

# Coexistence of Time in Rewritten Architecture

Restoration and Transformation Design Studio

Master Thesis in Building Architecture

Politecnico di Milano

School of Architecture Urban Planning Construction Engineering

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## 1. Introduction

The main purpose of this project is to restore and transform a post-war modern architecture in Milan and change the building type from police station to dormitory. According to the change, around 2600 m<sup>2</sup> increase are required.

The site is located 1km away from city center, Duomo, and involves buildings of school and structure of underground parking lot inside, which become one of important constrains of this project. This main historical building to be conserved through this project is located at the corner of the site, and exposed to all directions, which means surrounding given conditions affect it, and any intervention with it affects surrounding.

The point of this project is the way to deal with the each different given condition. We need to conserve the historical building, and also of course, this project requires transformation in order to serve for students who live today. Both of historical value and development or today's demand should be considered. Furthermore, passengers in North side have different feeling from people in South due to the difference of given conditions, accordingly design of those façade would differ. The dormitory serves not only for student but also for professors, invited people and also for publics.

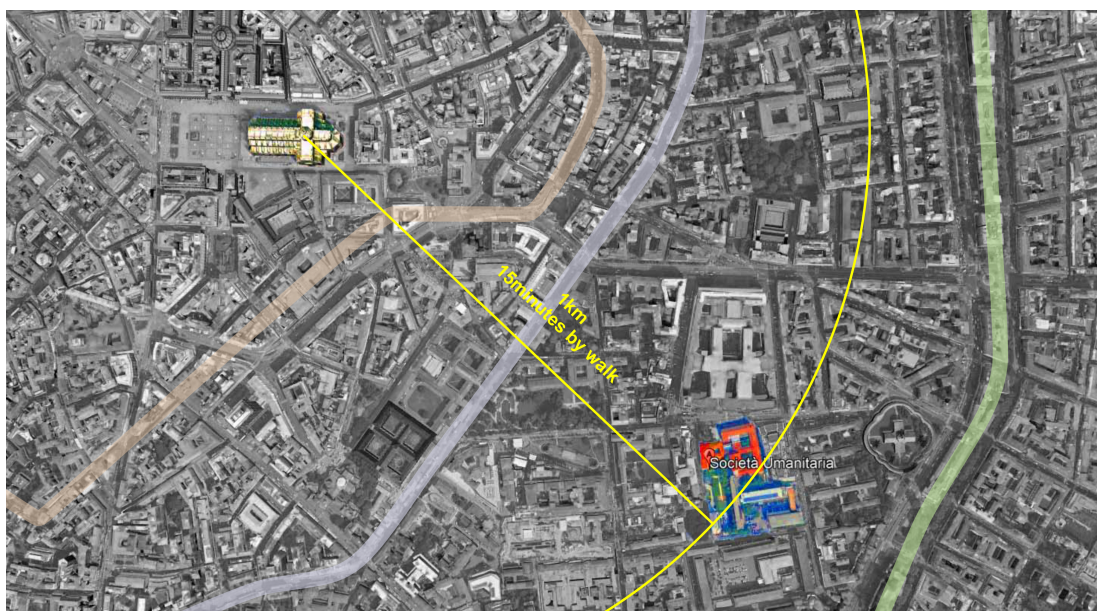
In this project, various types of given conditions affect restoration and transformation design, and the architectural intervention affect not only the historical building itself but also surrounding environment. Furthermore, historical building does not stand still, it also actively affects the design of new volumes, and of course vice versa, today's building affects original system. Each has its own pace space and time but they do not exist alone and inevitably they influence each other. This conflict will be reduced by rewritten architecture, and it also brings out the potential that coexistence of time have.

## 2. Survey

### 2.1. Urban and Site

SOCIETA UMANITARIA was founded in 1893. The goal of the association is to provide support and education without distinction in so that students improve themselves. It is Non-Profit-Organization, and provides long-lasting essential education instead of just temporary support, which means it requires tuition fess and, at same time, provides professional training.

Around 1930, in West side of the site, new garden appeared, which is called Piazza Umanitaria. On the August of 1943, bombing destroyed the city of Milan, and facilities of Umanitaria were not exception. Therefore, the construction of the new building has been planed and implemented. Giovanni Romano was the Architect of the project and completed those works in 1957, although historical map in 1956 shows part of the new profiles.



Roman Wall Medieval Wall (12c) Spanish Wall (16c)









Project Site

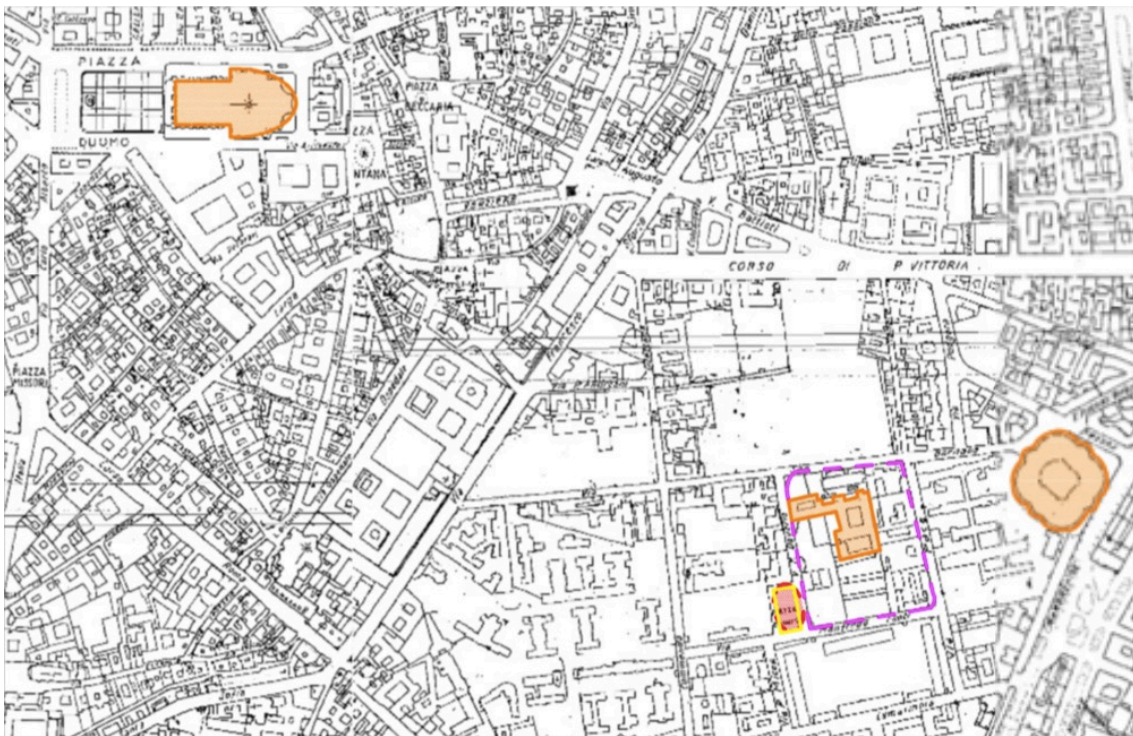




1910 Milan, 1910 PRG, Comune di Milano

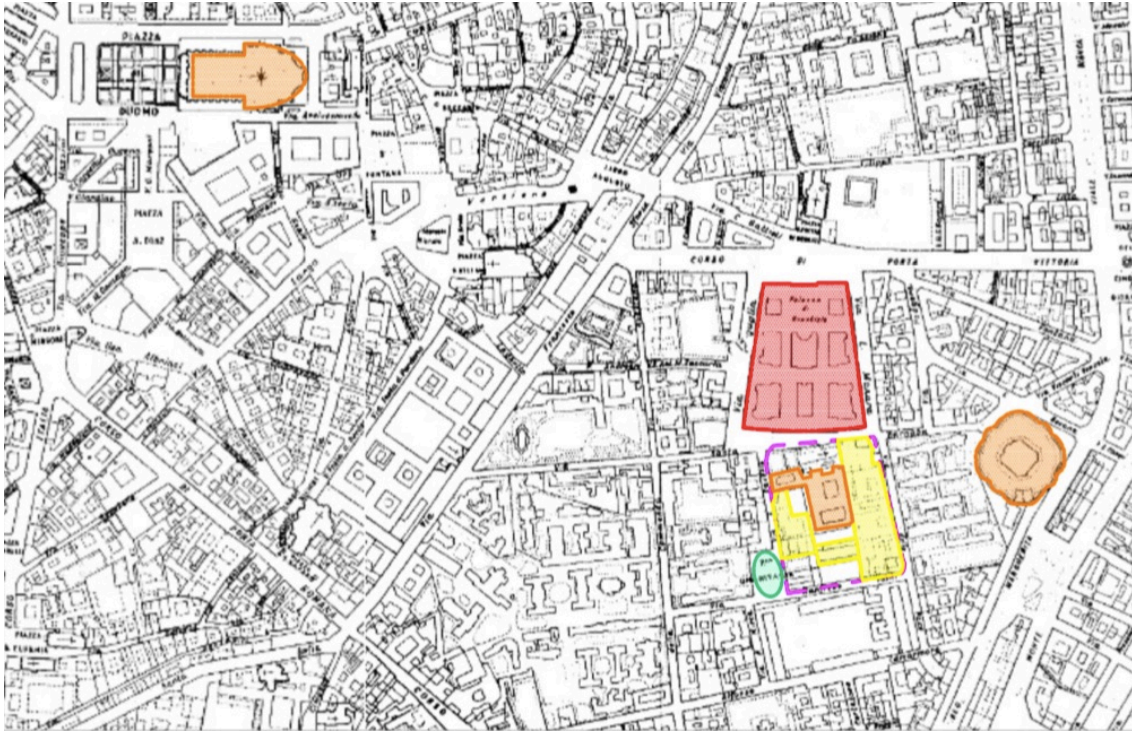
Legend

	: Project Site		: Notable Existing Element		: Notable Demolished Element		: Notable New Element		: Piazza Umanitaria
	Roman Wall		Medieval Wall (12c)		Spanish Wall (16c)				

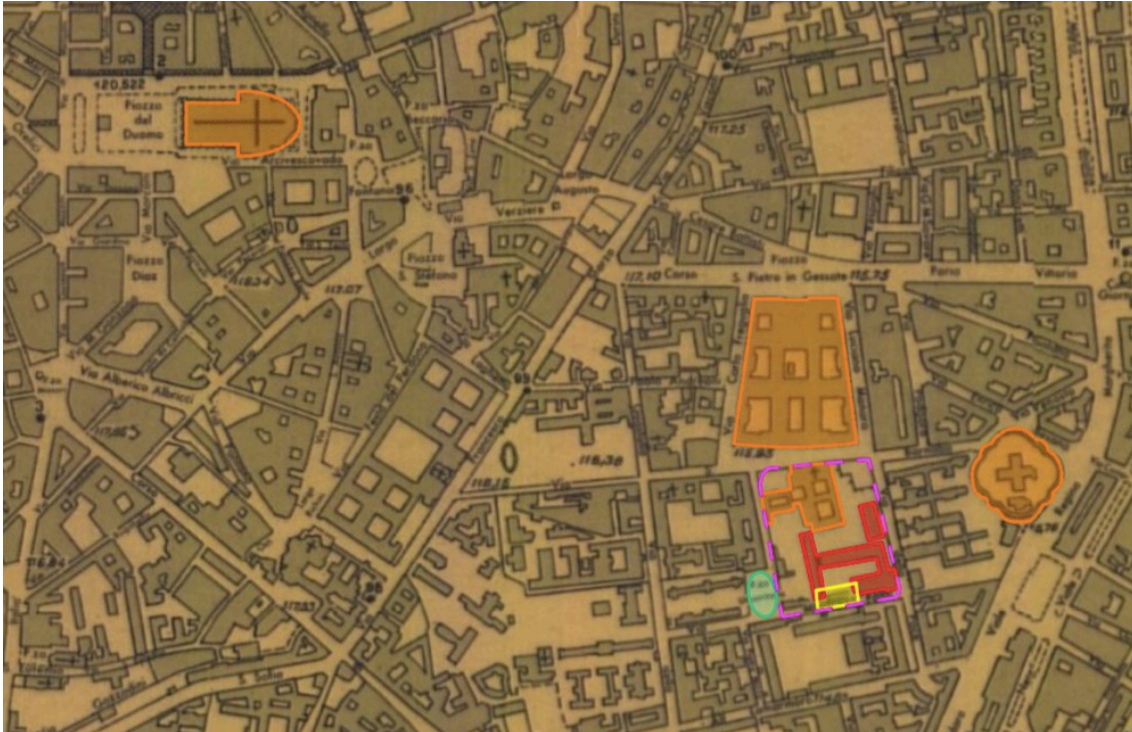


Milan, 1930 CTC, Comune di Milano



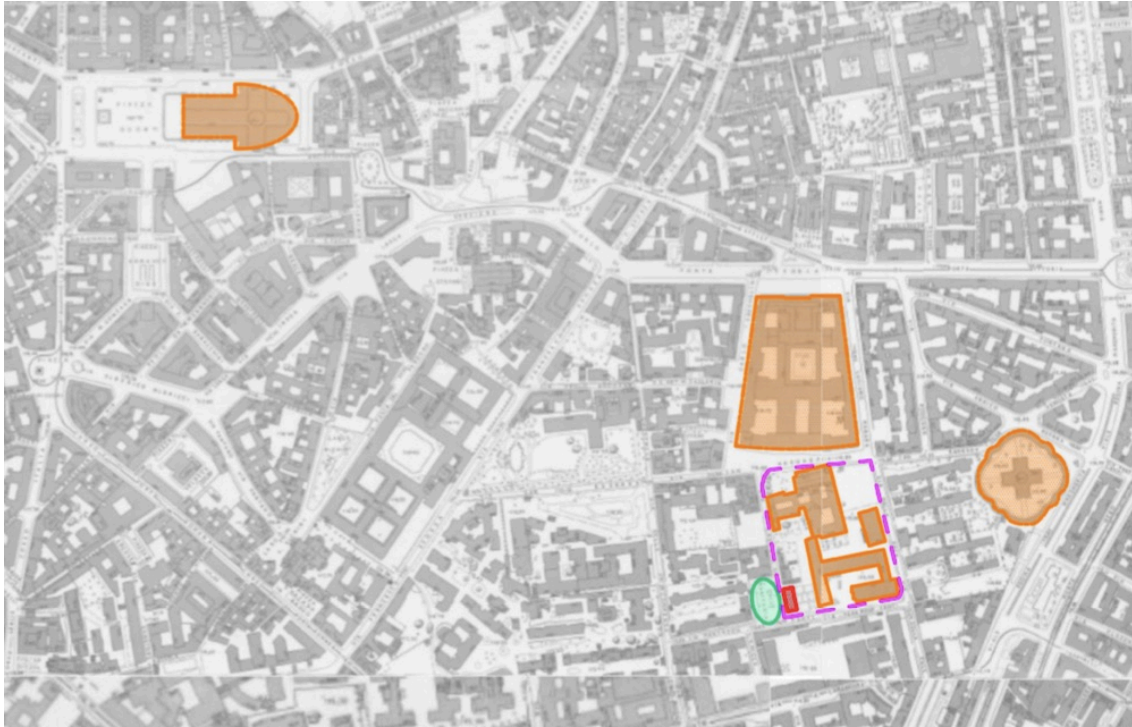


Milan, 1946 CTC, Comune di Milano

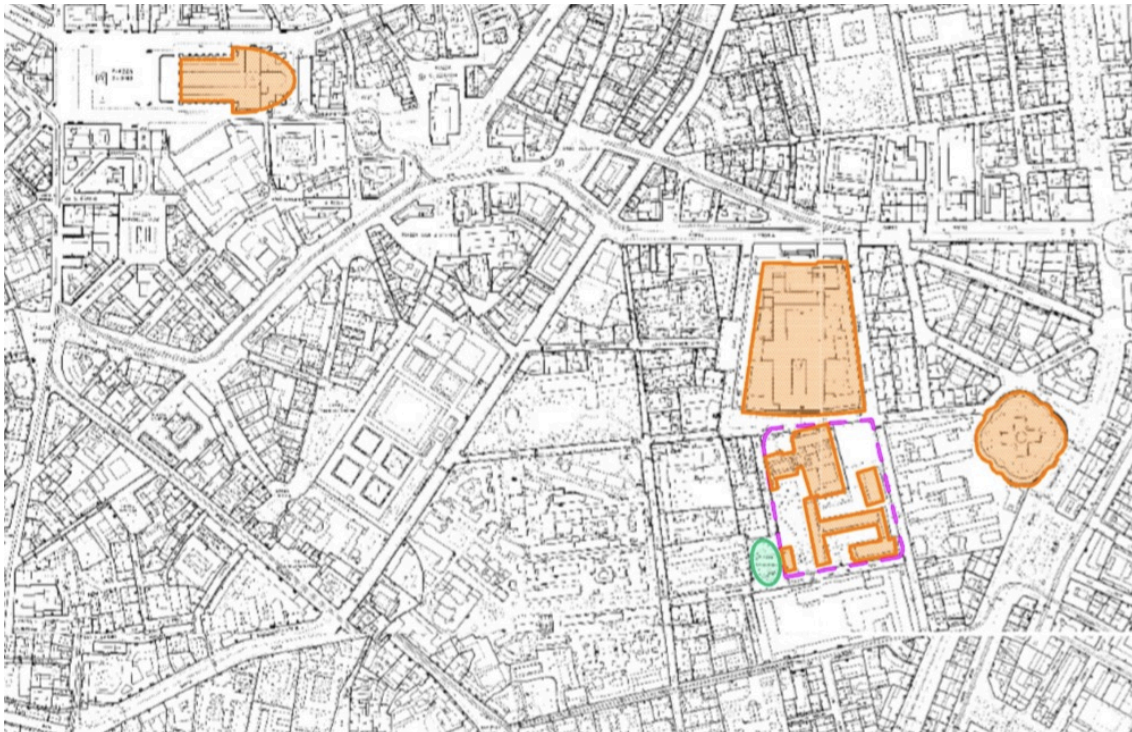


Milan, 1956 PRG, Comune di Milano

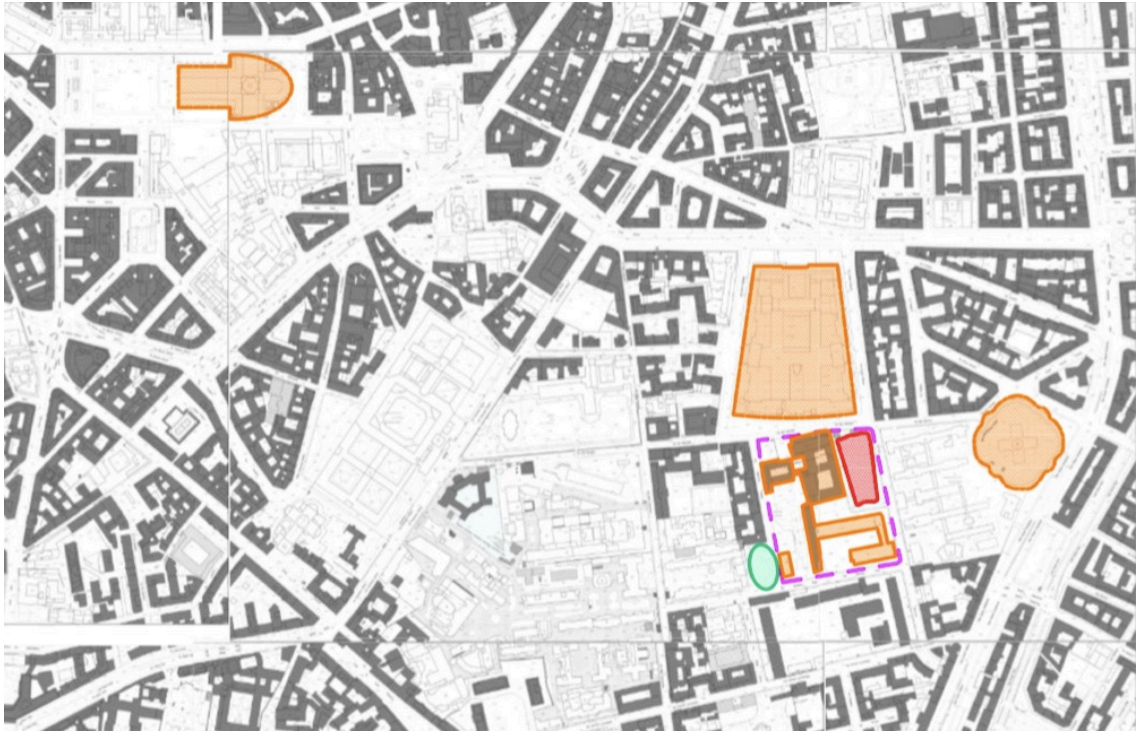




Milan, 1965 PRG, Comune di Milano



Milan, 1990 PRG, Comune di Milano

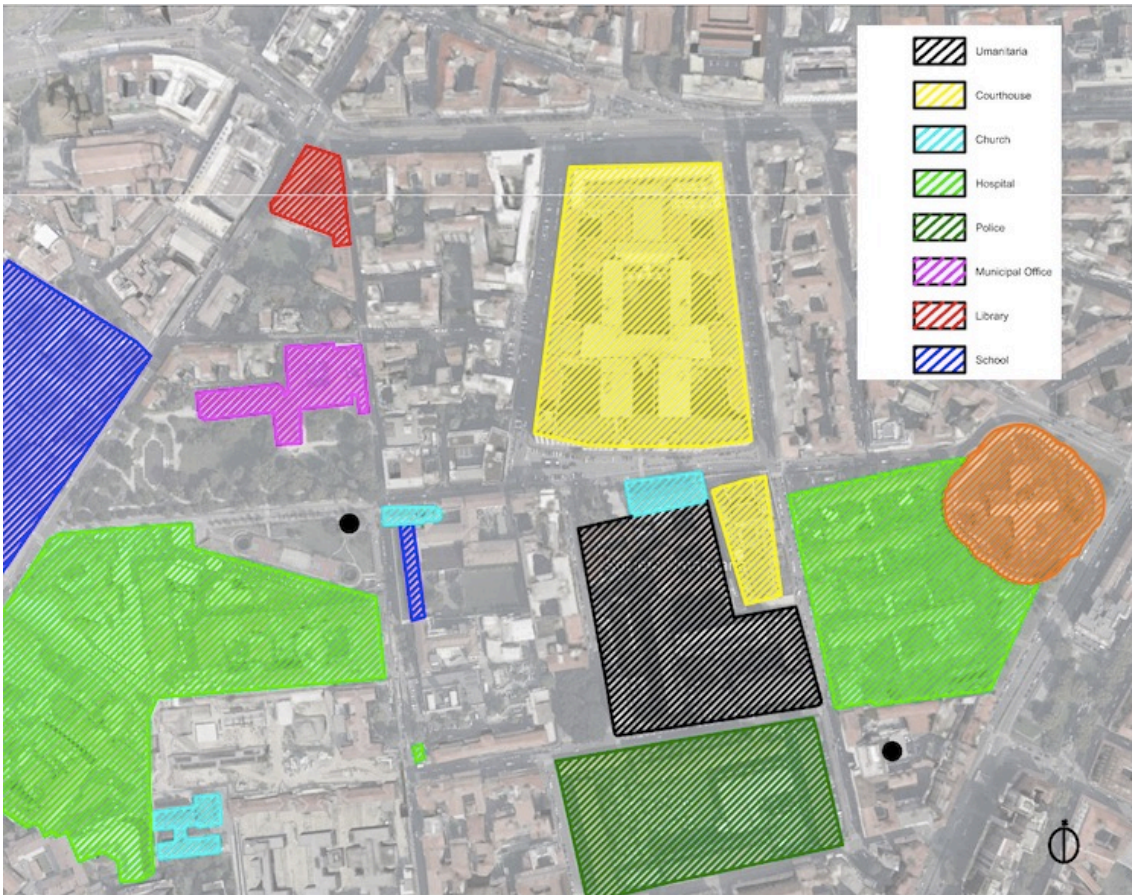


Milan, 2012 PRG, Comune di Milano



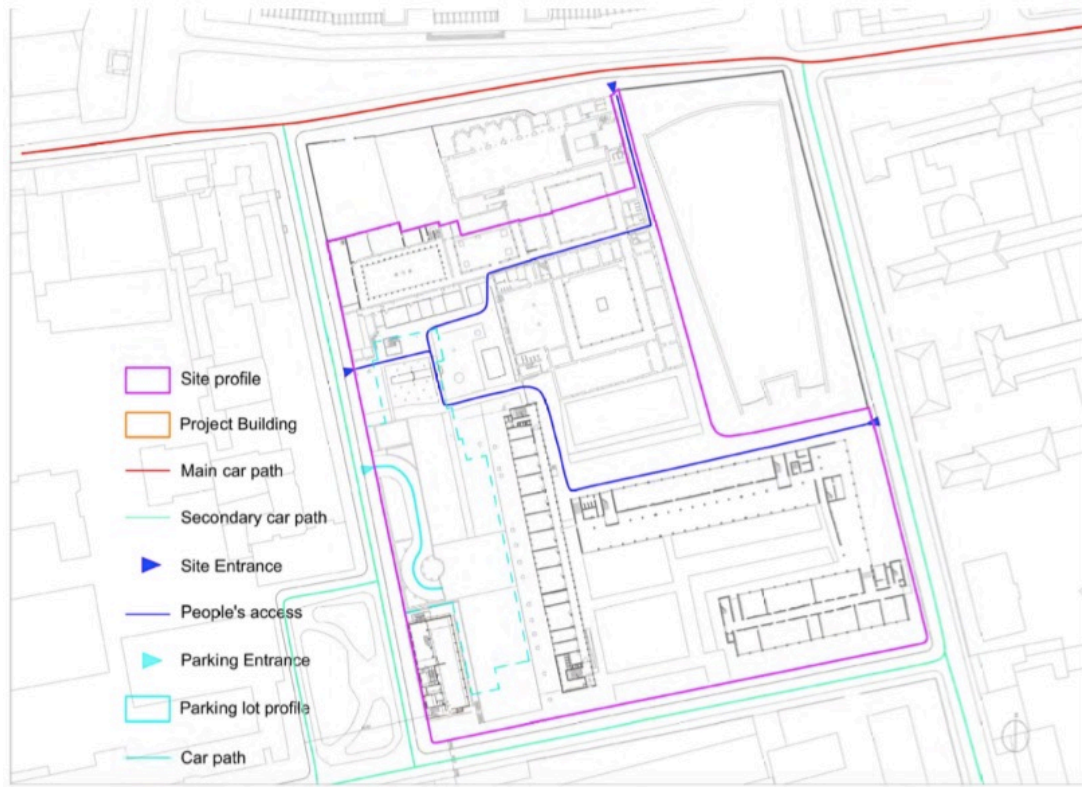


Urban Situation From South-West



Urban Function

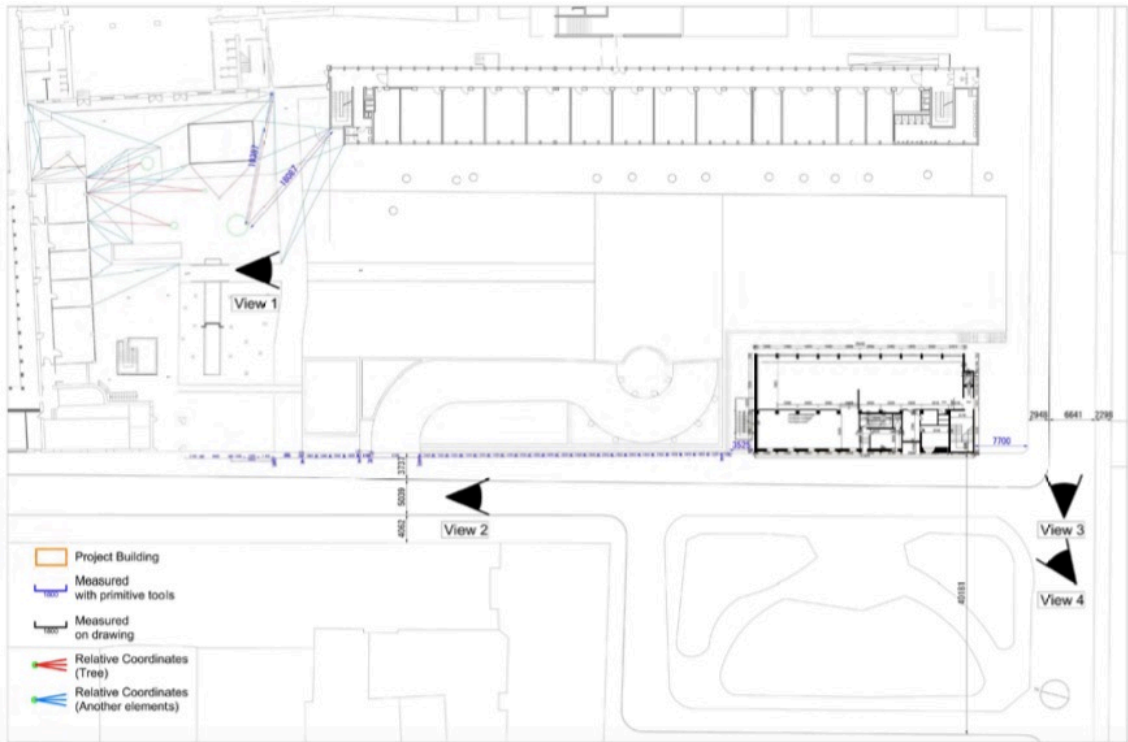




Urban Path



Program inside Site



General Site and GF Survey



View1



View2



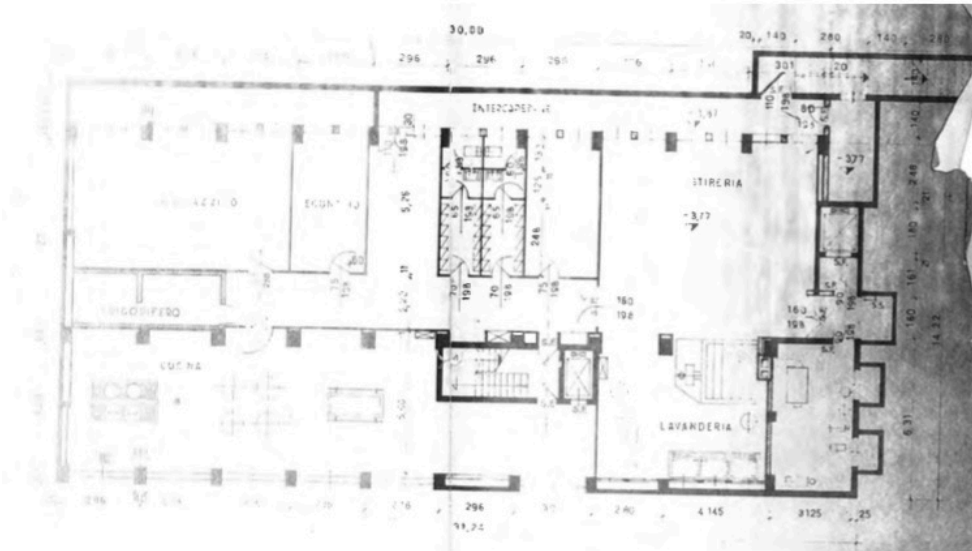
View3



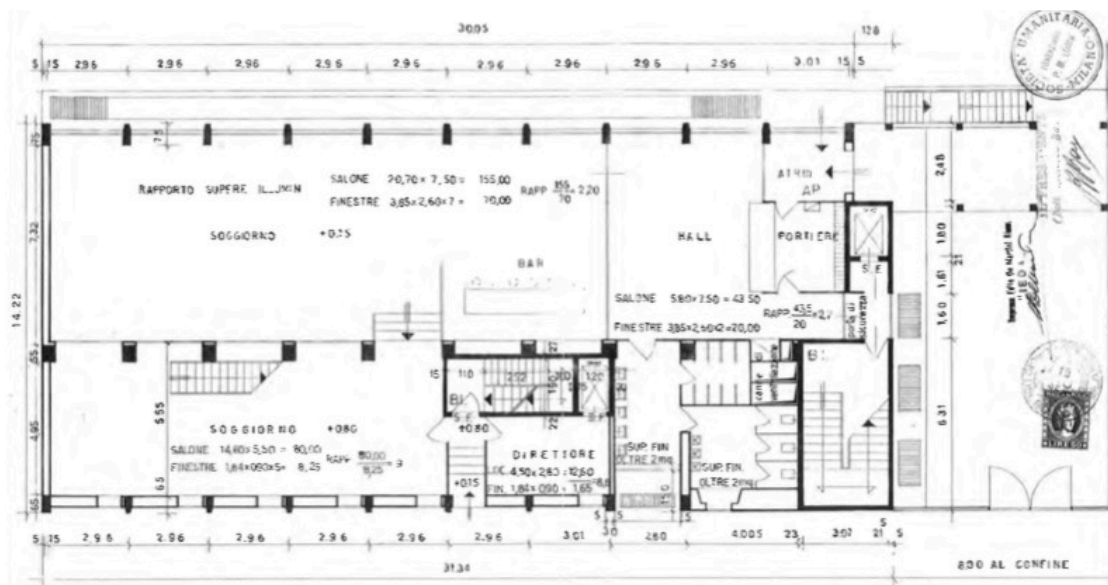
View4

## 2.2. Building

### Original Drawings

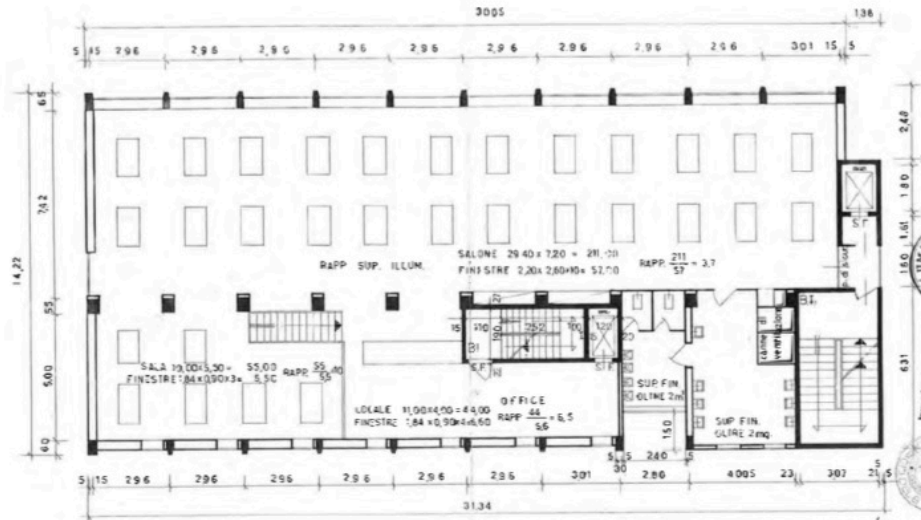


Underground Floor (original)

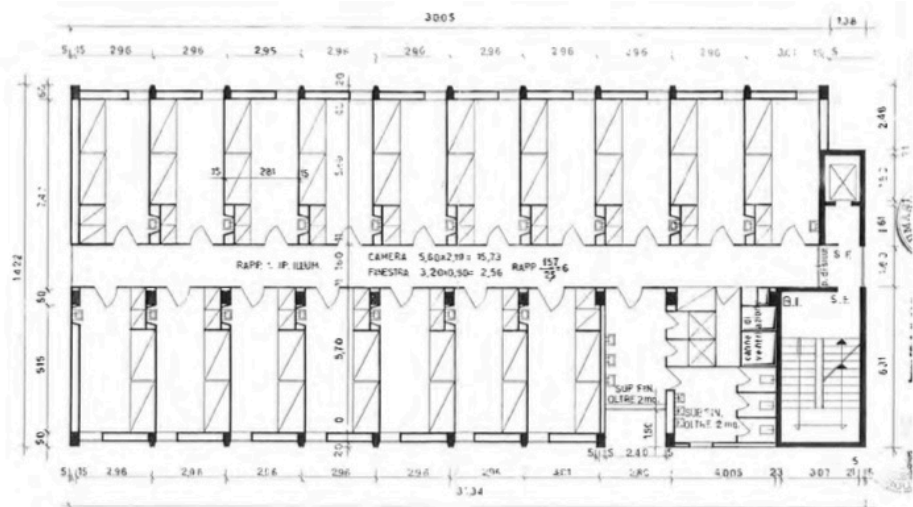


Ground Floor (original)

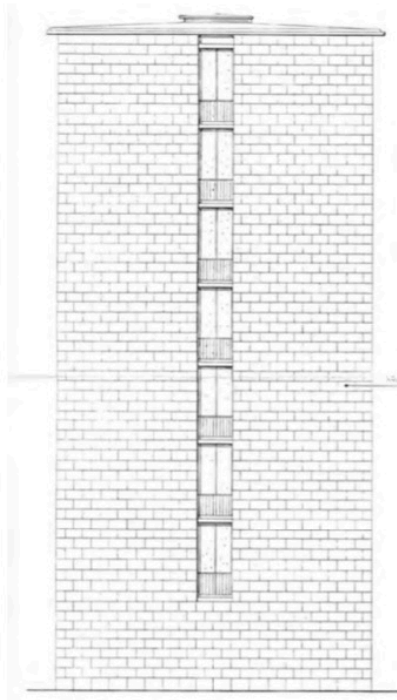




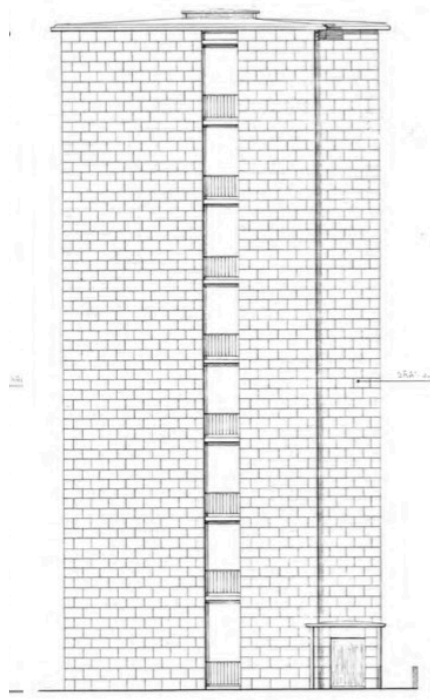
First Floor (original)



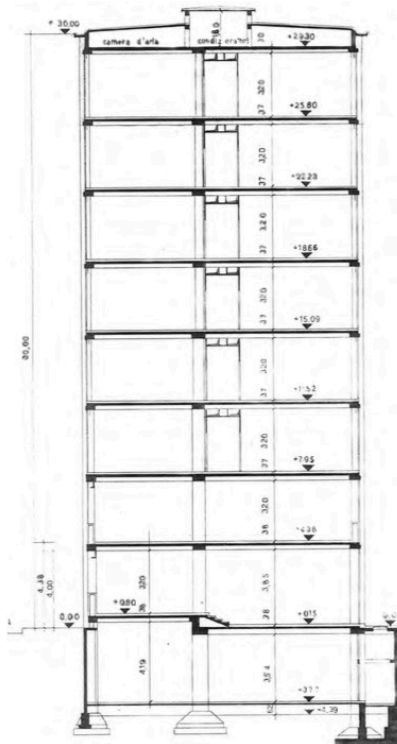
Typical Floor (original)



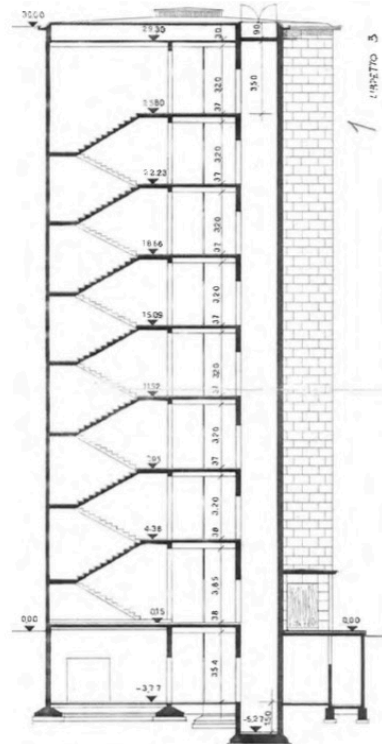
North Elevation (original)



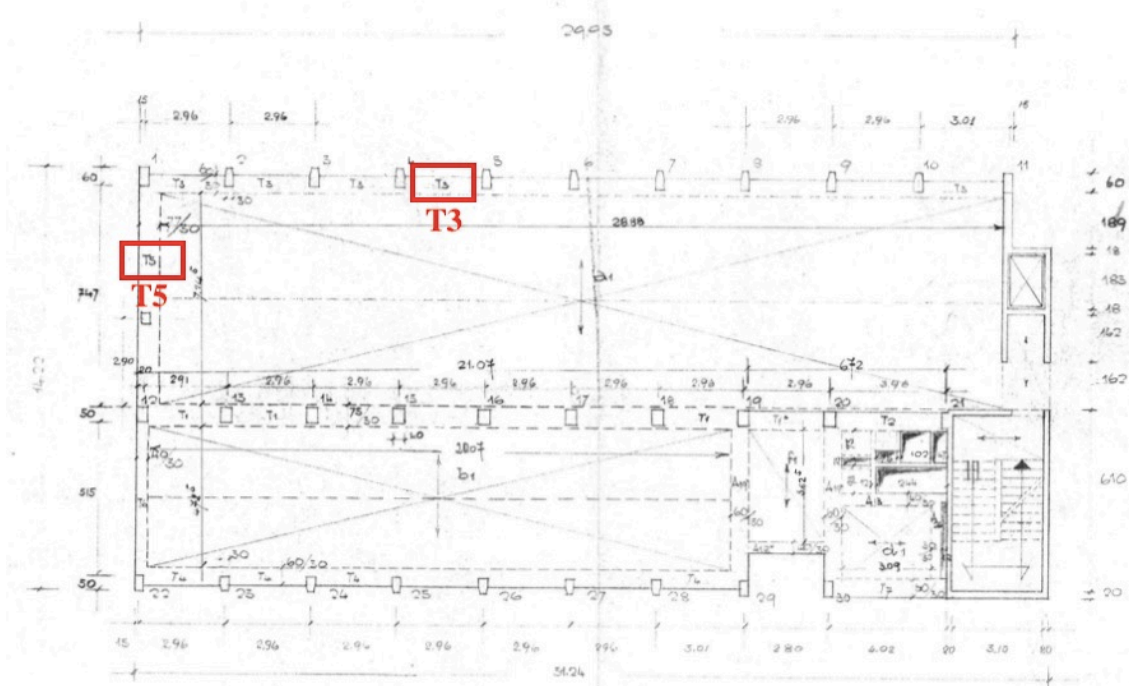
South Elevation (original)



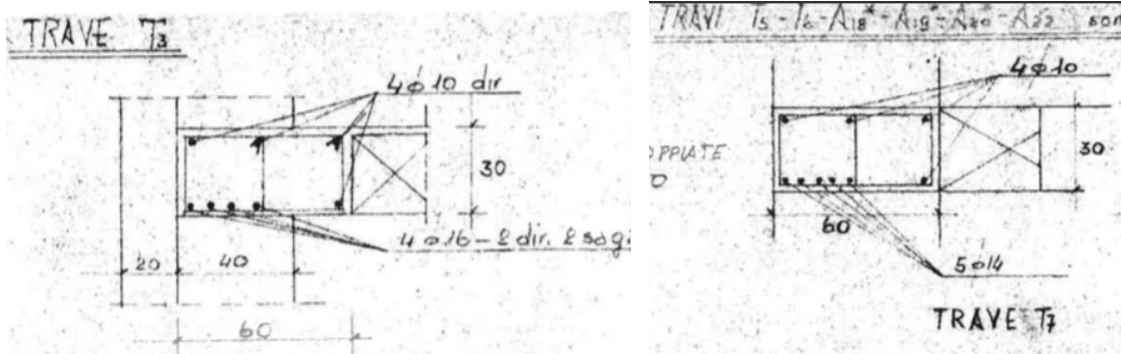
North Section (original)



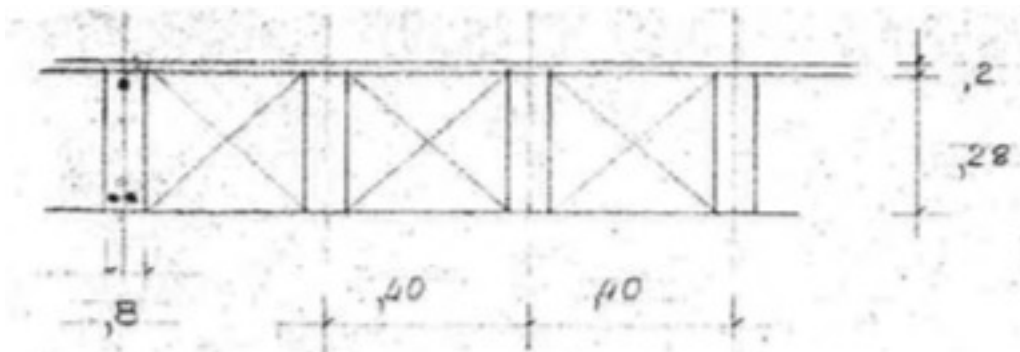
South Section (original)



Structure Drawing and Tributary Area (original)

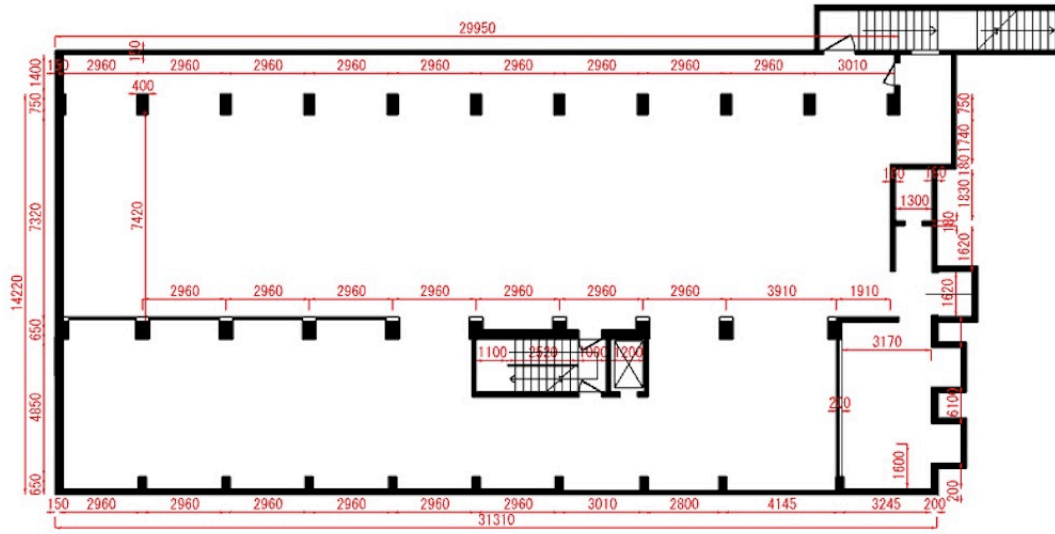


Profile of Beam (Left:T3, Right:T5) (original)



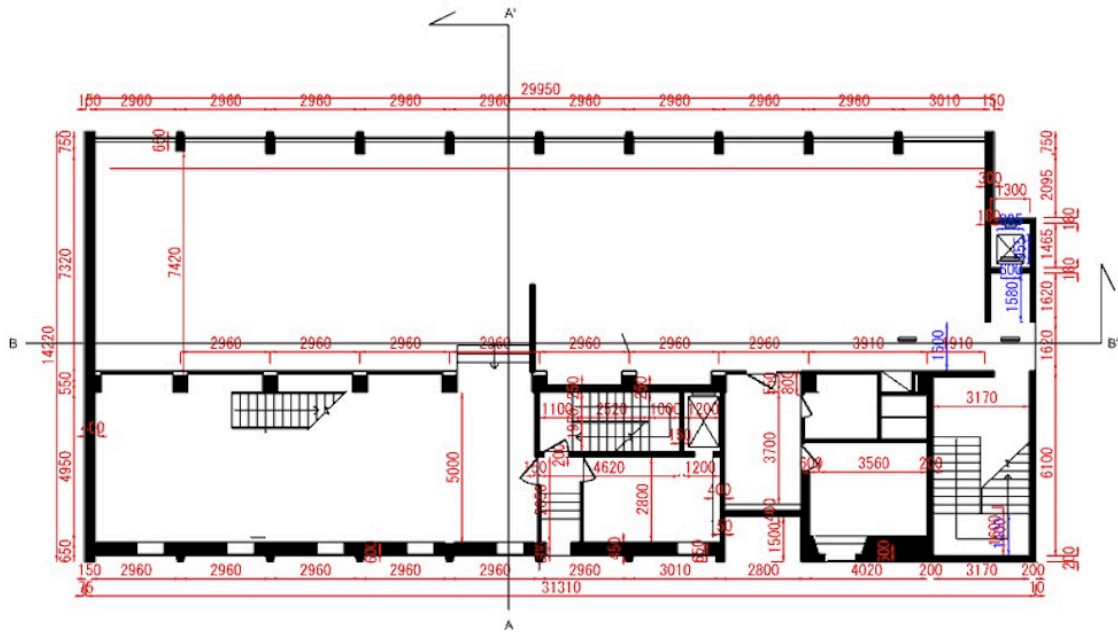
Composition of Slab (original)

## Geometrical Survey

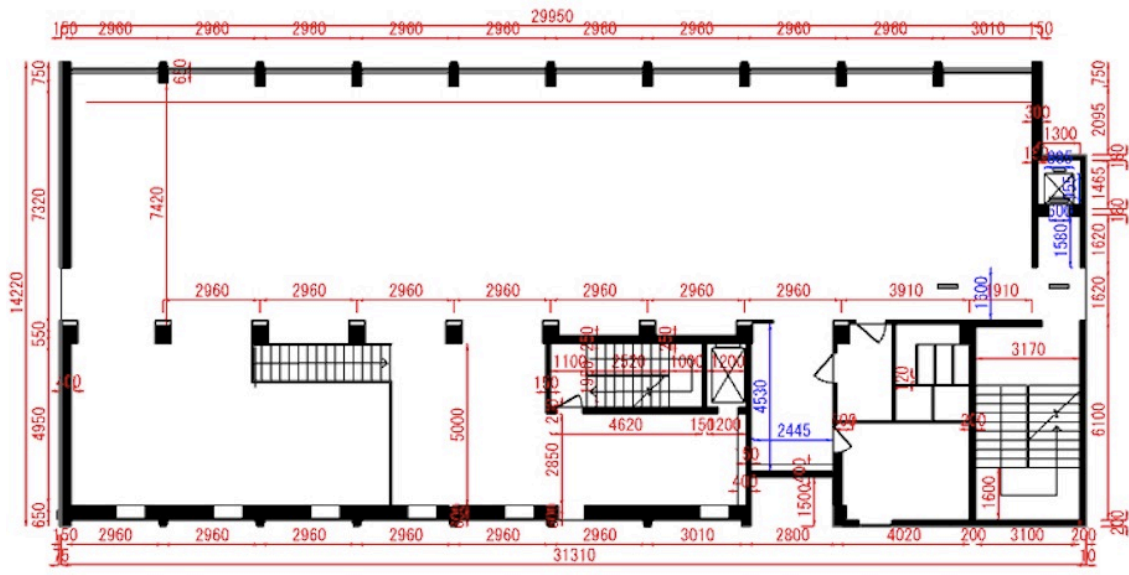


┌───┐ Measured from drawing ┌───┐ Measured from survey  
1800 1800

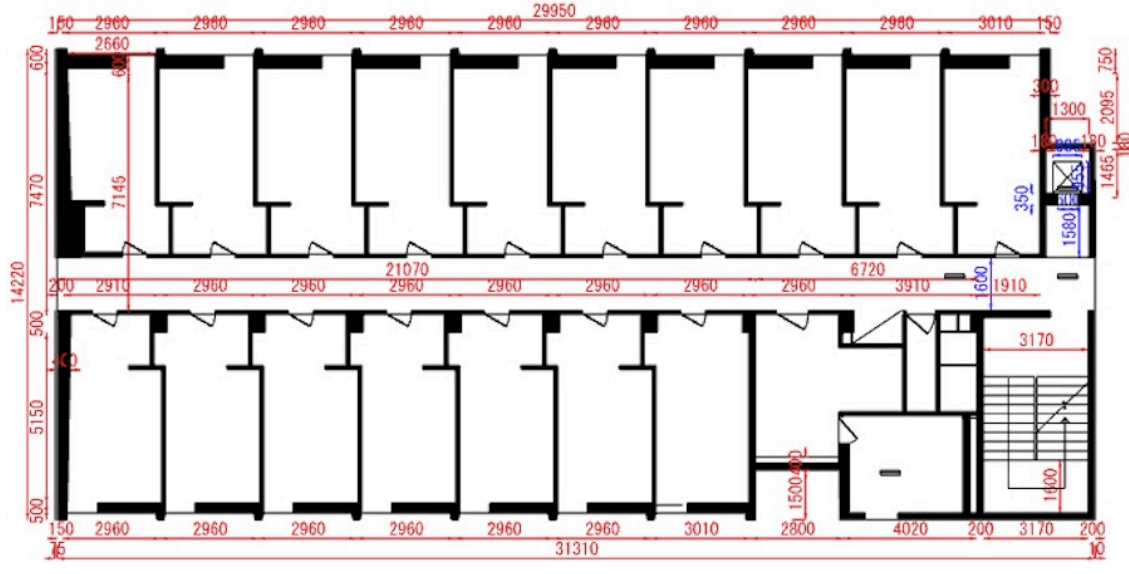
## Underground Floor



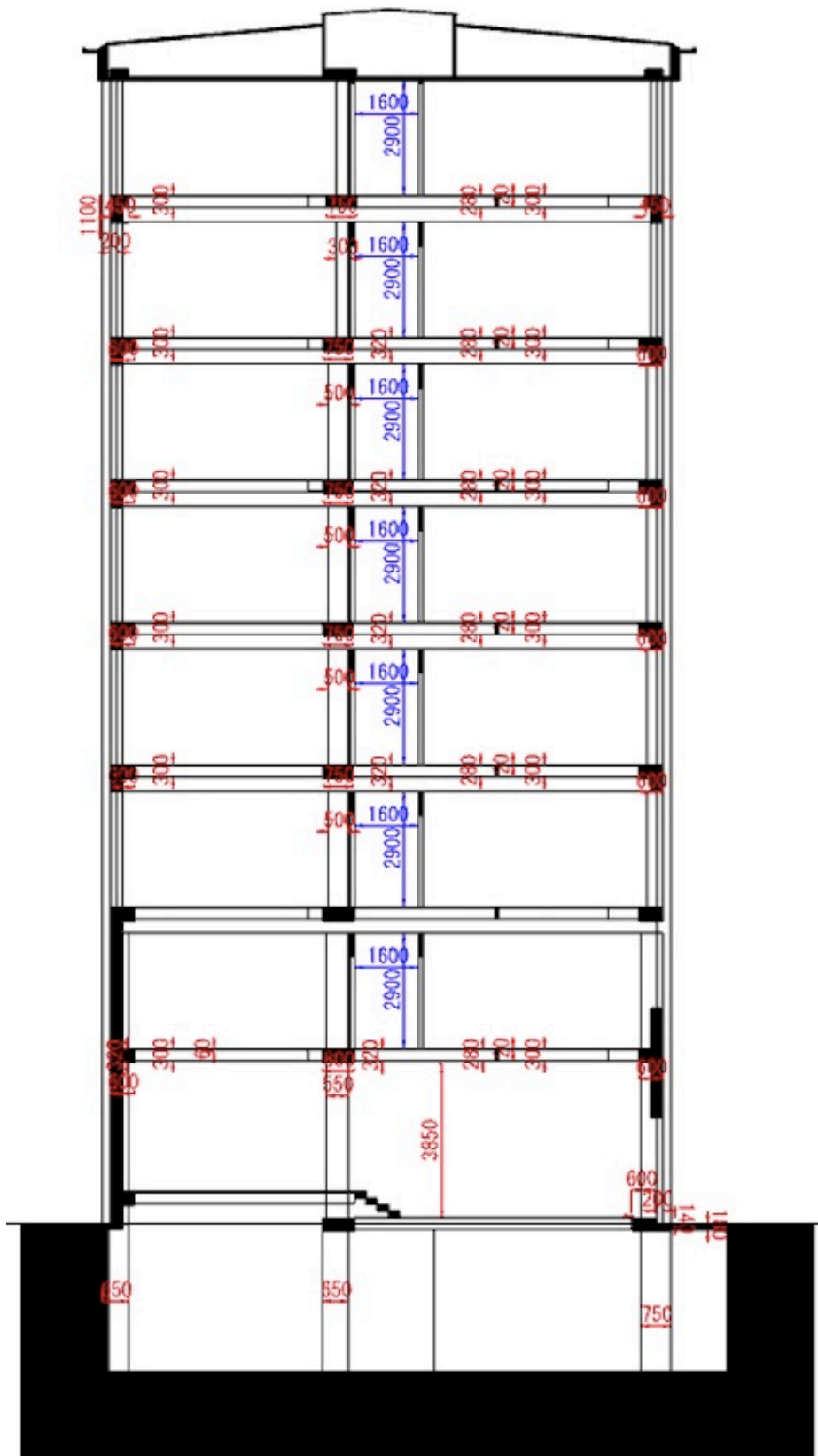
## Ground Floor



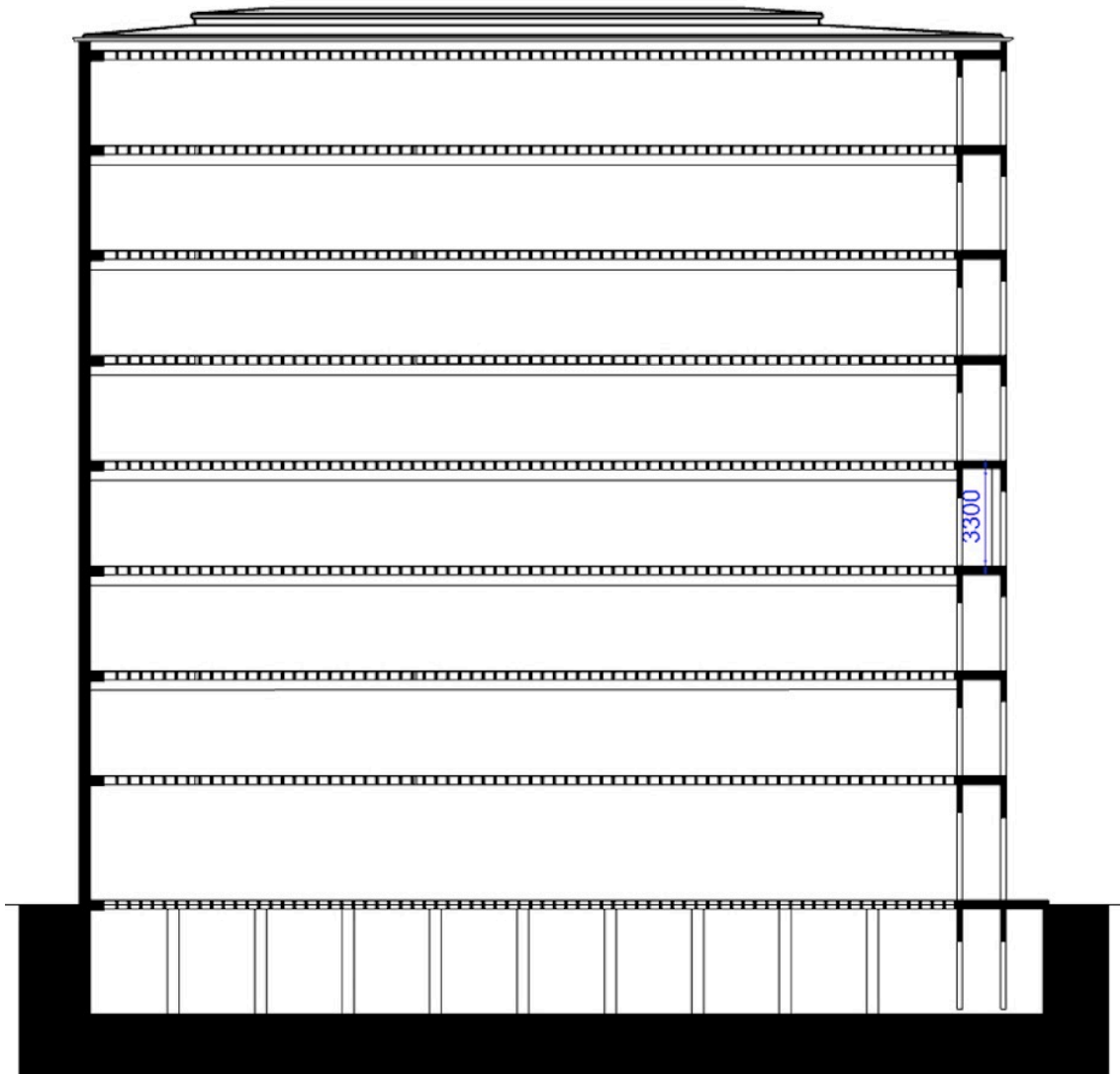
First Floor



Typical Floor



Section A-A'



Section B-B'

### 2.3. Features and Constrains

1. Given conditions are diverse and heterogeneous

There is historical building, and there are demands from today's perspective.

North side has large open space, while south has only narrow road.

West has enough distance to see the whole façade of Convitto, while East does not.

There are often students in North, while passengers are in West or South.

2. How could the diverse and heterogeneous elements share a same history?

If the design does not ignore contexts and given conditions, and if the project is involved in more than several given conditions, as a result, there should be various types of design principle or tastes according to the different given conditions or elements. But Architect still need to propose the design as a one fixed project, and should put it on successive line of certain history.

Or, are we courageous enough to ignore the importance of accumulation of history?



### 3. Architecture



 : New Elements       : Historical Element

New and Historical Buildings

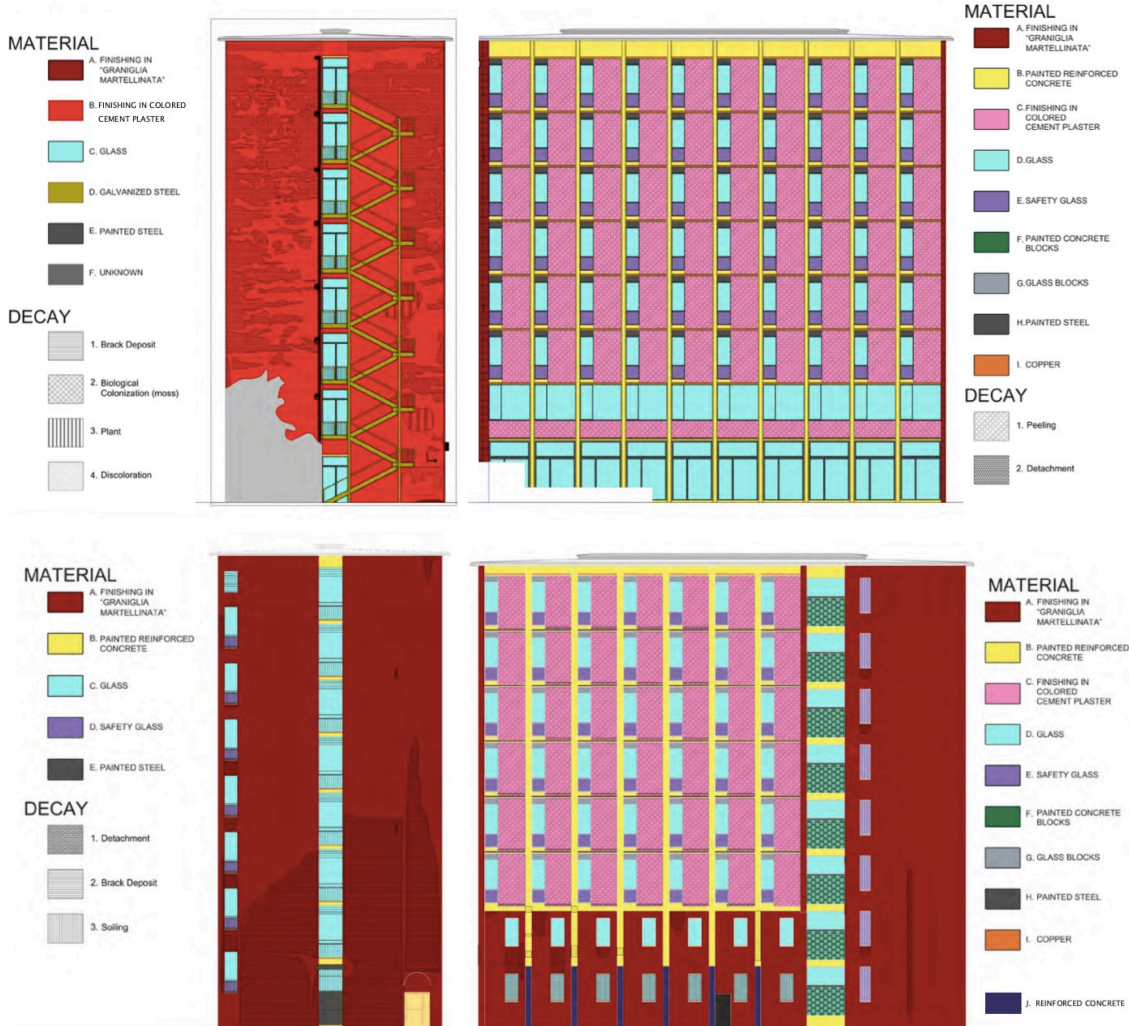
#### 3.1. Design Strategy

First, I will show Architectural strategy.

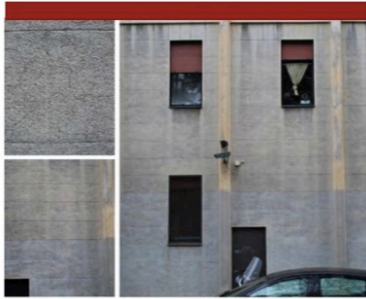
1. Avoid intervening existing structure of underground parking lot
2. Avoid intervening existing structure of Historical Building
3. Separate entrance according to the type of user
4. Use various types of design methods according to given conditions
5. Unify new and existing elements by setting vanishing point (axis)
6. Unify different principle's designs by using the same taste of design, Light Weight.

### 3.2. Architecture

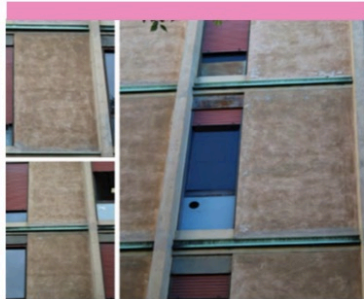
#### Material and Intervention.



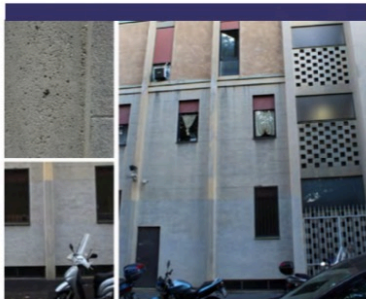
Material and Decay



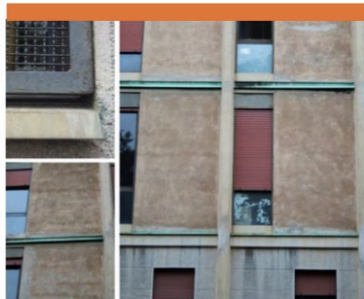
FINISHING IN "GRANIGLIA MARTELLINATA"



FINISHING IN COLORED CEMENT PLASTER



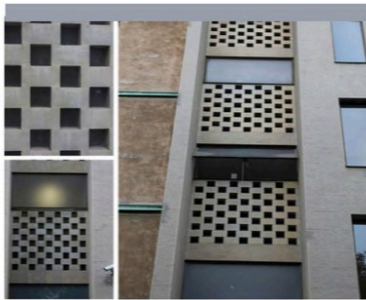
REINFORCED CONCRETE



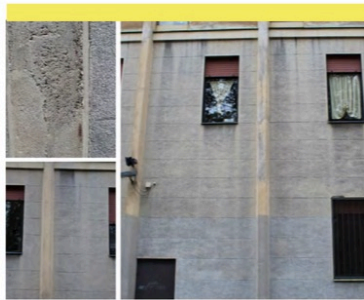
COPPER



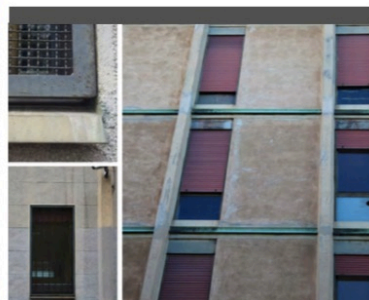
FINISHING IN CEMENT PLASTER



GLASS BLOCKS



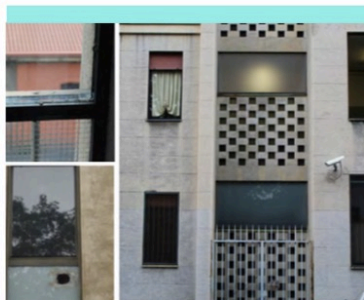
PAINTED REINFORCED CONCRETE



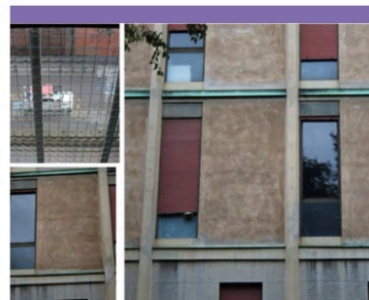
PAINTED STEEL



GALVANIZED STEEL



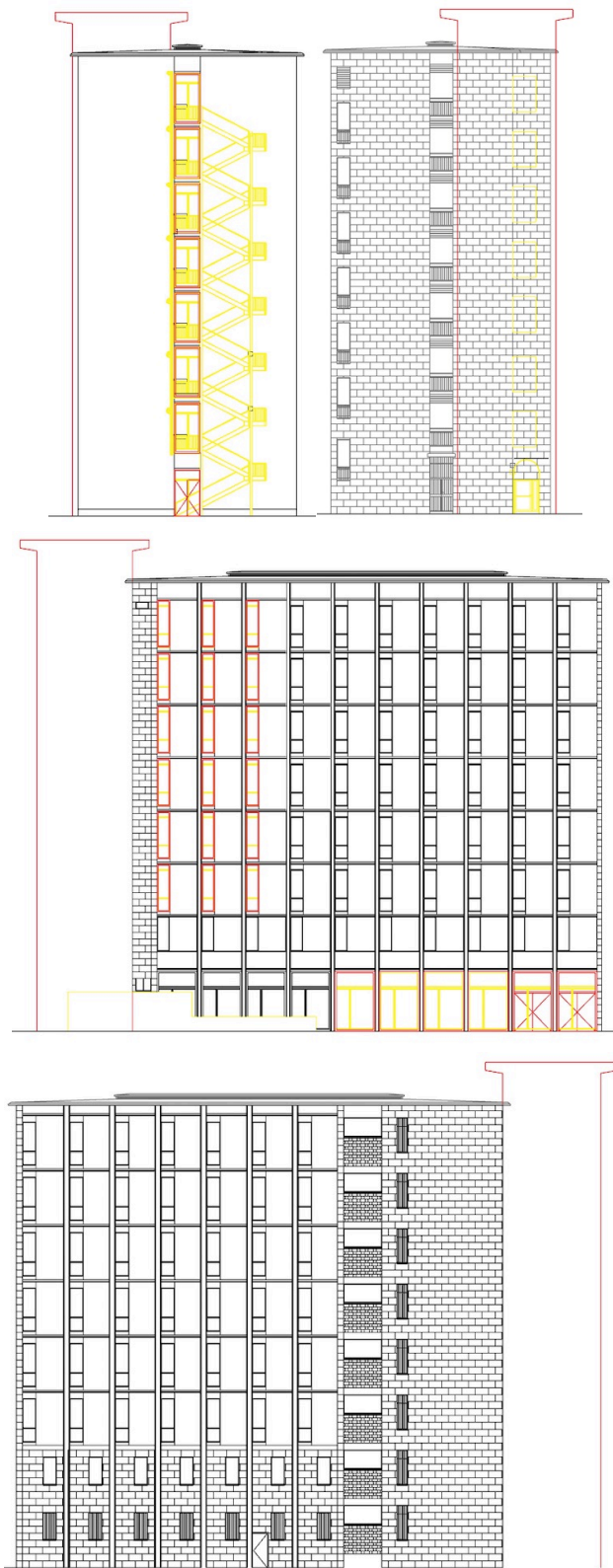
GLASS



SAFETY GLASS

## Material Legends





Demolition in Yellow and Construction in Red (North, South, East, West)



Peeling



Detachment



Discoloration



Biological Colonization (moss)



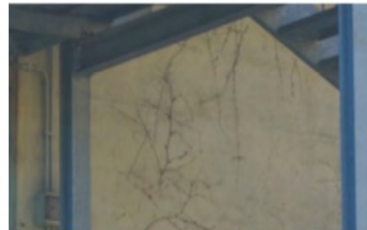
Black Deposit



Soiling

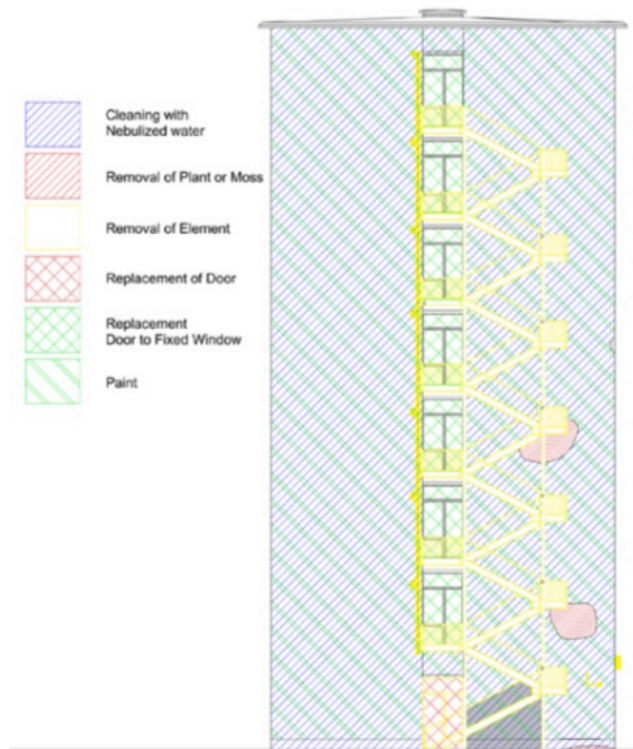


Coloration



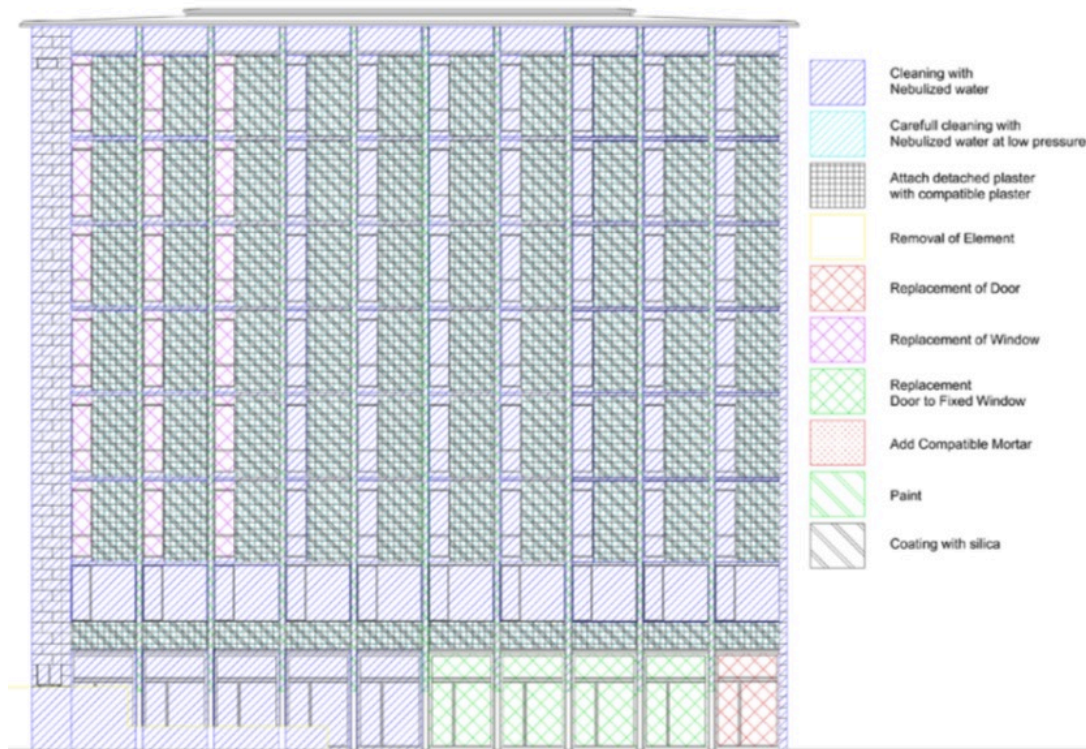
Plant

## Deterioration Legends



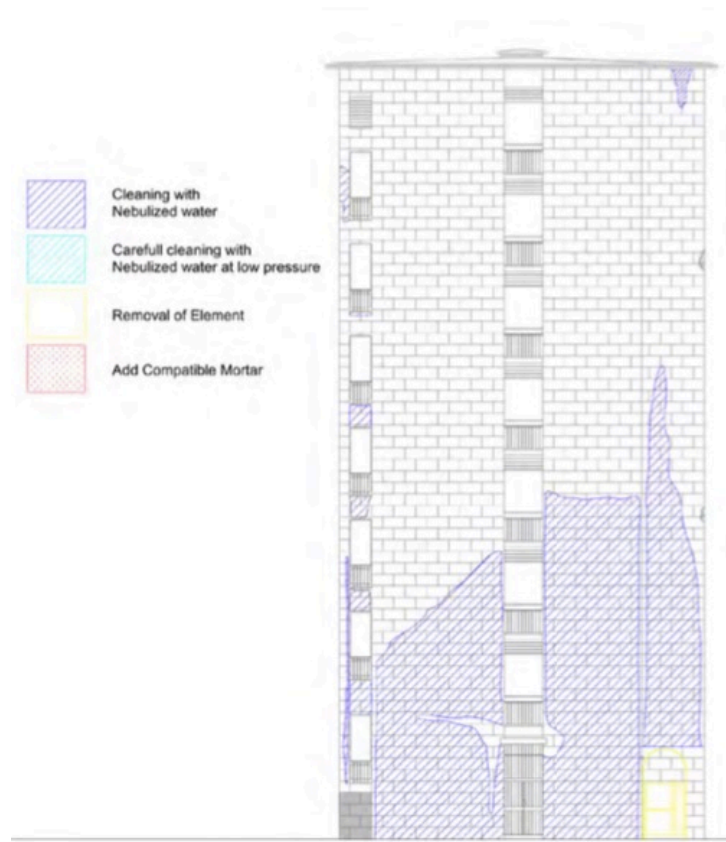
### Intervention- North

North Facade is one of most visible facade for students, but is spoiled by staircase. Plus, original drawing indicates this wall should be rendered by tile or stone tiles, however, now it is simply painted. Putting tiles might be one of choices to intervene this side. However, I could not conclude to the question that What Kind of Reconstruction Should be Executed and Why. As an "invader" of this historical building, I admit my limit, and decided to implement conservative simple intervention towards this side.



### Intervention- East

East Facade is not so visible to the people throughout this project. However, it is this side that is affected severely by new buildings, from material and spatial point of view. As the left part of this side will be shaded by new volume, vertical windows of first to third row from the left will be replaced, in order to improve the lightness of Common Space. Several doors on GF will be replaced according to the change of function of GF.

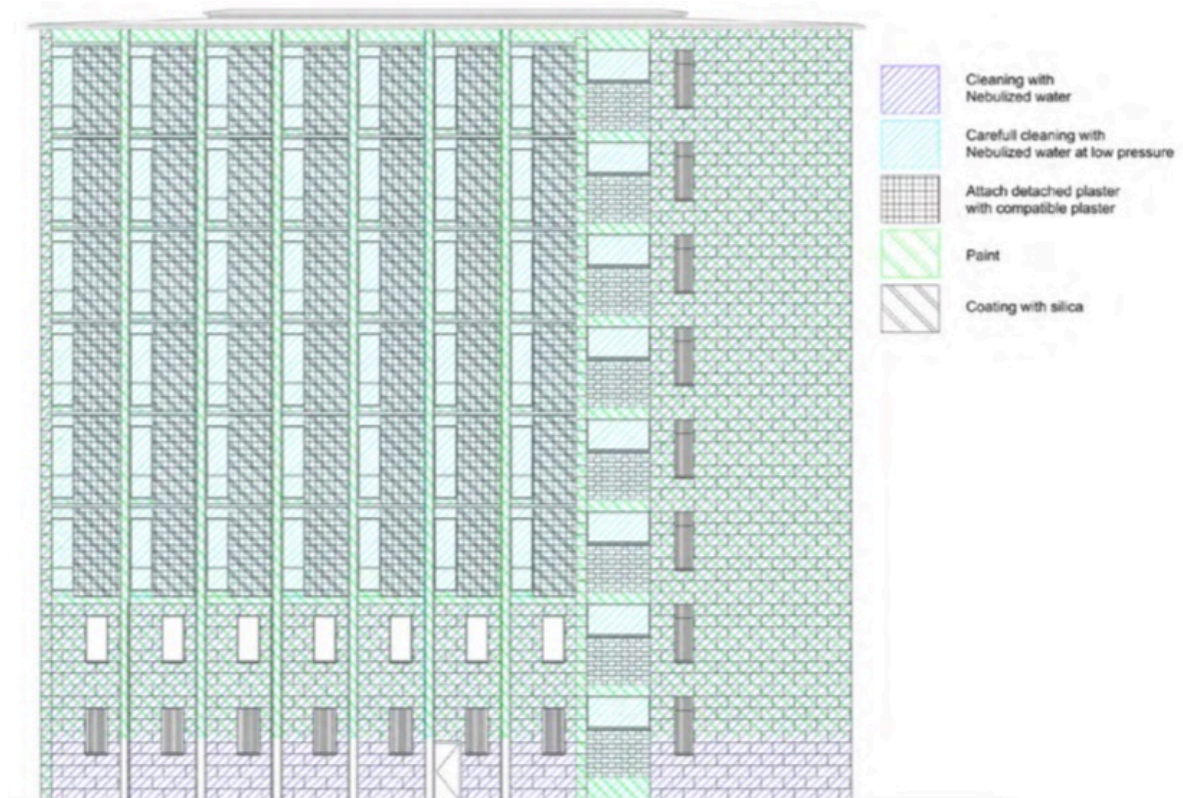


### Intervention- South

*On this façade, black deposits are found on part of this wall.*

*Most important thing to be mentioned is that the rebar of the RC wall is exposed to external air, which should be filled with mortar.*





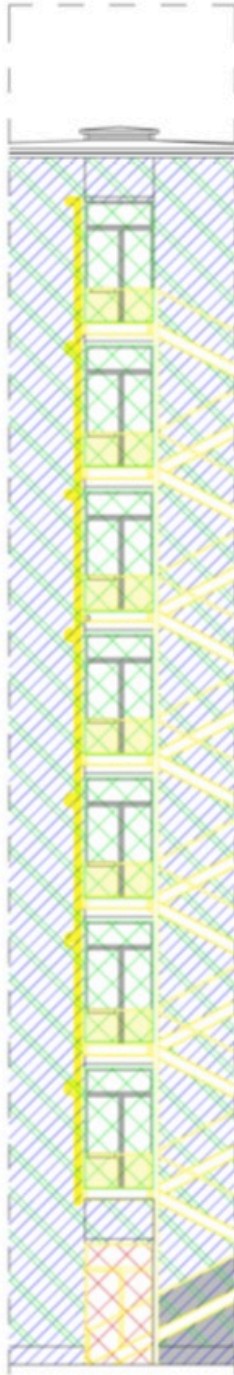
### Intervention- West

*West is the best side to recognize the original facade design of this historical building. Thus, the intervention should be considered very carefully. For instance, Discoloration of the painted pillars can be found only part of them, however, I decided to pain them from certain line to the top continuously. If only parts of them are painted, the color of new and old parts may differ therefore, it will be painted continuously.*

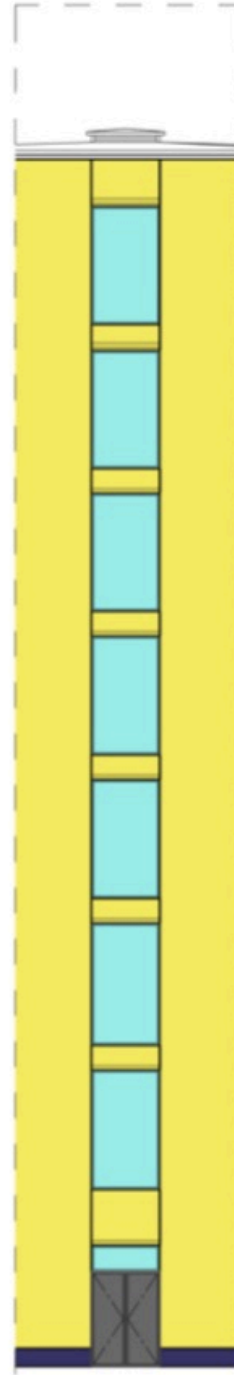
*Material and Deterioration Mapping*



*Intervention*

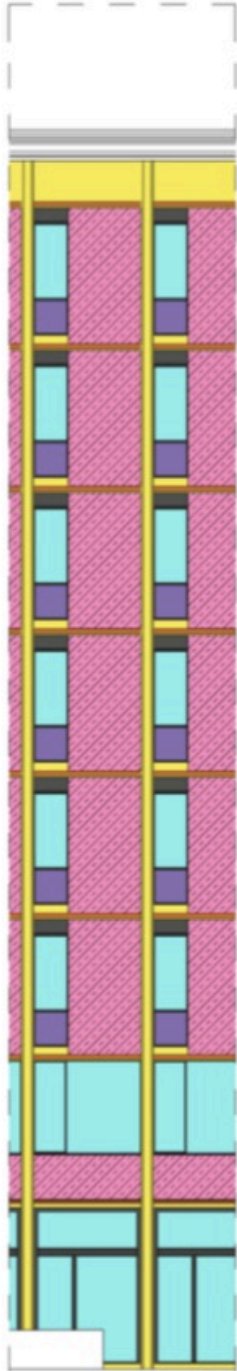


*New Facade*

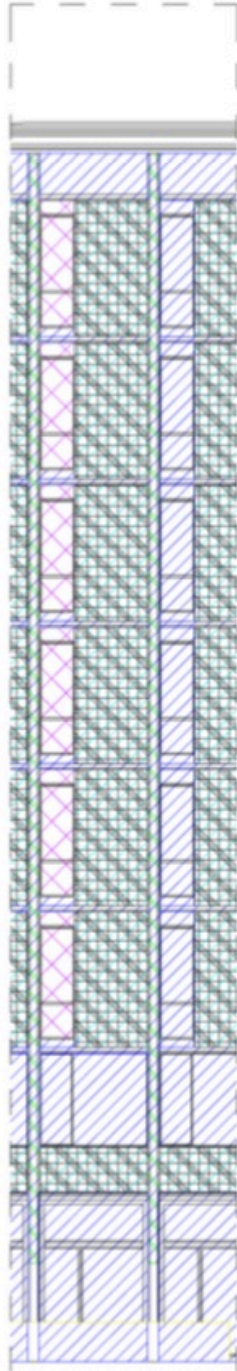


Detail from Existing to Project: North Facade

*Material and Deterioration Mapping*



*Intervention*



*New Facade*



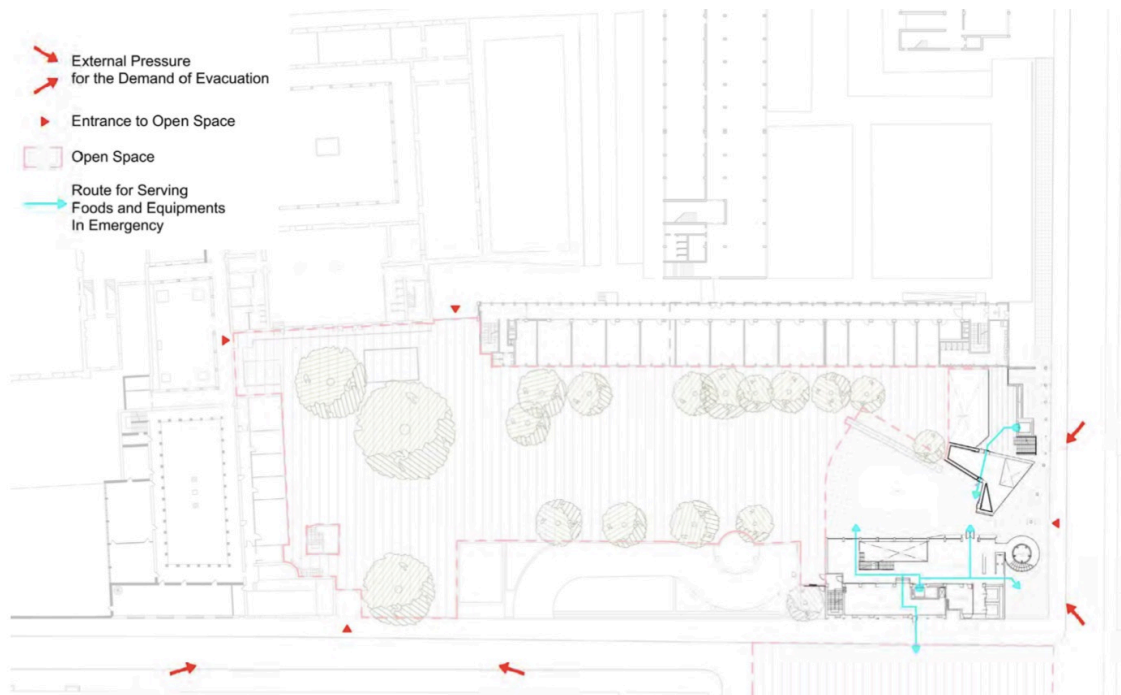
Detail from Existing to Project: East Facade



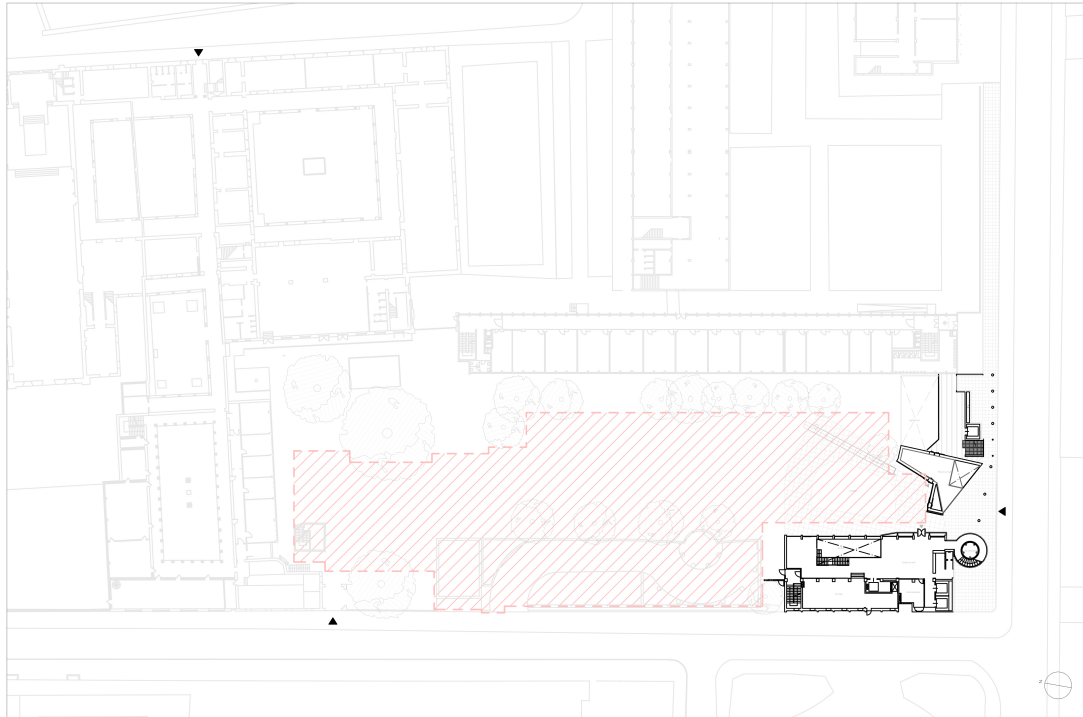
Design Approach (Allocation and Composition)



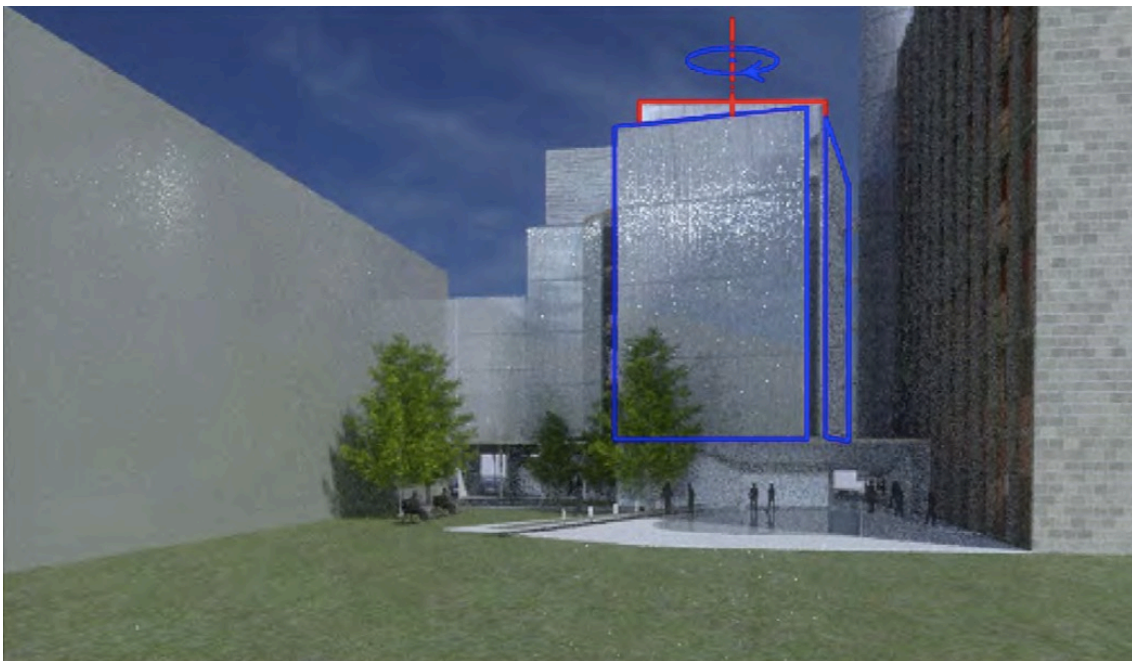
Diagram



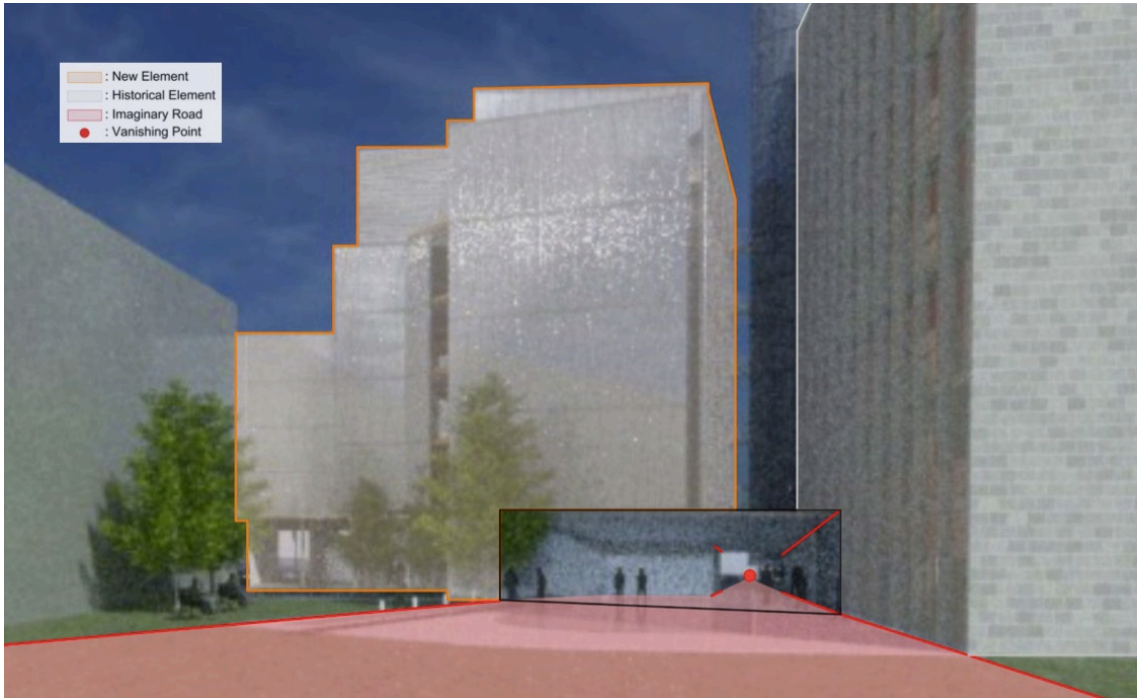
Site Plan and Site Use



Existing Structure: Underground Parking Lot  
(Red Hatch: Underground Parking Lot)



Avoiding Structure of Basement Parking Lot by Rotation  
By rotating volume, new structure avoided intervening existing structure.



Different Elements on a Same Road; Forced Perspective Create Imaginary Road



Road Leads to Future



Design Approach (Given Condition and Building)



Site Plan



View 1



View 2



View 3



View 4





North Elevation



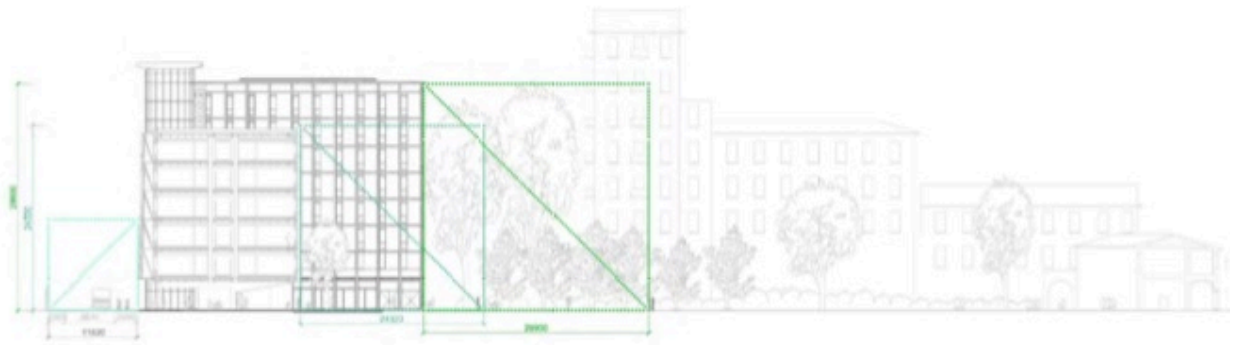
South Elevation



East Elevation

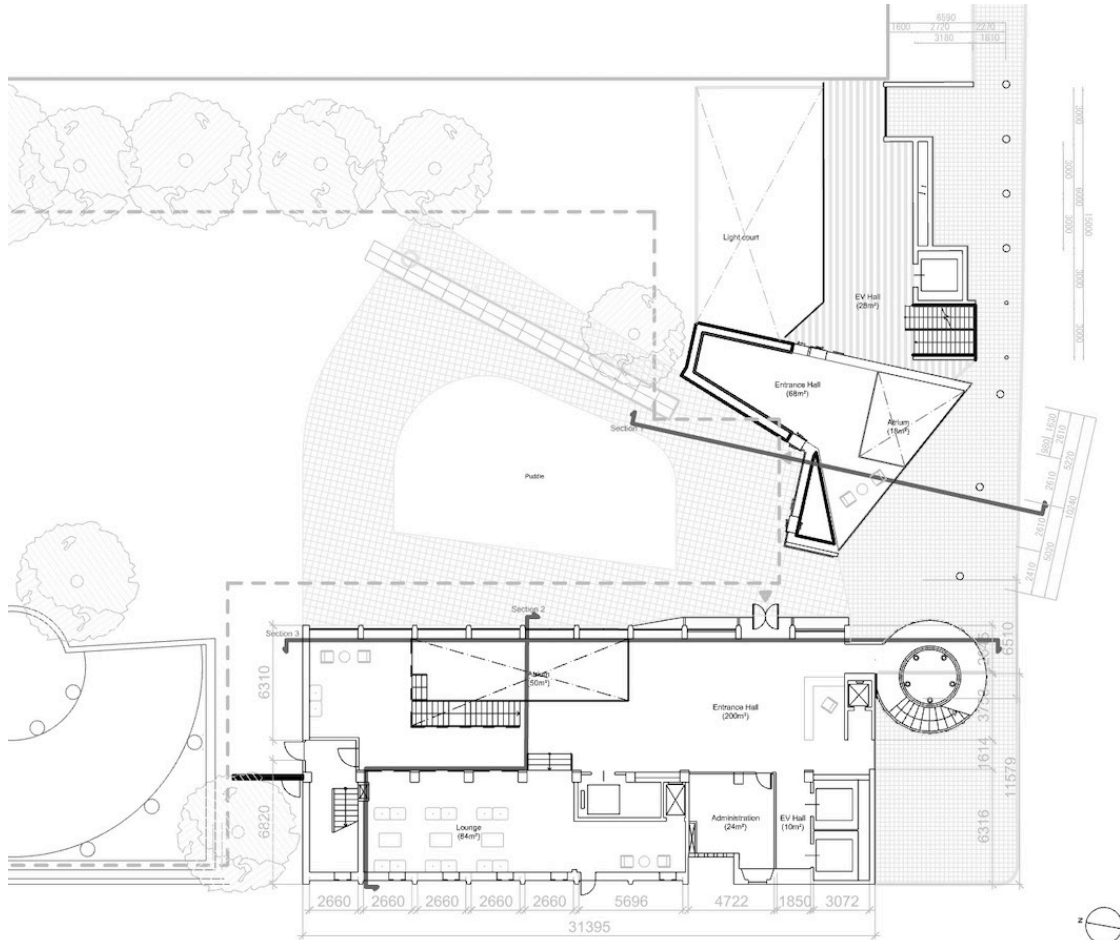


West Elevation



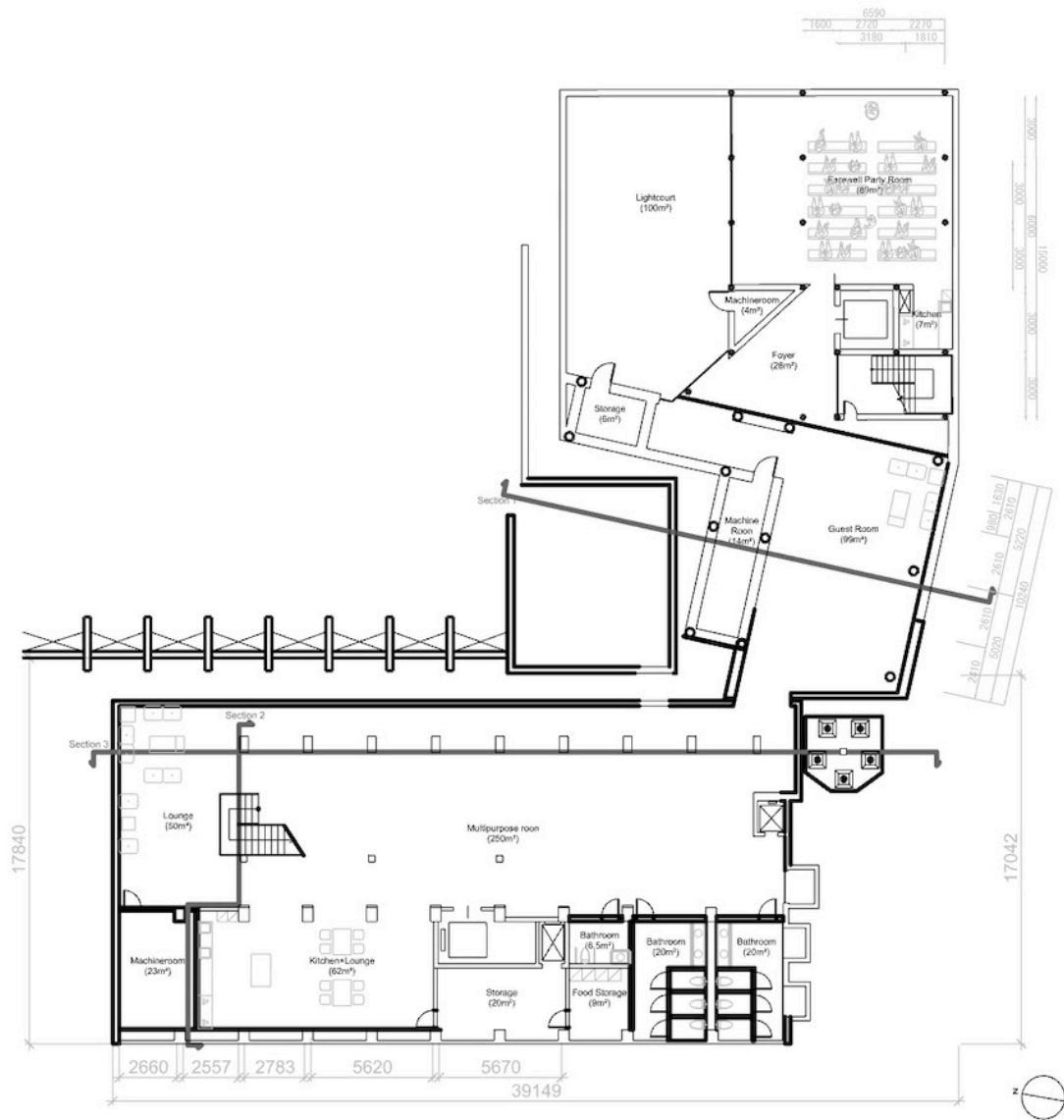
Urban Section

Drawings

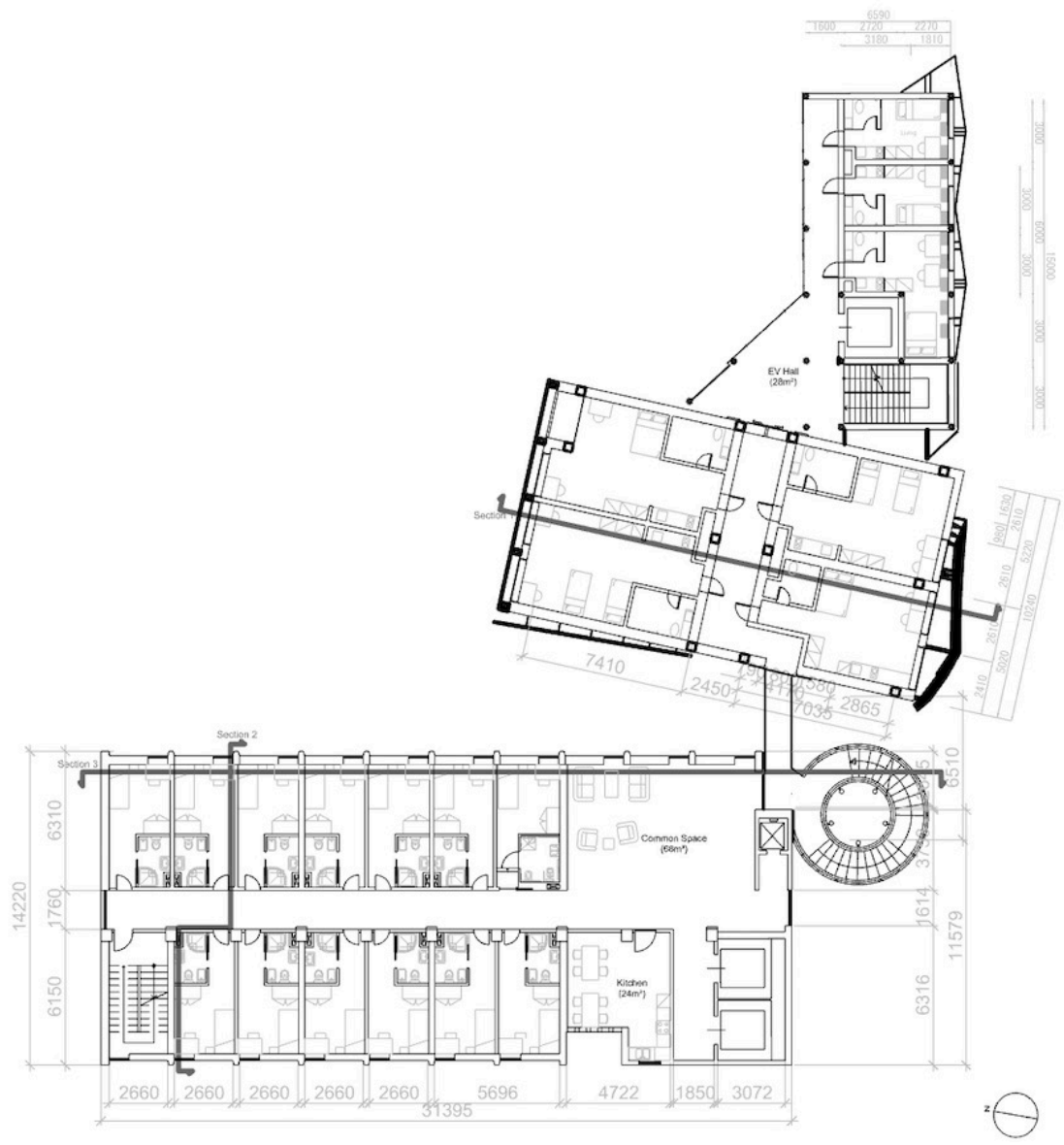


Site Ground Floor

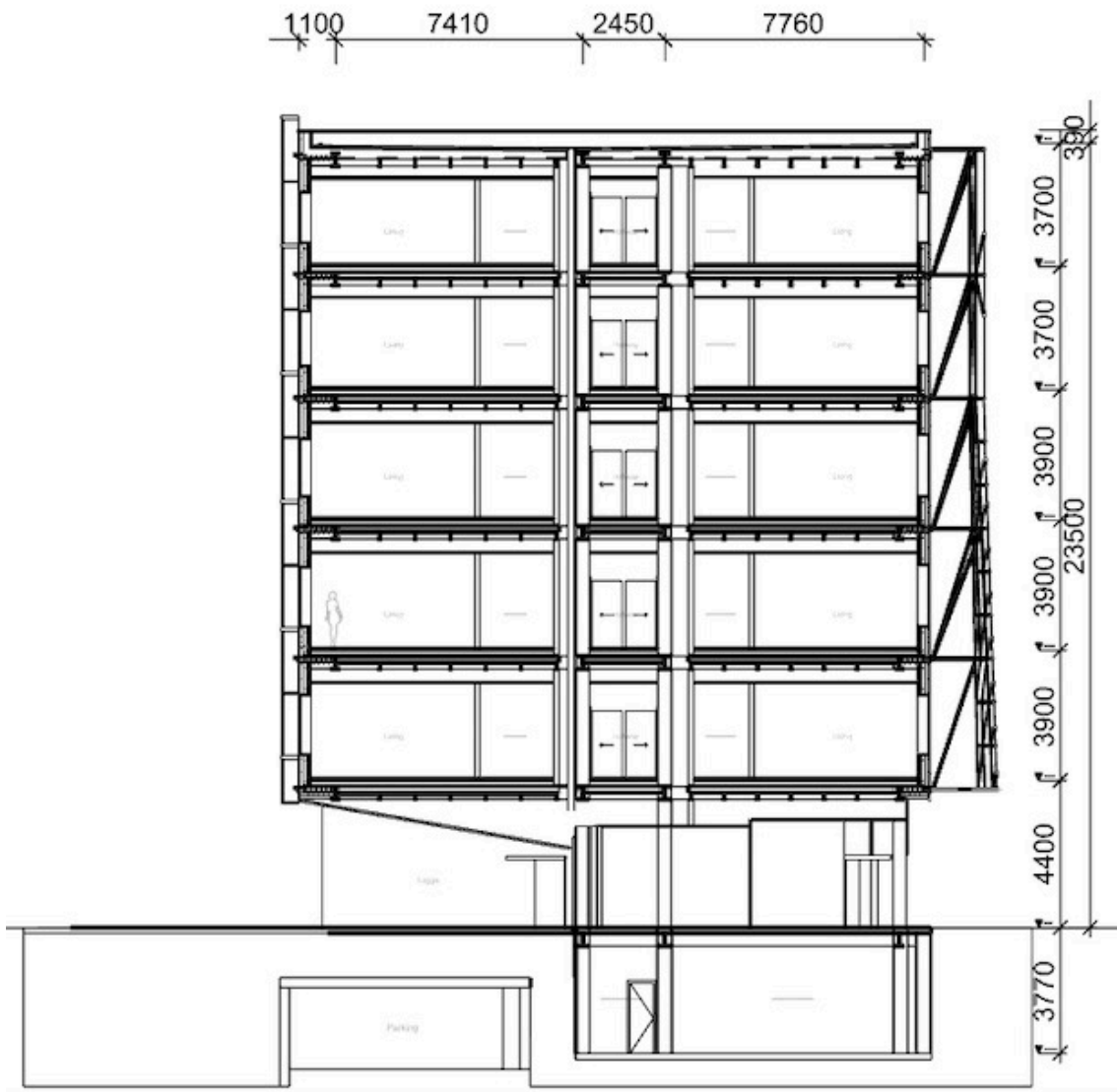




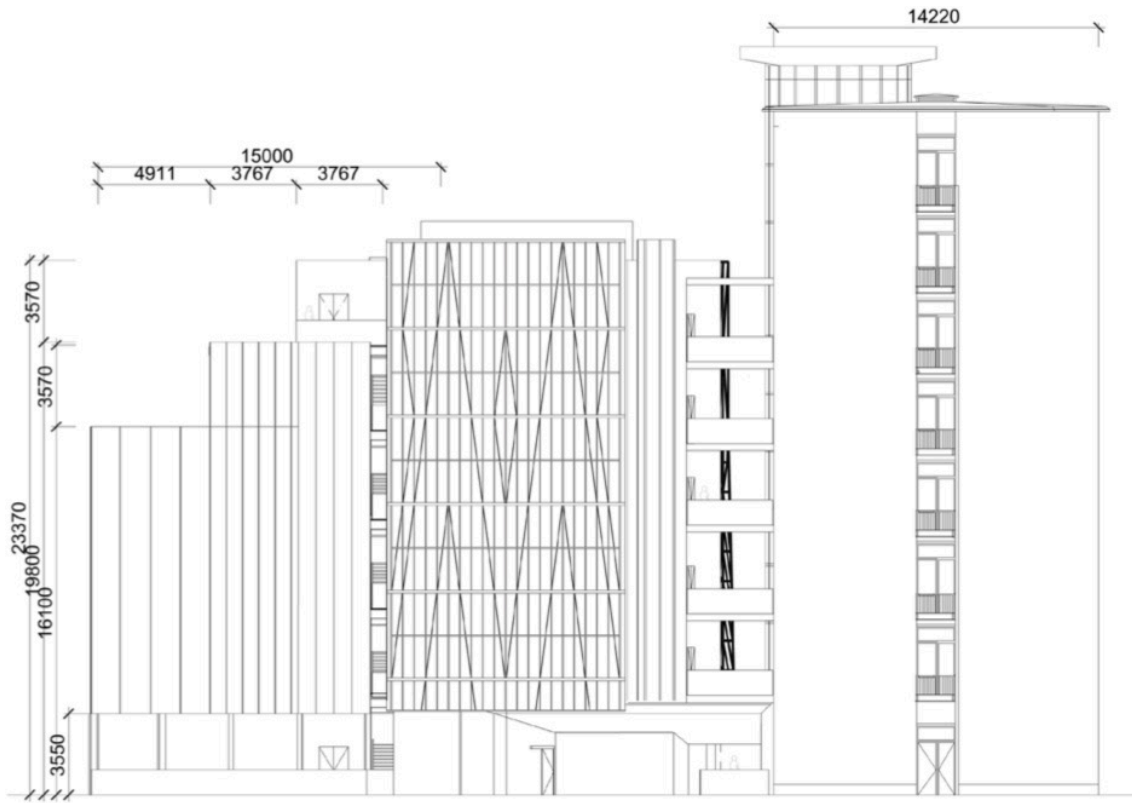
Under Ground Floor



Typical Floor

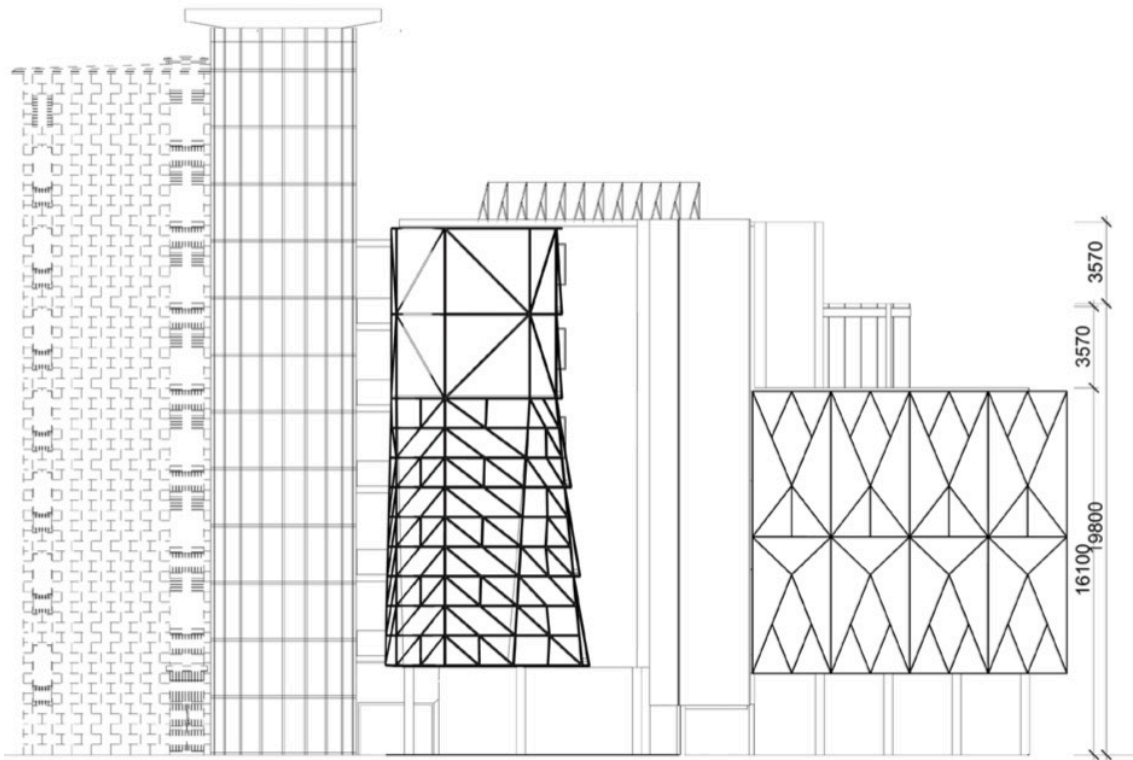


Section

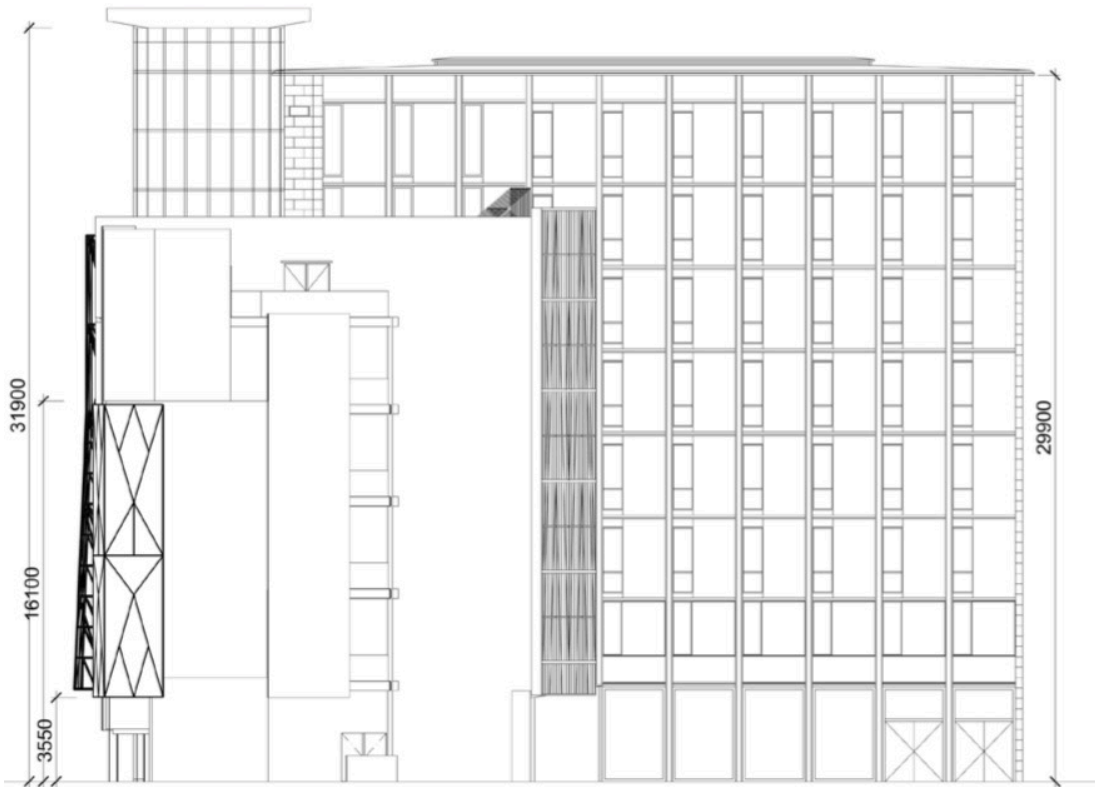


North Elevation

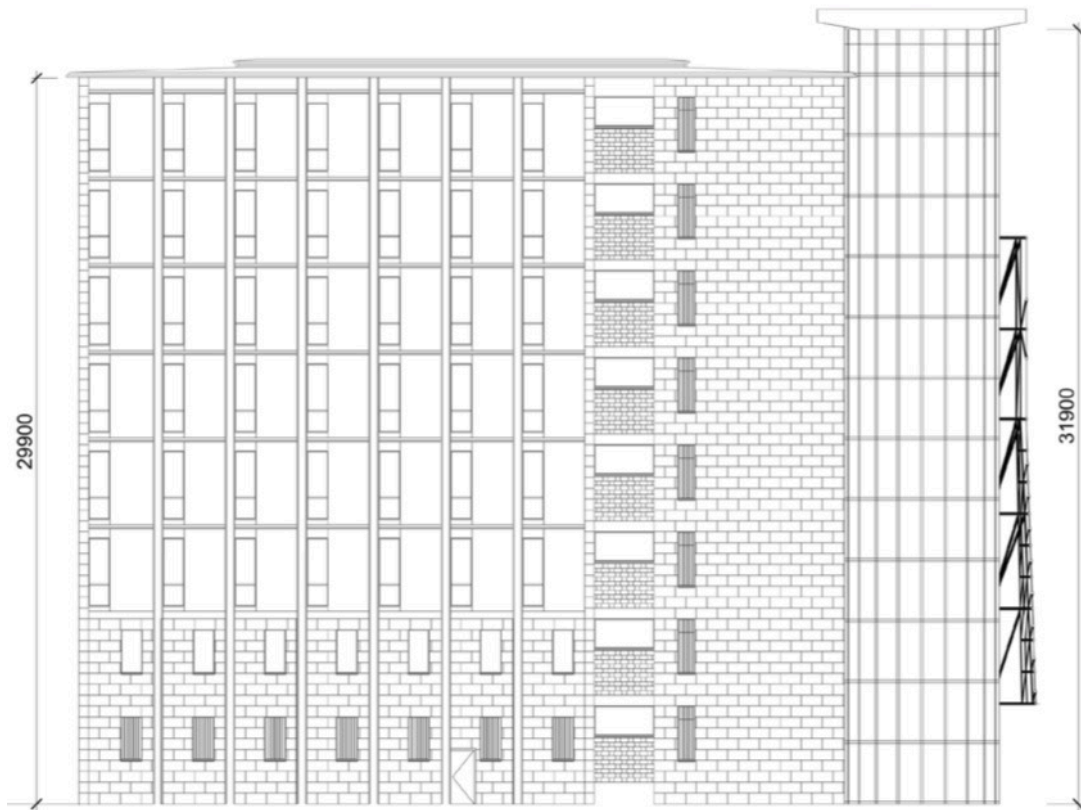




South Elevation

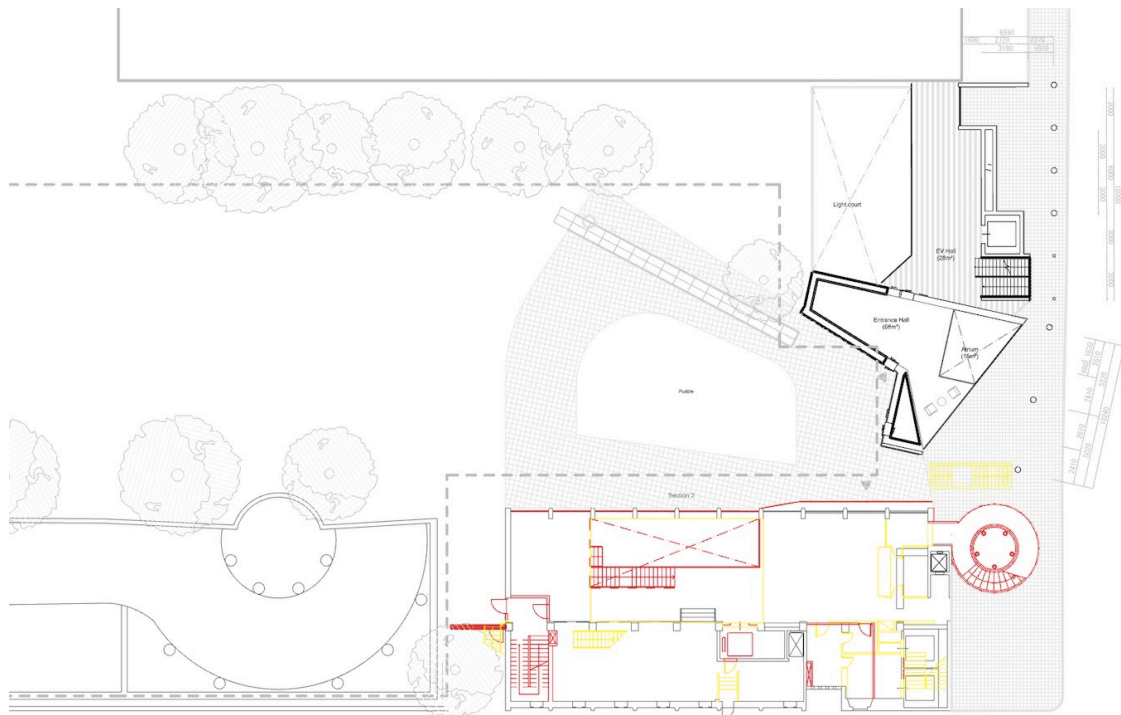


East Elevation

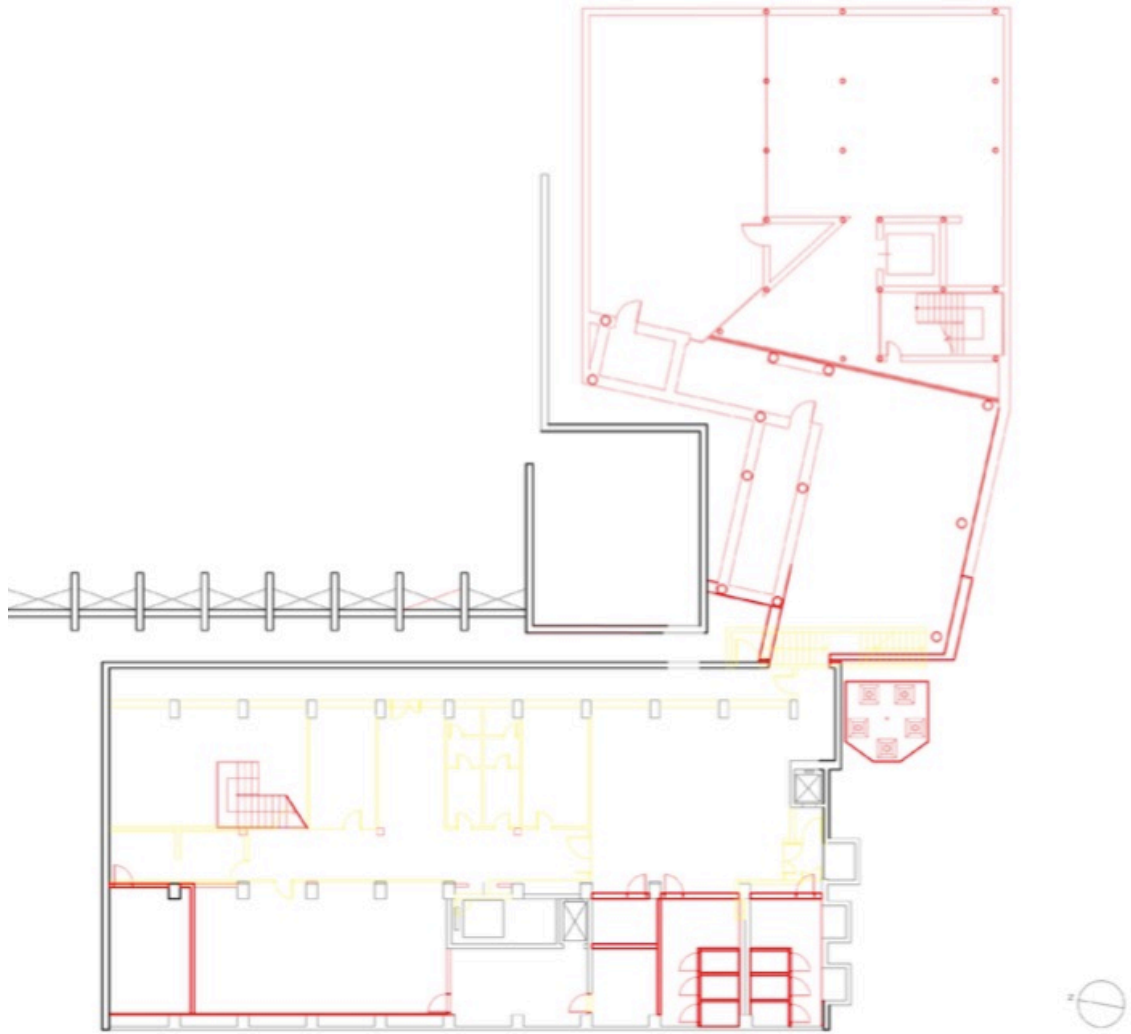


West Elevation

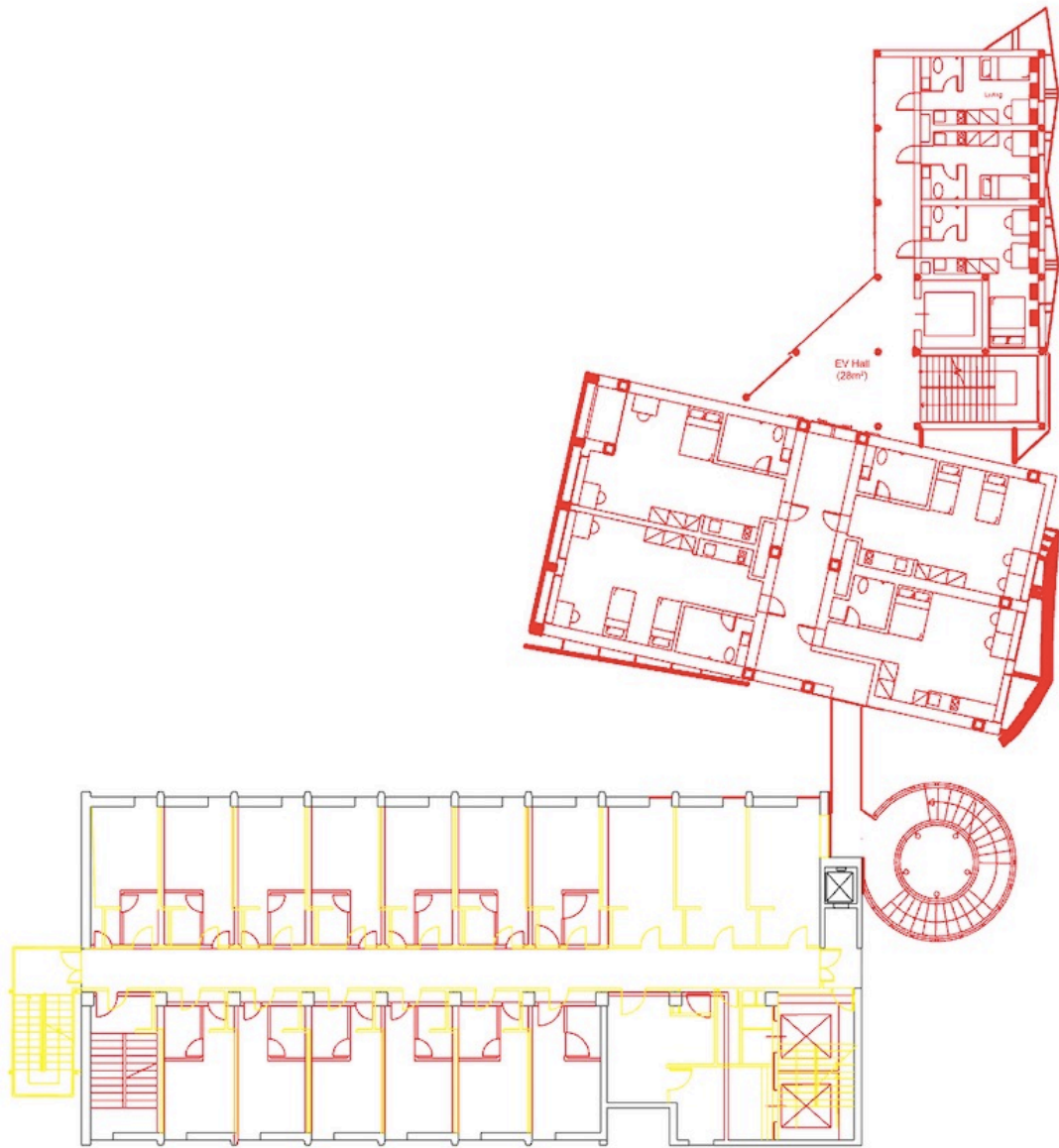
Demolition and Construction



Site Ground Floor



Underground Floor

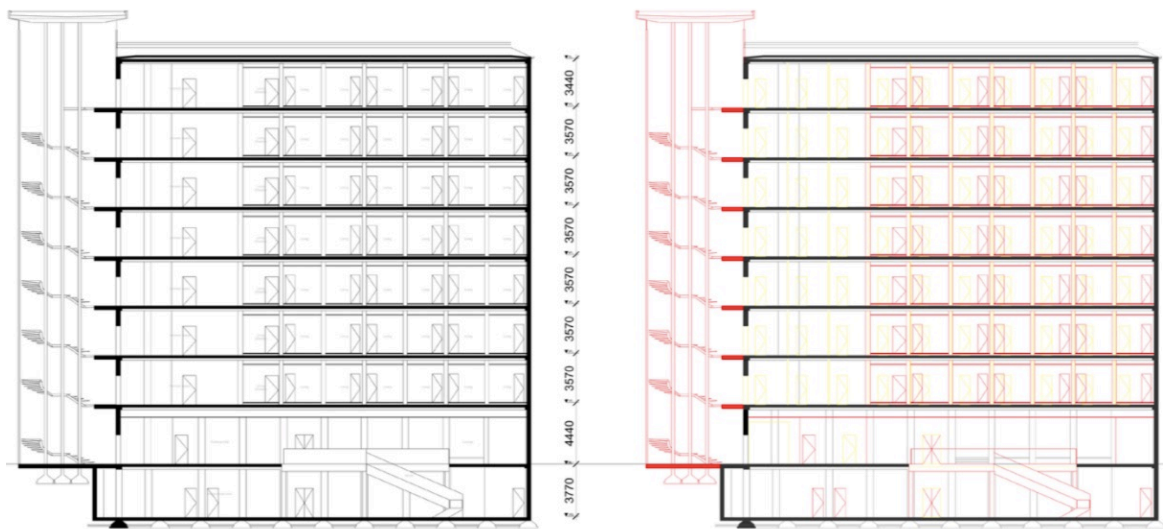


Typical Floor



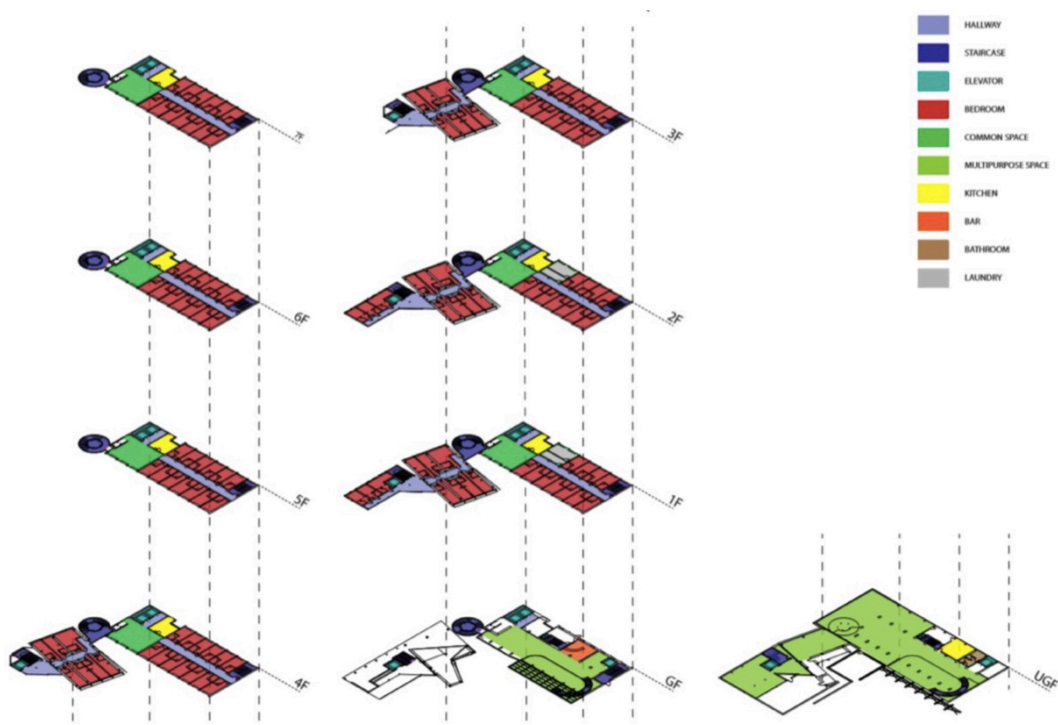


Section A-A'



Section B-B'

## Program

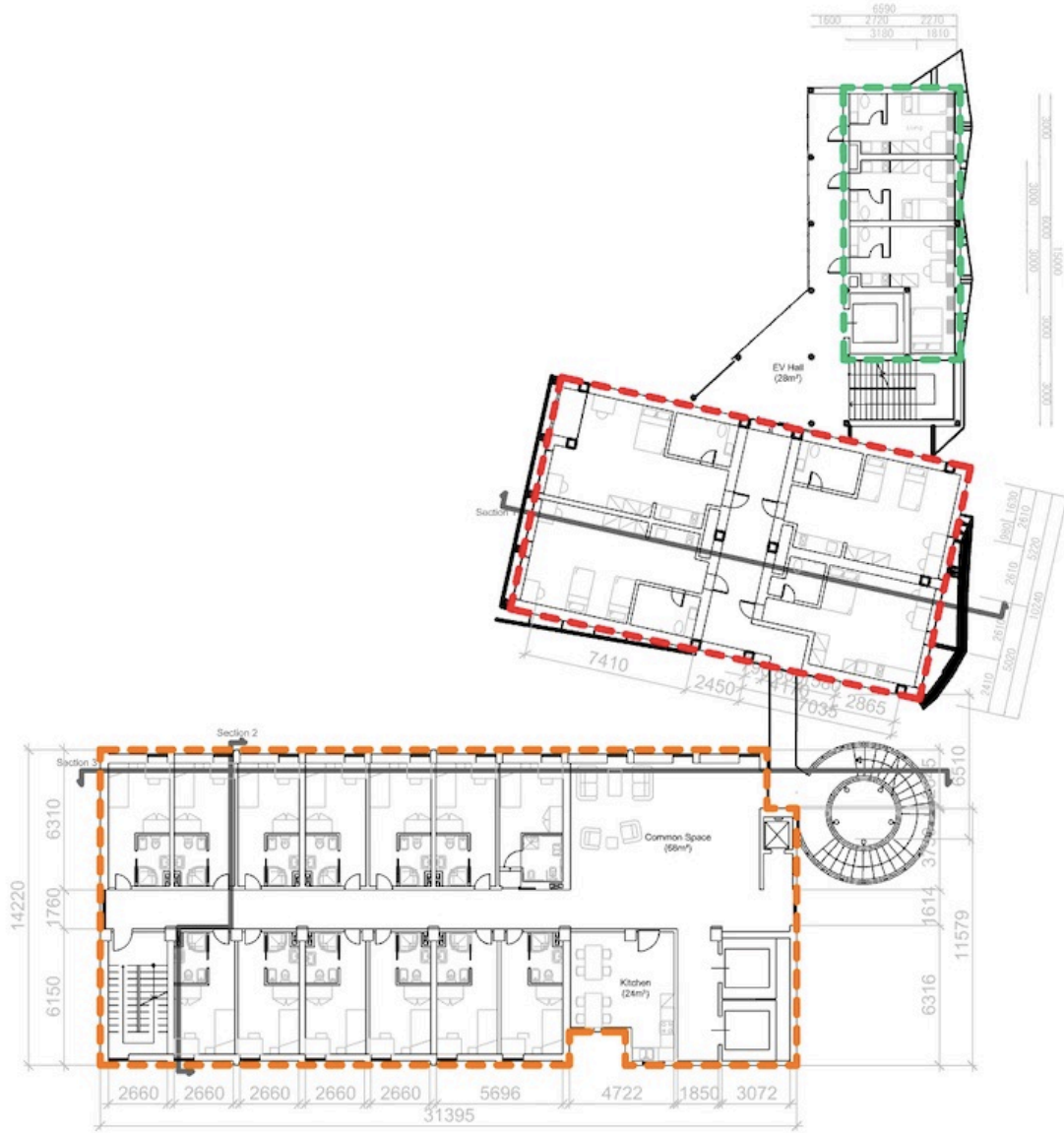


## Program

Loggia on ground floor leads different users to different entrances.

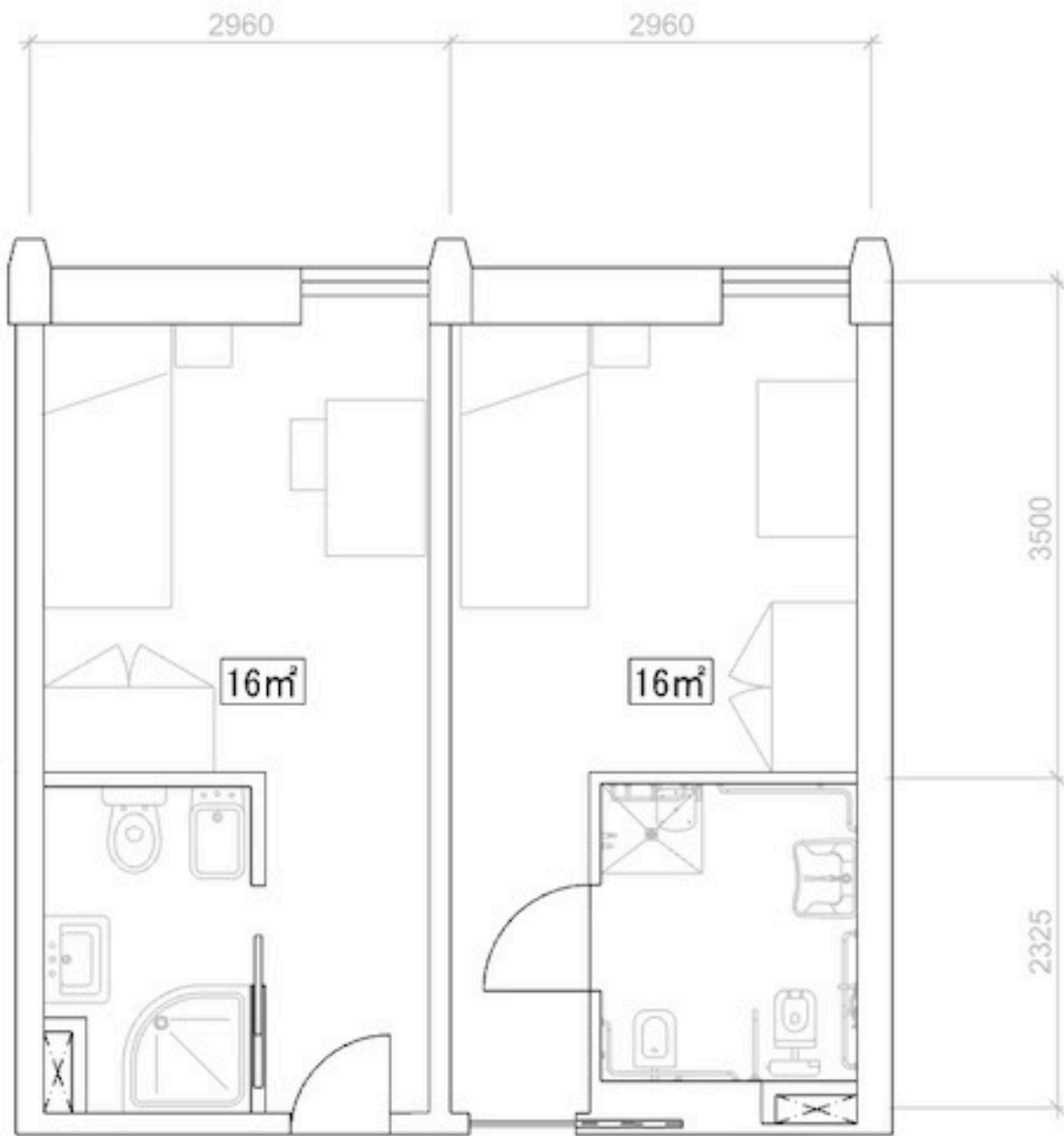
Existing building will be used by students of UMANITARIA and new volume will be used by professors and invited people.

Standard Rooms in Each Building



Different Three Types (Orange, Red, Green)

Orange Area

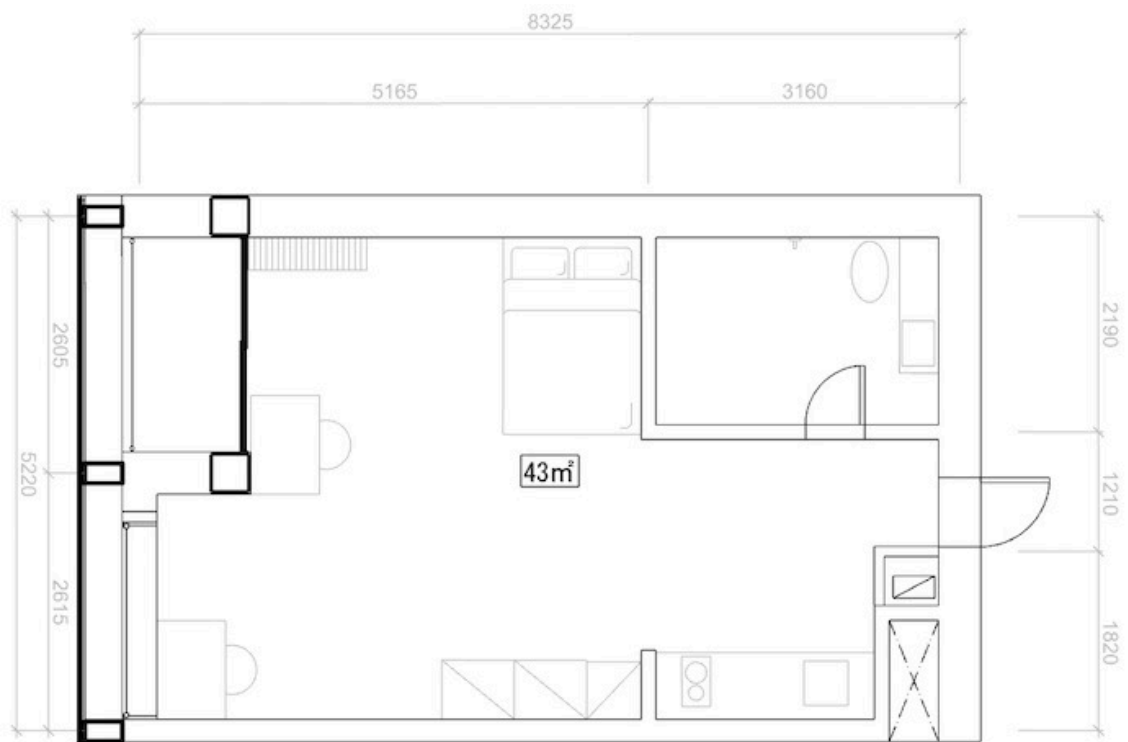


Type1 (left): Single Room without kitchen

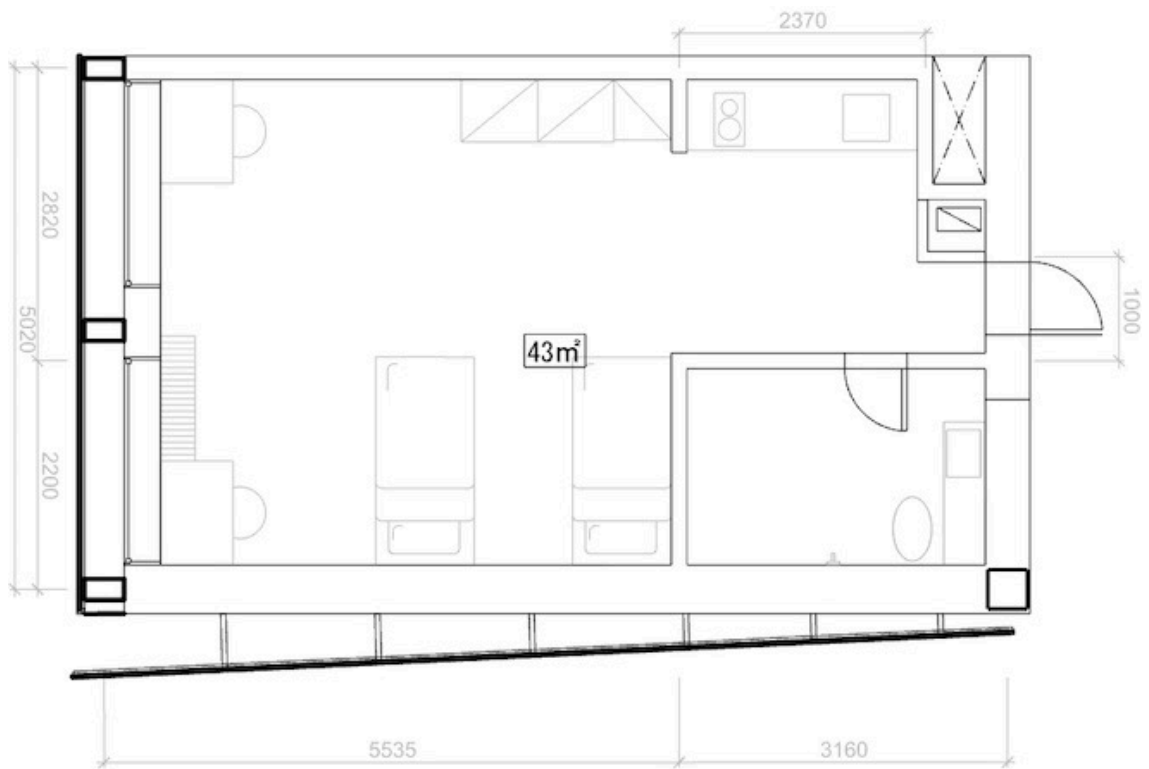
Type2 (right): Universal Single Room without kitchen



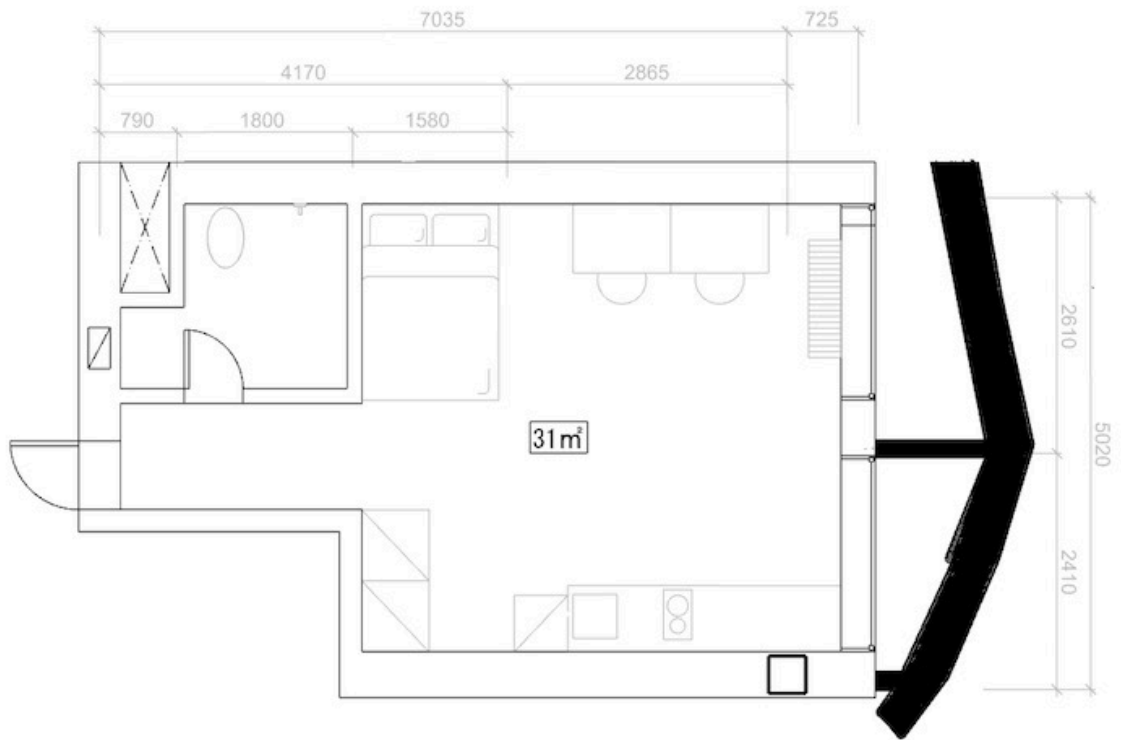
Red Area



Type3: Double Room with Balcony

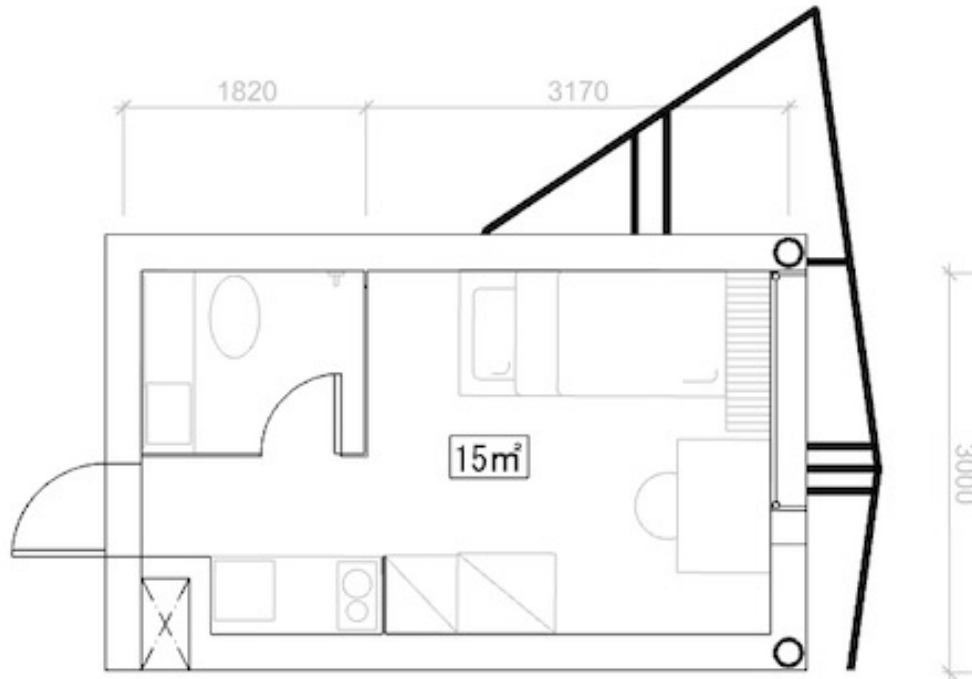


Type4: Double Room



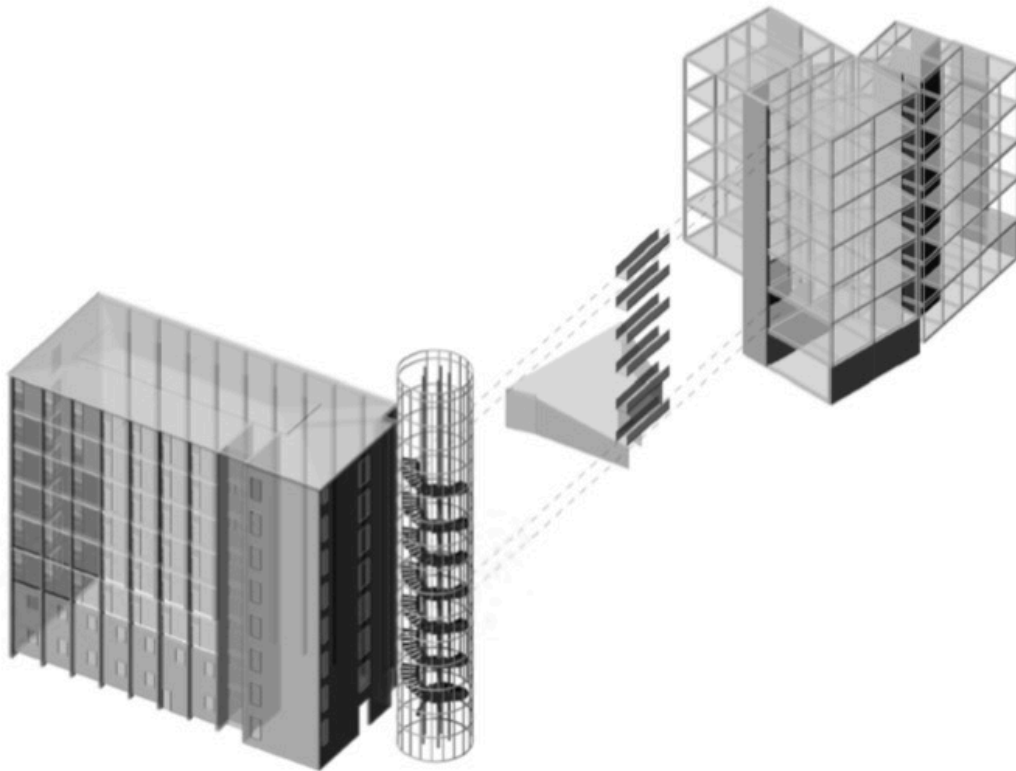
Type5: Double Room with Larger Kitchen

Green Area

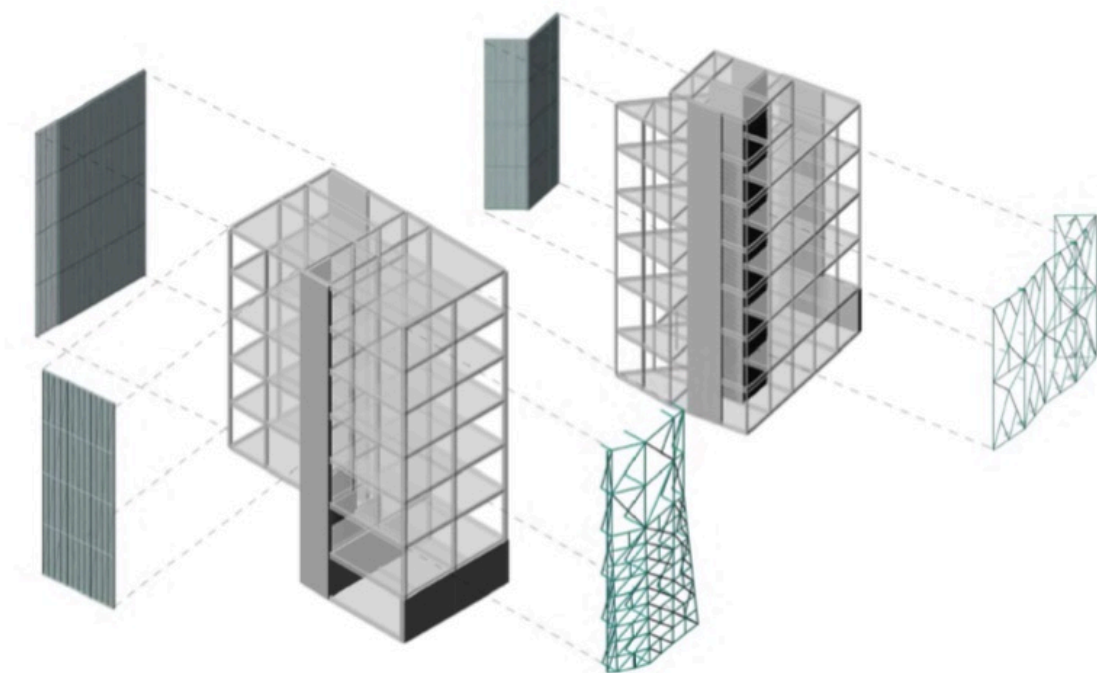


Type6: Single Private Room

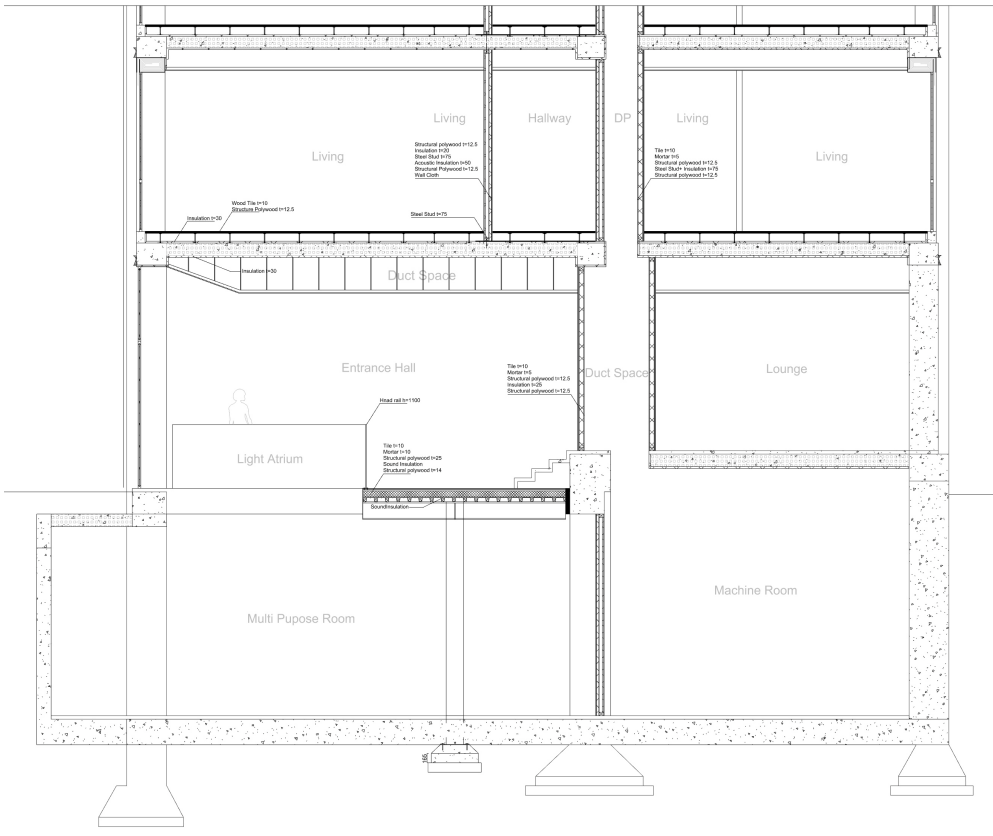
Structure



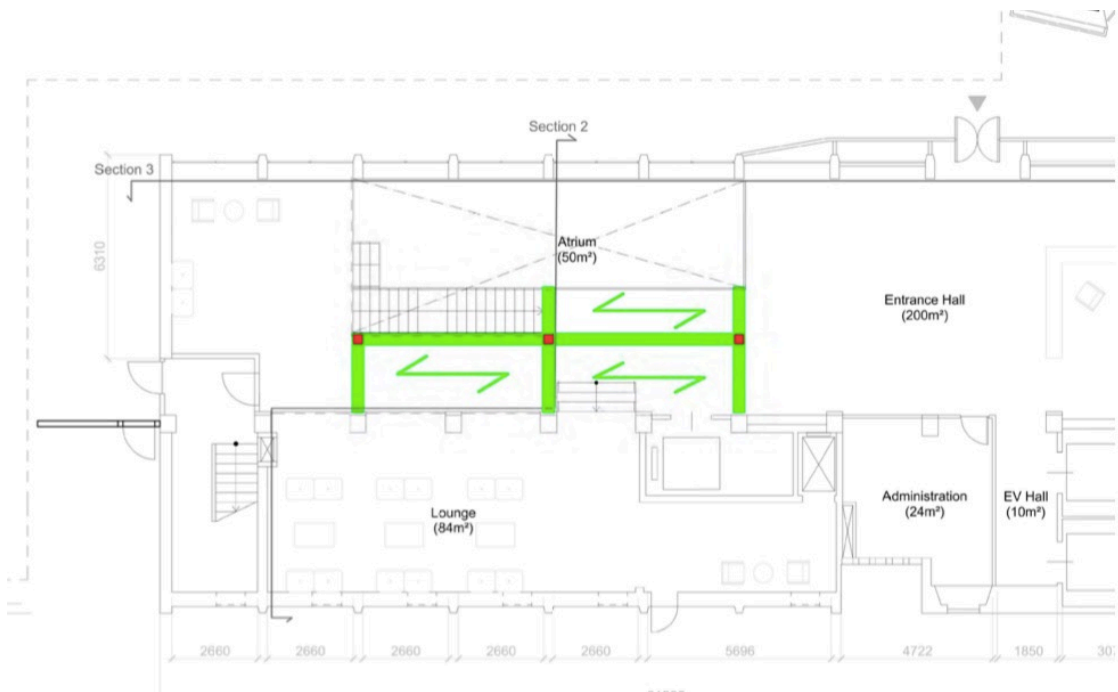
Structure Composition



Structure Composition



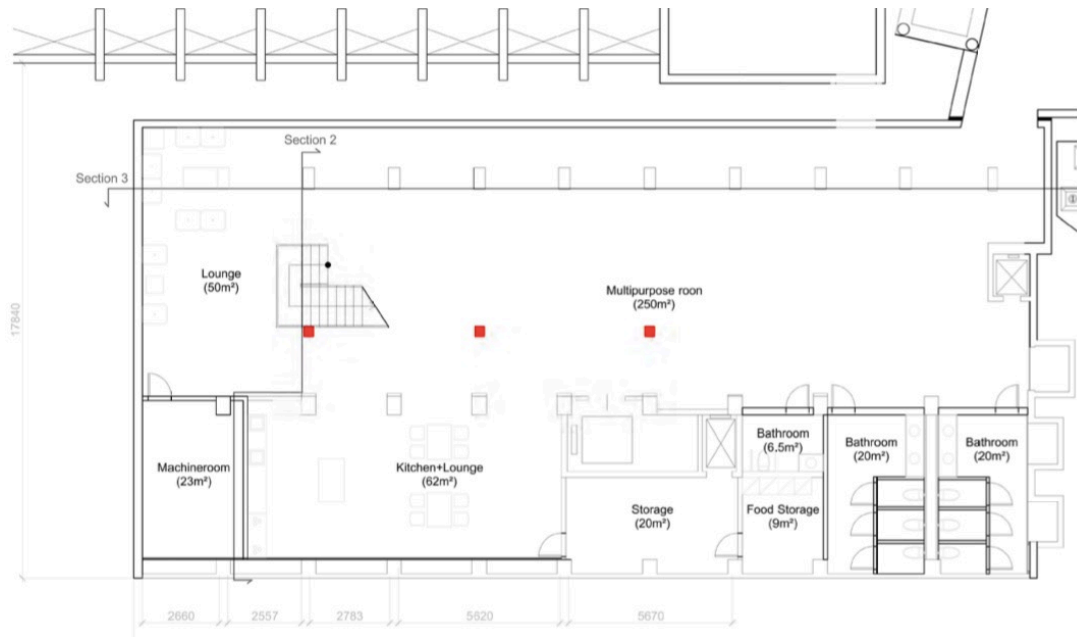
Section (Existing Building)



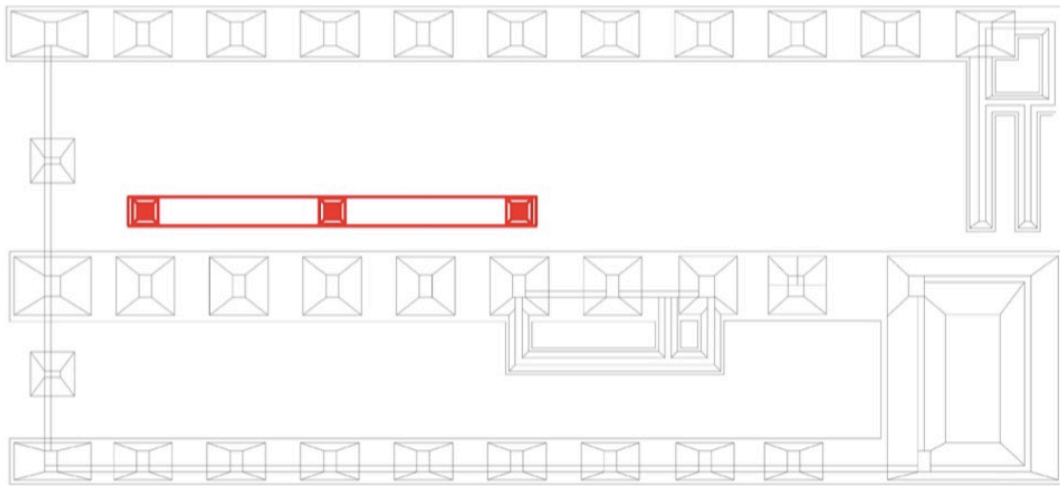
Green: New Beams Red: New Column

Ground Floor and Tributary Area

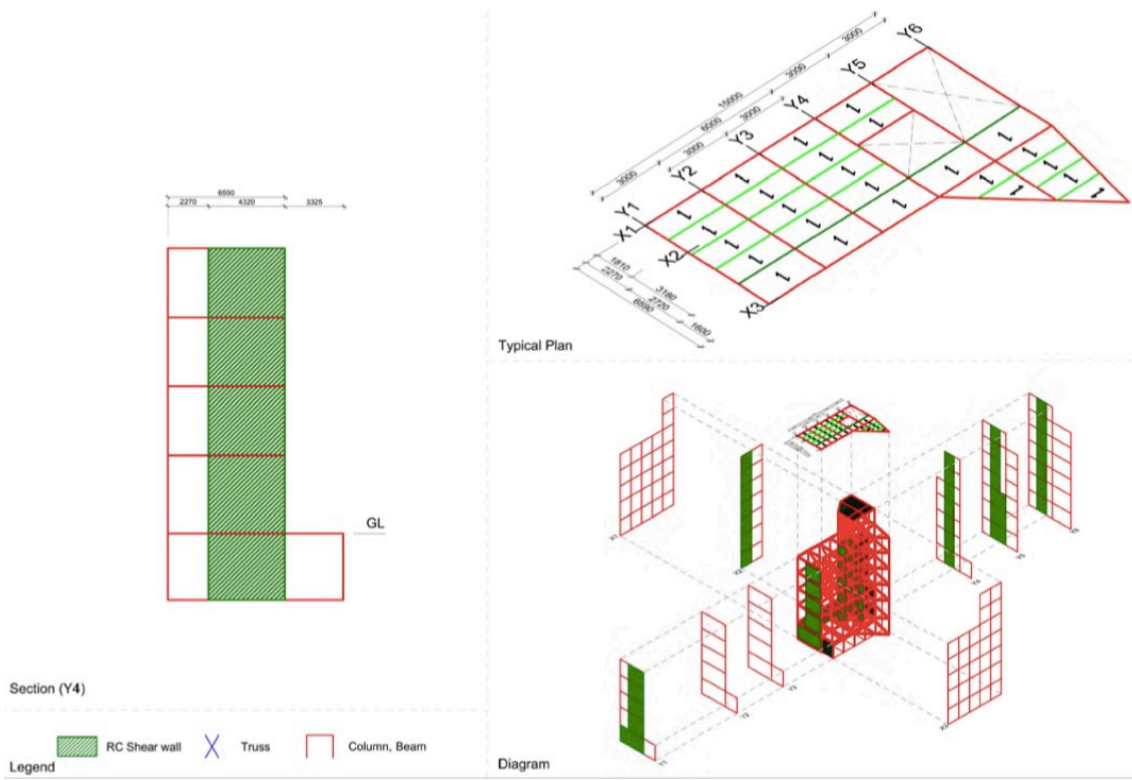




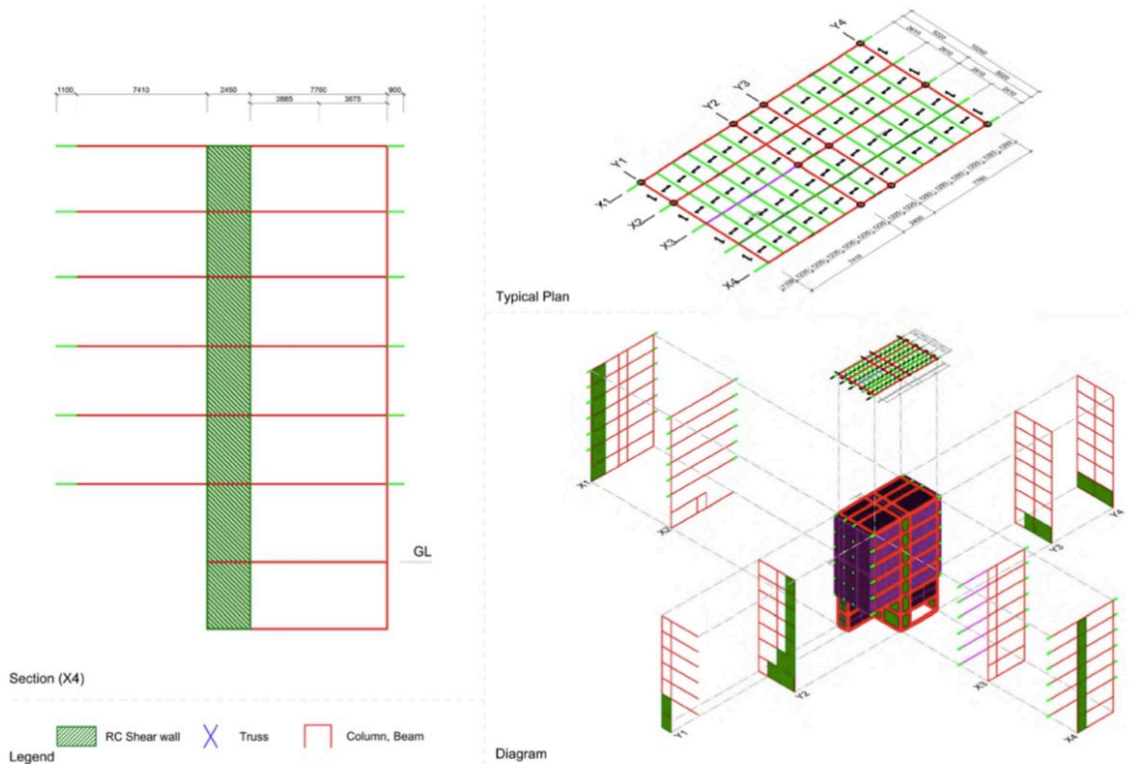
Underground Floor



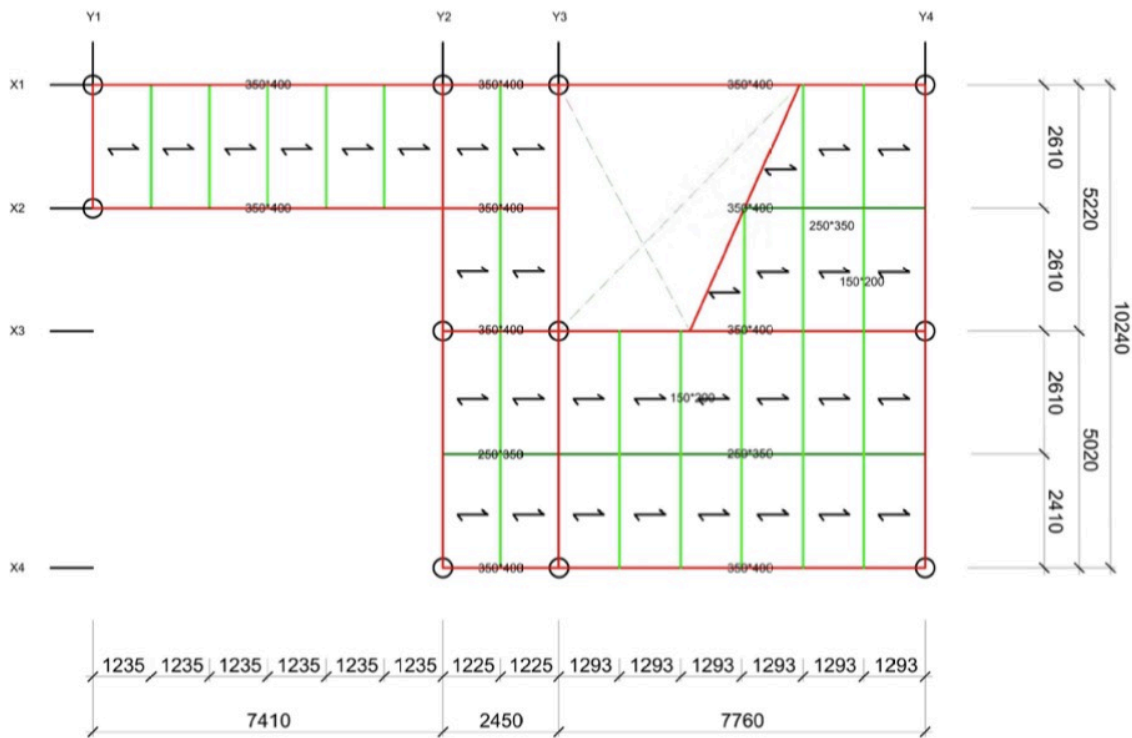
Foundation



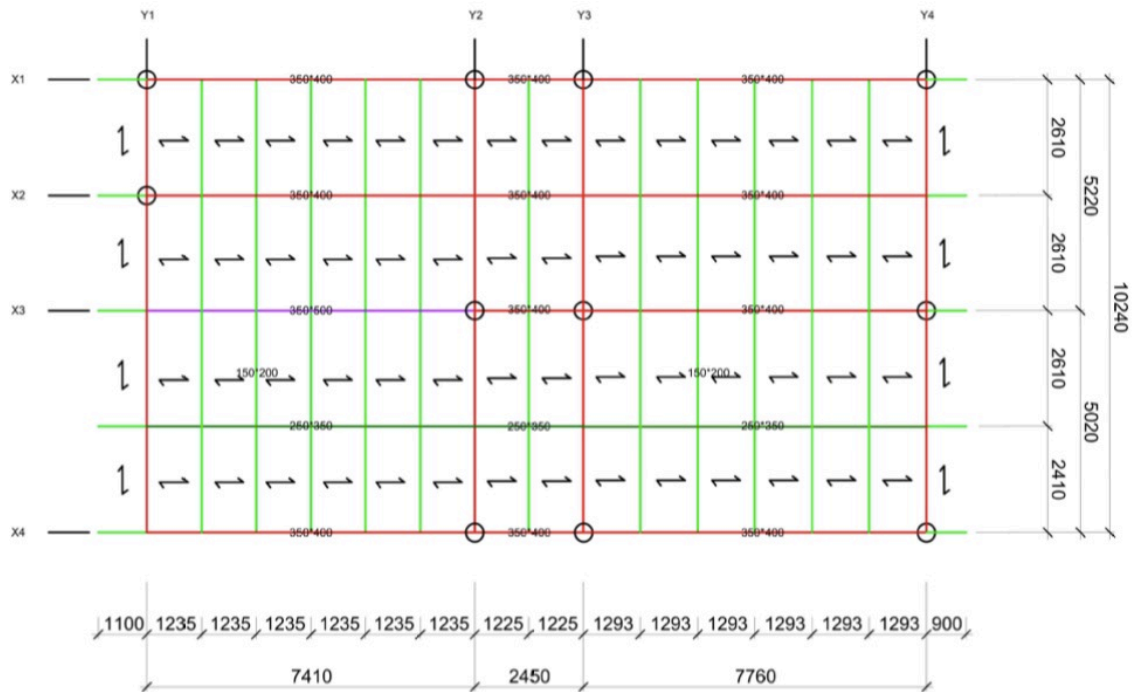
Structure Diagram: Horizontal New Building



Structure Diagram: Vertical New Building



Ground Floor



Typical Floor

Dead Load					
Inner Wall (between rooms)			Exterior Wall		
	Thickness[mm]	Weight [N/mm <sup>3</sup> ]		Thickness[mm]	Weight [N/mm <sup>3</sup> ]
Finishing	-	-	Finishing	-	-
Plaster	12.5	6.99x10 <sup>-6</sup>	ALC Panel	150	6.5x10 <sup>-6</sup>
Lead sheet	1	1.14x1 <sup>-e-4</sup>	Insulation	150	1x10 <sup>-8</sup>
Insulation	300	1x10 <sup>-8</sup>	Air	20	-
Lead sheet	1	1.14x1 <sup>-e-4</sup>	Plaster	20	6.99x10 <sup>-6</sup>
Plaster	12.5	6.99x10 <sup>-6</sup>	Finishing	-	-
Finishing	-	-	-	-	-
<b>Total</b>		<b>1.24x10<sup>-6</sup></b>	<b>Total</b>		<b>3.48x10<sup>-6</sup></b>
Live Load					
0.01 [N/mm <sup>2</sup> ]					

Material and Load

• Material

In this simulation, SS400 is selected for steel structure, RC(Fc39) is chosen for concrete wall, Light Wight Reinforced Concrete is applied to slab.

Acceptable stress of JIS SS400 is 235 [N/mm<sup>2</sup>].

• Load

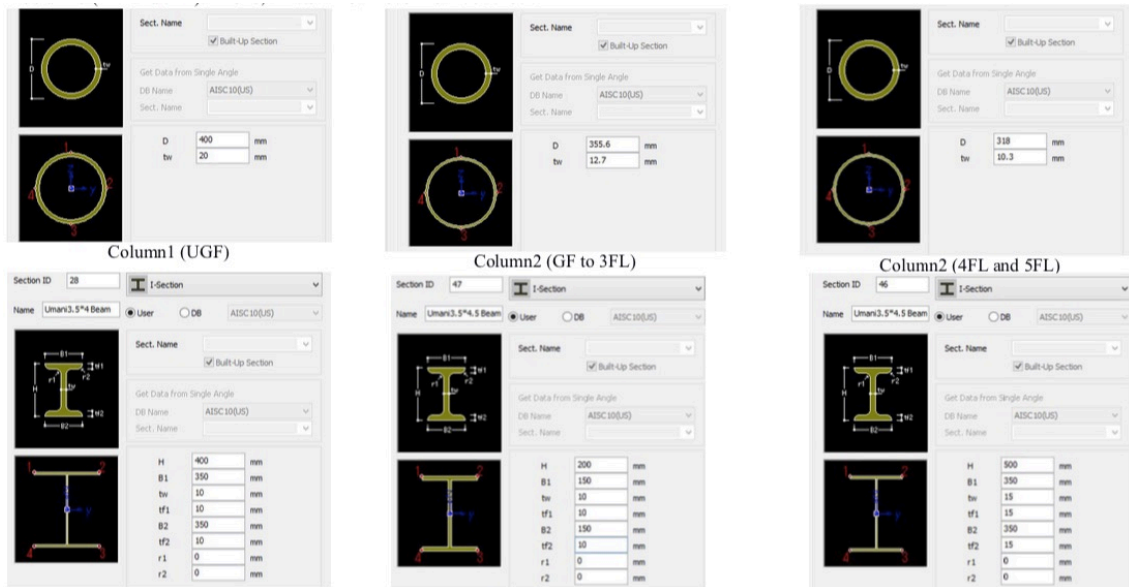
DL: Dead Load The following value of dencity will be used to calculat the Dead Load on Midas, with the definition of Thickness and the area of the Plate on the software.

SS400 is about 7.97[g/cm<sup>3</sup>] RC is around 2.5 [g/cm<sup>3</sup>] LWRC is around 1.8 [g/cm<sup>3</sup>] Non



structural Internal Wall is 0.124 [g/cm<sup>3</sup>] as it contains thick insulation Non Structural External Wall is 0.124 [g/cm<sup>3</sup>]

LL: Live Load As the program of this building is residential use, the room is furnished, 1.1[N/mm<sup>2</sup>] is chosen for the Live Load.



Structure's Section

• Section

Mainly, there are three types of sections for Columns.

The columns get slender as the level gets higher, same principal is applied to beam.

The specification is described below:

Column1 (UGF): D=400, t=20

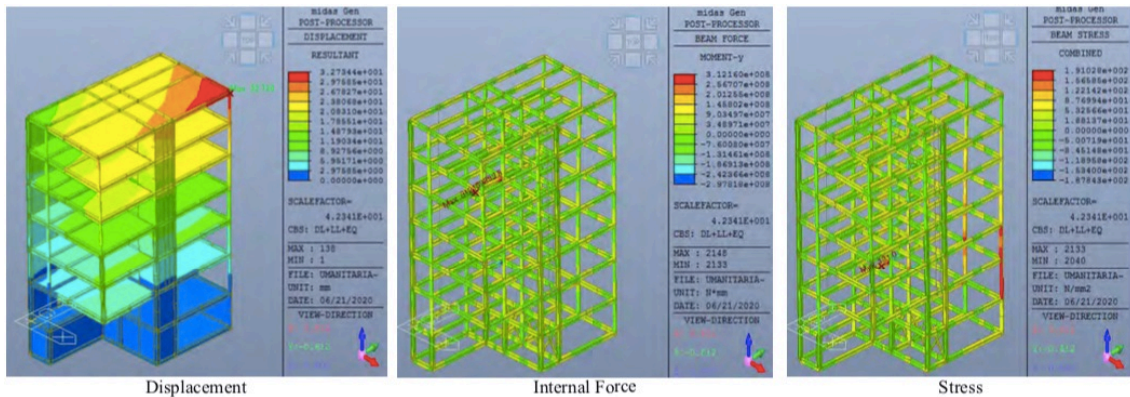
Column2 (GF to 3FL): D=356, t=12.7

Column3 (4FL and 5FL): D=318, t=10.3

Primary Beam: 400x350

Secondary Beam: 200x150

Cantlever Beam: 500x350



### Structure Analysis

- Boundary condition and Beam end release

Fix system was chosen for the boundary condition, basically.

- Dimension of each element

Inner Wall Thickness: 200 [mm] Exterior Wall Thickness: 400 [mm] Slab: 200 [mm]

- Horizontal forces

This building will be constructed in Milan, and earthquake should be considered. 1.0 coefficient is used. In addition to earthquake, the effect of wind can not be ignored. However, in this simulation, it was assumed that both earthquake and strong wind would not

- Calculation DL+LL+EQ

Allowable displacement value;  $7760/200 = 38.8$  [mm] Maximum displacement value;  $32.8$  [mm] <  $38.8$  [mm]

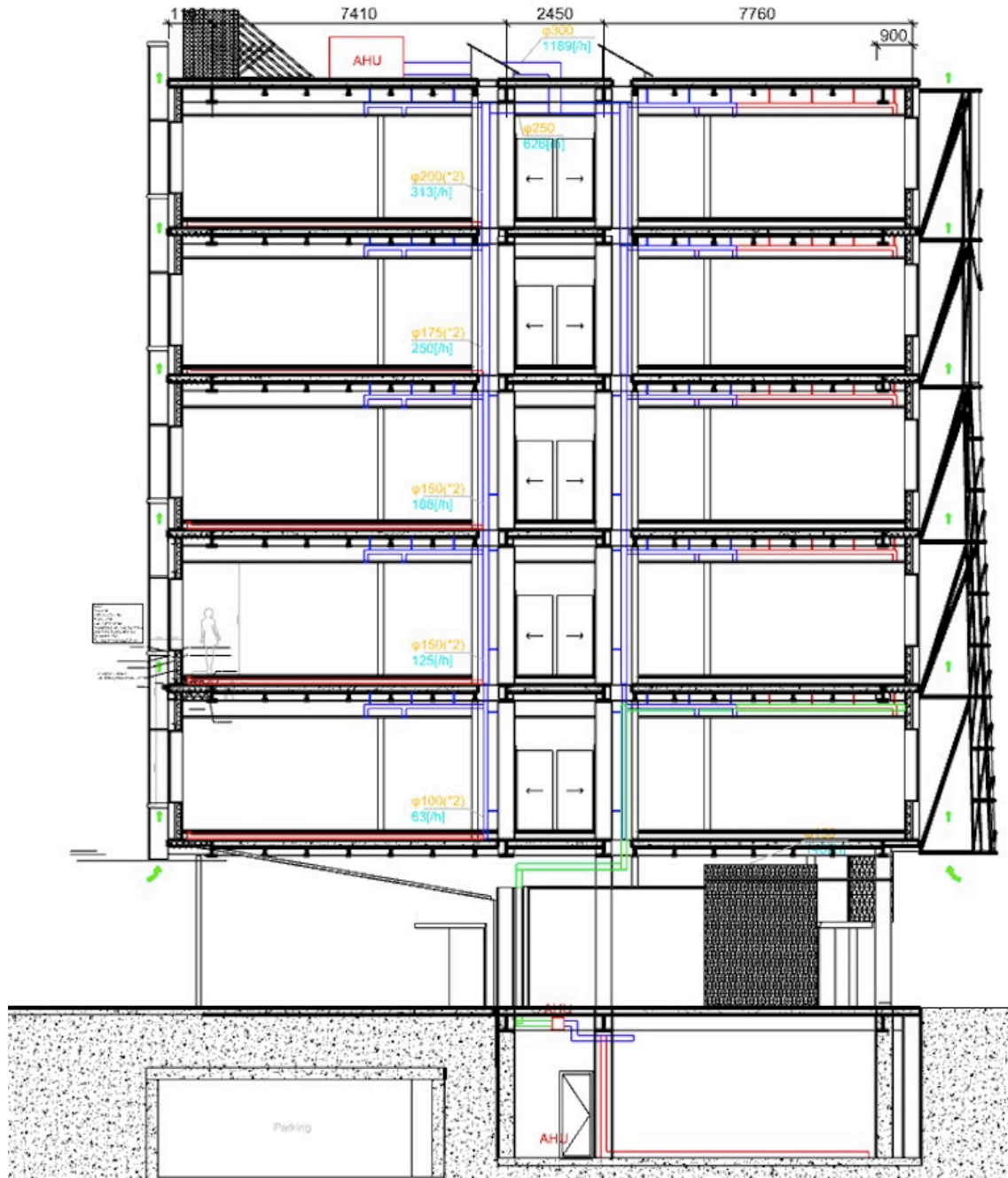
Maximum internal forces (M);  $312.2$  [kN\*m]

minimum internal forces (M);  $-297.8$  [kN\*m]

Allowable stress value; Maximum beam stress;  $191.0$  [N/mm<sup>2</sup>] <  $235$  [N/mm<sup>2</sup>]

minimum beam stress;  $-187.8$  [N/mm<sup>2</sup>]

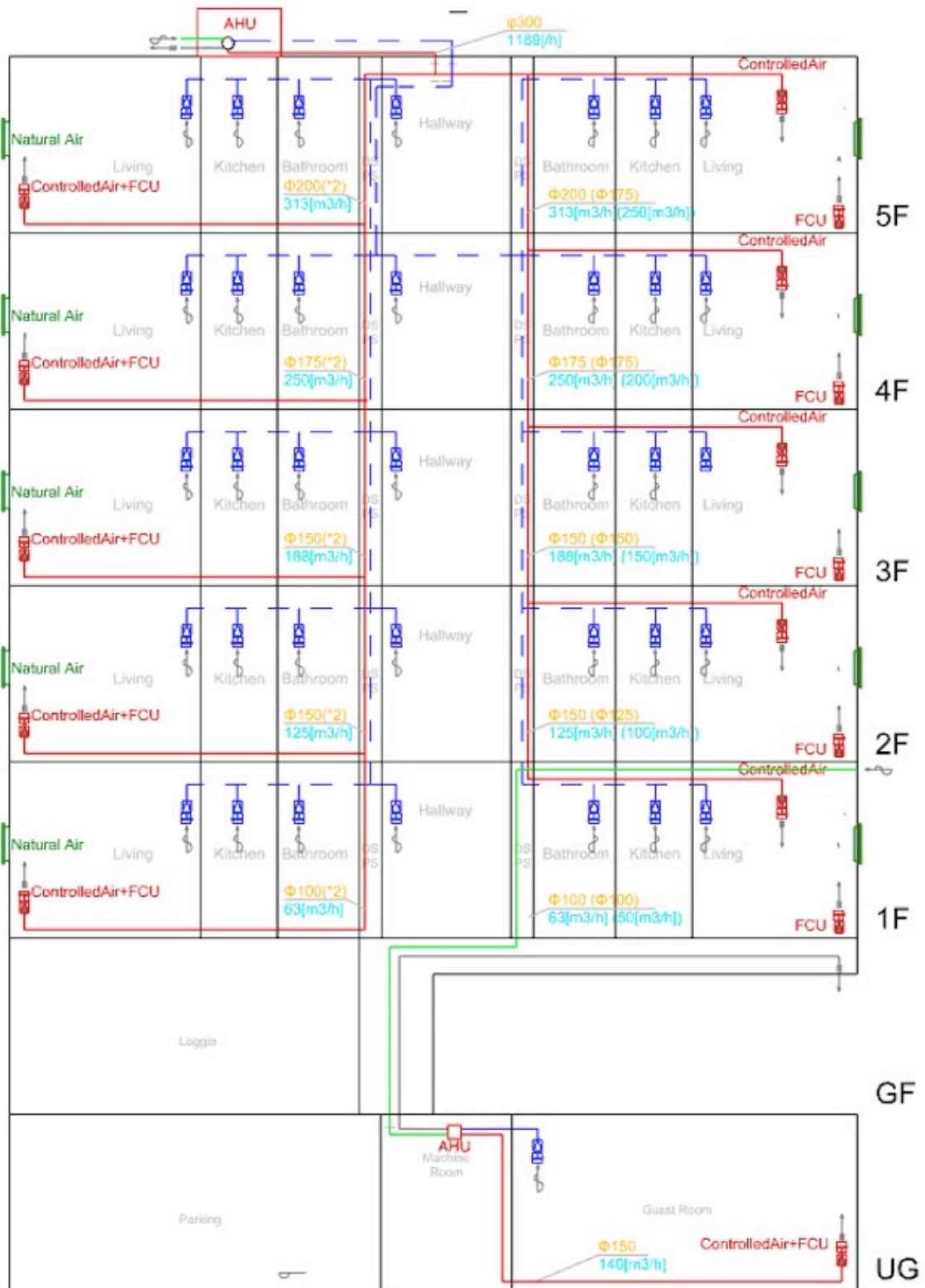
Service



AHU : AIR HANDLING UNIT    F : FAN UNIT    S : VAV UNIT

SA : SUPPLY AIR DUCT    RA : RETURN AIR DUCT    OA : OUTSIDE AIR DUCT    EA : EXHAUST AIR DUCT

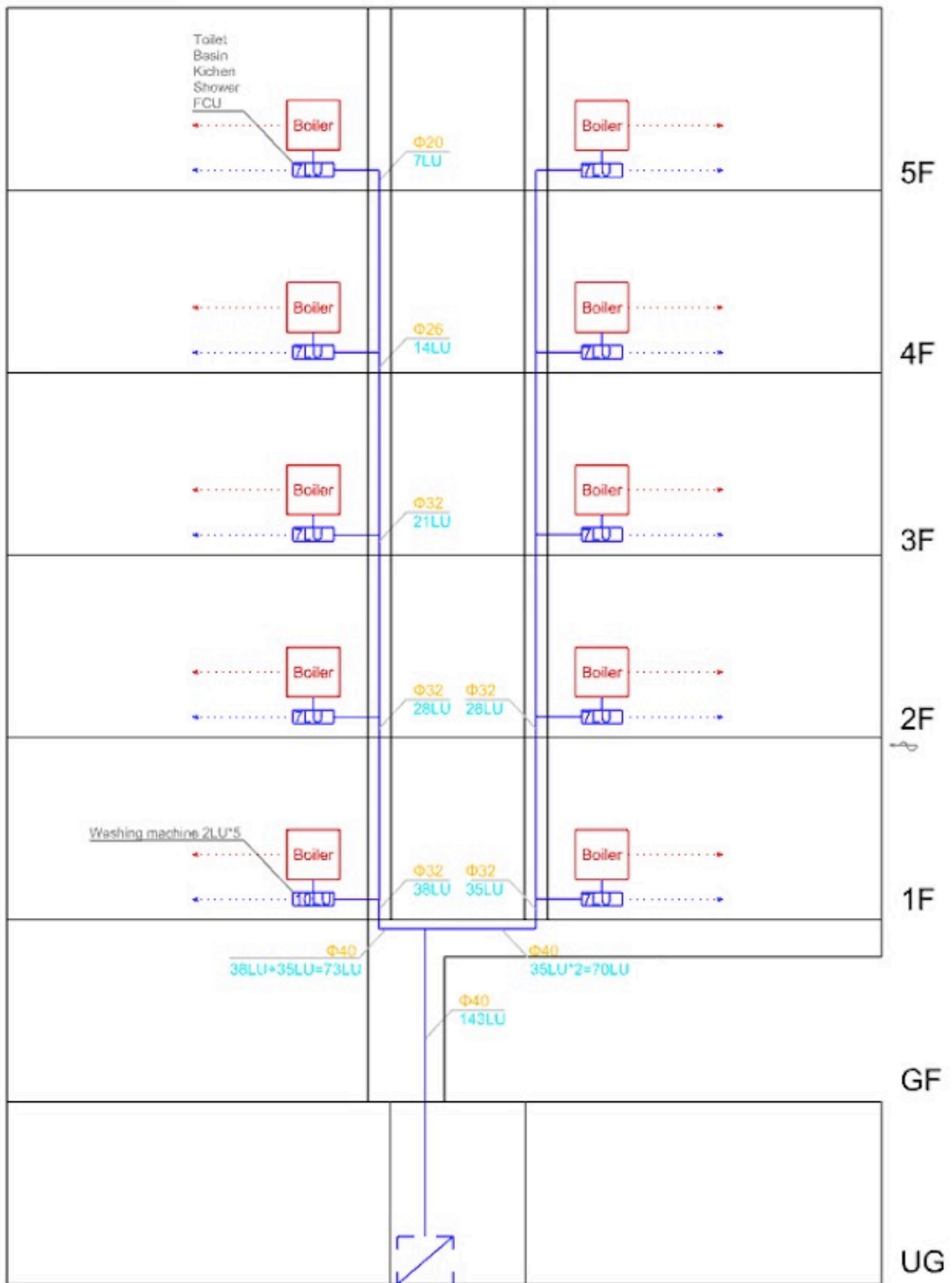
Protection Envelope in Section



Air Flow Distribution

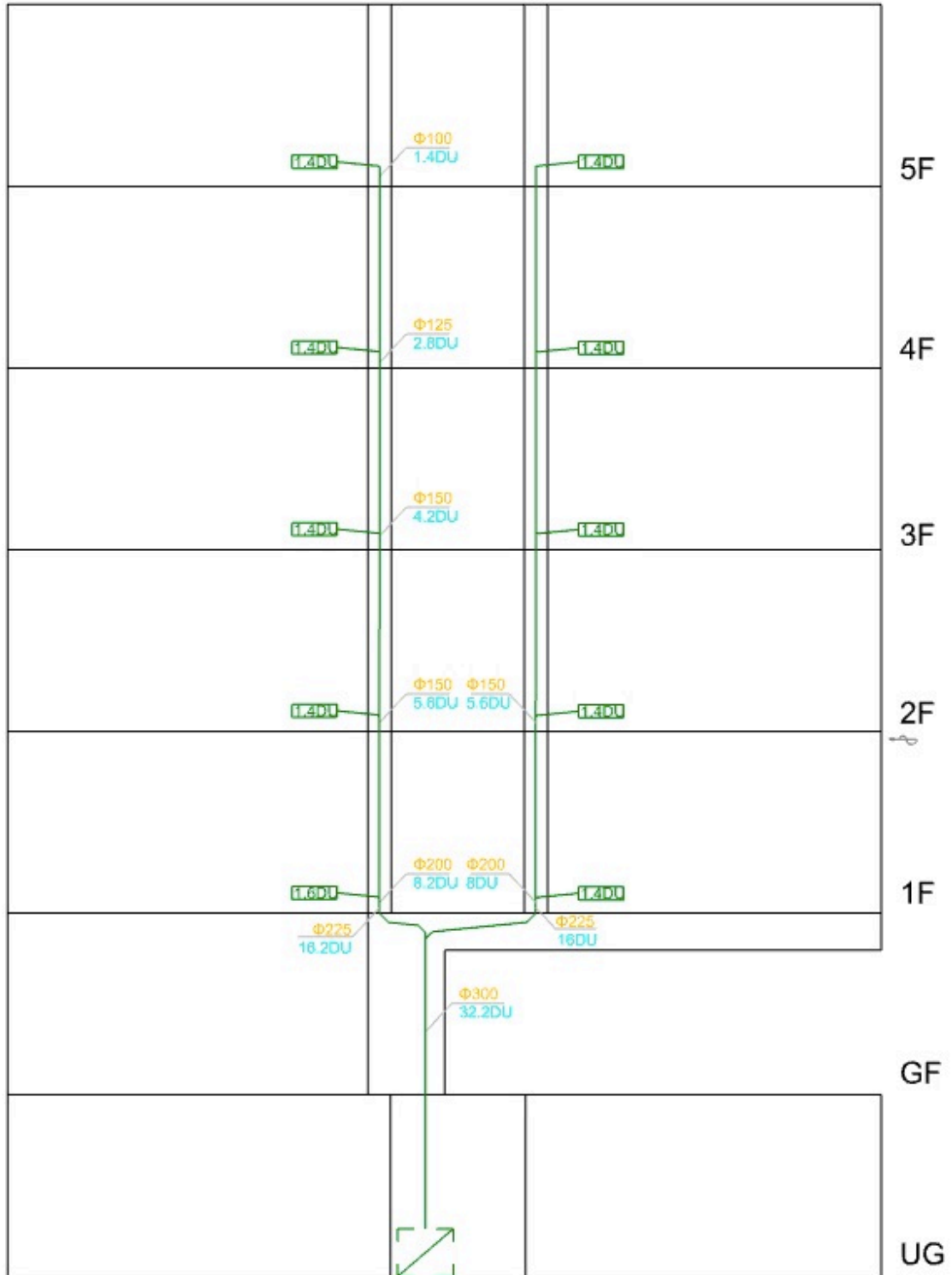


— : HOT WATER  
 — : COLD WATER

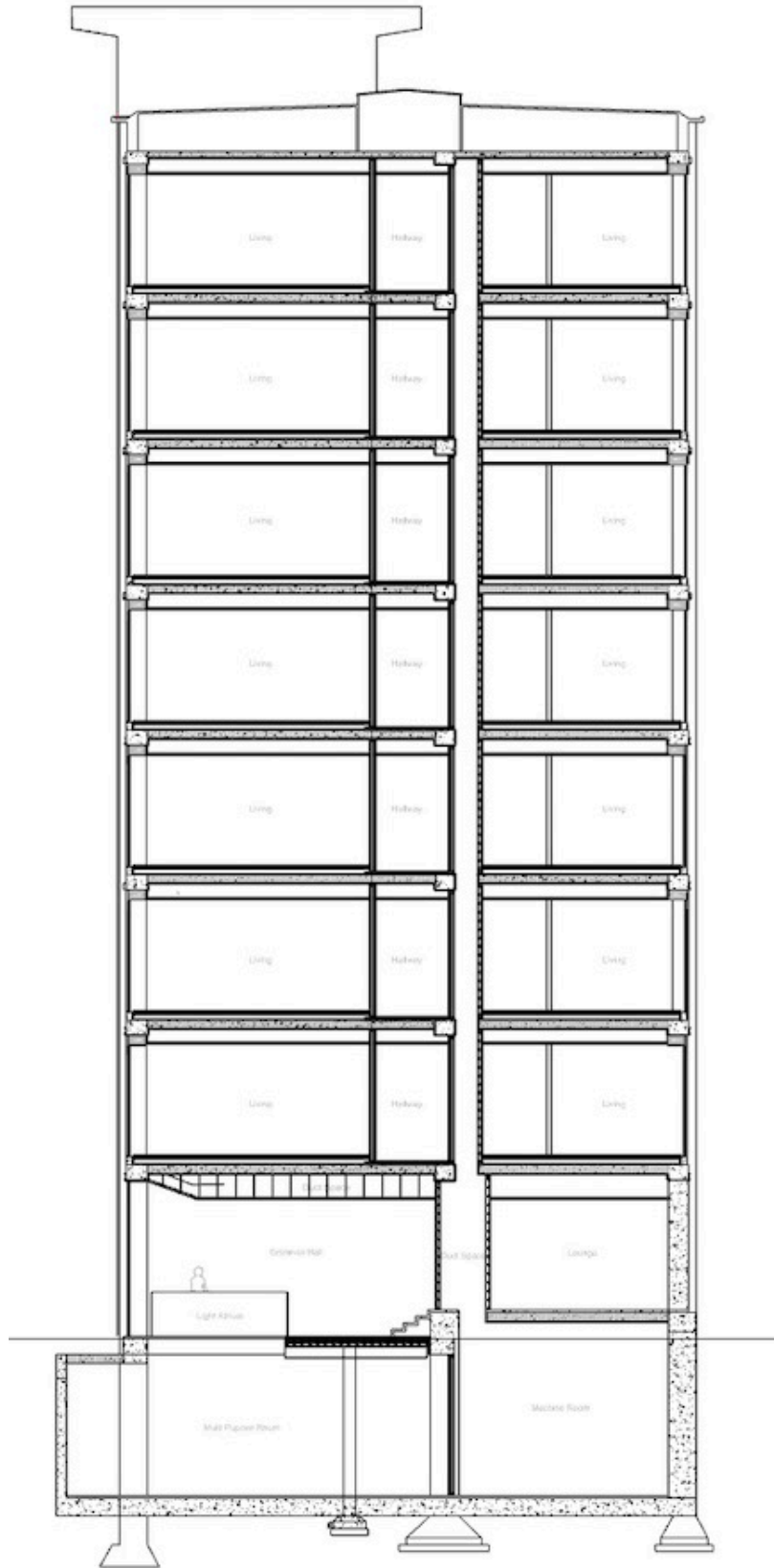


Cold and Hot Water Flow

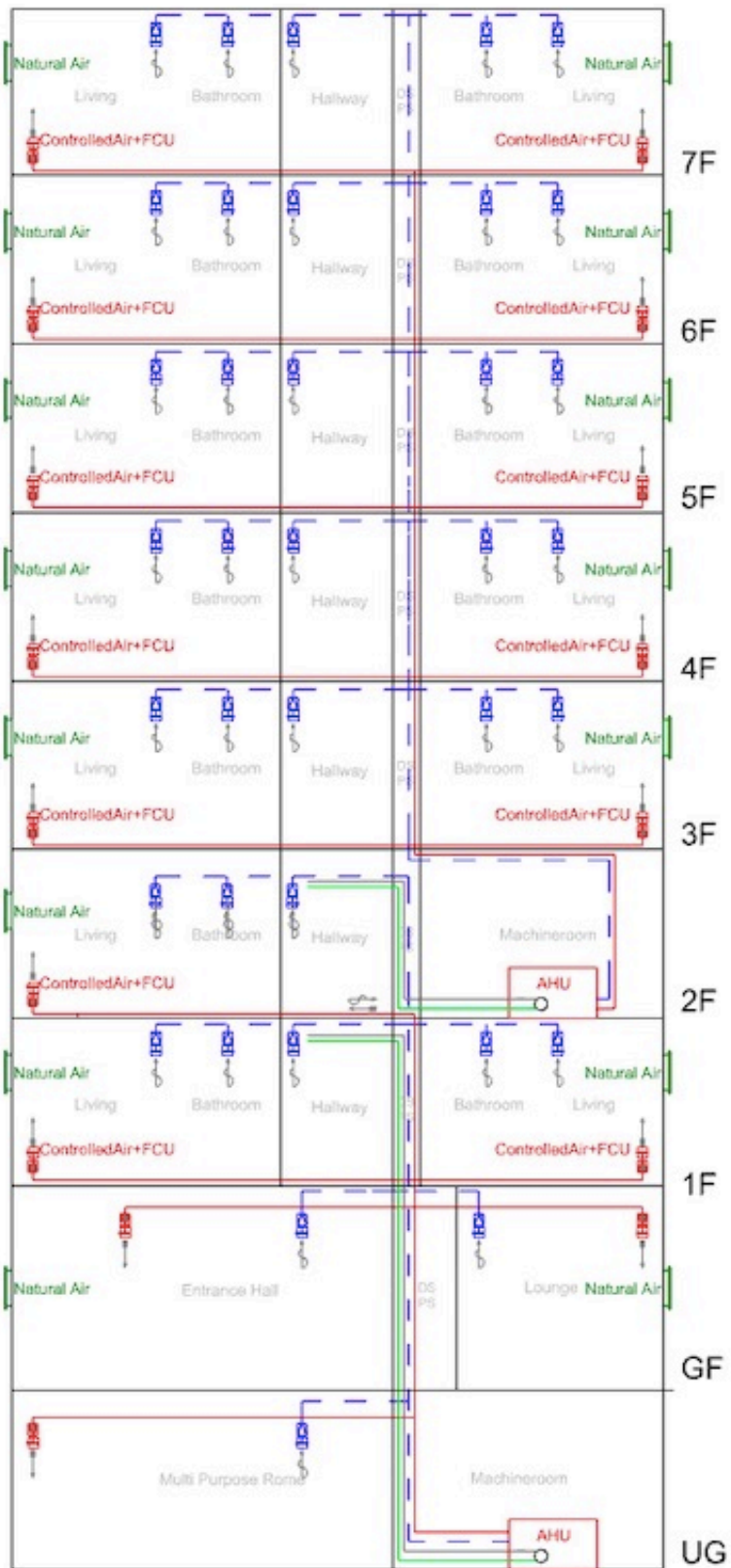
— : WASTE WATER



Waste Water Flow

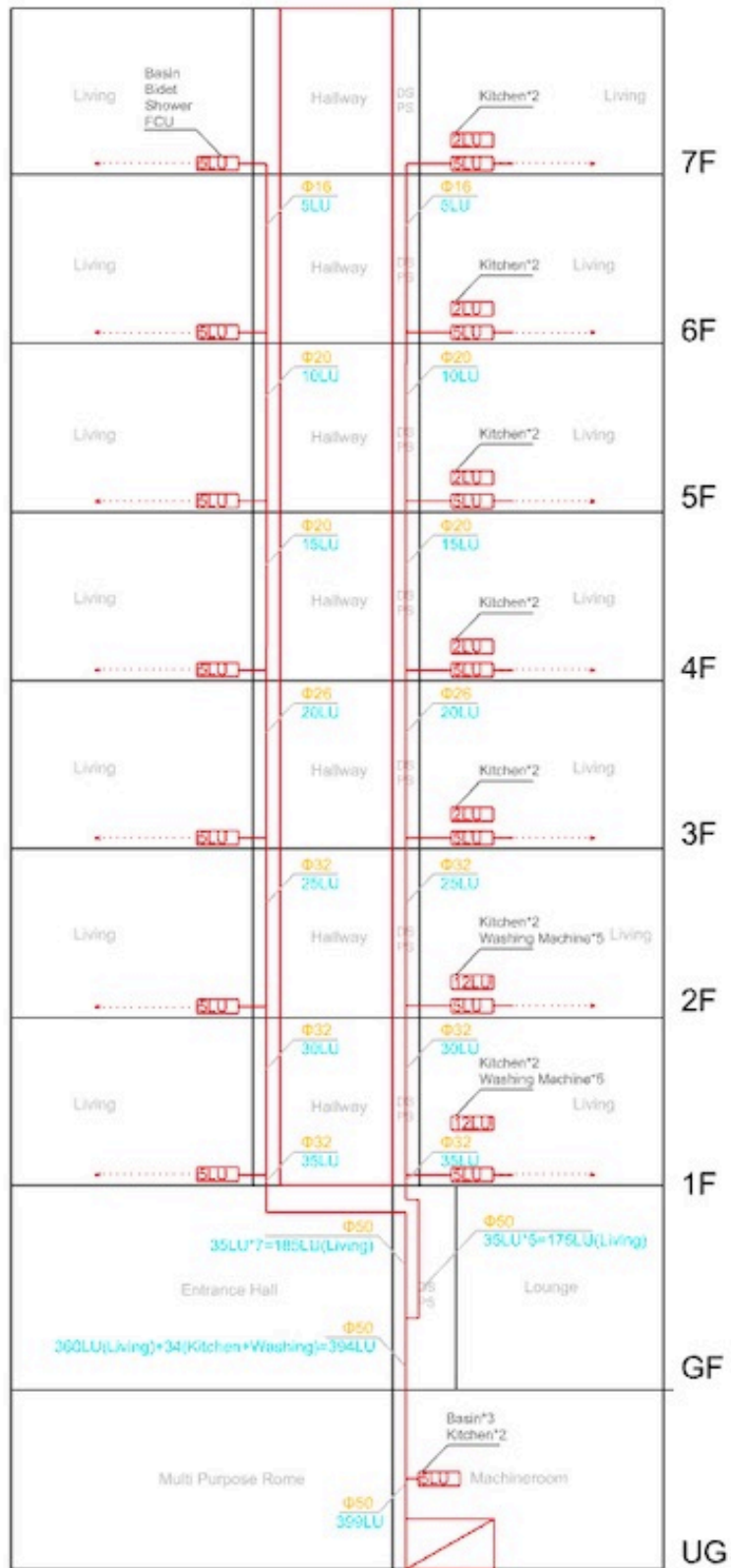


Section (Existing)

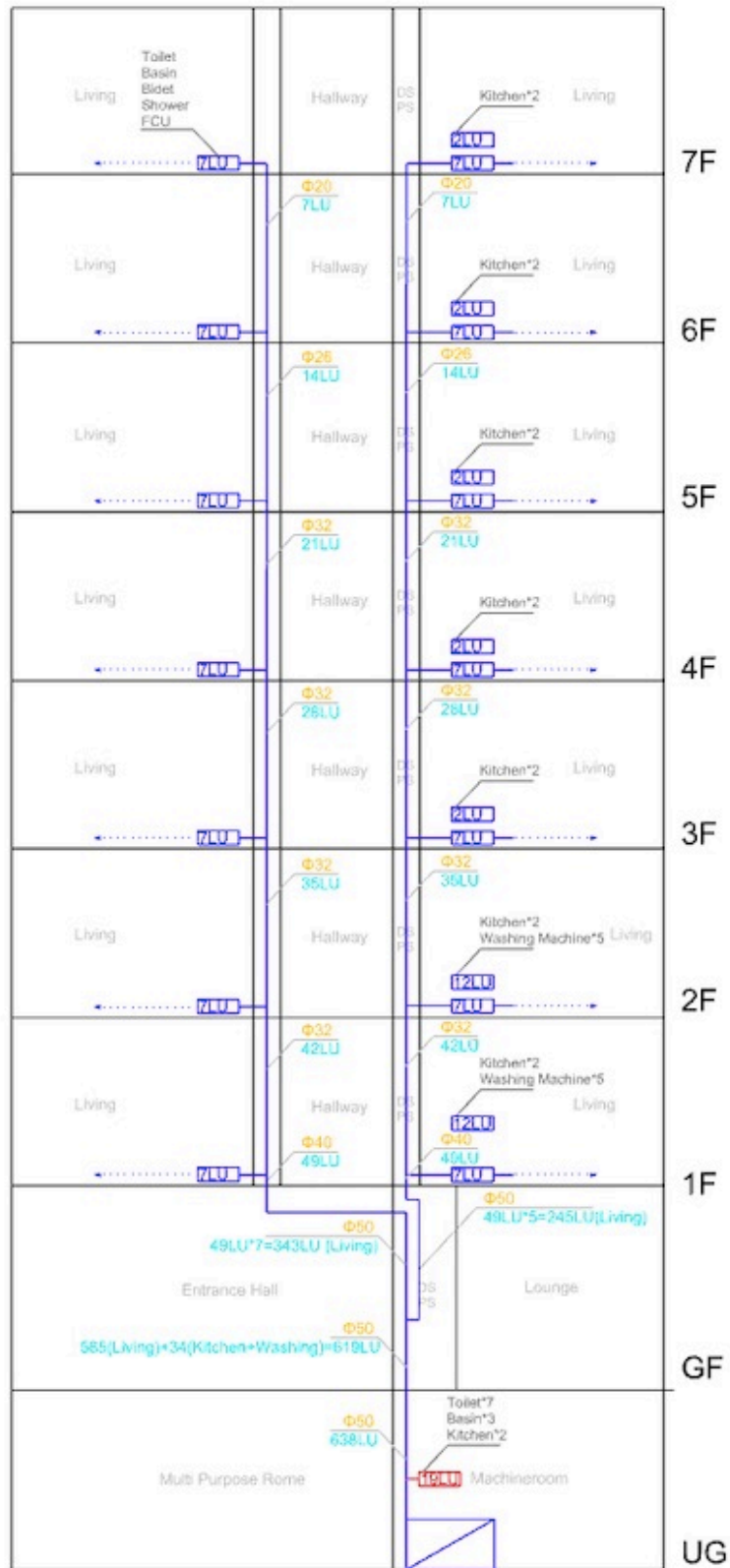


Air Flow Distribution





Hot Water Flow

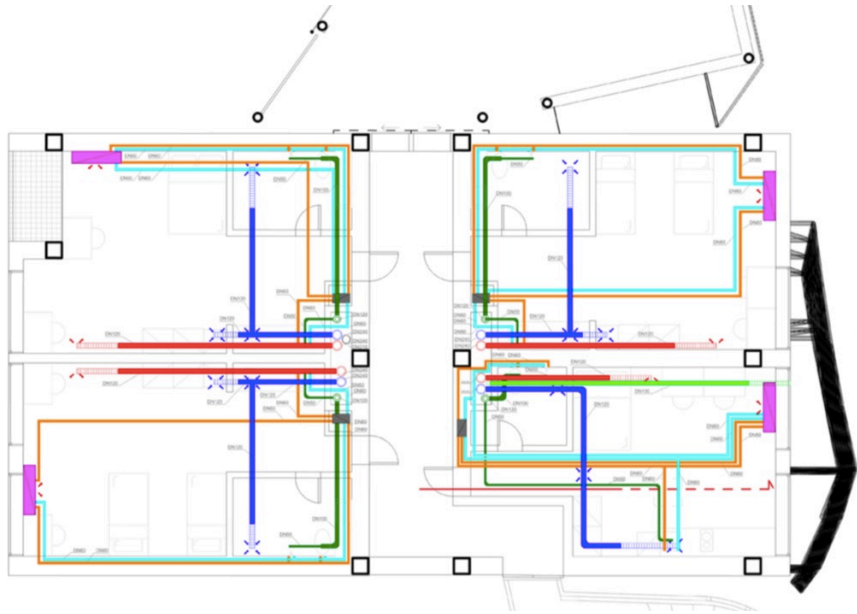


Cold Water Flow

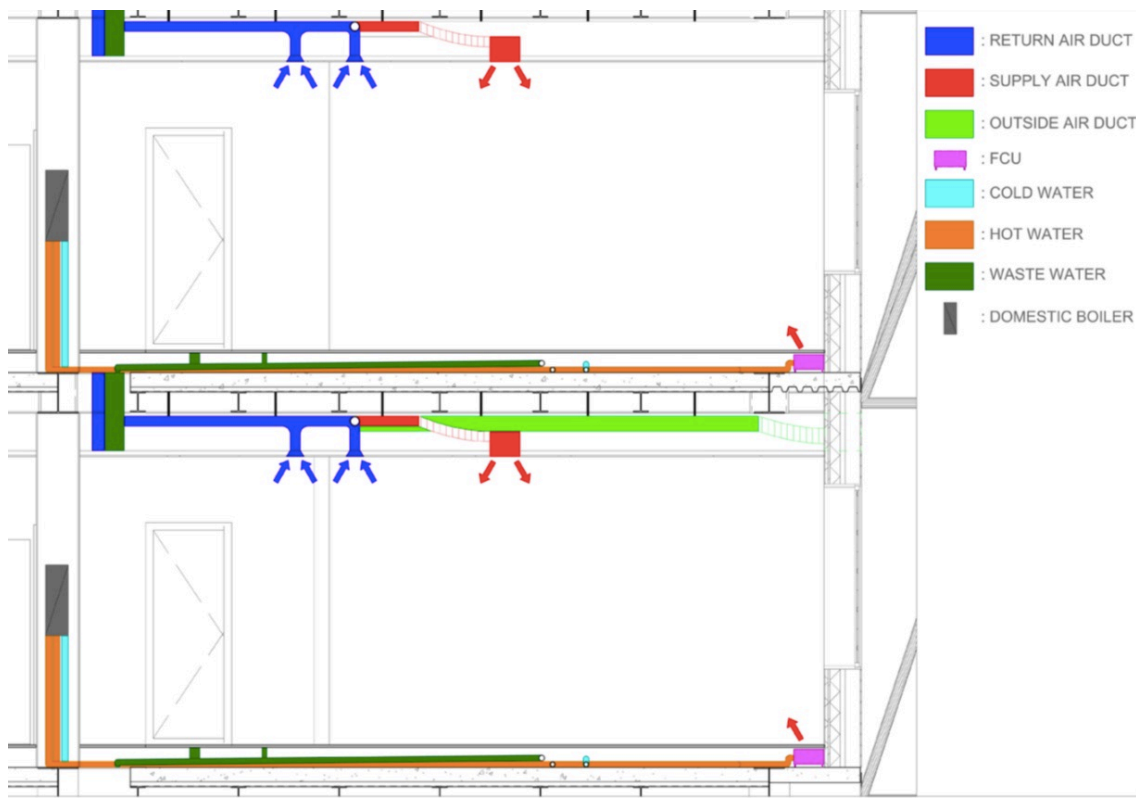
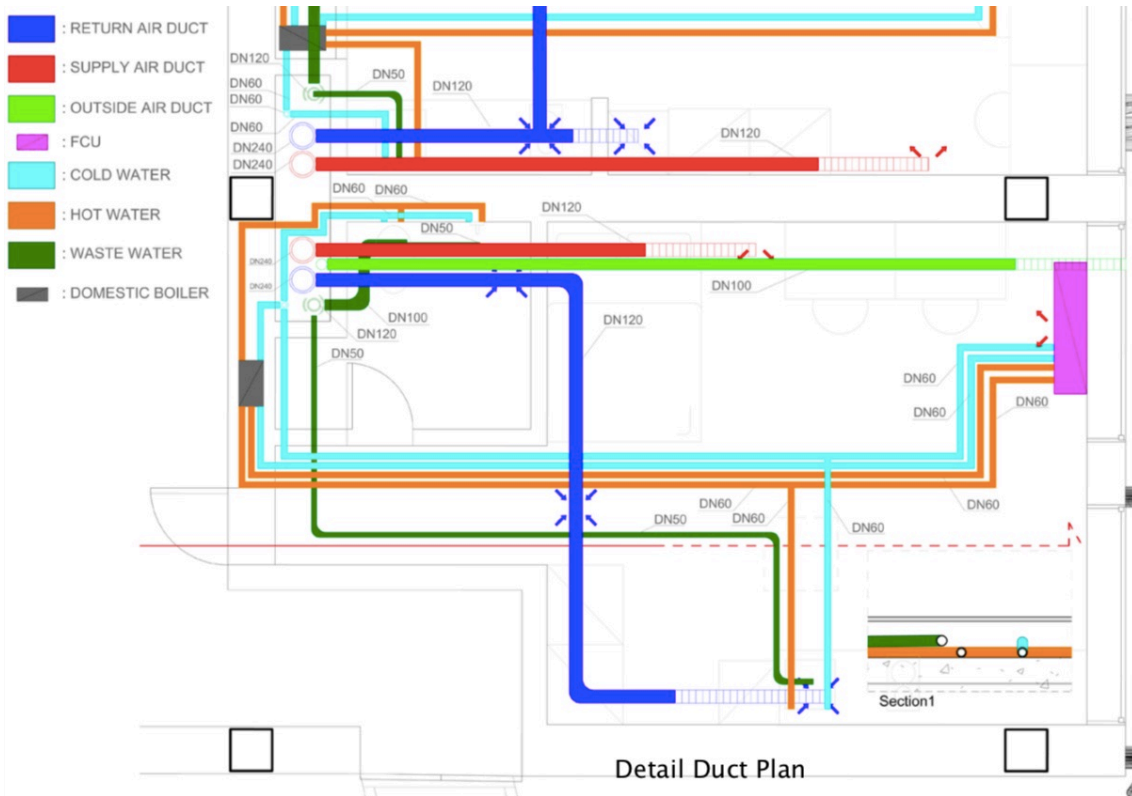


Waste Water Flow

- : RETURN AIR DUCT
- : SUPPLY AIR DUCT
- : OUTSIDE AIR DUCT
- : FCU
- : COLD WATER
- : HOT WATER
- : WASTE WATER
- : DOMESTIC BOILER

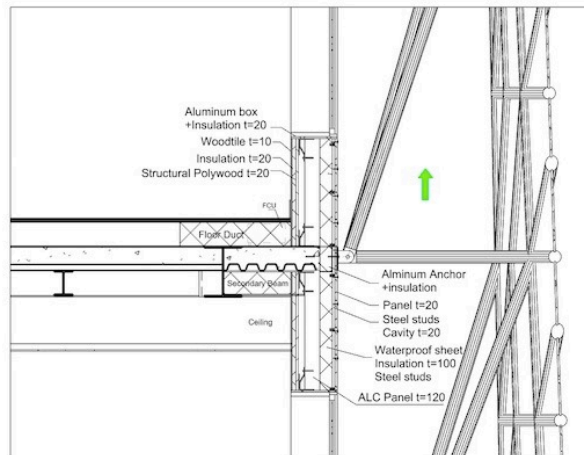
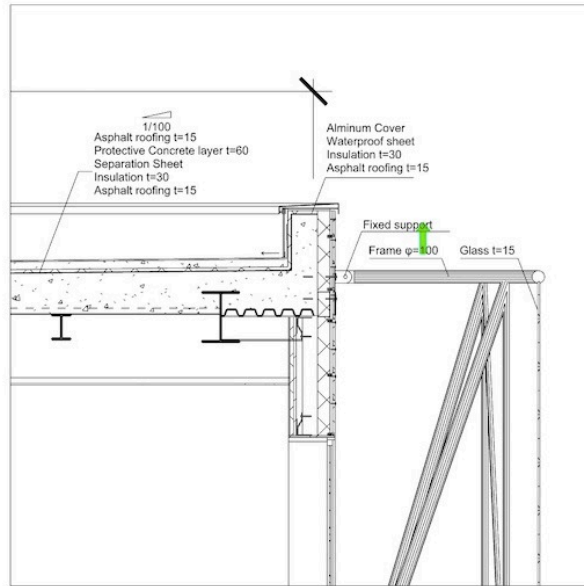
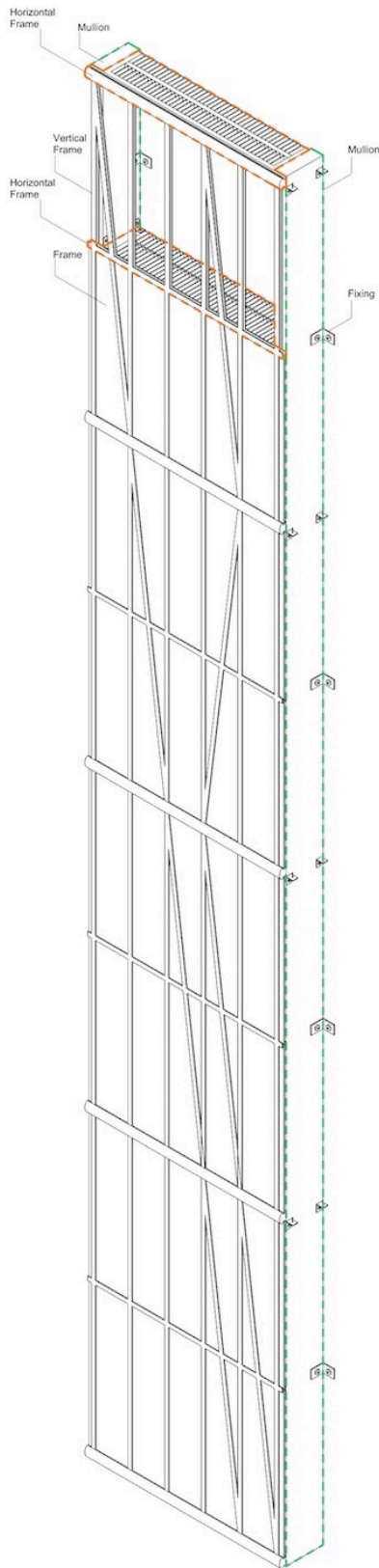


General Duct Plan

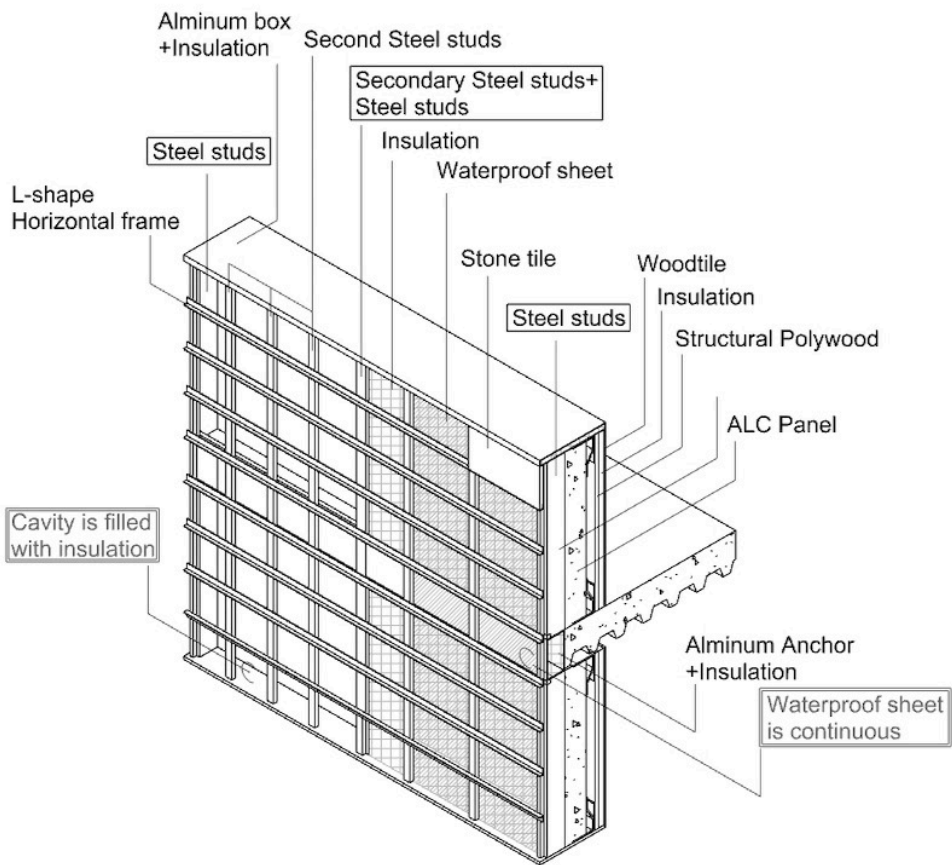
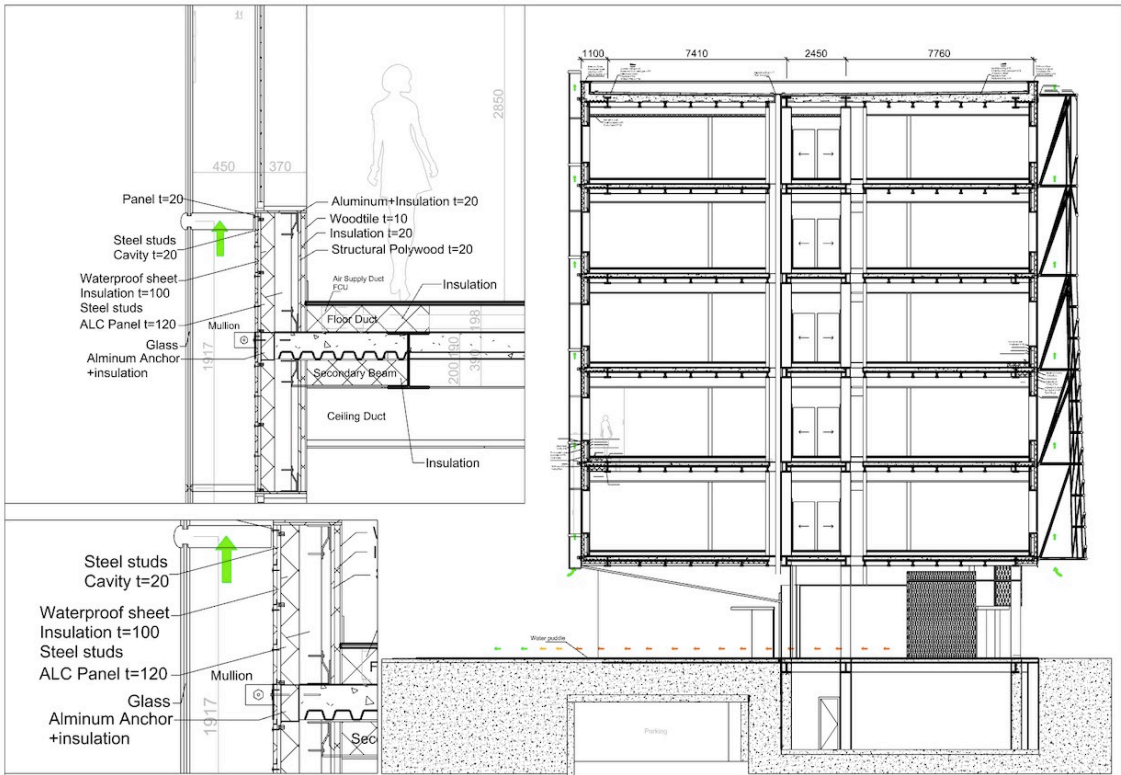




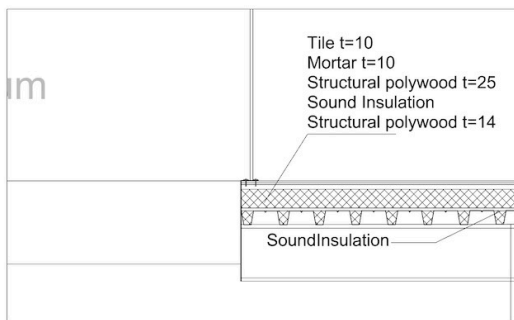
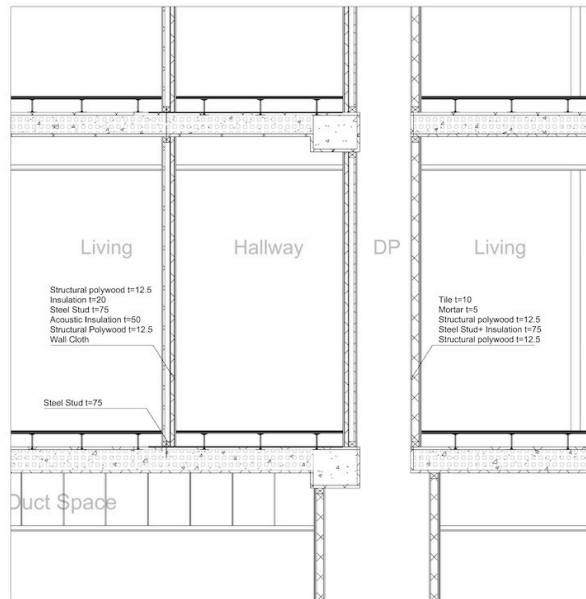
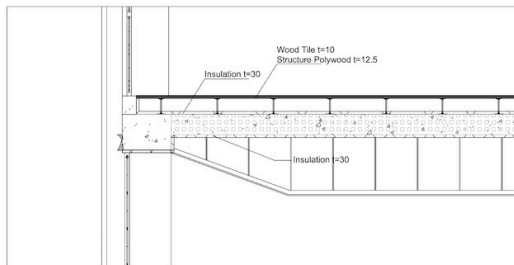
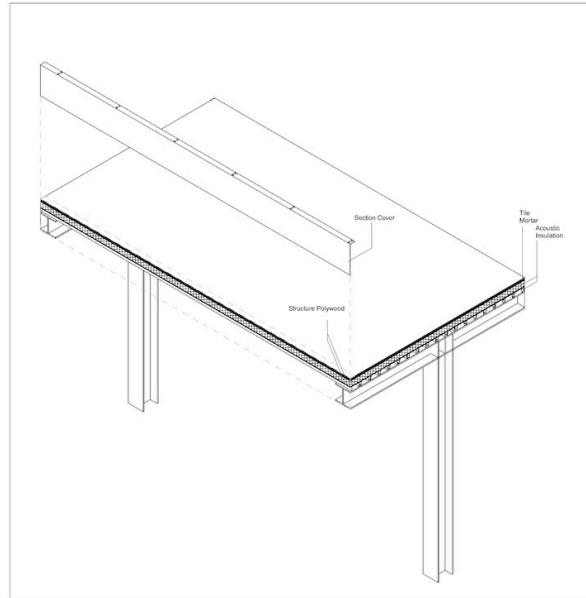
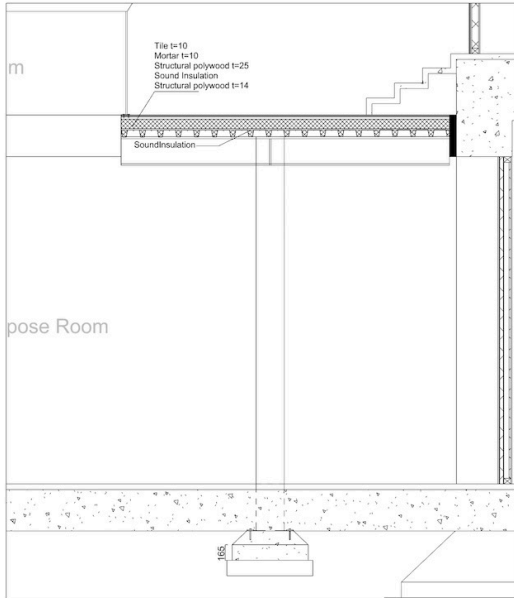
# Technology



Envelopes



Cladding



New Internal Wall and New Floor (Existing Building)

#### 4. Conclusion

This paper was about Restoration and Transformation Design for historical post-war modern buildings in SOCIETA' UMANITARIA, Milano. A lot of time was spent on geometry, material, structure and history survey, and after those careful research, this project started.

After understanding features and constrains as much as possible, it was realized that there are various type of given conditions that would affect this project; underground parking structure that cannot be surveyed, today's demand in 20<sup>th</sup> building, historical value and today's development, large open space in North and narrow road in south, enough distance in West not enough in East, student professors publics, which are all the things that has to be taken into account in this project. Various kinds of given conditions surround this project, and we need to deal with them as a one project.

My answer is: 1. deal with heterogeneous given conditions one by one by using various type of design principles; 2. do not mention with logical consistency among the design principles, because diverse and heterogeneous given conditions do not exist in a way that is consistent with each other; 3. Make the various design principles share existing design clusters. In my case, the clusters of Light Weight and Scale were chosen. Because these two principles seems shared by many architects even in this society.

The Restoration and Transformation design basically follows this strategy. Vanishing point set by loggia created a one-point perspective imaginary road. The historical and new elements share the same road that leads to the future. They may be of different ages and principles, but they share same future goal and coexist on a same road. All interventions were designed to be reversible, distinguishable and recognizable, and great care was taken not to change the micro-climate. The historical facade was kept as unchanged as possible, but the glass was partially changed for residents. Without any doubt, History is important, and at the same time, we live in the present day with today's demands. Coexistence of Time in Rewritten Architecture is often accompanied by heterogeneity and contradiction; nevertheless things share same space. Thus, the concept to chain them is a must, and at same time attitude to accept differences as they are is also essential for Coexistence of Time in Rewritten Architecture.

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