



Tivoli

Towards a Homogeneous Heterogeneity
Housing onto an existing garage building

Thesis project by
Johan Siim, MPARC, Chalmers, Spring 2014
Examinator - Sten Gromark
Supervisor - Jonas Lundberg, UFO



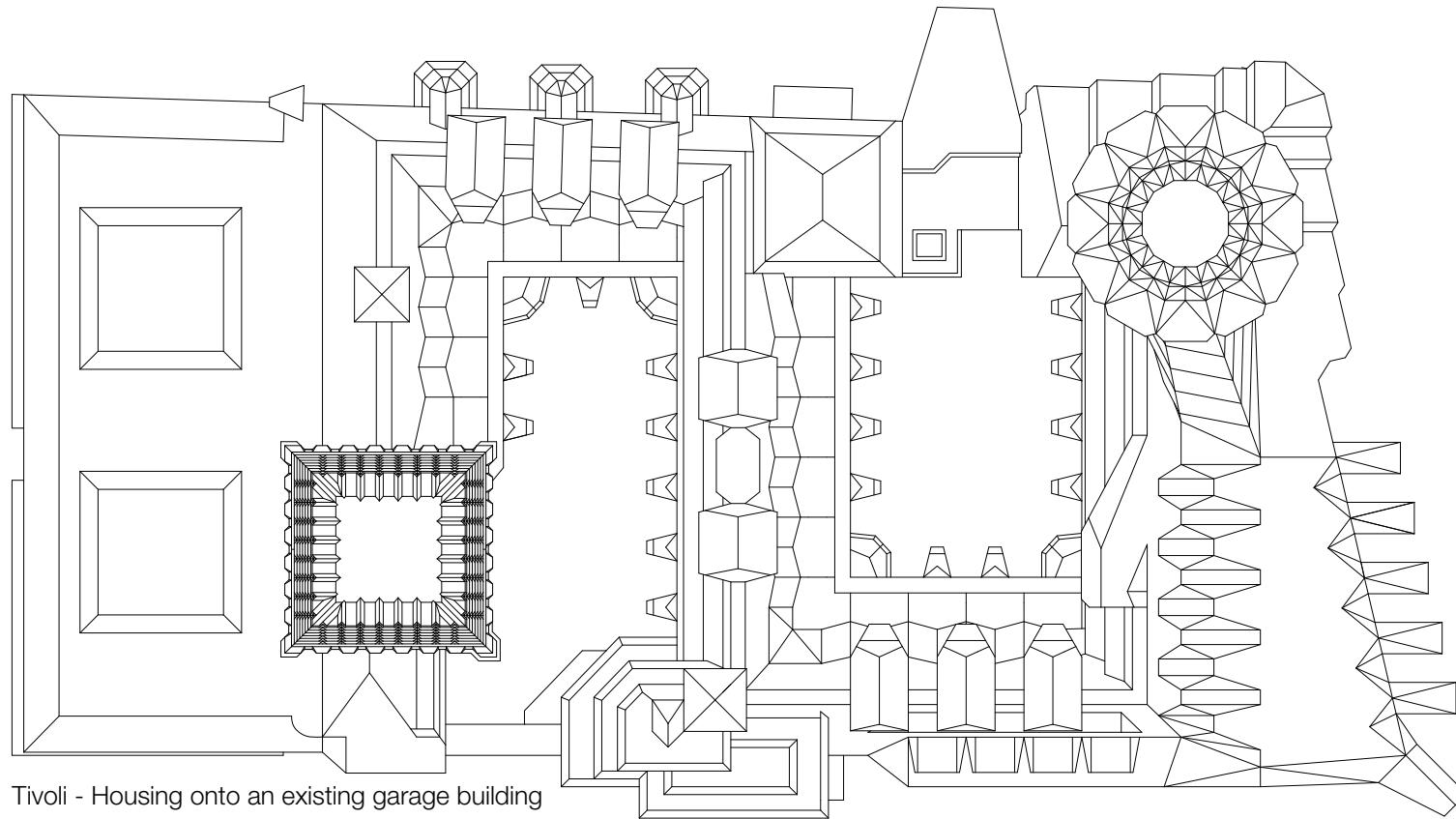
Nordstan P-hus is an existing garage building and the site for the thesis project.

Summary

Further densification within city centres become problematic because land is scarce where it is seldom possible to add new housing.

The thesis explores the possibility in how to apply housing onto an existing garage building, Nordstan P-hus in Gothenburg, Sweden.

The intervention breathes new life onto the existing garage building, enabling a residential neighbourhood to emerge right in the heart of the city.



Tivoli - Housing onto an existing garage building

Abstract

Thesis question:

How can an existing garage building further densify a city centre with housing?

Problem area and delimitations:

Further densification within city centres become problematic because land is scarce where it is seldom possible to add new housing. The envelope of existing garage buildings then offer the possibility in populating housing to further densify the city centre.

Nordstan P-hus in Gothenburg, Sweden becomes the test bed within this thesis in populating housing onto an existing garage building. The parking spaces of the garage building is mainly used by those who use the neighbouring shopping mall as well as for those who work close by. Still there is an underuse of the garage building when it comes to parking spaces. This in turn enables the opportunity in reconfiguring the buildings usage by adding housing onto it, while preserving the shopping mall on ground level and some of the parking levels above.

Aim and objectives:

The main departure of the thesis is to offer a mixed variety of housing types allowing students, single/couples and families to live coincided within the city centre. The structural logics of the garage building acts as an influential part in the way how housing is placed and arranged.

Methods and process:

The process of the thesis is divided into 2 phases: 1.Information and 2.design. The first phase focus on gathering information of the existing garage building and framing a conceptual approach. The second phase focus on proposing a design solution in how to apply housing onto the existing garage building.

Results and conclusion:

The design proposal offers a possibility in breathing new life onto the existing garage building, enabling a new residential neighbourhood to emerge right in the heart of the city.

Phase 1 - Analysis

+Site and context

The garage building lays within the heart of Gothenburg city centre facing the waterfront. It sits at the end of a large indoor shopping mall, Nordstan. On its eastern side lies the Central station with its busses and trains. Towards the waterfront lies the opera house as well as a large office block. Above a highway tunnel close by rests a green recreational area under development. Within a near future the city will start to connect with the waterfront area, which previously has been mainly used for industrial purposes. And Nordstan P-hus will have a more frontal image to play, rather than now being the backside of the largest indoor shopping mall within the Northern region.

+Existing garage building - Program

The building mainly houses parking spaces except for the ground floor which mostly contains commercial space connected to the shopping mall. There are 8 parking levels and throughout the year the minimum usage of parking space is 50% which at times reaches 70%. During Christmas maximum usage of parking space is reached.

+Existing garage building - Structure

The garage building consists of a grid of T-shaped pillars that hold up the floor slabs. The floor slab is made of pre-fabricated tt-cassettes. The building is built like a house of cards, where the slabs are placed on the vertical pillar bearings. Within the existing structure, no indoor climate is present, except for the elevator cores, meaning air flows free in and out creating an outdoor zone within the entire garage.

+Concept

The design proposal for populating housing onto the garage building takes its departure from the existing structural layout, the surrounding building heights as well as massing principles for the specific housing types applied.

+Concept - Analogies

The massing of the residential neighbourhood is a fusion between Townhouses, a courtyard block and 2 towers. This is to break up the massing of the housing so to perceive the residential neighbourhood as being a cluster of heterogeneous buildings. The heterogeneity enables variation of housing types to occur as being perceptible, enabling a visual identity of where one lives. Yet there is homogeneity that draws all the separated building volumes together in order to be perceived as a single residential neighbourhood.

The variety of housing types is like the attractions within a Tivoli. Each attraction contain a specific type of thrill and the same should occur with each housing type in terms of identity. Differentiation implicates a housing type's floor plan layout in order to create varieties of spatial arrangements of apartment units and how they all come together as a volume creating a unique diversity of buildings within the residential neighbourhood.

+Concept - Massing

The massing of the design proposal starts by removing redundant floor slabs within the garage levels in order to preserve the height relationship to neighbouring buildings. Then the housing is added and arranged according to the existing structural system of the pillar grid and cylindrical spiral ramp.

Phase 2 - Design

+Urban

The new residential neighbourhood is perceived as a plateau with towers on top. The plateau respects the surrounding building heights, while the towers relate to surrounding tower heights that are scattered around the city. The massing plays with the dialectics of presenting itself as being a mega block (the presence of the existing building) yet it's broken up into a cluster of buildings (the new residential neighbourhood).

+Building

The building constitutes of a vertical layering of program where the residential area sits on top of the base. On ground level it mainly hosts the existing shopping mall with its commercial spaces, plus entrance points for the housing inhabitants as well as for the parking. 4 levels of parking space sits above ground level. Above the parking levels rests the residential neighbourhood consisting of a variety of housing types (townhouses, an apartment block and two towers) arranged according to the underlying structural system.

The townhouses and the apartment block within the plateau are arranged according to the pillar grid while the high rise towers are placed within the cylindrical spiral ramp. The main housing volume within the plateau is an S-shaped apartment block framing the base of the building with 2 courtyard gardens, where one is opened towards residing street alley on the southern side and the second courtyard garden opens up towards the waterfront area. An internal street (communal hall) that lays within the S-shaped block connects both ends of the residential neighbourhood and containing communal areas such as laundry room/storage, offices/ateliers gym/running track etc. the program of the communal hall are arranged according to need of direct sunlight. So the winter garden is placed next to the façade on the southern of the communal hall, while laundry rooms and storage may be placed in darker areas.

+Housing

A large variety of housing types are offered to the inhabitants. The inhabitants may live either more small scale in townhouses with their own sky streets, or within the courtyard gardens, or in a row house with large terraces, or cantilevered out above the streets to review the street life below, or live high up in the towers with views towards the city and beyond.

+Housing - Block

A variety of housing types come together to form the apartment block. The block consists of courtyard apartments that reside within the courtyard gardens. The apartments that lay on top are the pitched roof row houses with large terraces. There are also two low rise towers with apartments within them.

+Housing - Townhouse

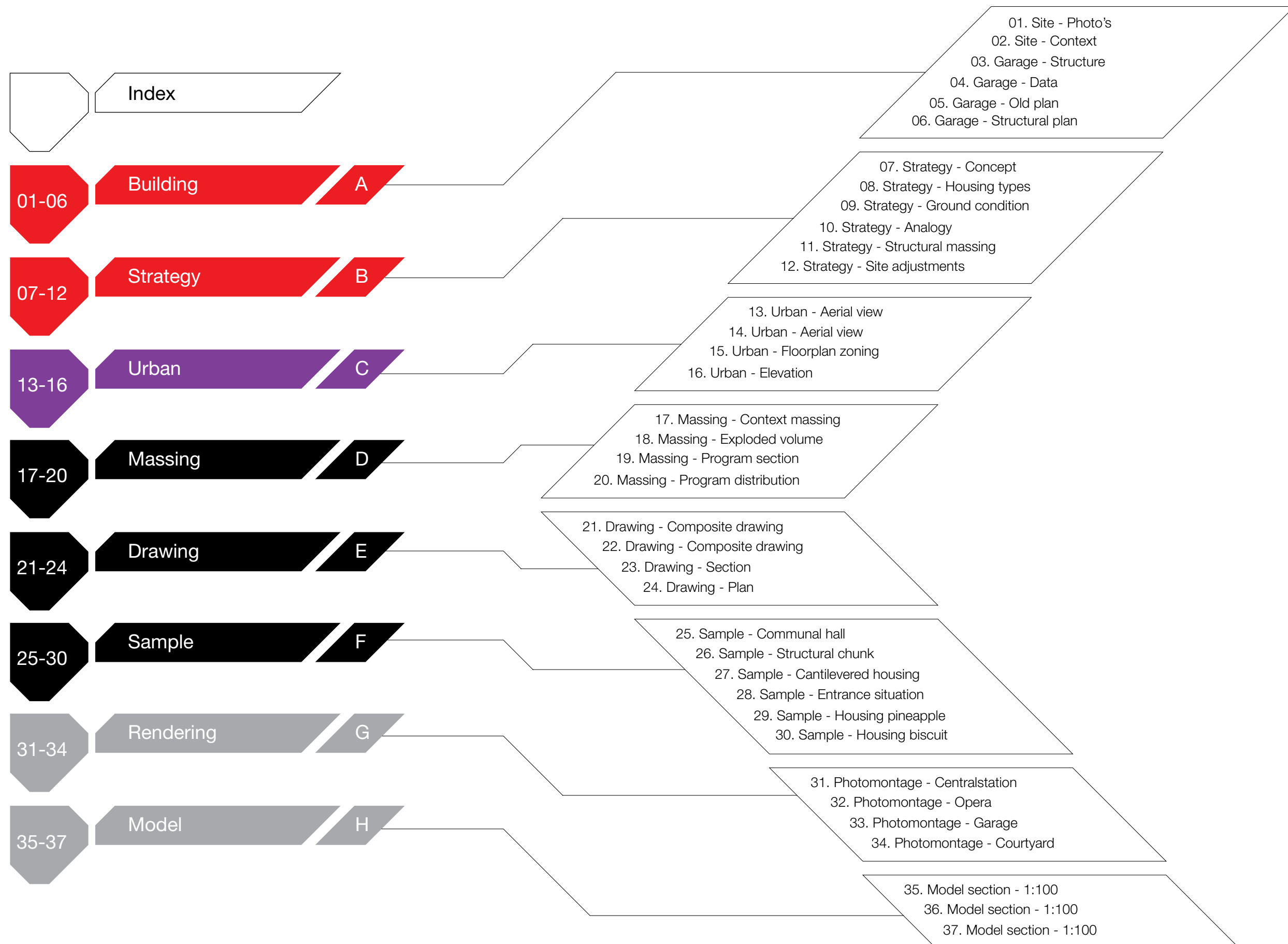
Above the apartment block lies the townhouses which are accessed via streets in the sky. The town houses give the impression of living in an actual house with private outdoor entrances and backyard gardens.

+Housing - Cantilever

Cantilevered apartment units extend out above the streets where it's mainly hold up through the residing structural pillars. They mainly consist of studios for students.

+Housing - Towers

The two high rise towers differentiate themselves from one another through either being circular, called the Pineapple or quadrant, called the Biscuit. The variegated floor plan layouts results in the unique shape of each tower given them an iconic identity within the city.





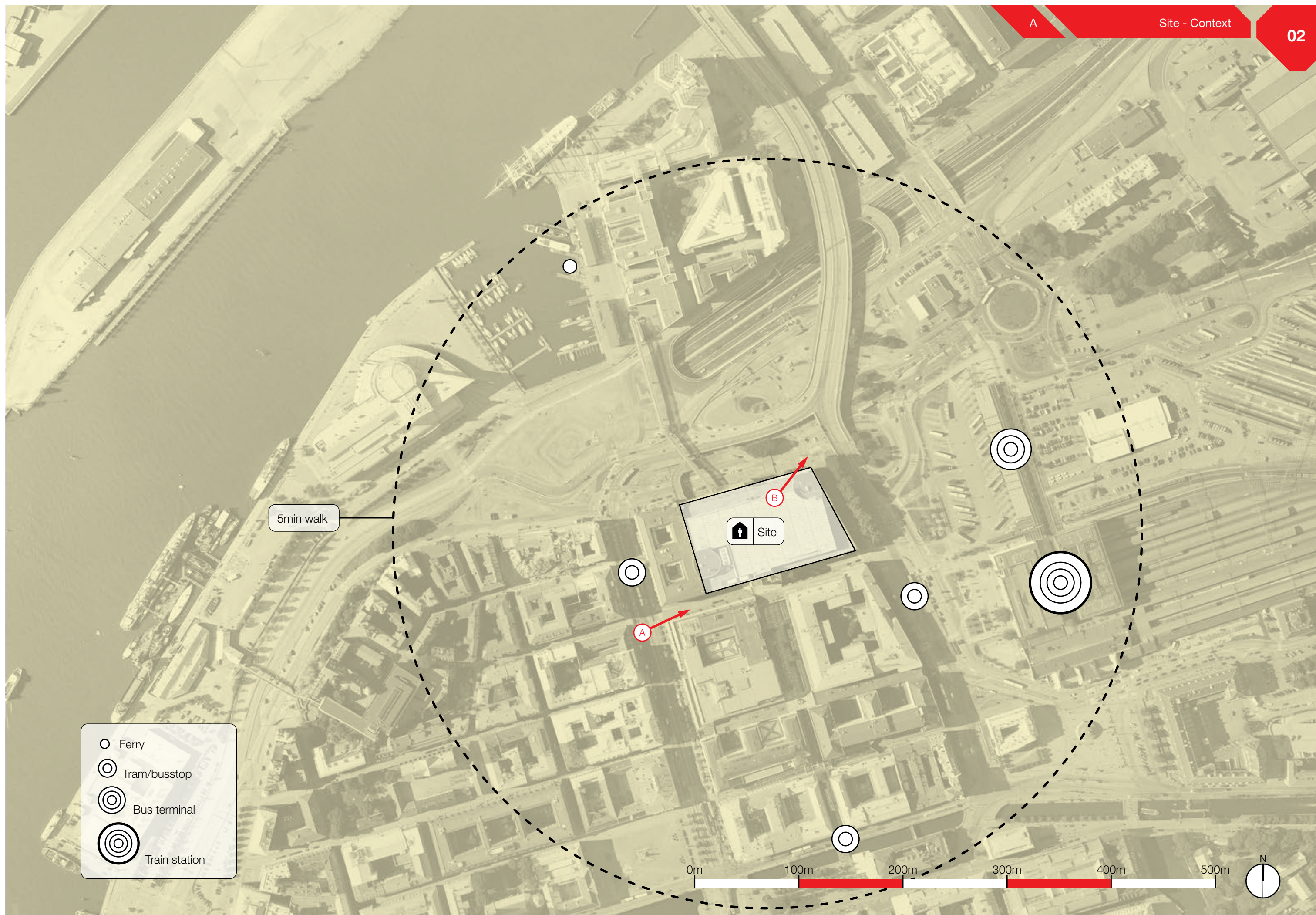
View A



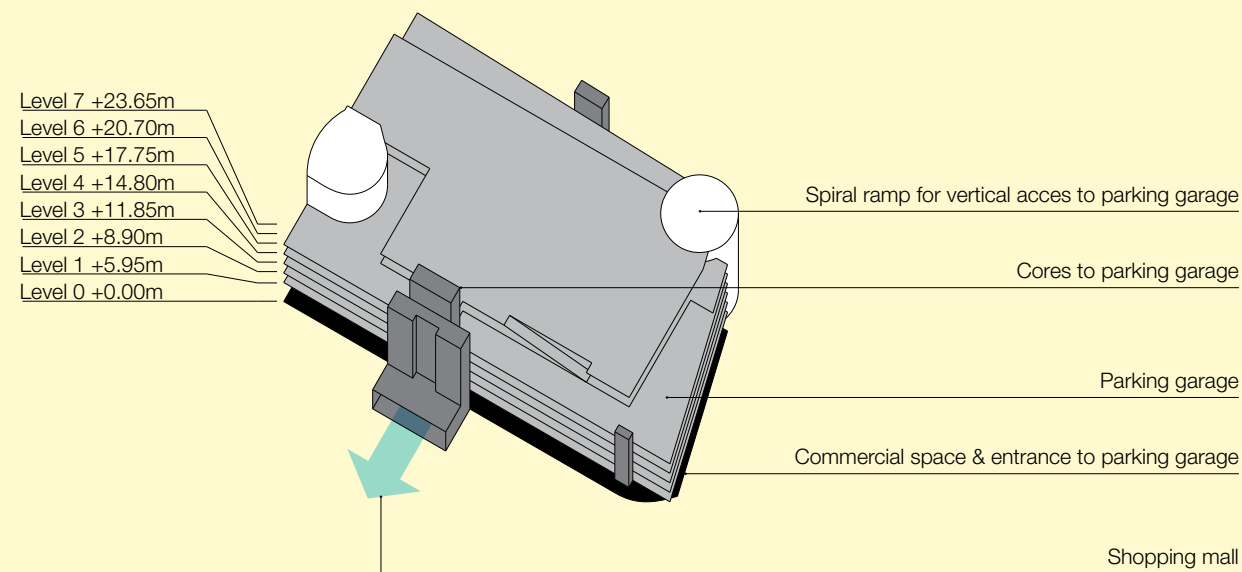
View B



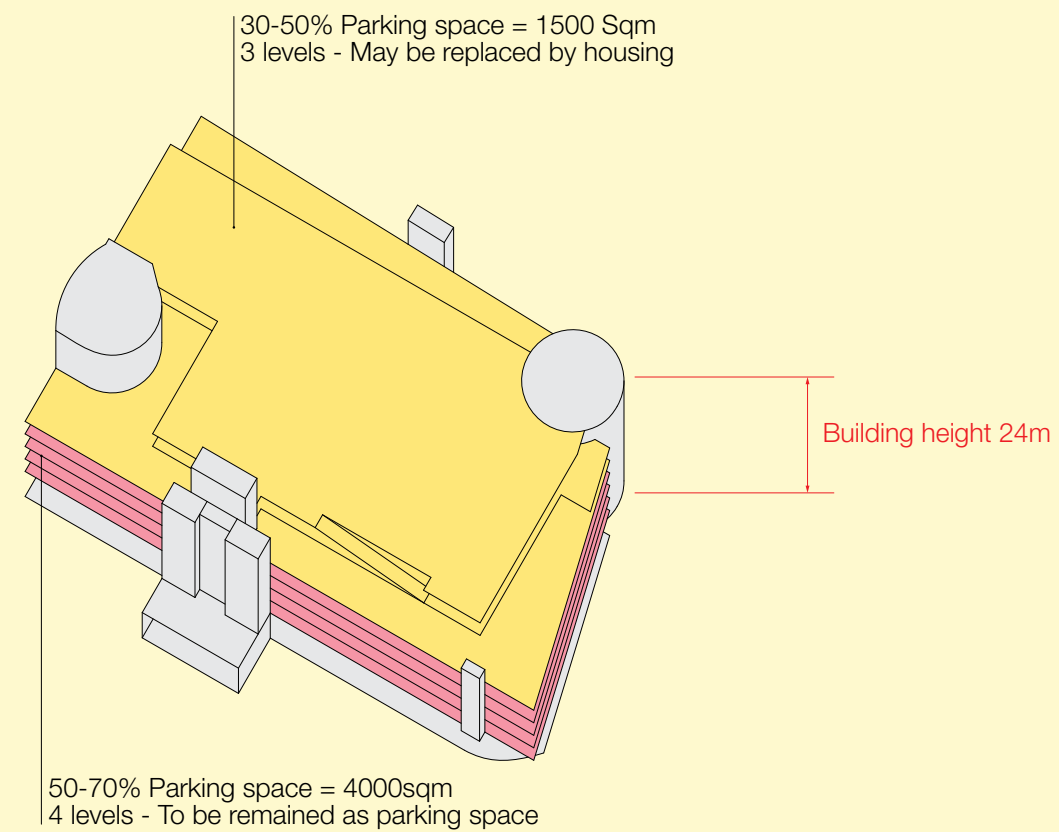
View within parking garage



Garage building components



Usage of parking space



Jan-Nov

50-70% parking usage

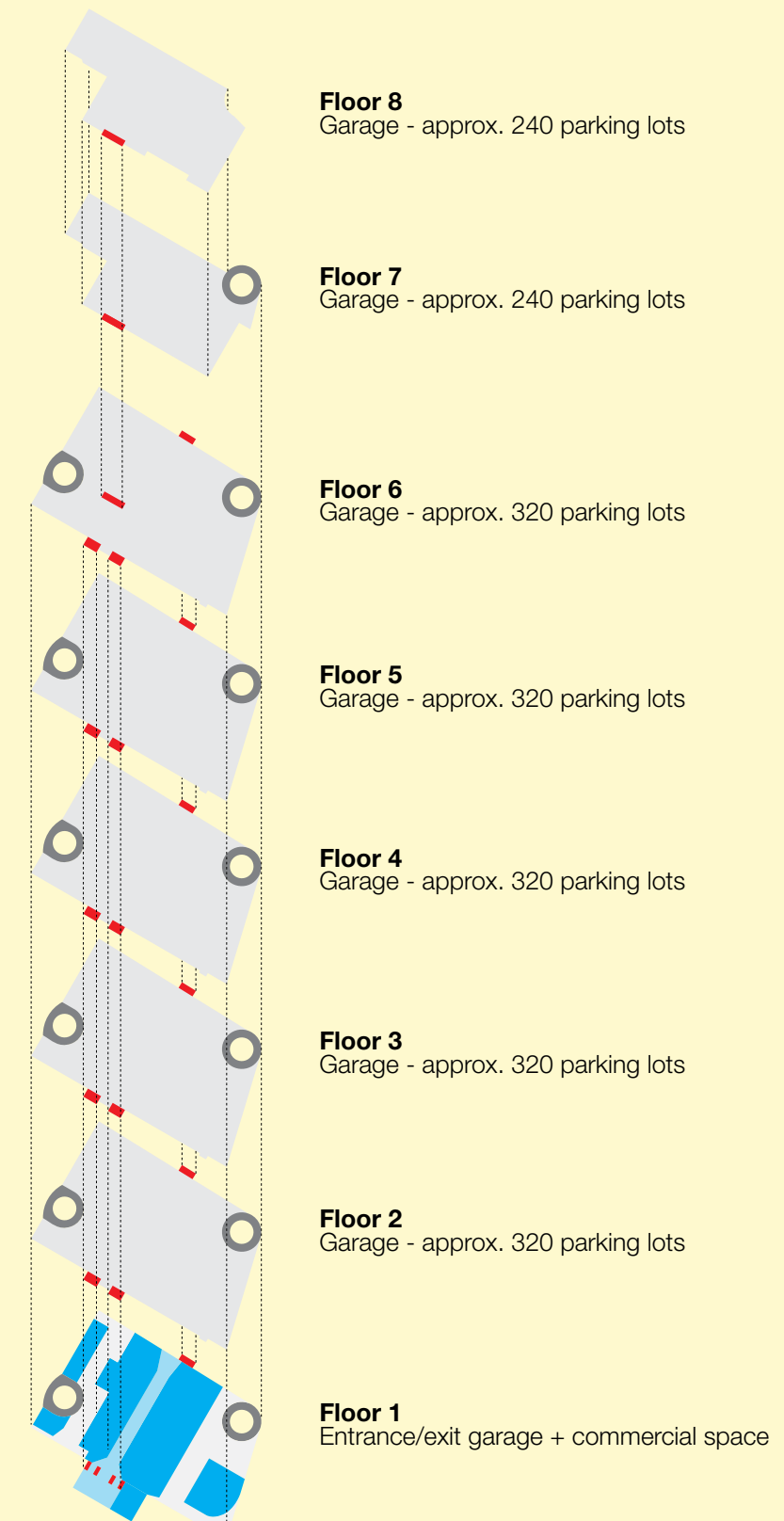
Dec

100% parking usage

Data of existing building

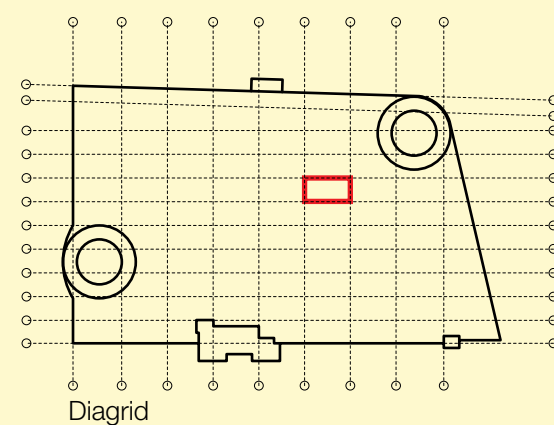
Total P. space - approx. 2030
 Floor 2-6: approx. 320 P per floor
 Floor 7-8: approx. 240 P per floor

Typical plan size:
 Length approx 130m + Width 80m
 10 615 Sqm

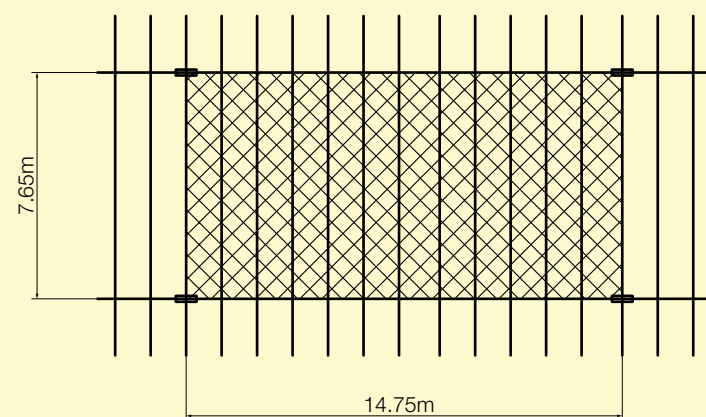
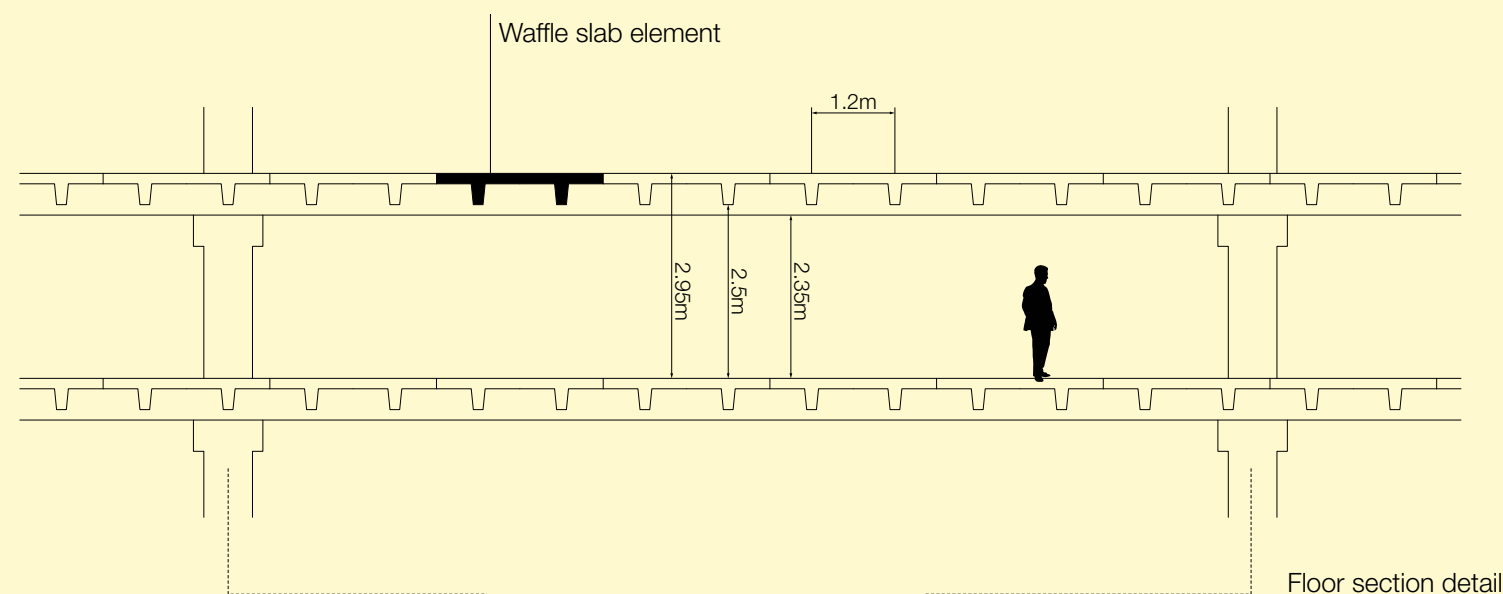
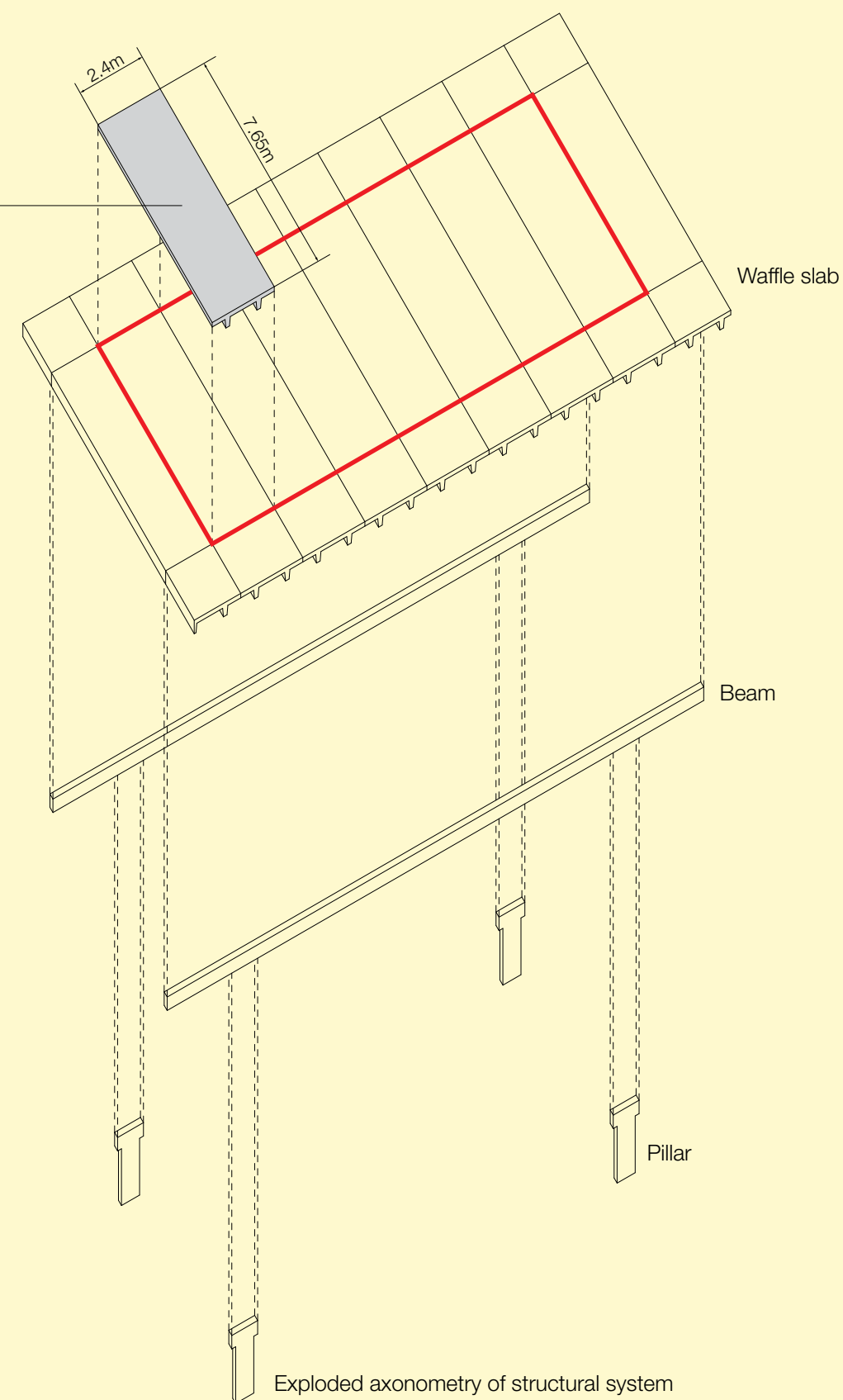


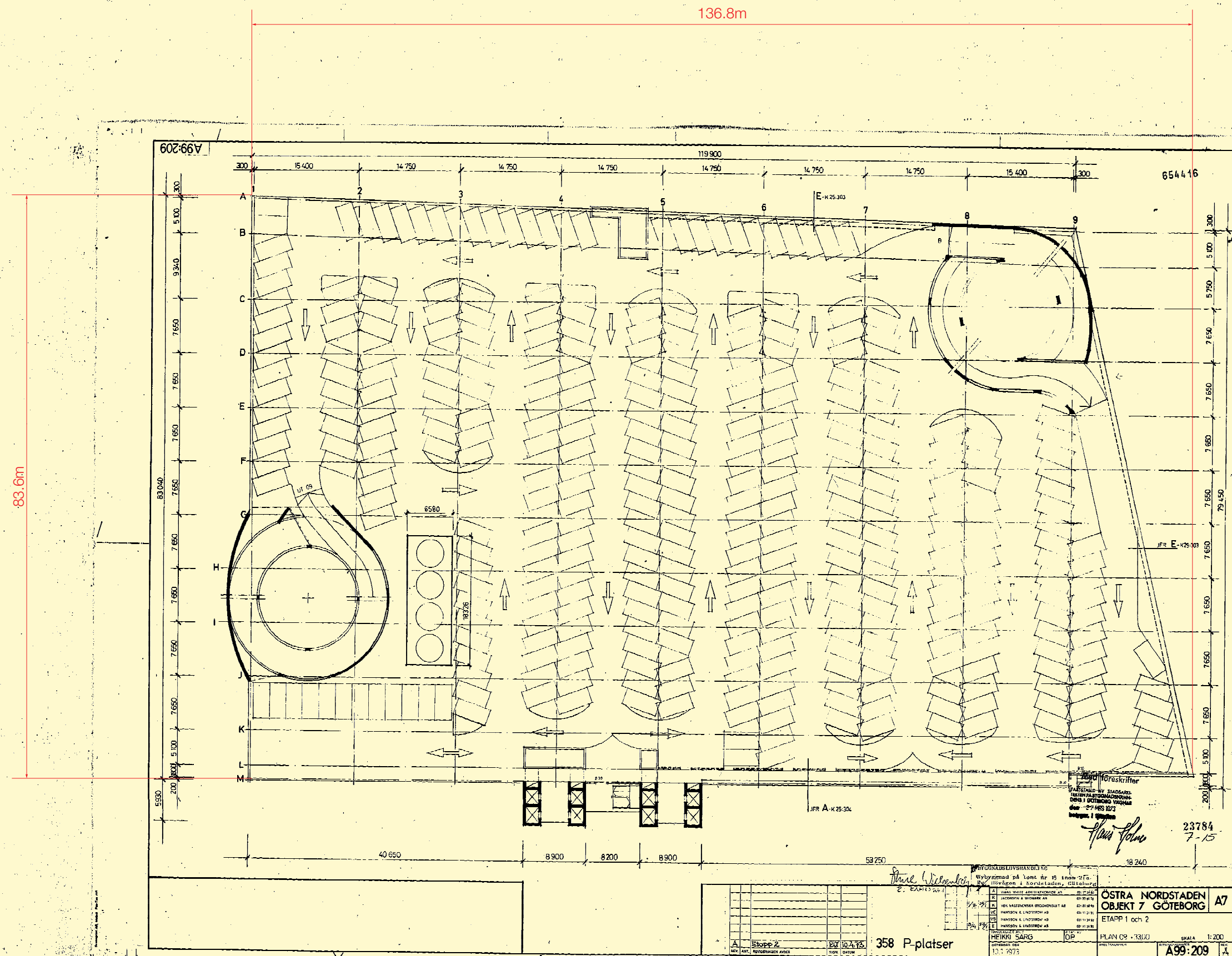
Existing structure

The main structure is made of pre-fabricated concrete elements. It is engineered based on a pillar slab system, where the slabs are made of pre-fabricated tt-cassettes (cc 1200 millimetres). The building is built like a house of cards, where the slabs are placed on the vertical pillar bearings. In the existing structure, no indoor climate is present, except for the elevator cores, meaning air flows free in and out creating an outdoor zone within the entire garage.

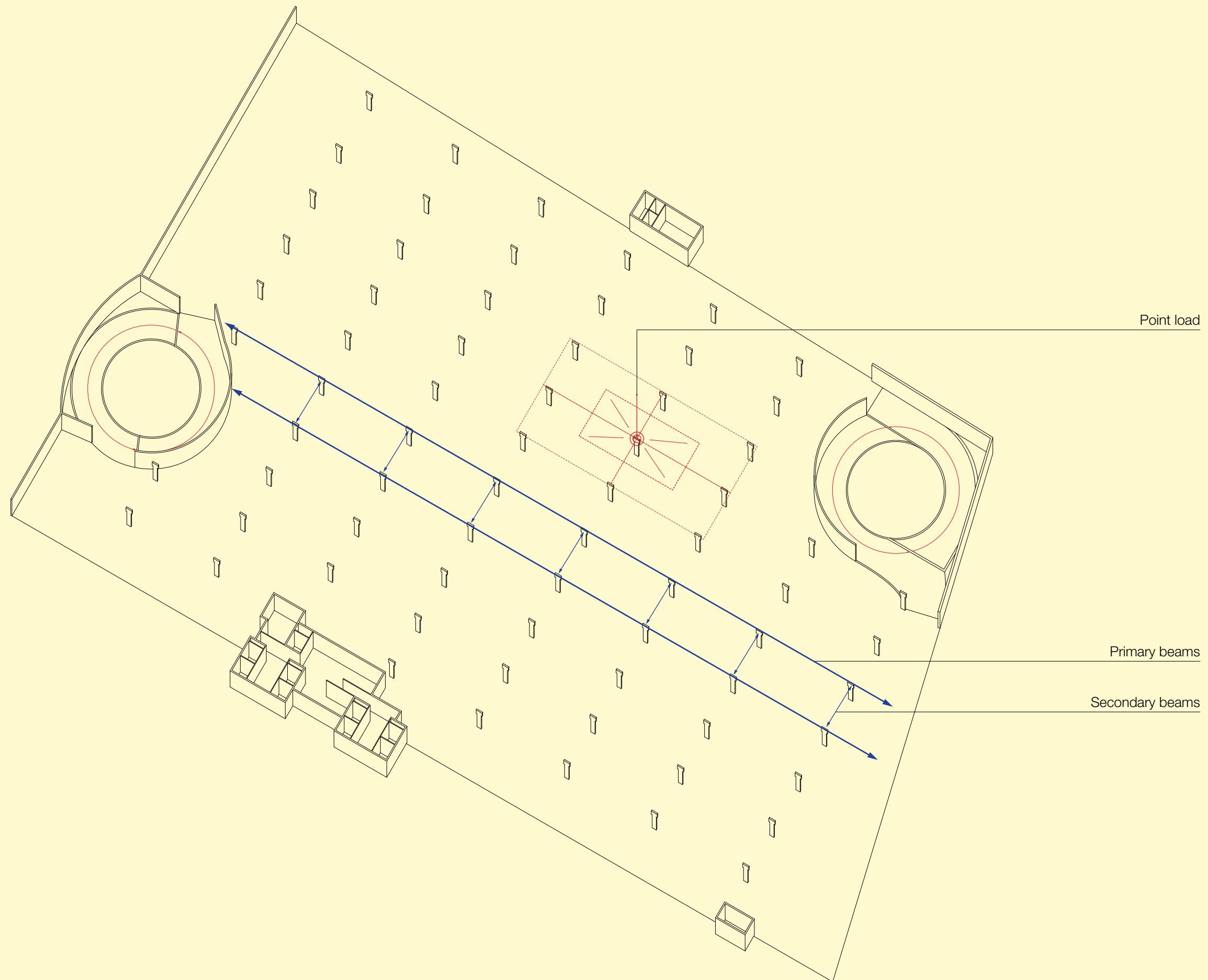


Waffle slab element





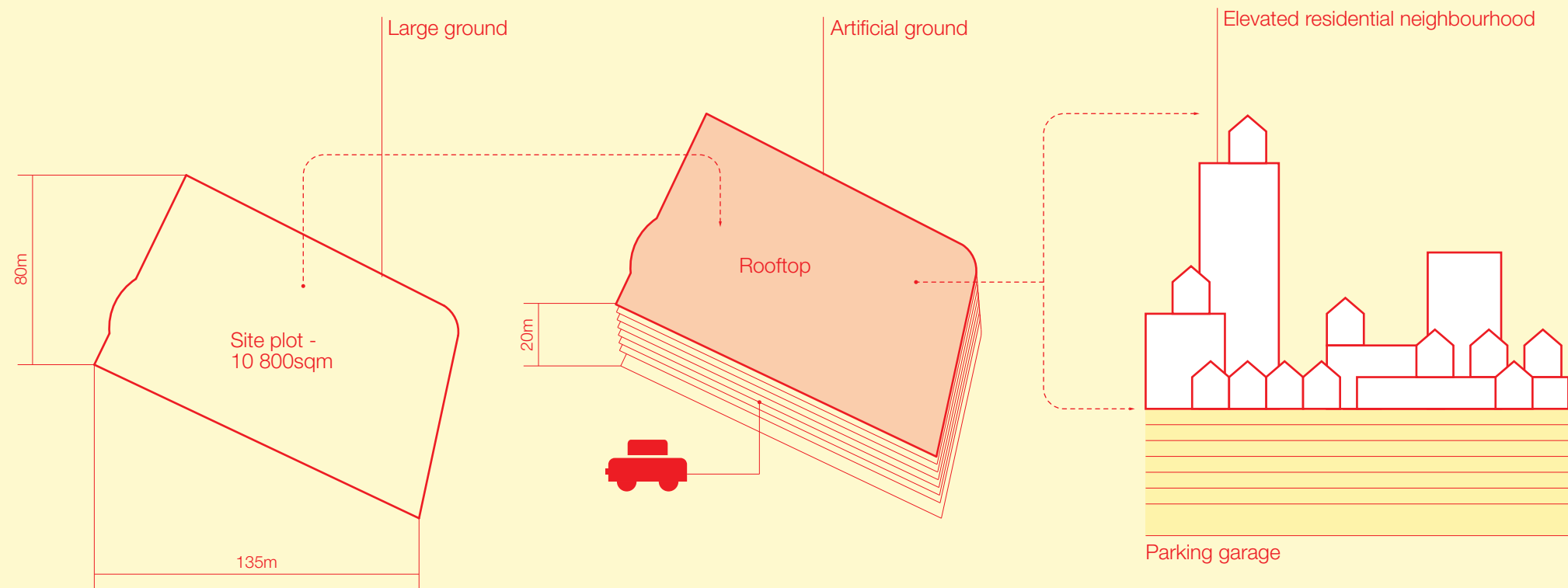
Typical floorplan from original construction drawing, dated 1973.



Typical floorplan axonometry showing structural principles pillar grid.

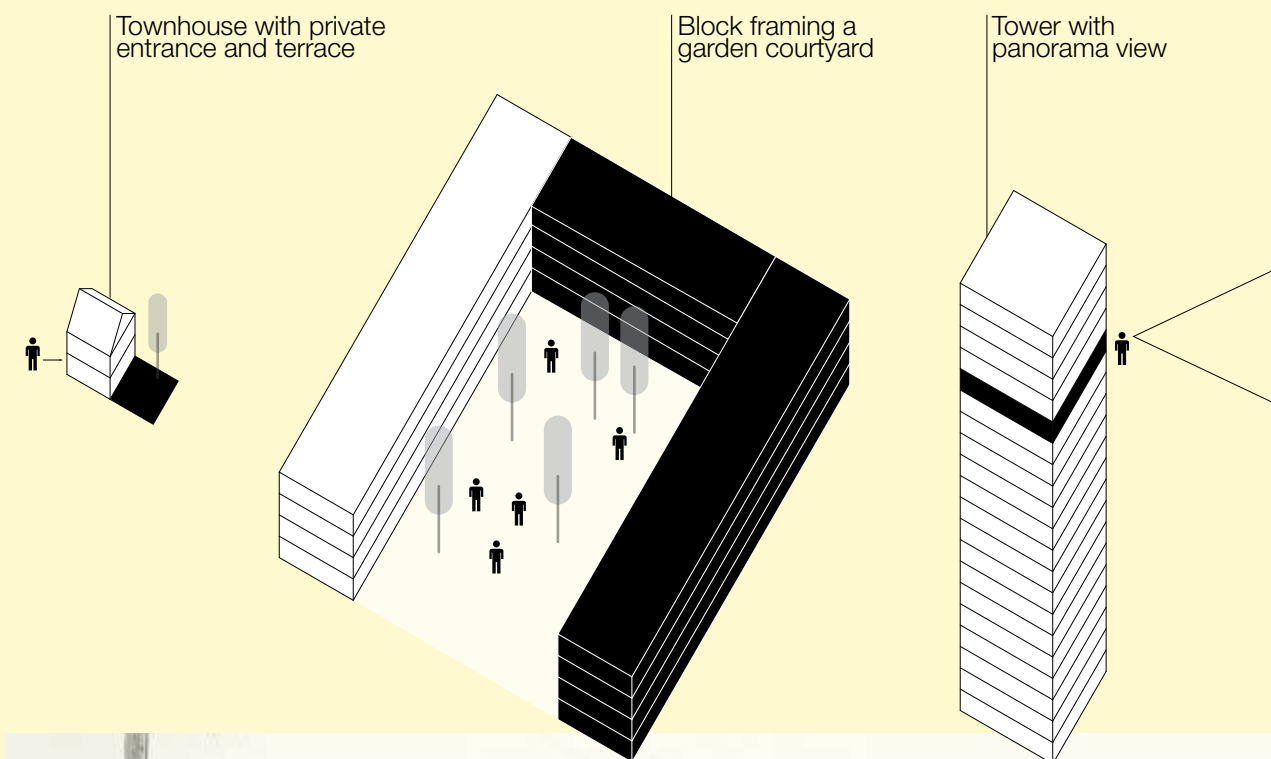
Concept

The rooftop of the garage building is large enough to house an entire elevated residential neighbourhood, giving the impression of a hovering city much like the movie "Howl's moving castle". The vertical setback of the elevated residential neighbourhood allows to create a distance from the busy streets around the site.

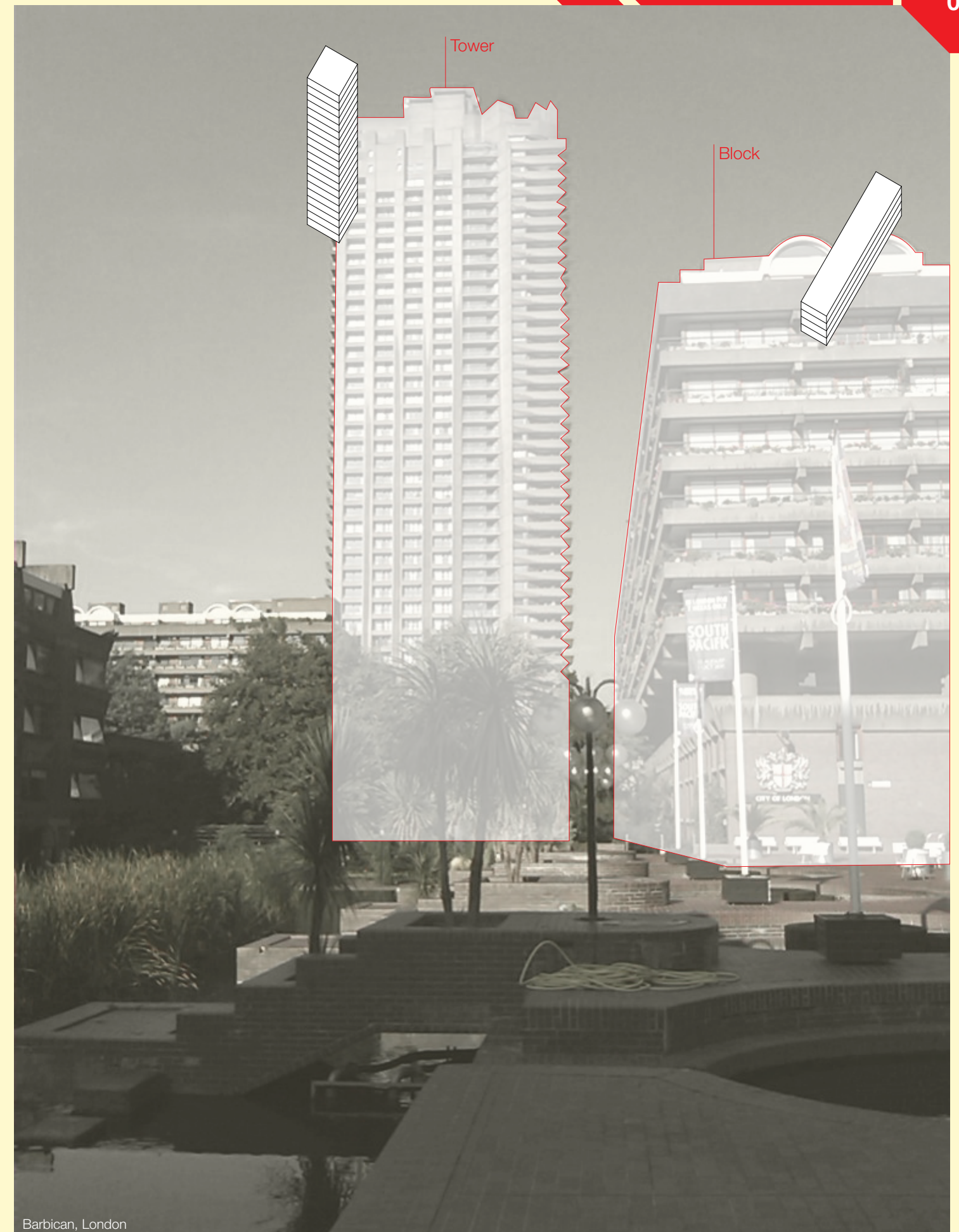


Housing types

In order to create a residential neighbourhood a mixture of housing types is needed to produce a diversity of apartment units ranging from towers with panorama views, towards blocks framing garden courtyards, towards more individual houses with private entrances and terraces.



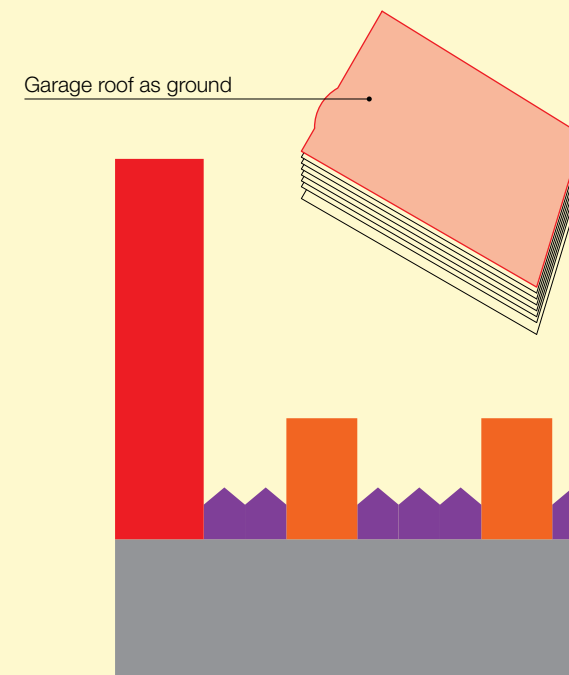
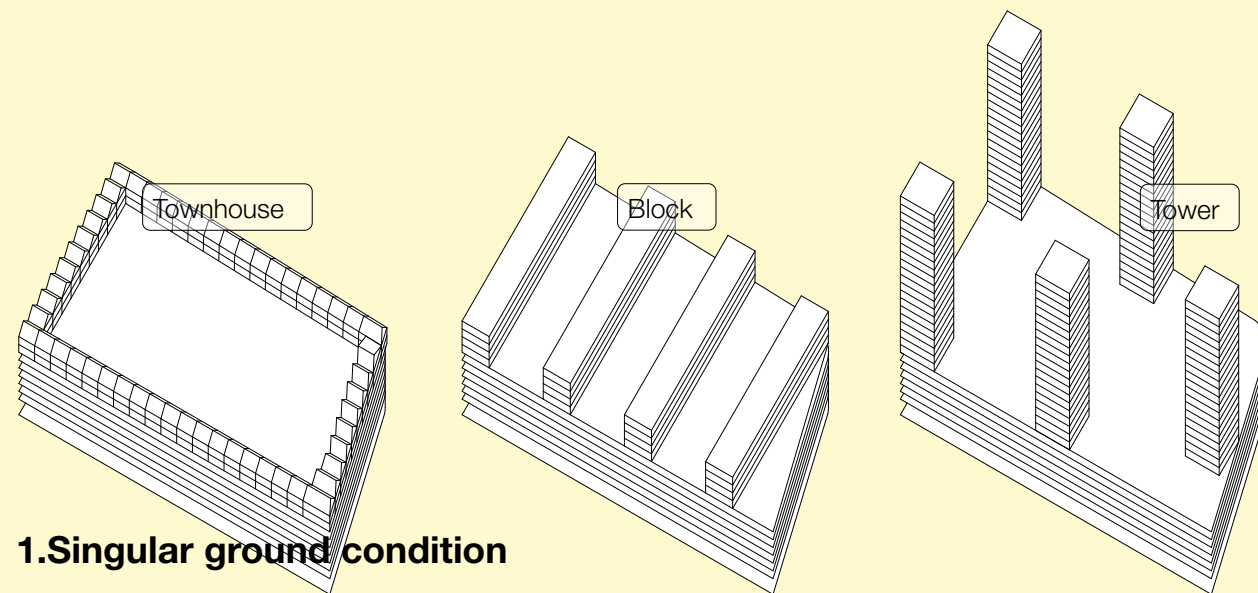
Typical British Townhouse



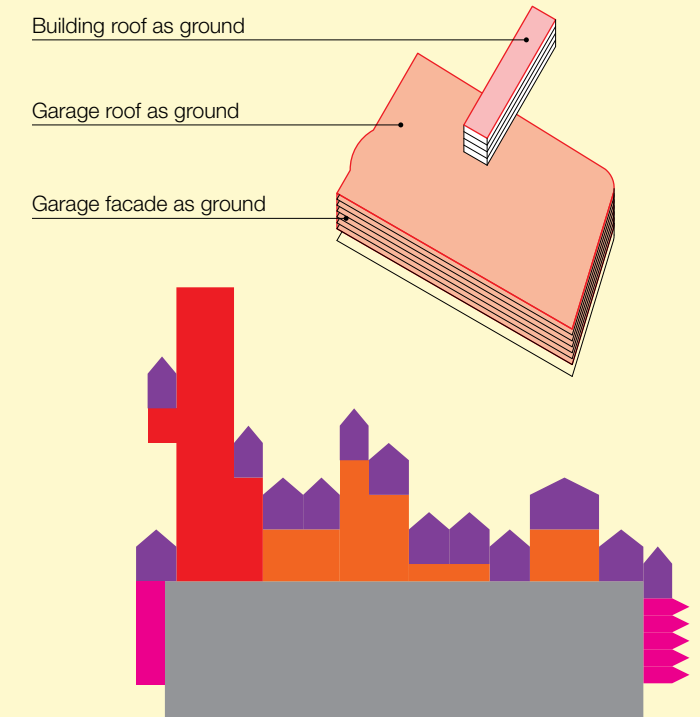
Barbican, London

Ground condition

If placing one type of housing on to the garage rooftop there becomes a danger of monotony. Monotony is still achieved within a 2D ground condition in that they do not interact with each other. Within a 3D ground condition the visual appearance of a small town start to emerge.



2.2D Ground condition

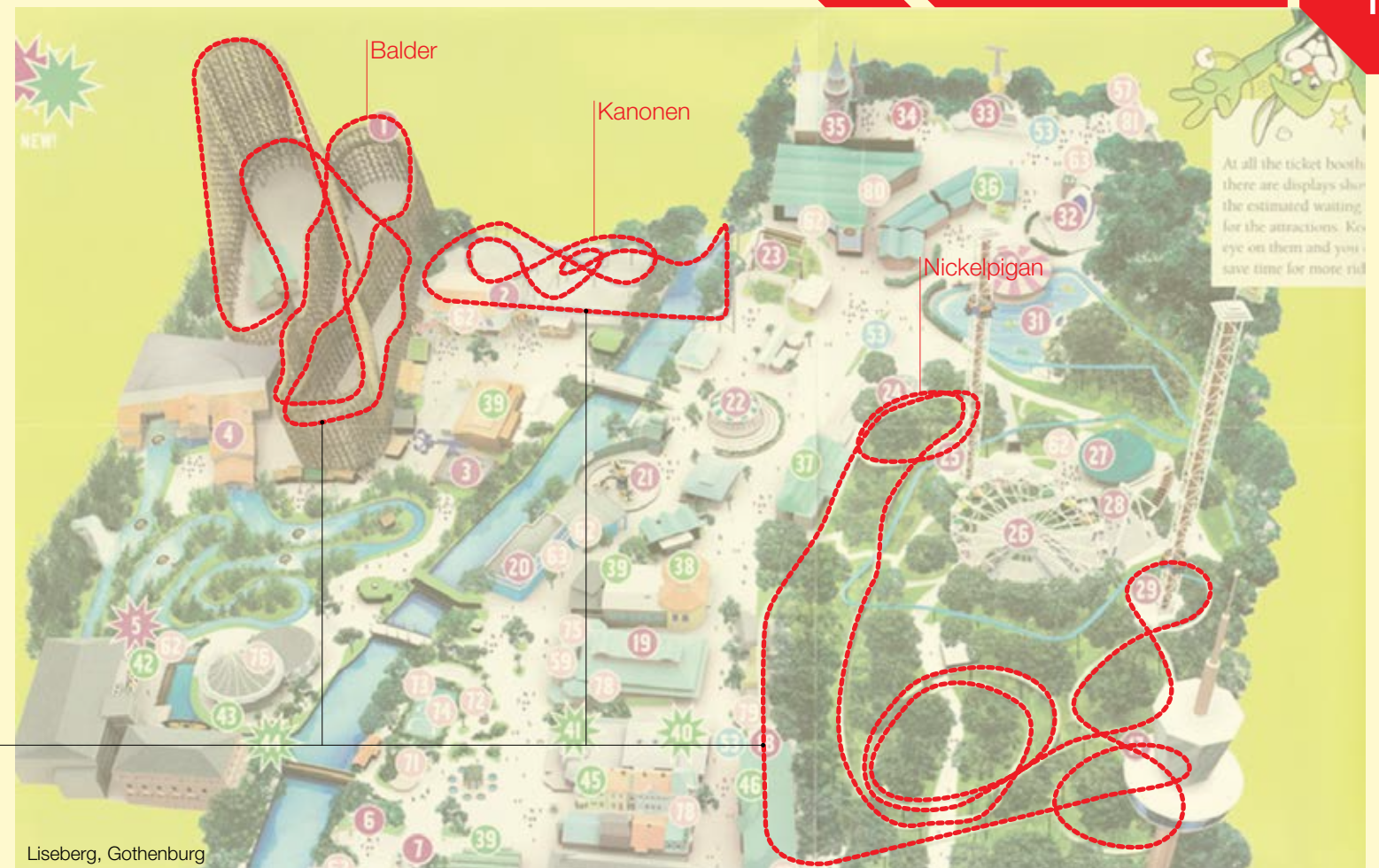
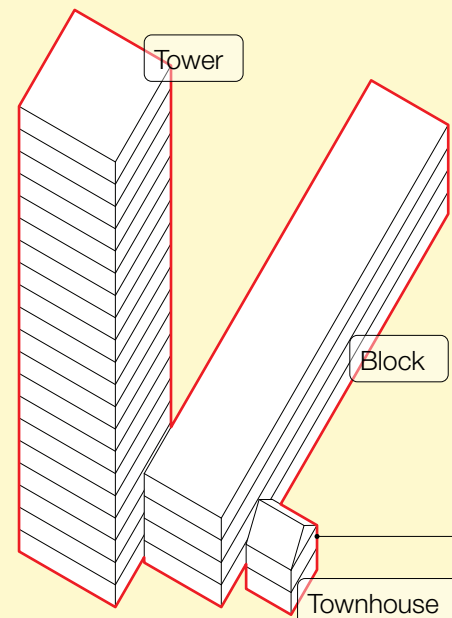


3.3D Ground condition

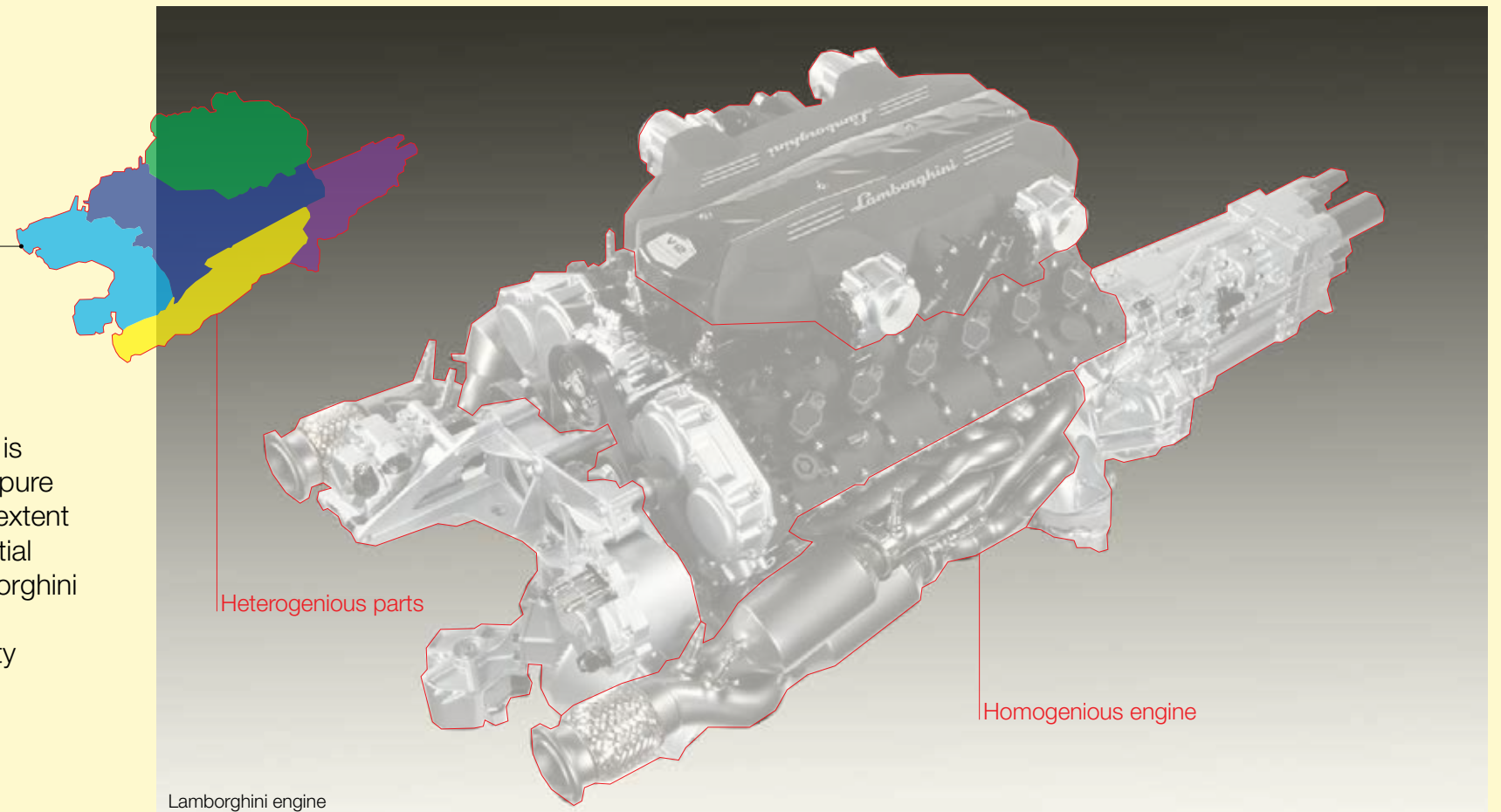
Tivoli

Much like in a Tivoli with a multitude of attraction types, each housing type (tower, block and townhouse) should all have varieties in order to allow for a perceivable identity to emerge within the residential neighbourhood.

Each housing type should differentiate itself like within the variety of rollercoasters contained in a Tivoli. Differentiation implicates a housing type's floor plan layout in order to create varieties of spatial arrangements of apartments and how they all come together as a volume creating a unique diversity of buildings within the residential neighbourhood.



Liseberg, Gothenburg



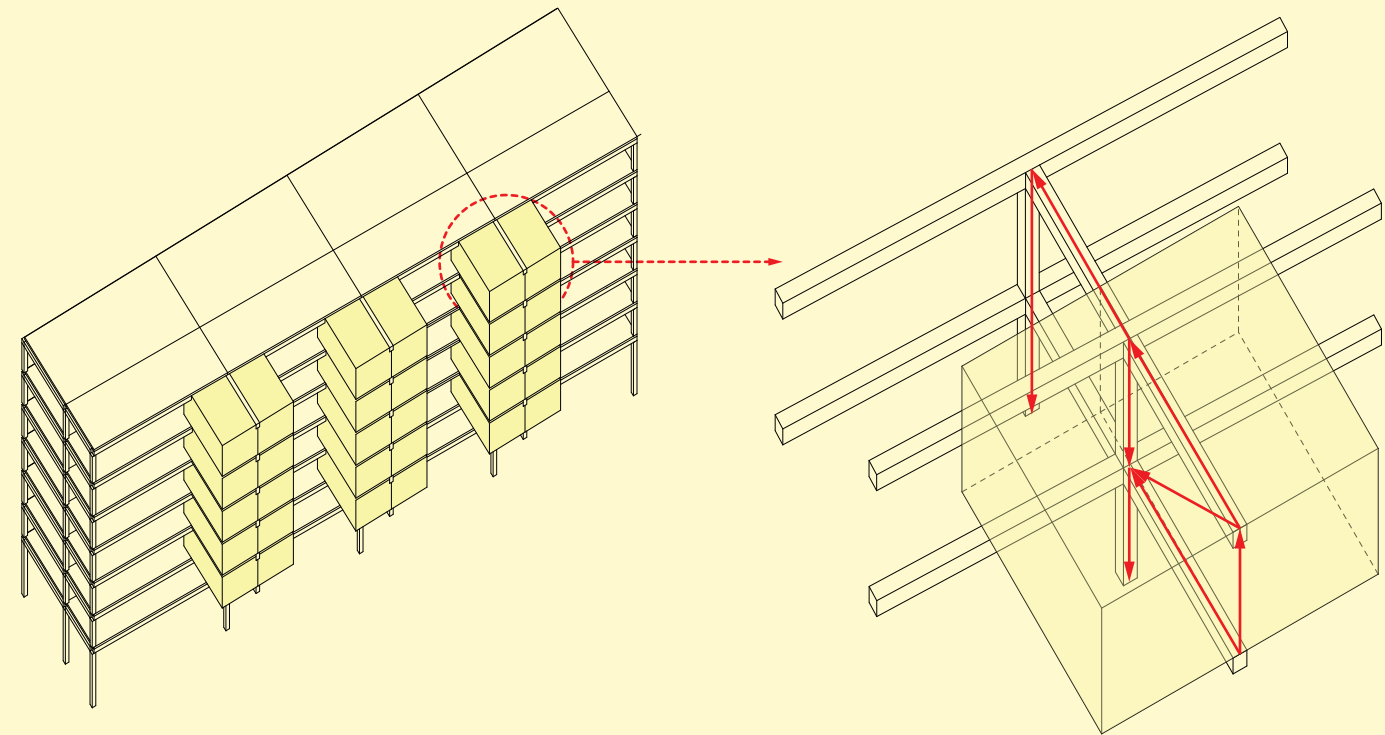
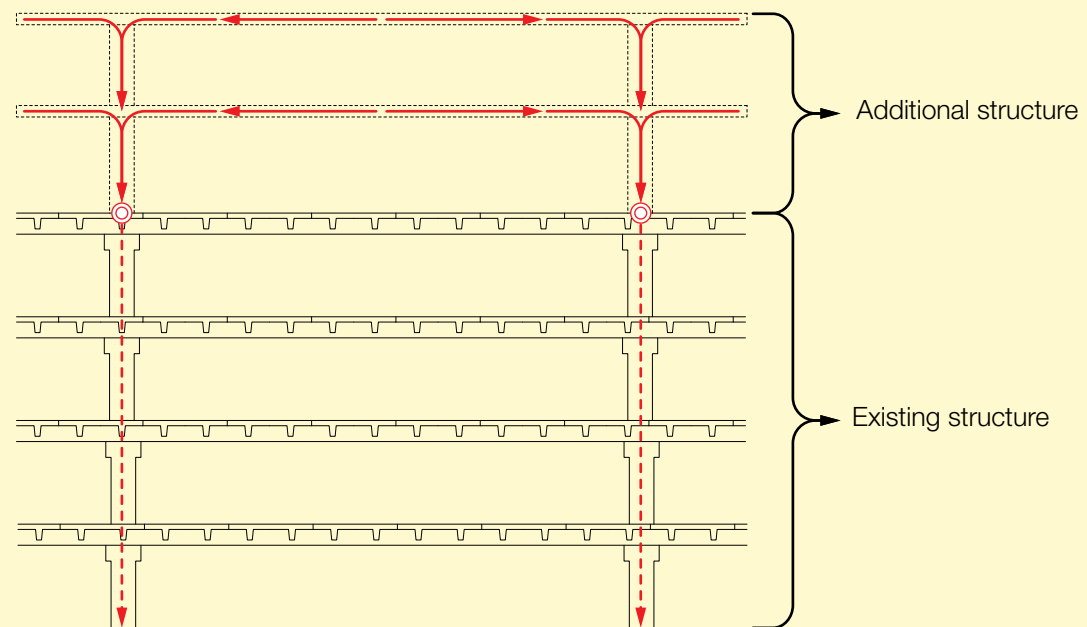
Lamborghini engine

The homogeneity of heterogenous volumes

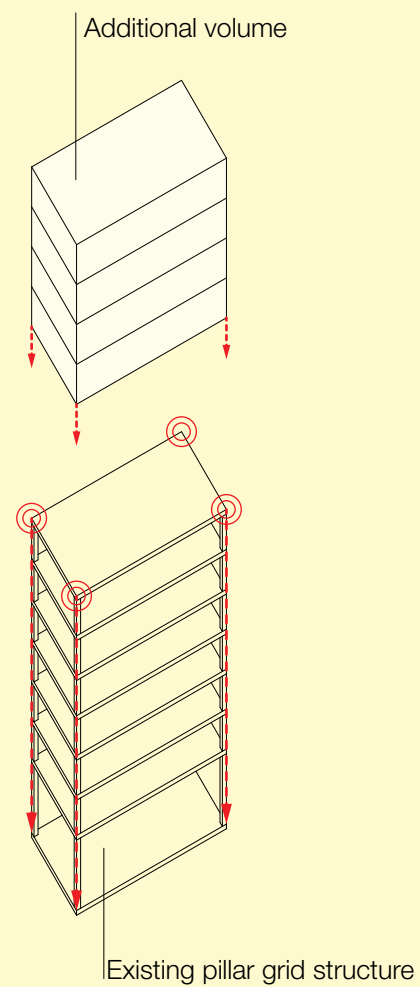
Though the main departure is to produce a heterogeneity of housing types it is important to gain a sense of homogeneity as well. This is firstly due to that if pure heterogeneity is allowed a cacophony of unrelated objects emerges in such extent that would pollute the identity of a coherent visual appearance of the residential neighbourhood. The housing types should come together much like a Lamborghini engine. At once the engine parts all formally differentiate but enables a clear reading of each parts specific function, yet coherent as a homogeneous entity giving the reading of its purpose as an engine.

Massing in relation to pillar grid structure

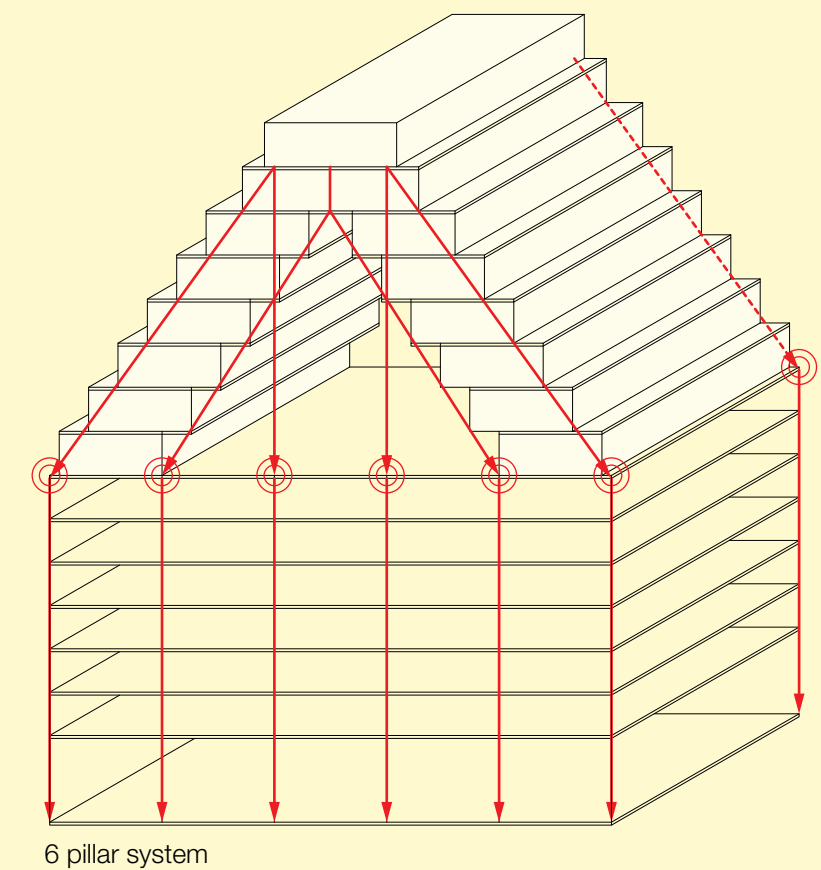
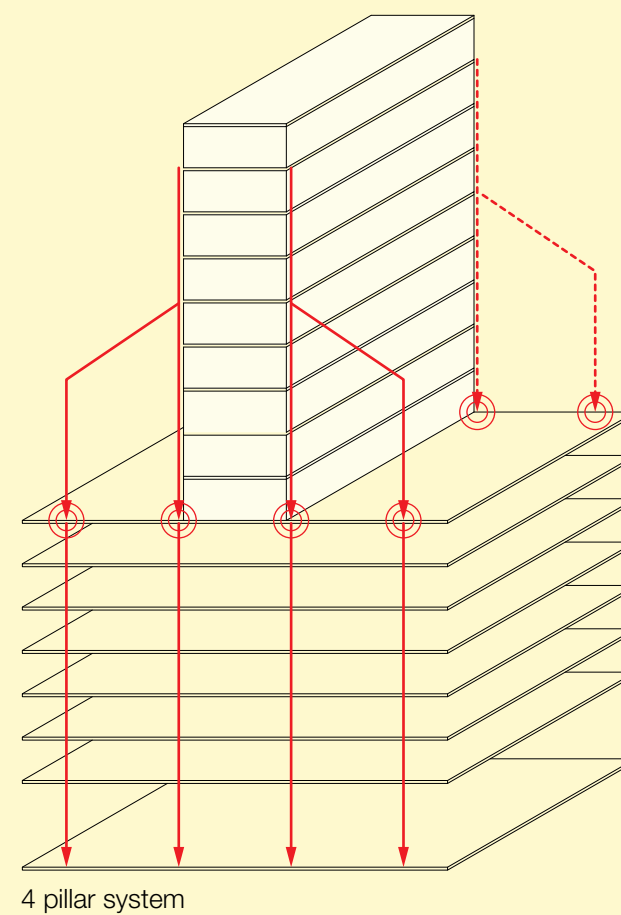
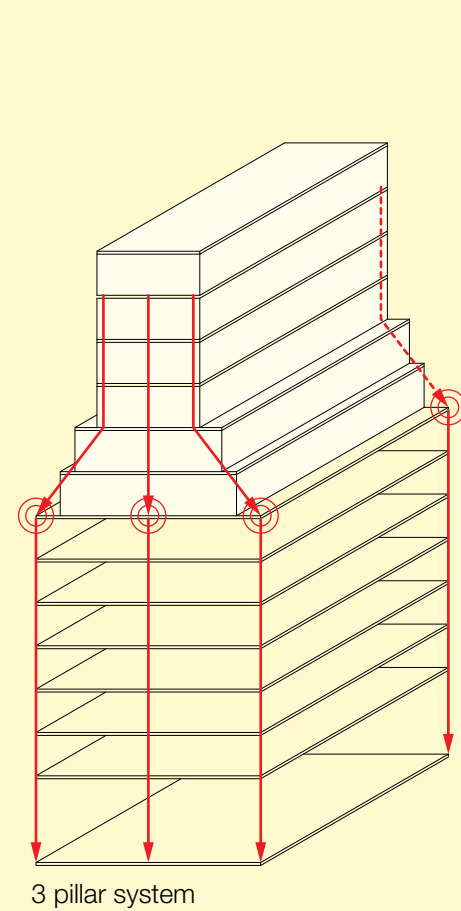
The massing of the apartment units are arranged and placed so according to the logics of the structural pillar grid.



Cantilevered apartment units in relation to pillar grid structure



Tower volumes in relation to pillar grid structure



Site adjustments

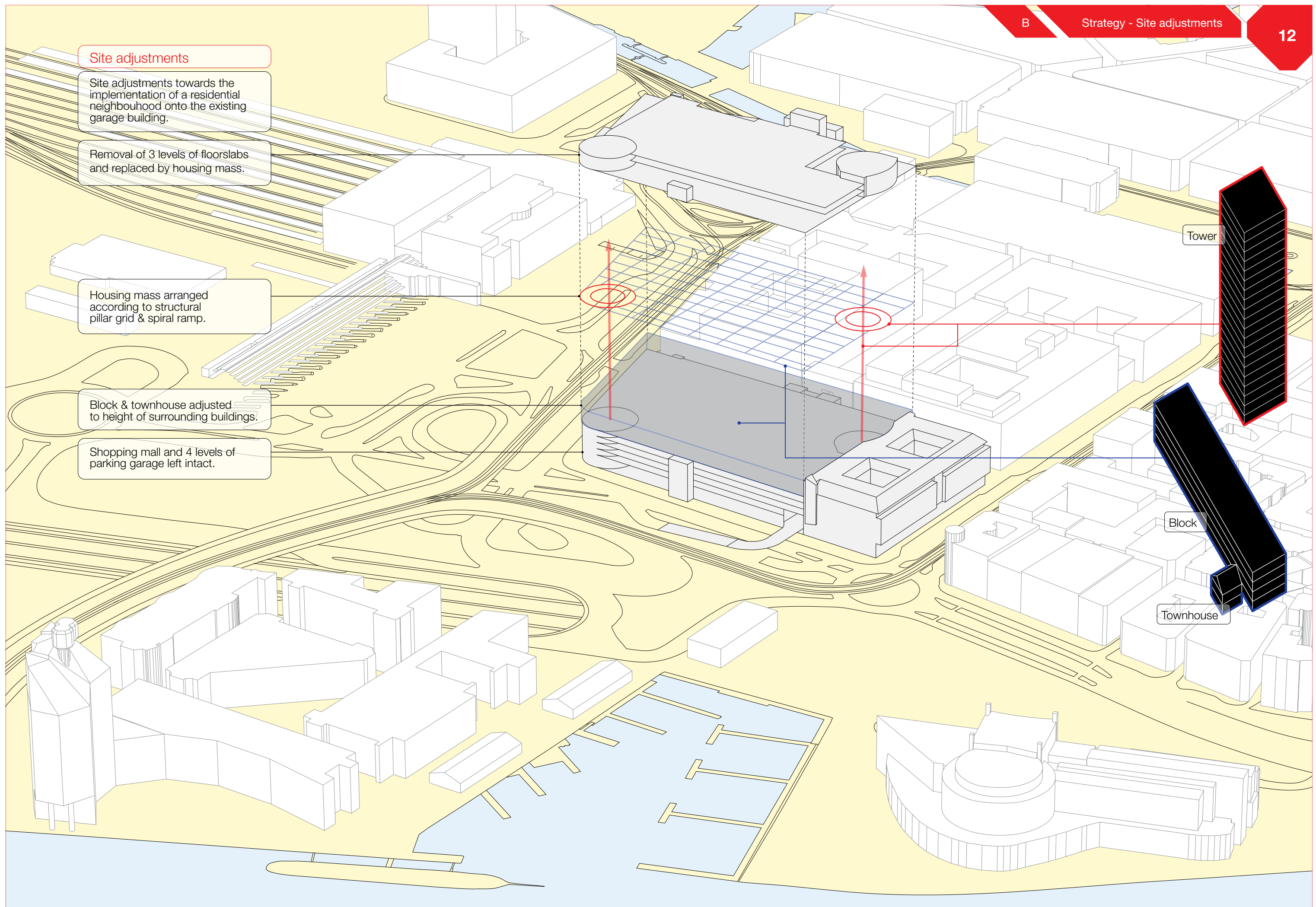
Site adjustments towards the implementation of a residential neighbourhood onto the existing garage building.

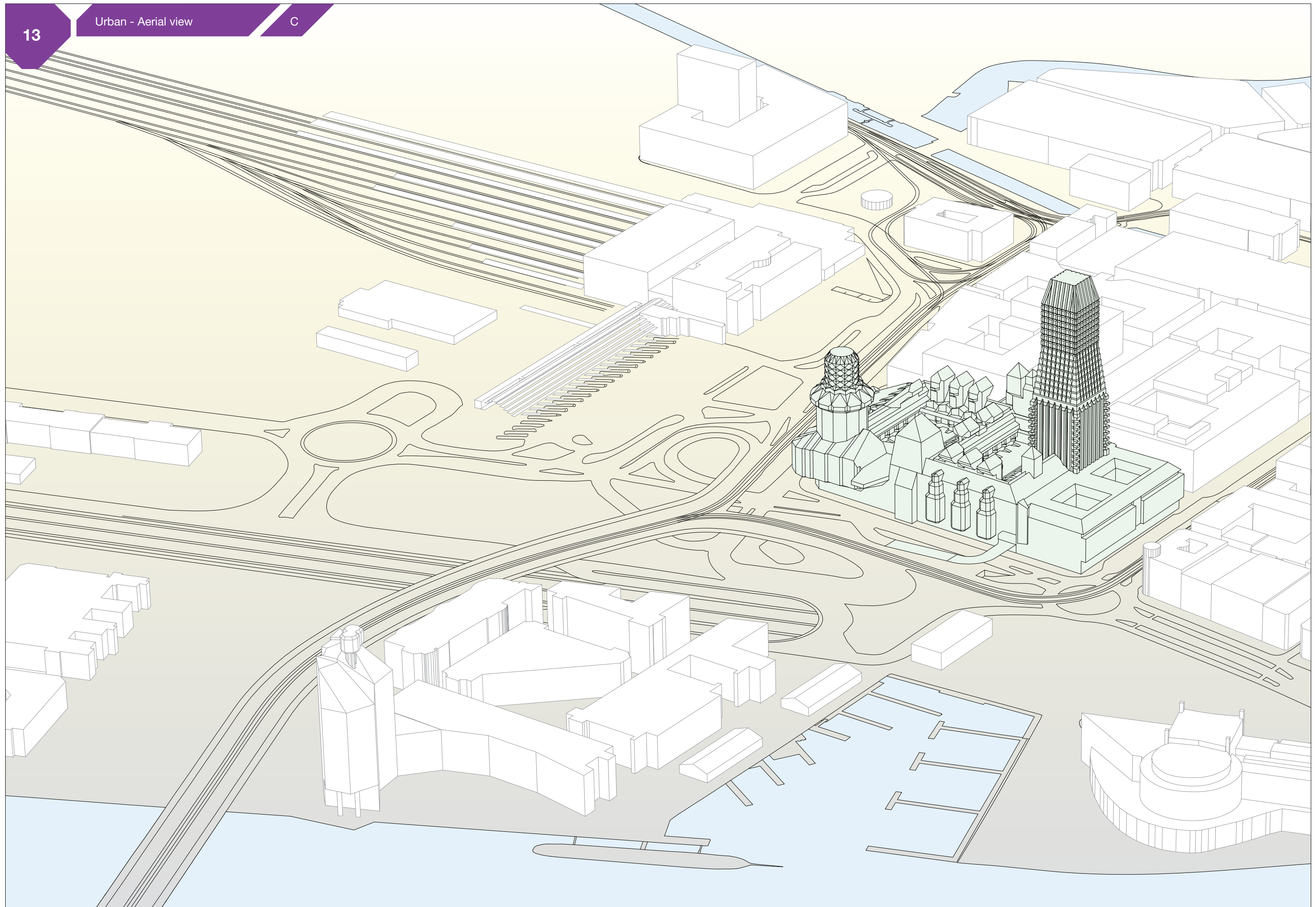
Removal of 3 levels of floorslabs and replaced by housing mass.

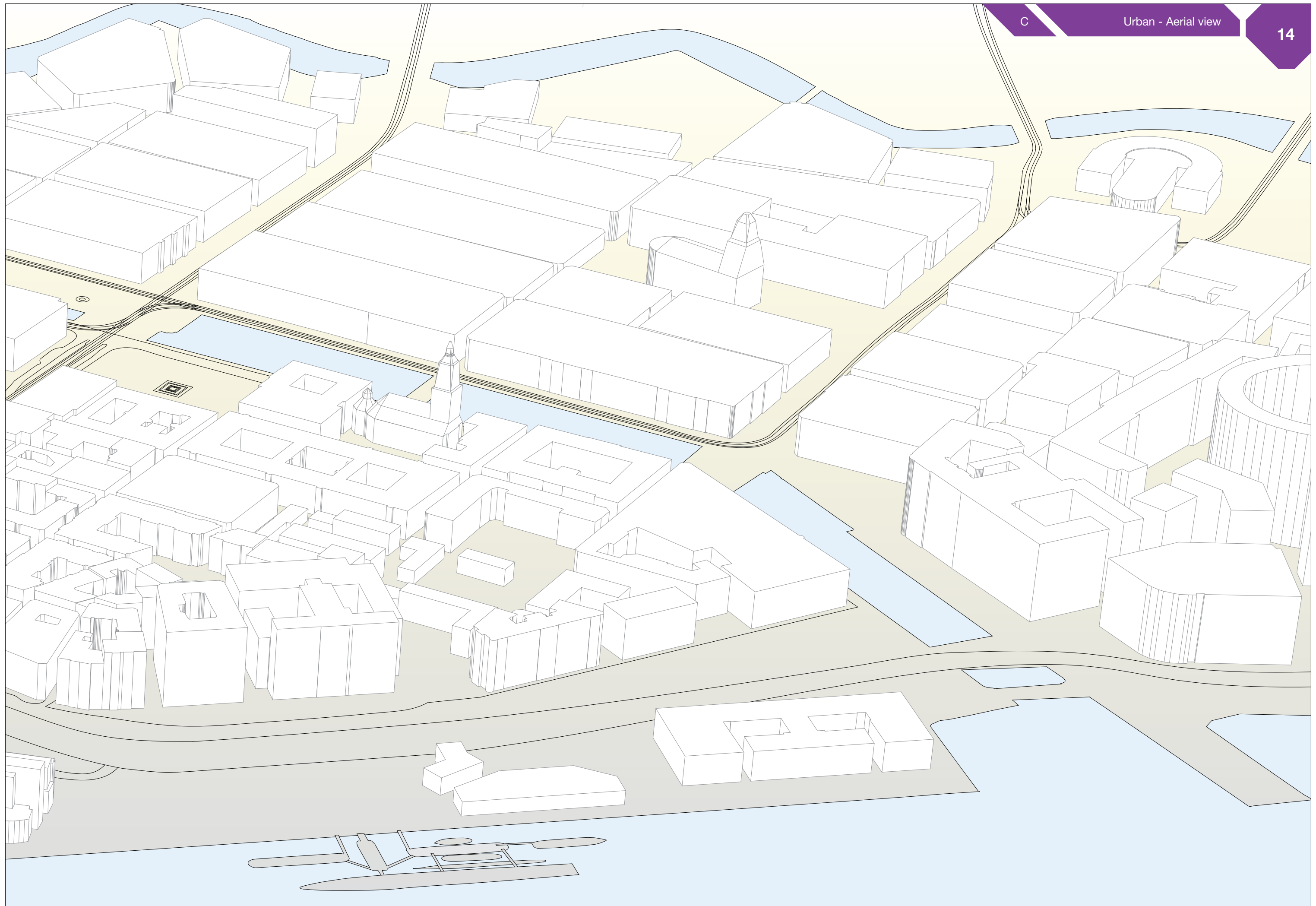
Housing mass arranged according to structural pillar grid & spiral ramp.

Block & townhouse adjusted to height of surrounding buildings.

Shopping mall and 4 levels of parking garage left intact.







Entrance to housing



Garage entrance/exit



Ground entrance



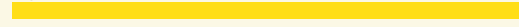
Elevator for housing



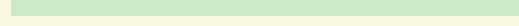
Communal area for housing inhabitants



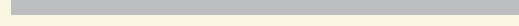
Apartments



Sky garden



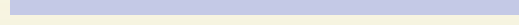
Parking



Elevator to garage



Commercial space



Shopping mall street



Adjacent office building

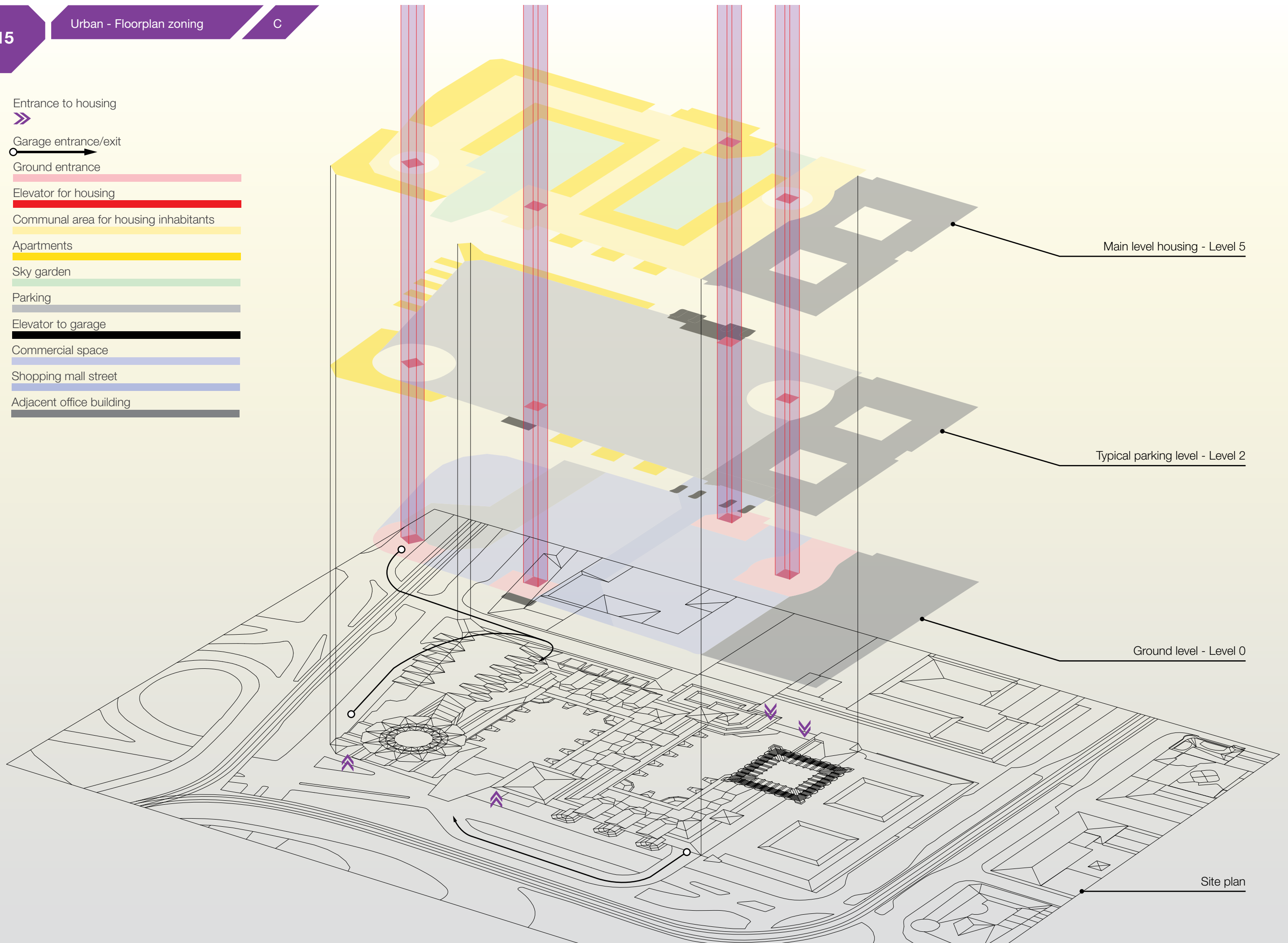


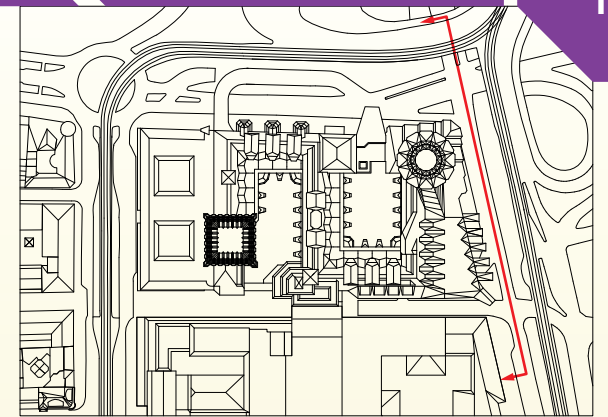
Main level housing - Level 5

Typical parking level - Level 2

Ground level - Level 0

Site plan





East elevation - scale 1:500

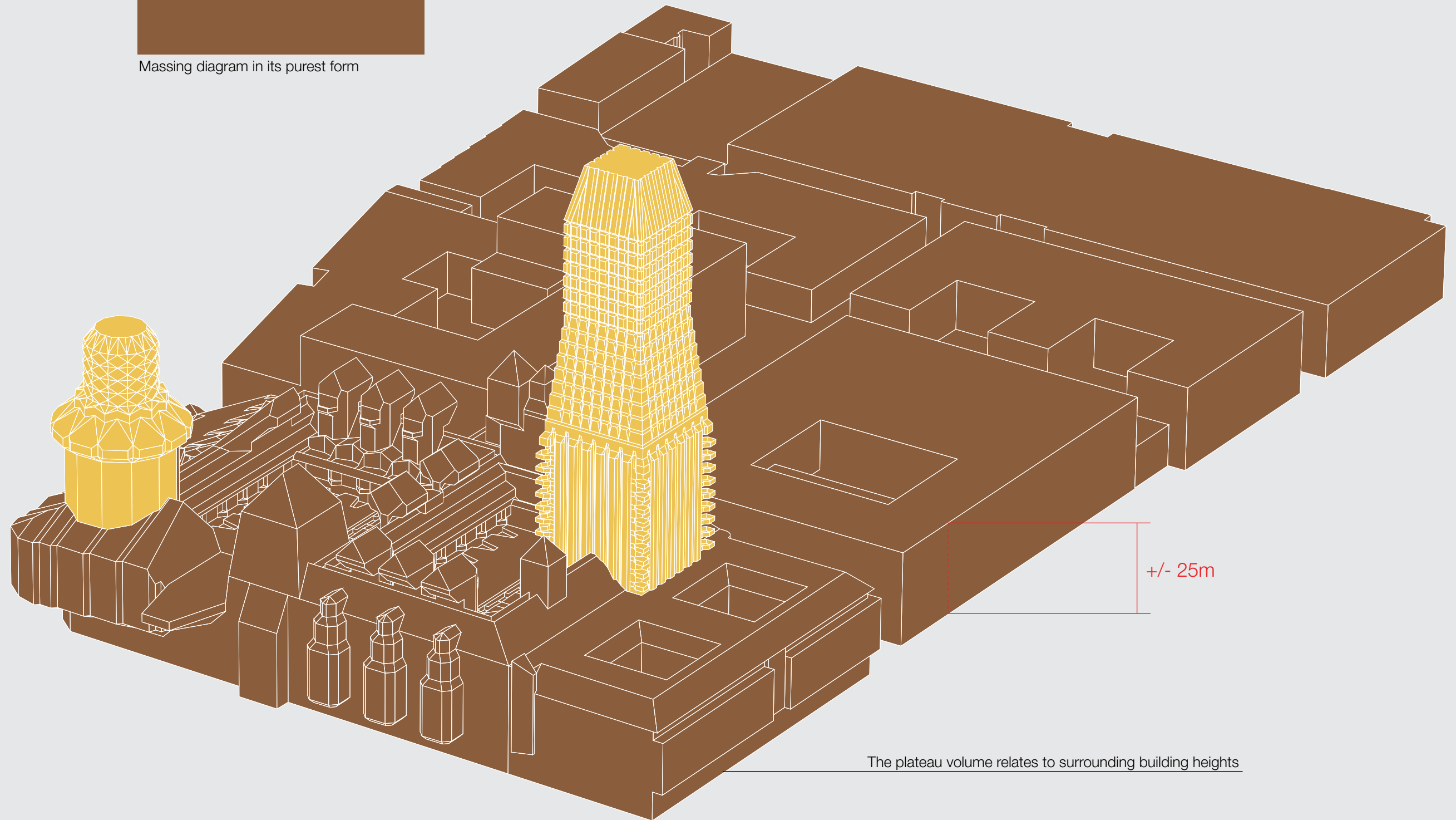


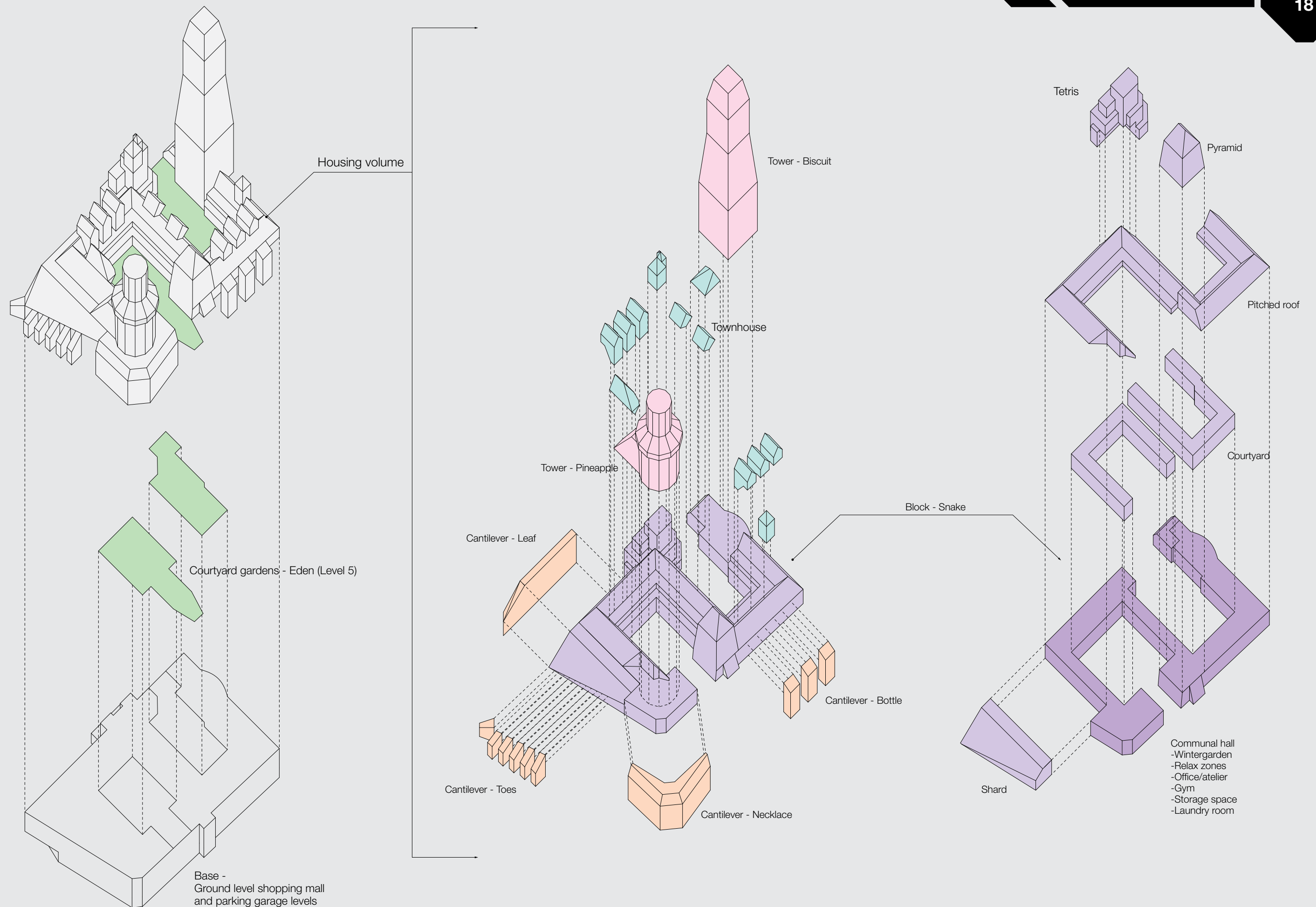
Tower

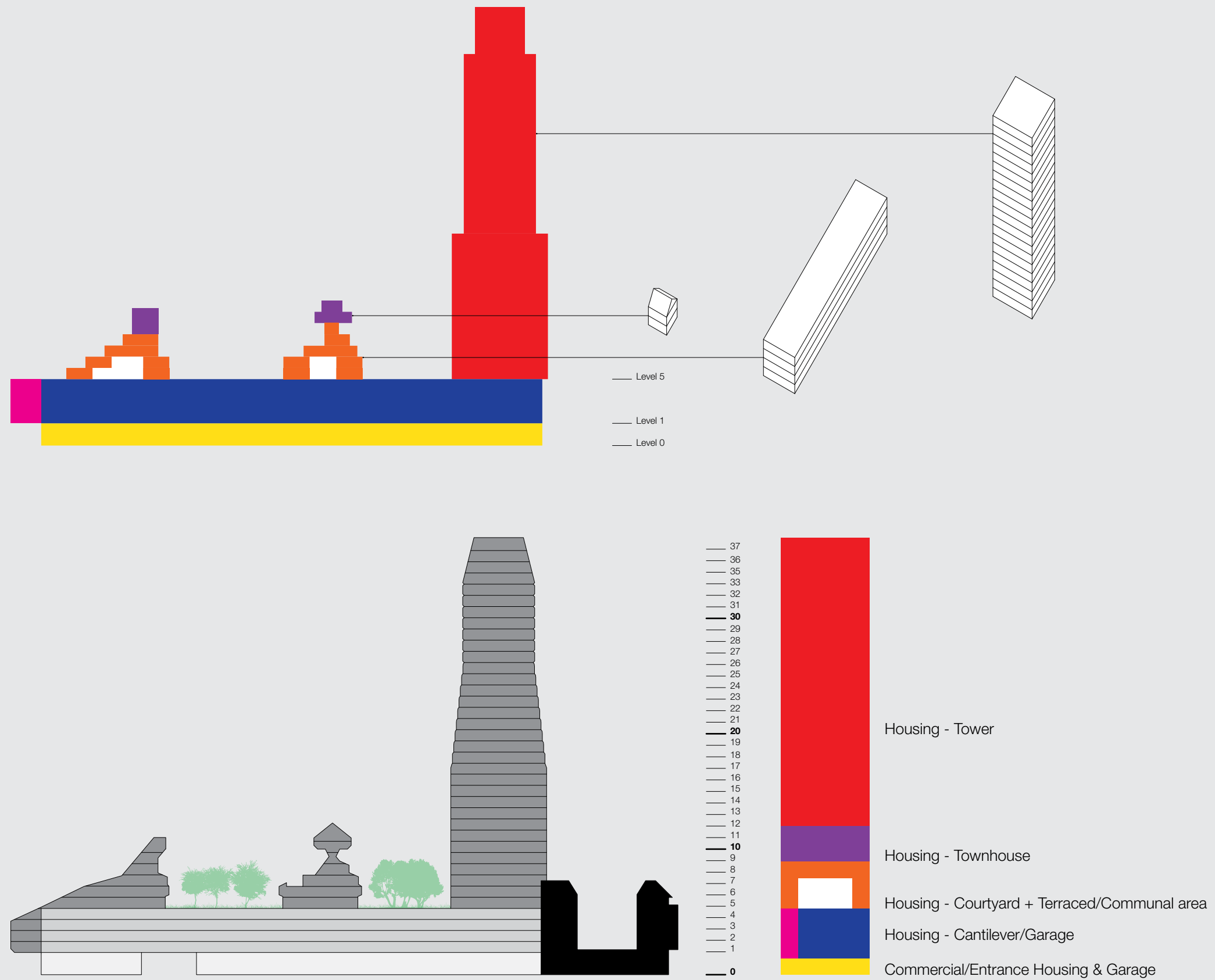
Plateau

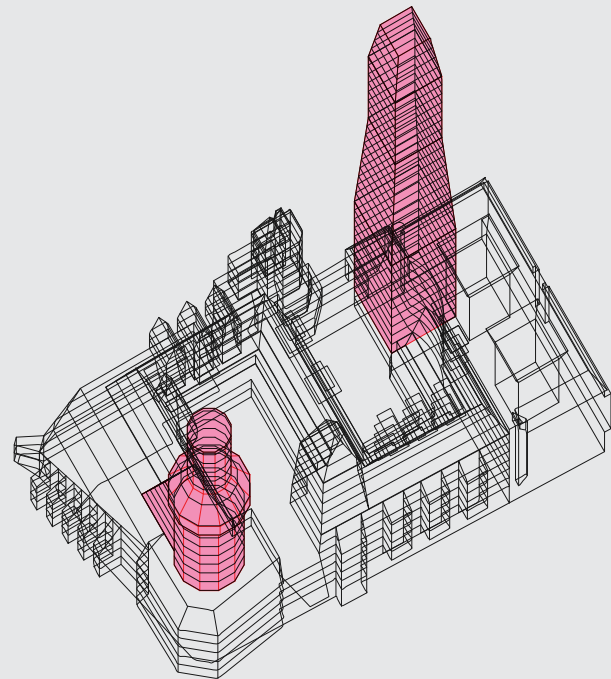
- Block
- Townhouses
- Base
- Adjoining building

Massing diagram in its purest form

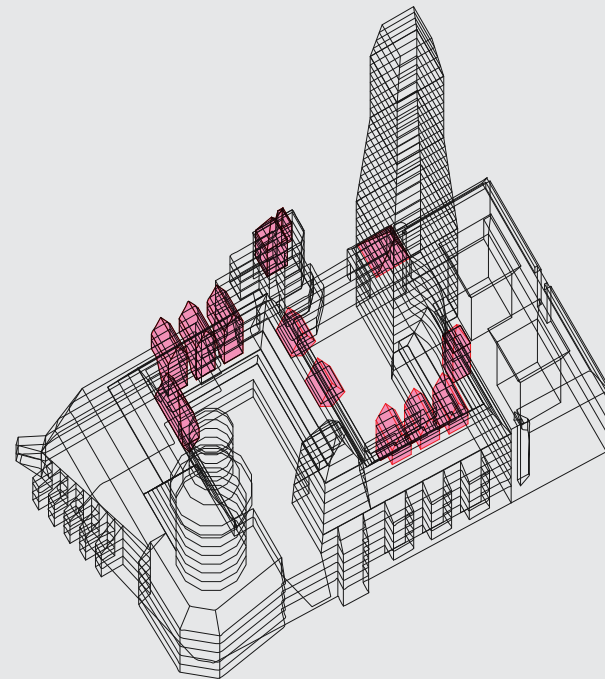




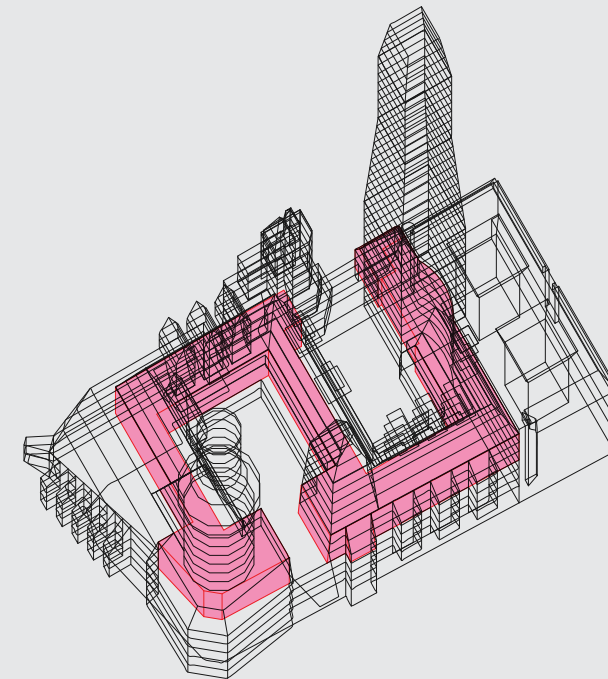




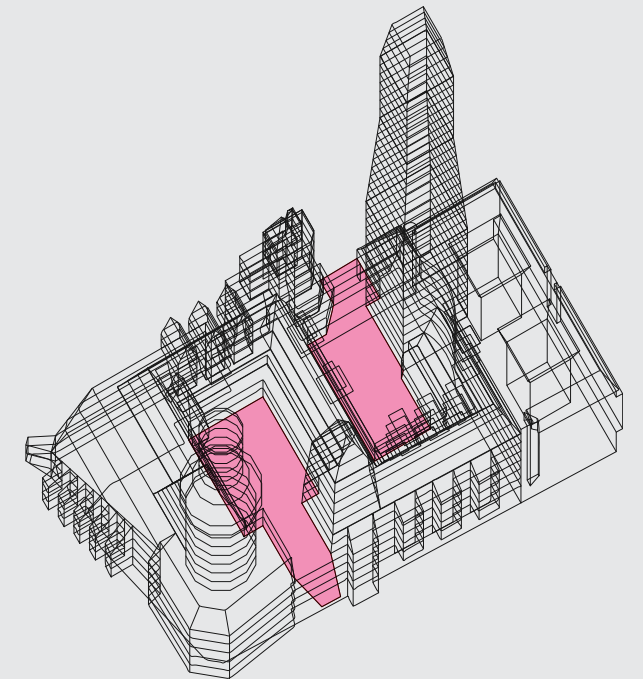
Towers - 20399sqm = 45.9%



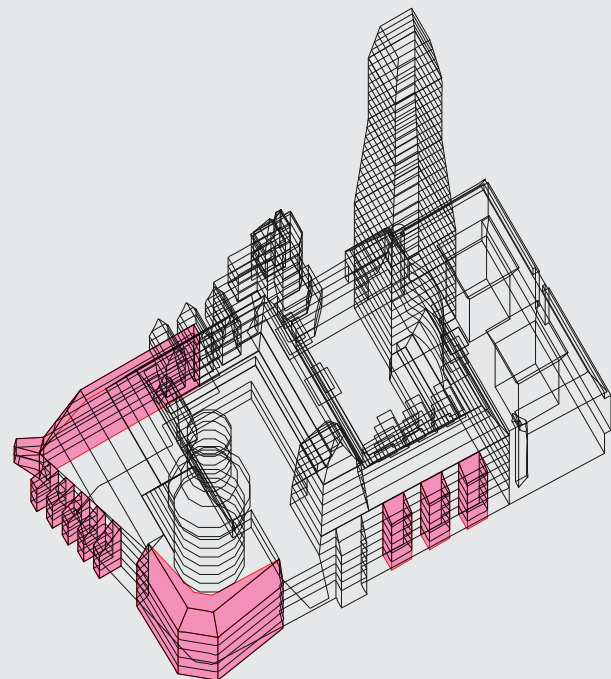
Townhouses - 2421sqm = 5.4%



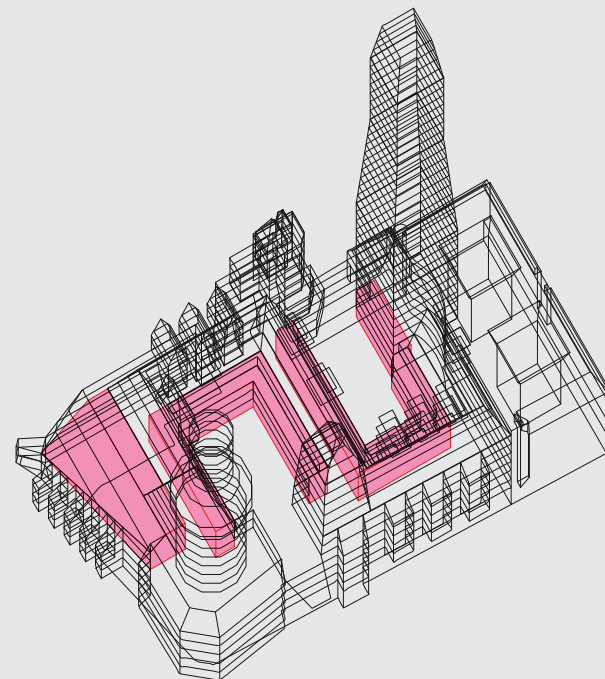
Communal hall - 4716sqm = 10.6%
 -Wintergarden
 -Relax zones
 -Office/atelier
 -Gym
 -Laundry room
 -Storage space



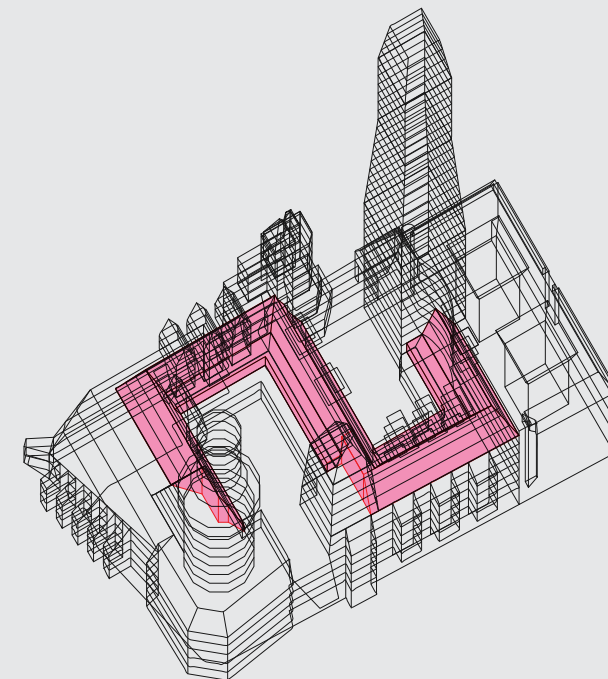
Courtyard gardens - Eden



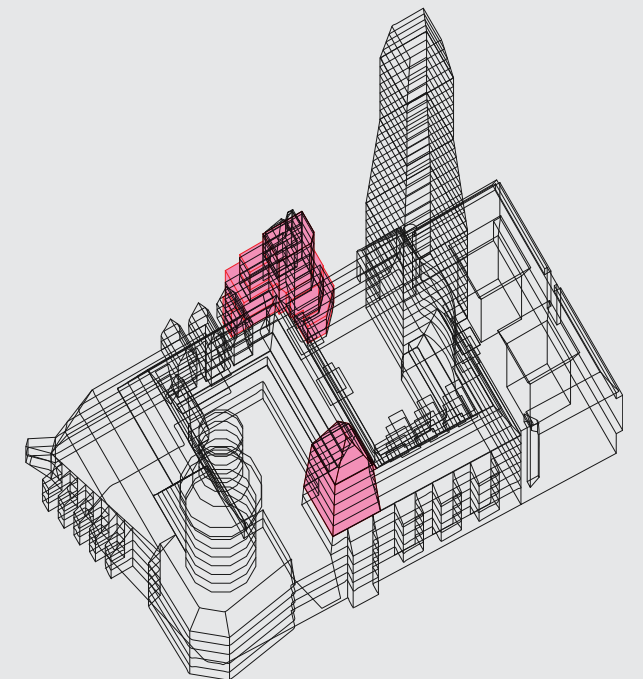
Cantilever - 5469sqm - 12.3%



Courtyard & Shard - 4450sqm = 10.1%

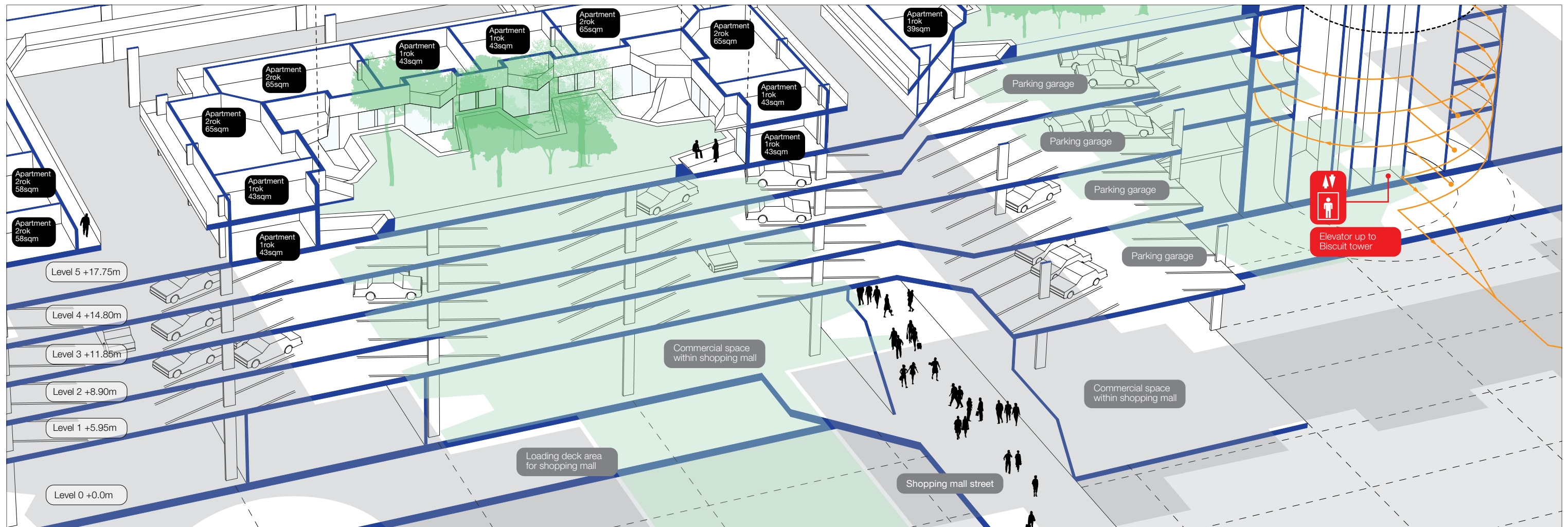


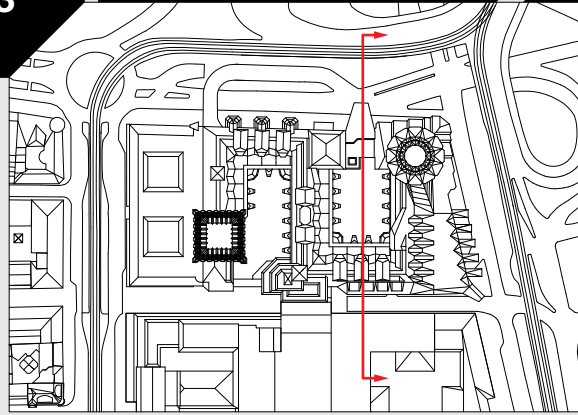
Pitched roof - 3235sqm = 7.2%



Rocks - 3750sqm - 8.4%

Total floor area within housing volume - 44412sqm = 100%





Axonometric section - 1:500

Apartments

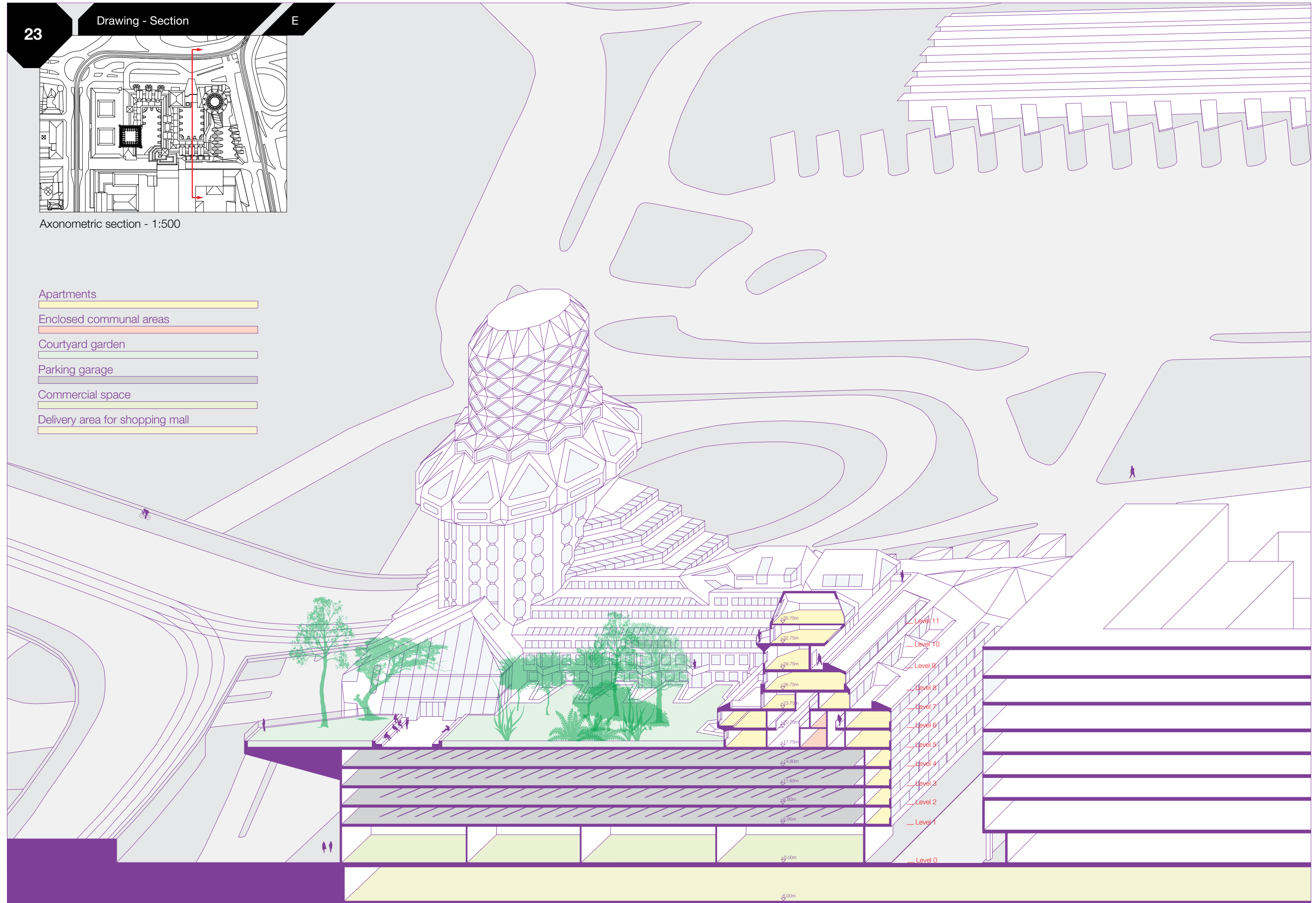
Enclosed communal areas

Courtyard garden

Parking garage

Commercial space

Delivery area for shopping mall



Apartments

Open communal area

Enclosed communal area

Courtyard garden

Sqm apartments on level 5
Total - 2532sqm

Apartments

Shard - Sa.1

Cantilever Leaf - Cla.1

Cantilever Necklace - Cna.2

Cantilever Bottle - Cba.3

Courtyard - COa.1

Tower Biscuit - Tb.1

Tetris - Ta.1

Communal area

C1.Wintergarden

C2.Relax area

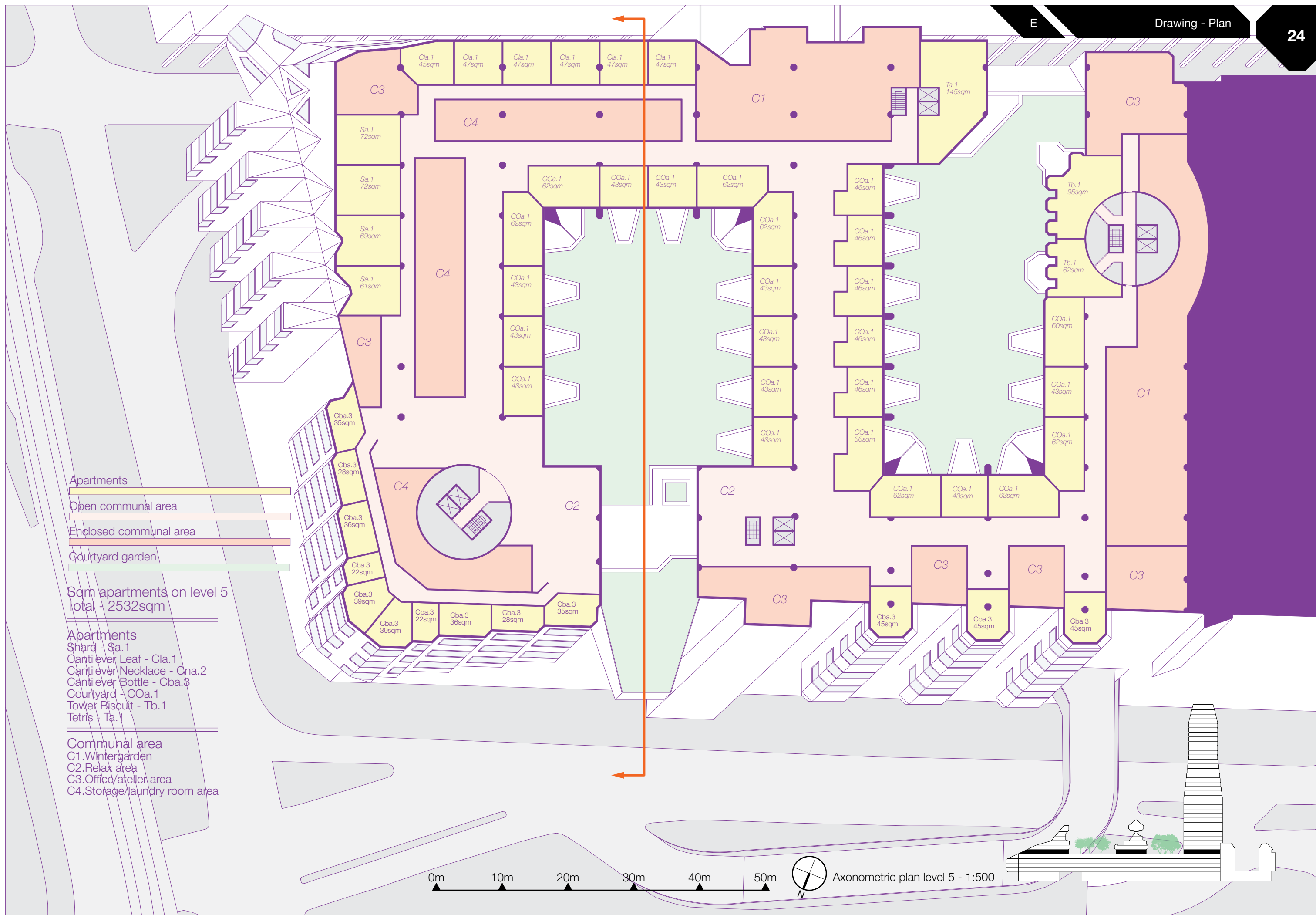
C3.Office/atelier area

C4.Storage/laundry room area

0m 10m 20m 30m 40m 50m



Axonometric plan level 5 - 1:500



Need of more sunlight

Less need of sunlight



Wintergarden

Relax

Office

Atelje

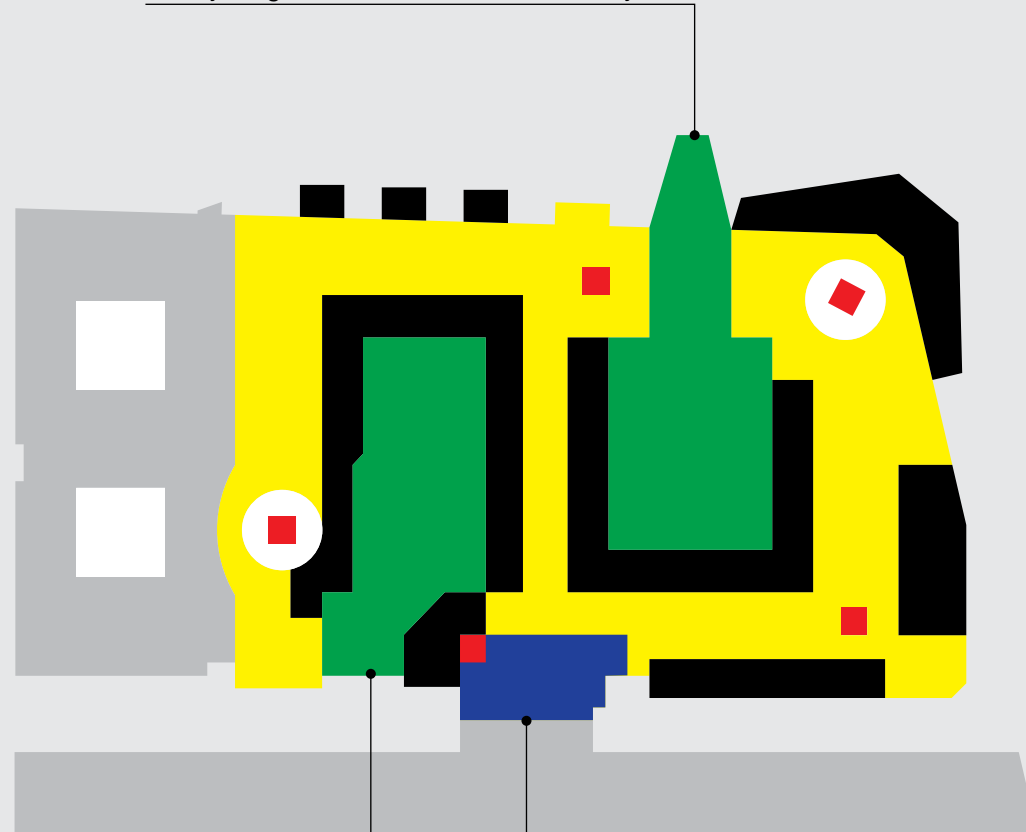
Laundry room

Storage

Communal hall for housing inhabitants
Program is placed according to need of sunlight. If a program needs more light then it is placed in proximity to the envelope. If a program needs less light then its placed in areas with minimum direct sunlight.

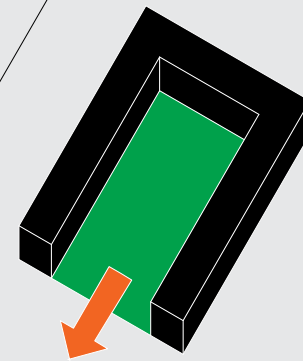
Level 5 - Communal hall

Courtyard garden with views out to the city



Wintergarden

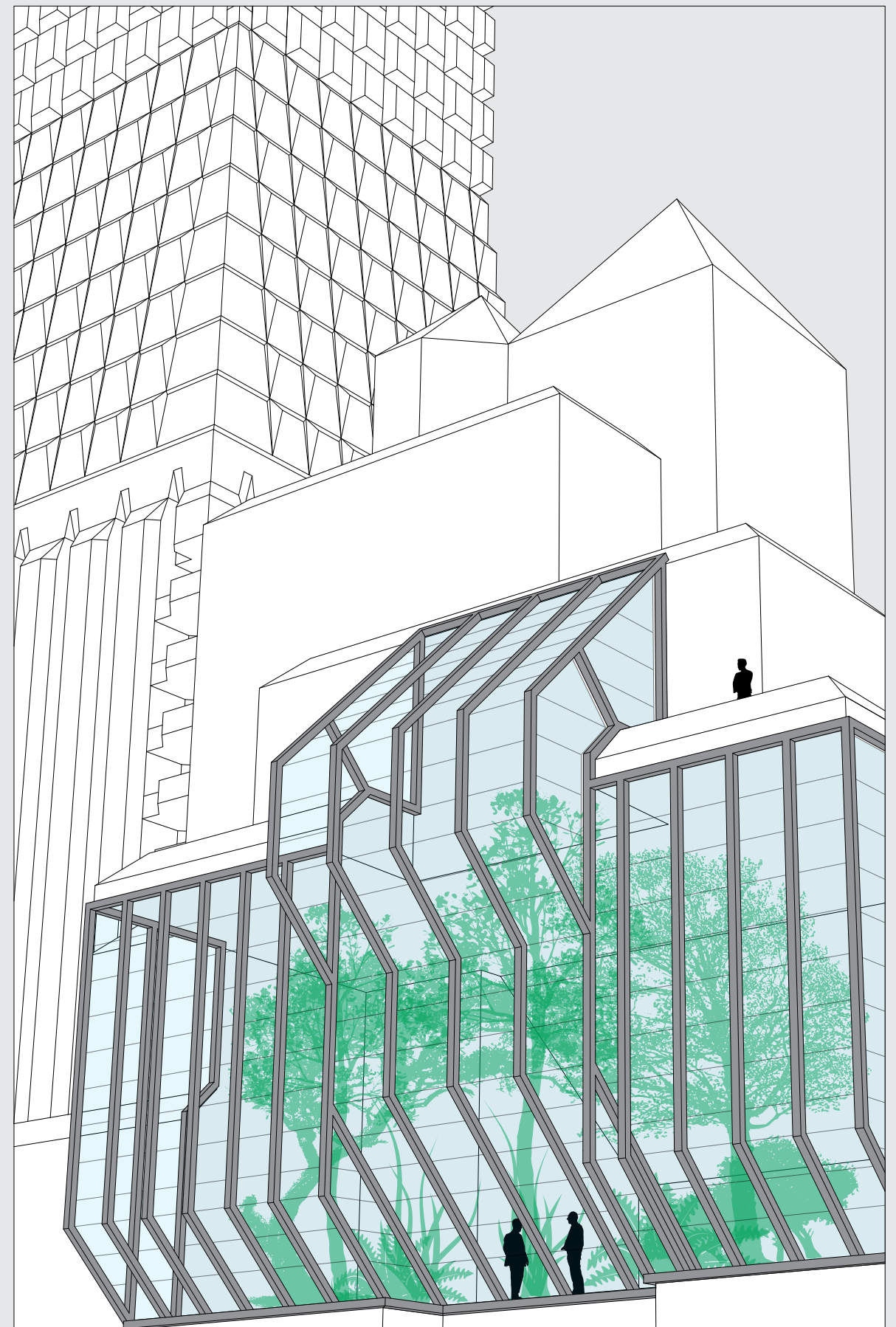
Courtyard garden with views in to the street alley



The housing block frames the courtyard garden while opening up on one side towards its surroundings.

Semi-enclosed courtyard garden

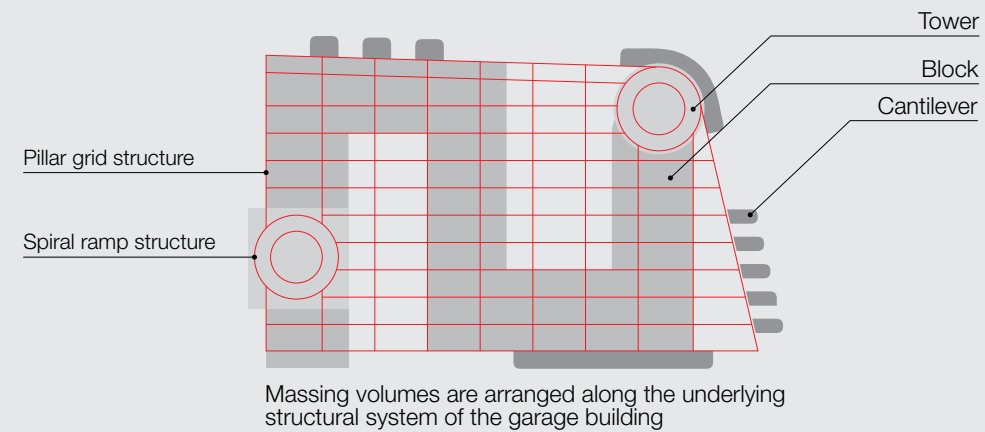
Level 5 - Courtyard garden



Wintergarden is placed on the southern side of the communal hall to maximize direct sunlight.

Massing in relation to structure

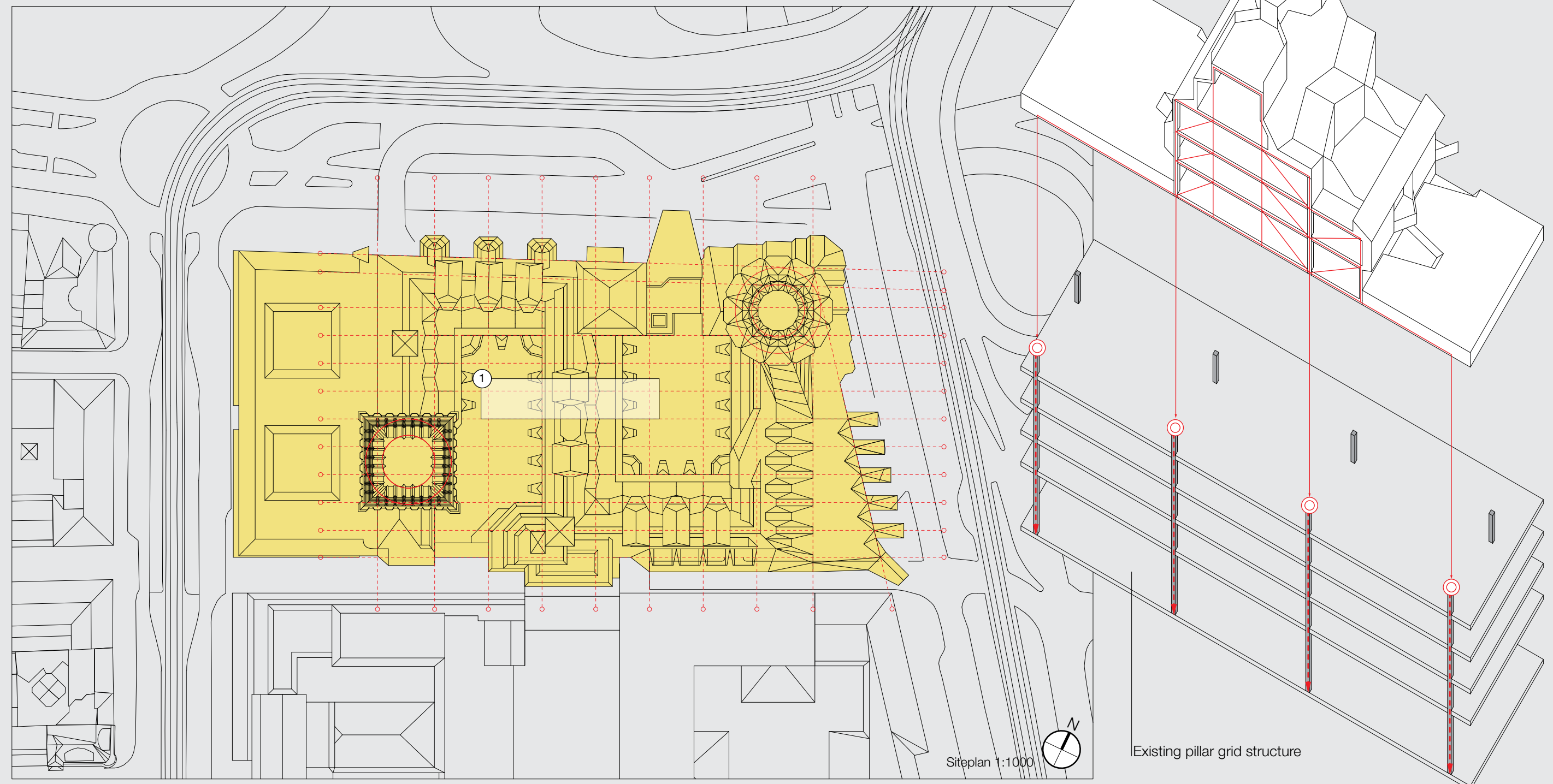
The layout of the massing is influenced by the existing parking garage structure. The plateau is influenced by the orthogonal pillar grid while the towers sits on top of the spiral ramp cylinders.

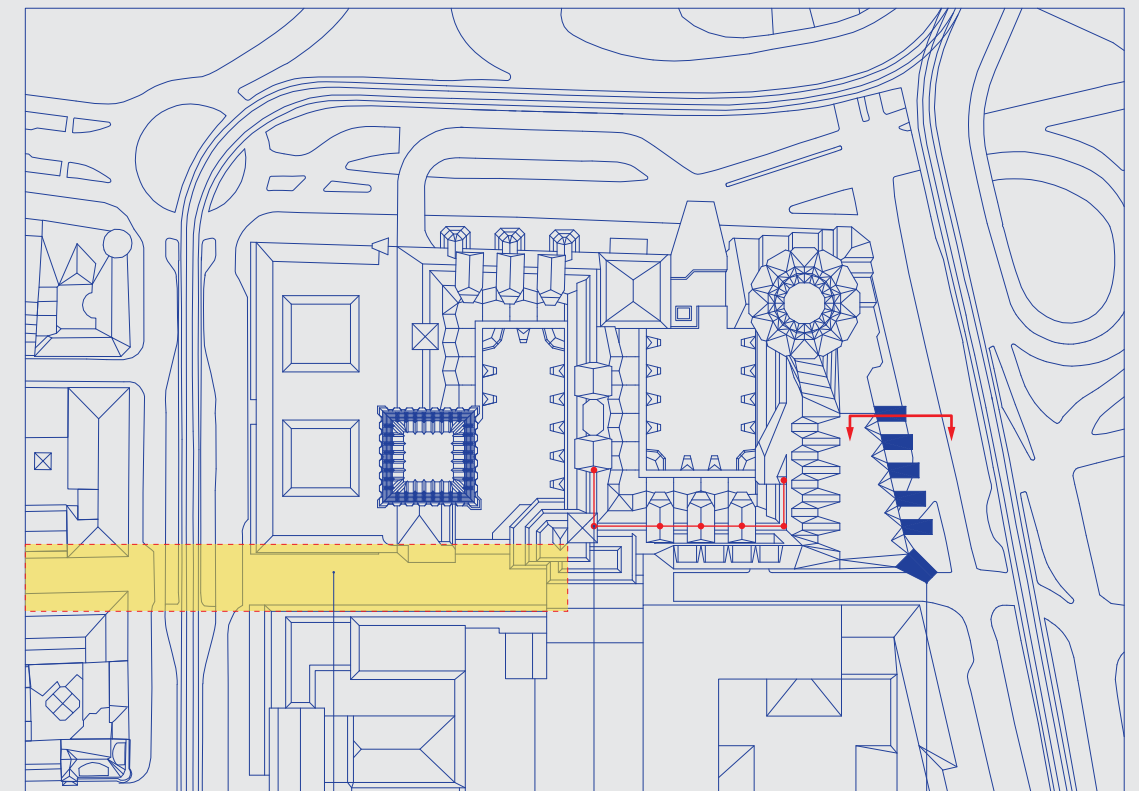
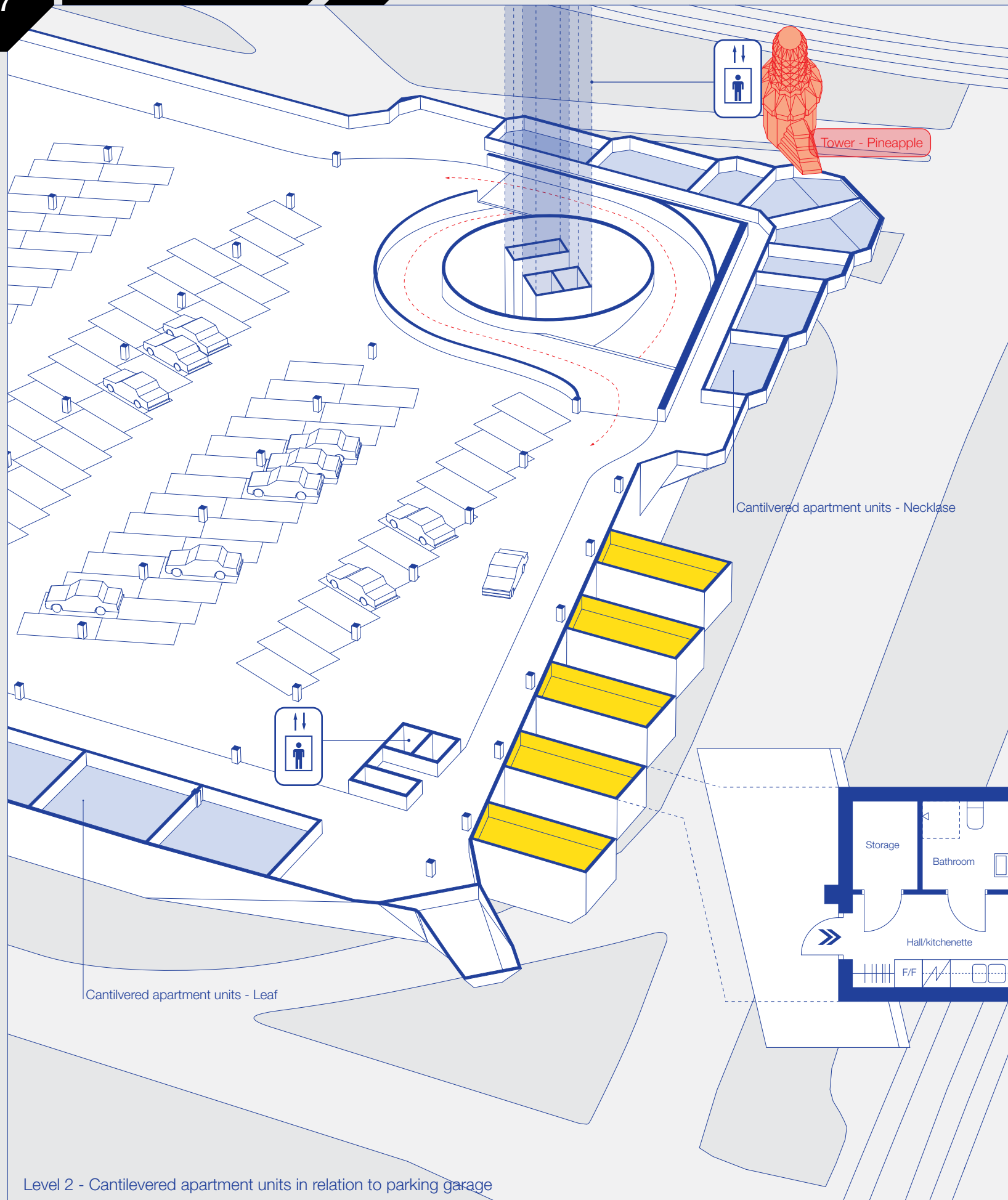


Structural forces move down from the housing volume that come together to funnel through the existing pillar grid structure.

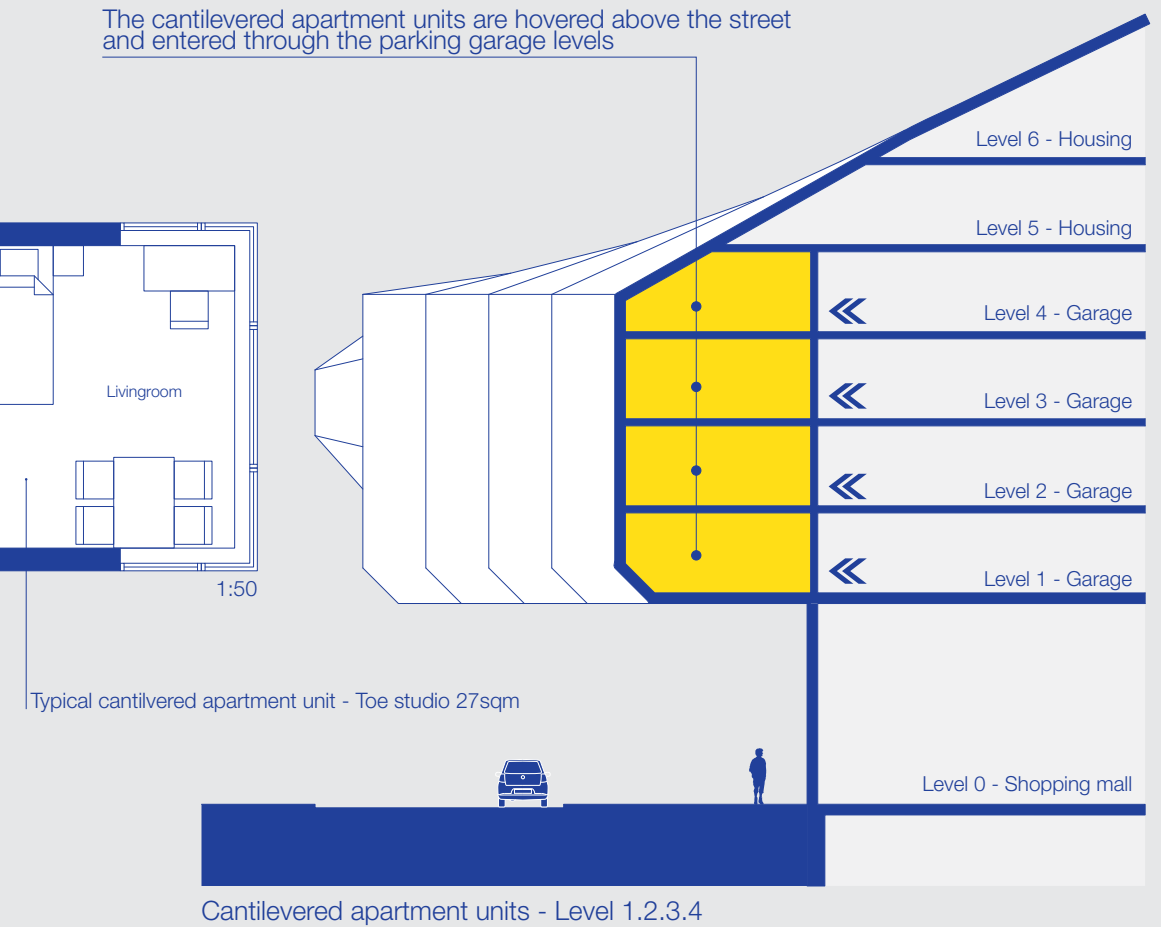
1

Housing volume

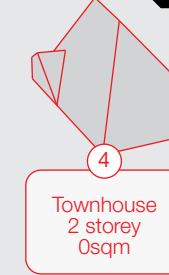
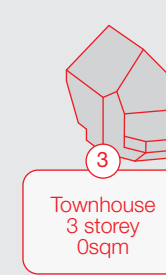
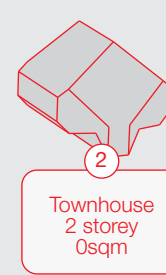
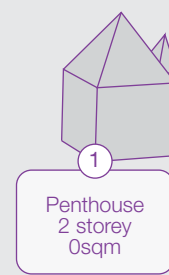




The cantilevered apartment units are hovered above the street and entered through the parking garage levels



Entrance situation - Tower Biscuit



Spine - Core for Biscuit

Penthouse accessed via lift up to level 11.

Townhouses are entered through the sky street via lift up to level 8.

Entrance to apartments
+sky street

Commercial space

Spiral ramp for cars to exit parking garage

Entrance to adjoining office building

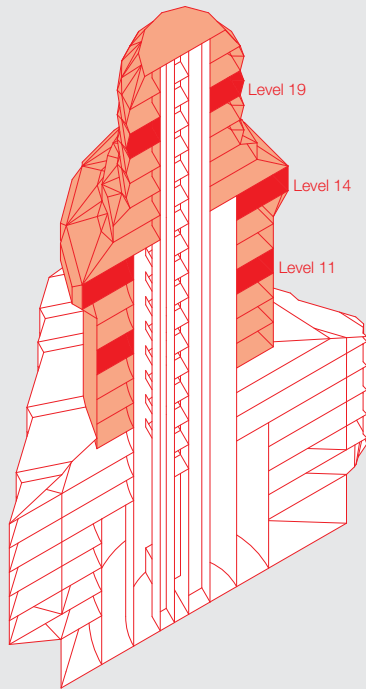
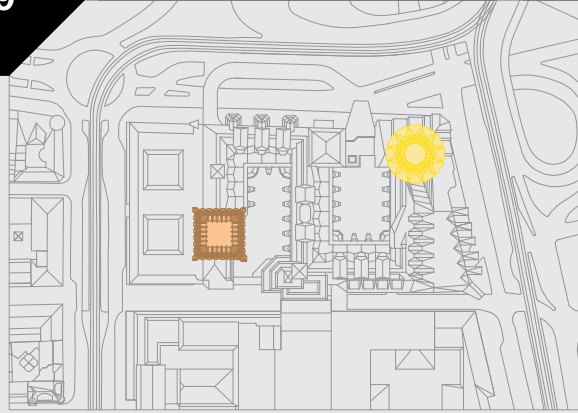
Commercial space

Shopping mall street

Commercial space

Street entrance to Biscuit Tower

Entrance situation - Townhouse



Level 12 - 491sqm

Level 11 - 523sqm

Level 10 - 564sqm

Level 9 - 614sqm

Level 8 - 633sqm

Level 21 - 192sqm

Level 20 - 192sqm

Level 19 - 192sqm

Level 18 - 192sqm

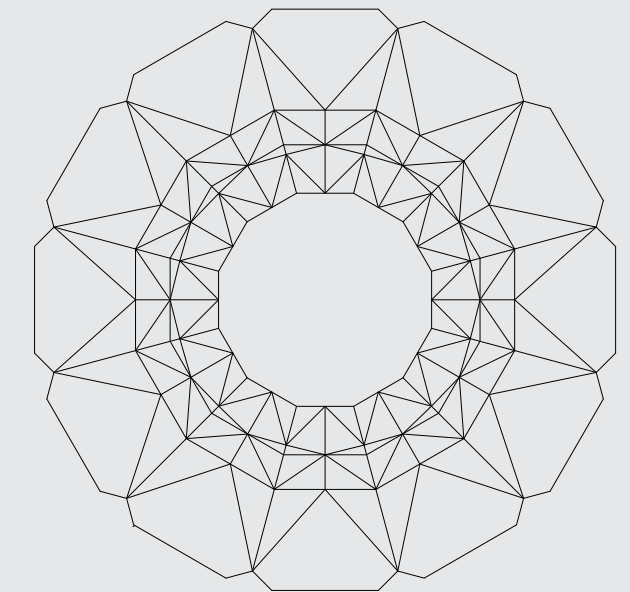
Level 17 - 192sqm

Level 16 - 352sqm

Level 15 - 630sqm

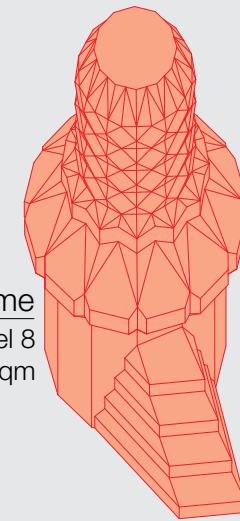
Level 14 - 708sqm

Level 13 - 463sqm

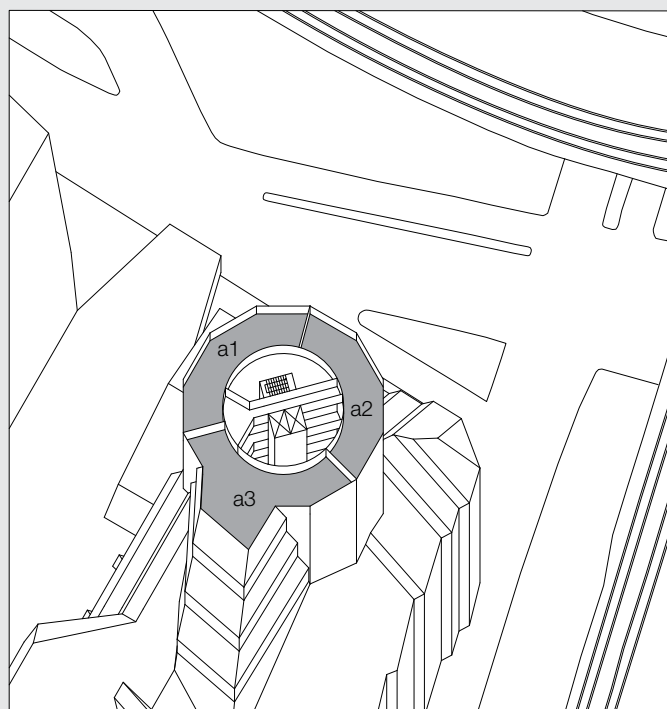


Tower - Pineapple

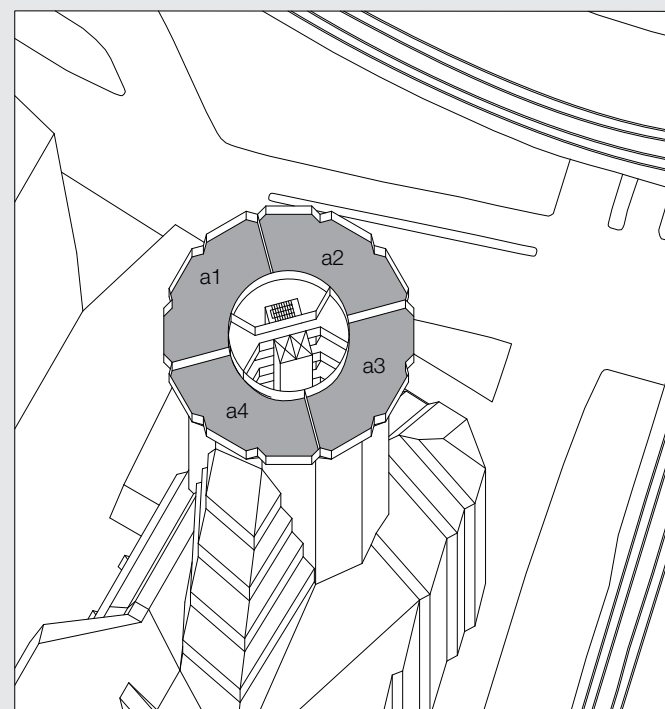
Pineapple volume
14 story high from level 8
Total 4604 sqm



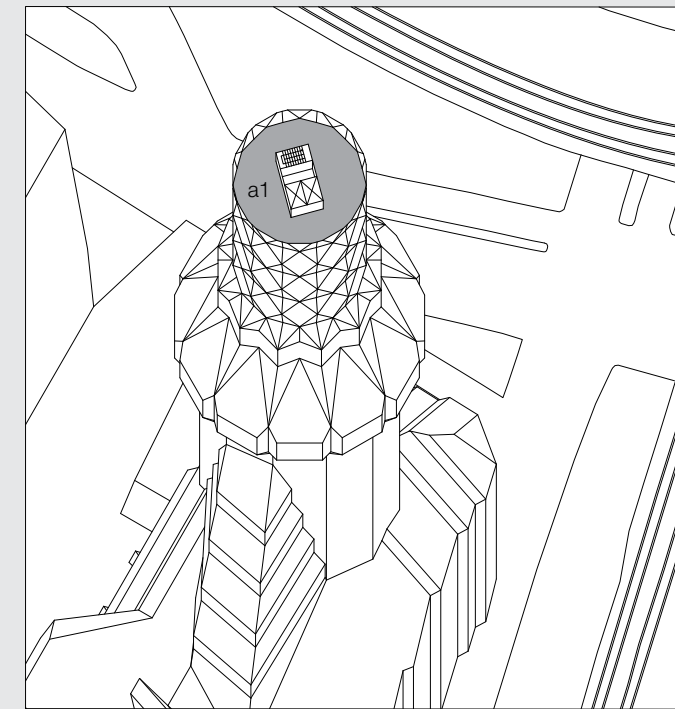
Floorplan layouts within various levels of Pineapple tower



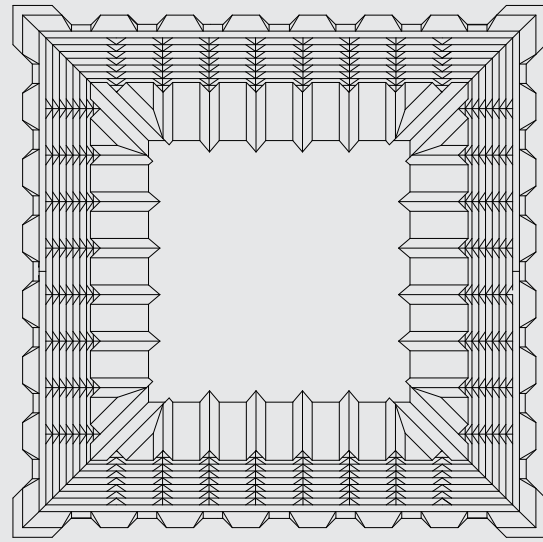
Level 11
3 apartments
a1.a2 - 99sqm
a3 - 156sqm



Level 14
4 apartments
a1.a2 - 129sqm
a3.a4 - 129sqm

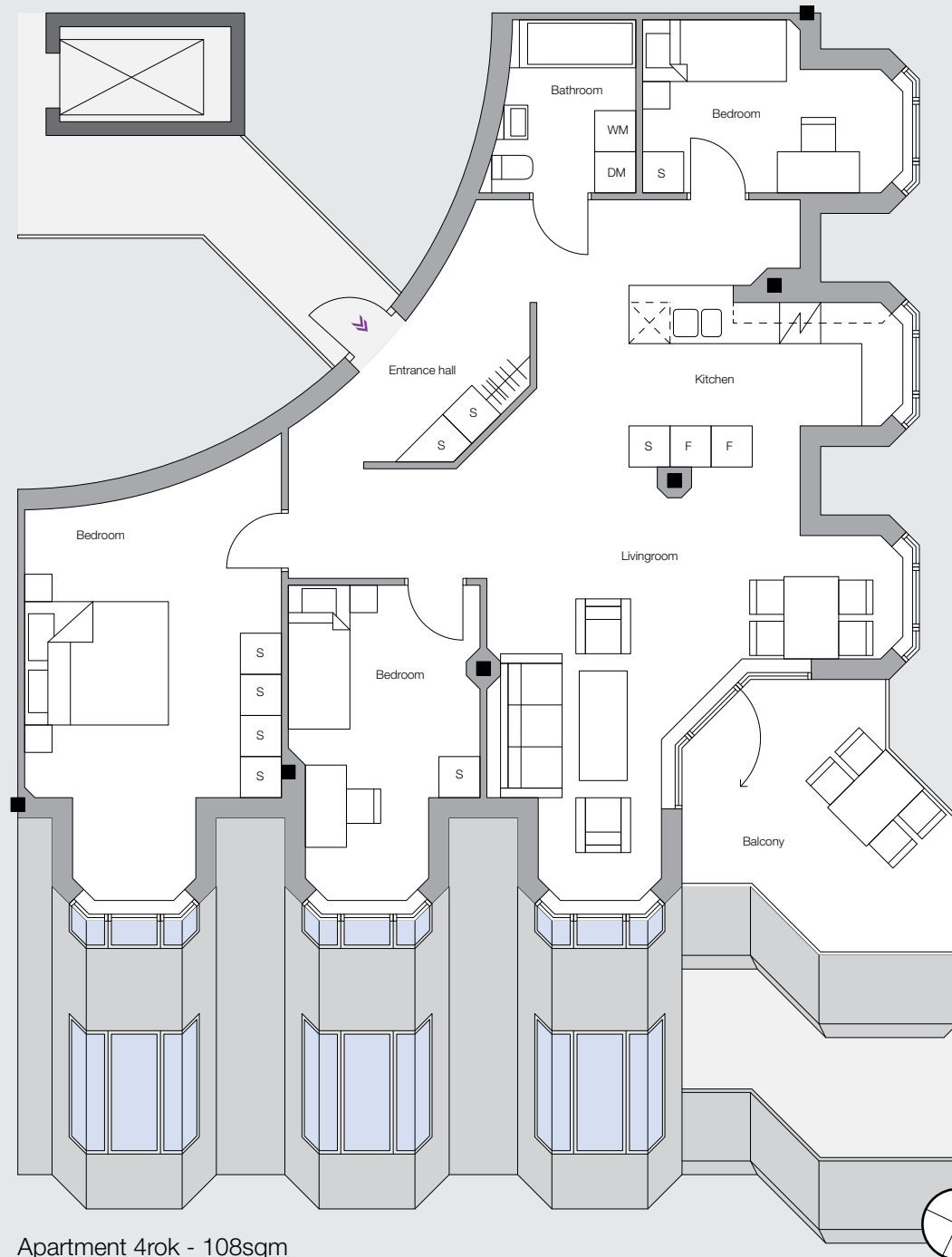


Level 19
1 apartment
a1 - 163sqm

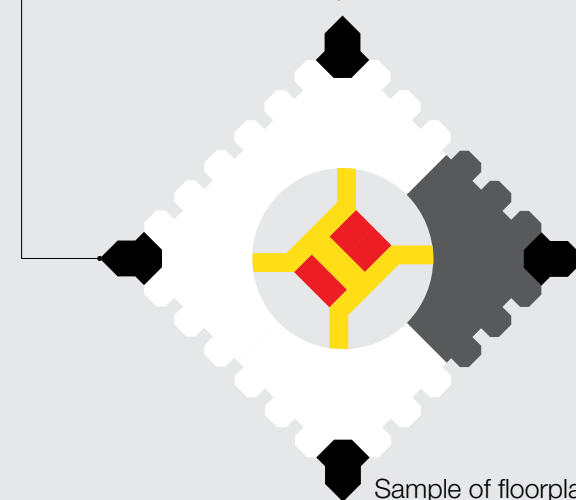
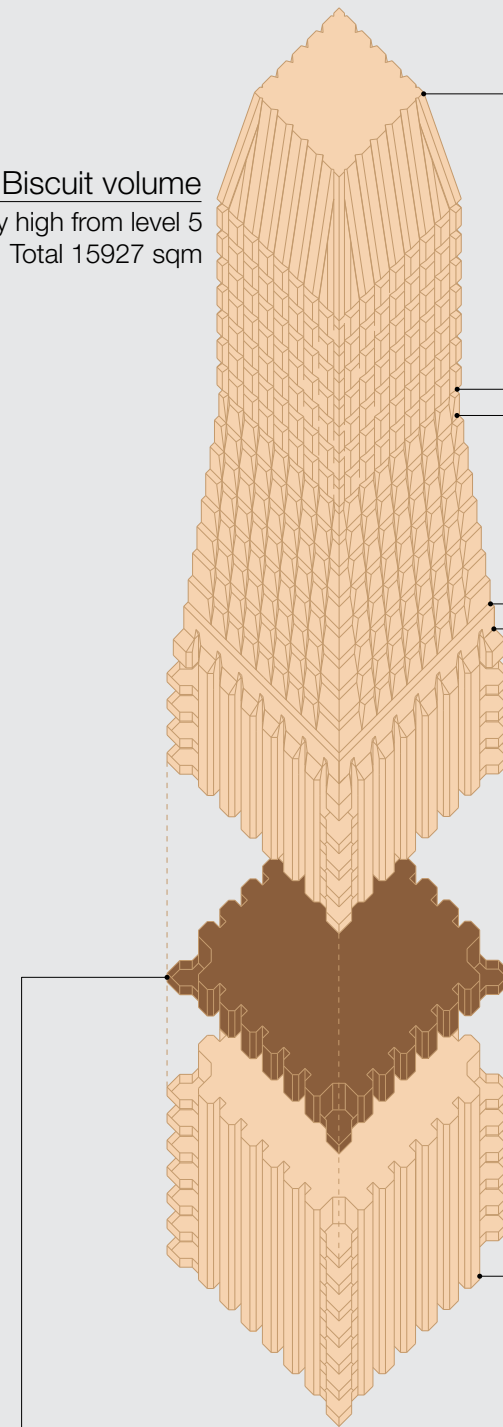


Tower - Biscuit

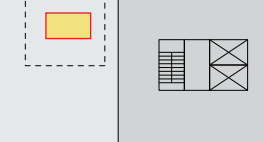
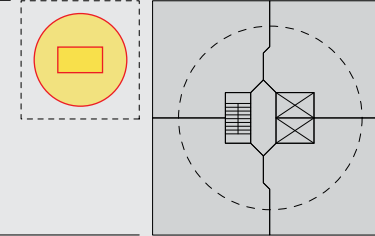
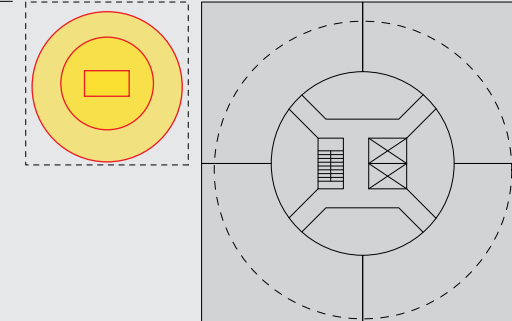
Biscuit volume
32 story high from level 5
Total 15927 sqm



Apartment 4rok - 108sqm



Sample of floorplan - 432sqm

Upper level floorplan
Level 32-37Mid level floorplan
Level 15-31Lower level floorplan
Level 5-15

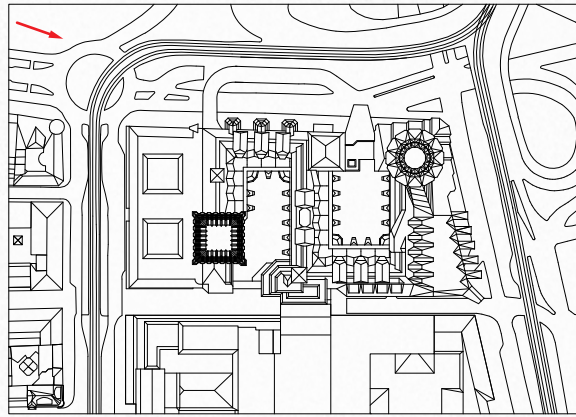
Inner ring

Outer ring

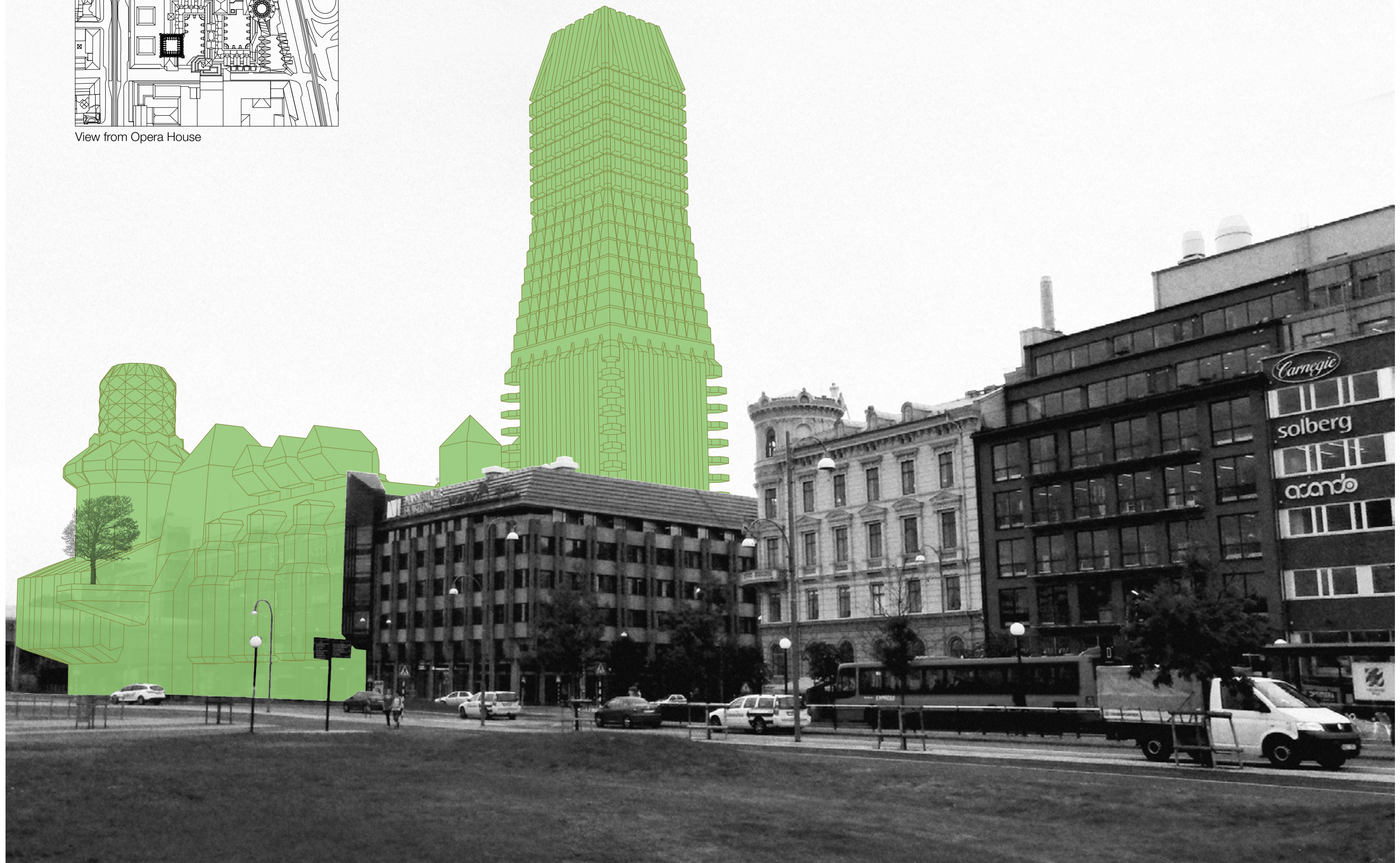
Core

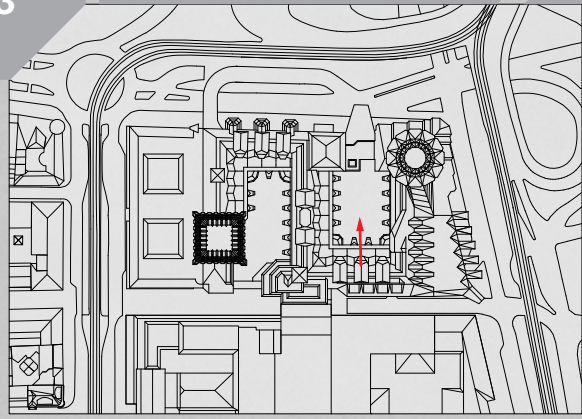
Structural system for Biscuit tower



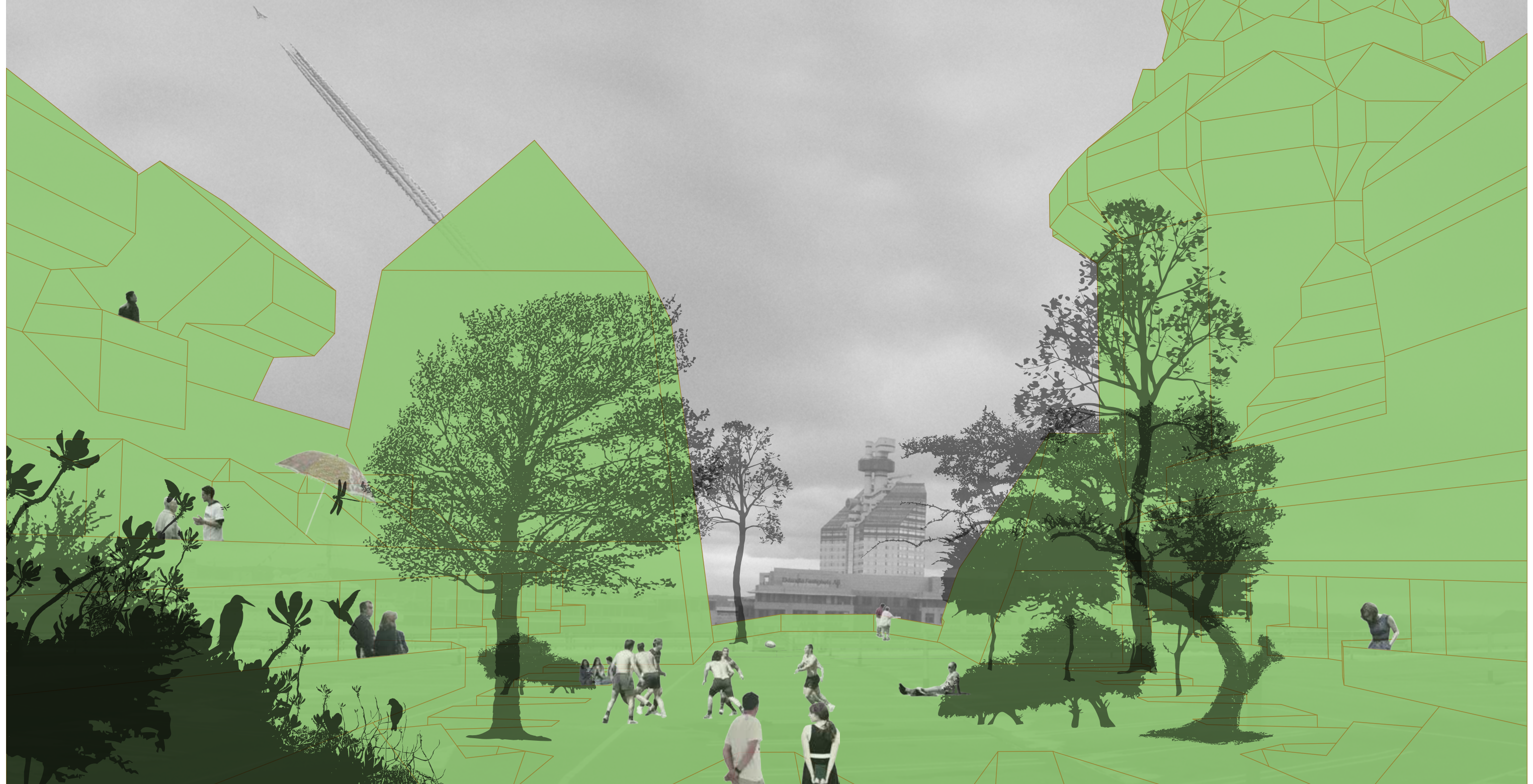


View from Opera House





View from courtyard garden





View from parking garage



