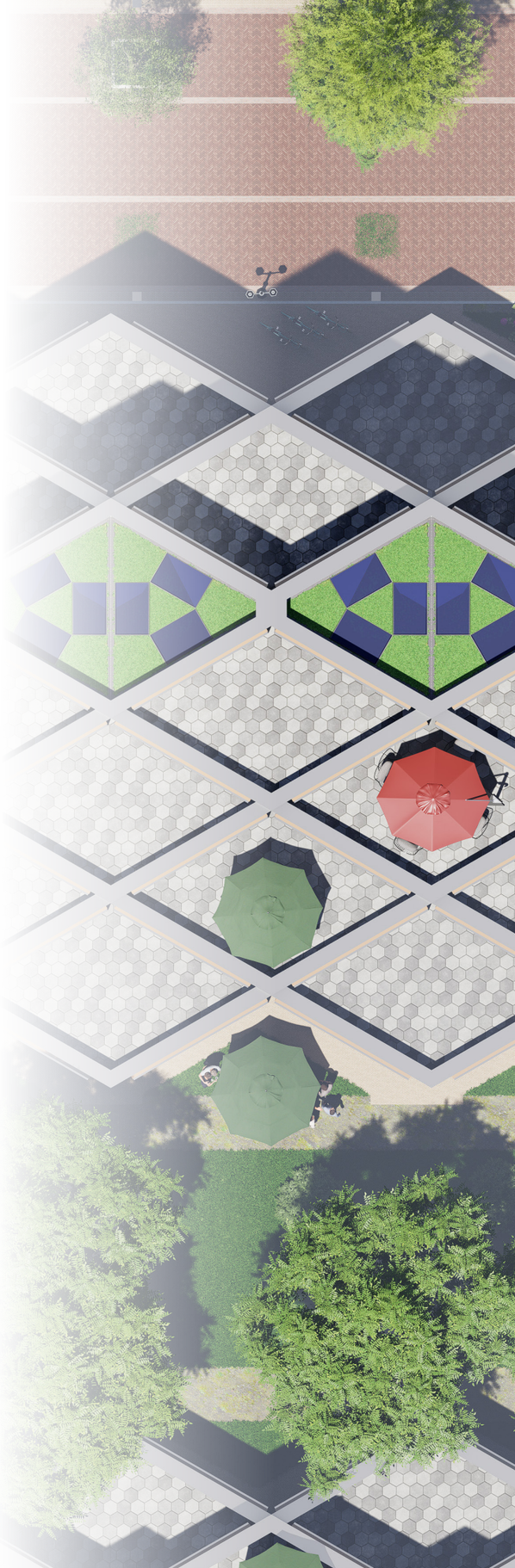
Architectural Engineering
A4

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Max Heerschop
5542030



Architectural Engineering:

Foreword

Current situation

National

Regional

Local

Current situation

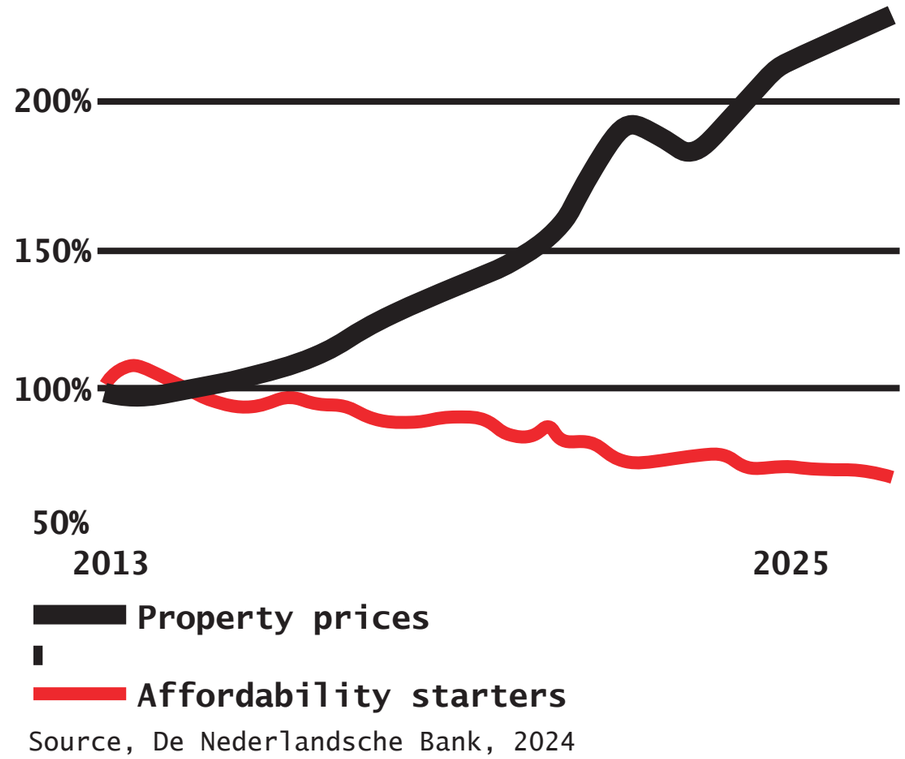
National

‘Everything’s just … on hold’: the Netherlands’ next-level housing crisis



Regional

Local



Source, De Nederlandsche Bank, 2024

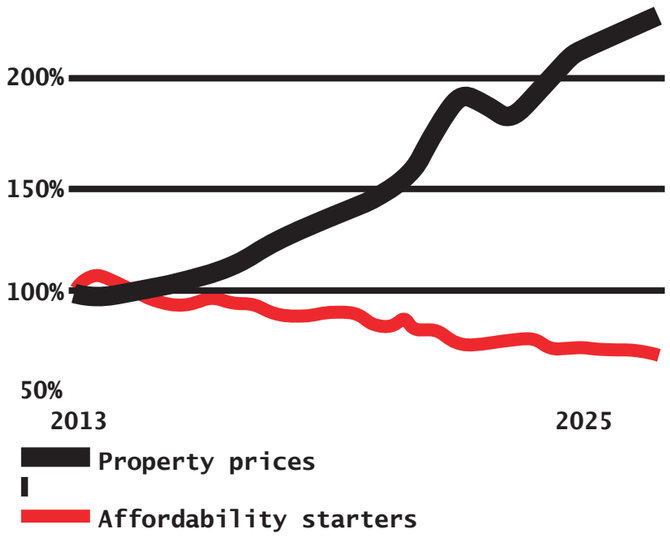
900.000 nieuwe woningen om aan groeiende vraag te voldoen

Er is in Nederland een groot tekort aan woningen. Dit komt onder andere door de groeiende bevolking, lange bouwprocedures en beperkte bouwgrond. Voor veel mensen is het hierdoor lastig een woning te vinden die aansluit bij hun wensen en mogelijkheden. Daarom wil de Rijksoverheid dat er 900.000 woningen gebouwd worden tot en met 2030.

Ministerie van Volkshuisvesting en Ruimtelijke Ordening

Current situation

National



Source, De Nederlandsche Bank, 2024

Soaring property prices

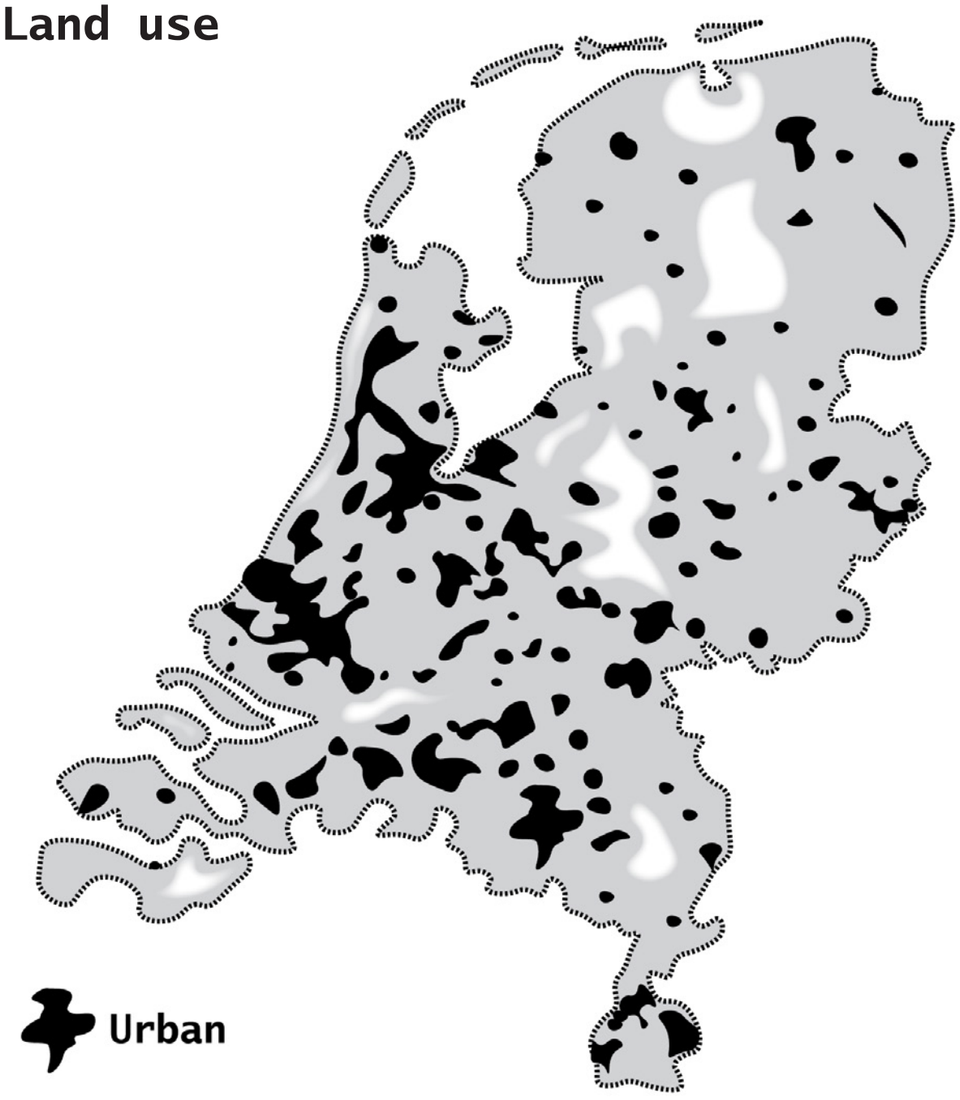
Shortage ~1 million homes

1.8 million people live in personal unpreffered typologies

Regional

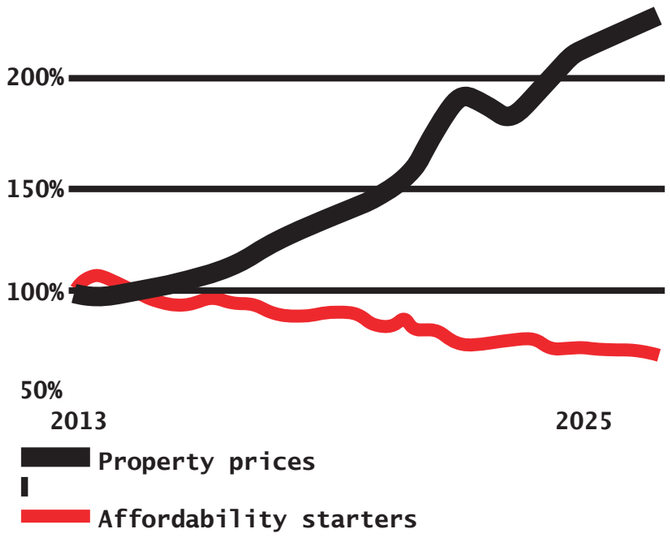
Local

Land use



Current situation

National



Source, De Nederlandsche Bank, 2024

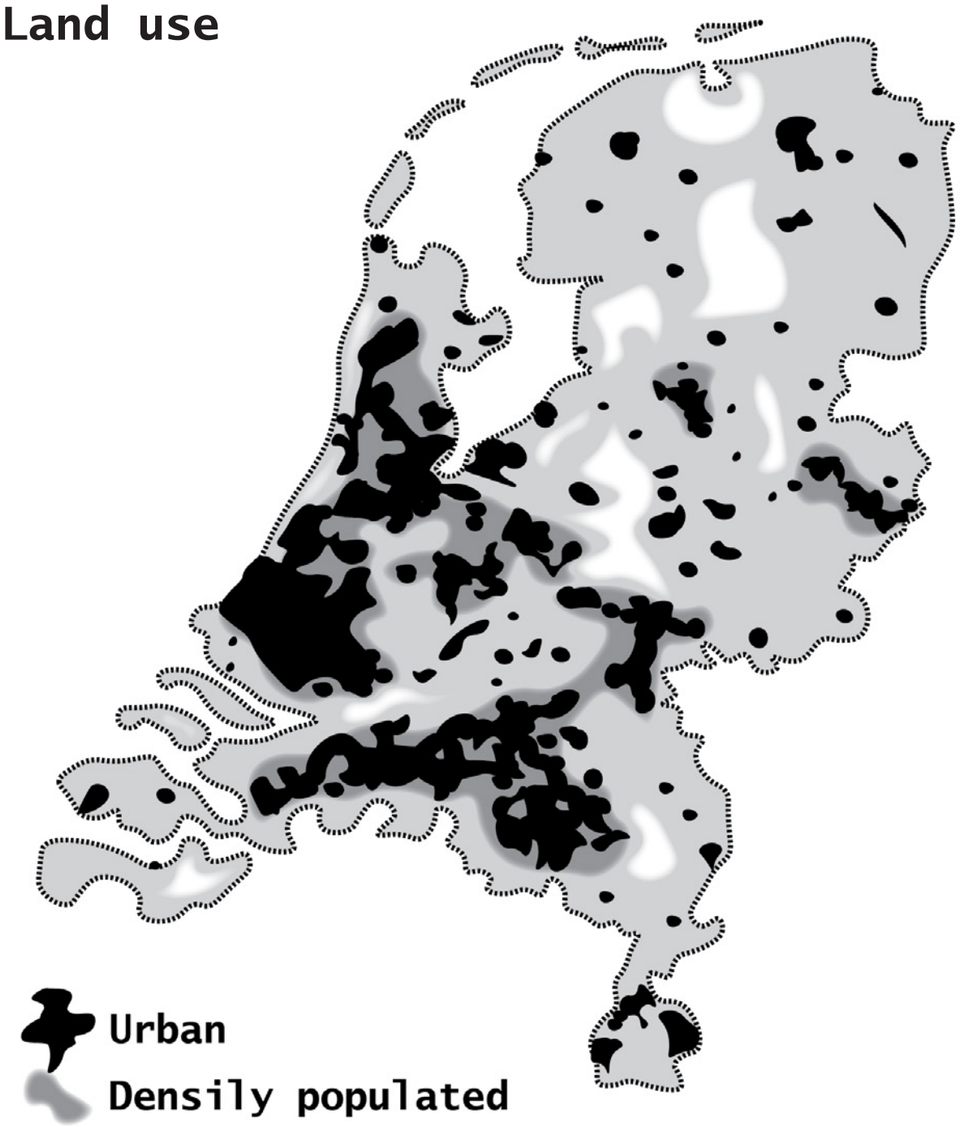
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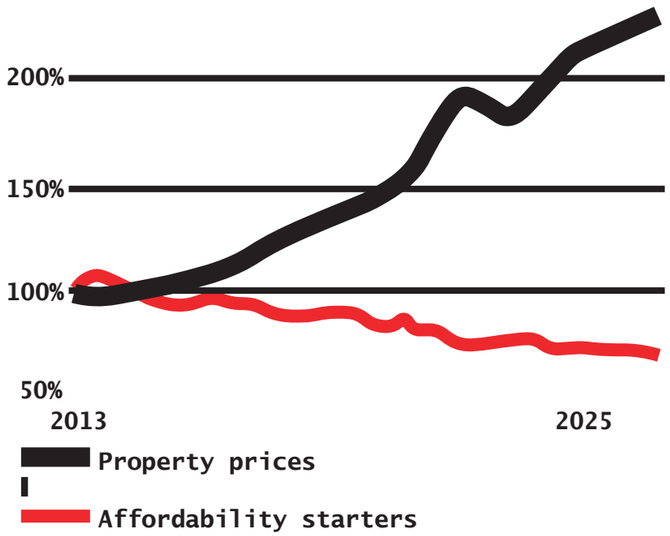
Land use



Local

Current situation

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Source, De Nederlandsche Bank, 2024

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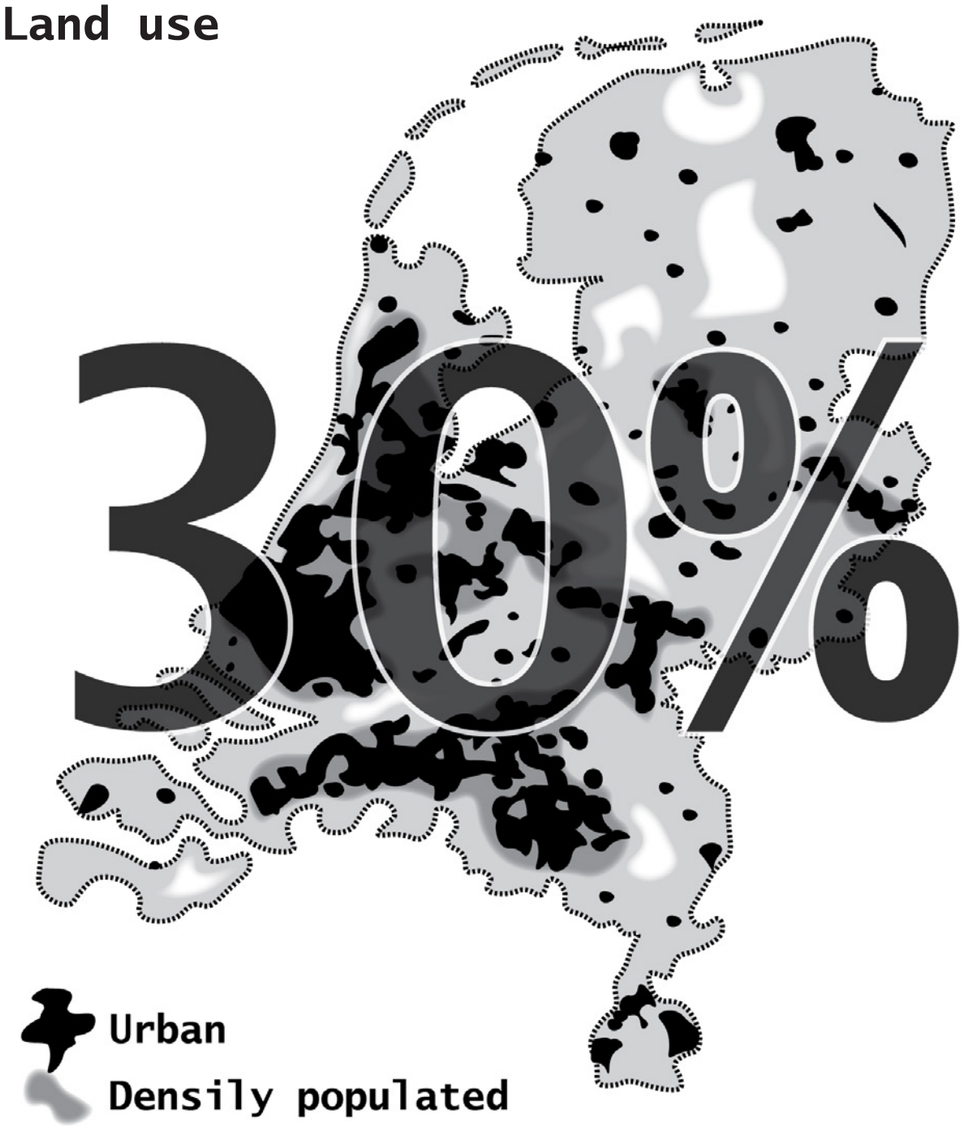
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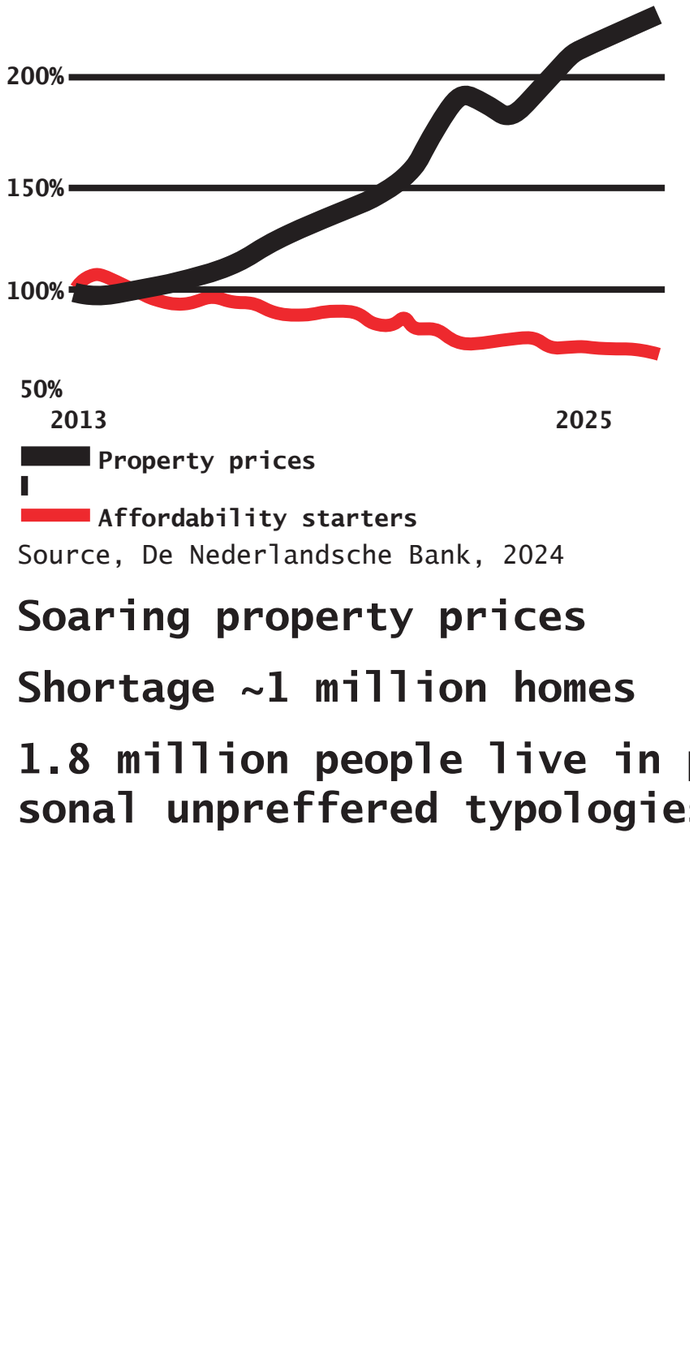
Local

Land use



Current situation

National



Source, De Nederlandsche Bank, 2024

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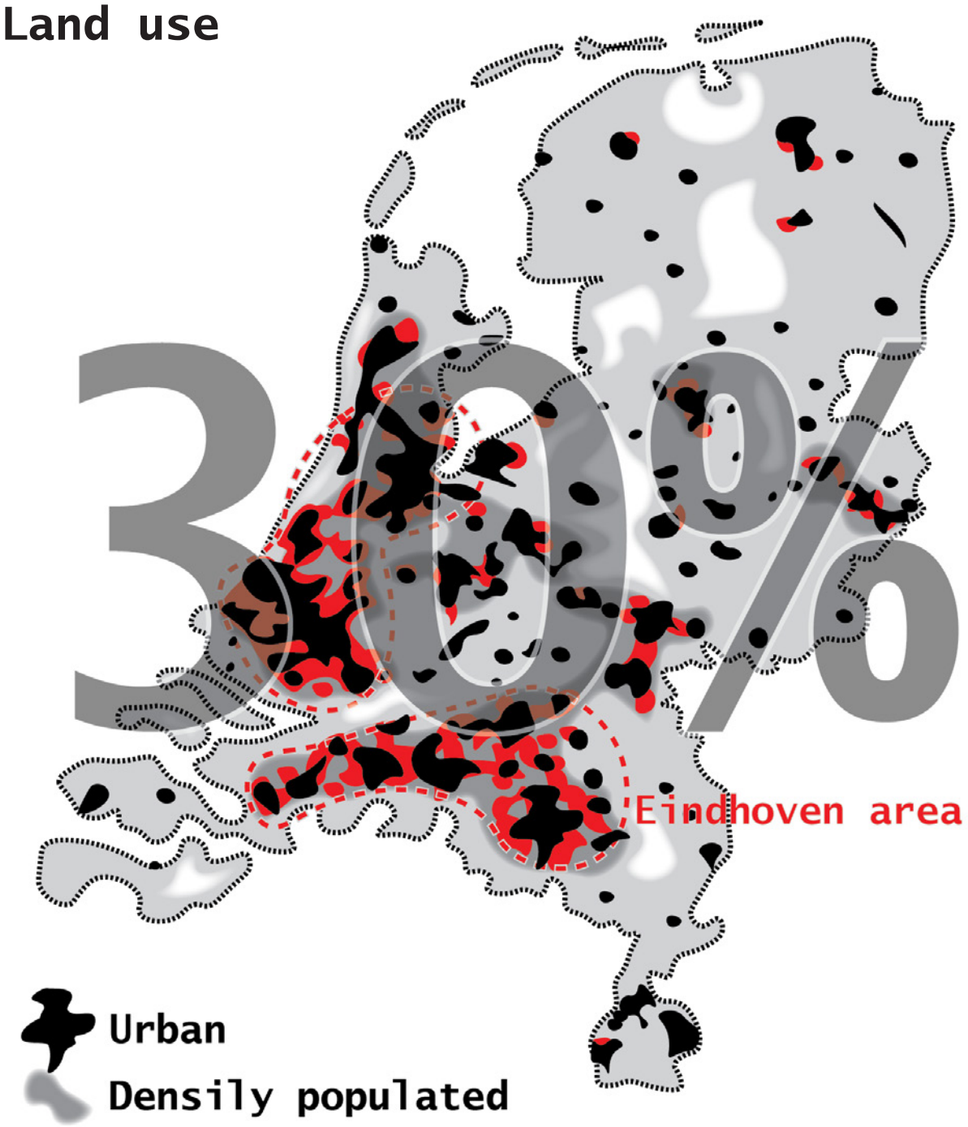
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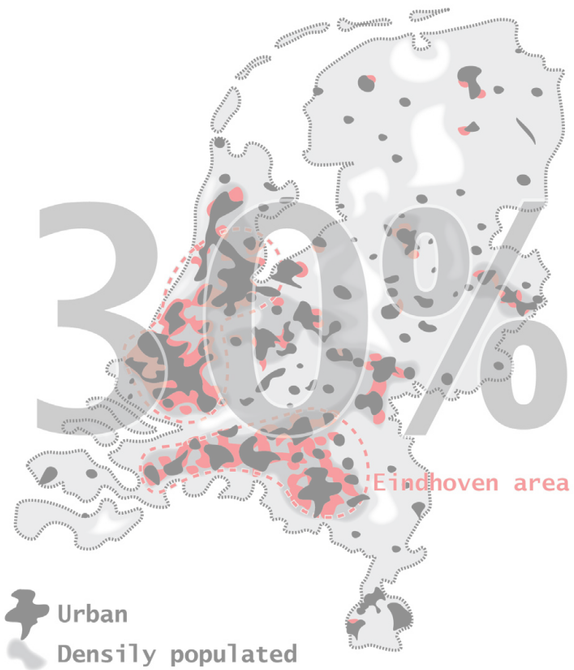
Local

Land use



Current situation

National



Heavy strain on land use

Soaring property prices

Shortage ~1 million homes

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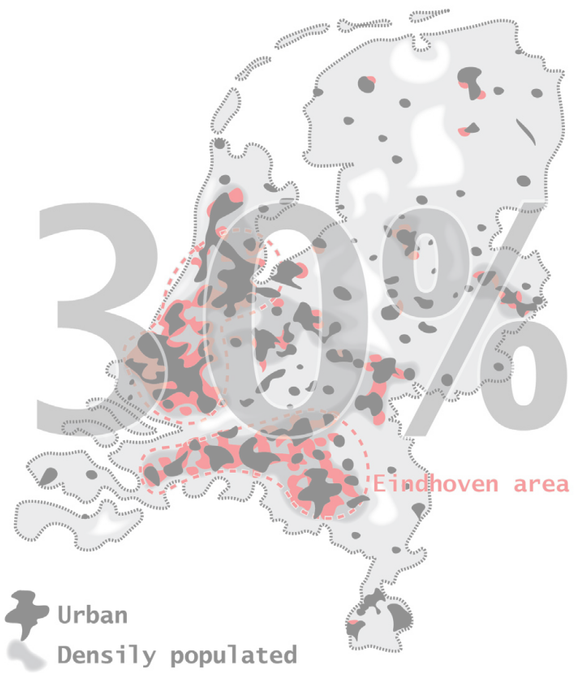
Regional



Local

Current situation

National



Heavy strain on land use

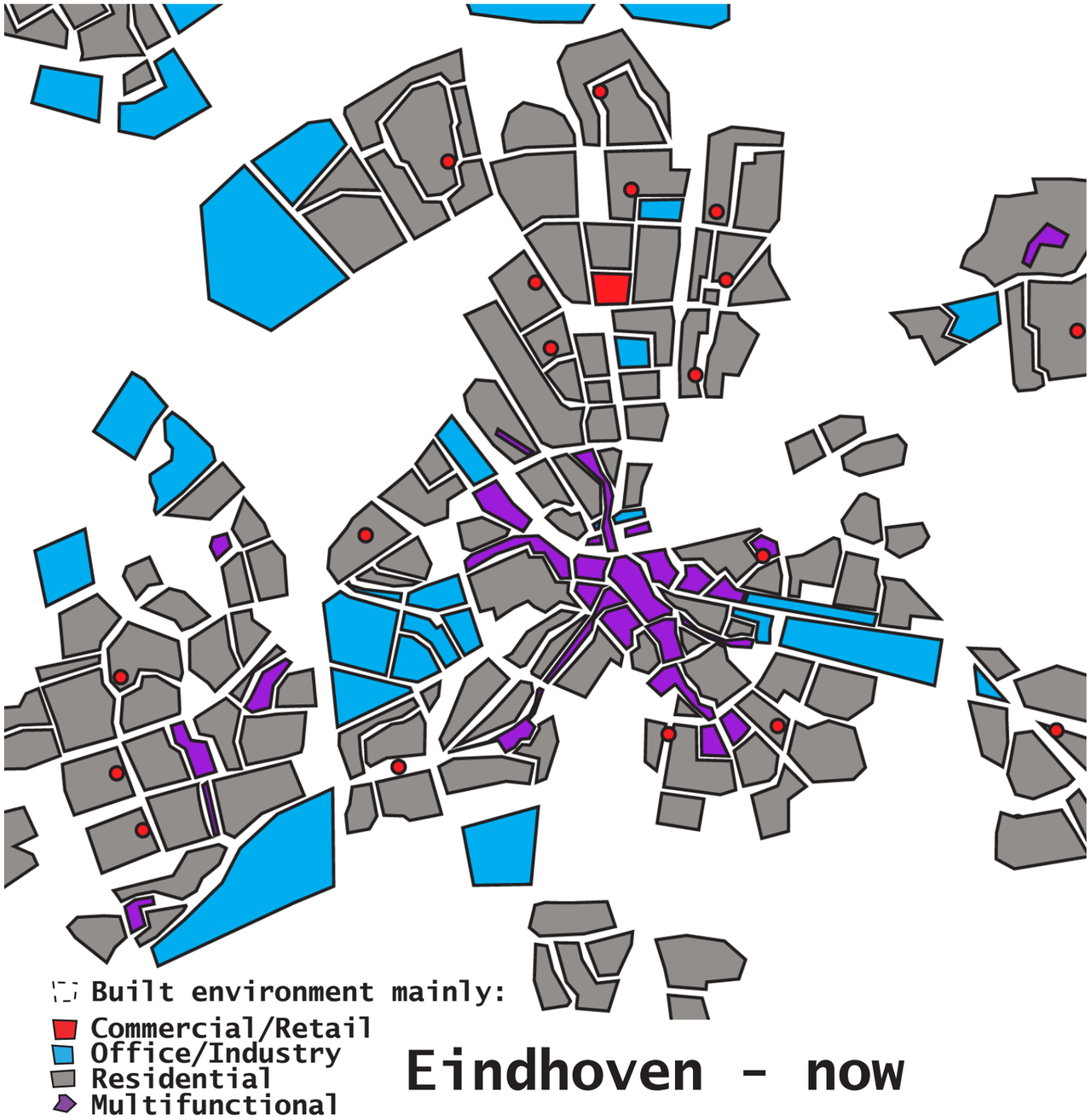
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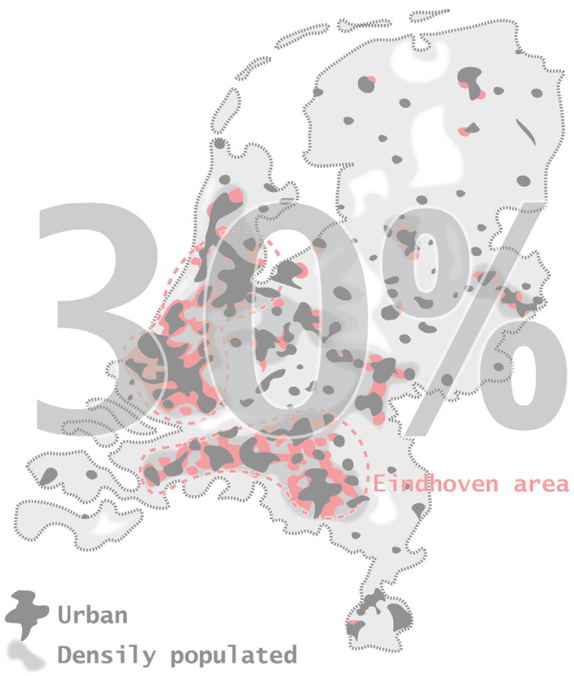
Local



Eindhoven - now

Current situation

National



Heavy strain on land use

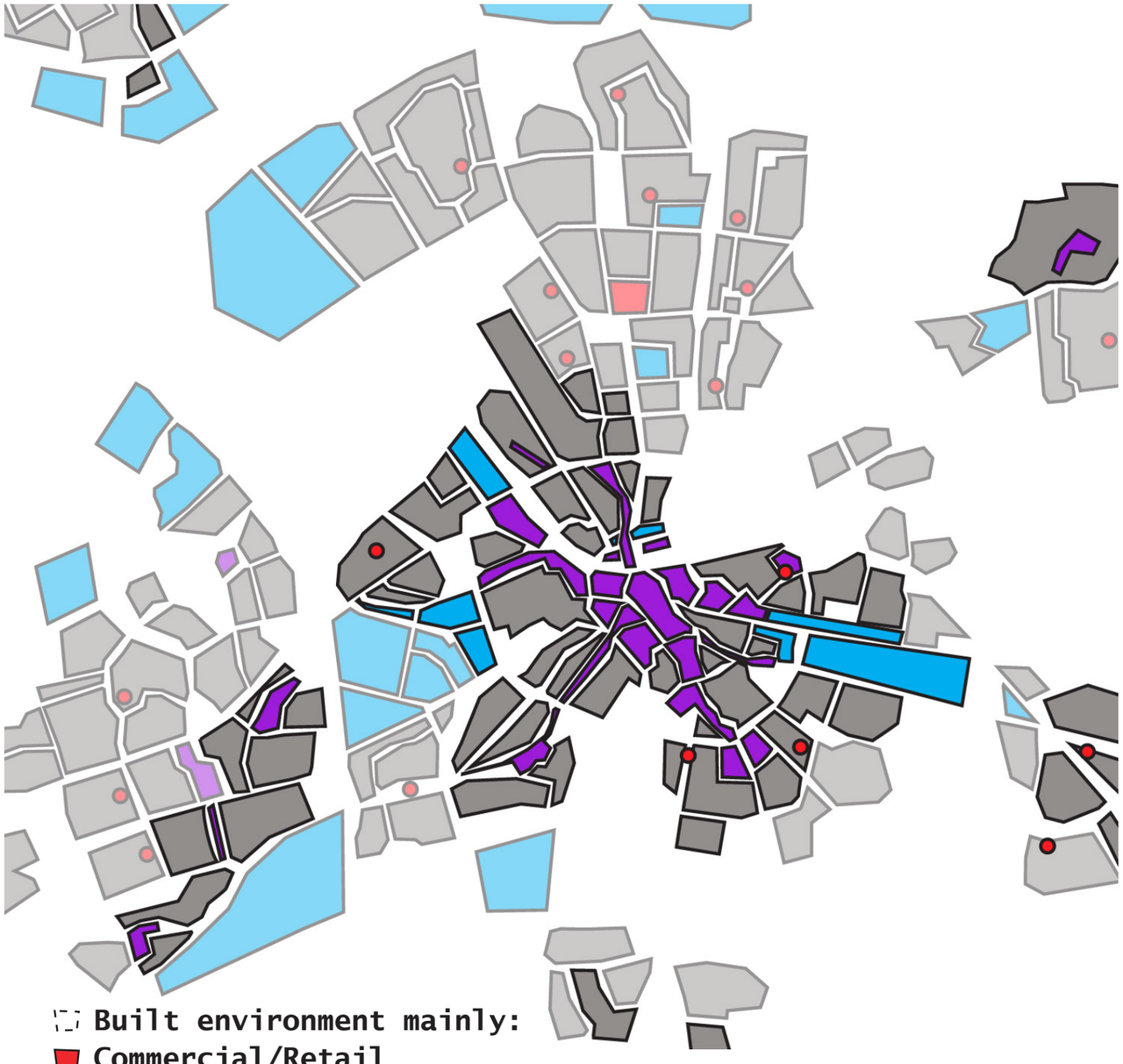
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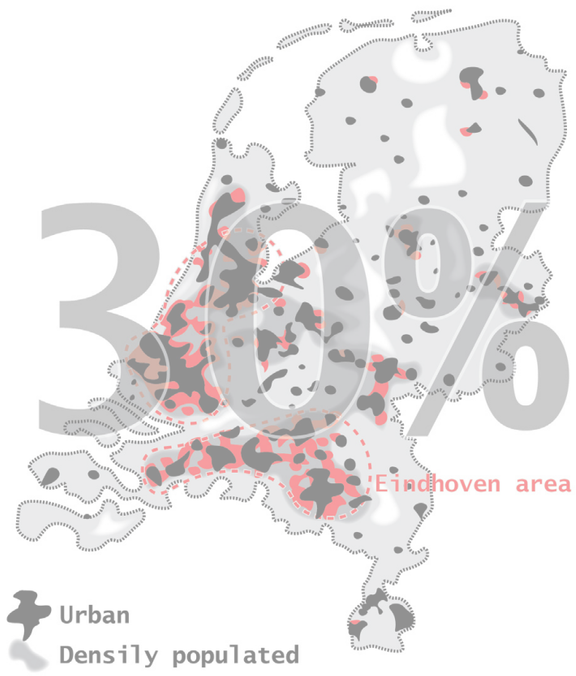
Local



Eindhoven - now

Current situation

National



Heavy strain on land use

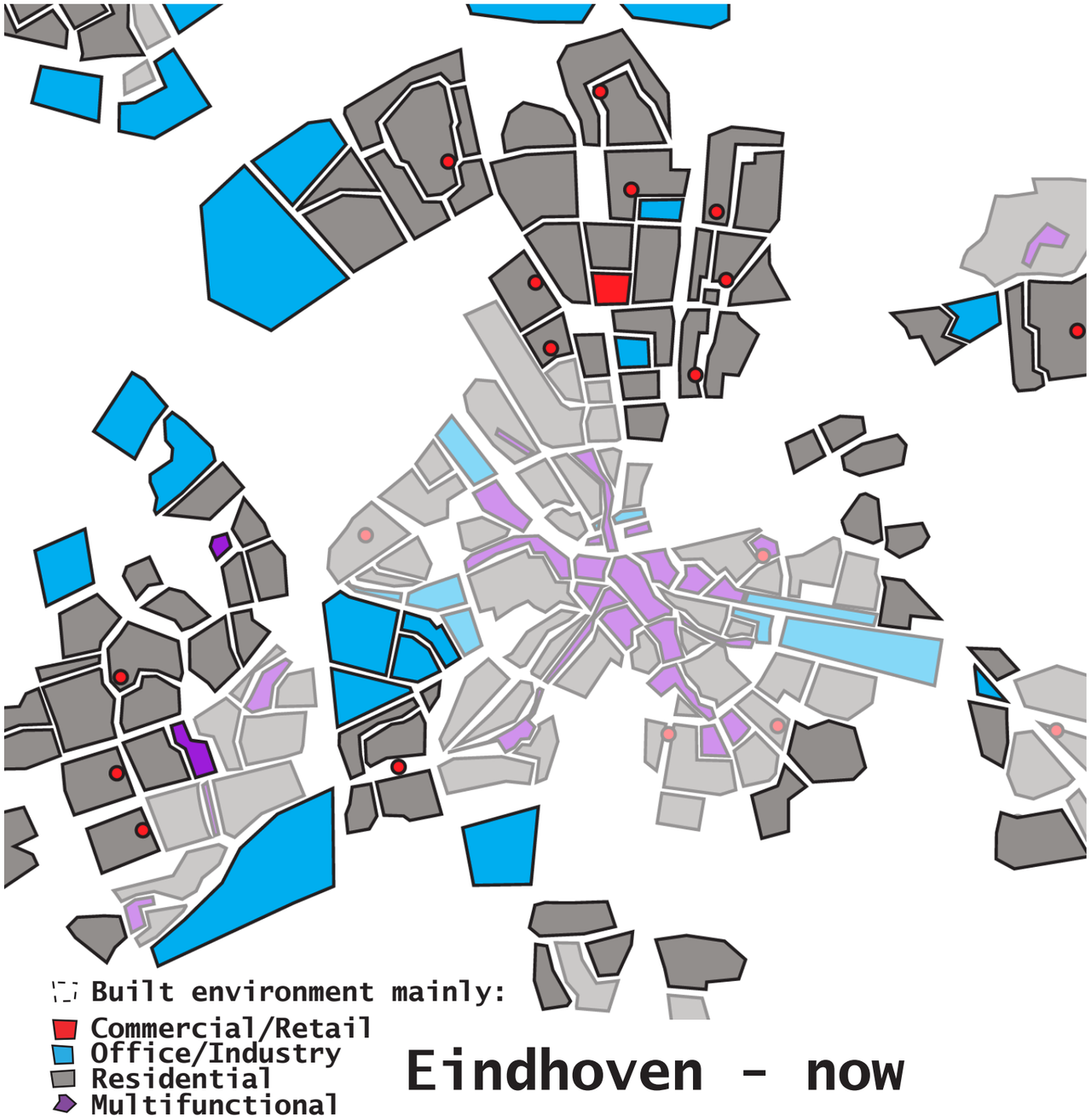
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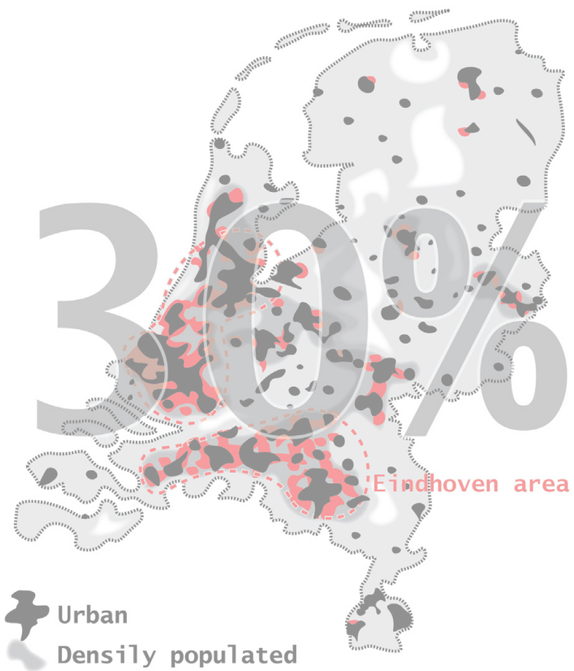
Local



Eindhoven - now

Current situation

National



Heavy strain on land use

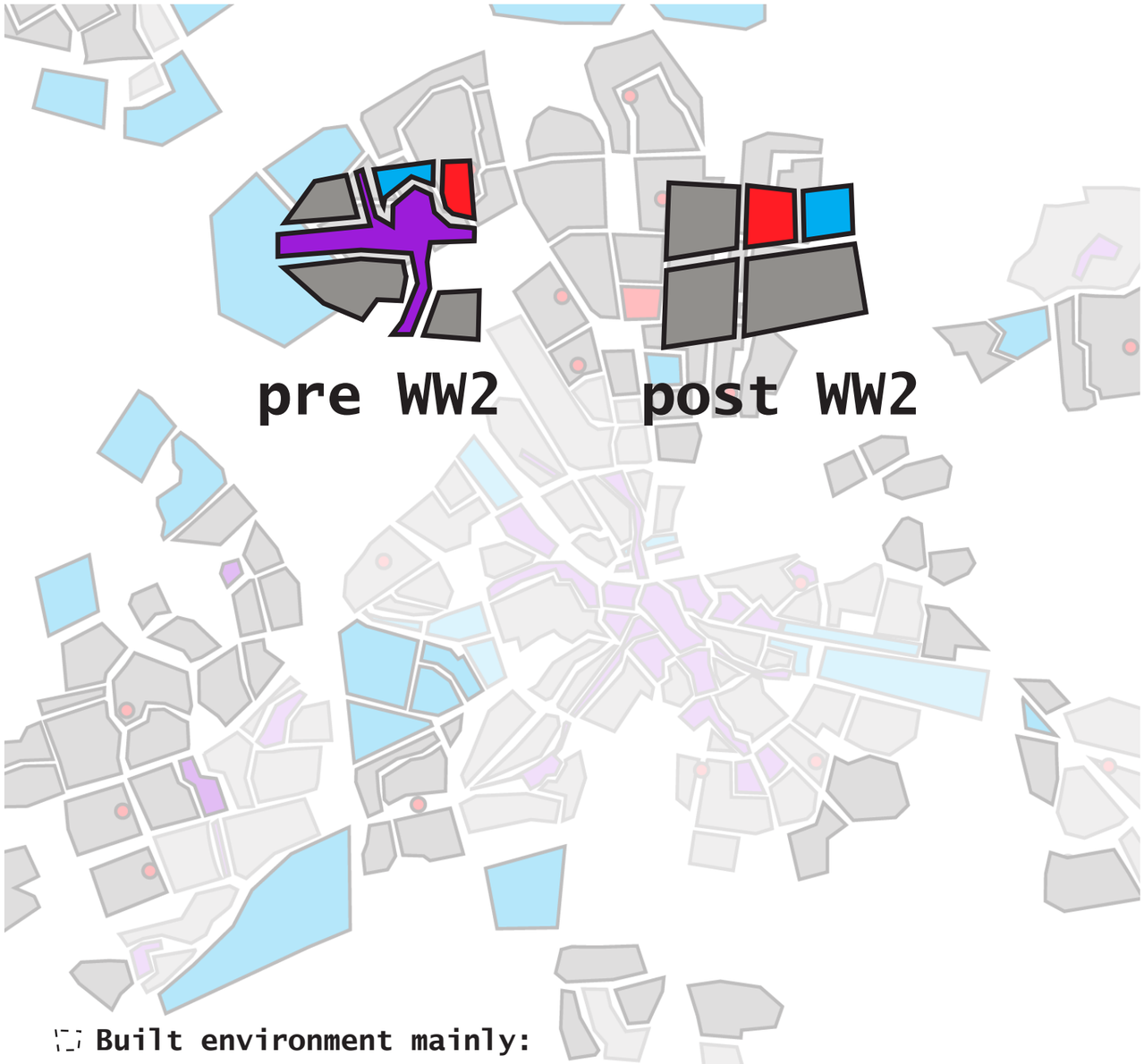
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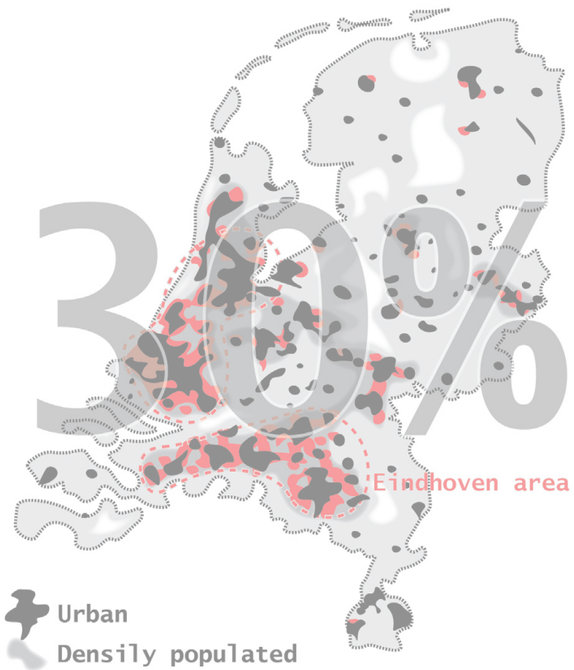
Regional

Local



Current situation

National



Heavy strain on land use

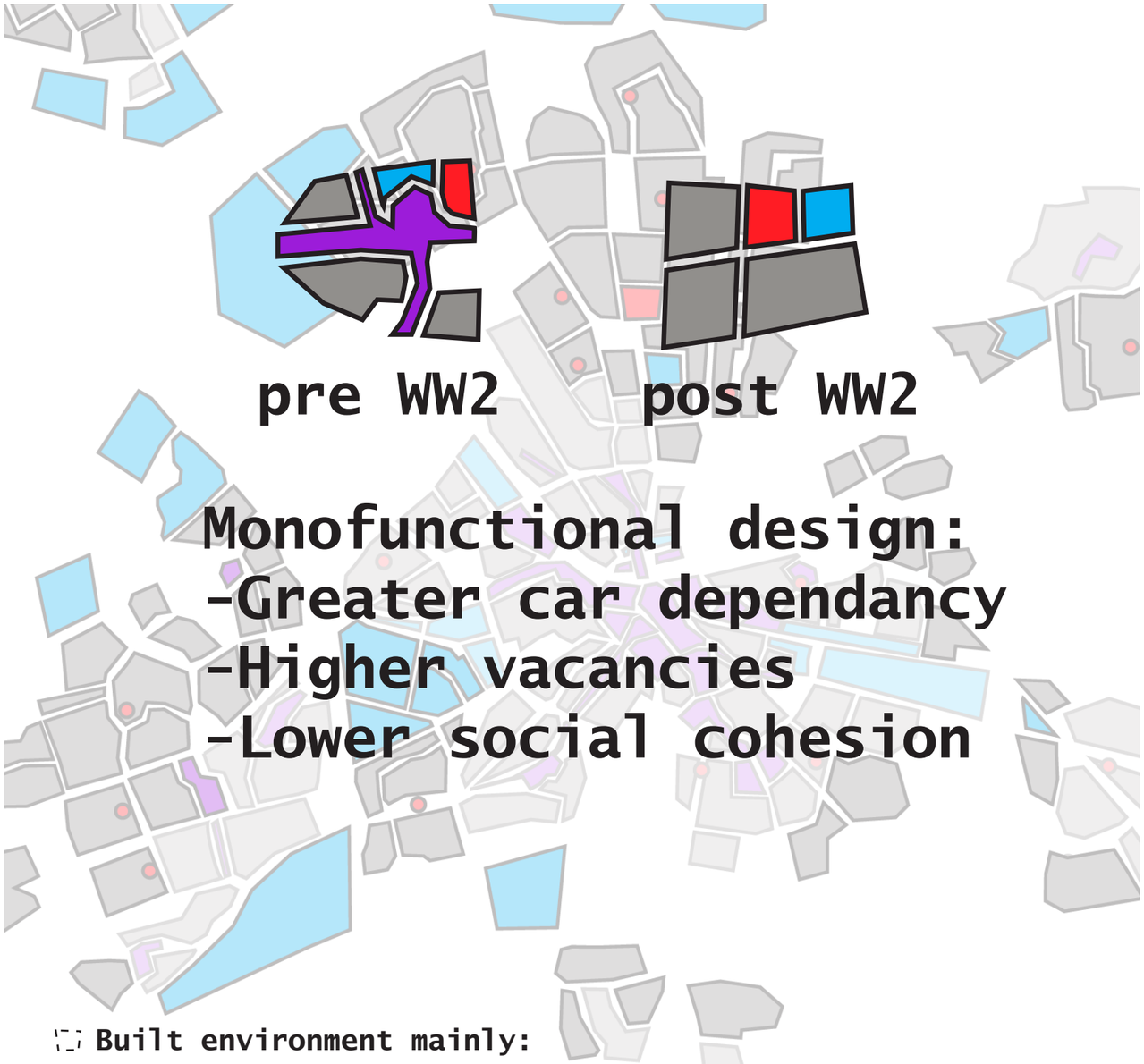
Soaring property prices

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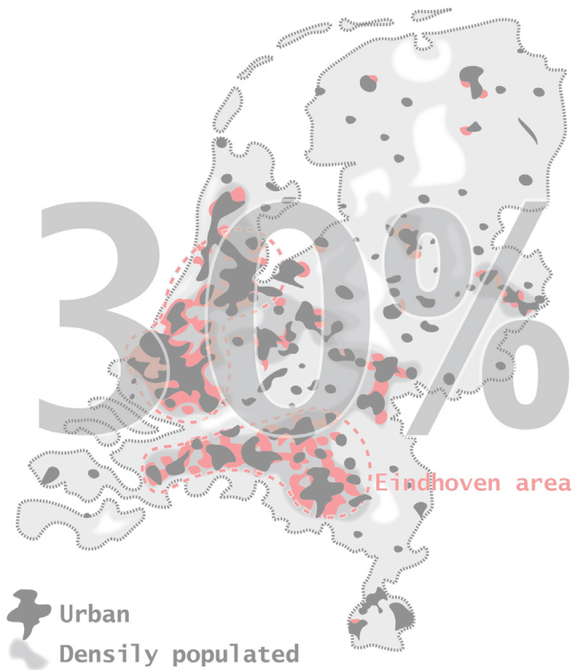
Regional

Local



Current situation

National



Heavy strain on land use

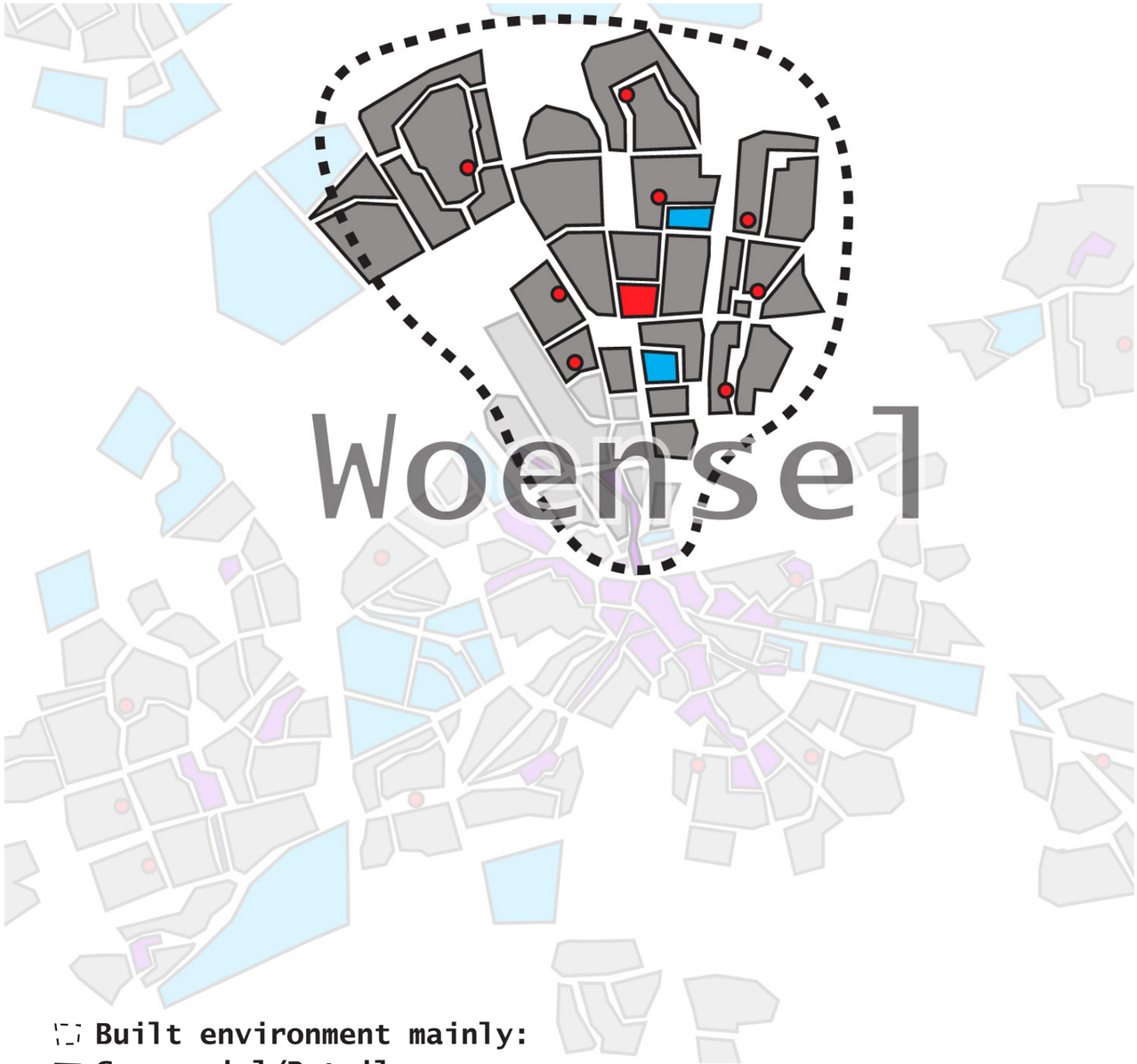
Soaring property prices

Shortage ~1 million homes

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Regional

Local



Eindhoven - now

Current situation

National **Regional** **Local**



Urban
Densily populated

Heavy strain on la

Soaring property p

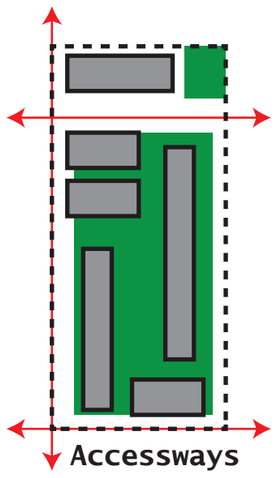
Shortage ~1 millio

1.8 million people
sonal unpreffered

Current situation

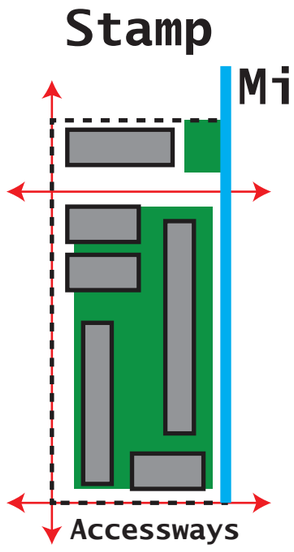
Local

Stamp



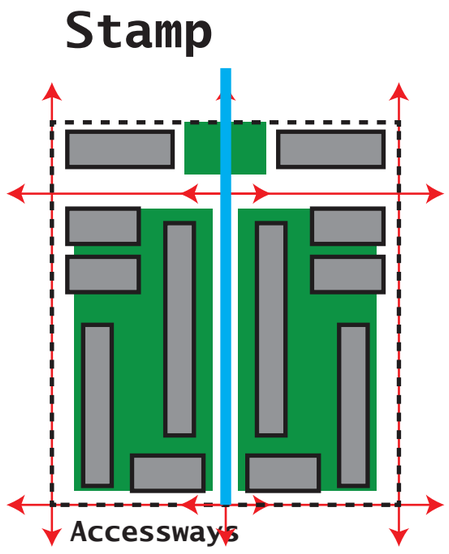
Current situation

Local



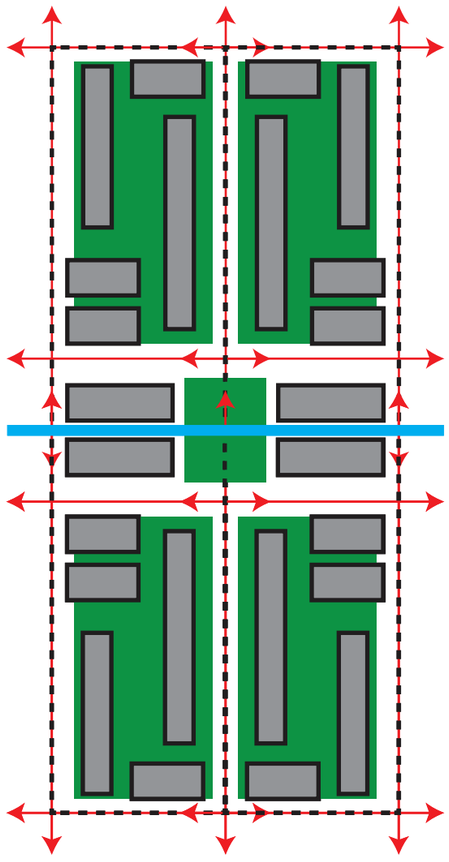
Current situation

Local



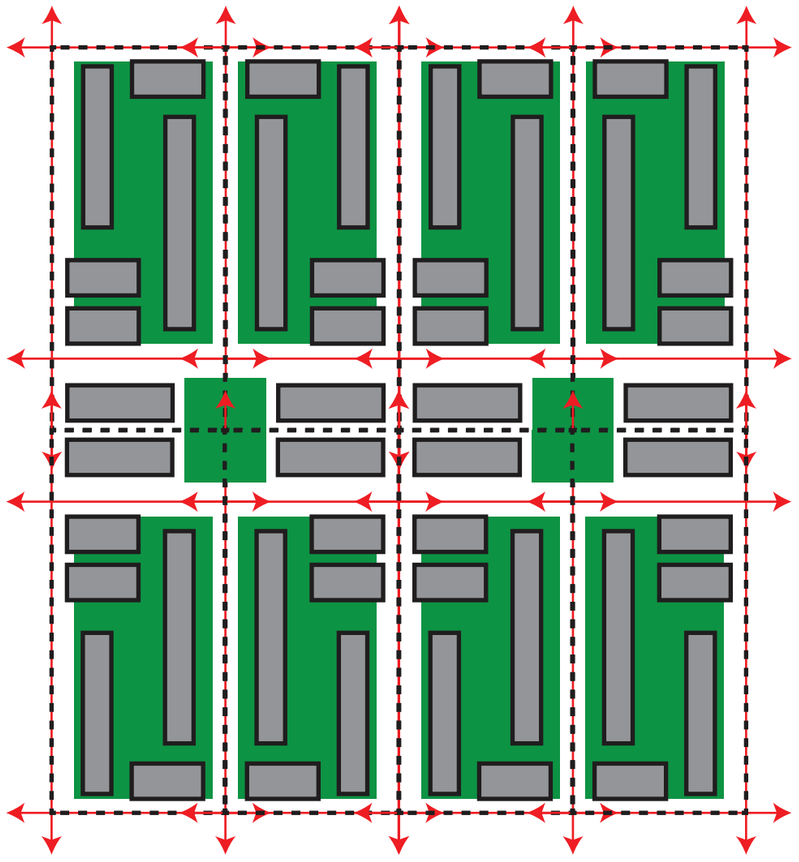
Current situation

Local



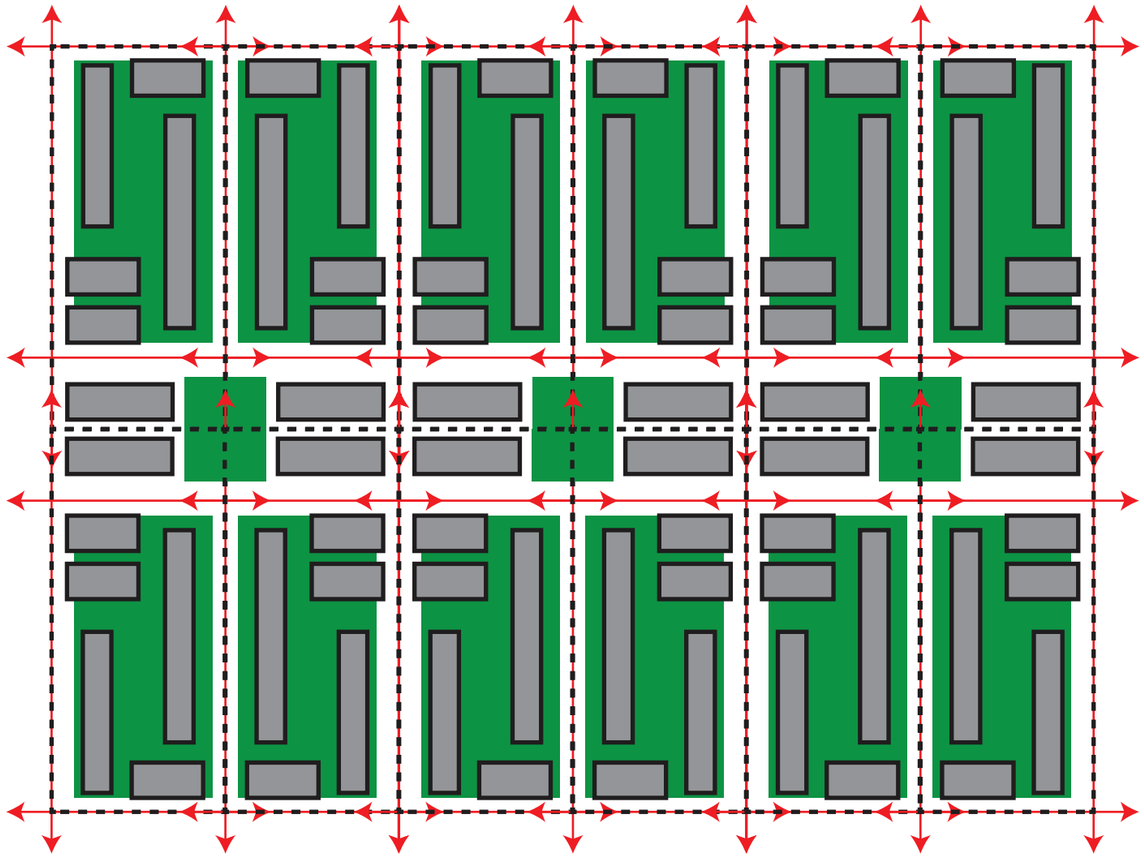
Current situation

Local

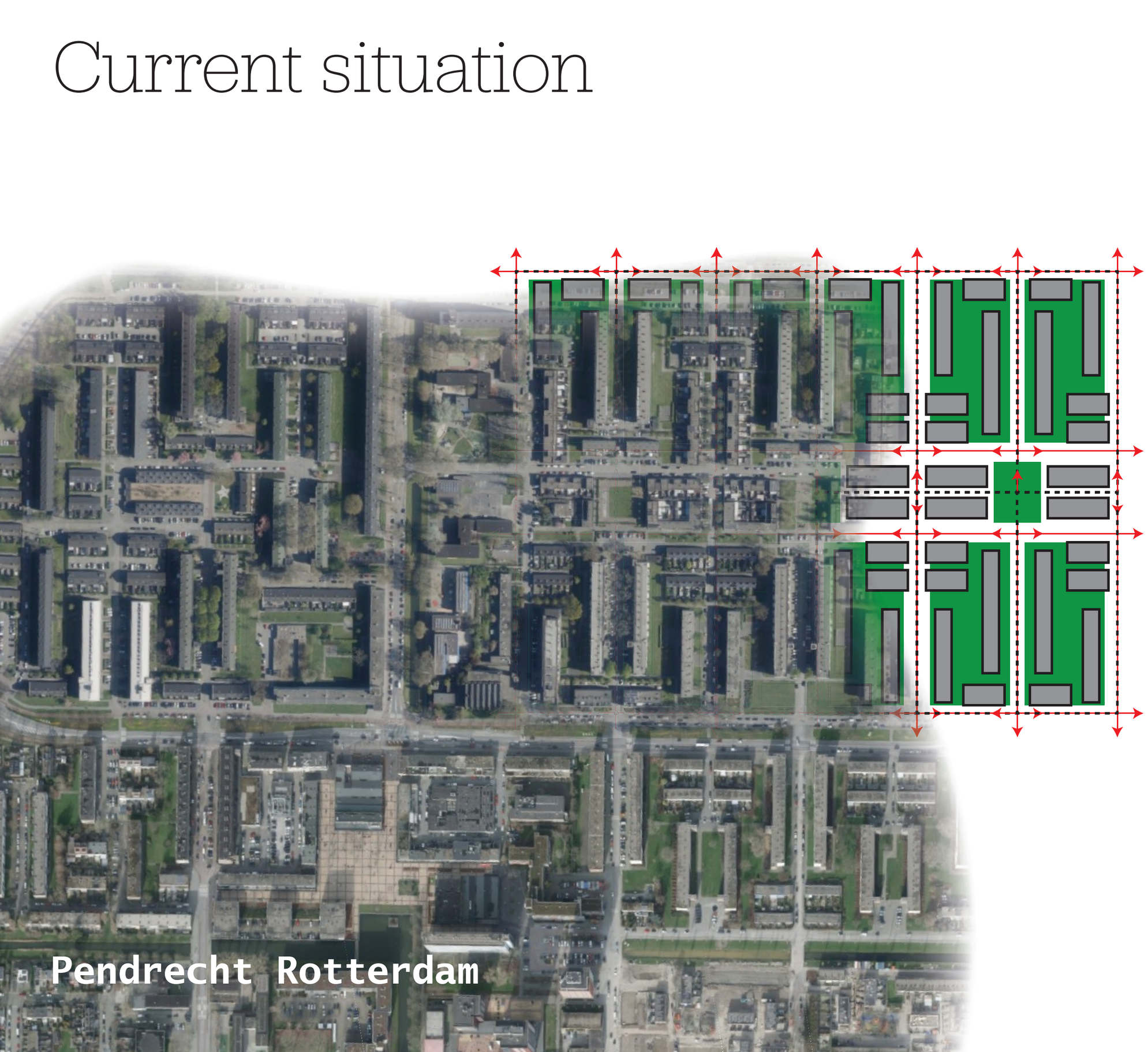


Current situation

Local



Current situation



Current situation

Local

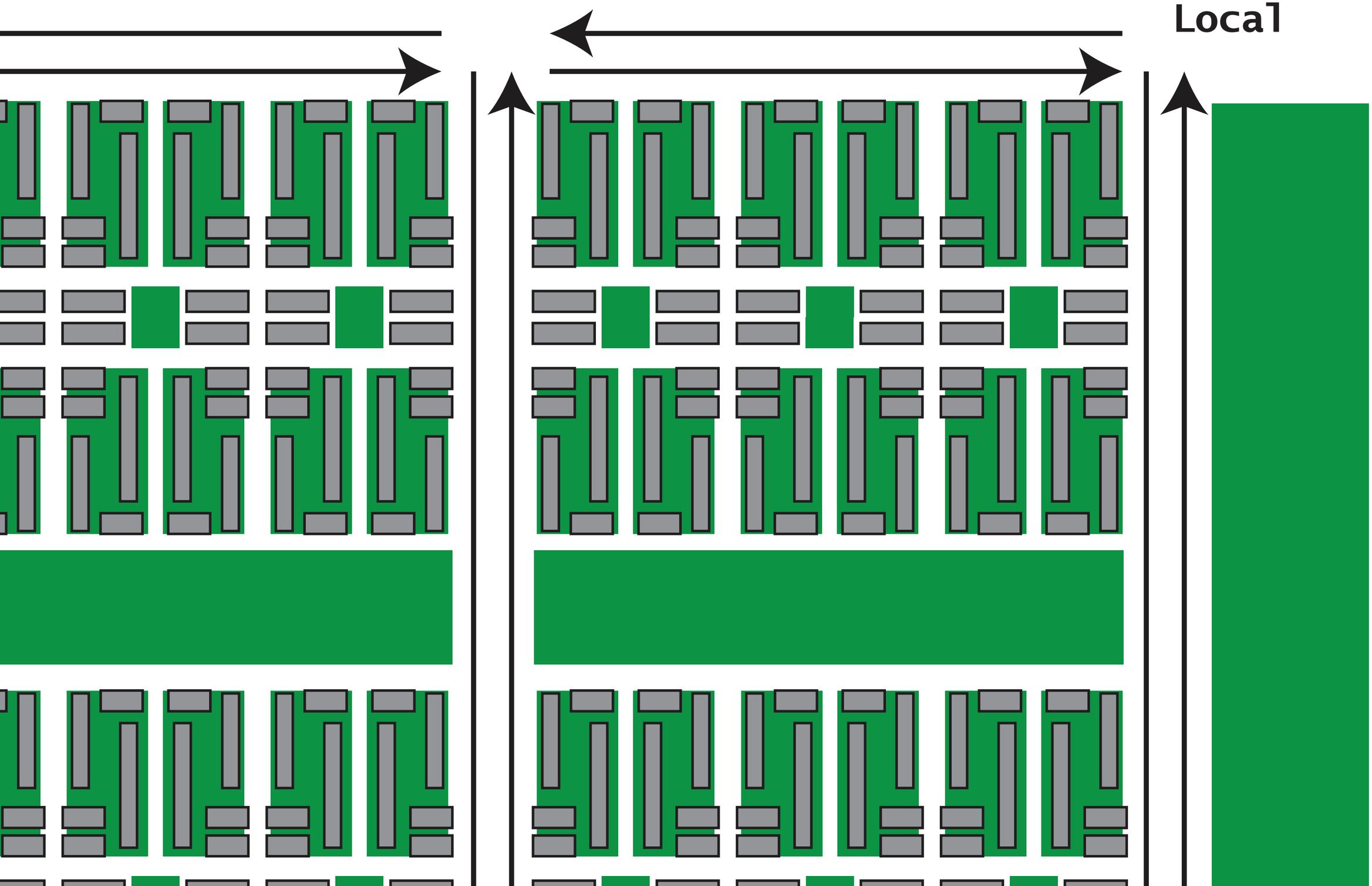


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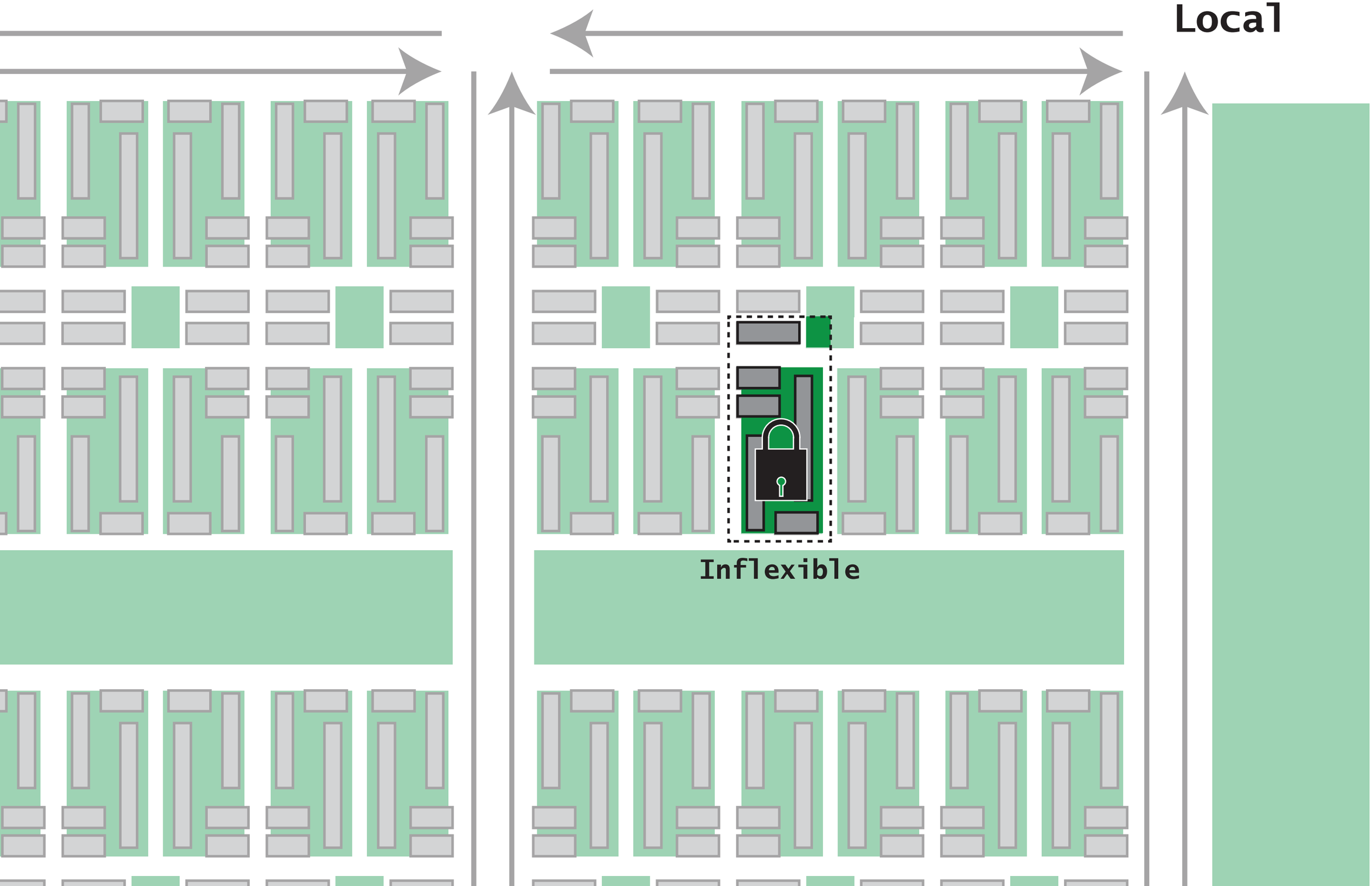


Bijlmer

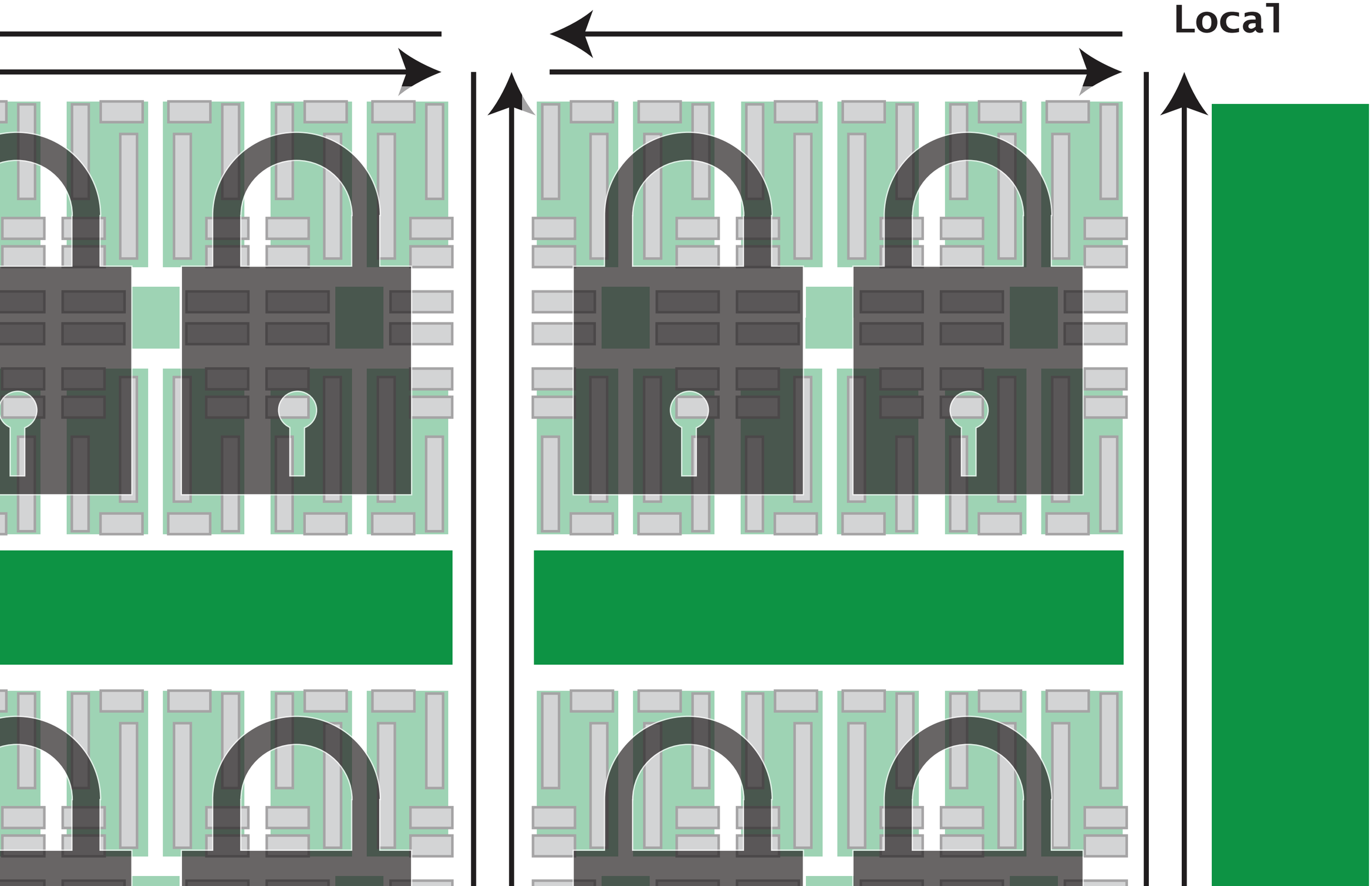
Current situation



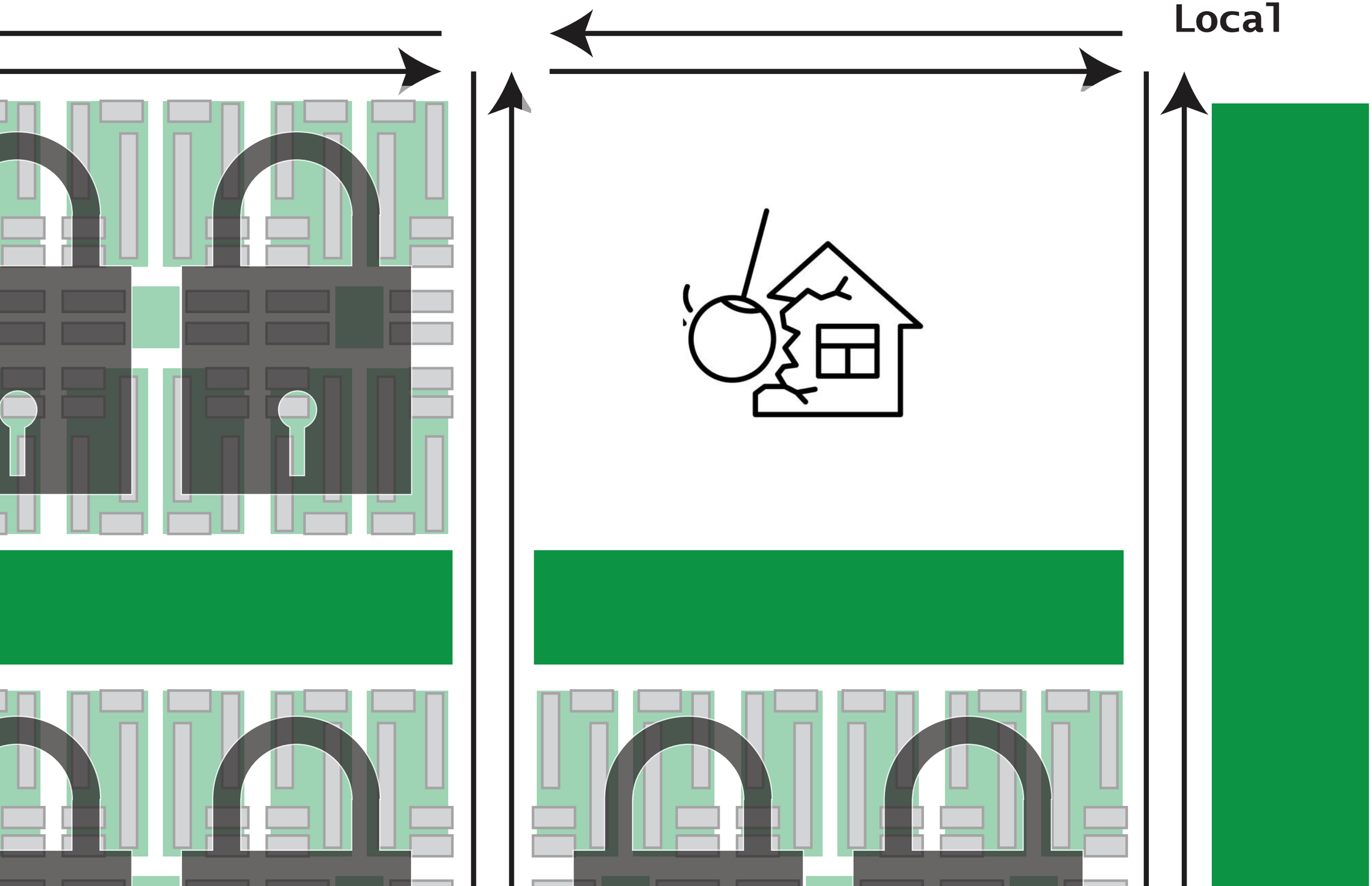
Current situation



Current situation



Current situation



Current situation

Local

Bijlmermeer

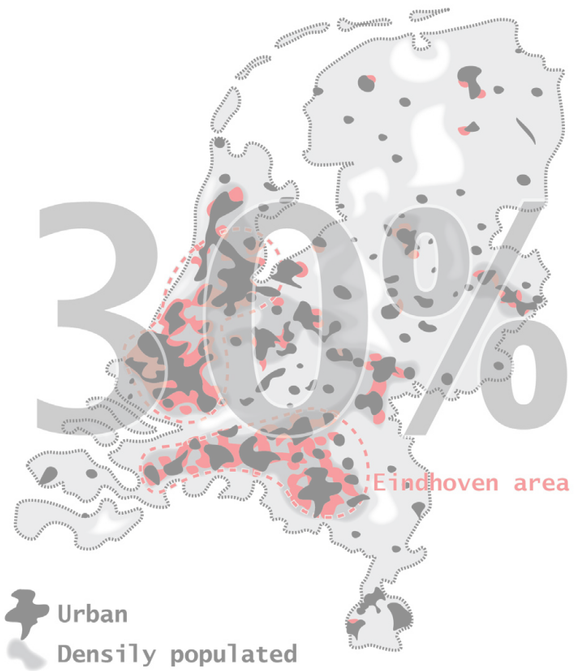


Demolished

Pushing away locals for change?

Current situation

National



Heavy strain on land use

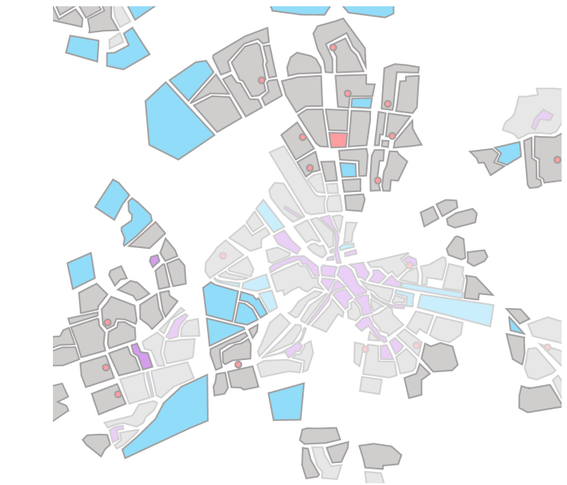
Soaring property prices

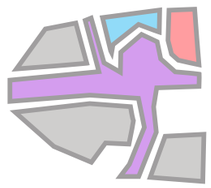
Shortage ~1 million homes

1.8 million people live in personal unpreffered typologies

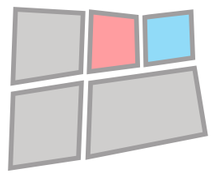
Regional

Heavy strain on land use
Shortage ~60.000 homes





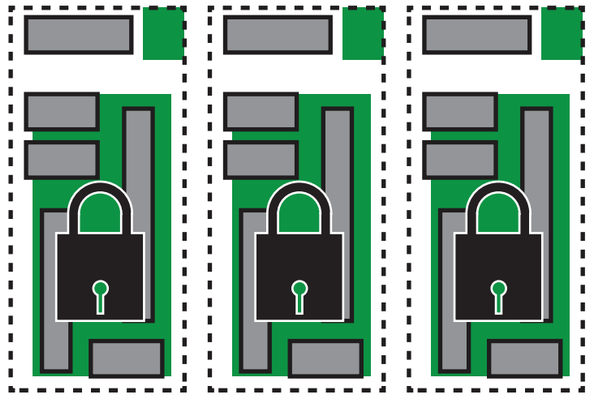
pre WW2



post WW2

Monofunctional design:
-Greater car dependancy
-Higher vacancies
-Lower social cohesion

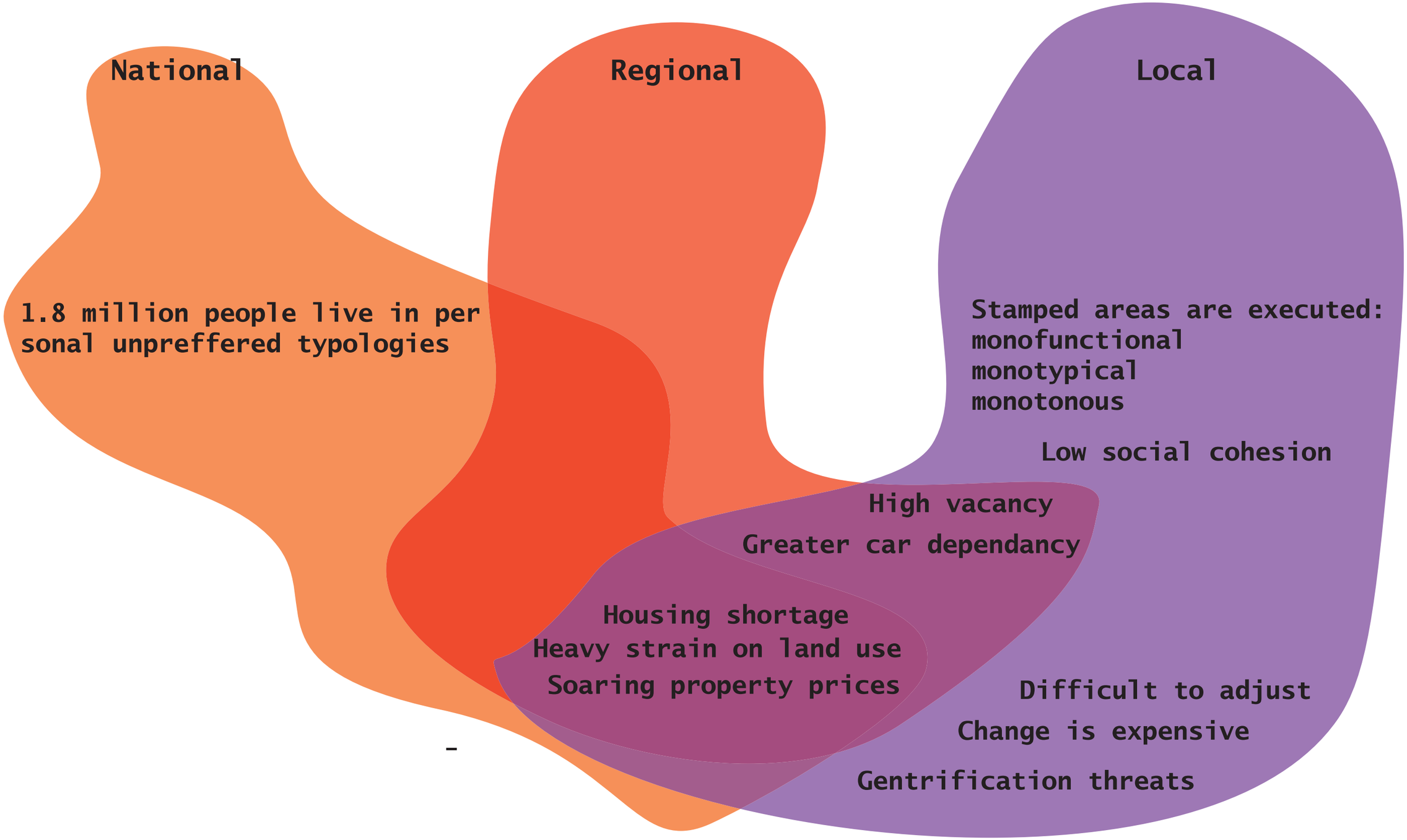
Local



Stamped areas are executed:
monofunctional
monotypical
monotonous

-Low social cohesion
-Difficult to adjust
-Change is expensive
-Gentrification threats
-High vacancy commercial and office areas

Current situation



-

Current situation

National

1.8 million people live in per
sonal unpreffered typologies

Regional

Local

Stamped areas are executed:
monofunctional
monotypical
monotonous

Low adaptability

Low social cohesion

High vacancy

Greater car dependancy

Housing shortage
Heavy strain on land use
Soaring property prices

Difficult to adjust

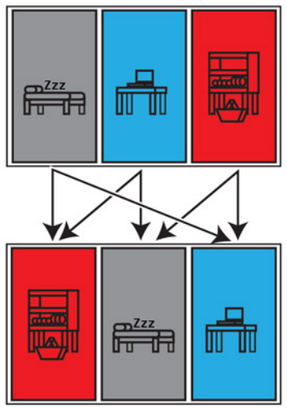
Change is expensive

Gentrification threats

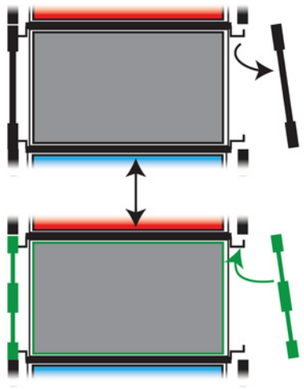
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Adaptability

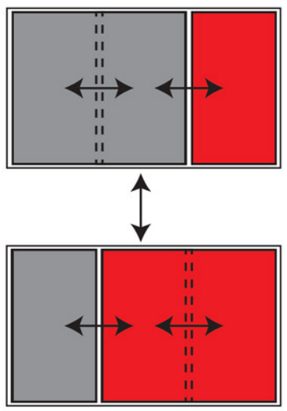
“the capacity for a building to accommodate effectively the evolving demands of its context, thus maximizing its value through life” Schmidt & Austin (2016)



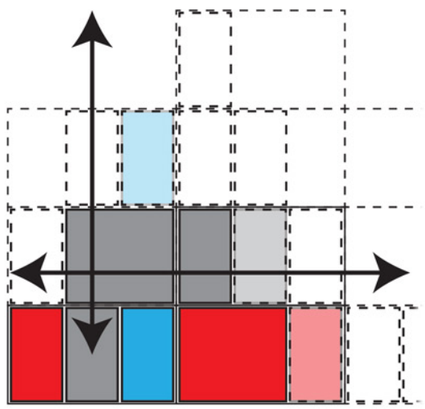
Convertible adaptability



Refitable adaptability



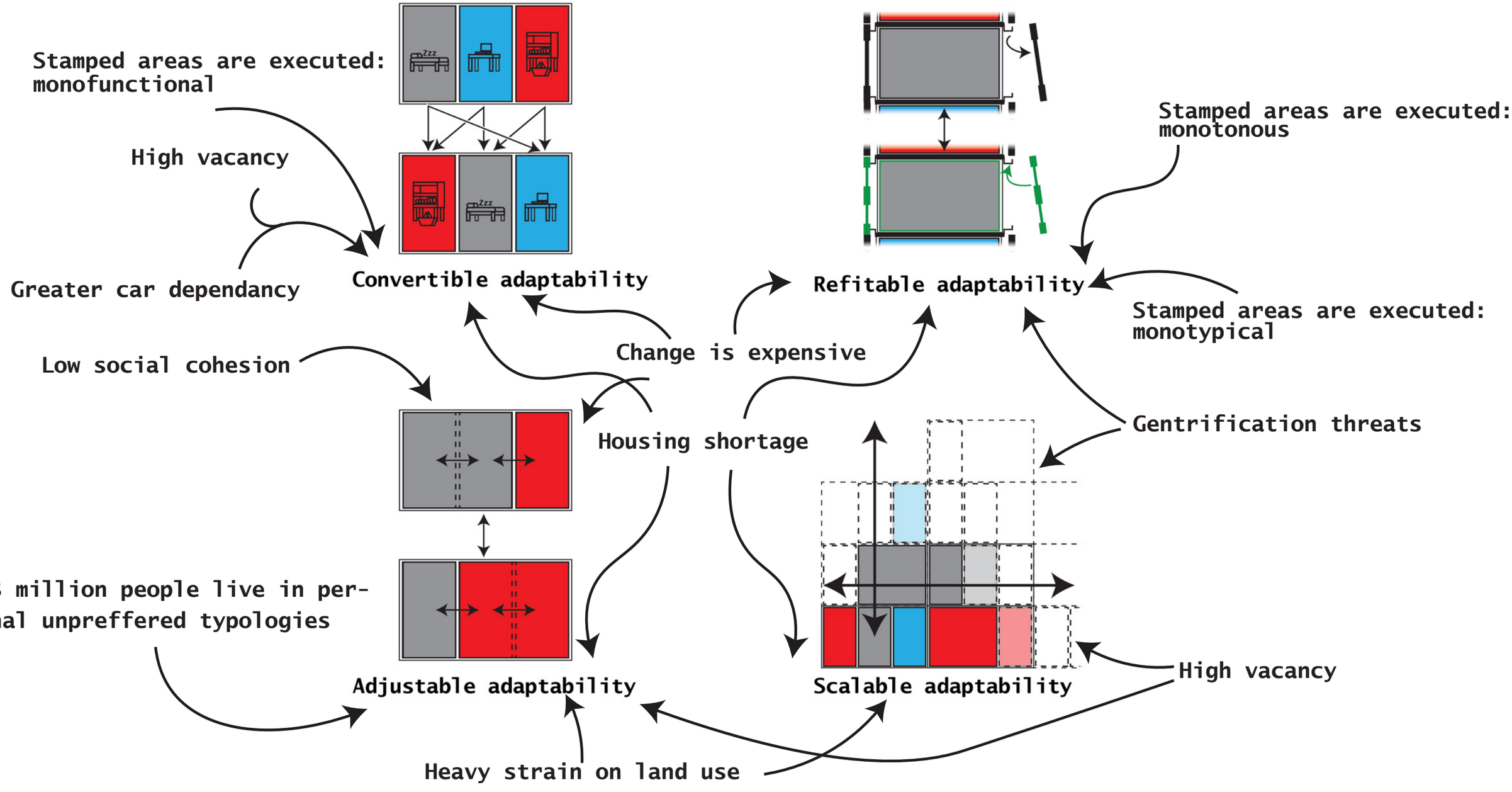
Adjustable adaptability



Scalable adaptability

Adaptability

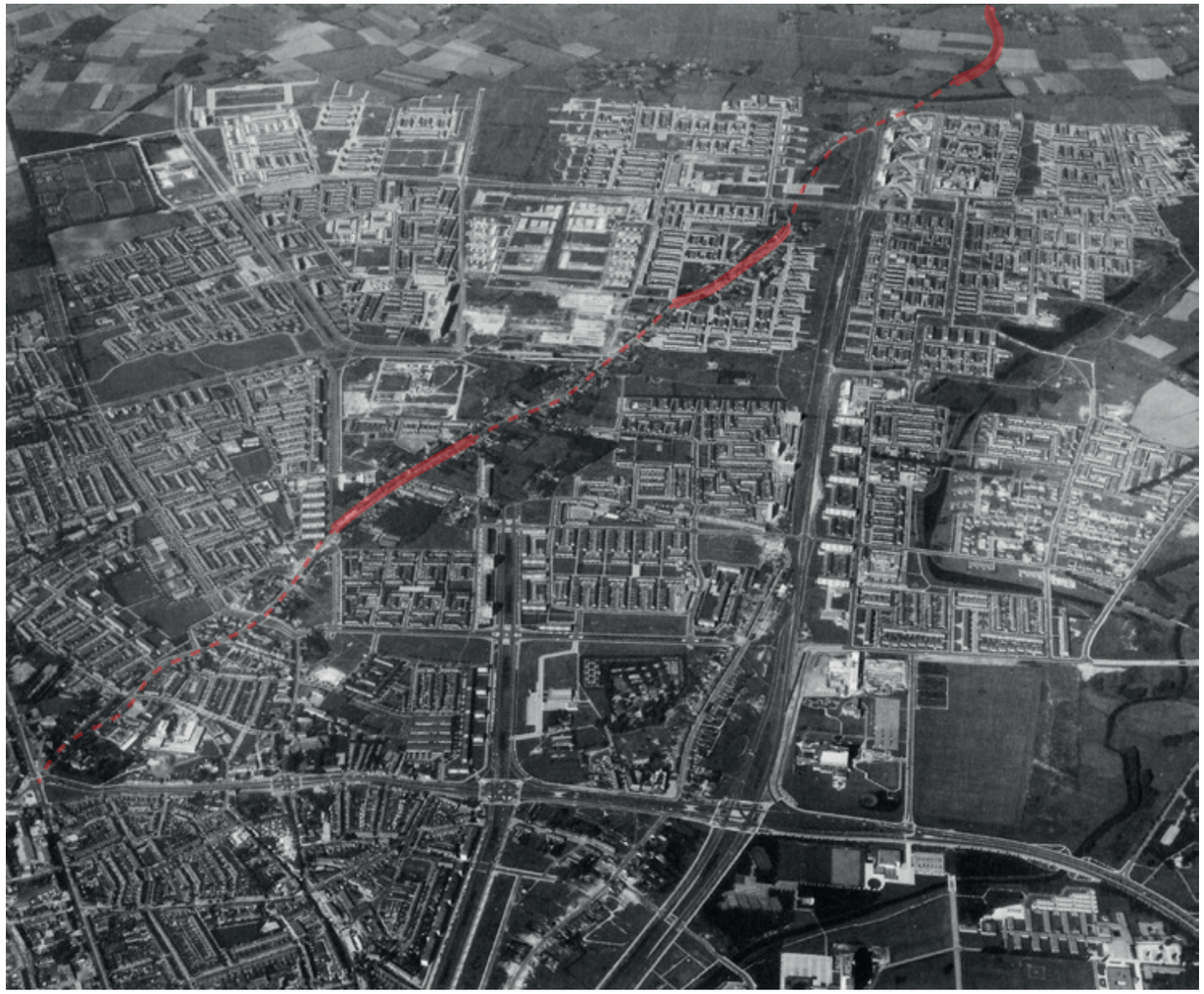
“the capacity for a building to accommodate effectively the evolving demands of its context, thus maximizing its value through life” Schmidt & Austin (2016)



Woensel



Structuurplan Woensel, 1957 (Eindhoven. Stadsontwikkeling 1900-1960)



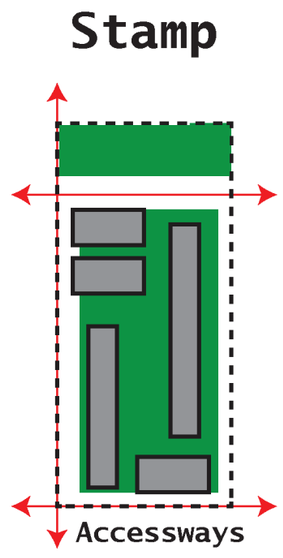
Woensel vanuit de lucht in 1969 (Historische Atlas van Eindhoven)

Woensel



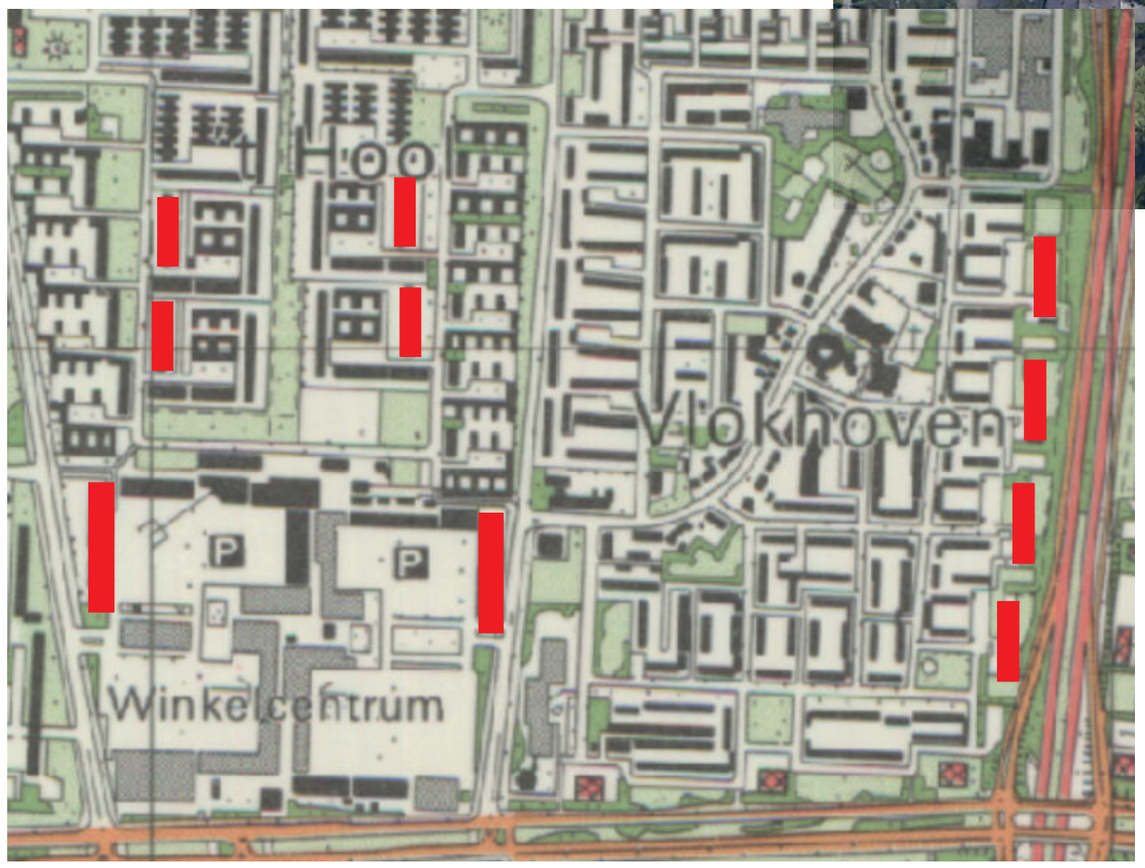
Woensel, jaren 70, topotijdreis



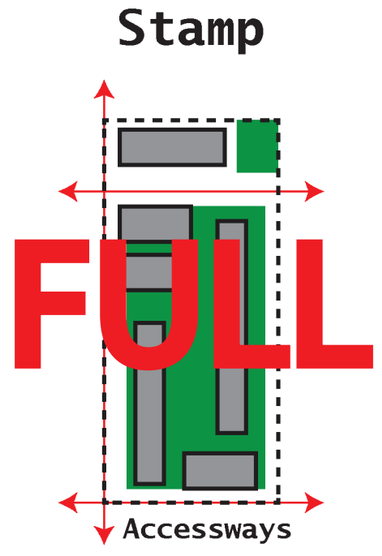


Woensel

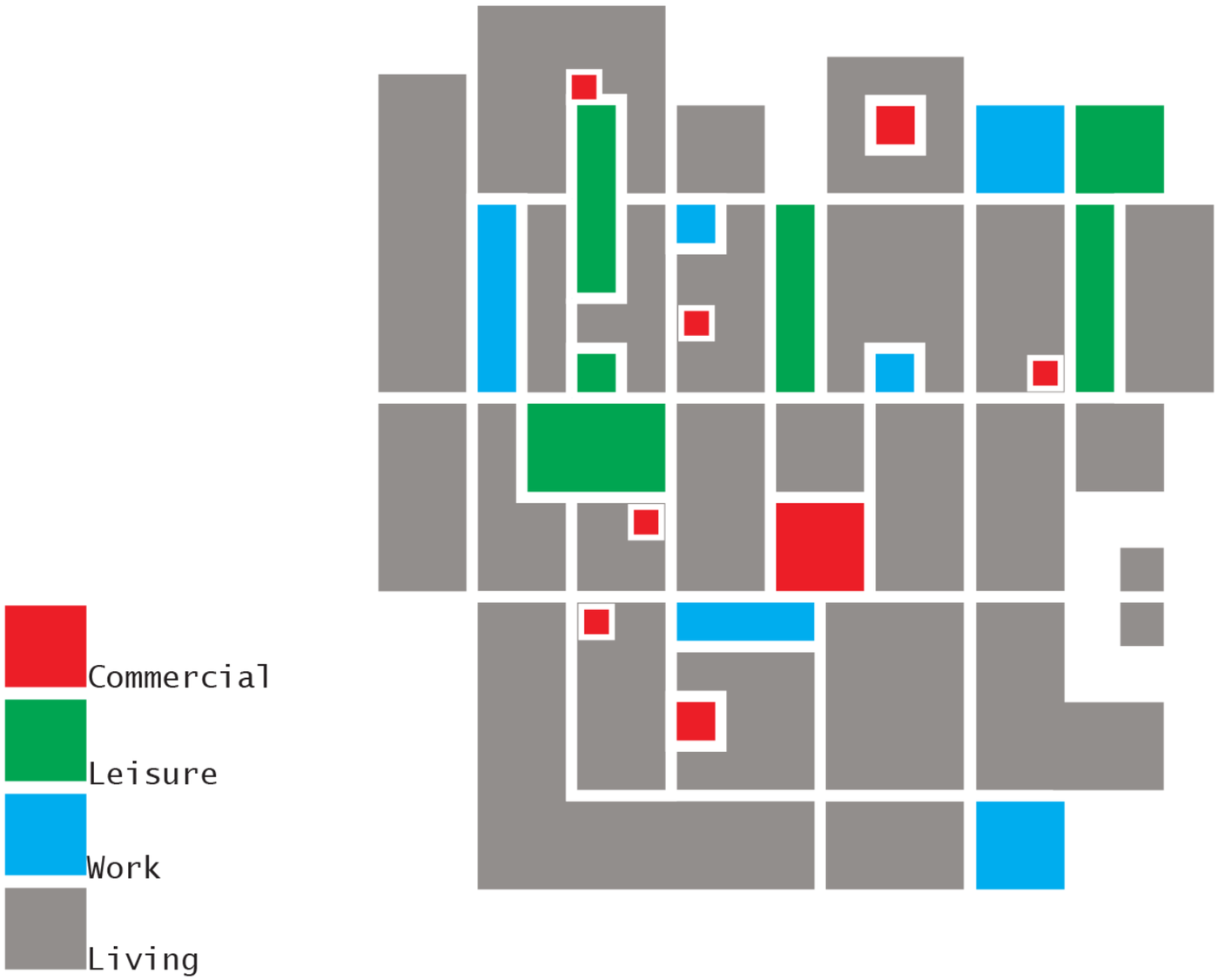




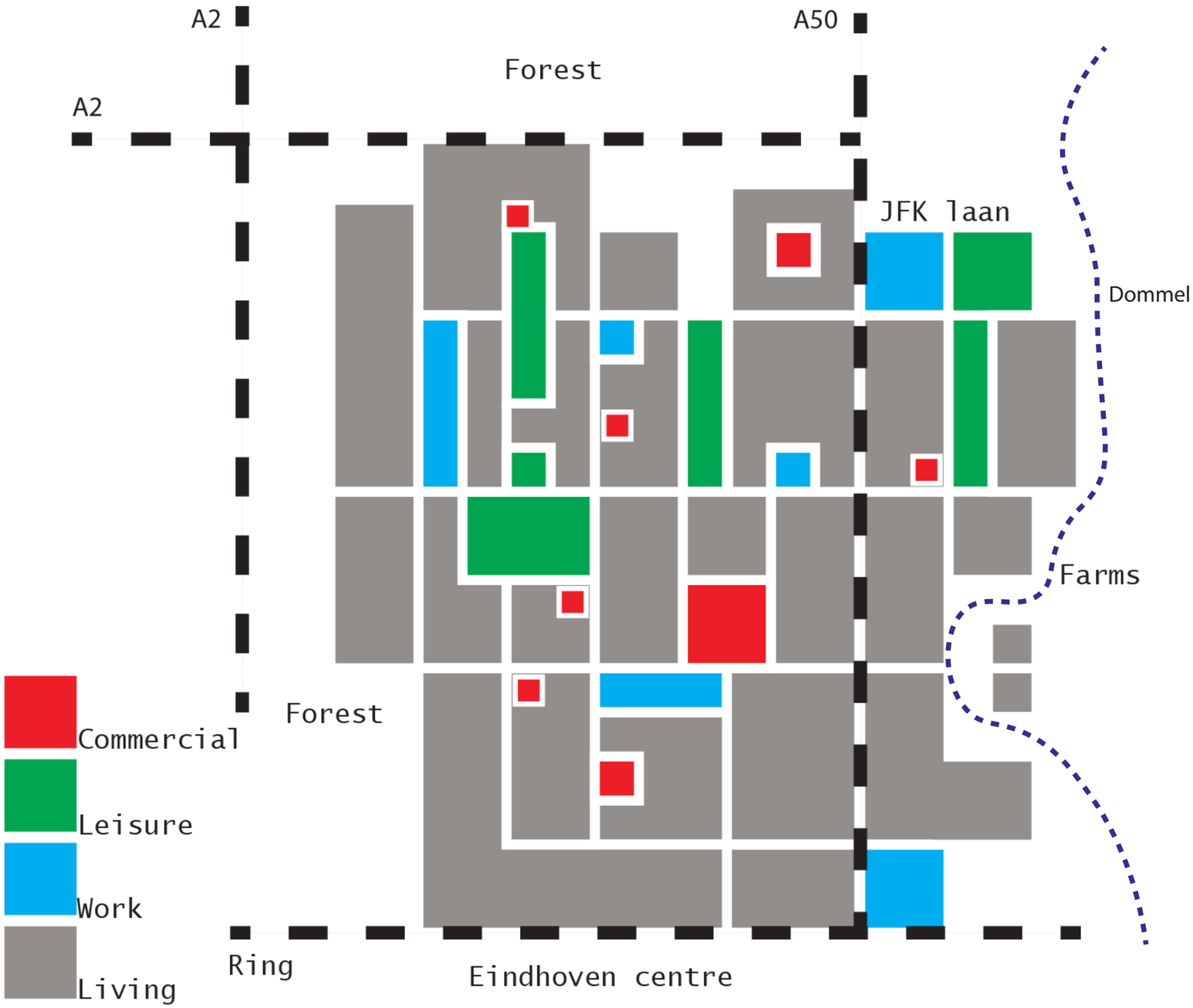
Woensel, jaren 80, topotijdreis



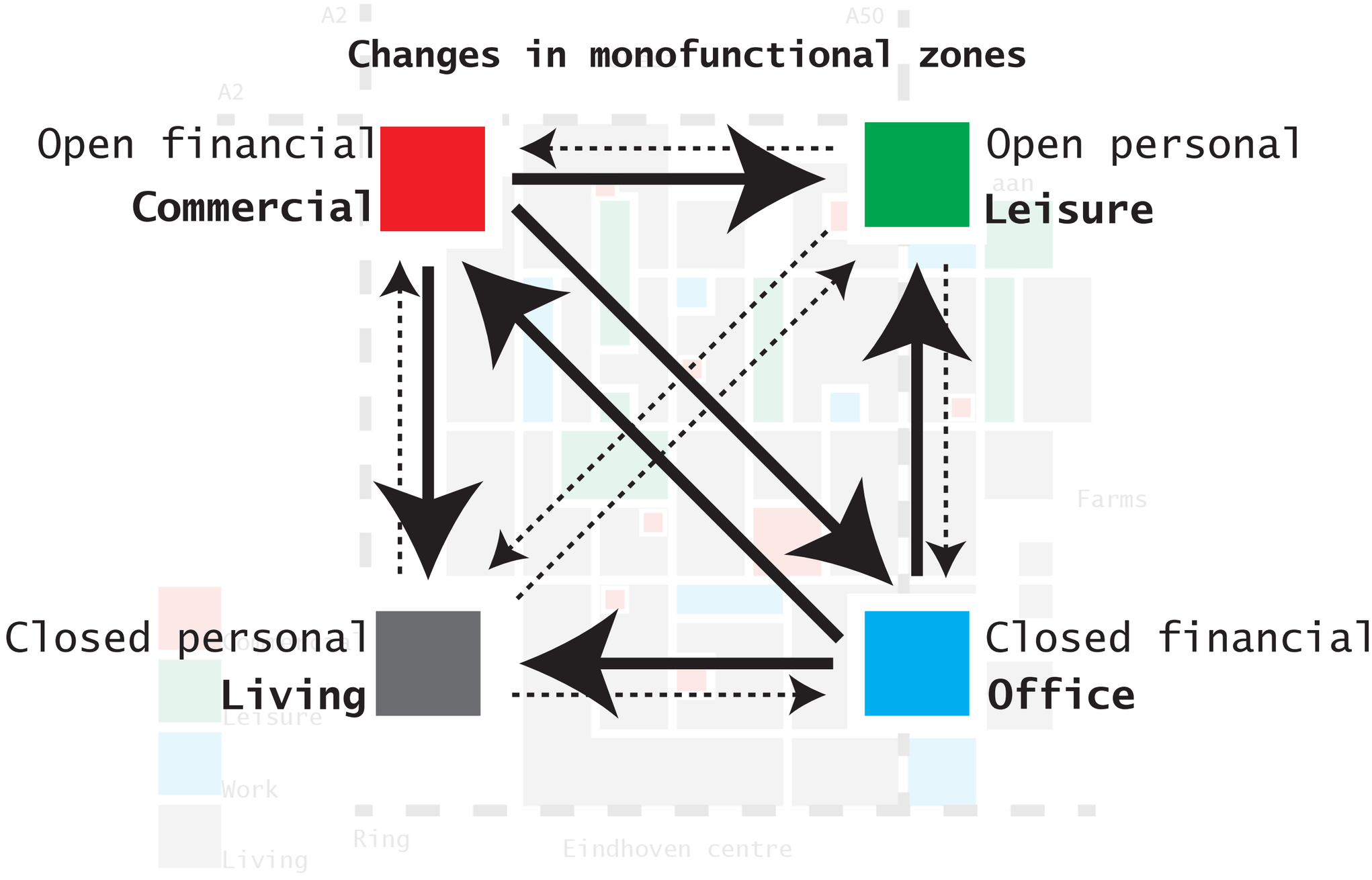
Woensel



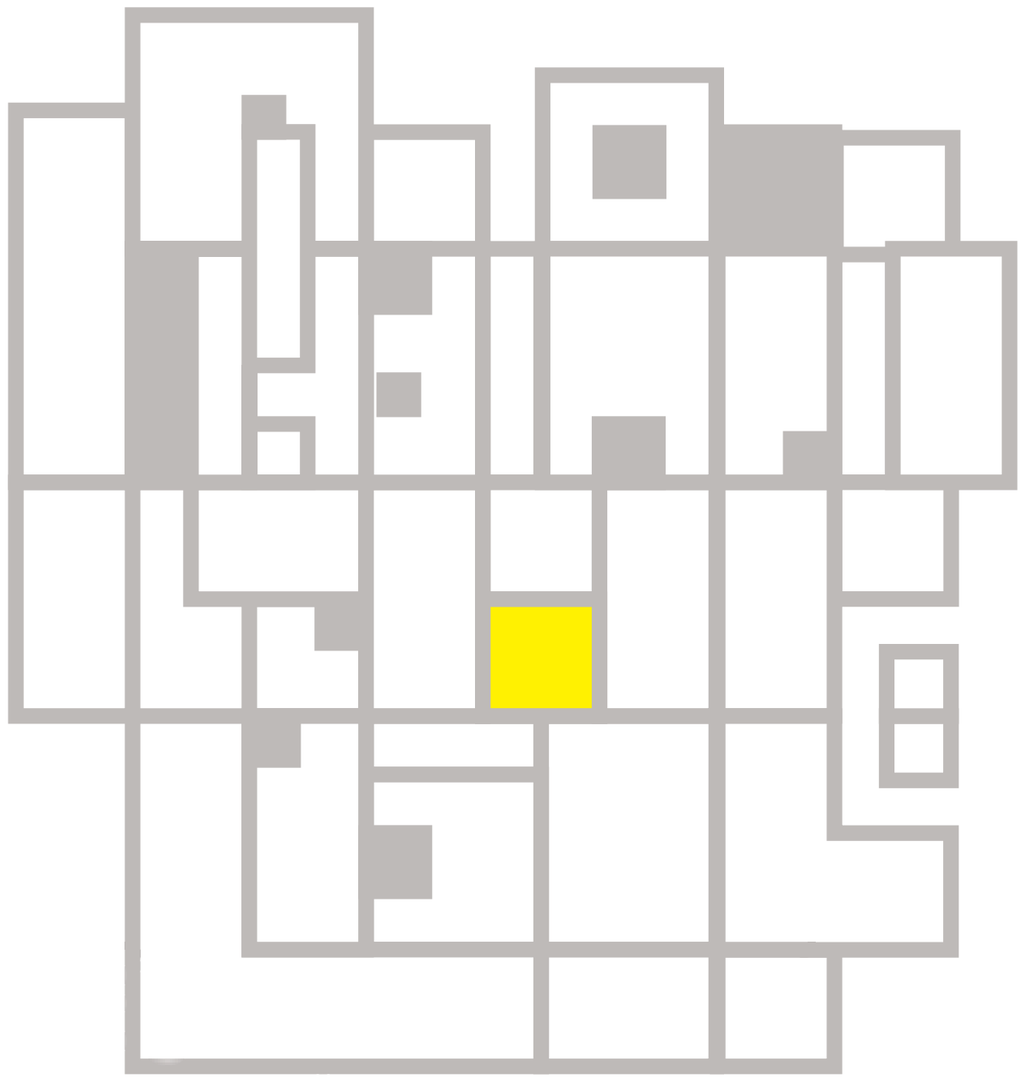
Woensel


A2
A50
A2
Forest
JFK laan
Dommel
Farms
Forest
Commercial
Leisure
Work
Living
Ring
Eindhoven centre

Woensel


Changes in monofunctional zones
Open financial
Commercial
Open personal
Leisure
Closed personal
Living
Closed financial
Office
A2
A50
A2
aan
Farms
Leisure
Work
Living
Ring
Eindhoven centre

Opportunities

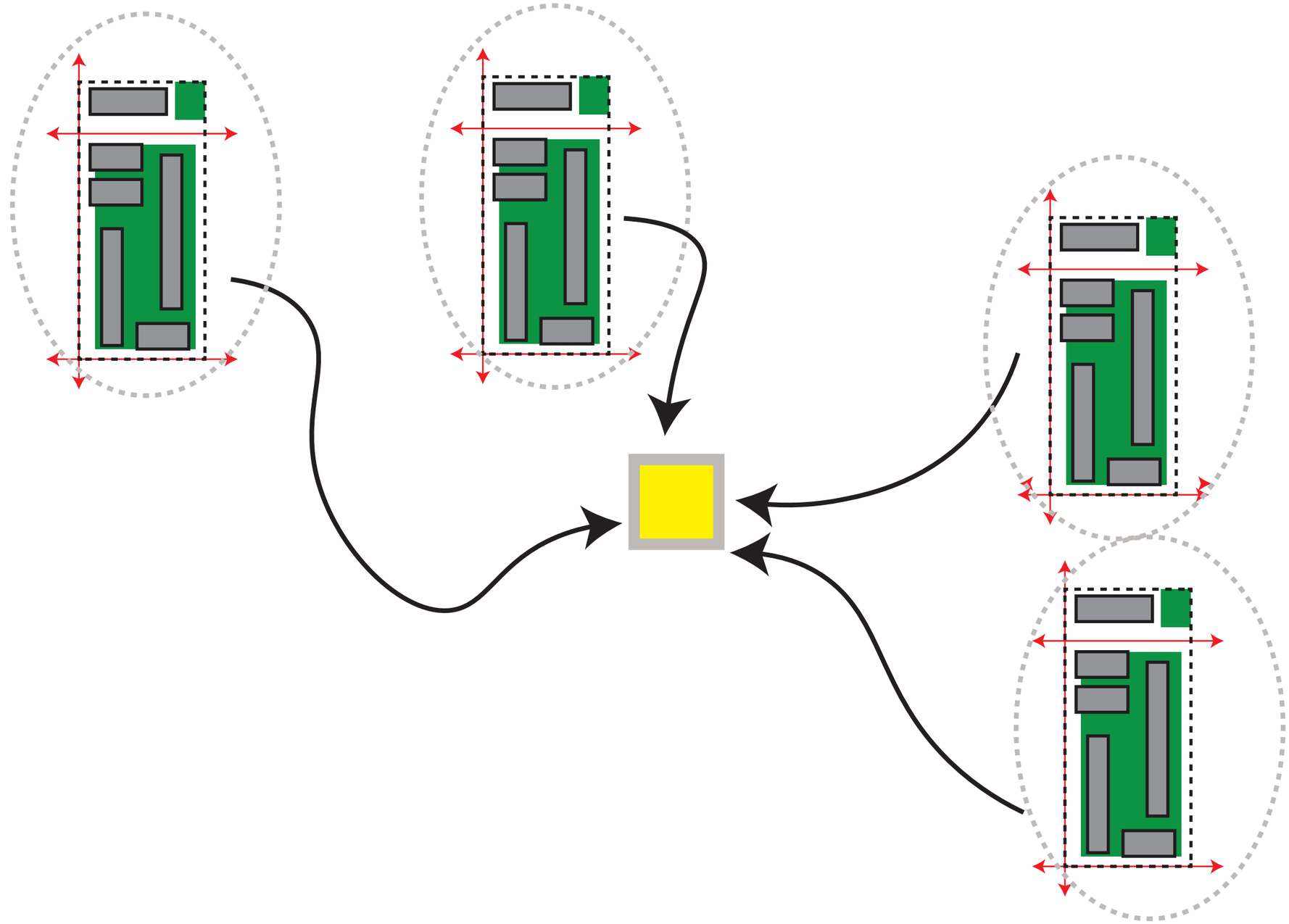


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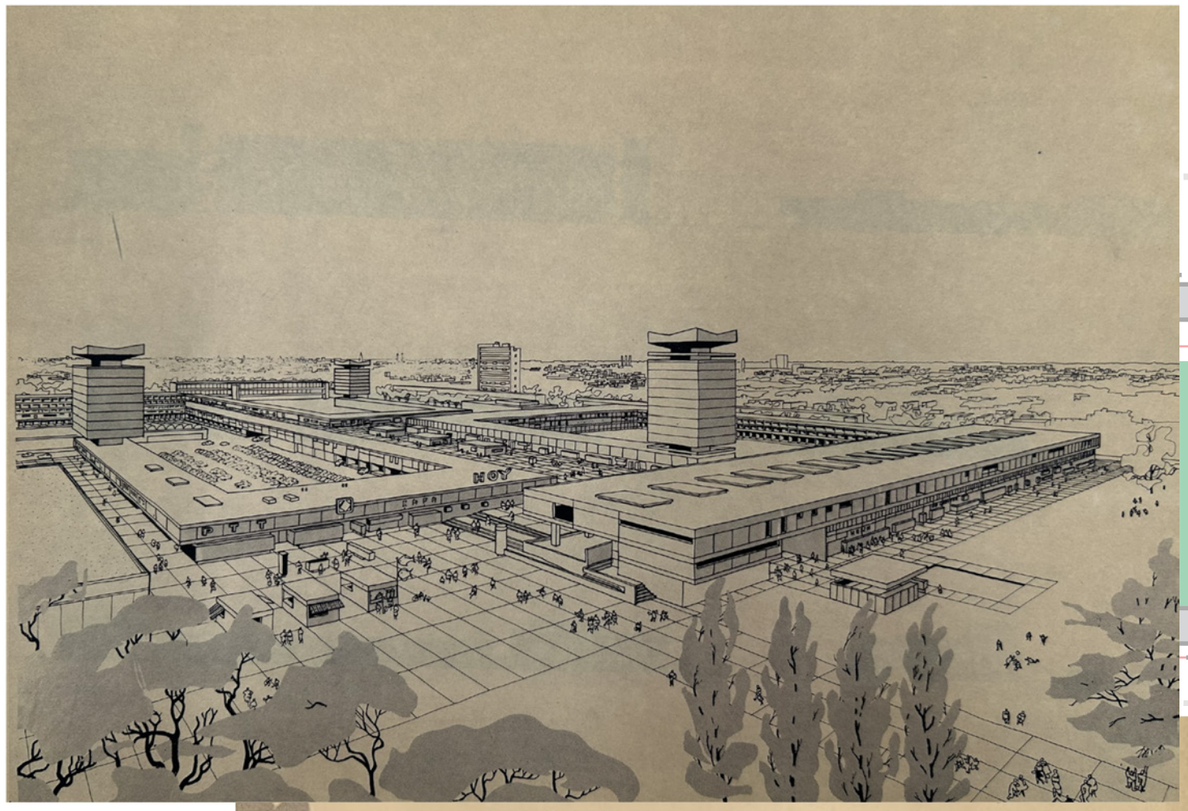
More accessible to change

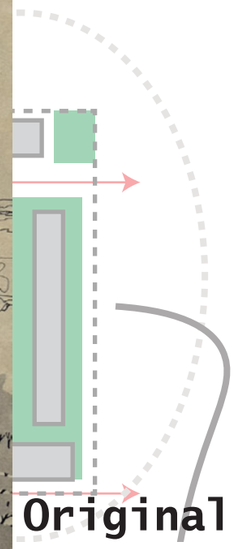
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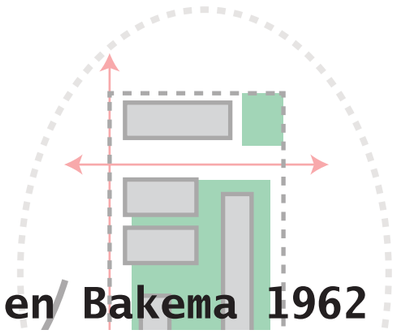
Opportunities



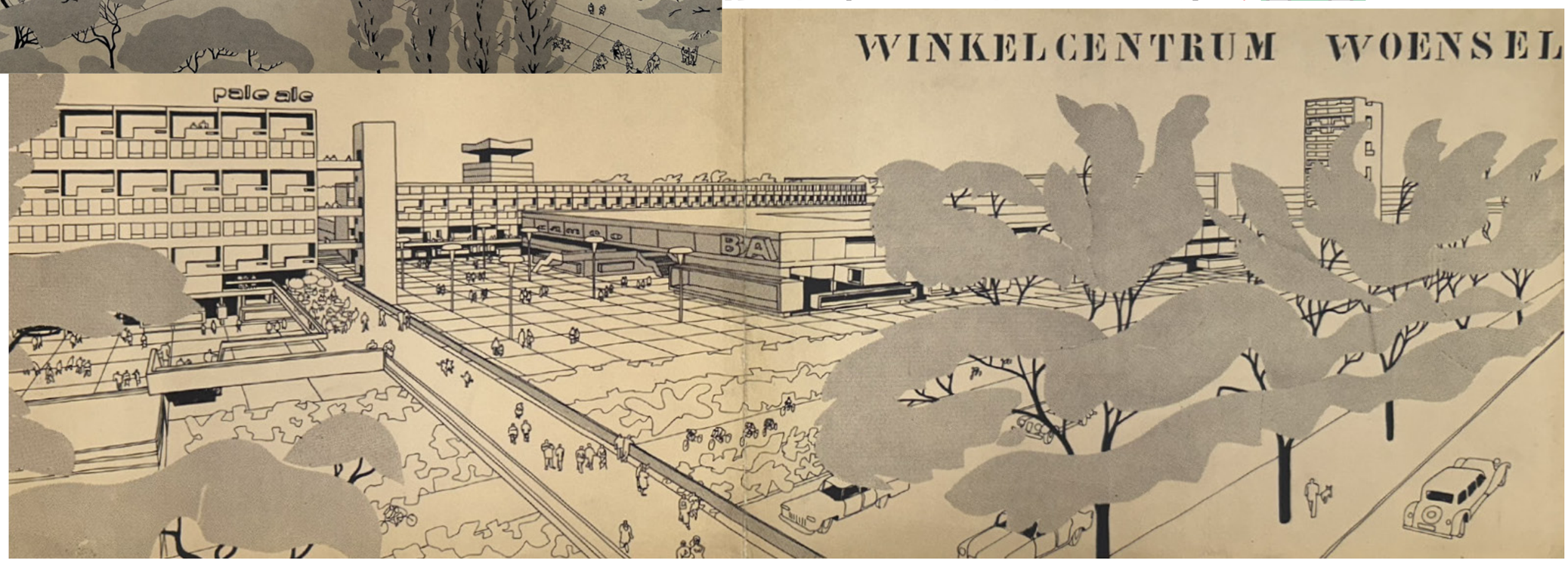
Opportunities





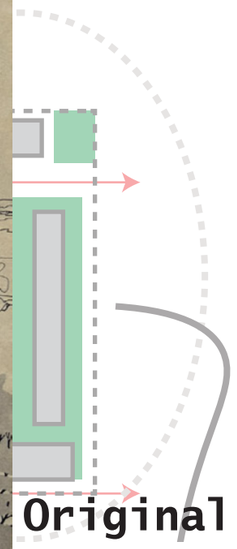


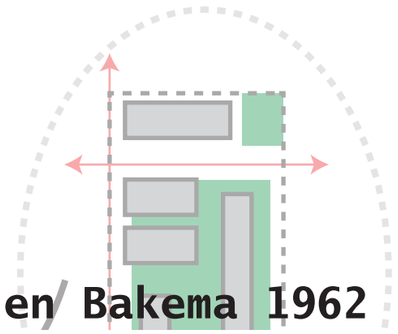
Original design Broek en Bakema 1962



Opportunities

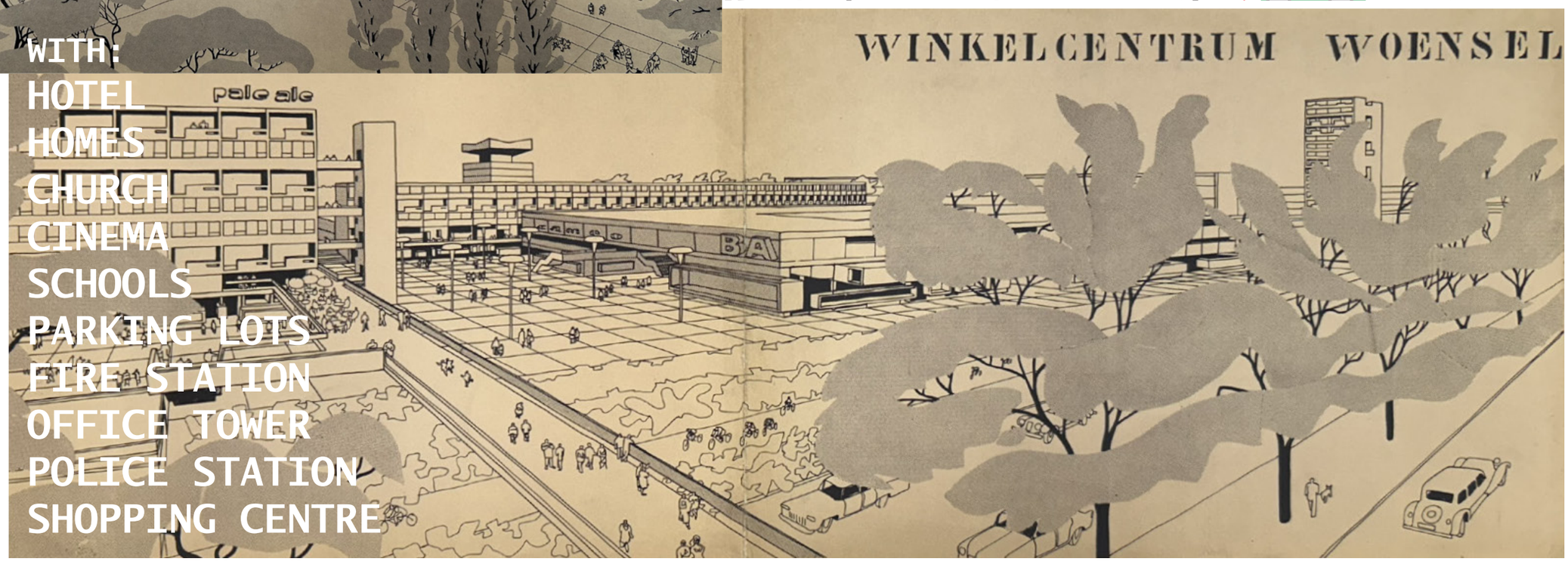






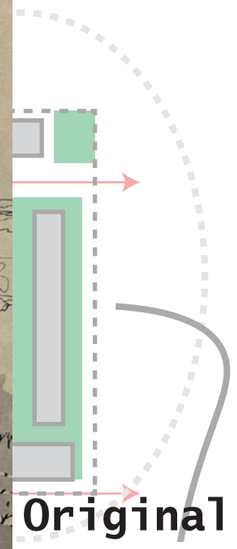
Original design Broek en Bakema 1962

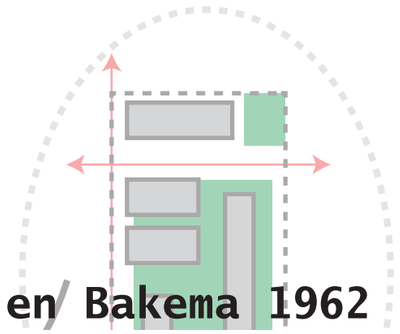
WITH:
HOTEL
HOMES
CHURCH
CINEMA
SCHOOLS
PARKING LOTS
FIRE STATION
OFFICE TOWER
POLICE STATION
SHOPPING CENTRE



Opportunities



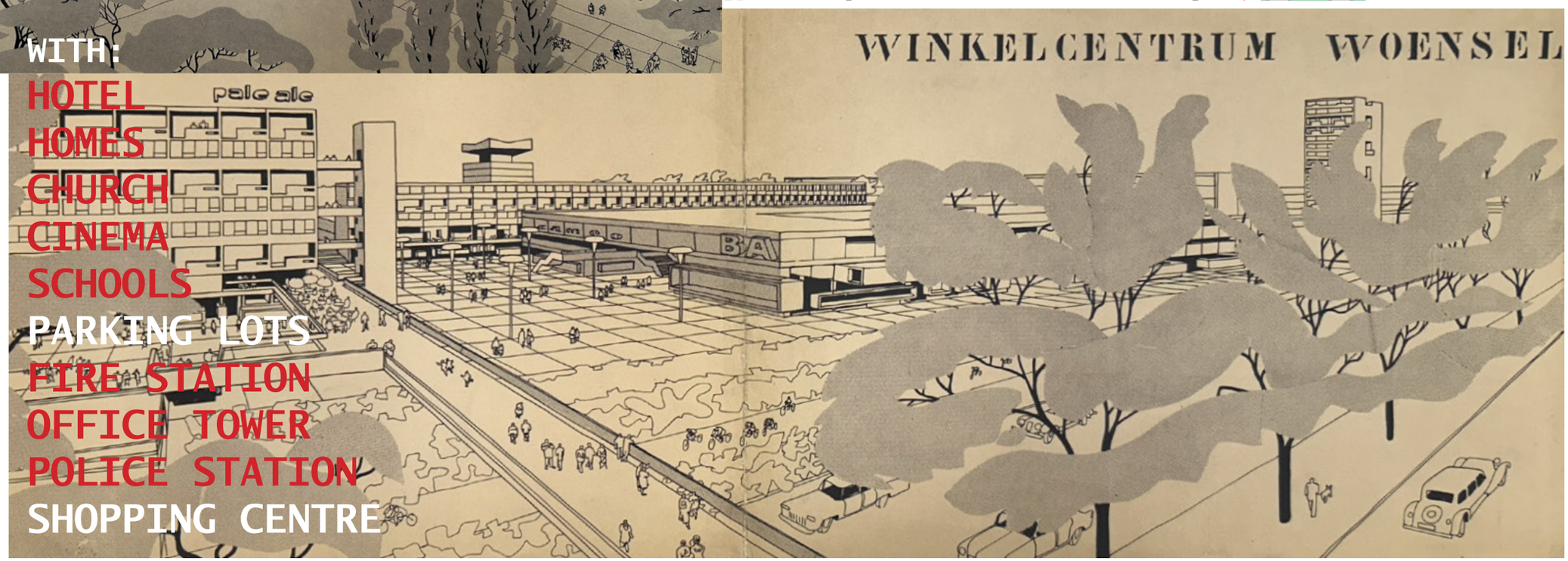




Original design Broek en Bakema 1962

WITH:

HOTEL
HOMES
CHURCH
CINEMA
SCHOOLS
PARKING LOTS
FIRE STATION
OFFICE TOWER
POLICE STATION
SHOPPING CENTRE



Opportunities



Realised shopping centre



Monofunctional
Monogenous
Monotypical

Opportunities



Still mainly

Monofunctional
Monogenous
Monotypical

Renovation 2003-2006



Opportunities

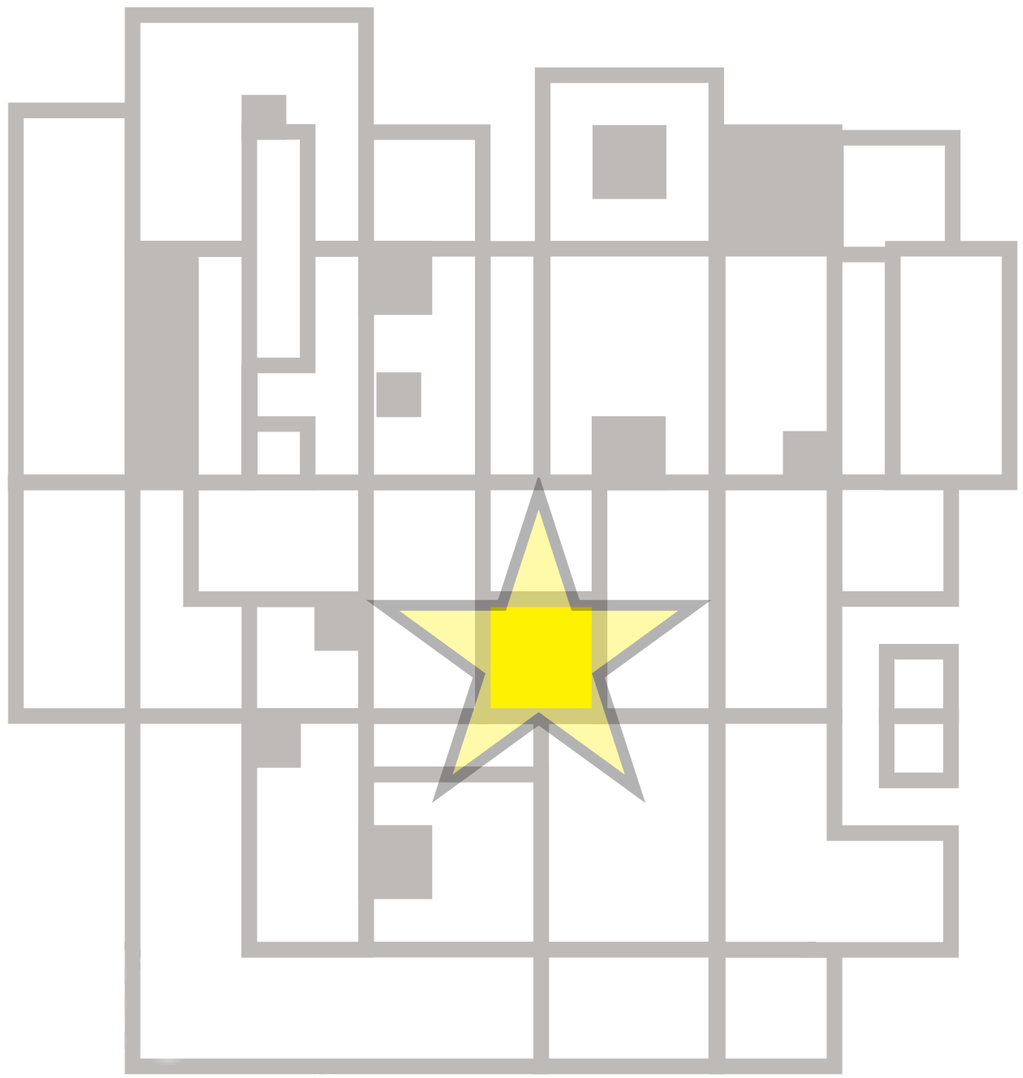


Removing retail space
Removing parking space
Adding 3500 homes
Add cultural venues

Current proposal



Opportunities



Less accessible to change

More accessible to change

Centre

Opportunities



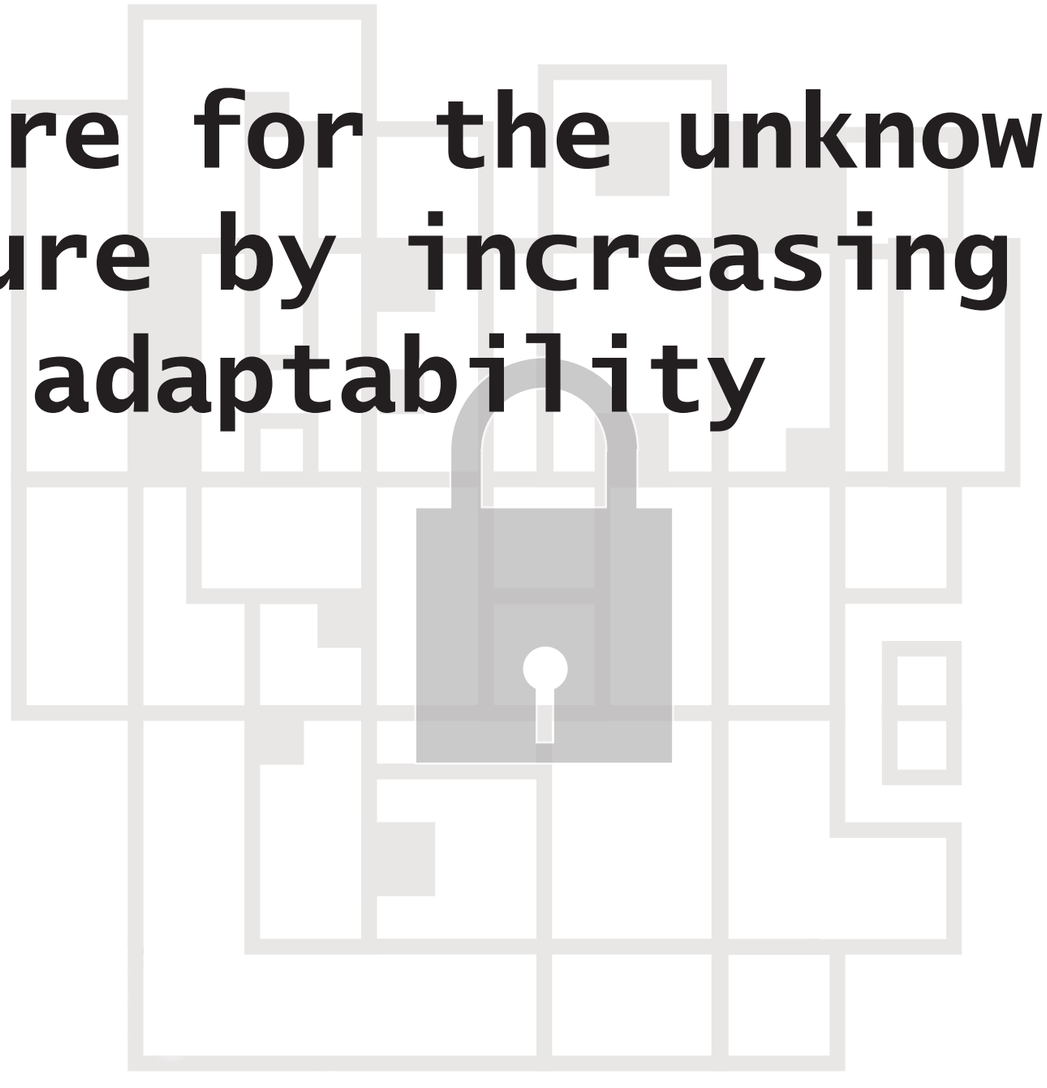
Less accessible to change

More accessible to change

Centre

Opportunities

Prepare for the unknown future by increasing adaptability

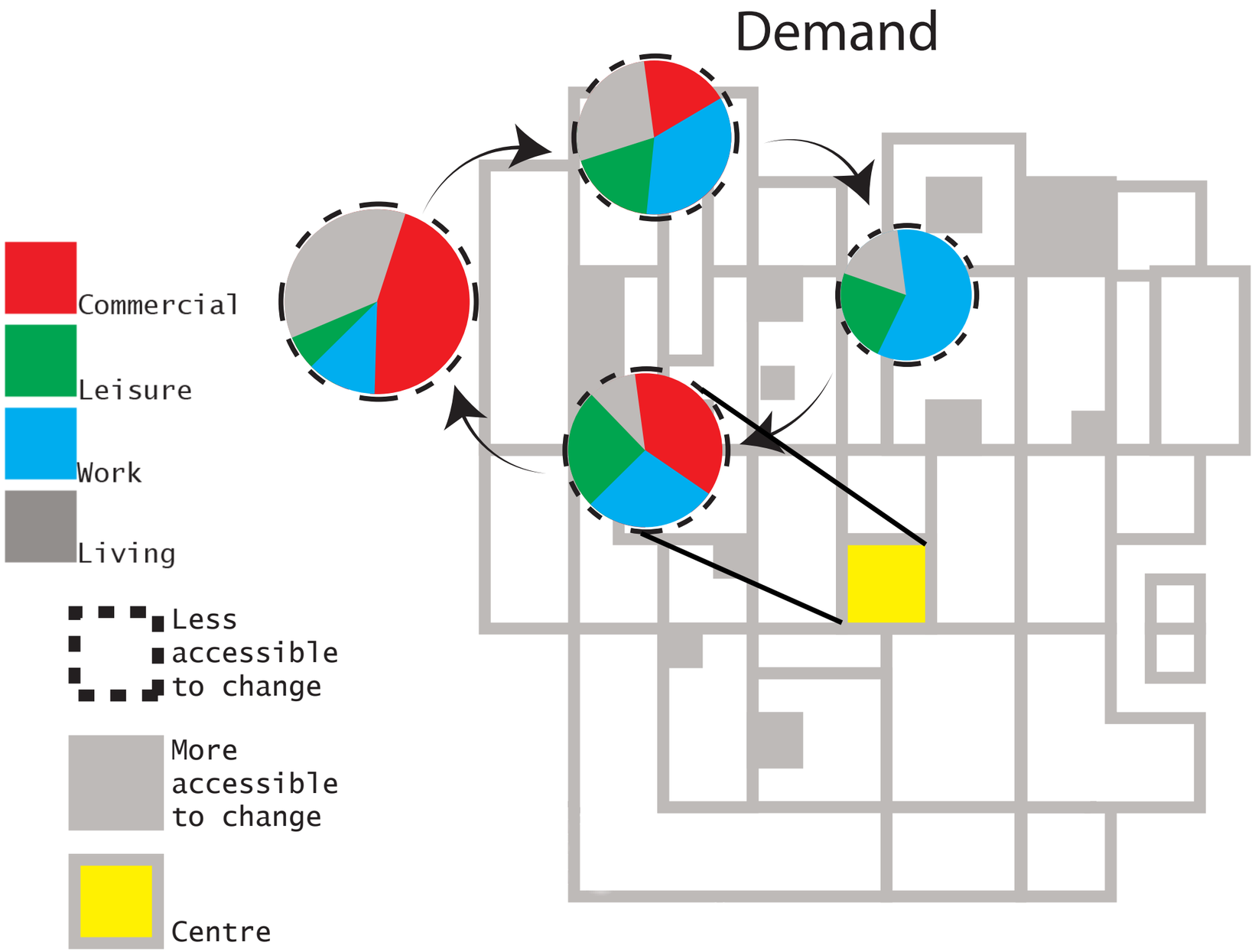


Less accessible to change

More accessible to change

Centre

Opportunities



Opportunities

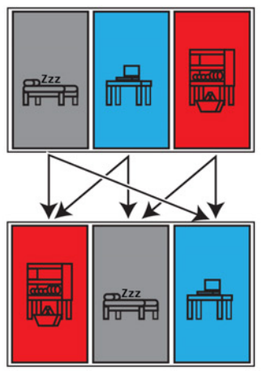


Less accessible to change

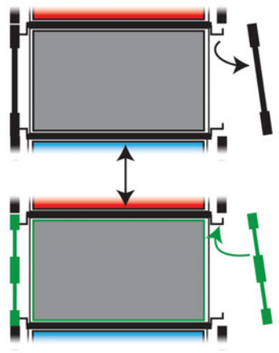
More accessible to change

Centre

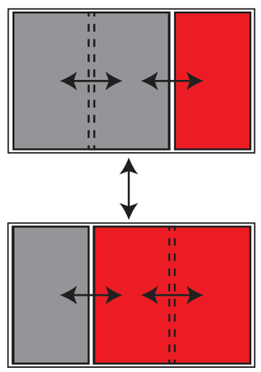
Research structure



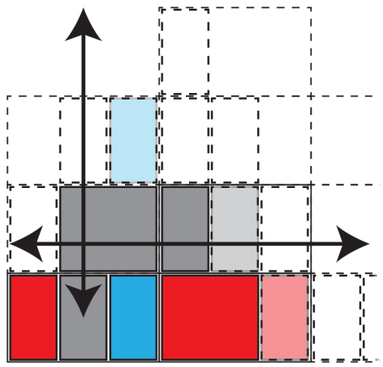
Convertible adaptability



Refitable adaptability



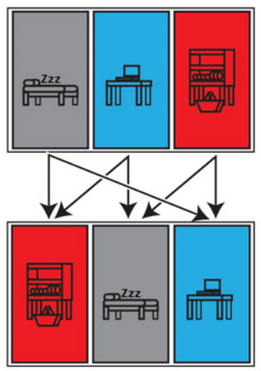
Adjustable adaptability



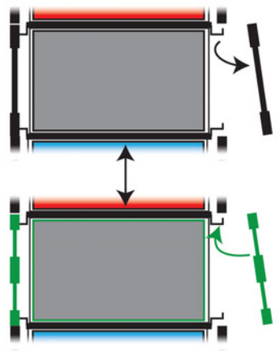
Scalable adaptability

Project goal:
Create a space filling structure, providing a multifunctional role as the town center of Woensel, that responds to changes in society, through future adjustments in: size, division, function and appearance.

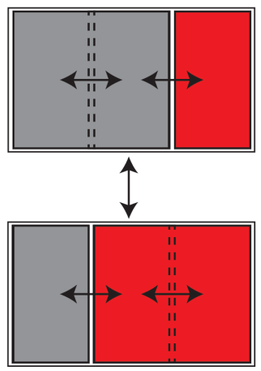
Research structure



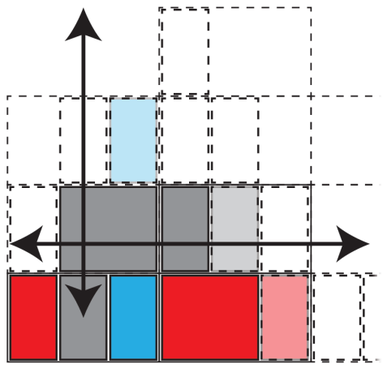
Convertible adaptability



Refitable adaptability



Adjustable adaptability



Scalable adaptability

Possible research value:
Embedding mass flexibility in future design could lengthen the lifespan and use of urban districts, buildings, and materials.

Research structure

Metabolism



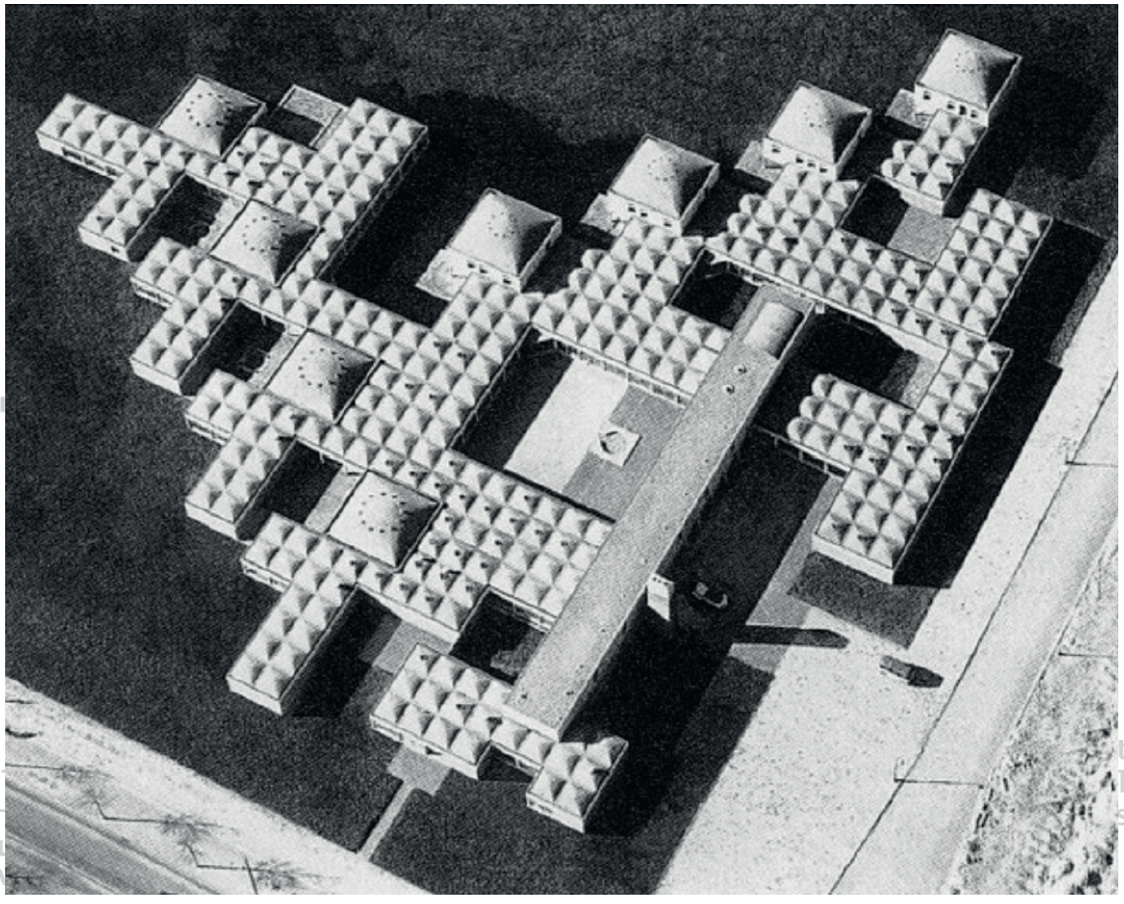
Kisho Kurokawa, 1972



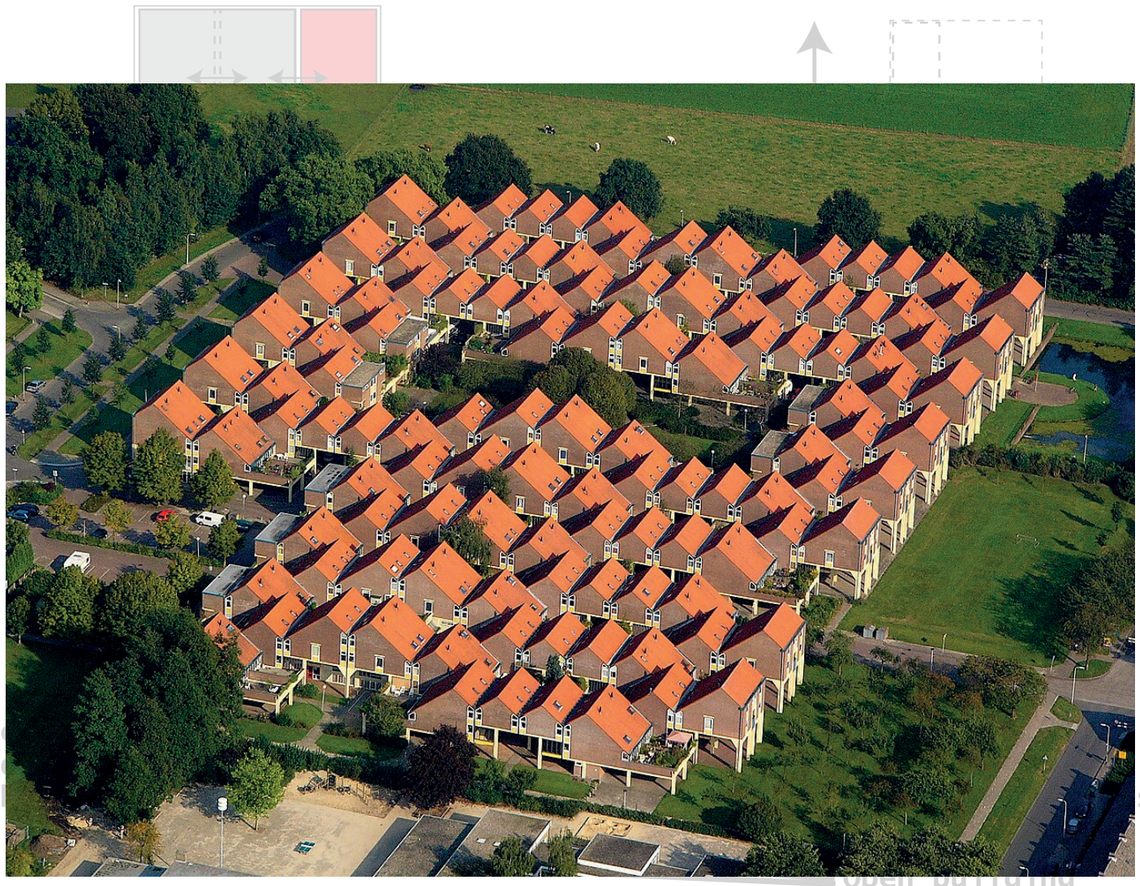
Kisho Kurokawa, 1970

Research structure

Structuralism



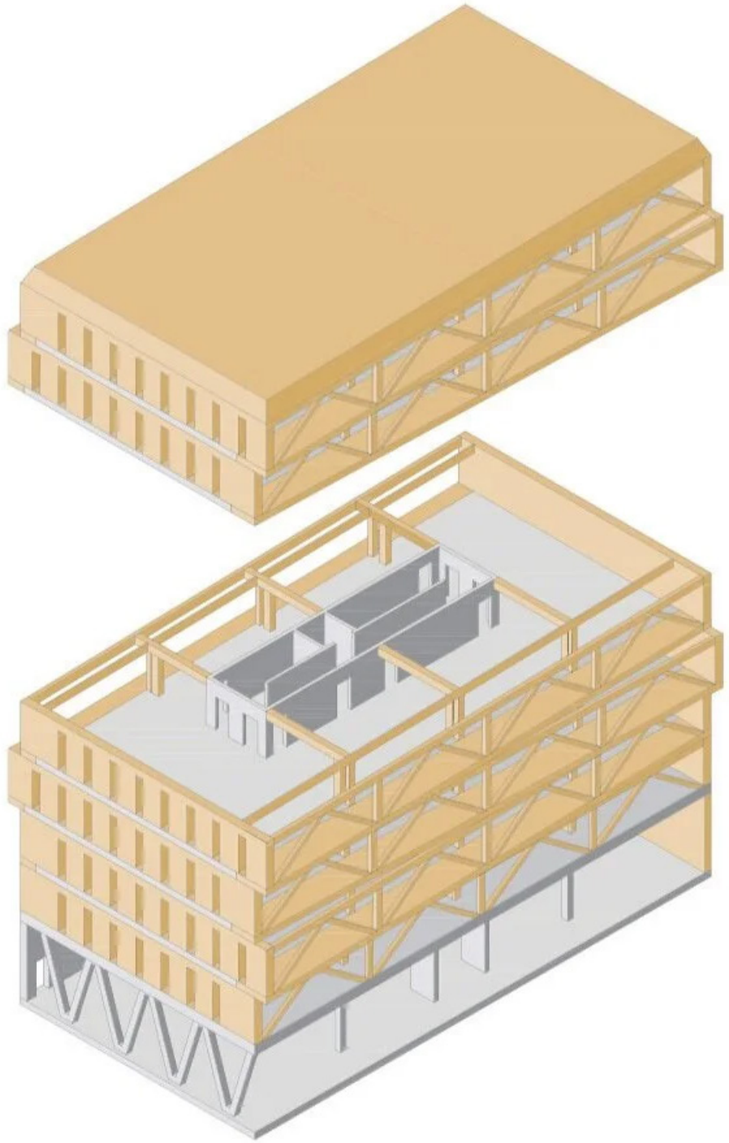
Burgerweeshuis, Aldo van Eyck, 1960,
24 February 1960, Aviodrome Lelystad - Luchtfoto archief



Kasbah, Piet Blom, 1973, 20 september 2005

Research structure

Open Building

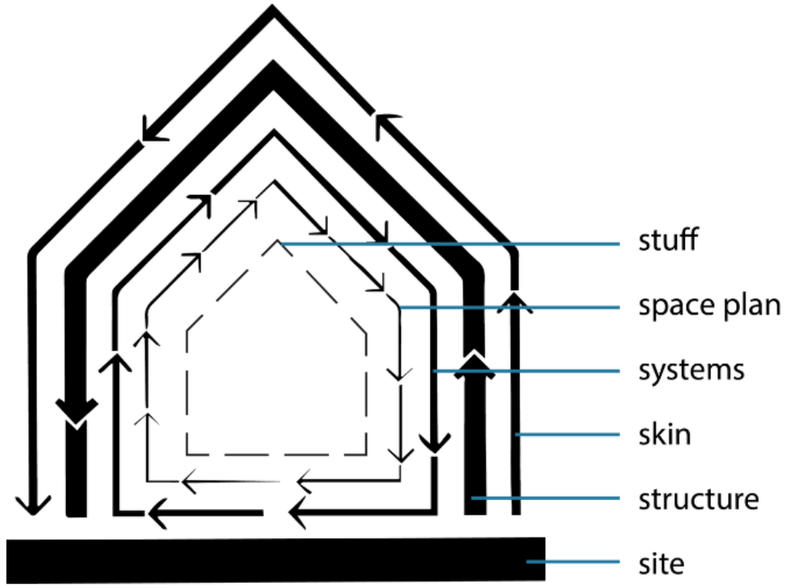


Tom Frantzen, 2016

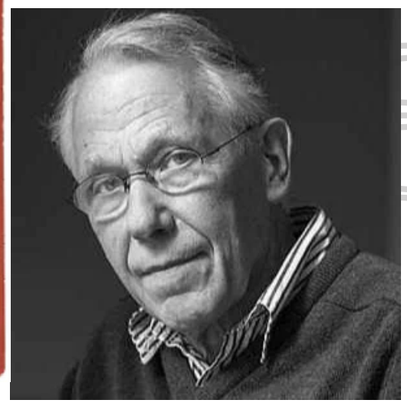


John Habraken, 1962

Shearing Layers



Stewart Brand 1994

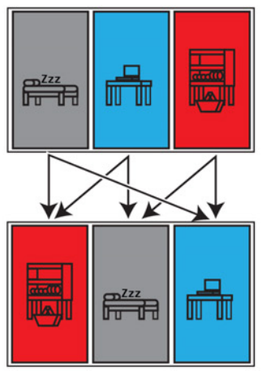


Metabolism

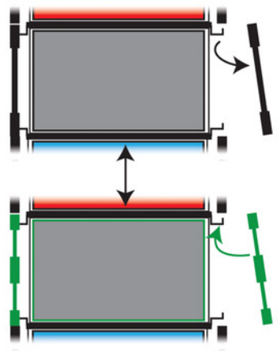
Shearing layers

Open building

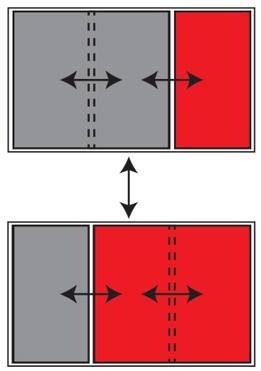
Research structure



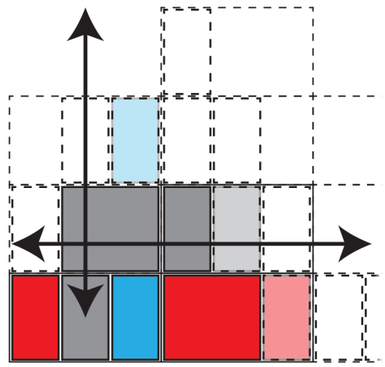
Convertible adaptability



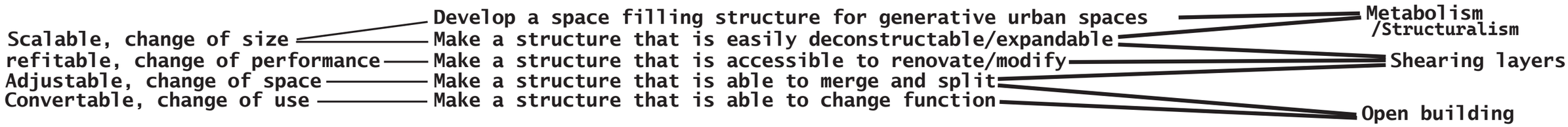
Refitable adaptability



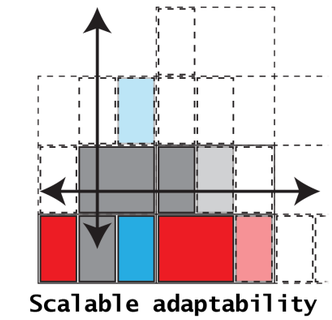
Adjustable adaptability



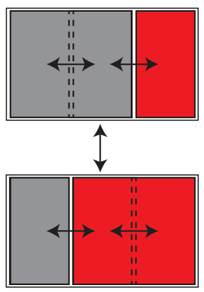
Scalable adaptability



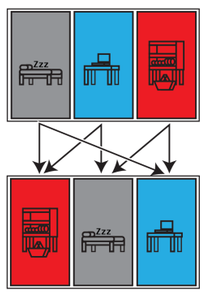
Research structure



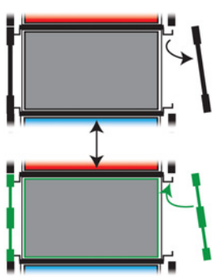
Scalable adaptability



Adjustable adaptability



Convertible adaptability



Refitable adaptability

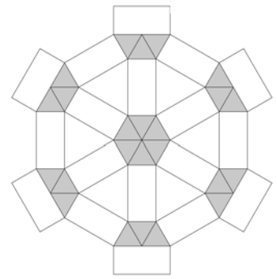
Prototype 2
Spatial - Conceptual
Space filling structure

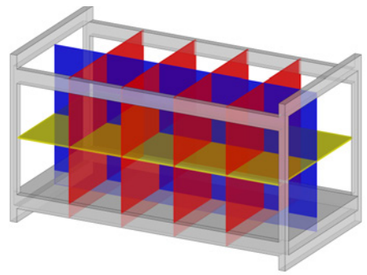
Prototype 1
Spatial - Conceptual
‘Open’ Modular unit

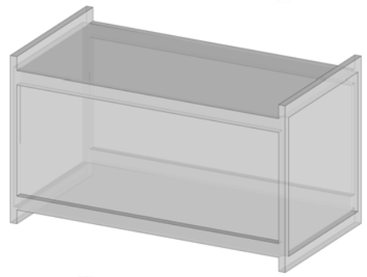
Prototype 3
Technical - Structural
Load bearing structure

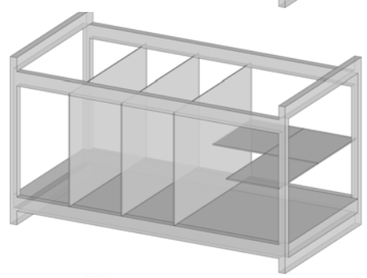
Prototype 5
Open Building
Interior structure

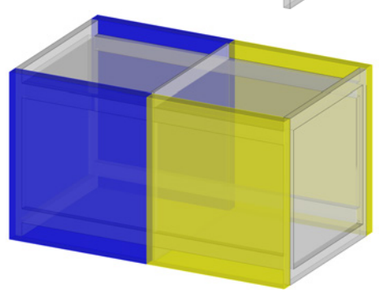
Prototype 4
Technical - Structural
Exterior structure



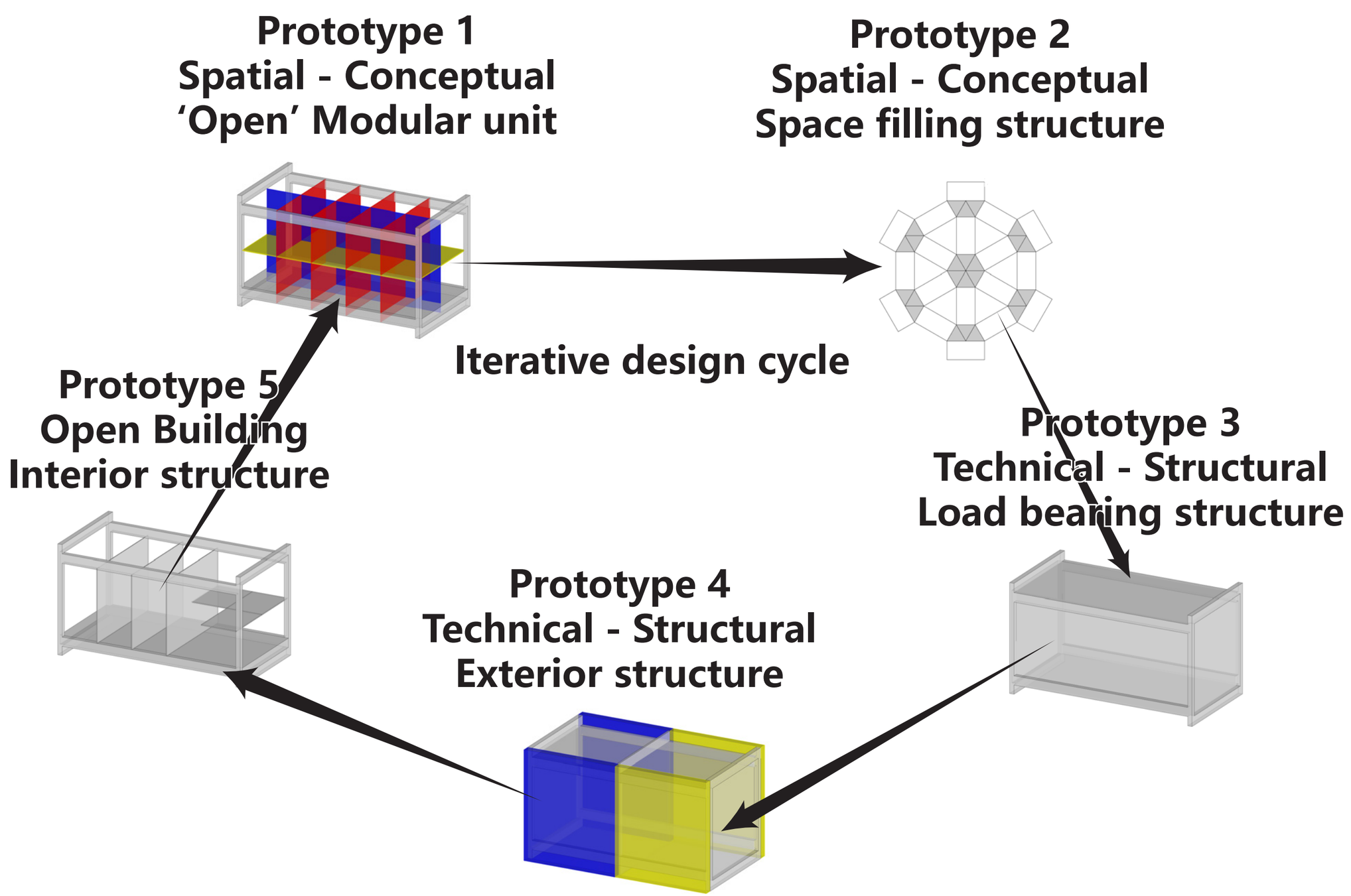








Research structure



Space filling structure

Benefits

- Consistent construction
- Less planning
- Fewer specifics to be designed
- Economy of scale

Space filling structure

Benefits

§ Consistent construction
§ Less planning
§ Fewer specifics to be designed
§ Economy of scale

Downsides

§ Predictable
§ Low sense of place
§ Anonimity through repetition

§ Little mixed use incorporated
§ Buildings often uneconomical to alter
§ Remaining space often quickly filled with similar fixed use

Space filling structure

Perhaps it is not the principle of the stamp but rather the
shape and filling that have resulted in undesired outcomes. Rethinking stamp
philosophy could improve devolopment, construction and cost.

Space filling structure



Bijlmermeer

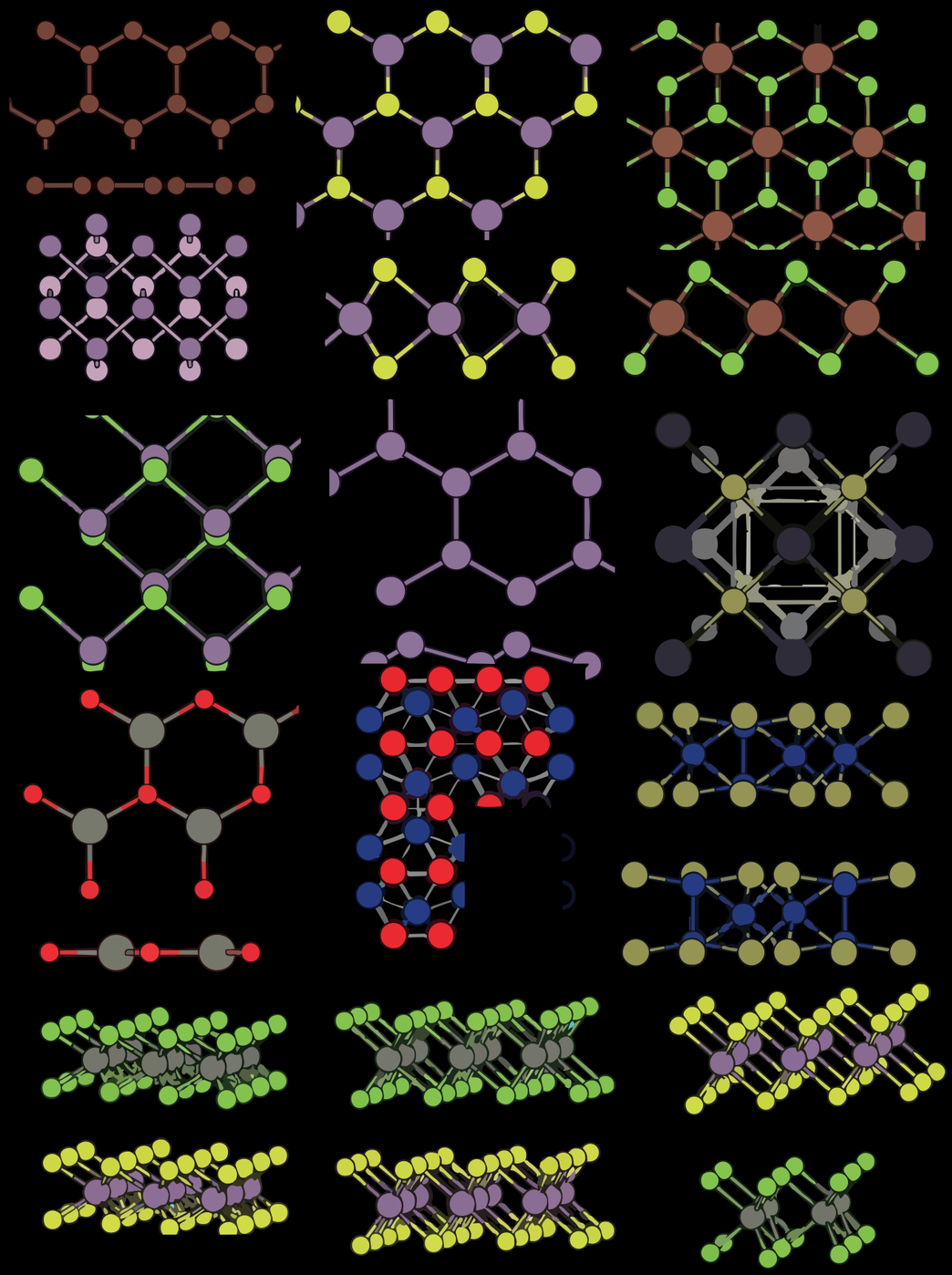


Holtenbroek

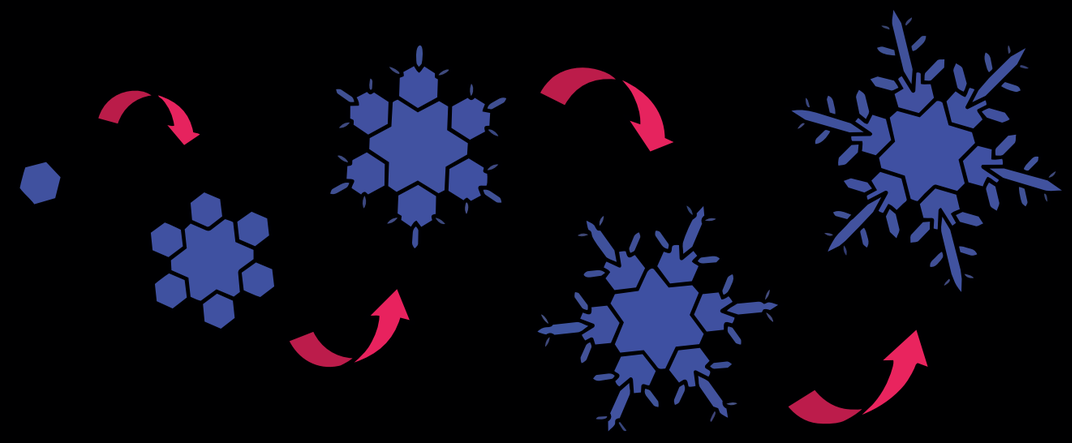


Woensel

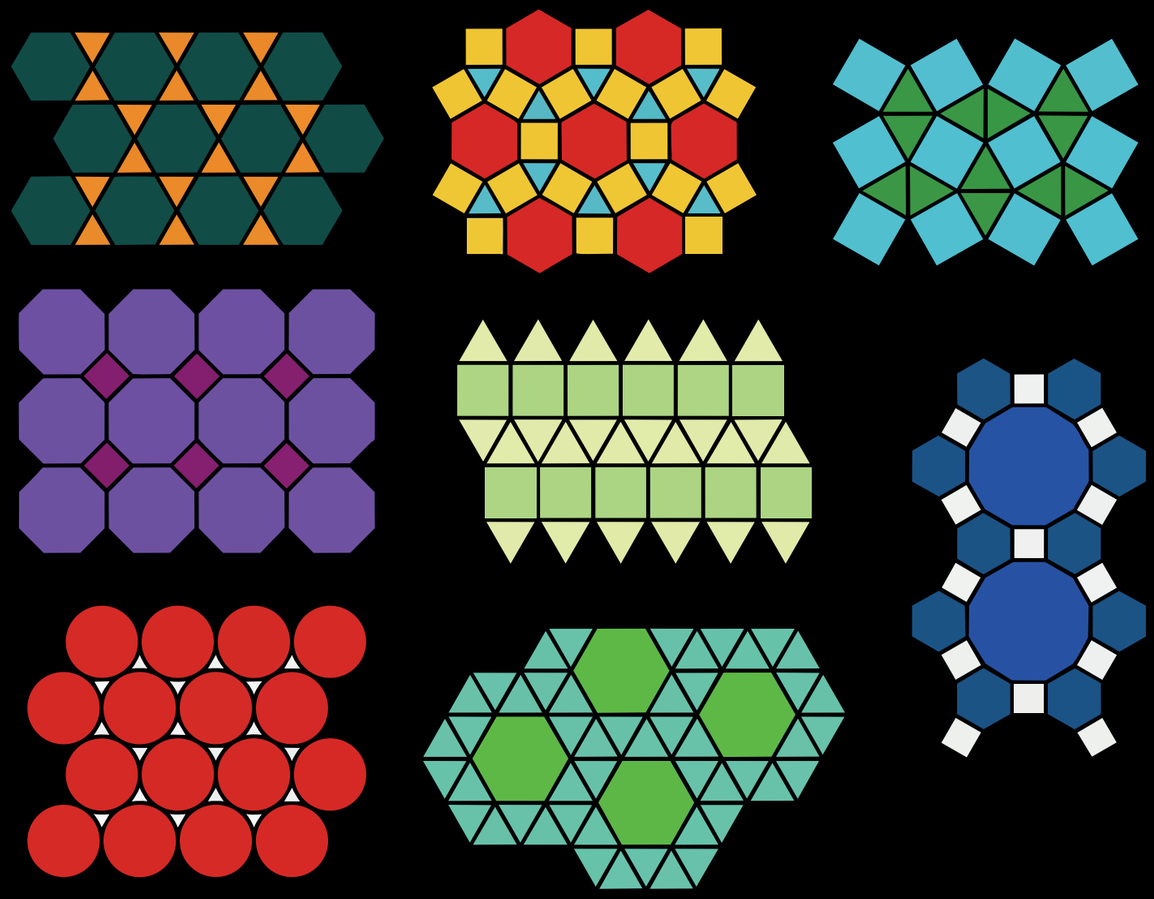
Space filling structure



Visualizations of various crystal growths, Srihari Kastuar et al. 2022

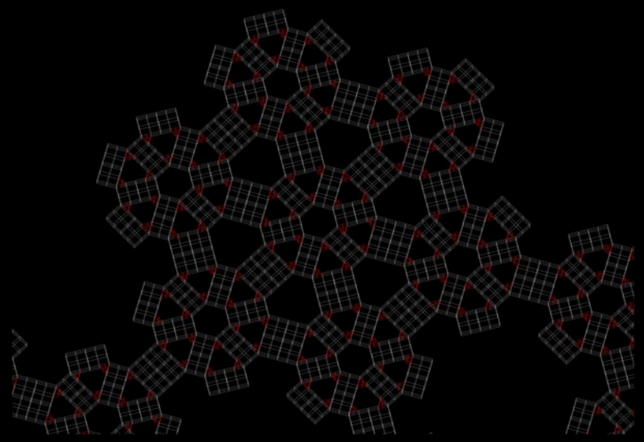
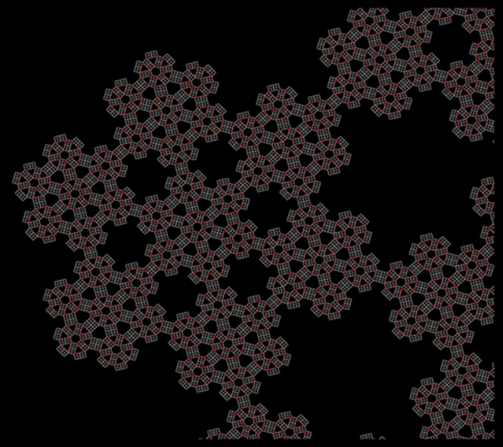
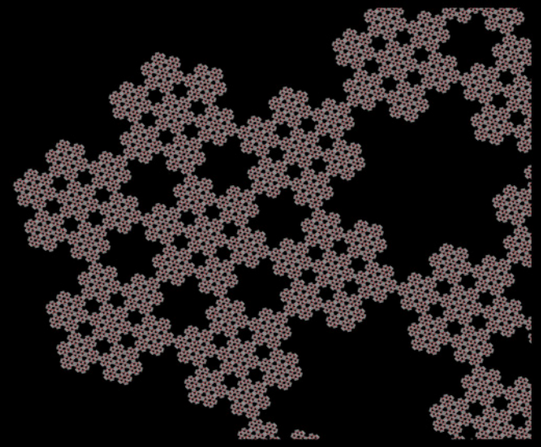
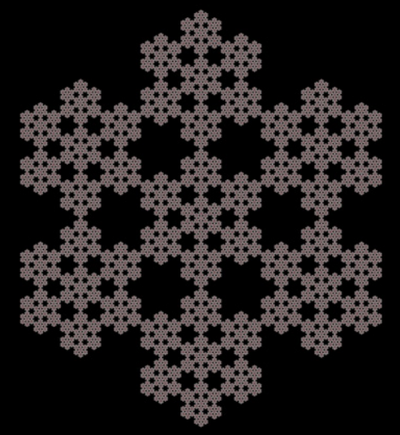
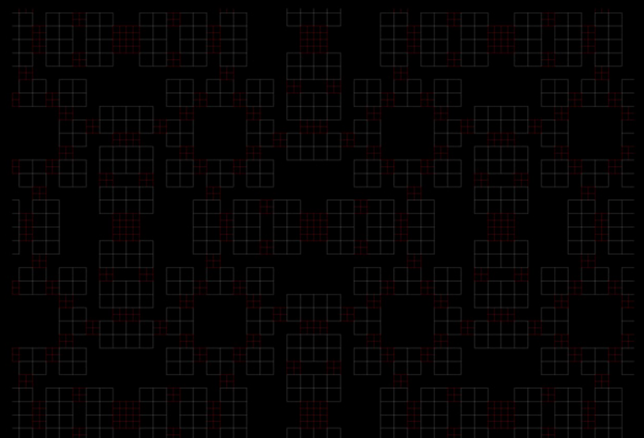
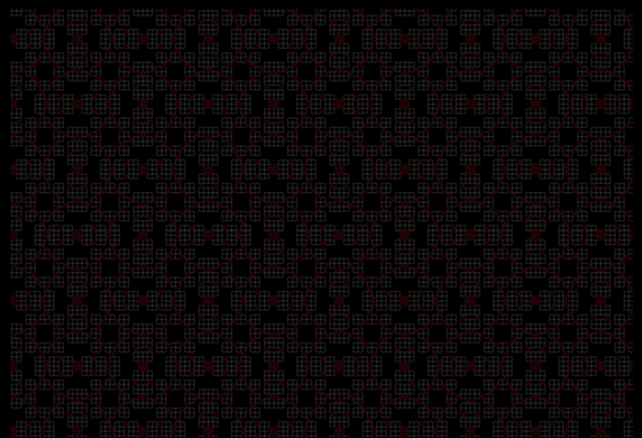
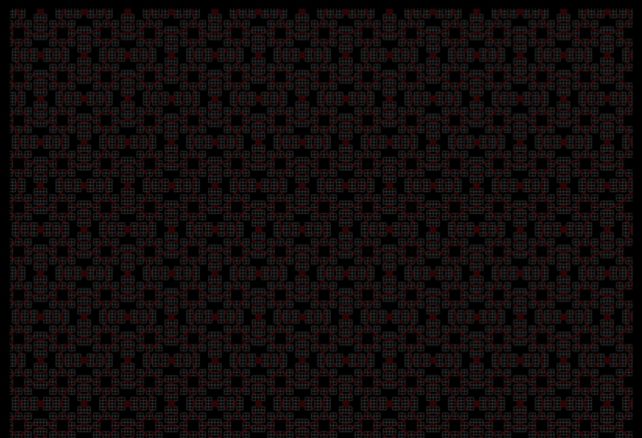
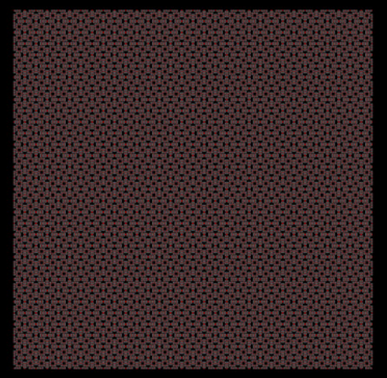
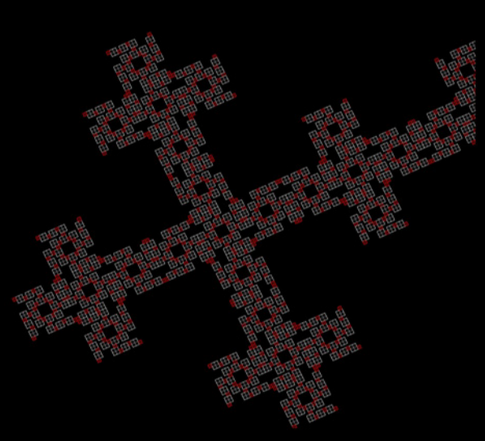
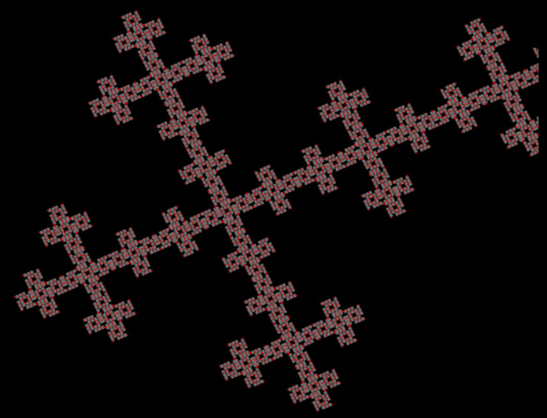
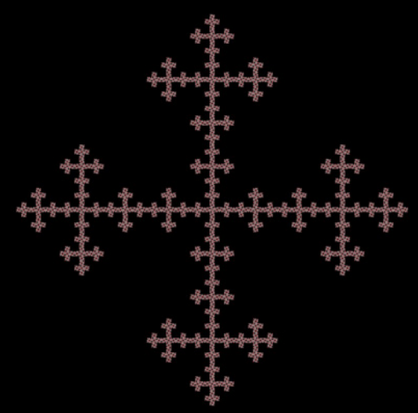
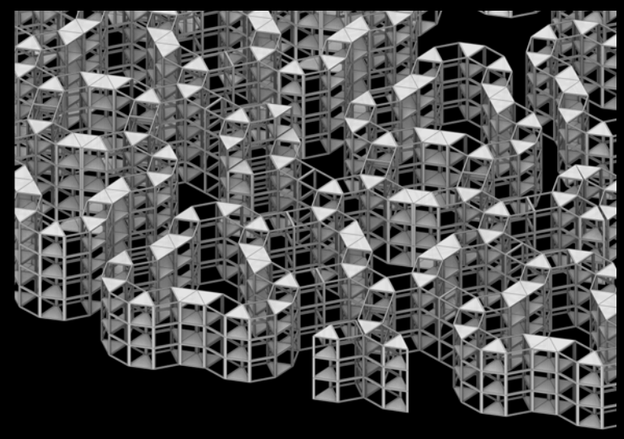
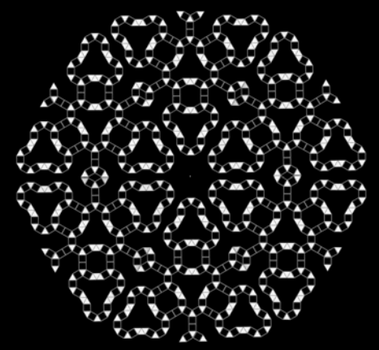


Snowflake development, Kenneth Libbrecht. 2015



Tessalations, Max Scout, 2015

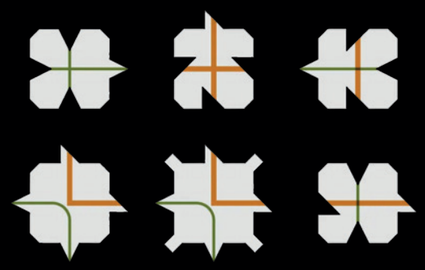
Fractal structures

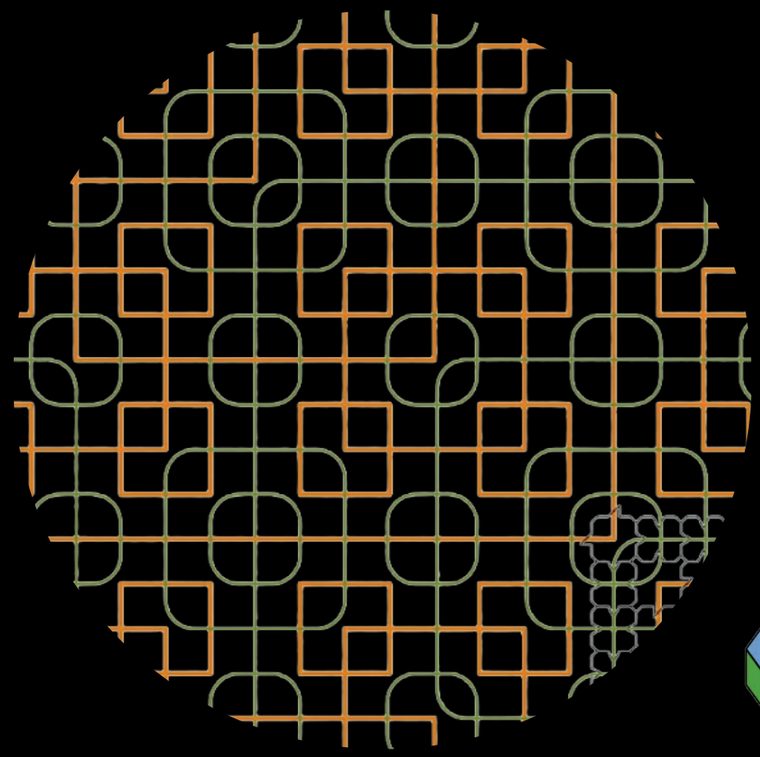














Space filling structure

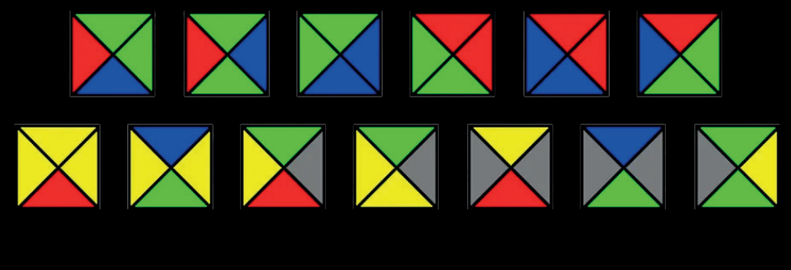
repeated units, that tile the plane,
while remaining unpredictable and varied throughout,
are needed.

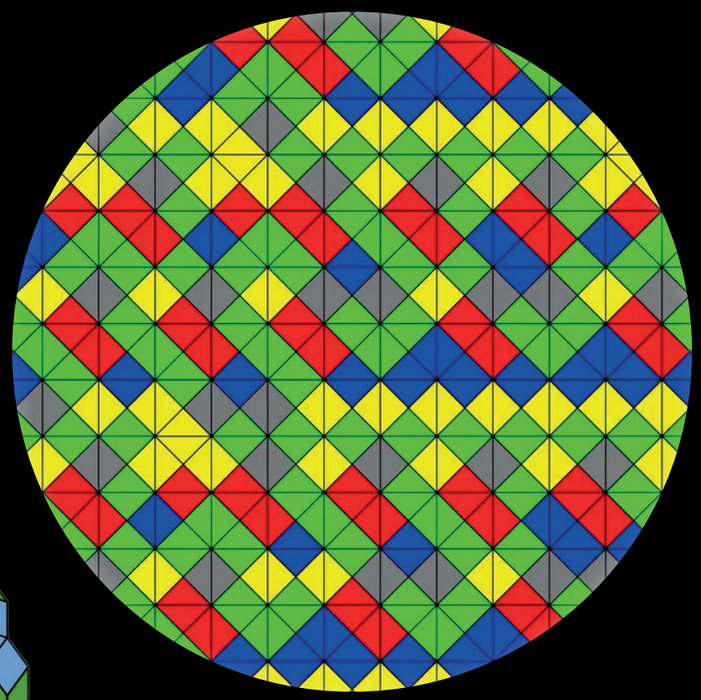
Space filling structure



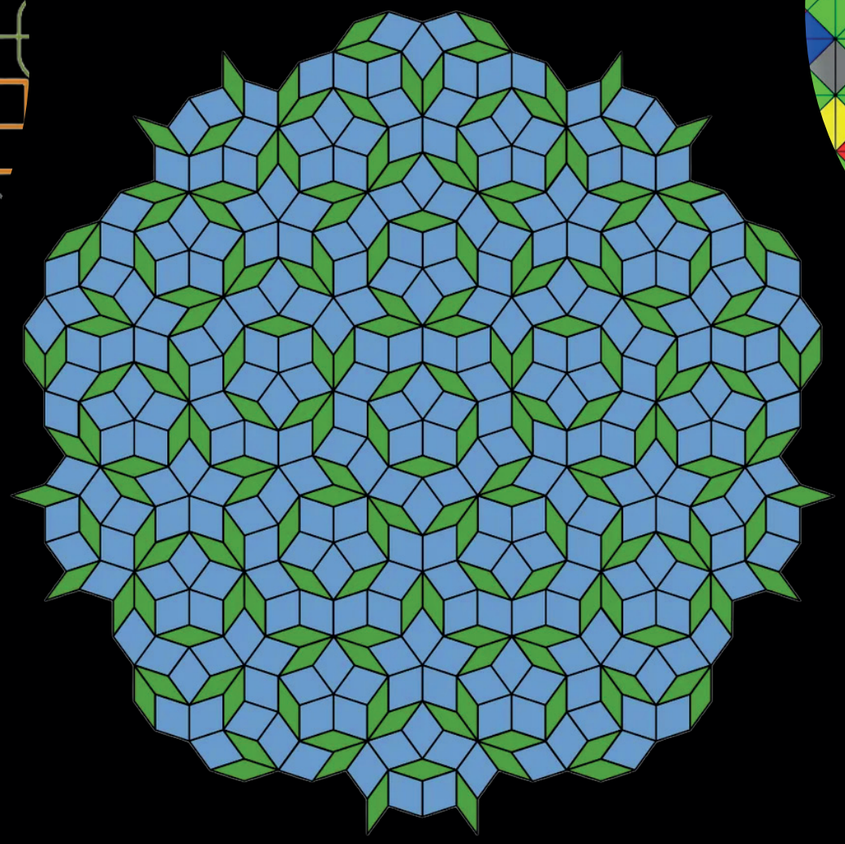


Robinson tiling, visualized by C. Straus





Aperiodic Mosaic, visualized by Claudio Rochchini

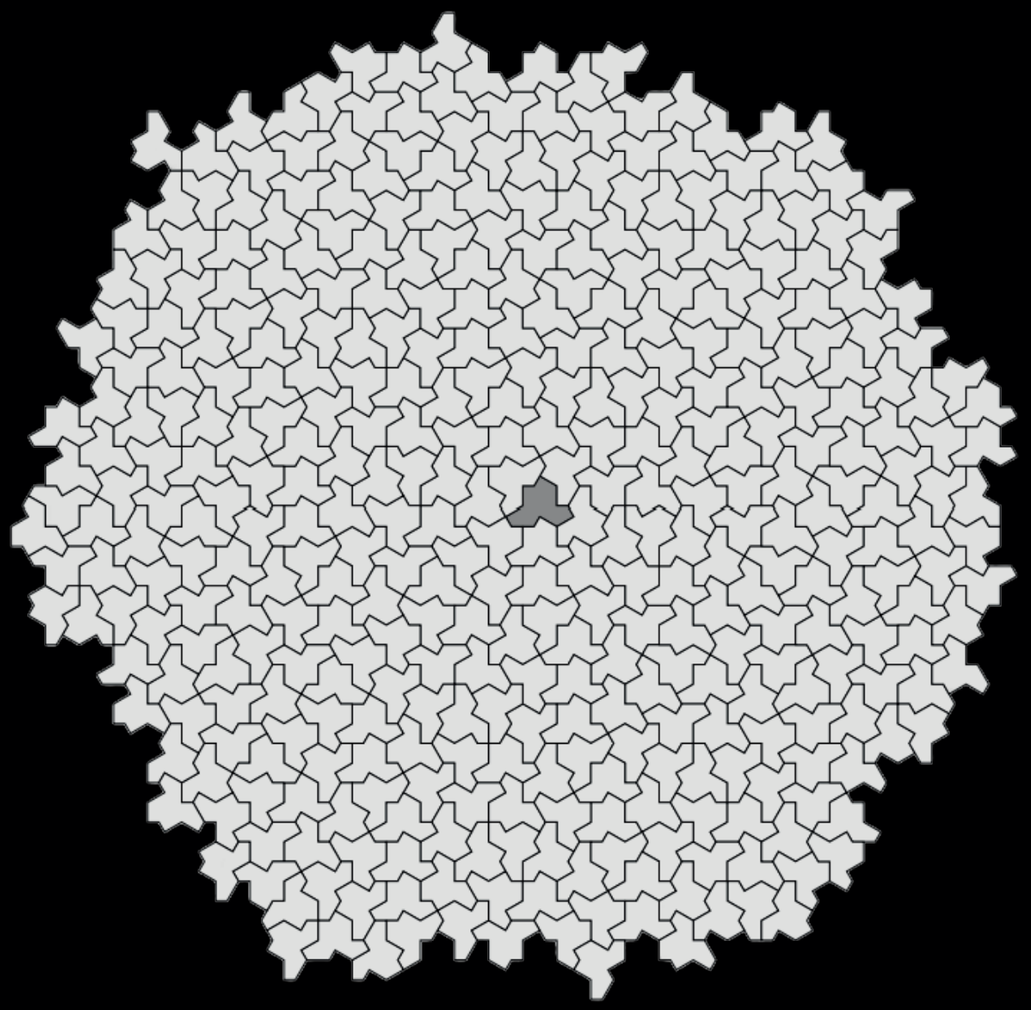


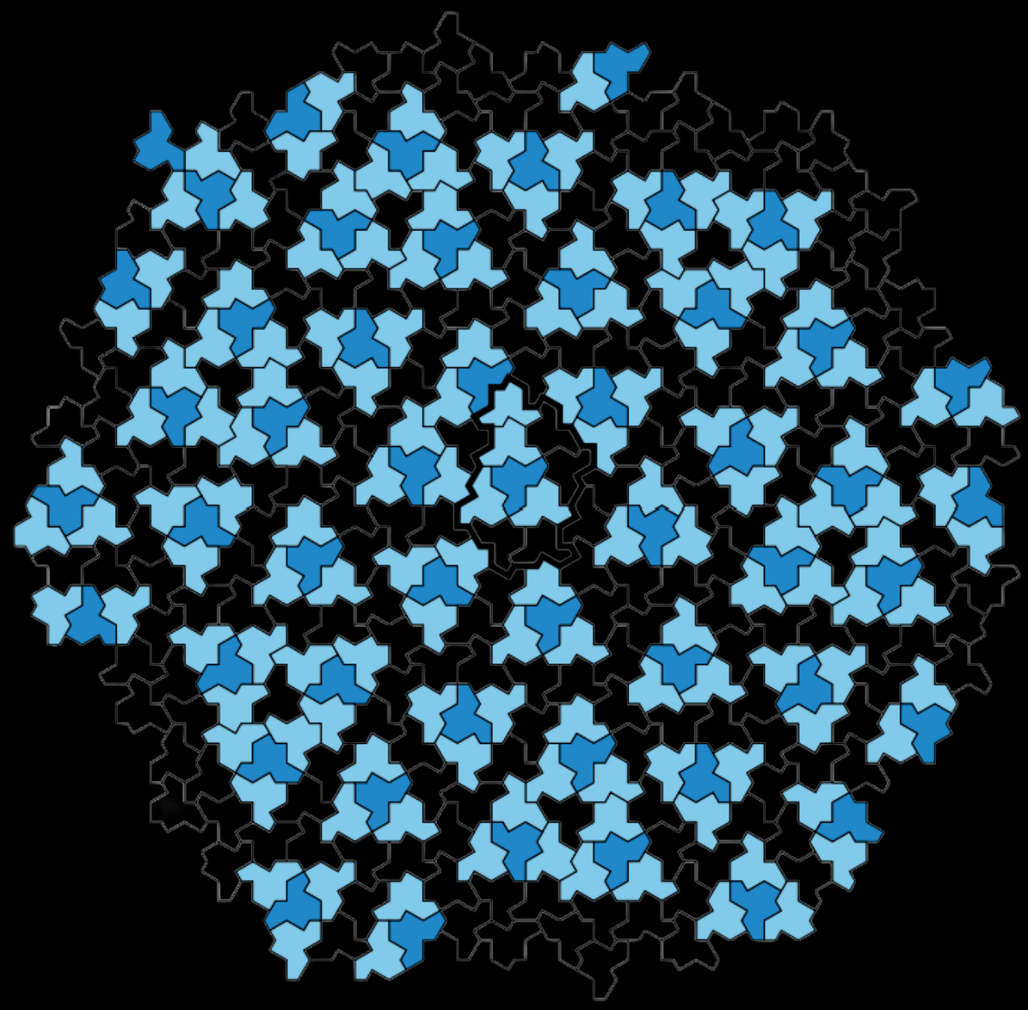
Penrose tiling, visualized by C. Straus

Space filling structure



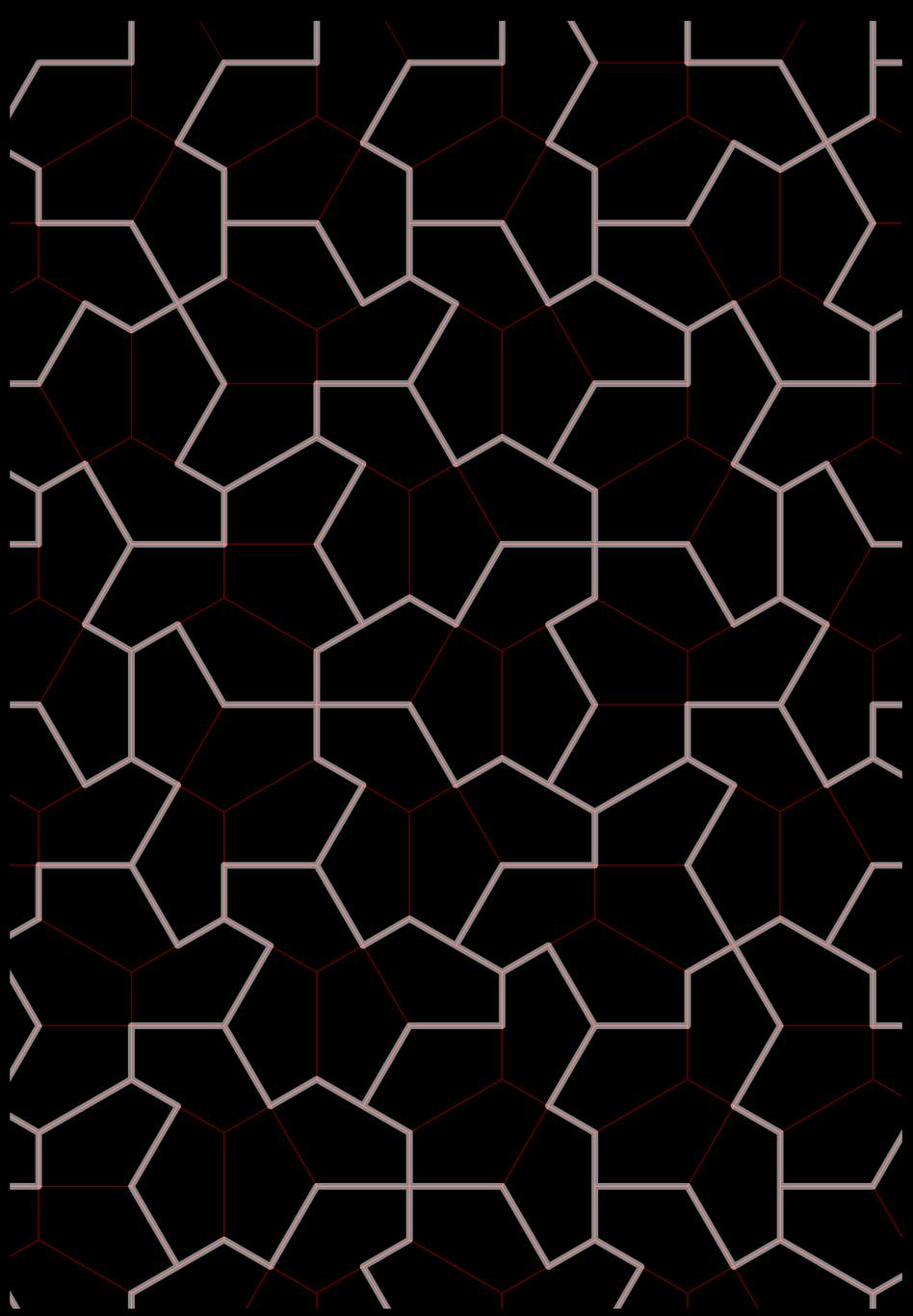
Einstein tile

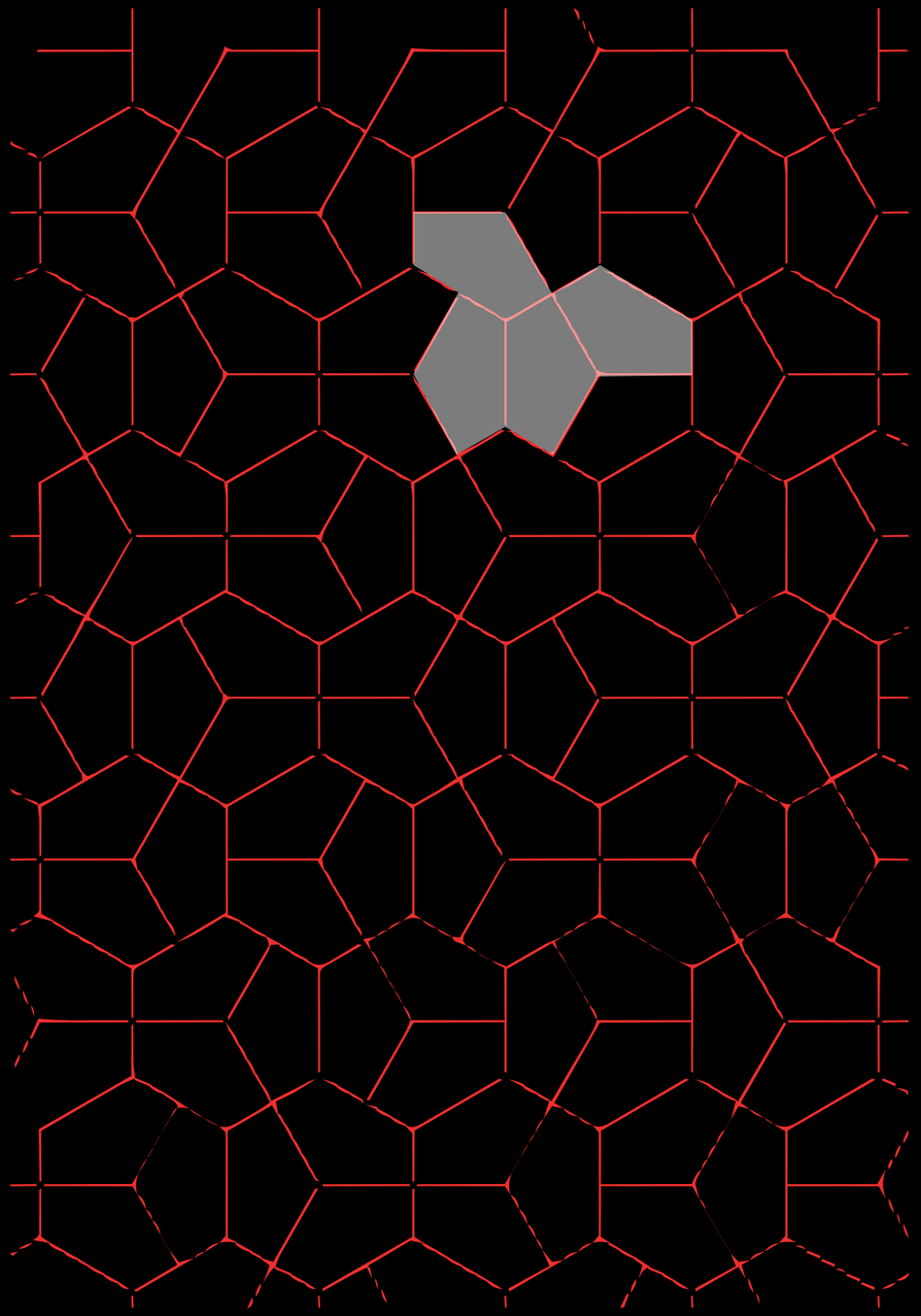




Einstein tiling visualization, edited from David Smith et al., 2024

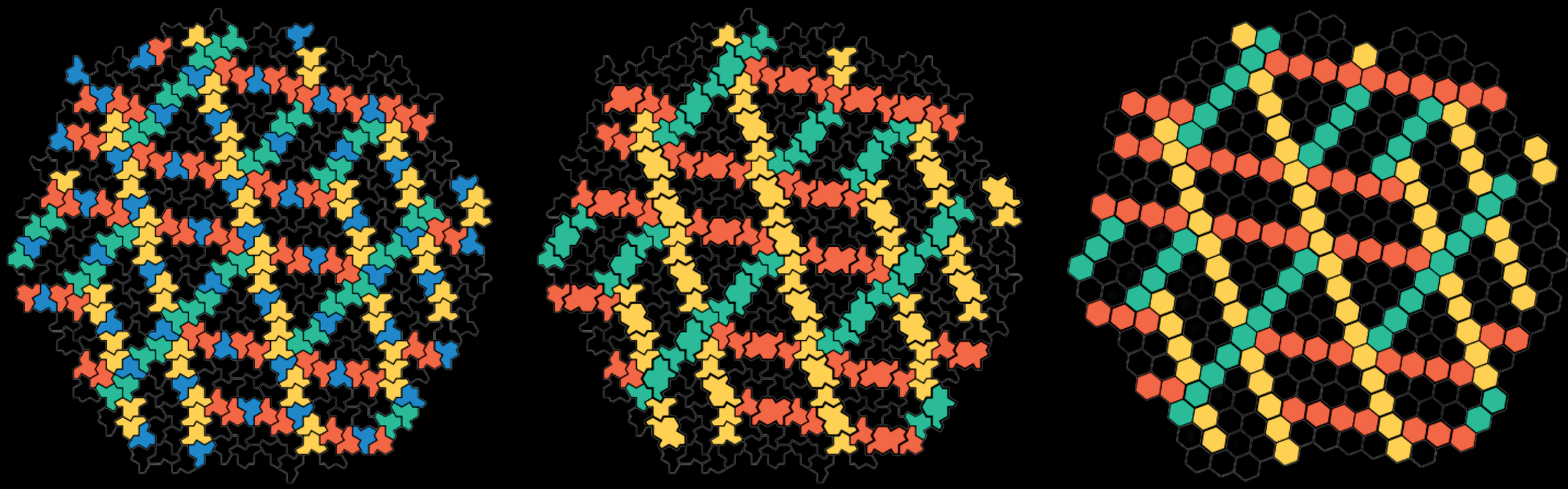
Space filling structure





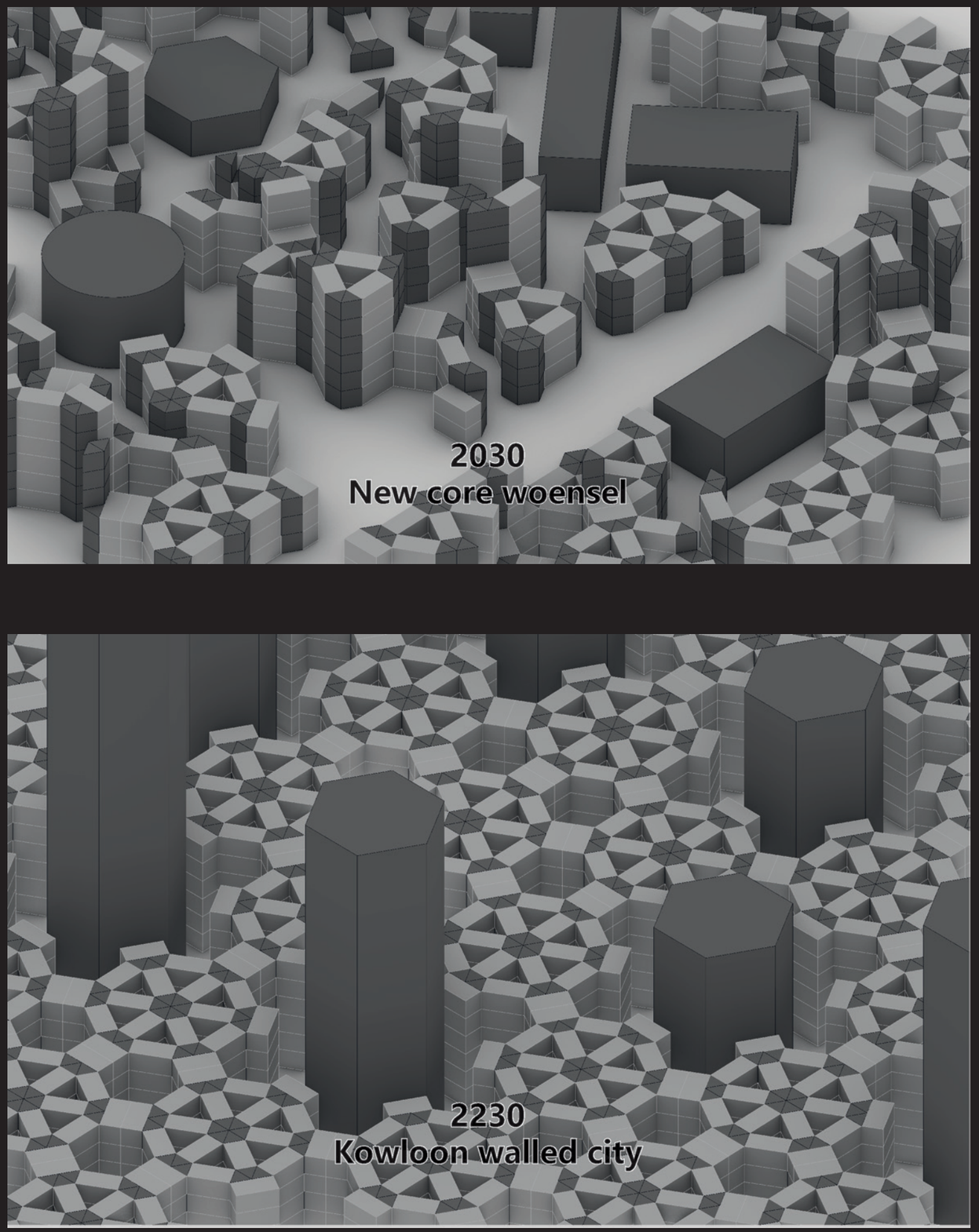
Space filling structure

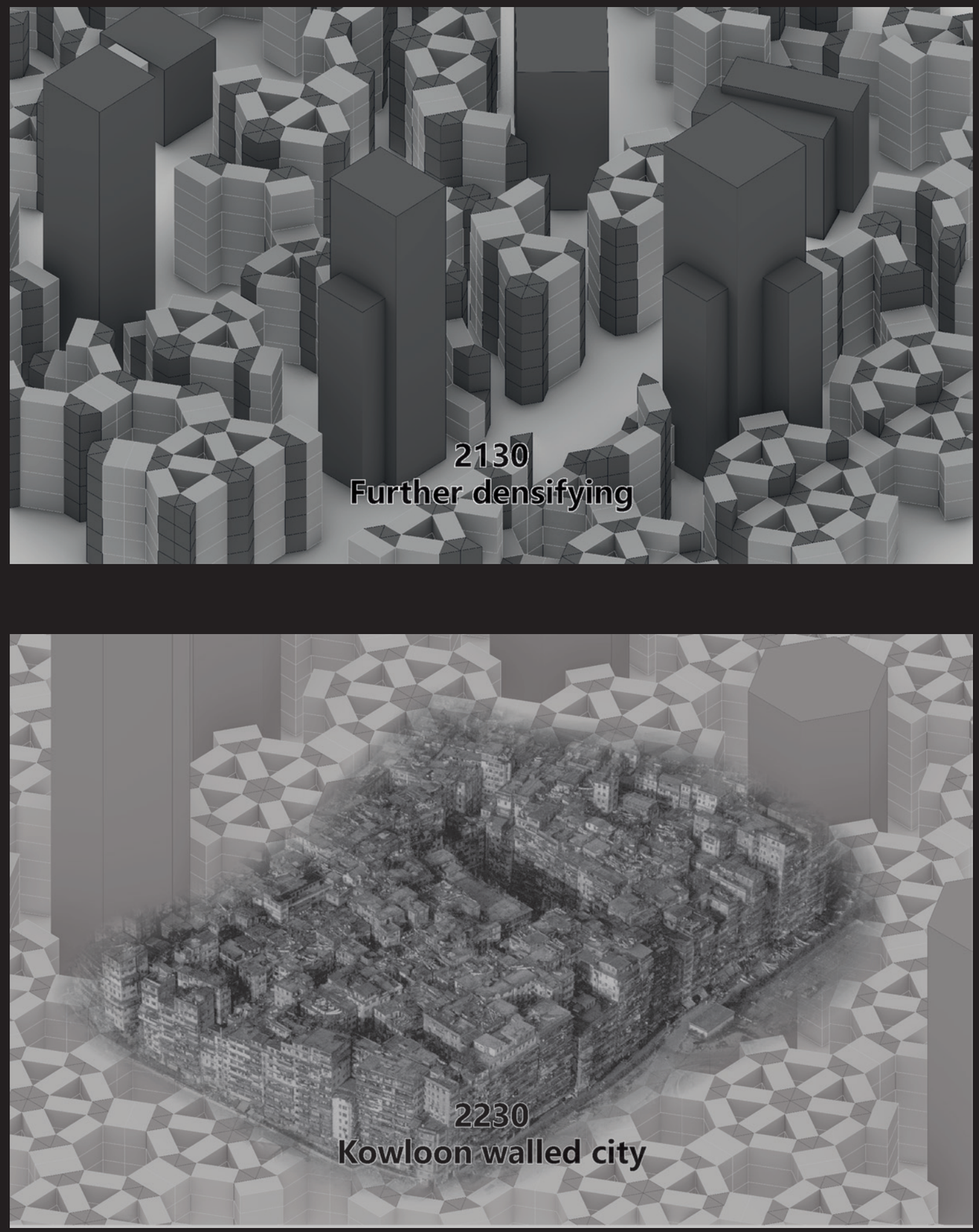




David Smith et al., 2024

Space filling structure



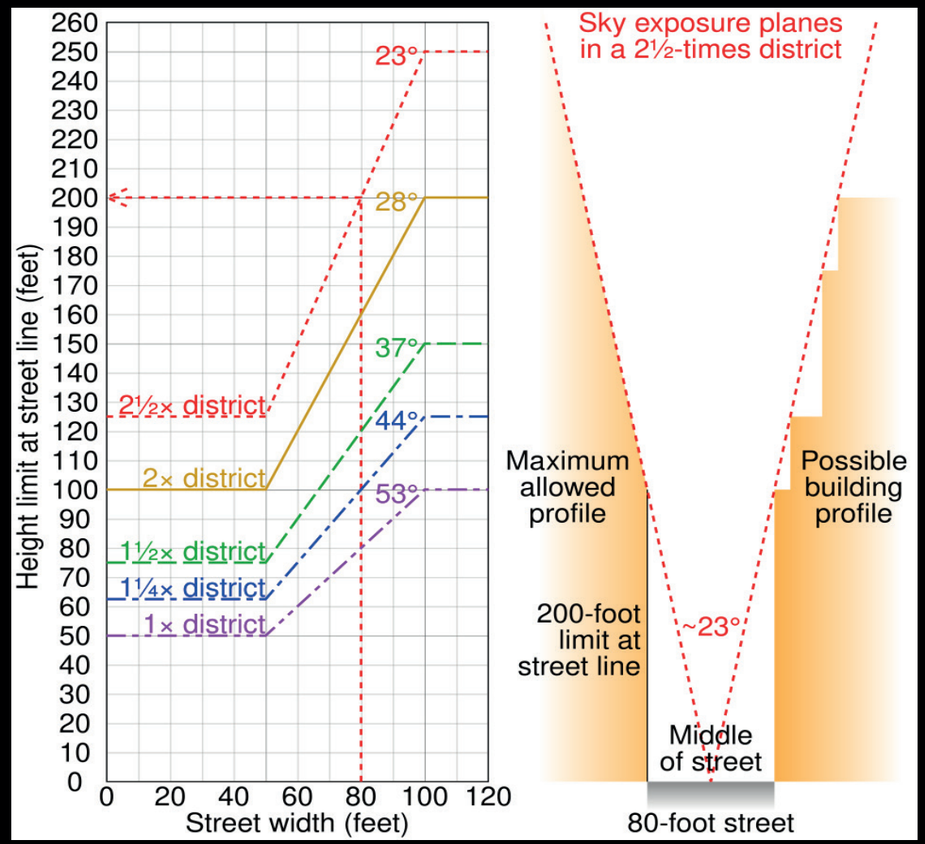


Generative structure

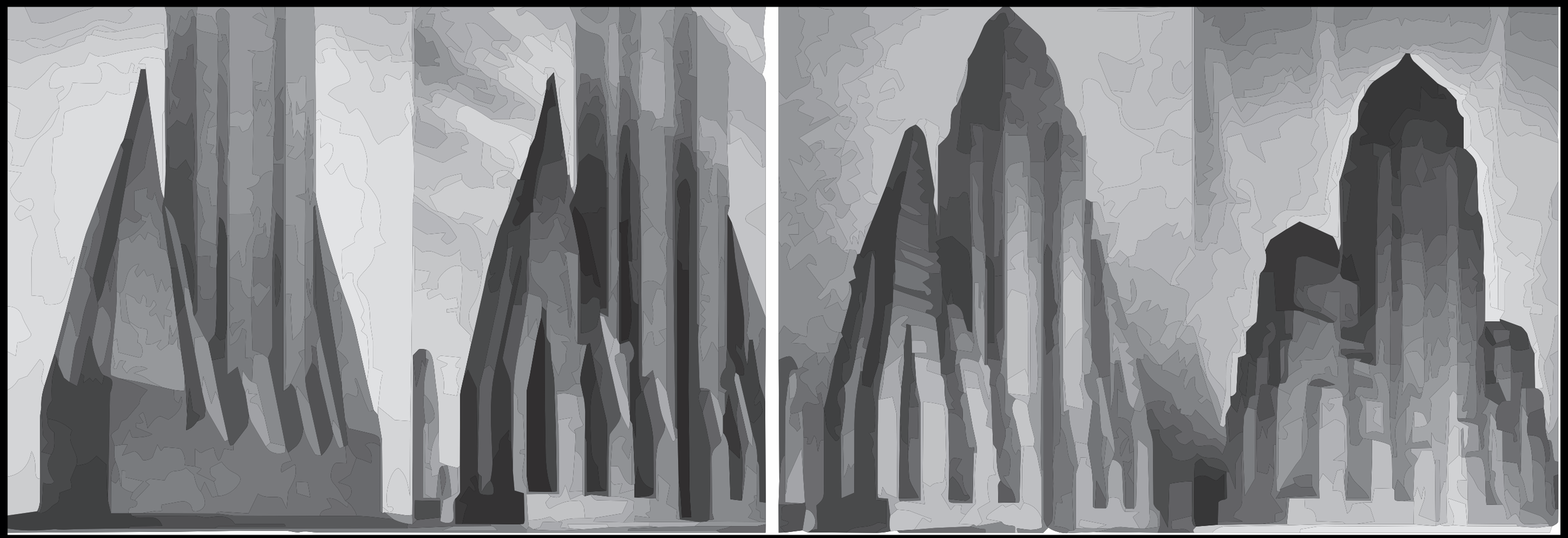


Kowloon Walled City. 1989 Aerial - Wikipedia - CC BY-SA 4.0

Generative structure

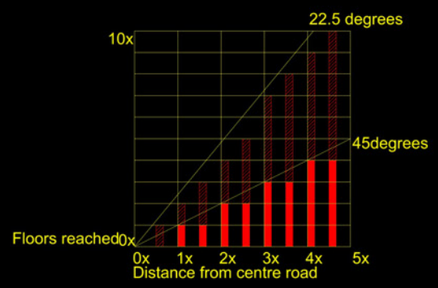


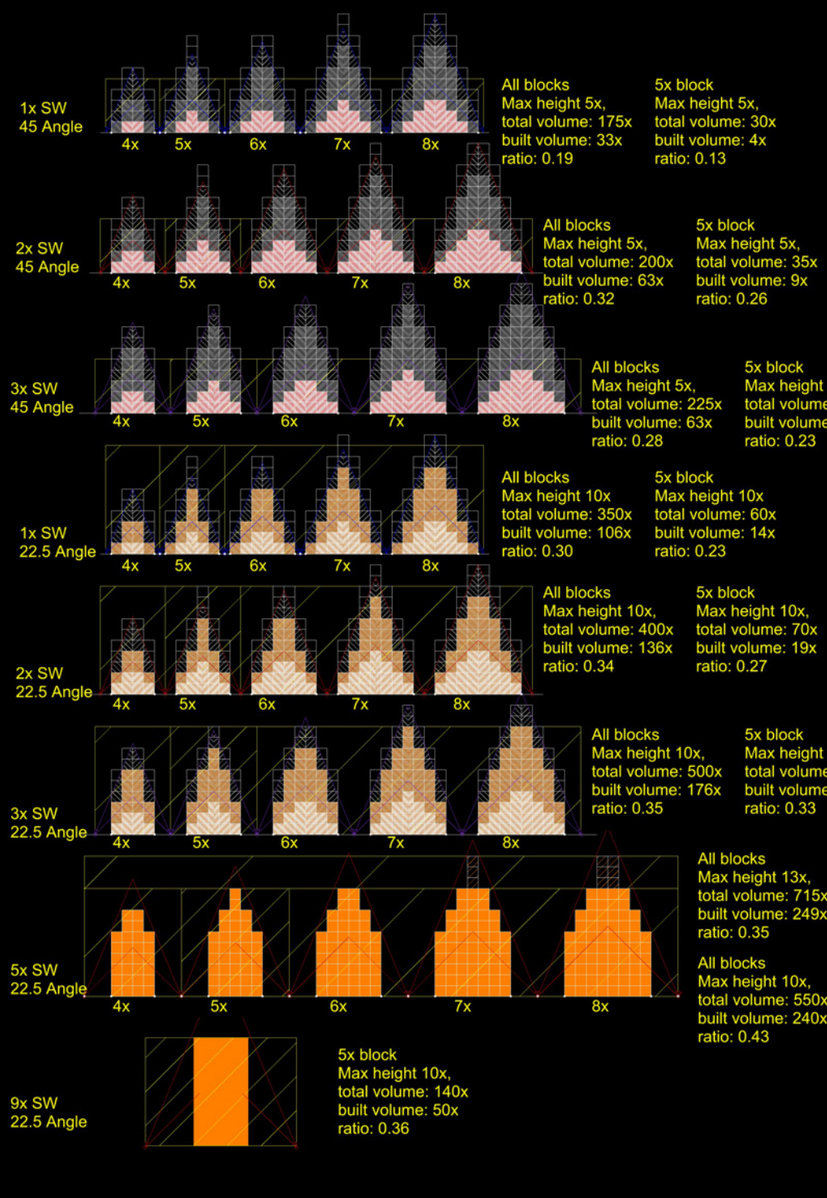
Cmglee. (2019). NYC 1916 setback principle

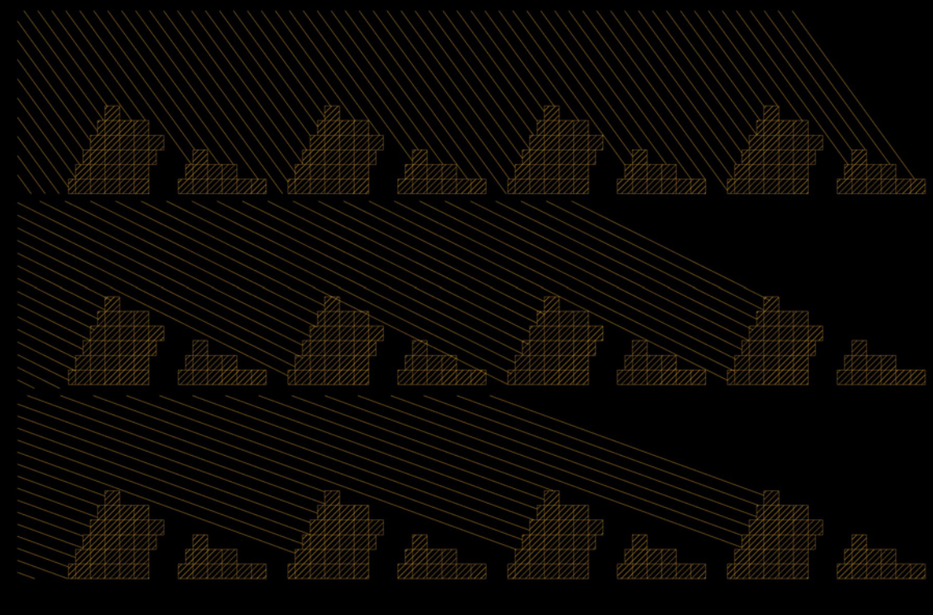


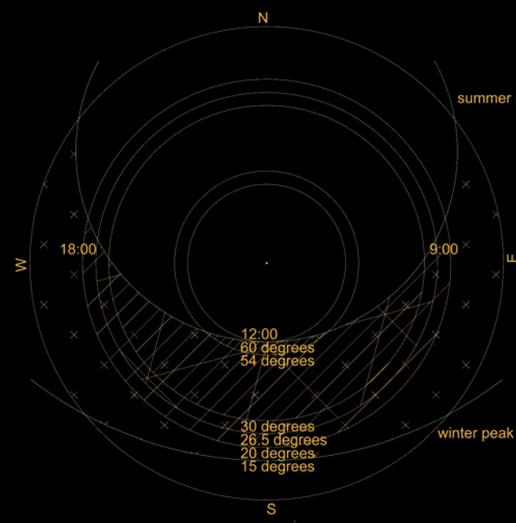
Hugh Ferriss, New York Times, 1922, edited

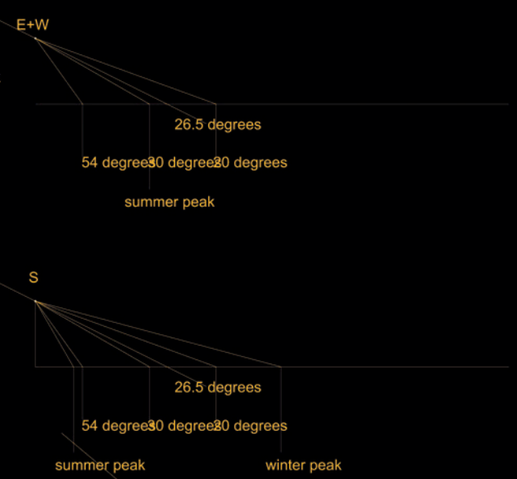
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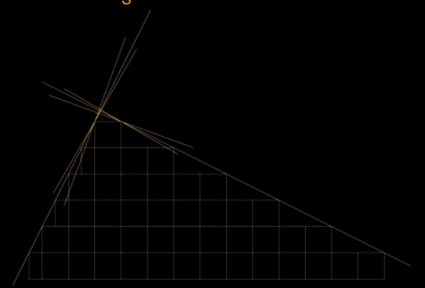


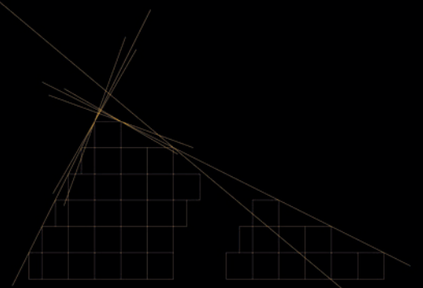




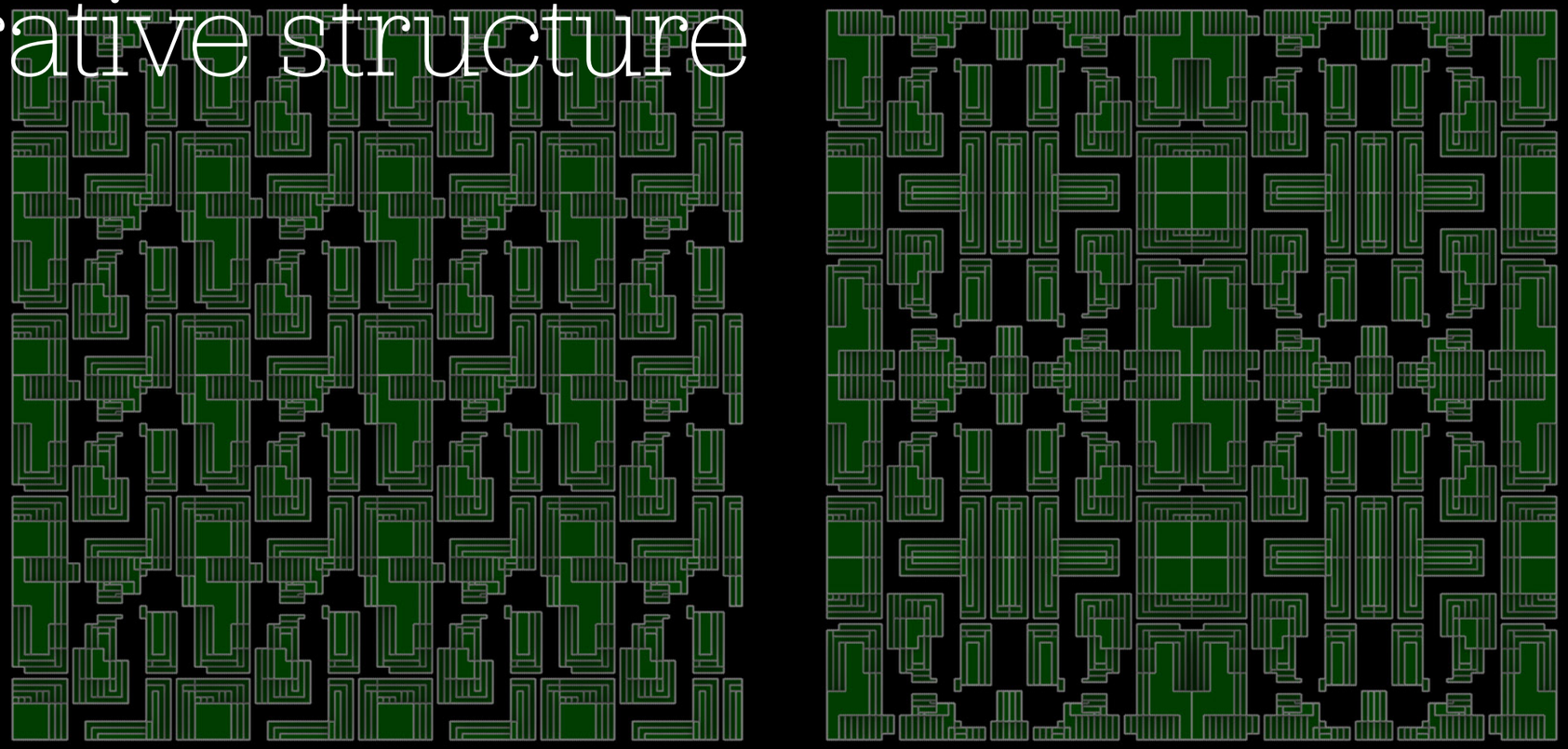


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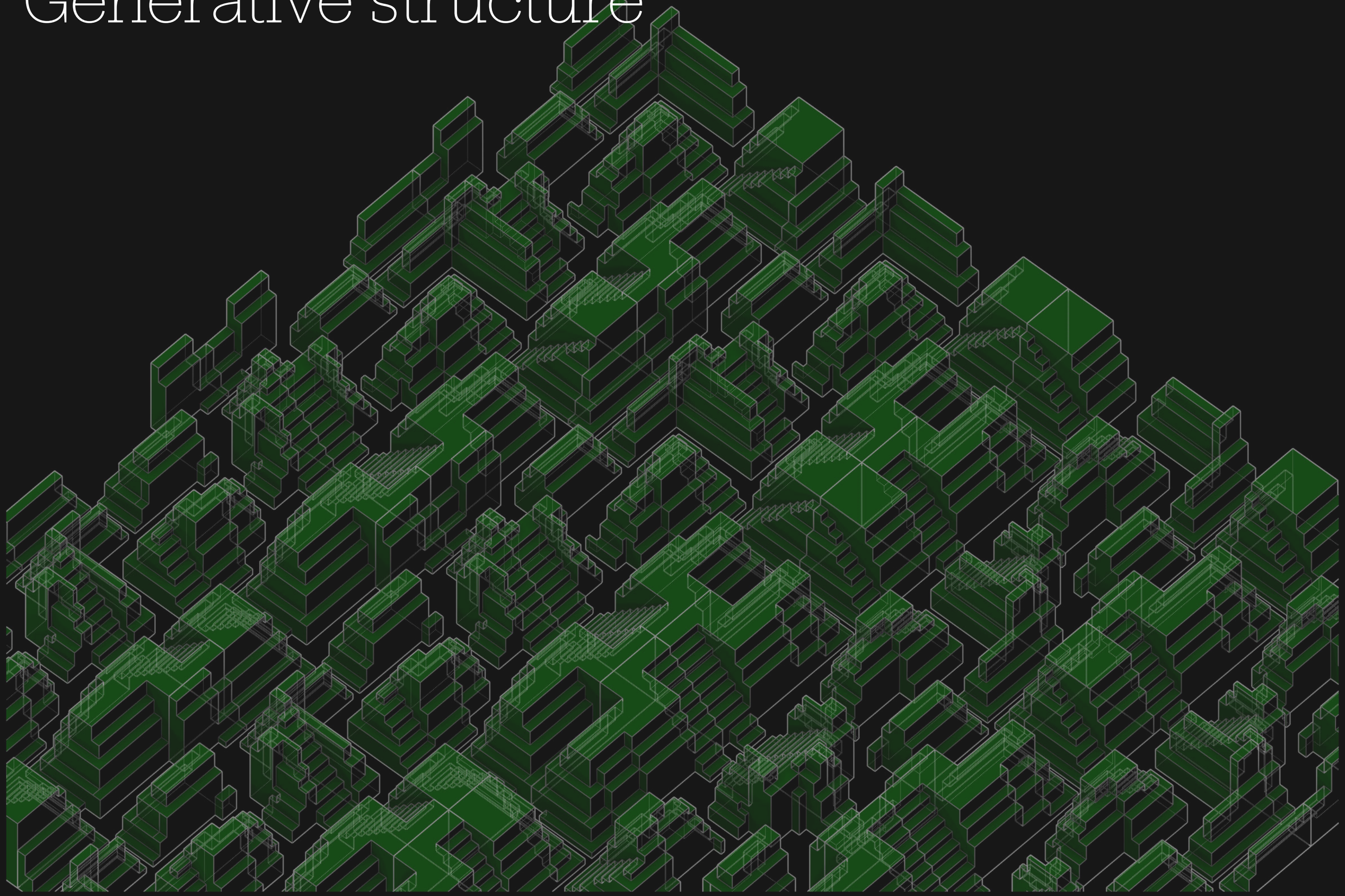




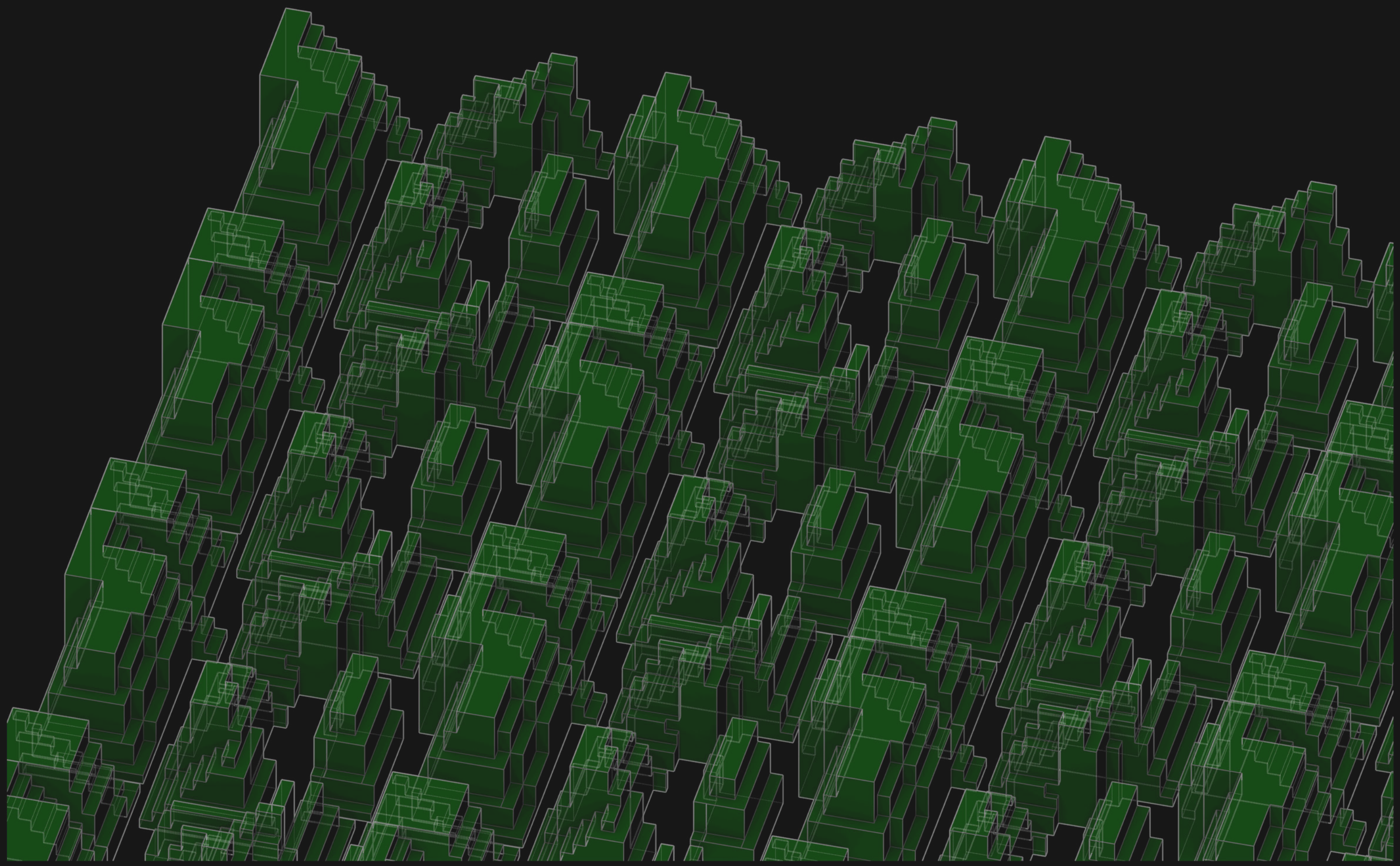
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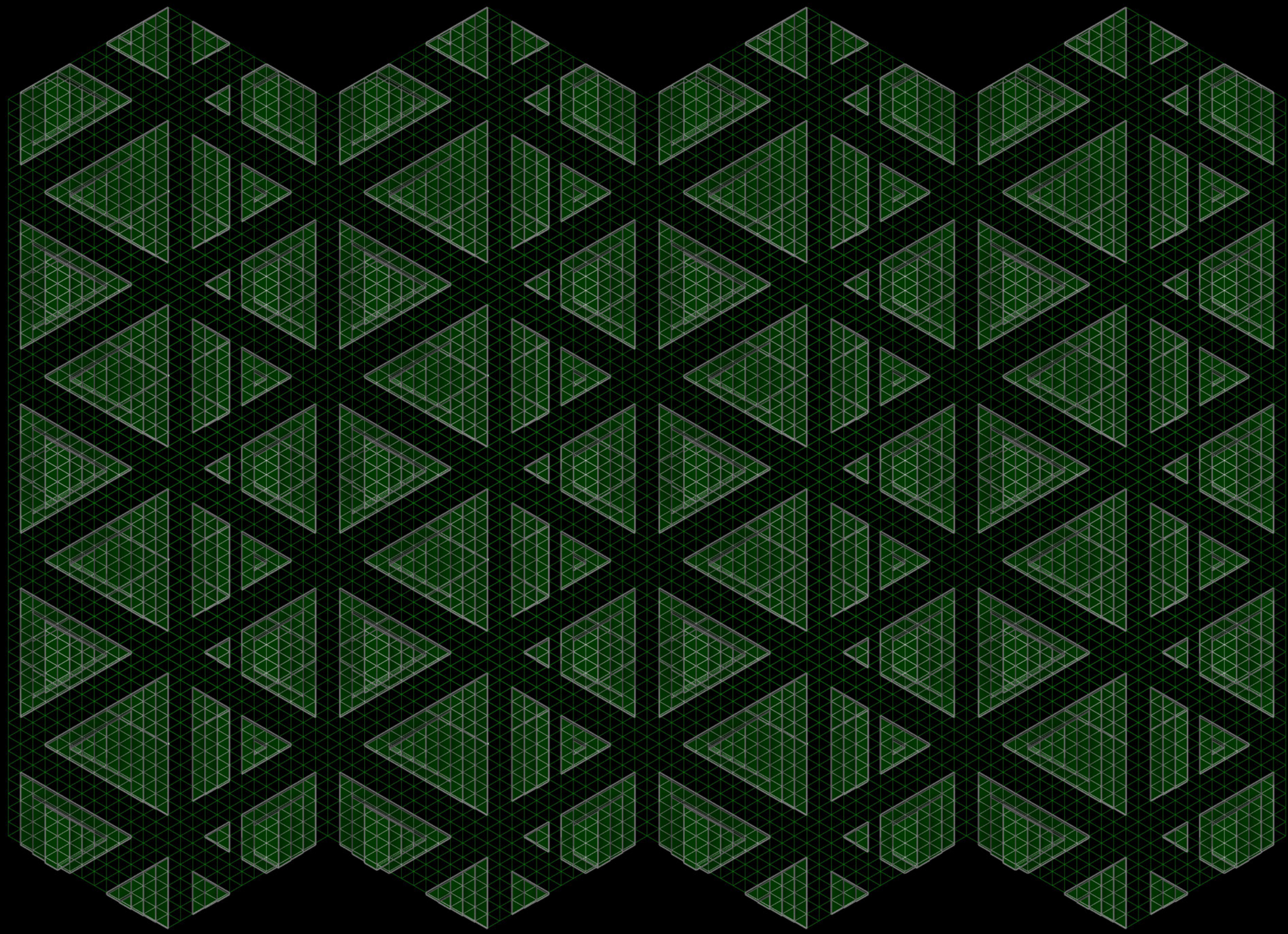
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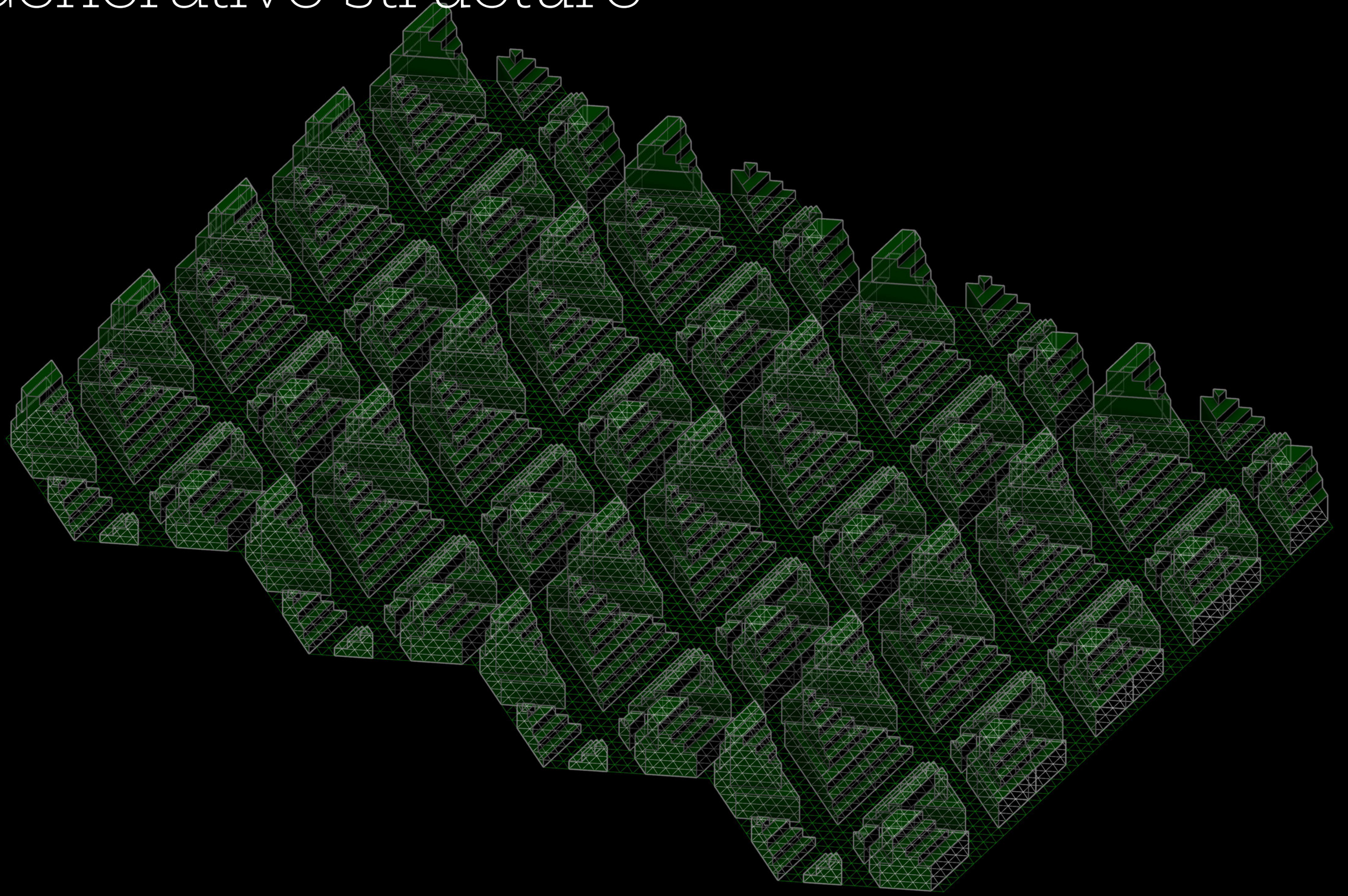
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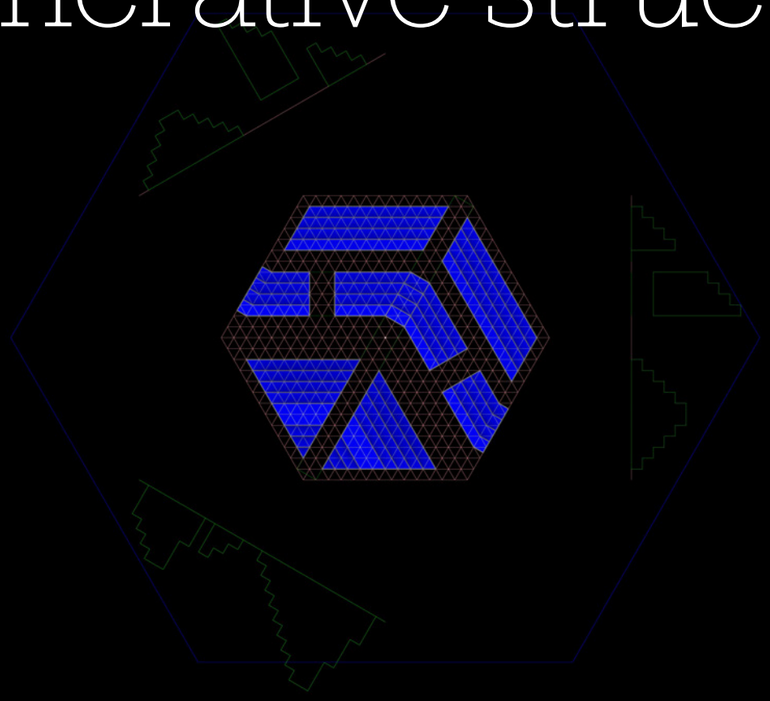
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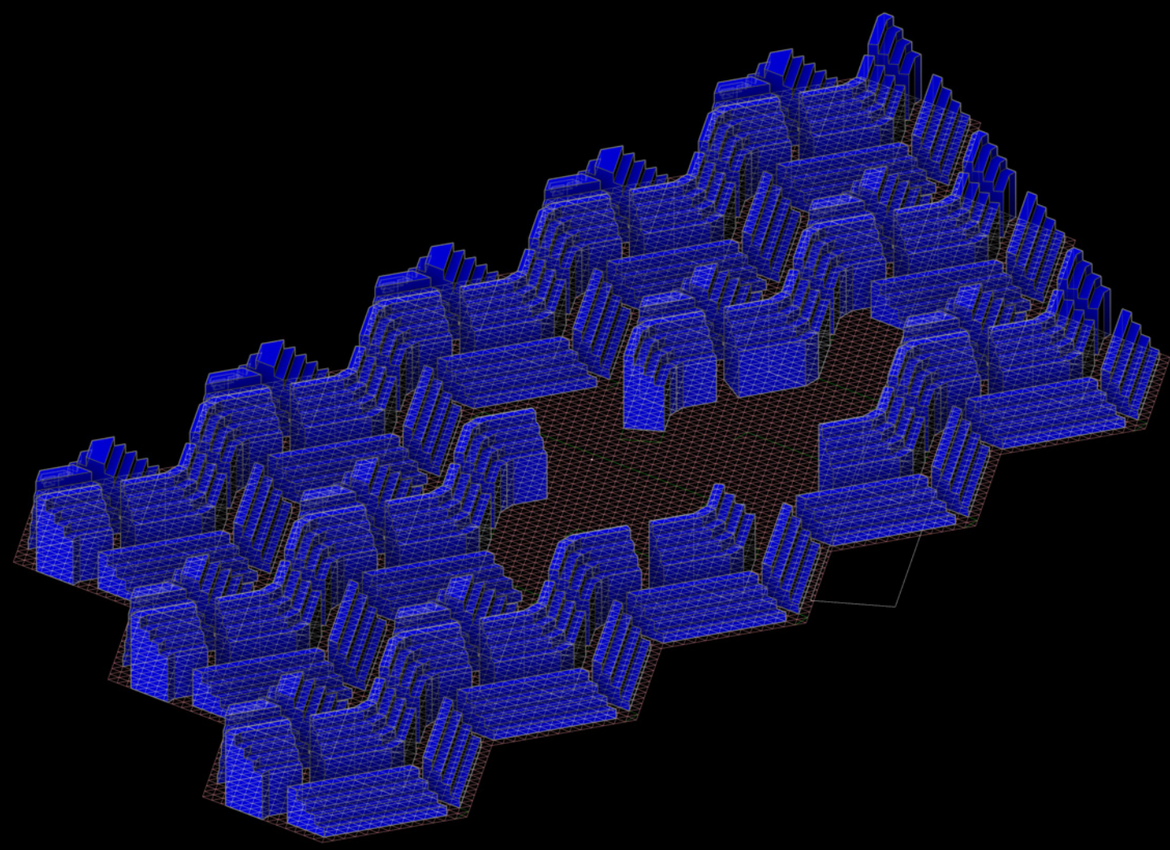


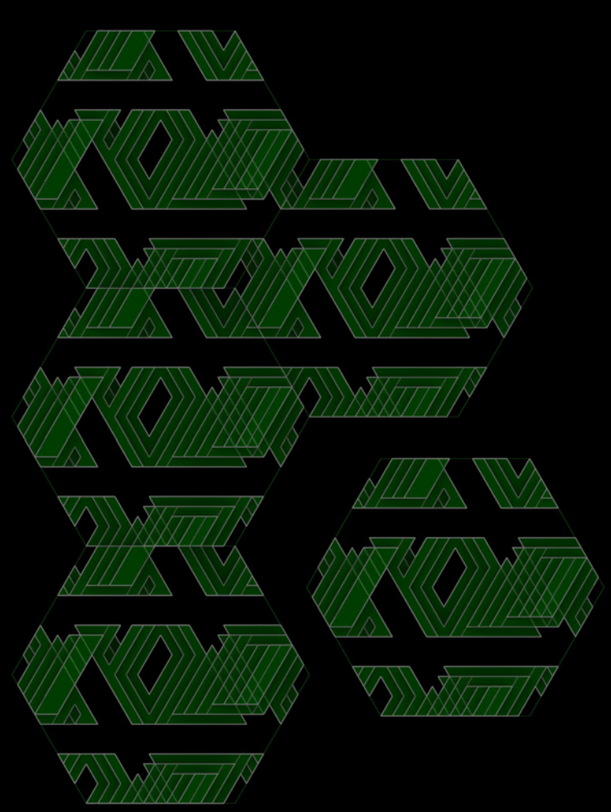
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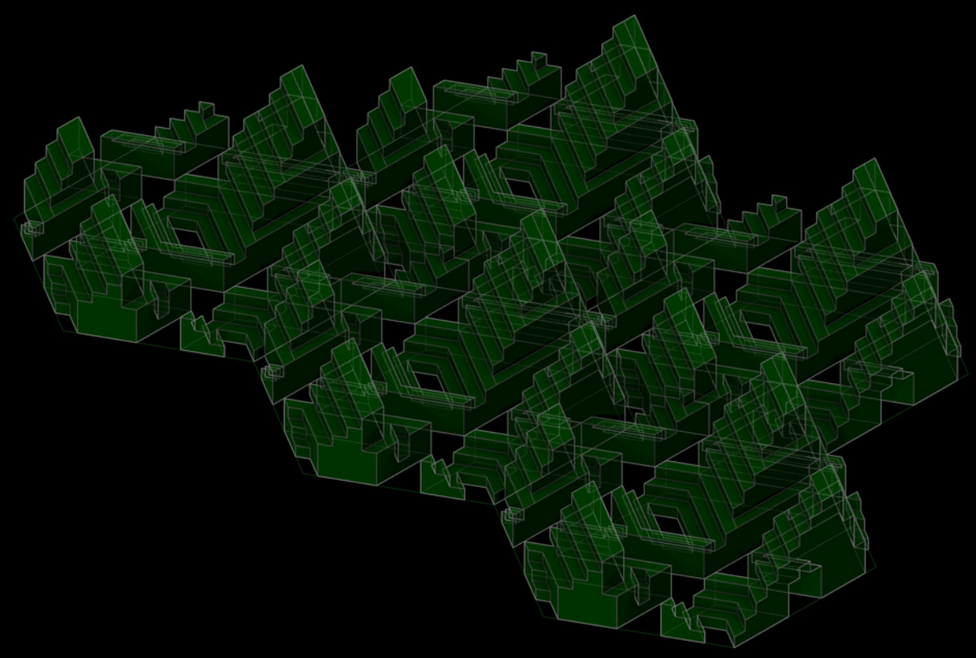


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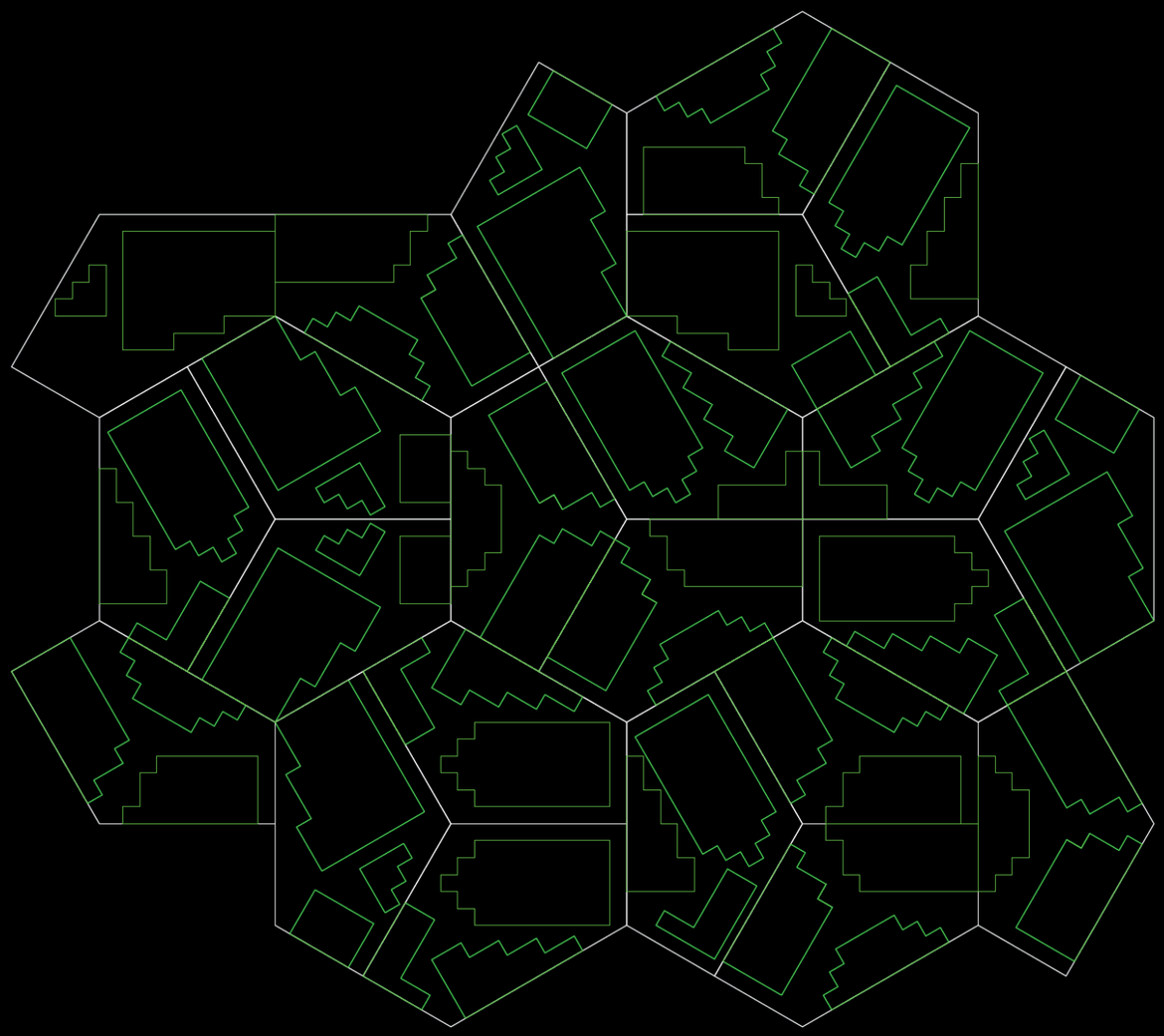






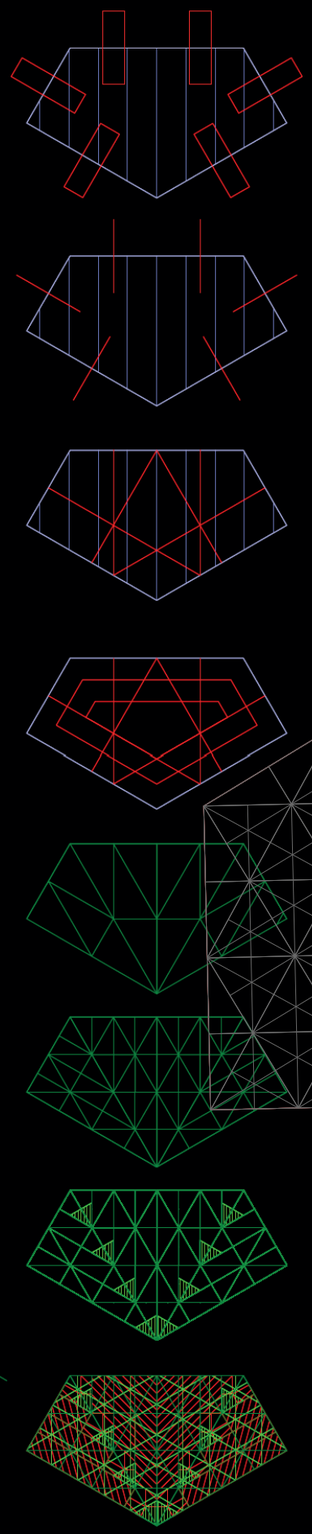


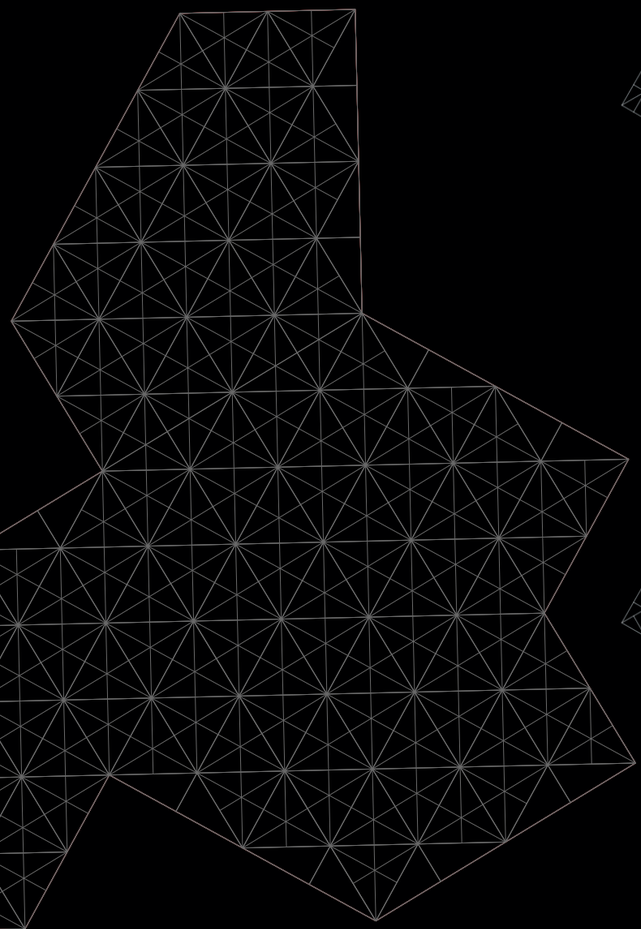
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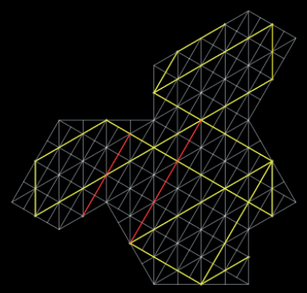


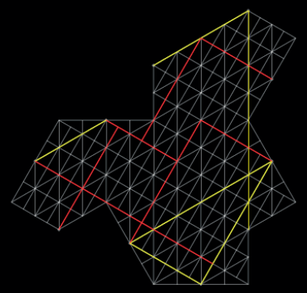


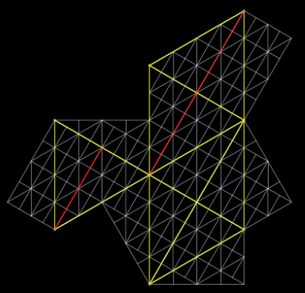
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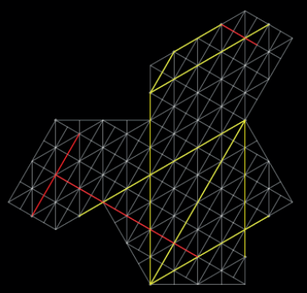


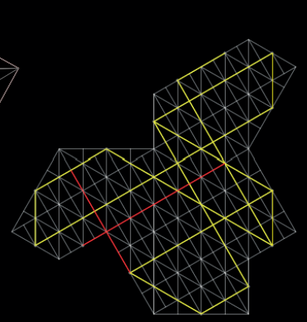


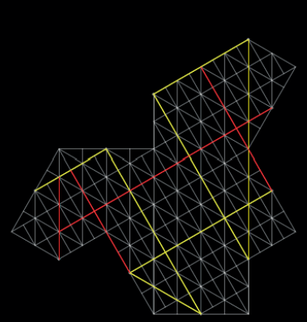


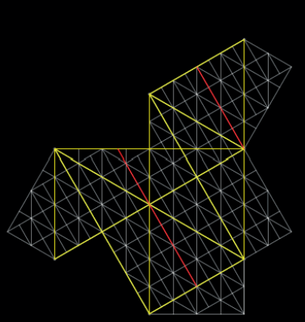


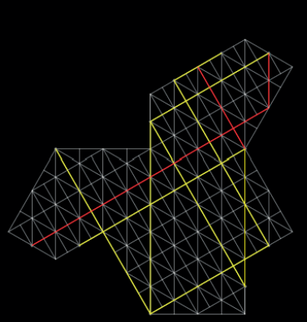


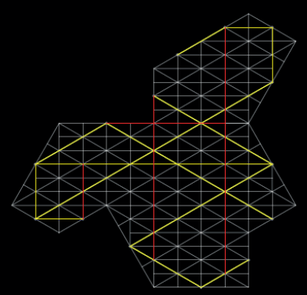


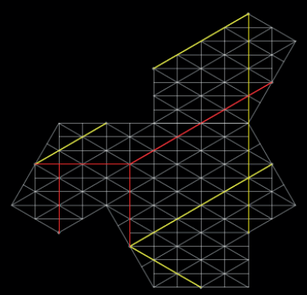


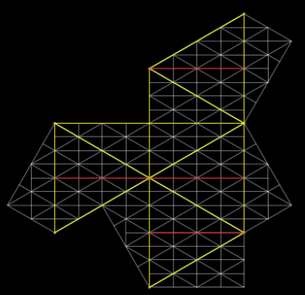


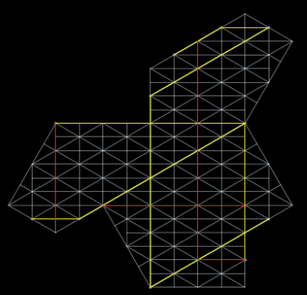




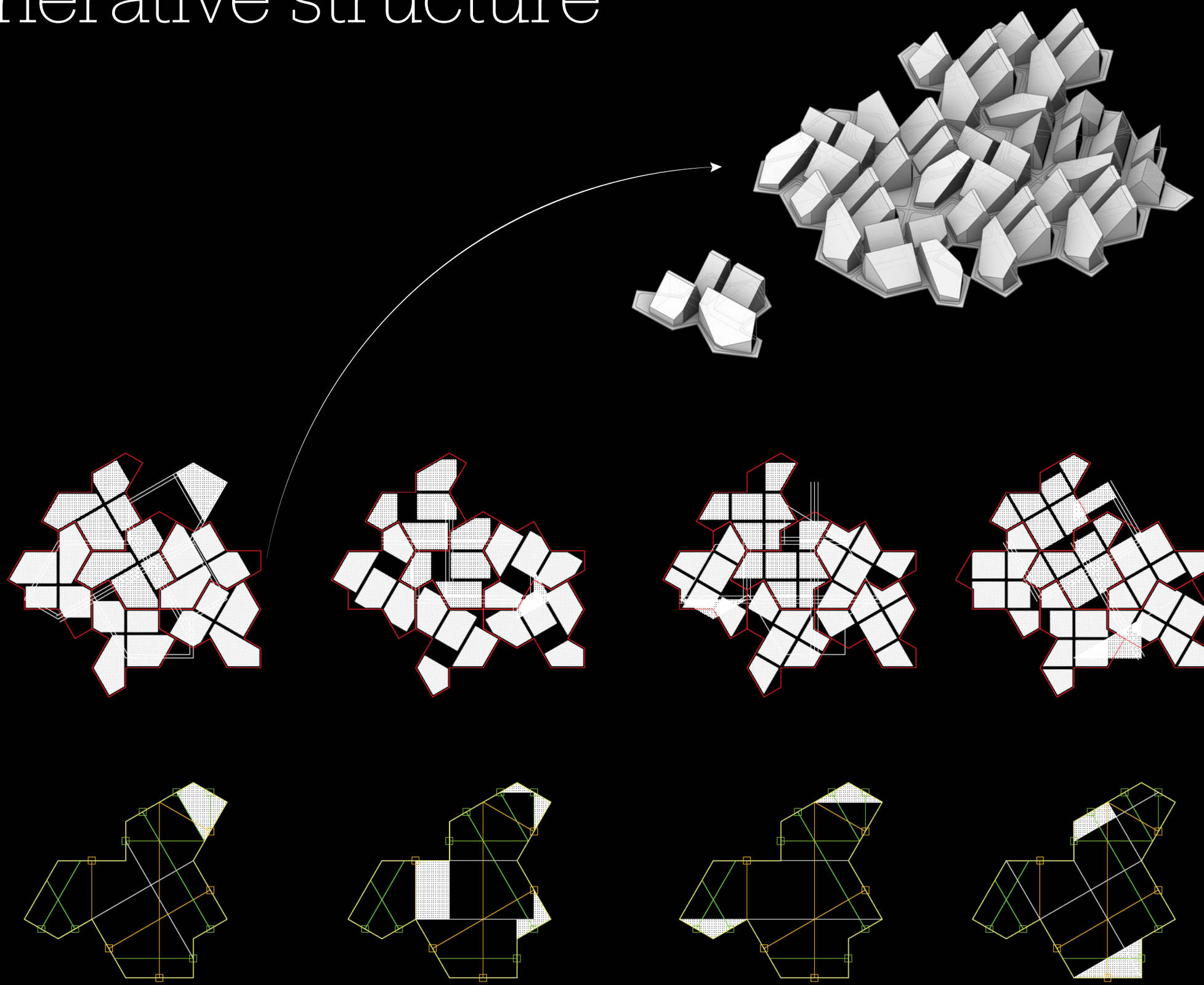




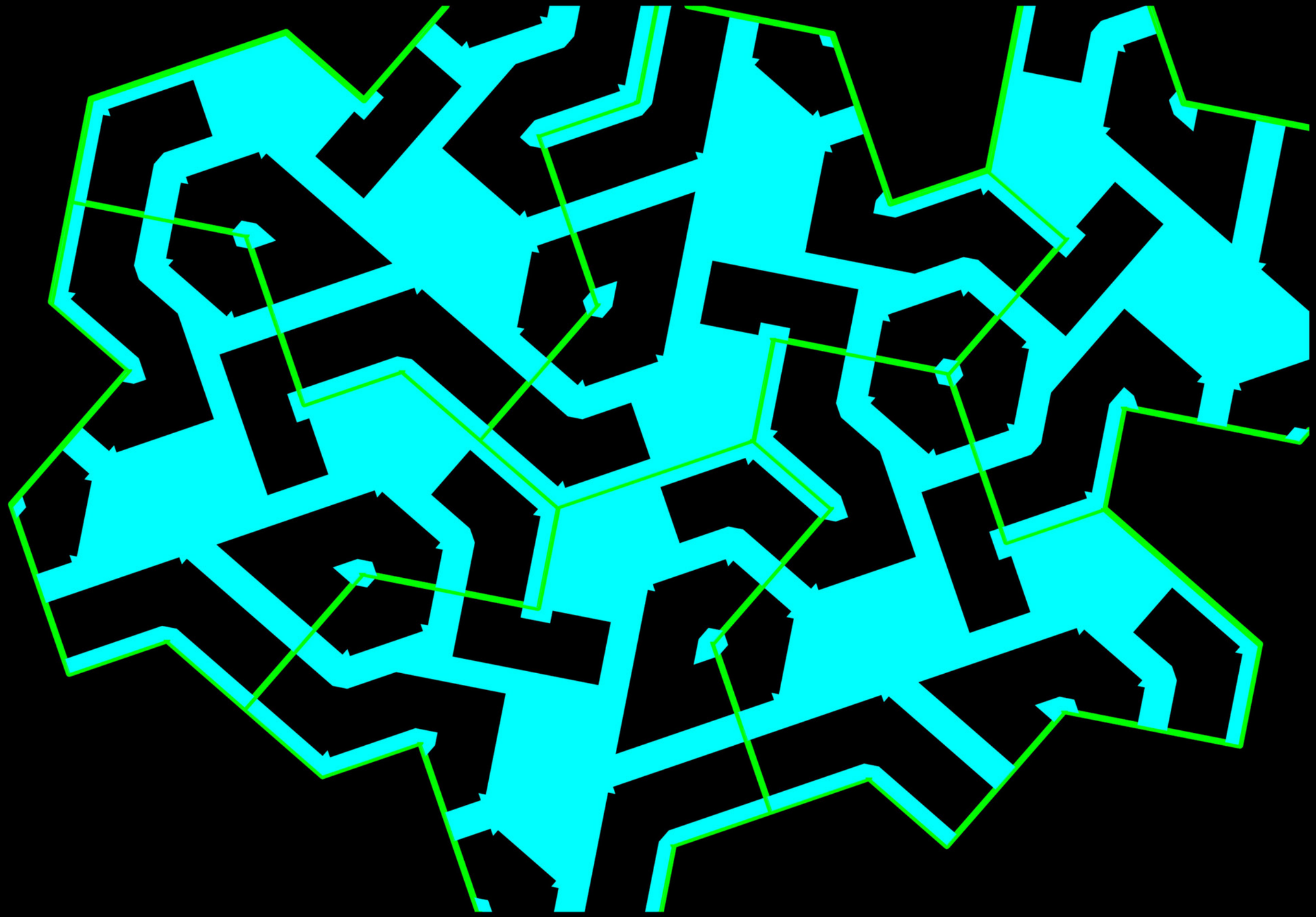




Generative structure

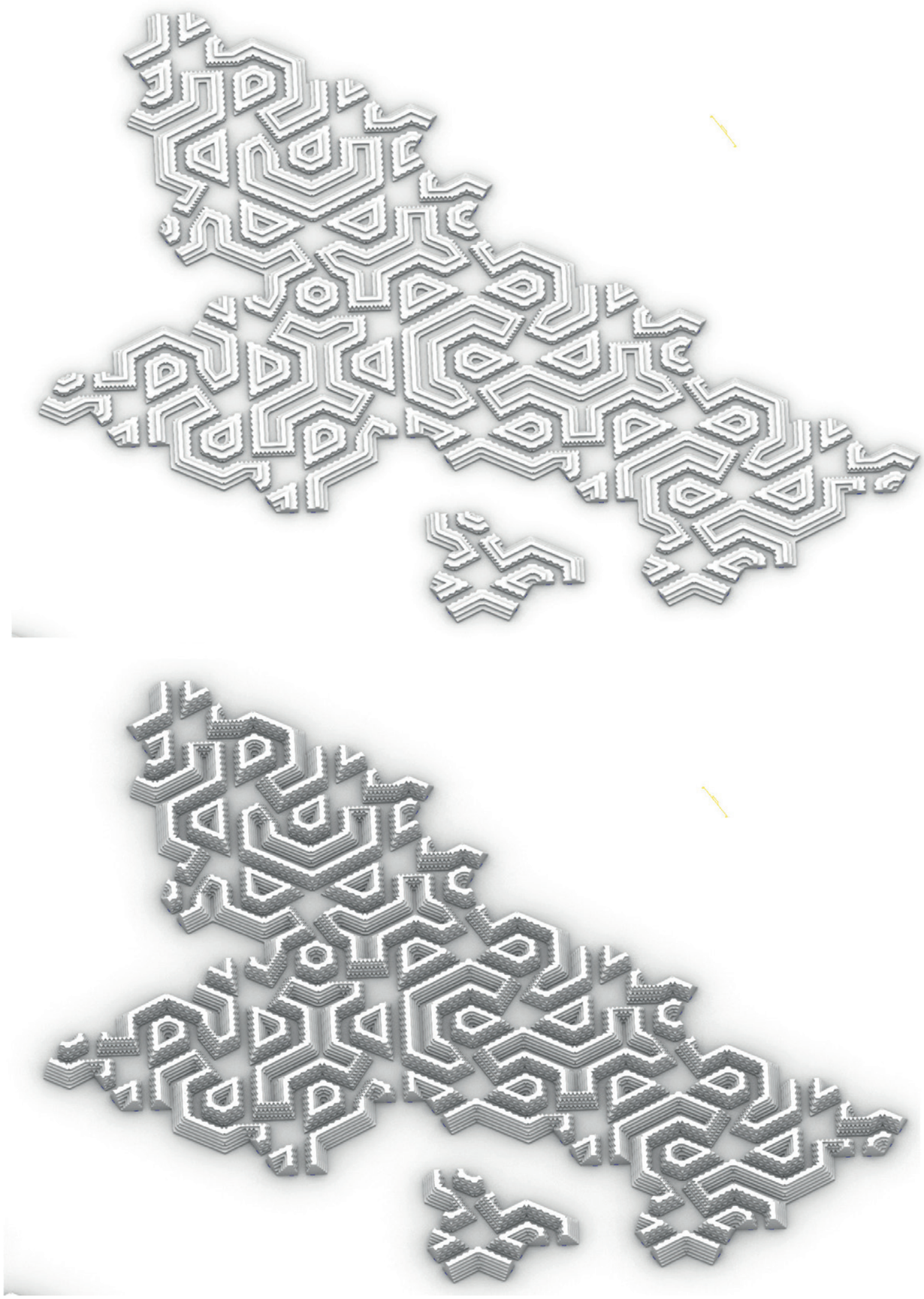


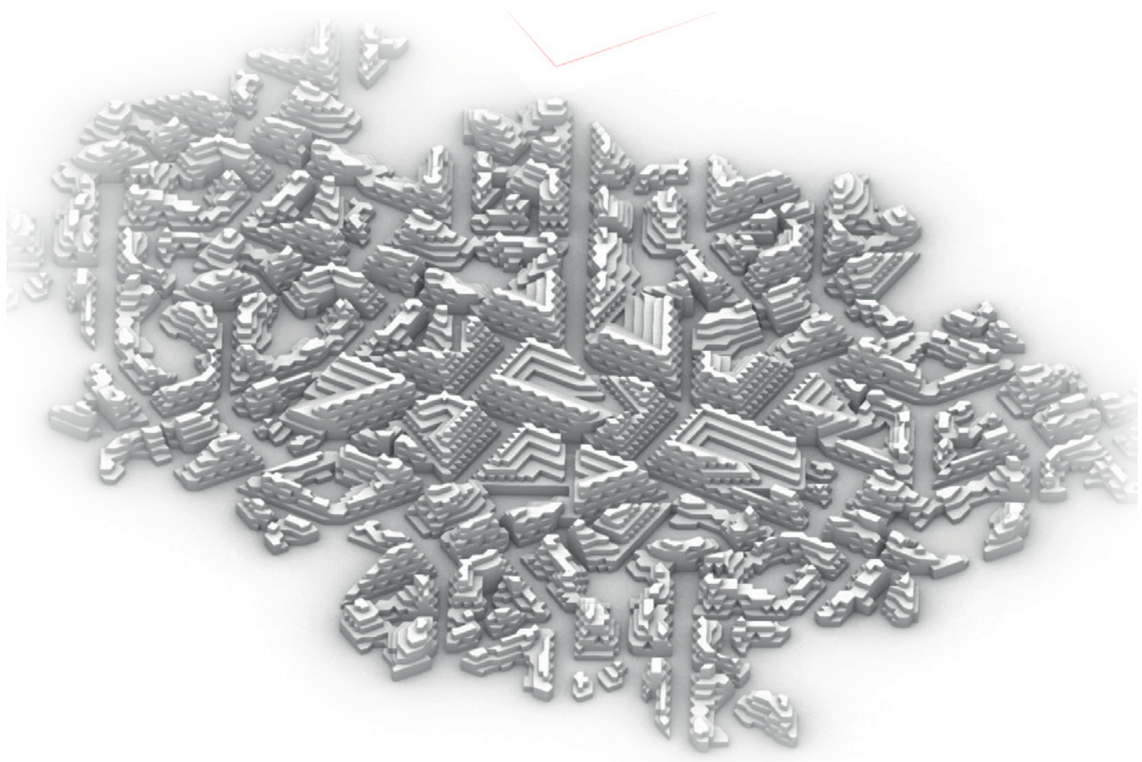
Generative structure



alternative structure







Generative structure

Generative structure

Generative structure

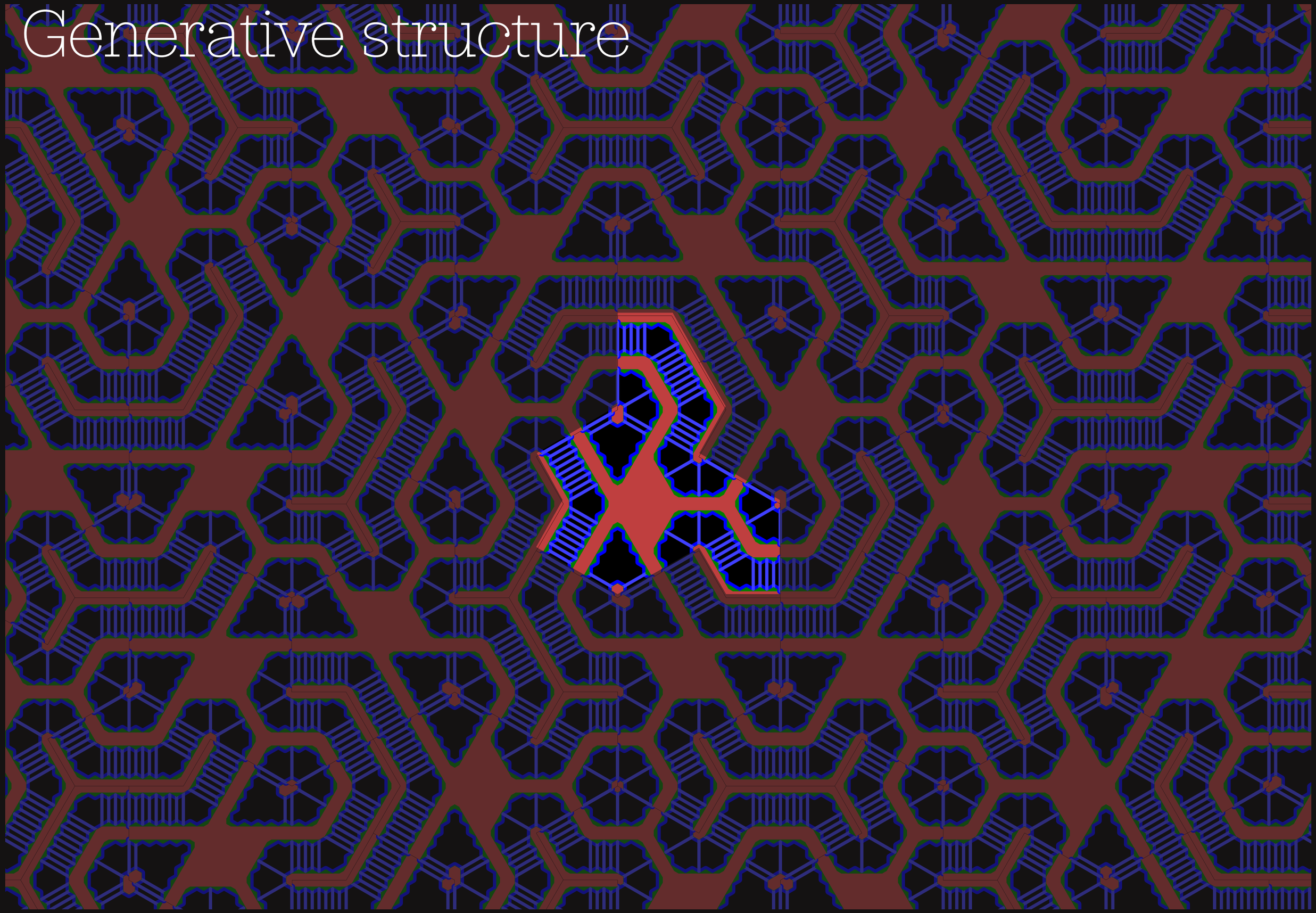
Generative structure



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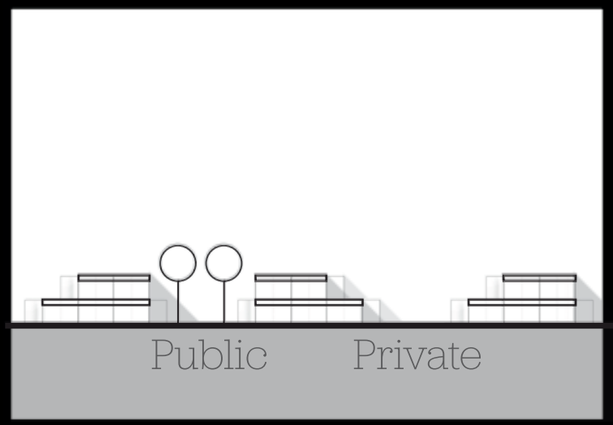


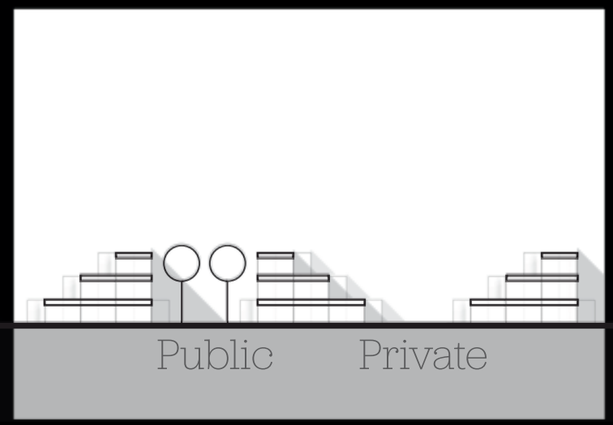
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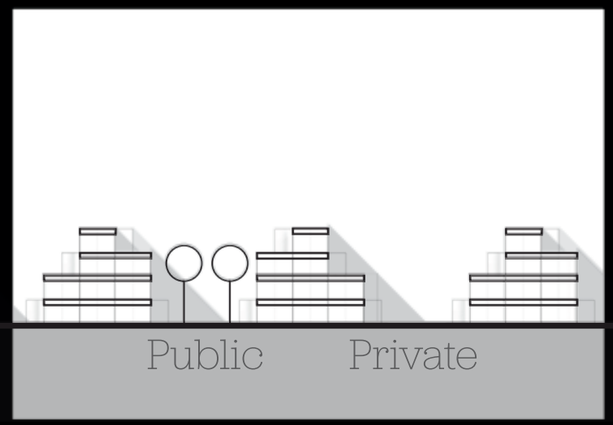


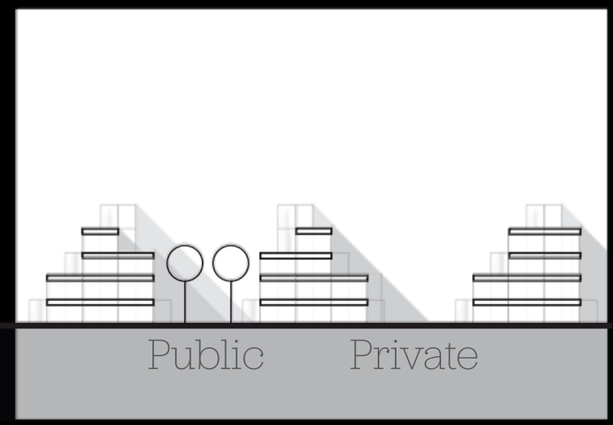
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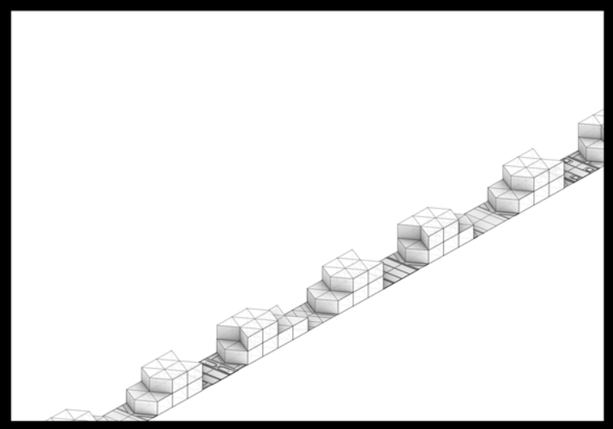
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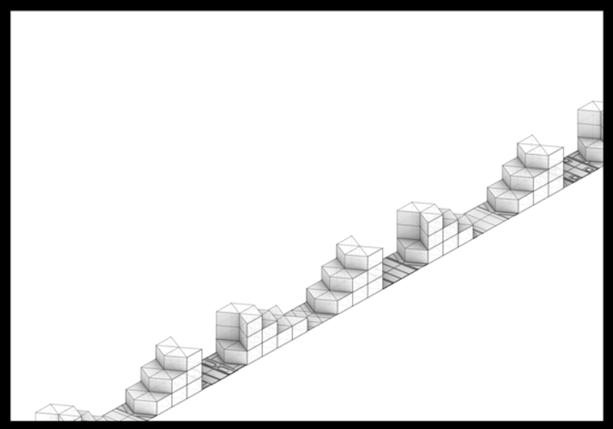


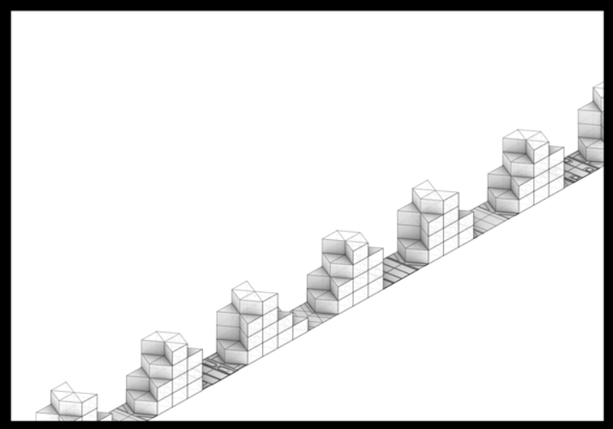


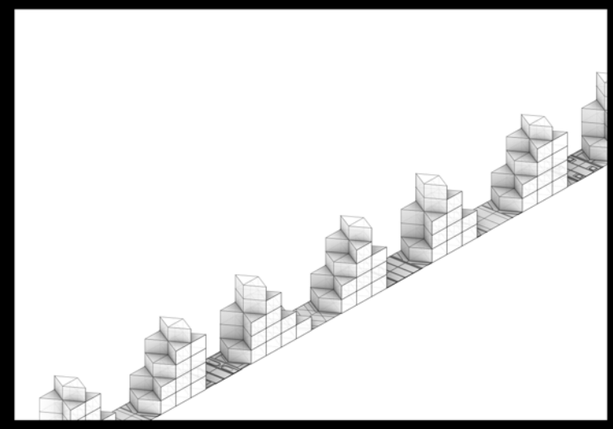


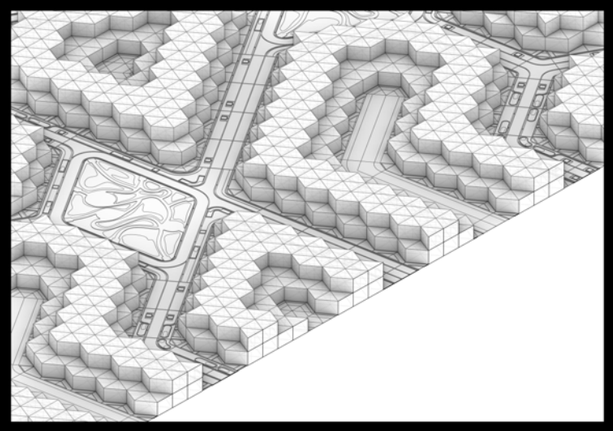


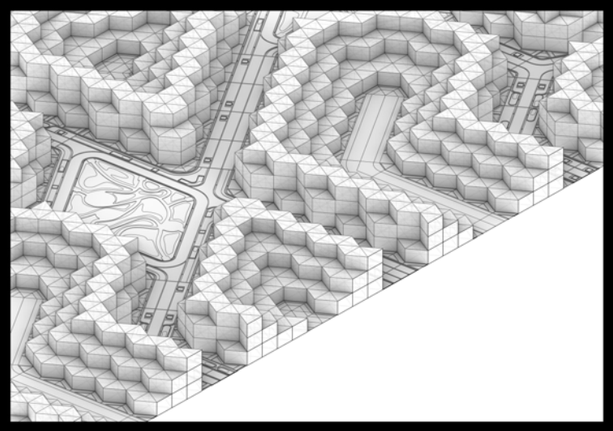


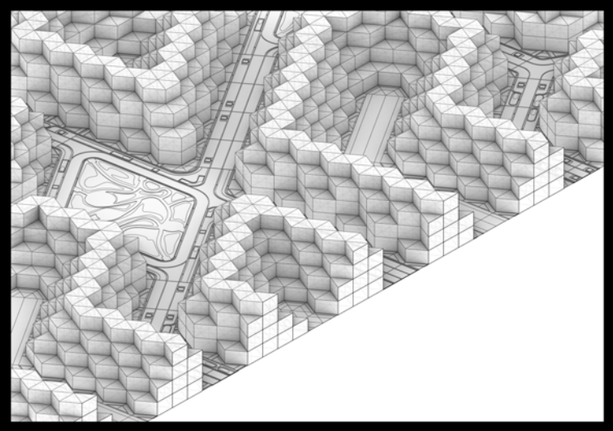


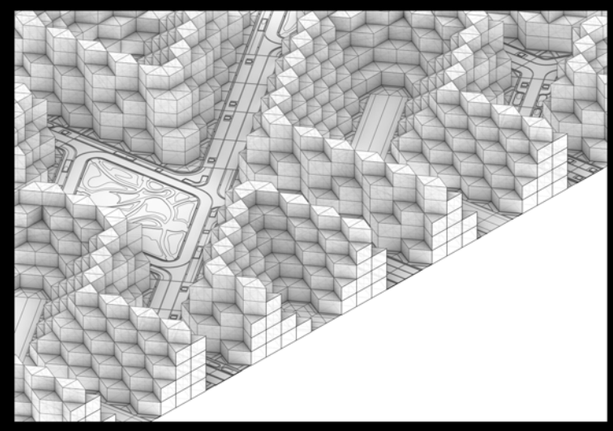




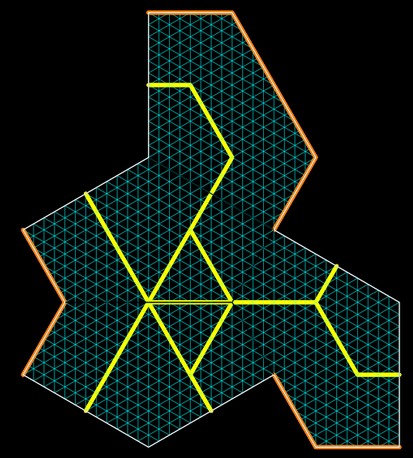


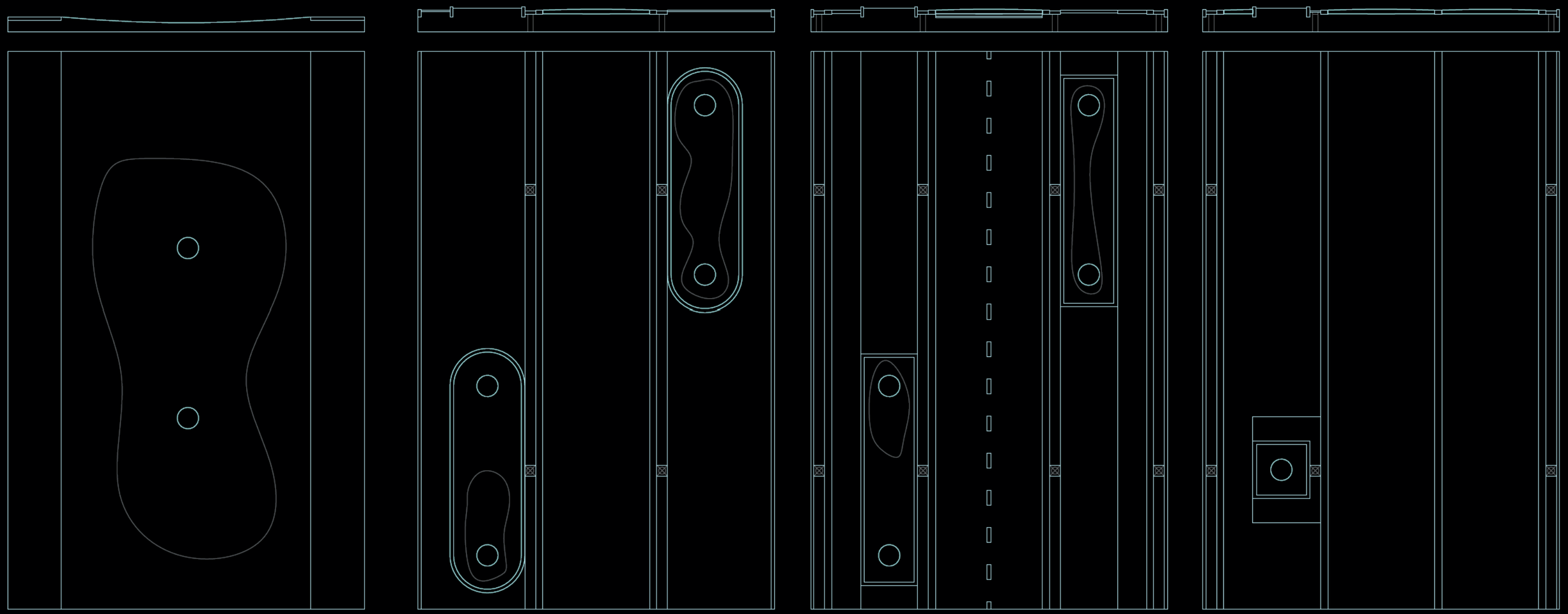






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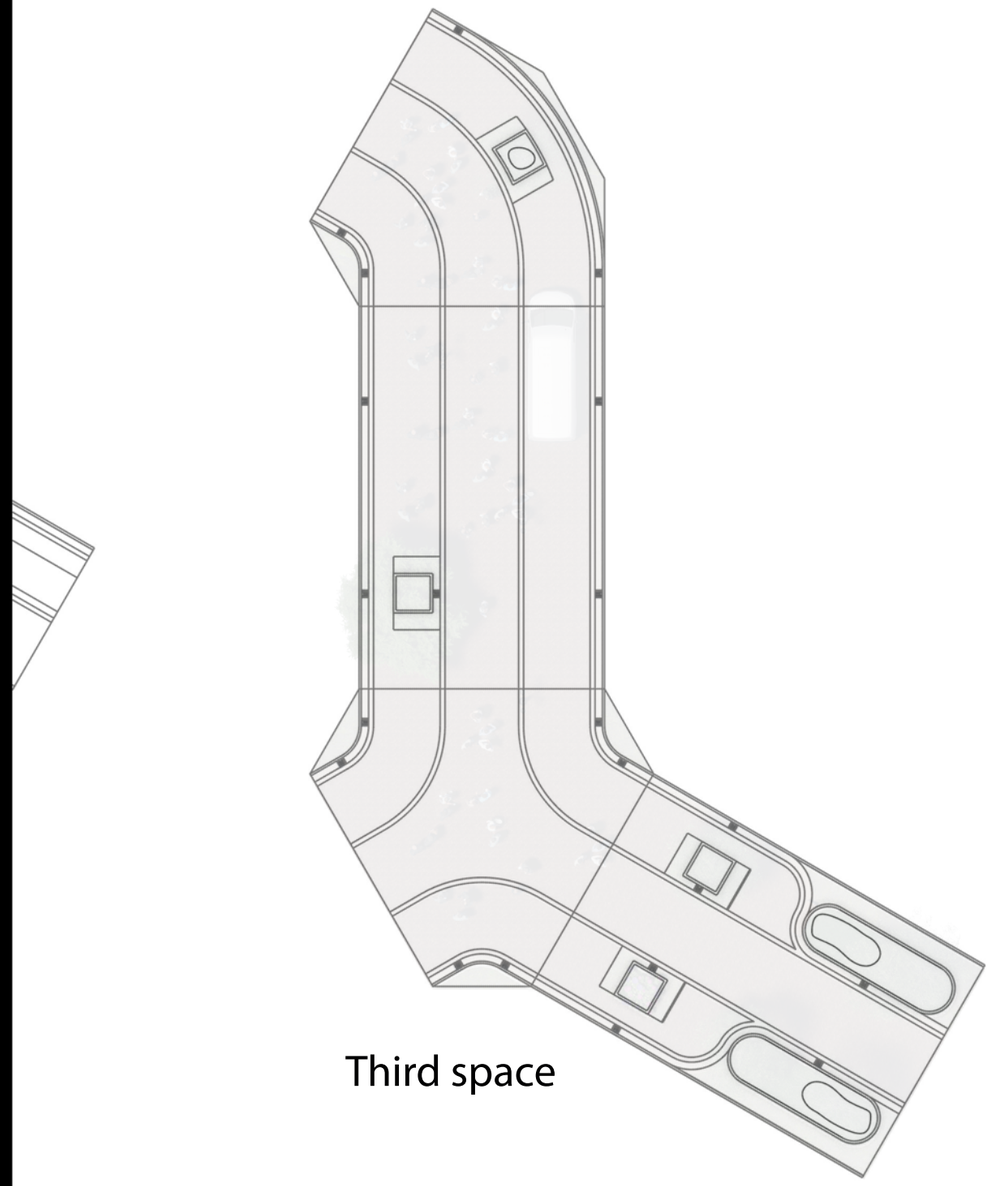


Courtyard

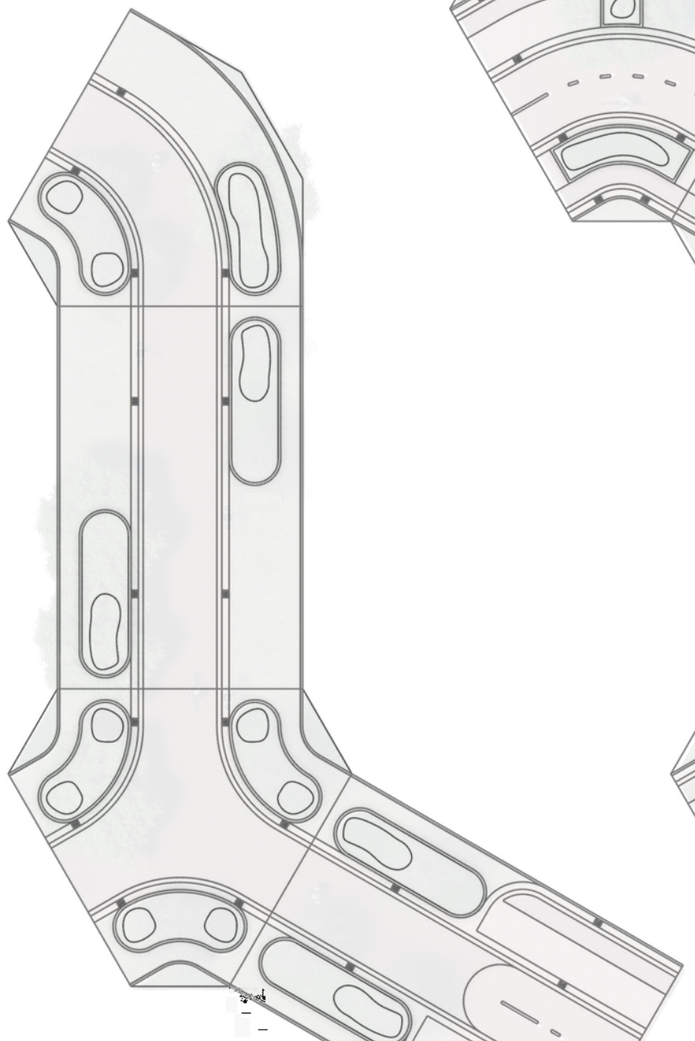
Low volume

High volume

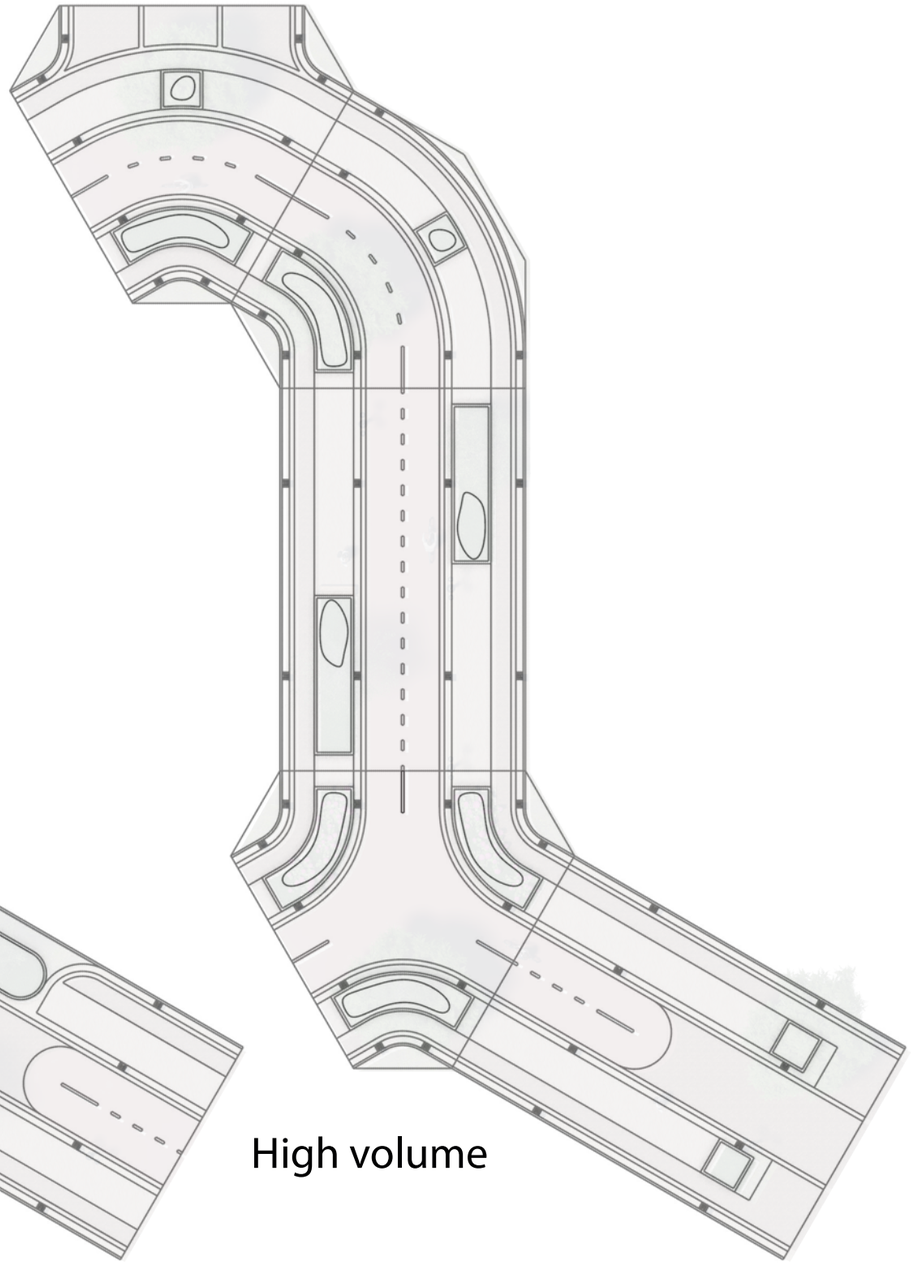
Third space



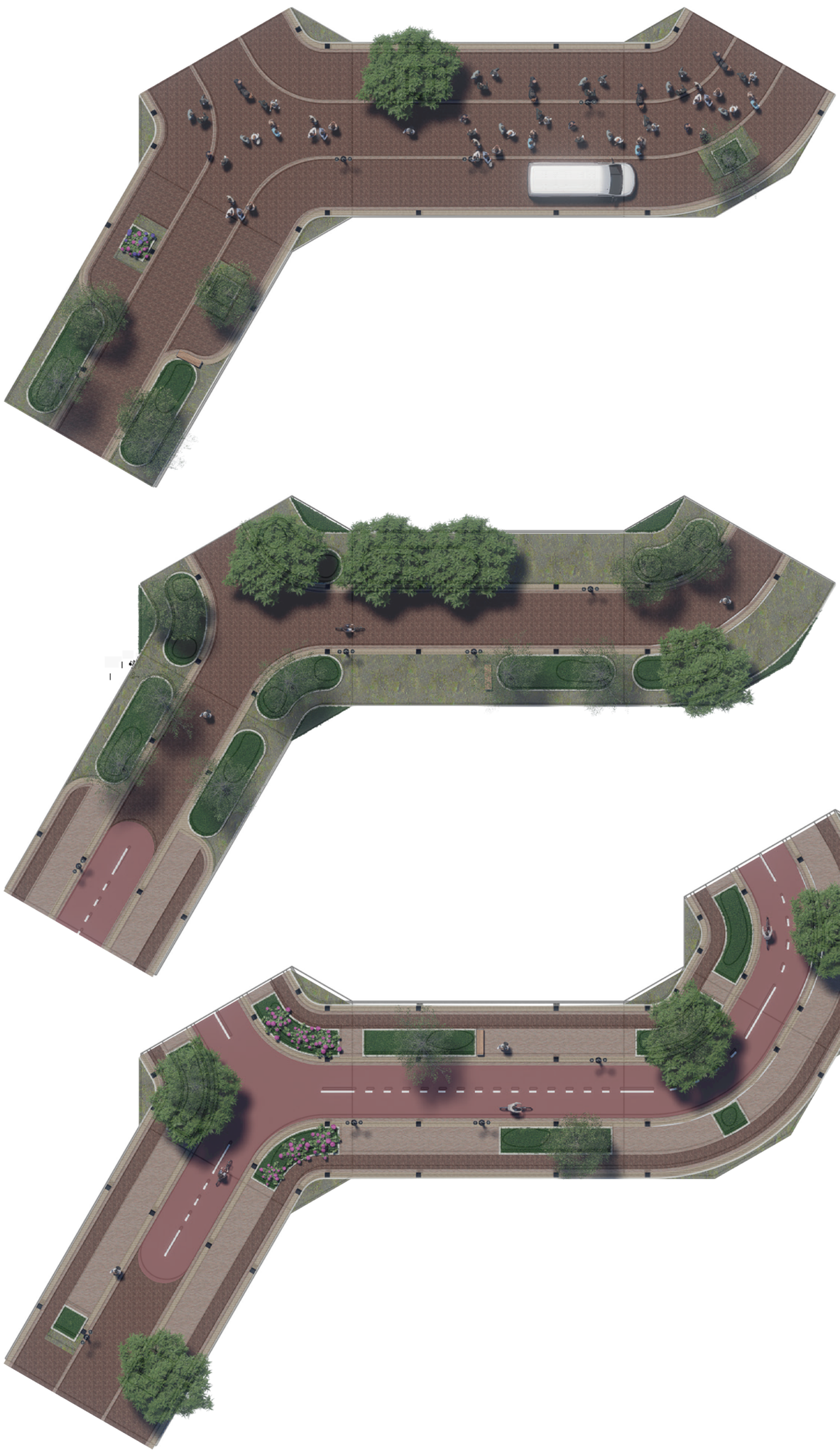
Third space



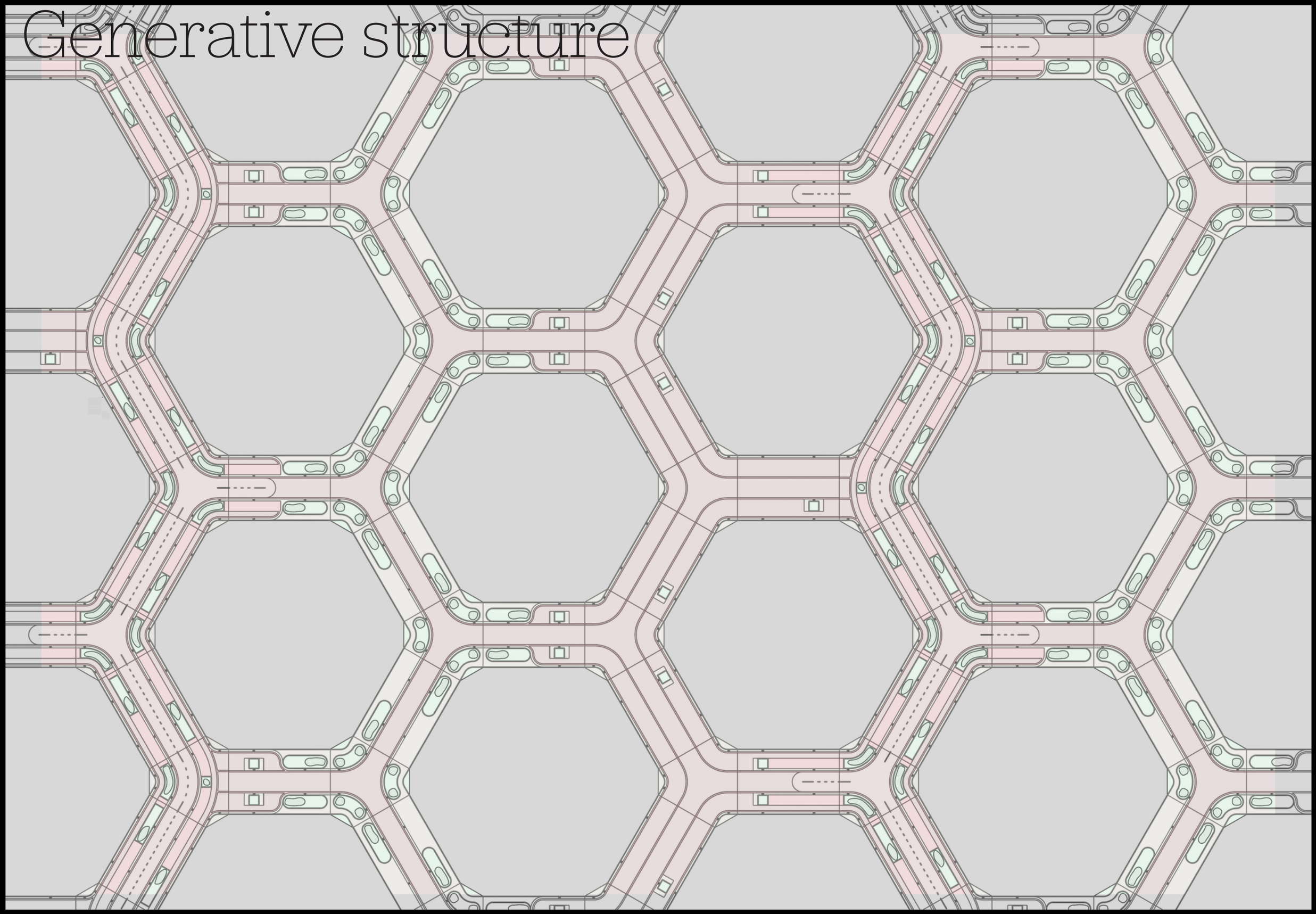
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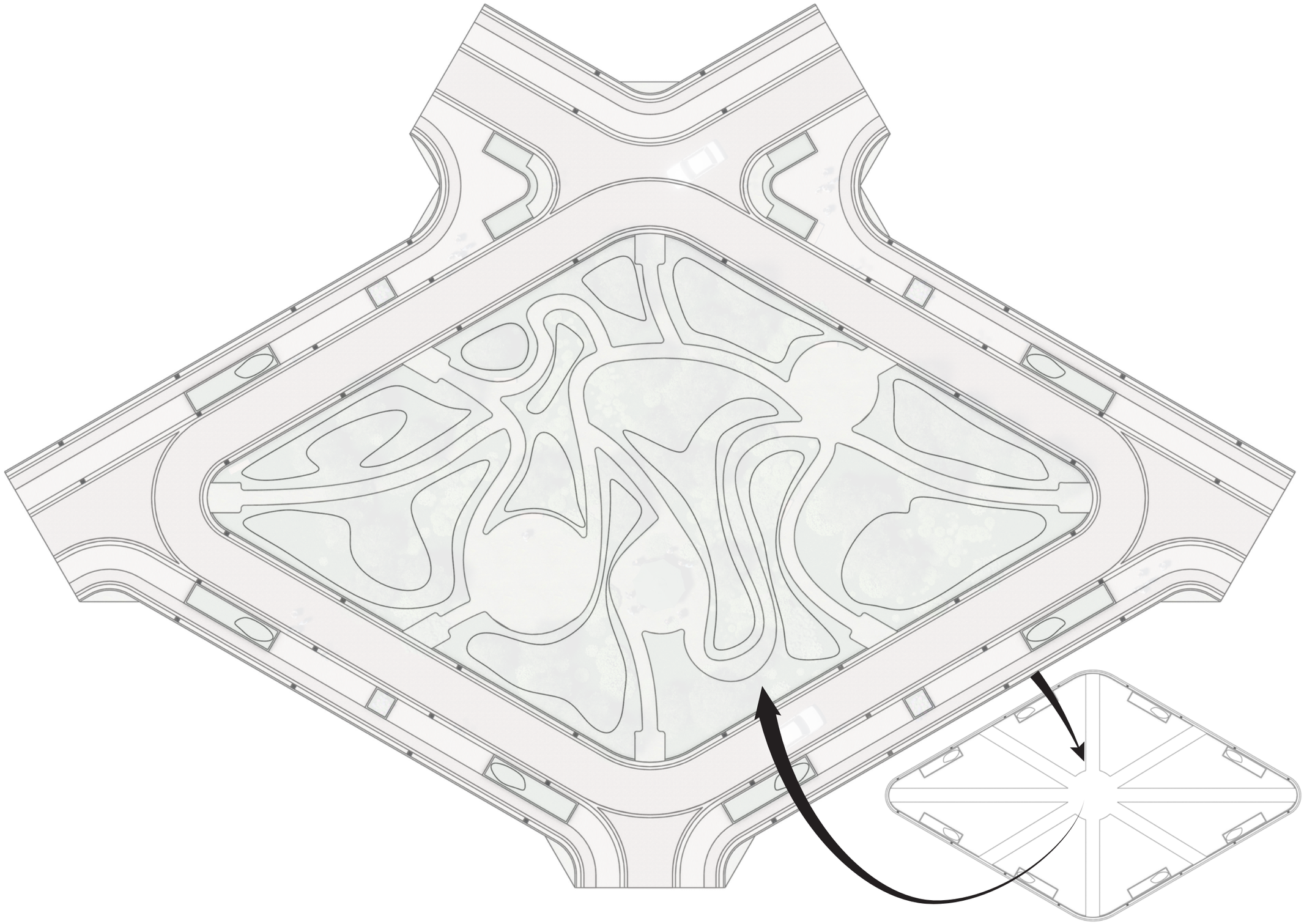


High volume



Generative structure

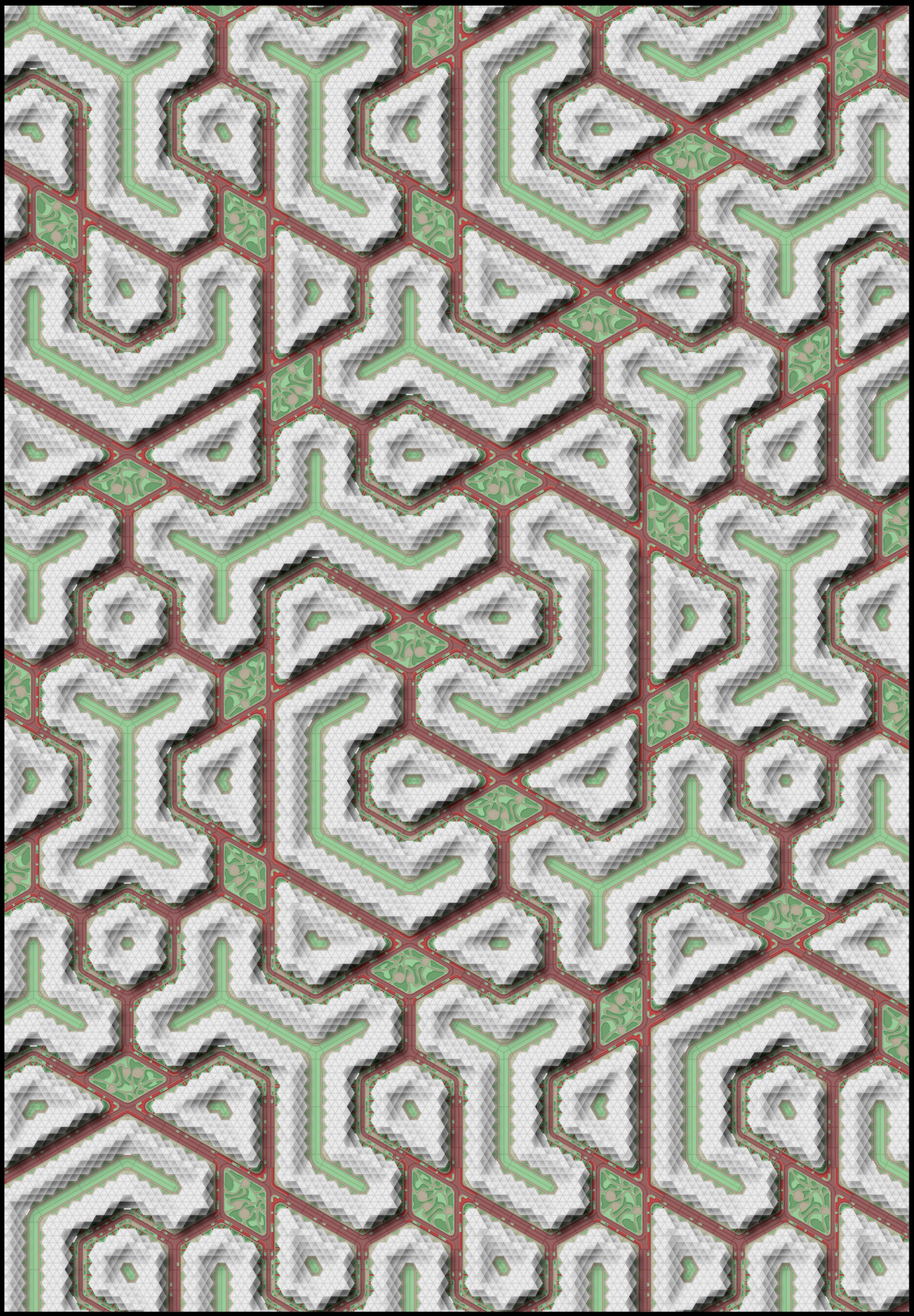




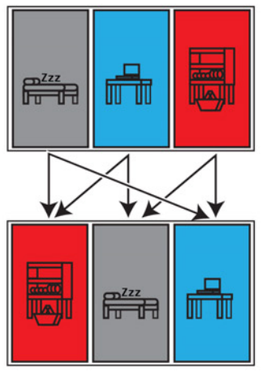
Interchangeable



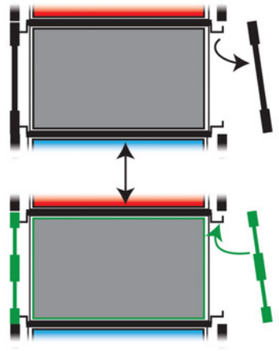
Generative structure



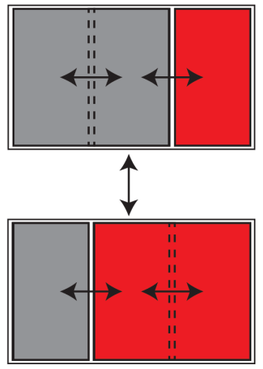
Building structure



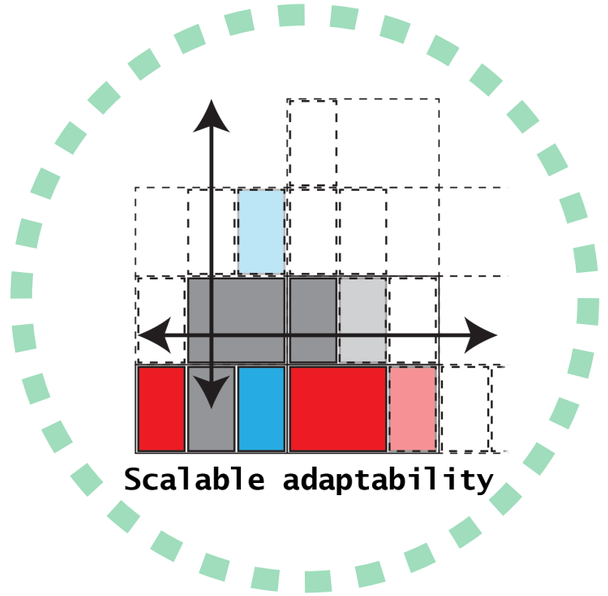
Convertible adaptability



Refitable adaptability

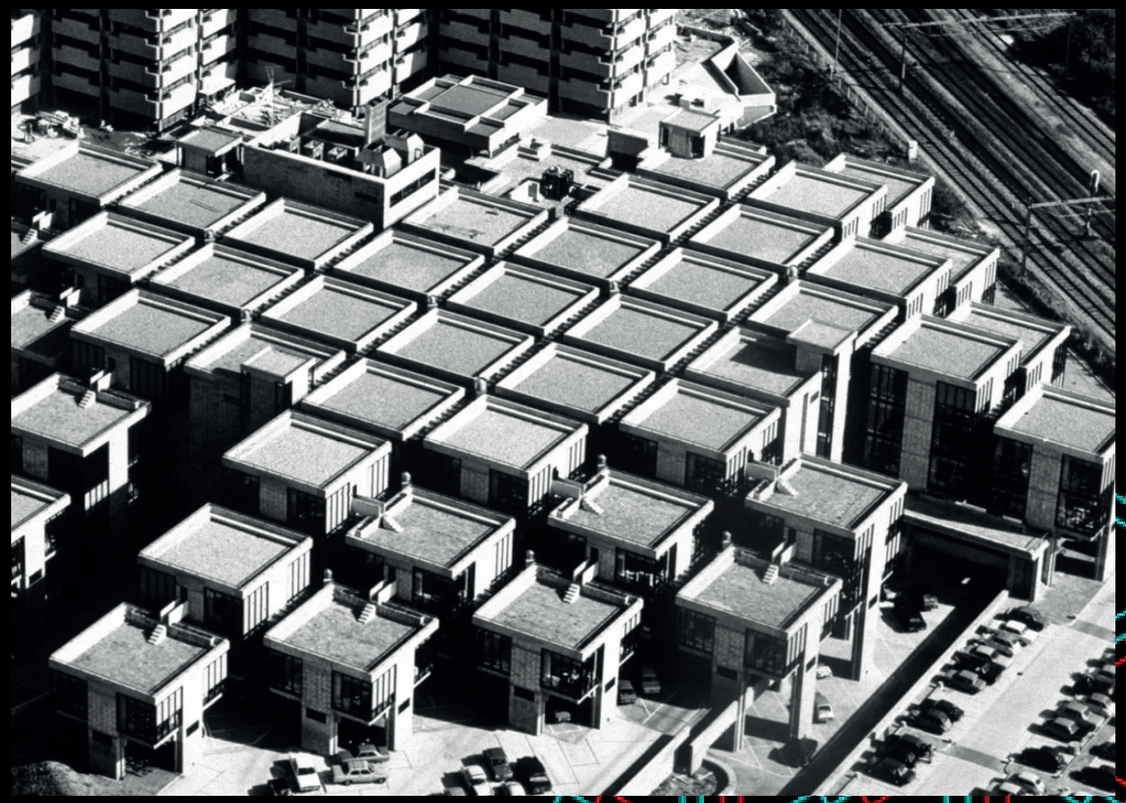


Adjustable adaptability



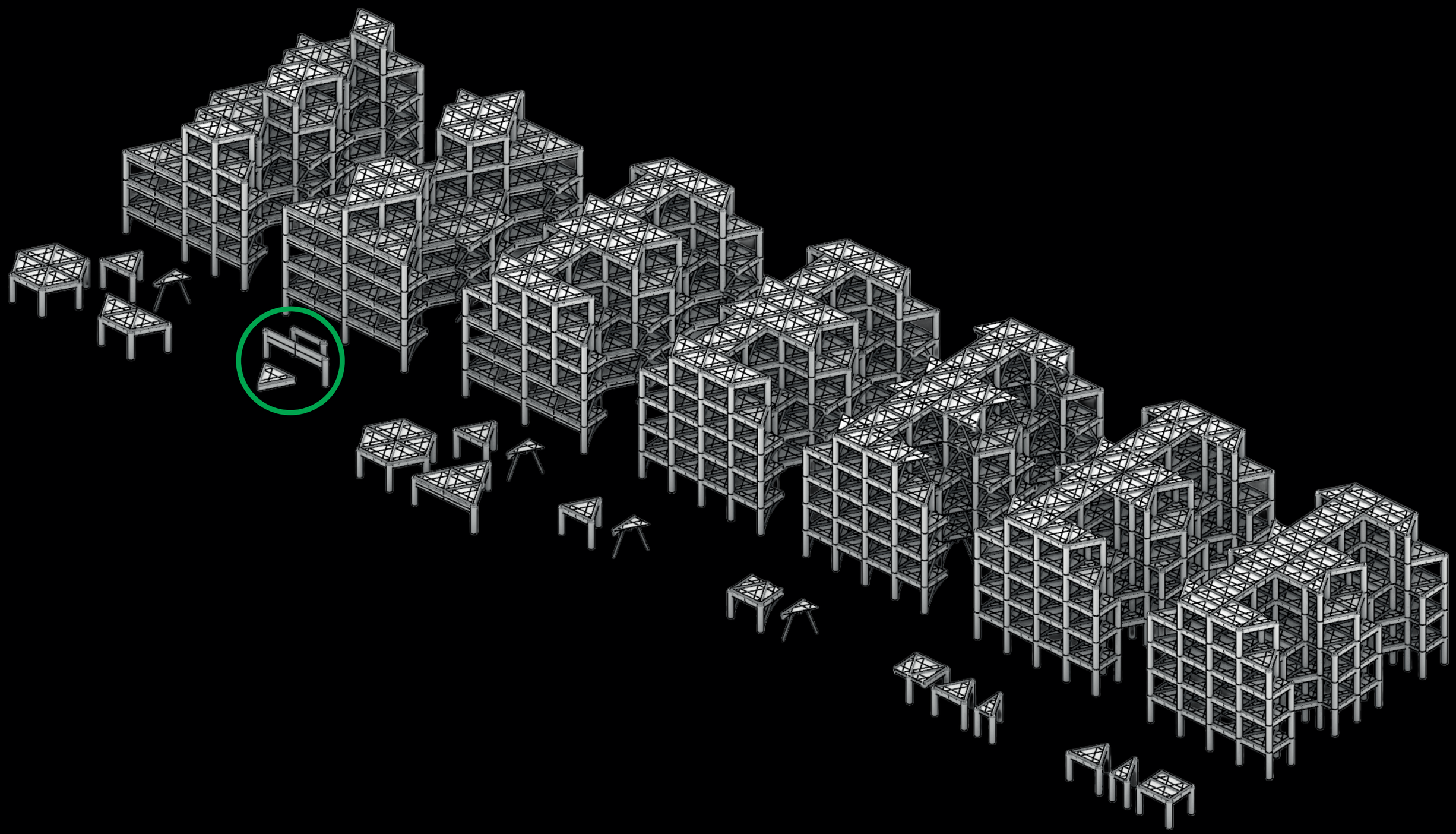
Scalable adaptability

Building structure

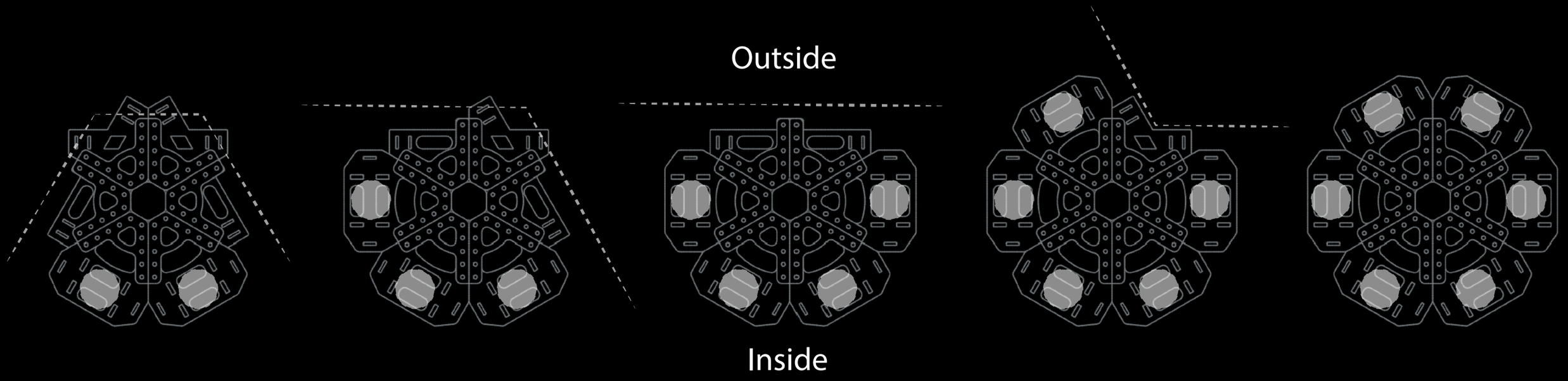


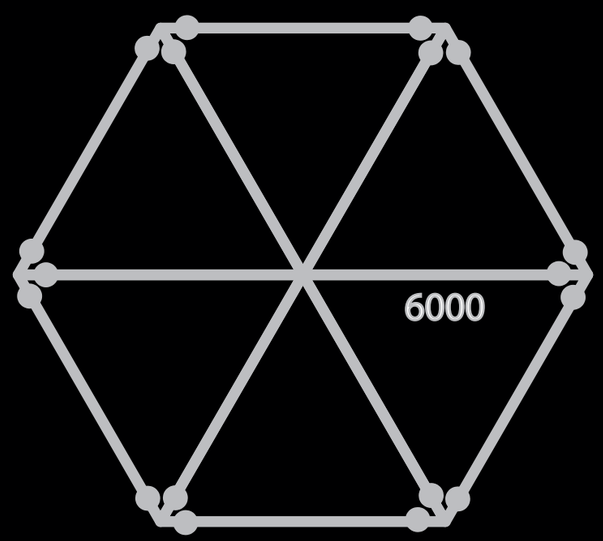
Herman Hertzberger, Centraal beheer Apeldoorn, 1972, aviodrome n.d.

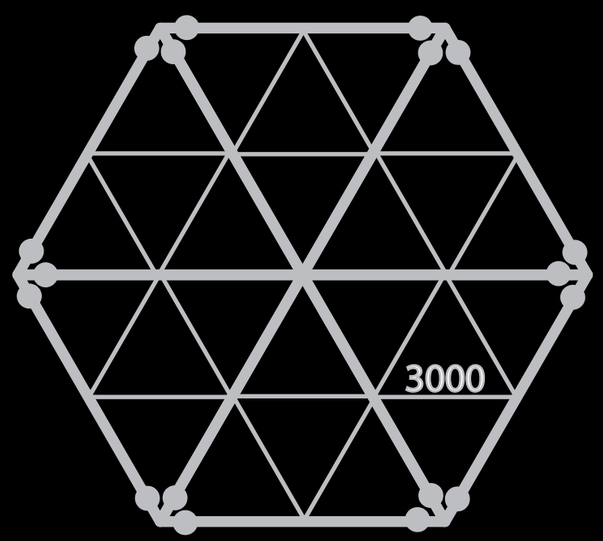
Building structure

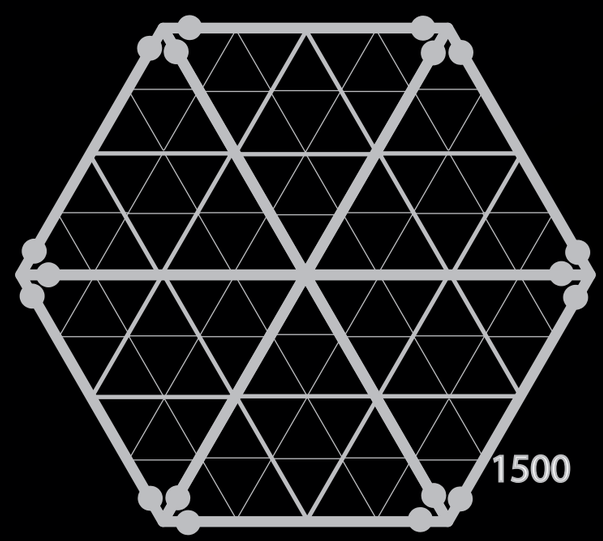


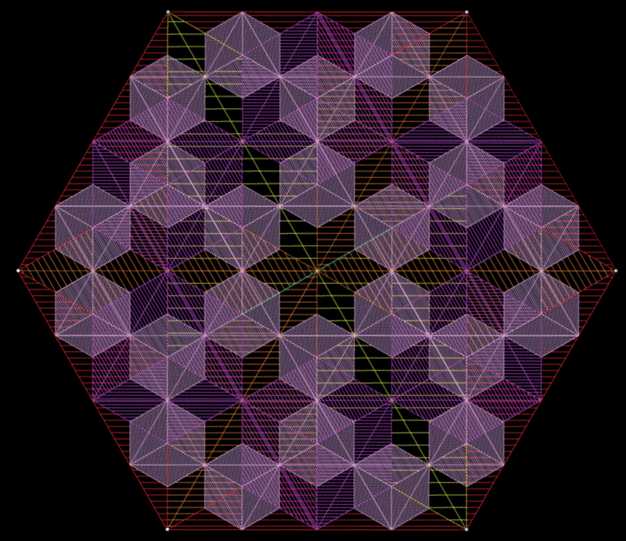
Building structure



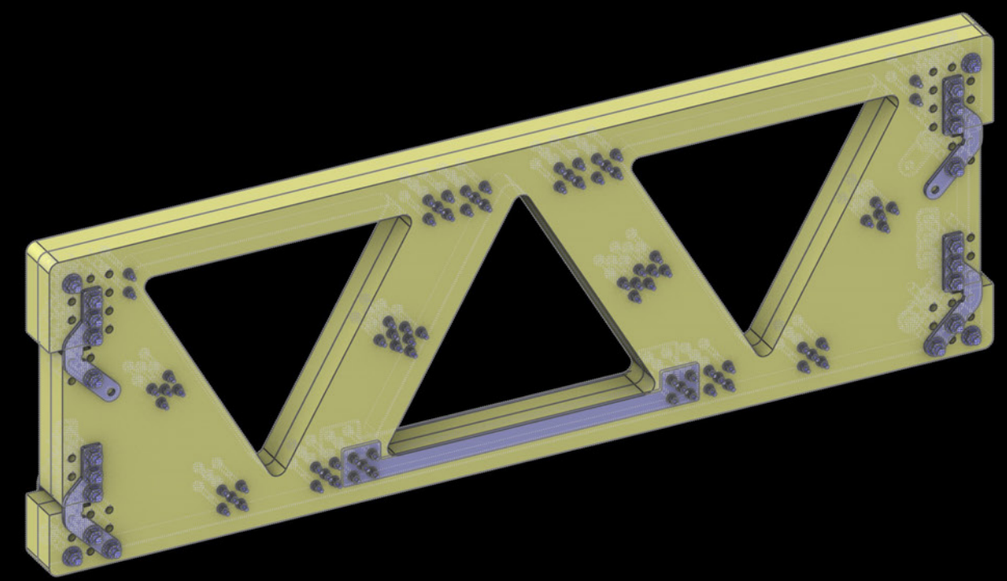




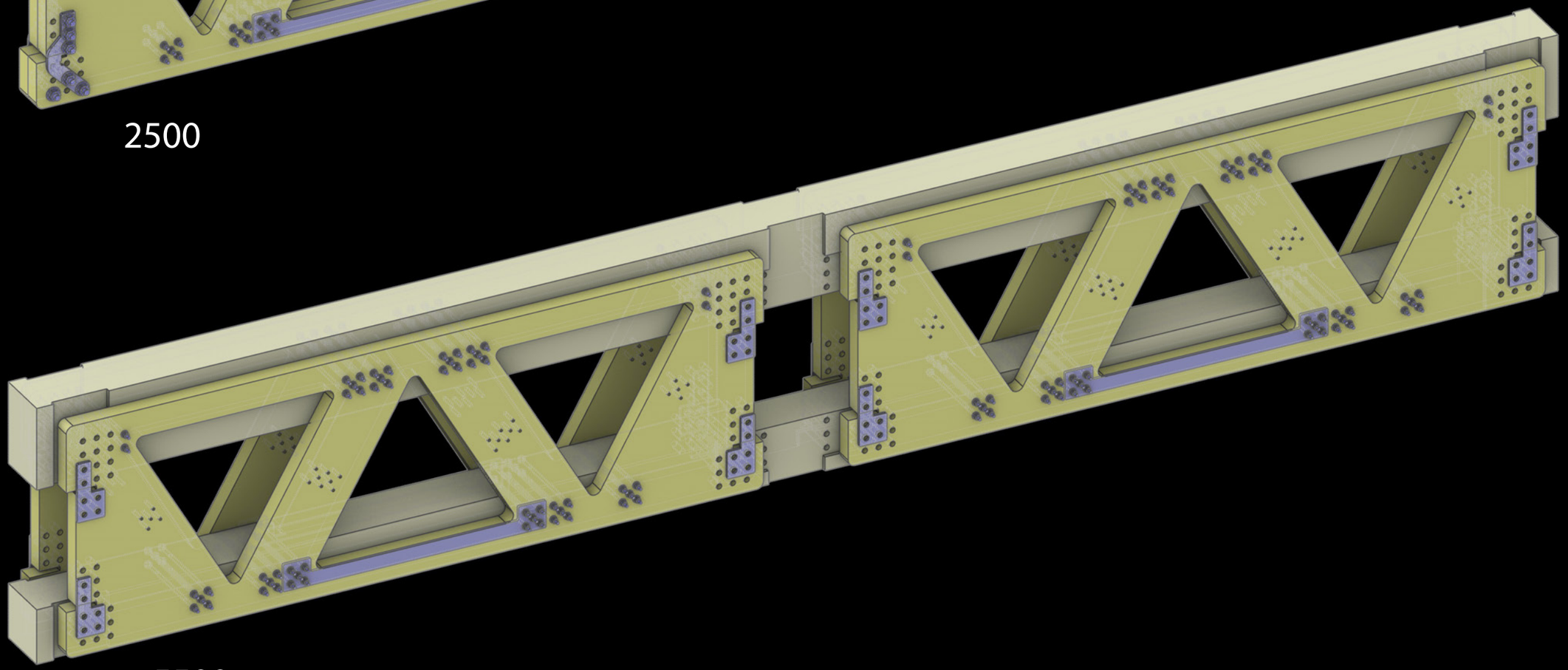




Building structure

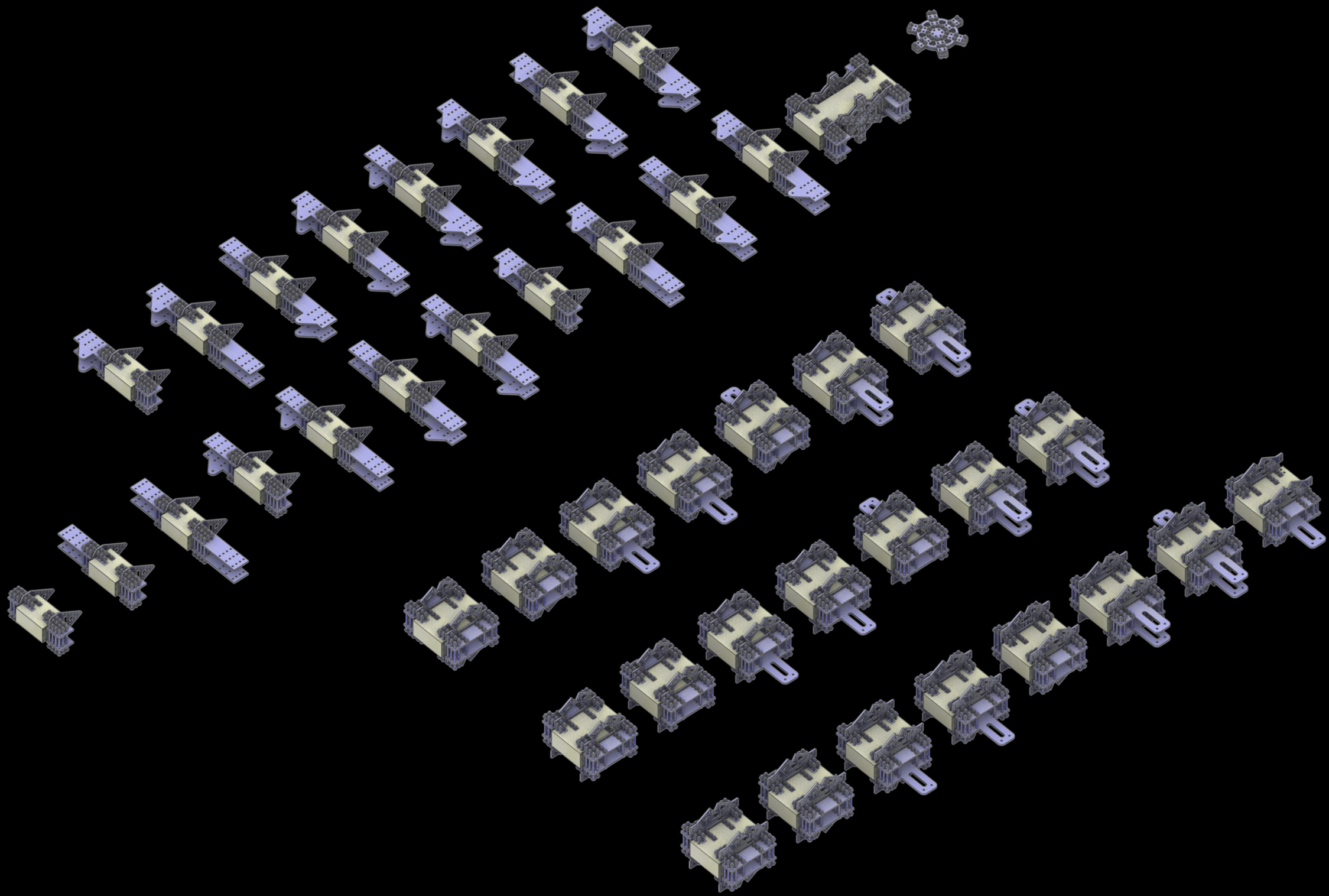


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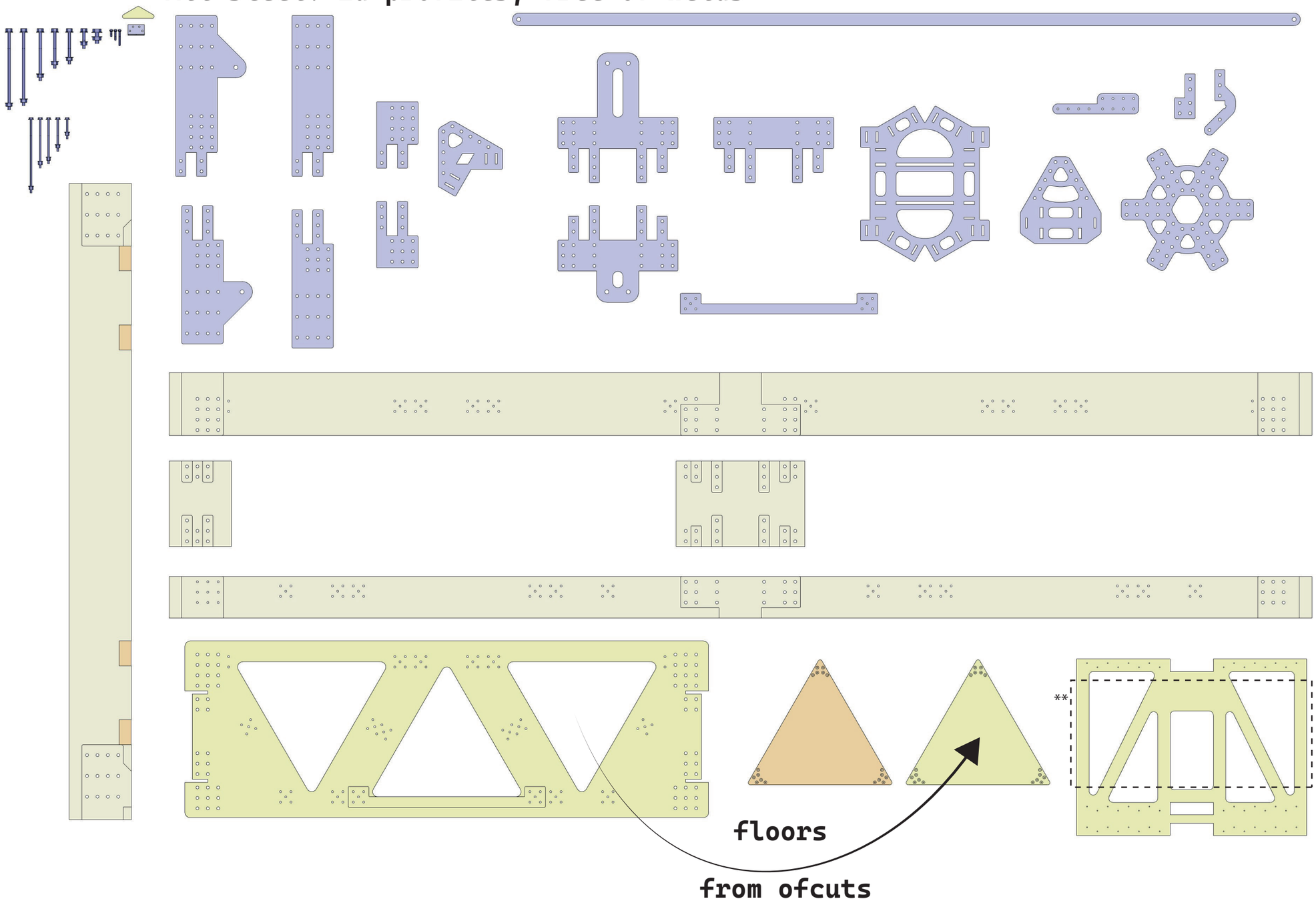
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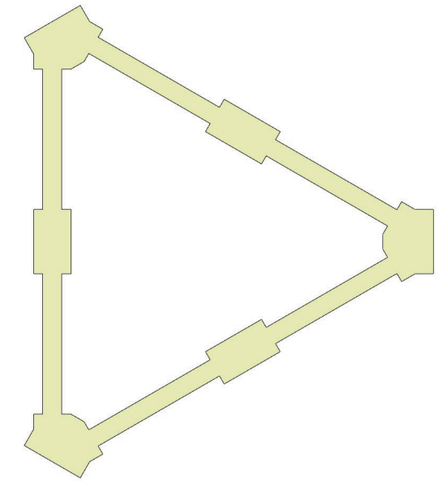
Building structure

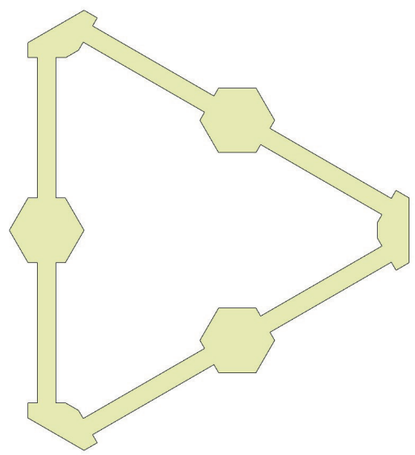


Building structure

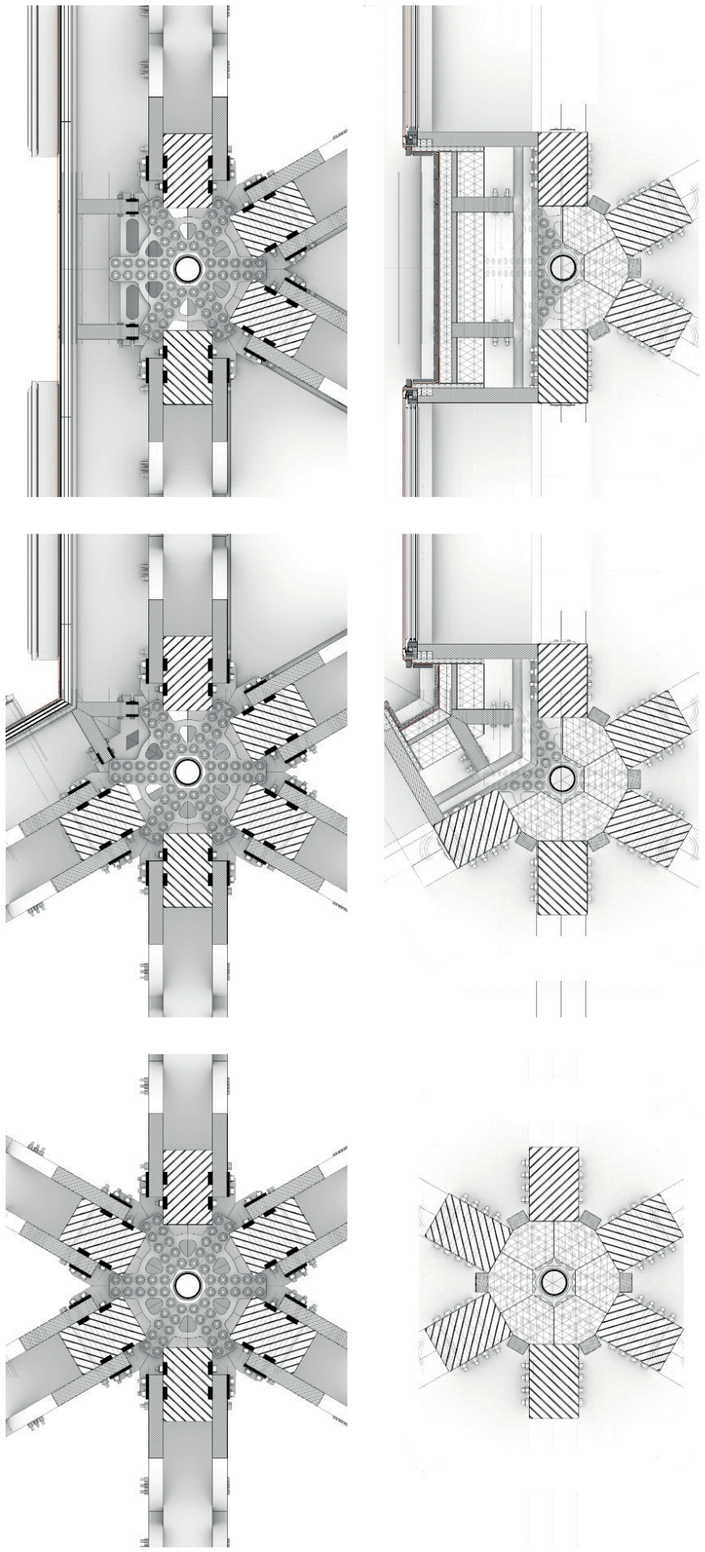
All steel: 2d profiles, free of welds



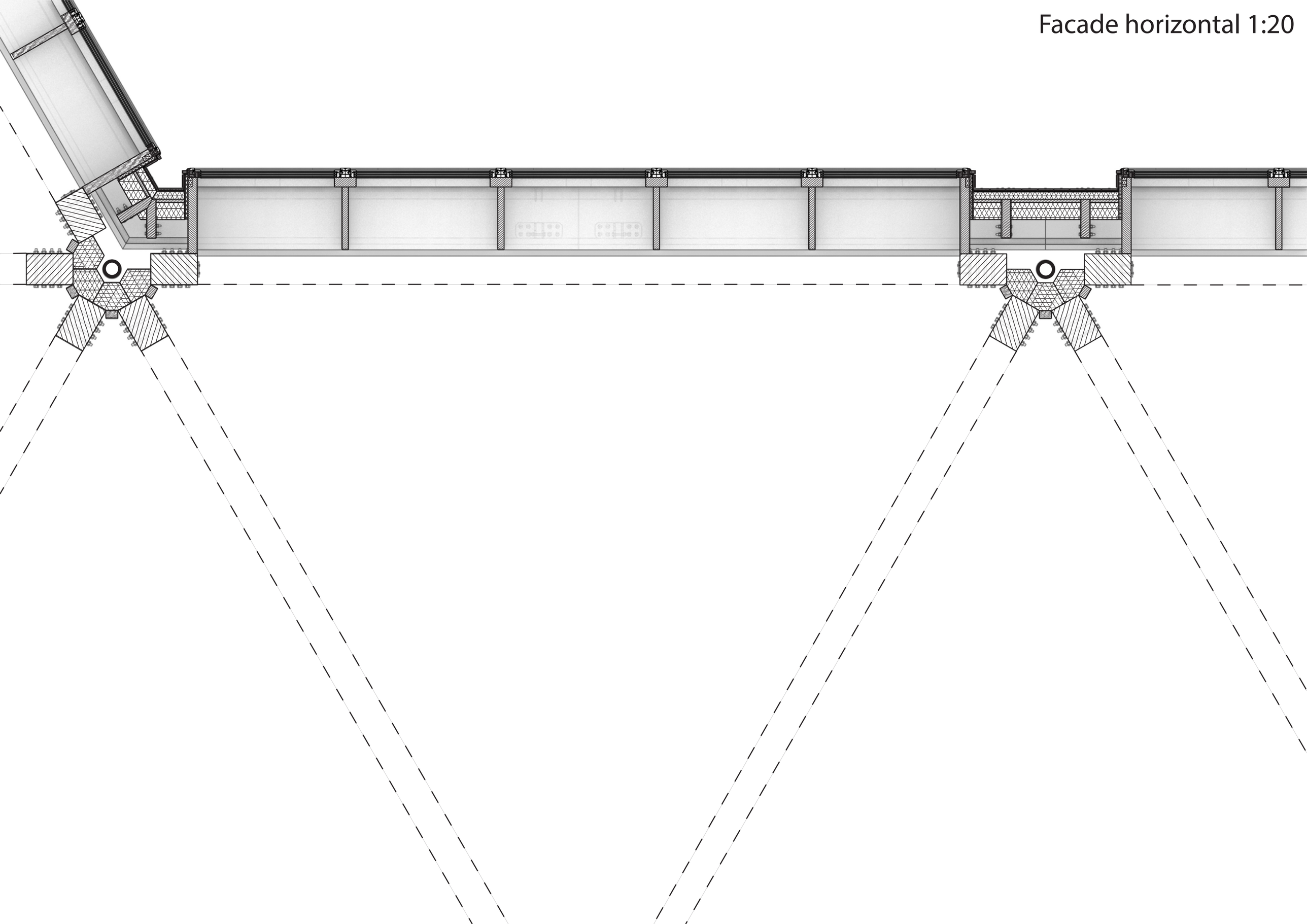




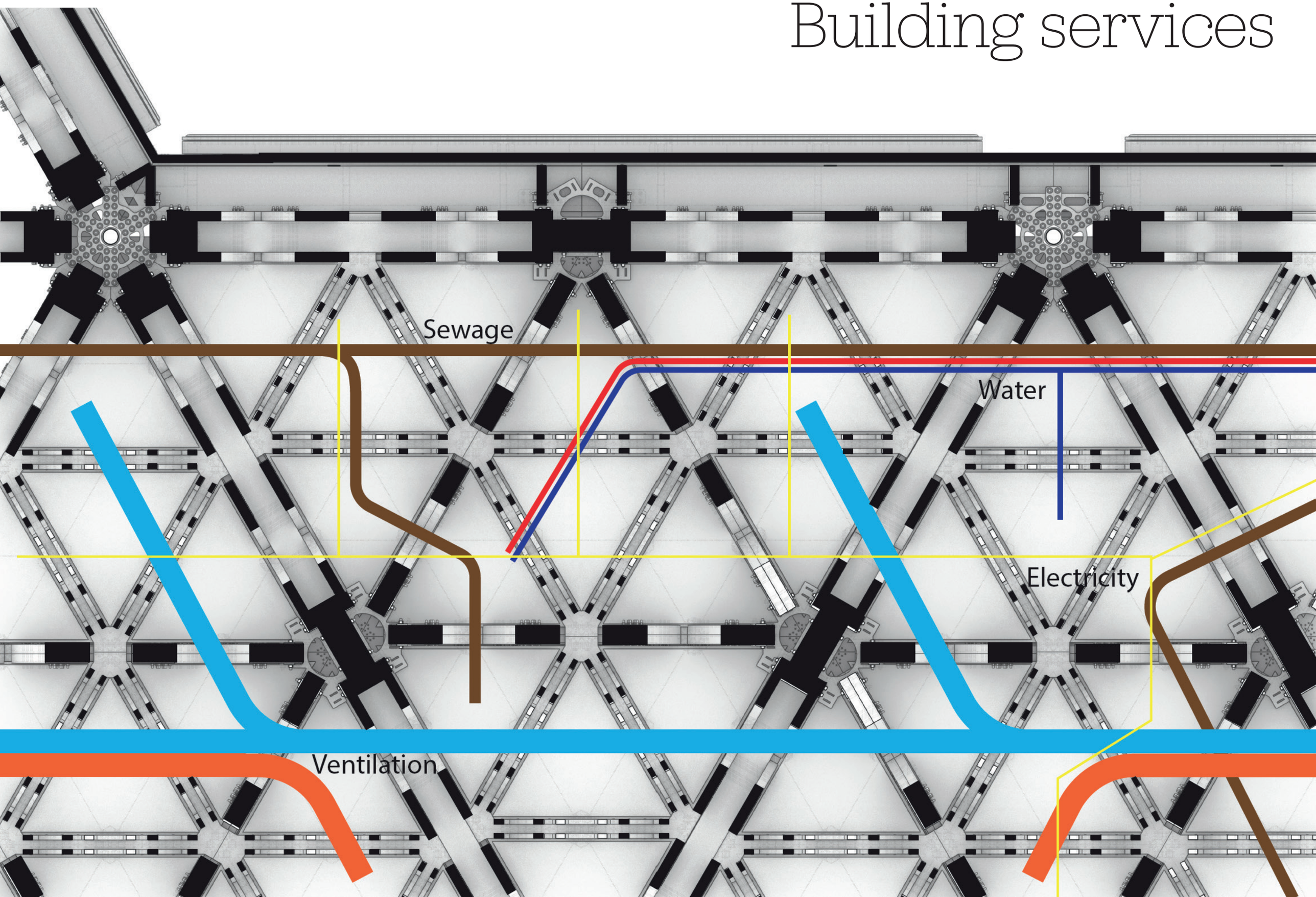
Building structure



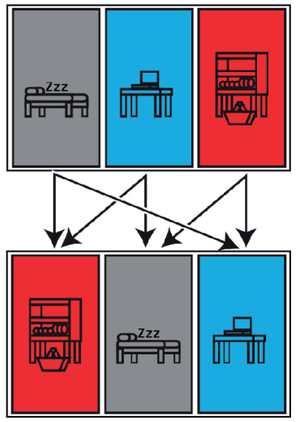
Facade horizontal 1:20



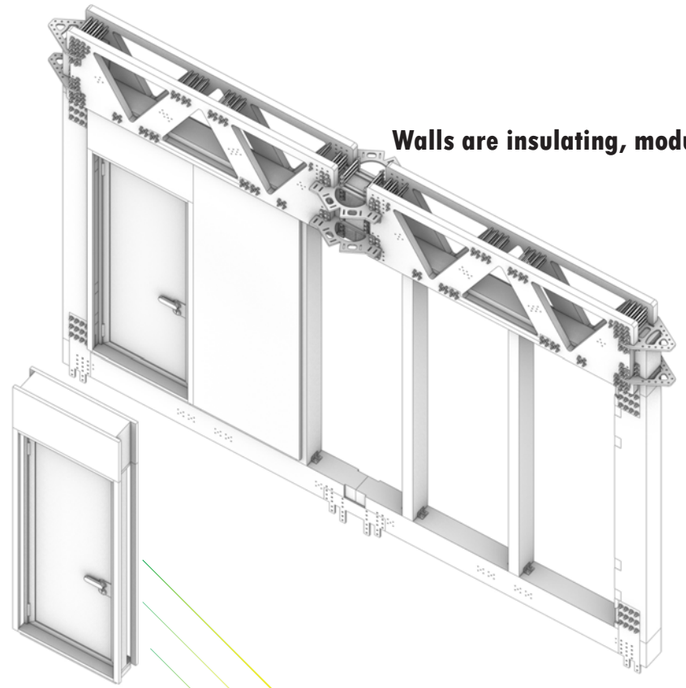
Building services



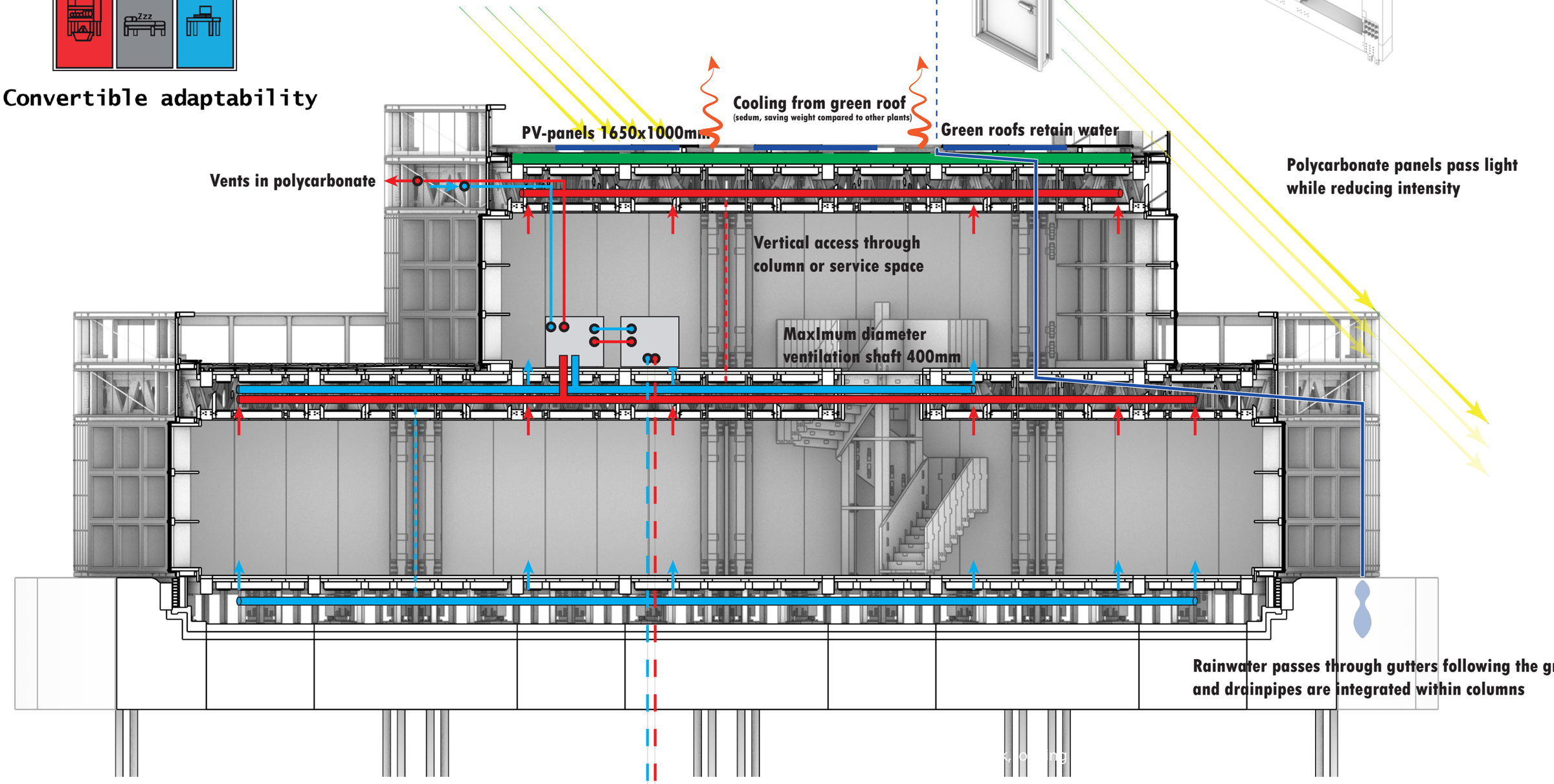
Building services



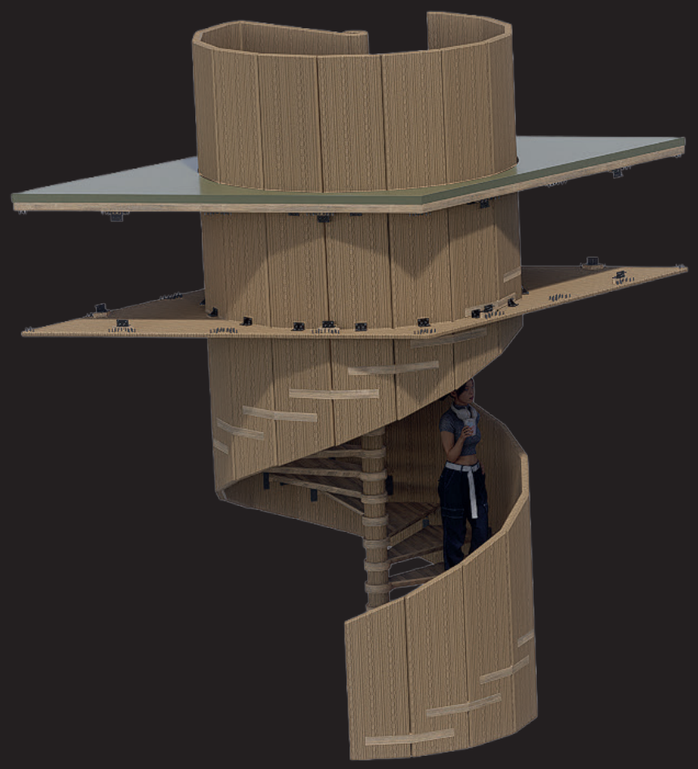
Convertible adaptability

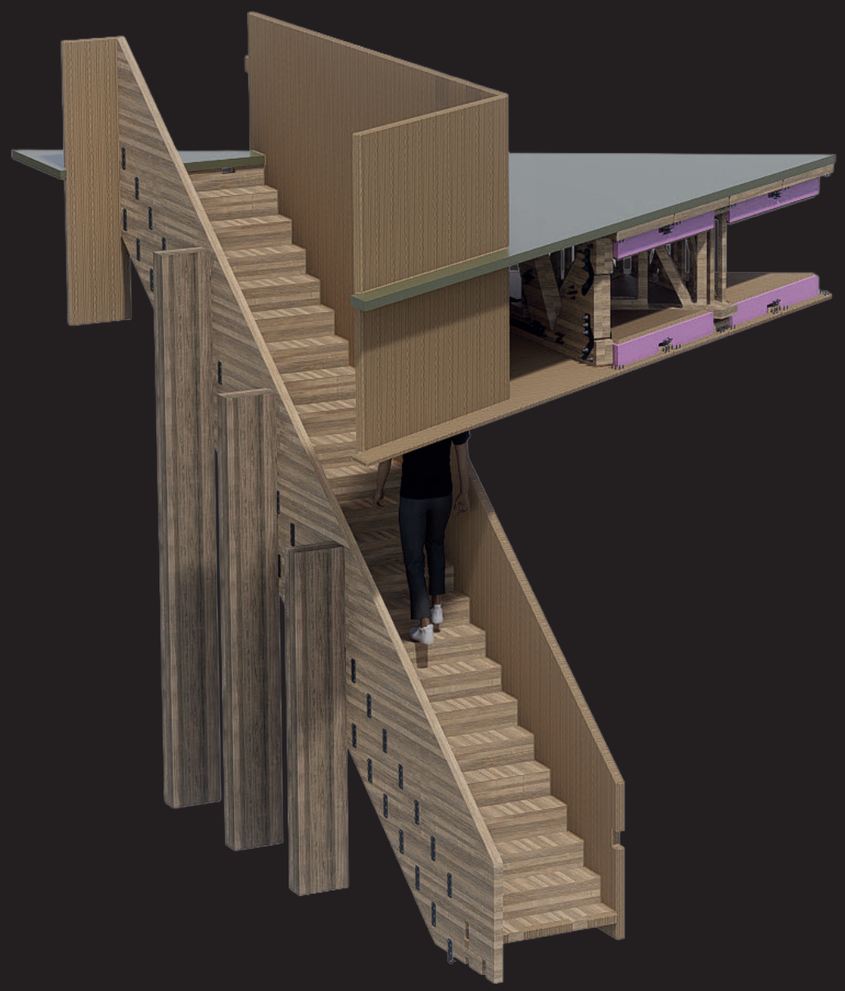


Walls are insulating, modular and easy to adjust



Vertical translation





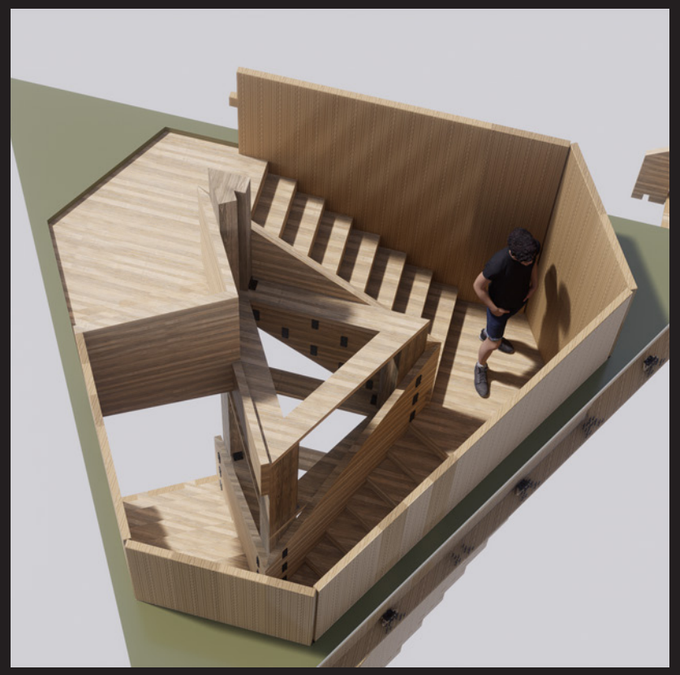


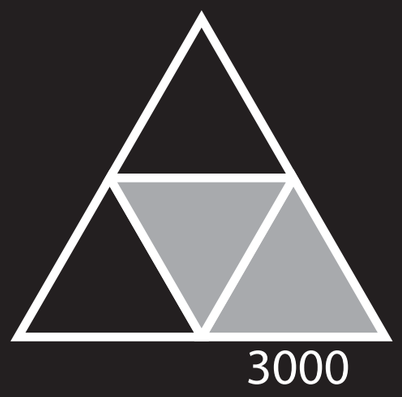
Traffic

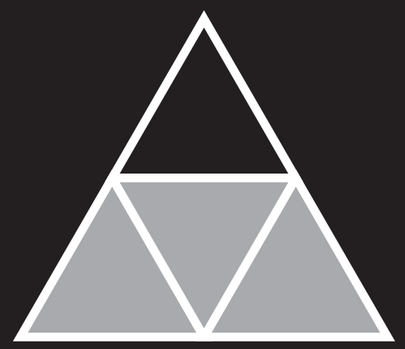
Vertical translation

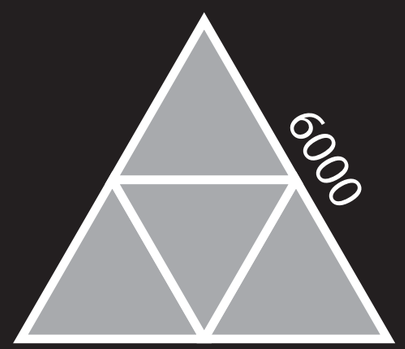




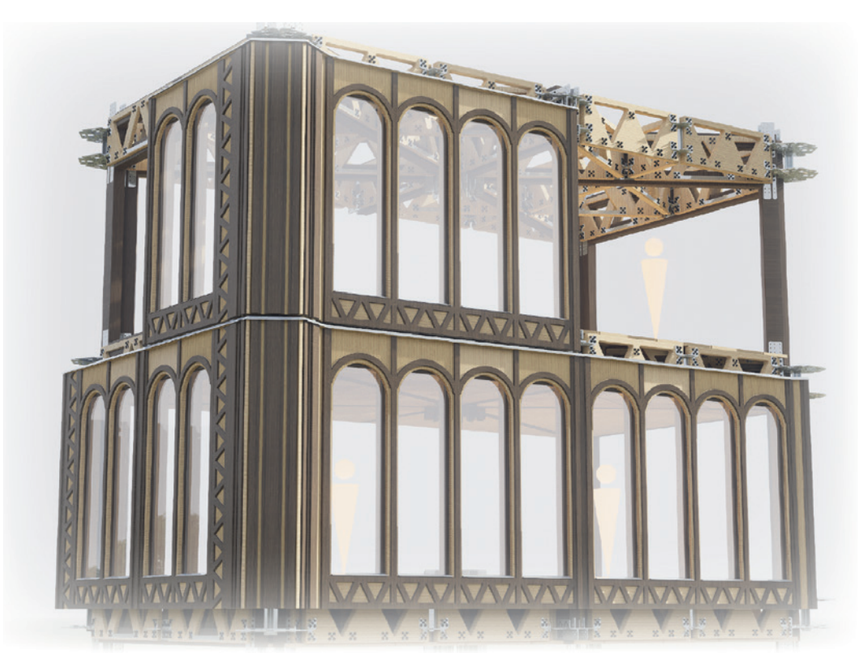






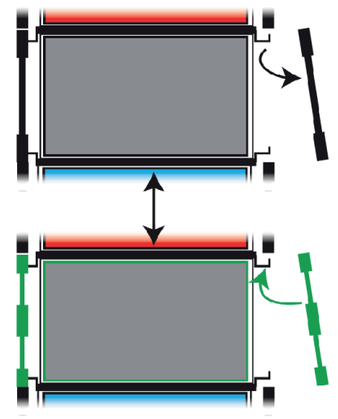


Building skin



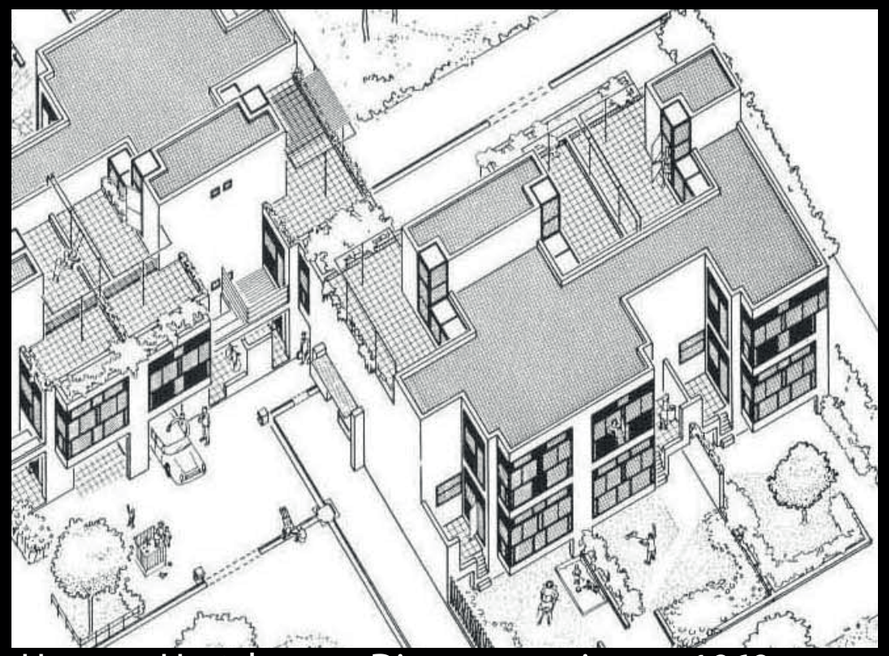






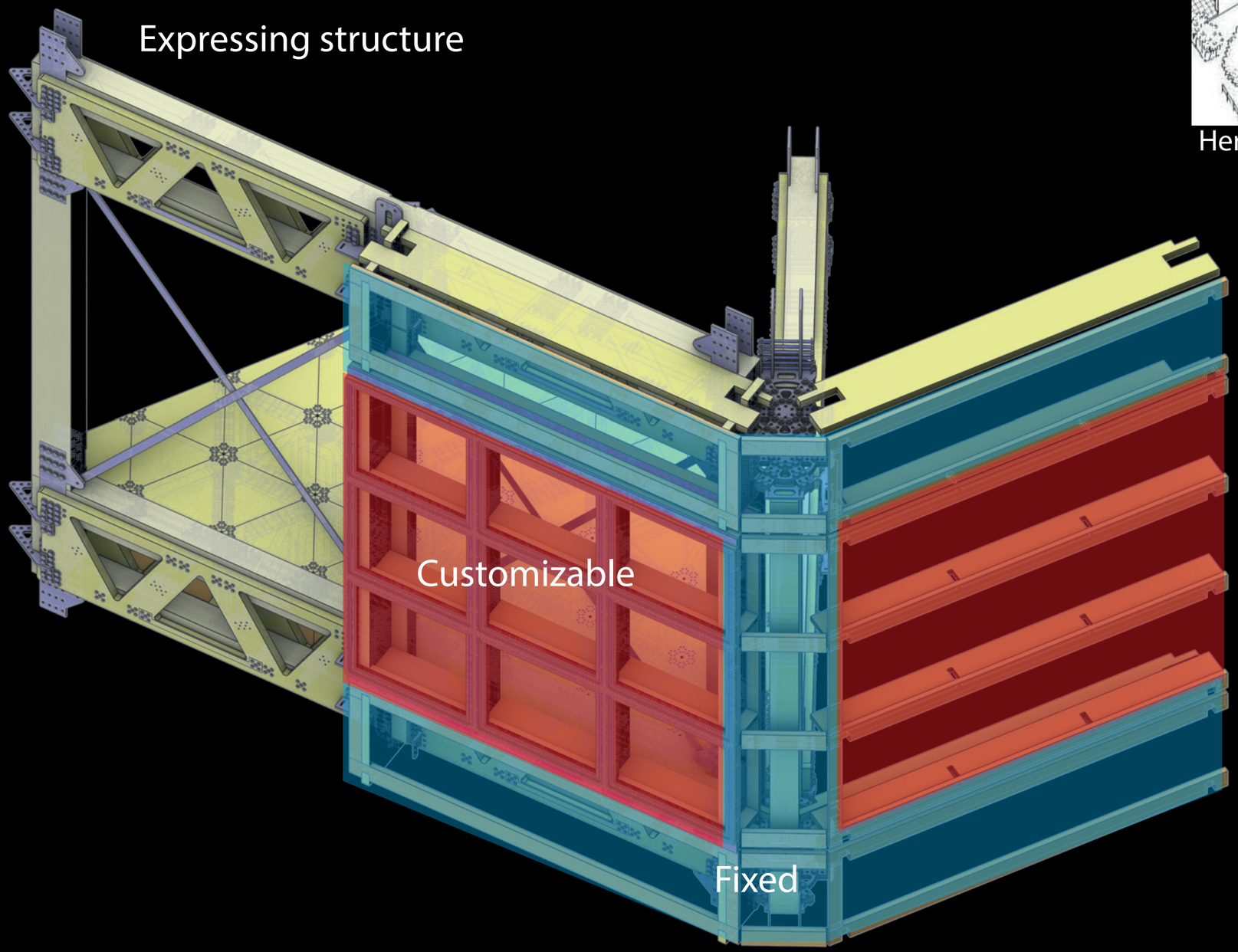
Refitable adaptability

Building skin

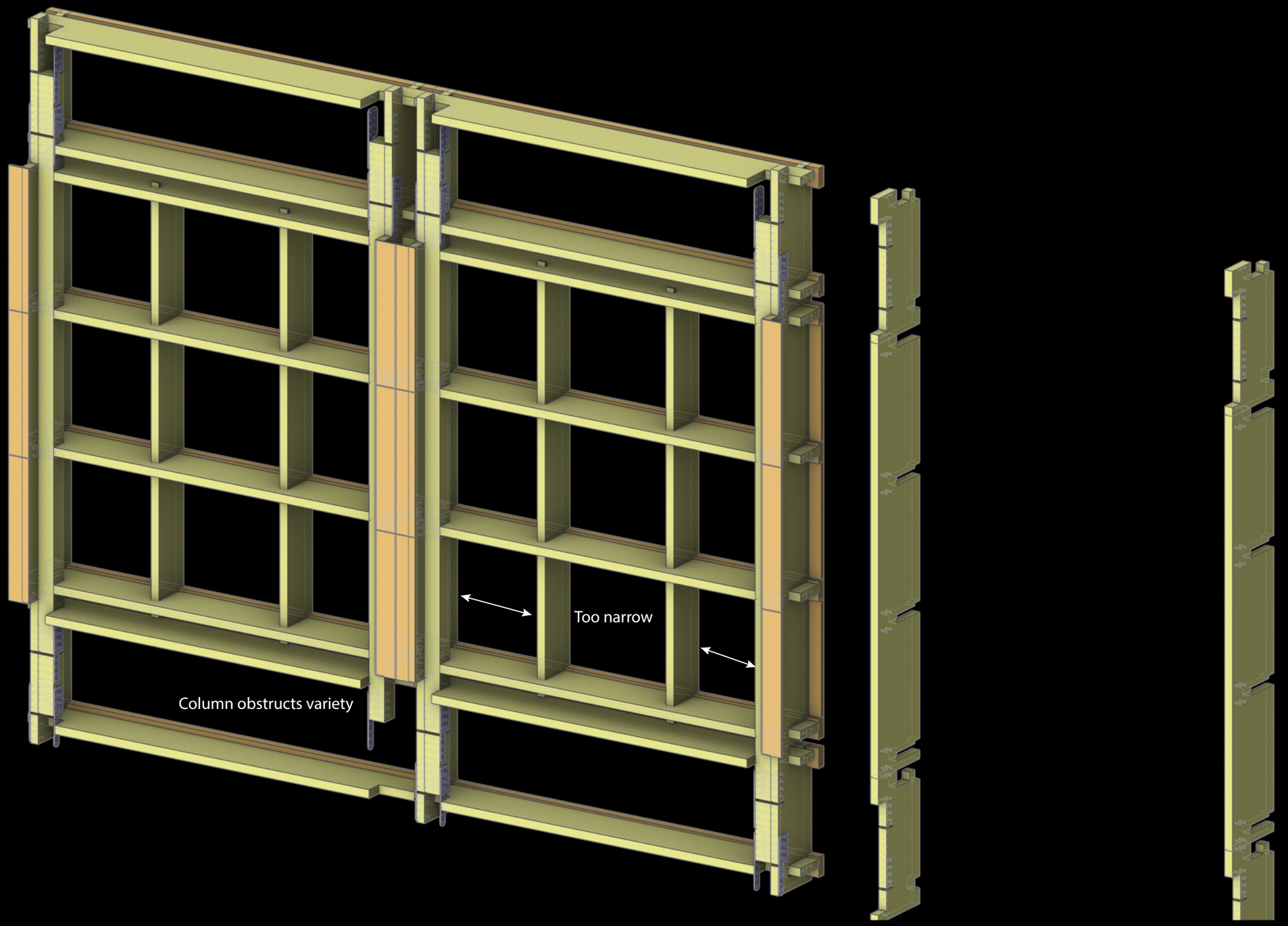


Herman Hertzberger, Diagoonwoningen, 1969

Expressing structure

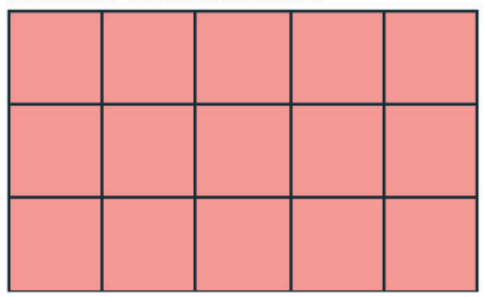


Building skin



Building skin

1 Choose frame geometry



#00001

2 Choose materiality

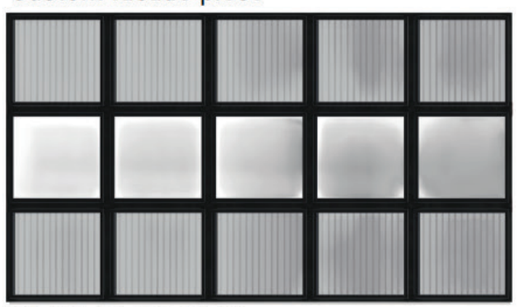
Polycarbonate

Glass

Polycarbonate

#00001

Custom facade piece

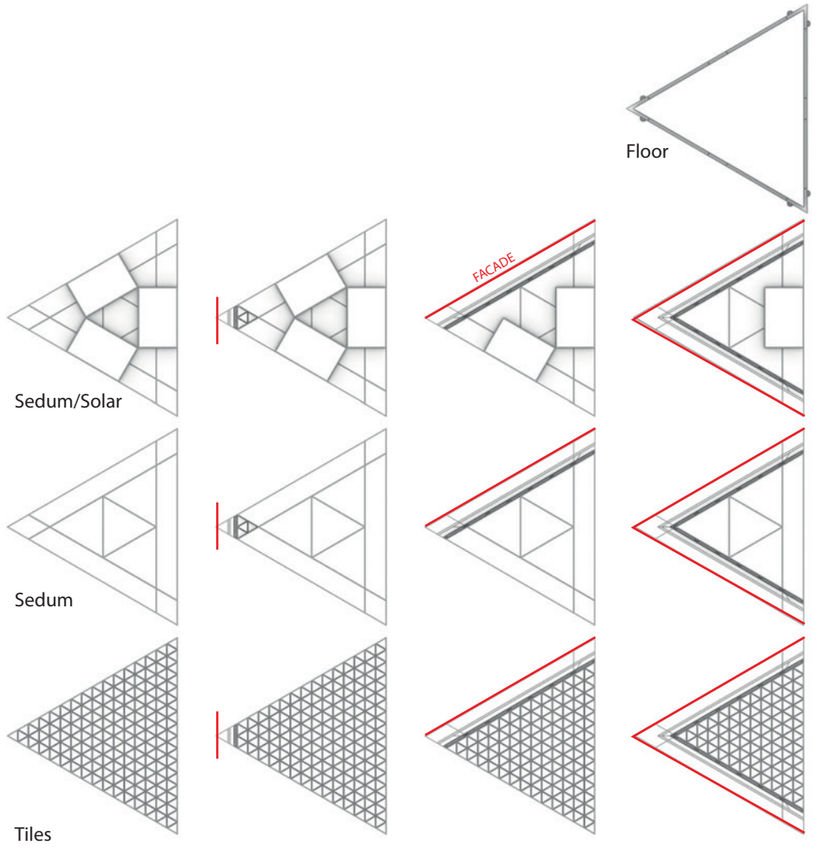


#00001

Installation



#00001





#12682



#20471



#20443



#00001



#22491



#23578



#25086



#11835



#05784

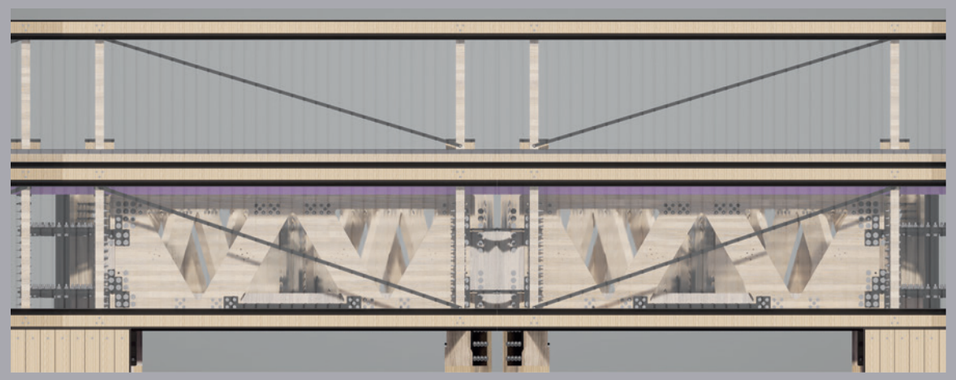


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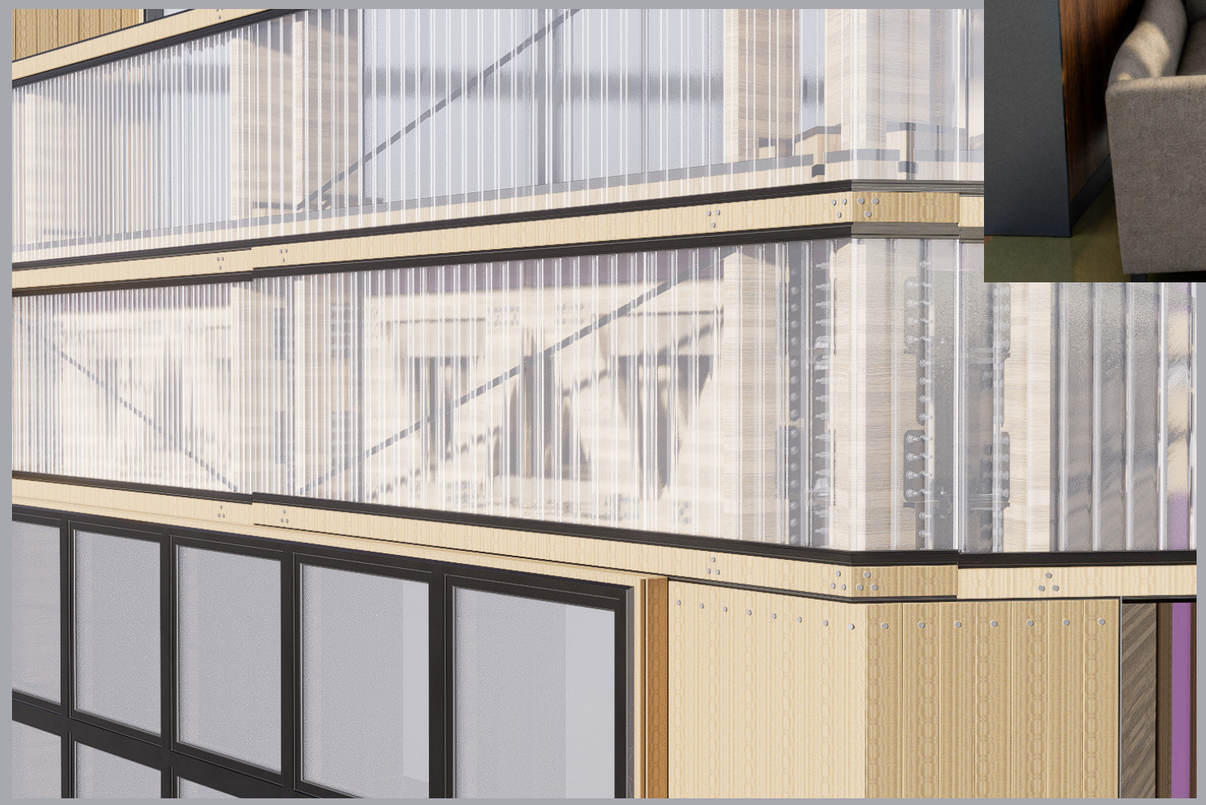


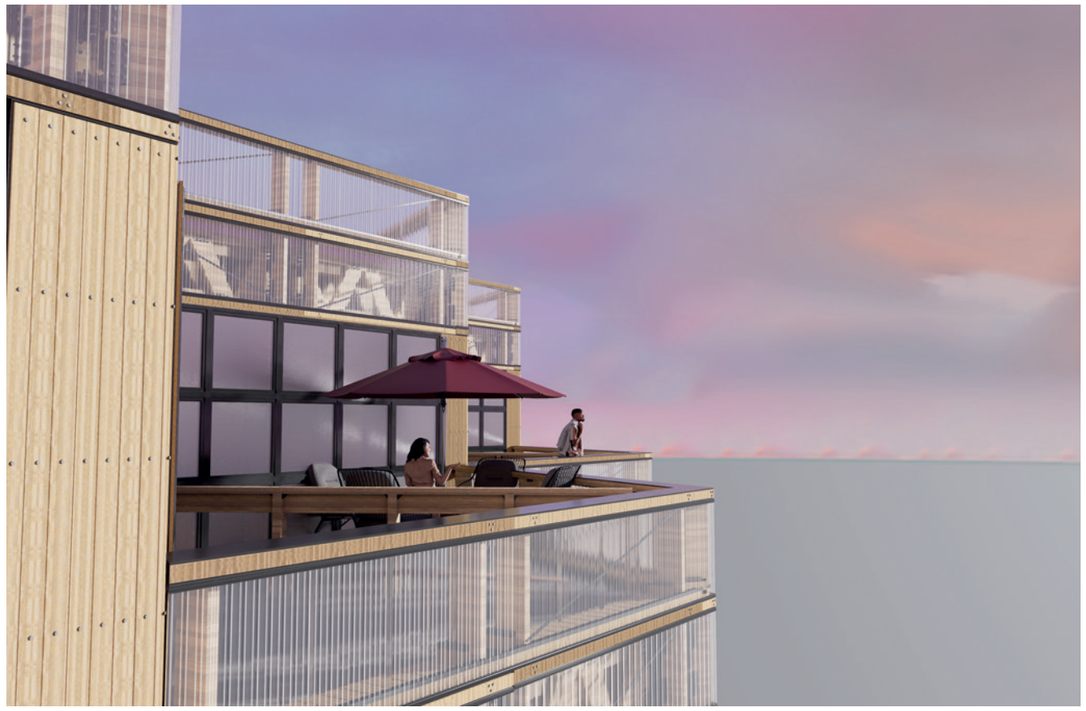
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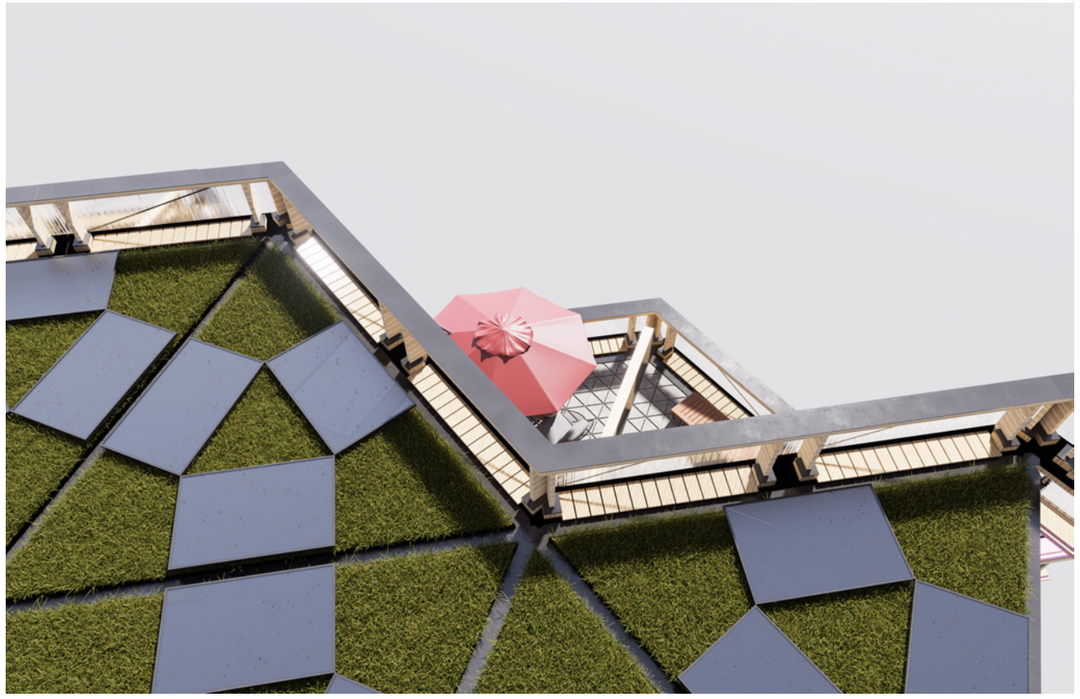
Building skin

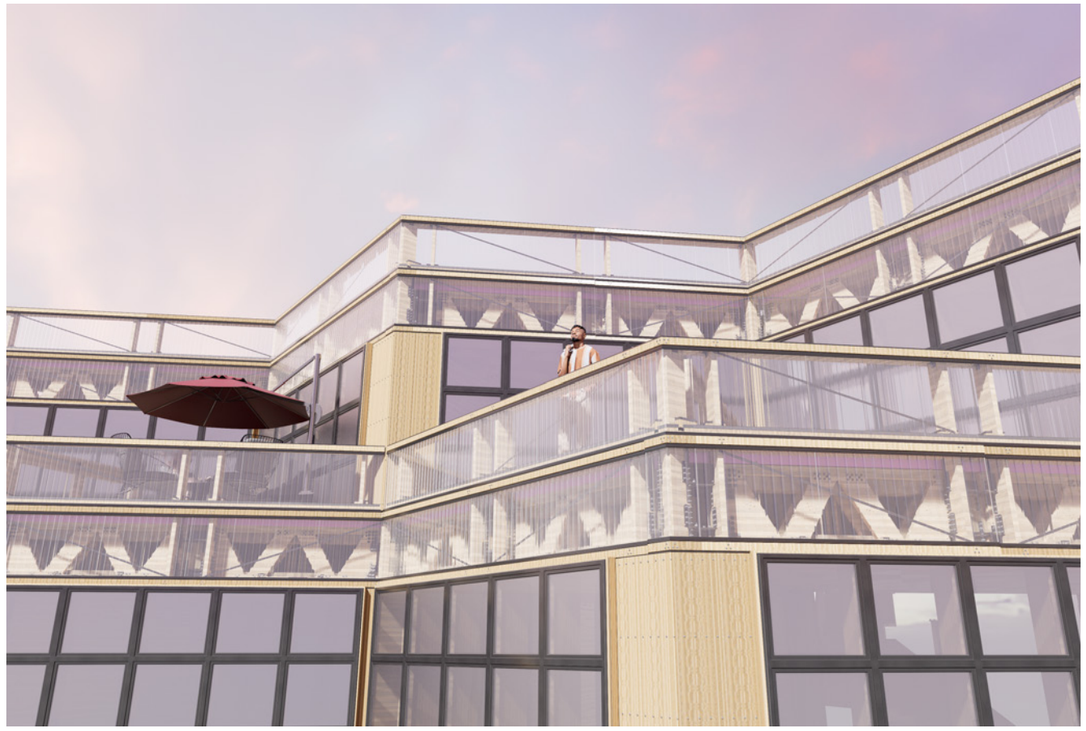


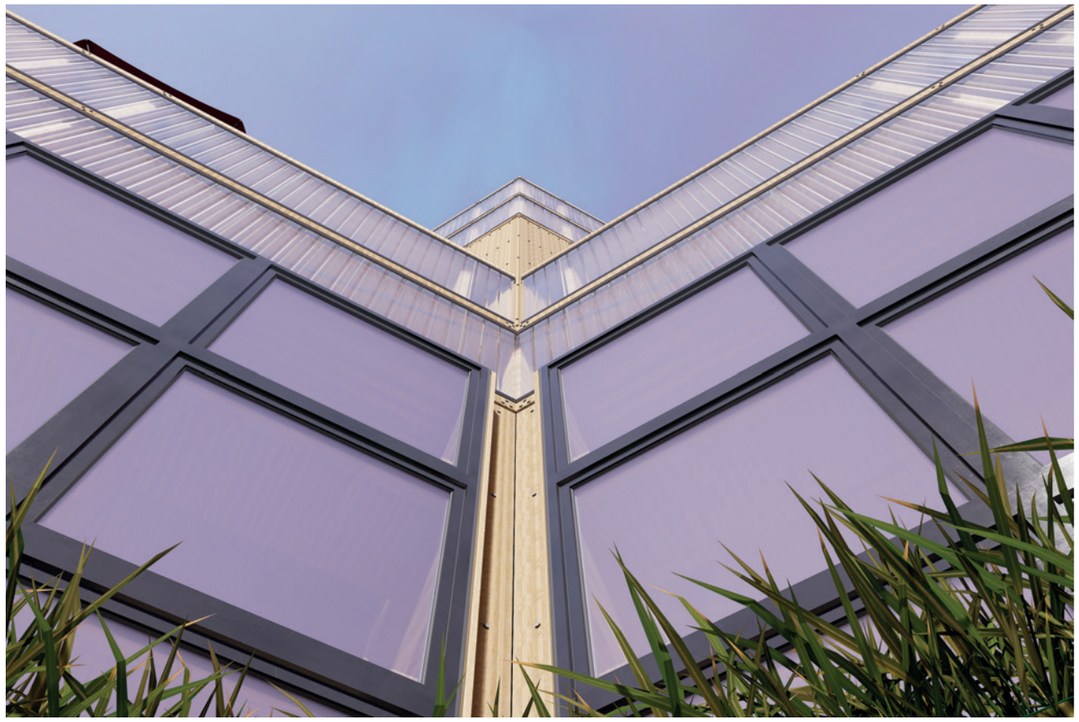




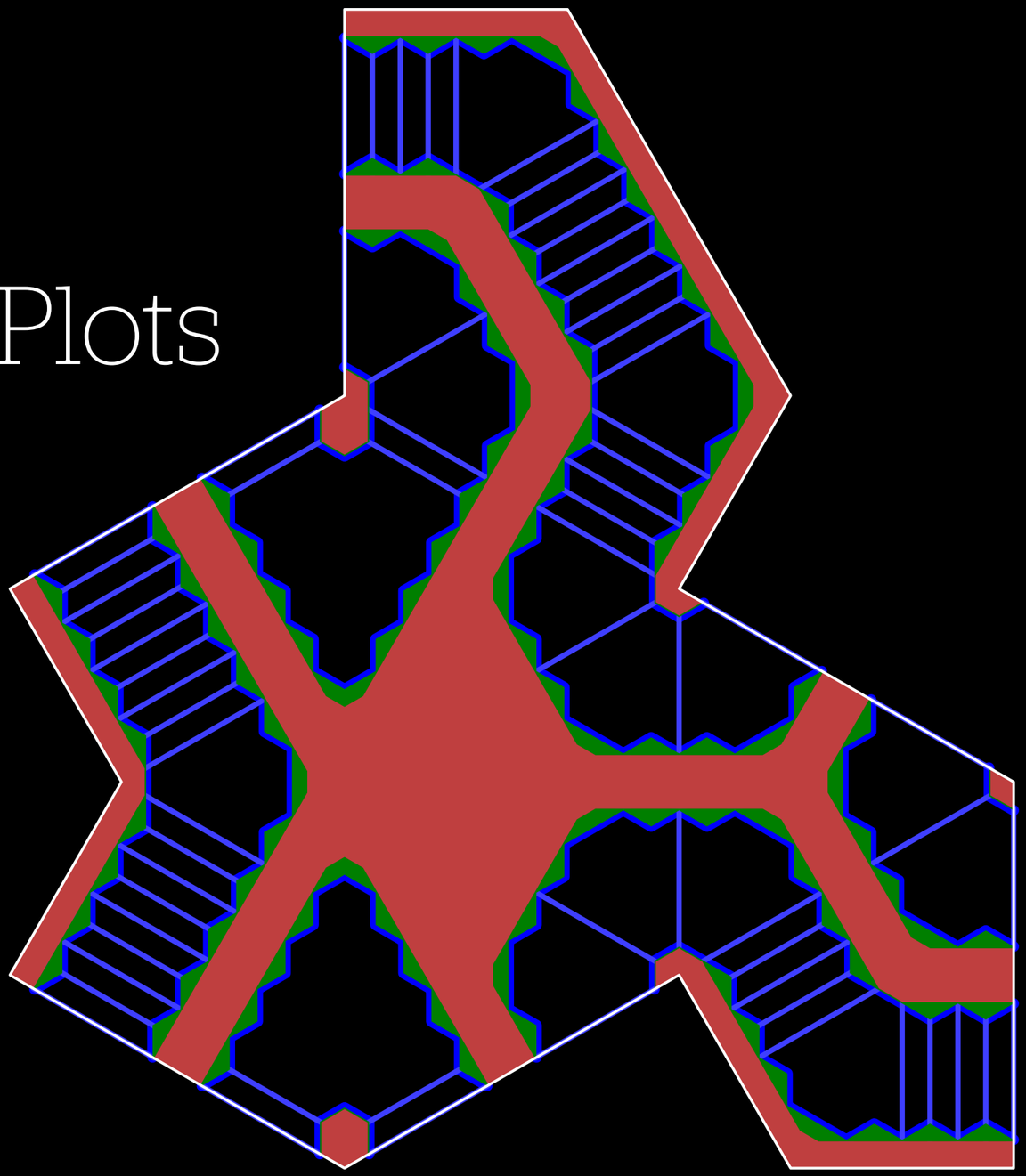


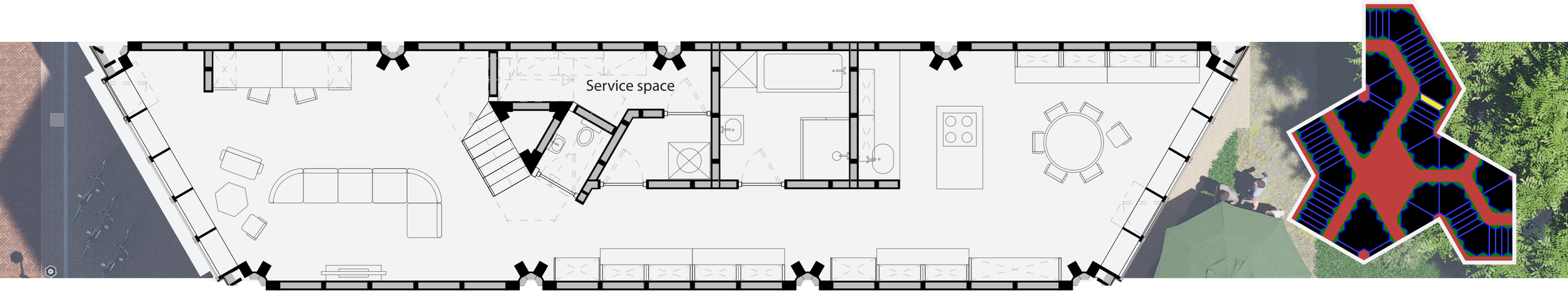


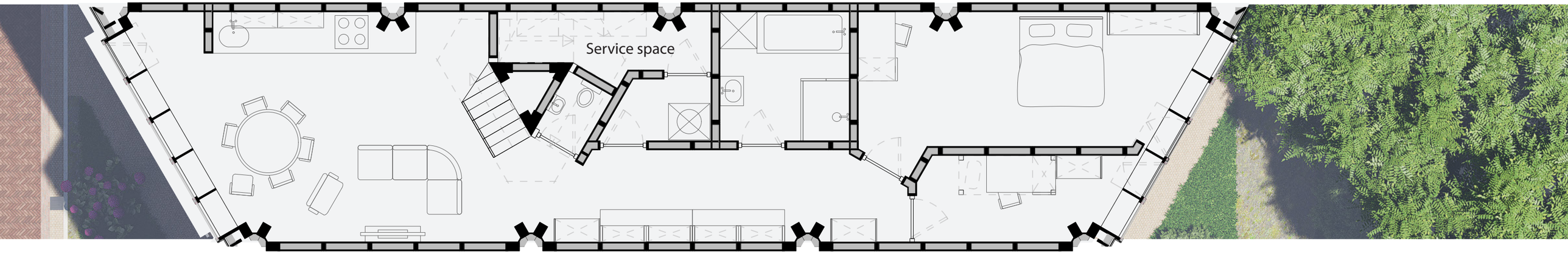


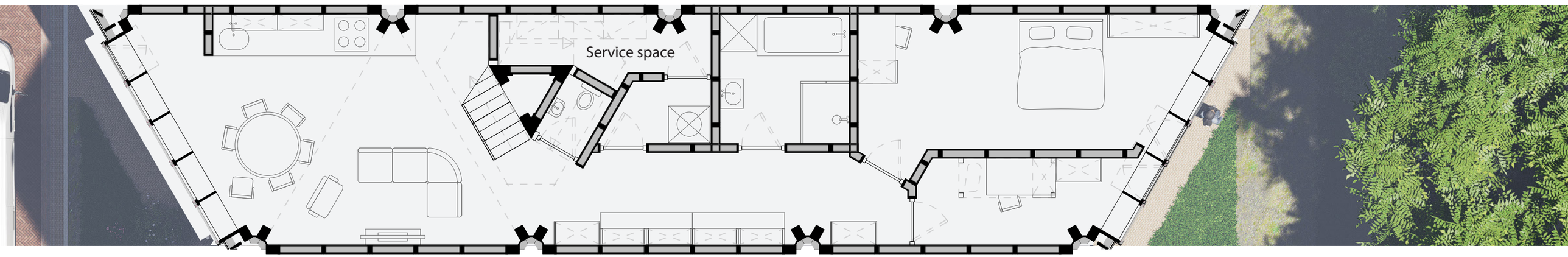


Plots

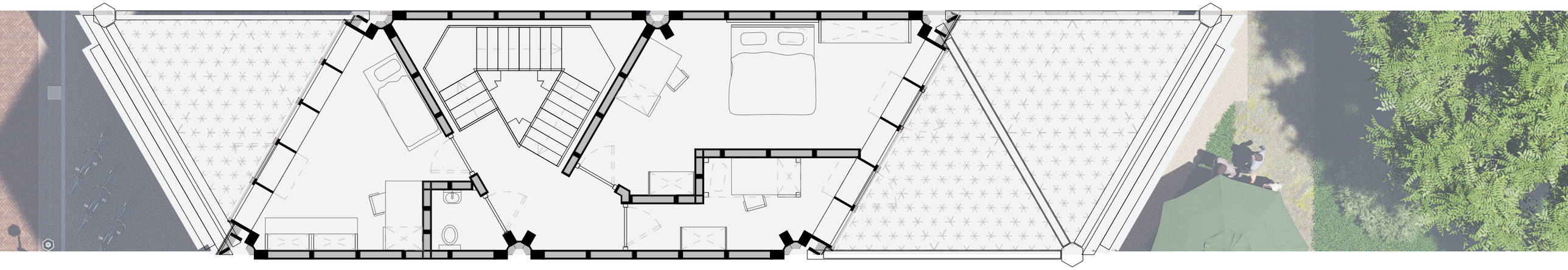


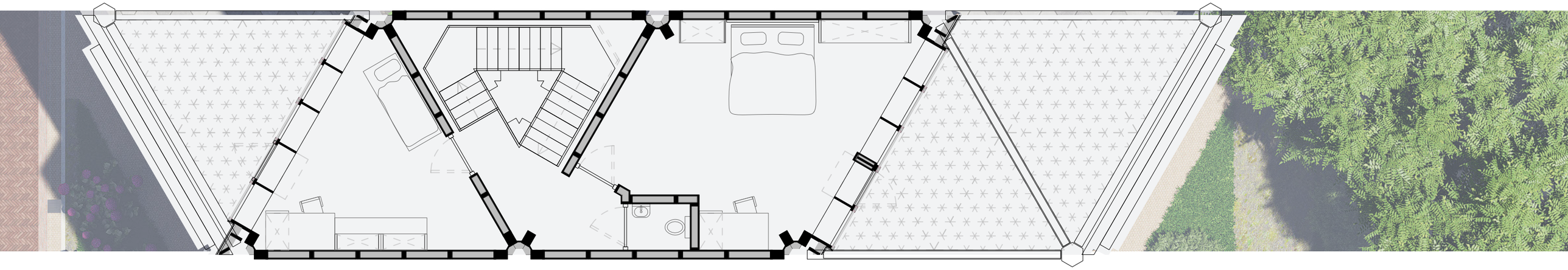


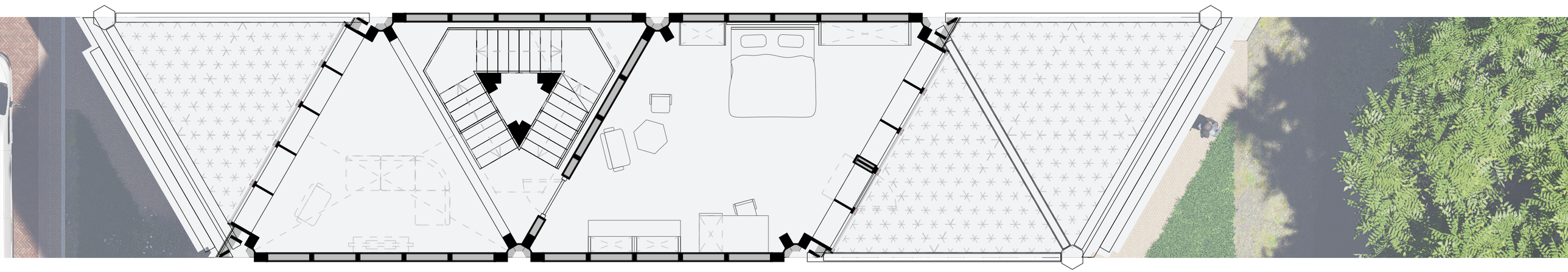




Floorplan: strip, terraced house, version 1,2,3 ground floor, 1:100

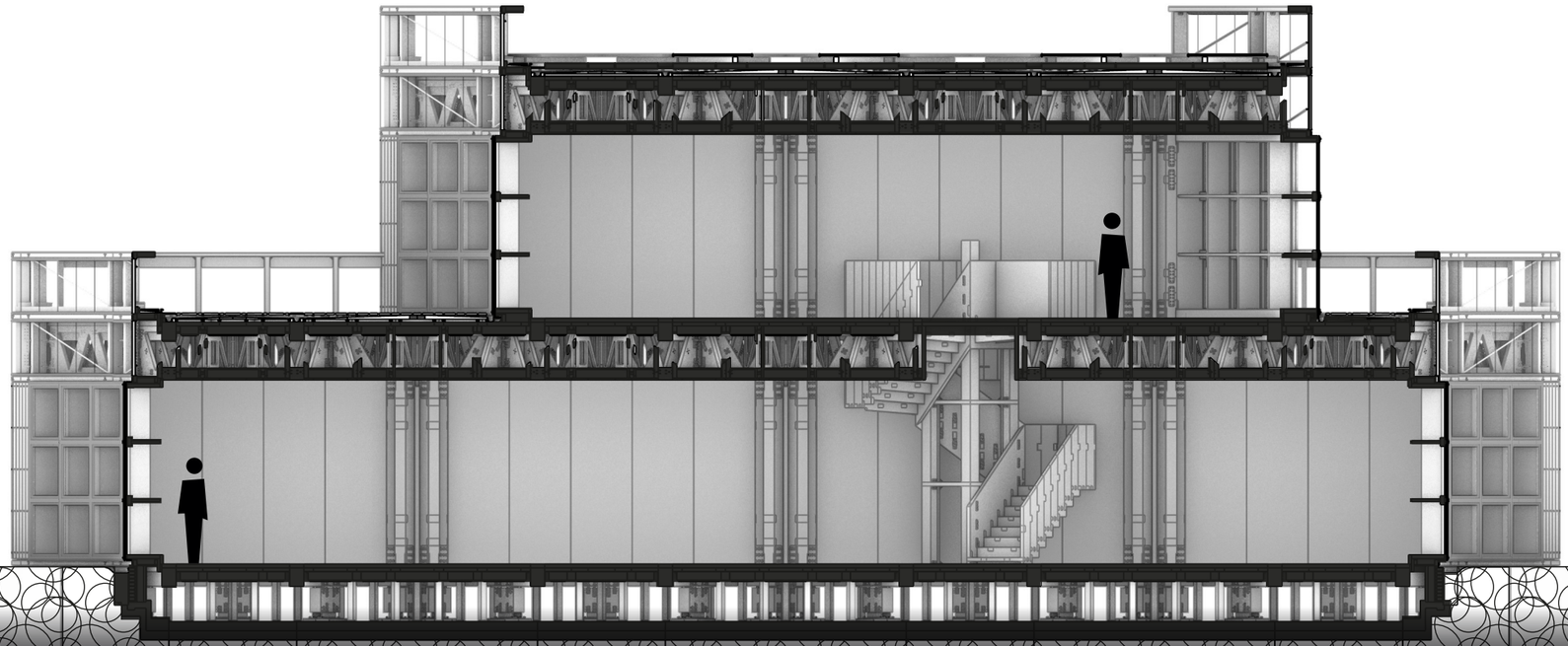




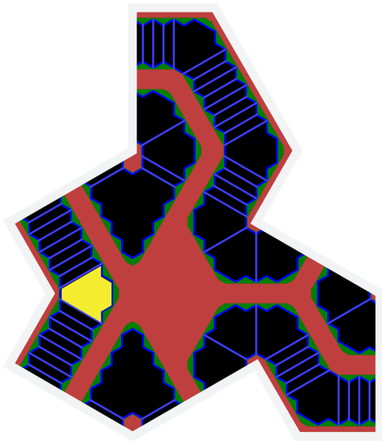


Floorplan: strip, terraced house, version 1,2,3 first floor, 1:100

Floorplan: strip, terraced house, version 1,2,3 roof, 1:100



Floorplan: bent, studios (5 units)
+ coliving (20 units)
ground floor
1:125



Comunal laundry

Service space

Storage

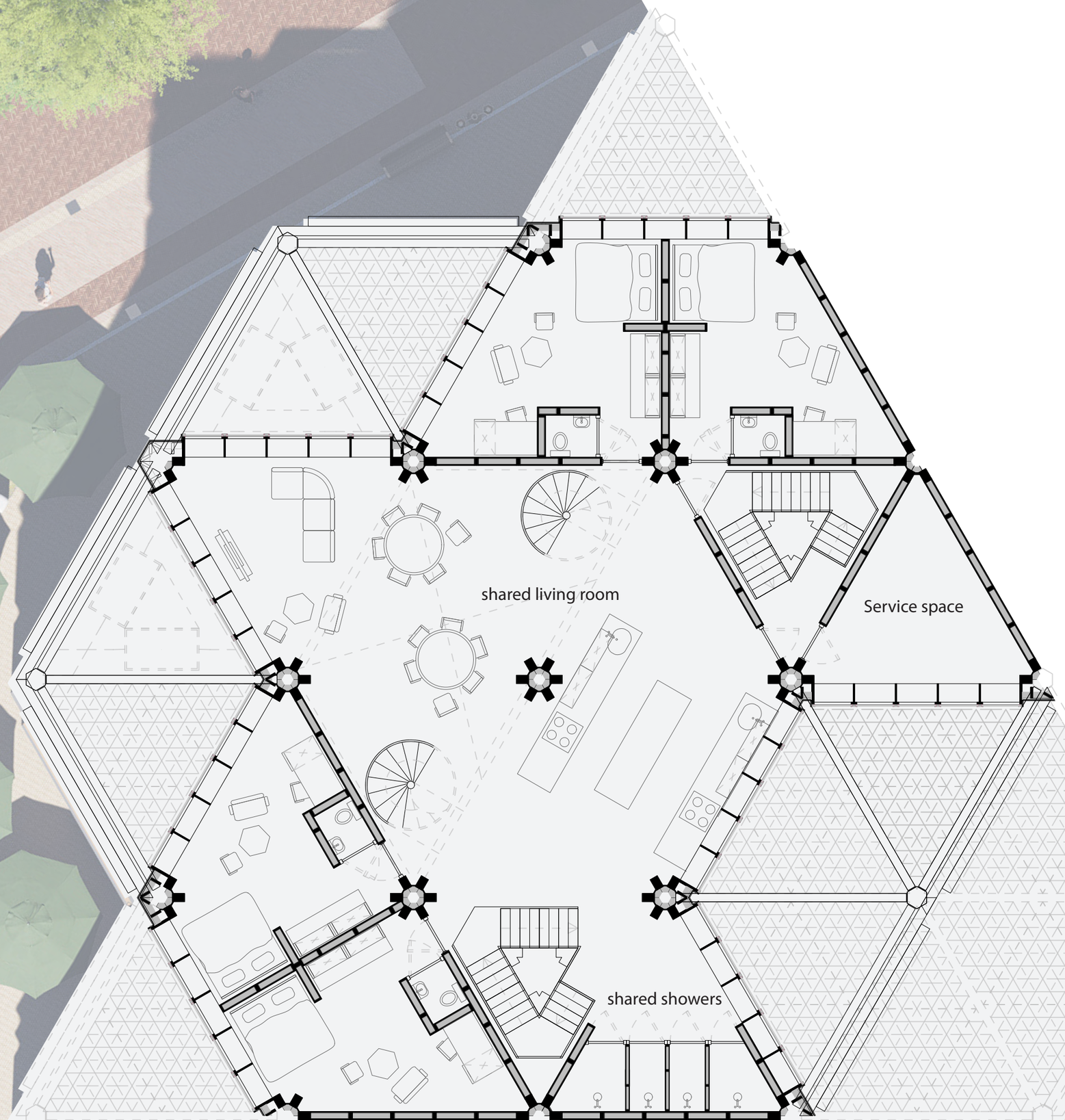
Bike storage

Floorplan: bent, studios (5 units)
+ coliving (20 units)
first floor
1:125

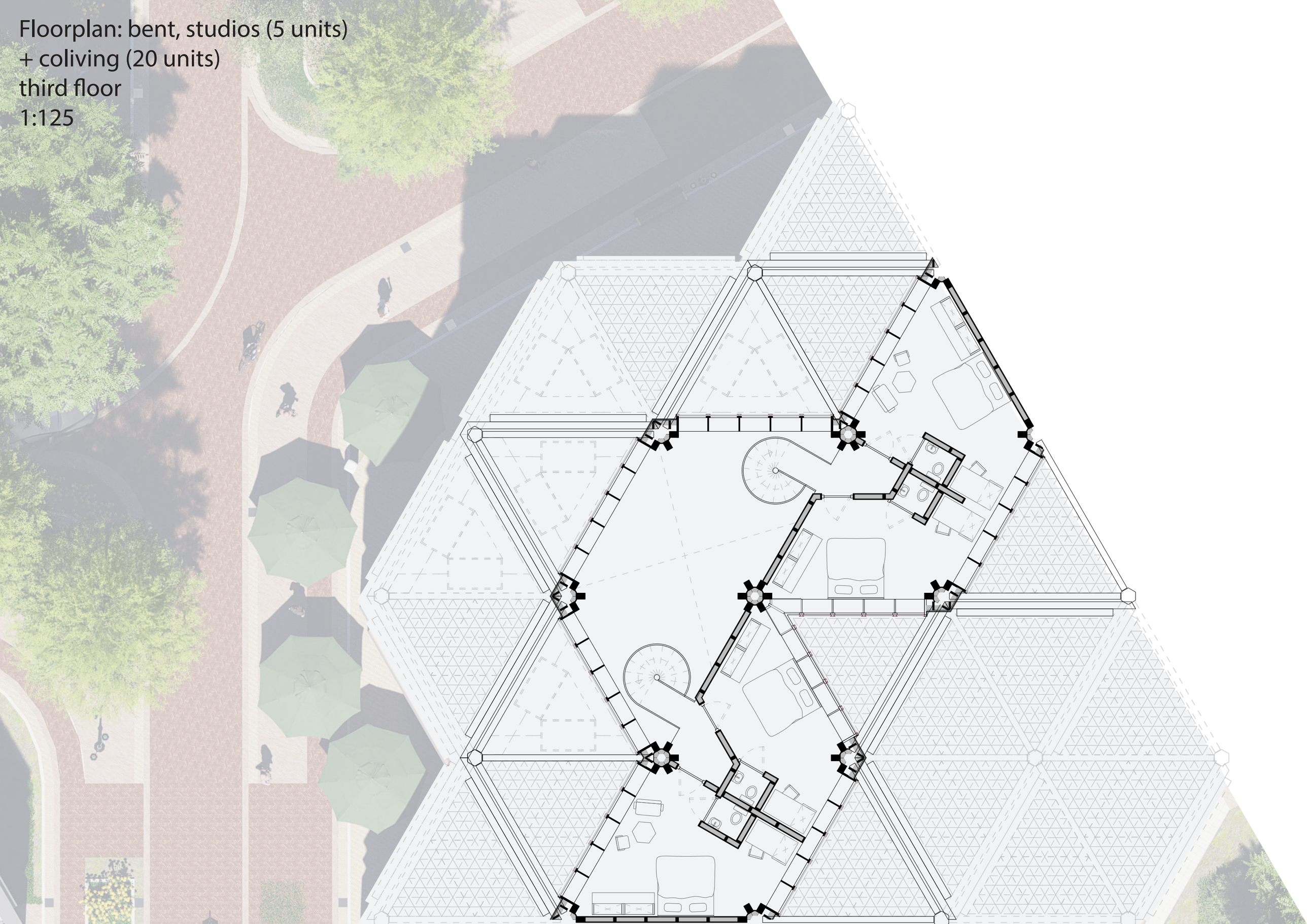
shared showers

Service space

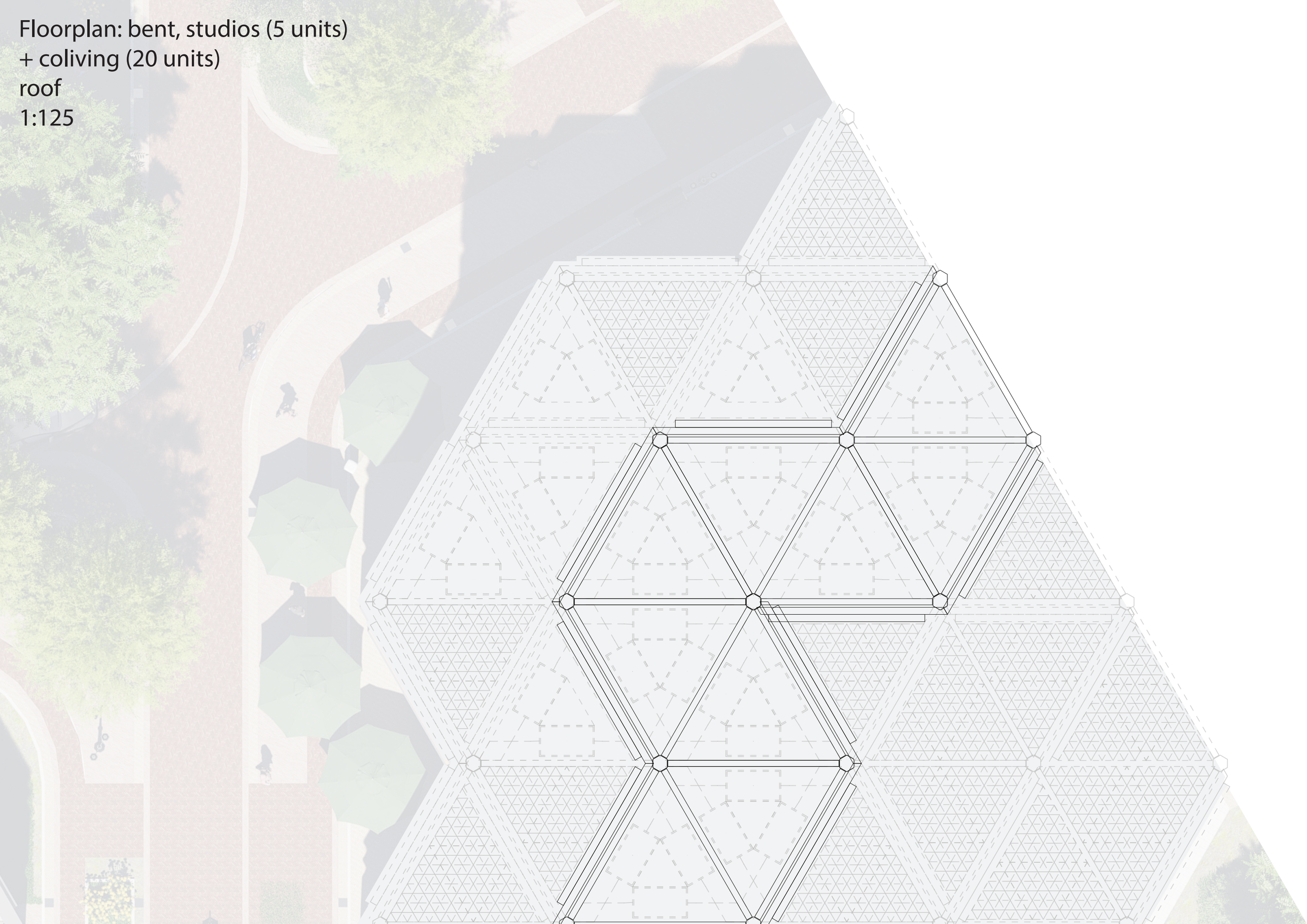
Floorplan: bent, studios (5 units)
+ coliving (20 units)
second floor
1:125



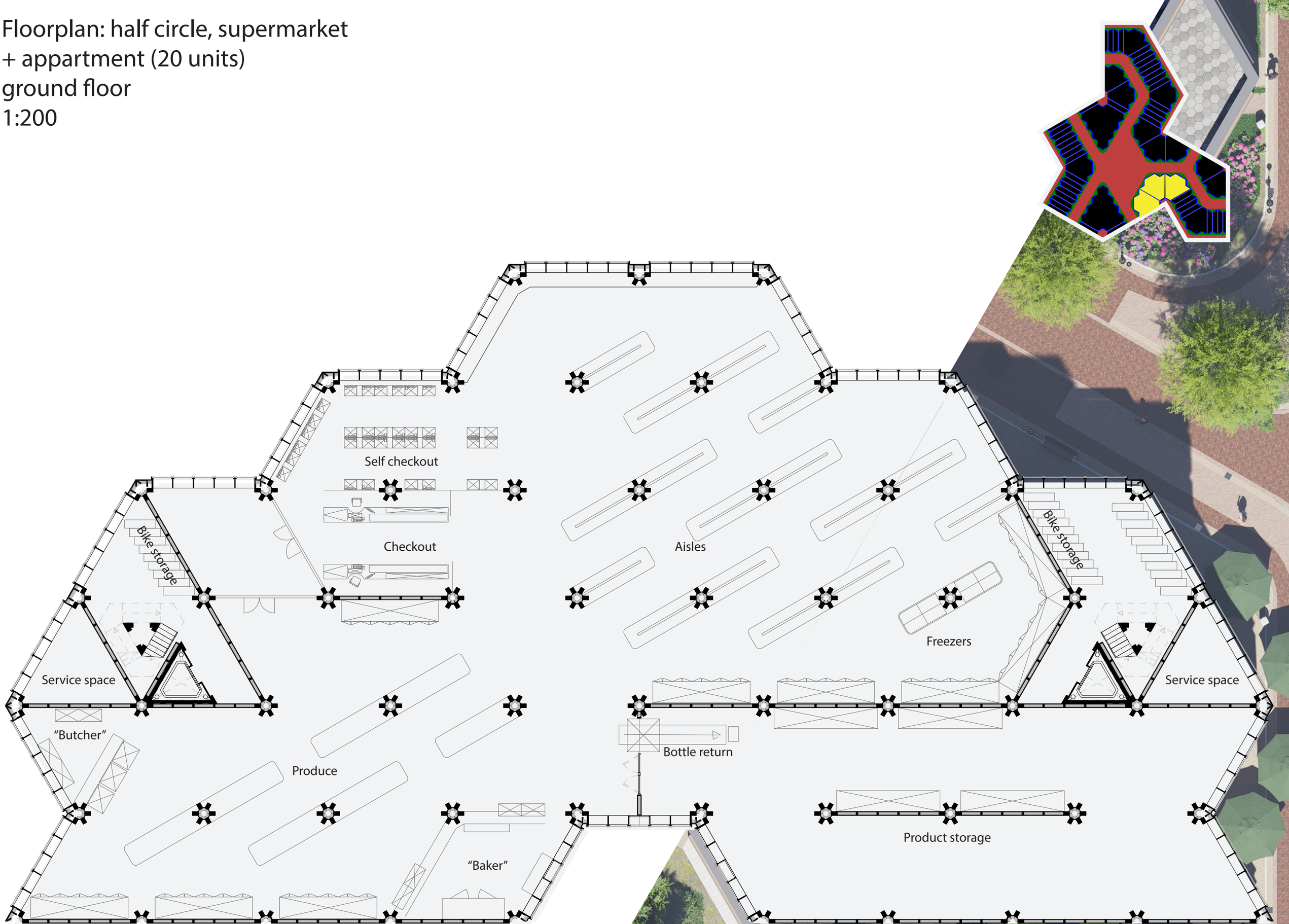
Floorplan: bent, studios (5 units)
+ coliving (20 units)
third floor
1:125



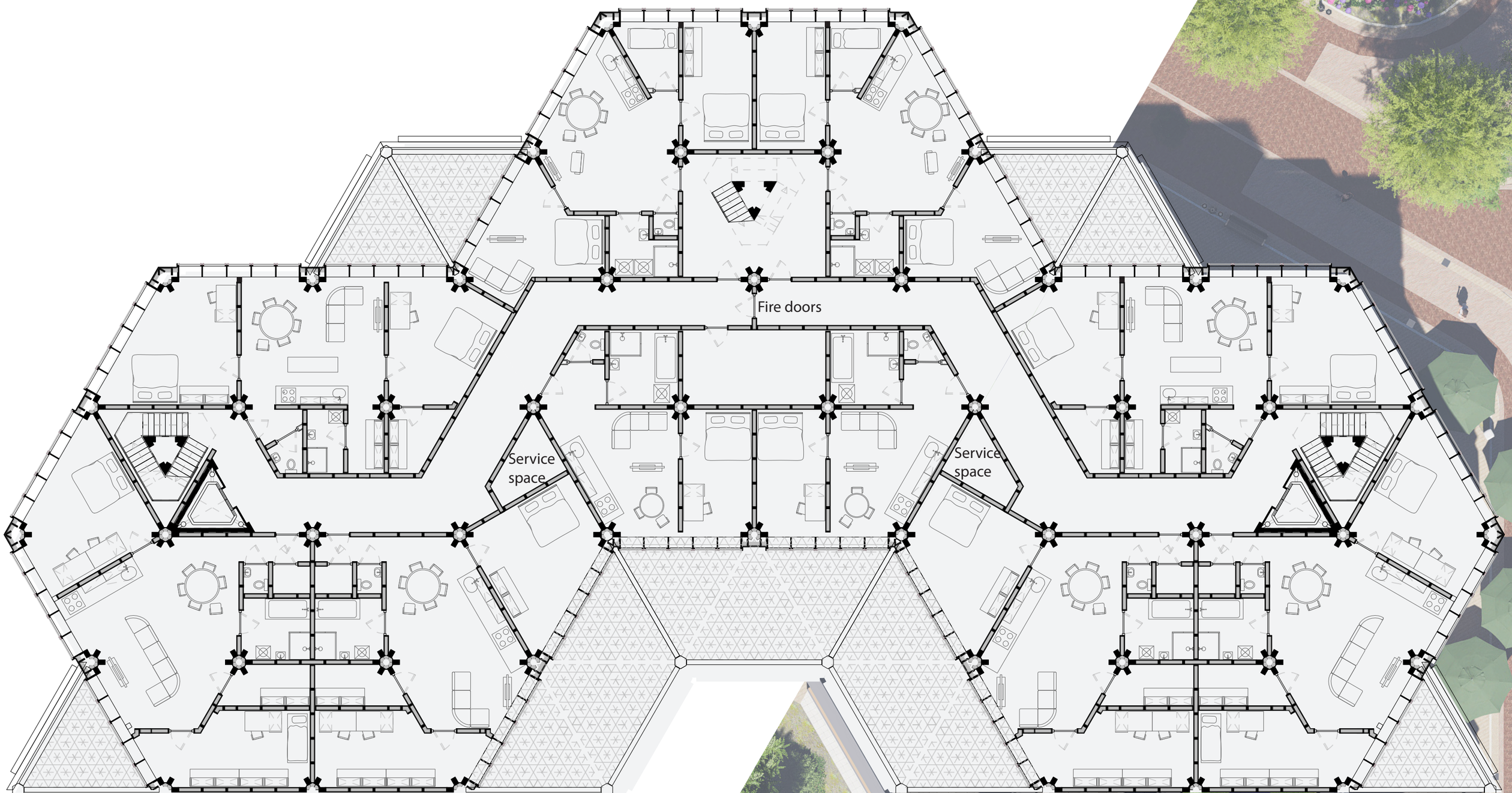
Floorplan: bent, studios (5 units)
+ coliving (20 units)
roof
1:125



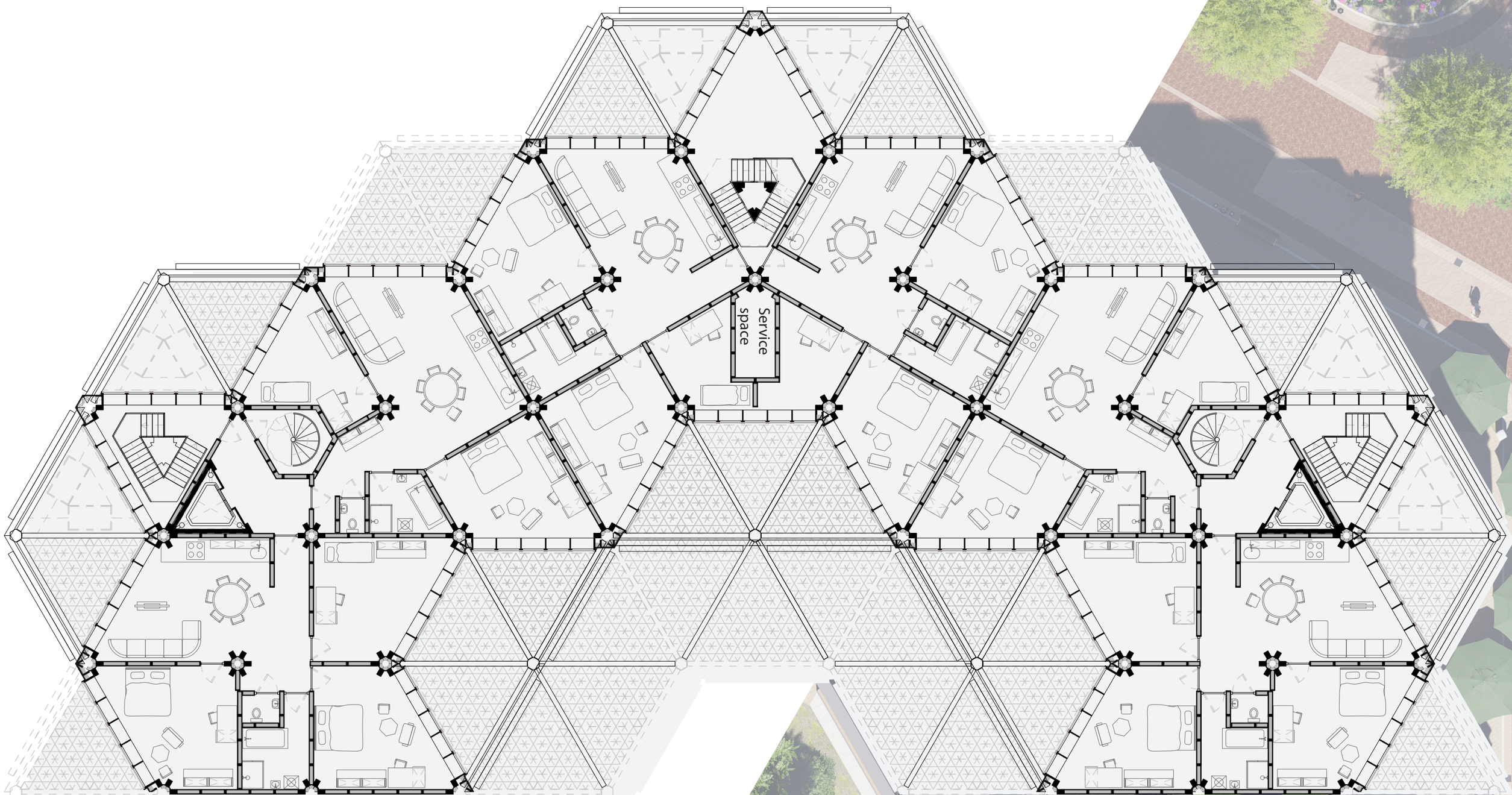
Floorplan: half circle, supermarket
+ appartment (20 units)
ground floor
1:200



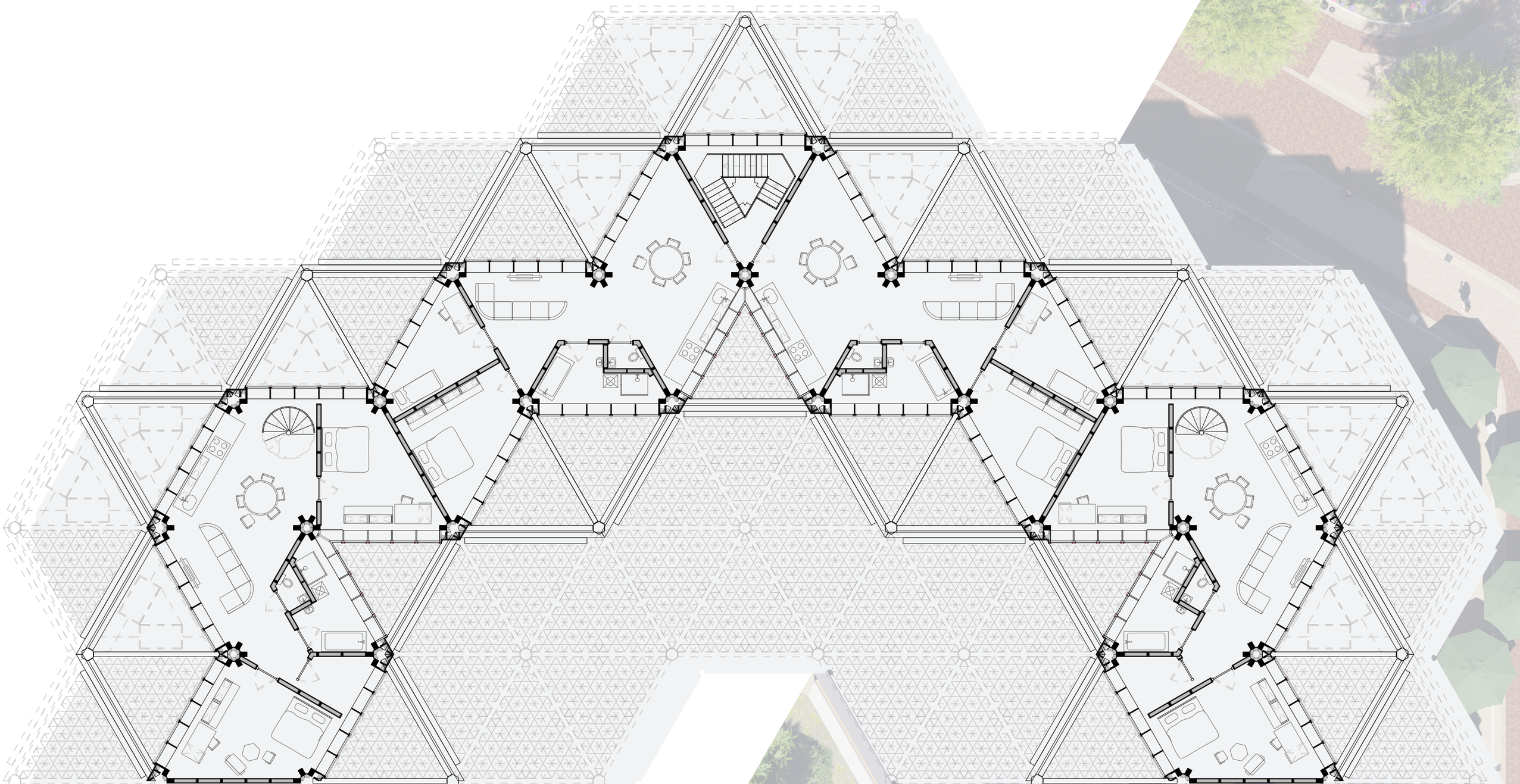
Floorplan: half circle, supermarket
+ appartment (20 units)
first floor
1:200



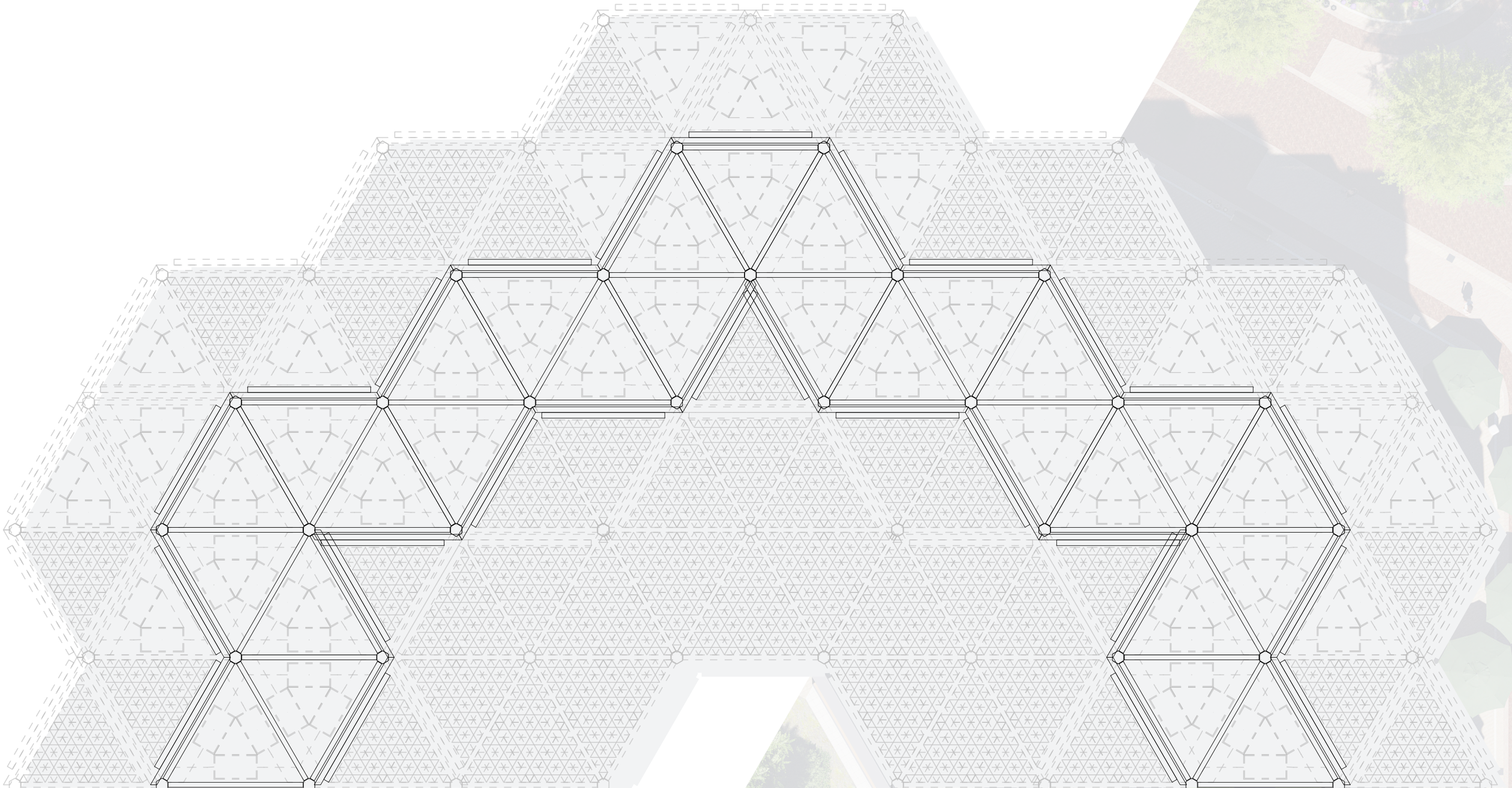
Floorplan: half circle, supermarket
+ appartment (20 units)
second floor
1:200



Floorplan: half circle, supermarket
+ appartment (20 units)
third floor
1:200

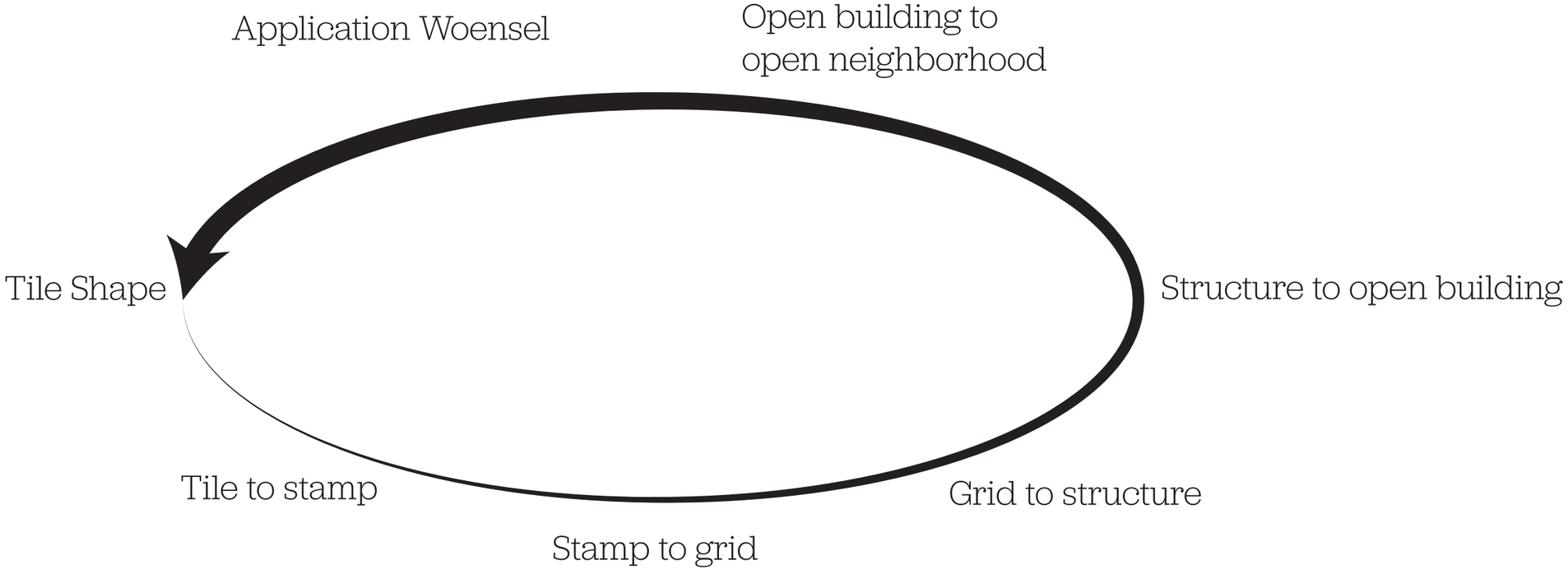


Floorplan: half circle, supermarket
+ appartment (20 units)
roof
1:200

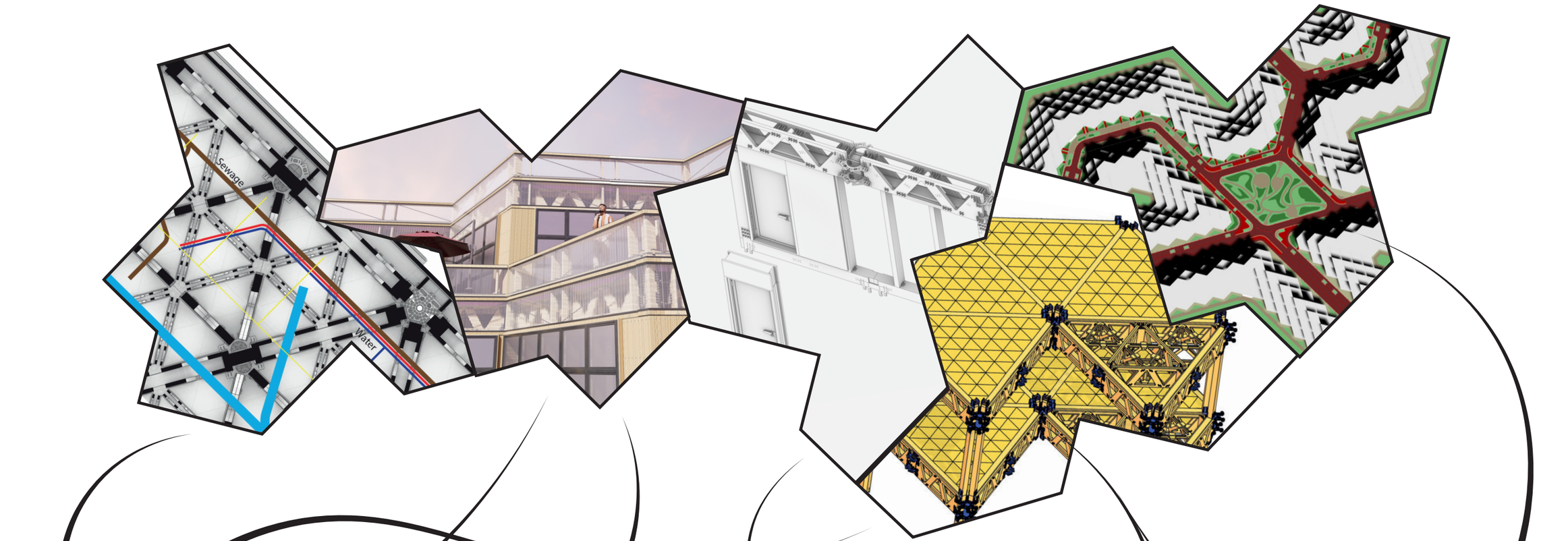


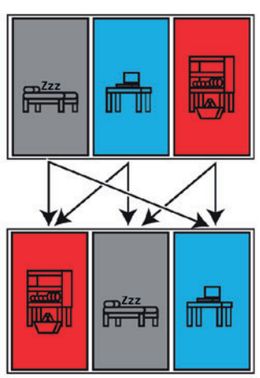
Developed tool

Project goal:
Create a space filling structure, providing a multifunctional role as the town center of Woensel, that responds to changes in society, through future adjustments in: size, division, function and appearance.

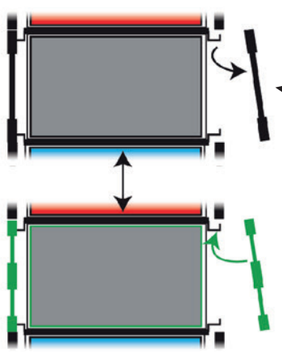


Developed tool

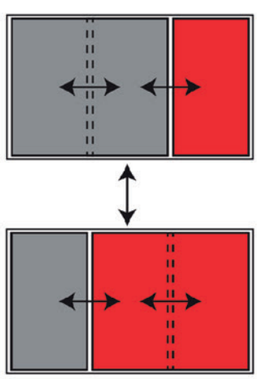




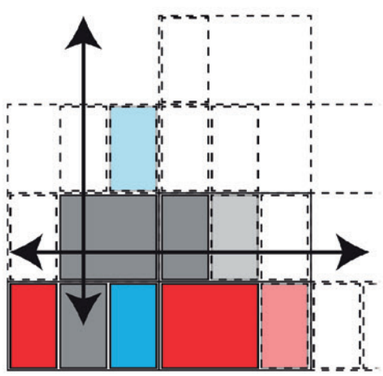
Convertible adaptability



Refitable adaptability



Adjustable adaptability

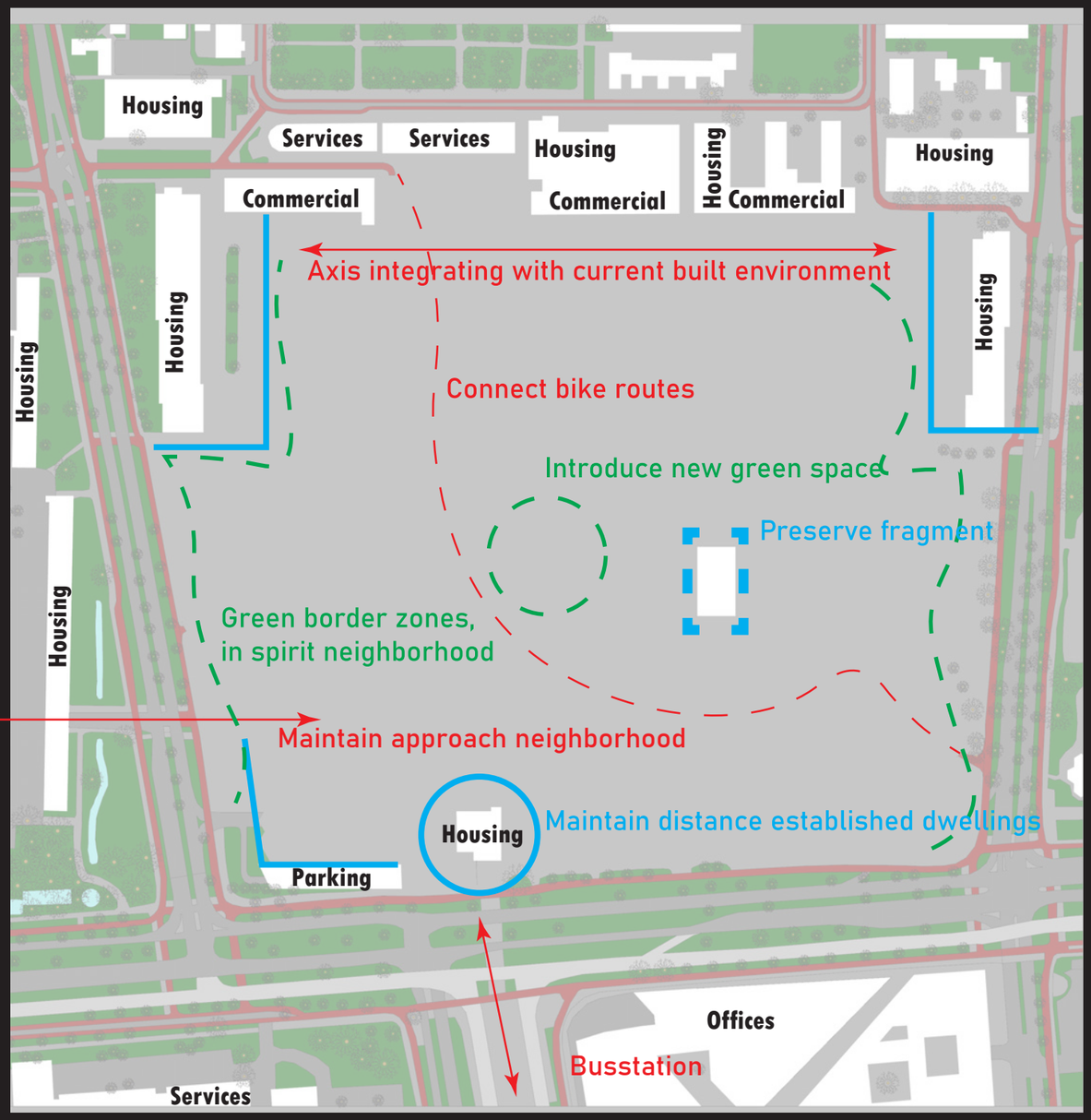


Scalable adaptability

Application Woensel



Establishing site boundary.



Add points of integration and care.

Application Woensel



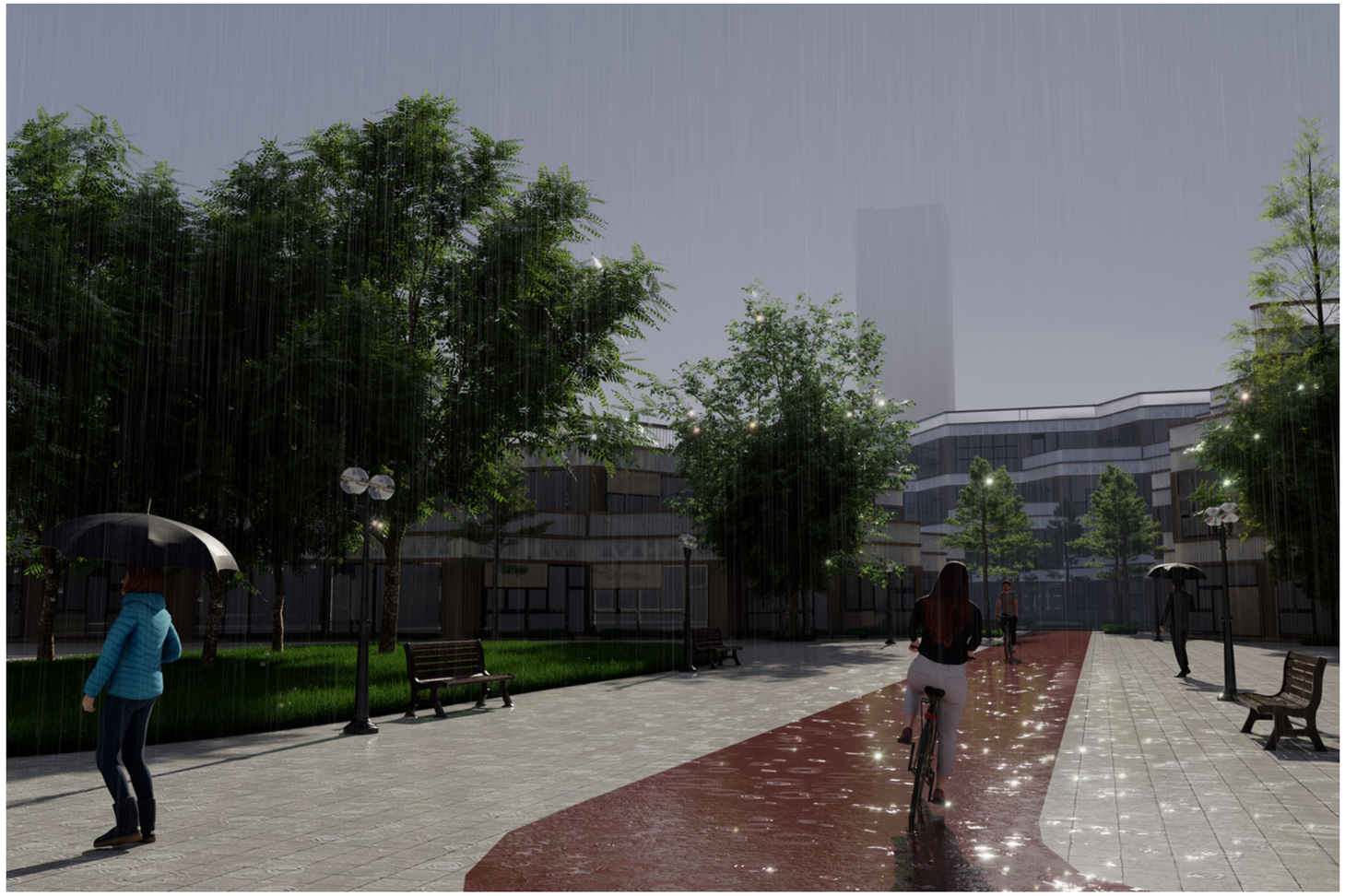
Generate structure, and include function fitting street profiles.



Generate urban volumes and create green boundary park.



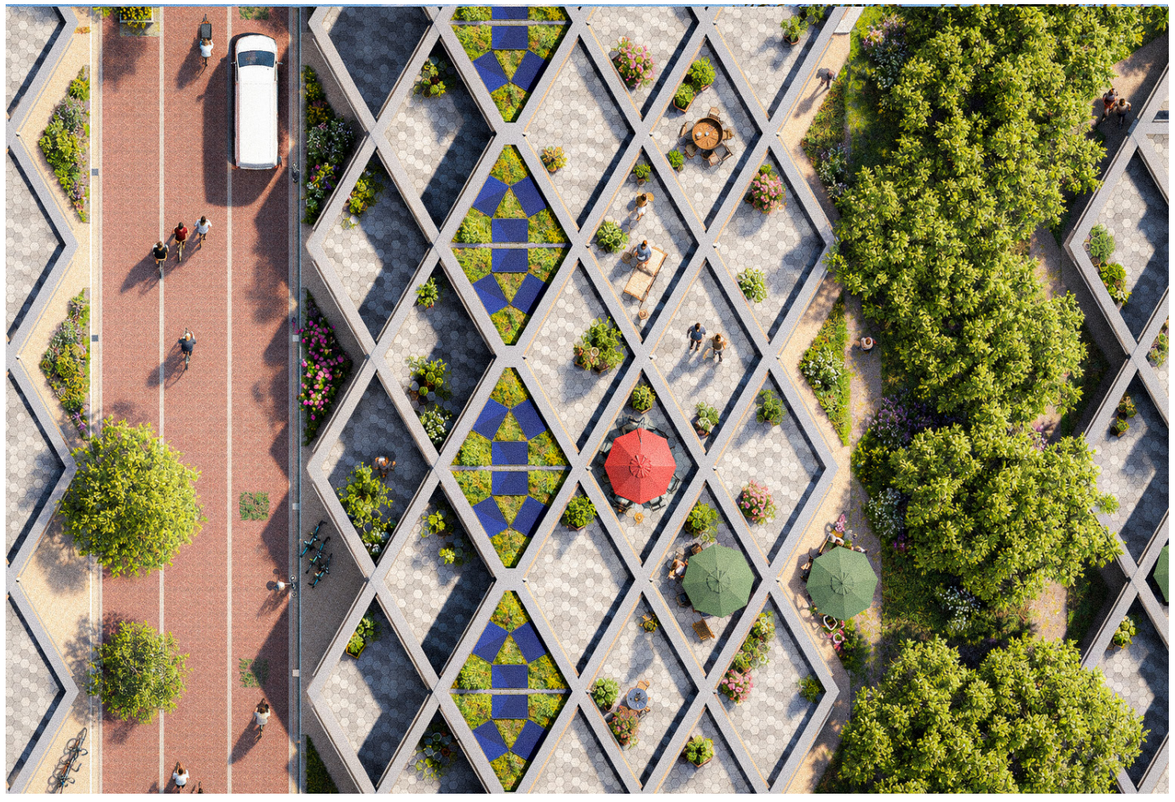
130.000 m2 (max 180.000)





















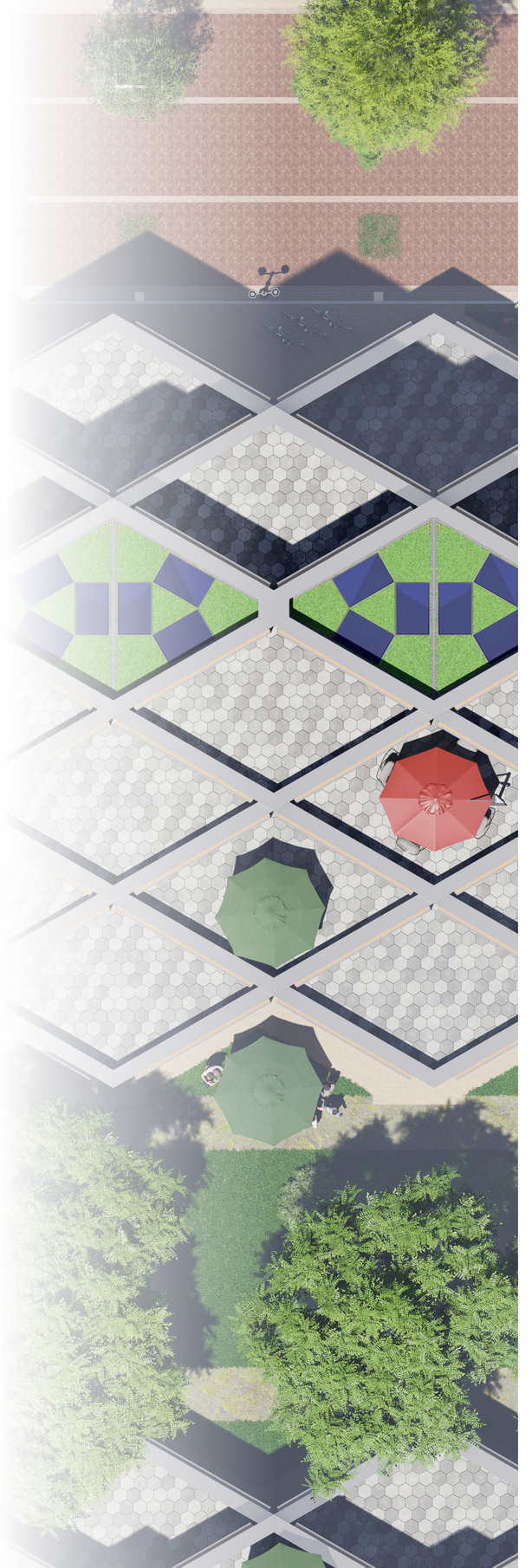








Architectural Engineering
A3



Max Heerschop
5542030