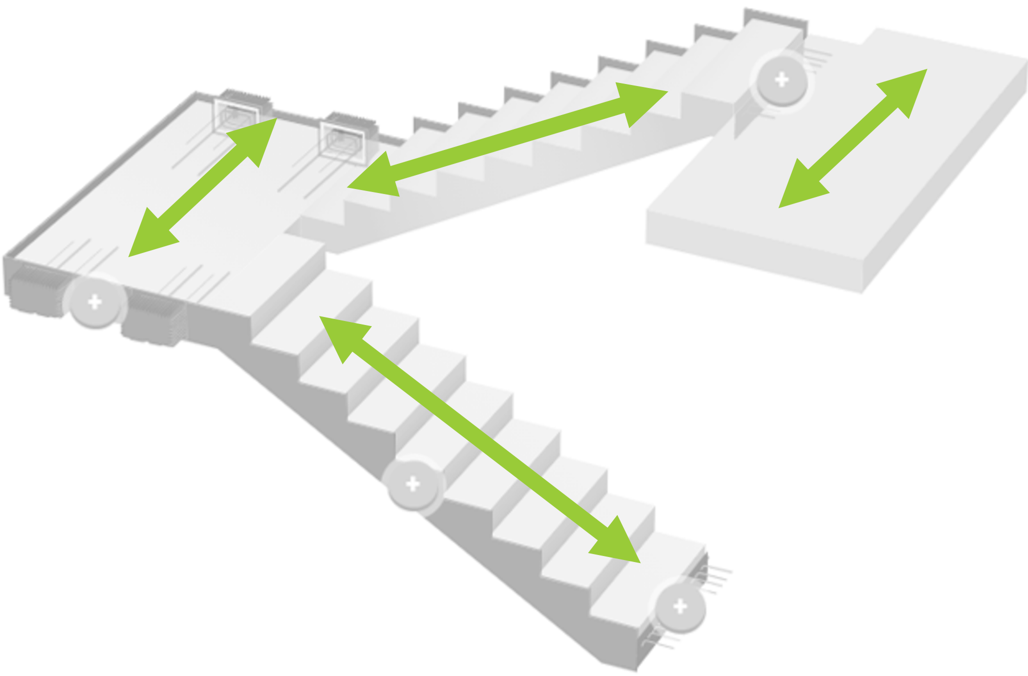
8. STRUCTURAL SKETCH



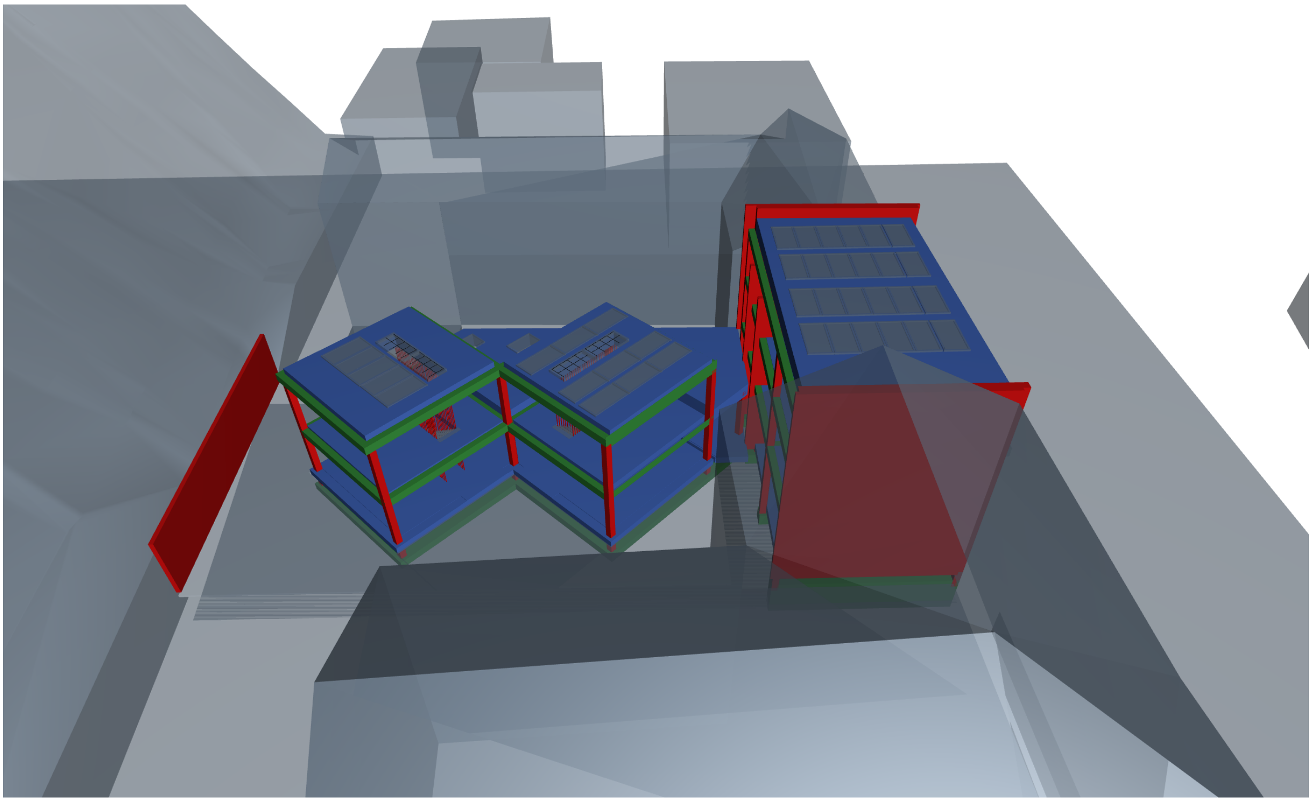
GROUND FLOOR RC WALL PERSPECTIVE

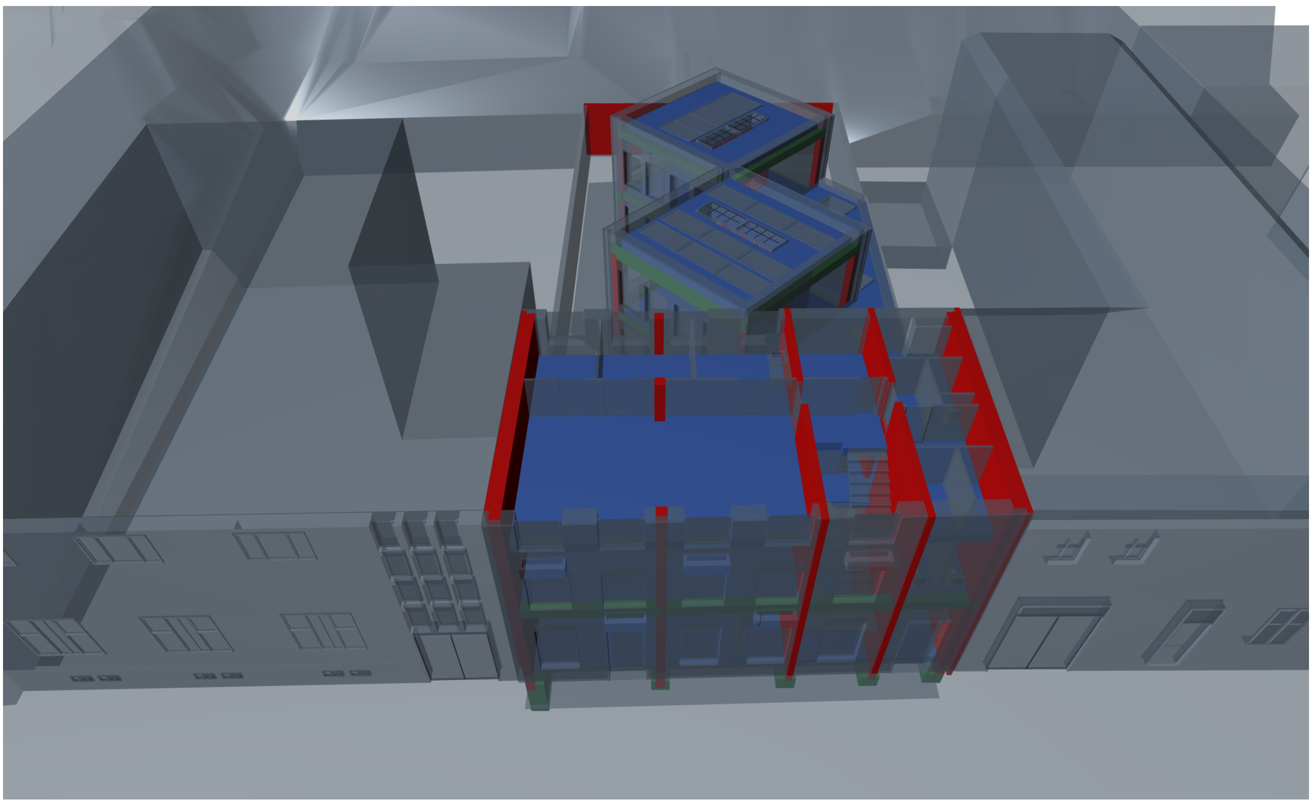
JOINTS CONECTION

STAIRCASE STRUCTURAL PERSPECTIVE

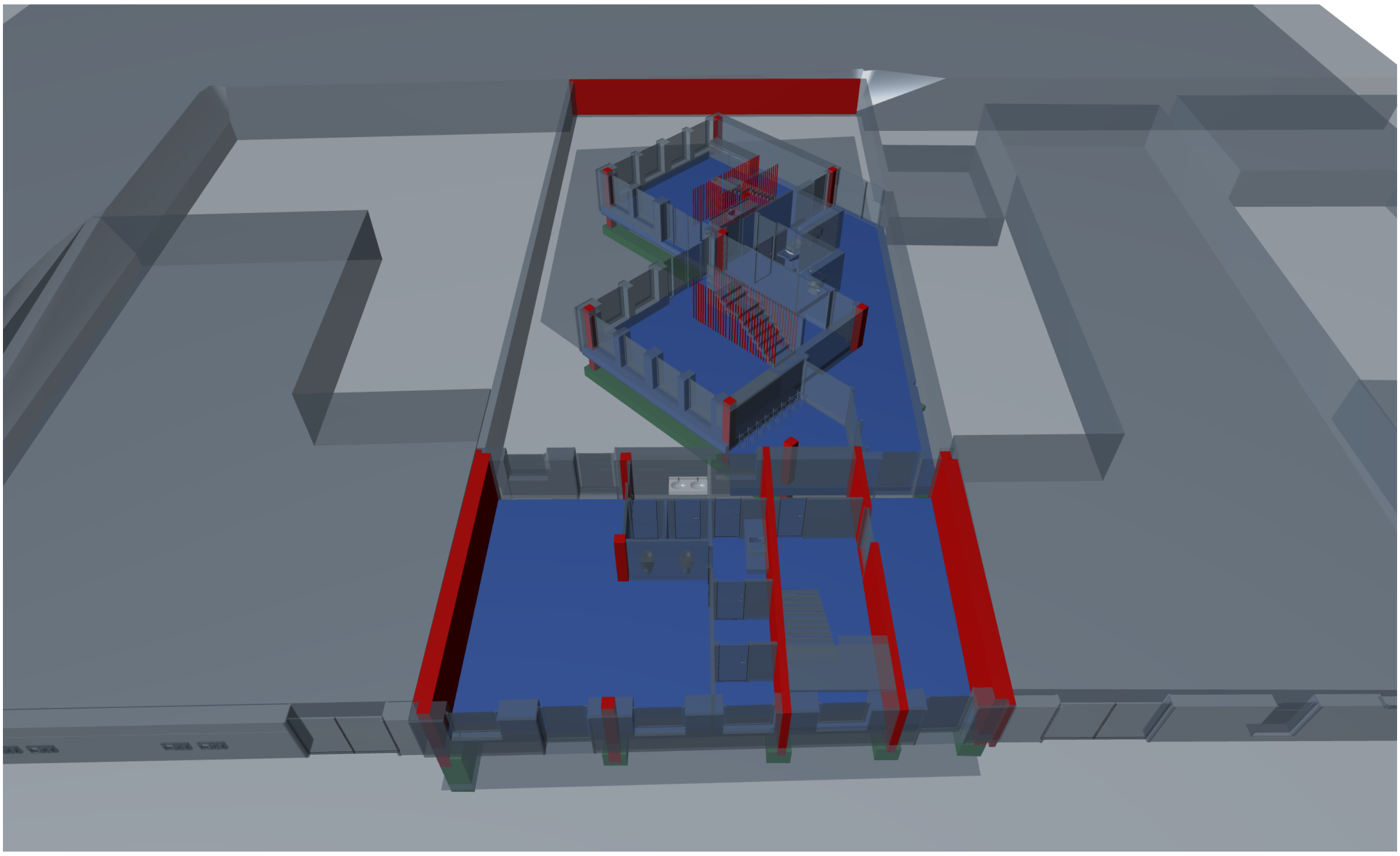


STRUCTURAL VIEW

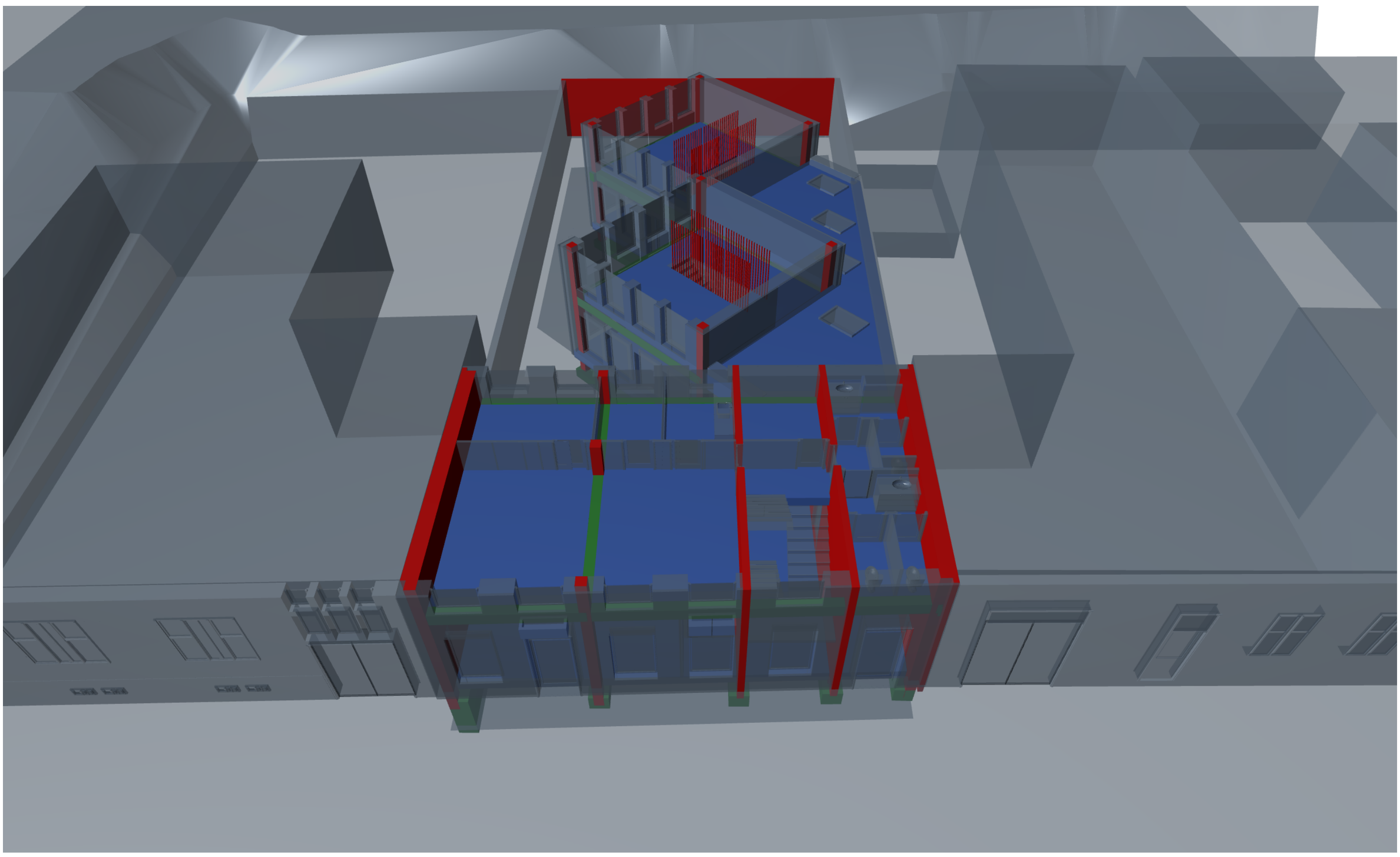




Red – Column and Wall
Green / Beam
Blue / Slabs



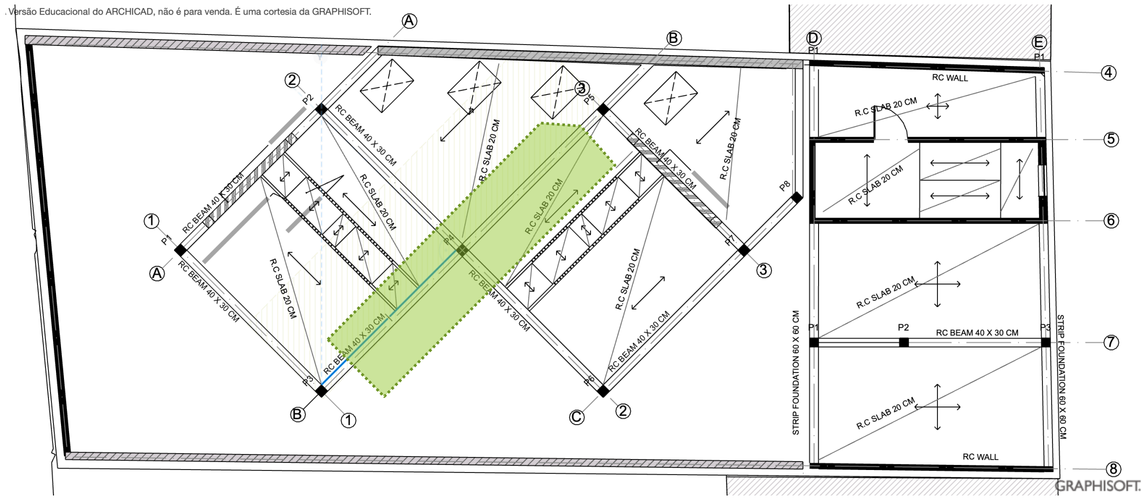
1st floor structure.

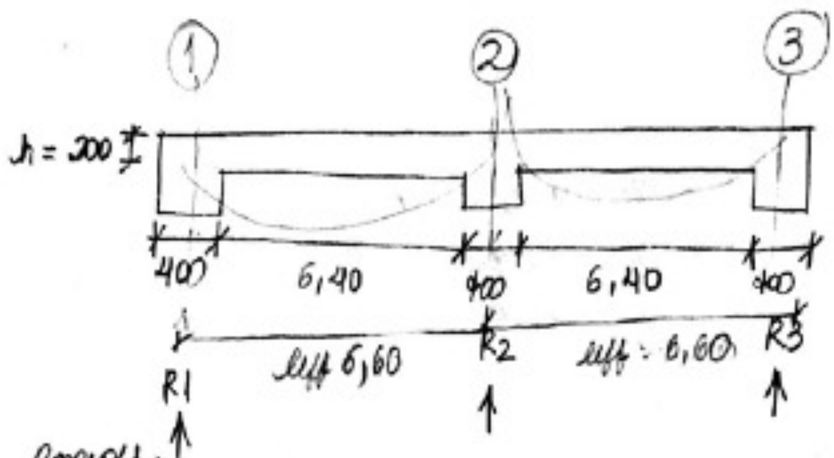


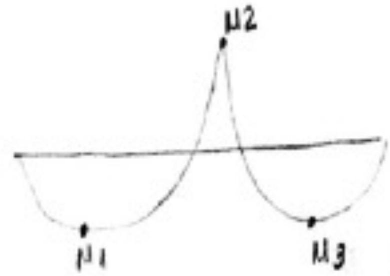
2nd floor structure.

9. LOAD BEARING STRUCTURE

CALCULATION AREA







$l_{eff} = l_n + a_1 + a_2$

$l_n = 6{,}40\,m$

$h = 0{,}18\,m$

$t = 0{,}3\,m$

$l_{eff} = 6{,}40 + 2\ min = 6{,}60$

loads:

Slab 1

1) Dead Loads.

concrete 16/20

parquet → $5 KN/m^3 \cdot 0{,}02 = 0{,}1 KN/m^2$

concrete → $25 KN/m^3 \cdot 0{,}04 = 1 KN/m^2$

floating layer → $0{,}1 \times 0{,}003 = 0{,}0003 KN/m^2$

Polystirene → $0.4 \times 0{,}03 = 0{,}012 KN/m^2$

monolithic RC slab → $25 \times 0{,}18 = 4{,}5 KN/m^2$

plaster + paint → $18 \times 0{,}015 = 0{,}25 KN$

$\Sigma = 5{,}86 KN m^2$

2) Live Loads:

g_k floor $= 5 KN/m^2$ loads of partitions $= 0{,}8 KN/m^2$

$l_1 =$

Ped floor $= 1{,}35 \times 5{,}86 + 1{,}5(2 + 0{,}8)$

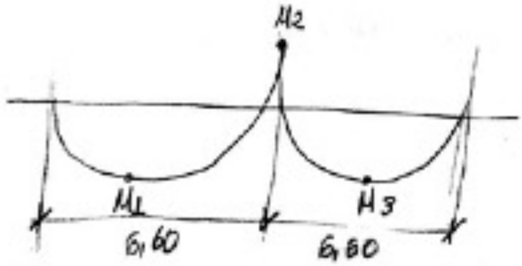
Ped $= 7{,}911 + 4{,}20$

Ped $= 12{,}11$ KNm

* Max moment

$$M_{ed} = \frac{P_{ed} \times l_{eff}^2}{8} = \frac{12{,}11 \times 6{,}60^2}{8} =$$

65,93 KNm



→ Reaction forces ⇒ moment

$R1 = 0{,}3 . l_1 . Ped$
$= 0{,}3 . 6{,}60 . 12{,}11$
$= 23{,}97$ KN

$R2 = (0{,}6 . 6{,}60 . 12{,}11) +$
$= 46{,}50$ KN $0{,}5 . 6{,}40 . 12{,}11$
$38{,}75$
$\Rightarrow 46{,}50 + 38{,}75$
$85{,}25$ KN

$R3 = 0{,}5 . 6{,}60 . 12{,}11$
$R_3 = 38{,}75$ KN

$M1 = 0{,}3 . l_1 . R1 . Ped . 0{,}4 . 0{,}2 . l_1$
$= (0{,}3 . 6{,}60 . 23{,}97) - (12{,}11 . 0{,}3 . 0{,}2 . 6{,}60)$
$47{,}46 - 4{,}79$
$M_1 = 42{,}66$ KN

$M2 = l_1 . R1 - (Ped . l_1 . \frac{l_1}{2})$
$6{,}60 . 23{,}97 - (12{,}11 . 6{,}60 . \frac{6{,}60}{2})$
$M_2 = -45{,}8$ KN

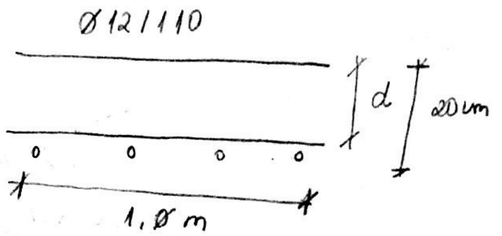
$M_3 = R_1 . (l_1 + \frac{l_2}{2}) + R_2 . \frac{l_2}{2} - Ped \left(\frac{l_1 + \frac{l_2}{2}}{2}\right)^2$

$M_3 = 23{,}97 (6{,}60 + \frac{6{,}60}{2}) + 85{,}25 . \frac{6{,}60}{2} - 12{,}11 \left(\frac{6{,}60 + \frac{6{,}60}{2}}{2}\right)^2$

$M_3 = 372{,}76$

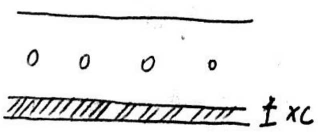
main reinf. width: 1m
Ø 18 / 110   tickness: 18mm

$As = 113 \times 1000 / 100 = 1028{,}3 \, mm^2$



$d = h - c_{nom} - Ø 2 = 180 - 20 - 12/2 = 154$ mm

steel 500



$fcd = 10{,}70$ KN $fyd = 435 \, N/mm^2$

Concrete 16/20

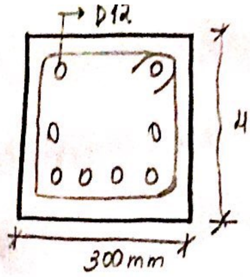
equilibrium ; $fcd \; xcd = as \; fyd$
$10{,}70 \; x_c \times 1000 = 1028{,}3 \times 435$
$x_c = \frac{447.310}{1000 \times 10{,}7} = 41{,}80$

$\varepsilon_c = \frac{41{,}80}{154} \Rightarrow 0{,}27 < \varepsilon_{co} \; 0{,}49$ ✓

$Mkd = 1028{,}3 \times 435 \times (154 - \frac{10{,}7}{2}) \times 10^{-6} = \boxed{66{,}492 \text{ KN}}$

MRd > Med → safe ✓

$d = h - c_{nom} - Ø = 180 - 20 - \frac{12}{2} . d = 154$ mm

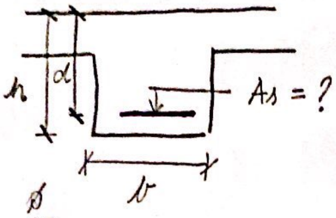


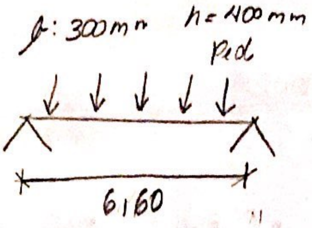
Beam ①

cross section → simple supported beam

Ø 20 mm

Ø 8 mm





$d = 400 - 20 - 8 - \frac{\overset{\phi}{20}}{2} \Rightarrow 362\ mm$

data

Ped: 12,14

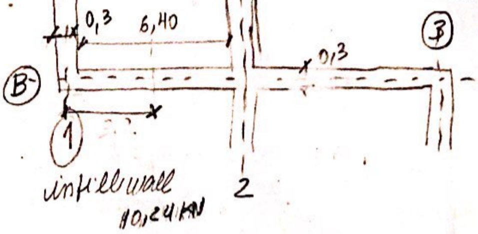
support reaction R.C slab

$\frac{3}{8} P_{ed}^{slab}\ l_{eff}^{slab}$

* self weight of the beam (300/400)

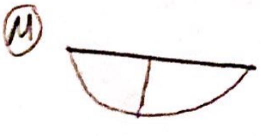
$g_{ed\,beam} = 1,35 \times 25 \times 0,3 \times 0,4 = 4.05\ KN/m$

$P_{ed\,beam} = \frac{3}{8} \cdot 12,14 \times 6,60 + \underset{g_{ed\,beam}}{4.05} \Rightarrow 34,02\ KN/m$



Internal forces:

$\frac{P_{ed} \cdot l_{eff}}{2} \Rightarrow \frac{34,02 \times 6,60}{2} \Rightarrow 112,27\ KN$



$M_{ed} = \frac{P_{ed}\, l_{eff}^2}{8} = \frac{34,02 \times 6,60^2}{8} = 185,23\ KN$

Material Properties:

C 25/30 f_{cd}: 16,70 N/mm²

B 500 f_{yd}: 435 N/mm²

$M_{Rd} = M_{ed}$

$f_{cd}\, x_c\, b \left(d - \frac{x_c}{2}\right) = M_{ed} \longrightarrow x_c = d\left(1 - \sqrt{1 - \frac{2M_{ed}}{b d^2 f_{cd}}}\right) \Rightarrow 362\left(1 - \sqrt{1 - \frac{2 \times 185,23 \times 10^6}{300 \times 362^2 \times 16,7}}\right) =$

$x_c = 123,08\ mm$

$\xi = \frac{x_c}{d} \Rightarrow \frac{123,08}{362} \Rightarrow 0,34 < \xi = 0,49$ yield.

moment equilibrium of gravity of concrete stresses

$M_{ed} = A_s f_{yd} \Rightarrow z = d - \frac{x_c}{2} \Rightarrow 362 - \frac{123{,}08}{2} \Rightarrow 300{,}46 \text{ mm}$

$A_s = \frac{M_{ed}}{z f_{yd}} \Rightarrow \frac{185{,}23 \times 10^6}{300{,}46 \times 435} \Rightarrow \frac{185230000}{130700{,}1} = 1417{,}22$

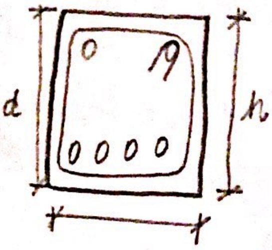
$* A_s^{req} = \frac{1417{,}22}{314} = 4{,}5 \rightarrow 5$ pieces $5\phi 20 \rightarrow 314 \times 5 = A_s = 1570$

Deflexion analyses:

$\alpha = l/d$ allowed 14 $\Rightarrow$

Concrete 25/30

shear capacity:



$l_{eff} = 6{,}60$

$V_{ed} = 59{,}15$

$P_{ed} = 30{,}81$

$\rightarrow$ reinforcing steel: B500

$A_s = 1570 \text{ mm}^2$ 5 pieces $\phi 20$

$\phi 8$mm (stirrup) $f_{yd} = 435 \text{ N/mm}^2$

$f_{cd}: 13.33$

$f_{ctd}: 1.0 \text{ N/m}$

$d = 362$ mm

$v = 0{,}15 \times 1{,}44 + \frac{0{,}45}{1 + 0{,}362} = 0{,}55 \quad \rho_1 = \frac{1570}{362 \times 300} = 0{,}017 \rightarrow 1{,}44\%$

$V_{Rd} = 0{,}55 \times 300 \times 362 \times 1 \times 10^{-3} = 59{,}73 \text{ kN} < 112{,}27 \text{ kN}$ ($V_{ed\,max}$)

not safe =(

Considering s:

$A_{sw} = 2 \times \frac{8^2 \times \pi}{4} = 101{,}00 \text{ mm}^2 \quad 2\phi 8 \rightarrow z\, 0{,}9d = 0{,}9 \times 362 = 325{,}8$

$V_{rd} = \frac{z}{s} A_{sw} f_{ywd} = \frac{325{,}8}{100} \times 101 \times 435 \times 10^{-3} = 143{,}14 > 112{,}27$ ✓

reinforcement added. safe

④

Column

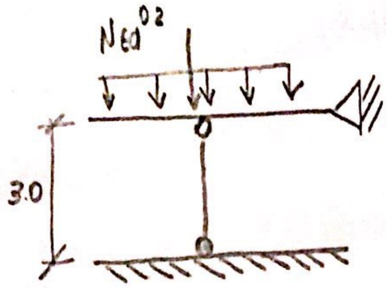
data → C20/25

height = 2,80m
steel B500
beam 300x400

Ped beam: 34,02 KN/m

Ved = 112,27 KNm

leff: 6,60 m   h: 0,18m



$N_{ed} \leq N_{rd}'$

load bearing capacity of column

g_k slab: 5,86 KN/m²

g_{ed} slab: $\underset{\gamma_g \times g_k}{1,35 \times 5,86}$ = 7,94

g_{ed} office: $\underset{\gamma_q \times g_k}{1,5 \times 2}$ = 3

⟹ Ped: 7,94 + 3 = 10,94

N_{ed} = Ped . a . b . n → n° of floors

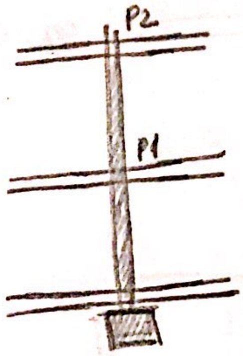
column selfweight = 1,35 x 25 x 0,30 x 0,30 x 3 = 9,11

beam selfweight = 1,35 x 25 x 0,3 x 0,4 = 4,05 KN/m

$f_{yd} = \frac{500}{1,15}$ = 435 N/m² f_{cd}: 13,33 KN/m² $N_{Rd}' = \varphi . N_{rd}$ =

N_{ed}^{02}: 10,94 x (2 x $\frac{5}{8}$ x 6,0) + 2x4,05 + 2 x 9,11 = 223 KN

(continuation Ped roof)



Internal forces:

N_{1d}: Ped floor x $\underbrace{2,4}_{\text{multi span}}$ x $\overbrace{\left(\frac{2 \times 5}{8 \times 6}\right)}^{\text{two span}}$ + N_{ed}^{02} + G_{ed}^{02} x 2,4 + G_{ed}^{01} =   (loads of column)

N_{ed} = 10,94 x 2,4 x $\left(\frac{2 \times 5}{8 \times 6}\right)$ + 223 + 4,05 + 2,4 x 9,11 = 445 KN

N_{u}' = 300 x 300 x 13,33 + 1256 x 435 = 1746,06 KN

φ = 0,73 → material φ = 0,86

$\frac{l_0}{h} = \frac{3000}{300}$ = 10

N_{Rd} = 0,73 x 1746,06 = 1274,62 KN

> Ned ✓ safe!

Determination of approx. cross section

$$\sqrt{\frac{Ned}{fcd}} = \sqrt{\frac{445 \cdot 10^3}{13,3}} = 182,71\,mm \cong 200 \checkmark \; b_{min}$$

Design:

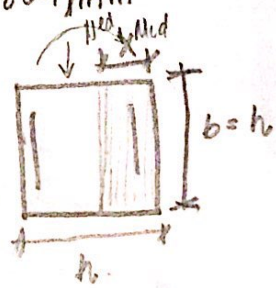
$$\frac{l_0}{h} = \frac{300}{200} = 15,00$$

consider reinforc. 18mm

$$Nu'req = \frac{445}{0,68} = 556,25 \times 10^3 N$$

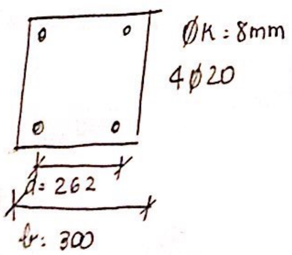
$$As_{req}: \frac{Nu'req - b \cdot h \cdot fcd}{fyd} = \frac{556,25 \times 10^3 - 200^2 \times 13,3}{435} = 536,04\,mm^2$$

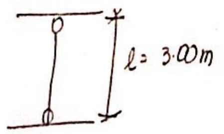
As provided $= 4\phi 16 \Rightarrow 804\,mm^2$



$$d: 300 - 20 - 8 - \frac{20}{2} = 262\,mm$$

Cross section





$e = min$

$h: 300\,mm < 600\,m: 20\,mm$

$$ei + e2 = 0,05d + \frac{l_0}{400} + 0,05 \times \left(\frac{l_0}{10d}\right)^2 \times d$$

$$0,05 \times 262 + \frac{3000}{400} + 0,05 \times \left(\frac{3000}{2620}\right) \times 262 = 22,08\,mm$$

$$Med = e \cdot Ned : 0,02 \times 223 = 4,46\,kNm$$

$$x_{c0} = \varepsilon_{c0} d$$

$$N_{bal} = fcd\, b\, x_{c0}$$

$$N_{bal} = 13,3 \times 300 \times 300 \times 0,49 \times 10^{-3} = 586,53\,kN$$

$$\Delta M = N_{bal}\left(\frac{h}{2} - \frac{x_{c0}}{2}\right) \Rightarrow$$

$$\Delta M = 586,53\left(\frac{300}{2} - \frac{300 \times 0,49}{2}\right) \times 10^{-3}$$

$$\Delta M = 44,86$$

capacity:

$$Ms = As \times fyd \times Zs$$

$$2 \times \frac{20^2 \pi}{4} \times 435 \times \left(300 - 2\left(20 + 8 + \frac{20}{2}\right)\right) \times 10^{-6}$$

$$Ms: 75,94\,kNm$$

$$MRd = Ms + \Delta M: 75,94 + 44,86 =$$

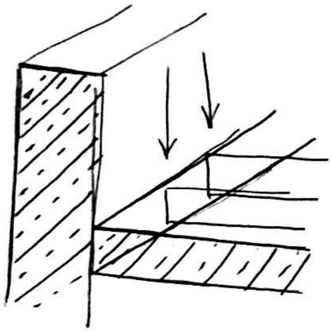
$$MRd = 120,80\,kNm$$

Safe ✓!

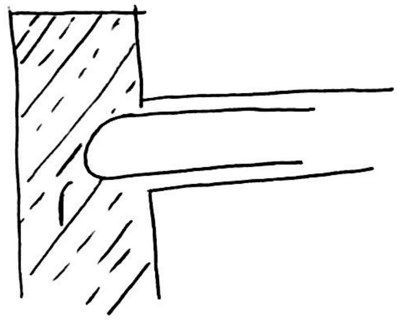
Structural details

Joint sketches:

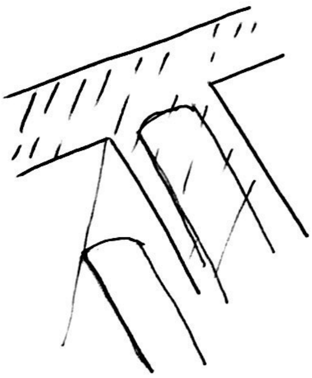
R.C wall to RC slab



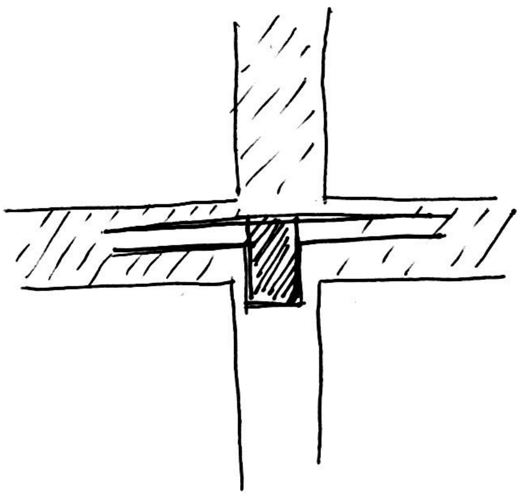
Wall to ceiling:



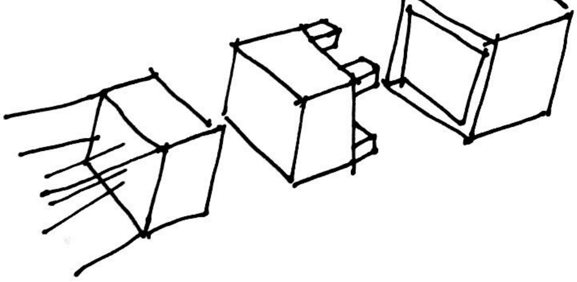
wall to wall



Sholck - element
(located on base)



sholck element.



SLAB CALCULATIONS		
leff1	6,60	m
leff2	6,60	m
Dead Loads	5,86	KN/m2
Live Loads	5	KN/m2
Ped Floor	12,11	KN/m2
Ped Slab	12,11	KN/m
R1	23,97	KN
R2	85,25	KN
R3	38,75	KN
Mmax1	42,66	KNm
Mmax2	-45,8	KNm
Mmax3	37,27	KNm
CROSS SECTIONAL DATA		
Width	1	m
Thickness	180	mm
Cnom	20	mm
Φ	8	mm
Distance between center of rebars (mm)	110	mm
As	1028,3	mm2
fcd	10,70	N/mm2
fyd	435	N/mm2
Xc	41,80	mm
MRd	66,49	KNm

CHECKING BEAM G1		
b	300	mm
h	400	mm
Φ	18	mm
Φlink	8	mm
Cnom	20	mm
d	362	mm
Load of Masonry Infill	10.24	KN/m
Self Weight of Beam	4,05	KN/m
Support Reaction of R.C. Slab	23.409	KN
Ped Beam	34,02	KN/m
Leff	6,60	m
Leff Slab	6,60	m
INTERNAL FORCES		
VED	112,27	KN
MED	185,23	KNm
Strength Analysis		
fcd	16.70	N/mm2
fyd	435	N/mm2
Xc	123,08	mm

CHECKING COLUMN 01		
Beam Height	400	mm
Beam Width	300	mm
Cnom	20	mm
Height of Column	3	m
Ped Floor	12,11	KN/m2
fcd	16,7	N/mm2
fyd	435	N/mm2
Safety Factor (Dead Loads)	1.35	
Self Weight of C1 KN	9,11	KN
Self Weight of beam above C1 KN/m	4,05	KN/m
Ned	445	KN
Φ	18	mm
Cnom	20	mm
ϕ Reduction Factor	0.5	
NRd	1274,62	KN
As Required	1256	mm2

8. CONSTRUCTION PHASES

Setting up the site;

Stripping top soil, clearing vegetation;

Excavation for strip foundation set up;

Construction strip foundation and retaining wall;

Gravel backfill and reinforced screed;

Waterproofing;

Bricklaying and loadbearing walls (R.C walls), Moment Frame on Ground Floor.

Preparing R.C slab/beams and columns (formwork; reinforcement; concrete);

Striking formwork;

Preparing R.C staircase;

Striking stairs formwork;

Installation of Steel Columns,

Bricklaying – Ground floor walls

Repeat activities from Ground to 2nd Floor

Constructing Loadbearing Flat Roof

Waterproofing;

Screed making ground floor

Screed making 1st floor

Screed making 2nd t floor

Thermal insulating;

Façade cladding installation with thermal insulation;

Sheetmetal works on façade for ventilation cladding; adding the concrete cladding;

Installing external doors and windows ;

Inner plastering ;

Ceramic tile covering on walls (wet areas)

Parket on floors

Dry Walls and suspended ceilings installation Installing internal walls (gypsum board)

Wooden covering (timber) on floors and staircase

Installing water and sewage pipes

Installing heating pipes

Electric wiring

Installing fittings sanitary equipment

Installing railings

Correcting faults

Cleaning.

10. CONSTRUCTION PLAN

10.1 PREPARATION OF THE SITE:

The first step for the construction plan is the preparation of the site. In this case, the site chosen currently has no function.

10.1.1 EXCAVATION

10.1.2 RETAINING WALLS

In order to contain the water flow coming from the uphill on western elevation. First do the placement of the molds of reinforced concrete this kind of wall will be after a compacted backfill and a bunch of gravel backfill also to help the drainage of building. After the base is securely installed, is time to install the footings to match any grade changes as well as increasing the as well increasing the strength and stability of the retaining wall.

10.1.3 FOUNDATION

For the building 60 cm concrete block strip foundation has been chosen. For its construction will be transported concrete blocks strips where the blocks will be placed.

STAIRCASE

(STREET ELEVATION BUILDING)

The stairs of the building are monolithic constructions supported on 20cm floor slabs in each floor.

The staircase design complies with the fire regulations for safe escape route (required dimension can be seen on ground level floor plan. For the stairs covering layer if 30 cm of fine concrete is used. The walls are left with exposed concrete, only special noncombustible veneer was applied to prevent dusting and surface deterioration.

Staircase design, is using 30 cm thread and 15 cm risers. Run thickness is 20cm, structural thickness of landing is 20cm and 10cm for floating floor layers:

For the acoustic insulation of the stairs the main floor is using floating floor technology, the same used also on the landings. The flights are connected with acoustic separation unit Tron sole type T by scholck and tronsole type PL is used to separate the flights from the side walls.

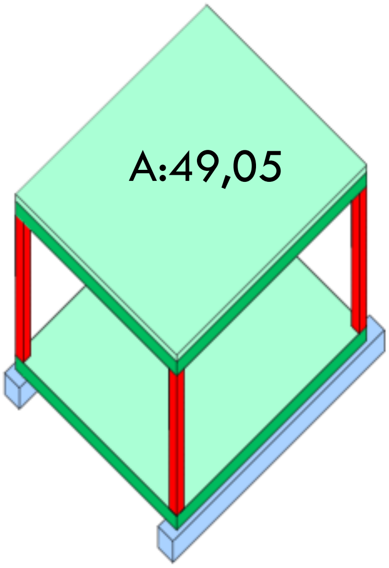
(ROTATED BUILDING)

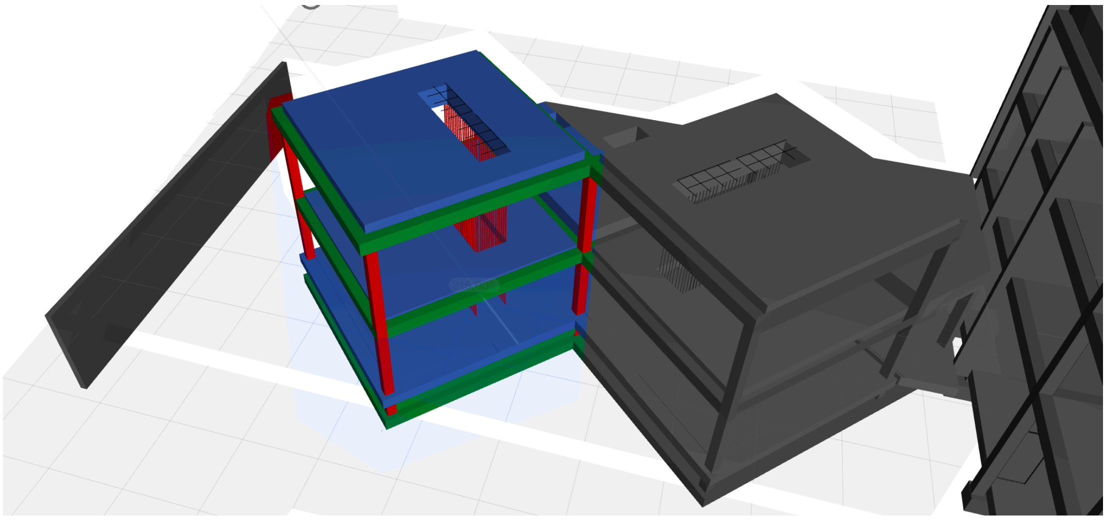
Placing RC staircase and steel columns as a loadbearing element.

Construction technique:

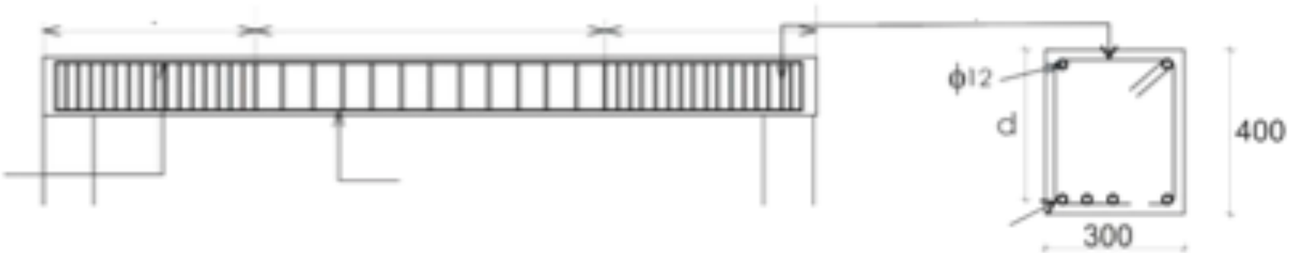
1. Assembling formwork
2. Placing reinforcement
3. Pouring concrete
4. Disassembling formwork
5. Placing sound insulation (Sholk element)

CONSTRUCTION PLAN

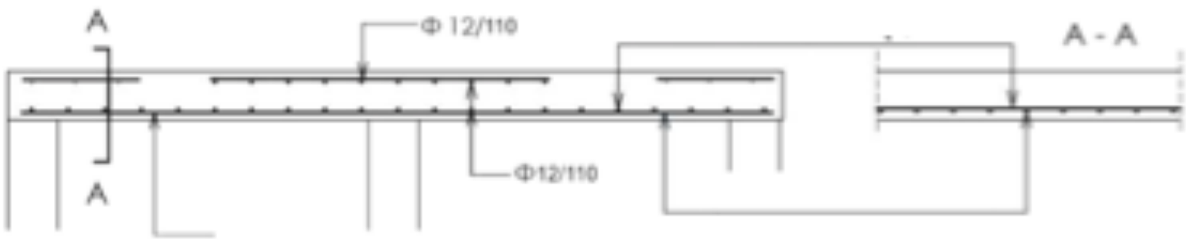




BEAM



SLAB

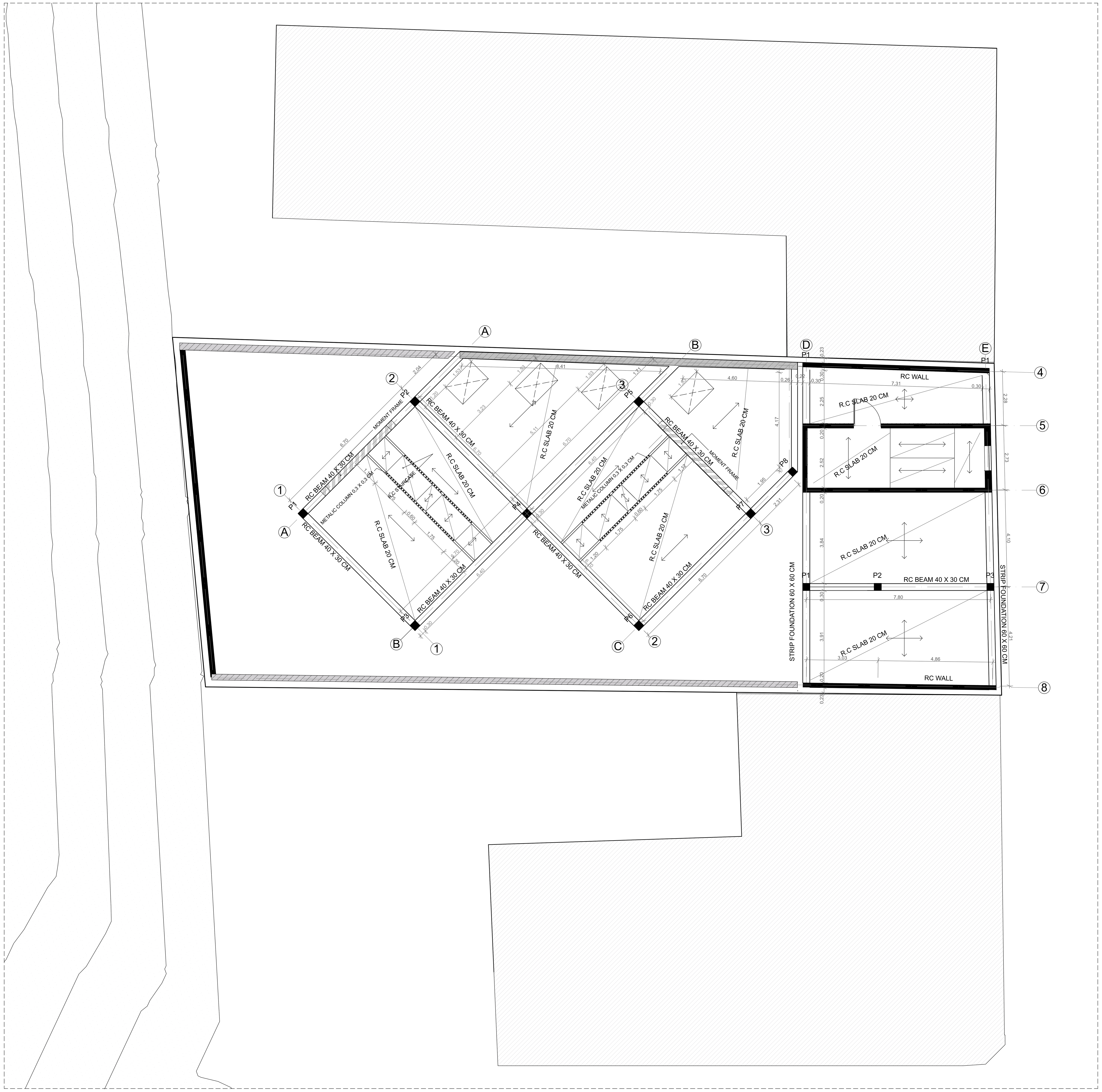


QUANTITY REPORT - CONCRETE

CONCRETE			
STRUCTURE ELEMENT	AREA	QUANTITY	TOTAL
COLUMN	A x h : 0,30M X 0,30 X 6	4	0,54 m3
BEAM	Length x A : 6,7 x 0,4x 0,3 : 0,80 m3	12	9,65 m3
SLAB	A x h: 49,05x0,2: 9,81 m3	3	29,43 m3
TOTAL			38,62 m3
TOTAL + SAFETY 10%			42,48m3

QUANTITY REPORT - STEEL

STEEL					
STRUCTURE ELEMENT	PER ELEMENT	QUANTITY	LENGTH	TYPE	TOTAL
COLUMN	4	4	6,40M	4 ϕ 20	16 BARS
BEAM	7	12	6,70M	8 ϕ 20	84 BARS
SLAB	4 BARS PER METER: 6,7 M : 28 BARS	3	6,70M	12 ϕ 110	84 BARS
TOTAL					

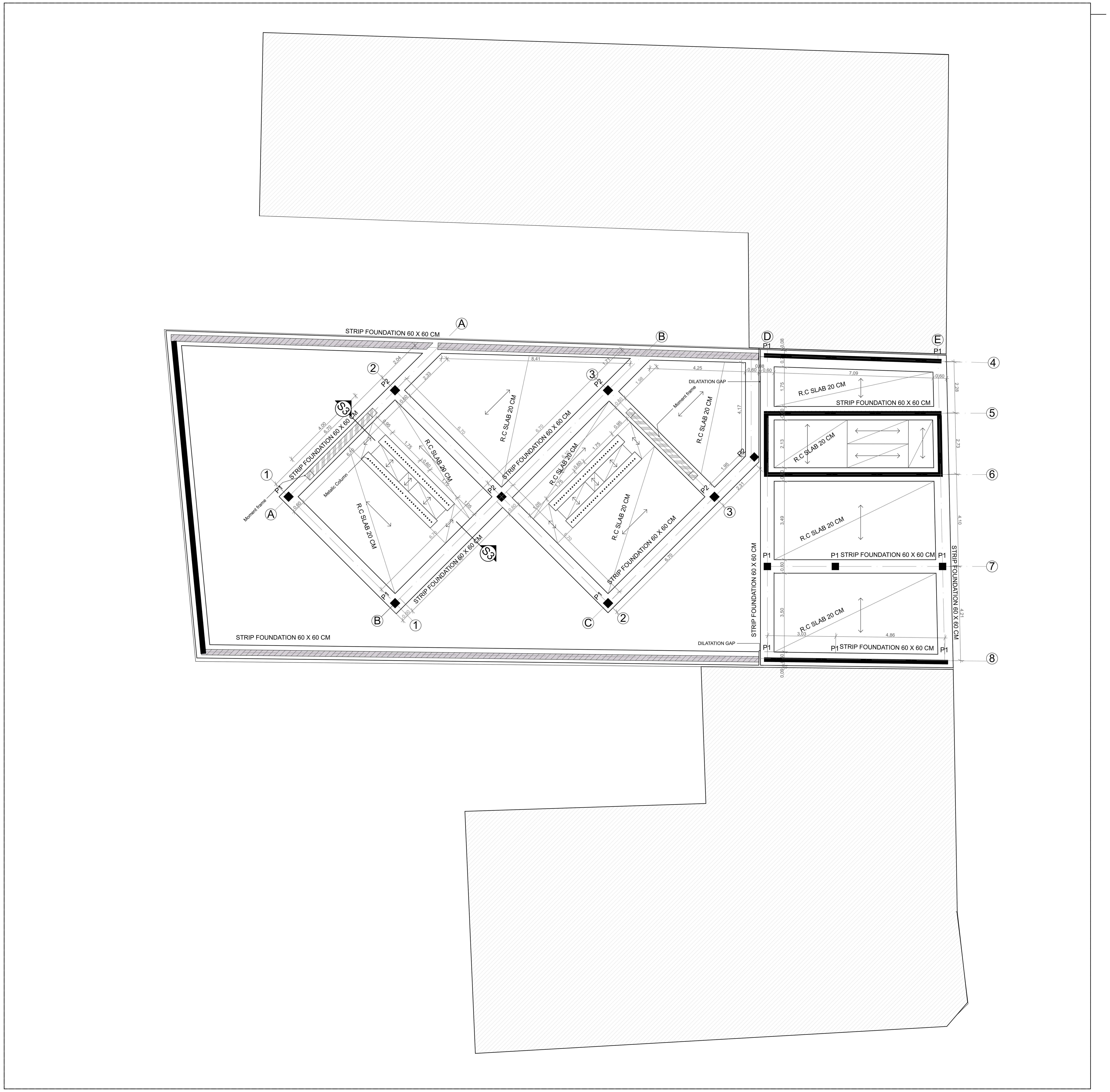


01 FOUNDATION PLAN
1:100

LEGEND

DRY WALL | HOLLOW BLOCK WALL | R.C WALL | GRASS

STUDENT:	PROJECT:	SUBJECT:	SEMESTER:	CONTENT:	SCALE:	DATE:	CONSULTANTS:	
NATALIE LAFAYETTE SAMPAIO - JO49DF	THE BUDAFOK L	DIPLOMA	FALL 2020-2021 /2	**FOUNDATION PLAN**	1:100	DECEMBER 2020	SZABO ARPAD SZIRKA CSABA HUNYADI ZOLTAN ISTVAN VIDOVSZKY	**01**

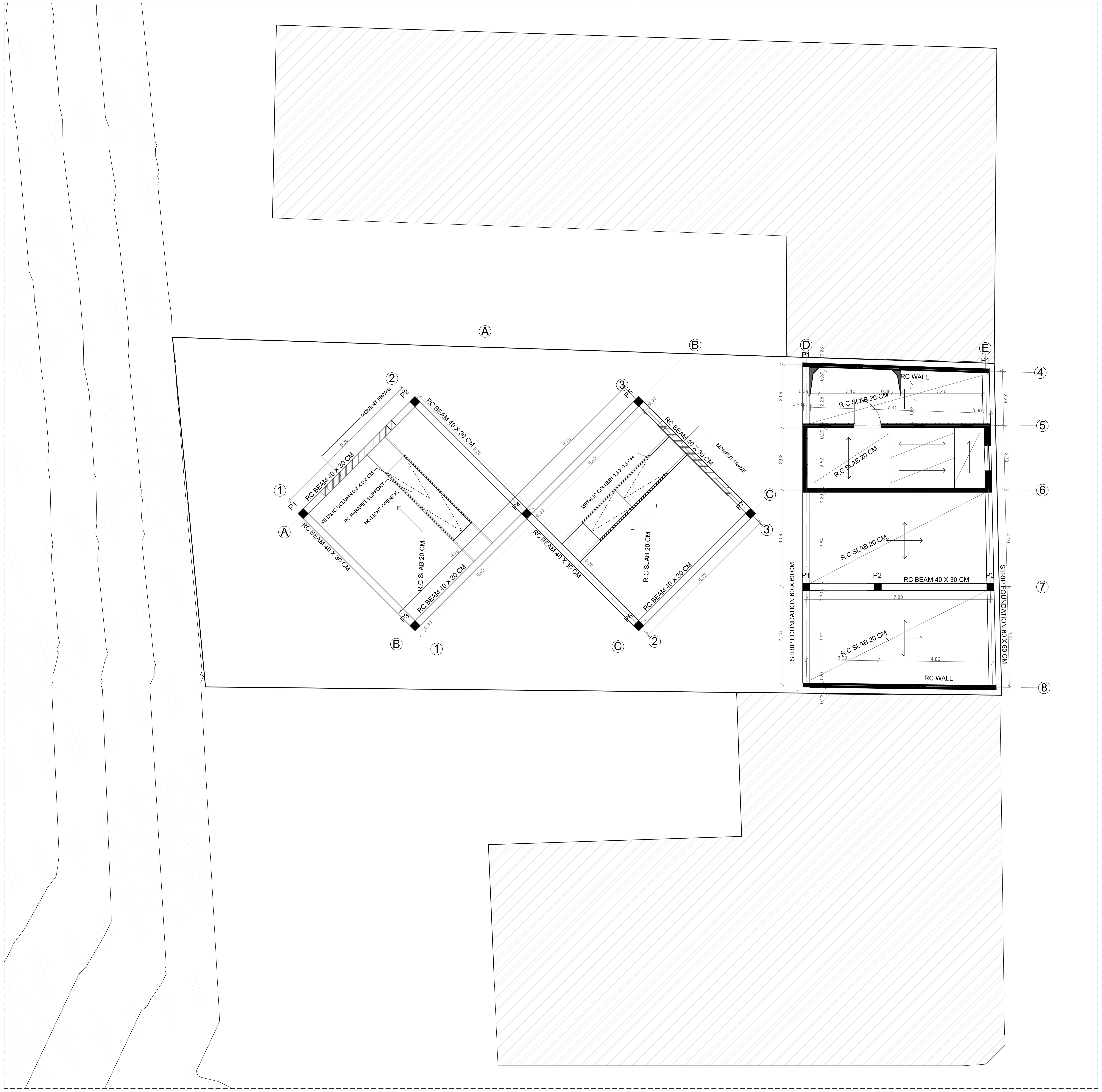


01 GROUND FLOOR FOUNDATION PLAN
1:100

LEGEND

DRY WALL HOLLOW BLOCK WALL R.C WALL GRASS

STUDENT:	PROJECT:	SUBJECT:	SEMESTER:	CONTENT:	SCALE:	DATE:	CONSULTANTS:	
NATALIE LAFAYETTE SAMPAIO - JO49DF	THE BUDAFOK L	DIPLOMA	FALL 2020-2021 /2	**GROUND STRUCTURAL PLAN**	1:100	DECEMBER 2020	SZABO ARPAD SZIRKA CSABA HUNYADI ZOLTAN ISTVAN VIDOVSZKY	**02**

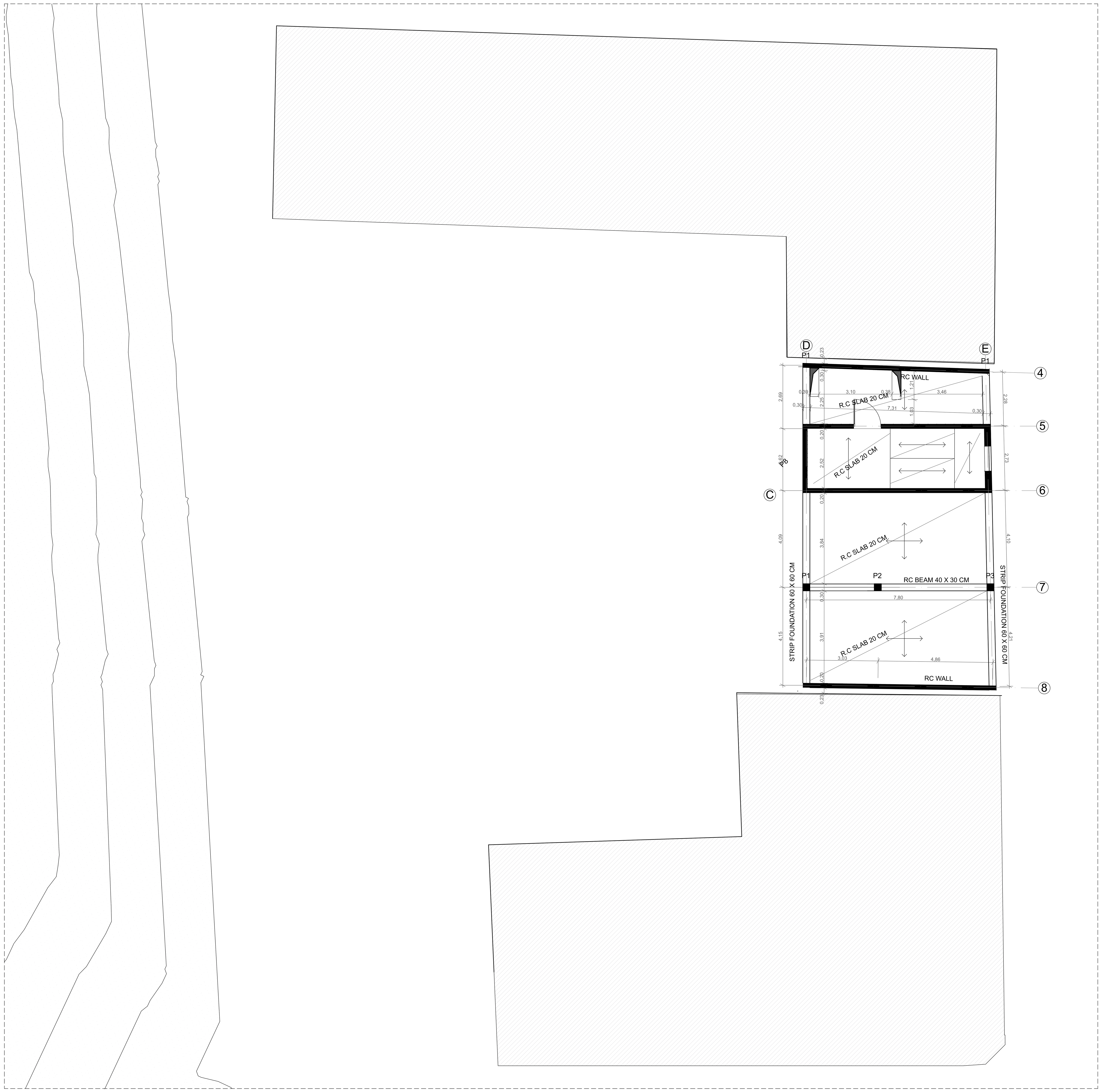


01 1ST FLOOR
1:100

LEGEND

DRY WALL | HOLLOW BLOCK WALL | R.C WALL | GRASS

STUDENT:	PROJECT:	SUBJECT:	SEMESTER:	CONTENT:	SCALE:	DATE:	CONSULTANTS:	
NATALIE LAFAYETTE SAMPAIO - JO49DF	THE BUDAFOK L	DIPLOMA	FALL 2020-2021 /2	**STRUCTURAL PLAN 1ST FLOOR**	1:100	DECEMBER 2020	SZABO ARPAD SZIRKA CSABA HUNYADI ZOLTAN ISTVAN VIDOVSZKY	**03**



01 2ND FLOOR
1:100

LEGEND

DRY WALL | HOLLOW BLOCK WALL | R.C WALL | GRASS

STUDENT:	PROJECT:	SUBJECT:	SEMESTER:	CONTENT:	SCALE:	DATE:	CONSULTANTS:	
NATALIE LAFAYETTE SAMPAIO - JO49DF	THE BUDAFOK L	DIPLOMA	FALL 2020-2021 /2	**STRUCTURAL PLAN 2ND**	1:100	DECEMBER 2020	SZABO ARPAD SZIRKA CSABA HUNYADI ZOLTAN ISTVAN VIDOVSZKY	**04**