

24-Hour Architecture — An exploration of space efficiency

An Integrated design approach for a flexible-use construction



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4728270

Tutors: Emiel Lamers (Architecture); Marcel Bilow (Research & Building Technology)



TOKYO

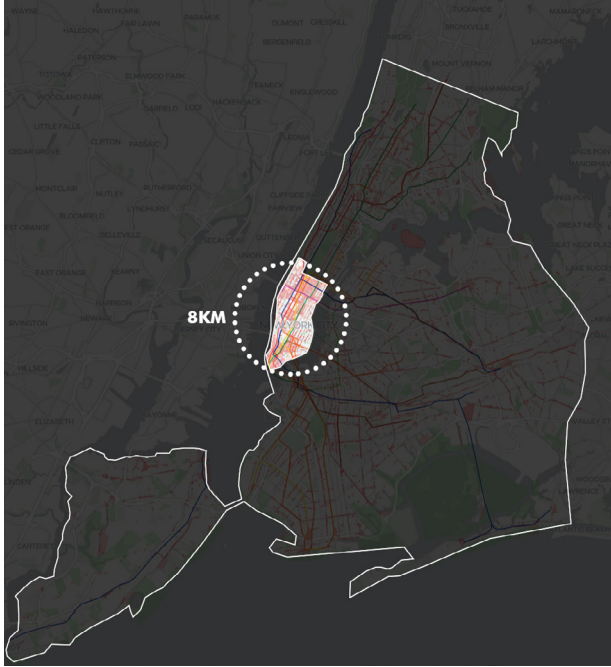


NEW YORK

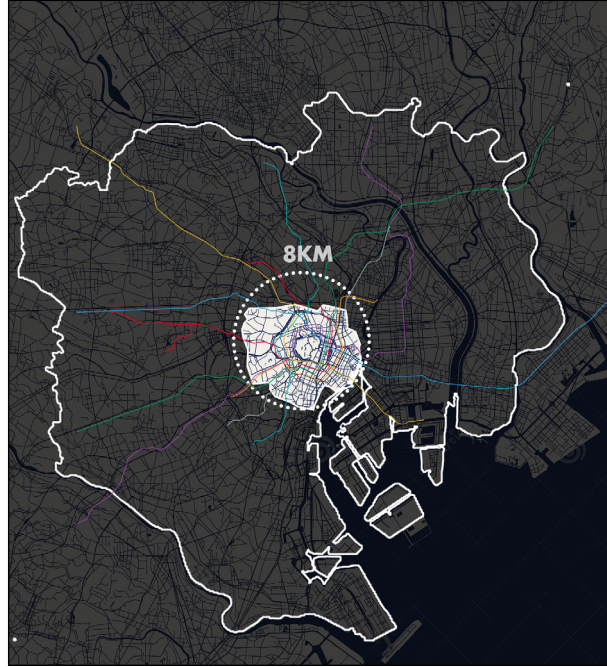


HONG KONG

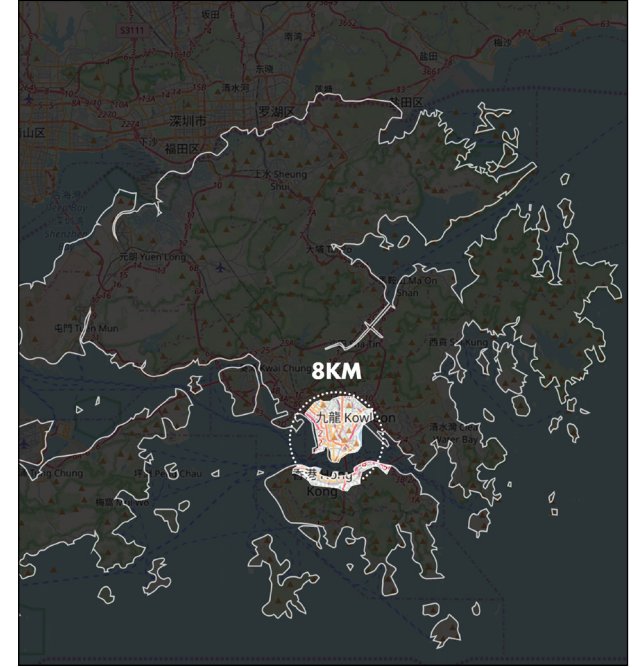
**METROPOLIS RESOURCE
CENTRALIZED**



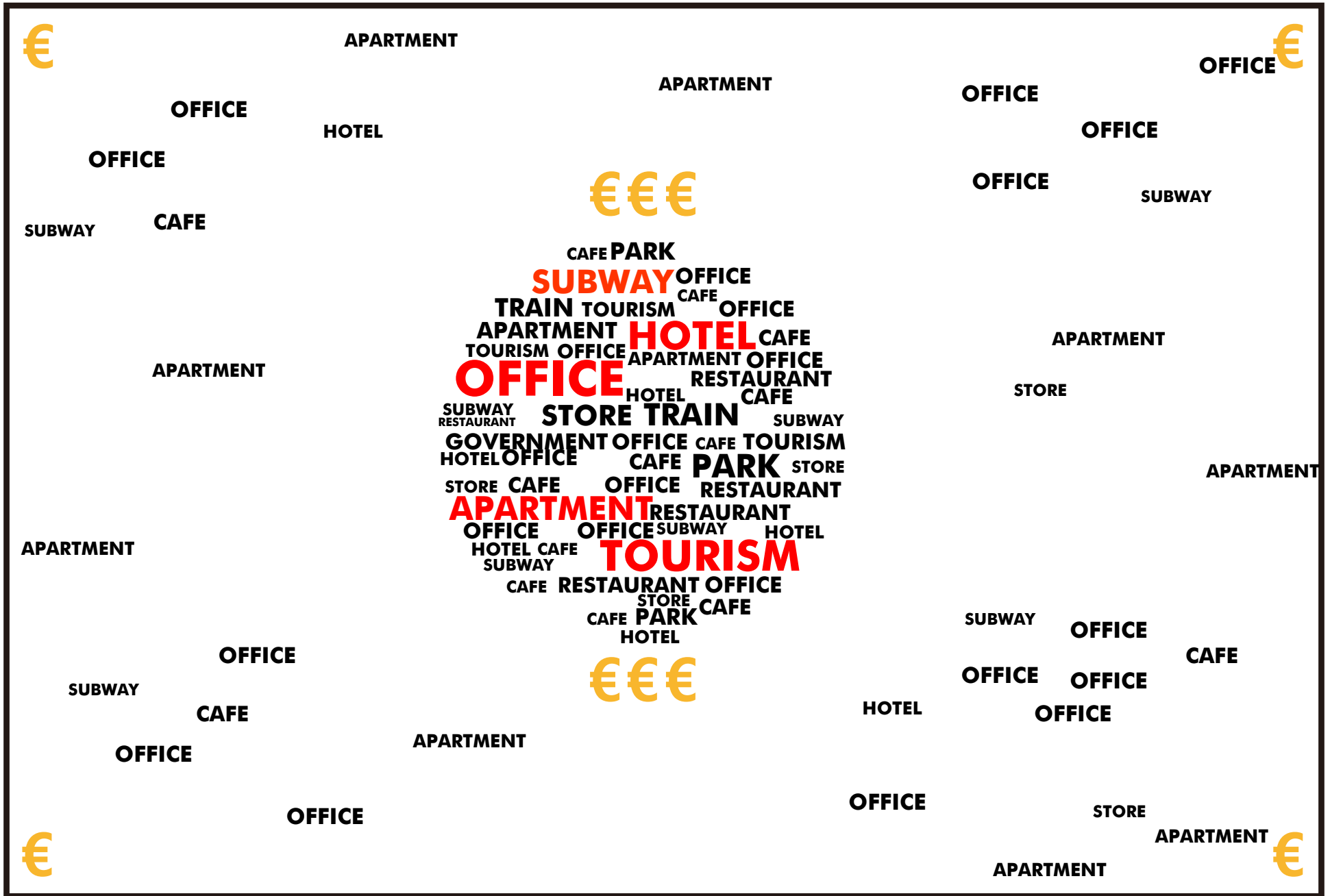
Mapping of New York



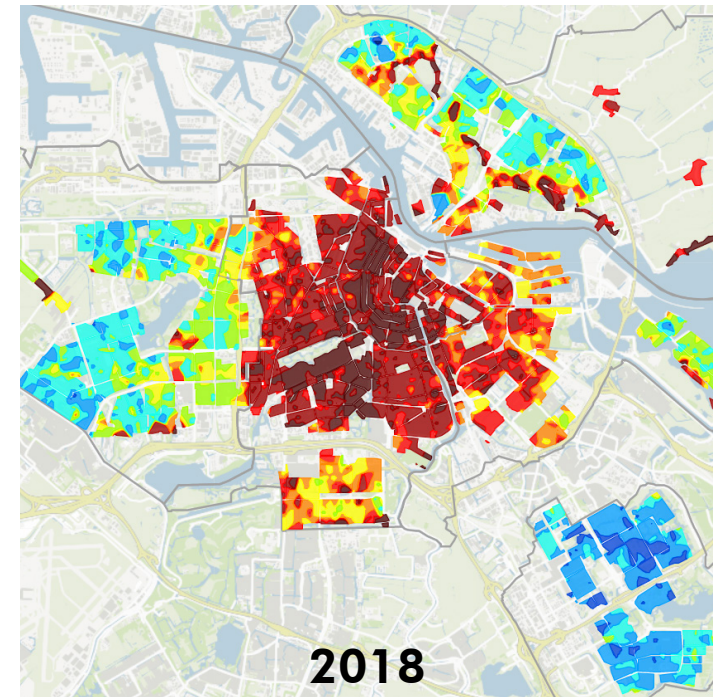
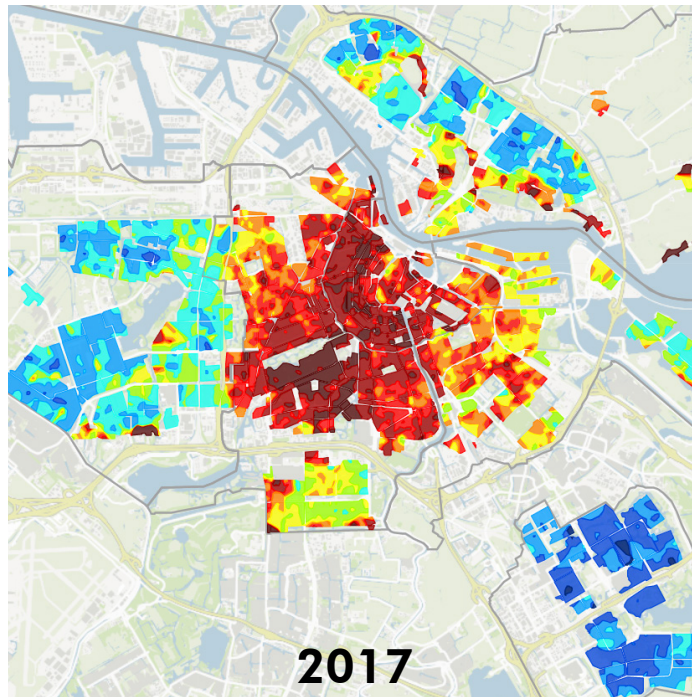
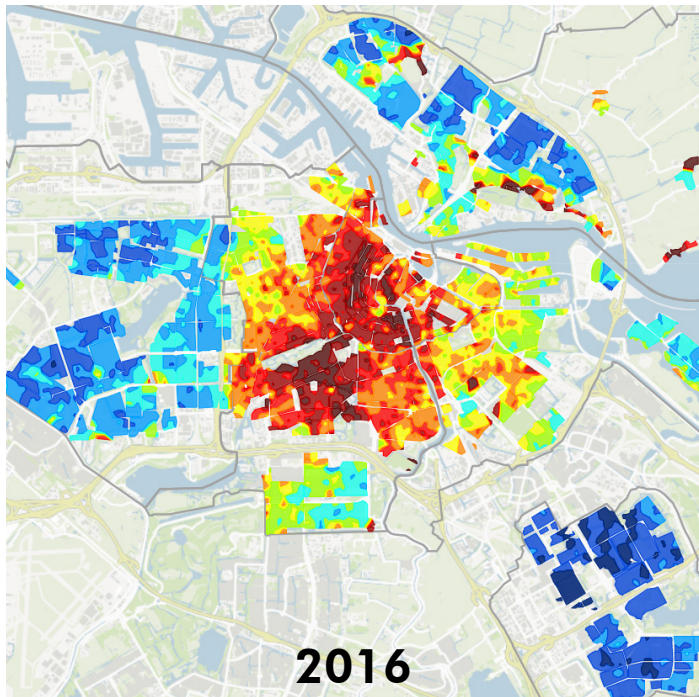
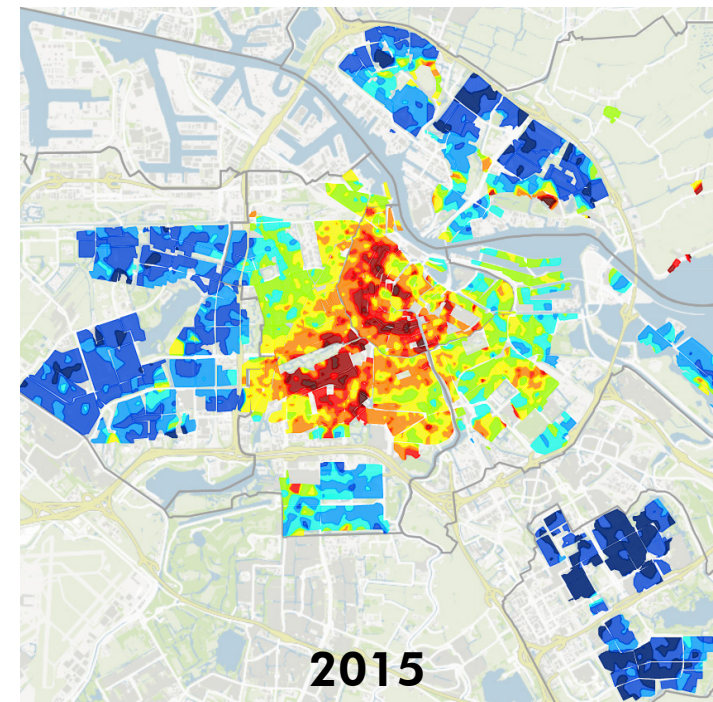
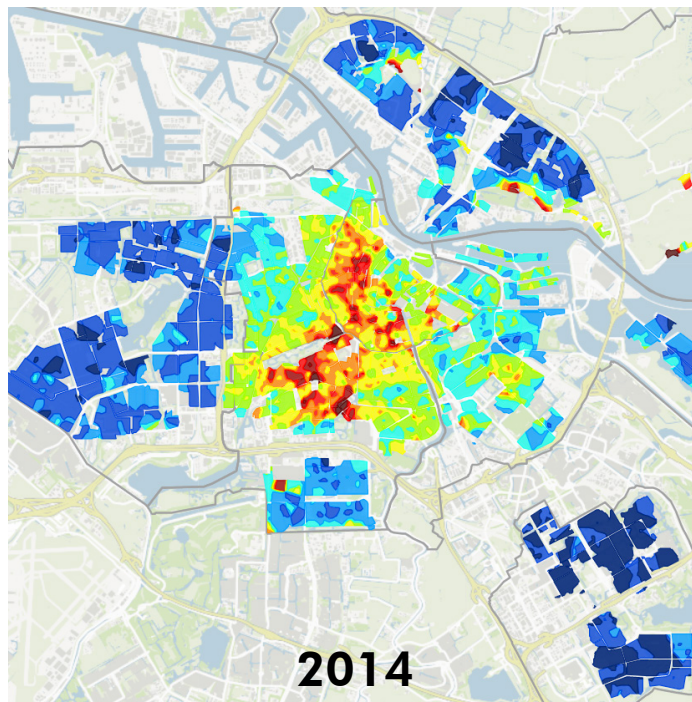
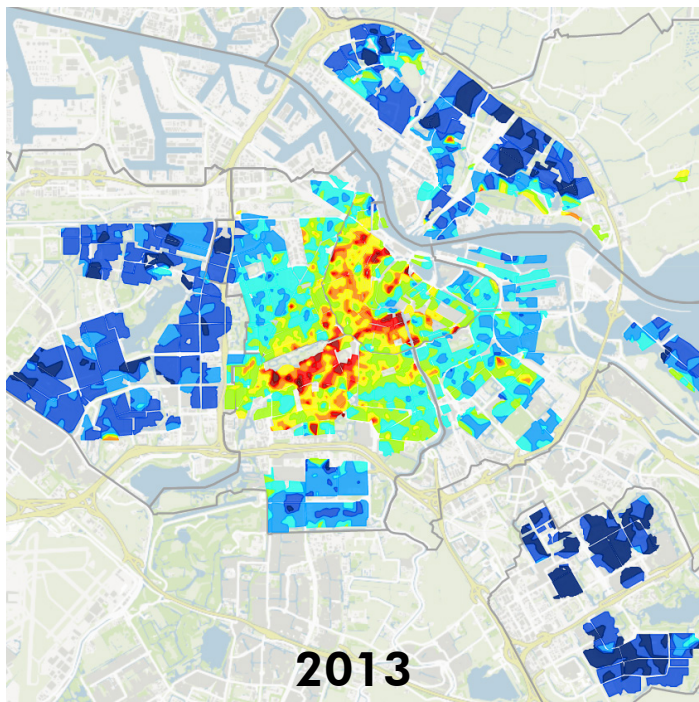
Mapping of Tokyo



Mapping of Hong Kong



CITY BOUNDARY



Property value in Amsterdam(source:<https://maps.amsterdam.nl>)

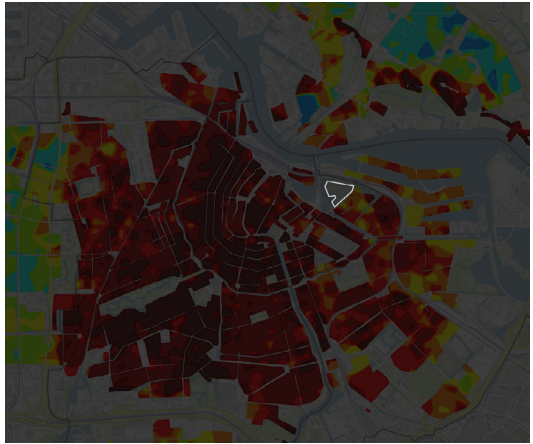


Image: Illustration from marinerrein.nl, Siebe Swart

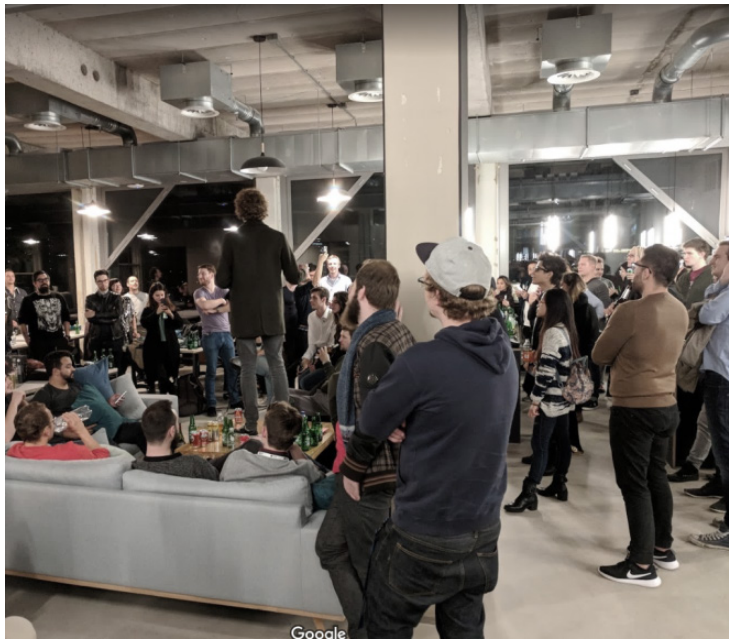
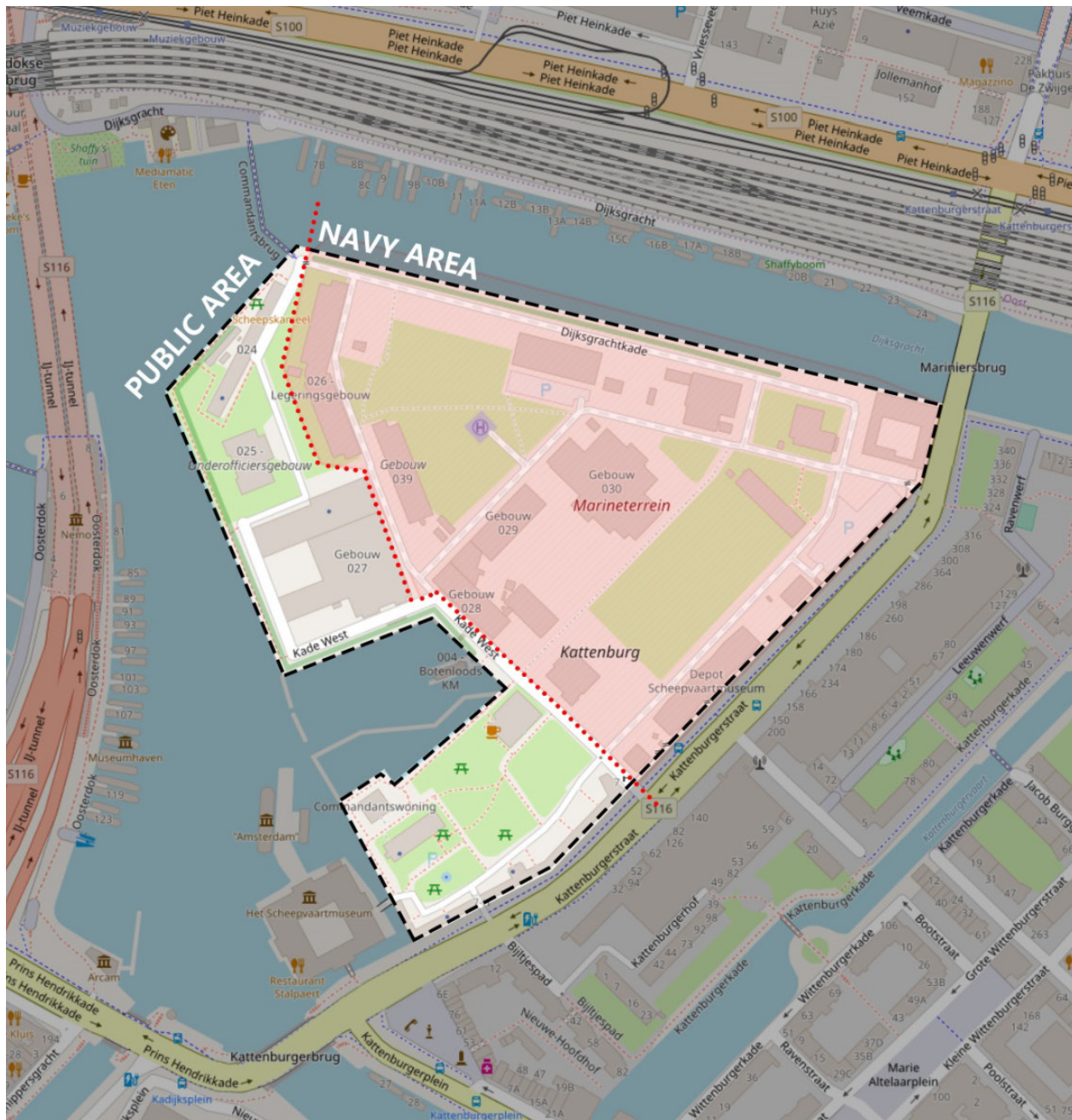


Image: All images are from googlemap



Current situation of the site

BUSINESS

AMSTERDAM OFFICE BUILDINGS SEE LARGEST PRICE INCREASE IN THE WORLD: REPORT

By Janene Pieters on October 24, 2018 - 10:00



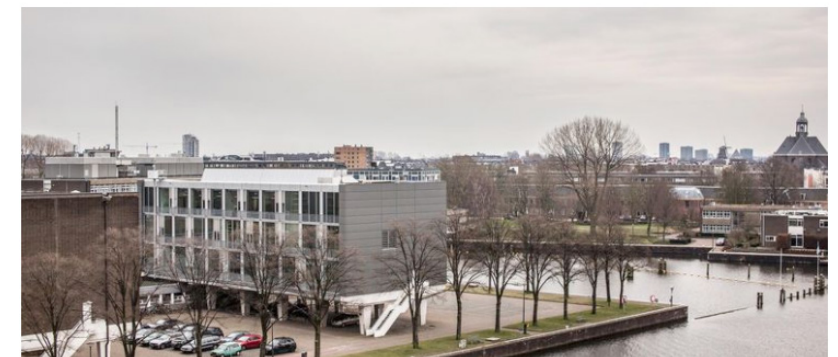
<https://nltimes.nl/2018/10/24/amsterdam-office-buildings-see-largest-price-increase-world-report>

Het Parool Het Overland

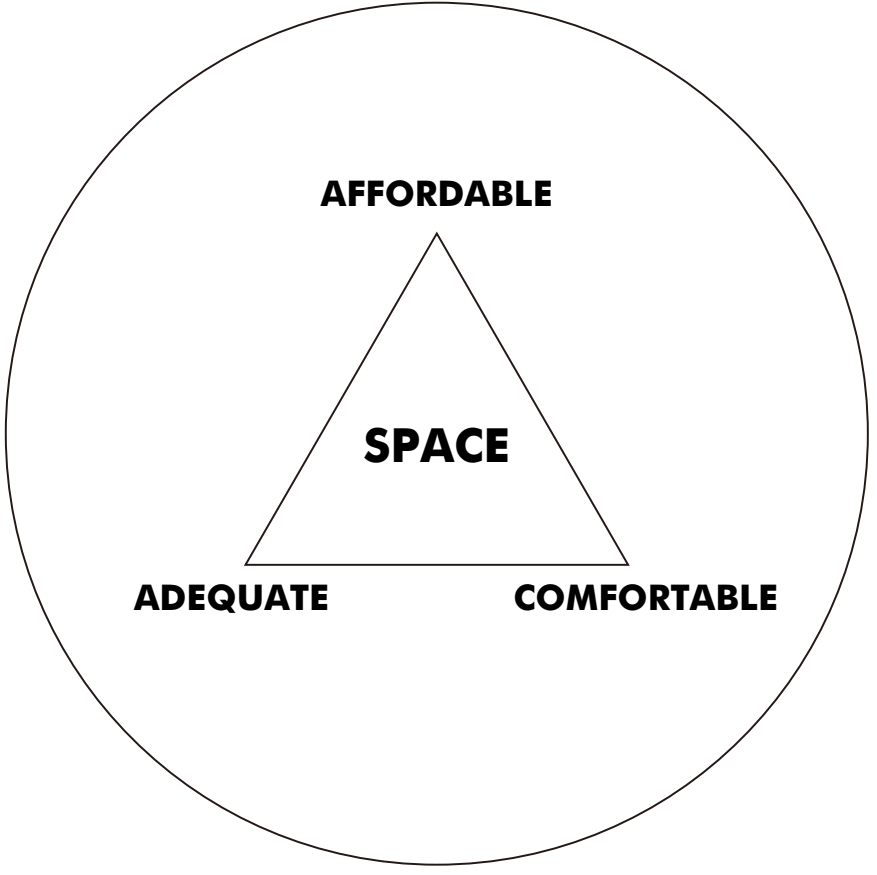
Defensie wil toch op het Marineterrein blijven

Al jarenlang is defensie bezig te vertrekken van het Marineterrein, maar nu ze eindelijk weg zouden zijn, heeft de krijgsmacht zich bedacht: defensie wil 'om strategische redenen' op het complex blijven.

Hanneke Keultjes en Marc Kruyswijk 3 juli 2018, 9:33



<https://www.parool.nl/nieuws/defensie-wil-toch-op-het-marineterrein-blijven~b9d91024/>



→ **NEW YORK, TOKYO, HONGKONG, BEIJING,.....**

AN EXPERIMENT IN MARINETTERREIN

RESEARCH

Problem statement

NOWADAYS CENTRAL AREA OF METROPOLIS FACE WITH HIGH RENT PRICE AND LOW SPACE SUPPLY.

Research question

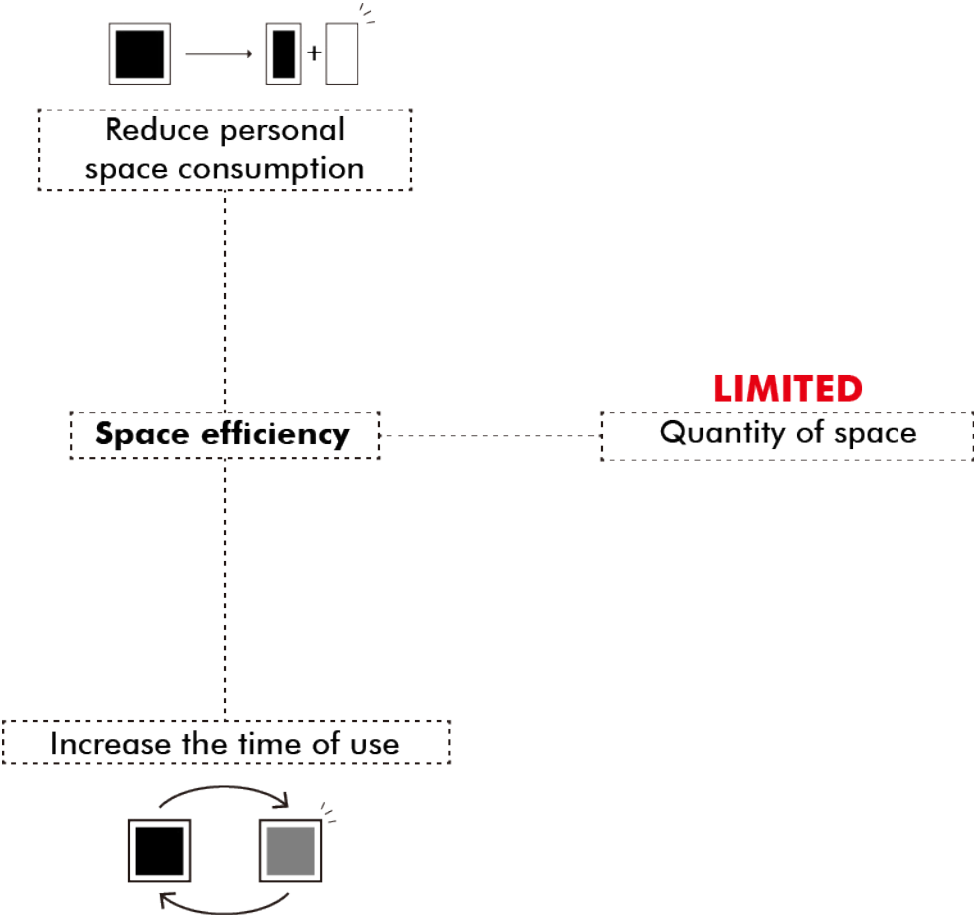
HOW TO CREATE AFFORDABLE ARCHITECTURAL SPACE WITH HIGH SPACE EFFICIENCY ?

- What is space efficiency ?
- What people have already done for it?
- Is there any other possibility?

RESEARCH

Research methods

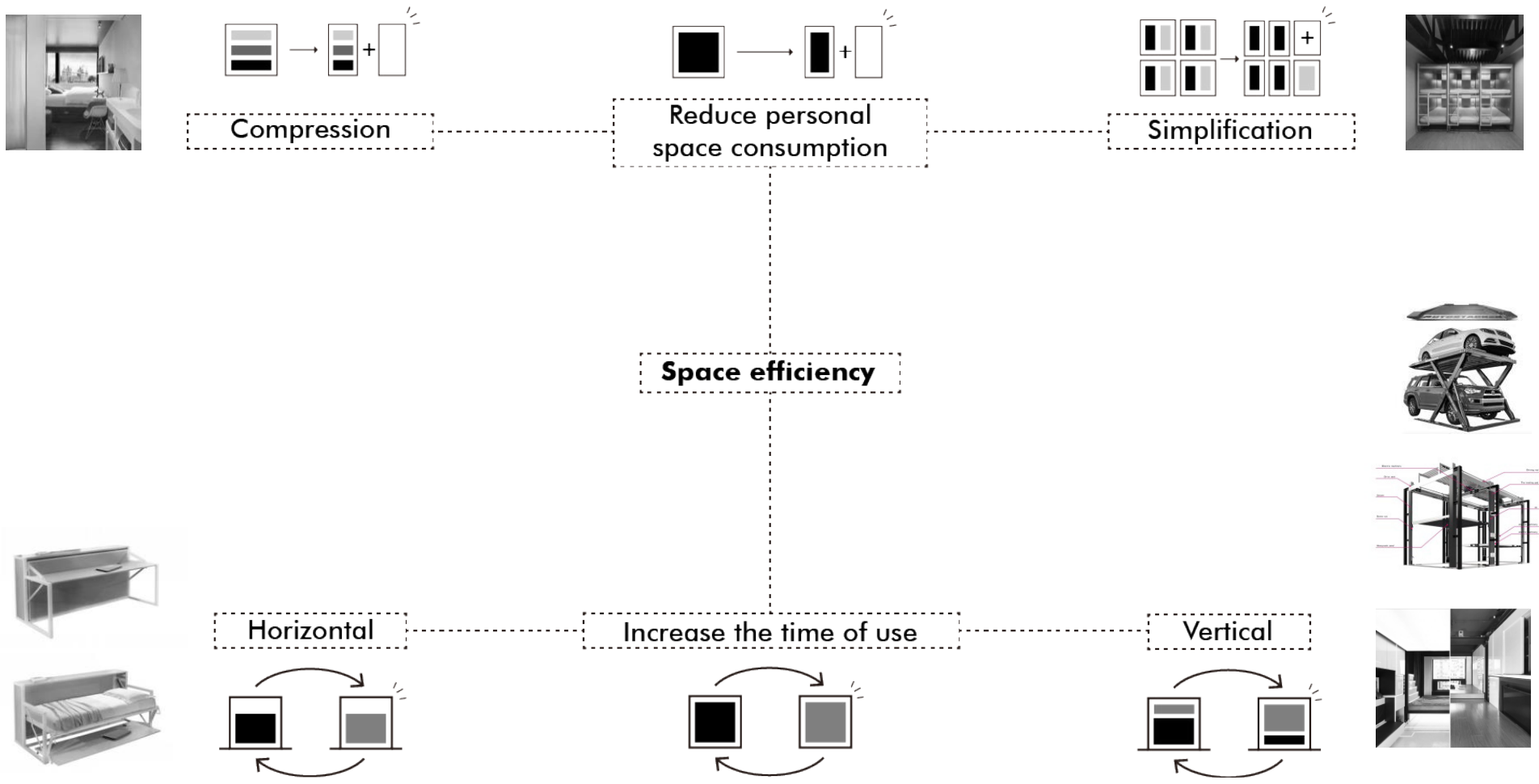
ESTABLISH DEFINITION



RESEARCH

Research methods

TYOPOLOGICAL CASE STUDY



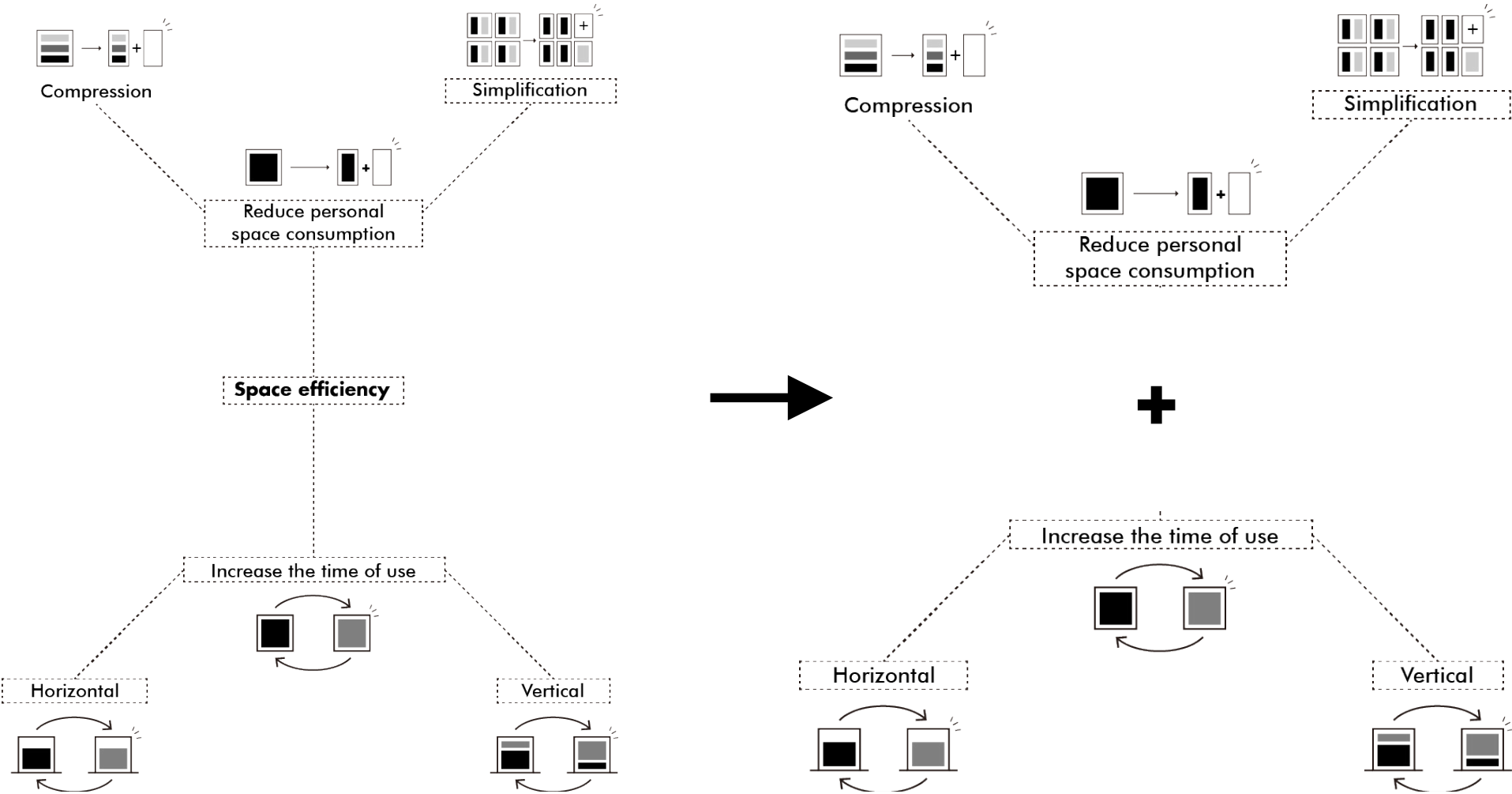
RESEARCH

Conclusion

- **All these examples can effectively increase space efficiency.**
- **The space of every example is used by same user during a day, but the user normally do not always use the space.**
- **There is no exploration that combine these two main aspects**

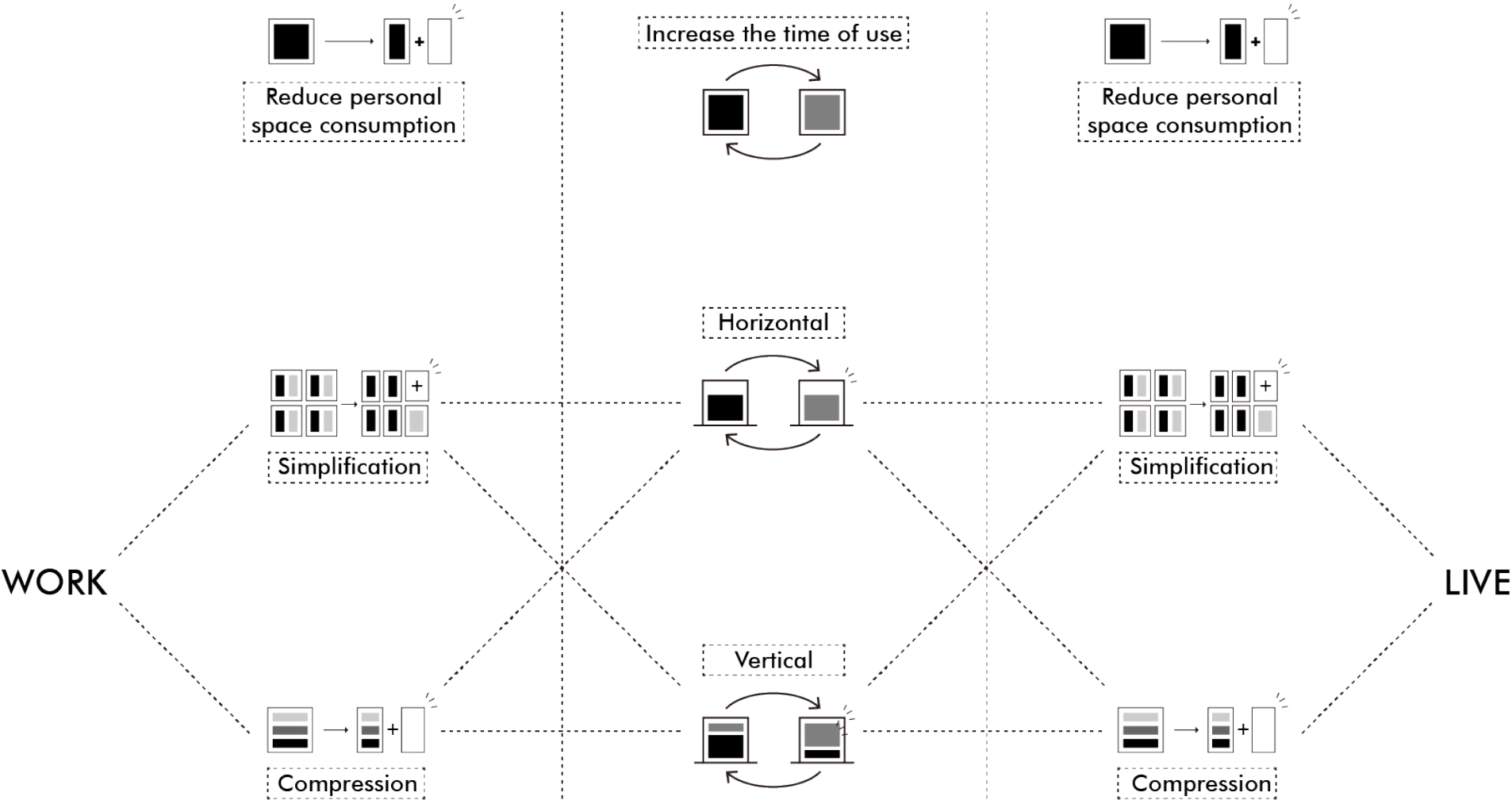
RESEARCH

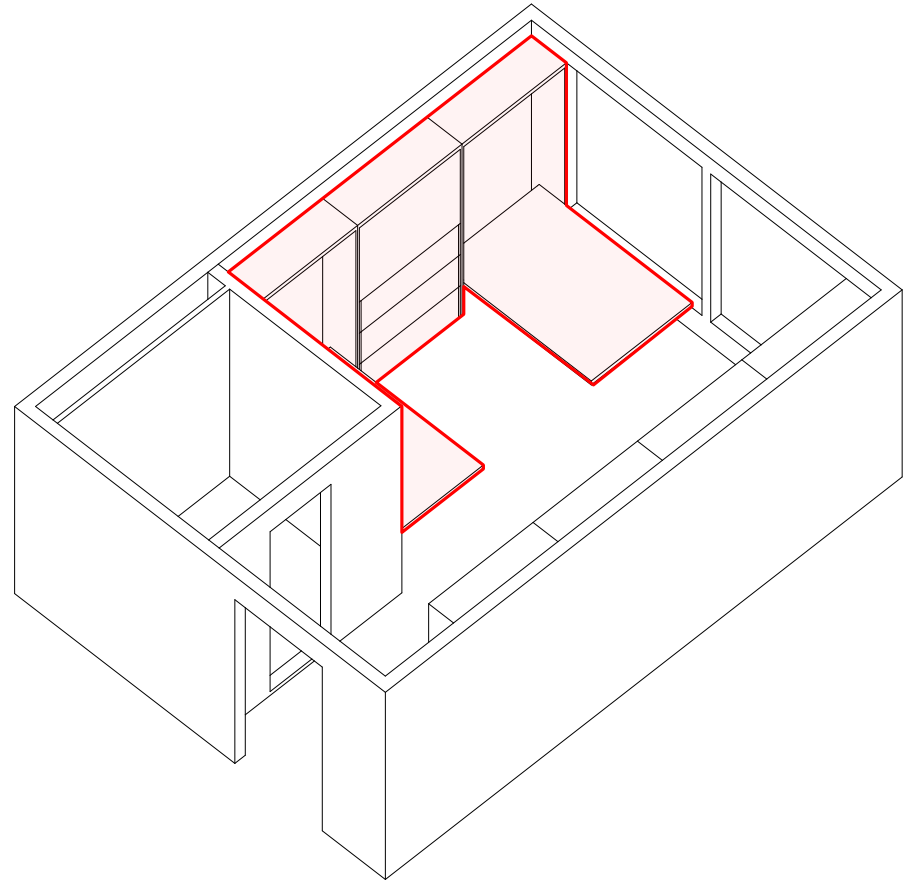
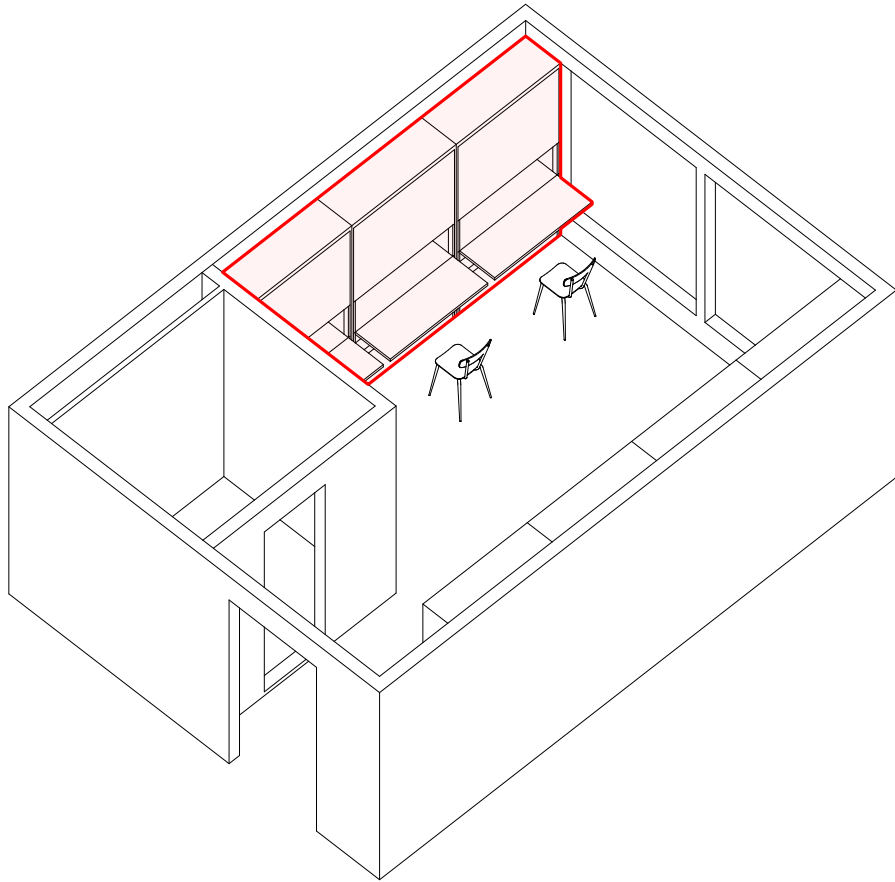
POTENCIAL EXPLORATIONS



RESEARCH

POTENCIAL EXPLORATIONS

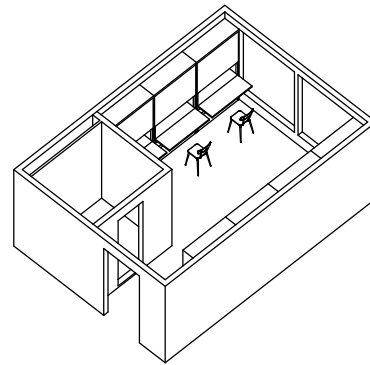
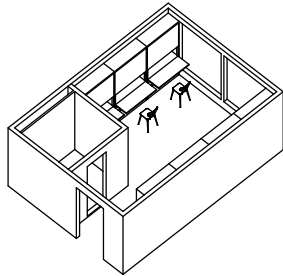




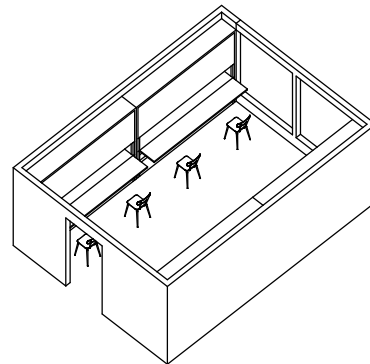
**Multifunctional
furniture**

More suitable for existing building

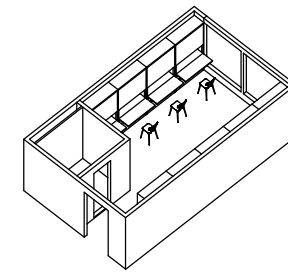
WORK — Flexible working time



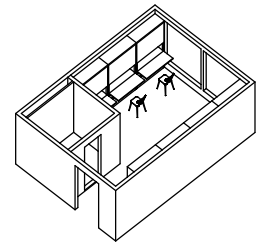
Normal price
& compressed but **completed functions**



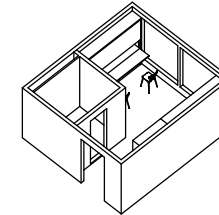
Lower price
& simplified space with **shared functions**



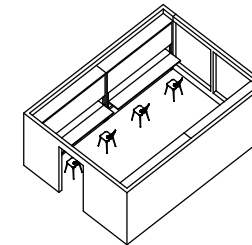
Large group



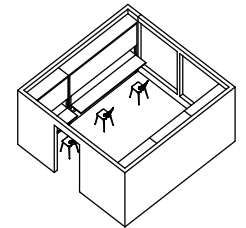
Medium group



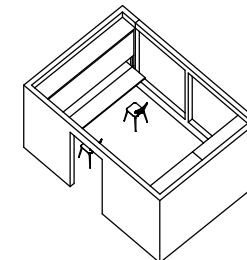
Small group



Large group



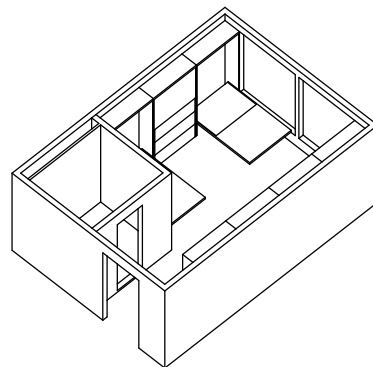
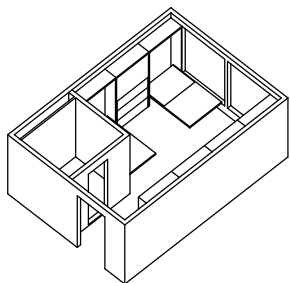
Medium group



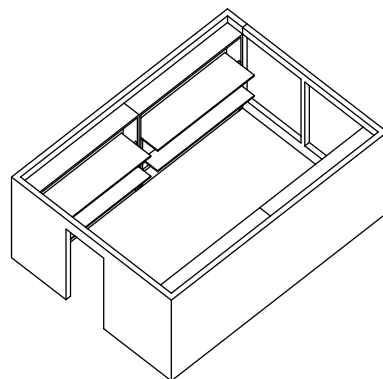
Small group

LIVE

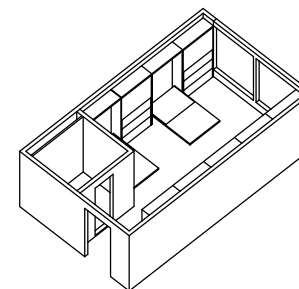
Flexible furniture



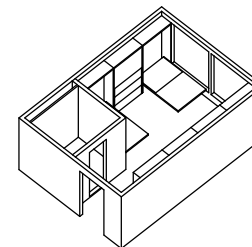
Hotel



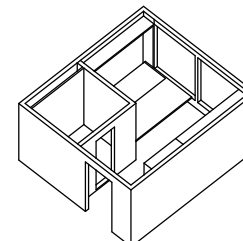
Hostel



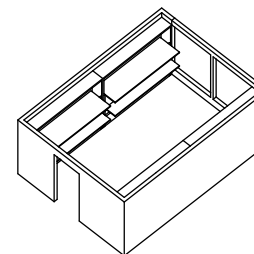
Large room



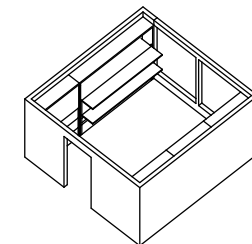
Medium room



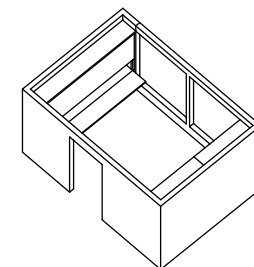
Small room



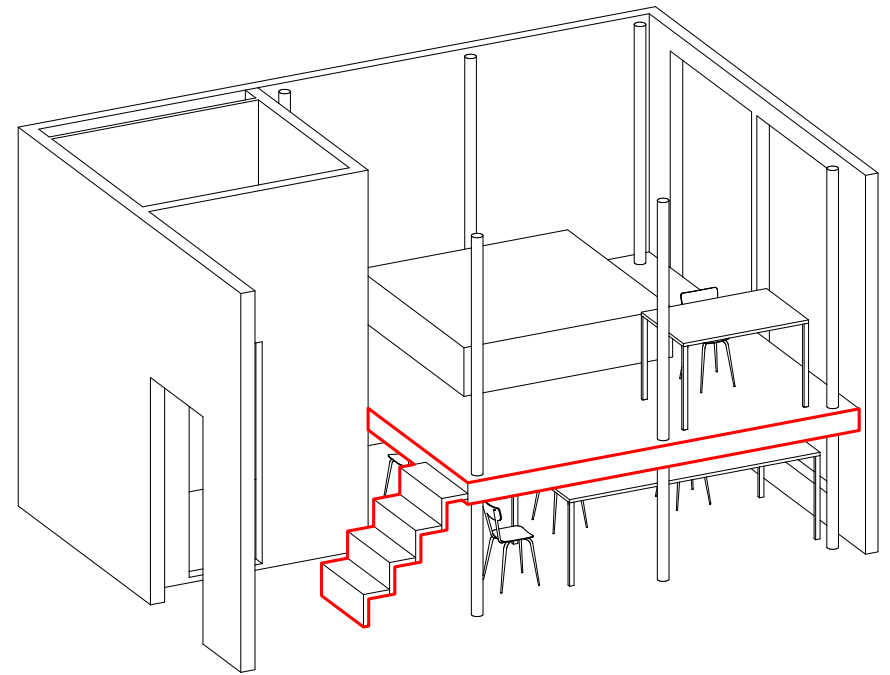
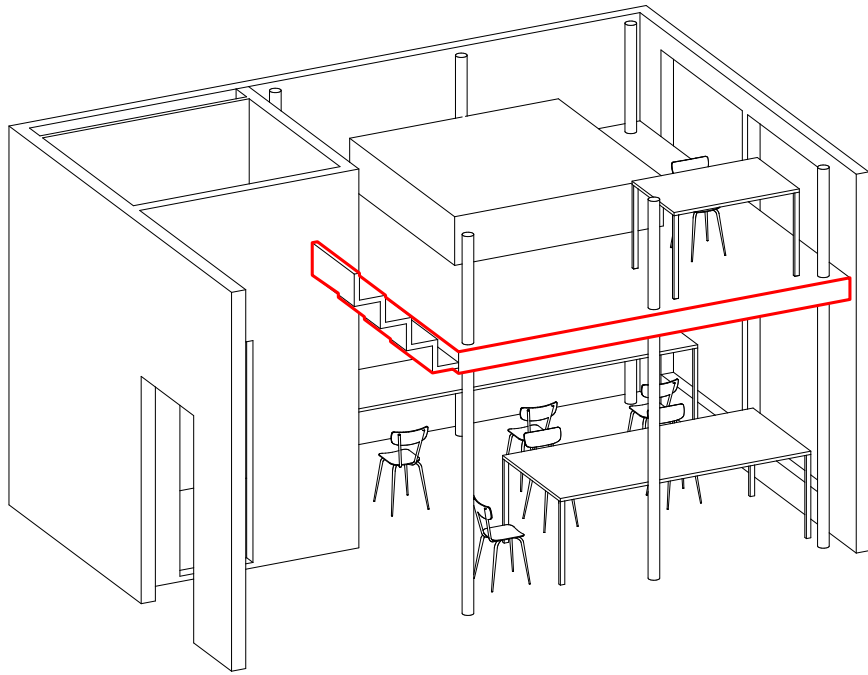
Large room



Medium room



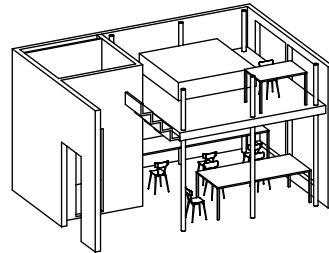
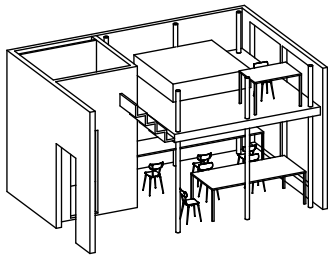
Small room



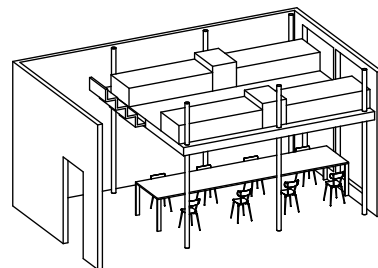
Flexible floor system

More suitable for new building
& building with enough height

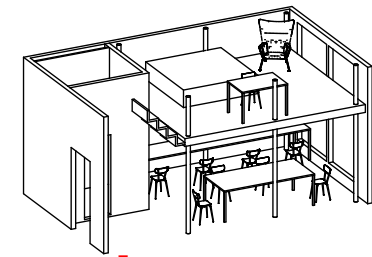
WORK — Stable working time



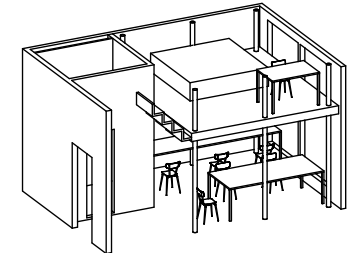
Normal price
& compressed but **completed functions**



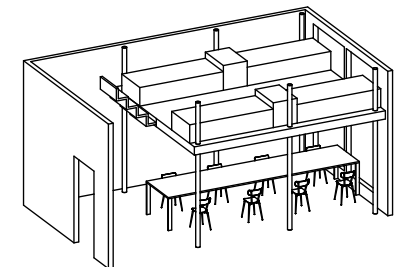
Lower price
& simplified space with **shared functions**



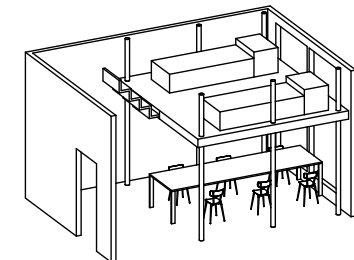
Large group



Medium group



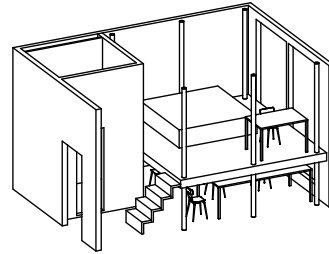
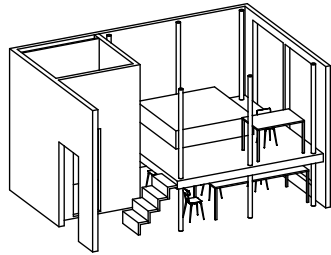
Large group



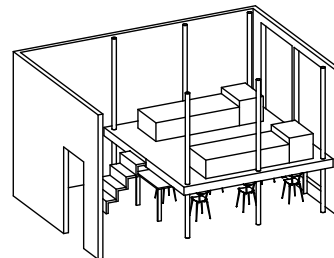
Medium group

LIVE

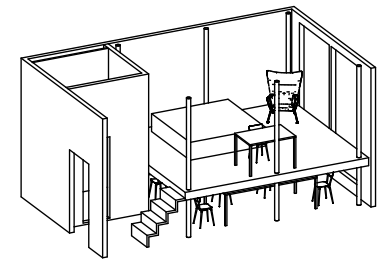
Flexible floor system



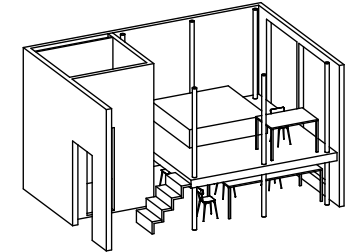
Normal price
& compressed but **completed functions**



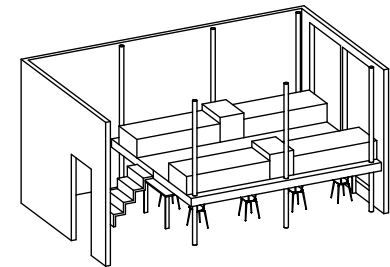
Lower price
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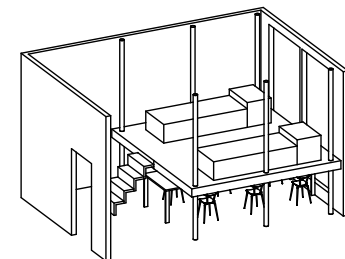
Large group



Medium group

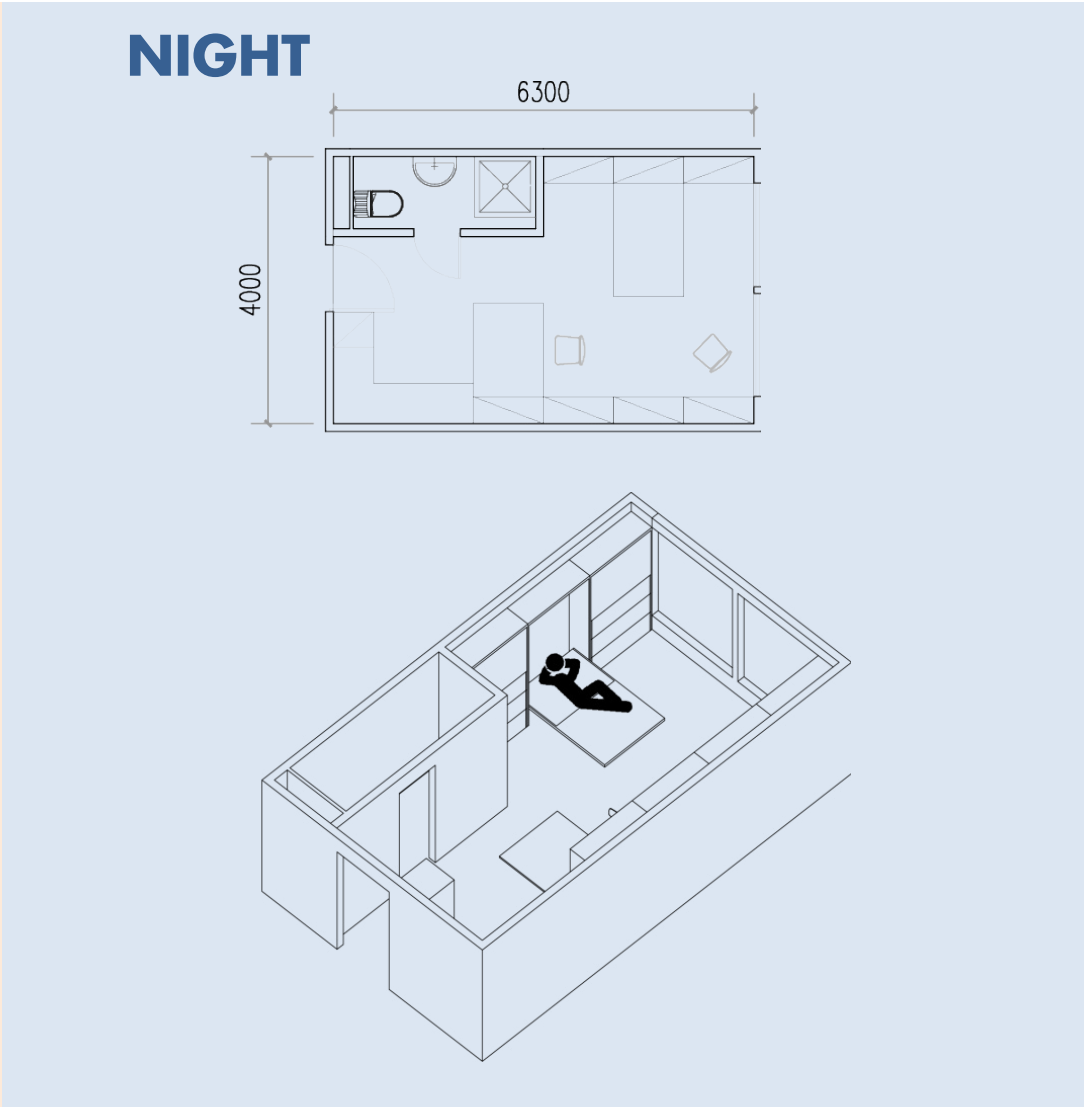
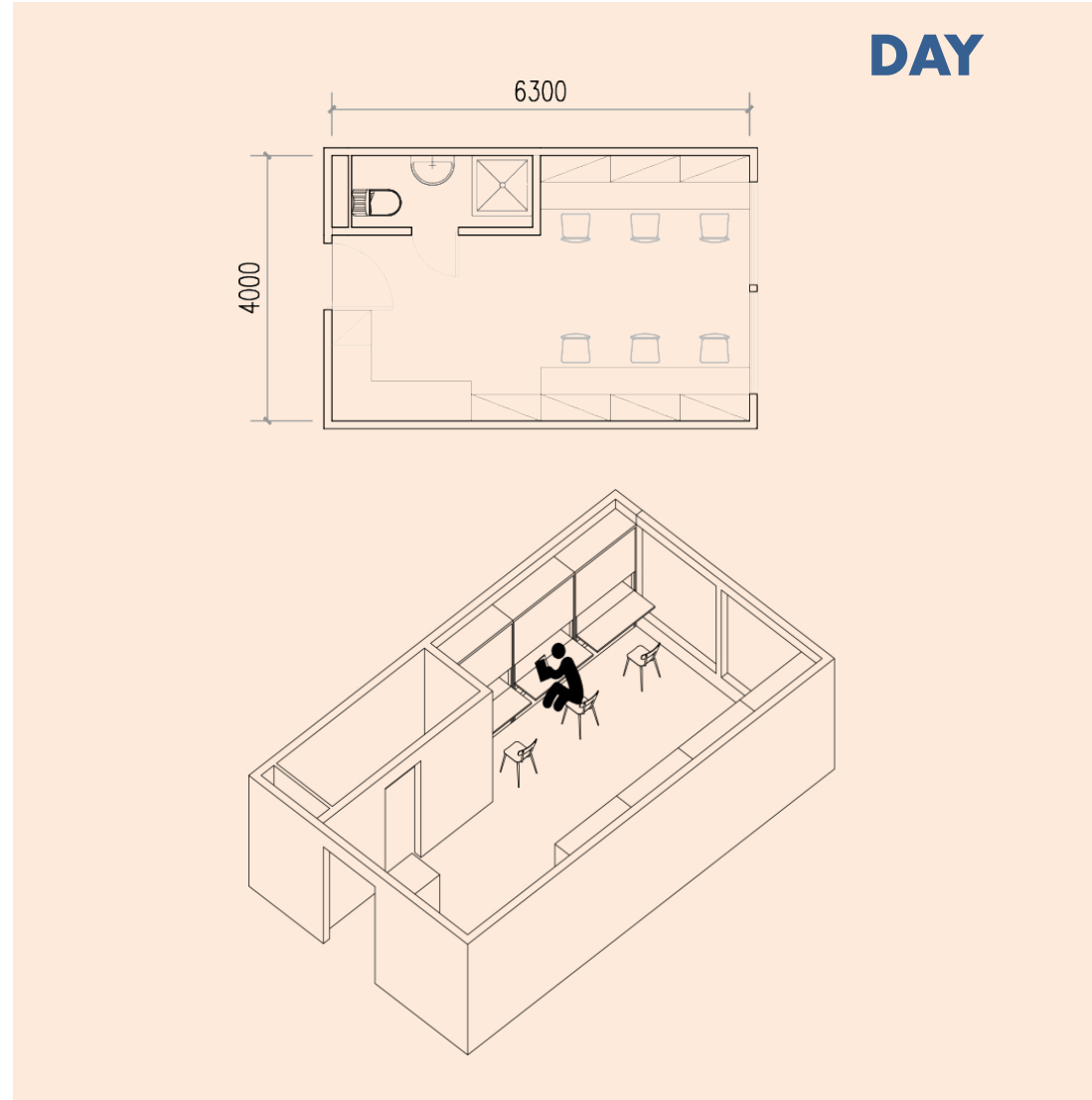


Large group



Medium group

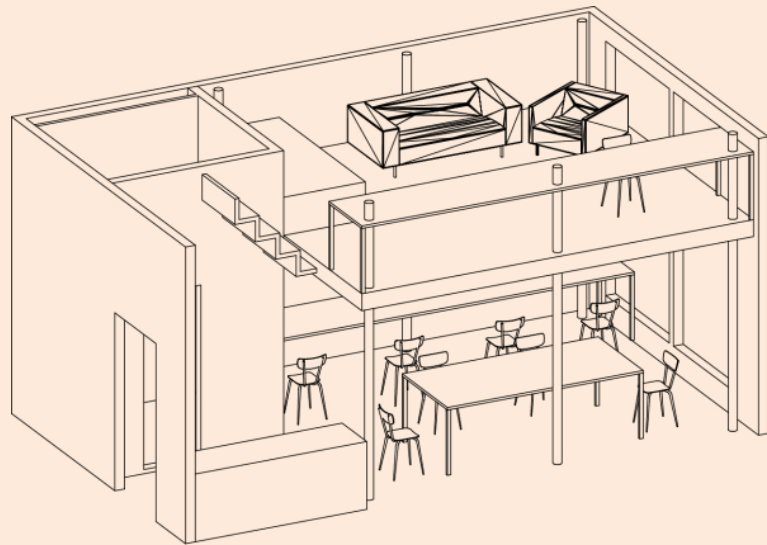
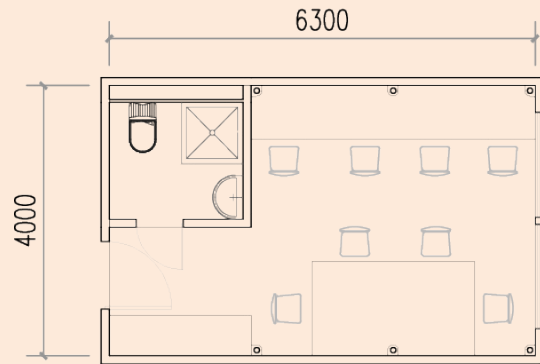
PROTOTYPE - Innovator apartment with flexible furniture system



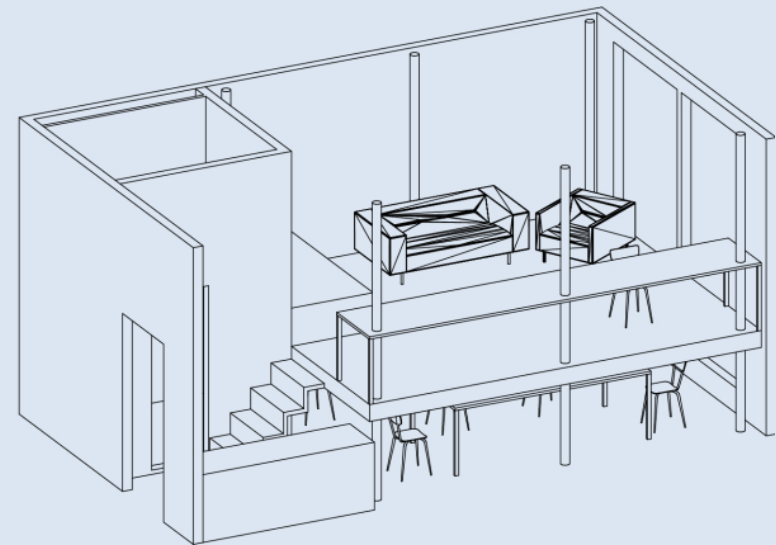
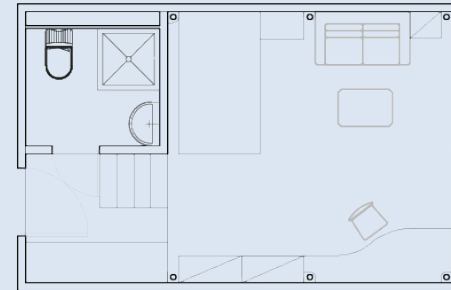
RESEARCH

PROTOTYPE - Innovator apartment with flexible floor system

DAY



NIGHT



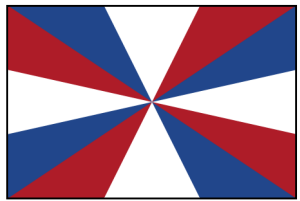
RESEARCH
SUMMARY

- **Achieve higher space efficiency**
- **Run in certain conditions.**

From research to design process:

How to realize and effectively run these prototype?

EXPERIMENT OF THREE PATTERNS



The Royal Netherlands Navy

RIGHT OF USE

MARINETERRAIN Amsterdam

RENOVATION

RIGHT OF USE
DAY AND NIGHT

1

INNOVATIVE GROUPS
WITH FLEXIBLE WORKING TIME

RIGHT OF USE
DURING NIGHT

TOURIST

NEW

2

RIGHT OF USE
DURING DAY

INNOVATIVE GROUPS
WITH STABLE WORKING TIME

RUN AS HOTEL
DURING NIGHT

TOURIST

RENOVATION / NEW

RUN AS
INNOVATOR STUDIO

3

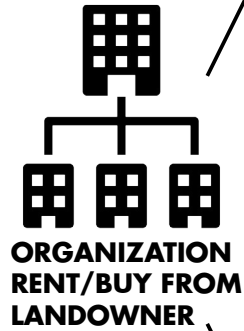
FOR INNOVATOR
WITH HER/HIS GROUP

FUTURE VISION



GOVERNMENT/LANDOWNER

RIGHT OF USE



RENOVATION / NEW

RIGHT OF USE
DAY AND NIGHT

1

INNOVATIVE GROUPS
WITH FLEXIBLE WORKING TIME

RIGHT OF USE
DURING NIGHT

TOURIST

RENOVATION / NEW

2

RIGHT OF USE
DURING DAY

INNOVATIVE GROUPS
WITH STABLE WORKING TIME

RUN AS HOTEL
DURING NIGHT

TOURIST

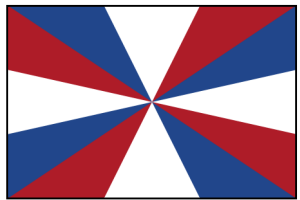
RENOVATION / NEW

RUN AS
INNOVATOR STUDIO

3

FOR INNOVATOR
WITH HER/HIS GROUP

EXPERIMENT OF THREE PATTERNS



The Royal Netherlands Navy

RIGHT OF USE

MARINETERRREIN Amsterdam

RENOVATION

RIGHT OF USE
DAY AND NIGHT

1

INNOVATIVE GROUPS
WITH FLEXIBLE WORKING TIME

RIGHT OF USE
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TOURIST

NEW

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RIGHT OF USE
DURING DAY

INNOVATIVE GROUPS
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RUN AS HOTEL
DURING NIGHT

TOURIST

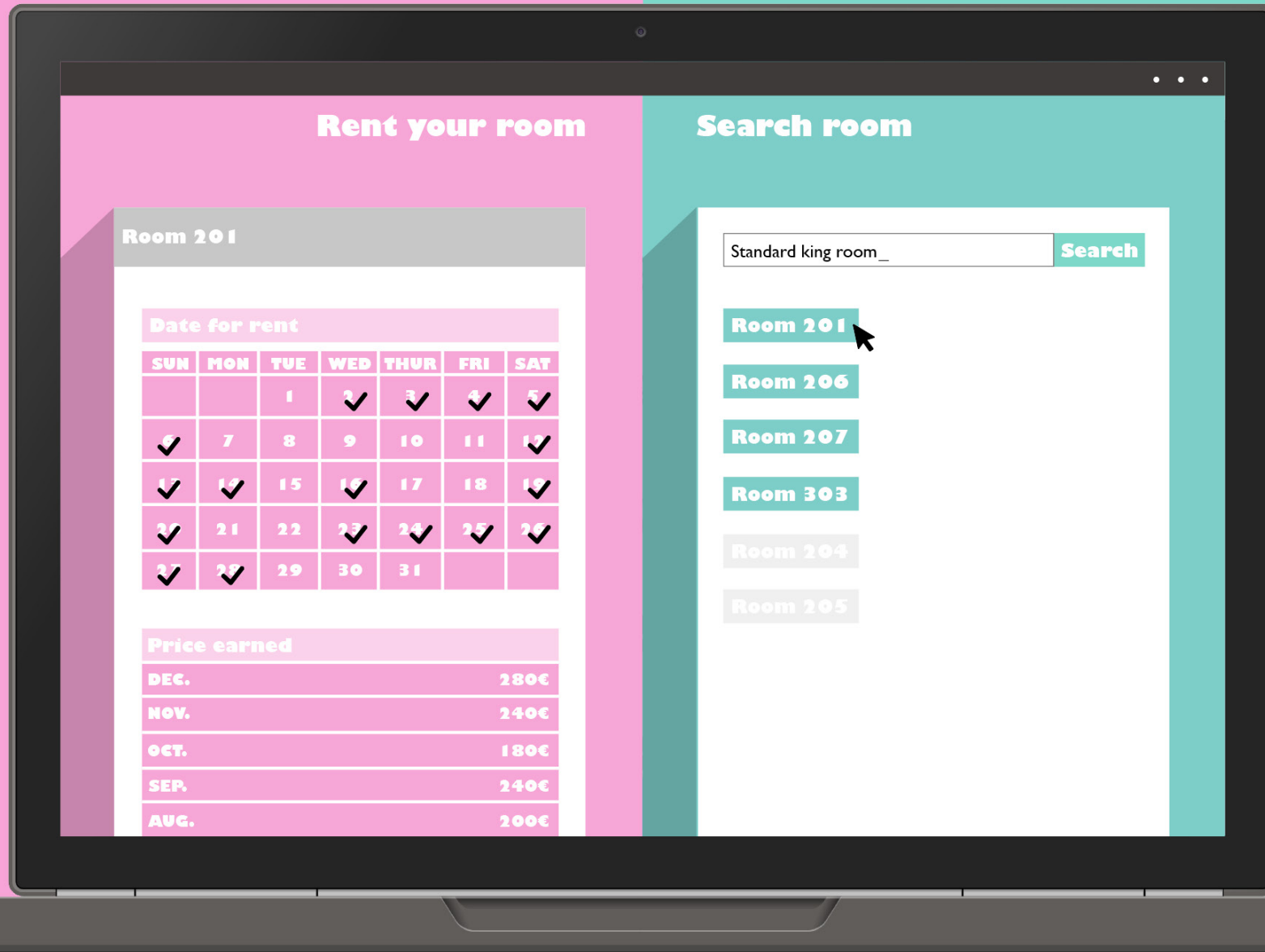
RENOVATION / NEW

RUN AS
INNOVATOR STUDIO

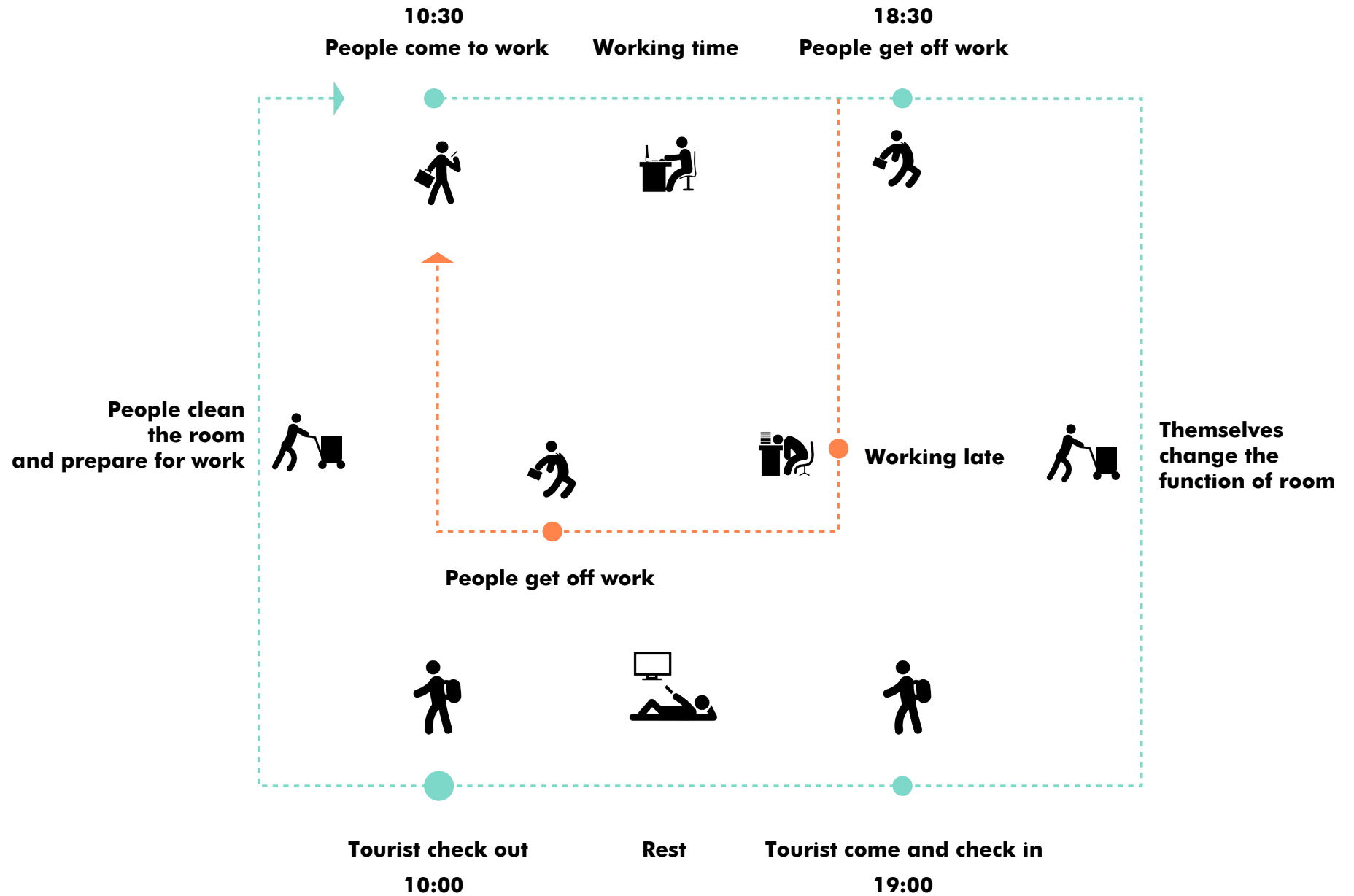
3

FOR INNOVATOR
WITH HER/HIS GROUP

Flexible online management

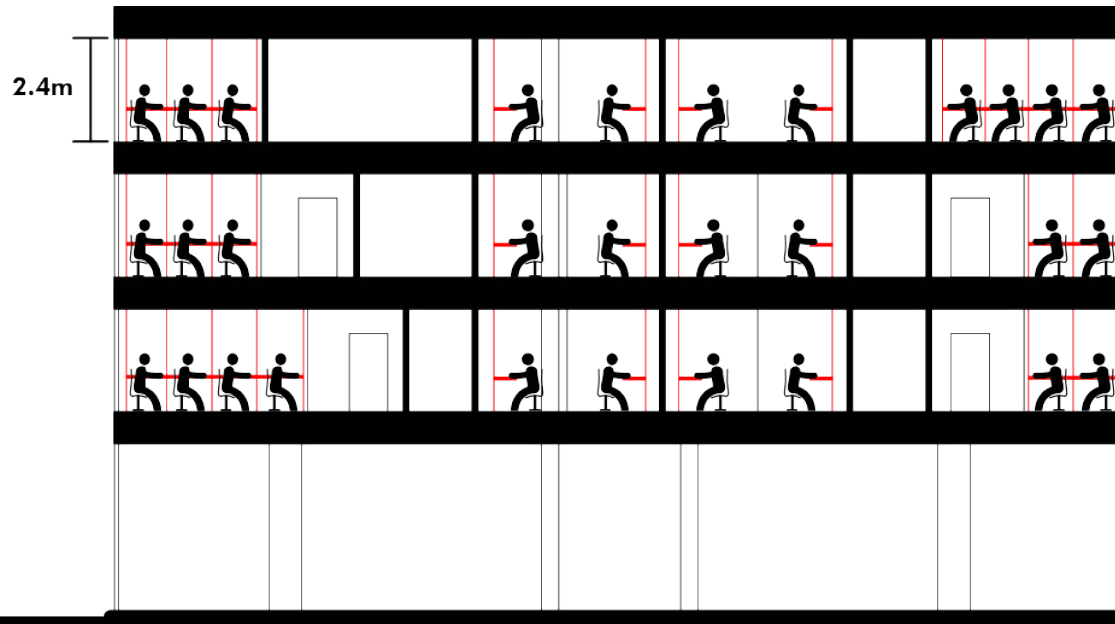
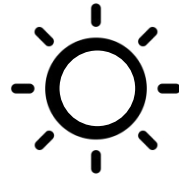


Flexible online management

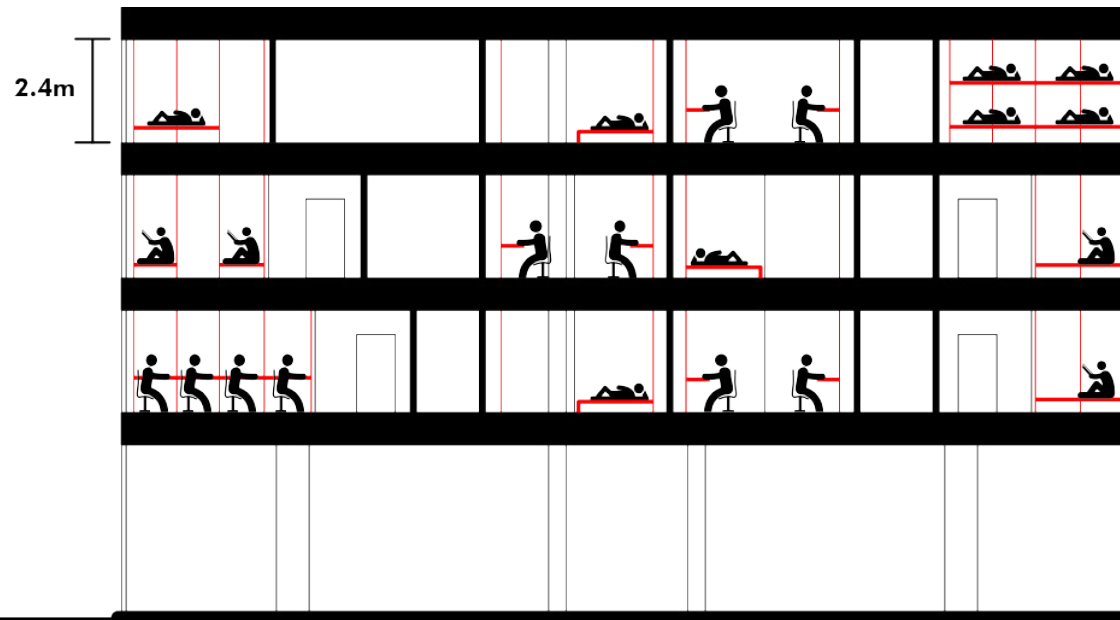


The tenant of the room take charge of transition

A flexible furniture series to translate different function

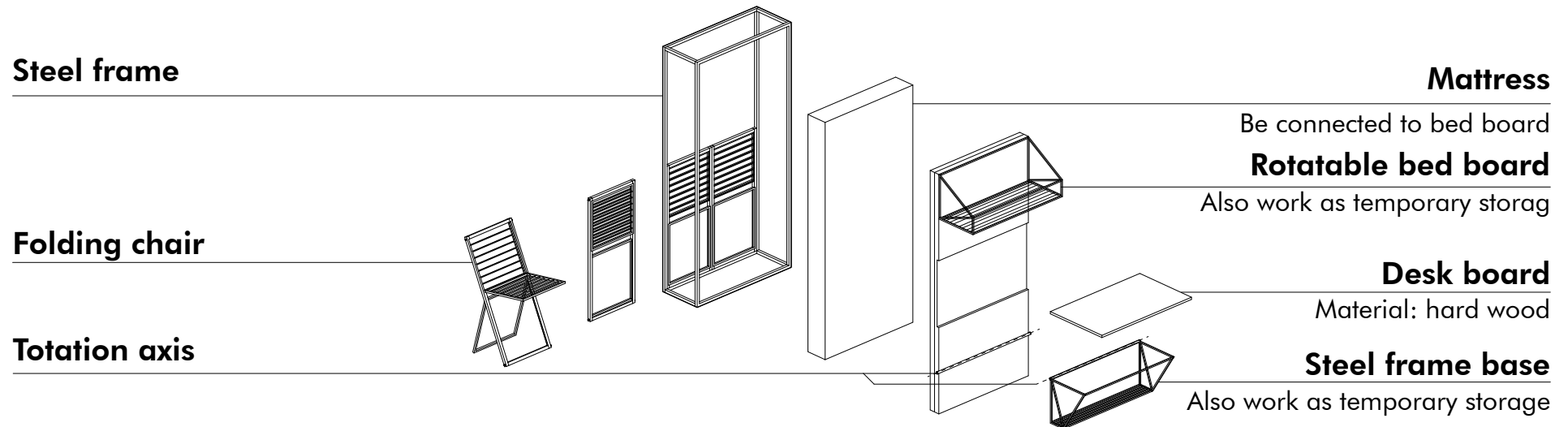


A flexible furniture series to translate different function

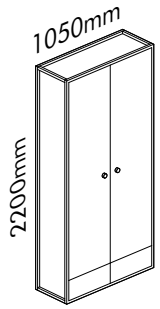


How to realize?

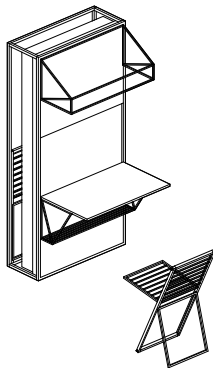
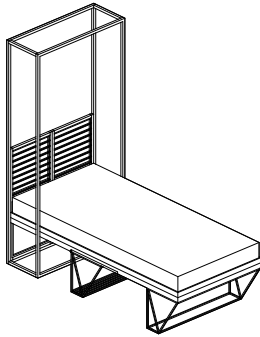
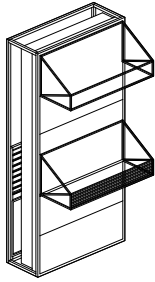
Flexible furniture series design



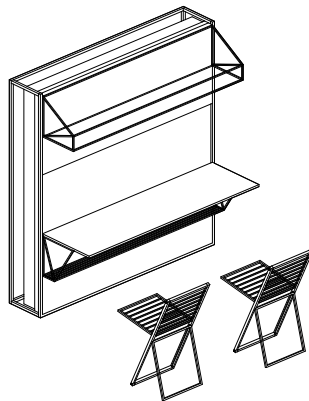
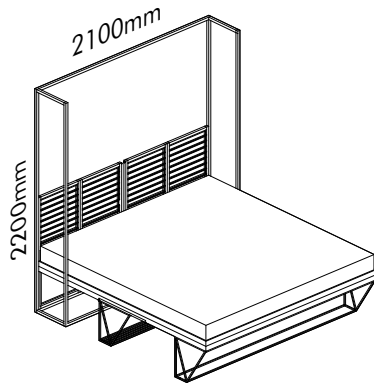
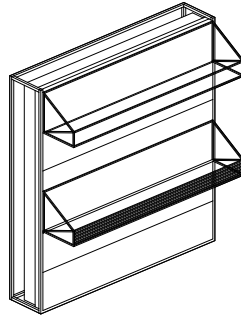
Element-0: Storage



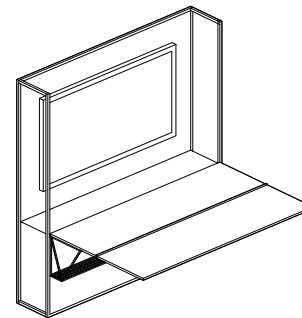
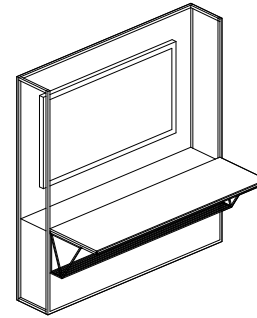
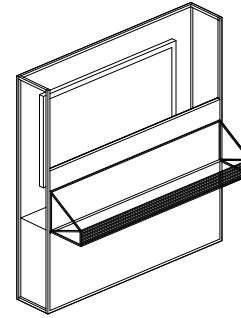
Element-1: Single bed & table



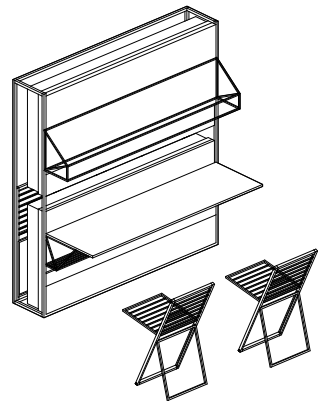
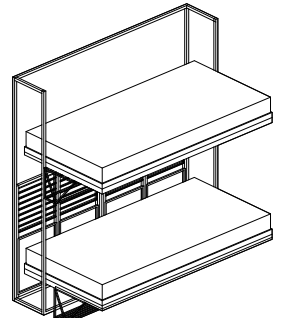
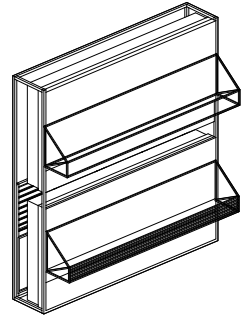
Element-2: Double bed & table

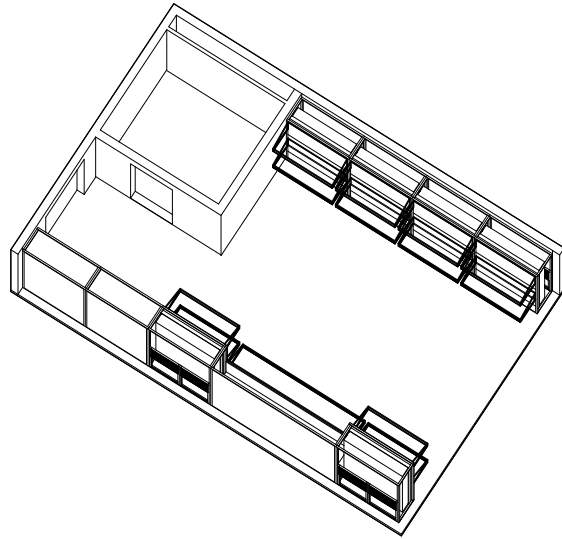


Element-3: TV bench & table & conference table

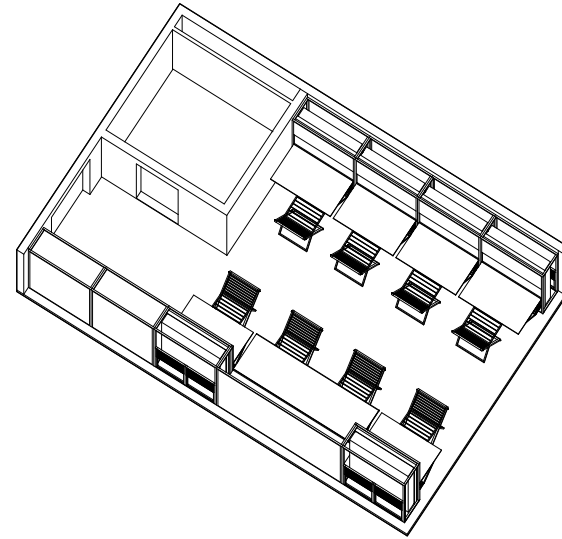


Element-4: Bunk bed & table

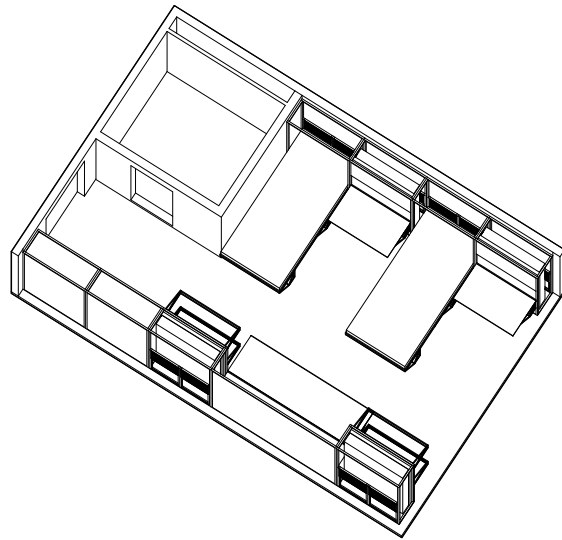




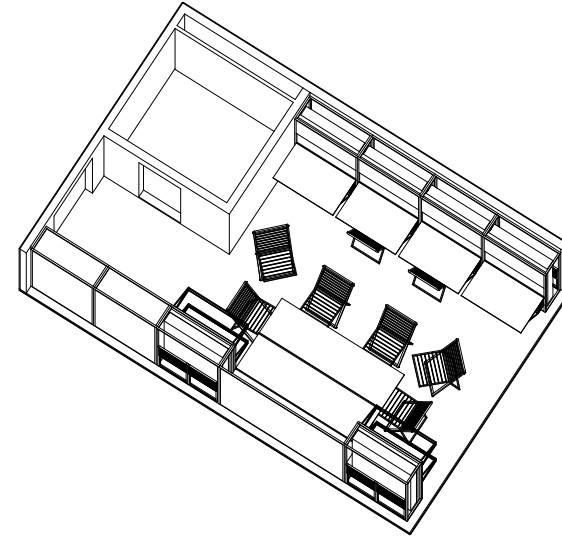
Close mode, for cleaning
1:100



Work space during day
1:100

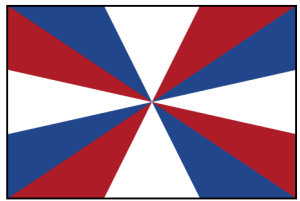


Live space during night
1:100



Work space for meeting during day
1:100

EXPERIMENT OF THREE PATTERNS



The Royal Netherlands Navy

RIGHT OF USE

MARINETERRREIN Amsterdam

RENOVATION

RIGHT OF USE
DAY AND NIGHT

1

INNOVATIVE GROUPS
WITH FLEXIBLE WORKING TIME

RIGHT OF USE
DURING NIGHT

TOURIST

NEW

2

RIGHT OF USE
DURING DAY

INNOVATIVE GROUPS
WITH STABLE WORKING TIME

RUN AS HOTEL
DURING NIGHT

TOURIST

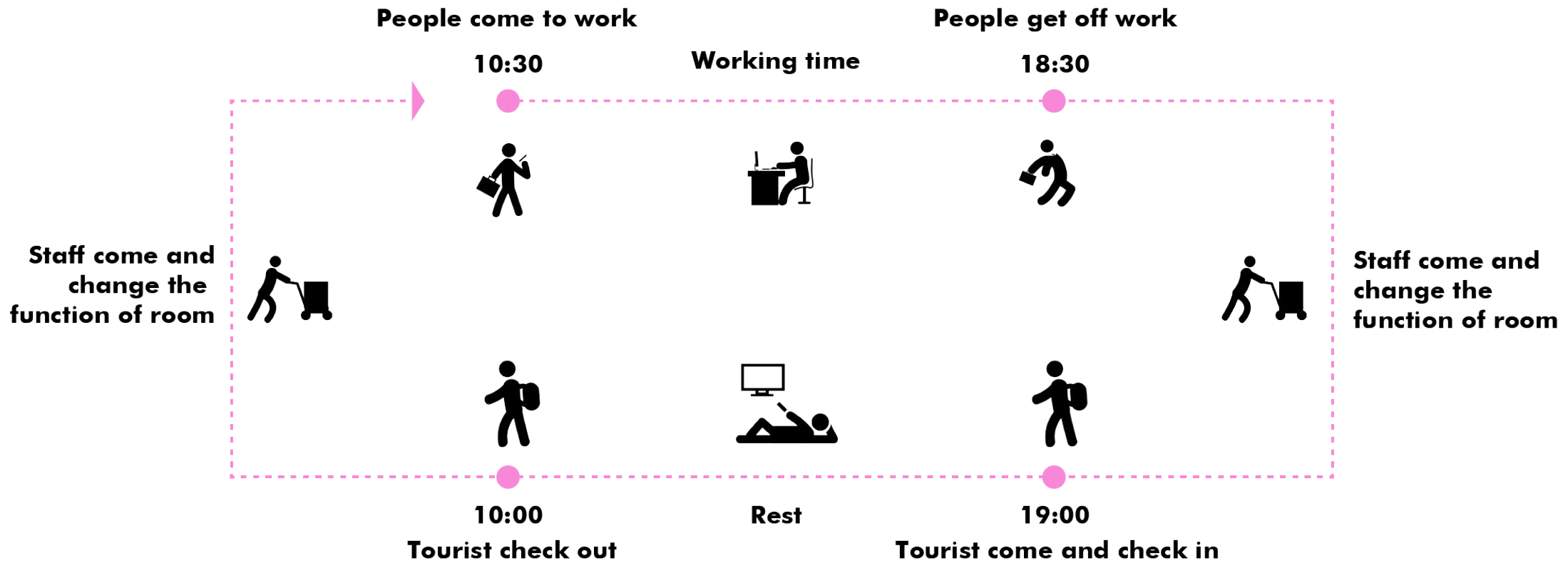
RENOVATION / NEW

RUN AS
INNOVATOR STUDIO

3

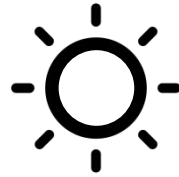
FOR INNOVATOR
WITH HER/HIS GROUP

Centralized management

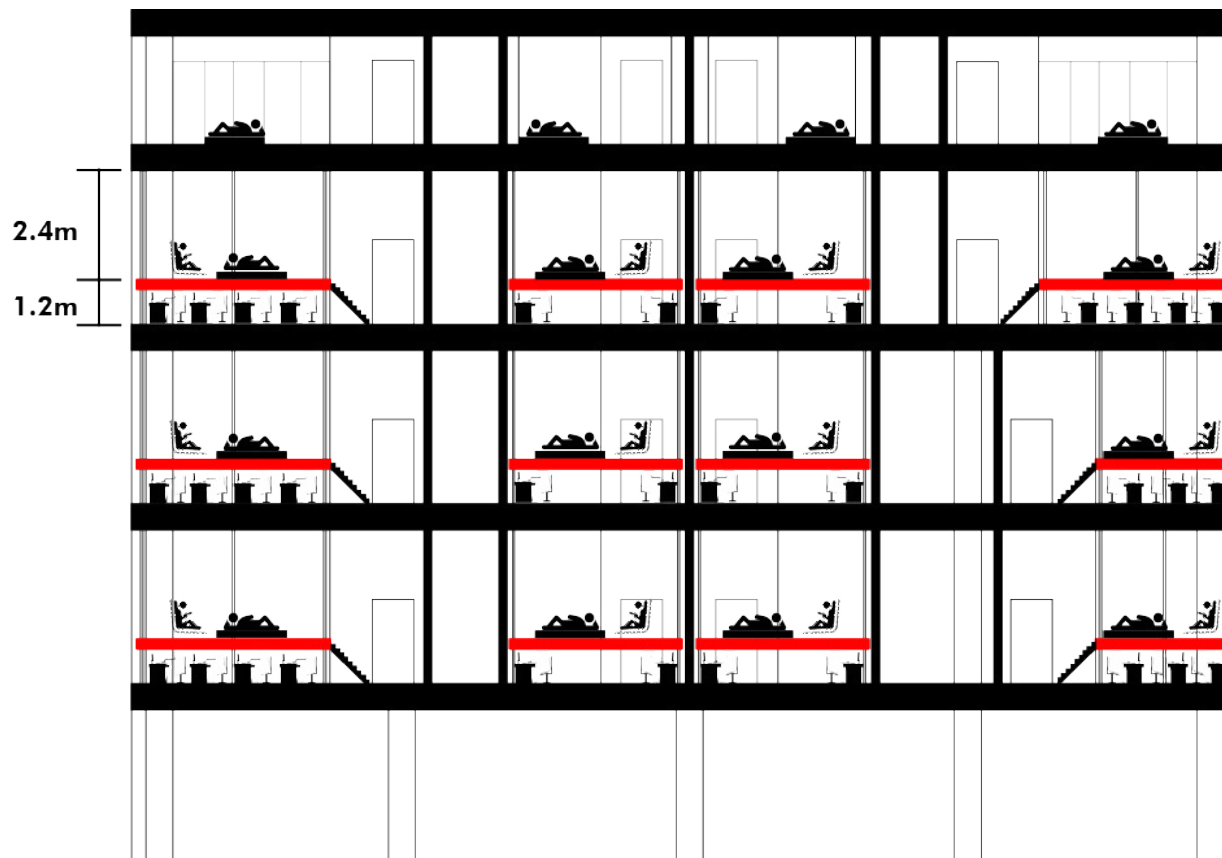


The staff of the building take charge of transition

A removable floor system to translate the scale of different function



A removable floor system to translate the scale of different function

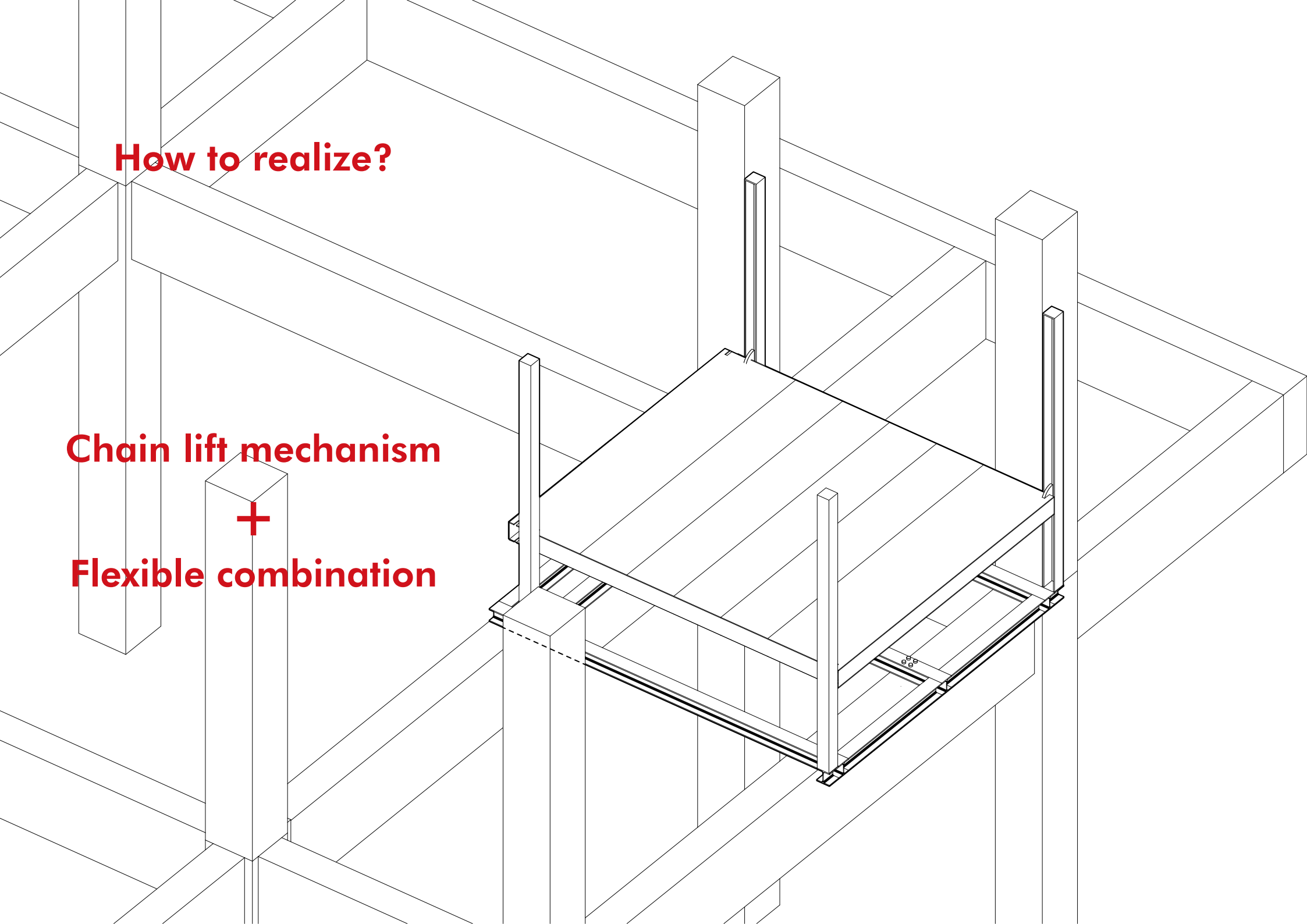


How to realize?

Chain lift mechanism

+

Flexible combination

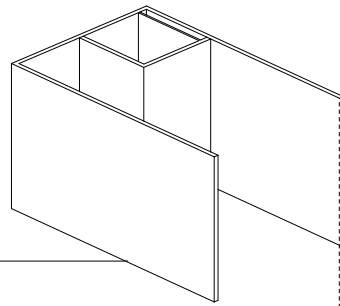


DESIGN

2 Main solutions

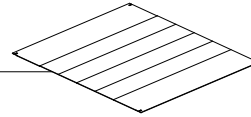
Showed also on poster

Standard room

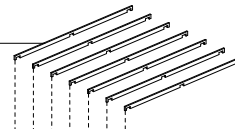


Wood floor

For live space



Wood keel plate

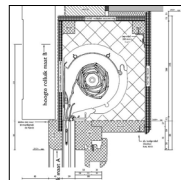


Rotatable steel stair



Roller shutters

For covering office space



Ideal section

<https://www.zonwerin.g.nl/rolluiken/inbouw-rolluiken/>

Customized Car lifting machine

Lifting capacity:3175kg

Cost:around 3200 EUR

Cover board of floor

Layout of light for office

Ceiling for office

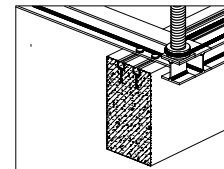
Steel base structure

Support whole flexible floor

Material: HEB160 I beam

Steel connection

Make whole flexible removable
and do not wreck concrete structure



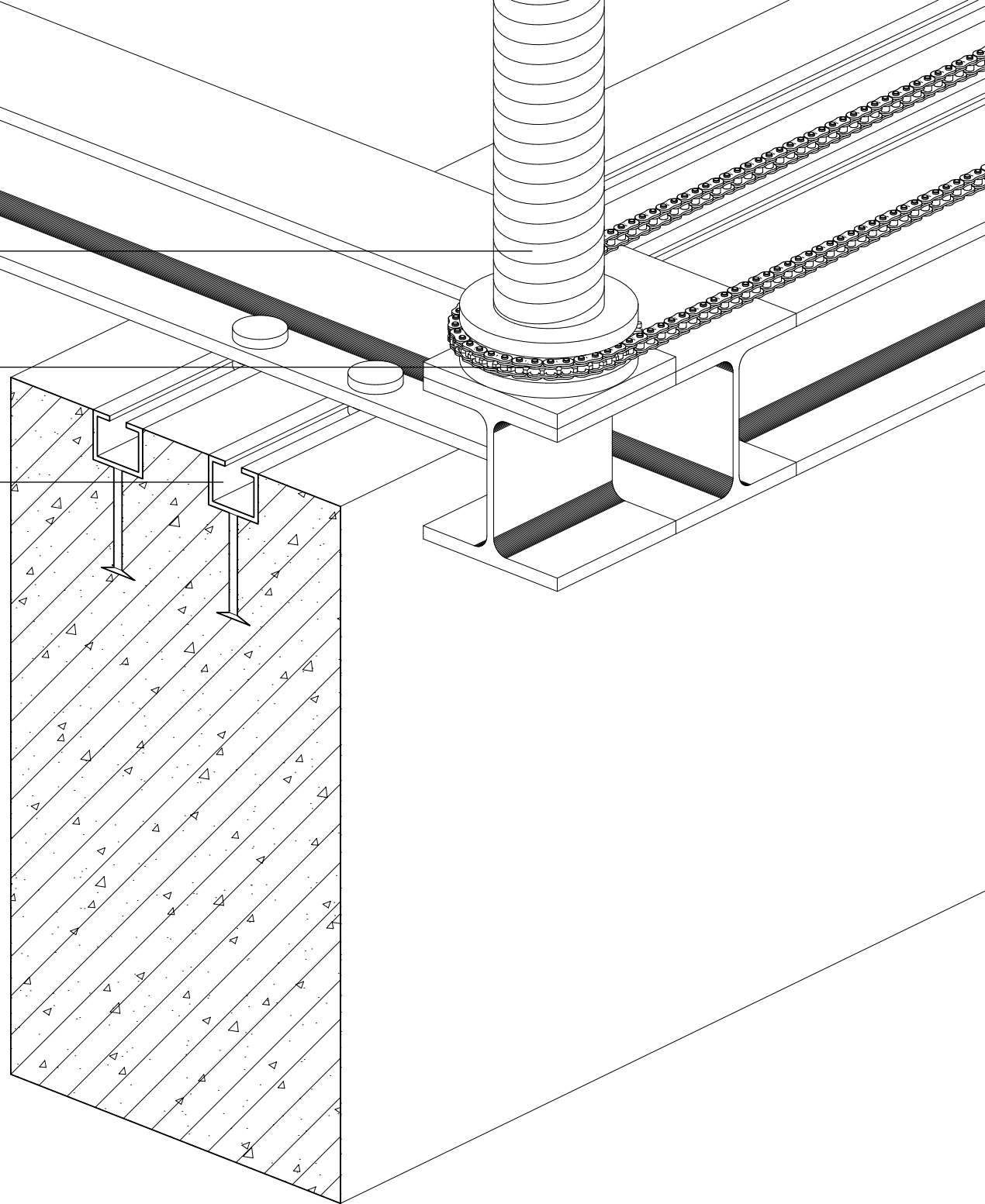
DESIGN

2 Main solutions

Screwed column

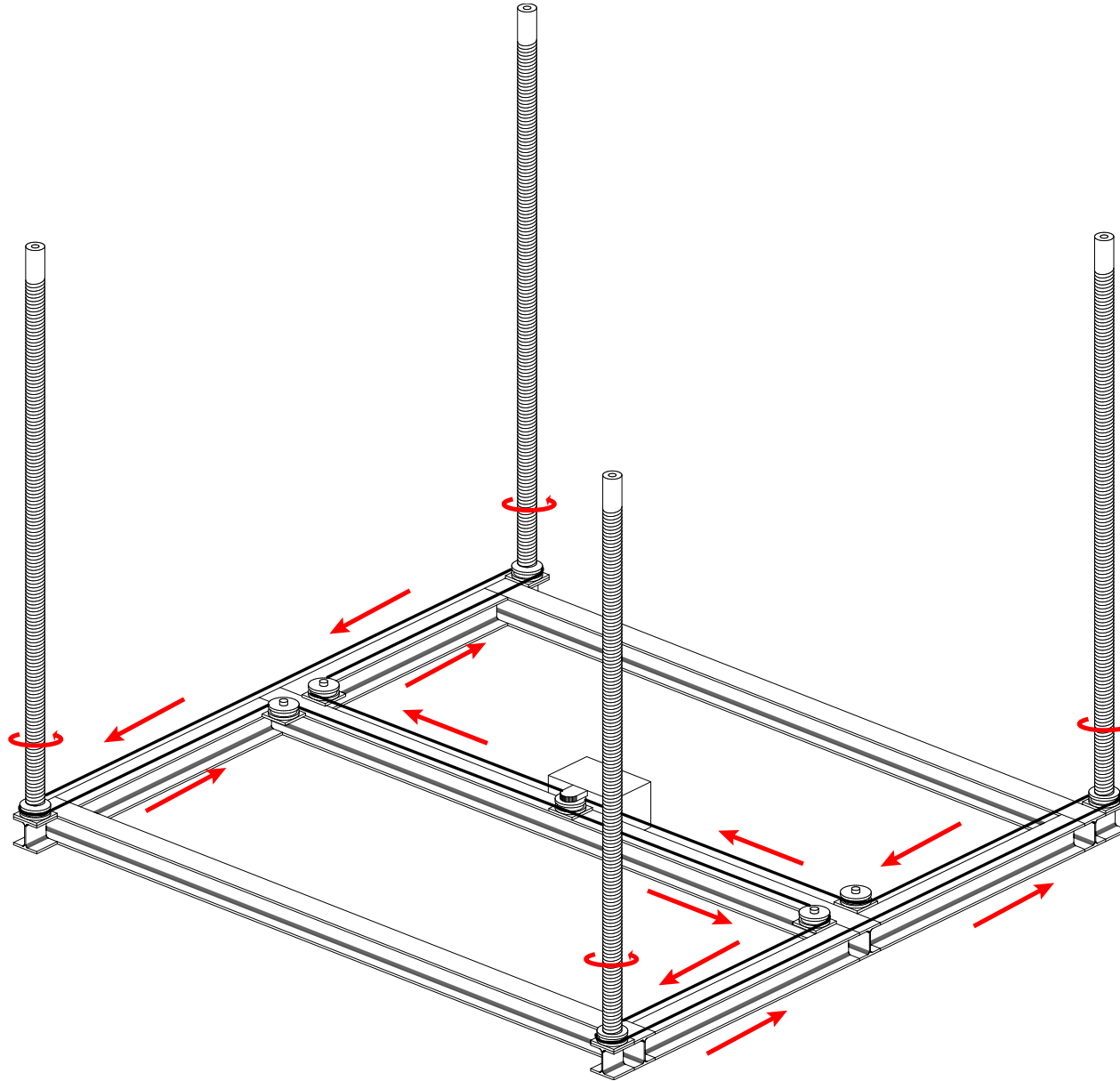
Electric chain system

Steel cast-in channels



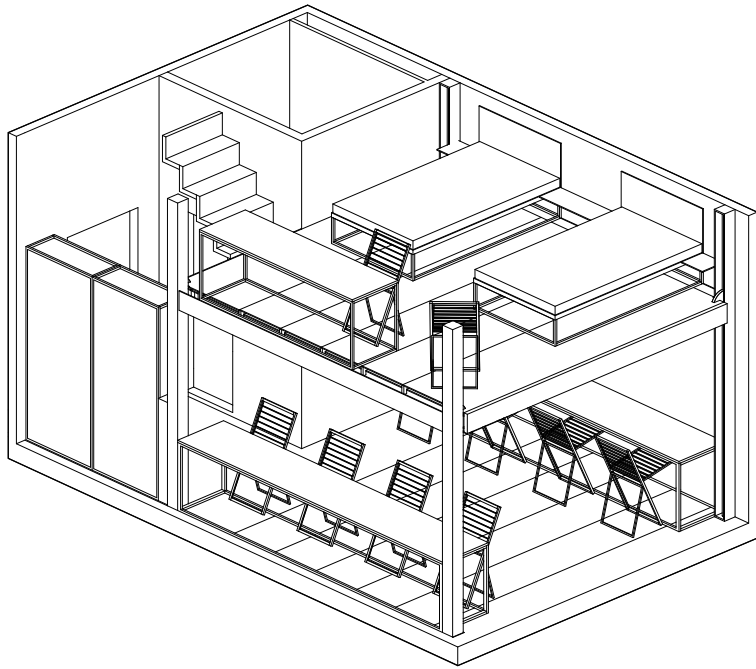
DESIGN

2 Main solutions

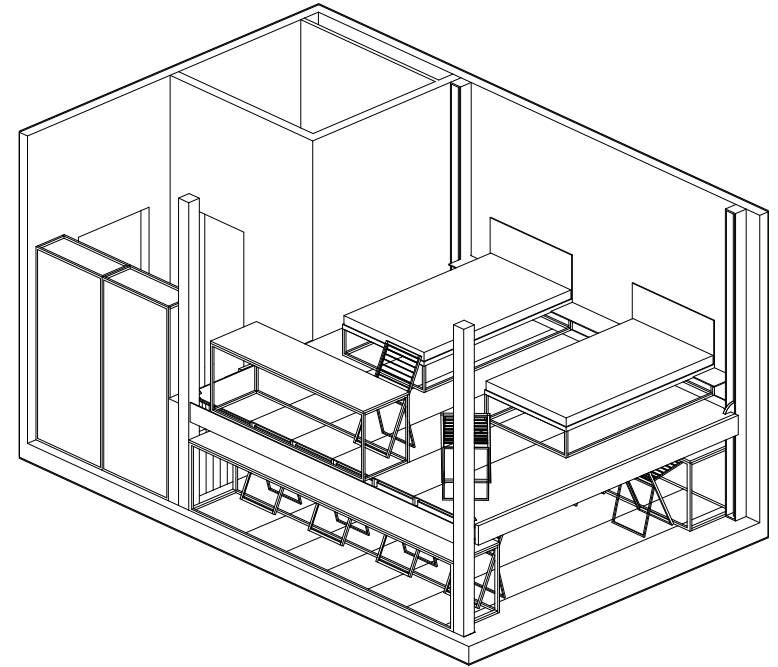


DESIGN

2 Main solutions



Work space during day, 1:50



Live space during night, 1:50

DESIGN



From research to design process:

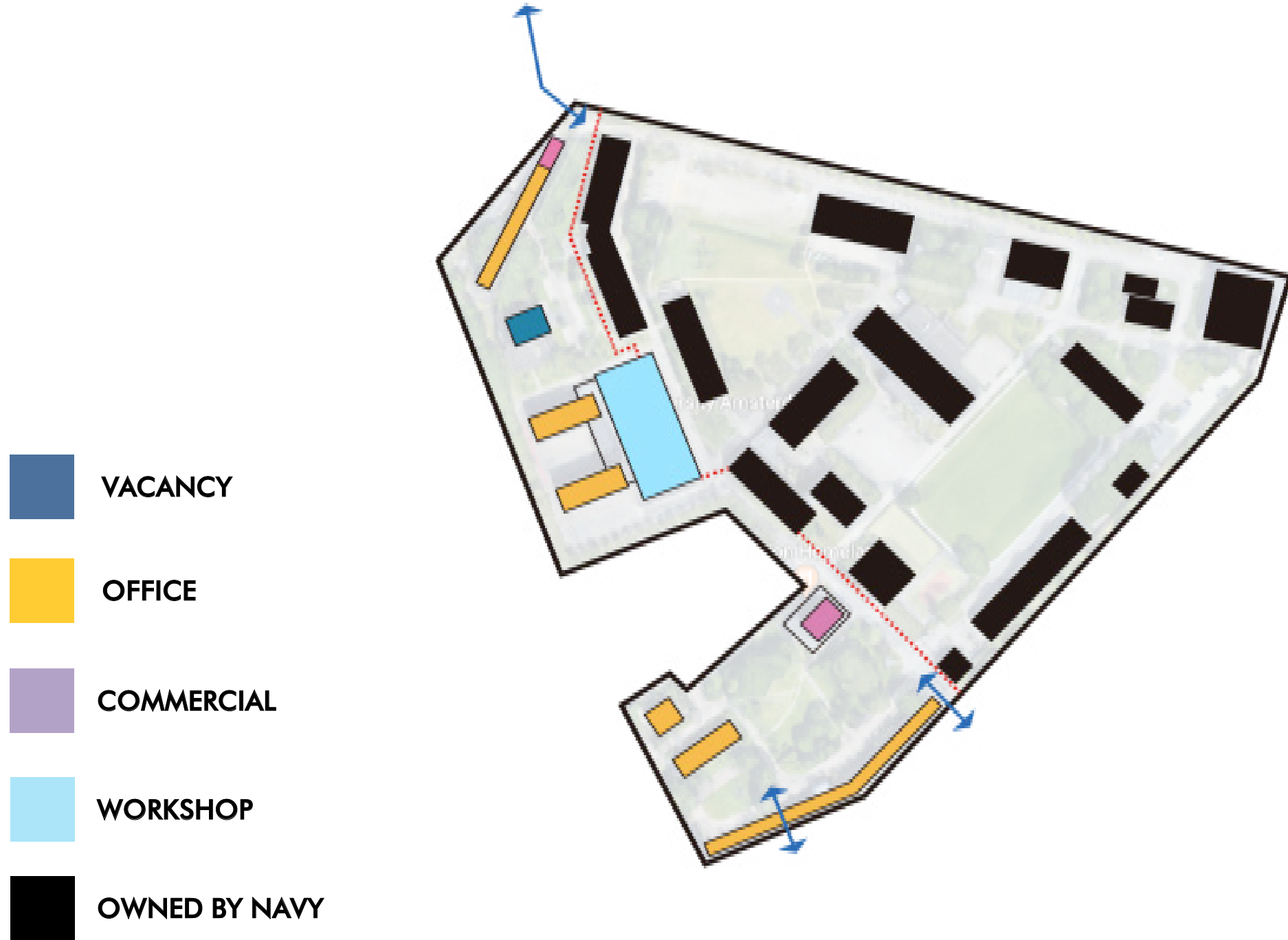
- **SITE?**
- **PROTOTYPE ARRANGEMENT?**
- **PUBLIC FUNTIONS?**
- **EXPRESSION?**
- **INTERIOR CLIMATE?**

SITE?

- **How to chose the most suitable part of the site to test this concept?**

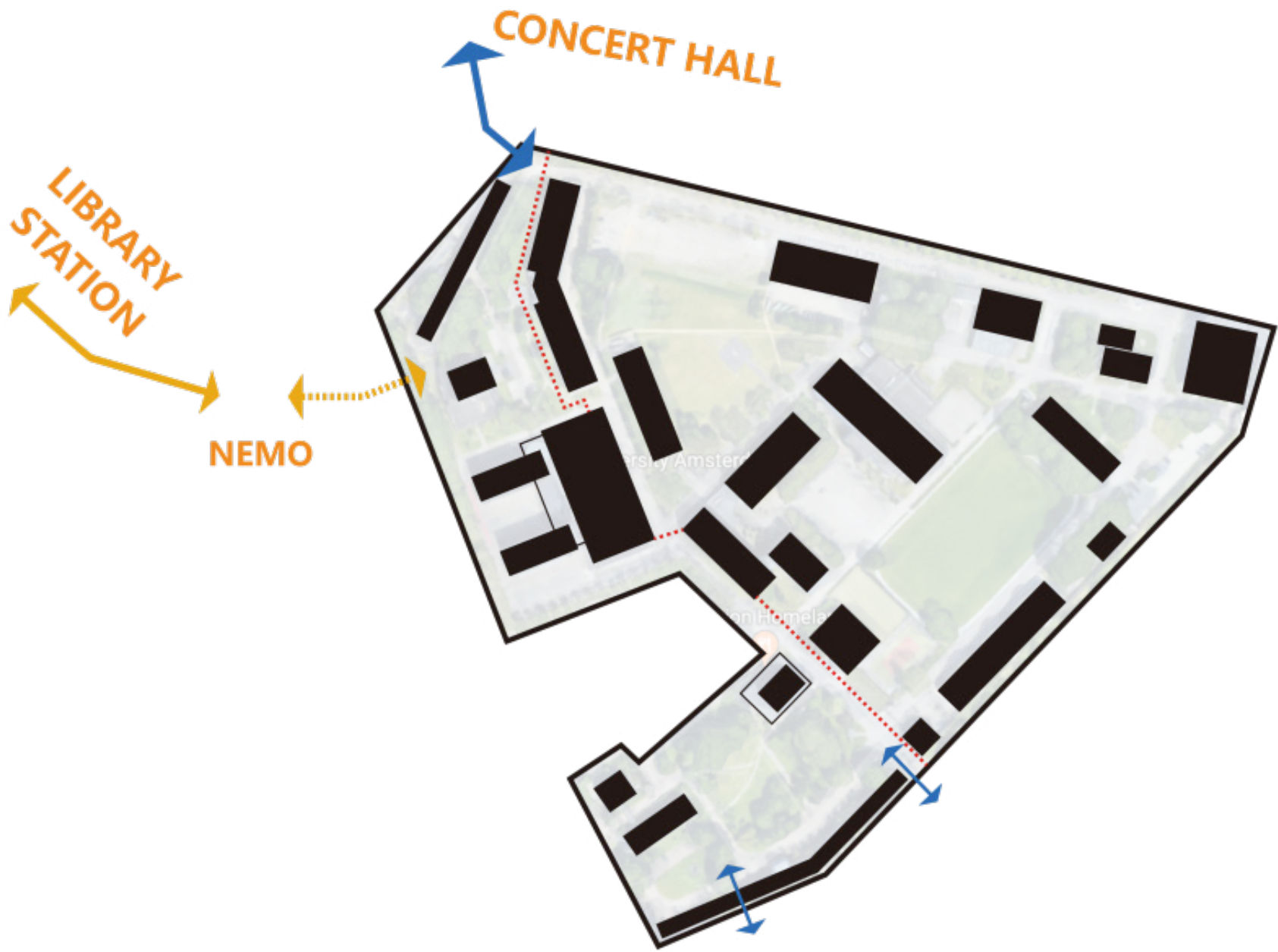
DESIGN

Site chose



DESIGN

Site chose



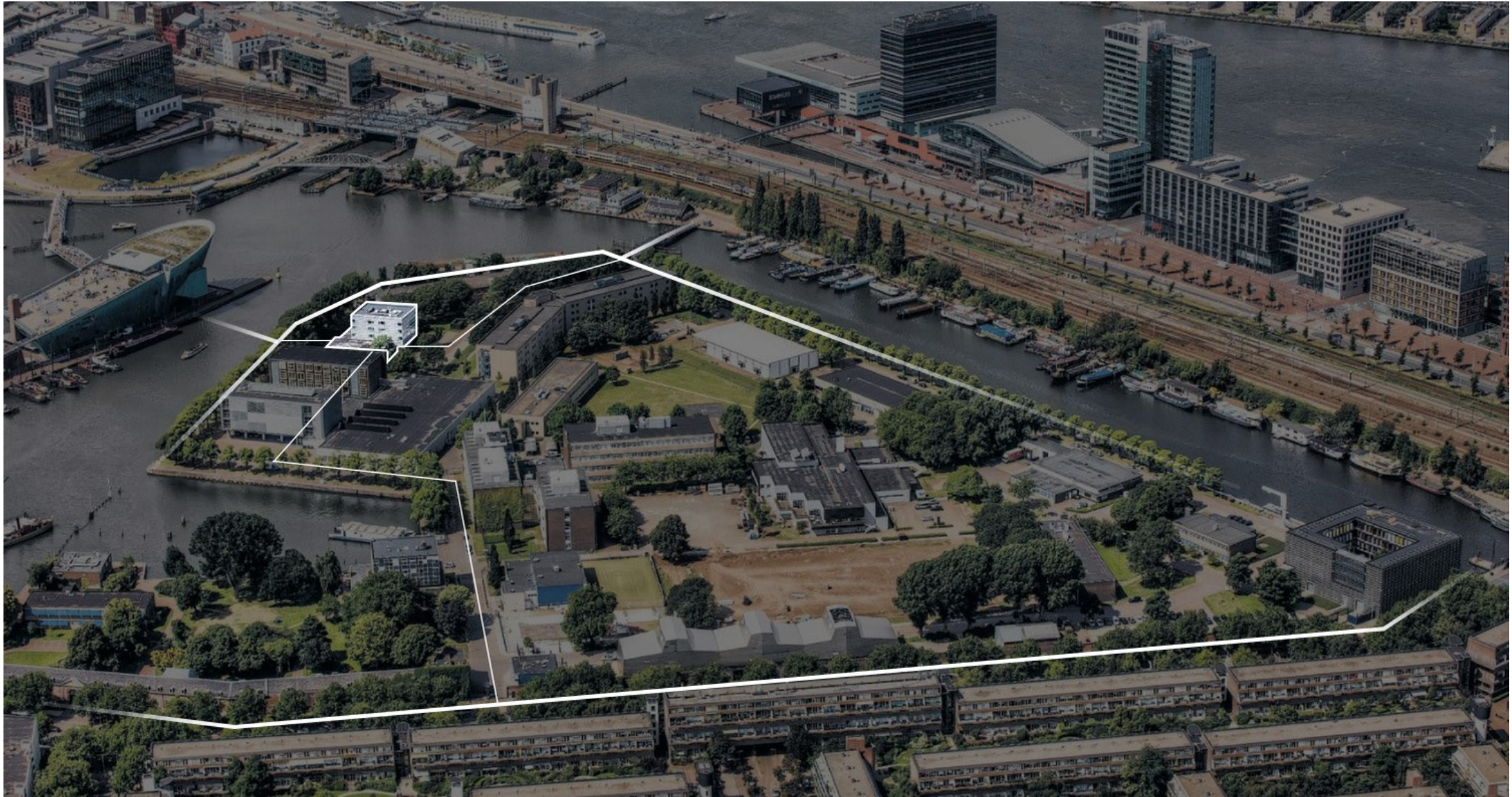
DESIGN

Site chose



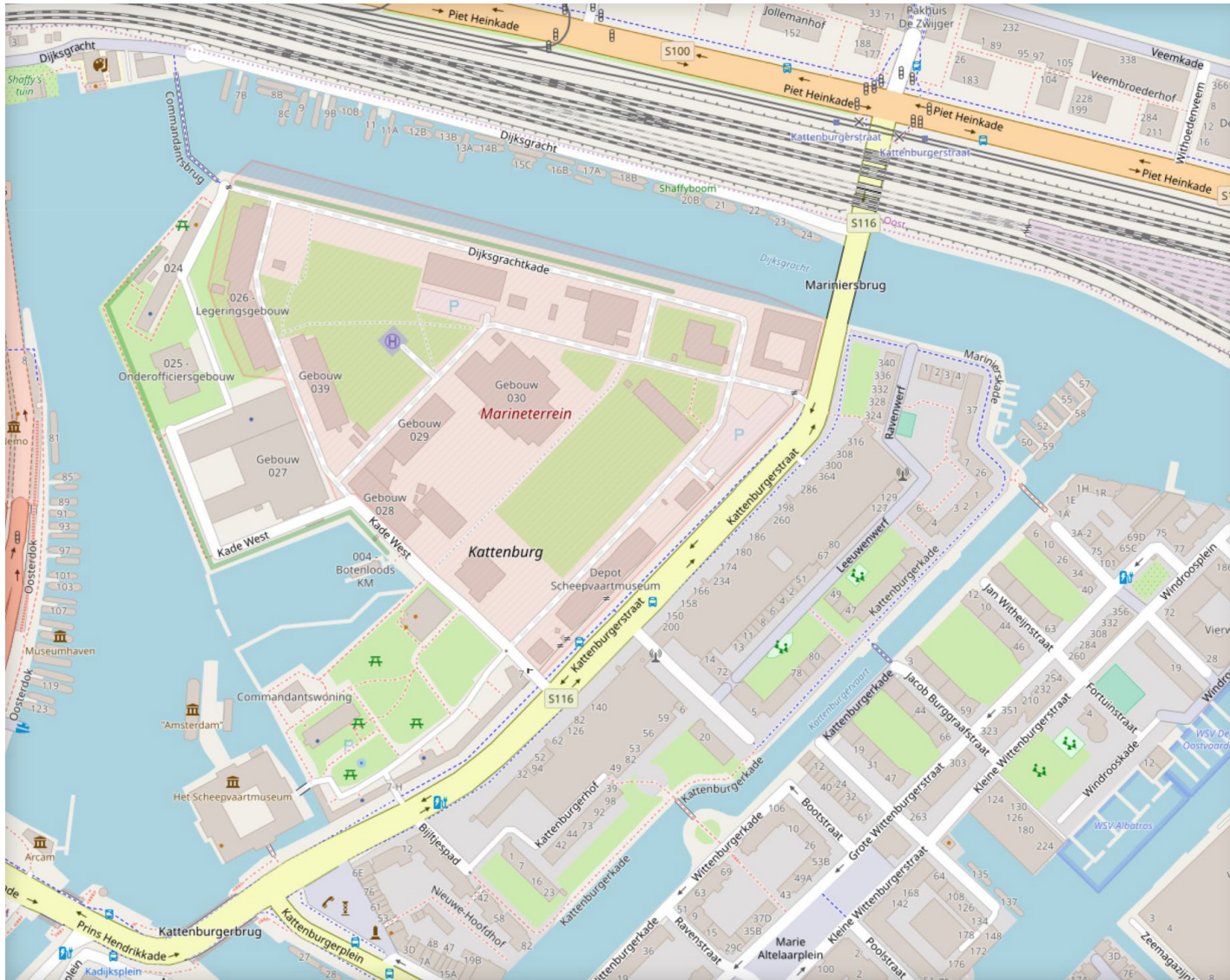
DESIGN

Site chose



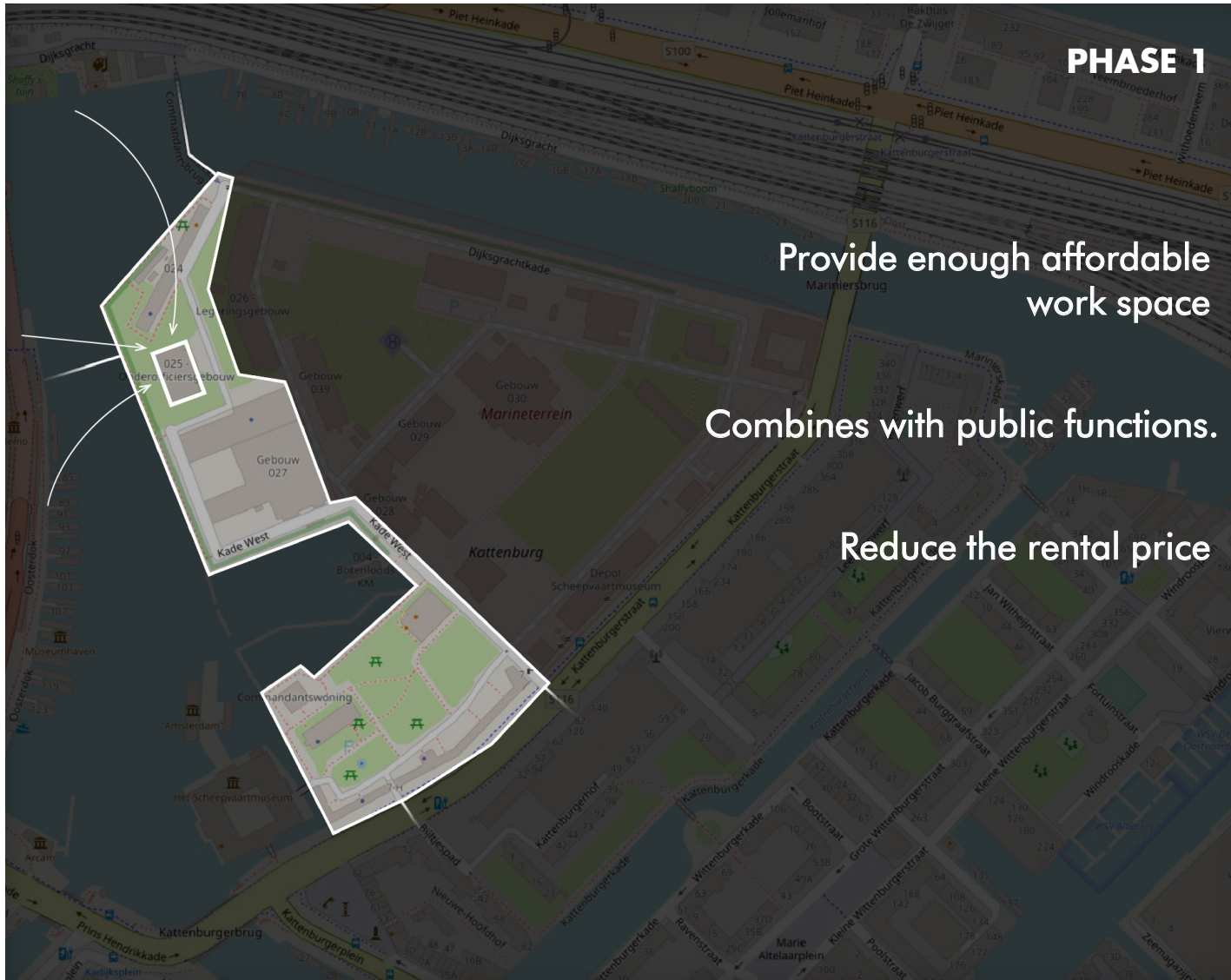
DESIGN

Future vision



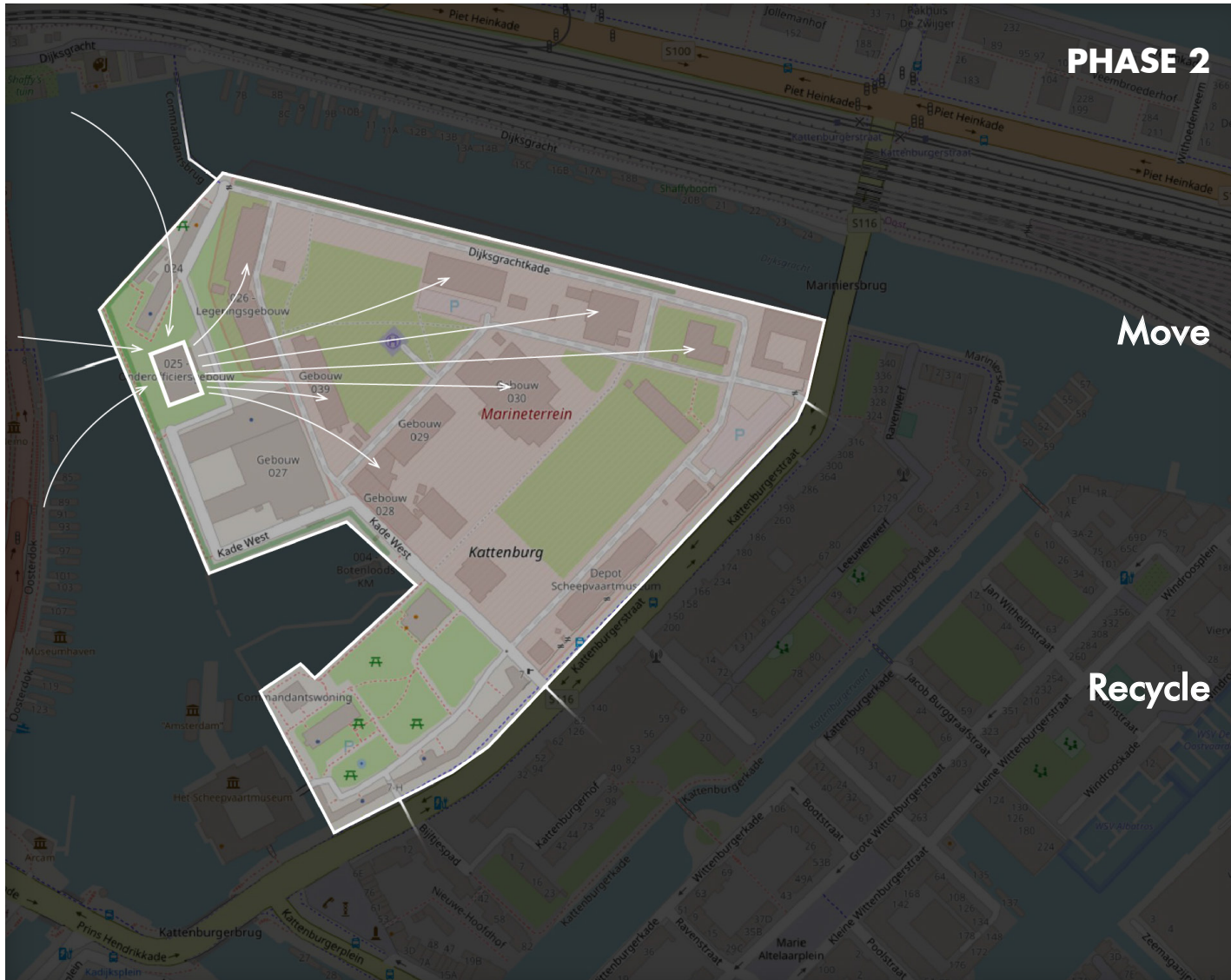
DESIGN

Future vision



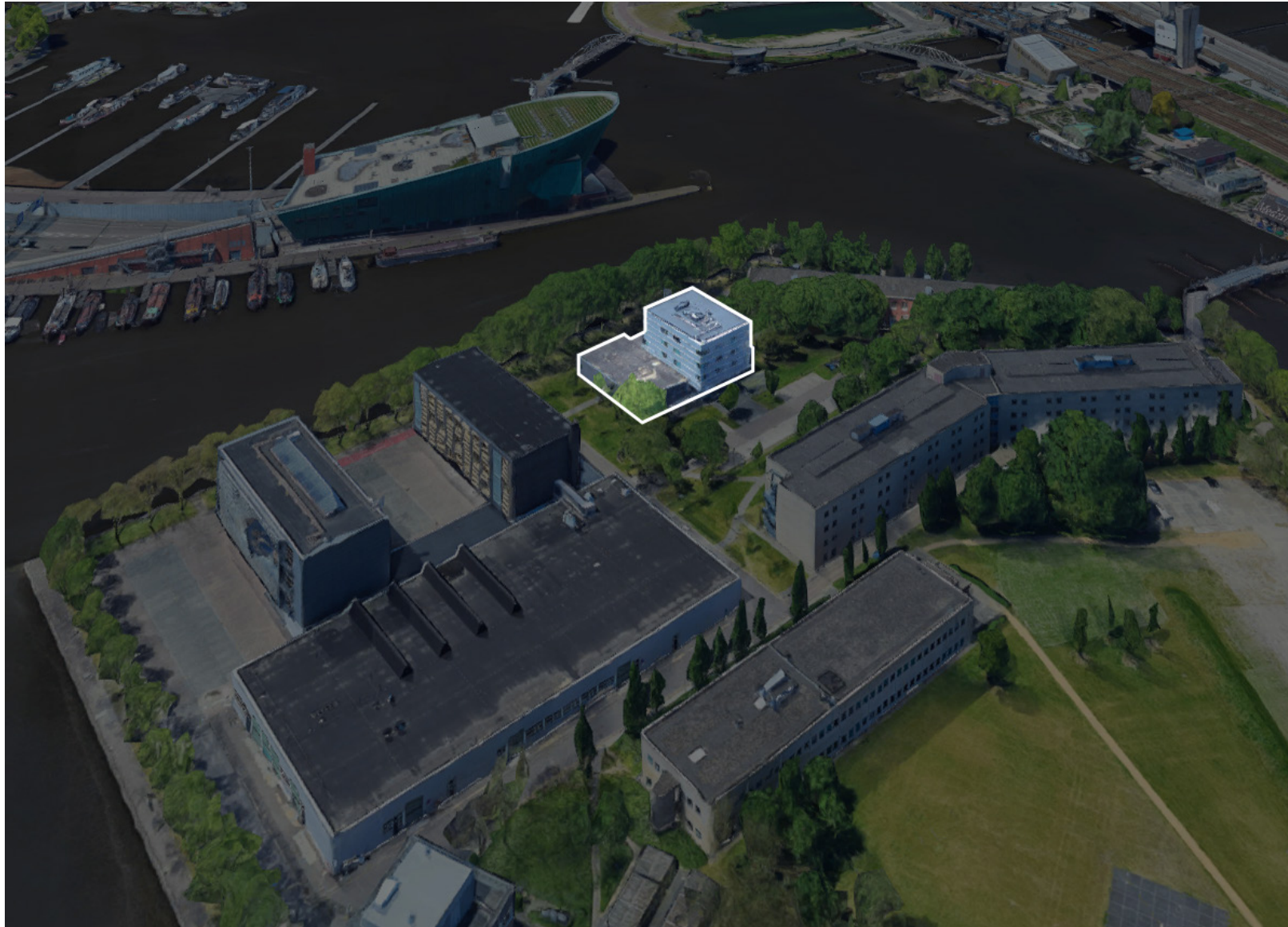
DESIGN

Future vision



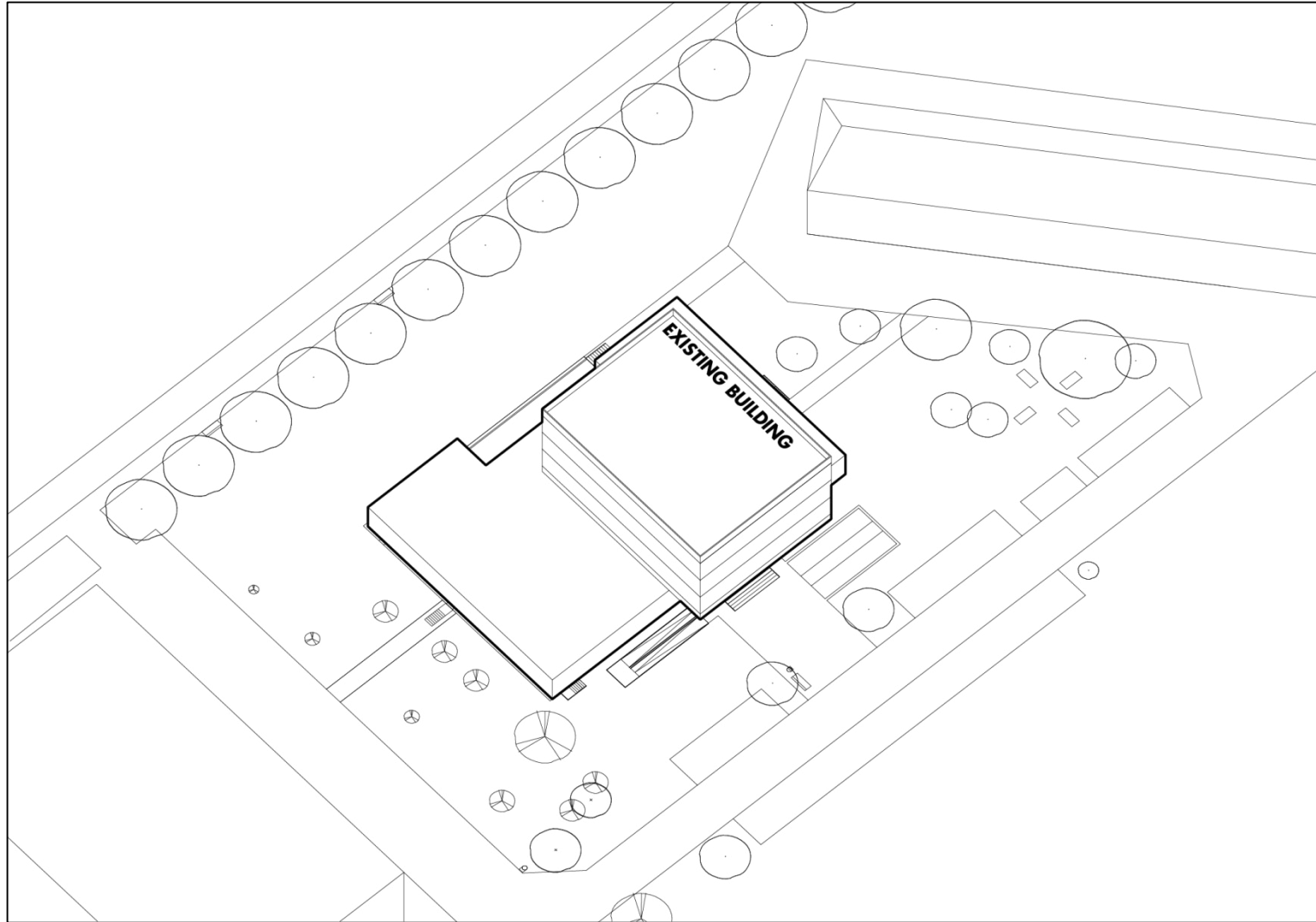
DESIGN

Space reconstruction



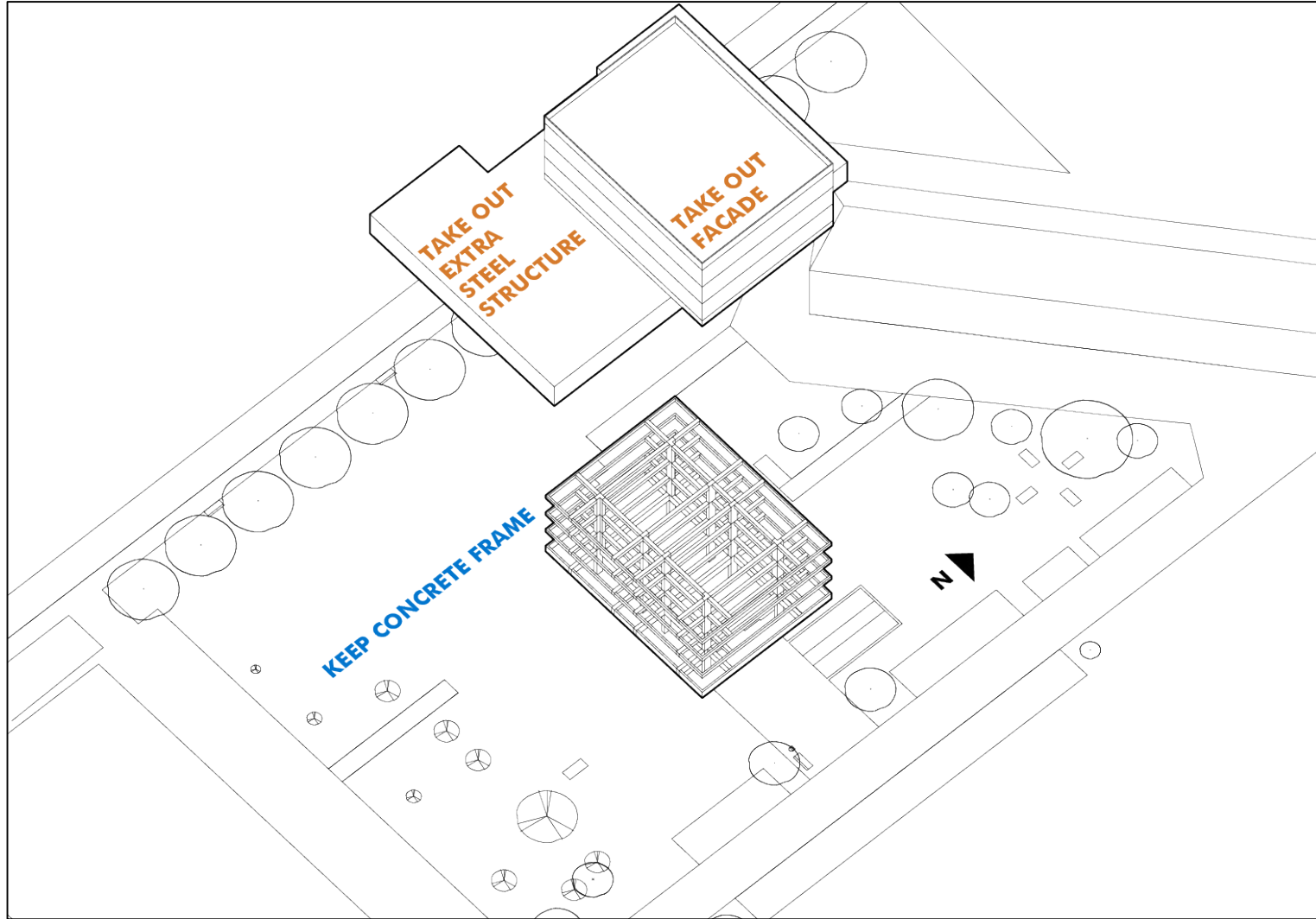
DESIGN

Space reconstruction



DESIGN

Space reconstruction

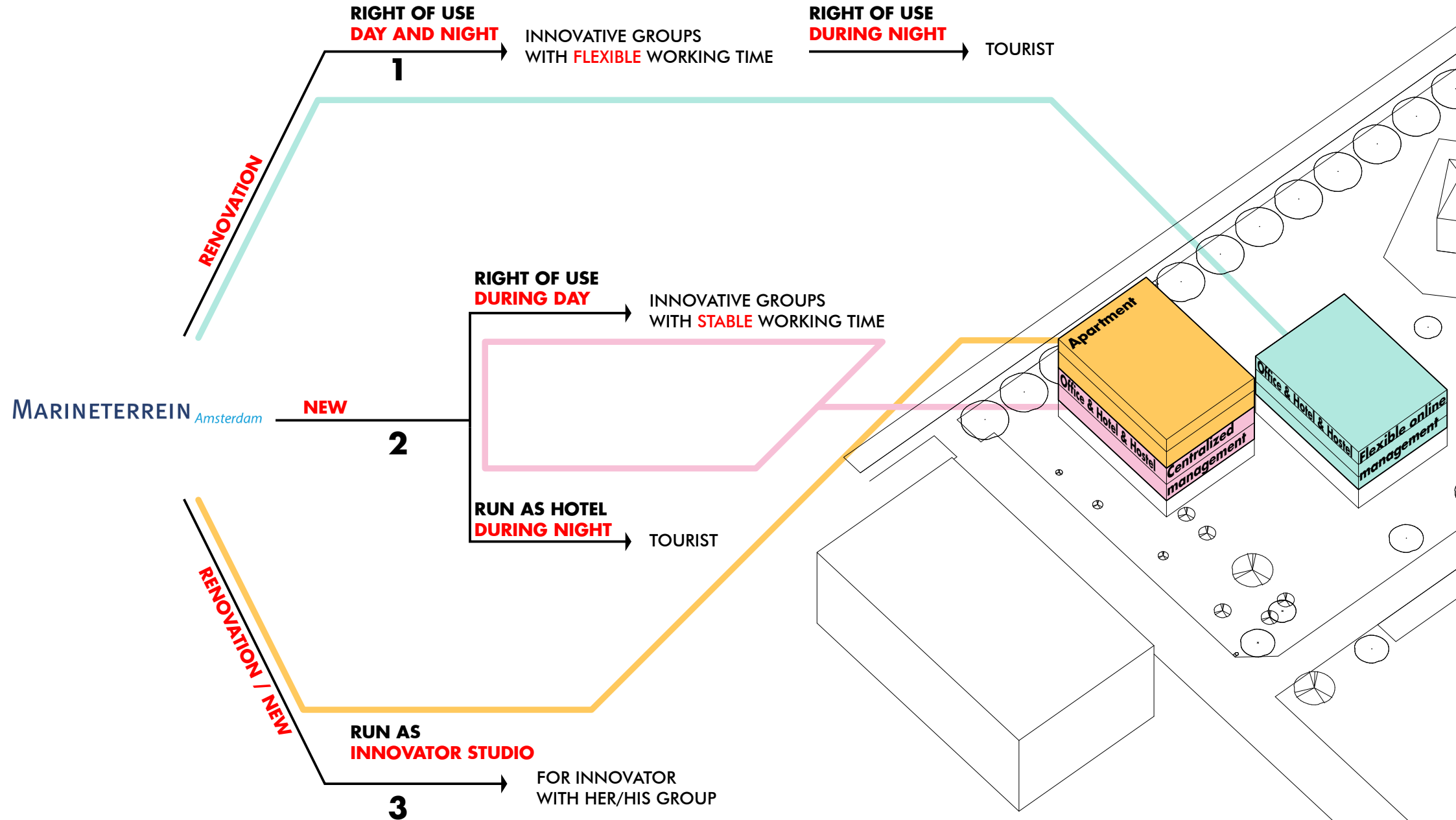


PROTOTYPE ARRANGEMENT?

- **How to arrange the prototypes?**

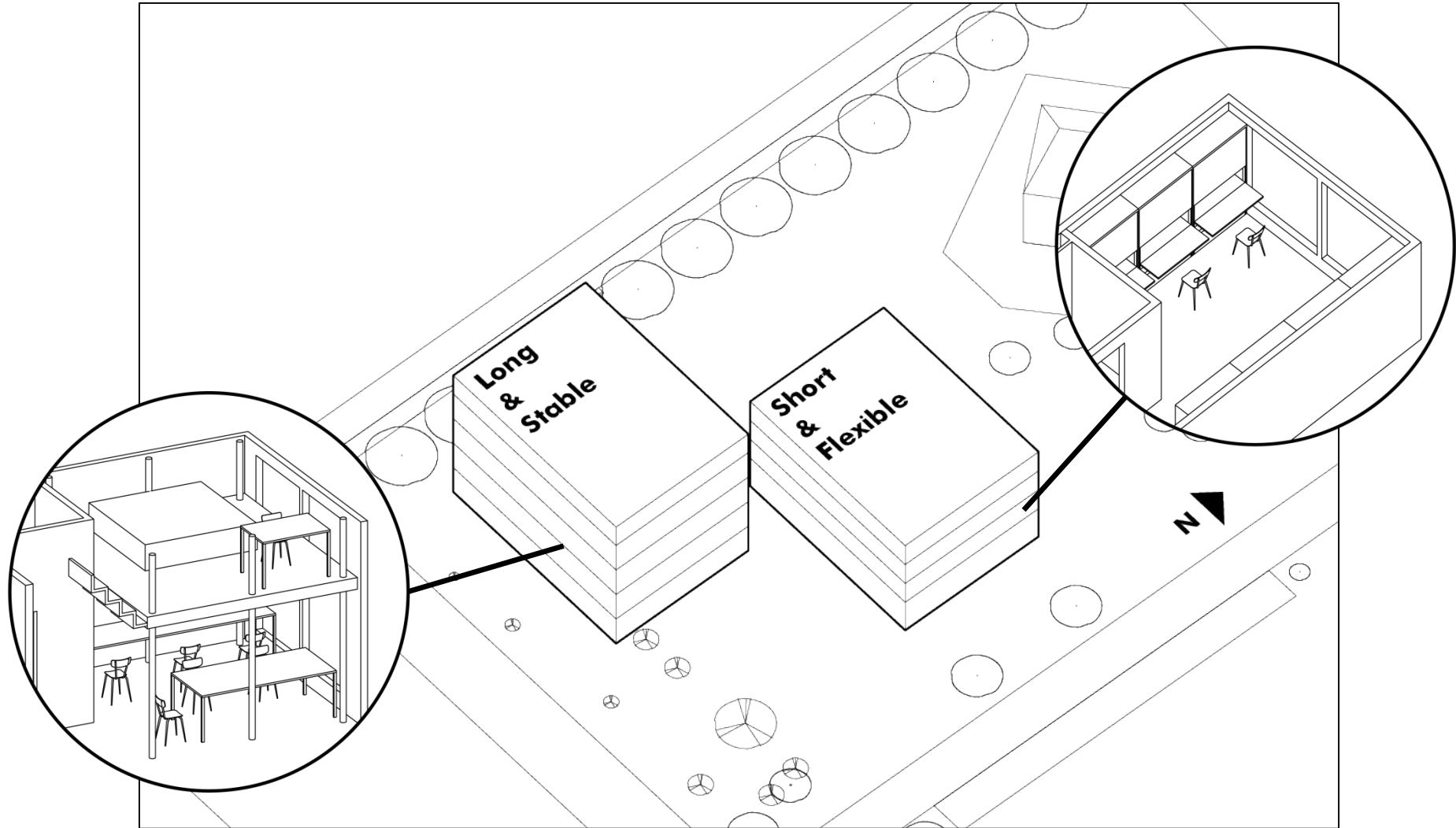
DESIGN

Concept diagram



Concept diagram

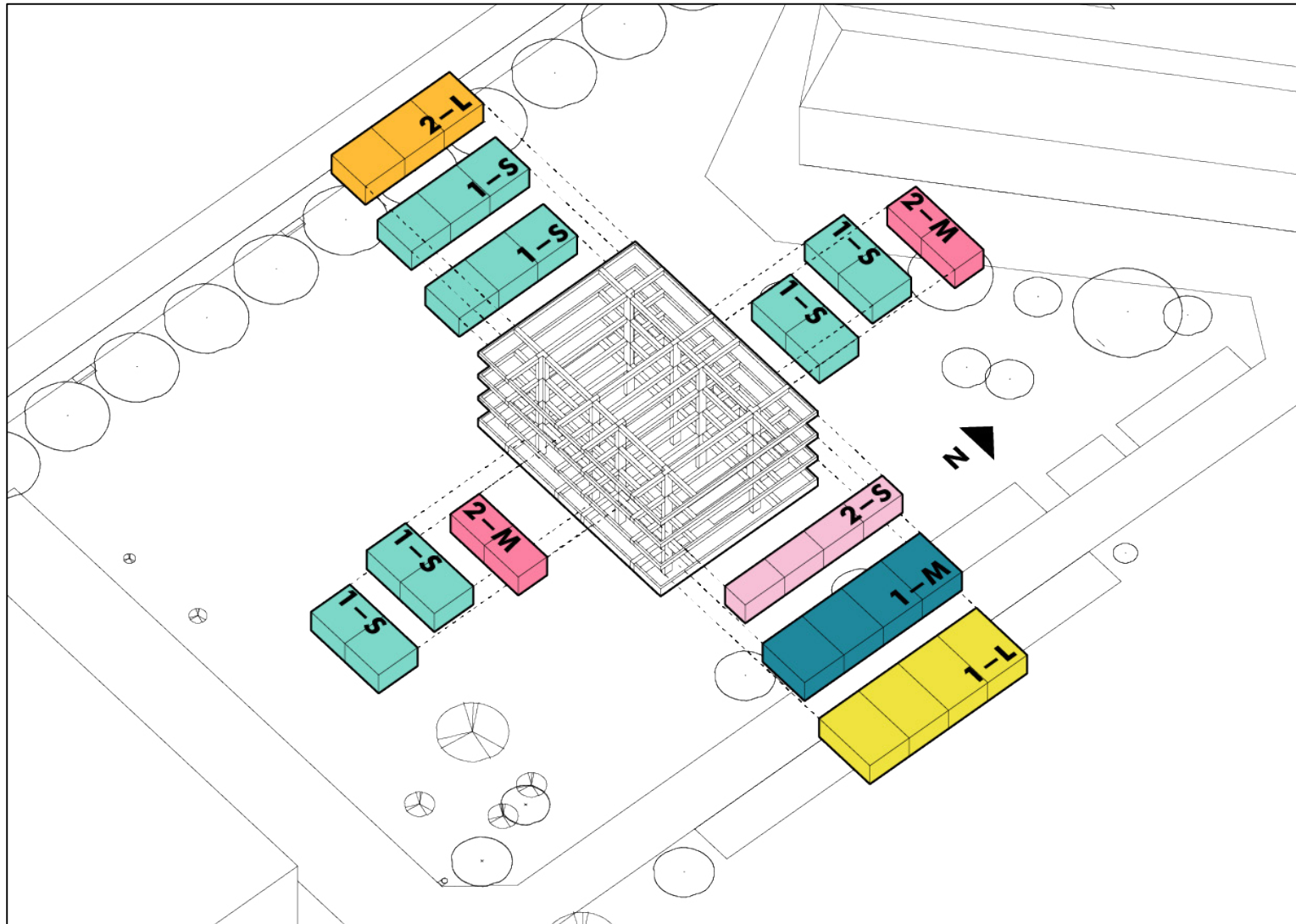
**Experiment for
Flexible furniture system**



**Experiment for
Flexible floor system**

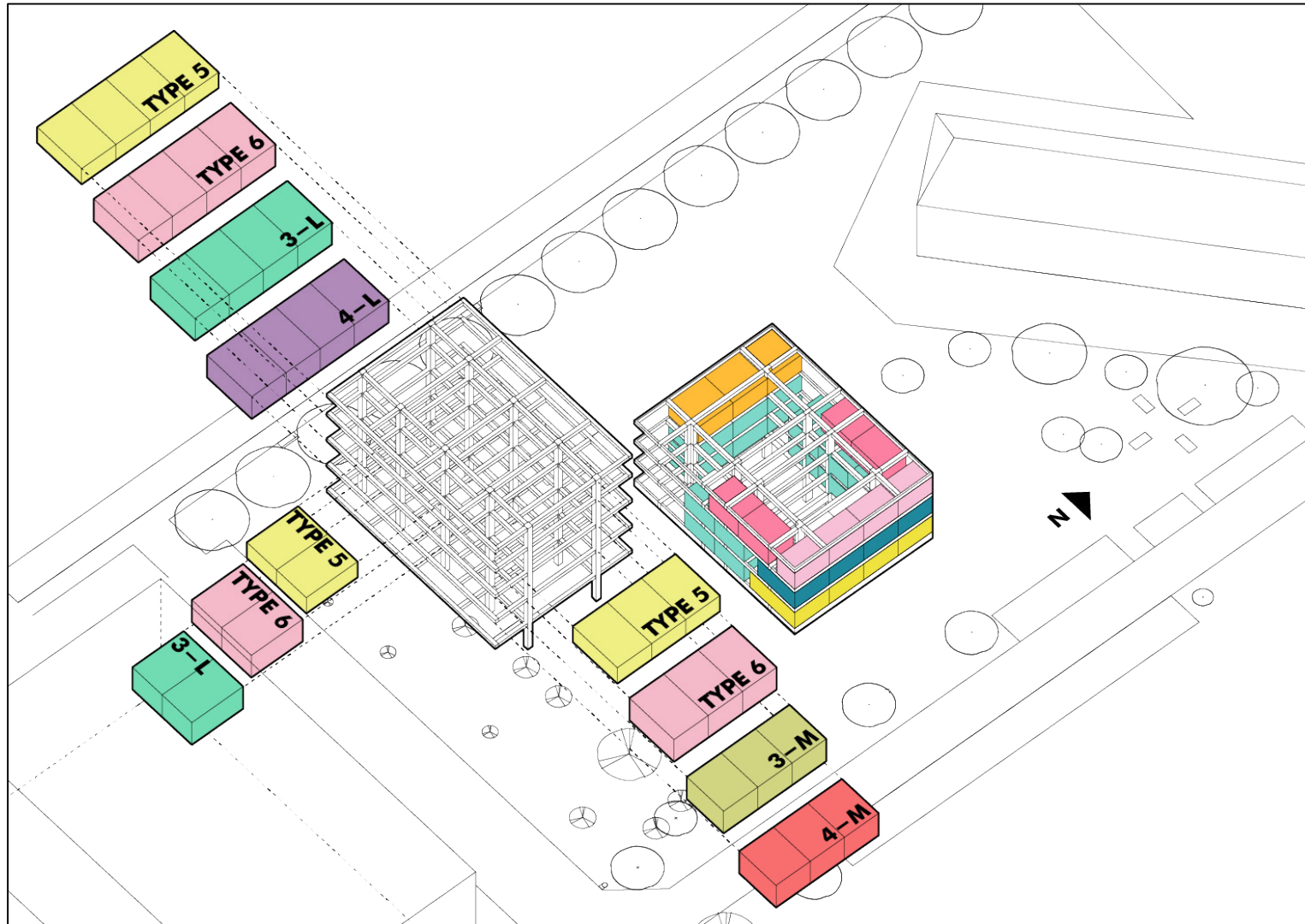
DESIGN

Assembly



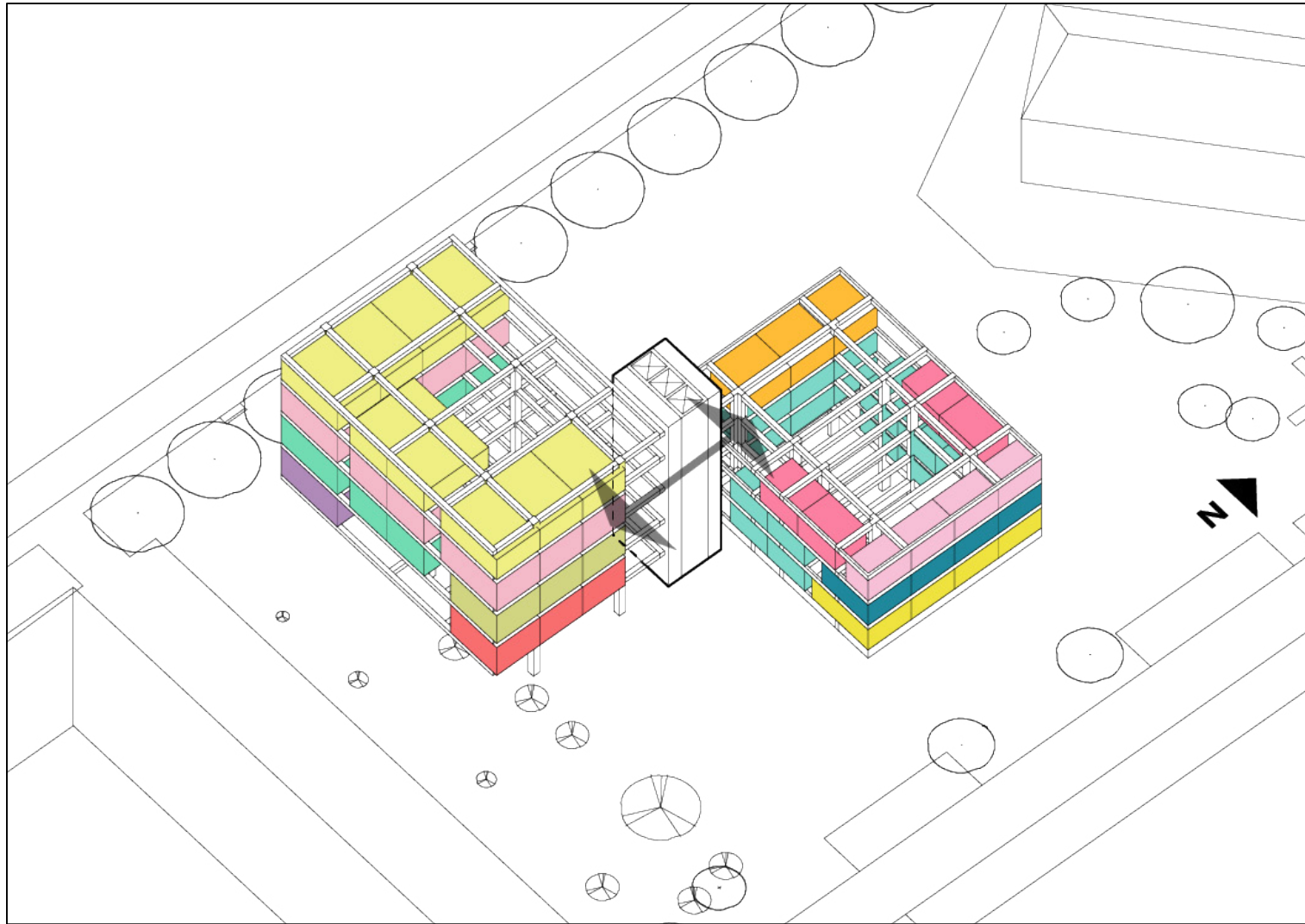
DESIGN

Assembly



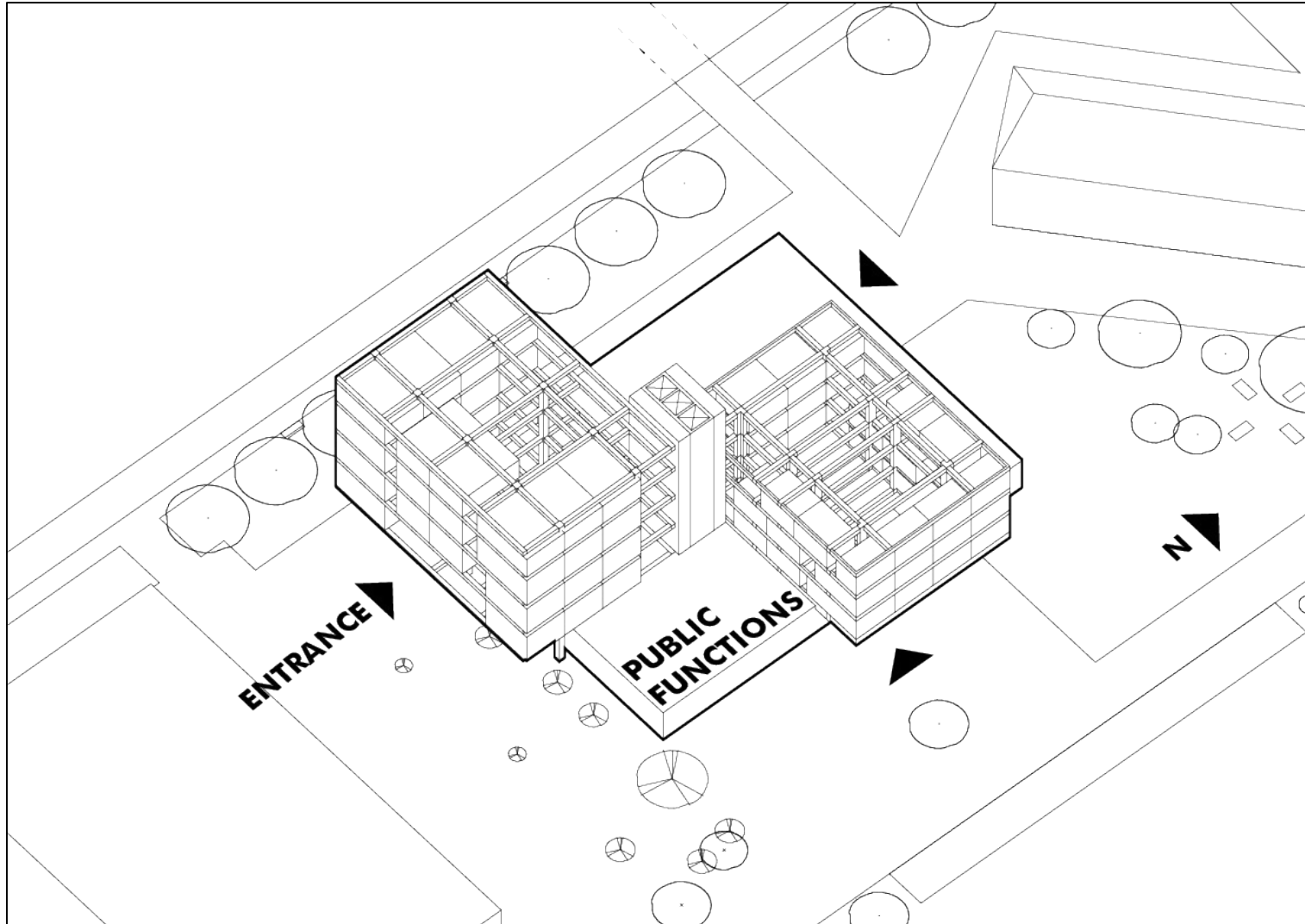
DESIGN

Assembly



DESIGN

Assembly

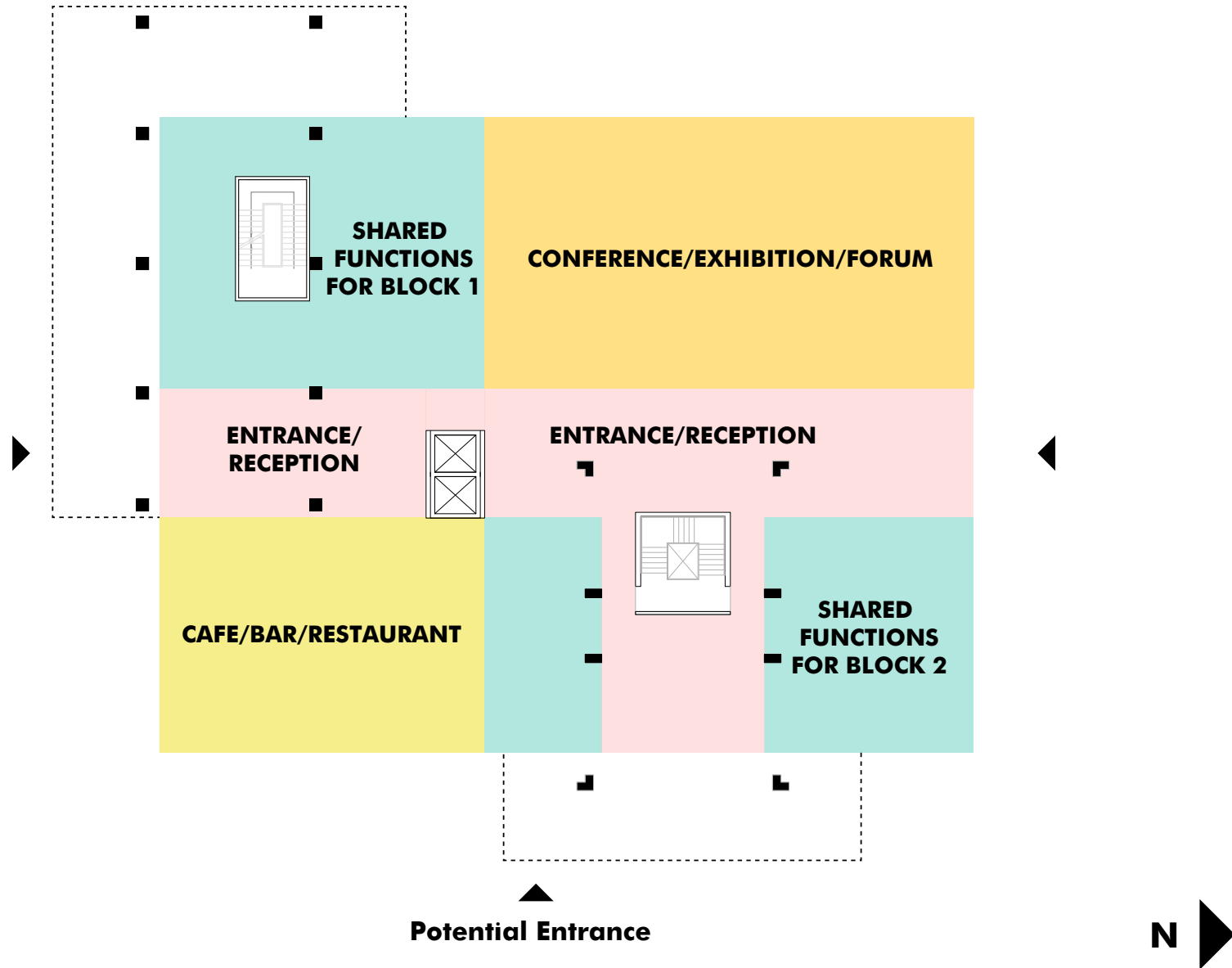


PUBLIC FUNTIONS?

- **What about public functions in building?**

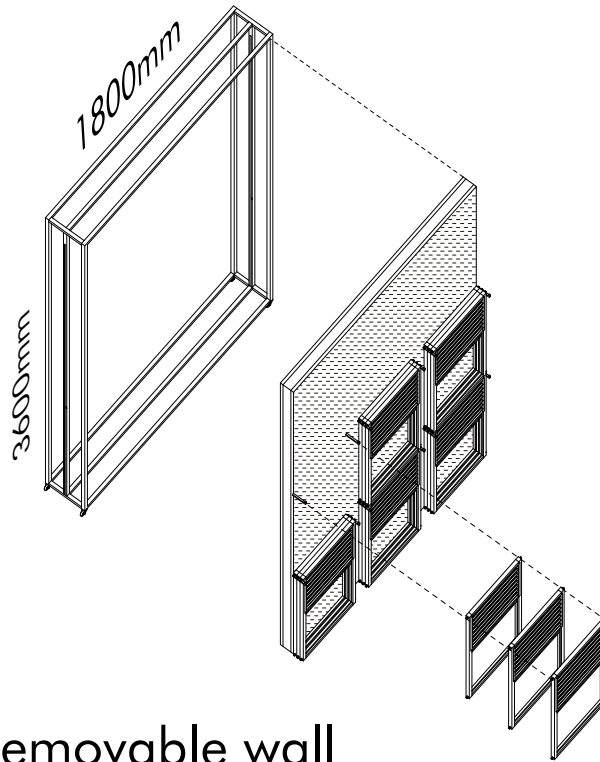
DESIGN

Concept of public functions

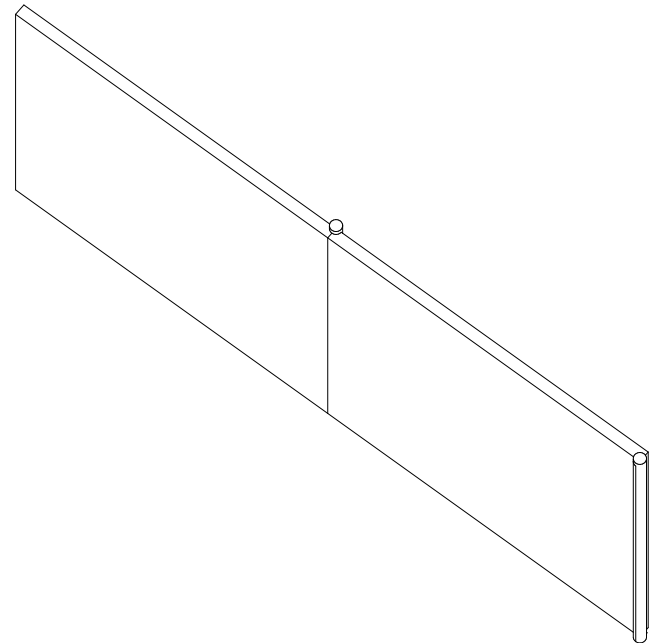
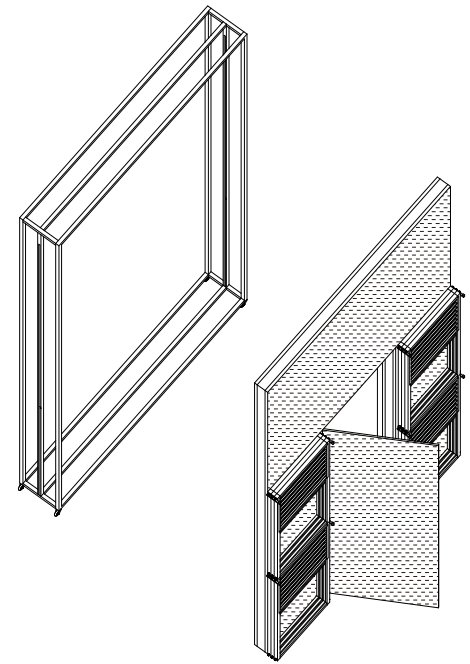


DESIGN

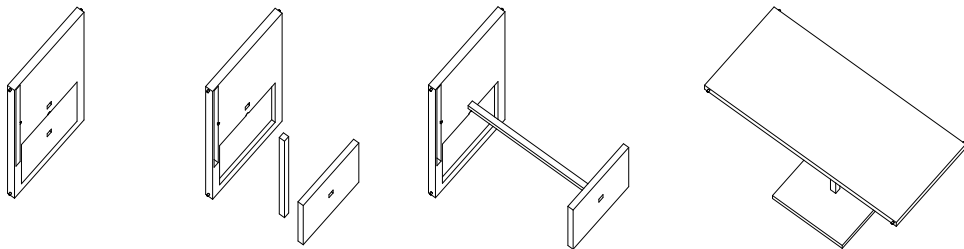
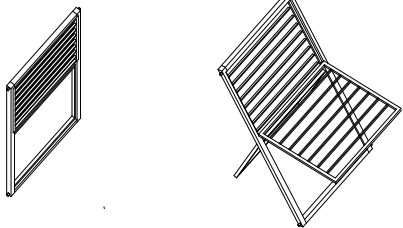
Concept of public functions



Removable wall



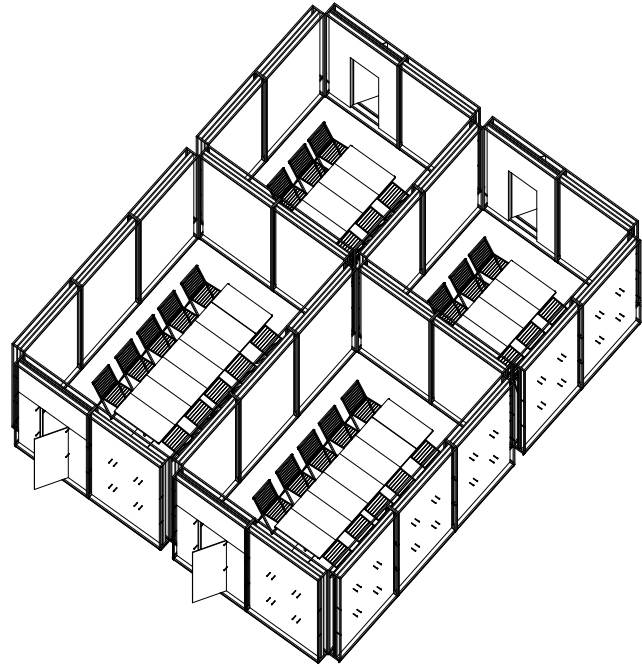
Foldable wall



Desk(connect with magnet)

DESIGN

Concept of public functions



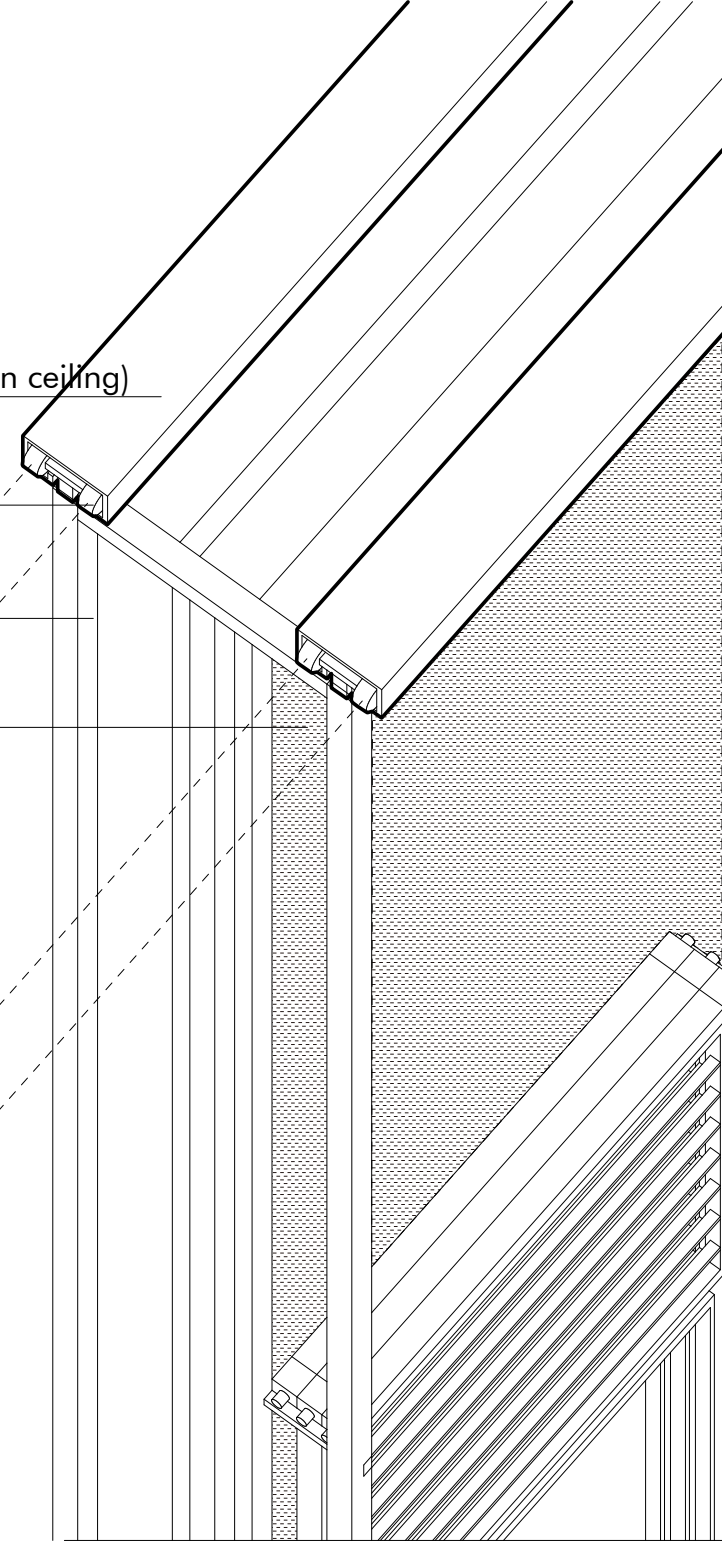
Meeting mode, 1:100

Steel sliding rail(Embedded in ceiling)

Pulleys

Steel frame

Porous plank



DESIGN

Concept of public functions



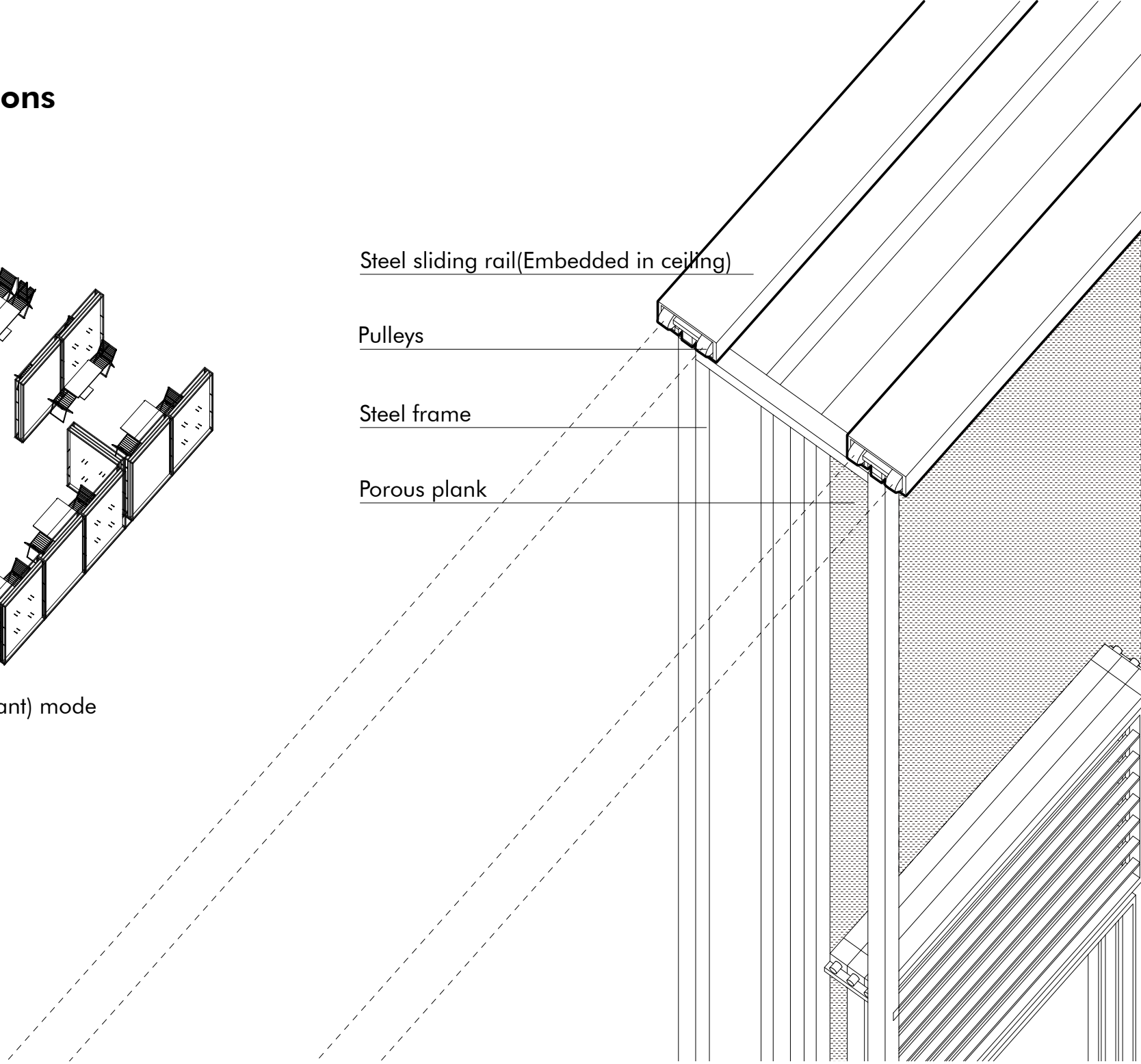
Bar(restaurant) mode

Steel sliding rail(Embedded in ceiling)

Pulleys

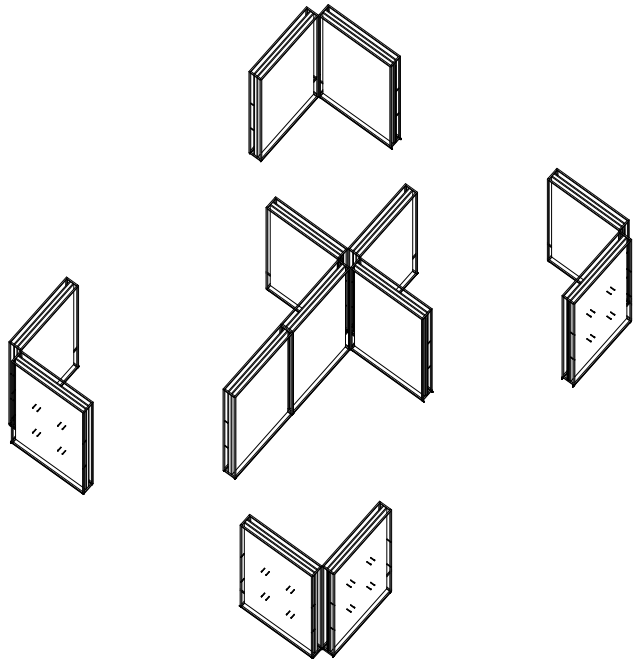
Steel frame

Porous plank



DESIGN

Concept of public functions



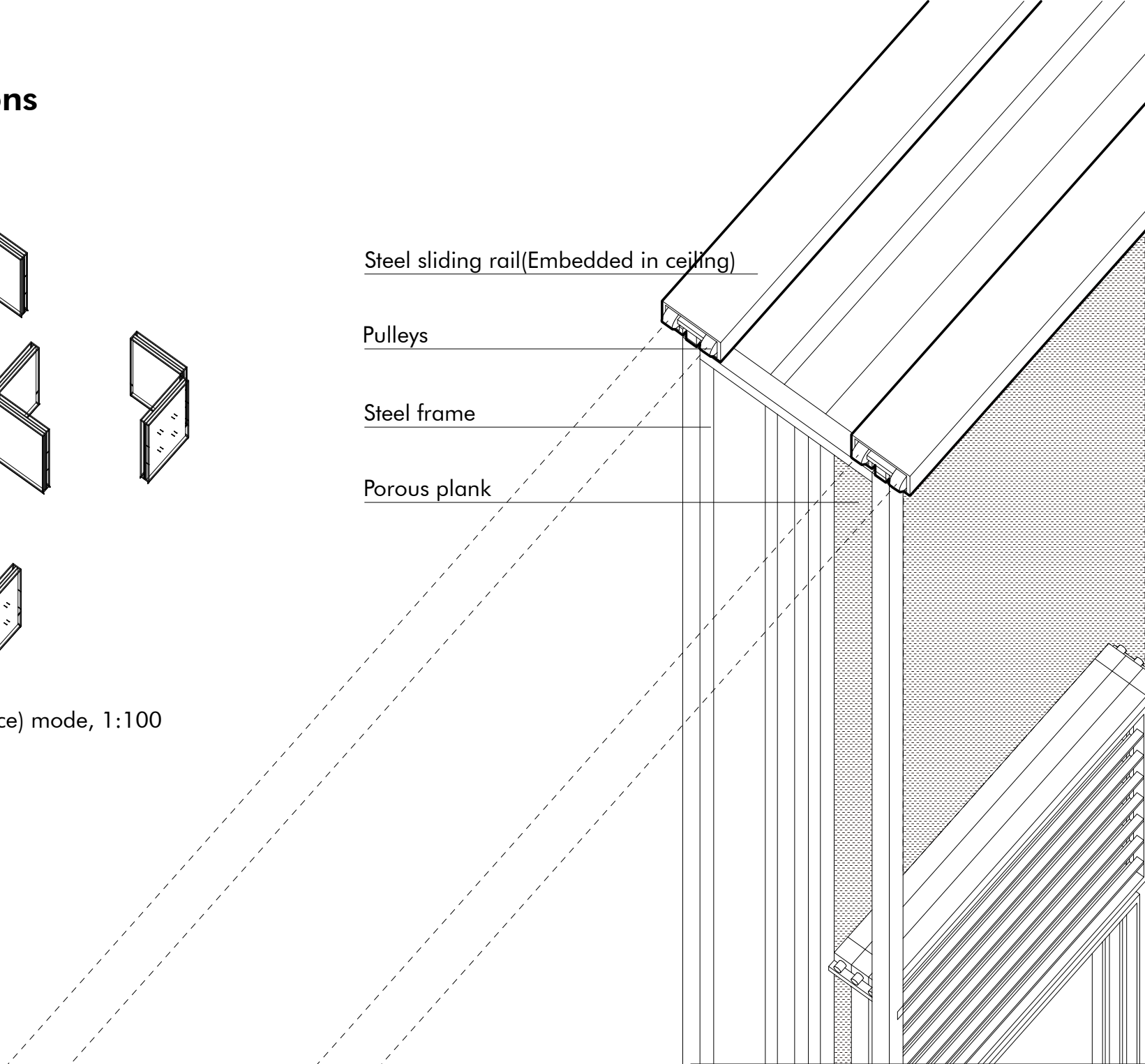
Exhibition(conference) mode, 1:100

Steel sliding rail(Embedded in ceiling)

Pulleys

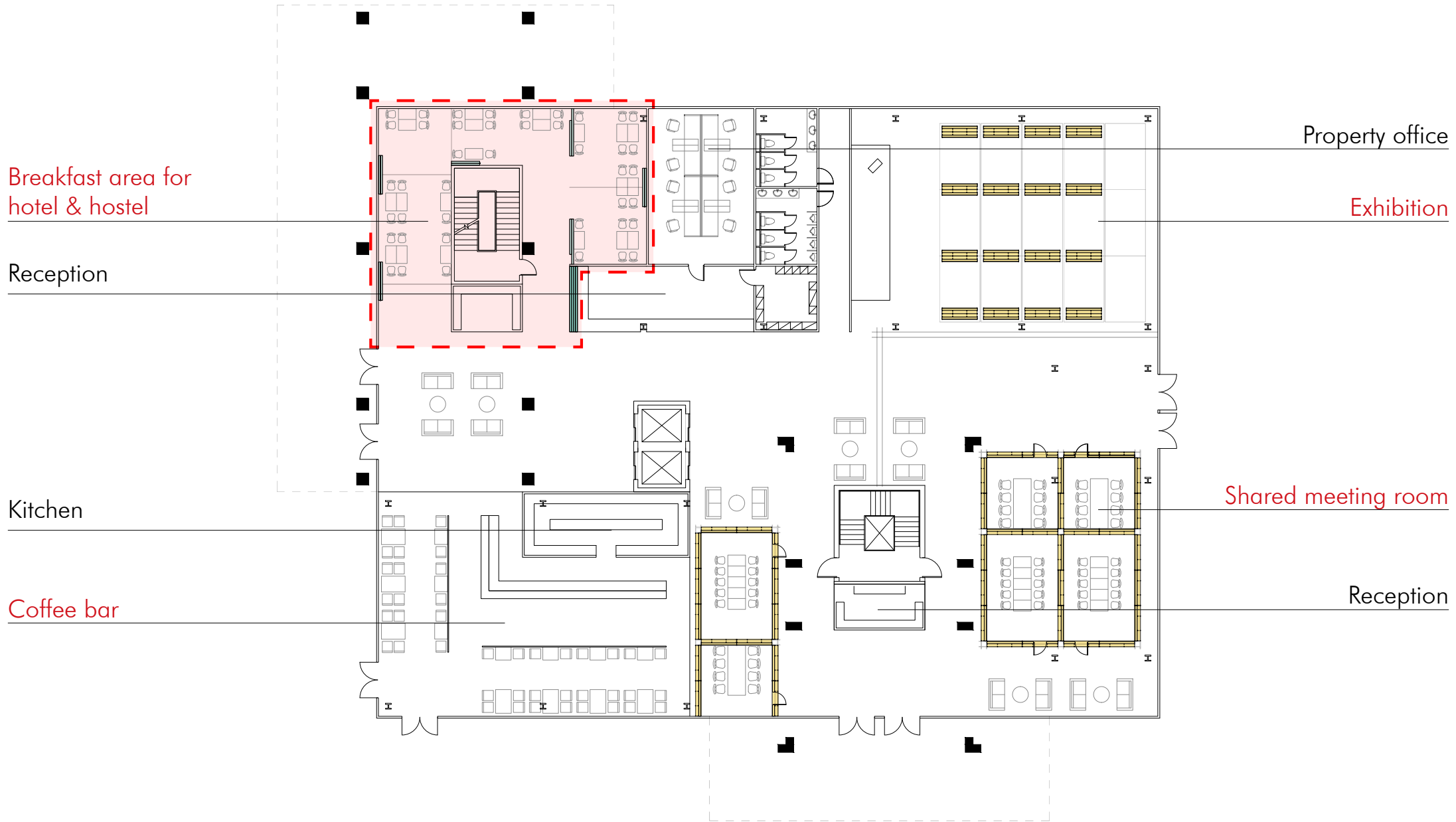
Steel frame

Porous plank



DESIGN

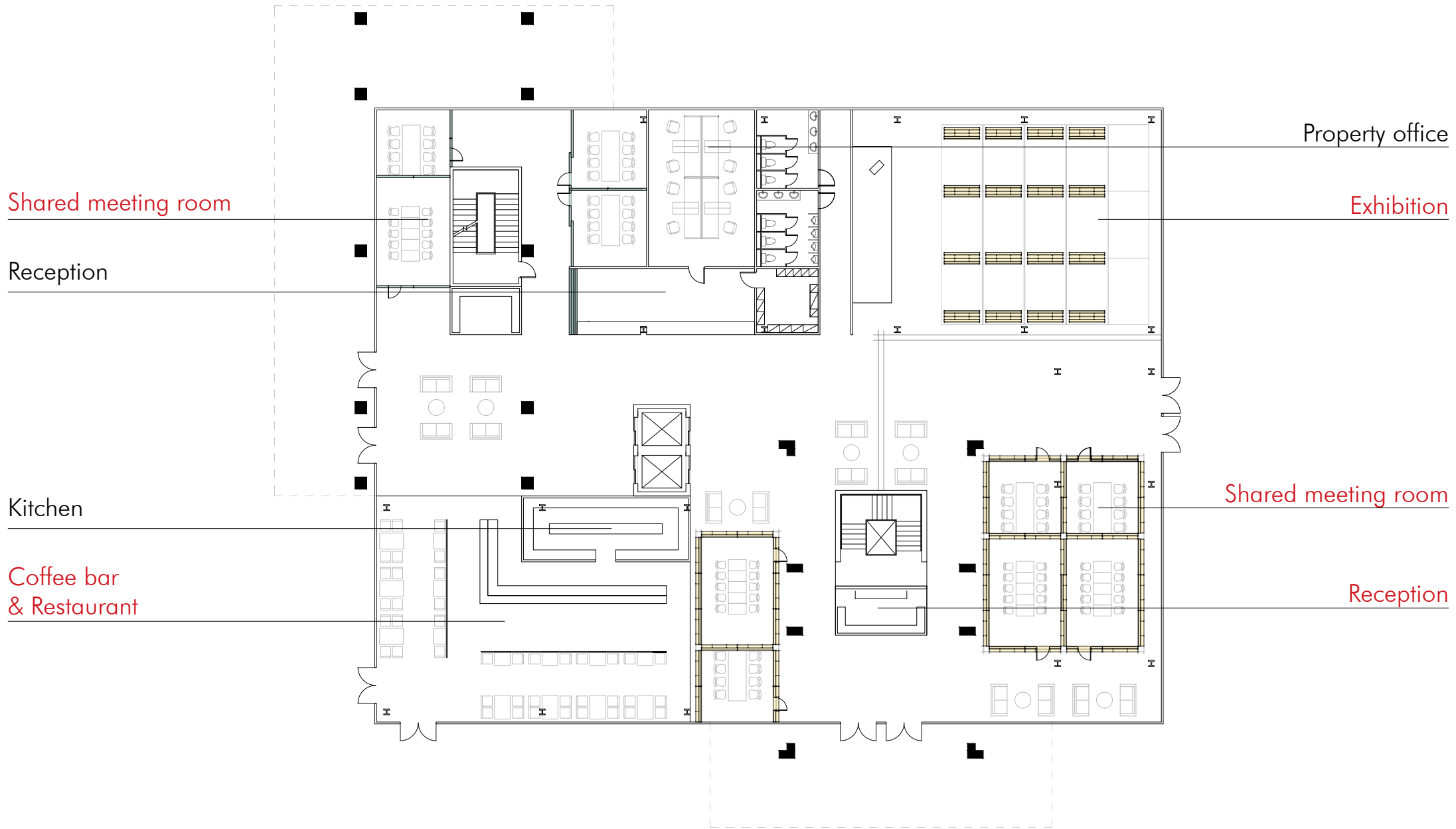
Ground floor plan



Ground floor plan (7:30-9:30)

DESIGN

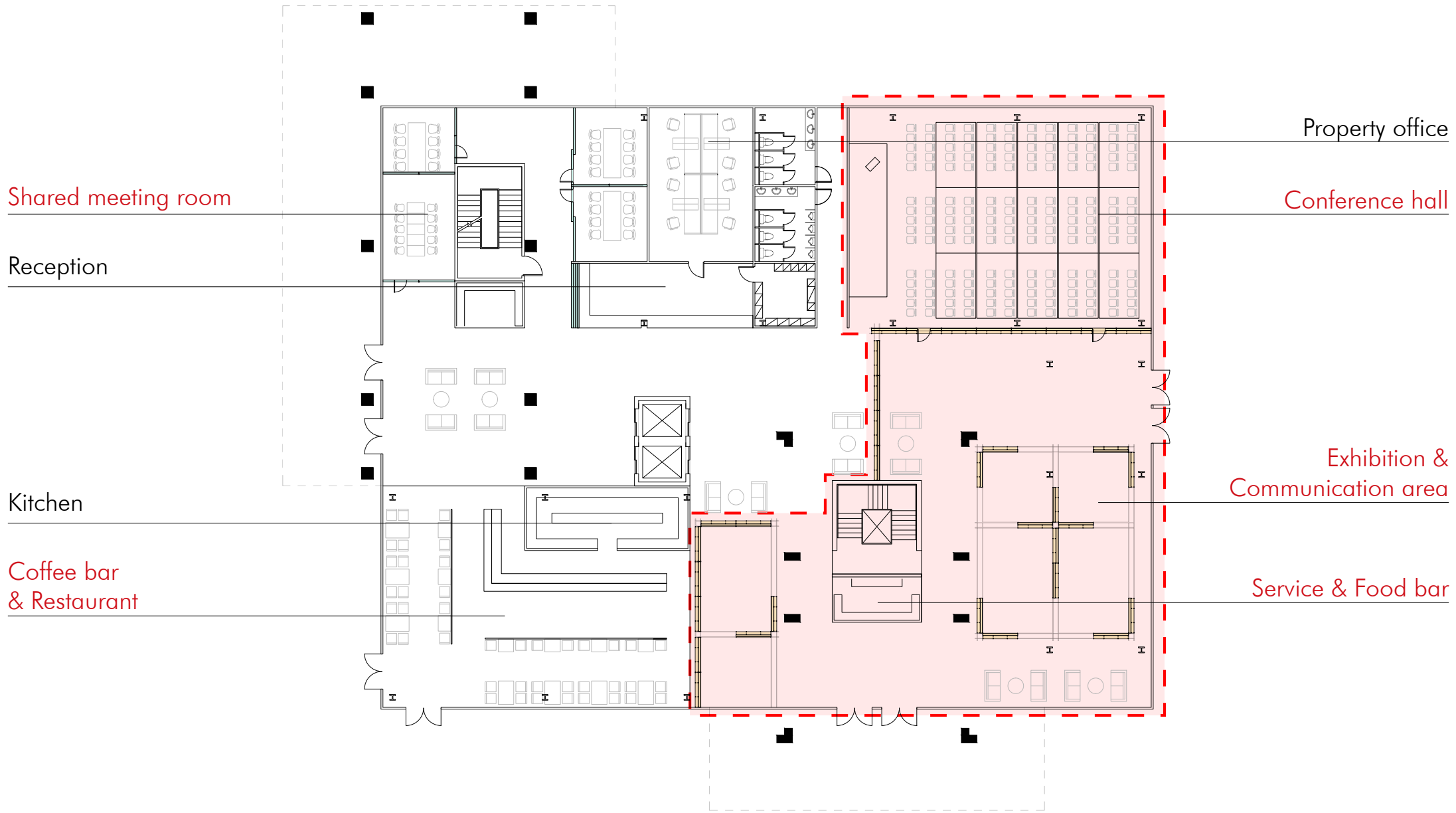
Ground floor plan



Ground floor plan (10:00-18:00)

DESIGN

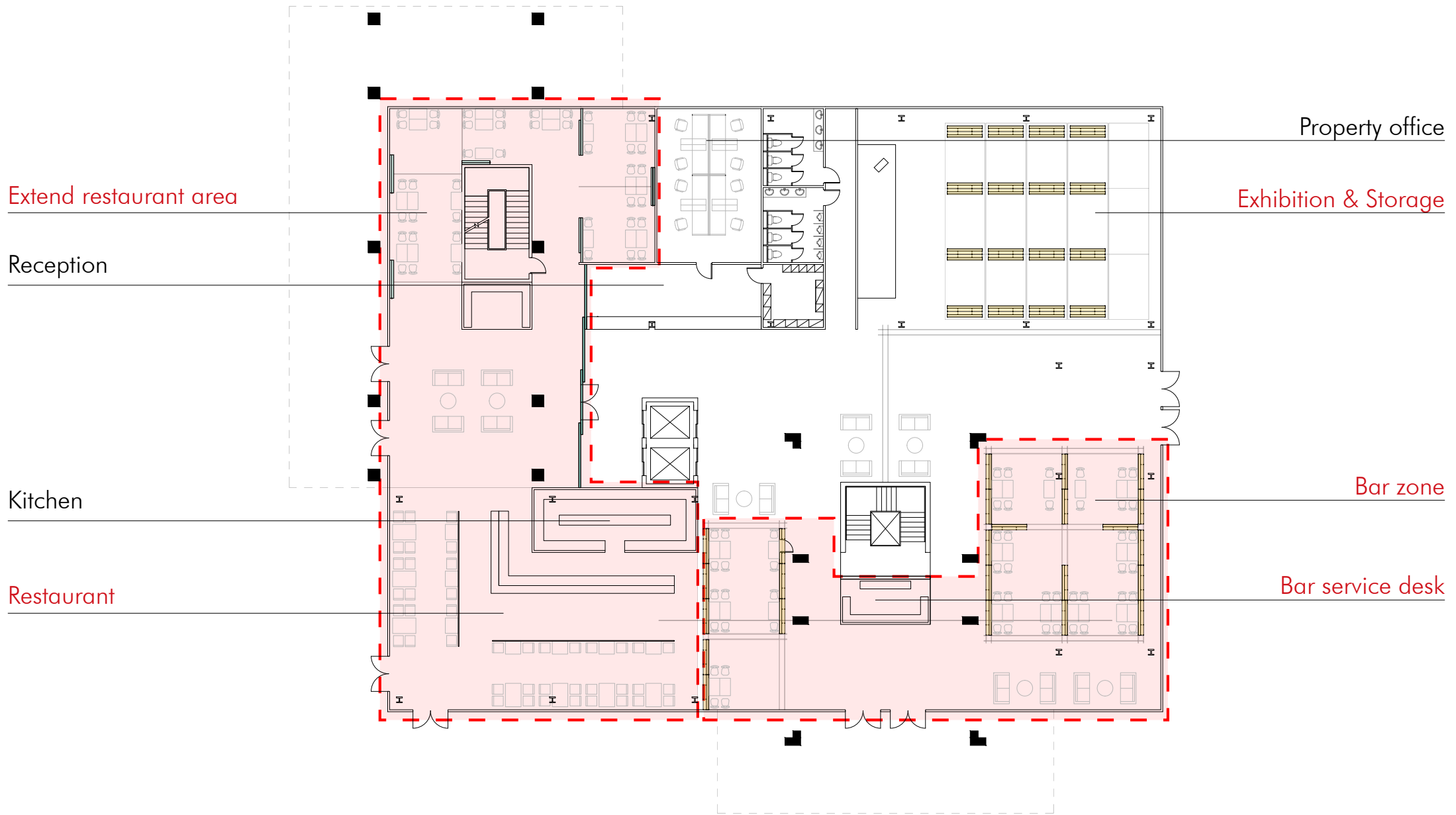
Ground floor plan



Ground floor plan during event (10:00-18:00)

DESIGN

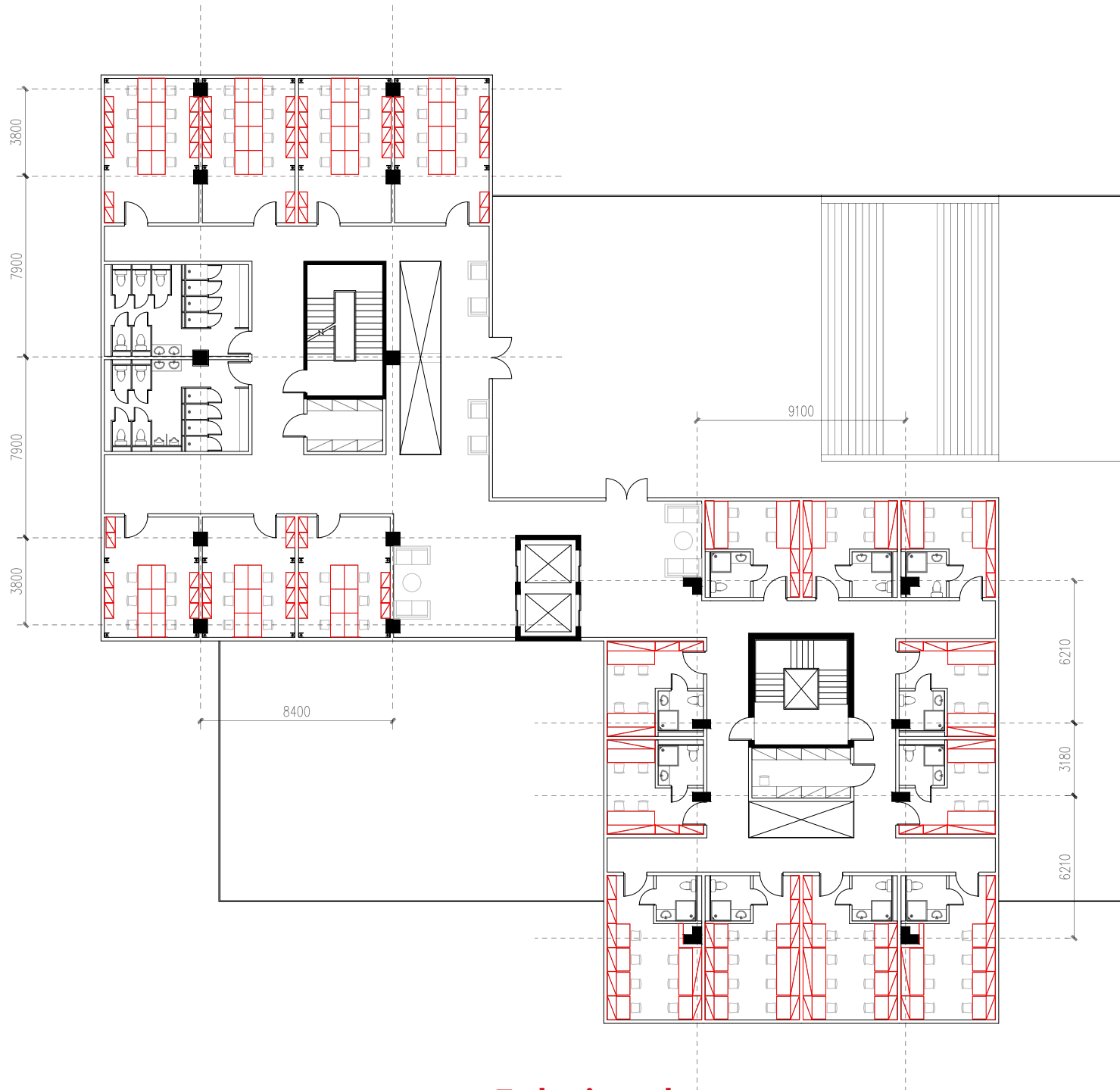
Ground floor plan



Ground floor plan (18:30-0:00)

DESIGN

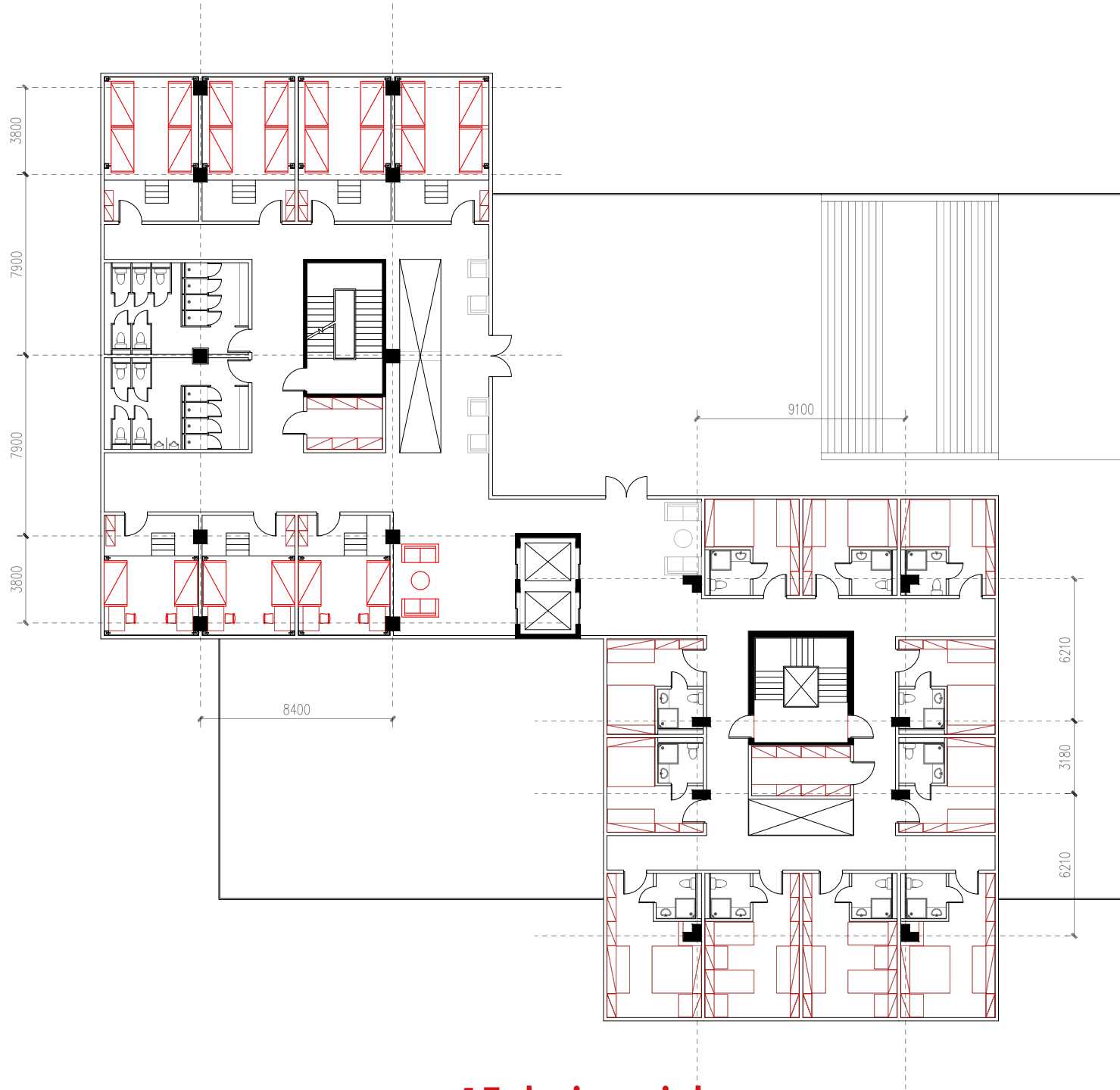
Floor plan



1F during day

DESIGN

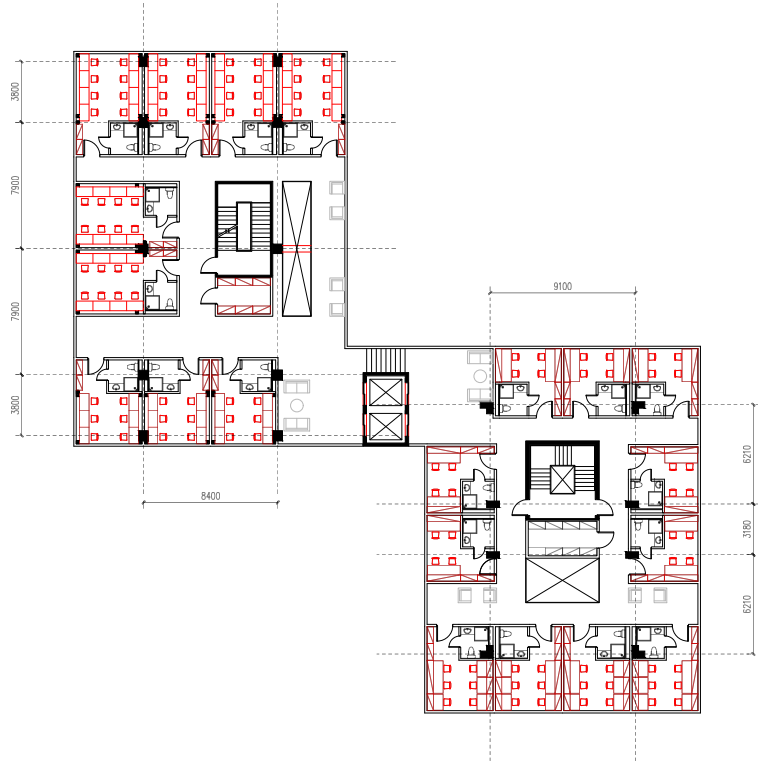
Floor plan



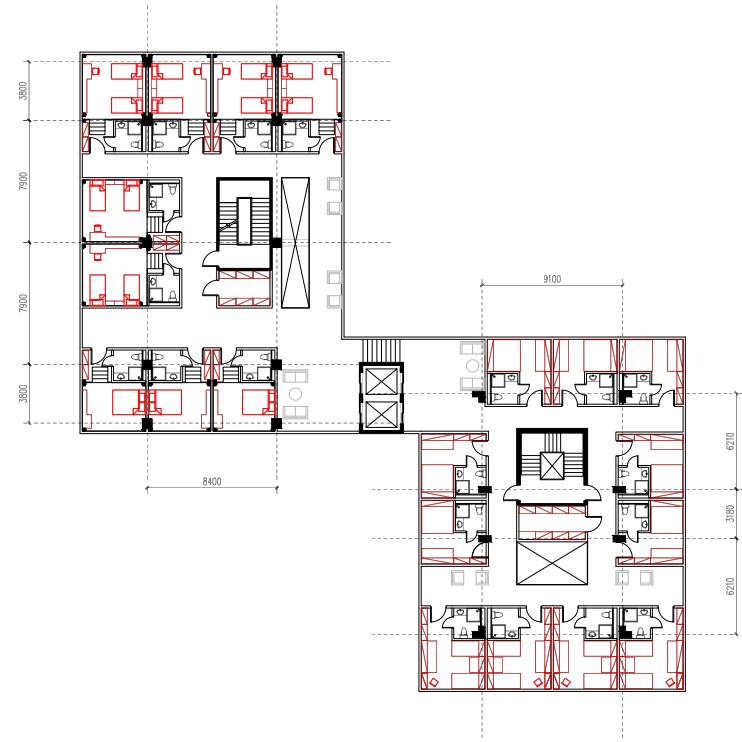
1F during night

DESIGN

Floor plan



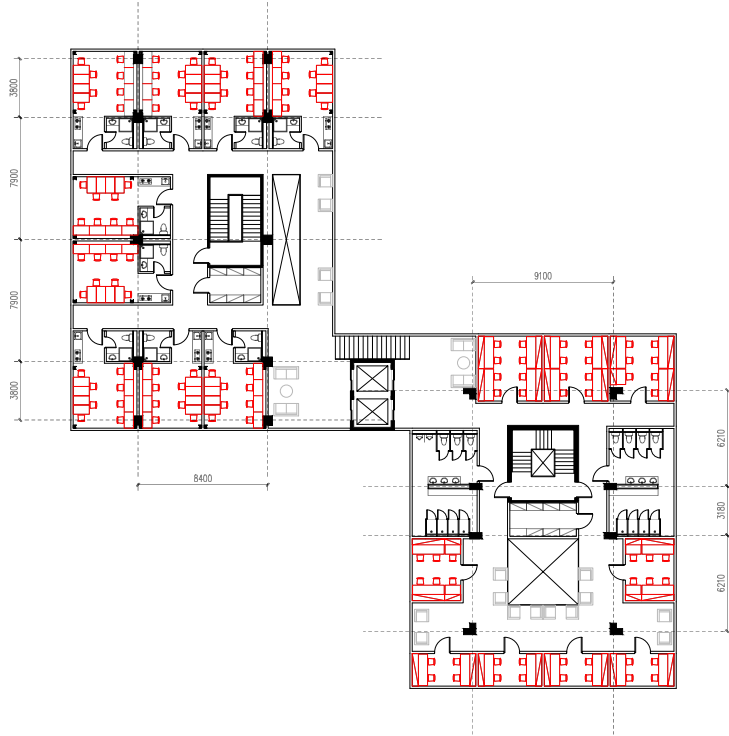
2F during day



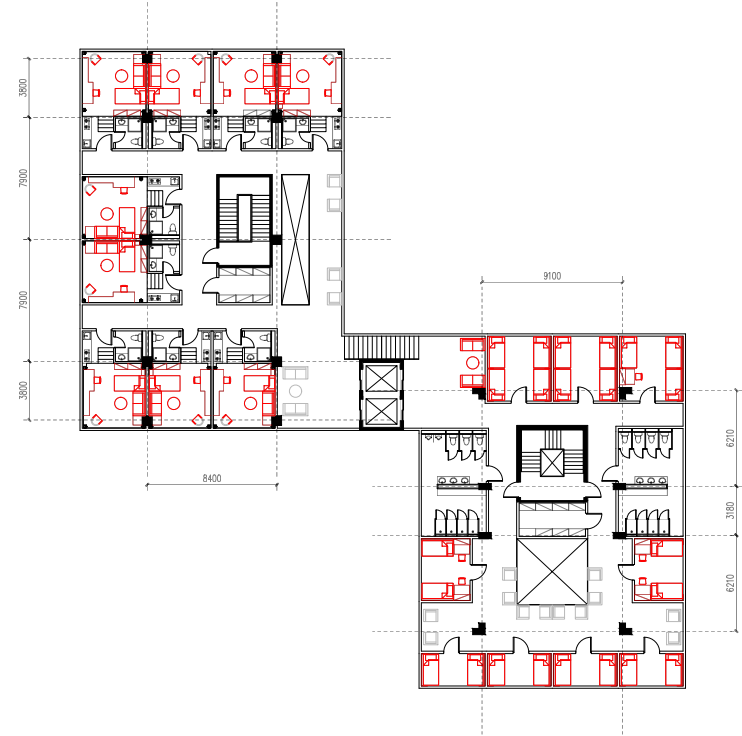
2F during night

DESIGN

Floor plan



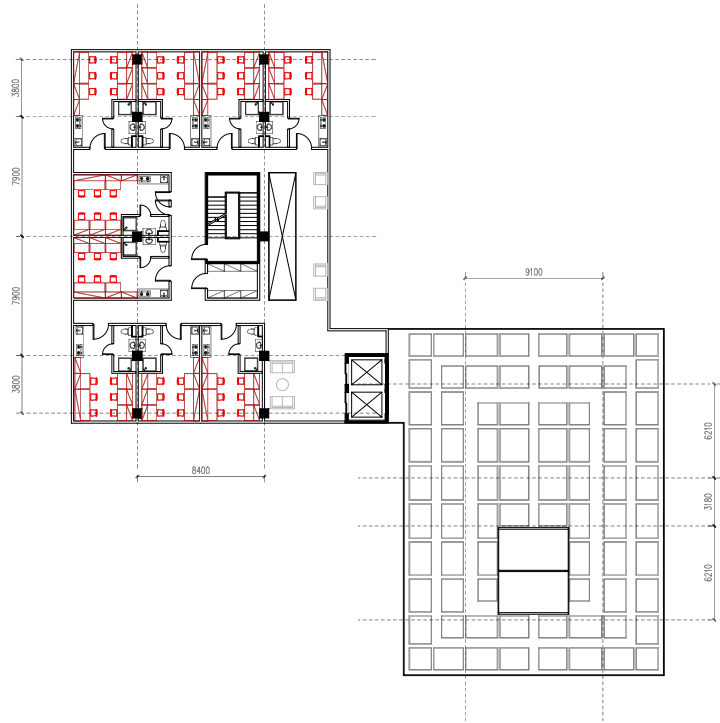
3F during day



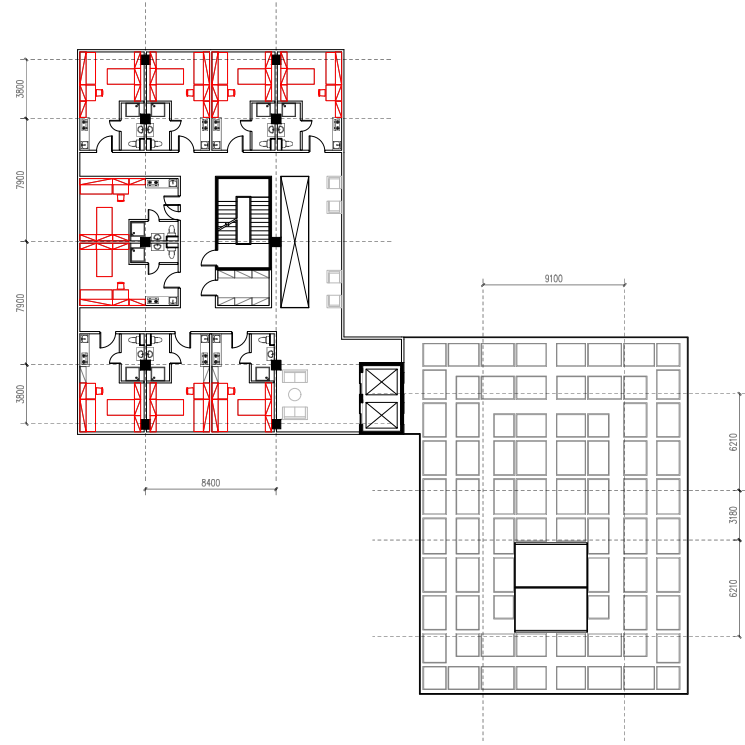
3F during night

DESIGN

Floor plan



4F during day

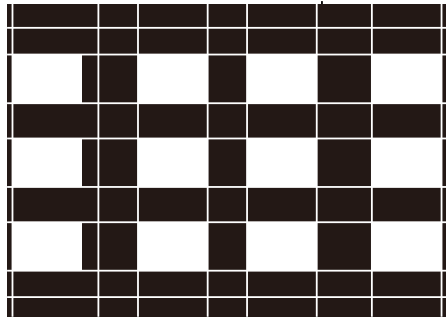


4F during night

EXPRESSION?

- **How to make the expression of the design adapt to the environment?**

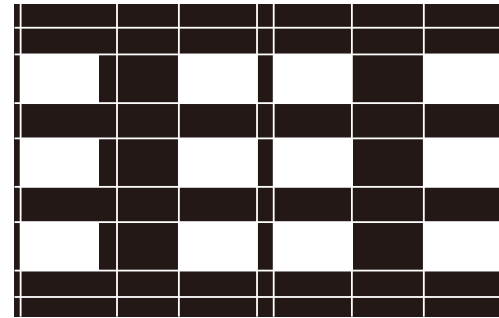




East elevation



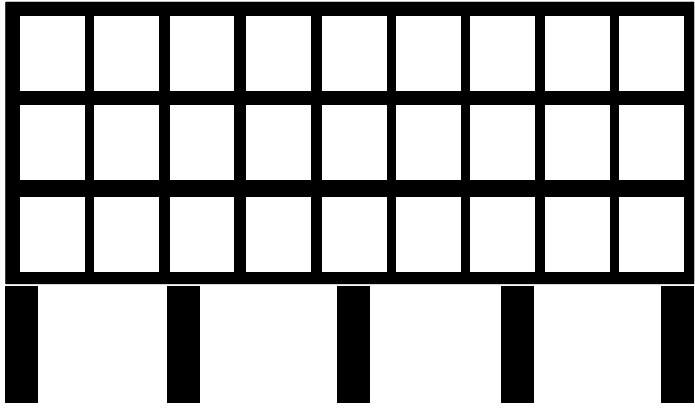
The facade of ground floor is close



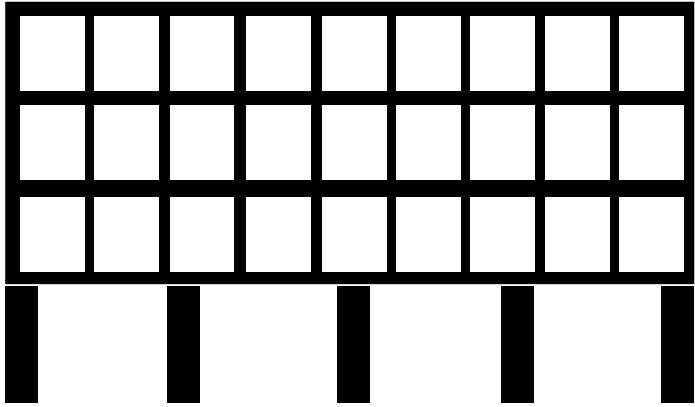
North elevation



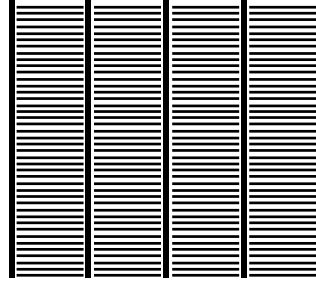
Exposure of structure on ground floor



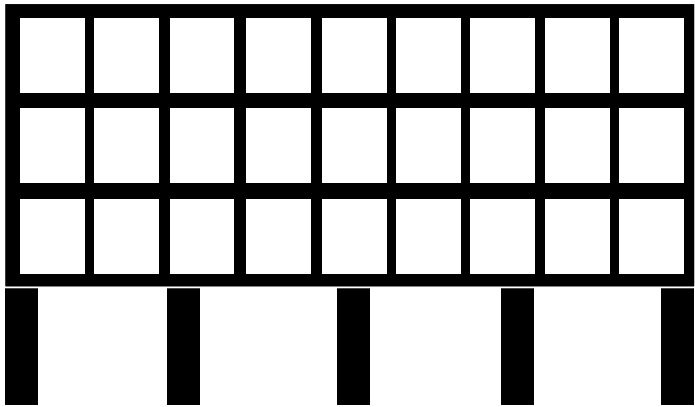
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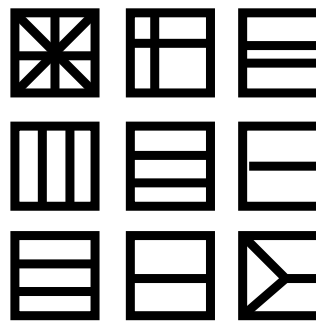
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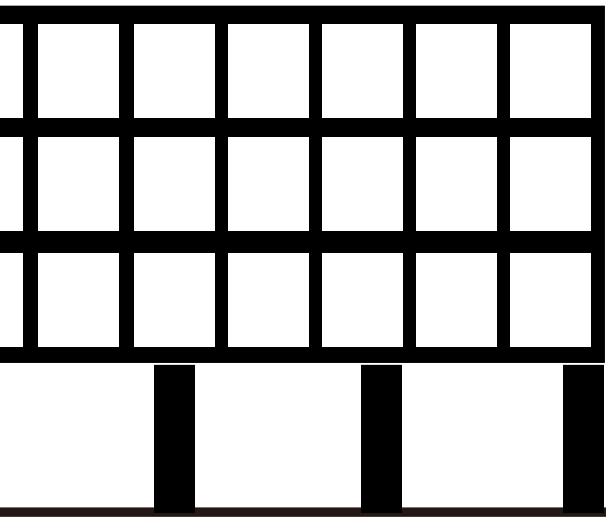


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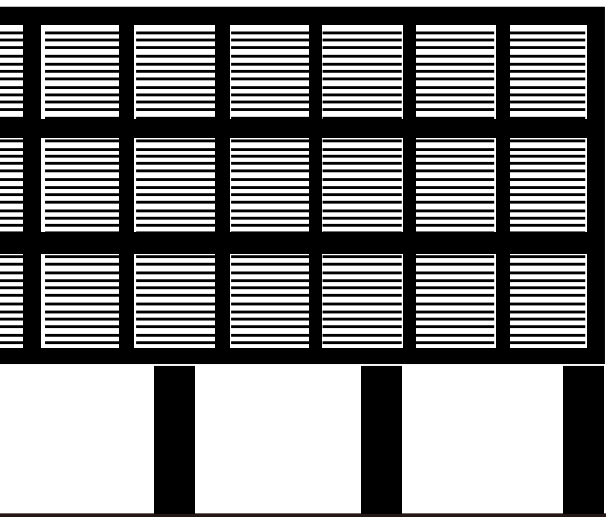
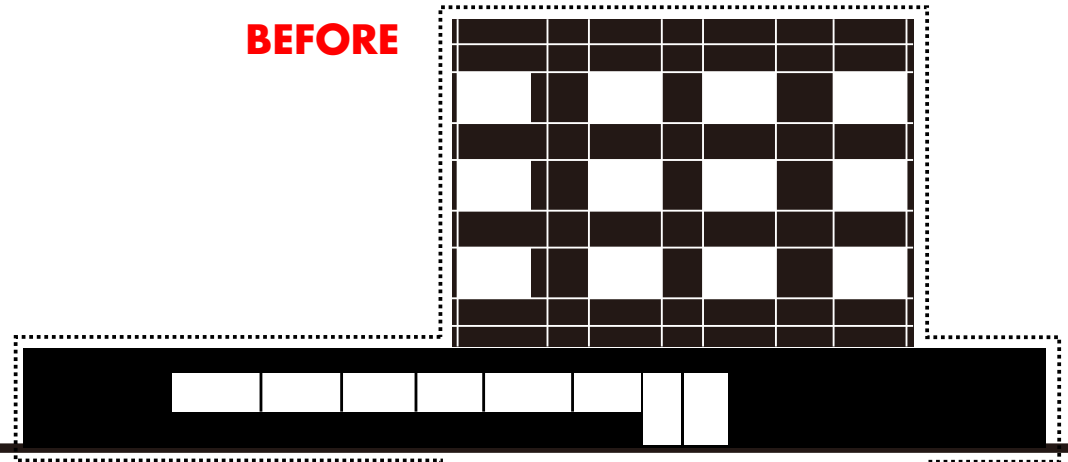


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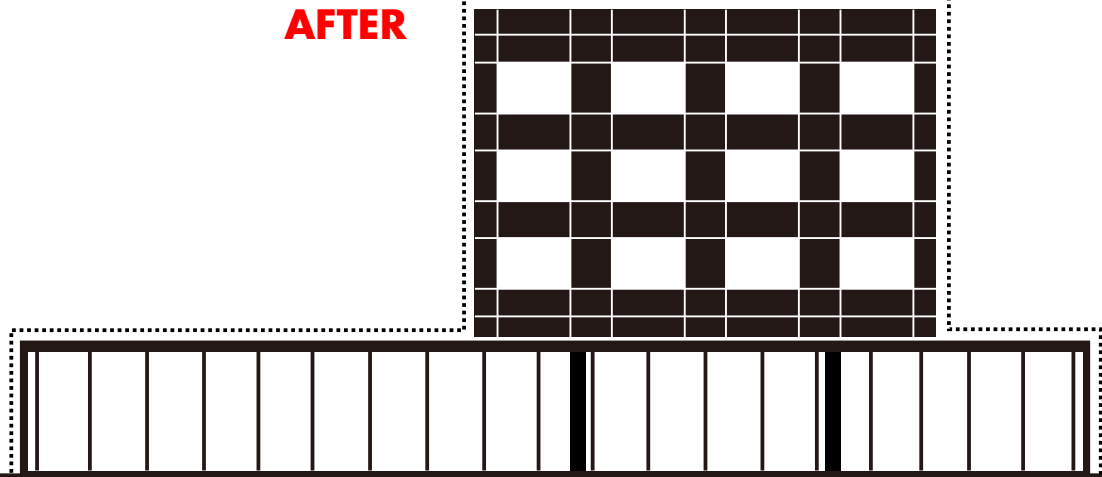


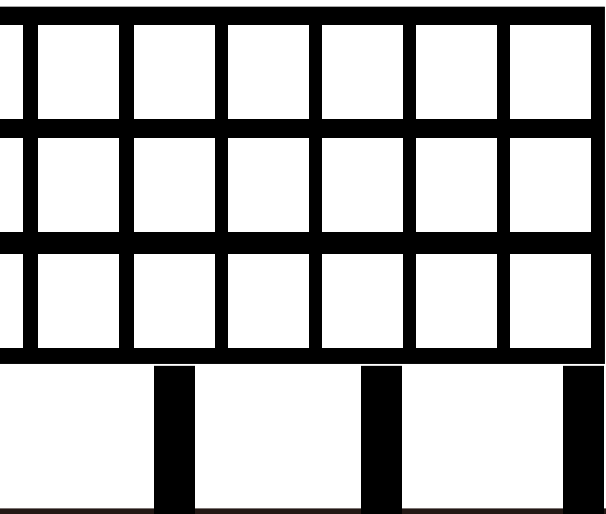


BEFORE

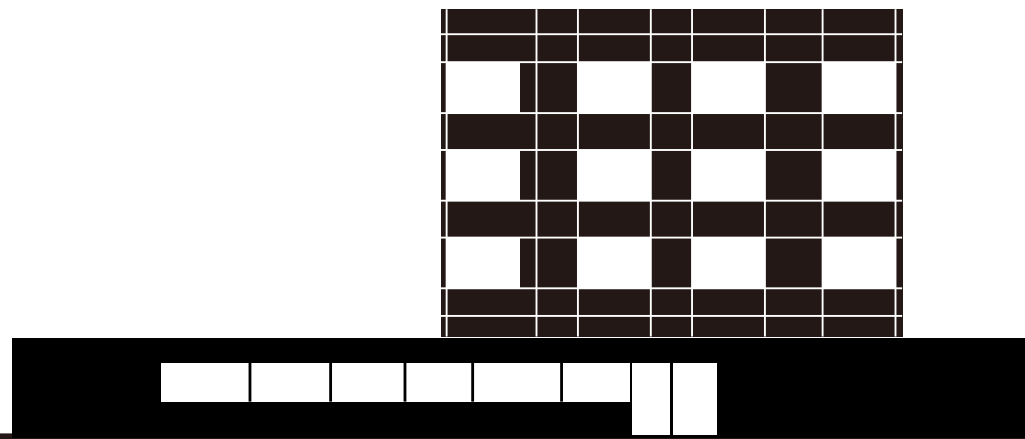


AFTER

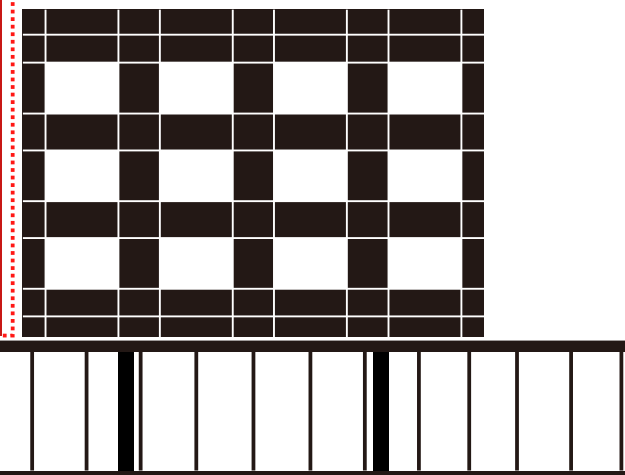
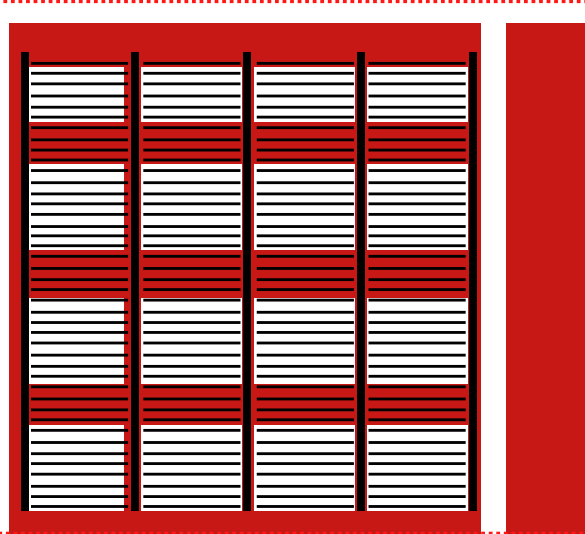
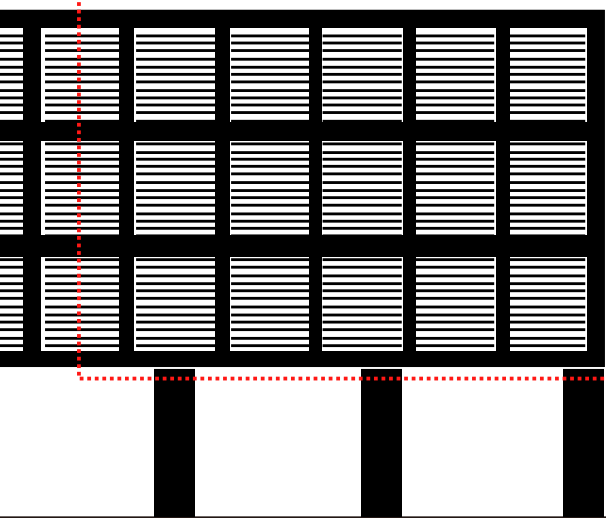




BEFORE



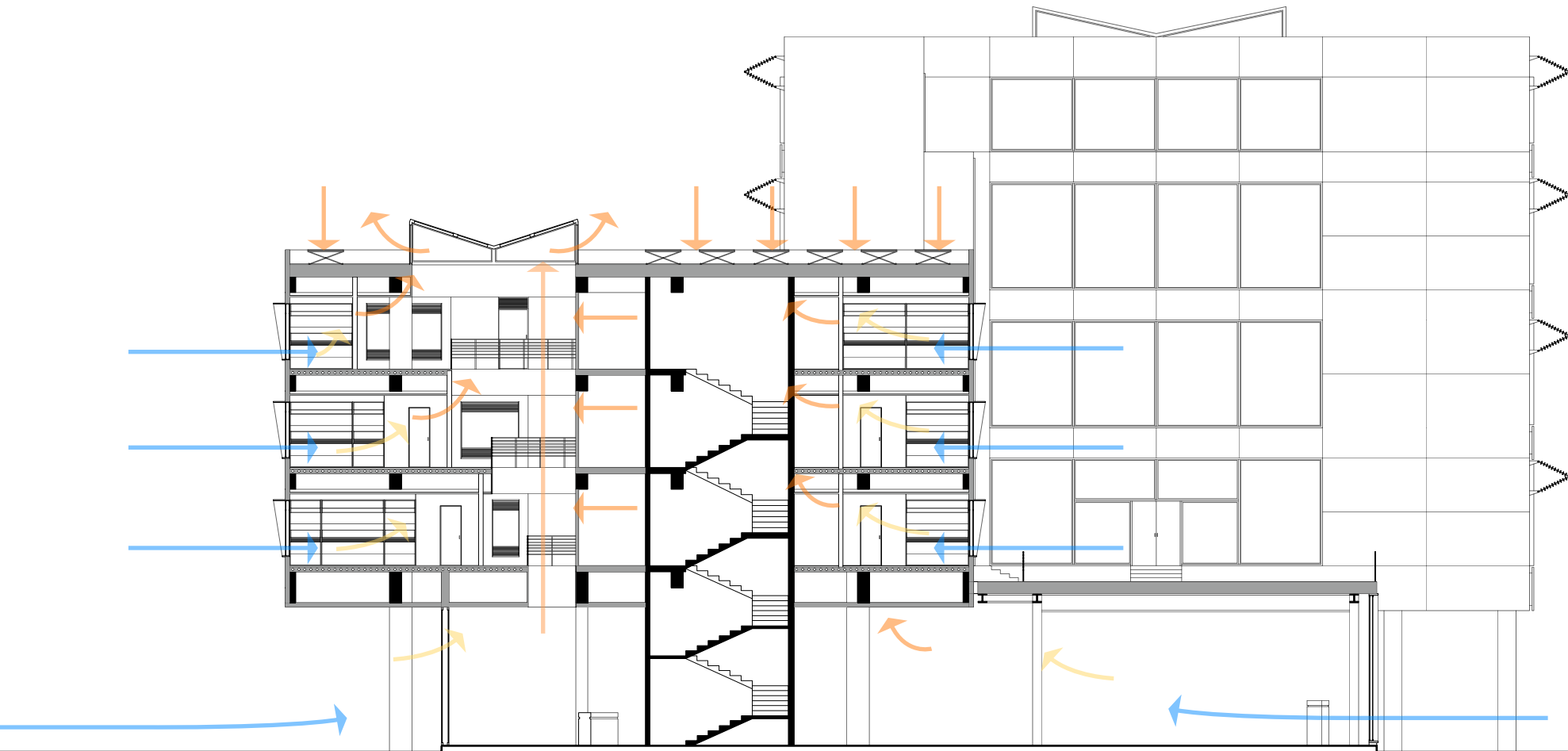
AFTER



INTERIOR CLIMATE?

- **How to make a good interior climate for such dense space?**

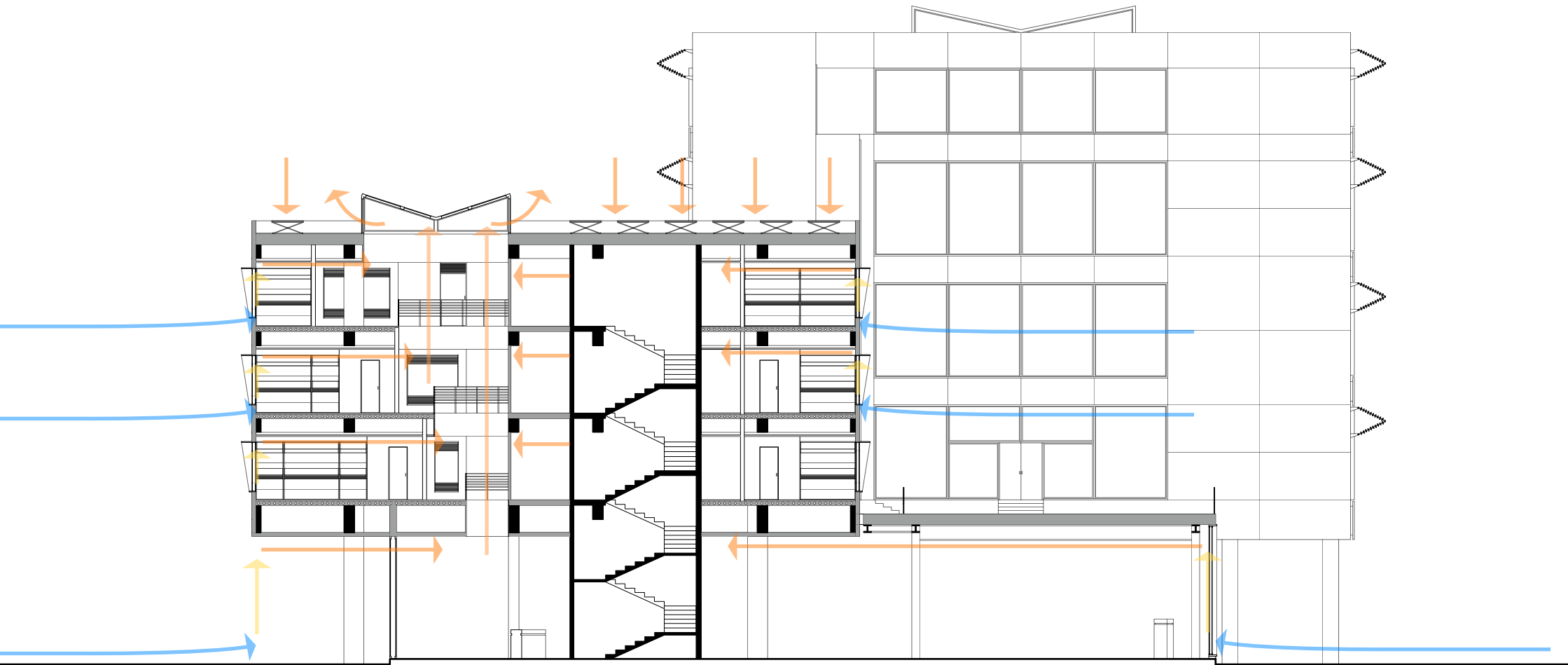
Building technology



Section 1 During Summer

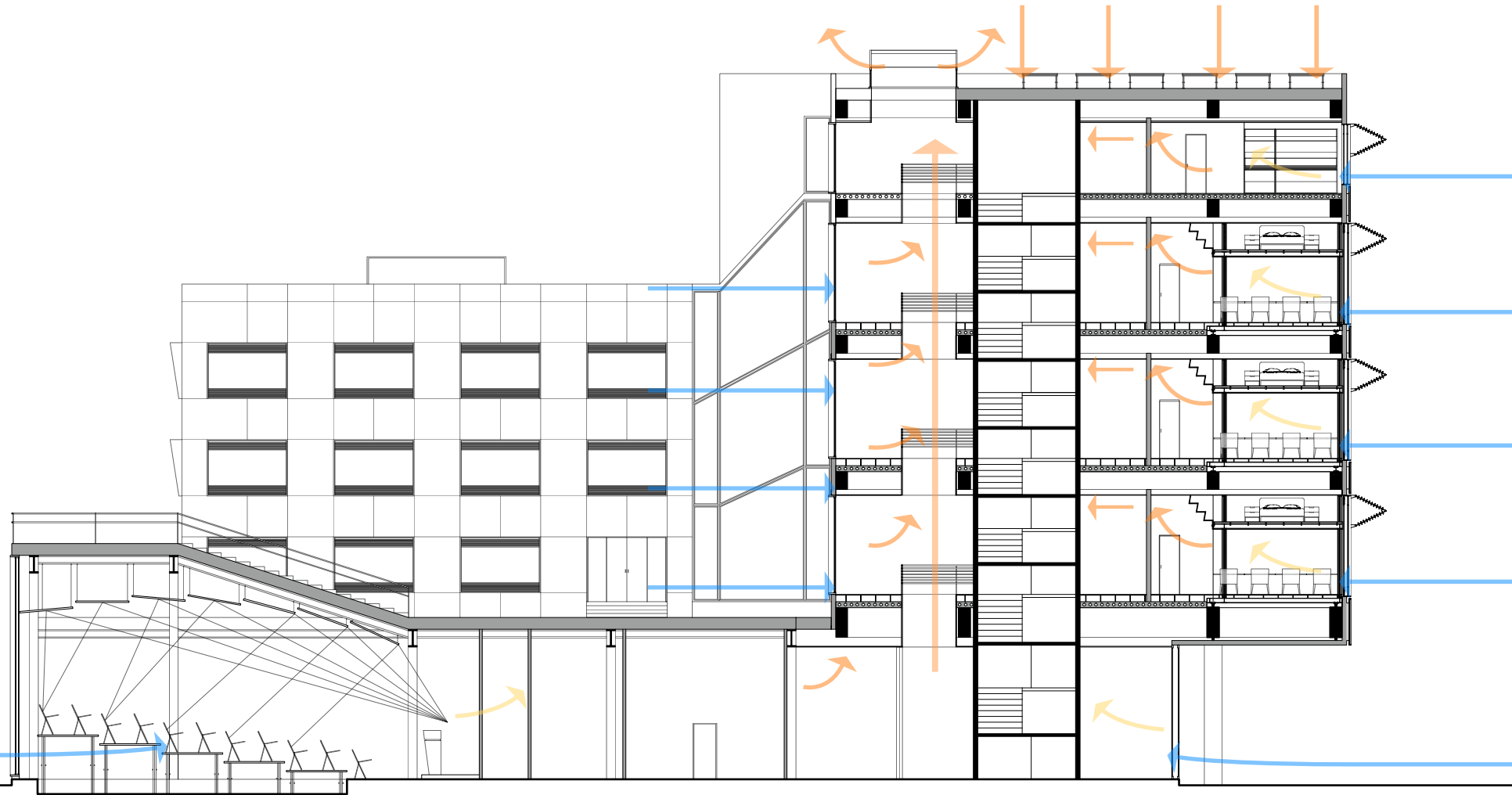
DESIGN

Building technology



Section 1 During Winter

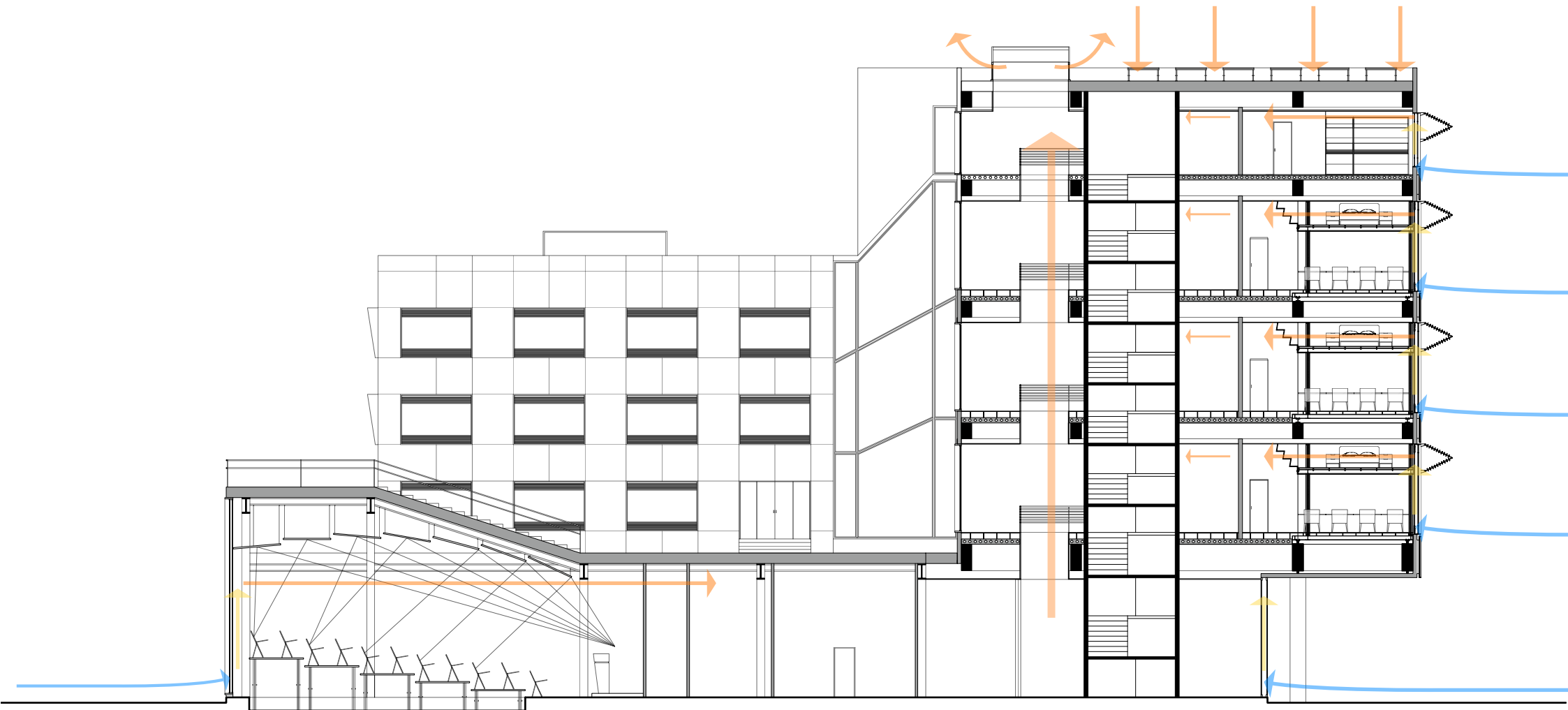
Building technology



Section 1 During Summer

DESIGN

Building technology

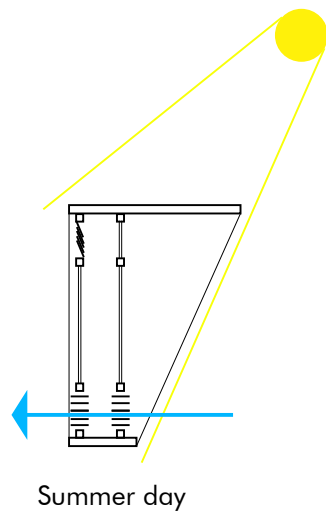


Section 1 During Winter

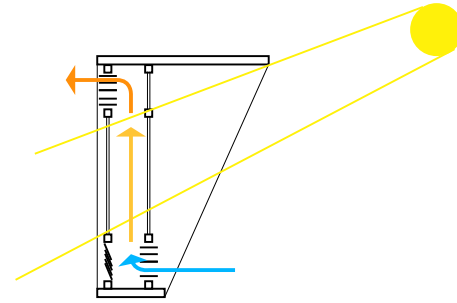
DESIGN

Building technology

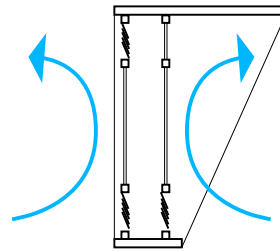
Solution for existing building



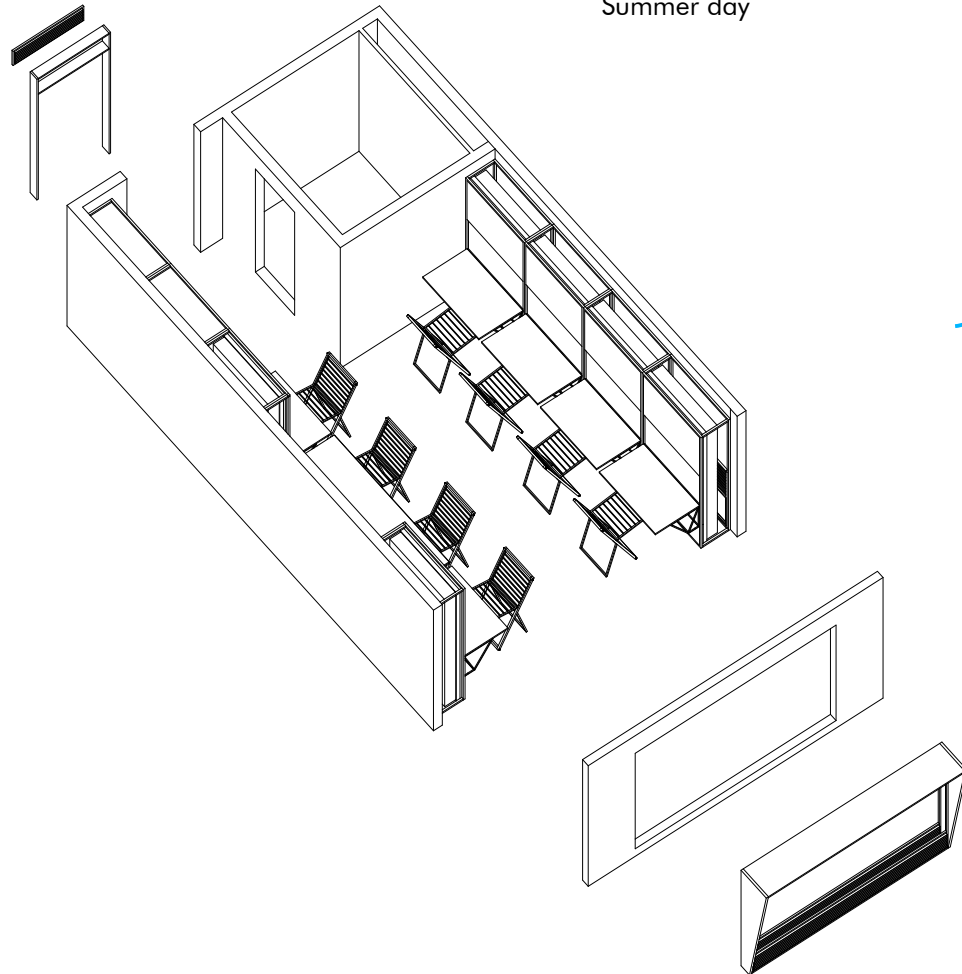
Summer day



Winter day



Night



**Can be customized
to adapt other**

Steel sun shield

First layer of window frame

Rotatable louver boards

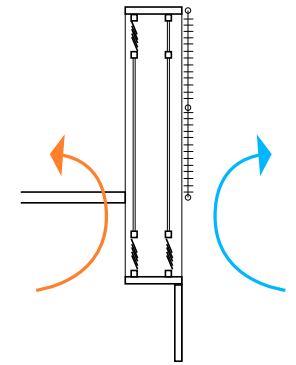
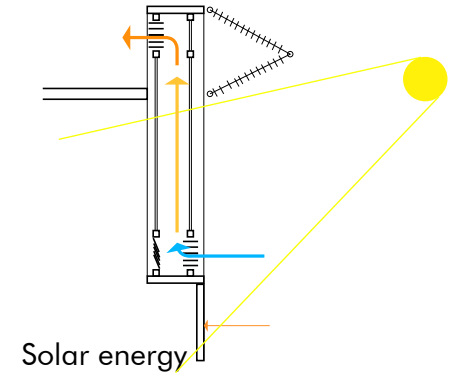
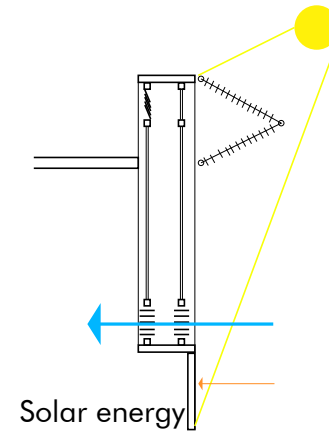
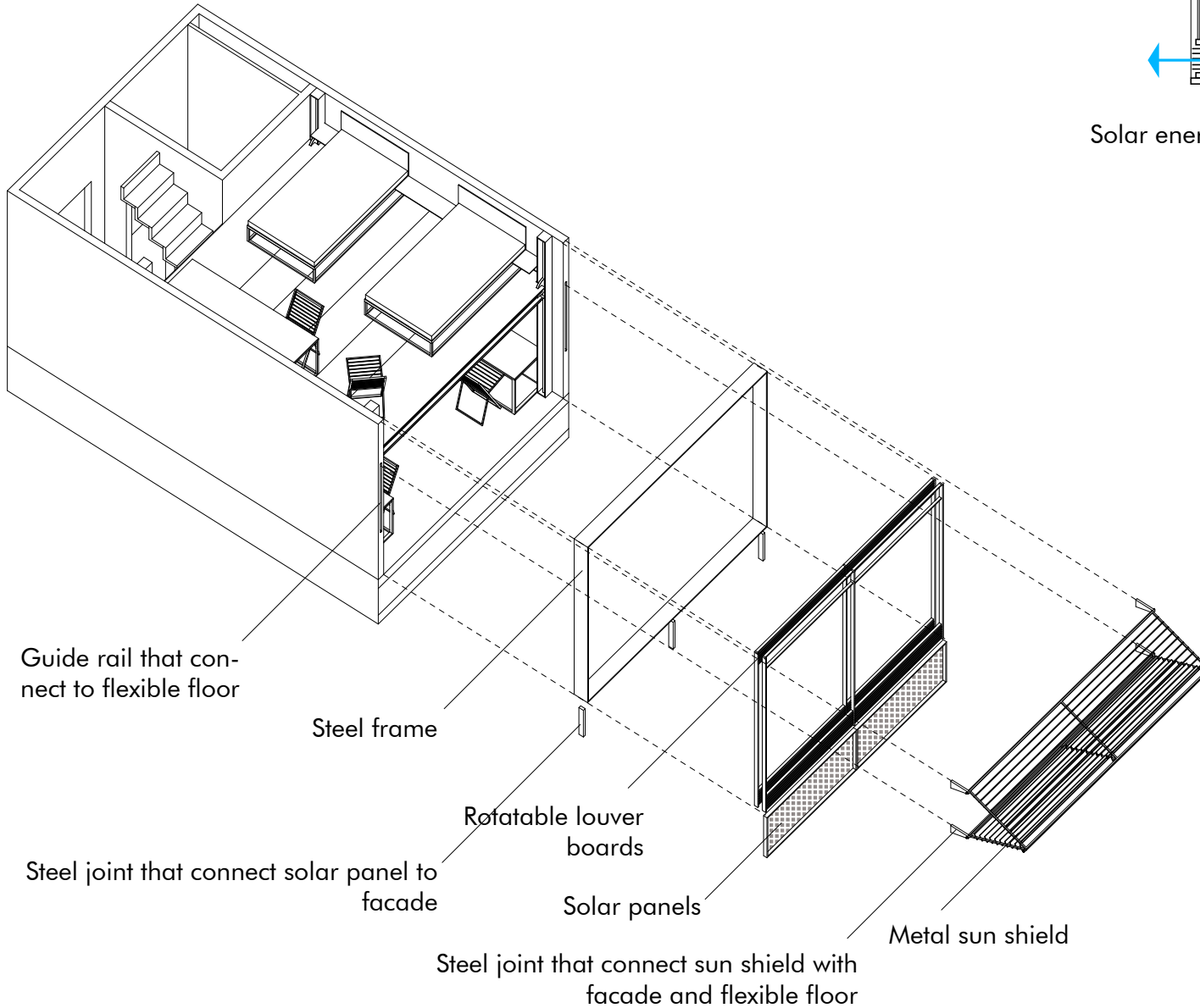
Second layer of window frame

Glass

DESIGN

Building technology

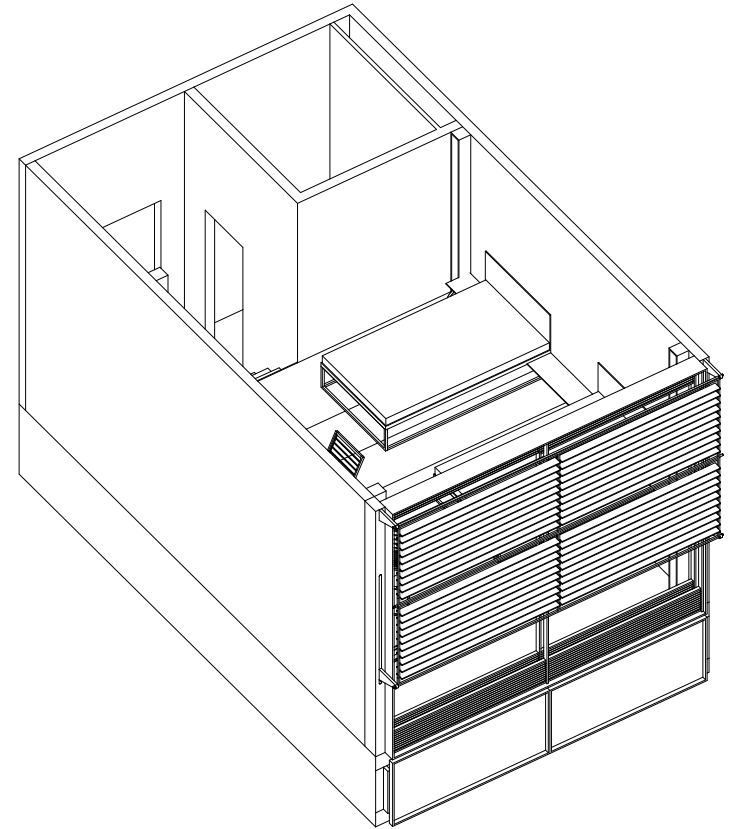
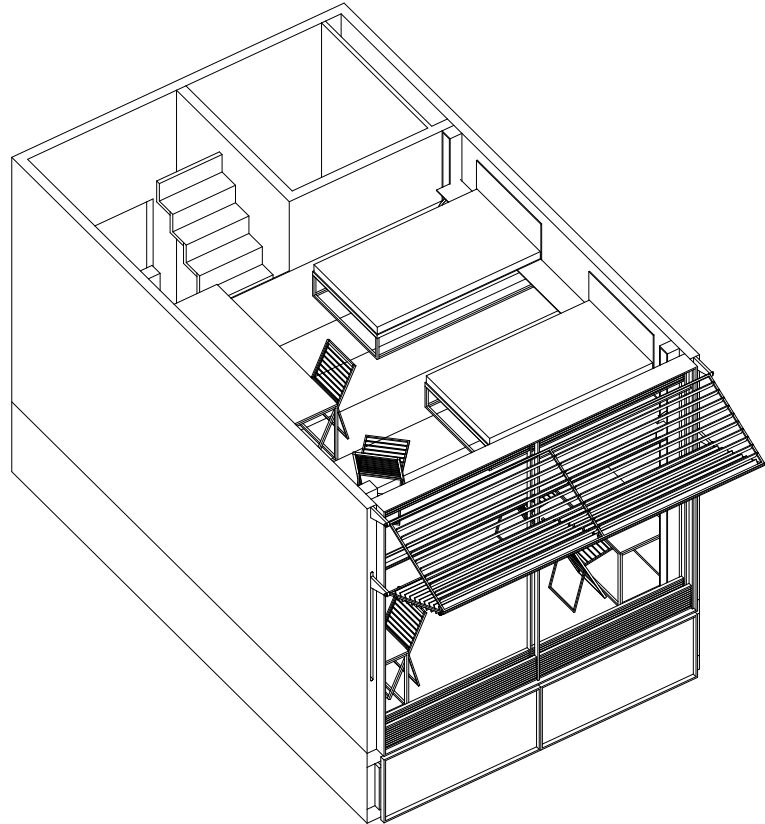
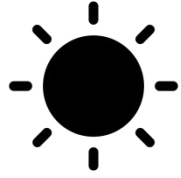
Solution for new building



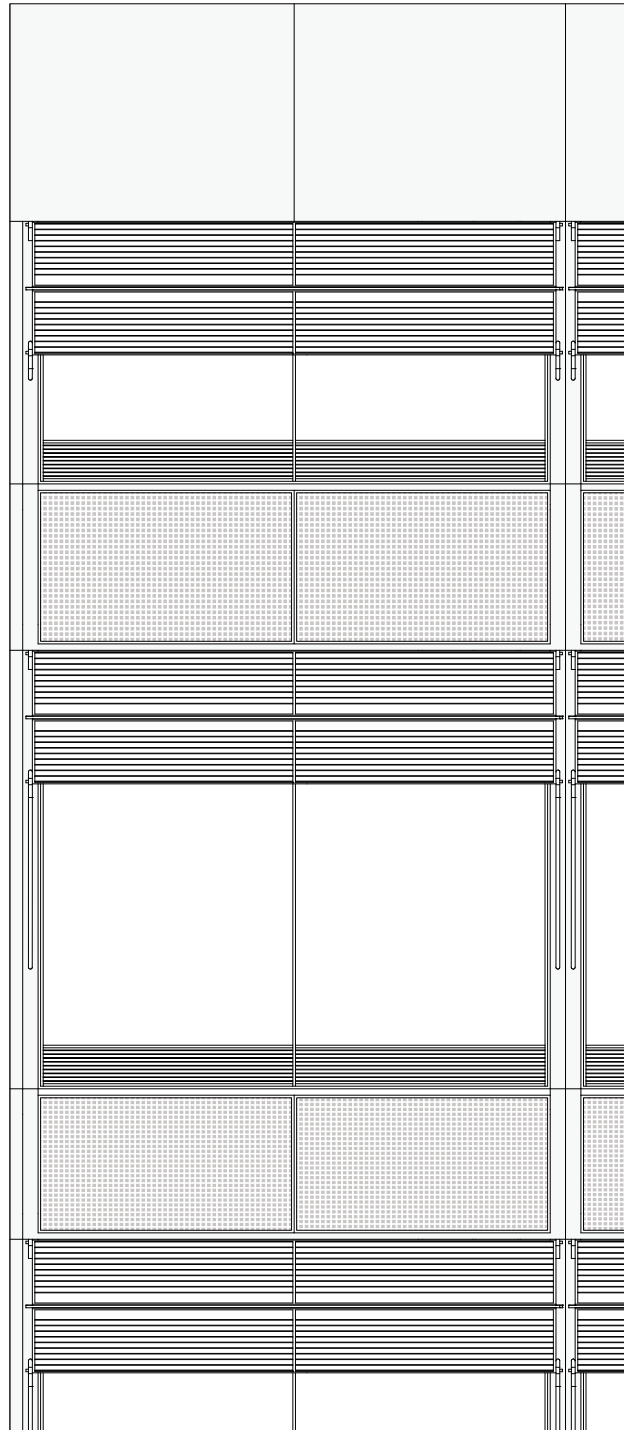
**Can be customized
to adapt other**

DESIGN

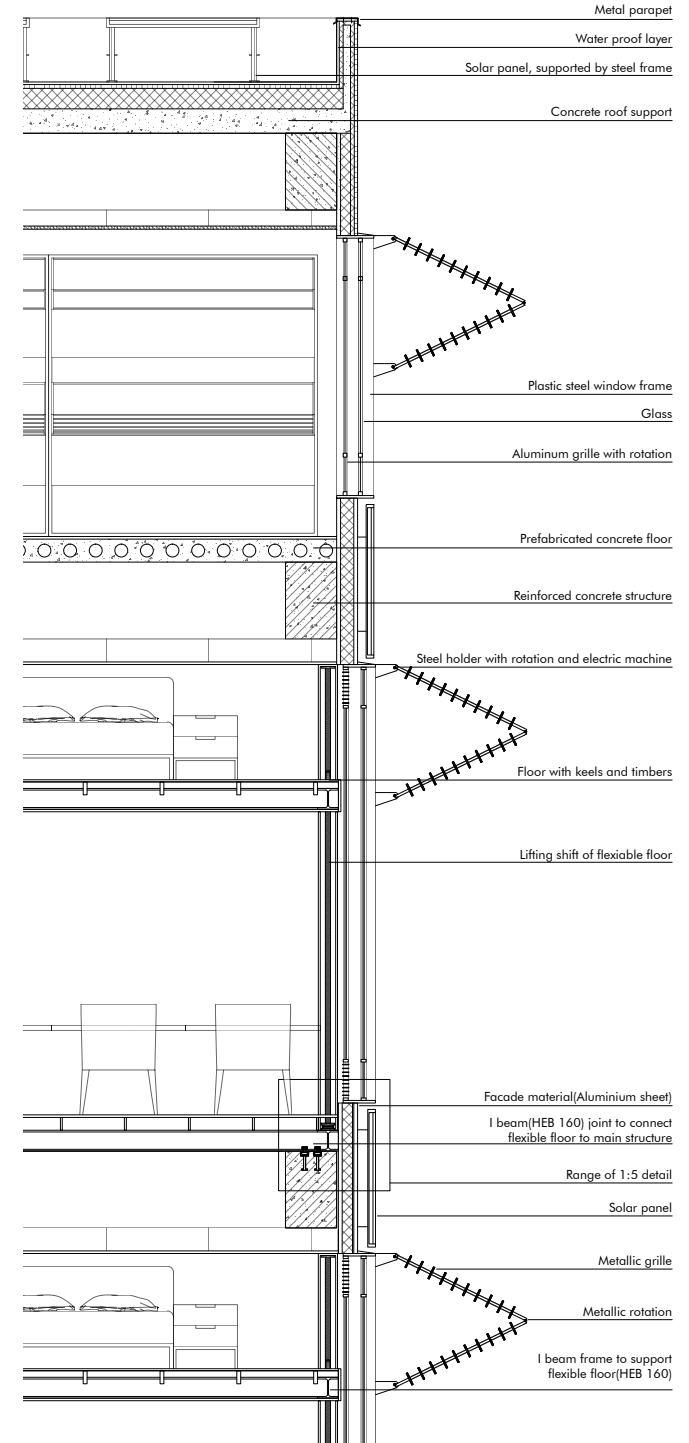
Building technology



Facade fragment, 1:20

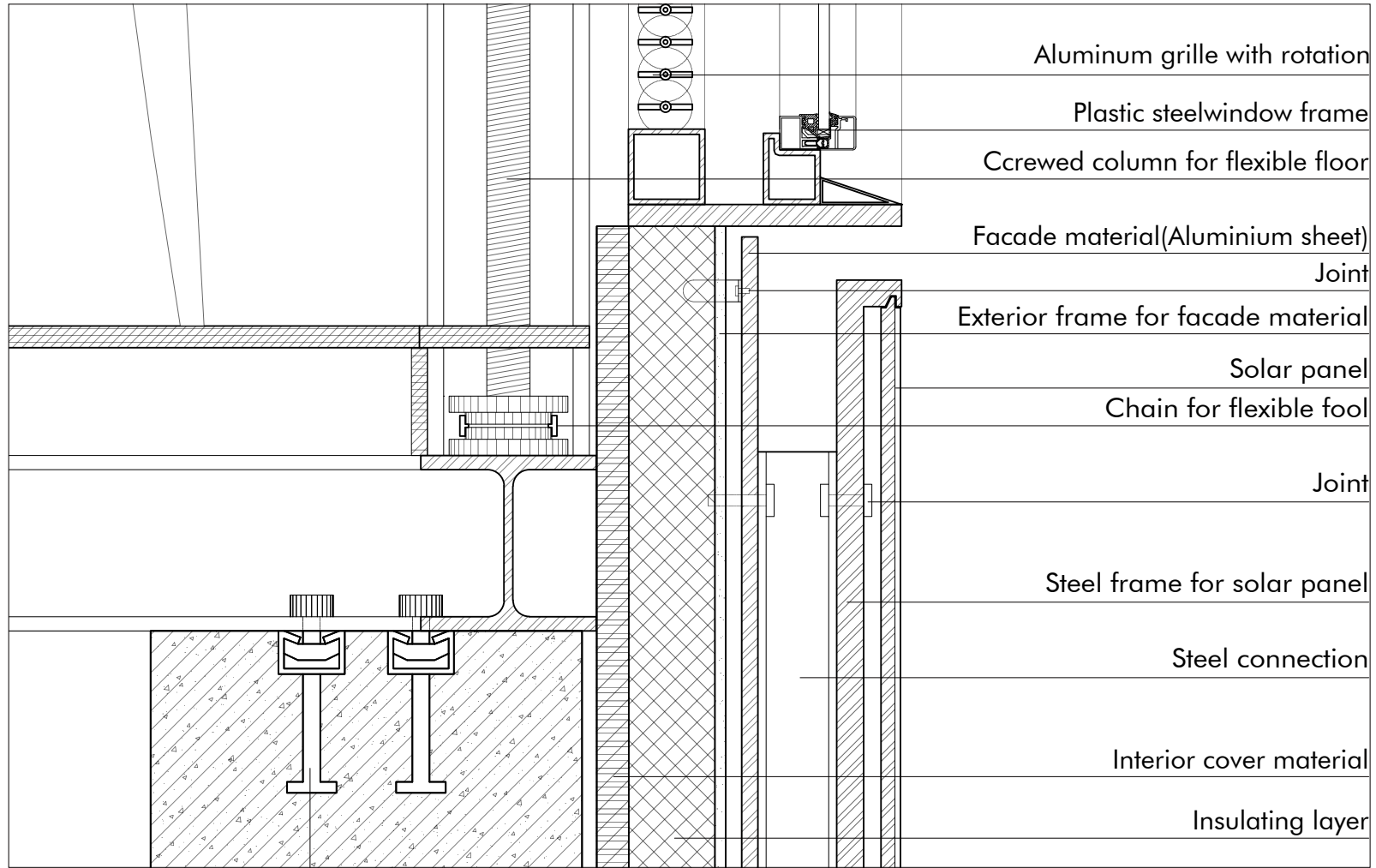


Section fragment, 1:20



Building technology

Detail, 1:5



Cast-In Channel

DESIGN

View from NEMO Science Museum during day



DESIGN

View from NEMO Science Museum during night



DESIGN

View from Flexible Furniture Prototype during day and night



DESIGN

View from Flexible Furniture Prototype during day



DESIGN

View from Flexible Furniture Prototype during night



DESIGN

View from Flexible Floor Prototype during day and night



DESIGN

View from Flexible Floor Prototype during day



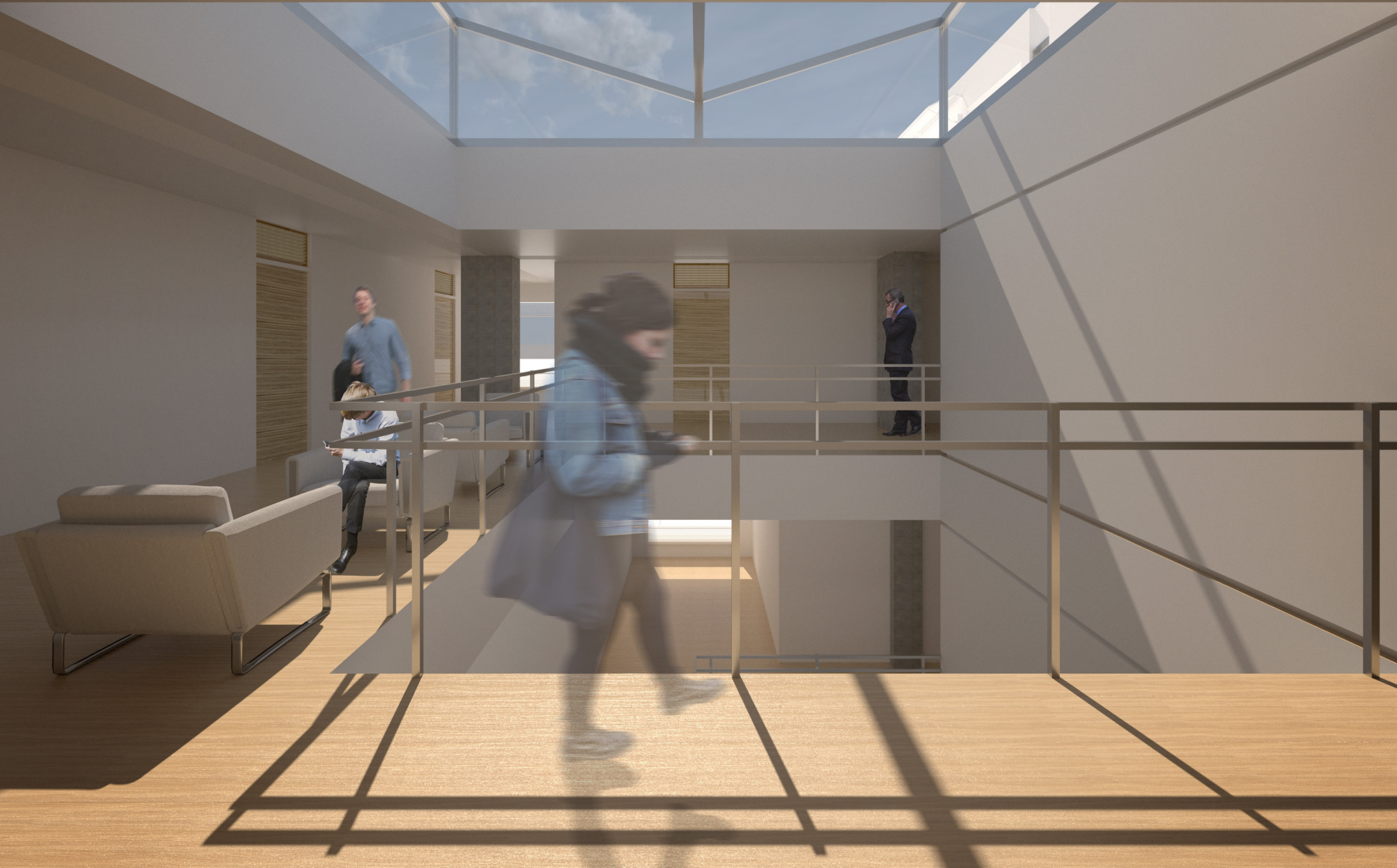
DESIGN

View from Flexible Floor Prototype during night



DESIGN

View from public area besides the patio



DESIGN

View from skylight



MODEL



MODEL



MODEL



MODEL

THE END
THANK YOU

