

# THE URBAN MANUFACTORY

FROM THE POST-INDUSTRIAL CITY  
TO THE PRODUCTIVE CITY

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P5\_February 2018\_ Complex Projects Graduation Studio



# MASS PRODUCTION + STANDARDIZATION



**LOSS OF URBAN POTENTIAL  
ENVIRONMENTAL PRESSURE  
ALIENATION OF MANUFACTURING**

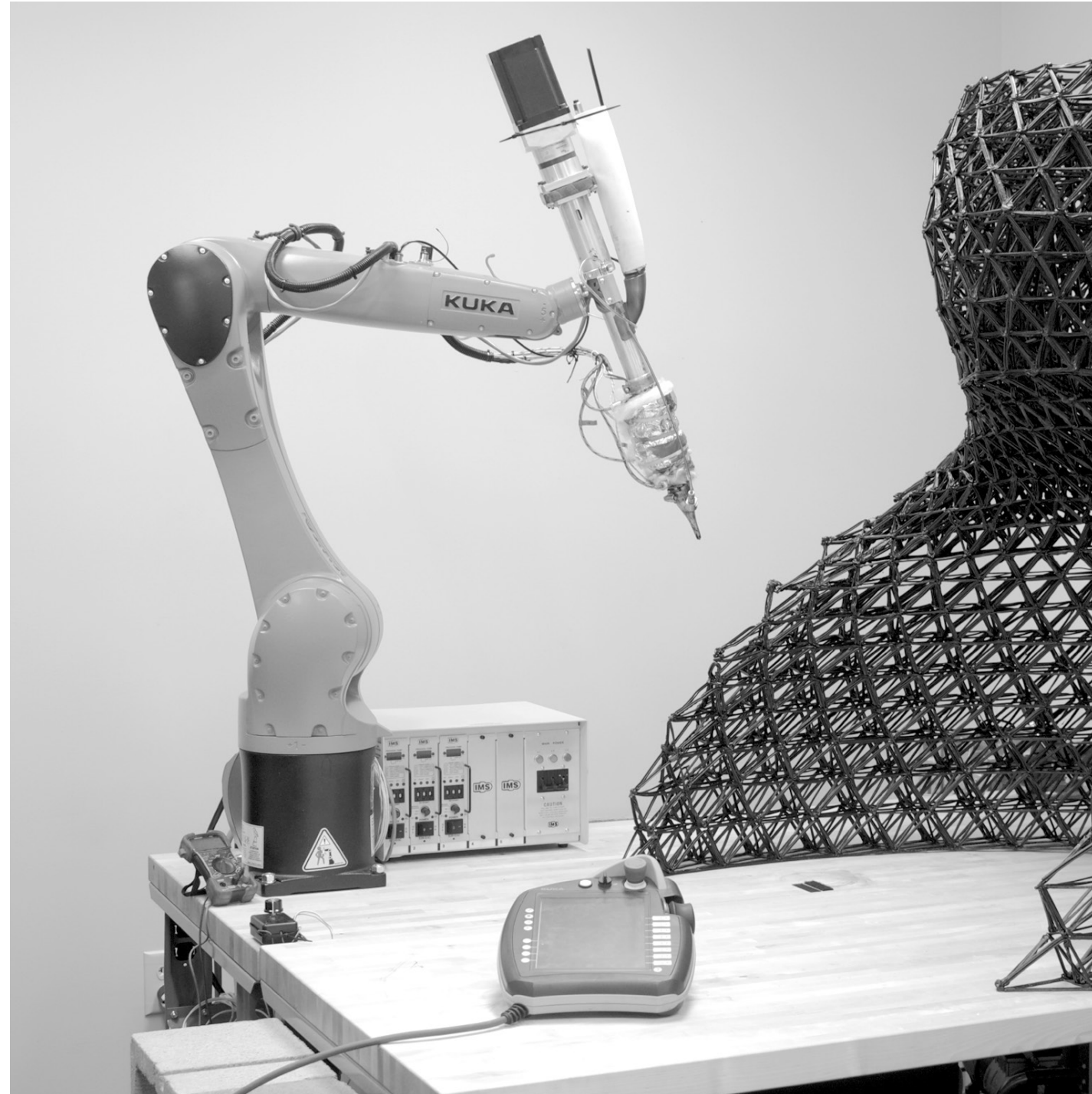
# ADVANCED MANUFACTURING



**Source:** Indumat (2017). The Belgian factory, Process, Infrastructure automation show. Kortrijk



# 3D PRINTING



# 3D SCANNING





# ADVANCED MATERIALS



## BIO-BASED POLYMERS

# CONNECTED MACHINES (IoT) & ADVANCED ROBOTICS



**MACHINE ORCHESTRA**

# QUALITY COSTS TIME



# ON DEMAND + CUSTOMIZATION



## **ON DEMAND + CUSTOMIZATION**

**“CHANGES IN ADVANCED MANUFACTURING TECHNOLOGIES AS WELL AS THE ECONOMICS OF MANUFACTURING HAVE SIGNIFICANT IMPLICATIONS FOR THE LOCATION AND SPATIAL ORGANIZATION OF PRODUCTION.”**

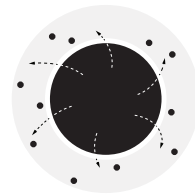
**Elisabeth Reynolds**

Executive Director, MIT Industrial Performance Centre

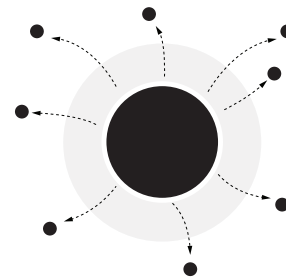
# RESTORING RELATIONSHIP PRODUCTION & CITY



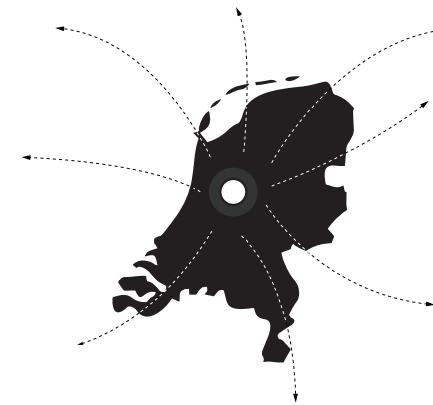
**Mercantile City**



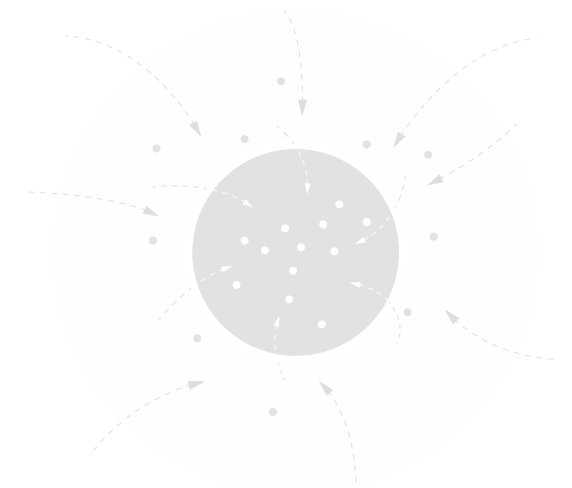
**Industrial City**



**Planned City**



**Piecemeal City**



**Productive City**

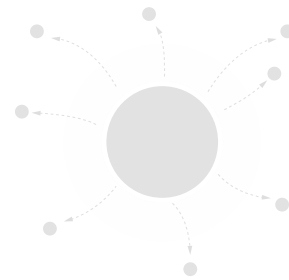
# RESTORING RELATIONSHIP PRODUCTION & CITY



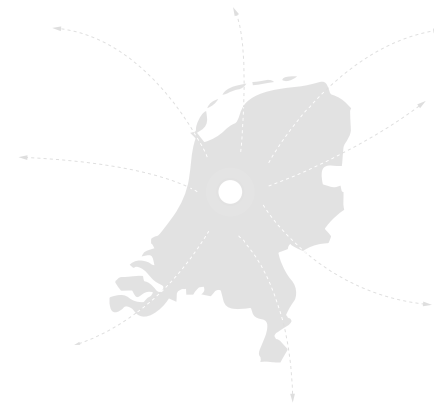
Mercantile City



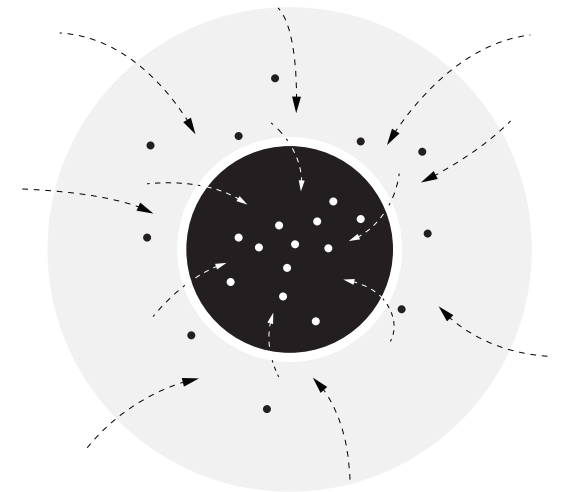
Industrial City



Planned City



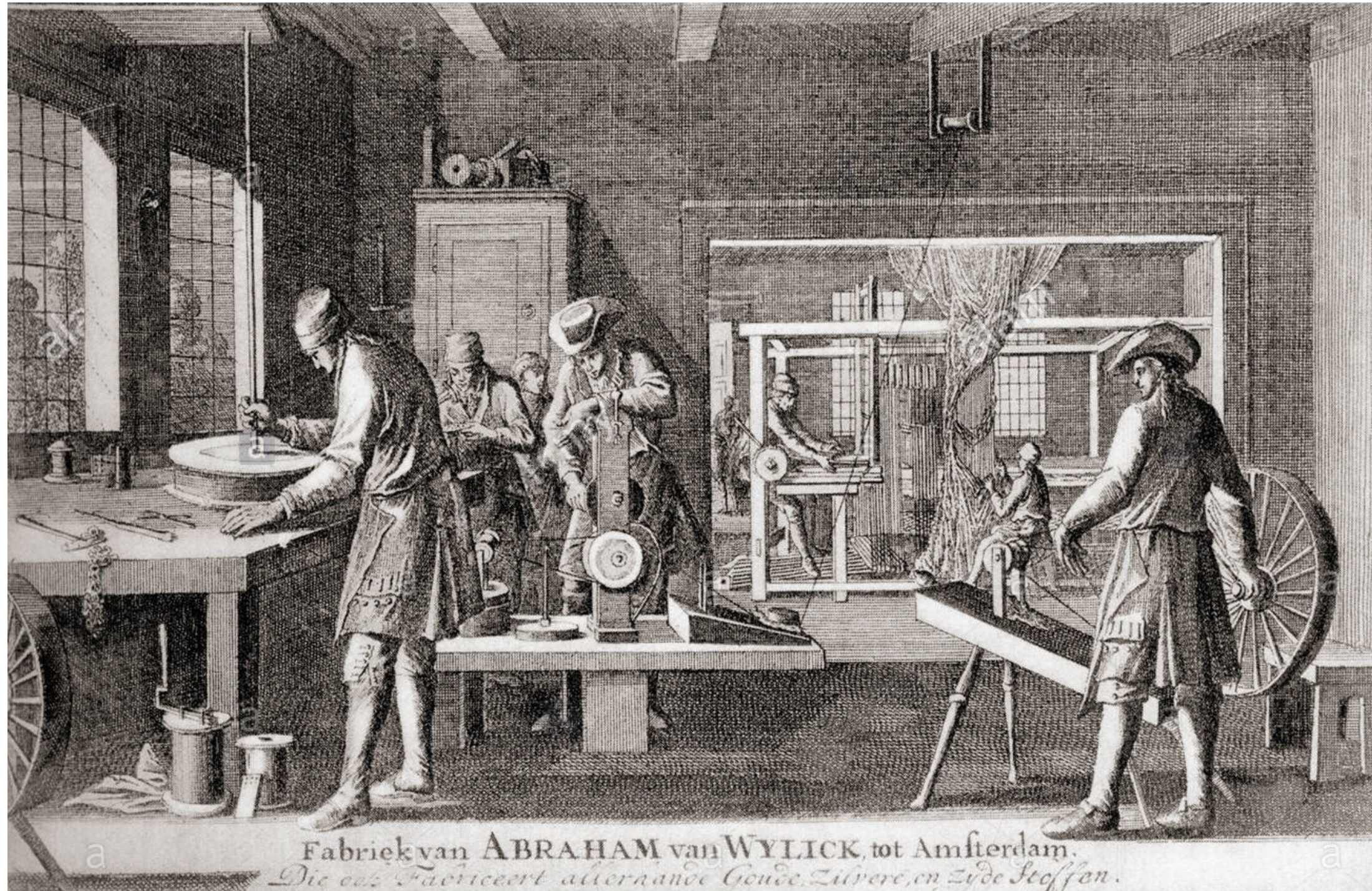
Piecemeal City



Productive City



# CRAFT PRODUCTION







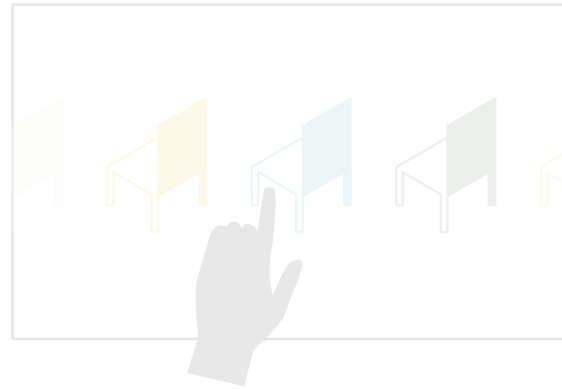
# THE URBAN MANUFACTORY



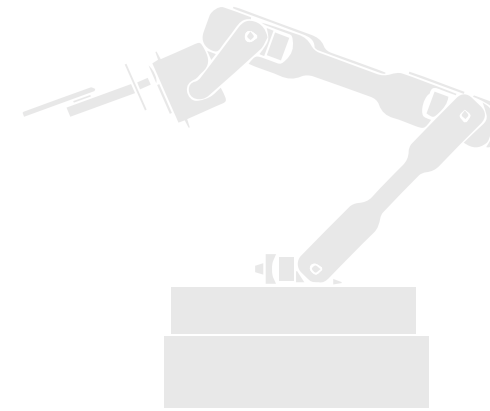
# AMBITION



INTREGATED



ON DEMAND AND  
COSTUMNIZED



ADVANCED  
DIGITAL MANUFACTURING

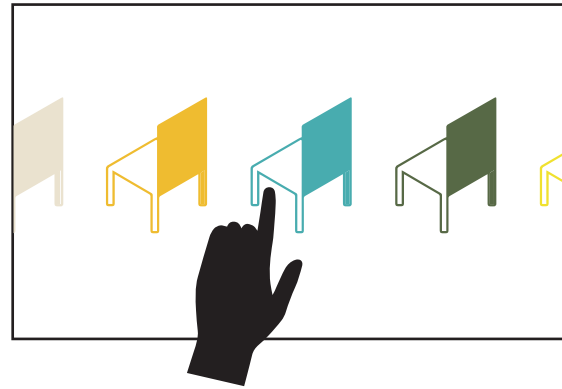


INTERACTION

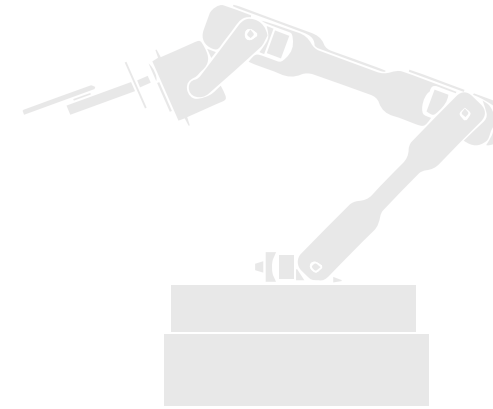
# AMBITION



INTREGRATED



ON DEMAND AND  
COSTUMNIZED



ADVANCED  
DIGITAL MANUFACTURING



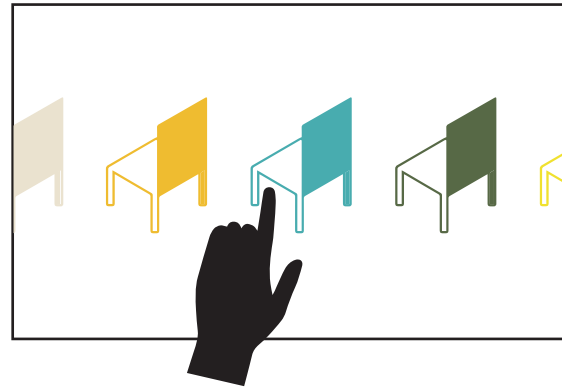
INTERACTION



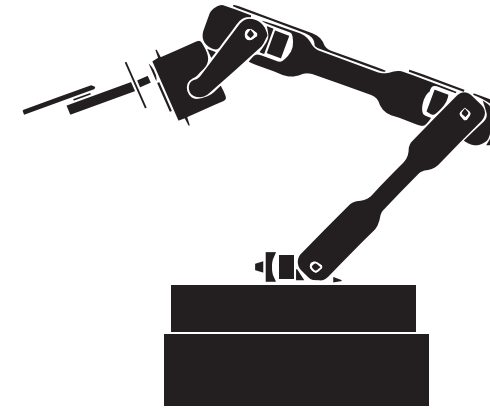
# AMBITION



INTREGATED



ON DEMAND AND  
COSTUMNIZED



ADVANCED  
DIGITAL MANUFACTURING

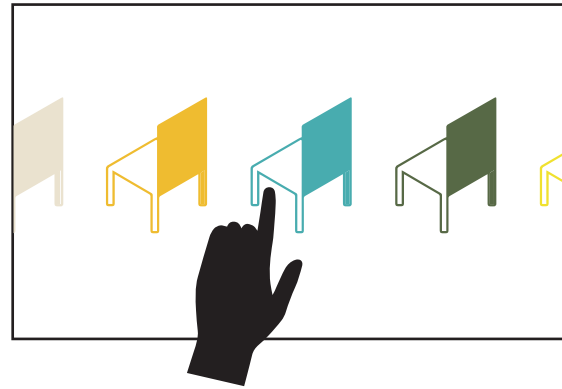


INTERACTION

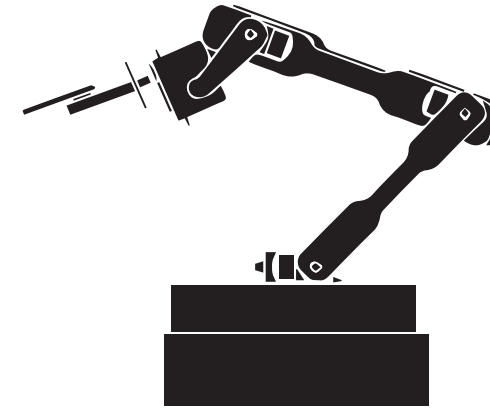
# AMBITION



INTREGATED



ON DEMAND AND  
COSTUMNIZED



ADVANCED  
DIGITAL MANUFACTURING



INTERACTION

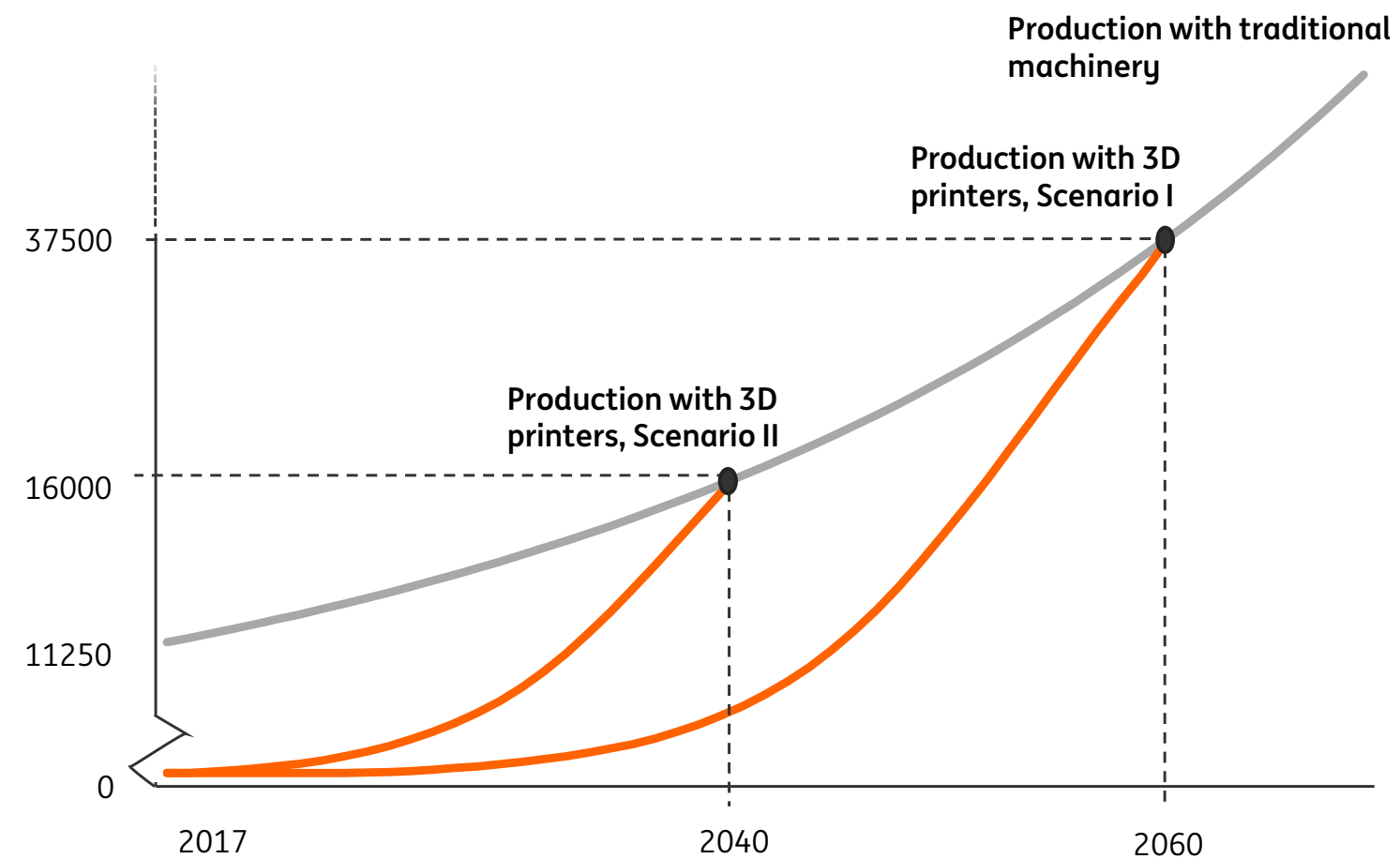
# **RESEARCH QUESTION**

**“HOW CAN MANUFACTURING PROGRAM (AGAIN) BE EMBEDDED IN THE URBAN ENVIRONMENT AND SEEK FOR SHORT SUPPLY CHAINS AND RELATIONSHIPS WITH POTENTIALITIES THAT THE CITY PROVIDES?”**

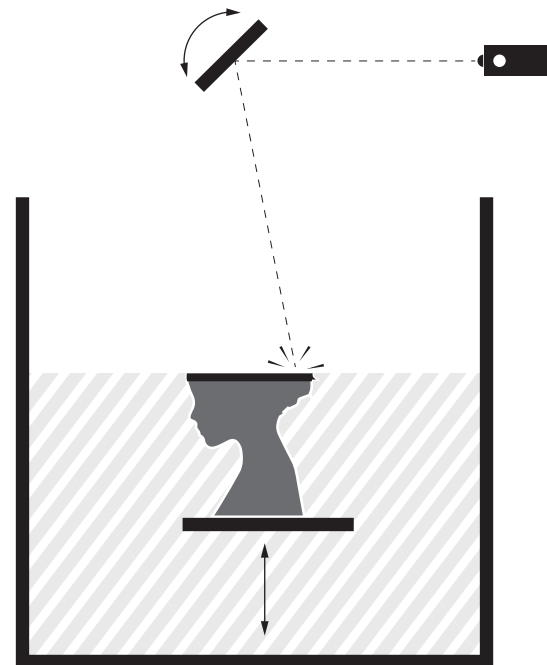


# RISE OF ADDITIVE MANUFACTURING

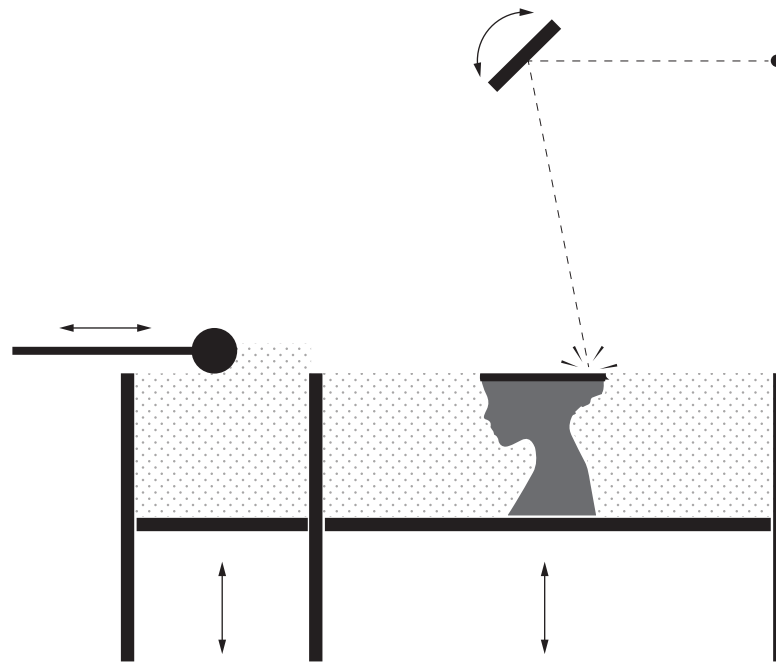
Fig 5 3D printing's impact on world manufacturing production, ING scenarios I and II\* (US\$bn)



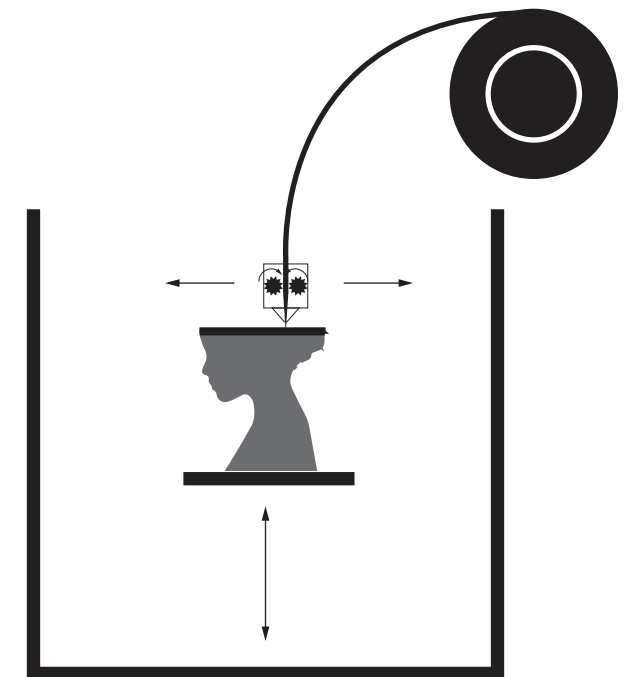
# METHODS



**Stereolithography**



**Selective laser sintering**



**Fused deposition modelling**

# SUPPLY MATERIAL

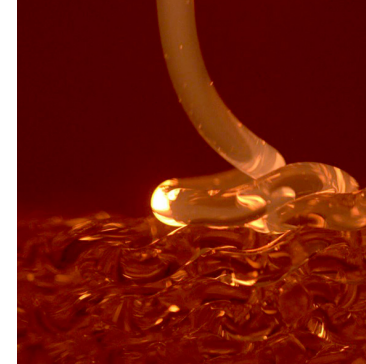
**METAILS**



**POLYMERS**



**GLASS**



**GYPSUM**



**WAX**



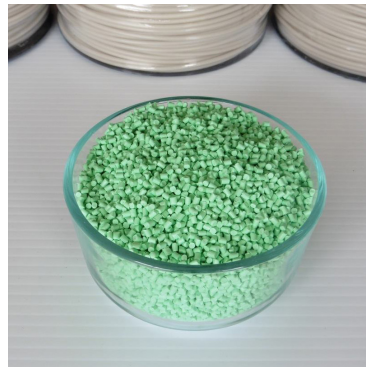
**CERAMICS**



**BIOMATERIALS**




**COMPOSITES**



**WOOD**





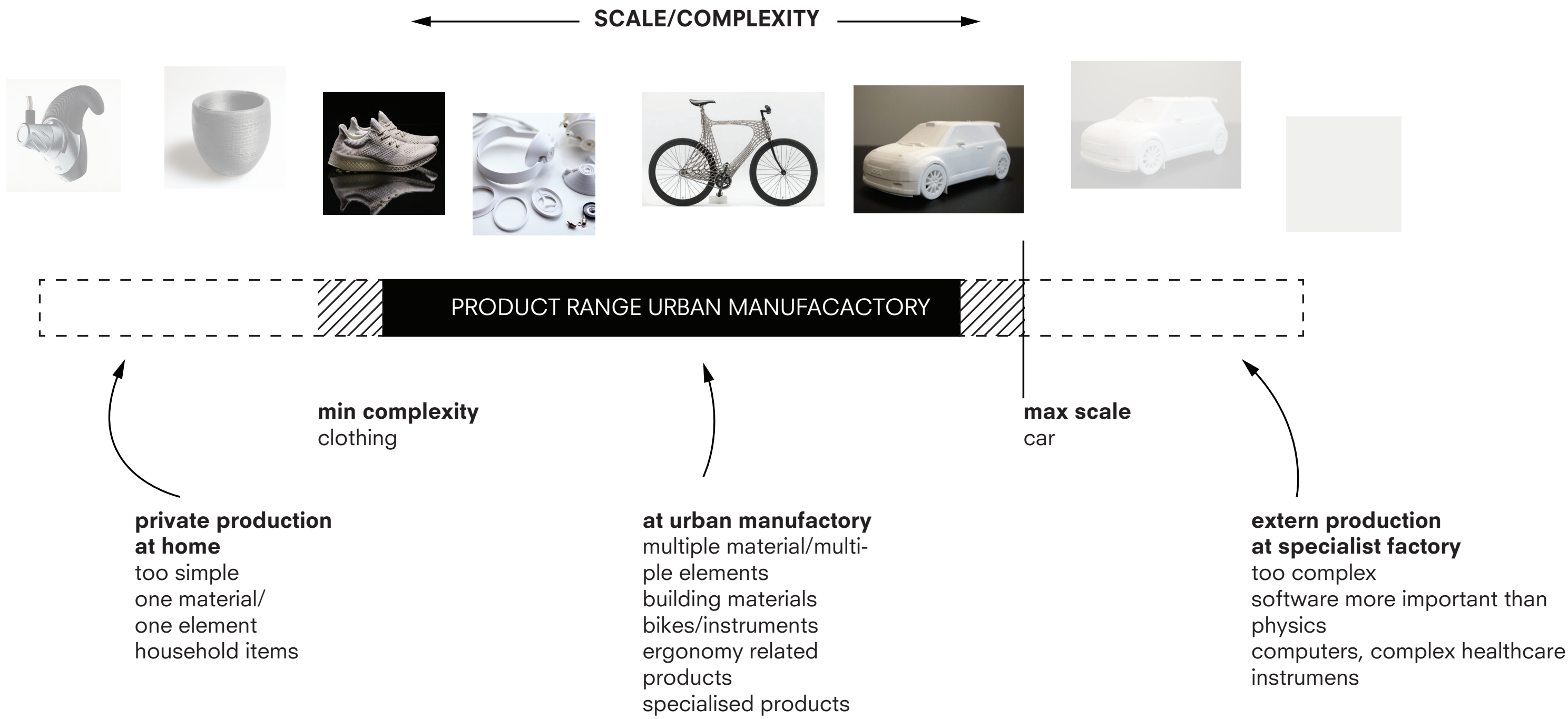


# ECONOMIC MODEL

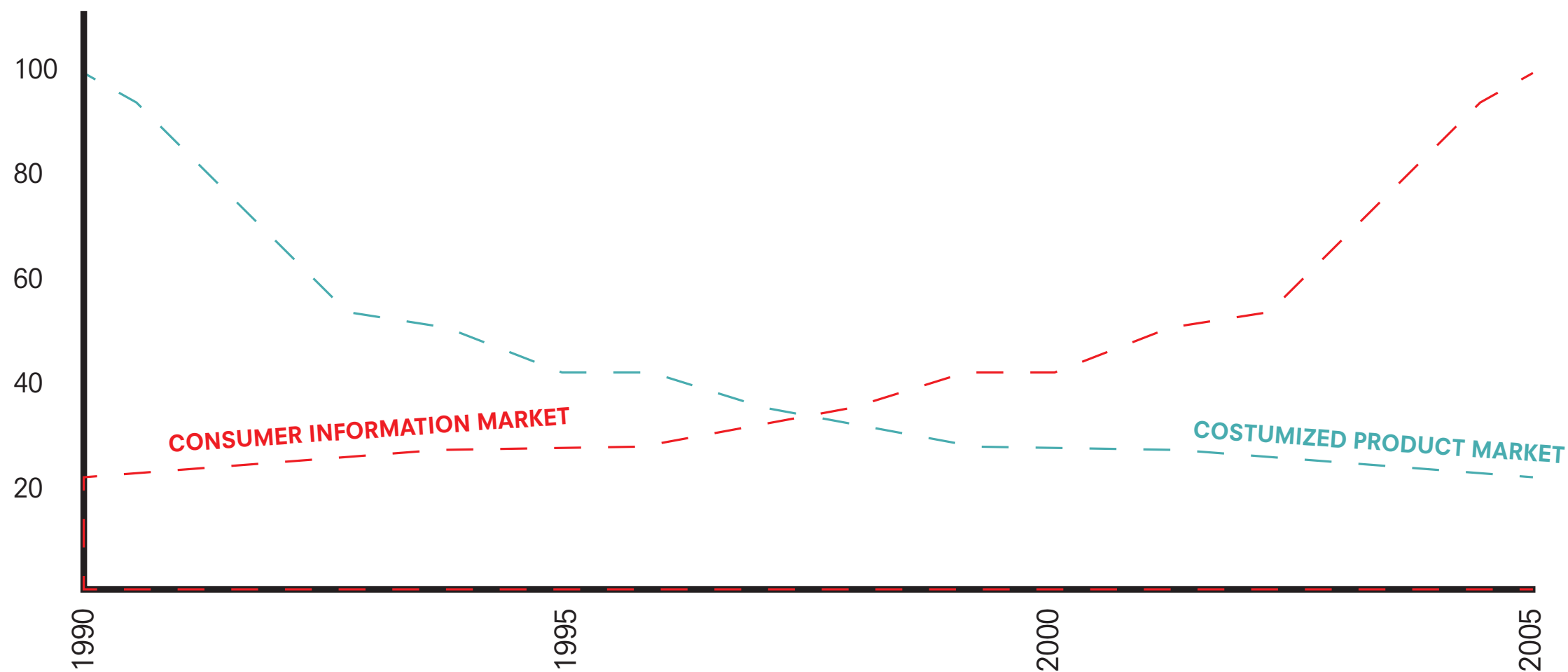
**Source:** Huckleberry Bicycles (2015). From: <http://www.huckleberrybicycles.com/5630/introducing-shinola-bicycles>



# PRODUCT RANGE



# MASS COSTUMIZATION AND INTERACTION

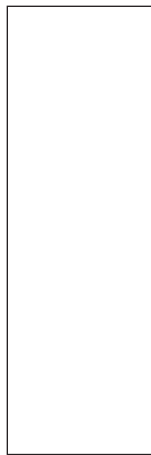


**Source:** Syam, N. B., & Dellaert, B. G. (2001). Consumer-producer interaction: A strategic analysis of the market for customized products.

# DEVELOPMENT

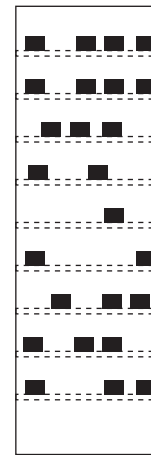
## DEVELOPER

realisation of facility



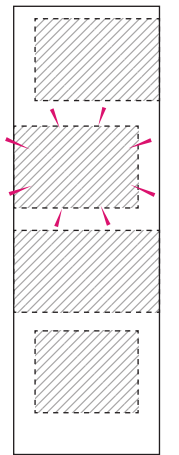
## URBAN MANUFACTORY

rental of space  
rental of machinery  
rental of employees  
rental of corporate identity  
rental of retail possibilities

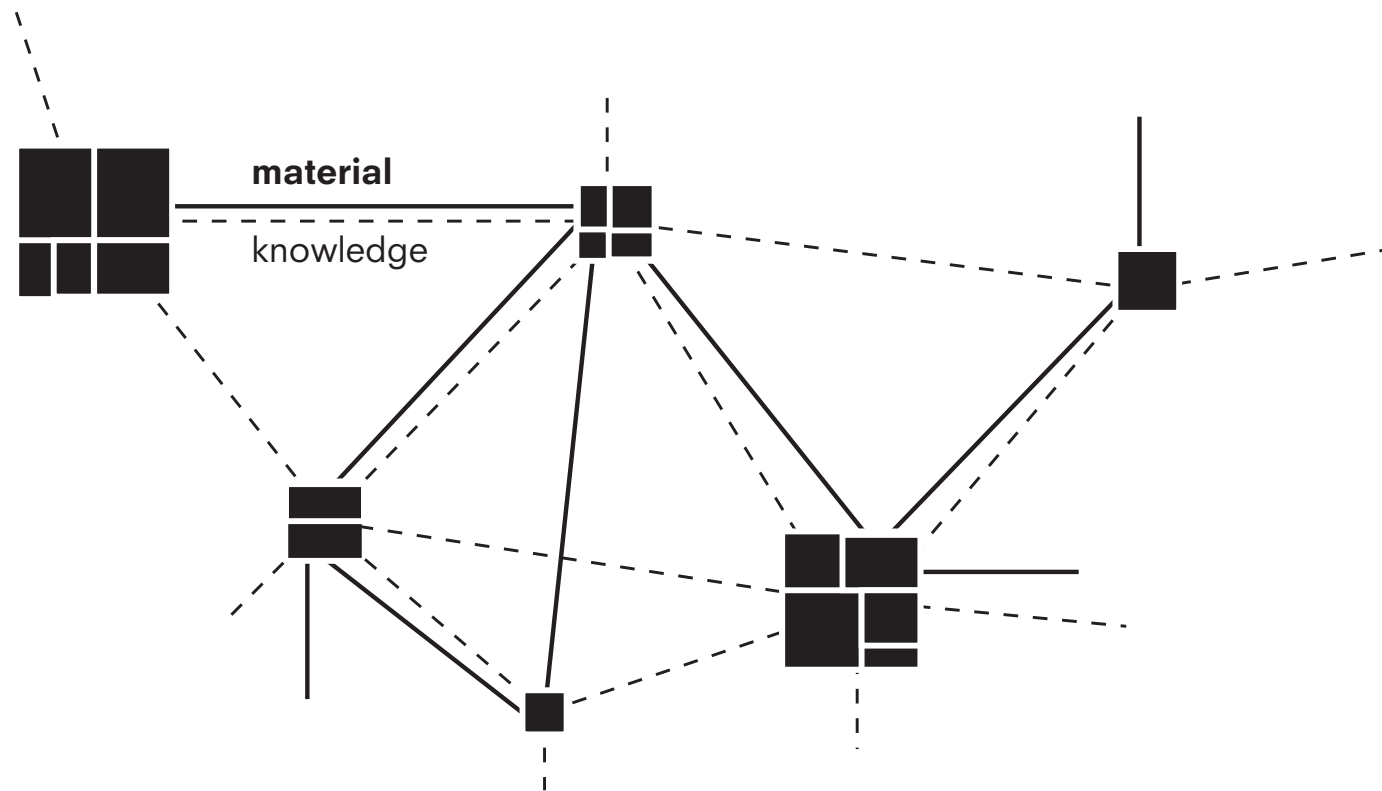


## PRODUCER

use of space  
use of machinery  
use of employees  
use of corporate identity  
rental of retail possibilities



# NETWORK







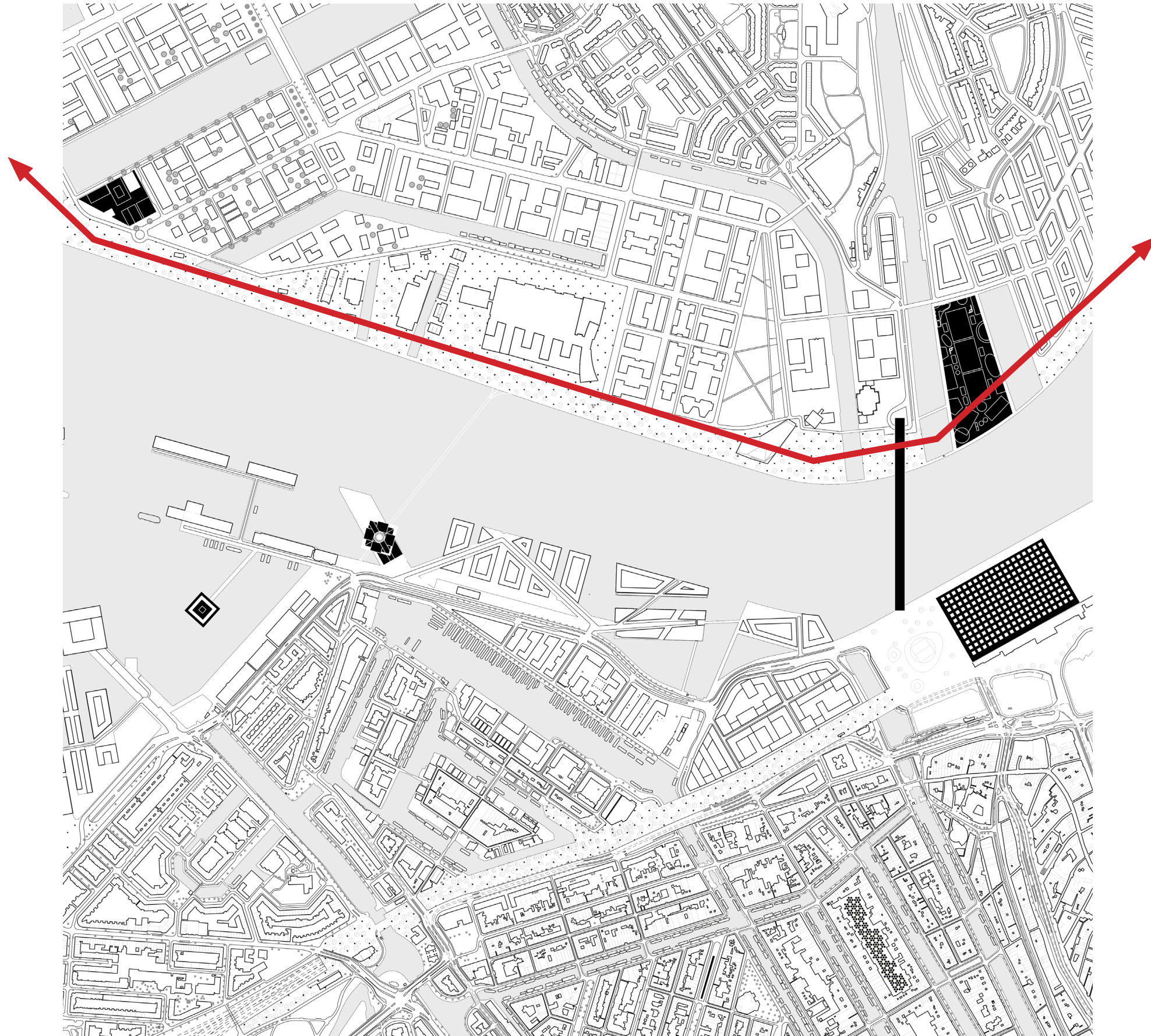
# AMSTERDAM 2050





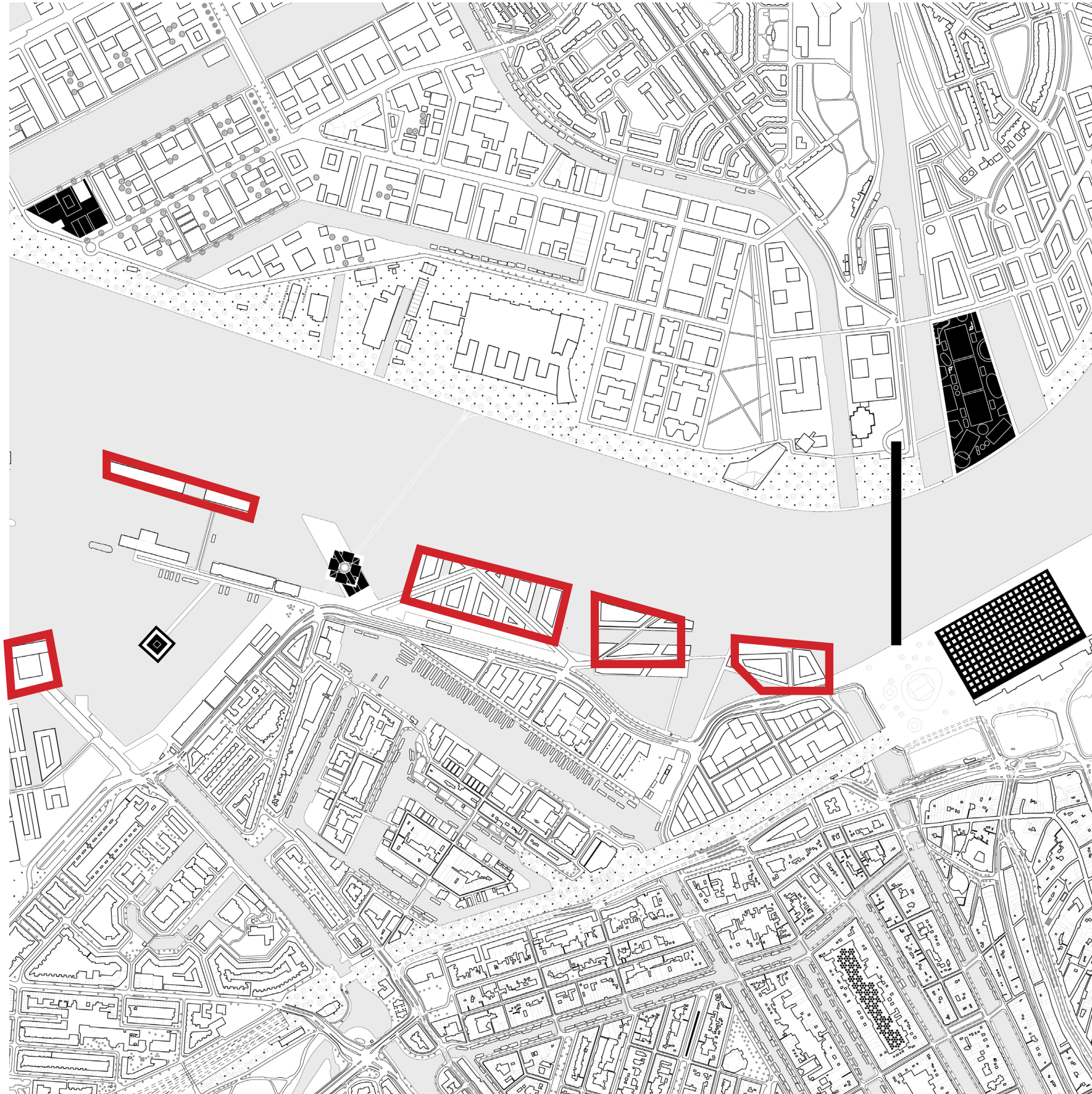


# BOARD WALK





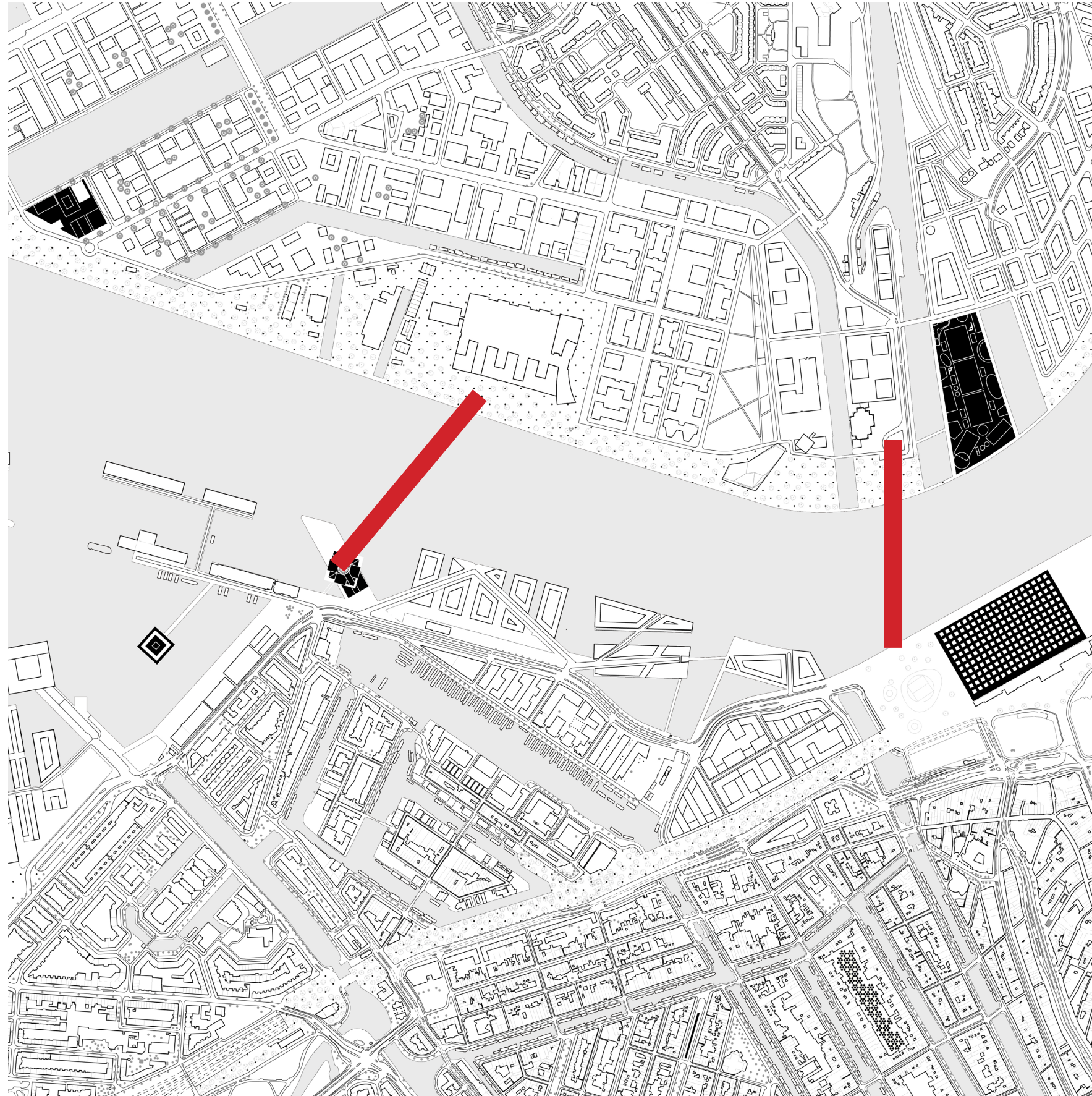
# RENEWED INTEREST FOR THE WATER



LANDMARKS ALONG THE IJ



# CONNECTING NORTH & SOUTH



LANDMARKS ALONG THE IJ

# BUIKSLOTERHAM





# MODEL FOR THE POST-INDUSTRIAL CITY





# MODEL FOR THE POST-INDUSTRIAL CITY





# AREA IN TRANSITION



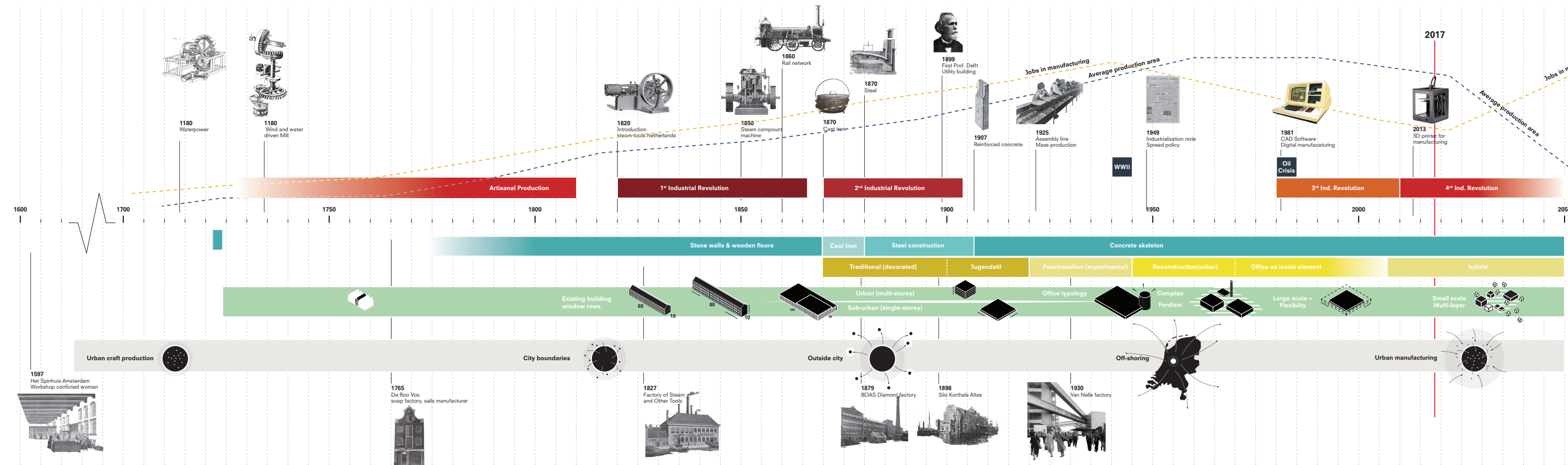
**Source:** David van Unen (2016, Februari 14). Op deze locaties wil Amsterdam 12.000 nieuwe woningen bouwen. *Het Parool*



# CONCEPT

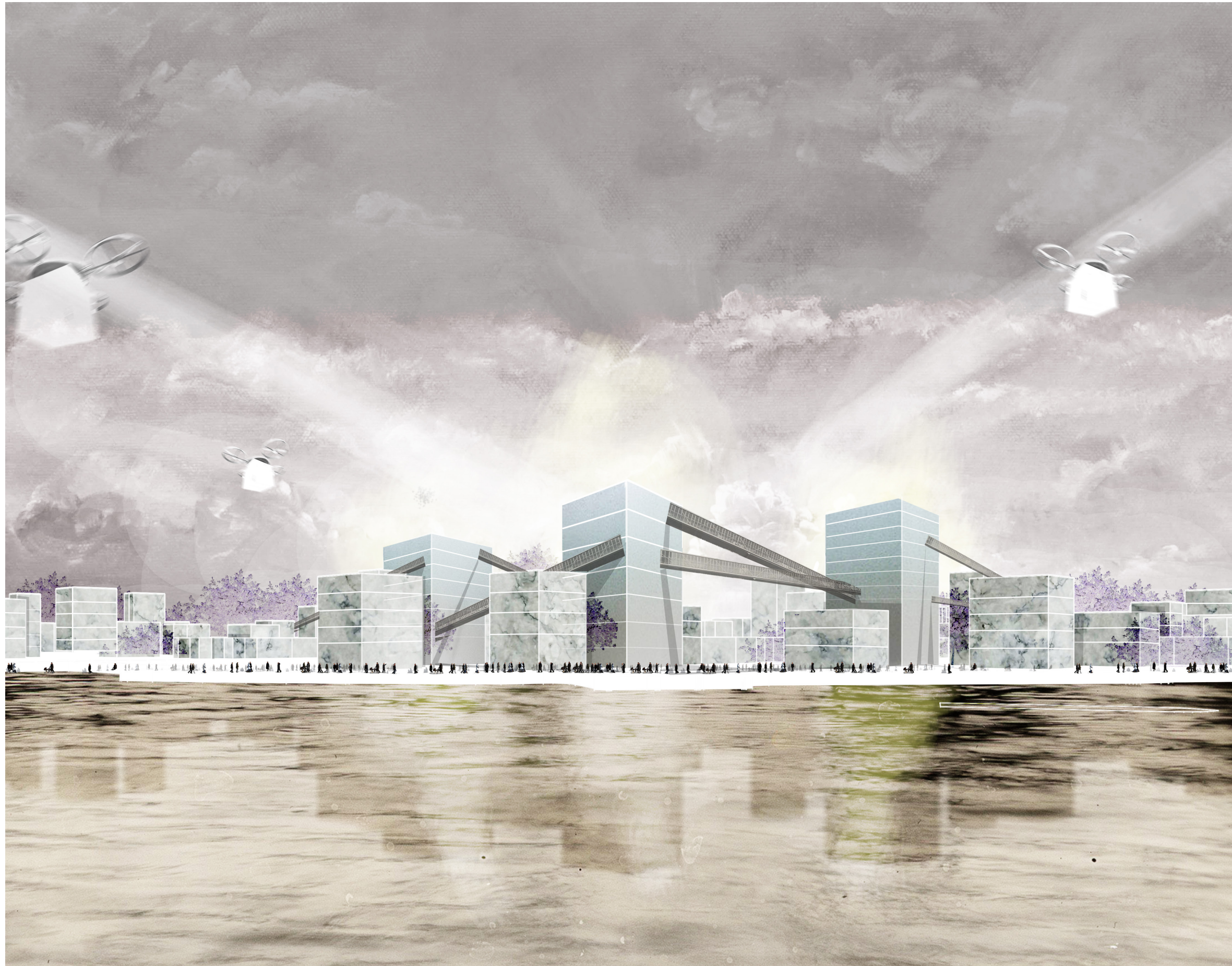
**Source:** H.G.Esch. Die Gläserne Manufaktur: Volkswagen Factory Germany. From: <https://www.e-architect.co.uk/dresden/glaeserne-manufaktur>

# THE EVOLUTION OF MANUFACTURING





# VERTICAL FACTORY





PROGRAM

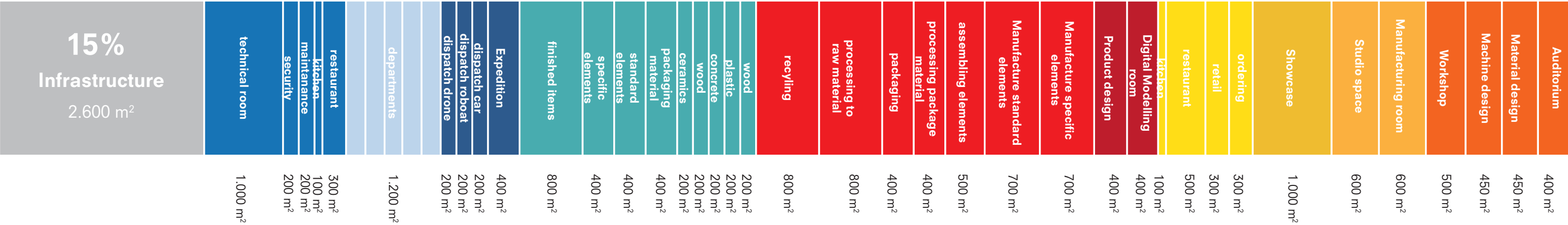
CATAGORY  
19.900 m²



FUNCTION  
19.900 m²



SPACE  
19.900 m²

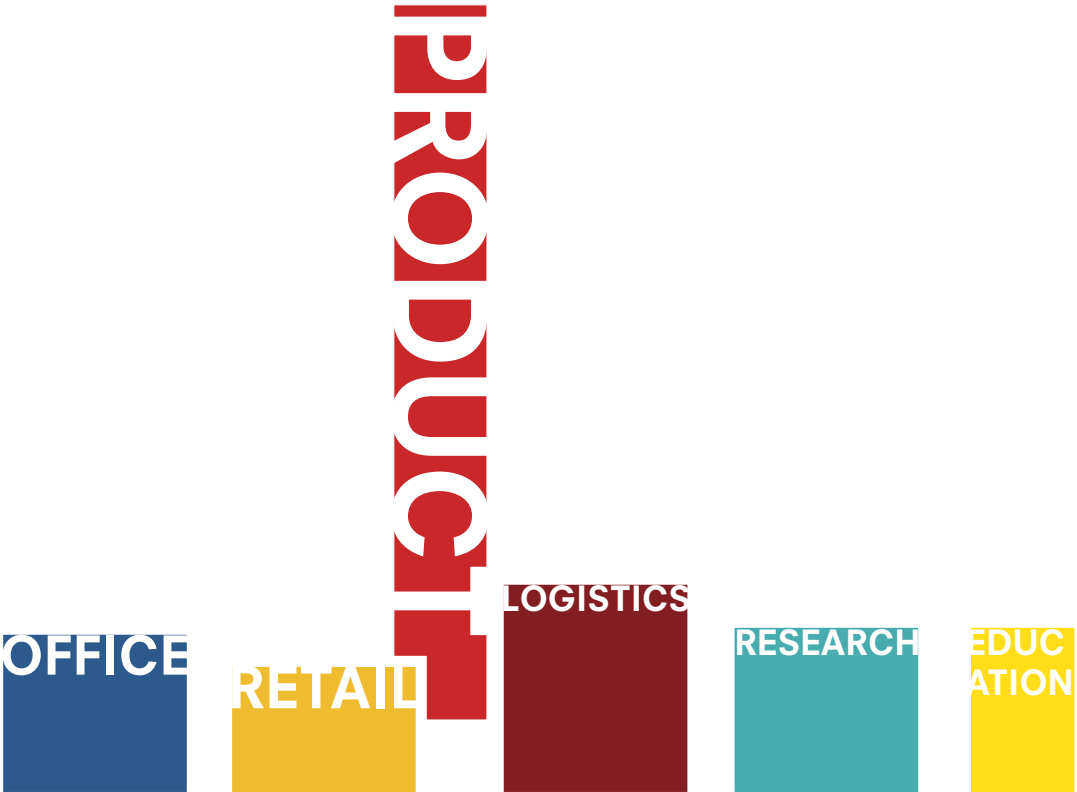


# TOWER & BASE

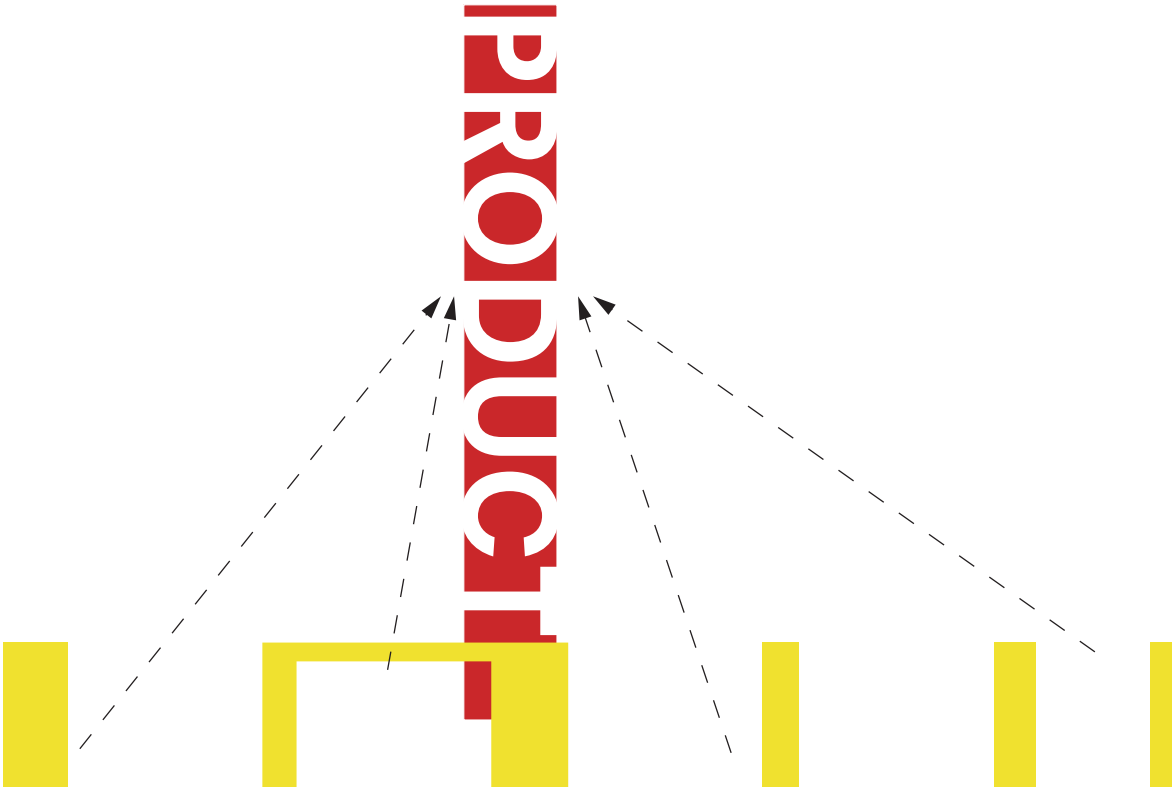




PRODUCTION VILLAGE



INTERIOR PUBLIC SPACE







# URBAN IMPLEMENTATION

**Source:** Pieter Godfried Bertichen (1823). The Shipyard 'St Jago' on Bickers Eiland, Amsterdam. From: <https://www.rijksmuseum.nl/en/collection/SK-C-1540>

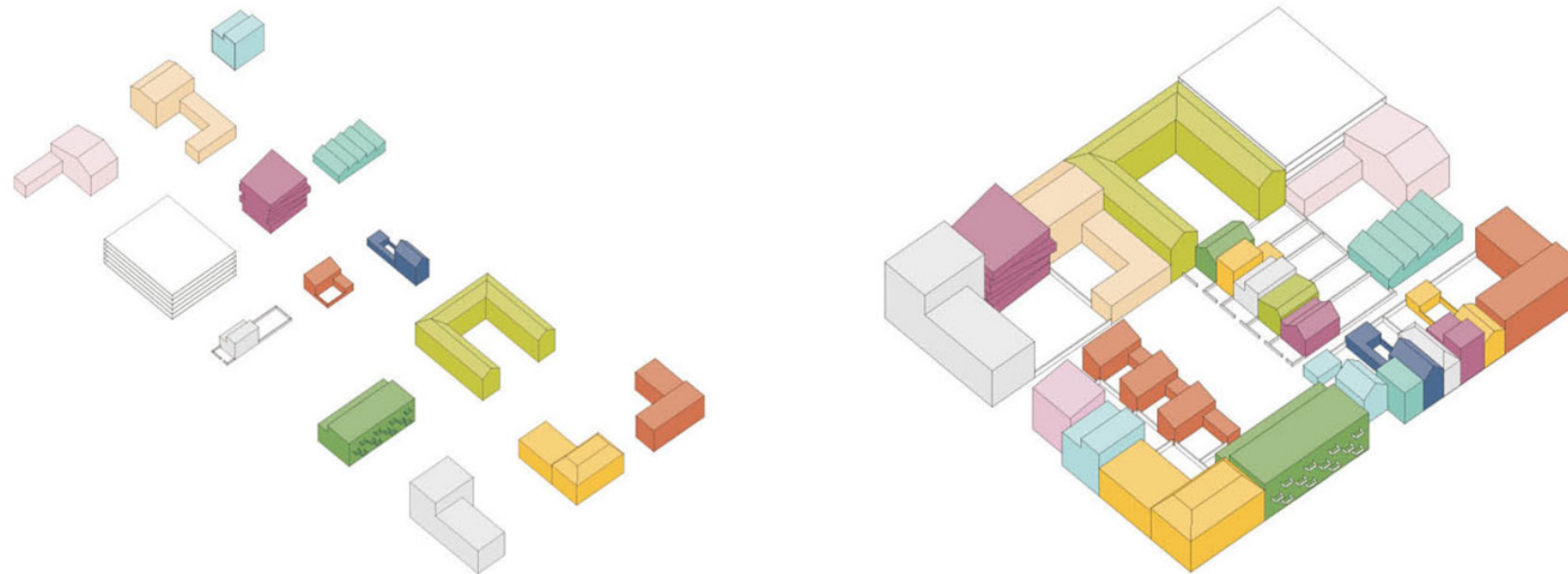


# NEW IMAGE FOR THE BUIKSLOTERHAM



© Studioninedots | DELVA Landscape Architects

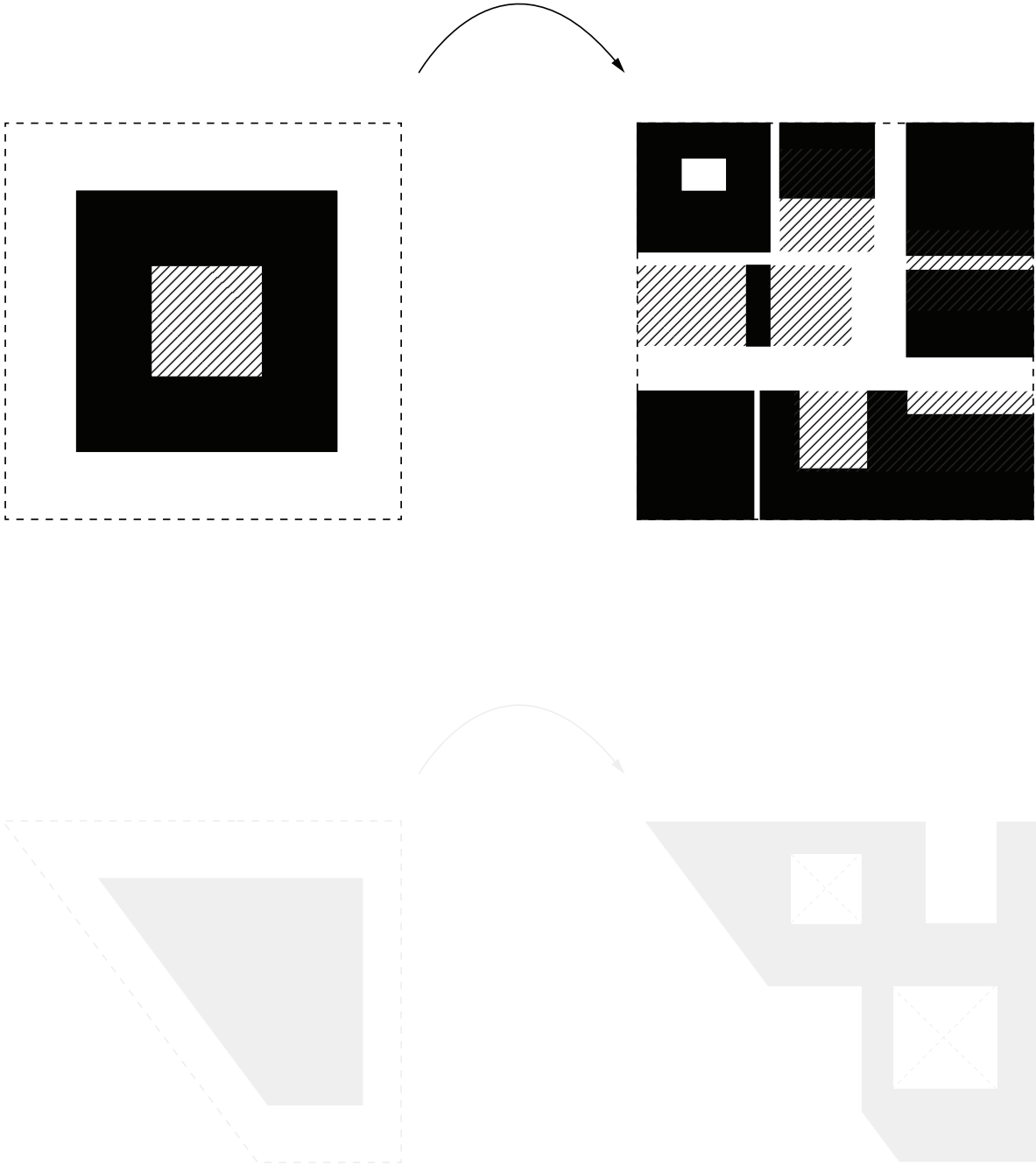
# THE POROUS AND MIXED URBAN BLOCK





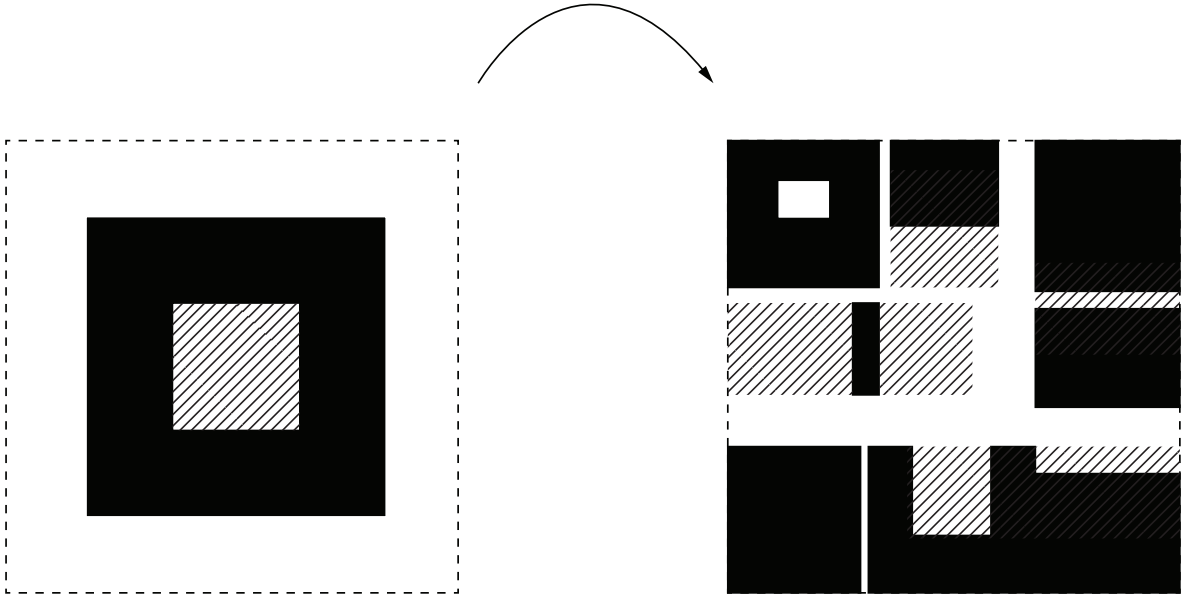
POROUS BLOCK

CITY PLOT

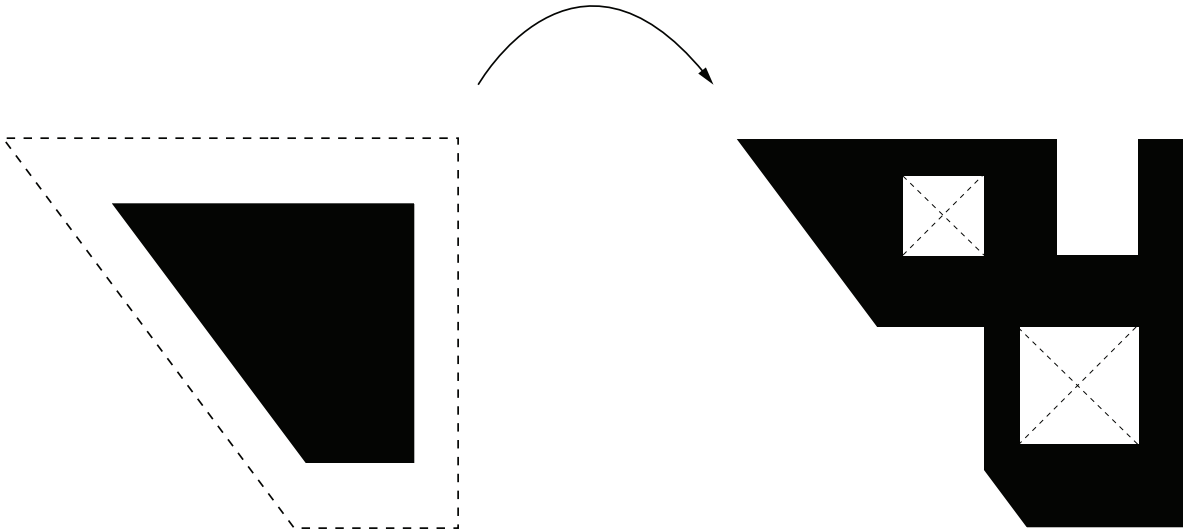


# POROUS BUILDING

CITY PLOT

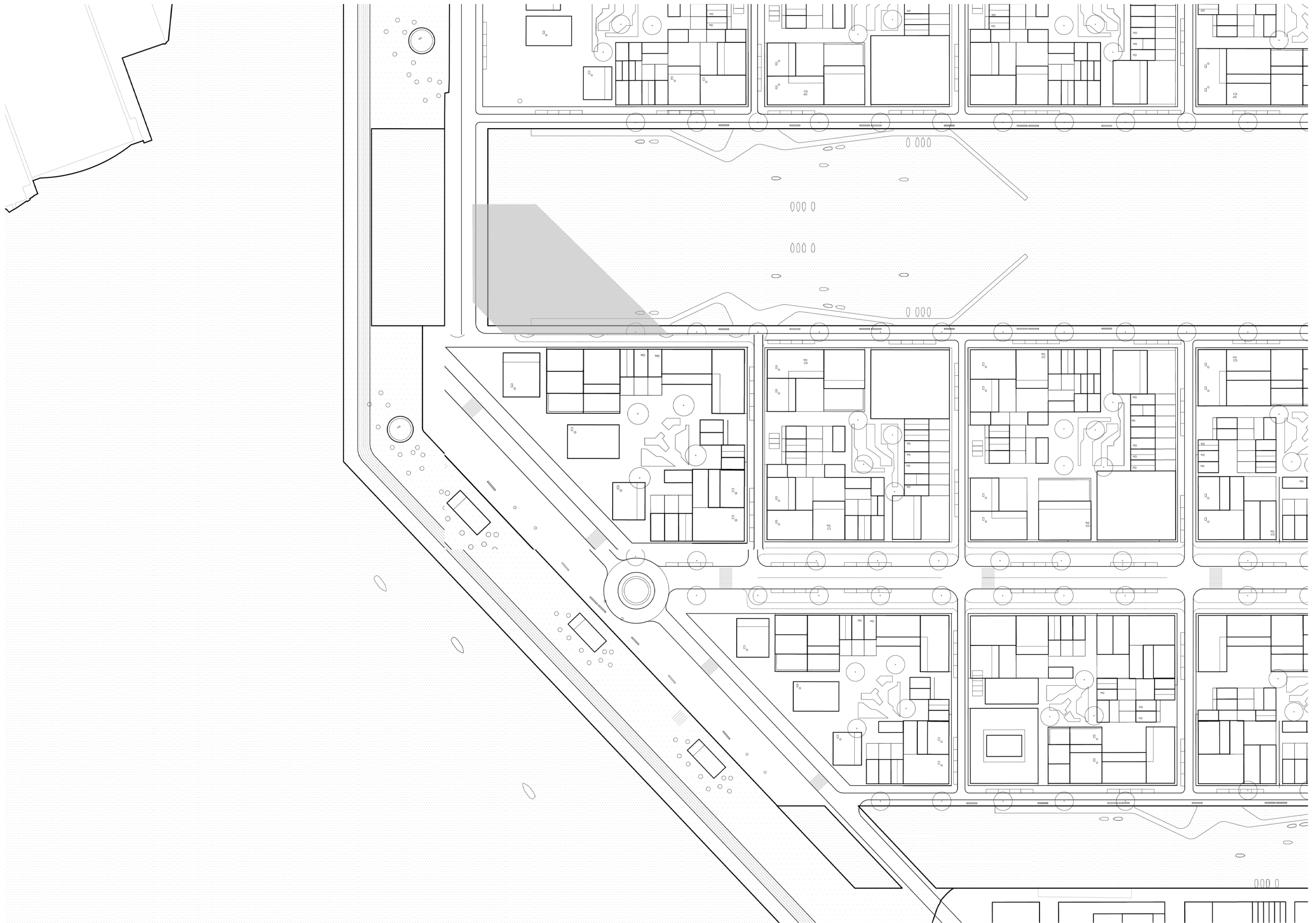


URBAN MANUFACTORY

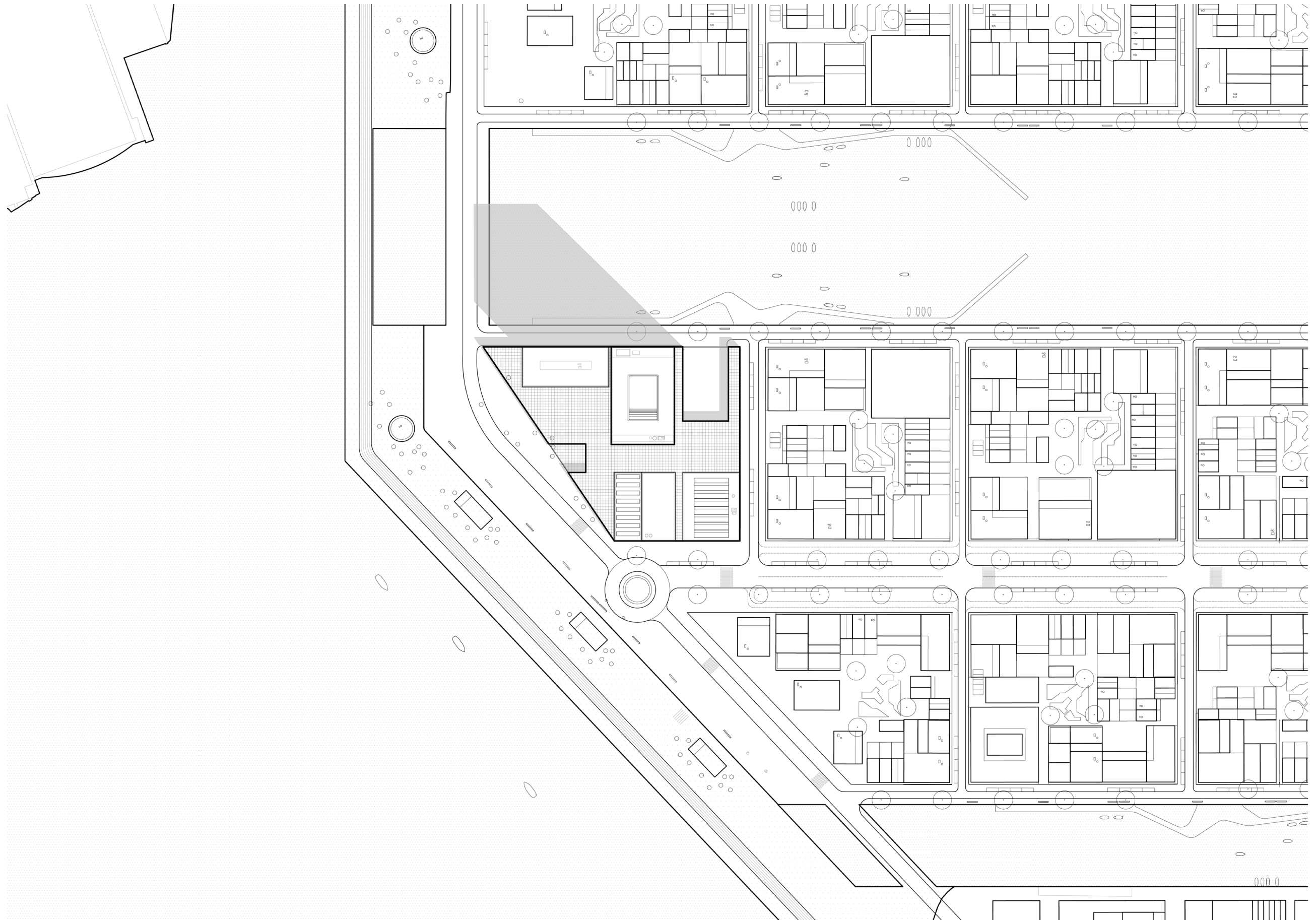




# NEW URBAN GRID



# INTEGRATION URBAN GRID

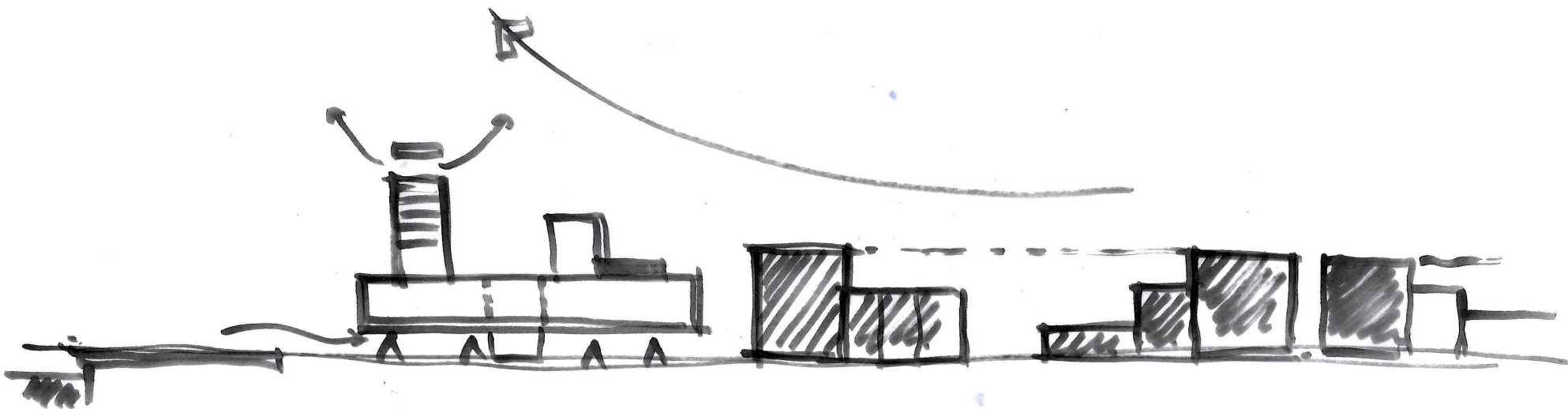


**THE SEMI-BLOCK**



URBAN STAIRS TOWARDS THE RIVERFRONT

RIVER IJ



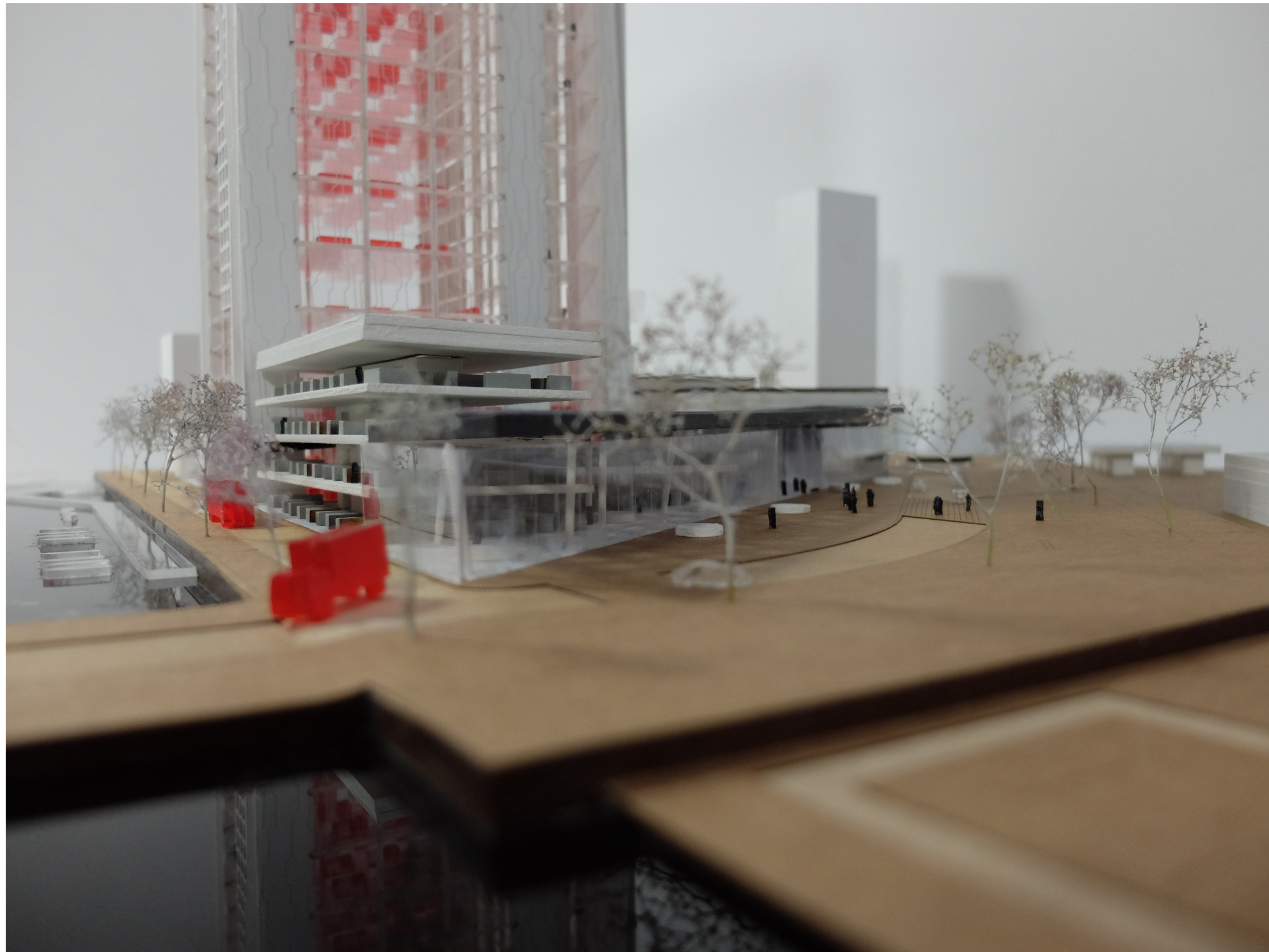
BUIKSLOTERHAM

# SCALE & SURROUNDINGS

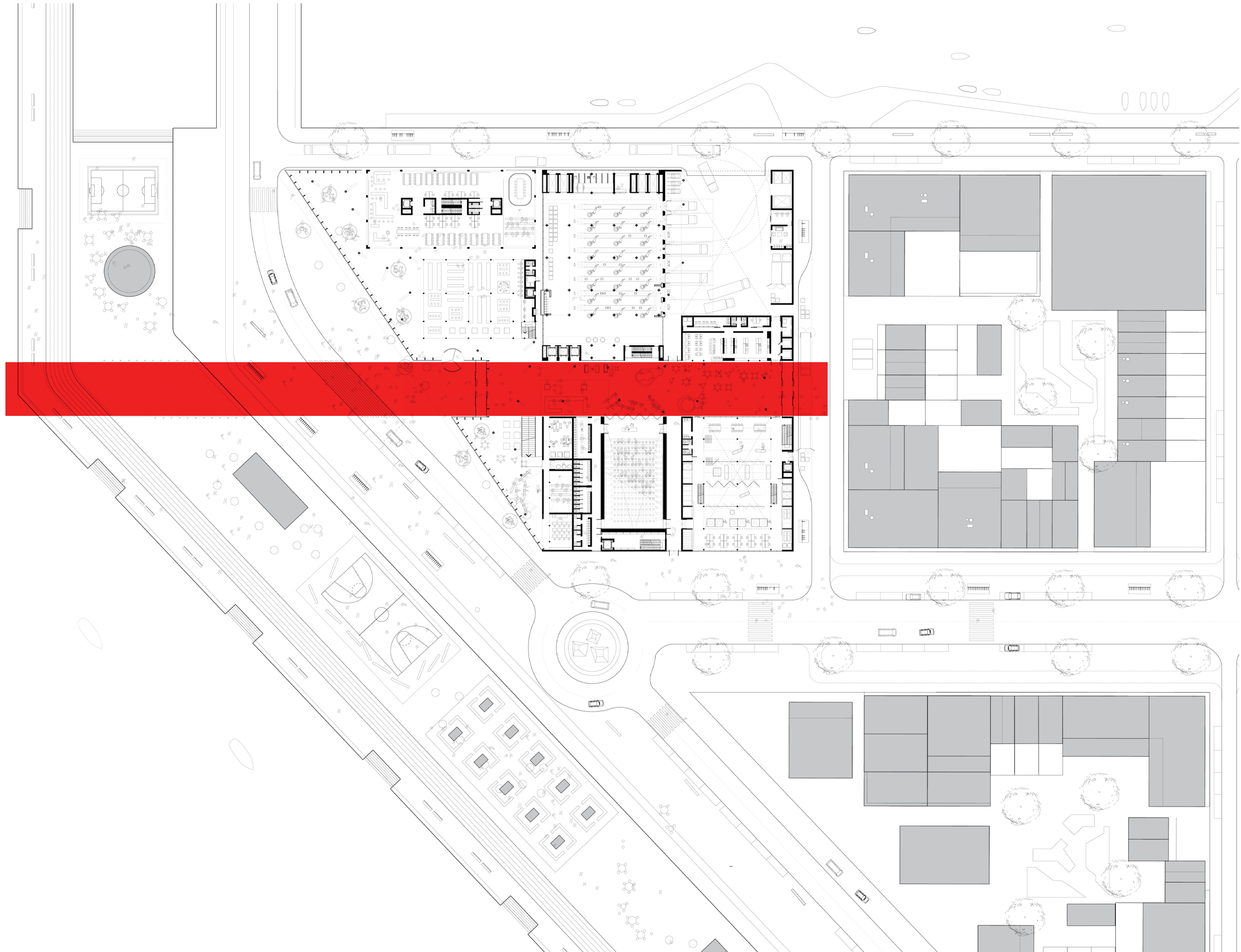




# CONNECTION TO THE BOARDWALK



# URBAN INTEGRATION



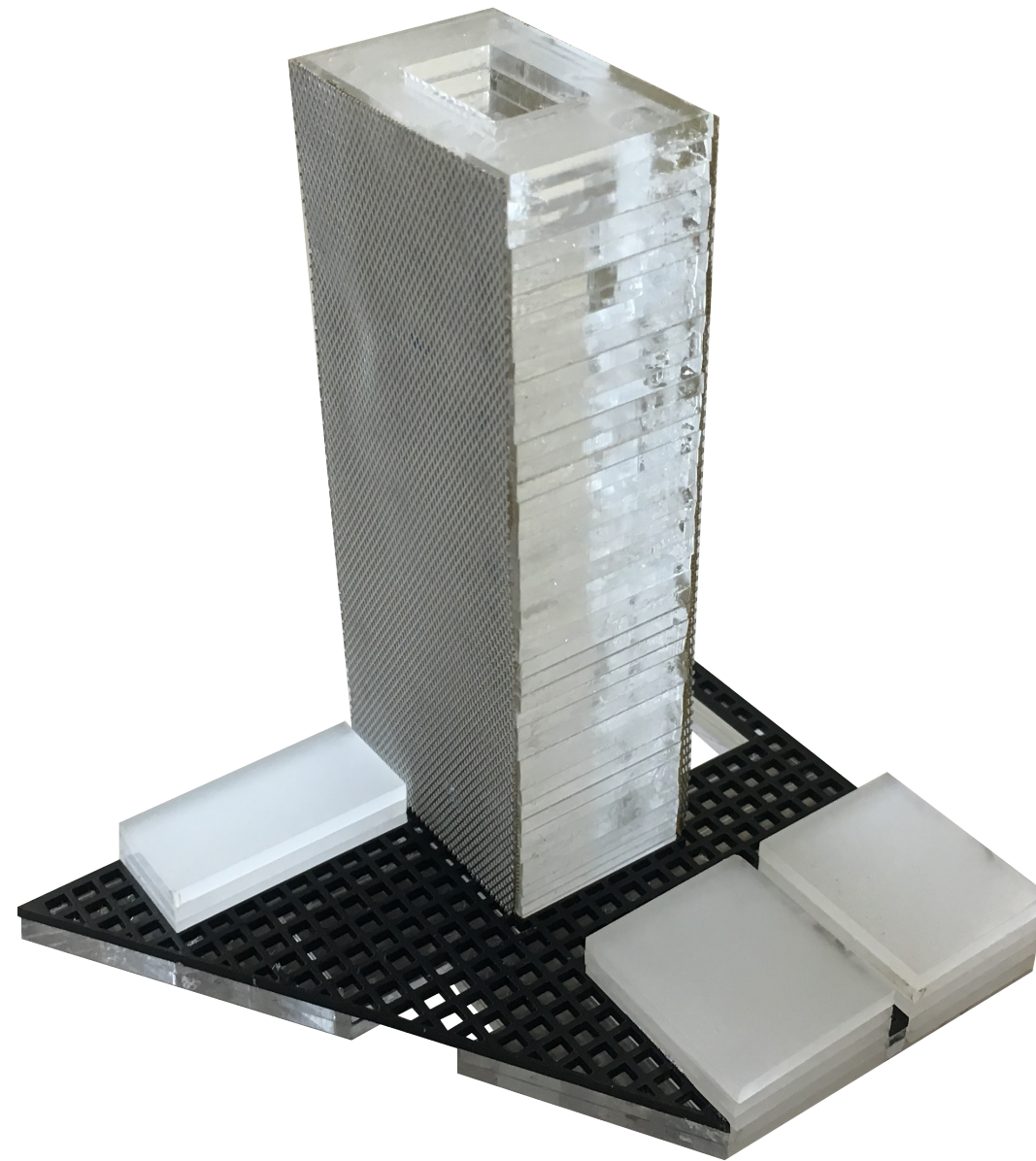




**BUILDING**



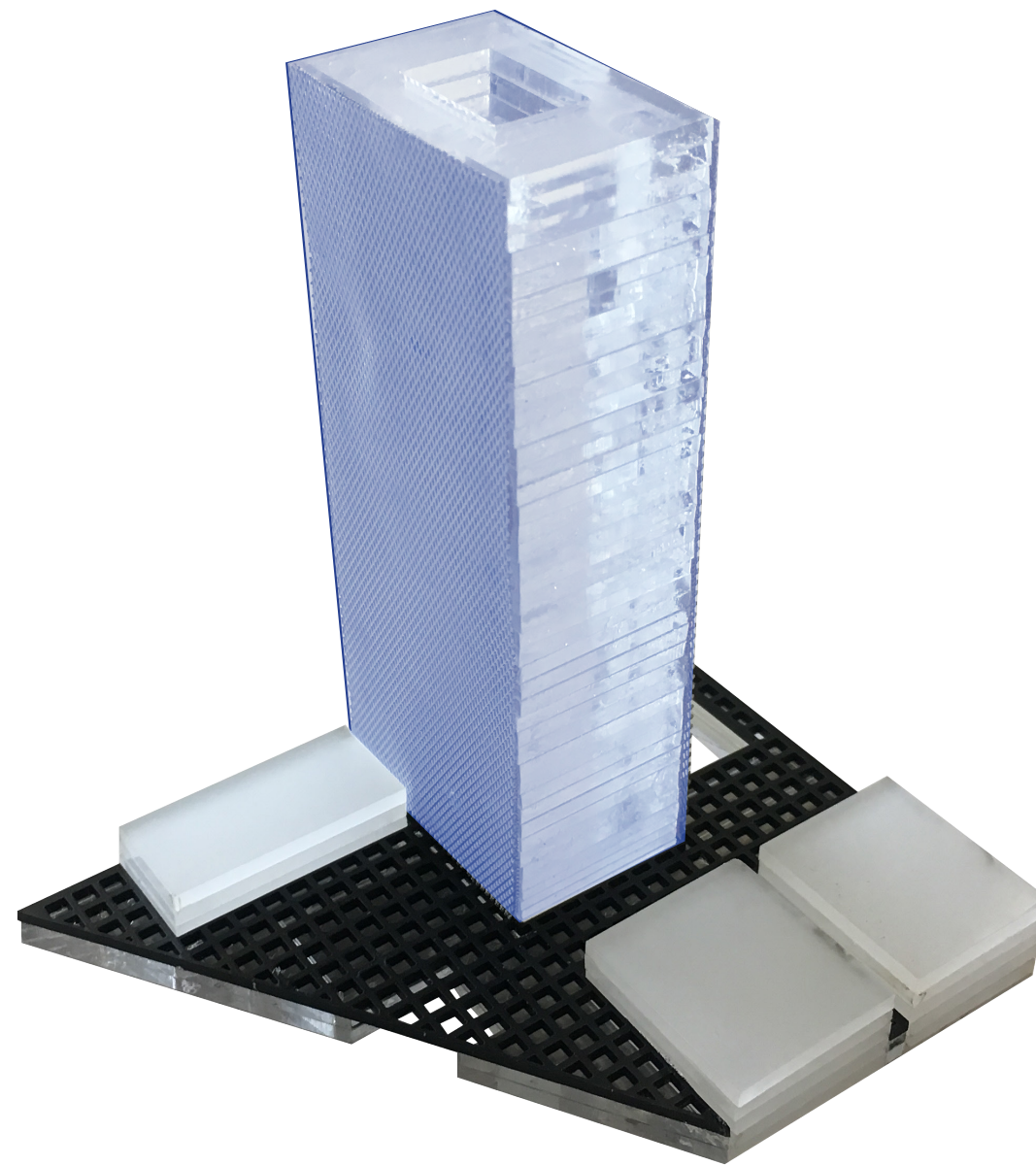
# VOLUMATIC STRUCTURE



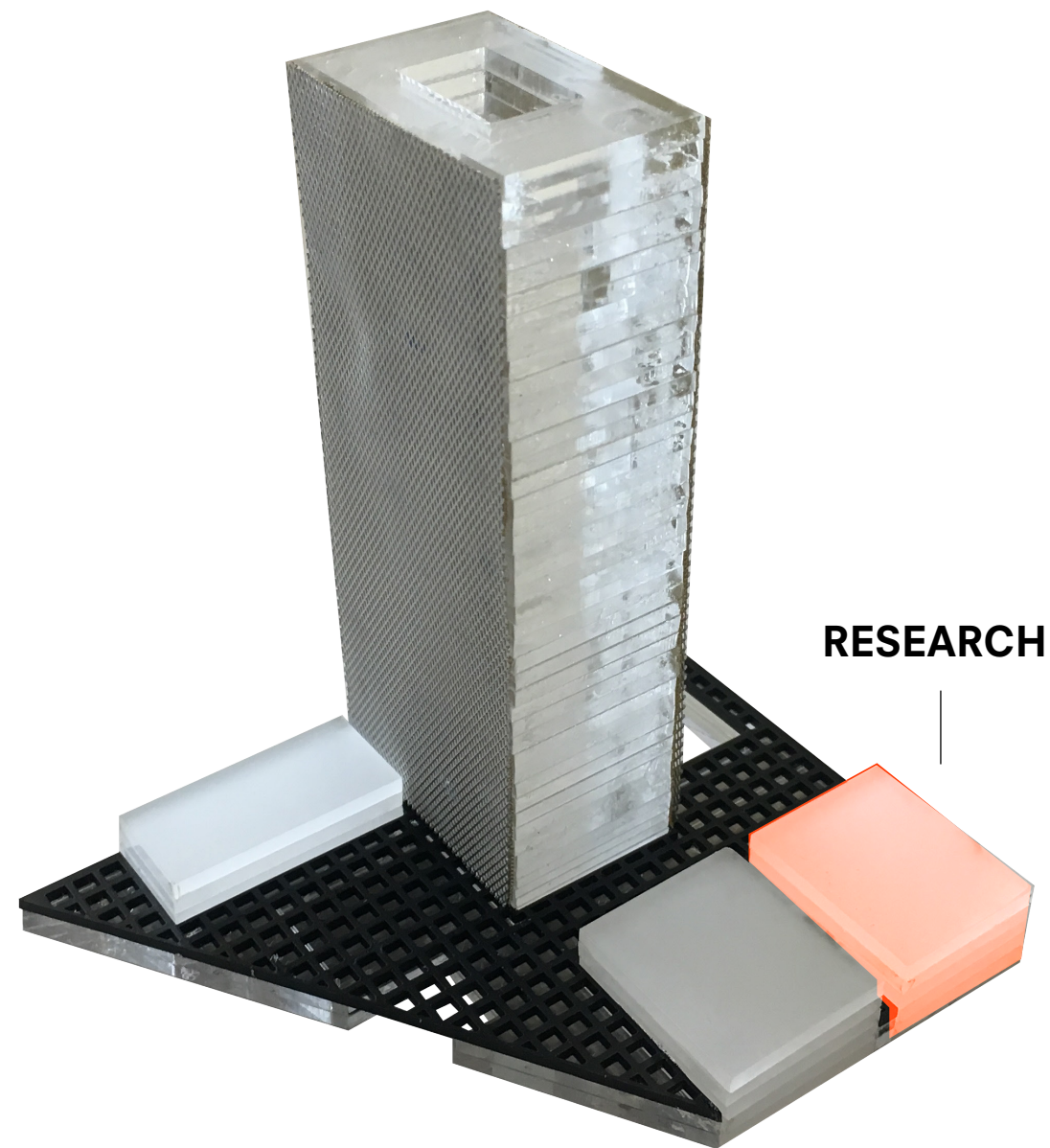


# VOLUMATIC STRUCTURE

PRODUCTION TOWER

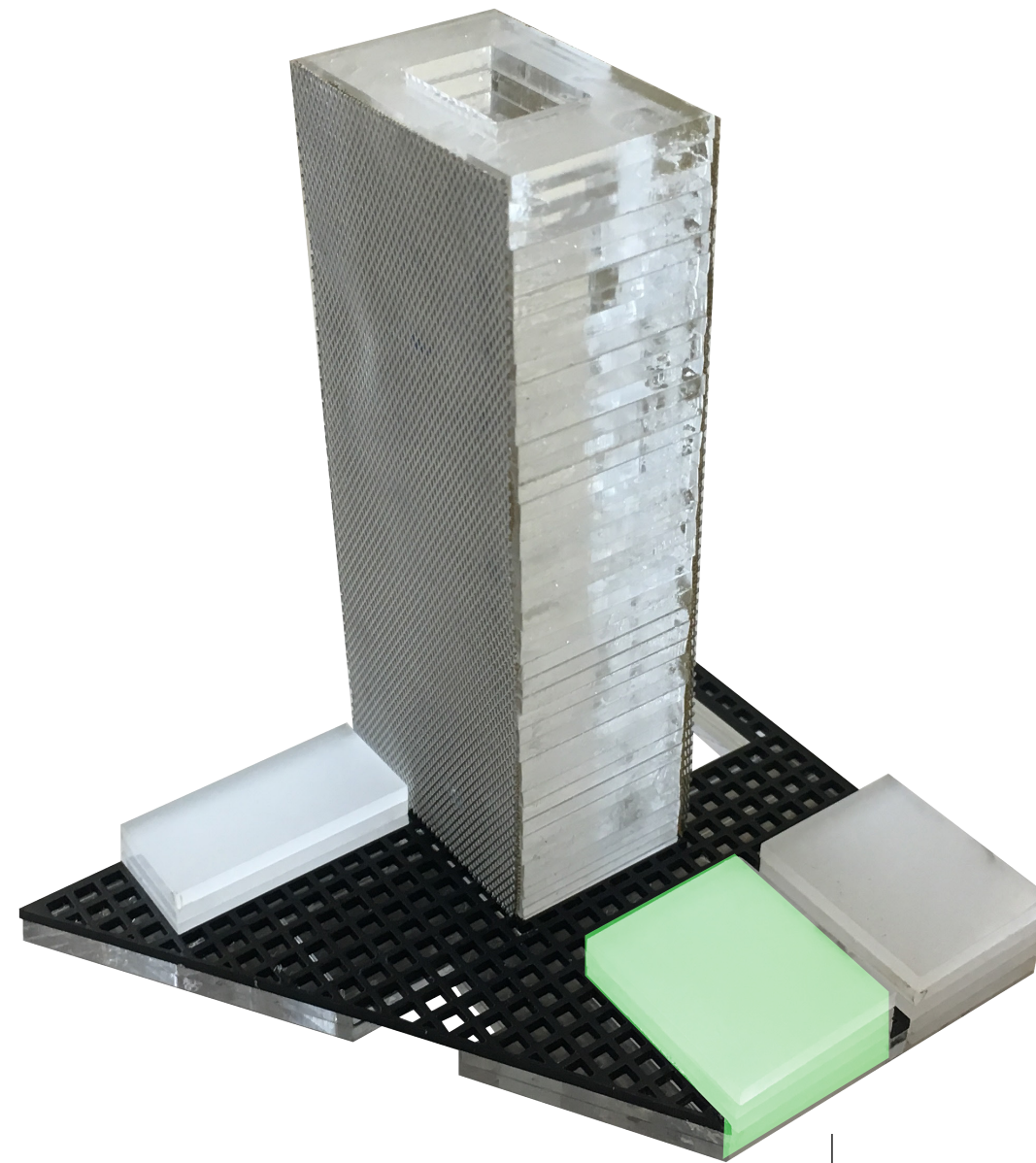


# VOLUMATIC STRUCTURE



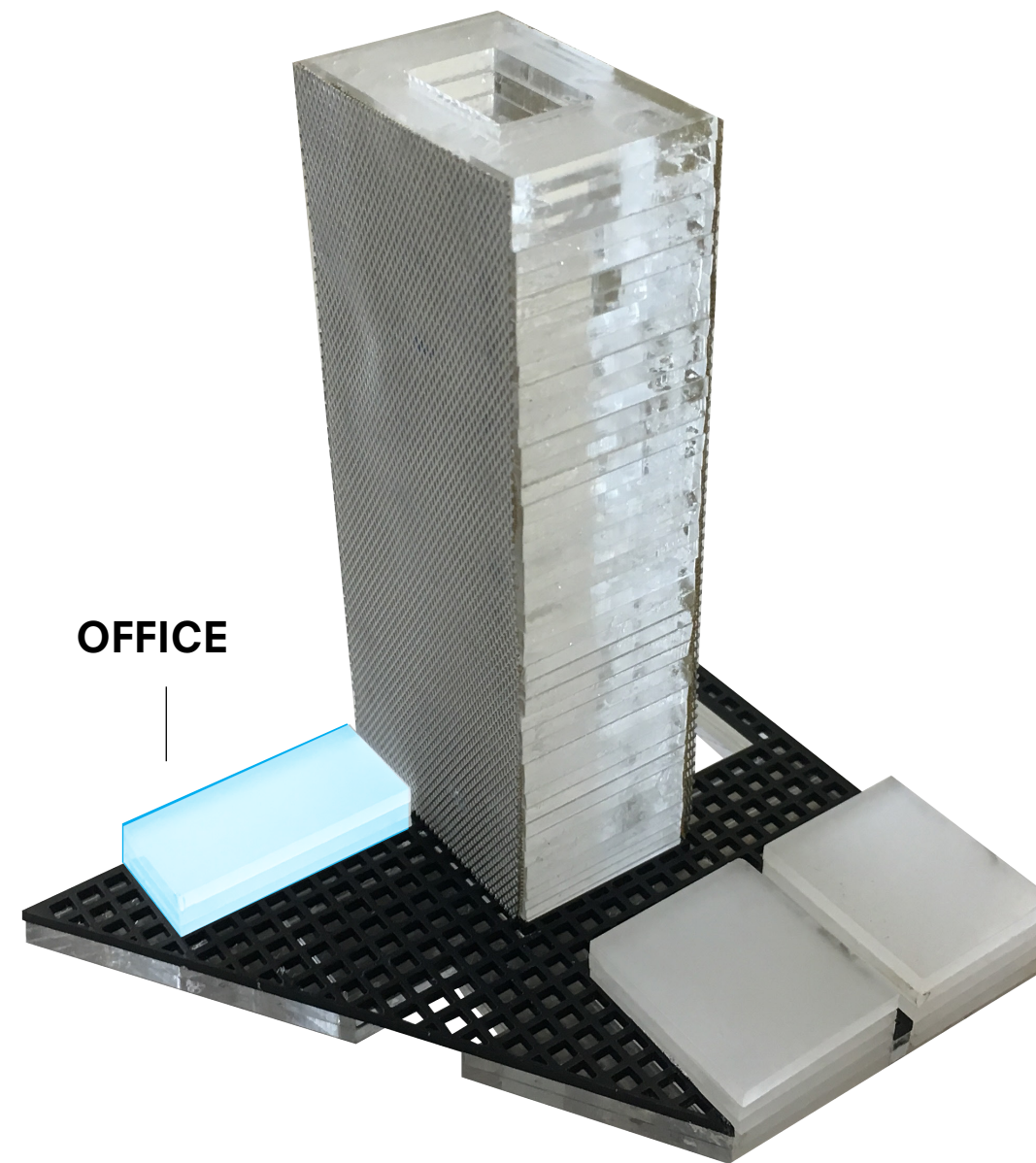


# VOLUMATIC STRUCTURE



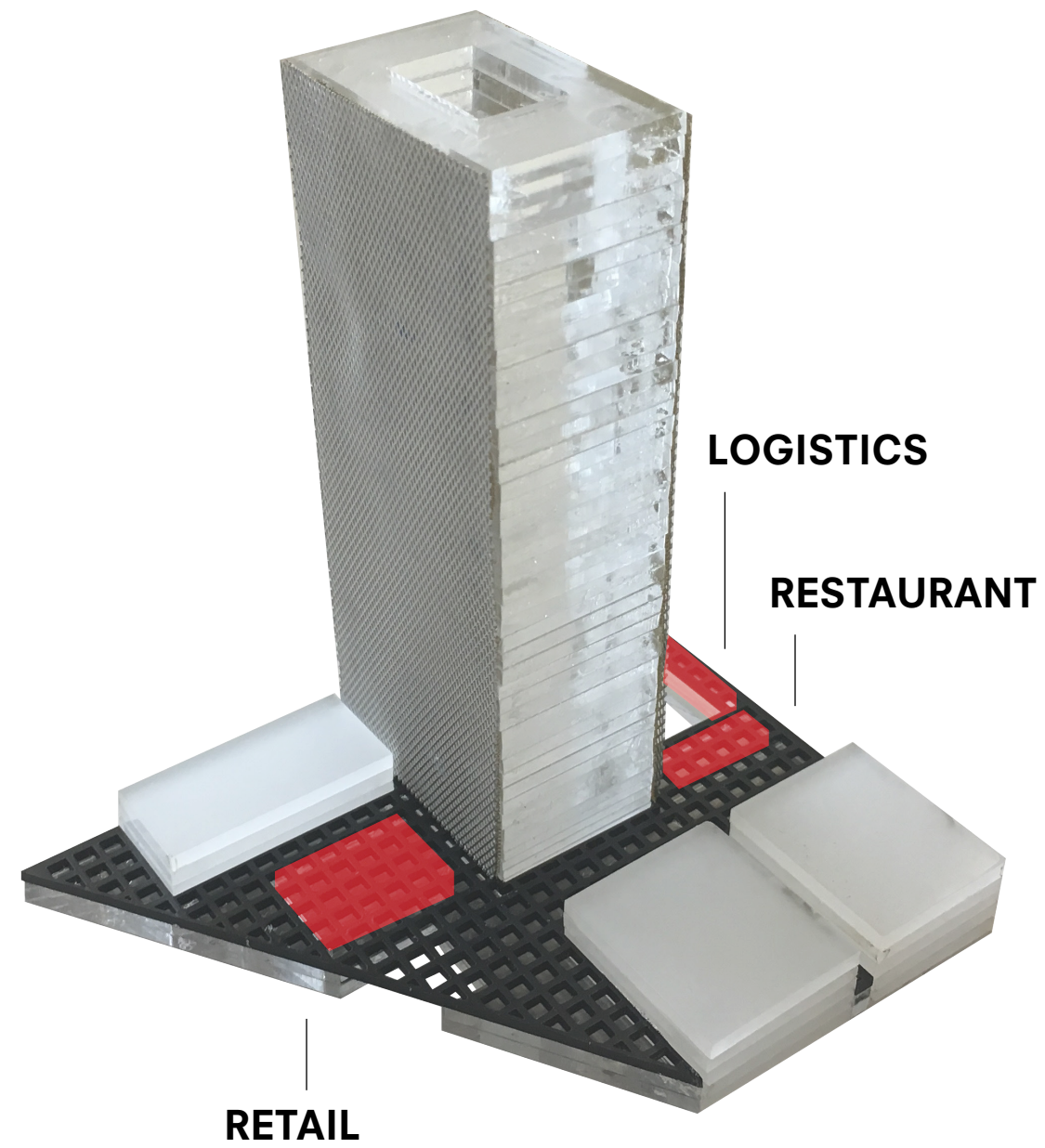
EDUCATION/  
KNOWLEDGE

# VOLUMATIC STRUCTURE

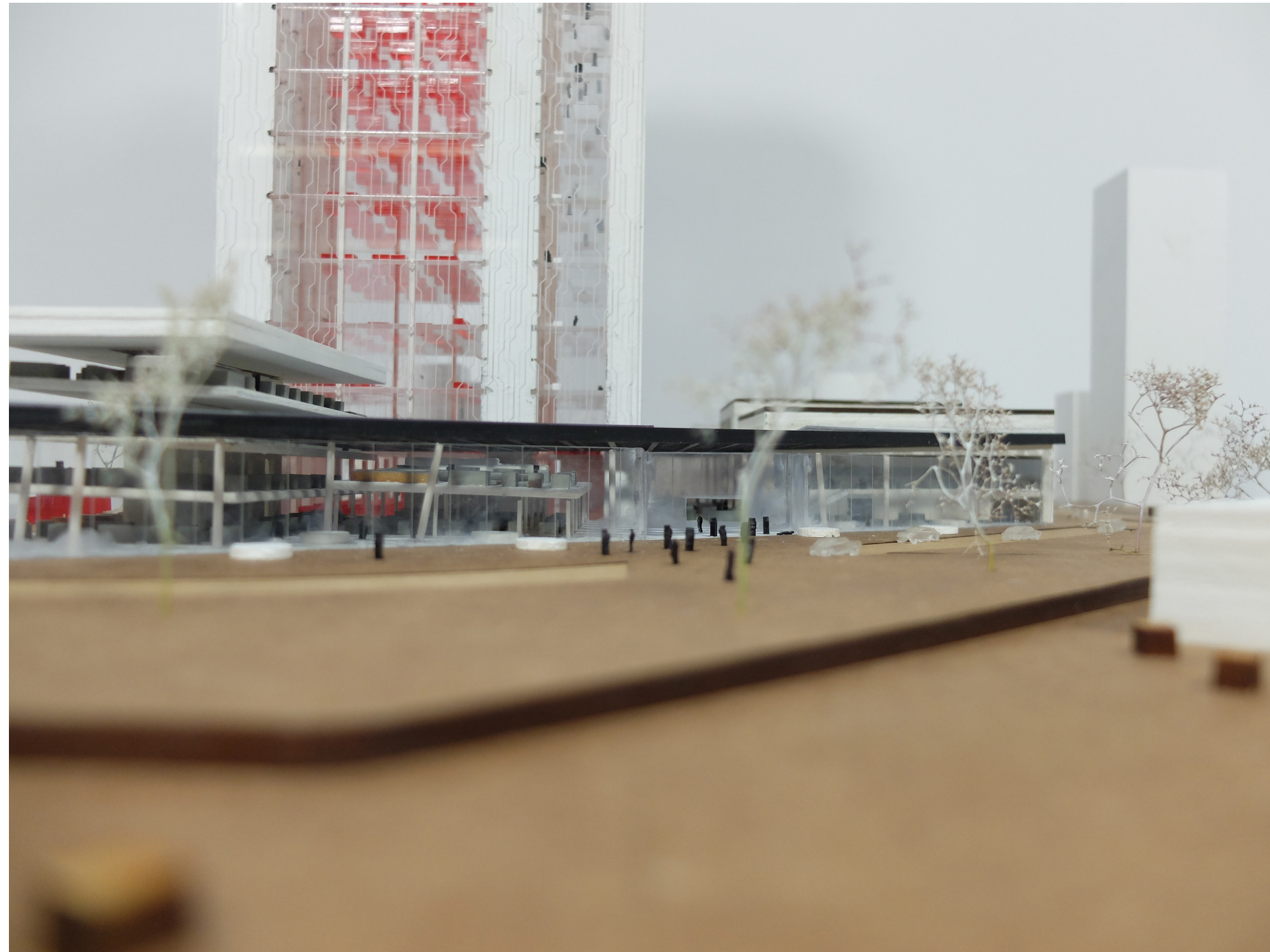




# VOLUMATIC STRUCTURE

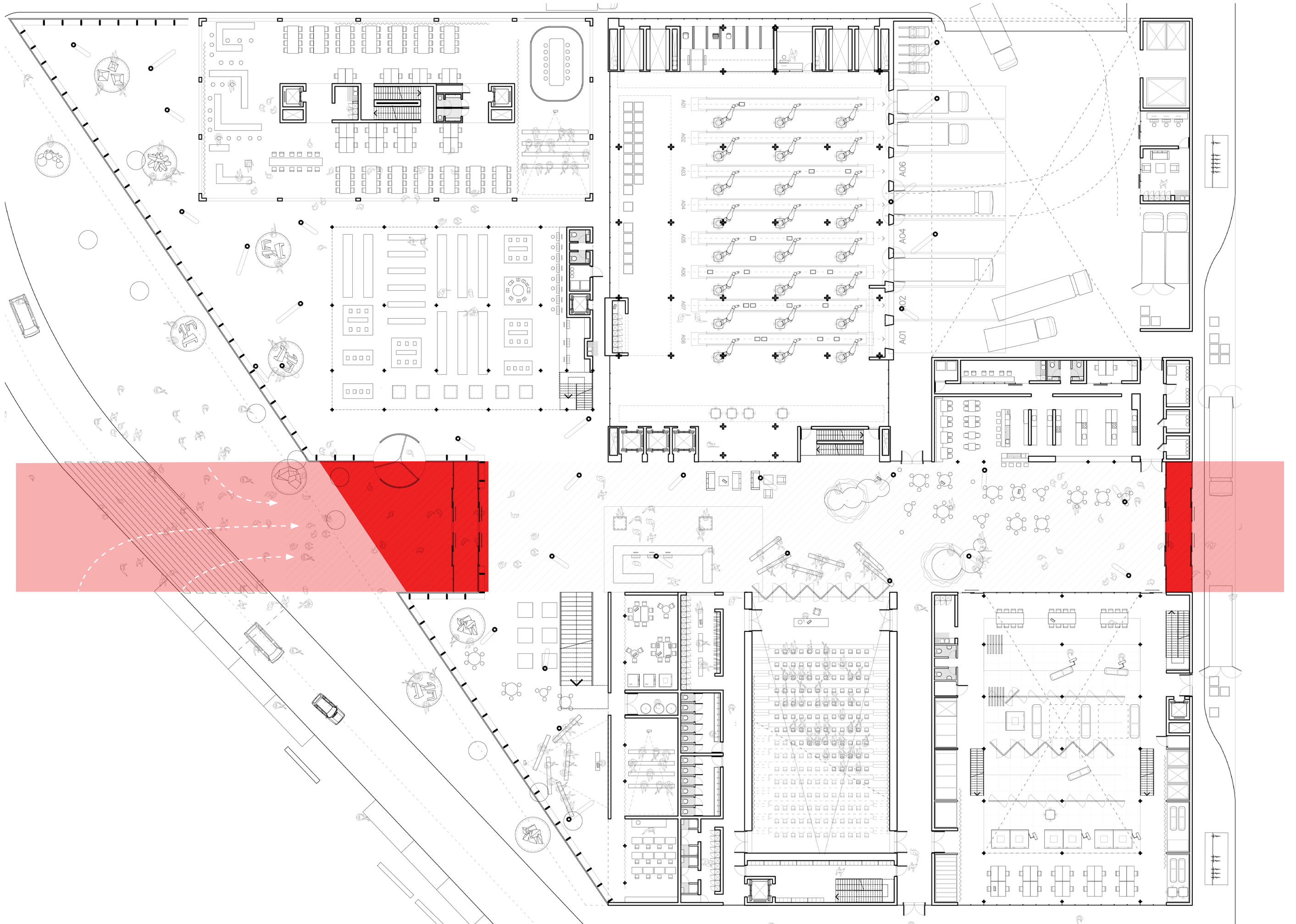


# ENTRANCE FROM BOARDWALK



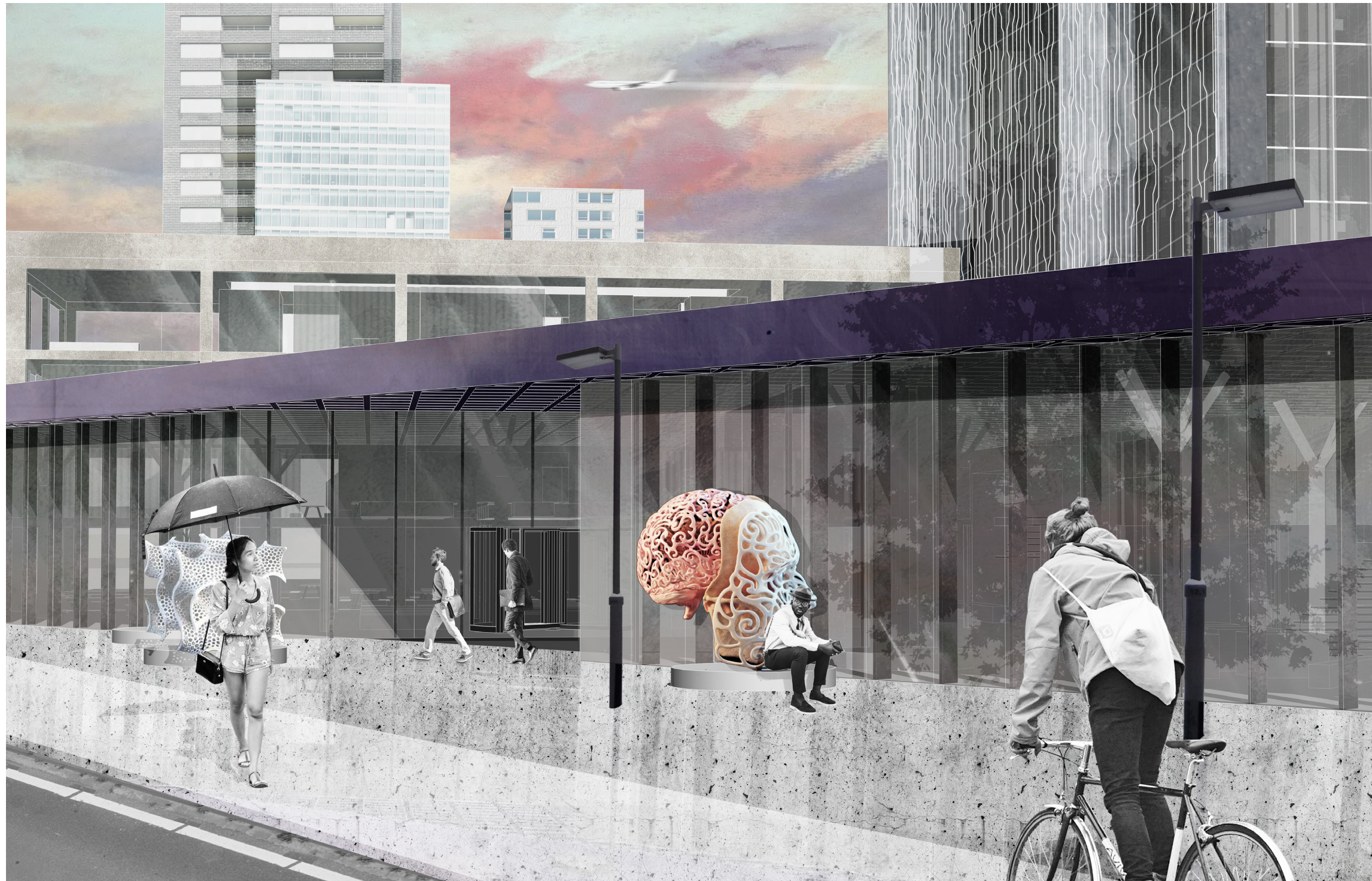


# ENTRANCE(S)



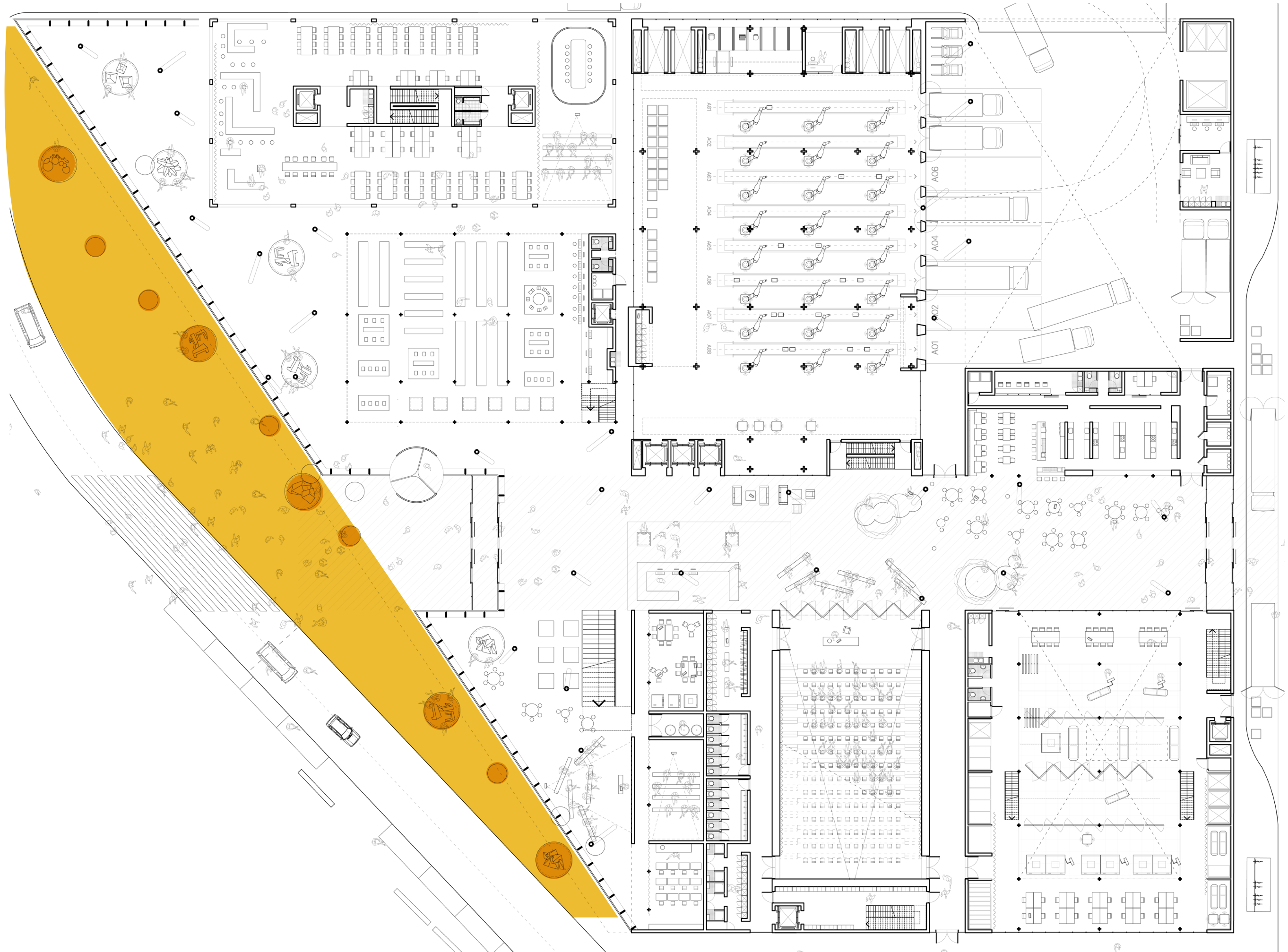


# ENTRANCE(S)

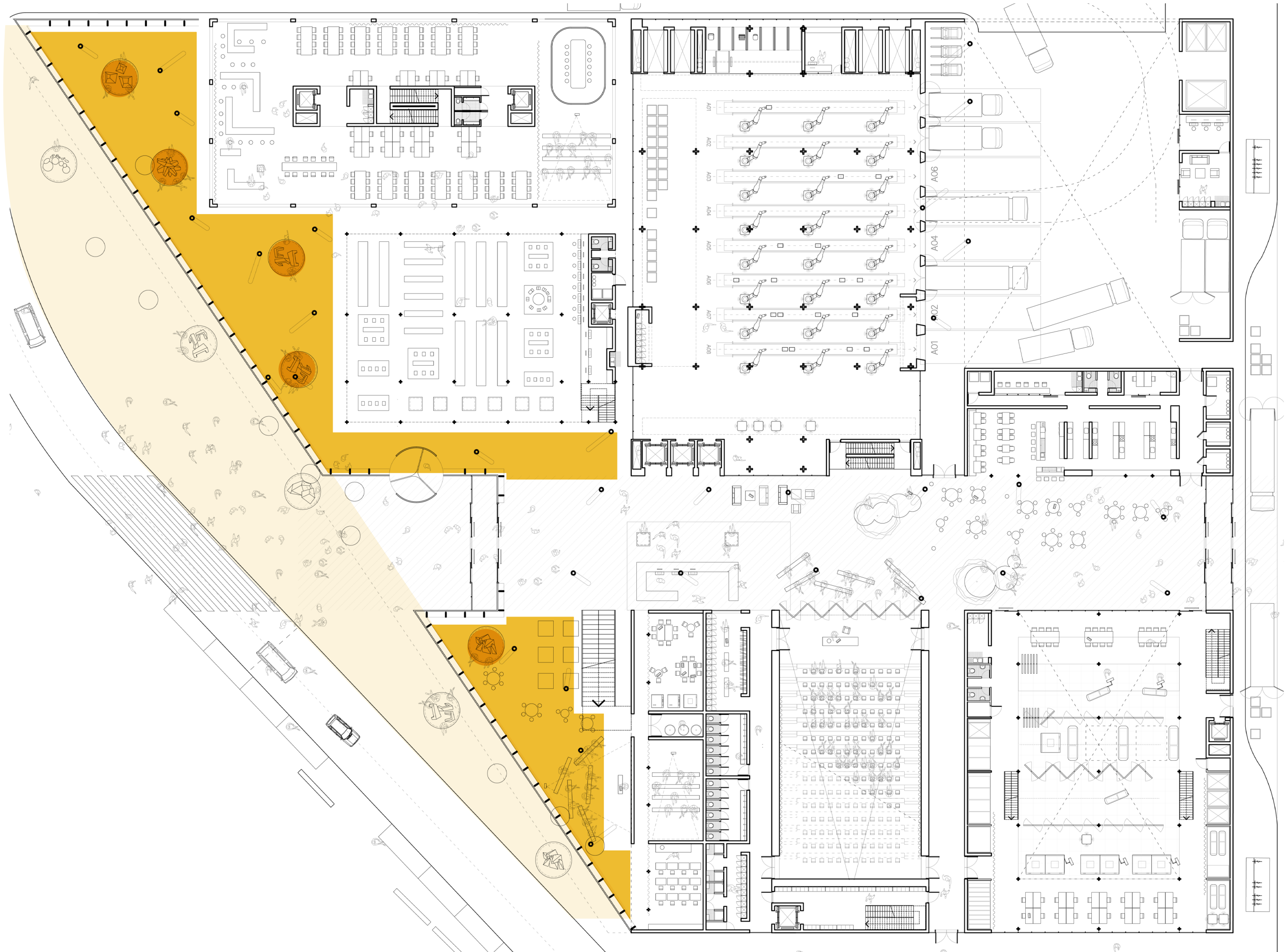




# EXPO



# EXPO



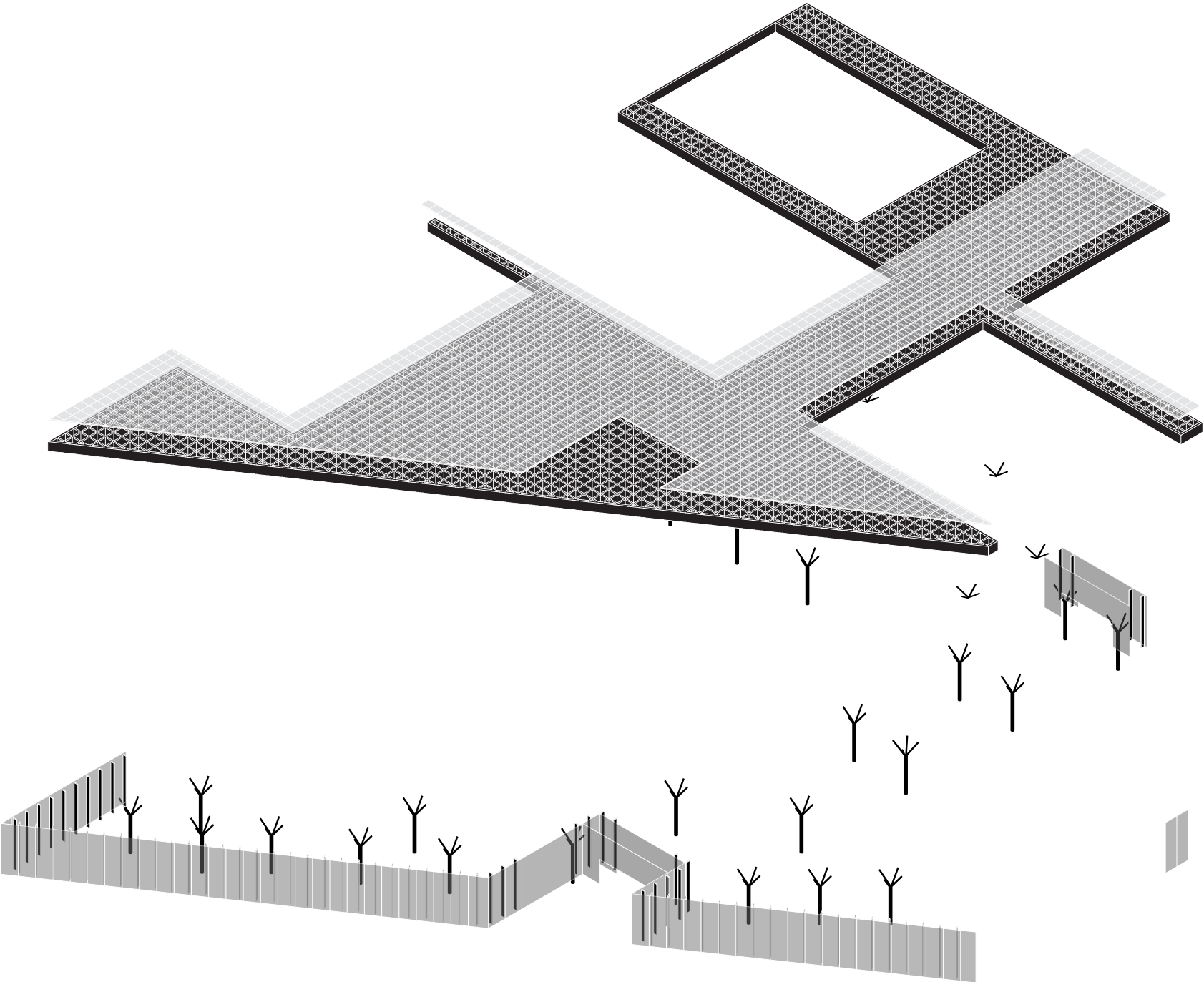


# ENTRANCE



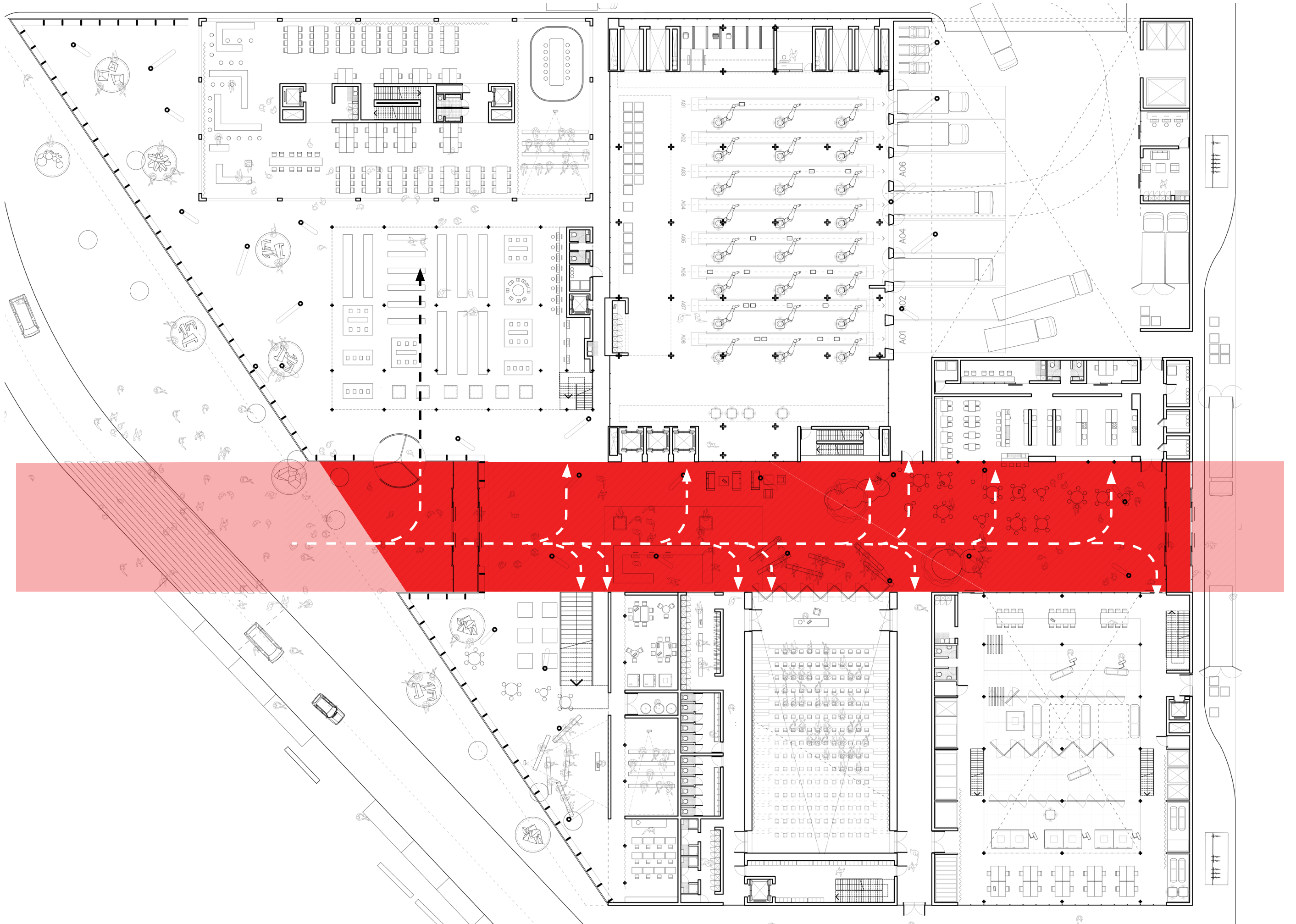


FREE STANDING ROOF





# INTERIOR STREET



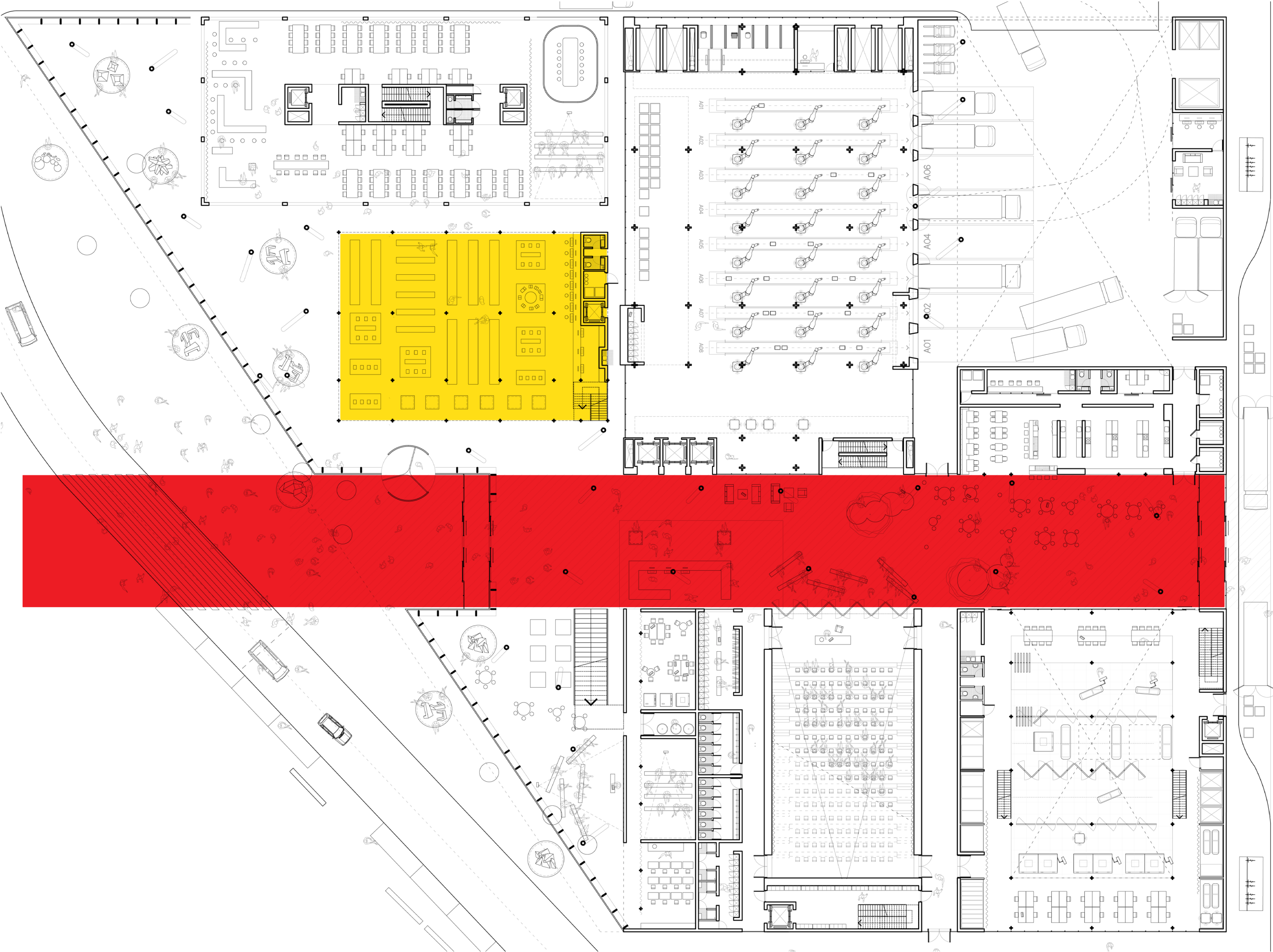


SHOP

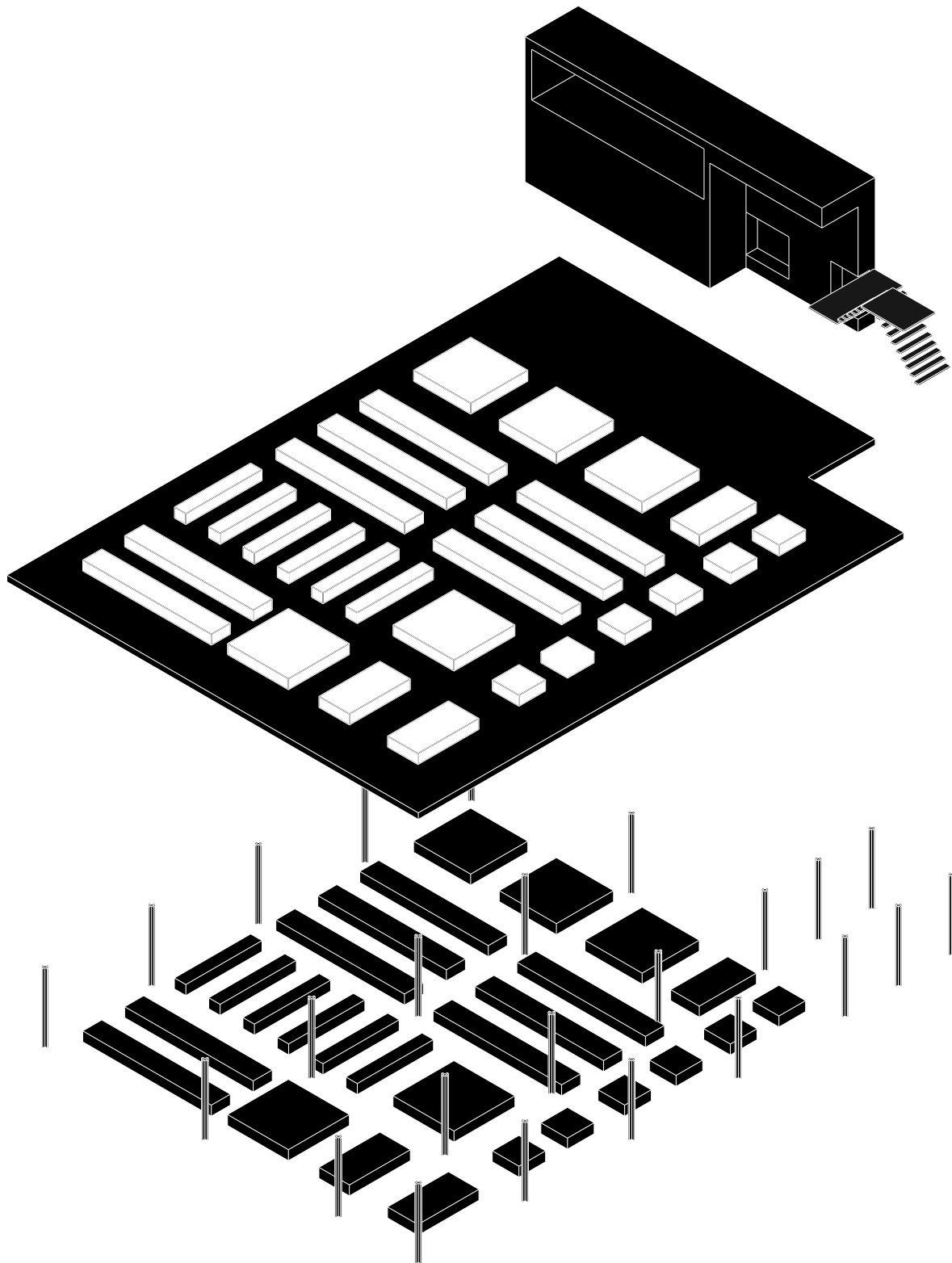




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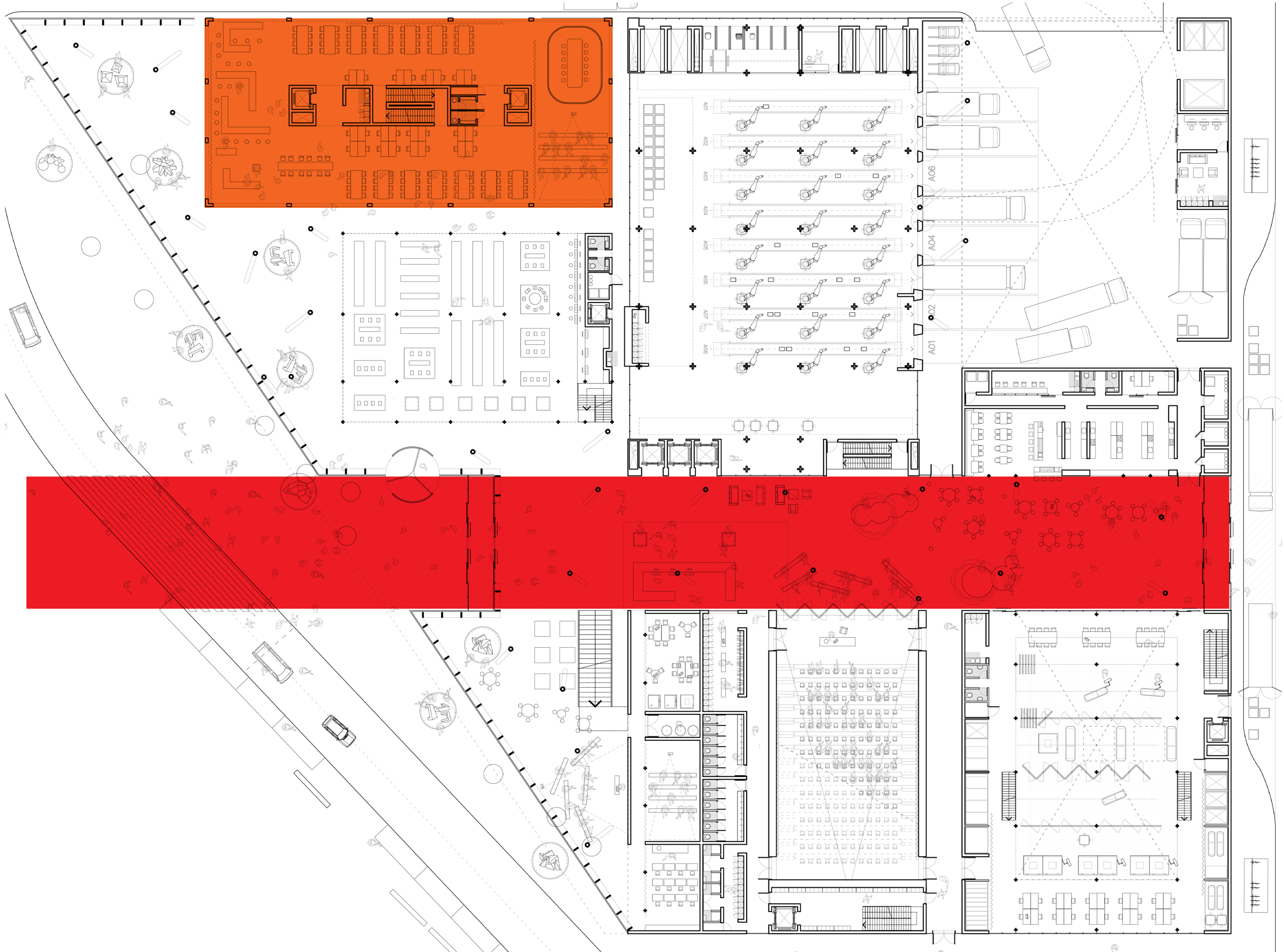


SHOP

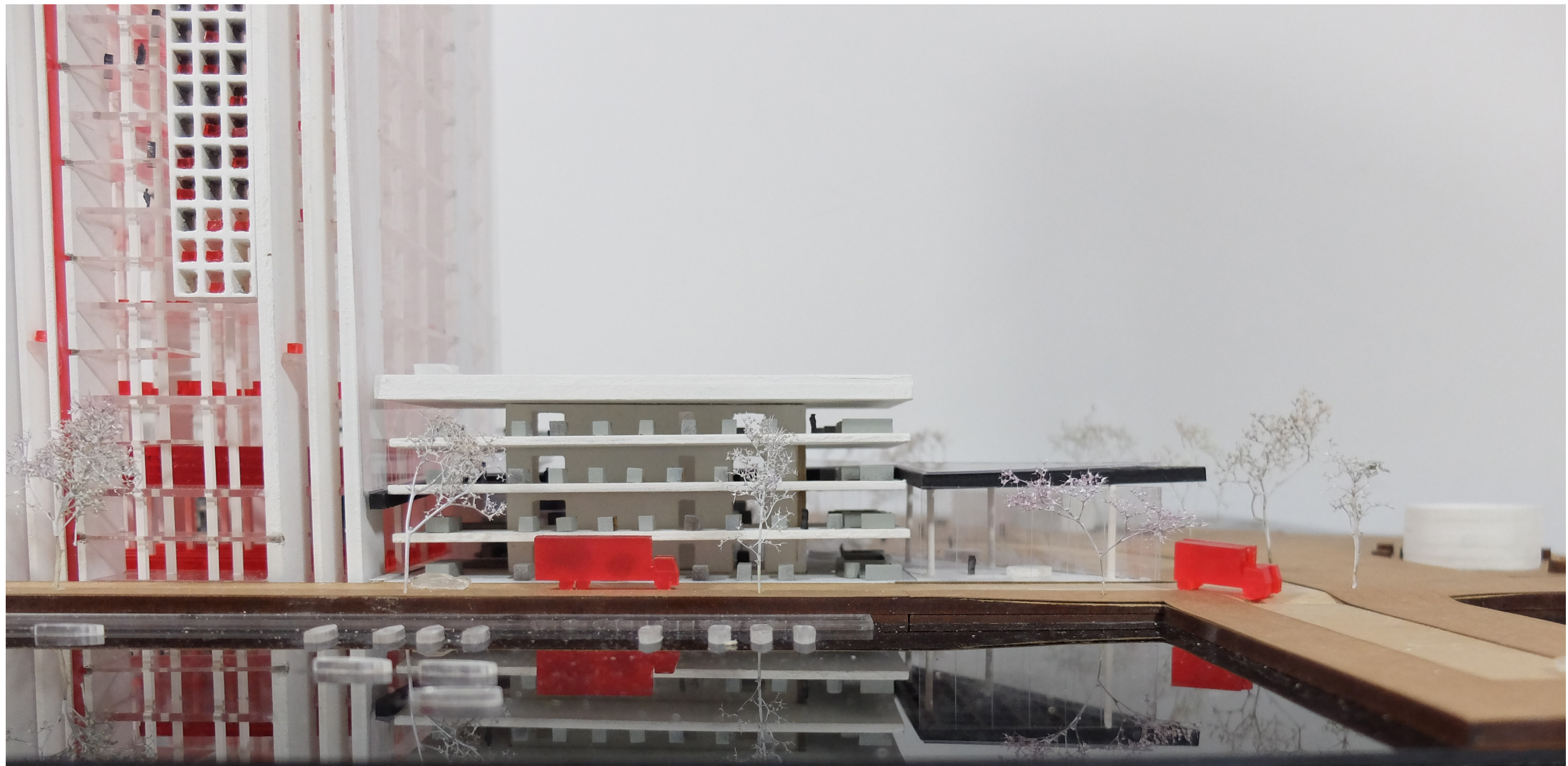




# OFFICE



# OFFICE

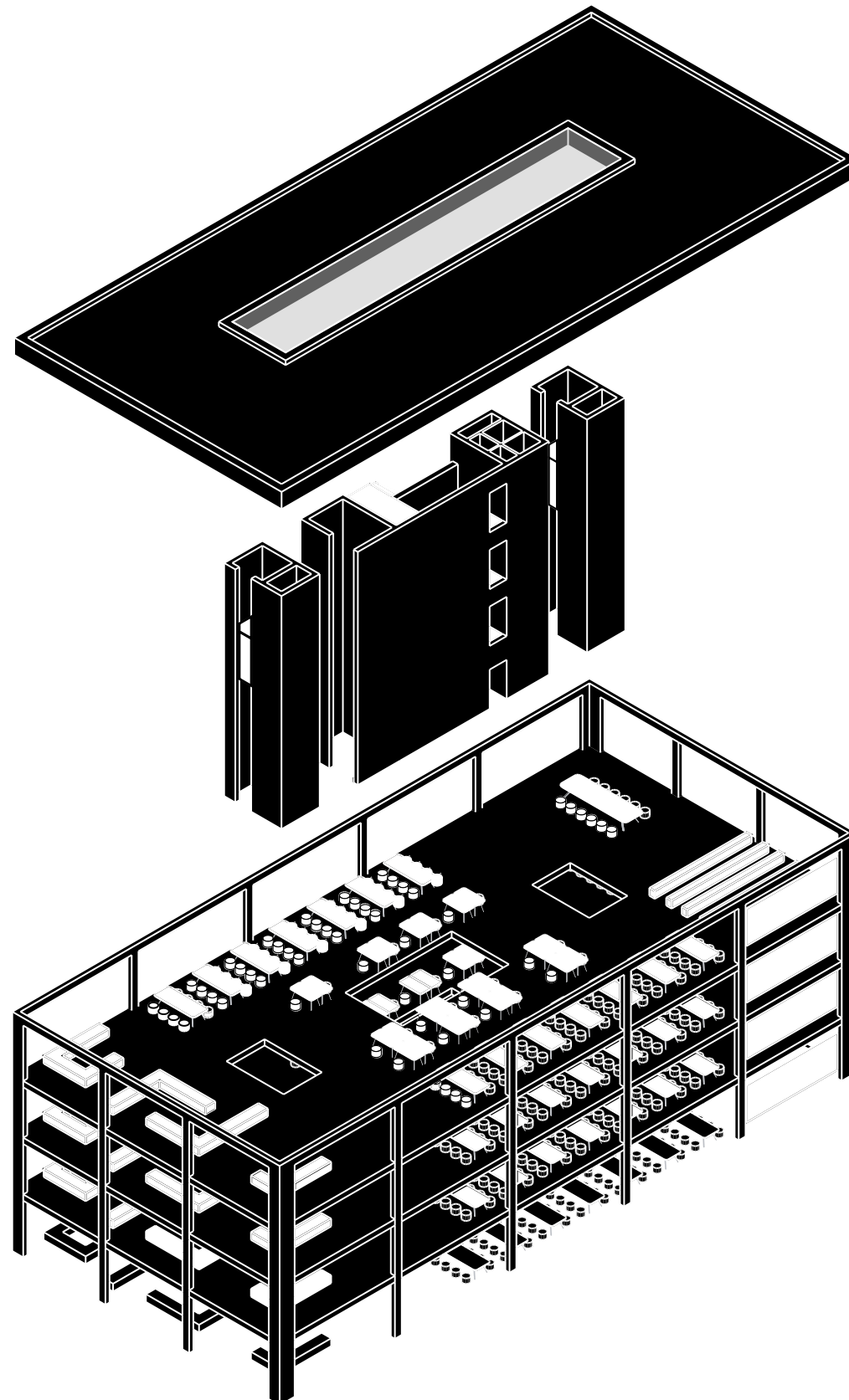




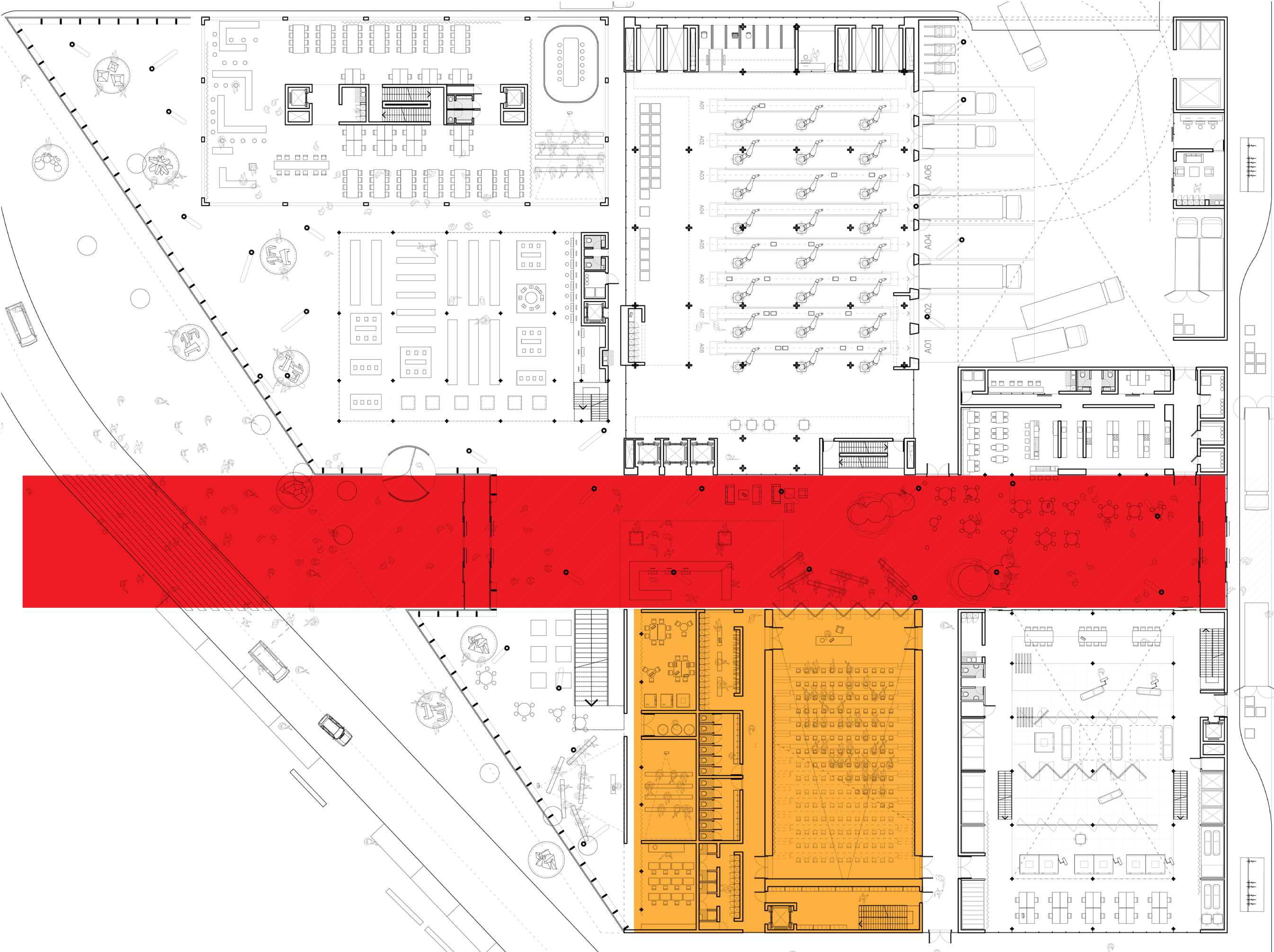
# OFFICE

## STRUCTURAL & SERVICE CORE

**WORKSPACES**  
Co-working spaces  
Individual workspaces  
Modeling department

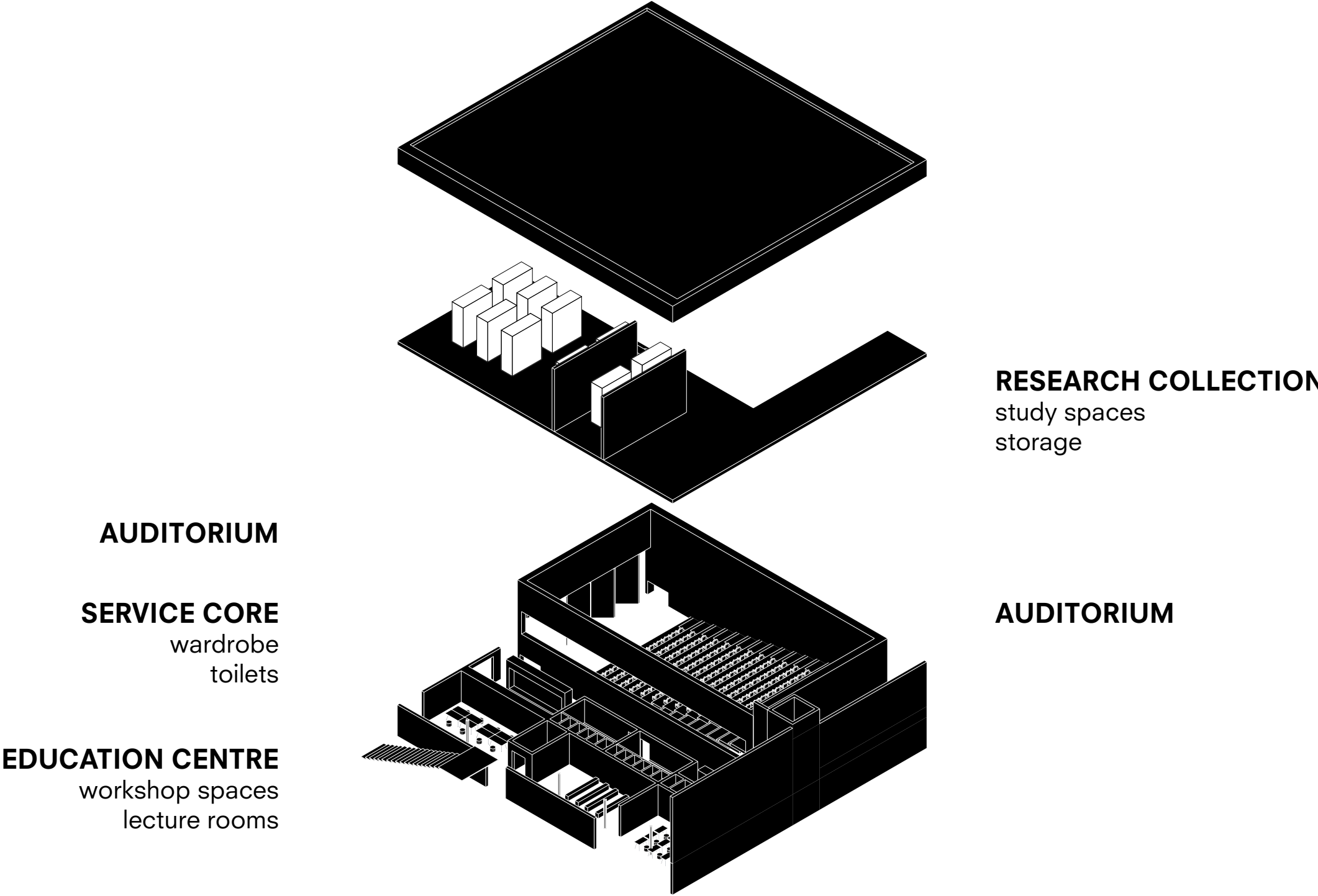


# EDUCATION AND KNOWLEDGE CENTRE

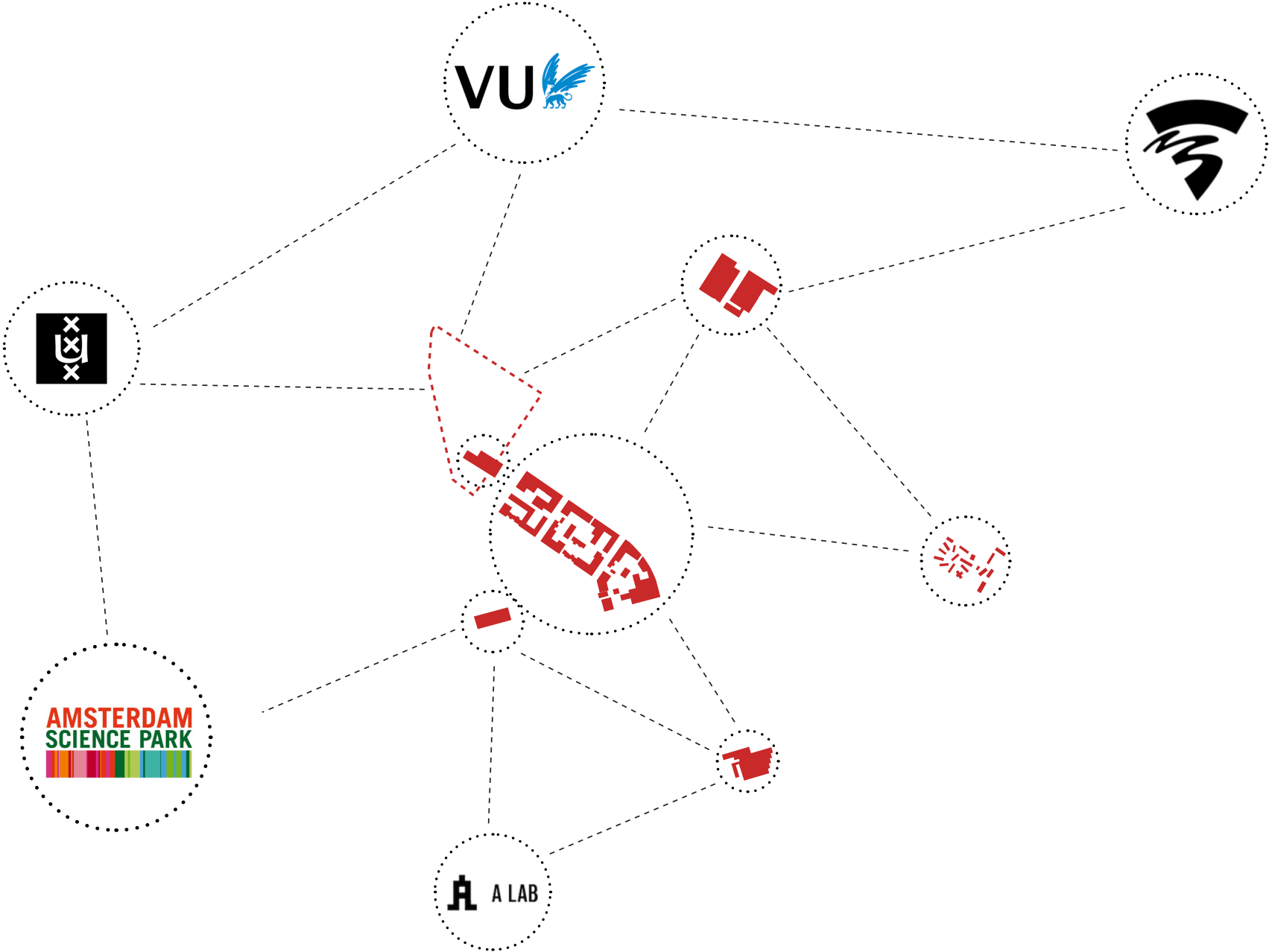




# EDUCATION AND KNOWLEDGE CENTRE



KNOWLEDGE





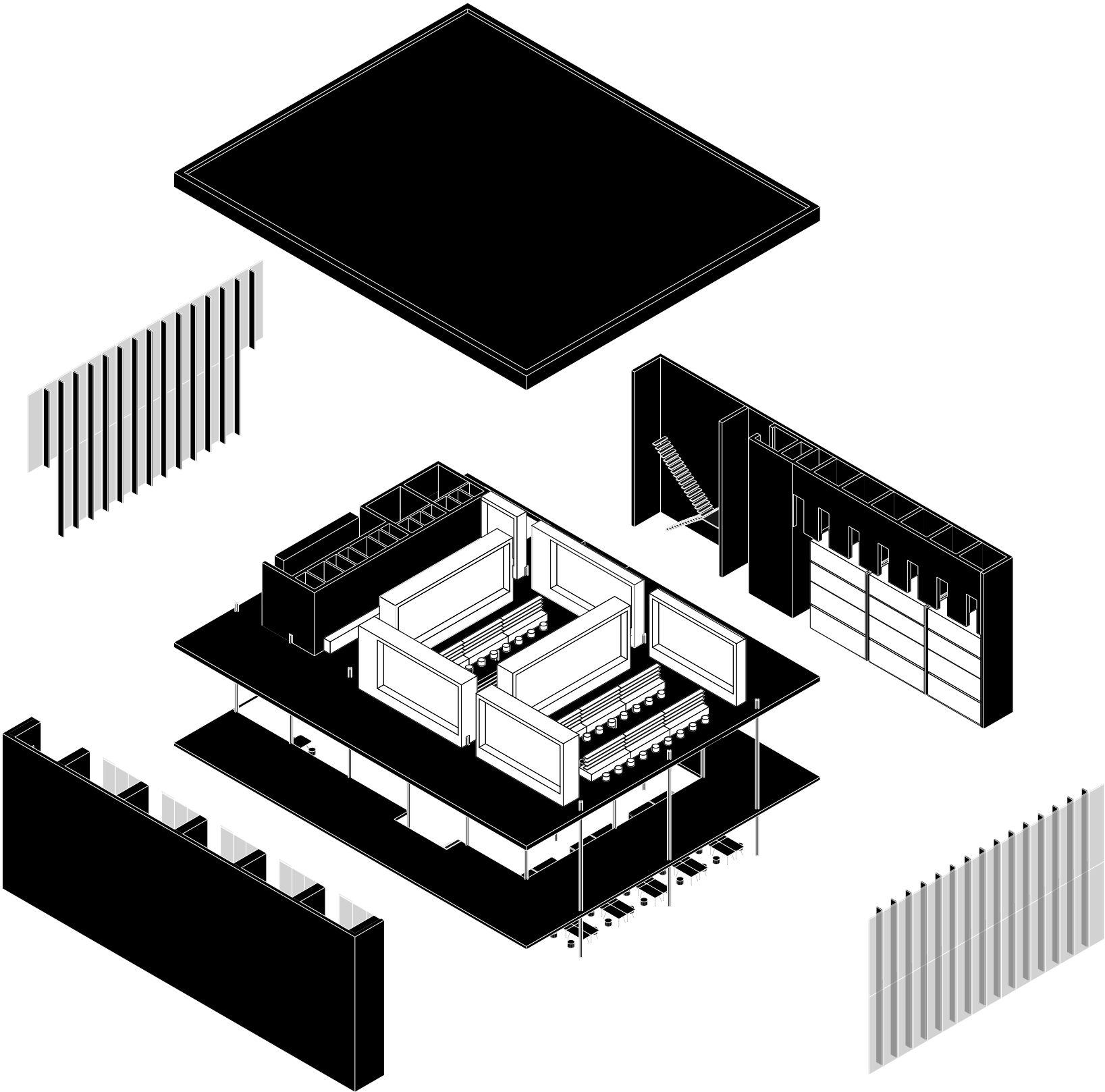
# RESEARCH CENTRE



RESEARCH CENTRE

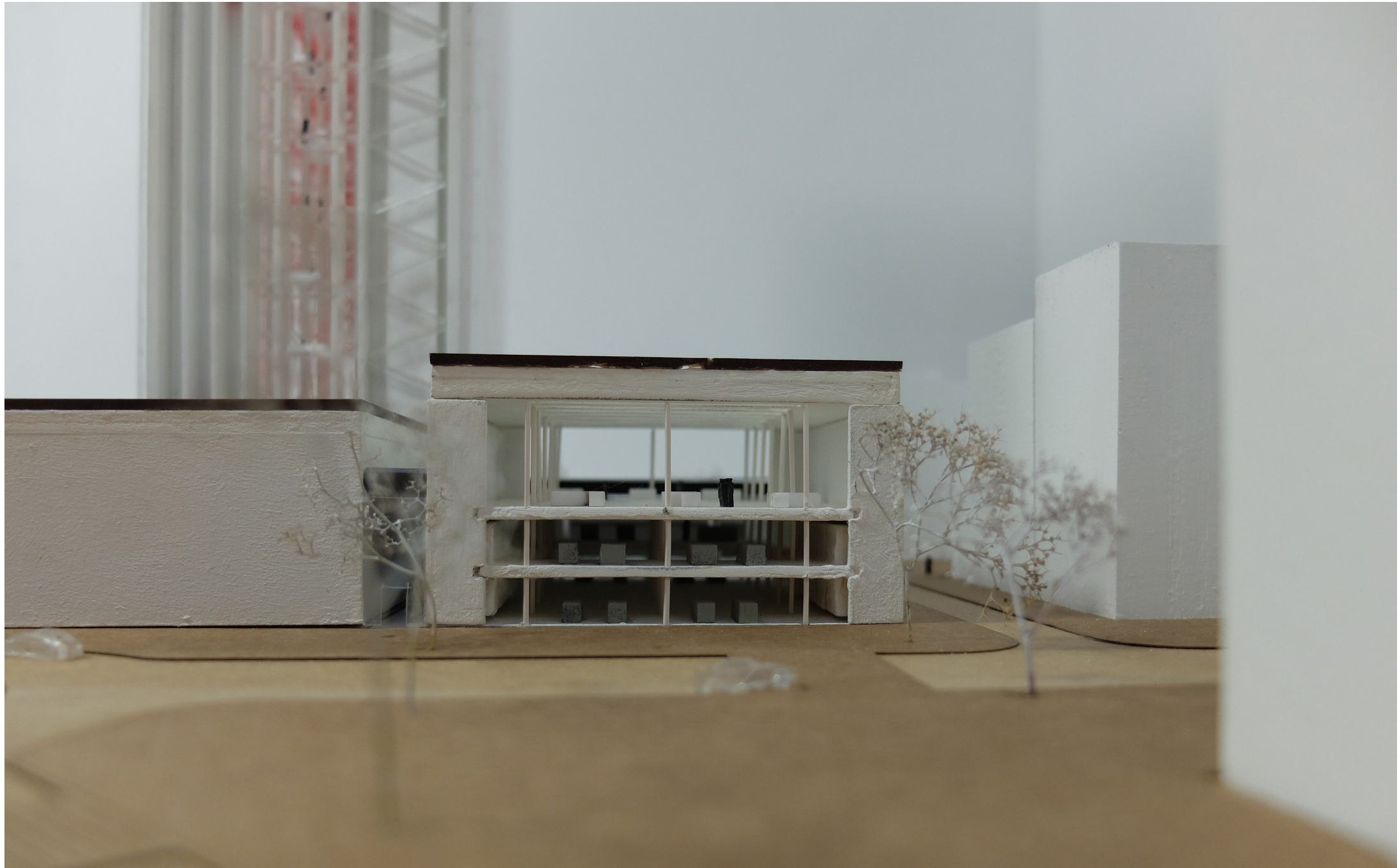
MATERIAL DESIGN LAB

MACHINERY DEVELOPMENT  
WORKSHOP





# RESEARCH CENTRE



VISIBILITY FROM THE OUTSIDE



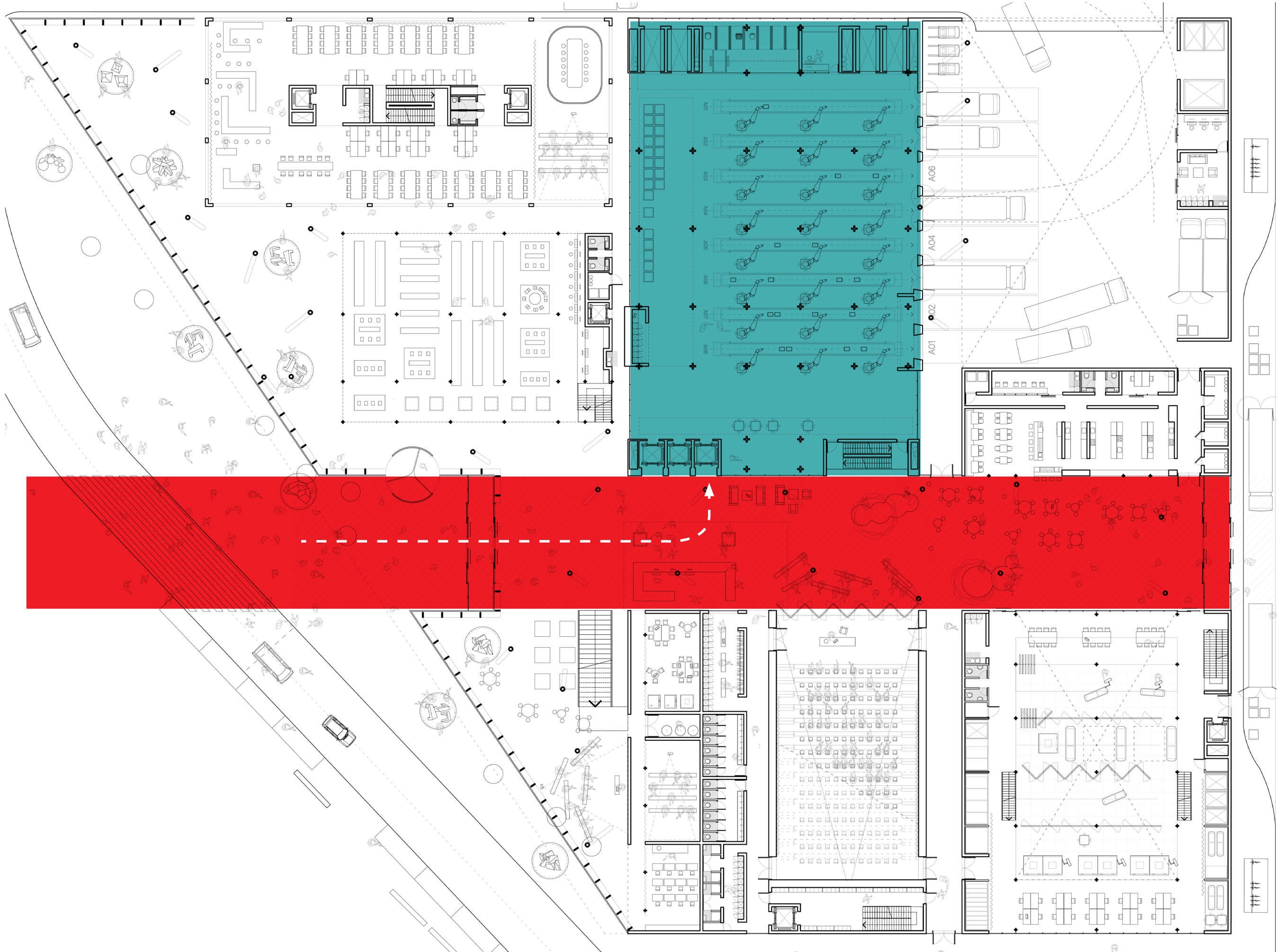
# RESEARCH CENTRE



VISIBILITY FROM PUBLIC STREET

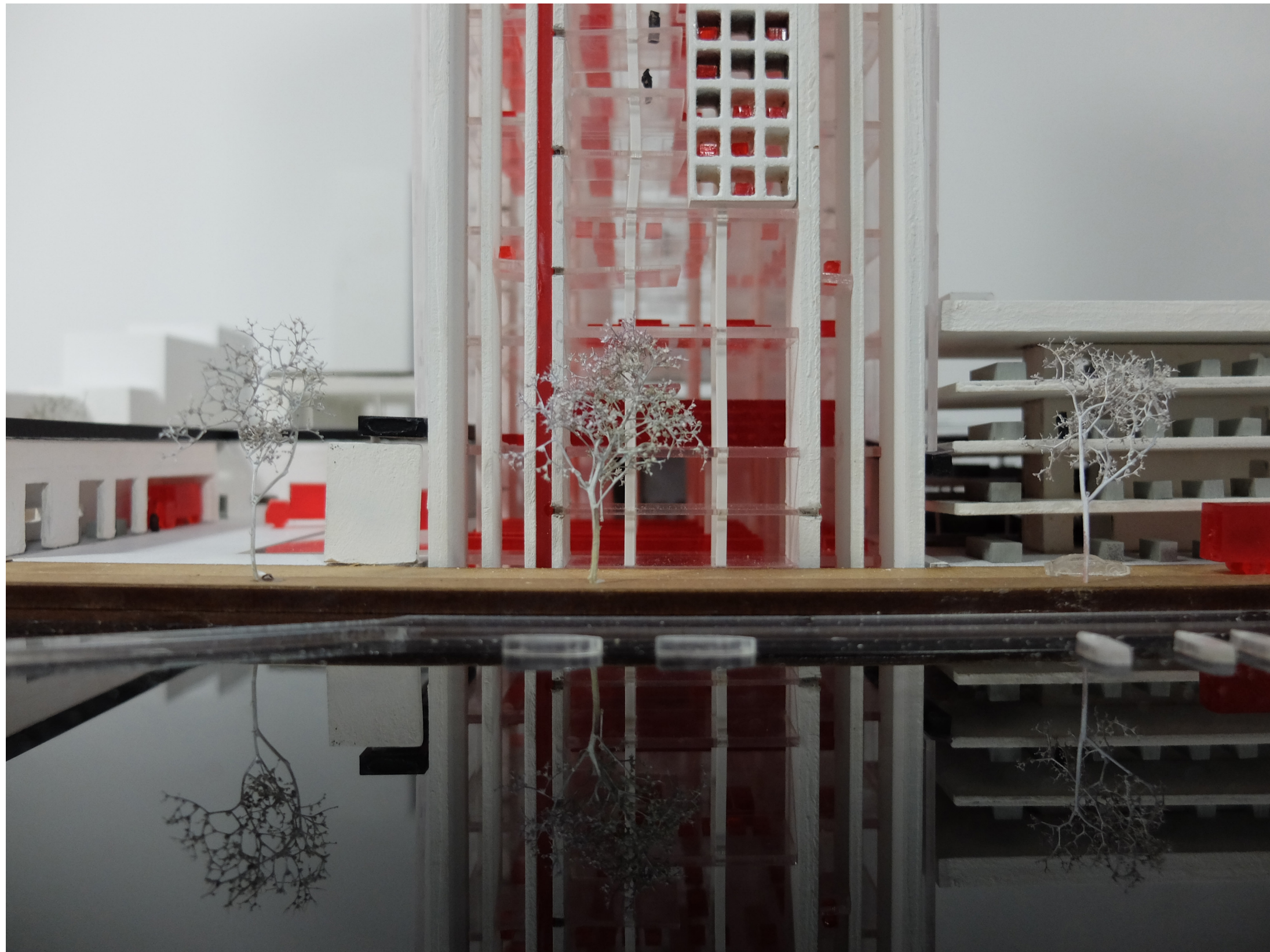


# PRODUCTION TOWER



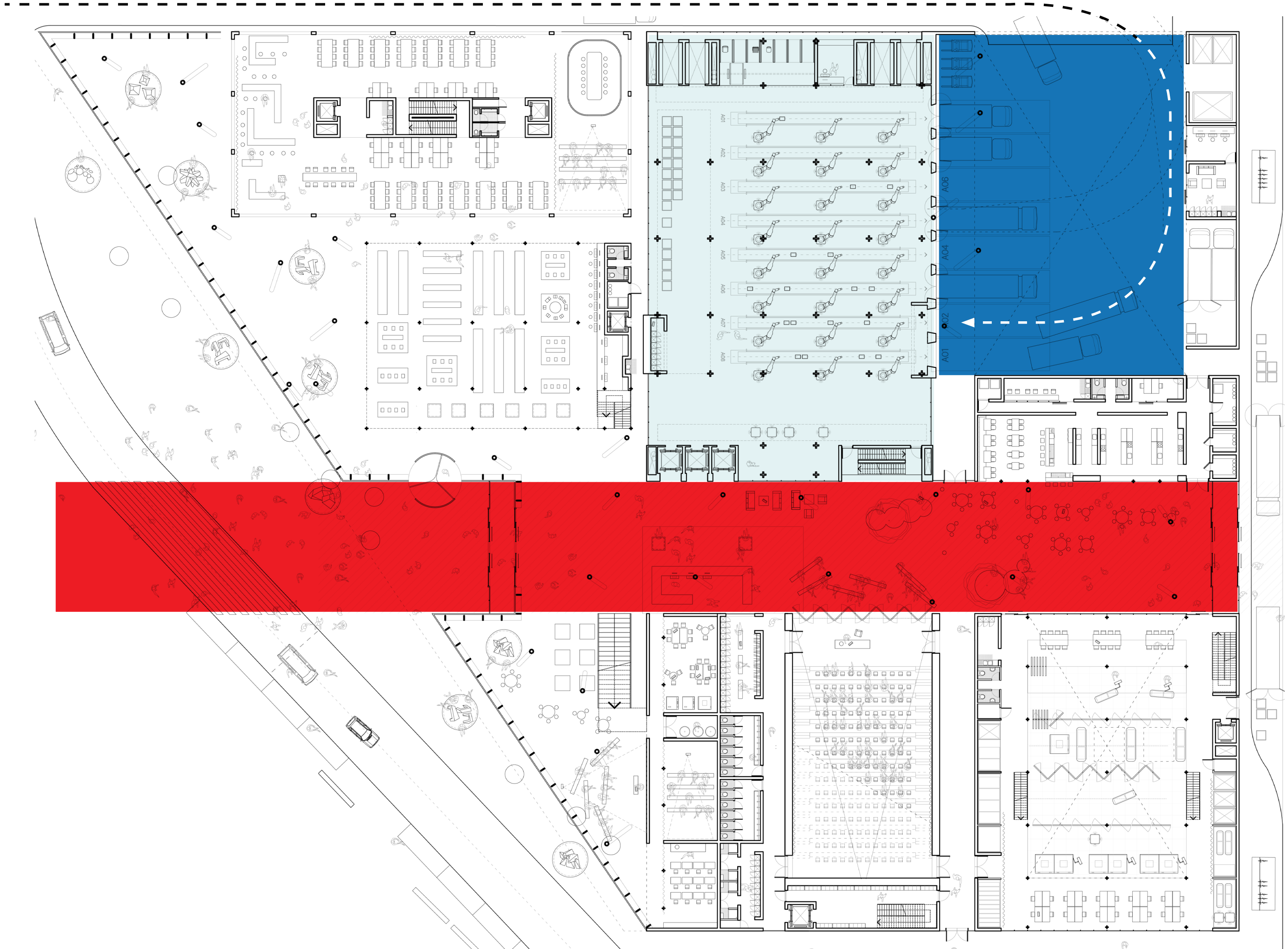


# PRODUCTION TOWER





# LOADING BAY



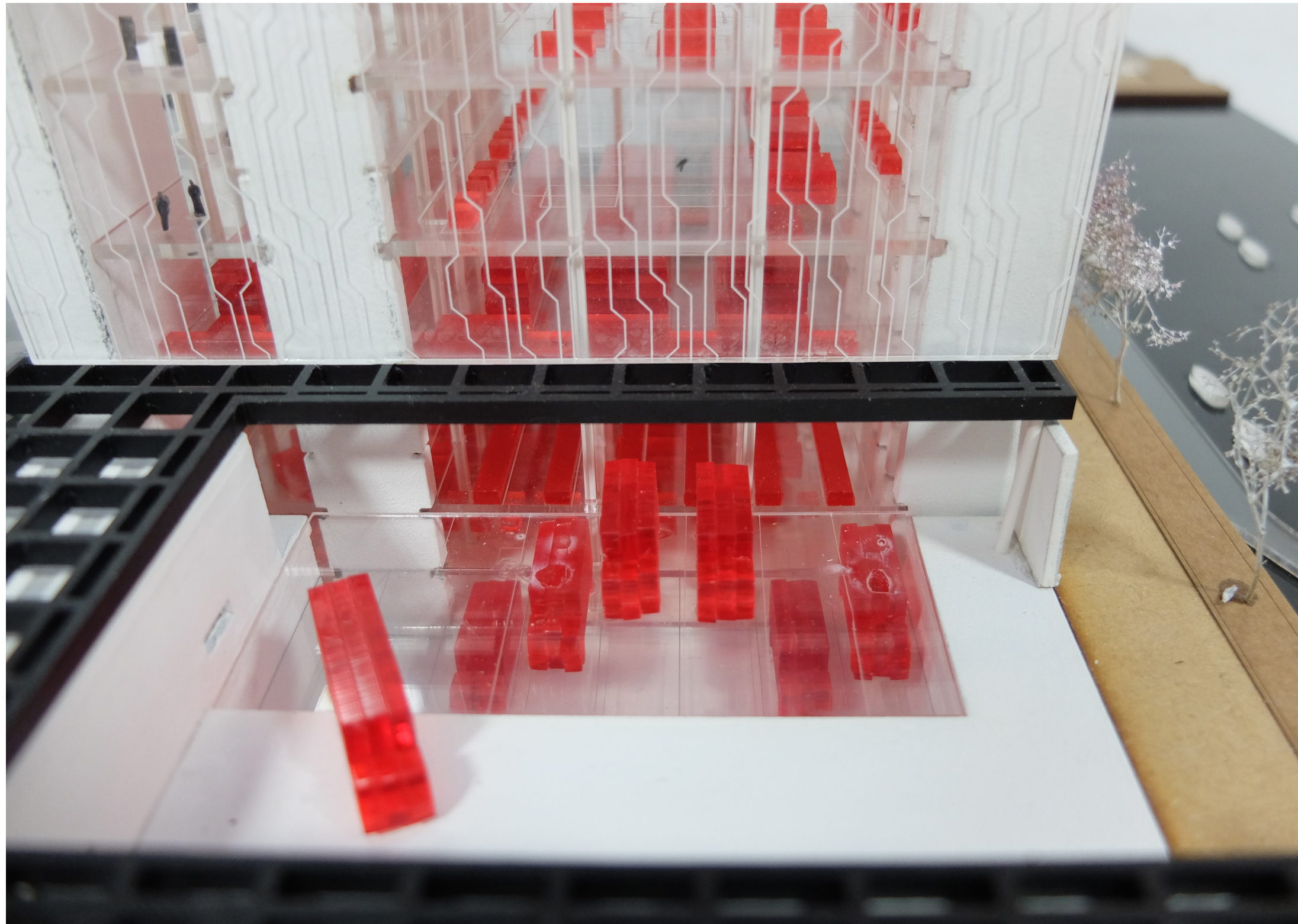


# LOADING BAY



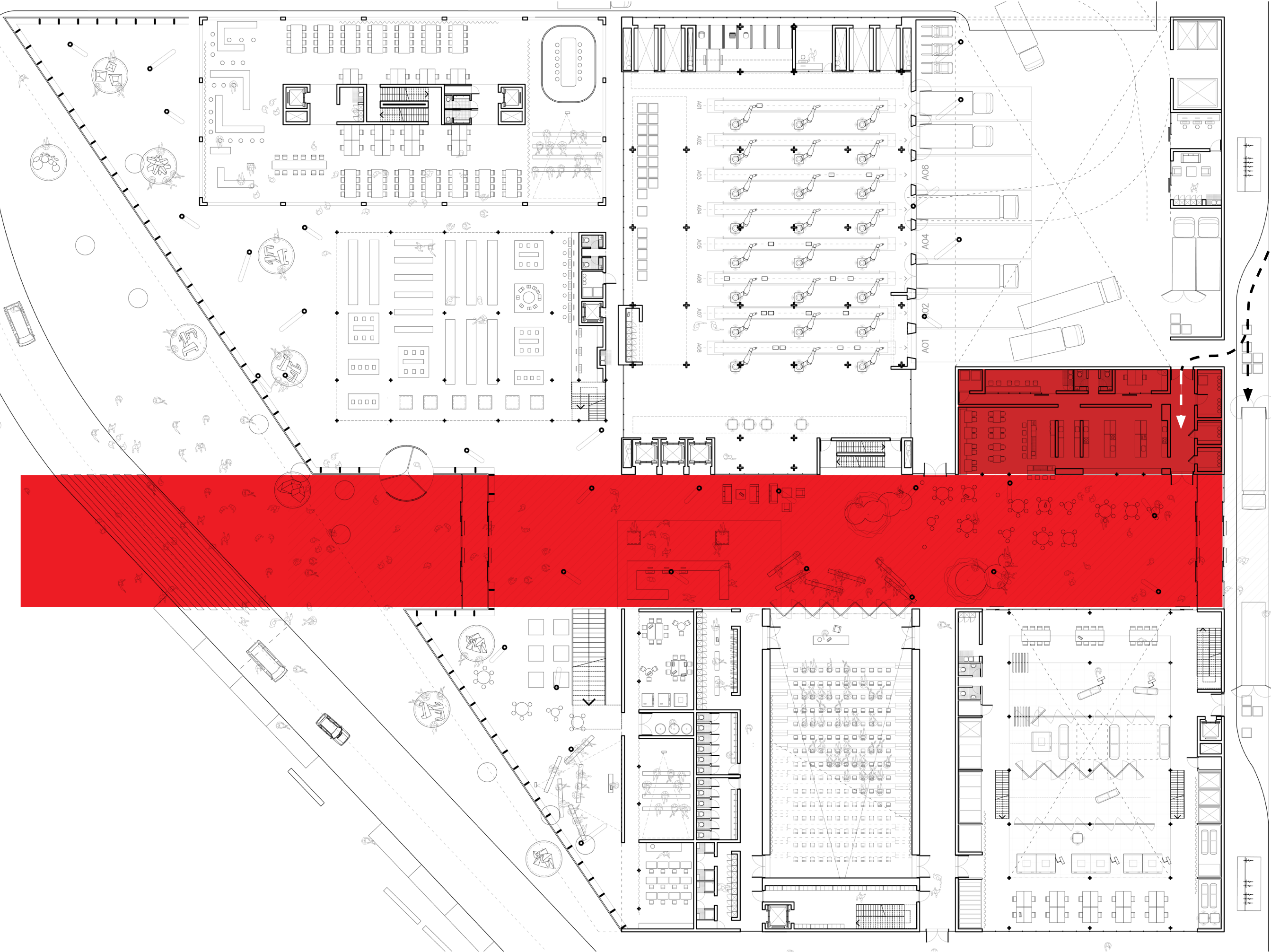


# LOADING BAY



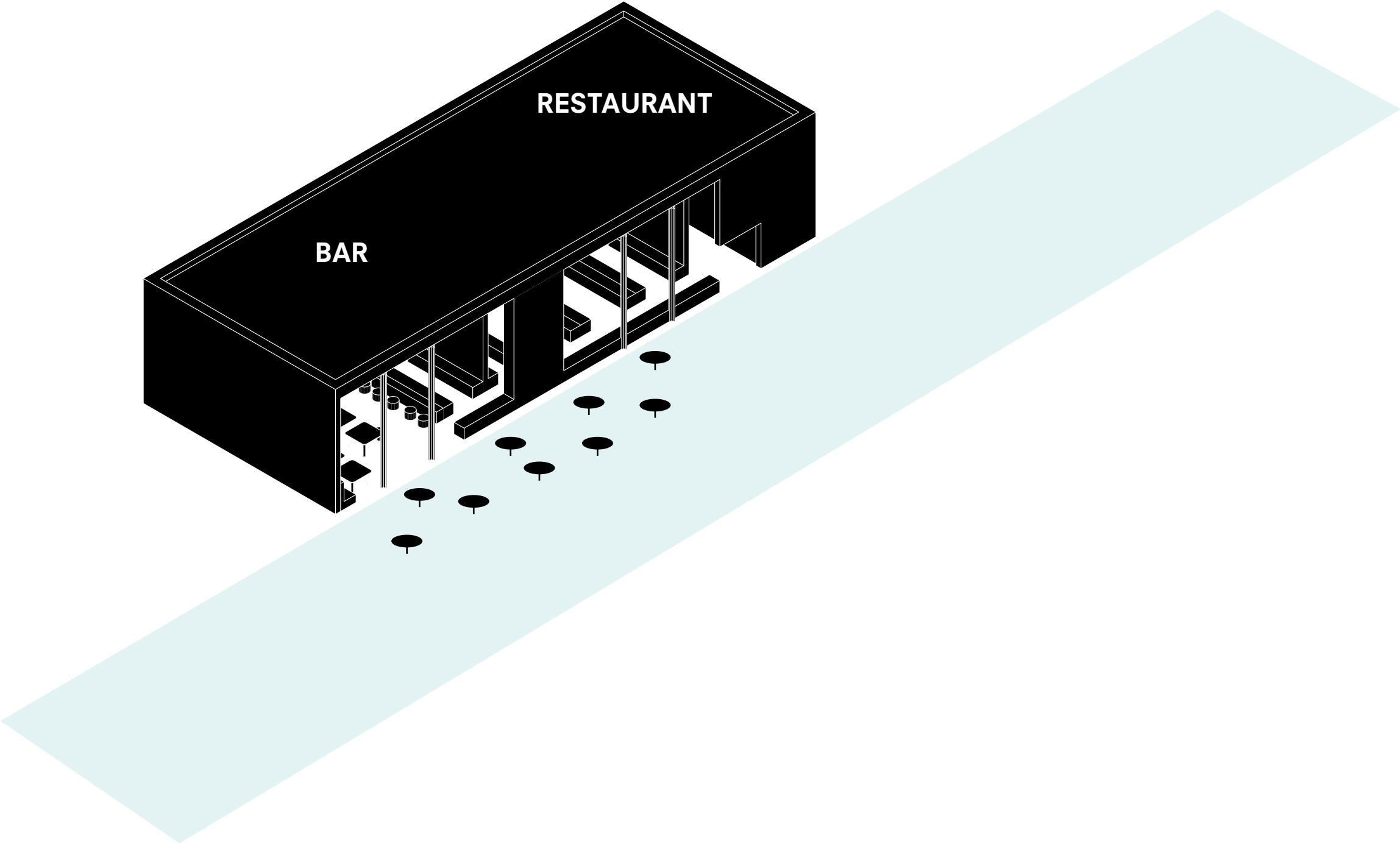


BAR + RESTAURANT

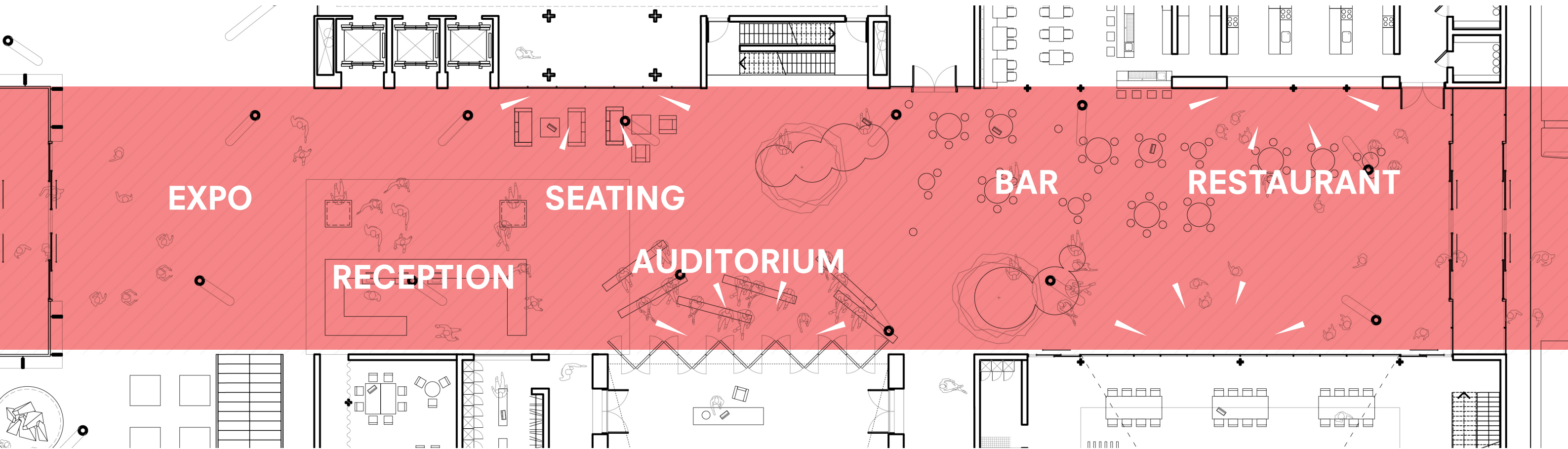




BAR + RESTAURANT



# PUBLIC SPINE







**PRODUCTION**



# VERTICAL LAYERING



**FABRICATION**



# VERTICAL LAYERING



# VERTICAL LAYERING





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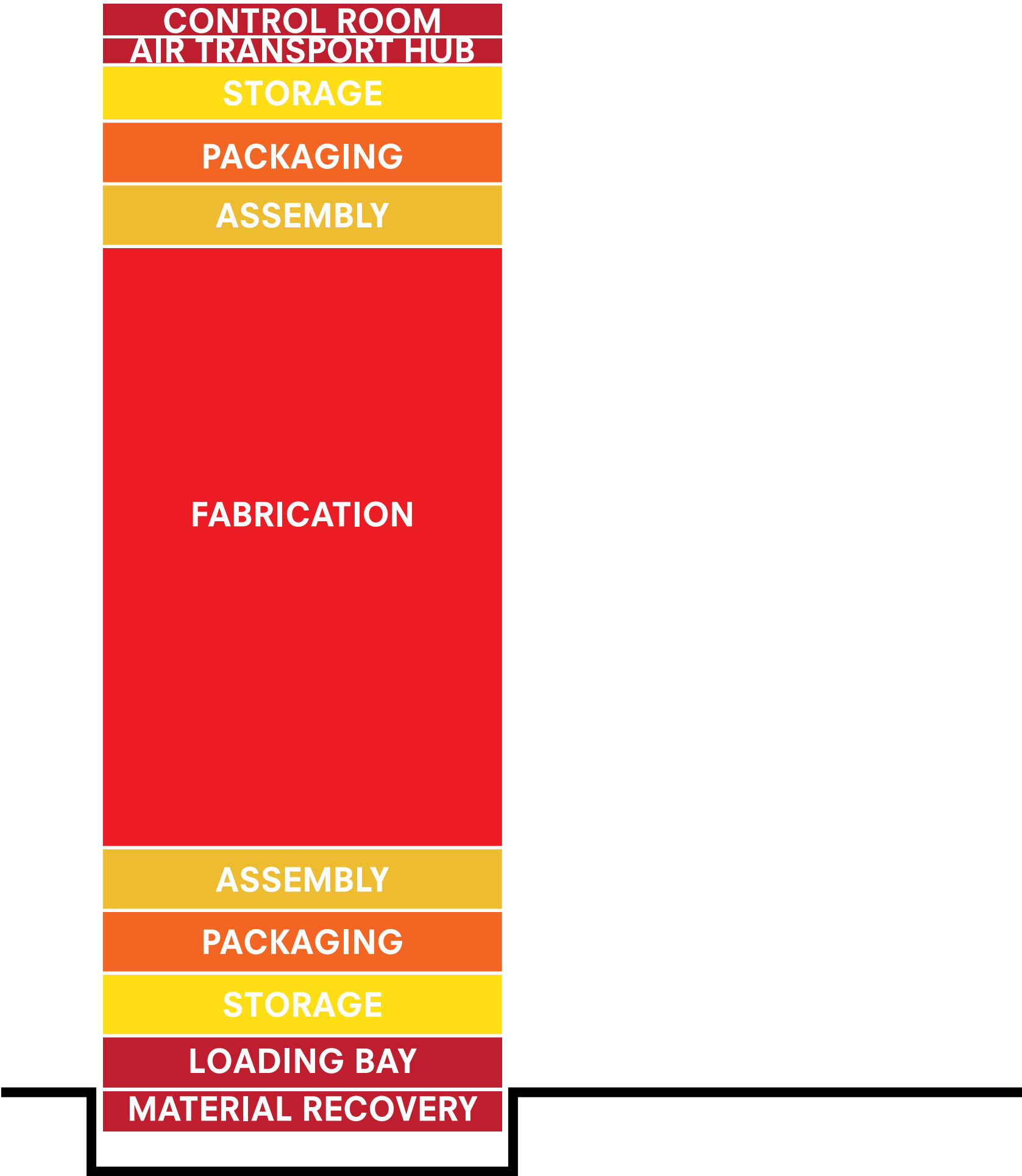




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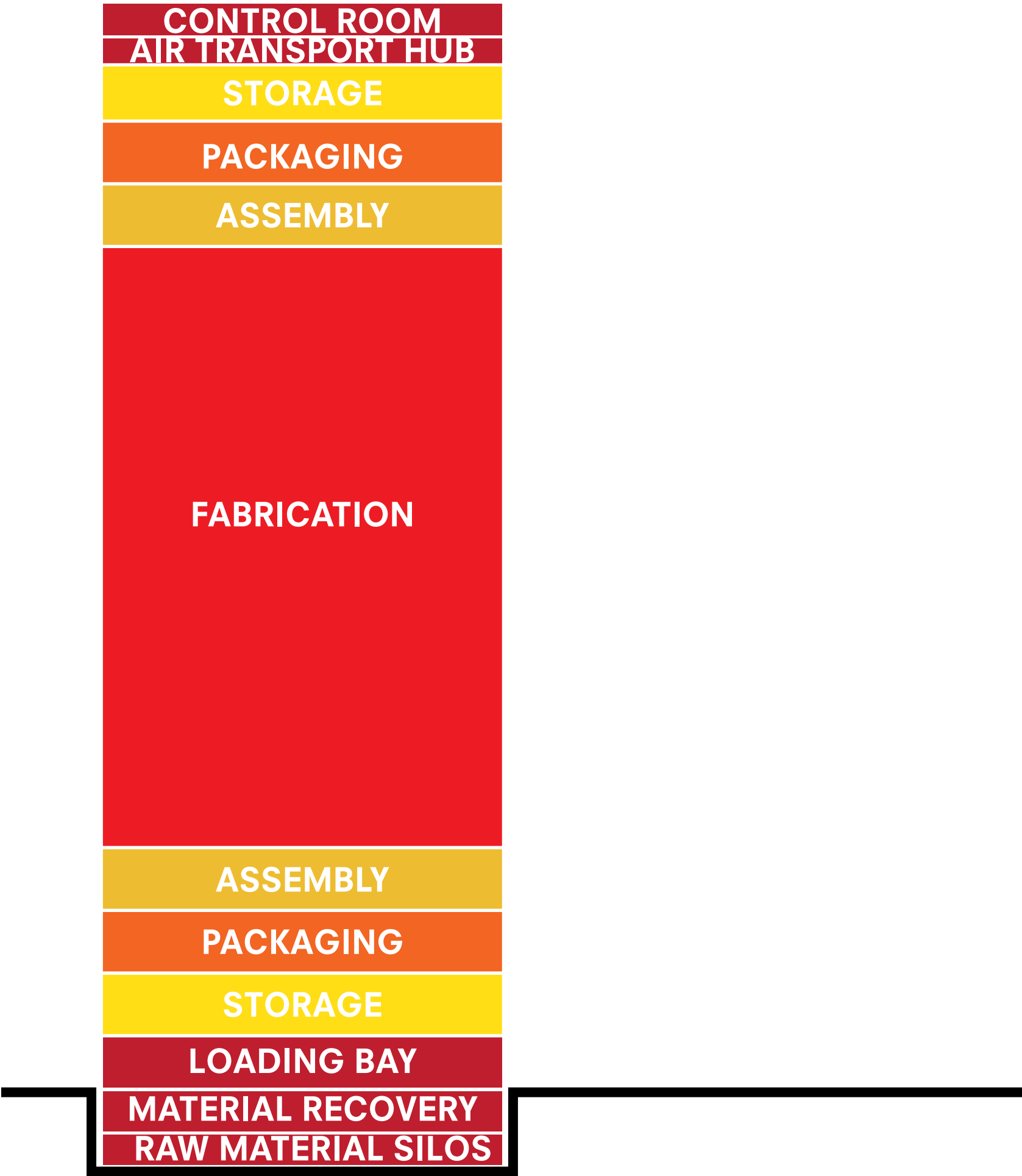


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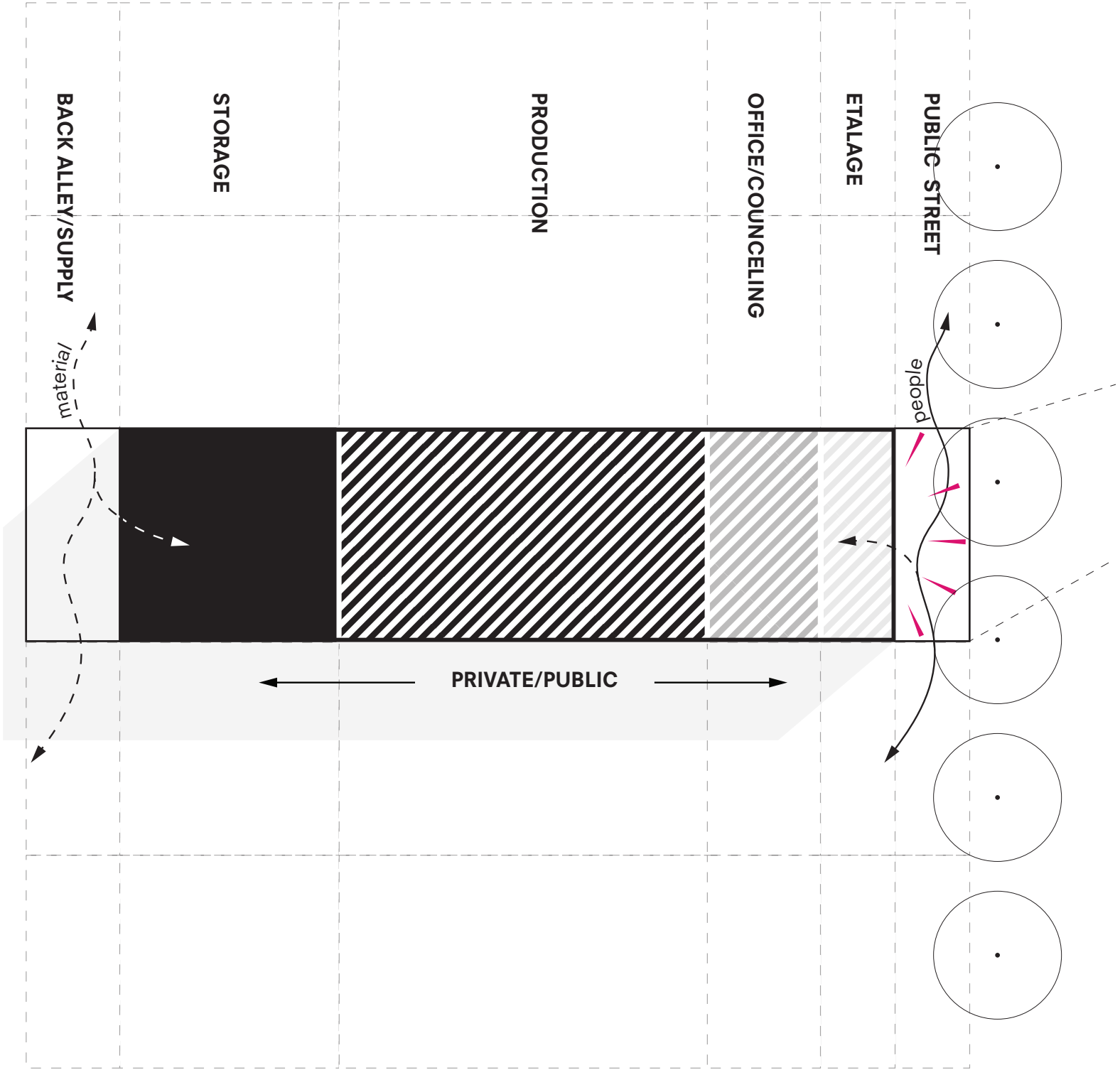




# VERTICAL LAYERING



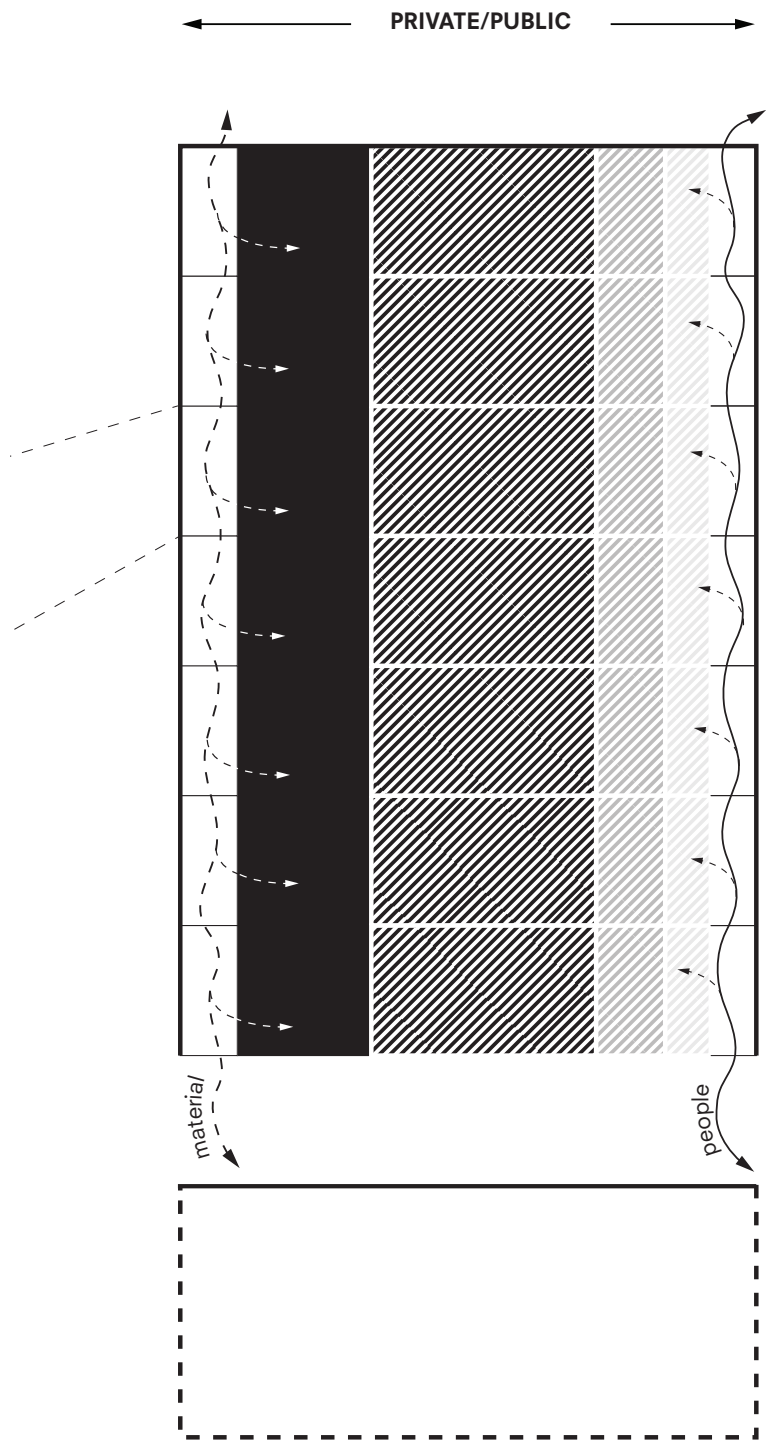
# HORIZONTAL LAYERING



CRAFTMANS' WORKSHOP  
(PLAN)



# HORIZONTAL LAYERING



URBAN MANUFACTORY  
(SECTION)

# ACCESSABILITY CORE





# LOBBY & SHOWCASE

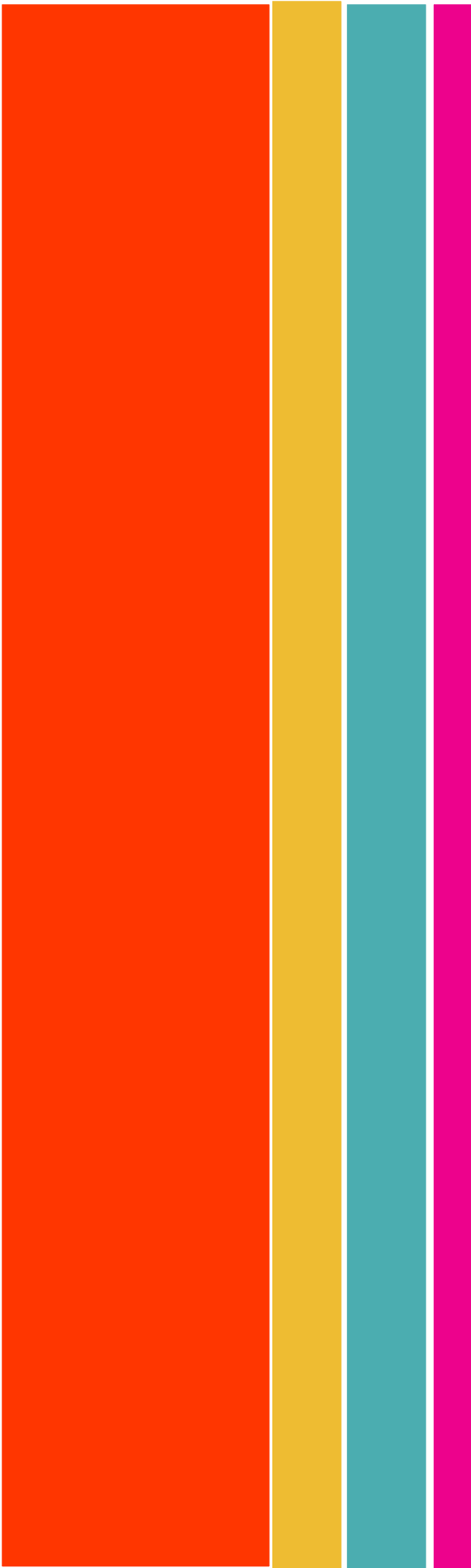


# COUNSELING





# PRODUCTION FLOOR

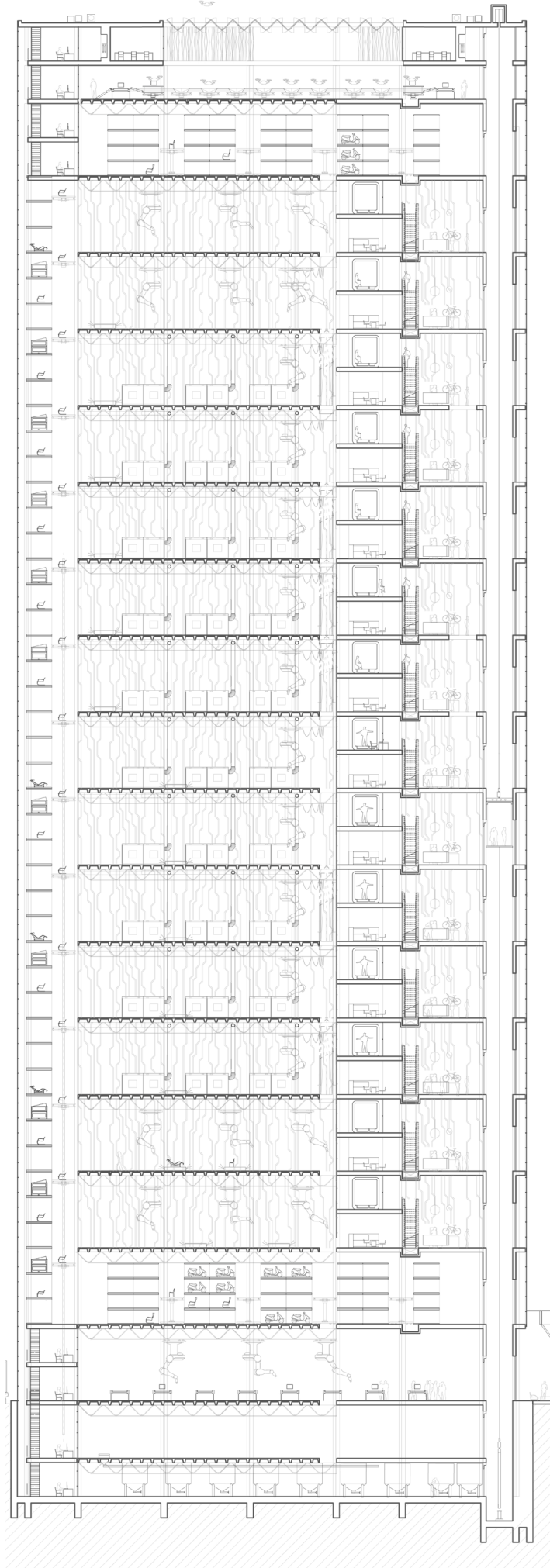


# LOGISTICAL CORE

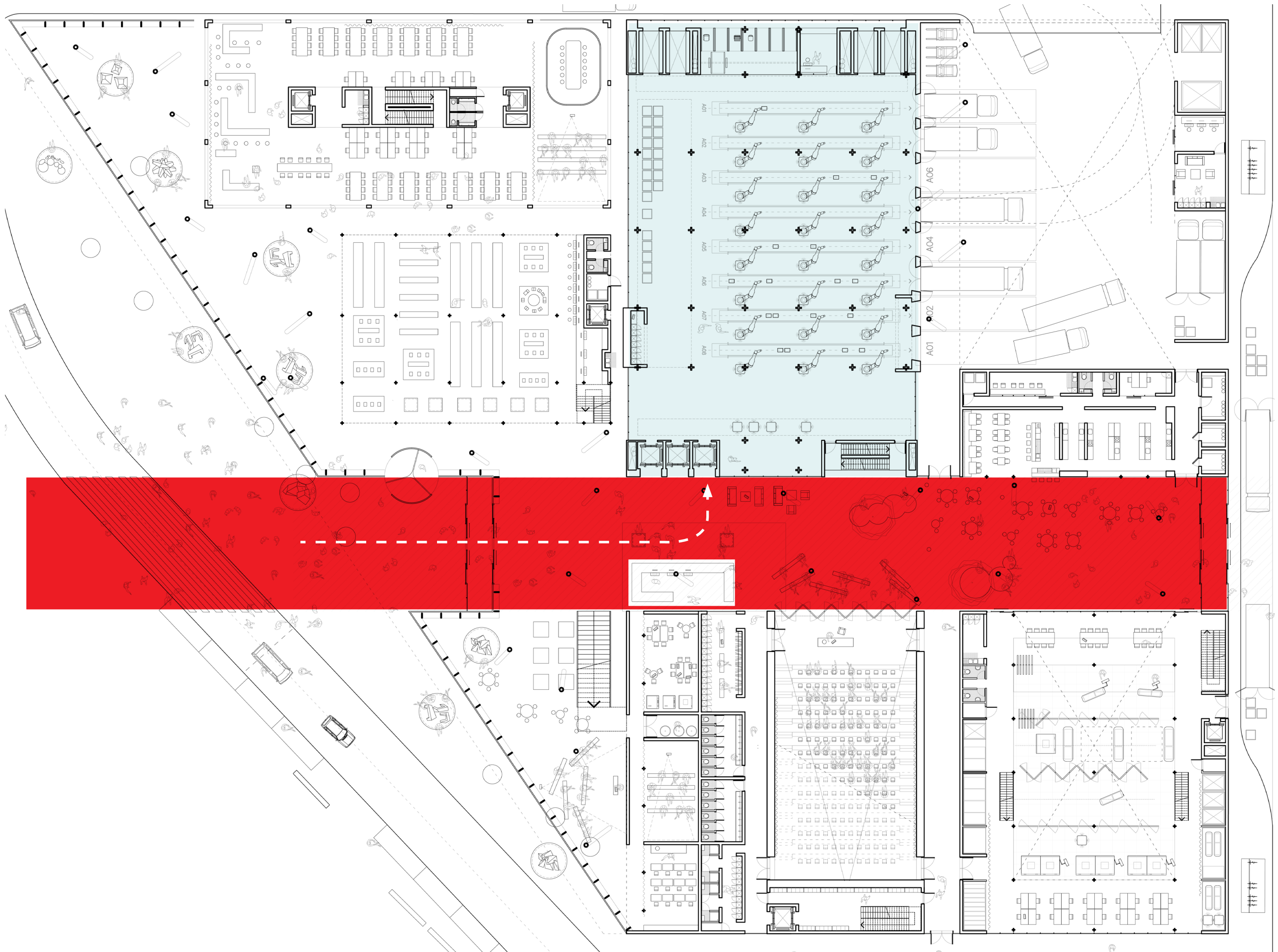




# PRODUCTION TOWER

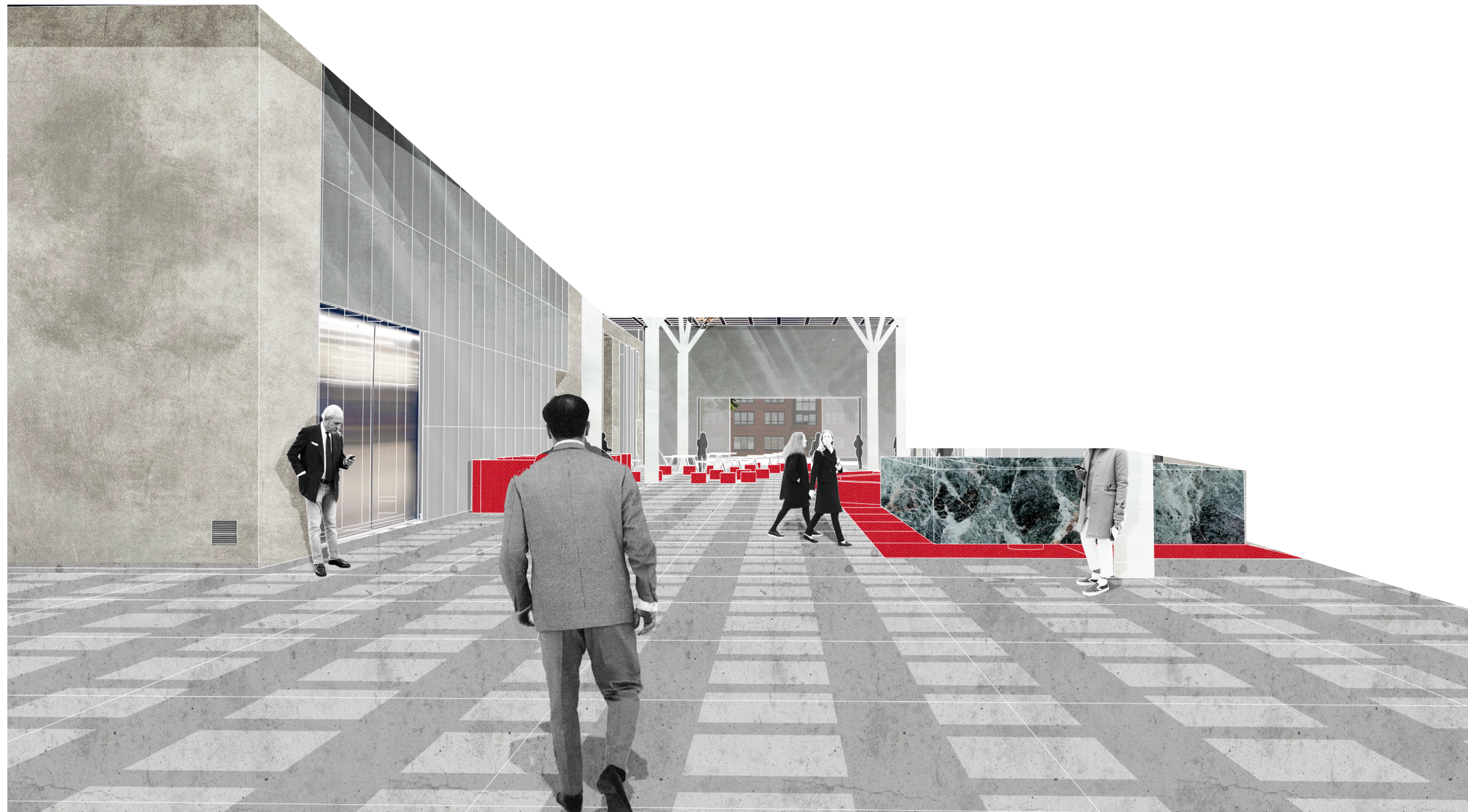


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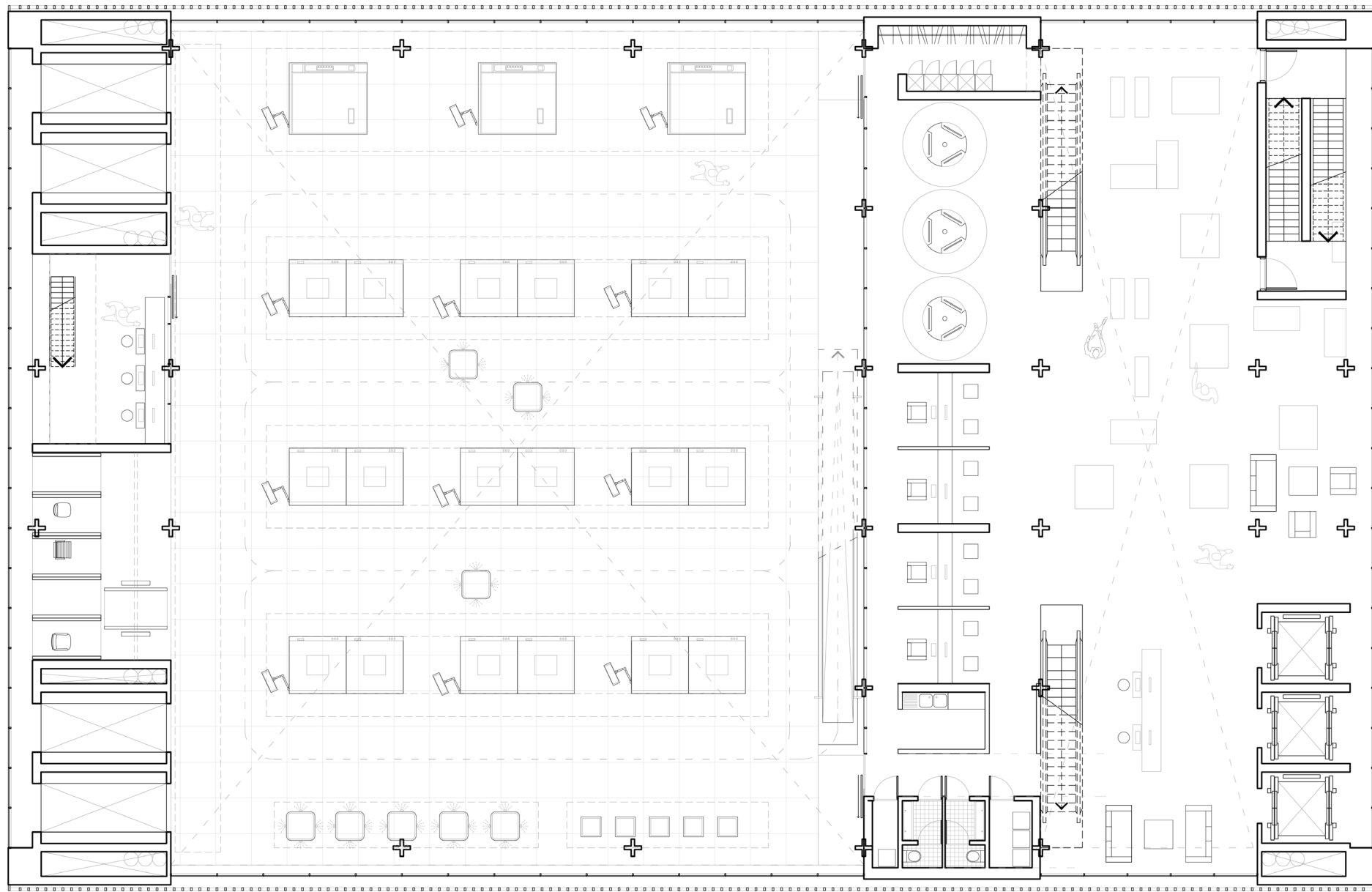




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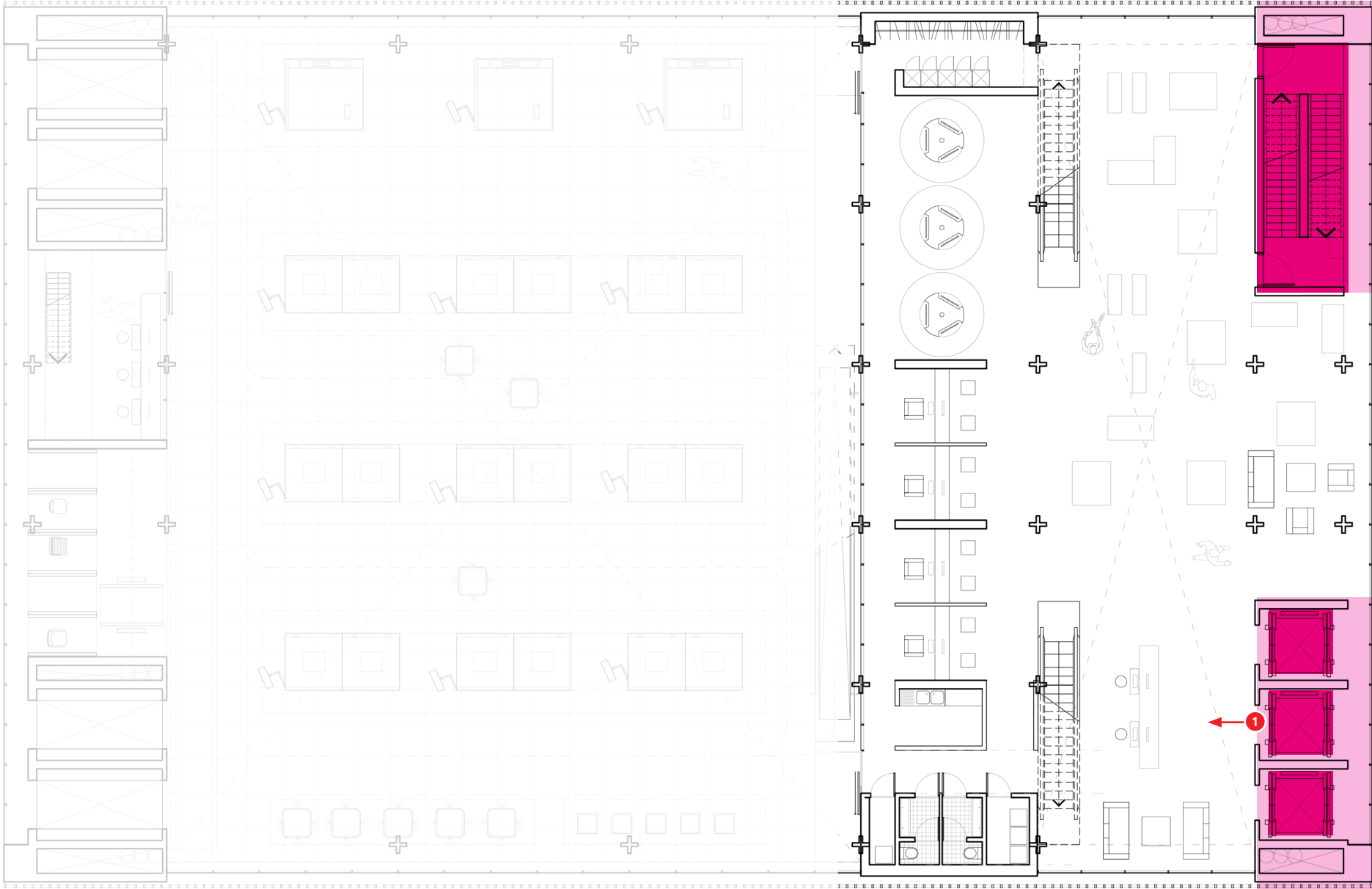


# TYPICAL FLOORPLAN



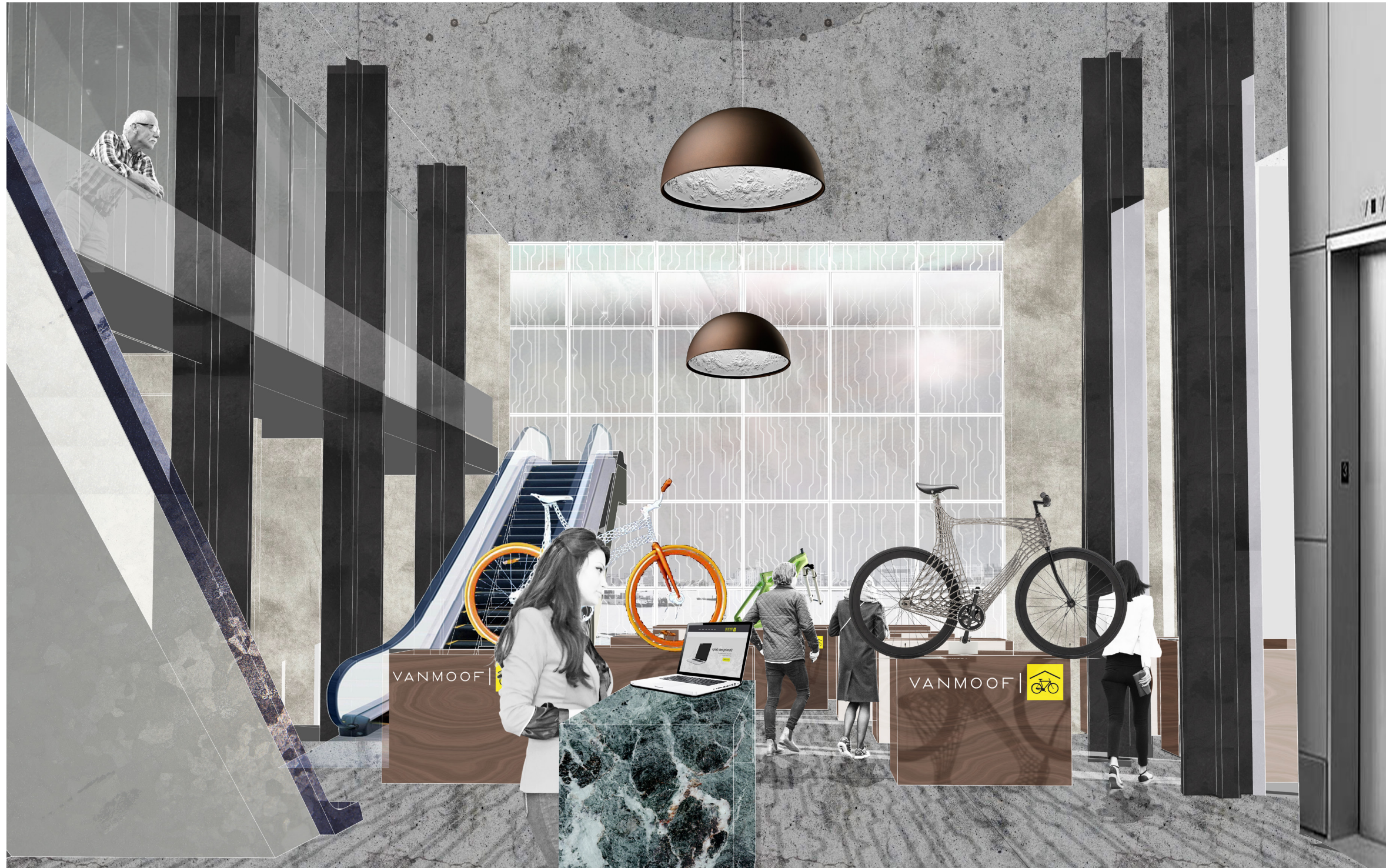


ENTRANCE



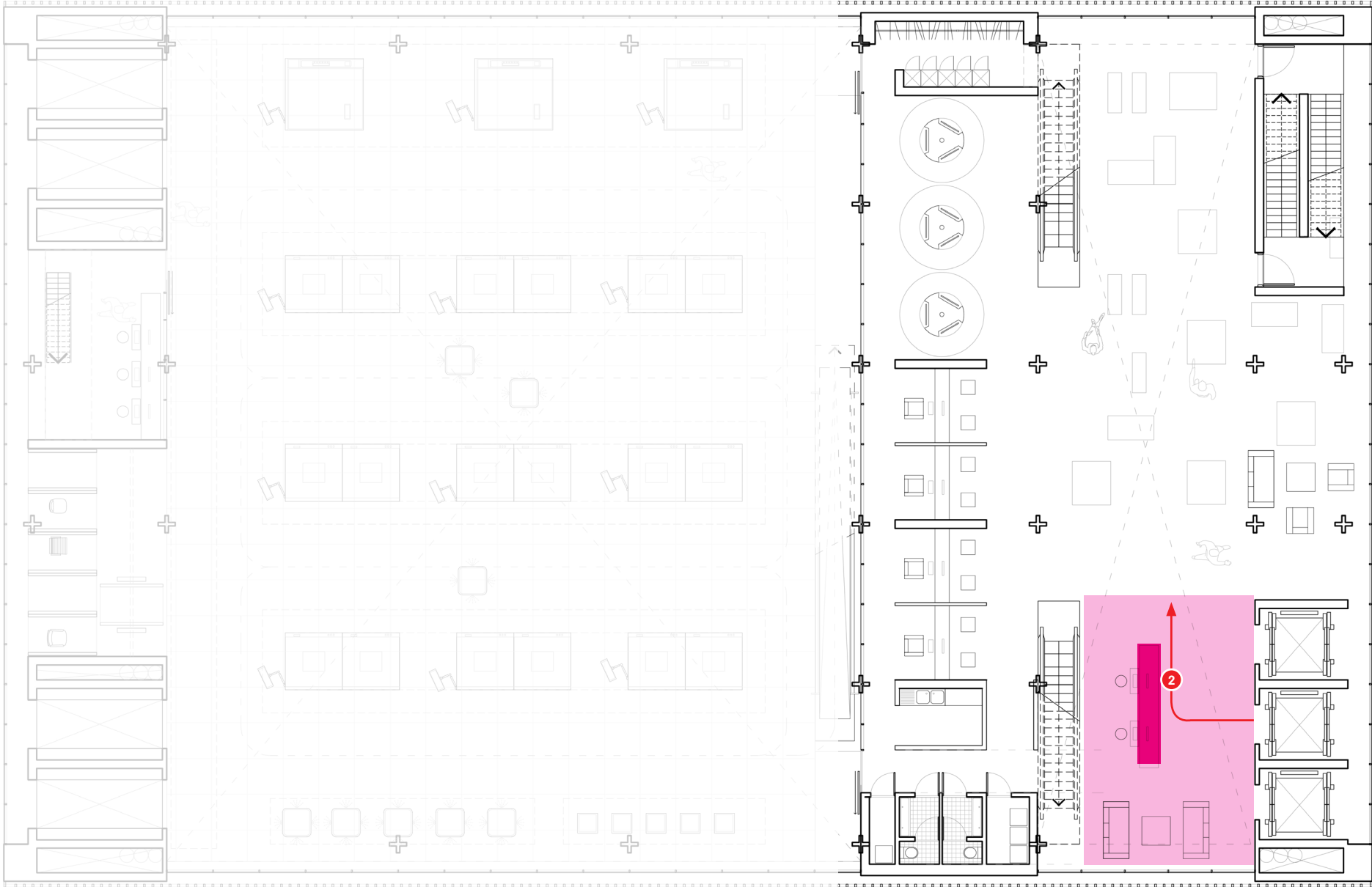


# MANUFACTURERS LOBBY

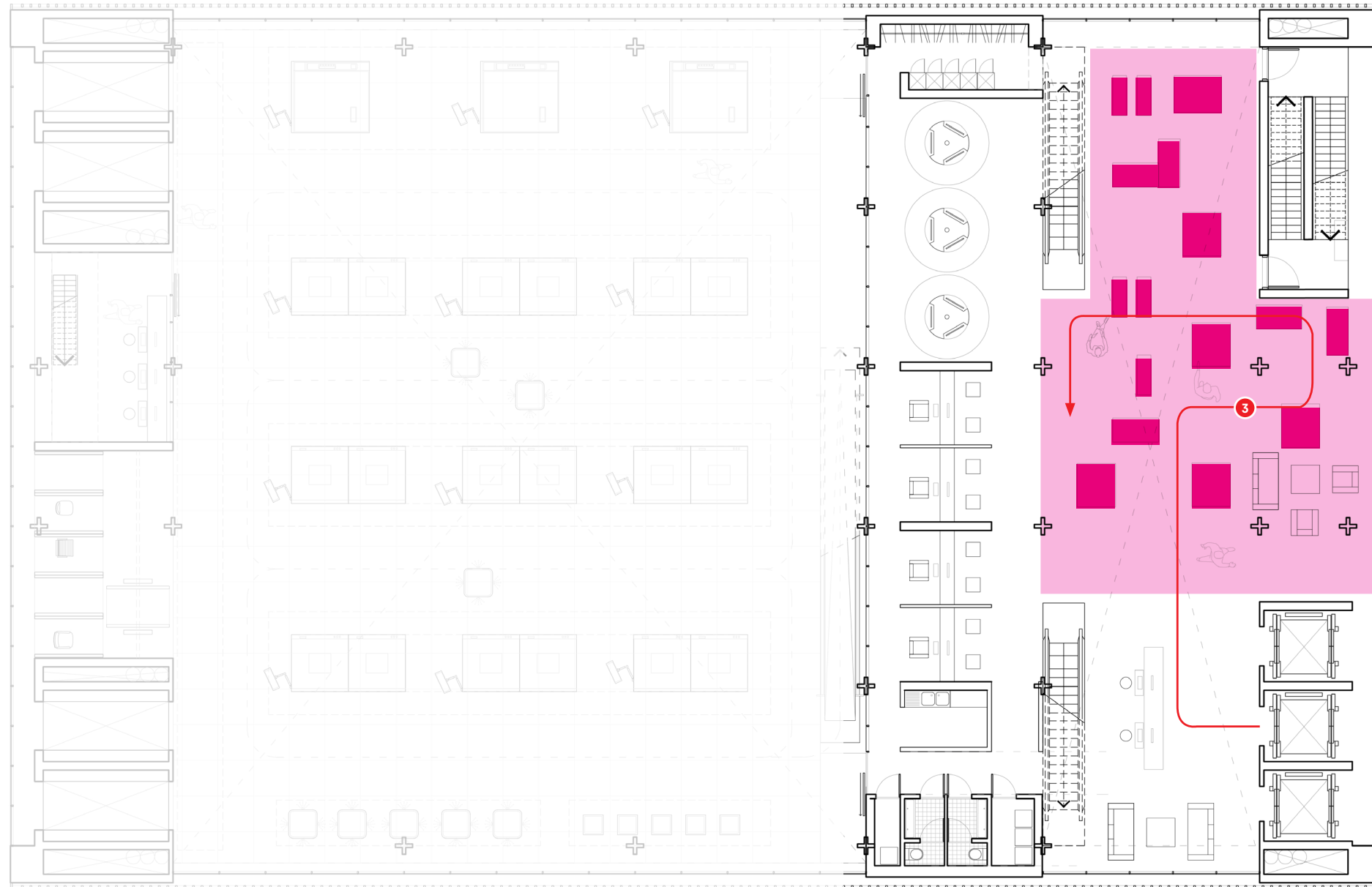




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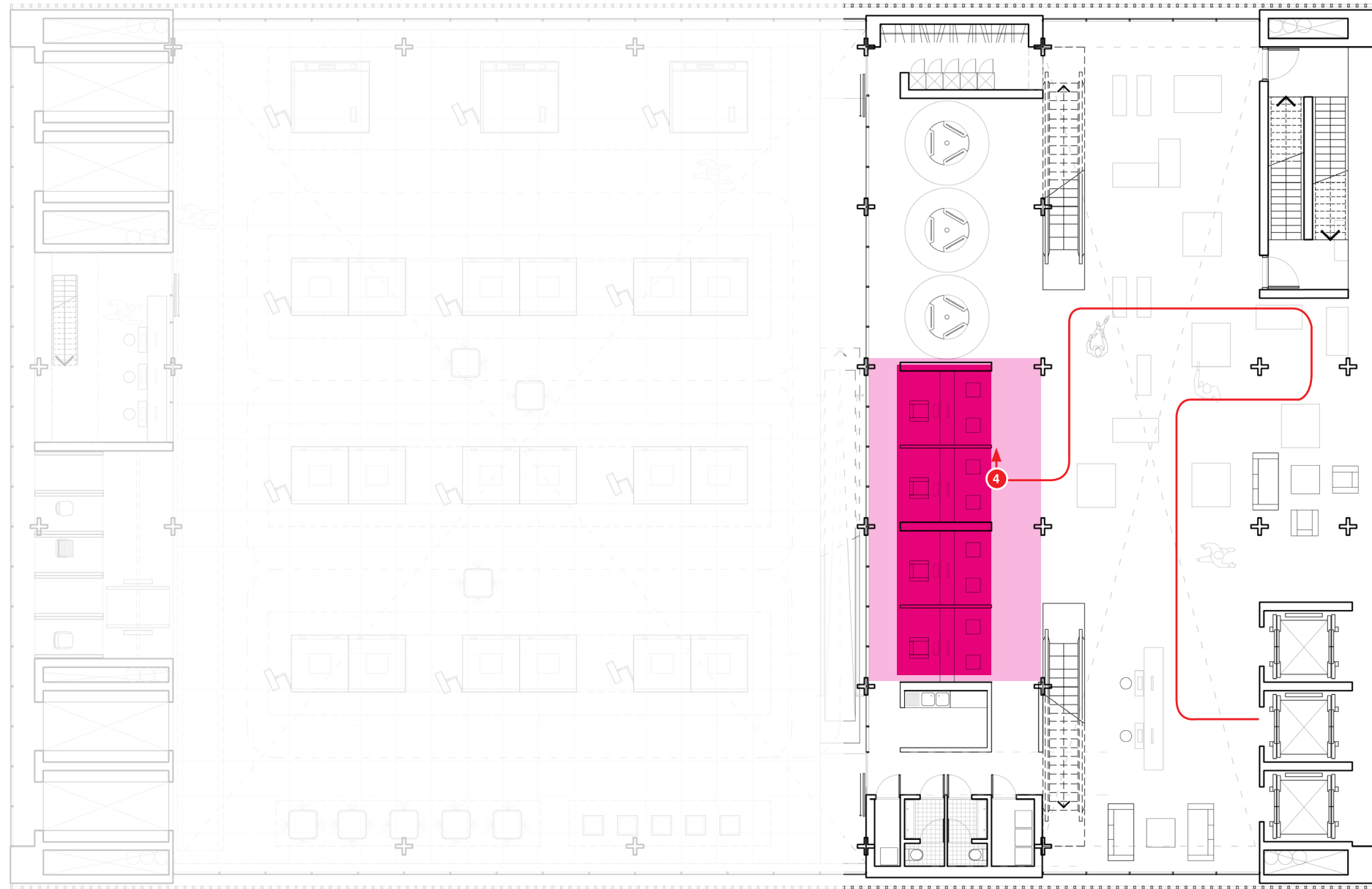


# SHOWCASE

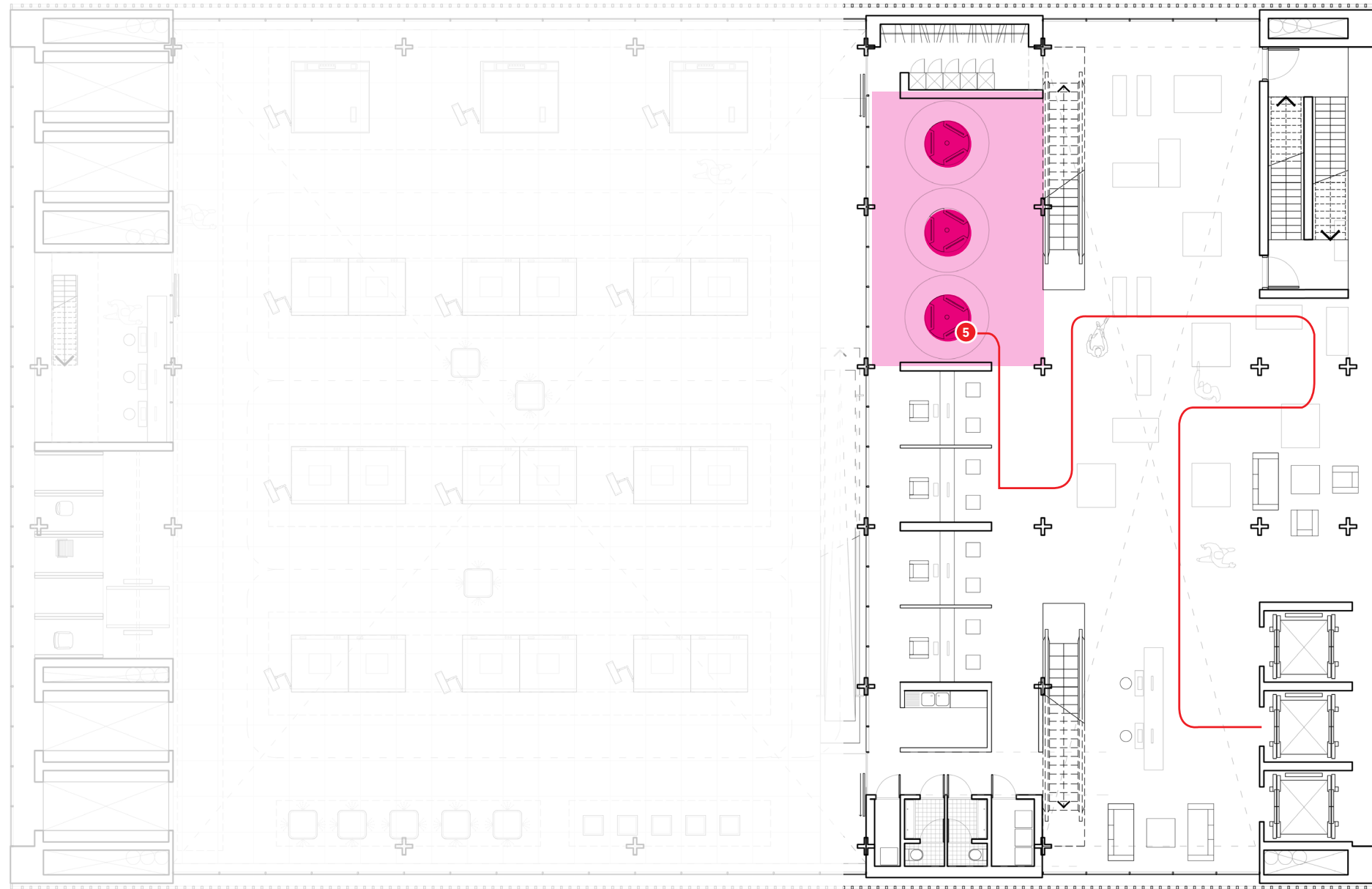




# COUNCELING

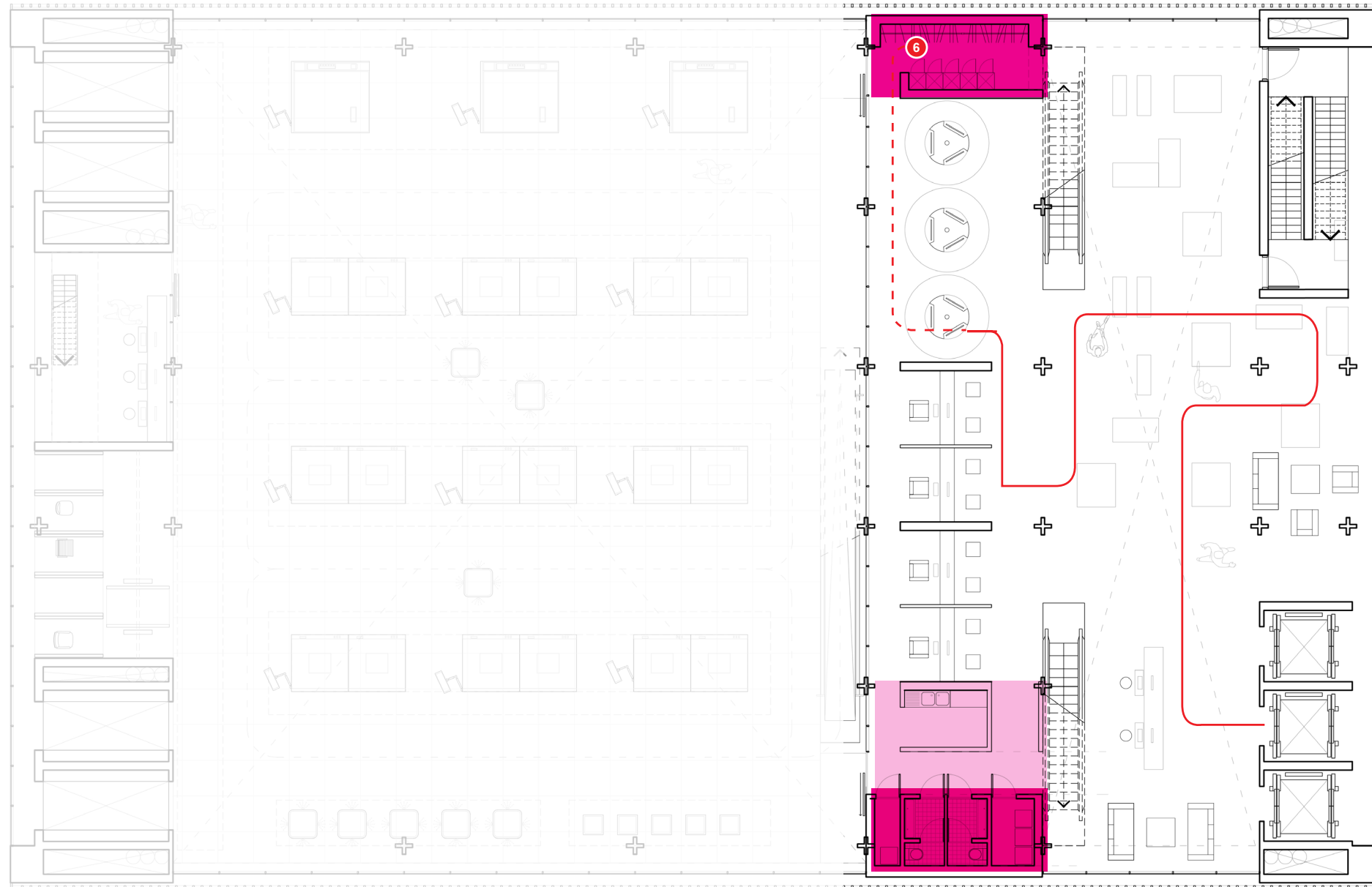


# BOOTH

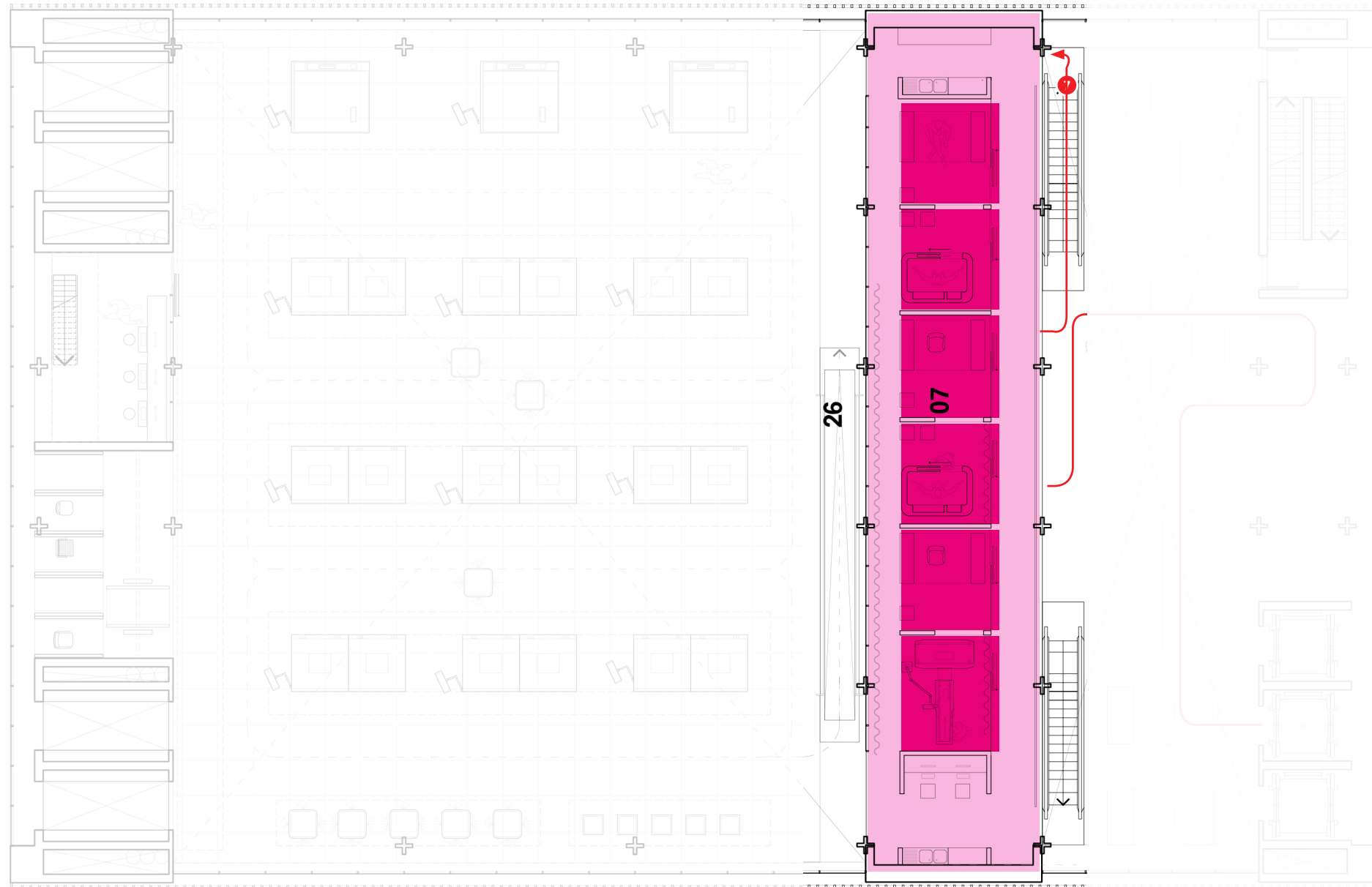




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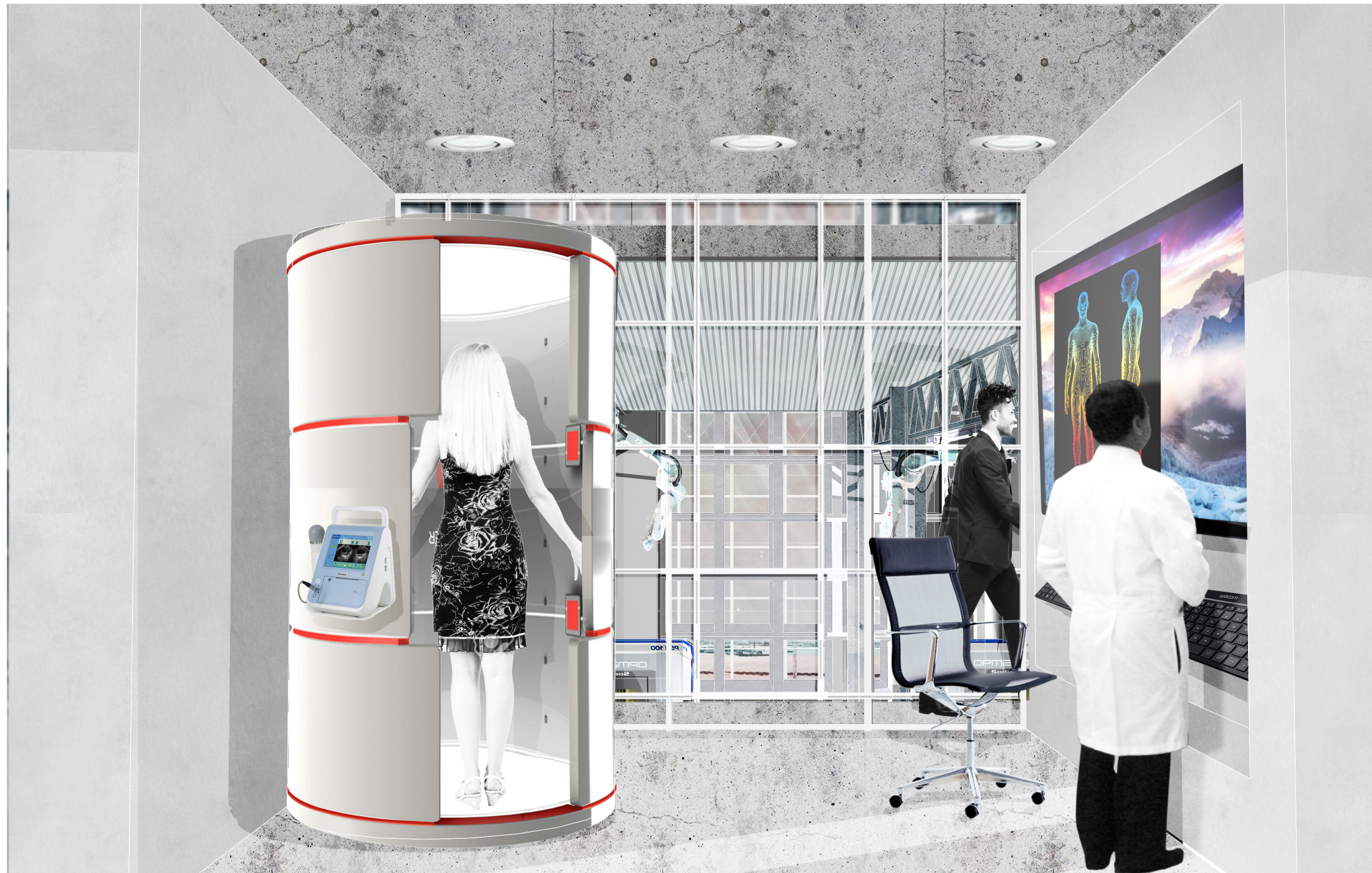


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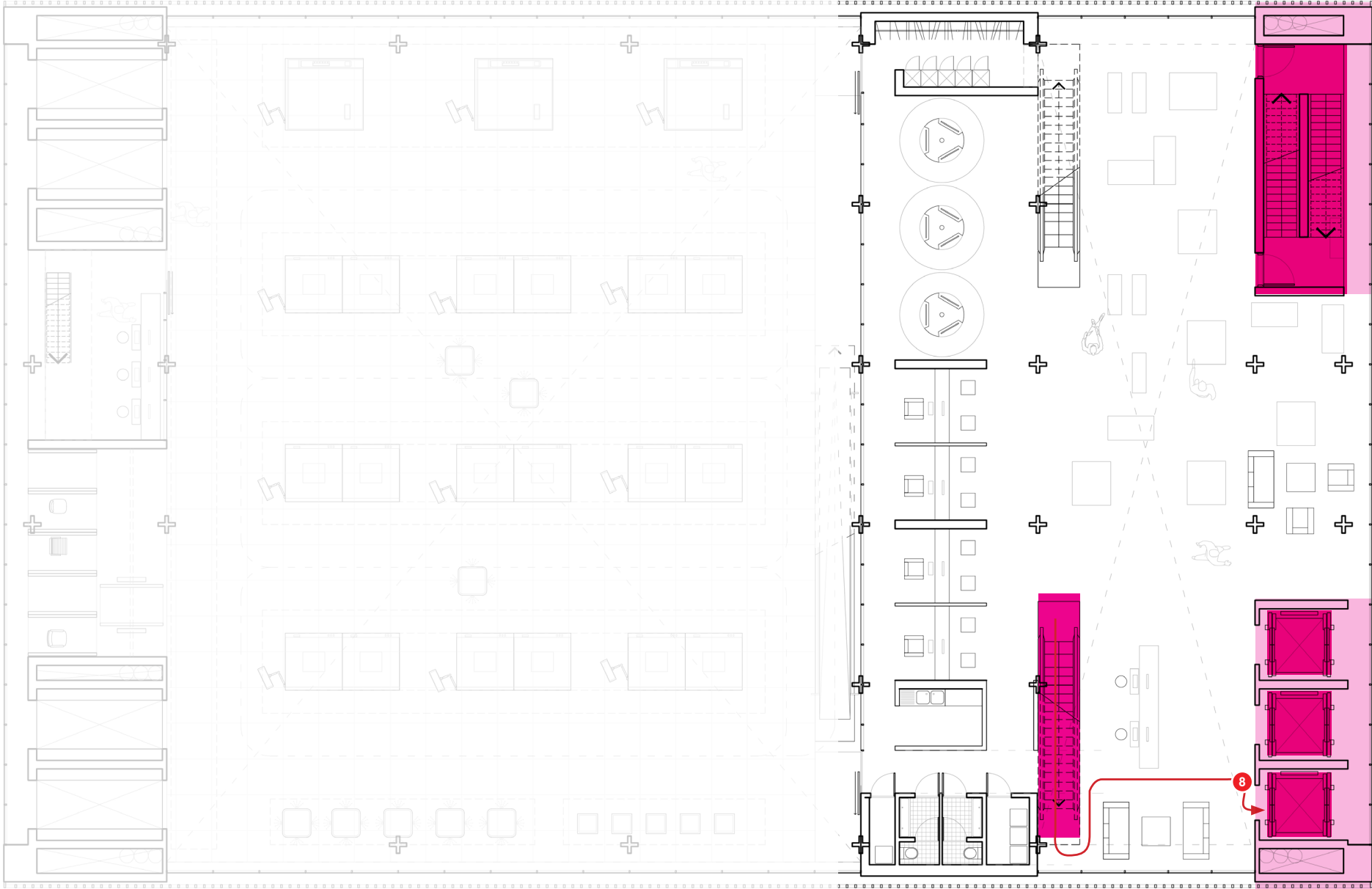




# ANALYSIS

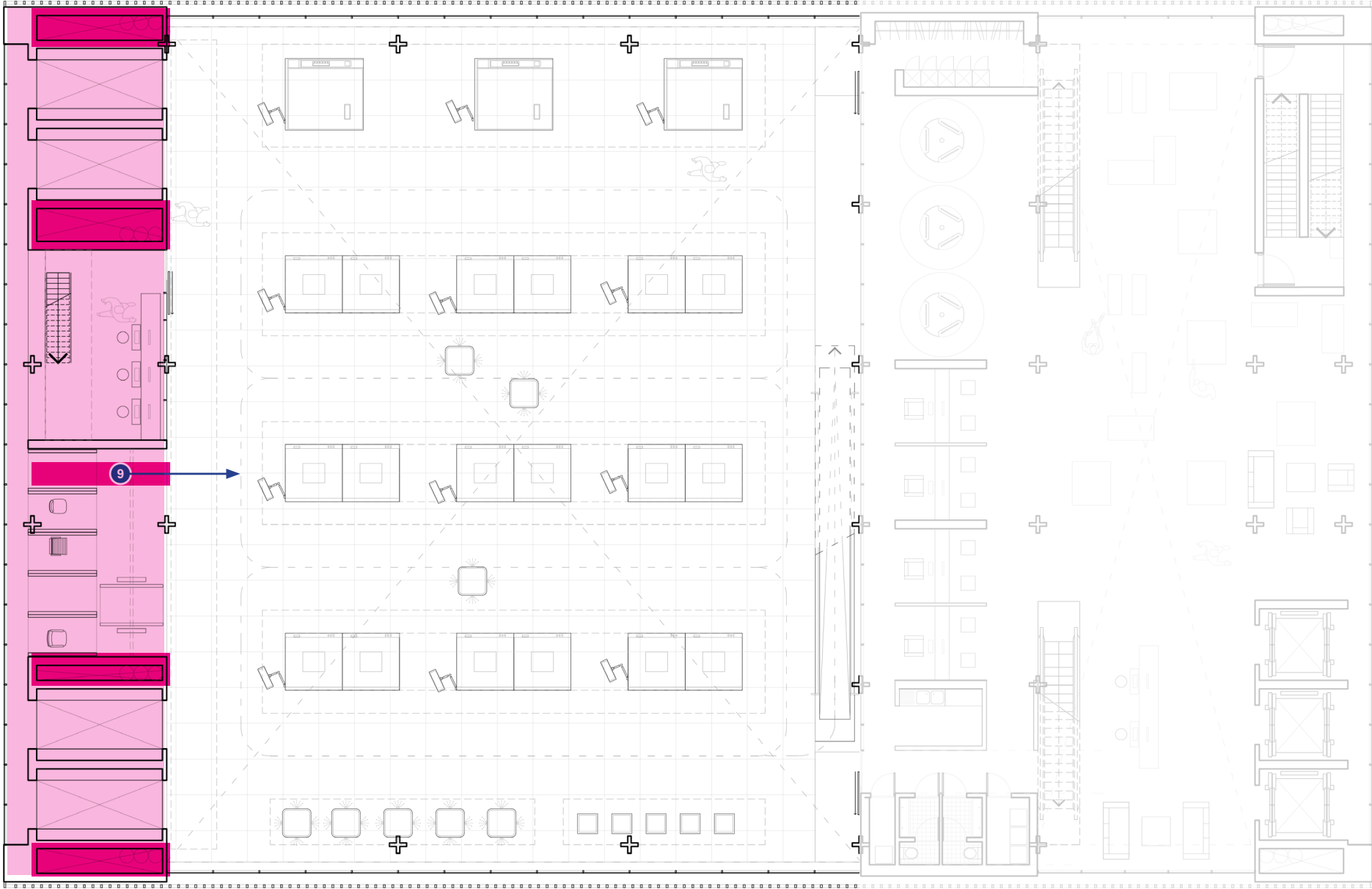


EXIT





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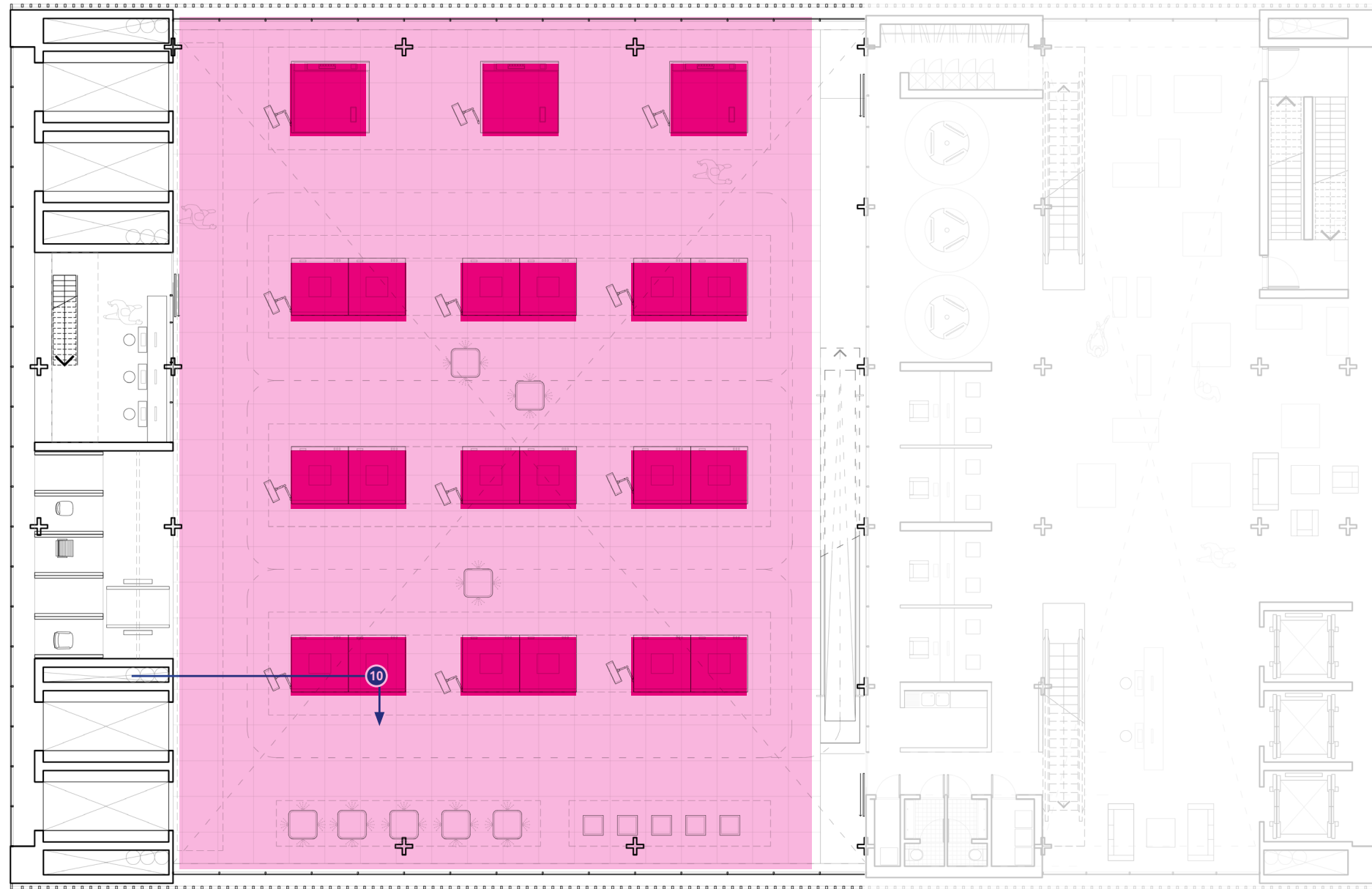


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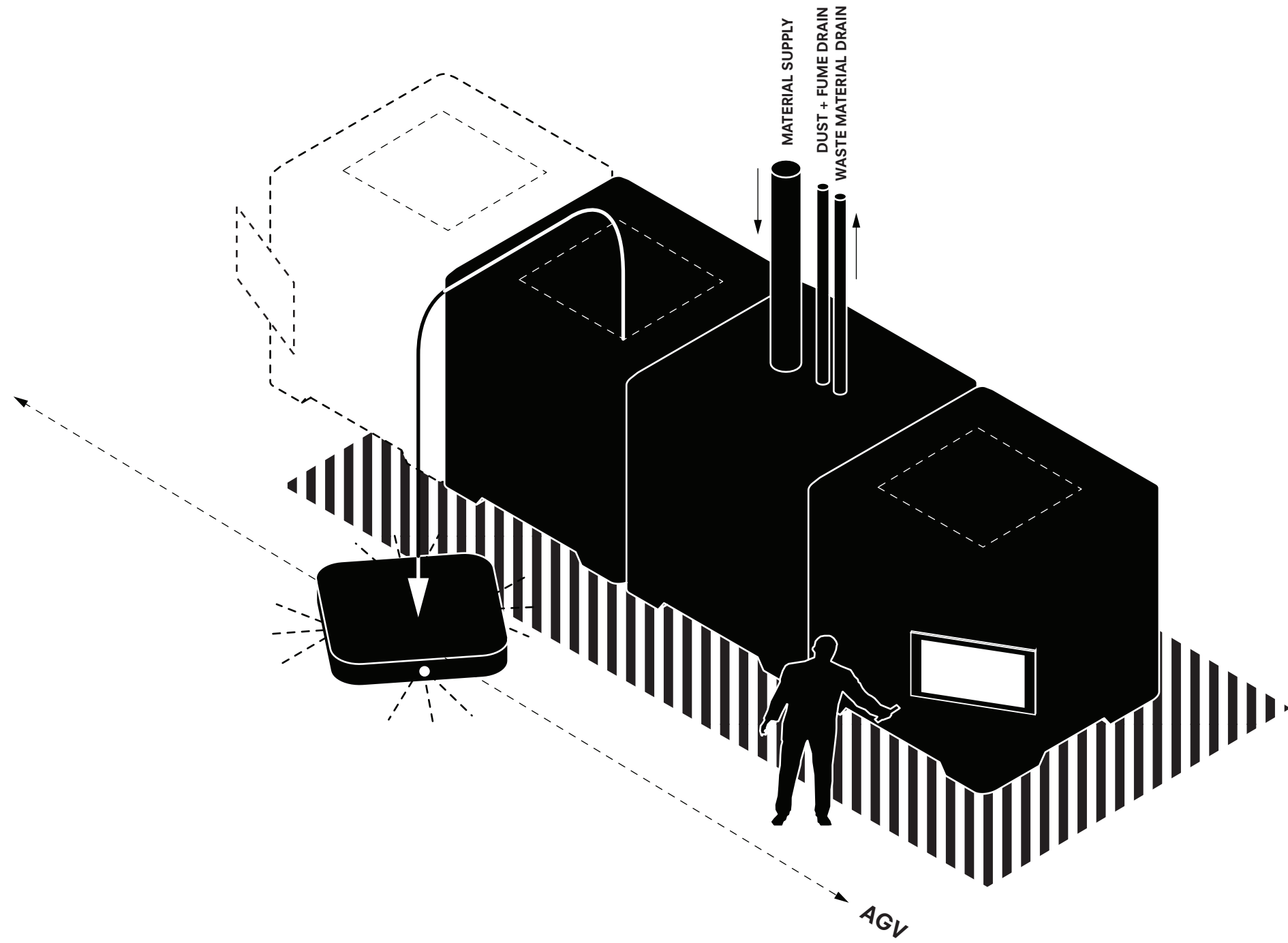




# FABRICATION



# AM

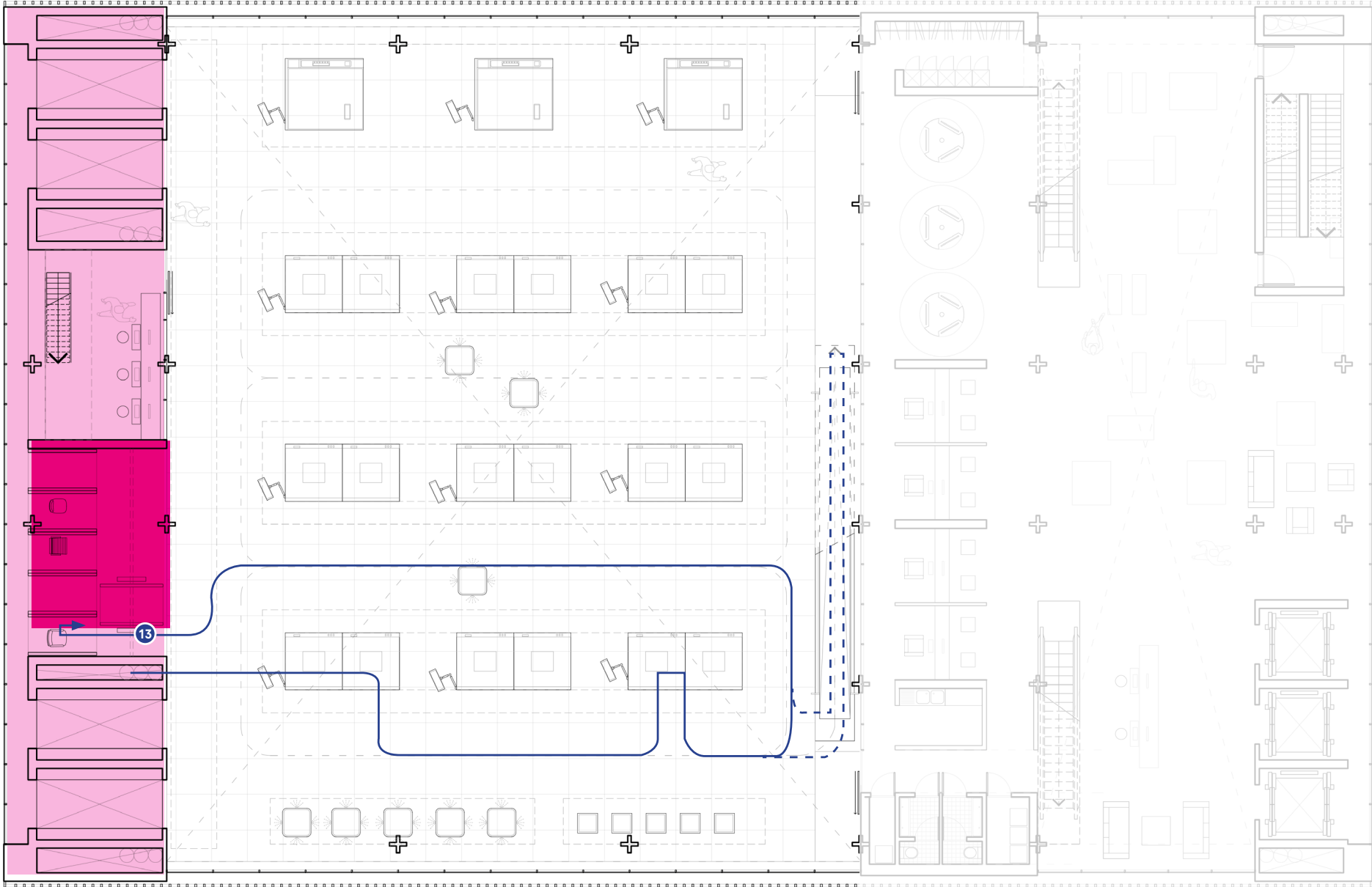




# PRODUCTION FLOOR

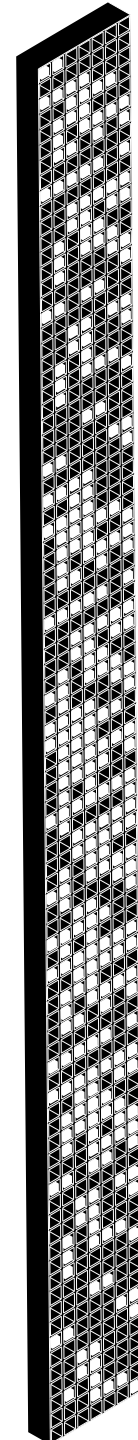


# LIVE STORAGE

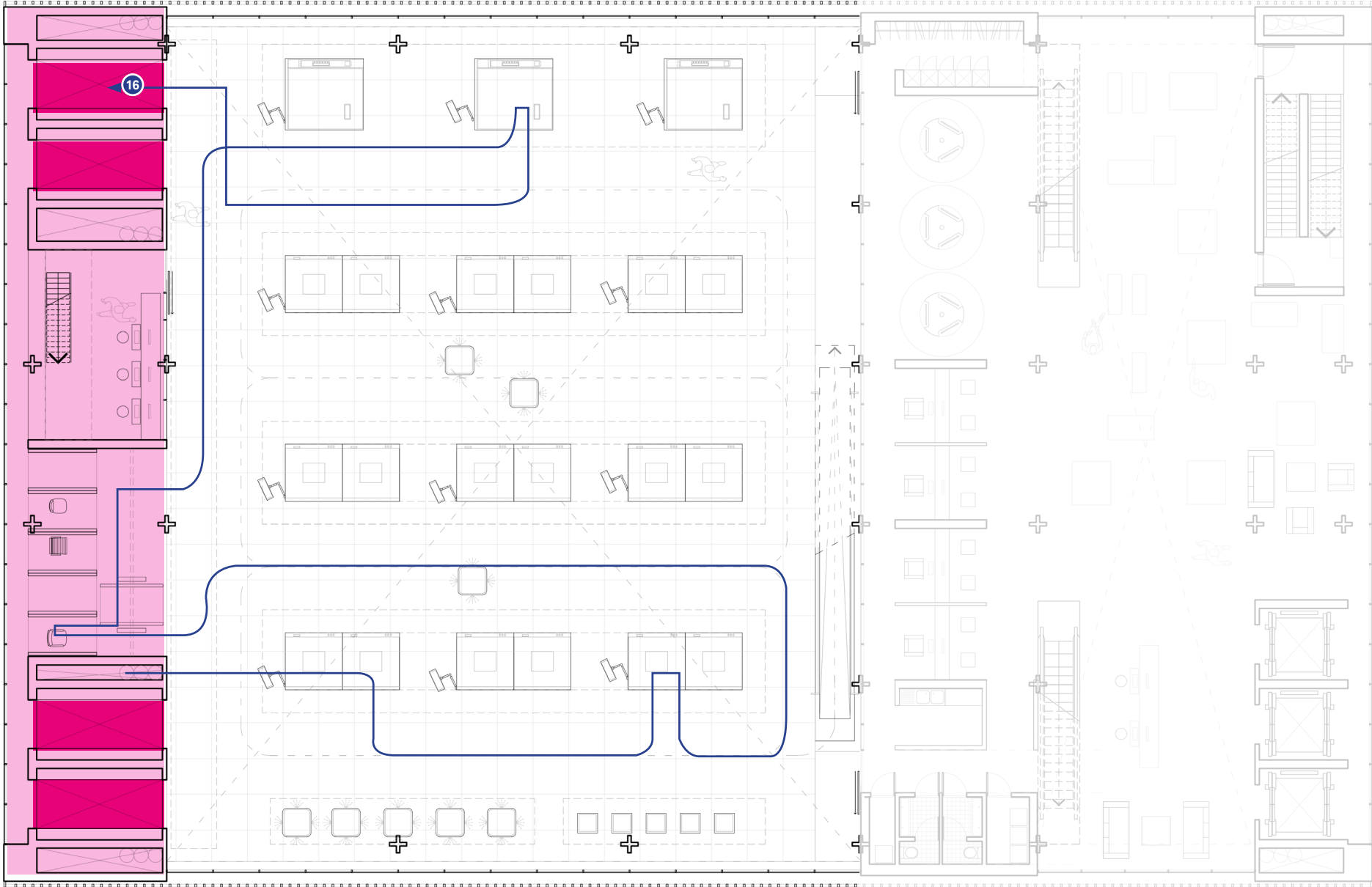




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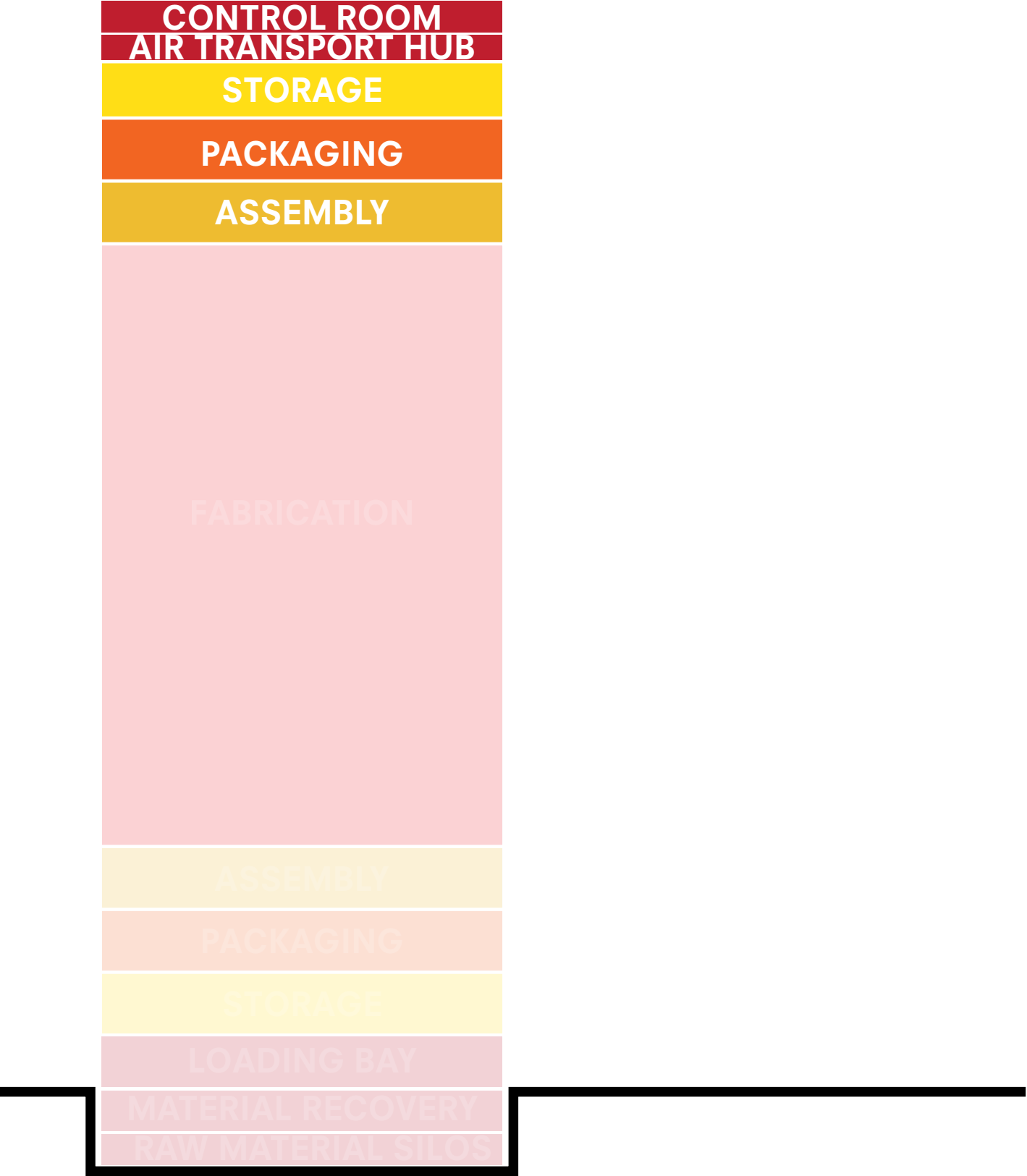


EXIT



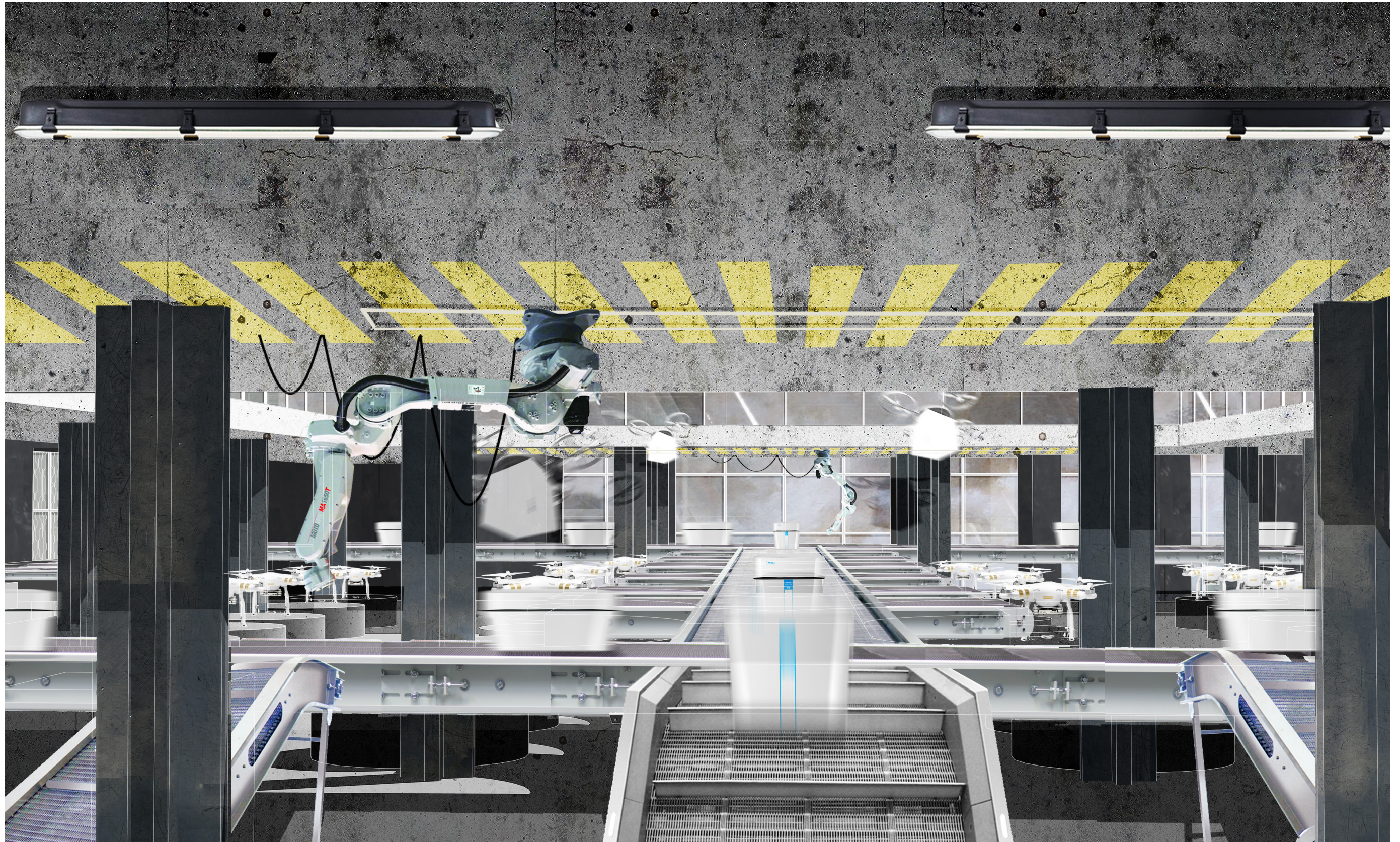


# AIR TRANSPORT HUB





# AIR TRANSPORT HUB





# SKYBAR & CONTROL ROOM



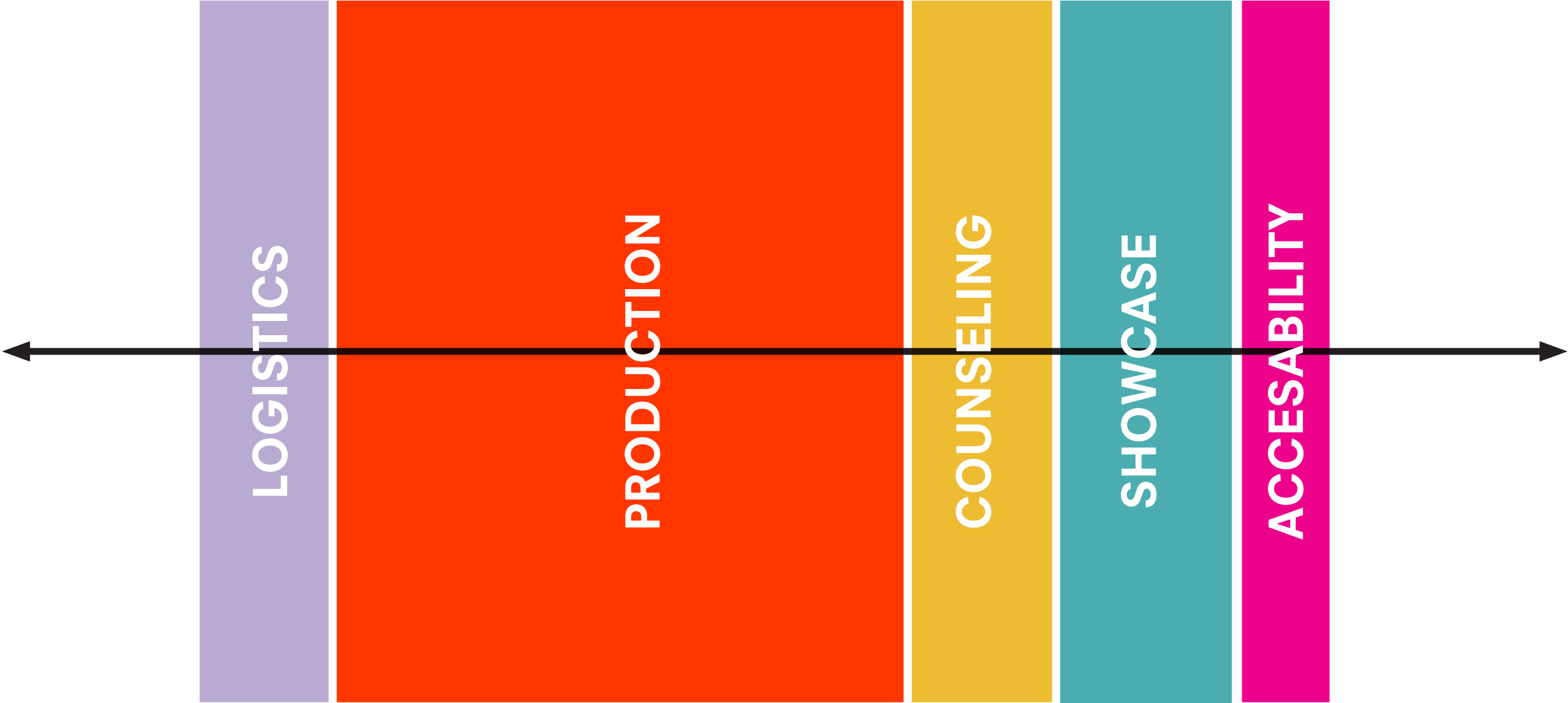




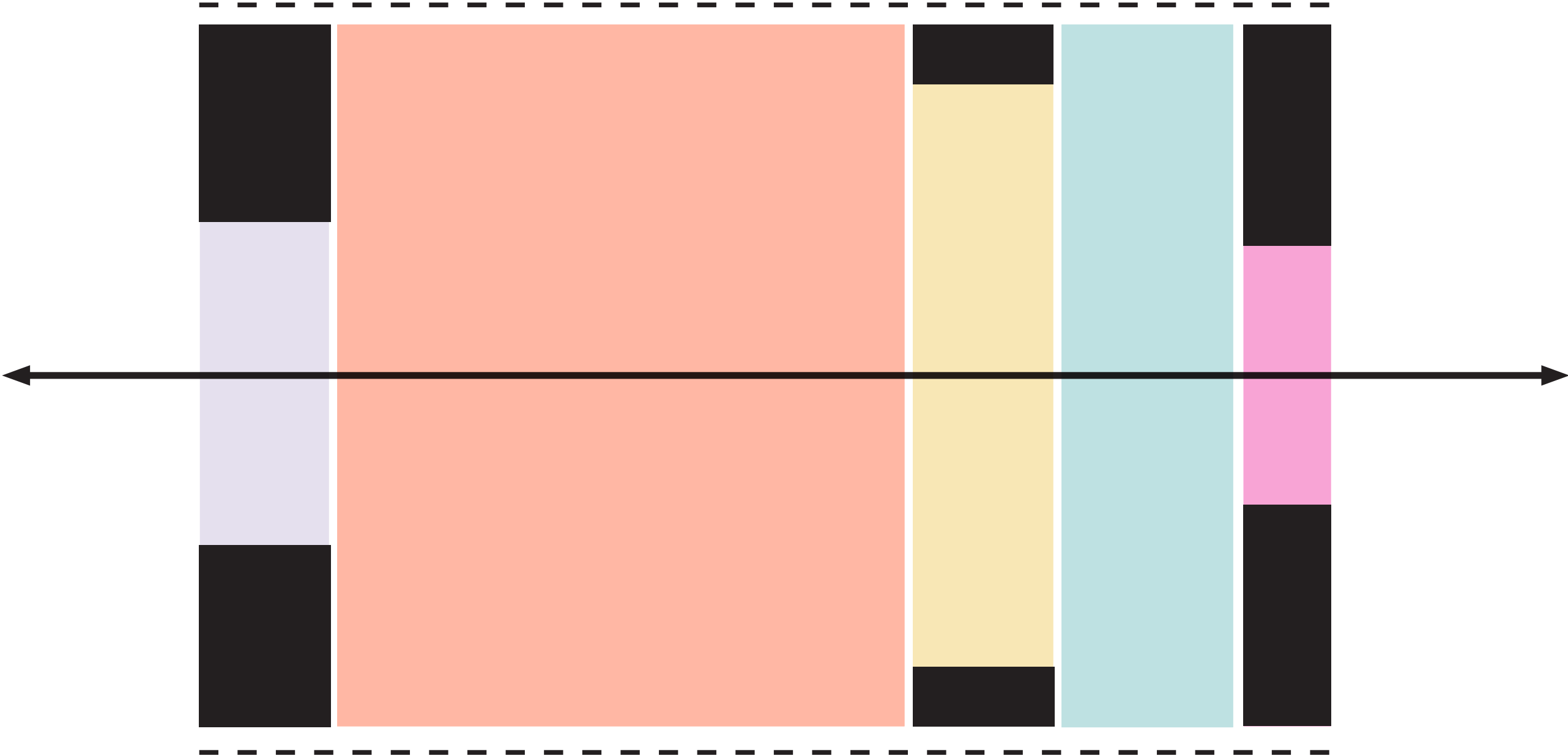
**EXPRESSION**



DIRECTION



DIRECTION





# DIRECTION



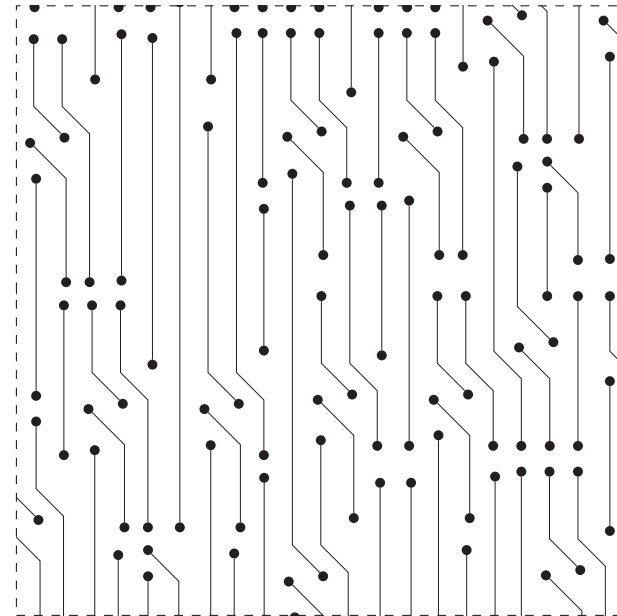
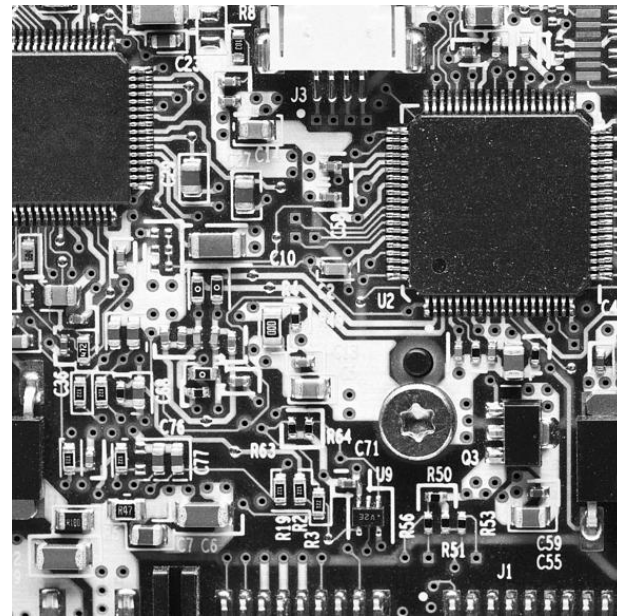


# TWO FACADES

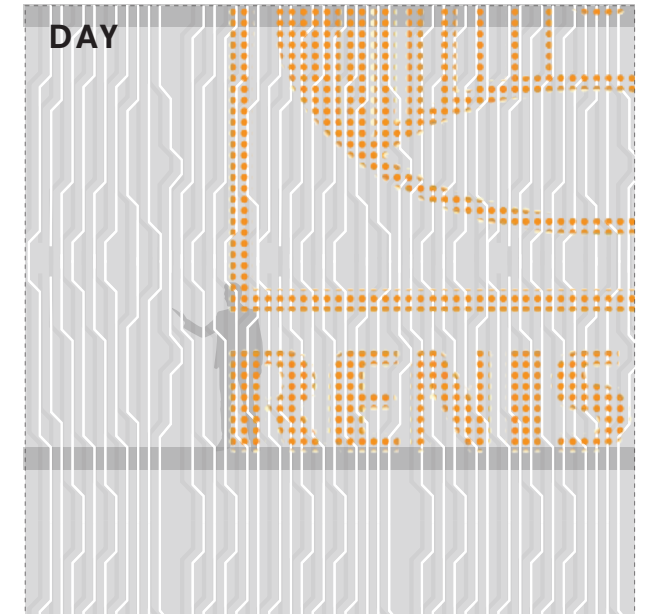
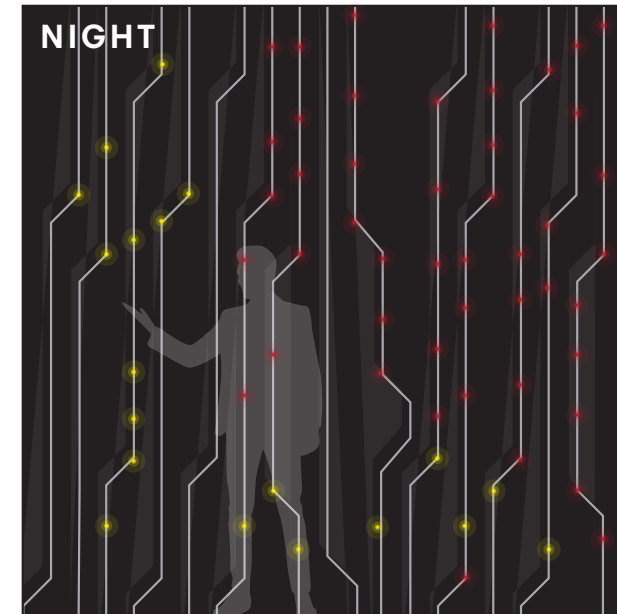
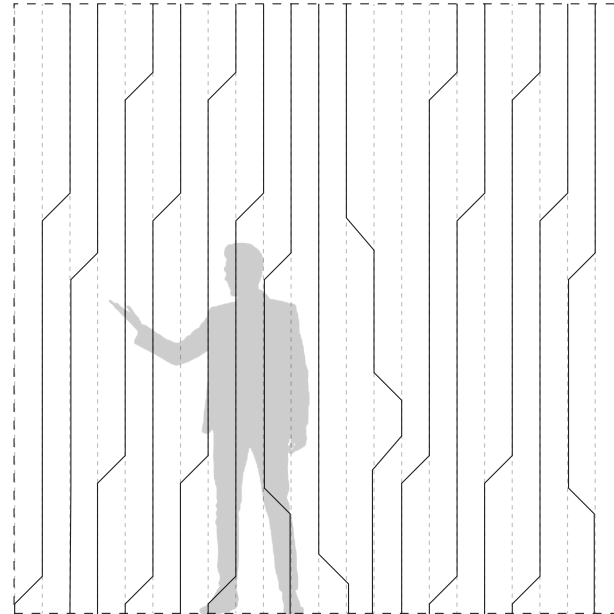
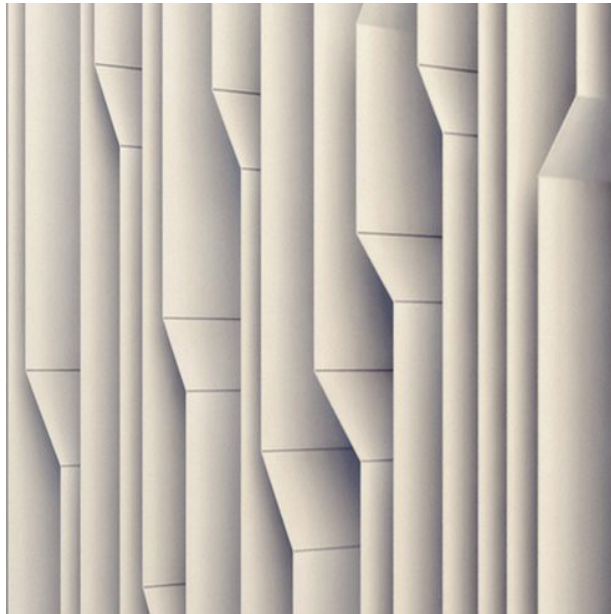




# MESH FACADE PATTERN

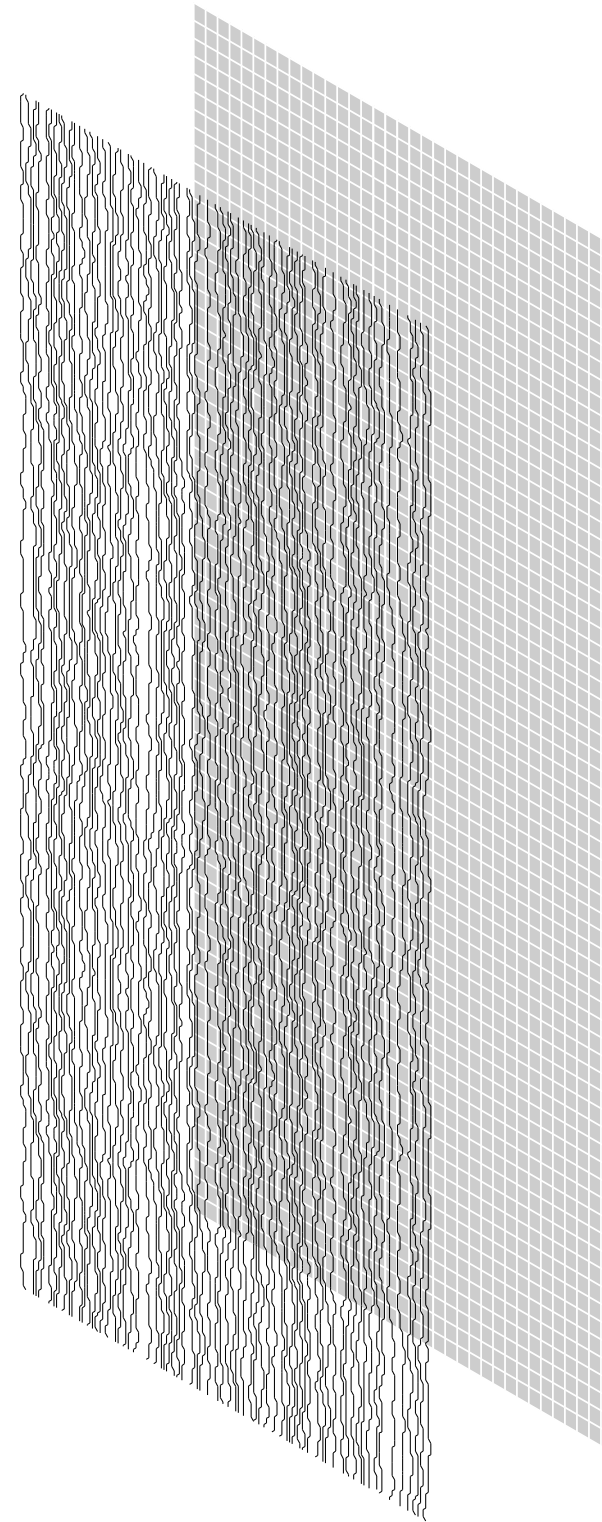
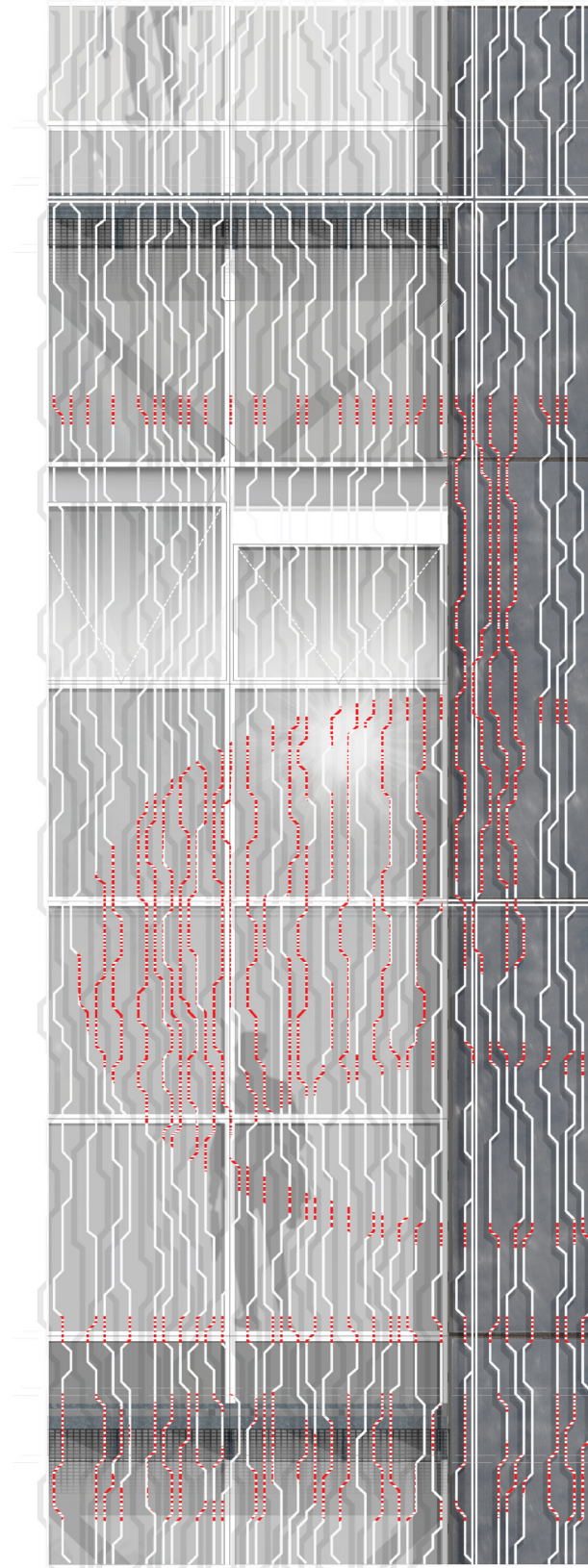


# MESH FACADE PATTERN

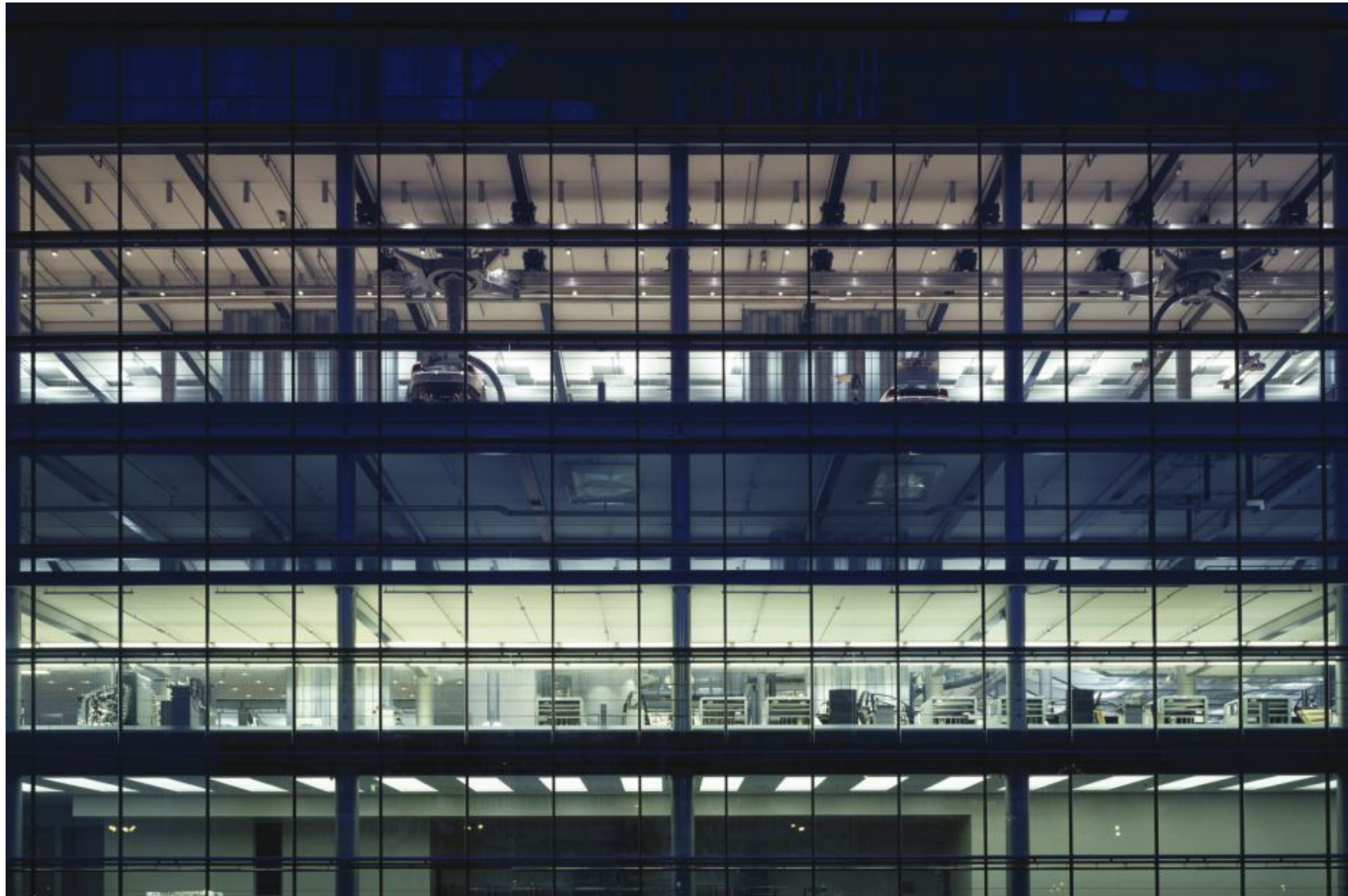




# MESH FACADE PATTERN



# LIGHT & TRANSPARANCY



**VOLKSWAGEN FACTORY DRESDEN**



# LIGHT & TRANSPARANCY



## BAUHAUS

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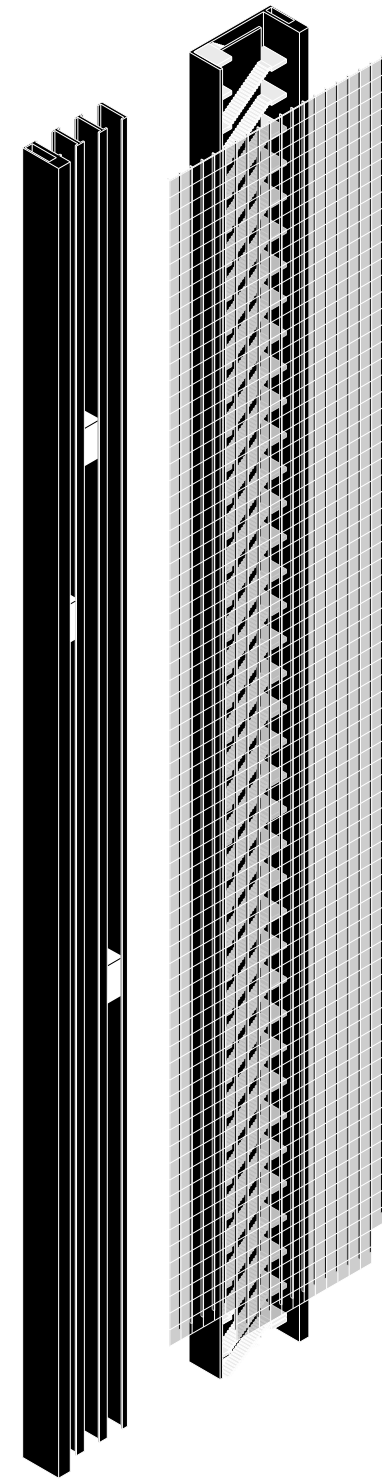
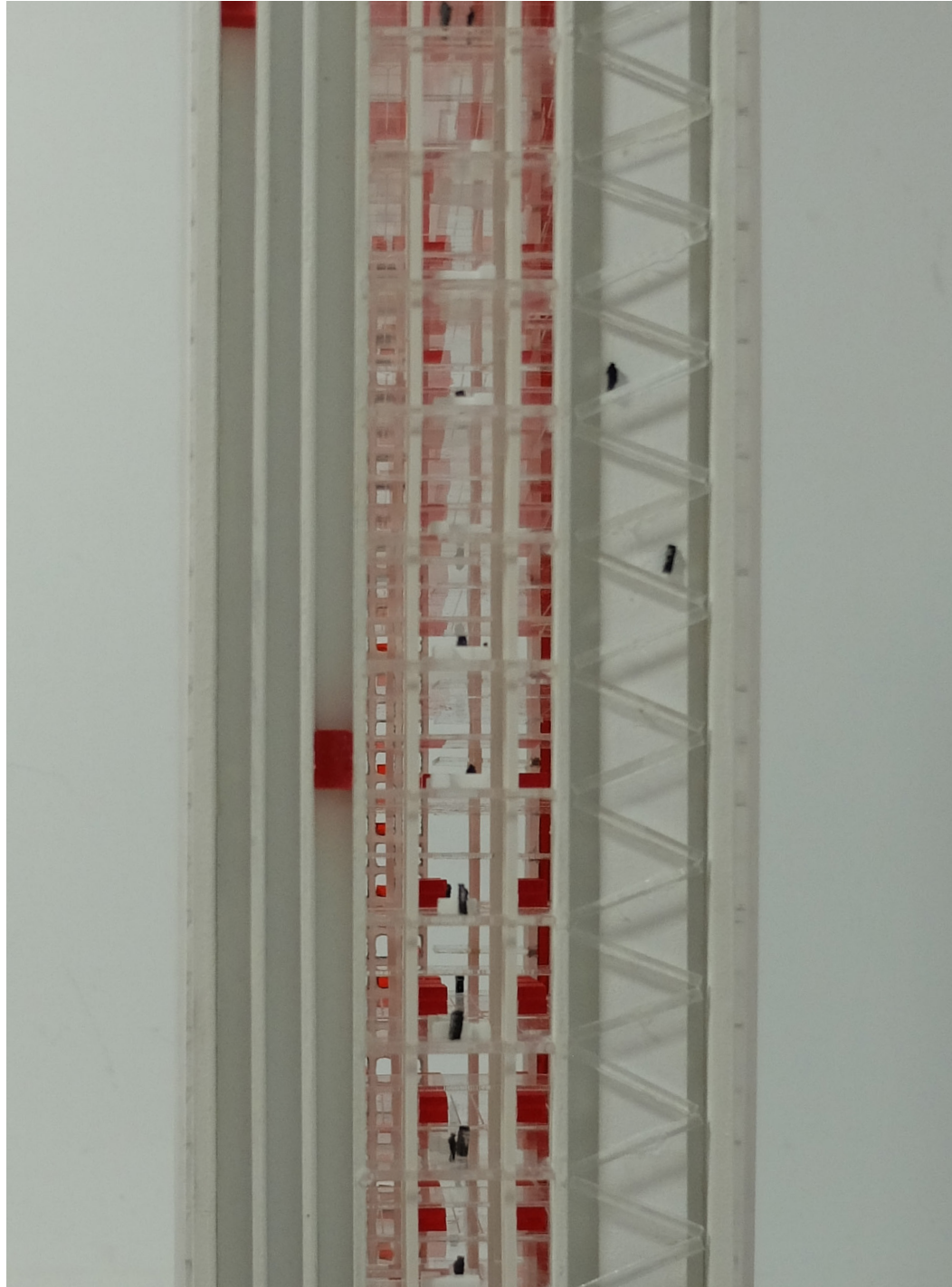
# MATERIAL MOVEMENT



SOUTHWEST FACADE

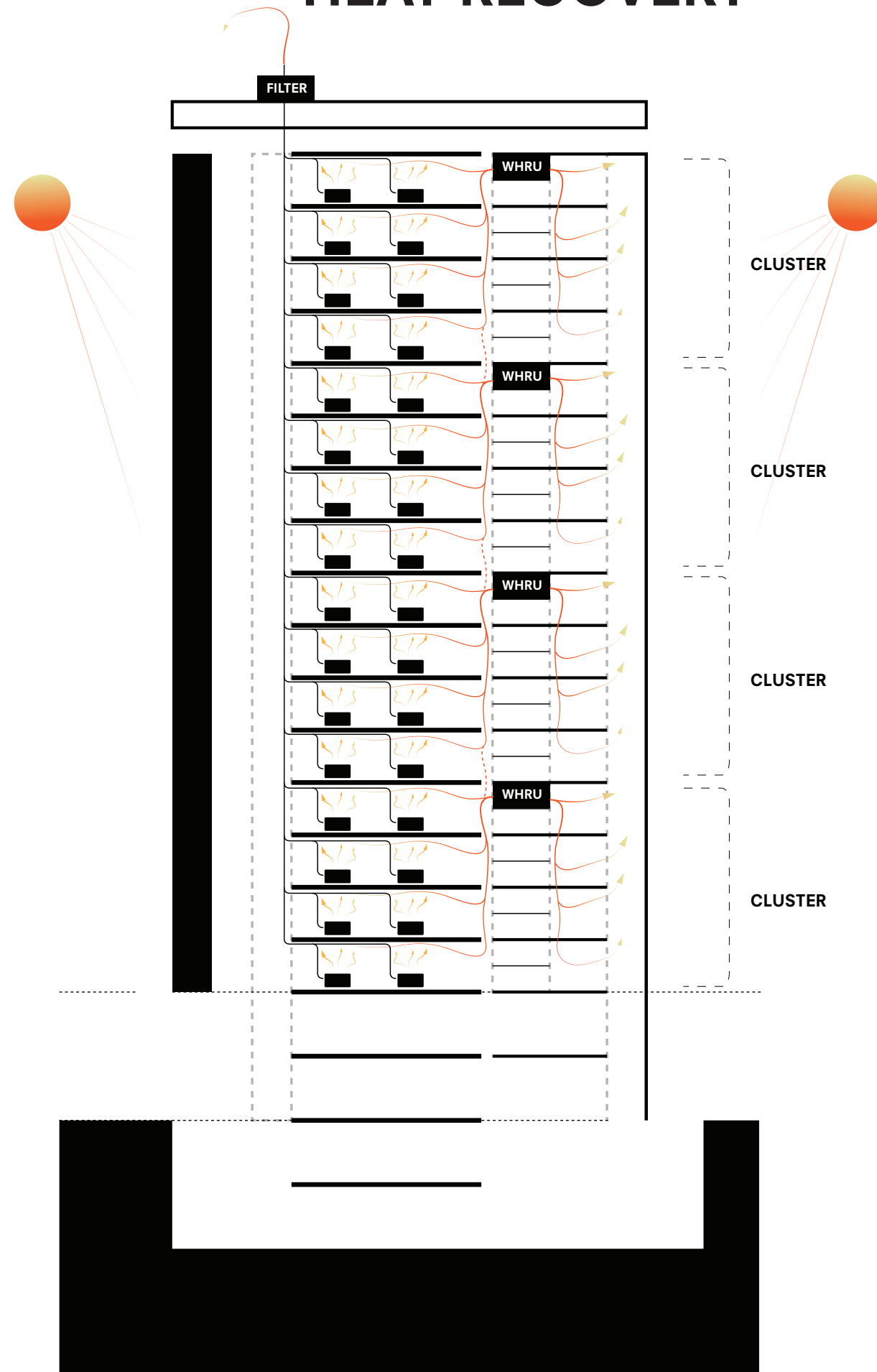


# HUMAN ACTIVITY



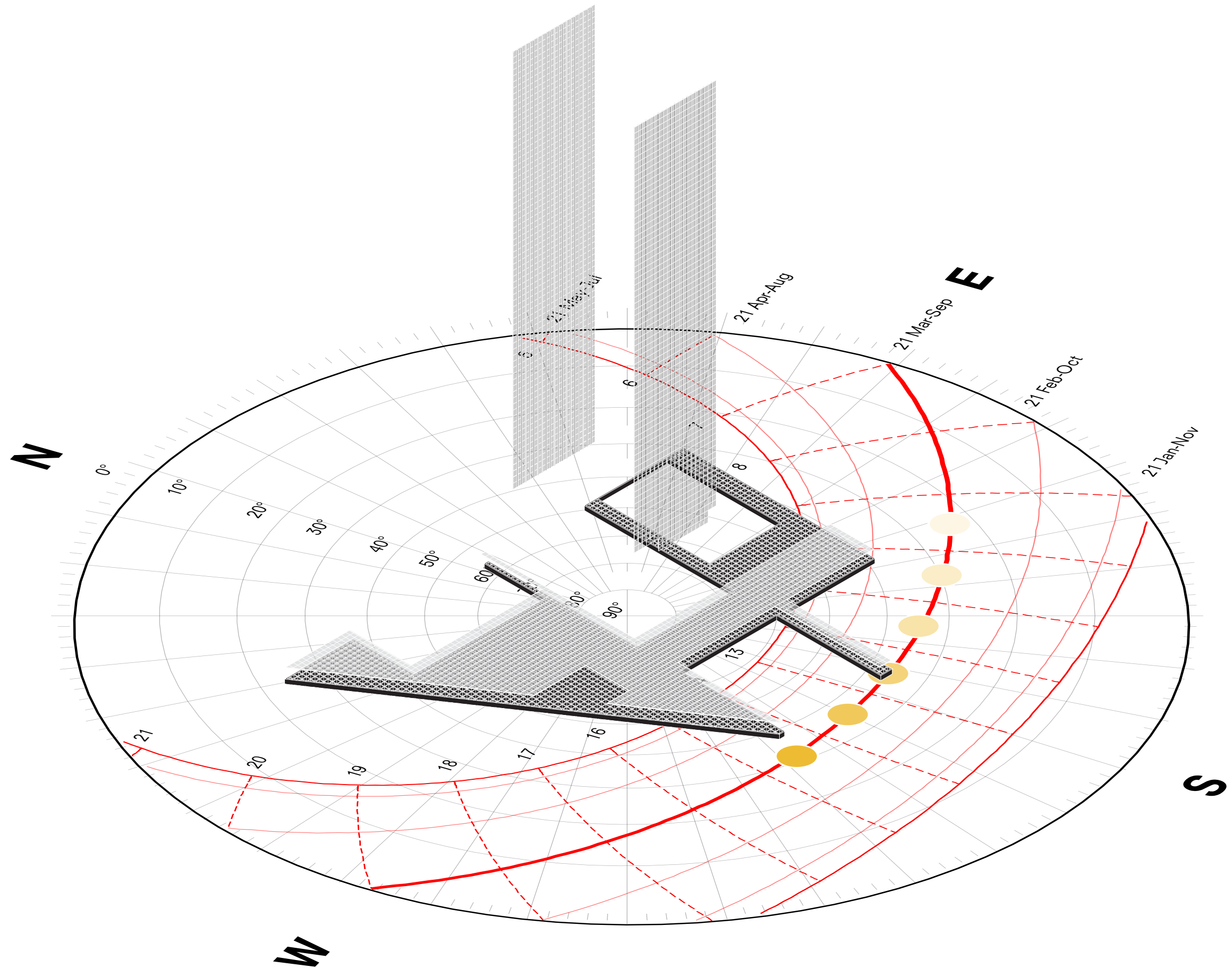
## NORTHEAST FACADE

# HEAT RECOVERY





# PRODUCING ROOFS & FACADES

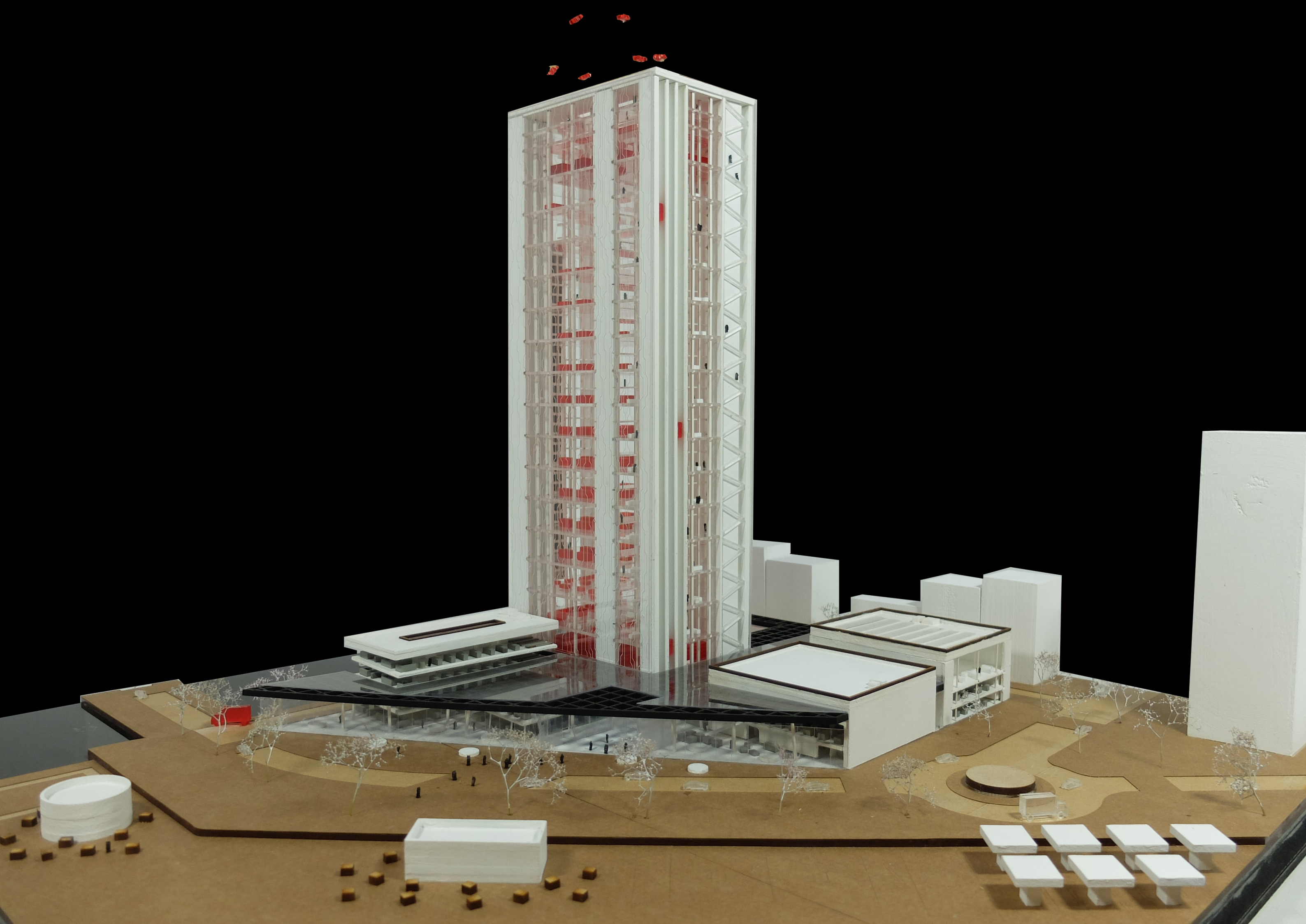


INTEGRATED PV



CONCLUSION







# THE URBAN MANUFACTORY

FROM THE POST-INDUSTRIAL CITY  
TO THE PRODUCTIVE CITY

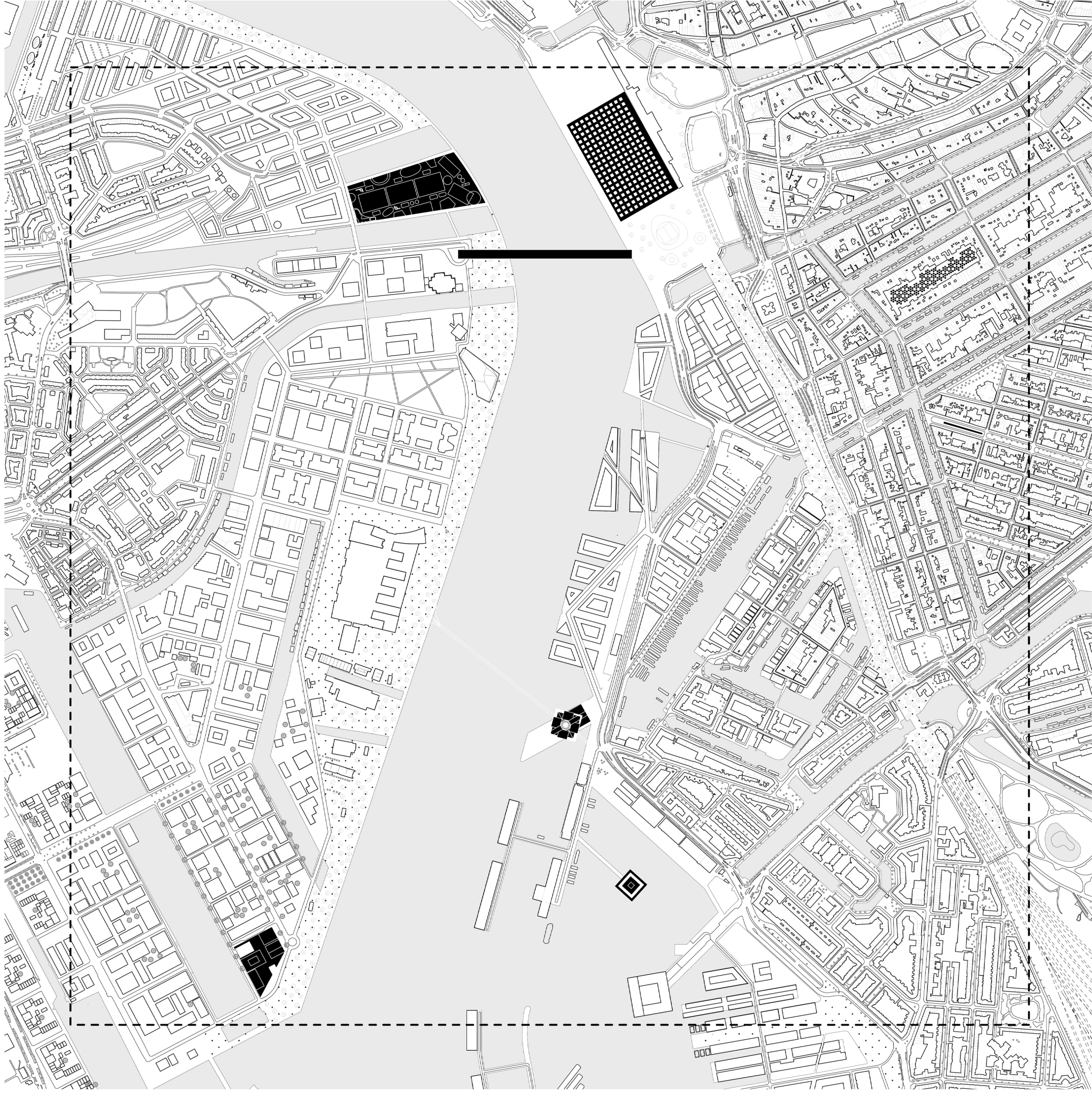
Sebastiaan van Arkel

P4\_December 2017\_ Complex Projects Graduation Studio



**DRAWING SET**





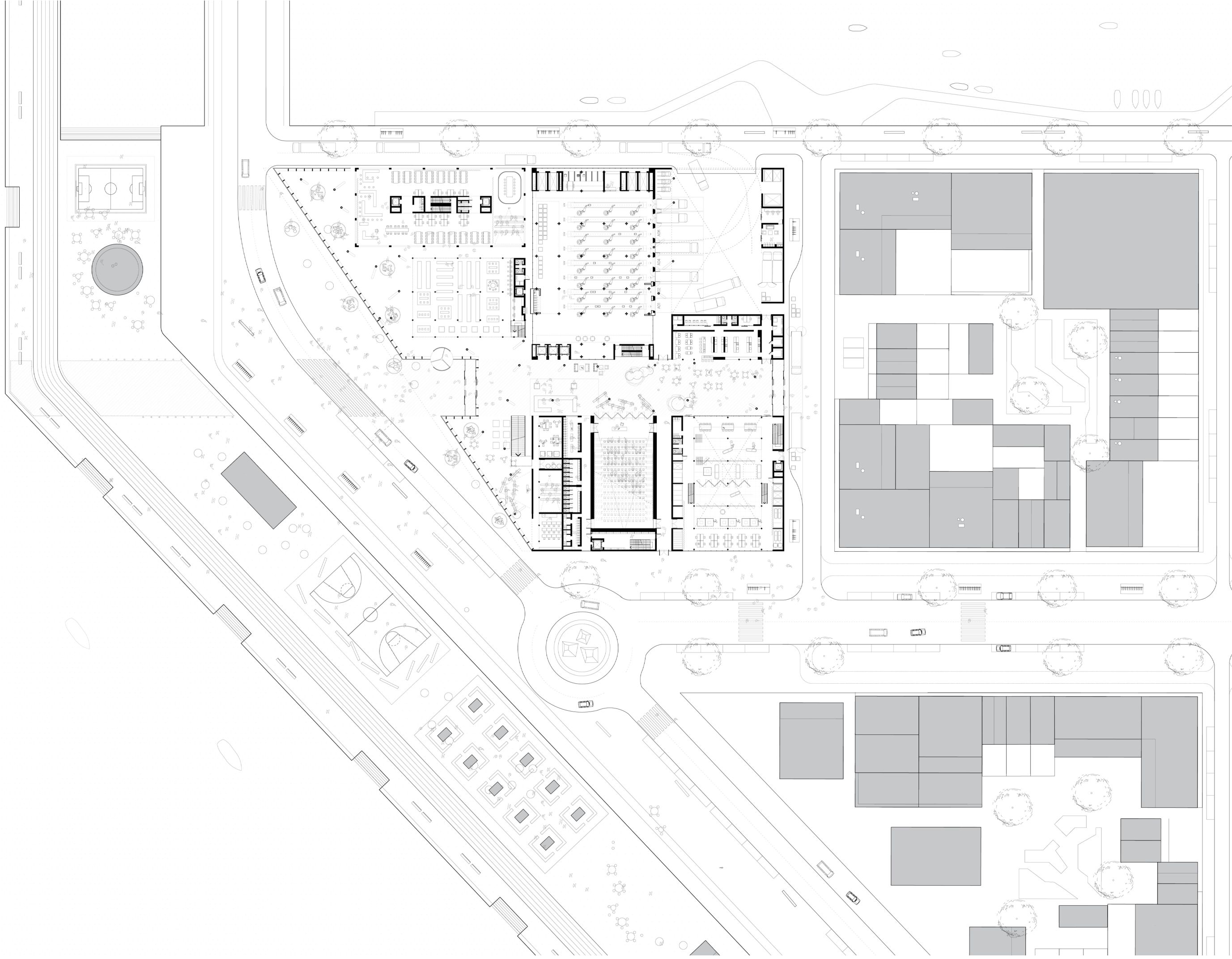




SCALE 1:1000





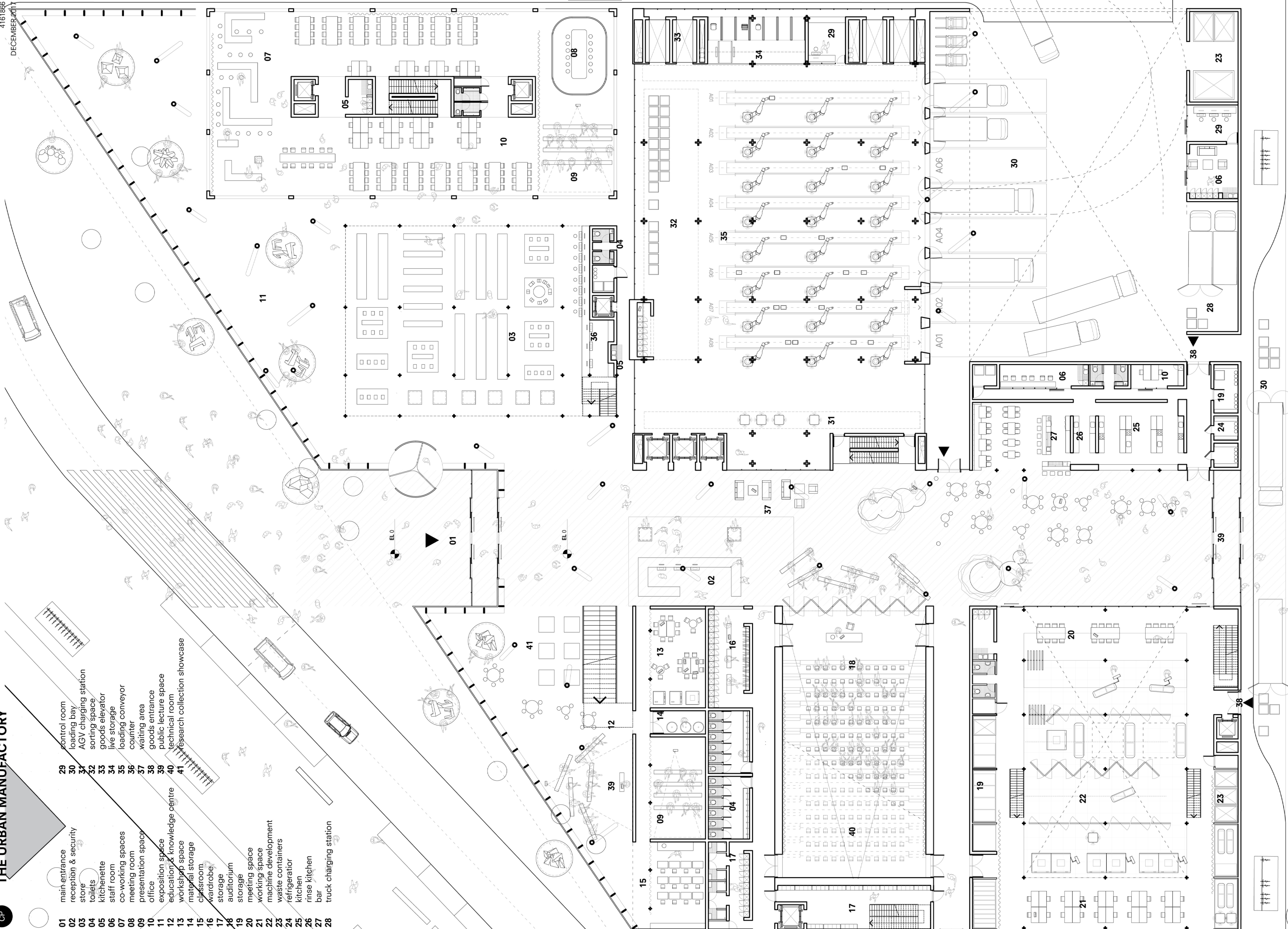


SCALE 1:500

5m 10m 25m 50m



- 01 main-entrance  
02 reception & security  
03 store  
04 toilets  
05 kitchenette  
06 staff room  
07 co-working spaces  
08 meeting room  
09 presentation space  
10 office  
11 exposition space  
12 education & knowledge centre  
13 workshop space  
14 material storage  
15 classroom  
16 wardrobe  
17 storage  
18 auditorium  
19 storage  
20 meeting space  
21 working space  
22 machine development  
23 waste containers  
24 refrigerator  
25 kitchen  
26 rinse kitchen  
27 bar  
28 truck charging station
- 29 control room  
30 loading bay  
31 AGV charging station  
32 sorting space  
33 goods elevator  
34 live storage  
35 loading conveyor  
36 counter  
37 waiting area  
38 goods entrance  
39 public lecture space  
40 technical room  
41 research collection showcase



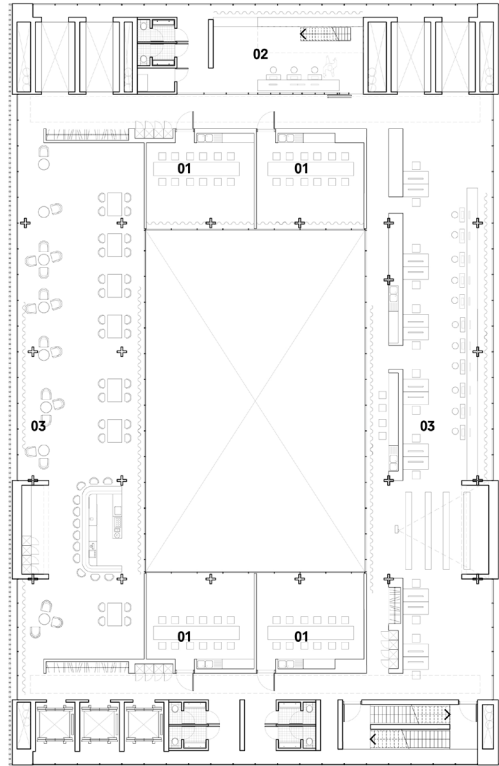
SCALE 1:200

2m 4m 10m 20m

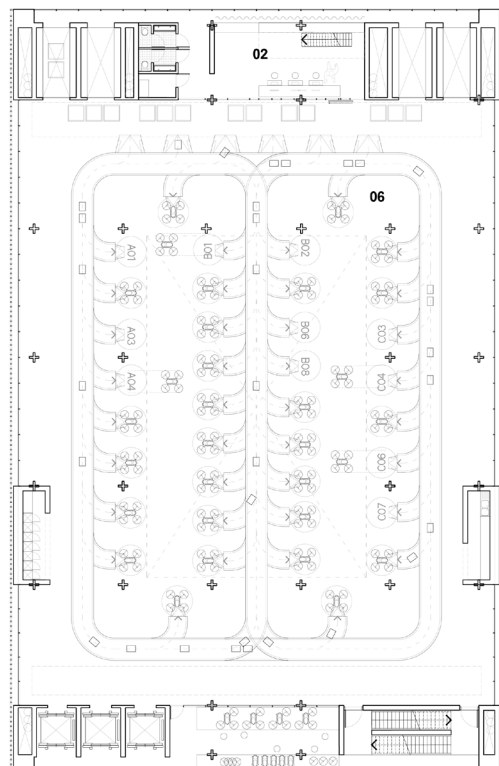
PLAN GROUND FLOOR BASE



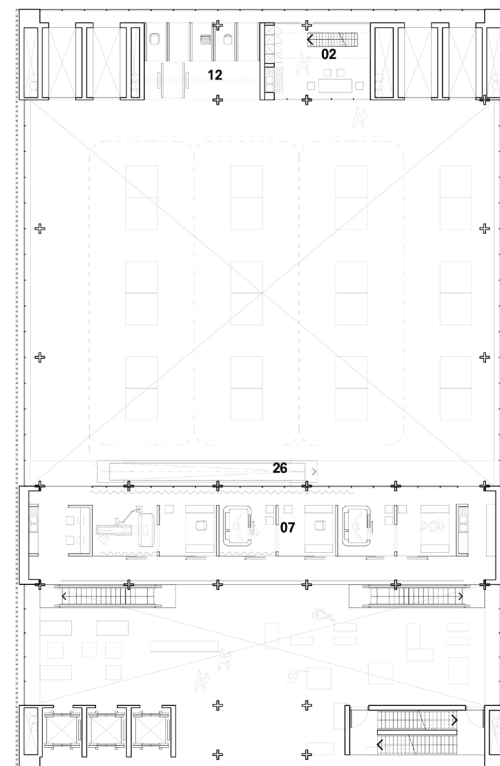




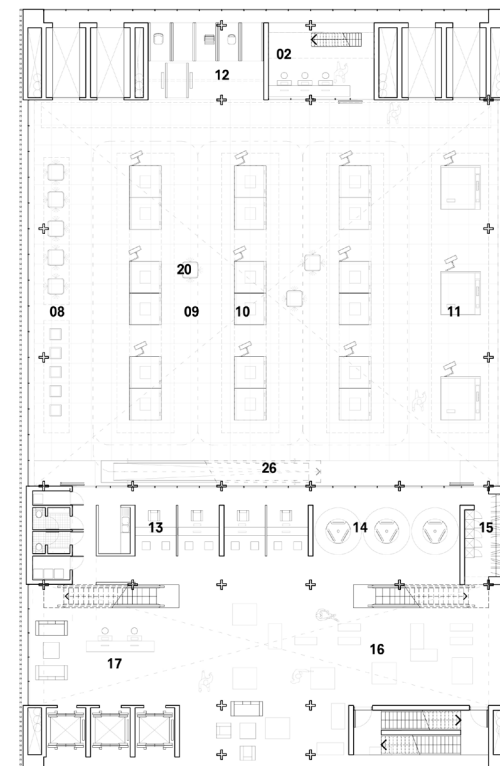
PLAN AIR CONTROL ROOM TOWER



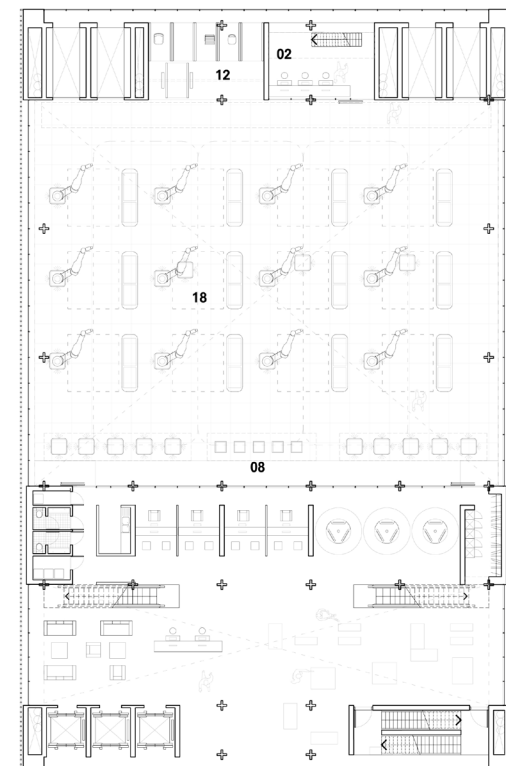
PLAN AIR TRANSPORT HUB TOWER



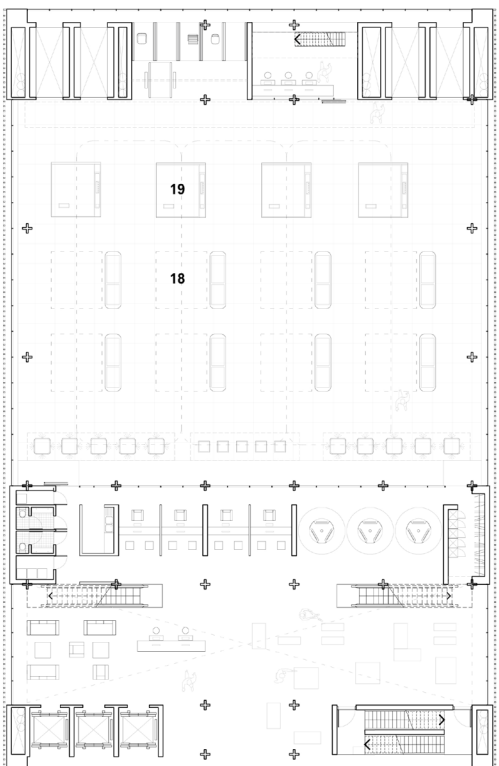
PLAN MEZZANINE PRODUCTION FLOOR TOWER



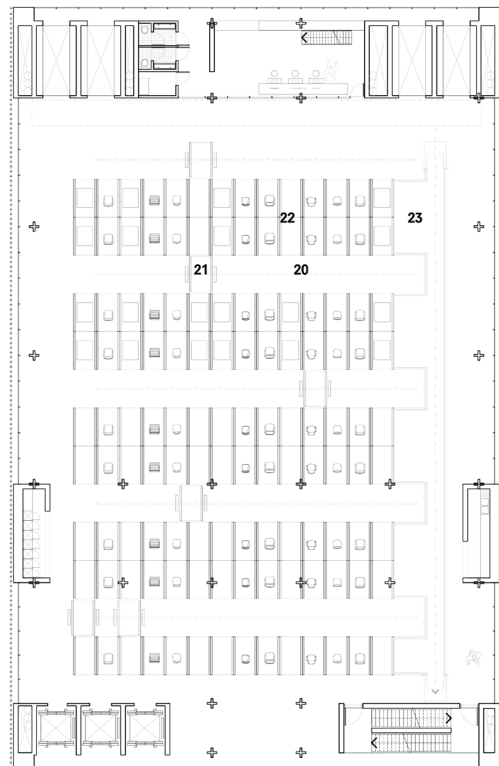
PLAN PRODUCTION FLOOR TOWER



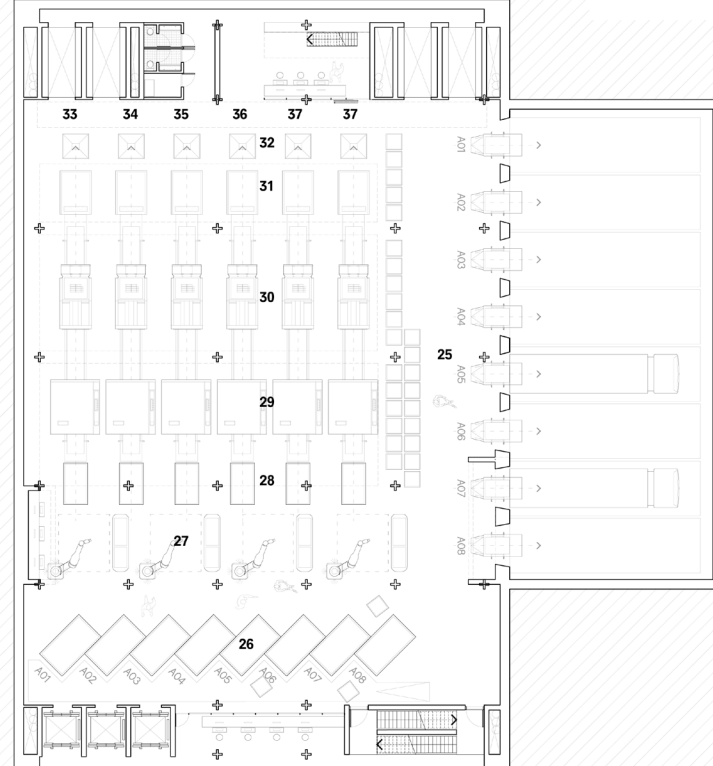
PLAN UPPER ASSEMBLY FLOOR TOWER



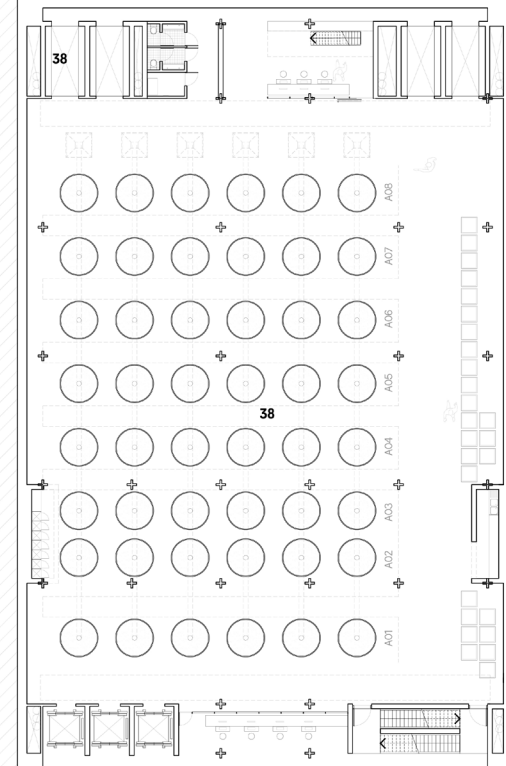
PLAN UPPER PACKAGING FLOOR TOWER



PLAN UPPER STORAGE FLOOR TOWER



PLAN MATERIAL RECOVERY CENTER BASEMENT TOWER



PLAN SILOS BASEMENT TOWER



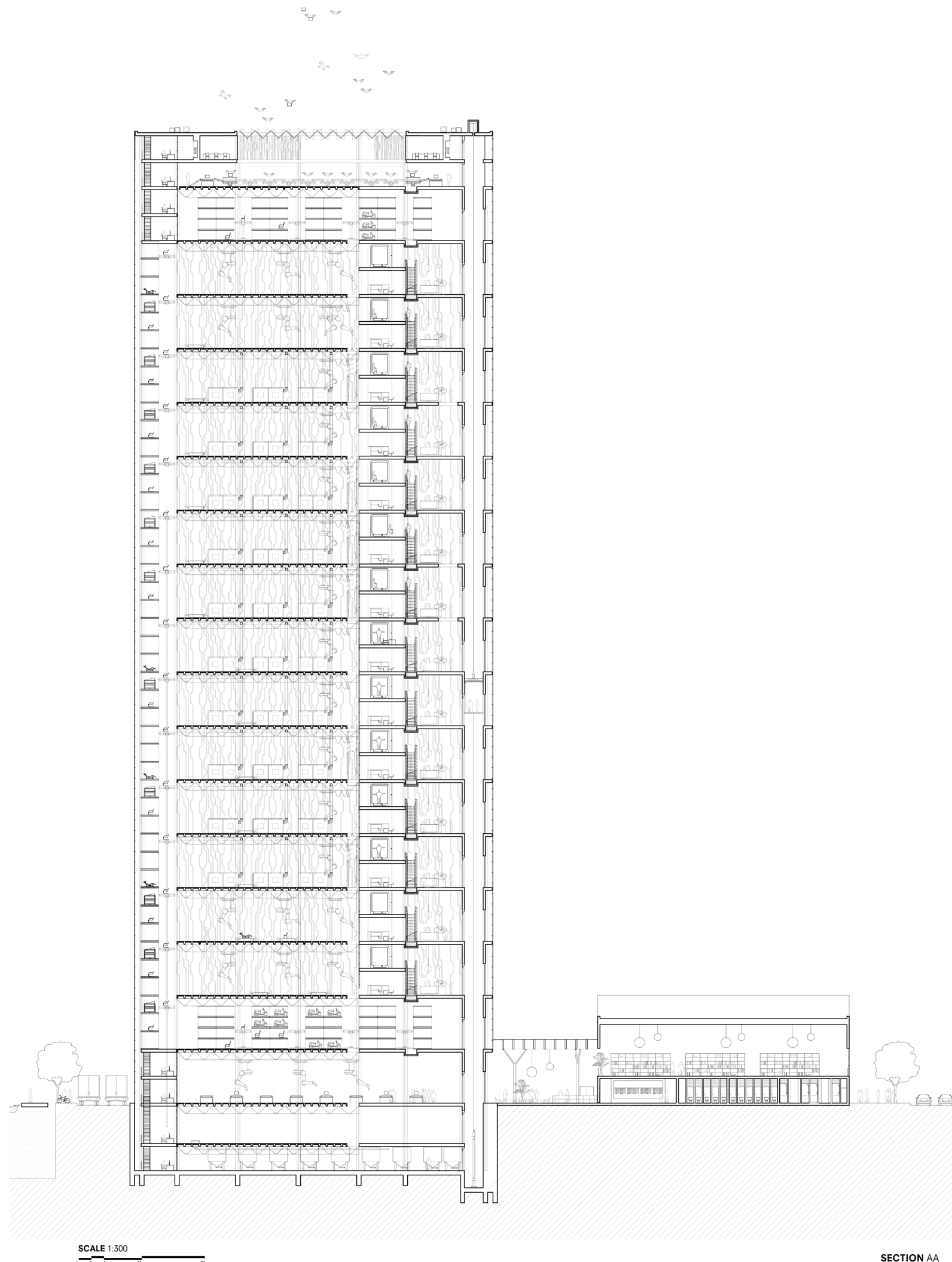
- |    |                    |    |                 |
|----|--------------------|----|-----------------|
| 01 | conference room    | 10 | AM machine      |
| 02 | conference room    | 11 | CNC machines    |
| 03 | control room       | 12 | live storage    |
| 04 | air control centre | 13 | counseling room |
| 05 | sky bar            | 14 | interface       |
| 06 | drone loading bay  | 15 | wardrobe        |
| 07 | analysis room      | 16 | showcase        |
| 08 | AVG charging area  | 17 | assembly robot  |
| 09 | AVG line           | 18 | packaging robot |

- |    |                                 |
|----|---------------------------------|
| 19 | quality control                 |
| 20 | automated storage and retrieval |
| 21 | stacker machine                 |
| 22 | storage racks                   |
| 23 | distribution conveyor           |
| 24 | automated guided vehicle (AGV)  |
| 25 | off loading bay                 |
| 26 | collecting area                 |
| 27 | dissassembling machines         |

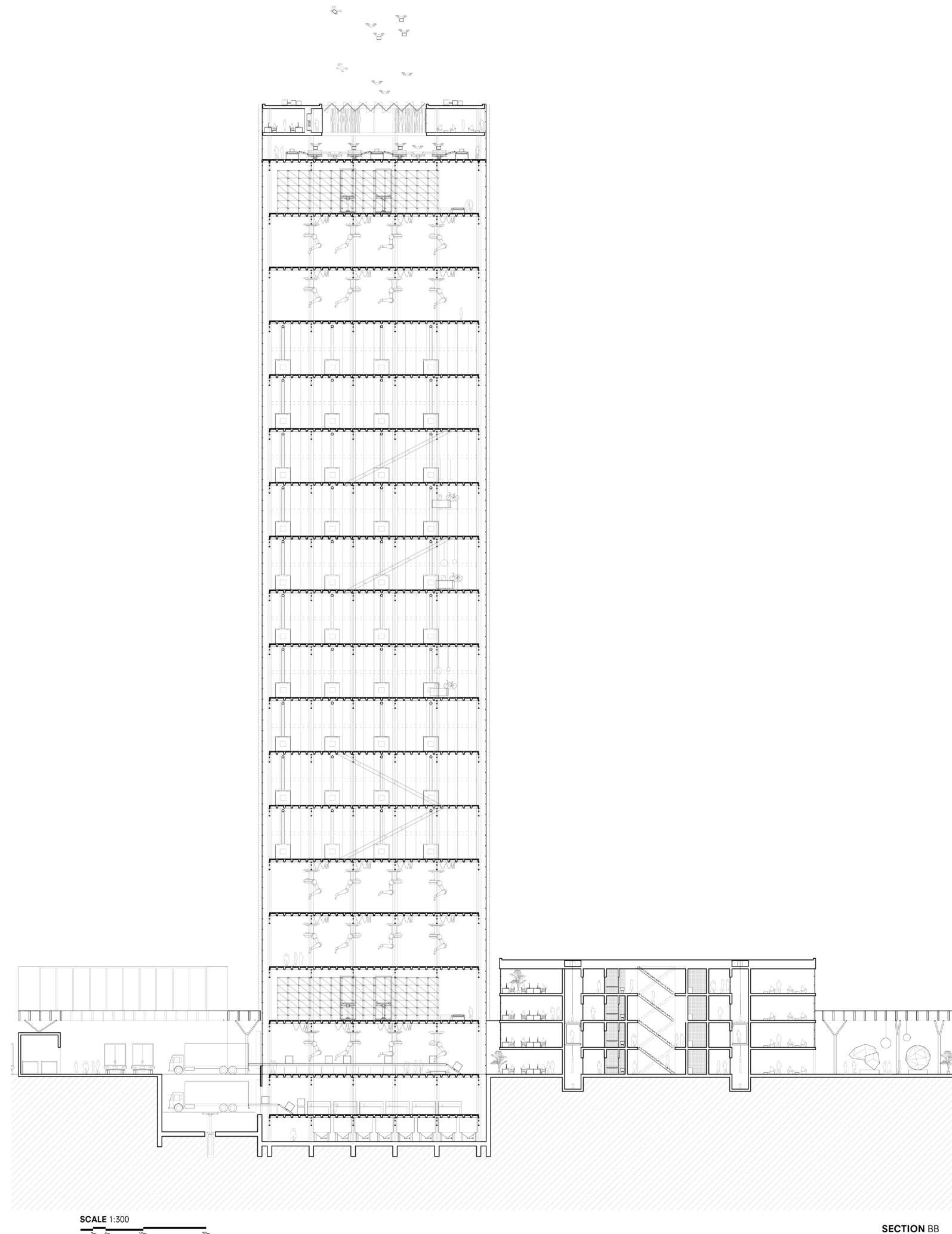
- |    |   |    |                         |
|----|---|----|-------------------------|
| 28 | seperation material types                             | 38 | silos                   |
| 29 | cleaning and drying                                   | 39 | goods lift              |
| 30 | shredding and filtering                               | 40 | floor to floor conveyor |
| 31 | extruding and spooling (filament) or milling (powder) |    |                         |
| 32 | storing in silos                                      |    |                         |
| 33 | metal conveyor  |    |                         |
| 34 | glass conveyor  |    |                         |
| 35 | polymer conveyor                                      |    |                         |
| 36 | bioplastic conveyor                                   |    |                         |

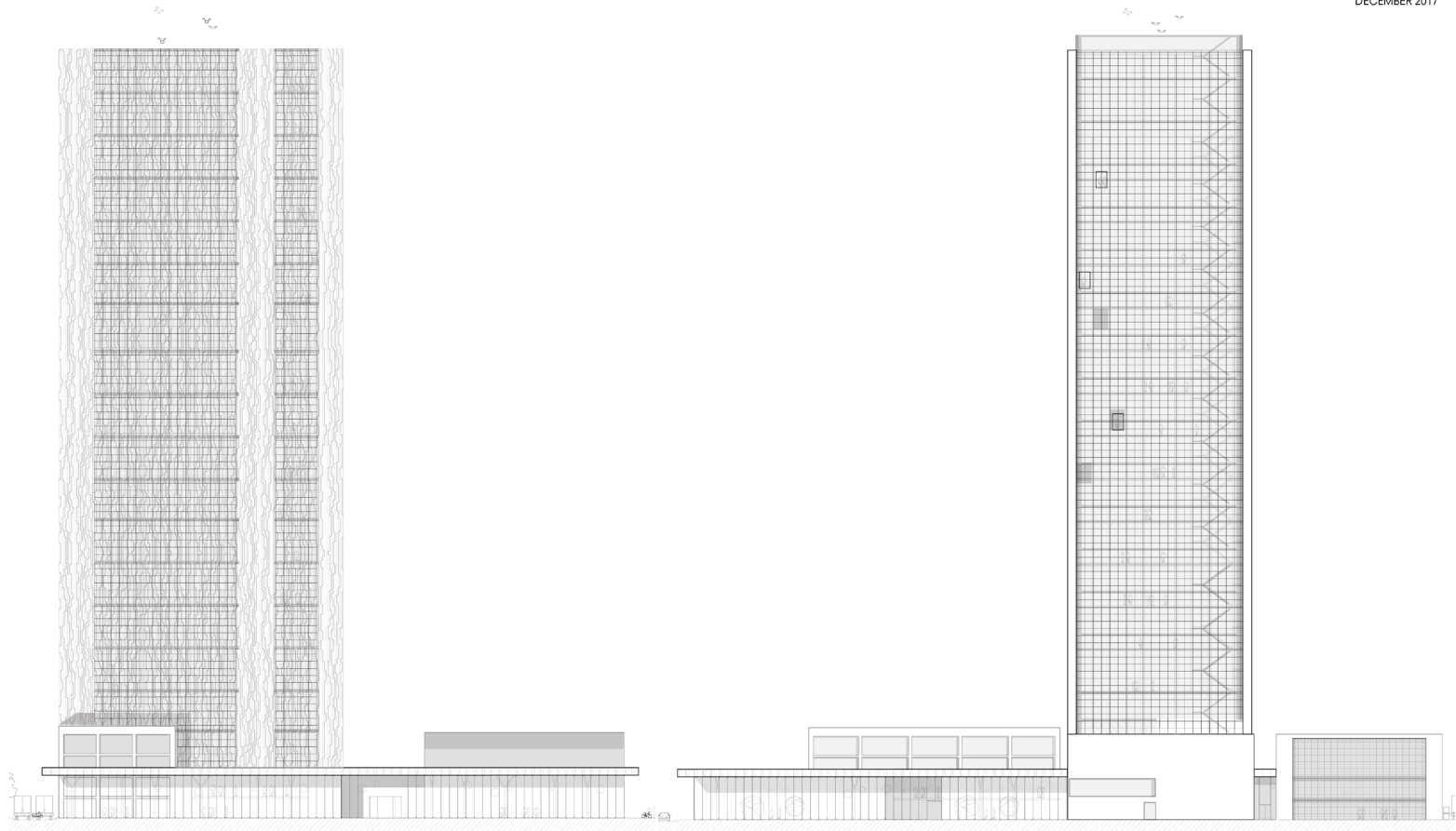
SCALE 1:200

90°





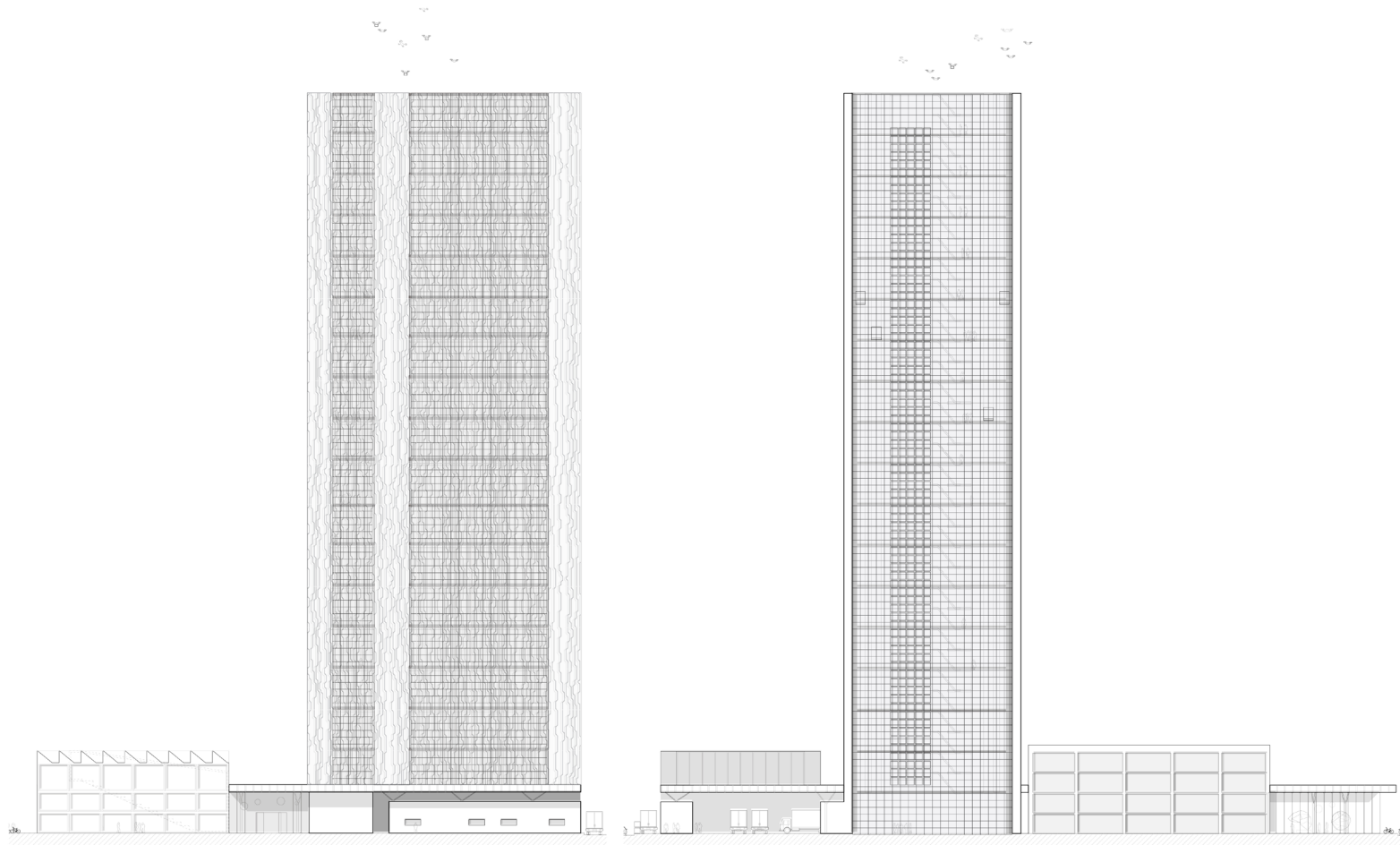




FACADE NORTHWEST



FACADE NORTHEAST



FACADE SOUTHEAST



FACADE SOUTHWEST



SCALE 1:500



FUTURE URBAN MANUFACTORY FACADE



- 01** After choosing the right floor and right producing company, clients enter the producers' lobby through the elevator from the public ground floor.
- 02** Clients go to the reception desk for a first intake. Receptionists gives clarity about following procedure, and tell the client where they need to be during the procedure.
- 03** Before or after consulting the reception desk the client can have a look and get an idea of the producers activities by viewing the showcased items. Here the client can see and feel the products and their materiality. At the same time the client has a constant view on the production floor to get a sense of how products are made. There is a possibility to take place in one of the seating areas and talk to one another about ones wishes concerning the purchasement.
- 04** When ready, client continues the

procedure and gets to speak with the producer at one of the counseling spaces. Here consumer and producer get in physical contact. Producer tells about the possibilities and gets to know what demands the client has. The producer can clarify the production process by easily point out to the production floor in the back where there is an overview over the process.

**05** After speaking to the producer, the client continues and signs in, in one of the self learning digital interface booths. Here the consumer can, by means of an easy and for everyone understandable platform do a lot of the customized design steps by themselves. Valuable customer information is saved and is also later used by the company to optimize product development.

**06** If necessary clients can hang their coat and lock up their belongings before proceeding to the next step in the production process.

**07** Clients take the escalator to the physical analysis booths on the mezzanine floor. Here client get physically analyzed. Also this valuable customer information is saved in a data base and used to optimize the production process.

**08** After going through the analysis procedure the client leaves the mezzanine floor by the second escalator. The client leaves the lobby through one of the elevators that brings them back to the ground floor level. At the same time the production process begins and finished customized and tailored products are brought to the client home.

**09** The production process starts with the supply of raw material coming from the silos in the basement of the building. Raw material in the form of powder or filament is transported through ducts.

**10** Parts of the product are manufactured

by the additive manufacturing machinery.

**11** When ready the machine remove waste material and clean the finished part. Finished parts are then loaded on an Automated Guided Vehicle (AGV).

**12** If possible new parts are directly fabricated on the product. If not, finished parts are temporary stored in the live storage.

**13** Parts are temporary stored in the live storage which is an Automated Storage and Retrieval System (ASRS). Parts are stored until they can further processed on the production floor.

**14** Parts stored in the live storage can be viewed from the public zone and from the exterior through the completely glass facade by the public as an etalage.

**15** Next to 3D printers that can process a

wide range of materials there are (according to the producing company) also CNC machine that can layered manufacture wood.

**16** Finished parts and products are after the printing process is finished transported to assembly floor, packaging- and quality control floor and transport floor. These are located in the bottom and top of the building, depending on the mode of transport (through air or over land).

**17** If needed producing companies can extend their production capacity by linking 2 or more production floors by means of a vertical conveyor.

**18** AGV's that run on electricity can be charged and stored in the designated areas at the side of the production floor. Here also the ranks can be stored that are fixed on the AGV to move parts and products.

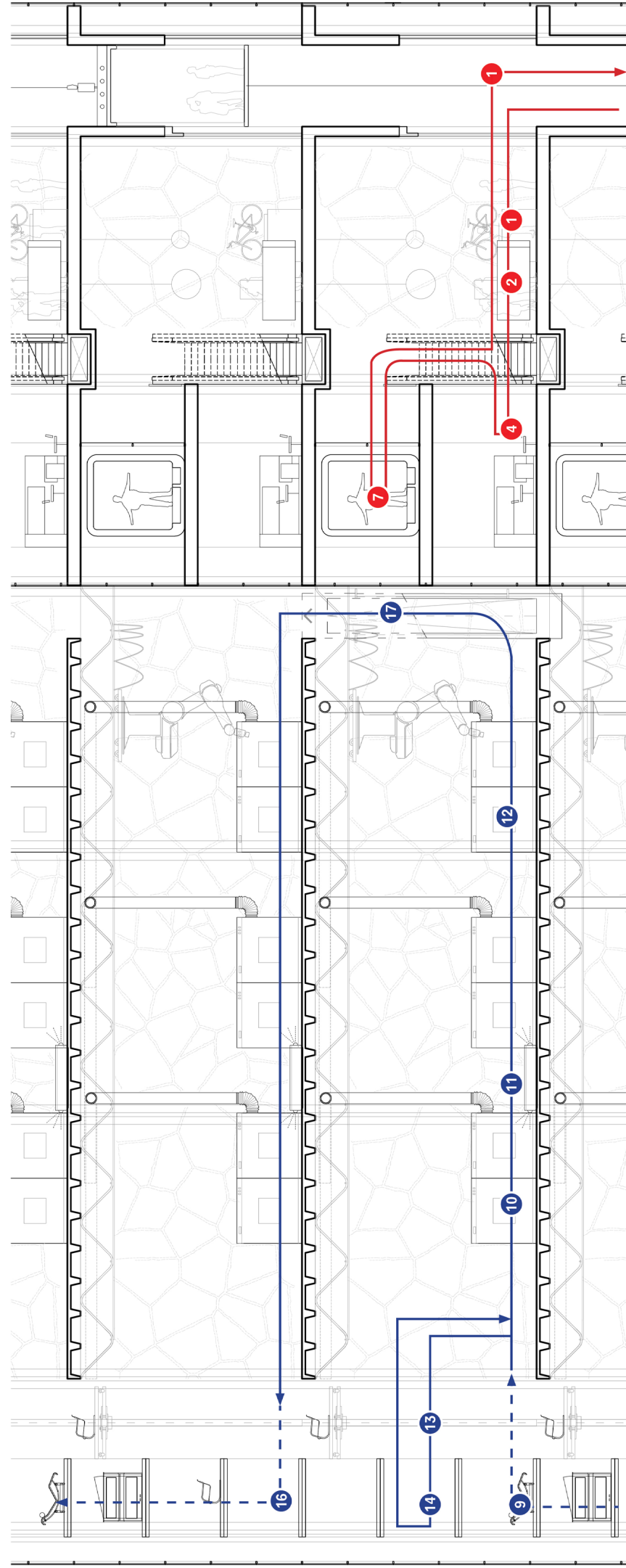
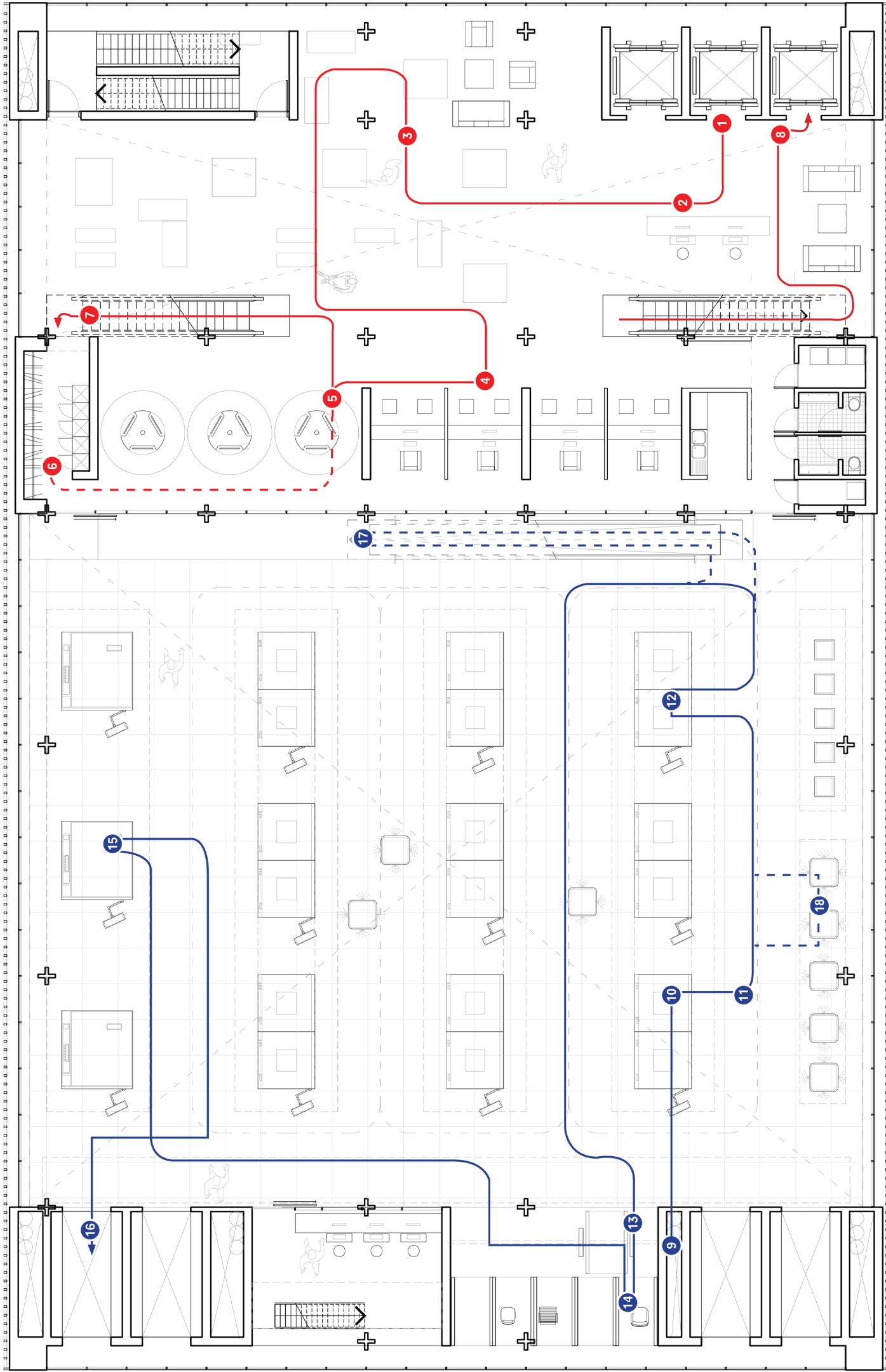
## LOGISTICAL CORE

## PRODUCTION FLOOR

## COUNSELING ZONE

## SHOWCASE

## ACCESSIBILITY

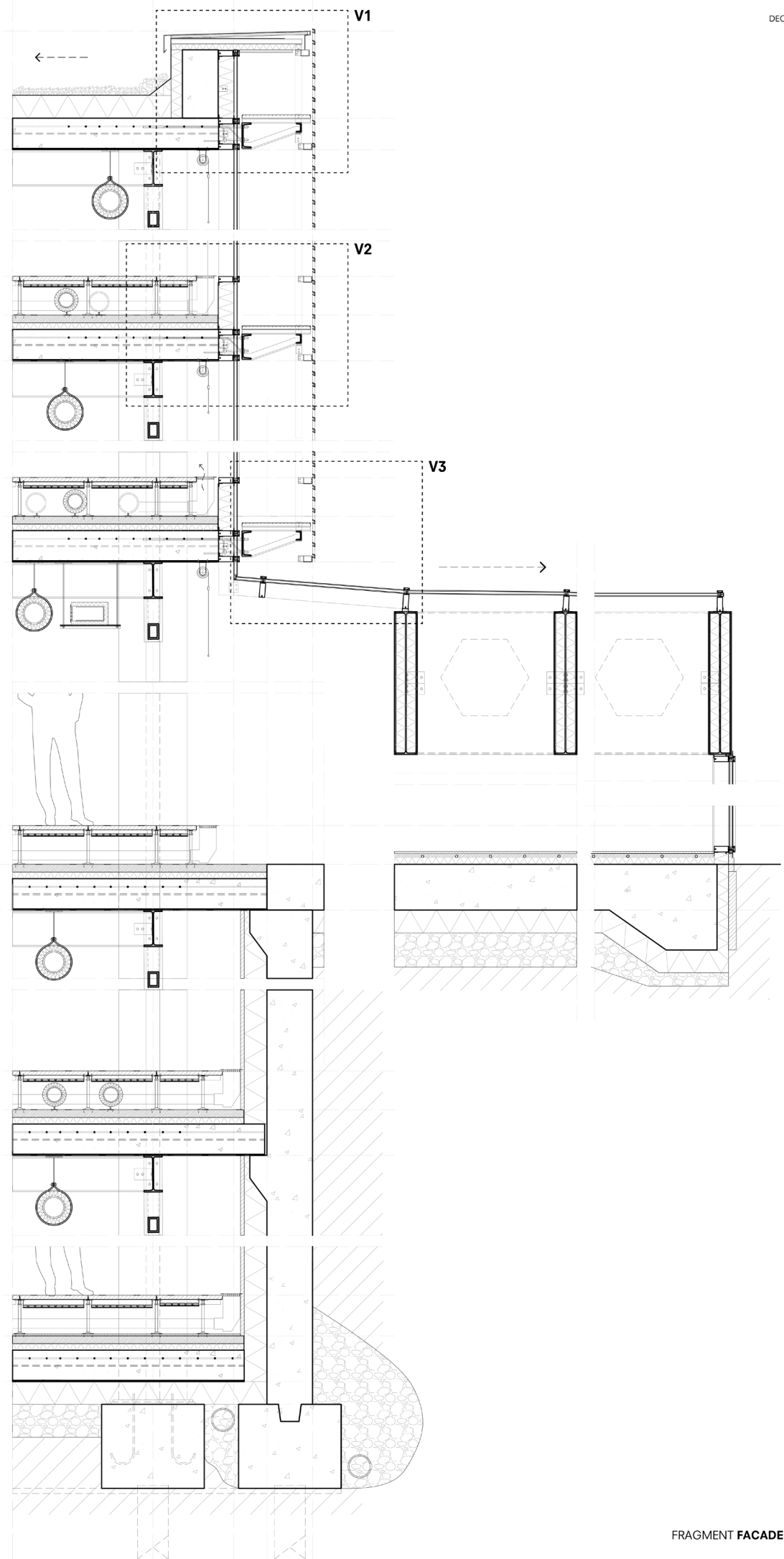
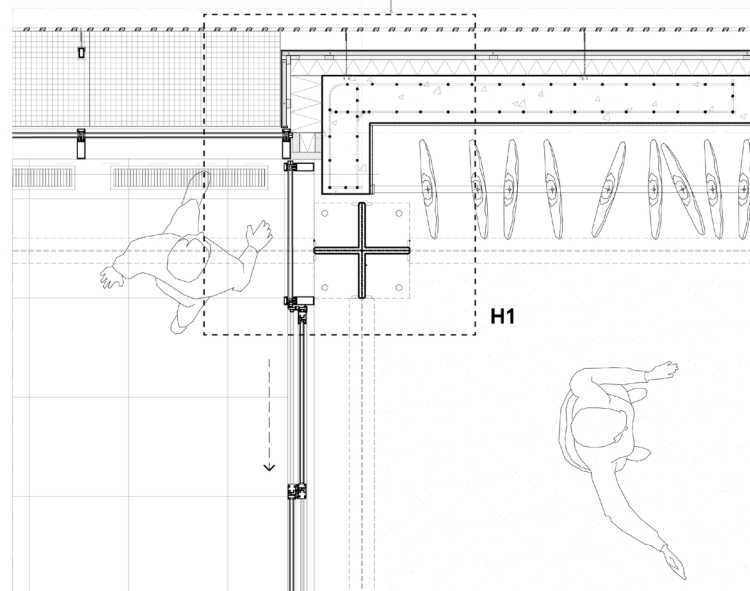
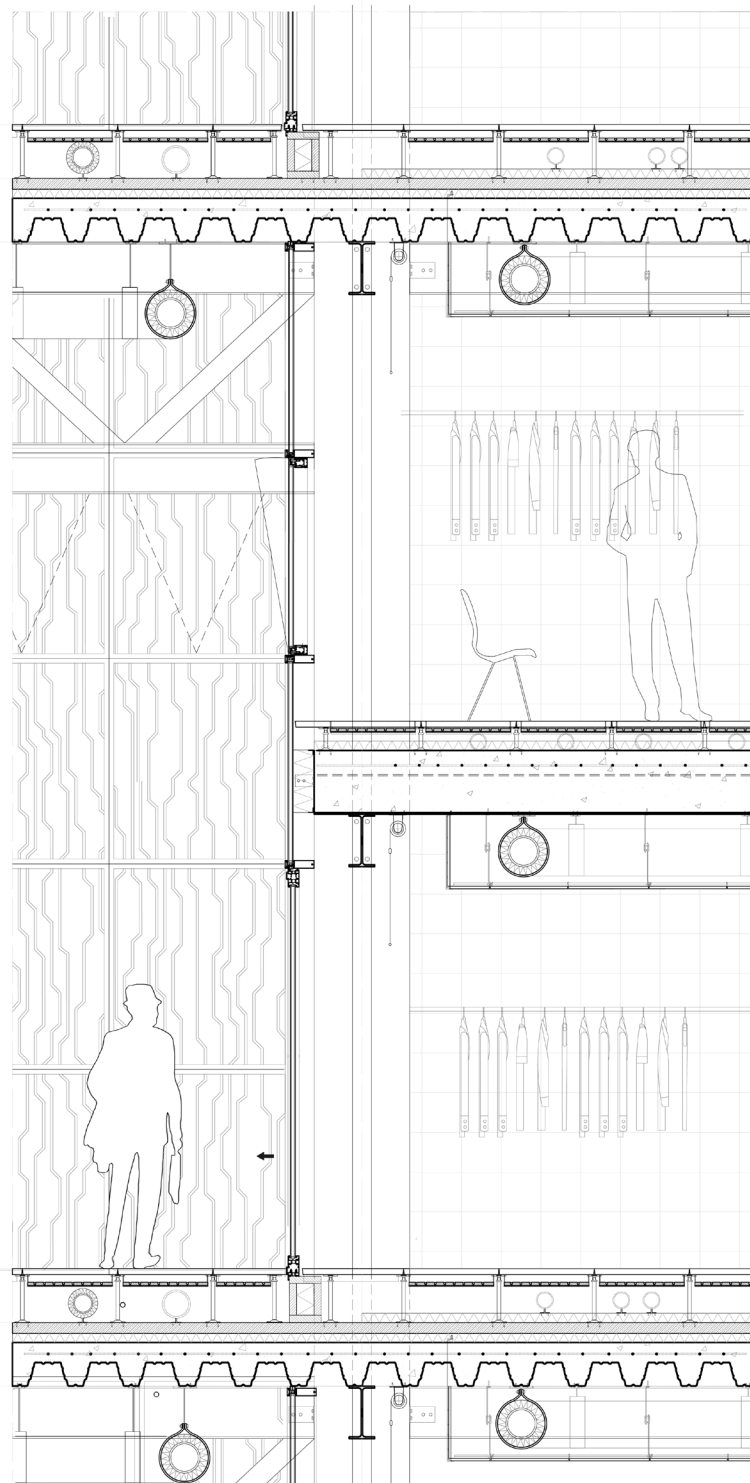
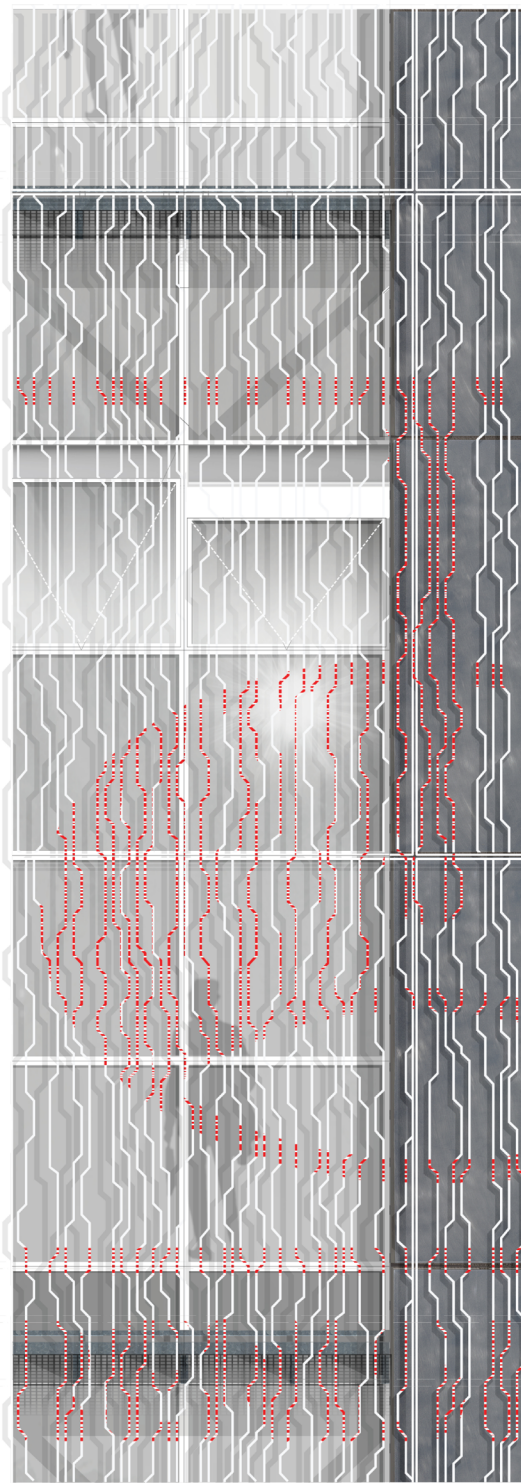
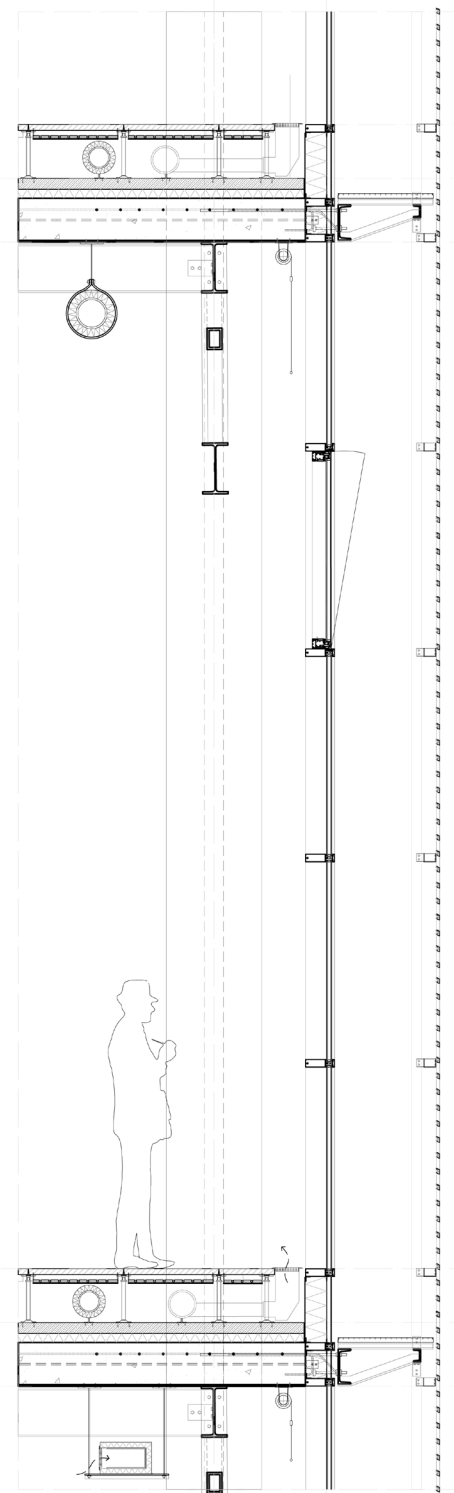


SCALE 1:100

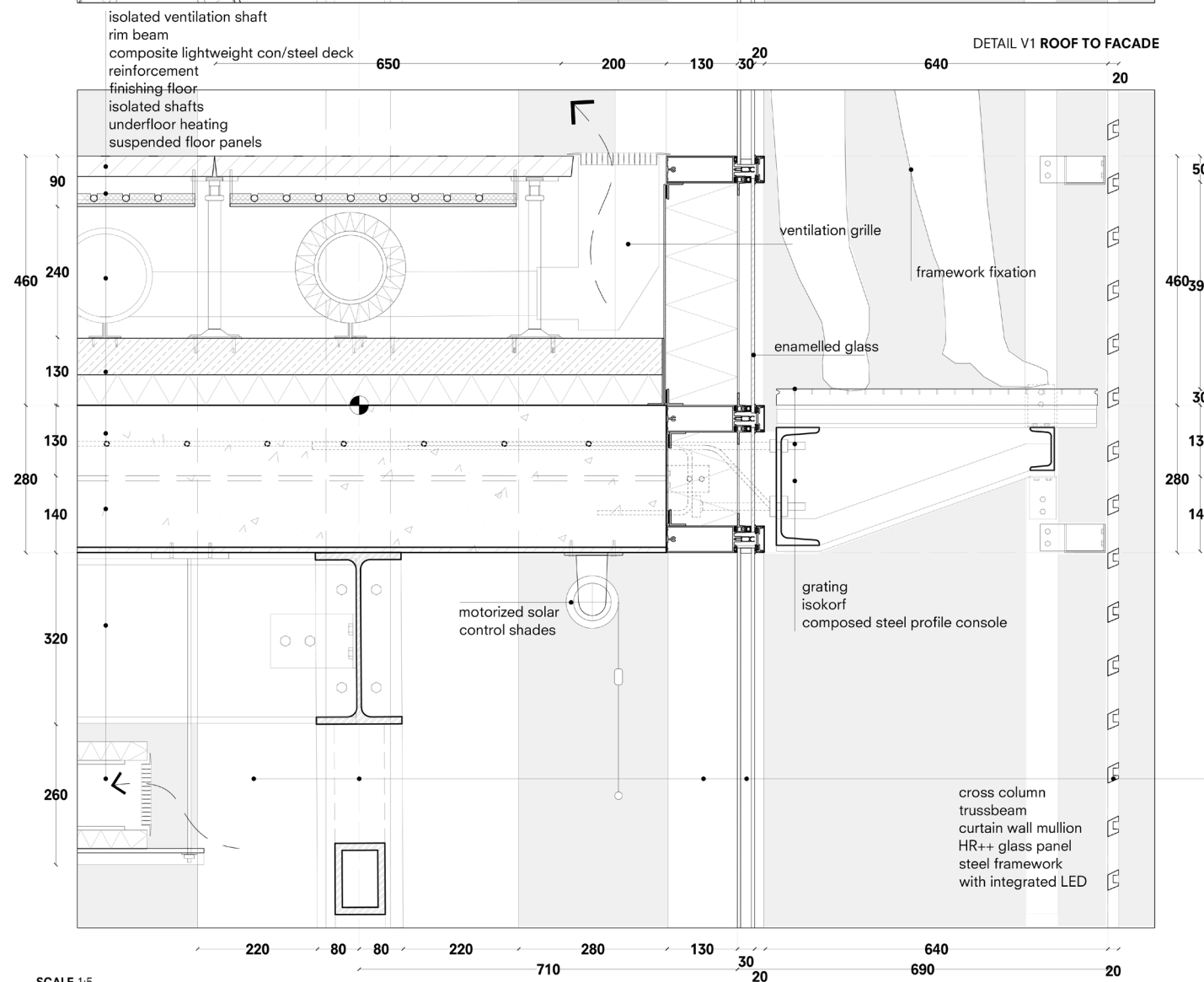
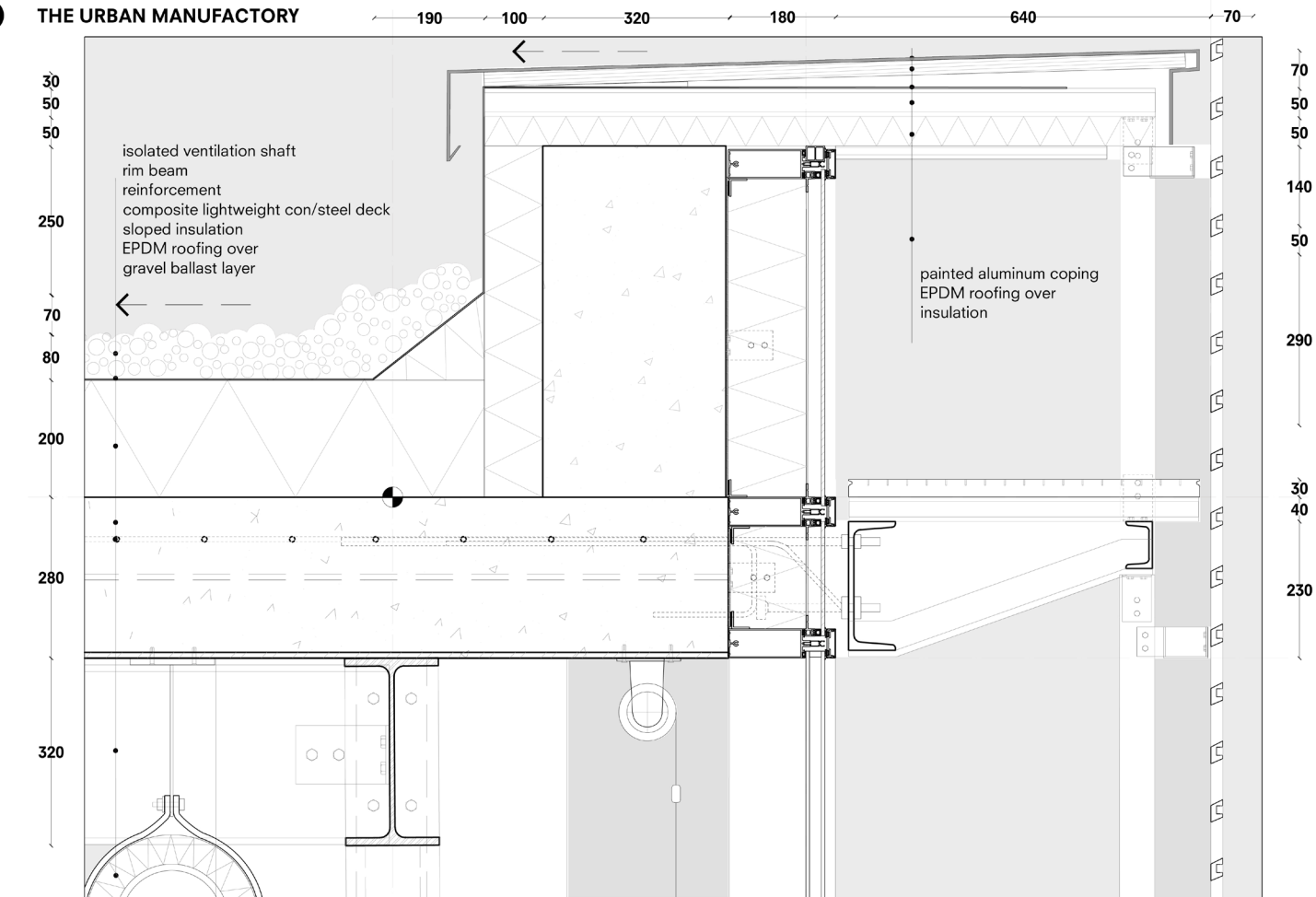
1m 2m 10m

FRAGMENT TOWER



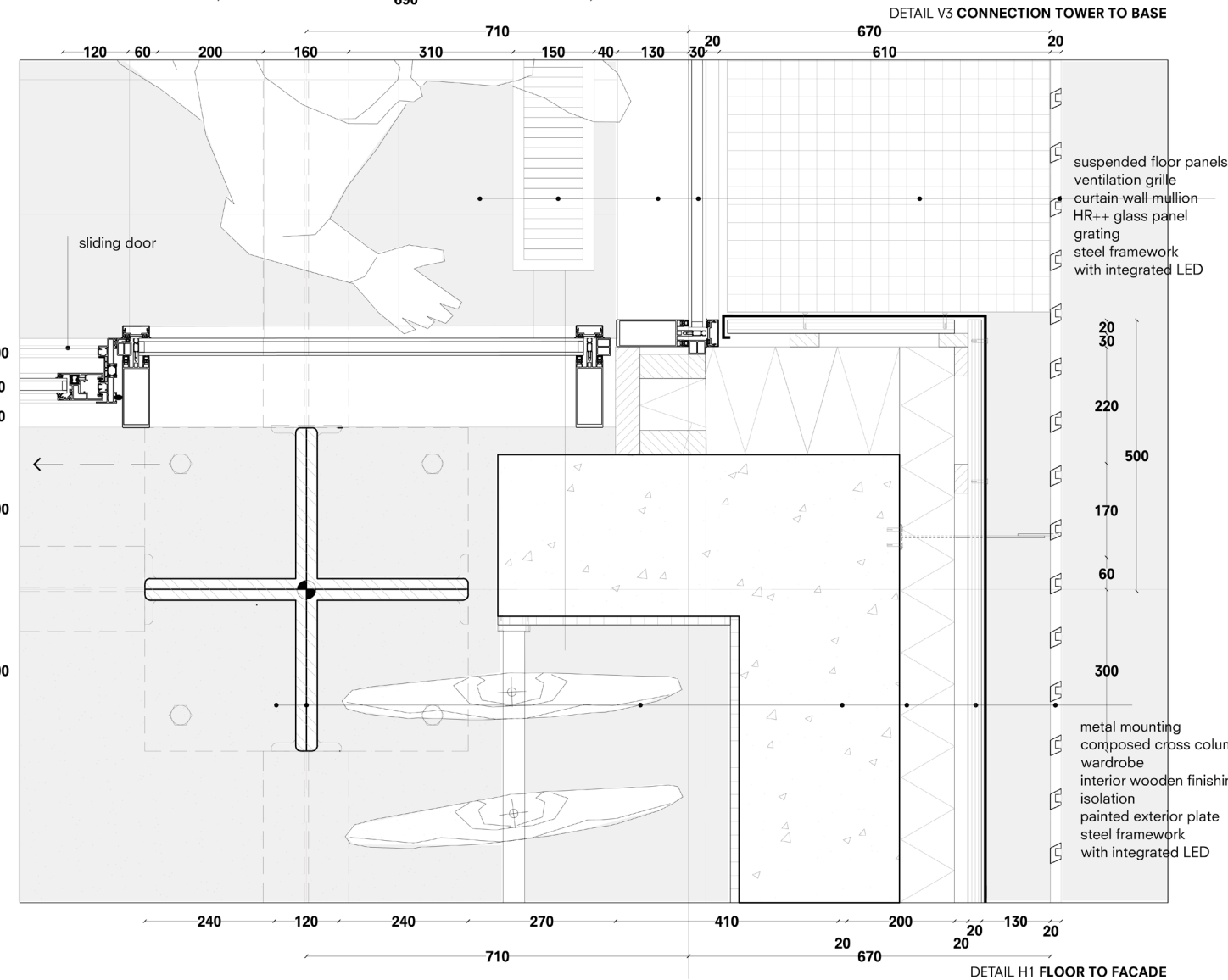
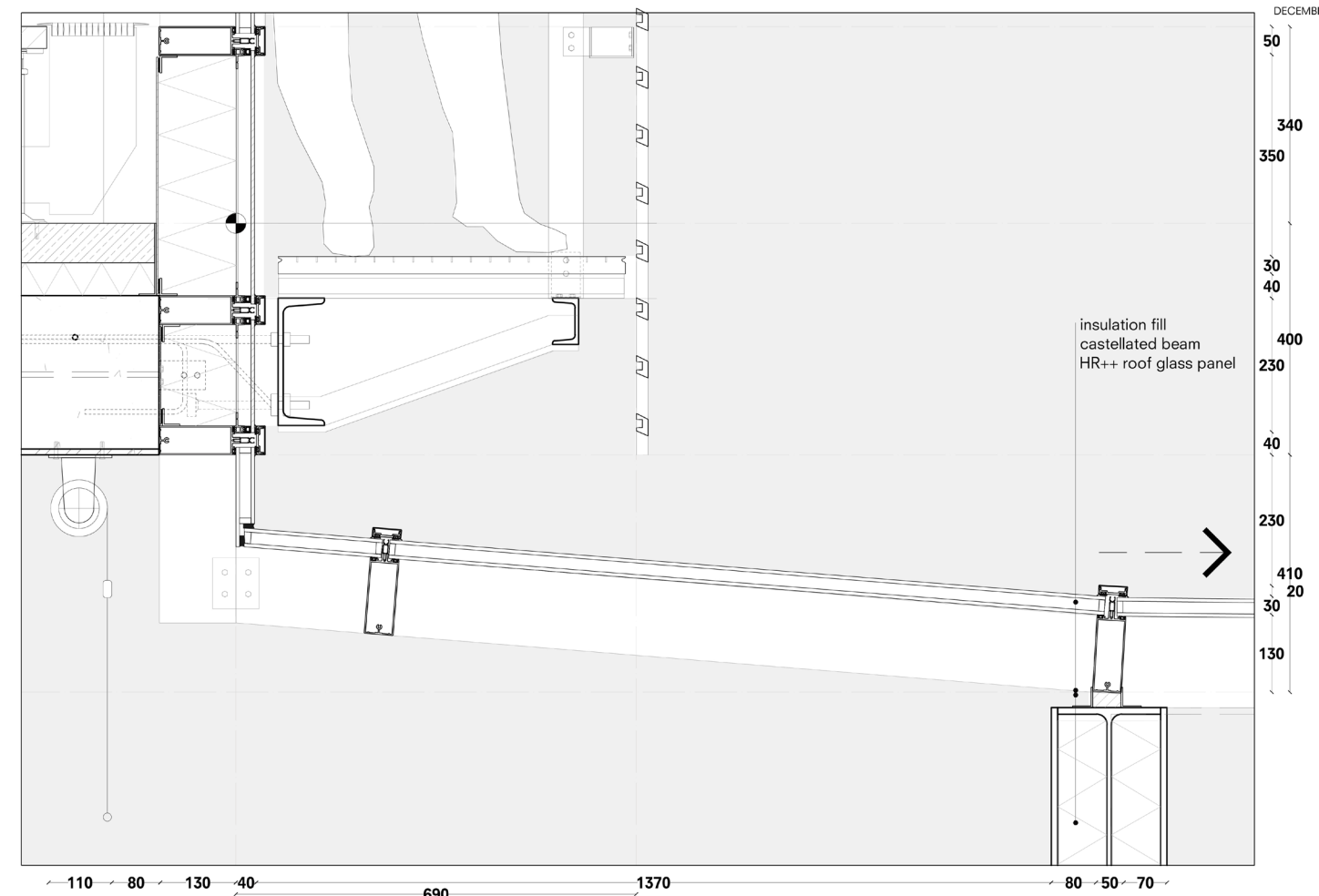






SCALE 1:5  
5cm 10cm 25cm 50cm

DETAIL V2 FLOOR TO FACADE



DETAIL H1 FLOOR TO FACADE