

SOUNDSCAPING THE FUTURE LIBRARY

Explorations of the auditory library experience

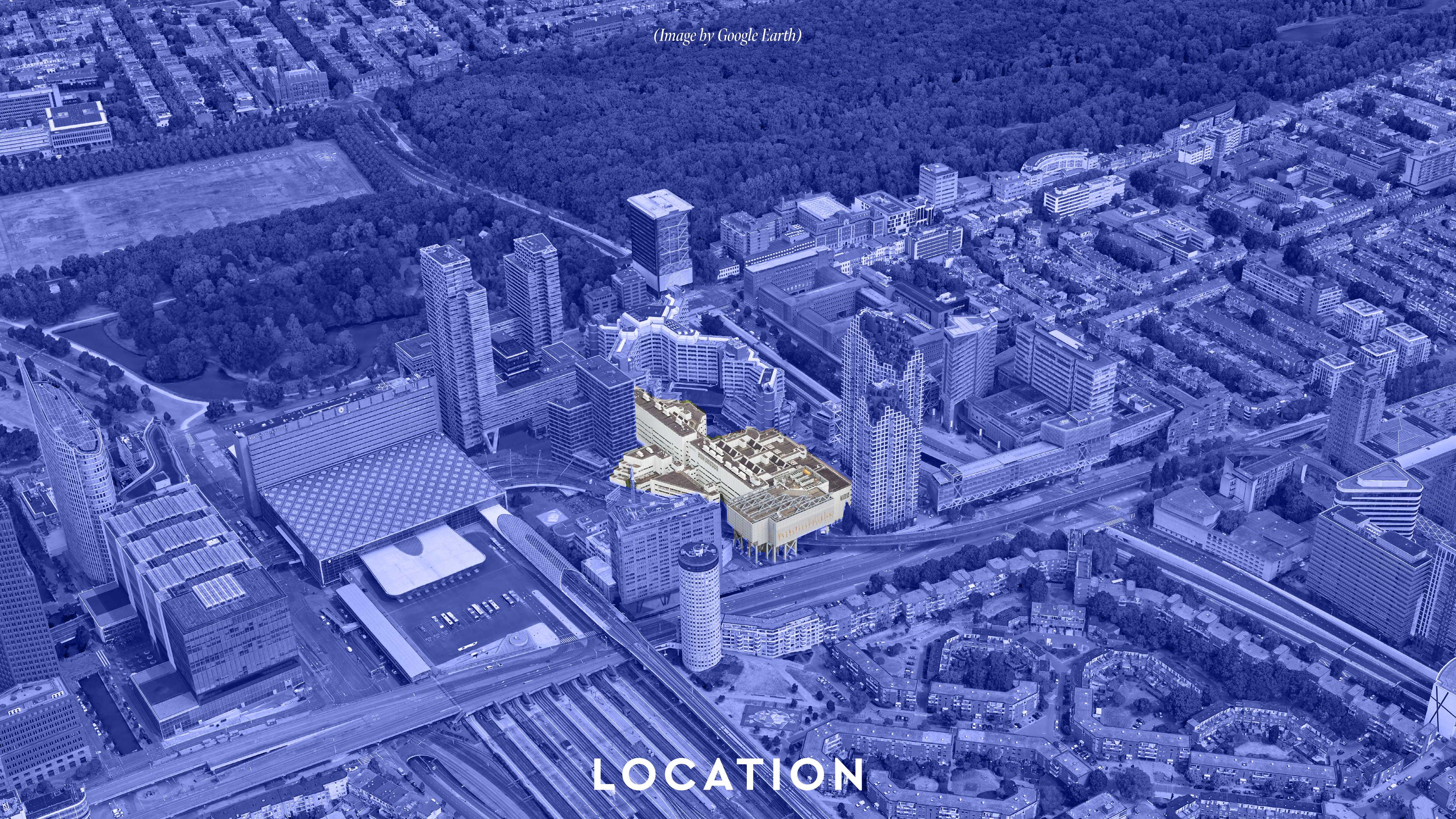


*“Heritage & Architecture is concerned with
preservation and renewal in existing architecture”*

(TU Delft, 2025)

HERITAGE & ARCHITECTURE STUDIO

(Image by Google Earth)



LOCATION



THE KB NATIONAL LIBRARY OF THE NETHERLANDS

What is a library without books?

The KB aims to position itself as

A PUBLIC SPACE

(Van Der Elst, 2026)



*“Accessibility is intrinsic to a library,
yet in our current building, entry is in fact far from straightforward.”*

- VAN WEZENBEEK

The KB aims to position itself as

A PUBLIC SPACE

... and an institution where people



LEARN
TO INTERPRET
INFORMATION

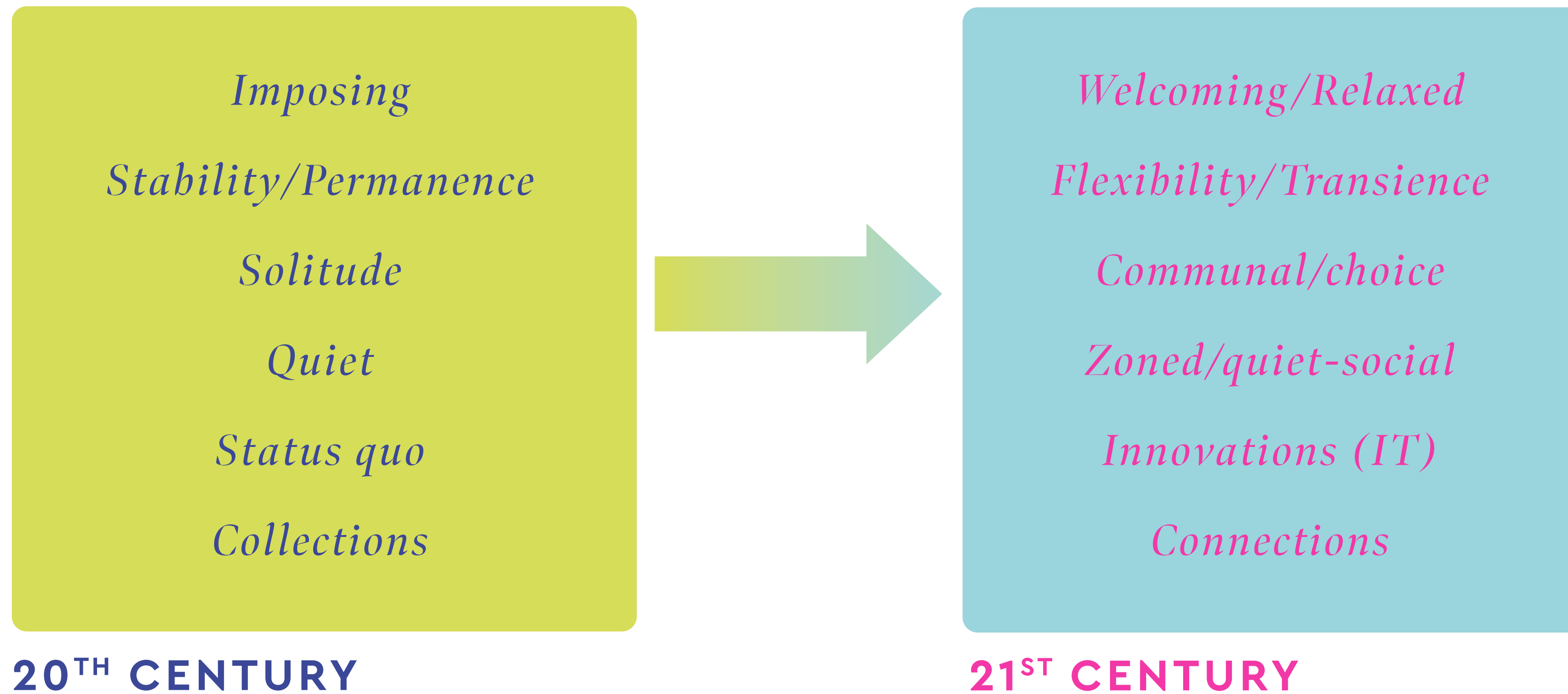


MEET
ONE
ANOTHER

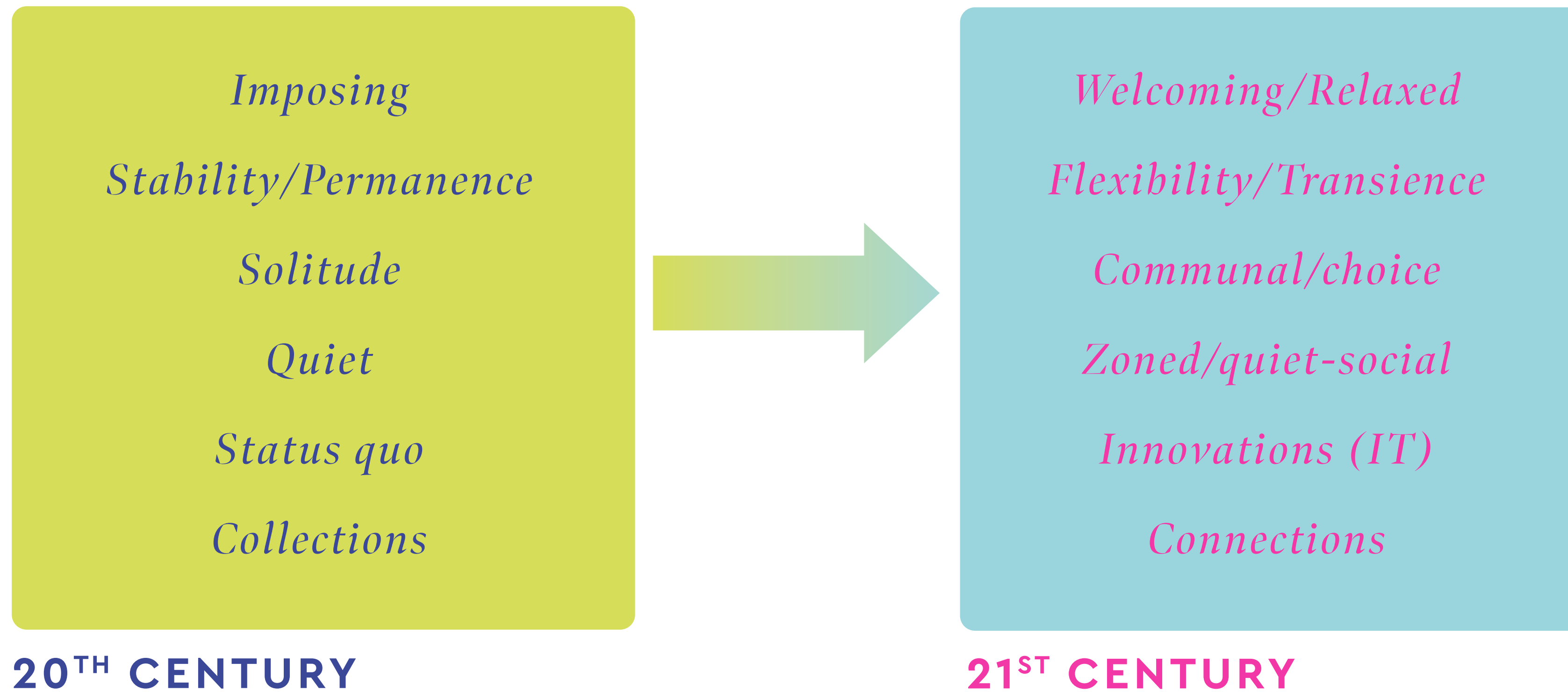


ENGAGE IN
DEBATE

Library buildings: a changing typology



atmosphere!
Library buildings: a changing ~~typology~~



atmosphere

noun [c]

the character, feeling, or mood of a place



seeing
visual



hearing
auditory



feeling
tactile

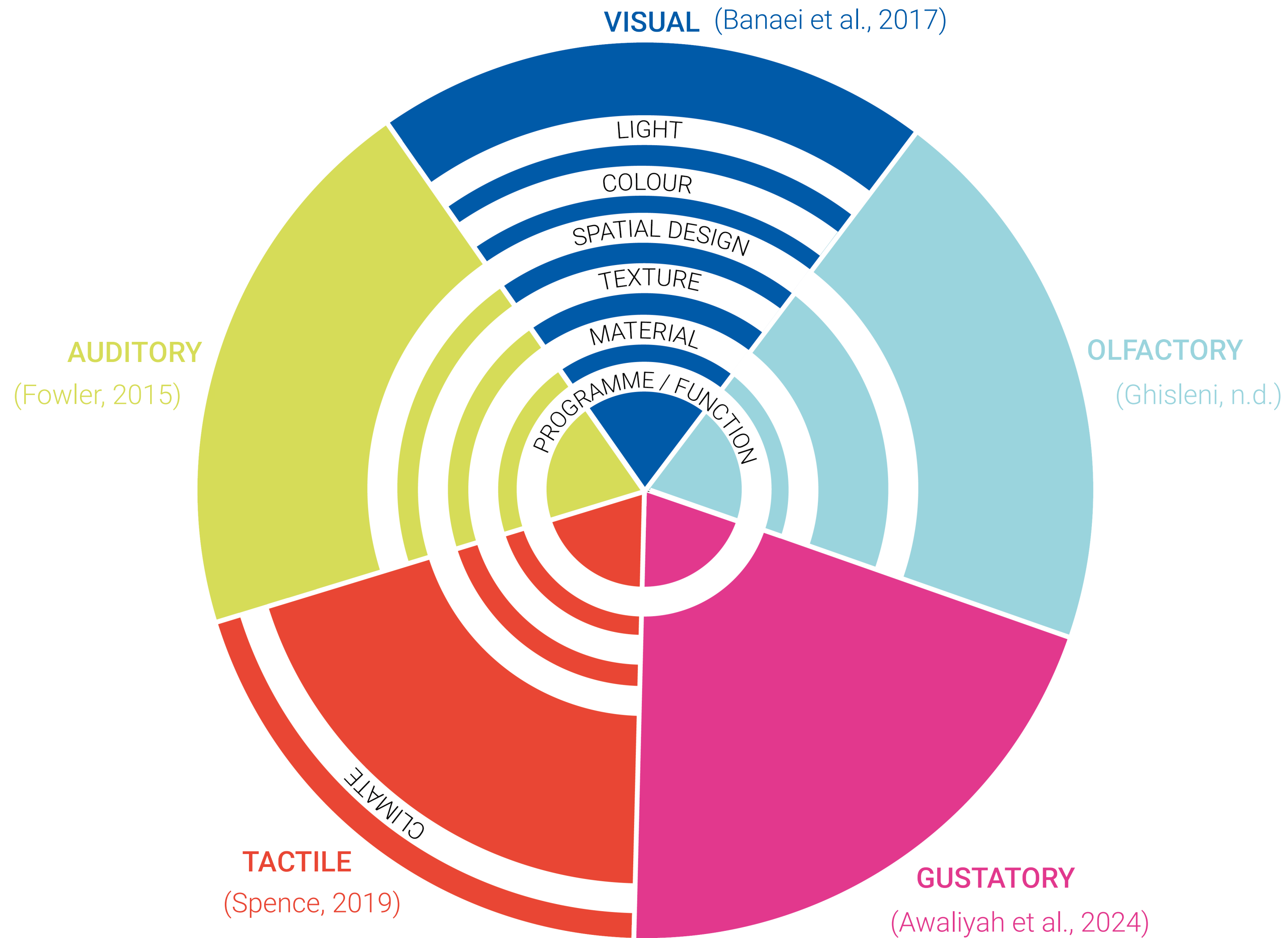


smelling
olfactory

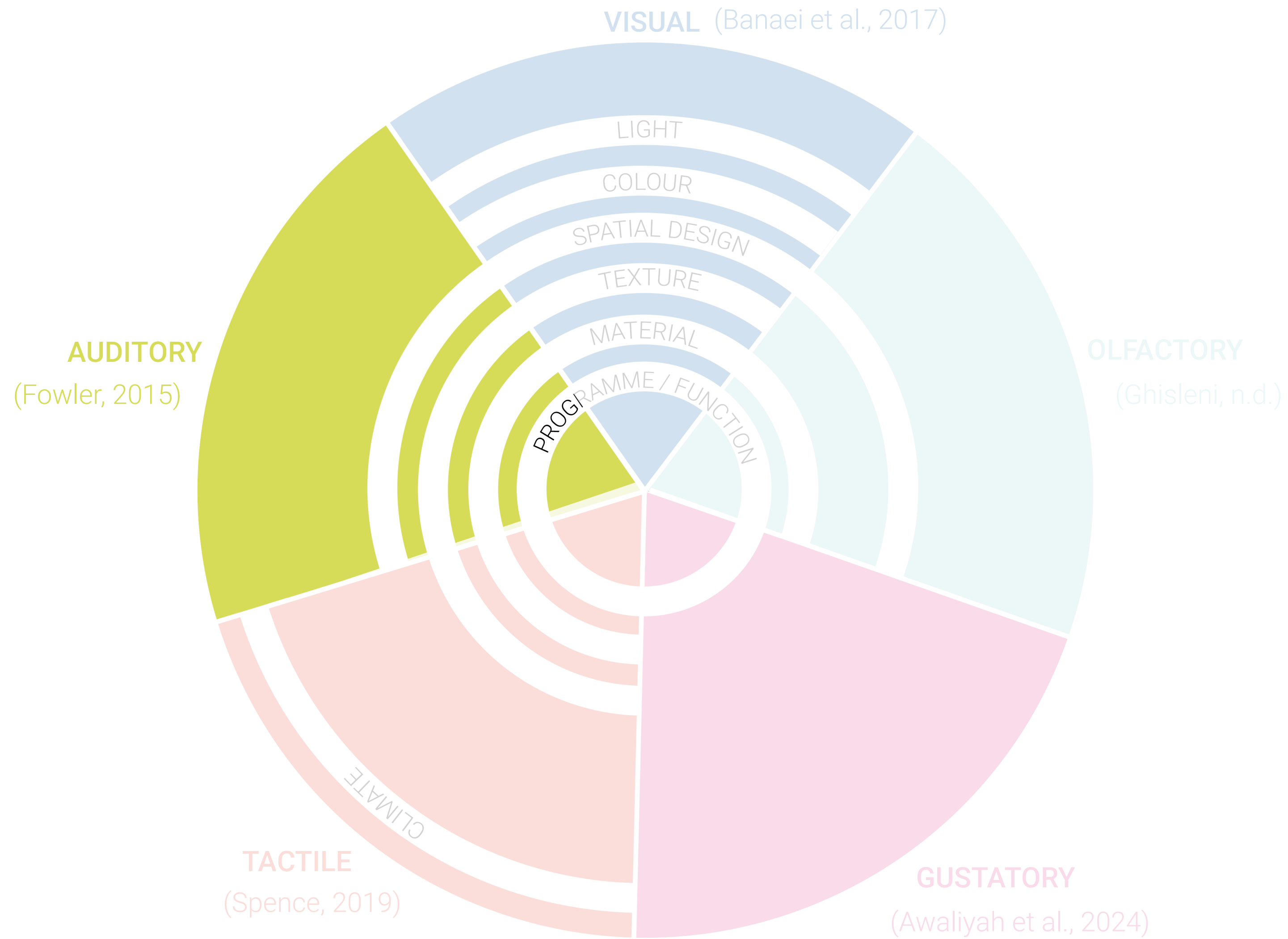


tasting
gustatory

experience of amosphere through the 5 senses (Karabašević, 2016)



experience of atmosphere in architecture through the 5 senses (own image)



experience of amosphere in architecture through the 5 senses (own image)

soundscape

noun [c]

the mixture of different sounds that are heard in a particular place

How can different soundscapes exist in the one library?

*“How can the **auditory experience** of library users be enhanced through design for **different zones** in a library’s soundscape?”*

RESEARCH QUESTION



LITERATURE REVIEW



EXPERT INTERVIEWS



CASE STUDIES / FIELDWORK

METHODS

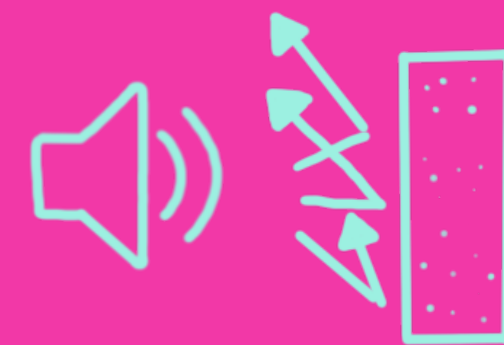
“The universal concert is always
in progress, and seats in the
auditorium are free.”

– R. MURRAY SCHAFER

PASSIVE



absorb
*with acoustic
materials,
greenery*



reflect
*with smooth
surfaces, spatial
design*

ACTIVE



conceal
*with other (nature)
sounds*



UNWANTED SOUNDS

high noise levels(Garner et al., 2021; Cohen, 2025; Y. Li et al, 2024)

sounds created by **other users** (Garner et al., 2021; Cohen, 2025; Y. Li et al, 2024)

environments where noise canceling headphones are **not able to cancel out** the sounds (Cox, 2019)

talking is mentioned most often (Cox, 2019)

AMBIENT SOUNDS

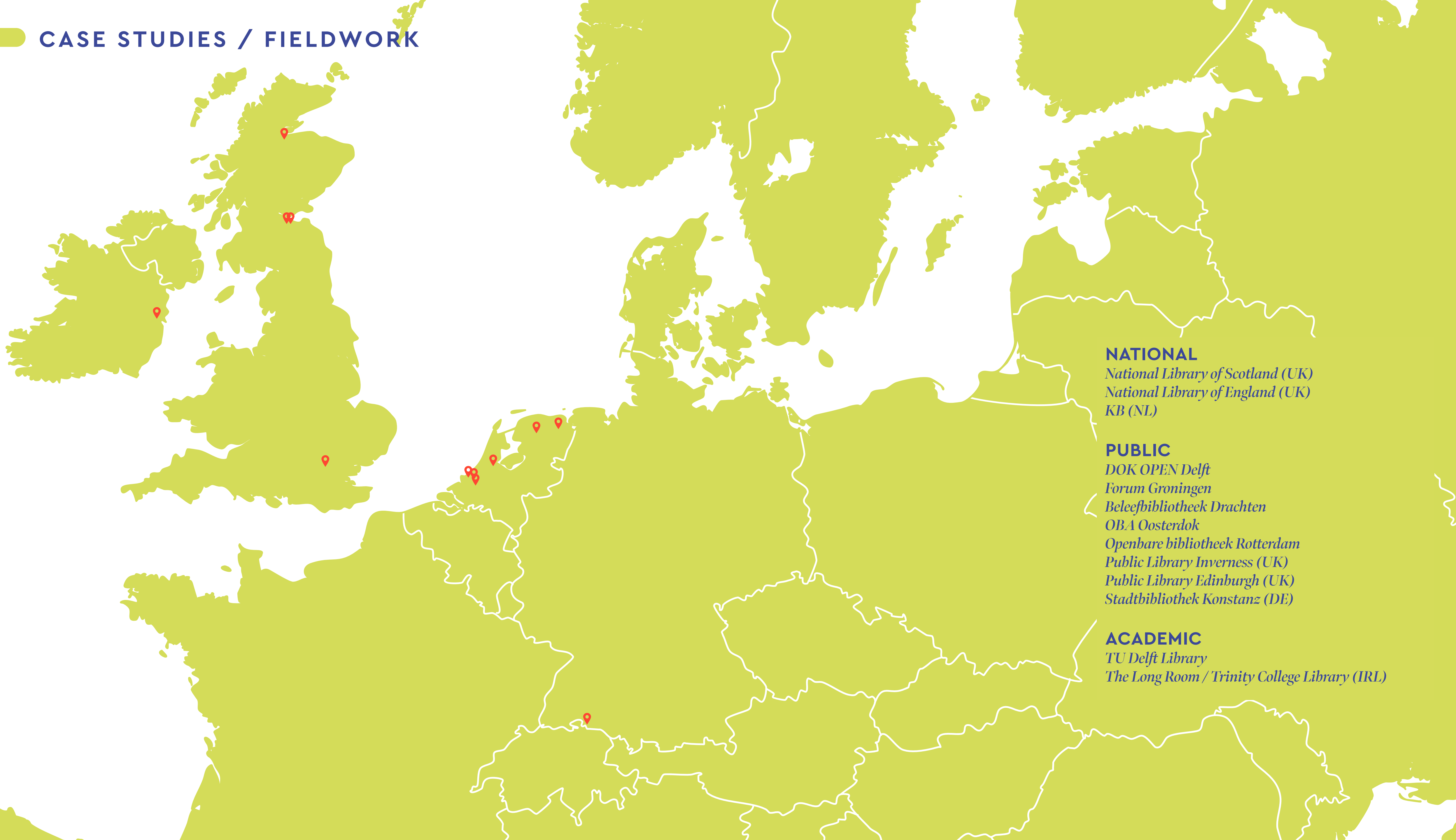
sound of rain on windows (Peterson, 2023)

Gentle sounds of others (Garner et al., 2021; Peterson, 2023)

Idea of '**alone togetherness**' (Garner et al., 2021)

Louder sounds during break, to wake users up and change their mood (Cohen, 2019)





NATIONAL

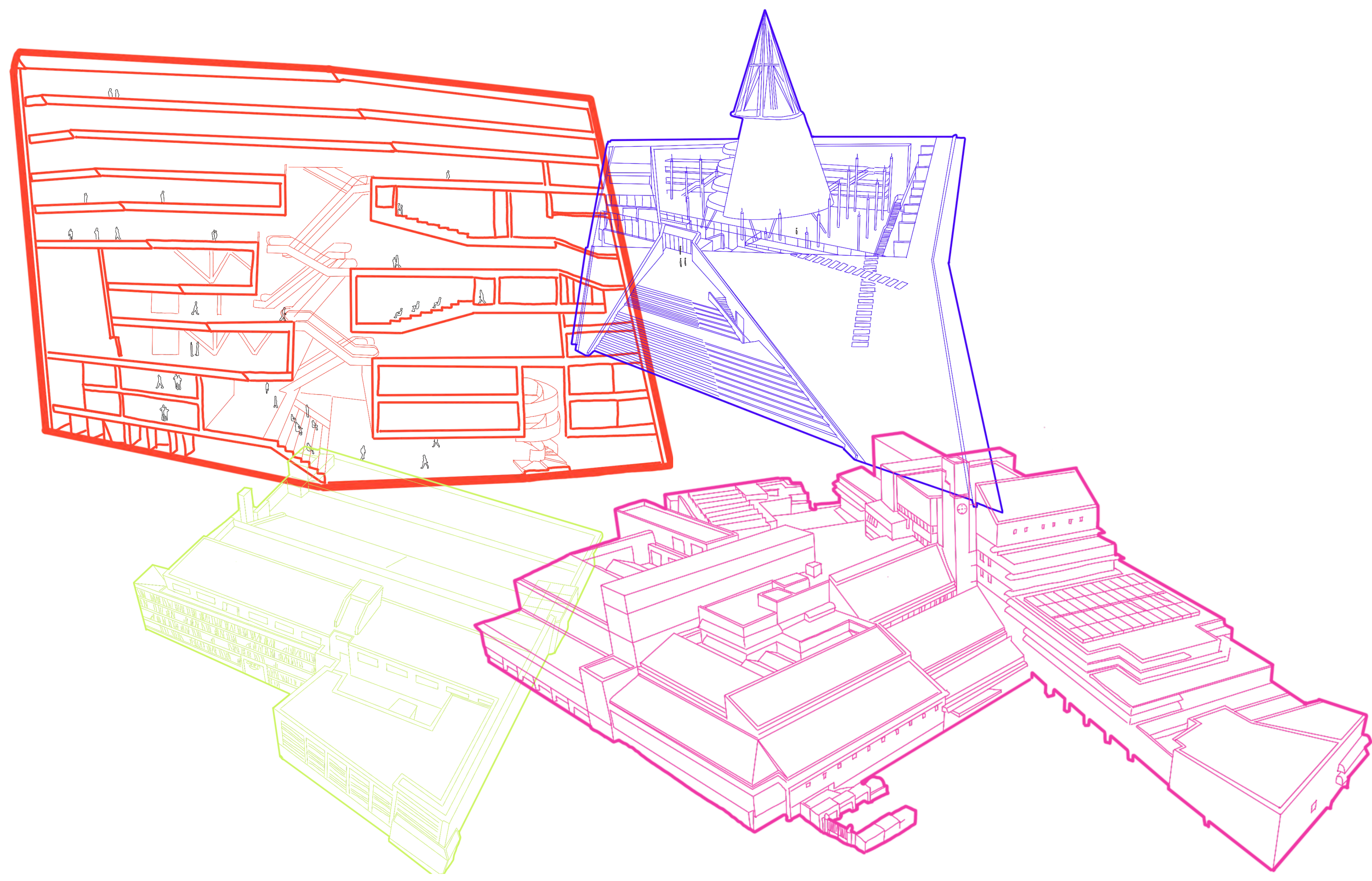
*National Library of Scotland (UK)
National Library of England (UK)
KB (NL)*

PUBLIC

*DOK OPEN Delft
Forum Groningen
Beleefbibliotheek Drachten
OBA Oosterdok
Openbare bibliotheek Rotterdam
Public Library Inverness (UK)
Public Library Edinburgh (UK)
Stadtbibliothek Konstanz (DE)*

ACADEMIC

*TU Delft Library
The Long Room / Trinity College Library (IRL)*





PATRICK CANNON
PARTNER DOK ARCHITECTEN

dok OPEN library Delft



AAT VOS
FOUNDER INCLUDI

*dok OPEN library Delft
Schleswig-holsteinische Landesbibliothek
stadshuis Nieuwegein
and many more...*



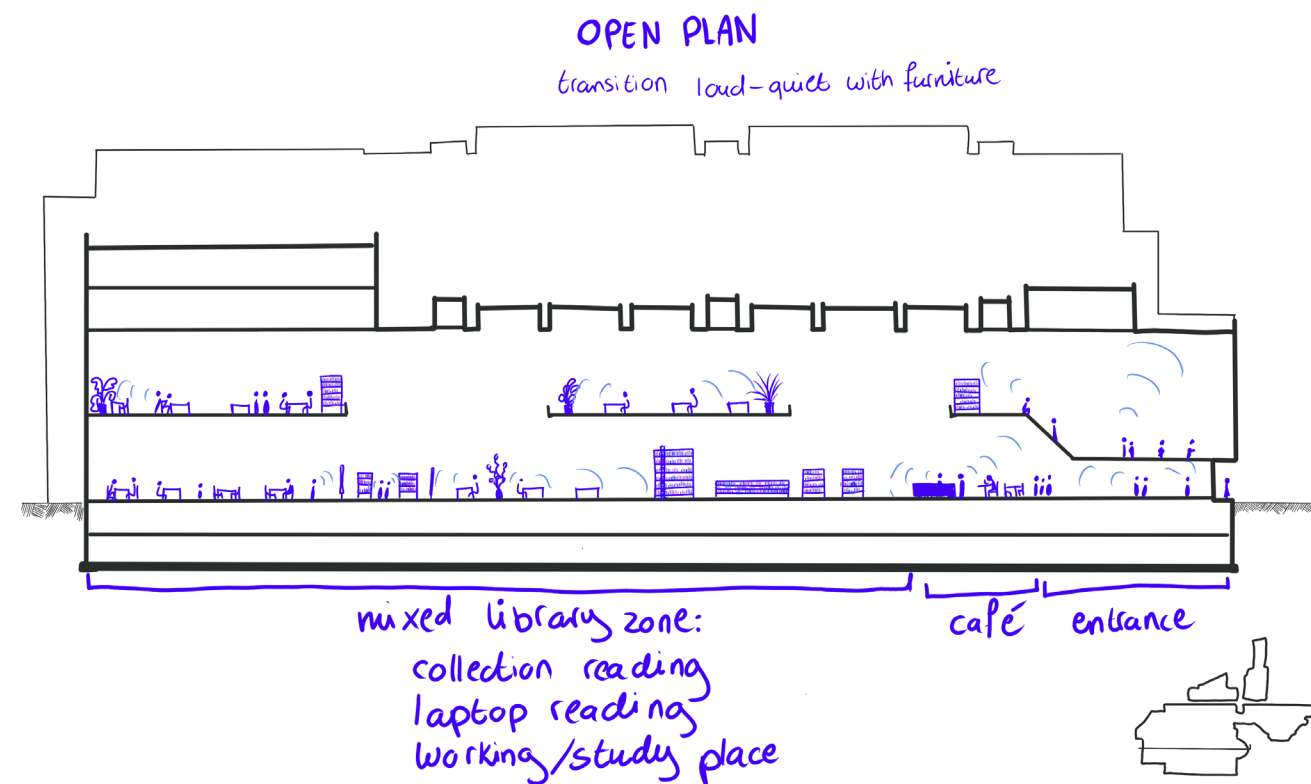
PATRICK CANNON



AAT VOS

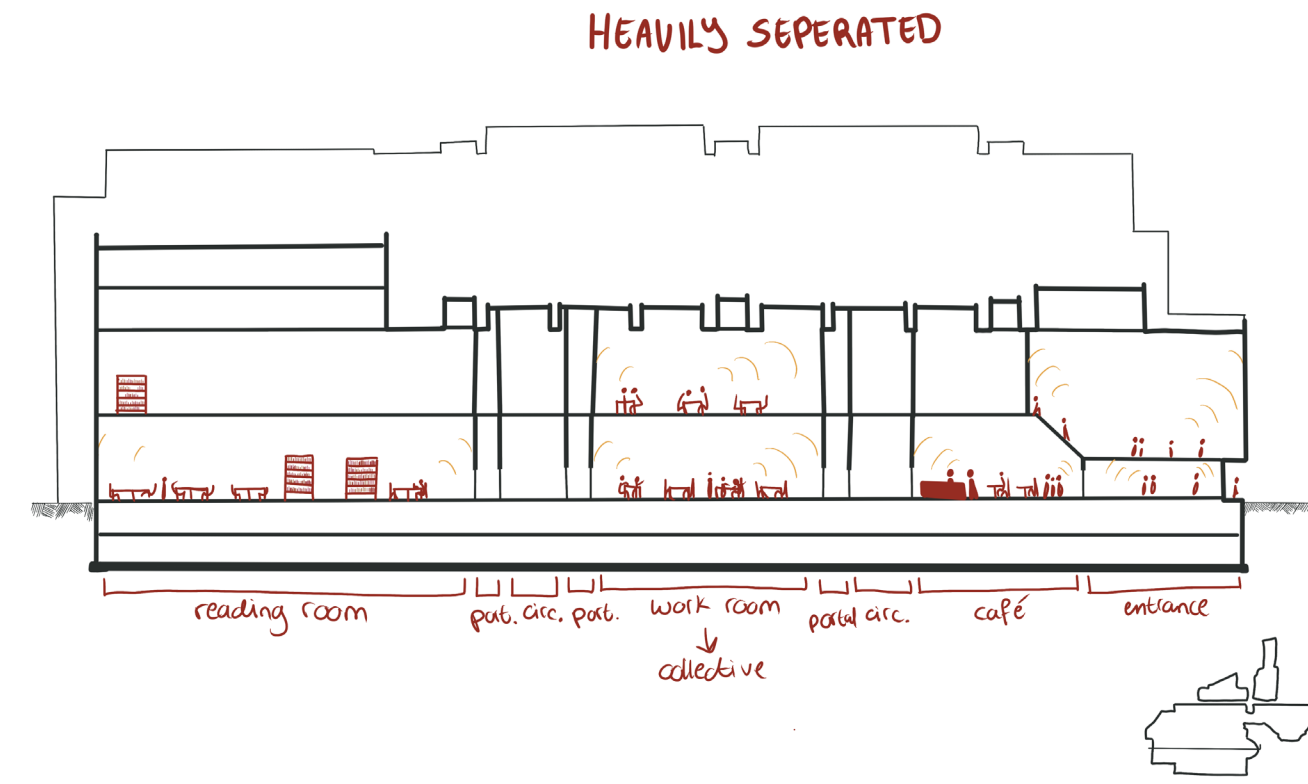
*“Decor [the walls / floors / ceilings of a space] is crucial for good soundscape design. However, to design qualitative soundscapes, designers need to think about sound **through all design scales.**”*

EXPERT INTERVIEWS
CASE STUDIES / FIELDWORK
LITERATURE REVIEW



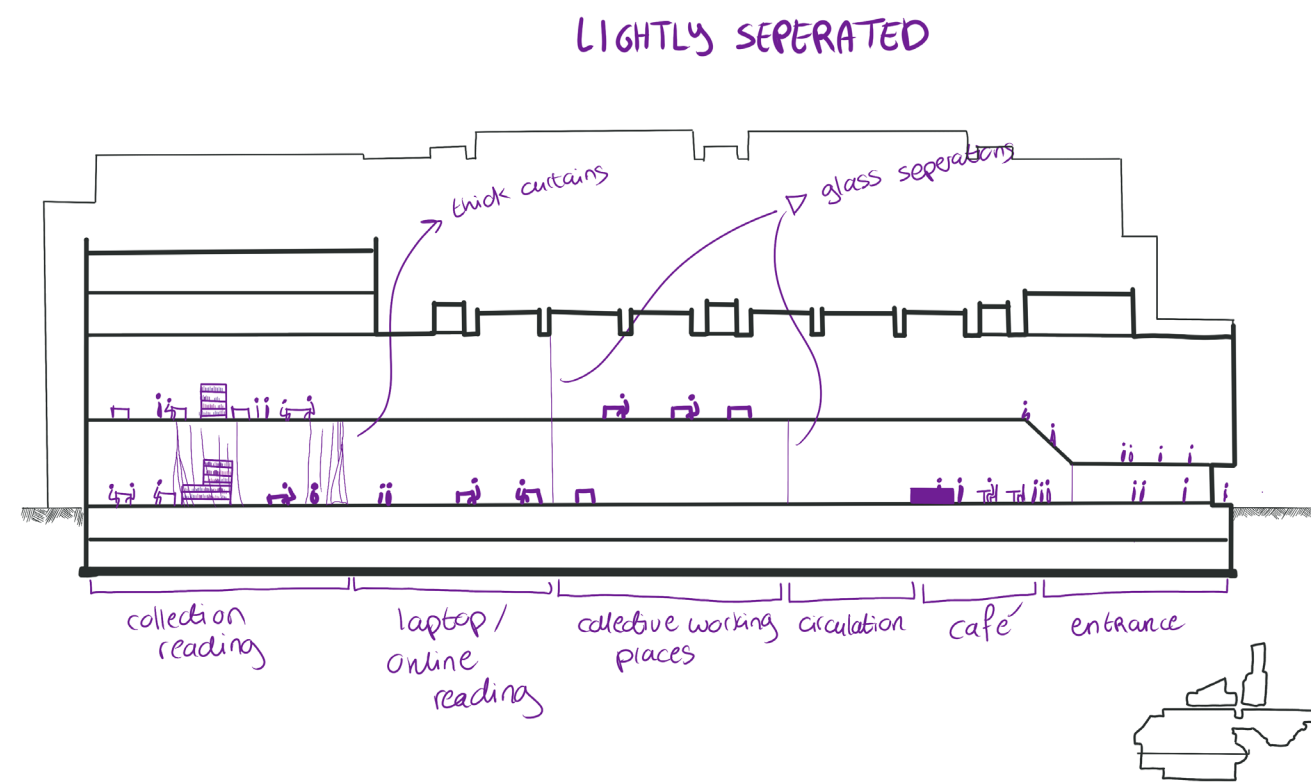
reference for spatial design: DOK
Beleefbibliothek

- + open character / welcoming
- + allows daylight to come in
- + big, high open spaces feel nice to be in (more air, luxurious)
- + spaces are flexible, defined by bookcases, planters or (moveable) acoustic panels
- noise will not be blocked well enough
- lots of concrete will have to be demolished
- books not safe
- still lots of acoustic materials needed



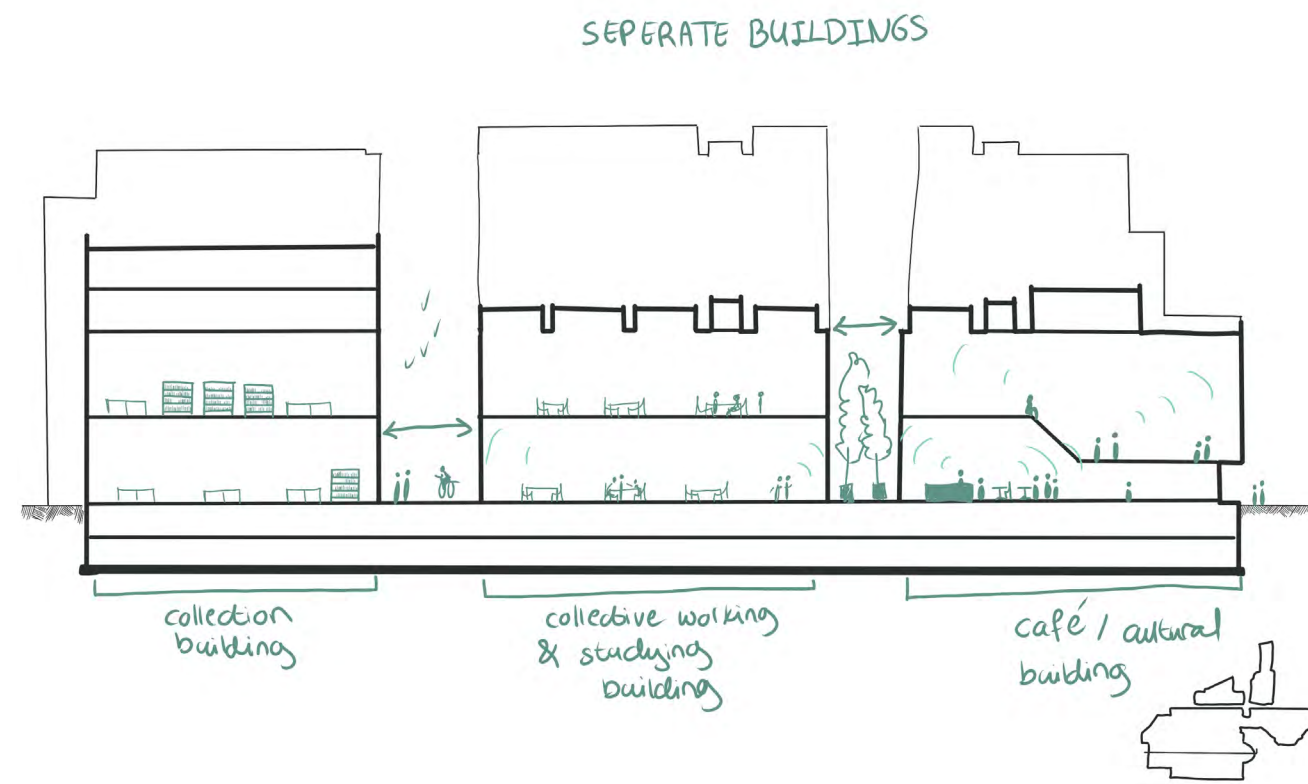
reference for spatial design: BNL
SNL

- + books are kept very safe (both from thieves and daylight)
- + sounds are kept within spaces (very quiet)
- + less floors demolished
- + not much acoustic materials needed
- no connection to rest of building / floors
- dark rooms - little daylight
- very fixed layout
- difficult wayfinding



reference for spatial design: TU Delft
Lochtal

- + open character (glass separations)
- + books can be kept safe (more)
- + glass walls muffle noise
- + less floors demolished
- no connection to other floors
- less daylight in middle parts (even though glass still lets through some)



reference for spatial design: UVA
Pauze Biblio. Esp.

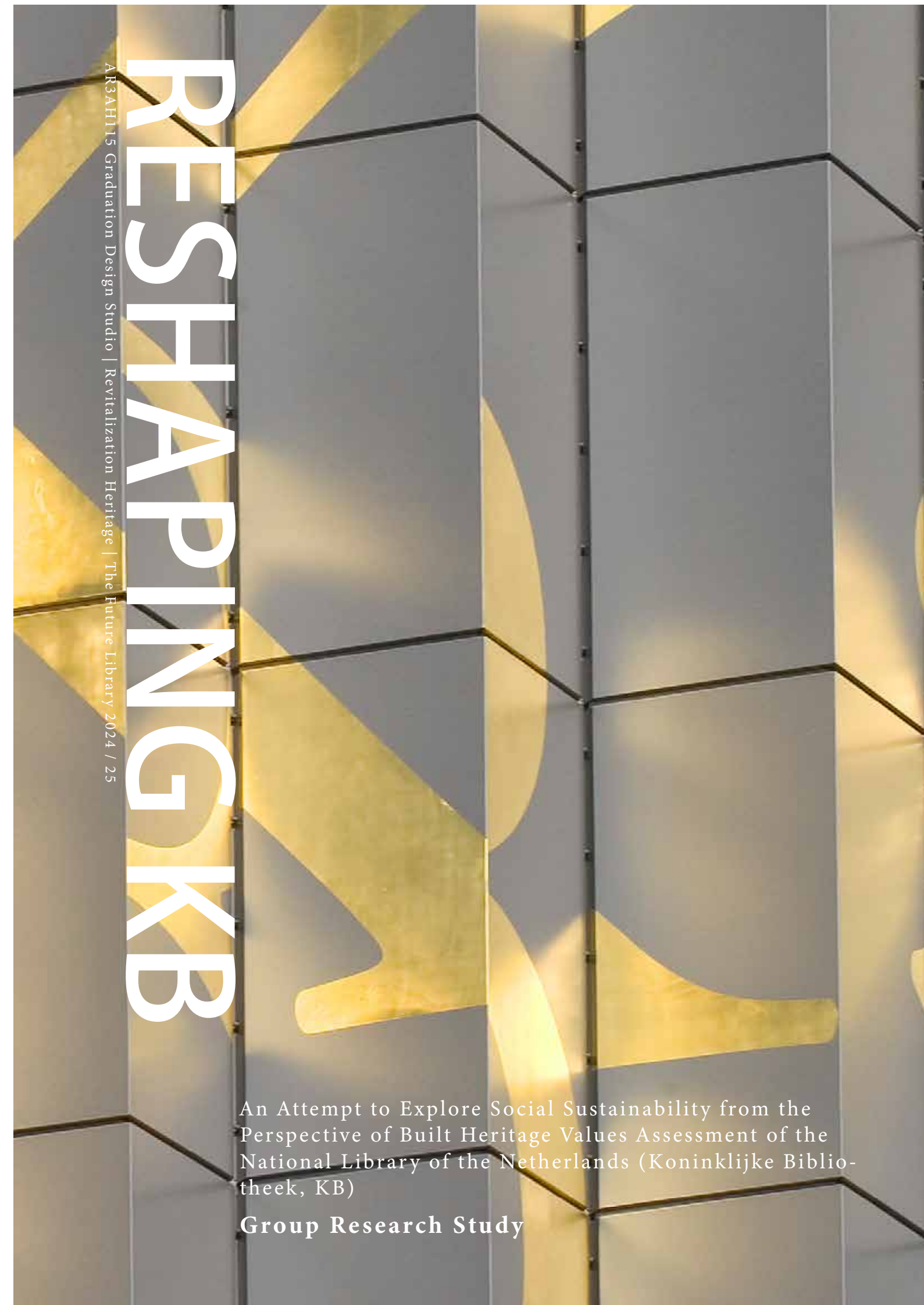
- + lots of daylight in the buildings
- + sounds are kept within spaces/functions don't disturb each other
- + clearly divided functions, helps with way finding
- + not much acoustic materials needed
- lots of demolition needed
- very fixed spaces/buildings
- have to go outside from one building to another
- more facade needed
- more heat loss due to more facade

TRANSITION TOOLBOX

HERITAGE

Values of the KB building

*group report on
heritage values of
the KB building
(Groupwork)*

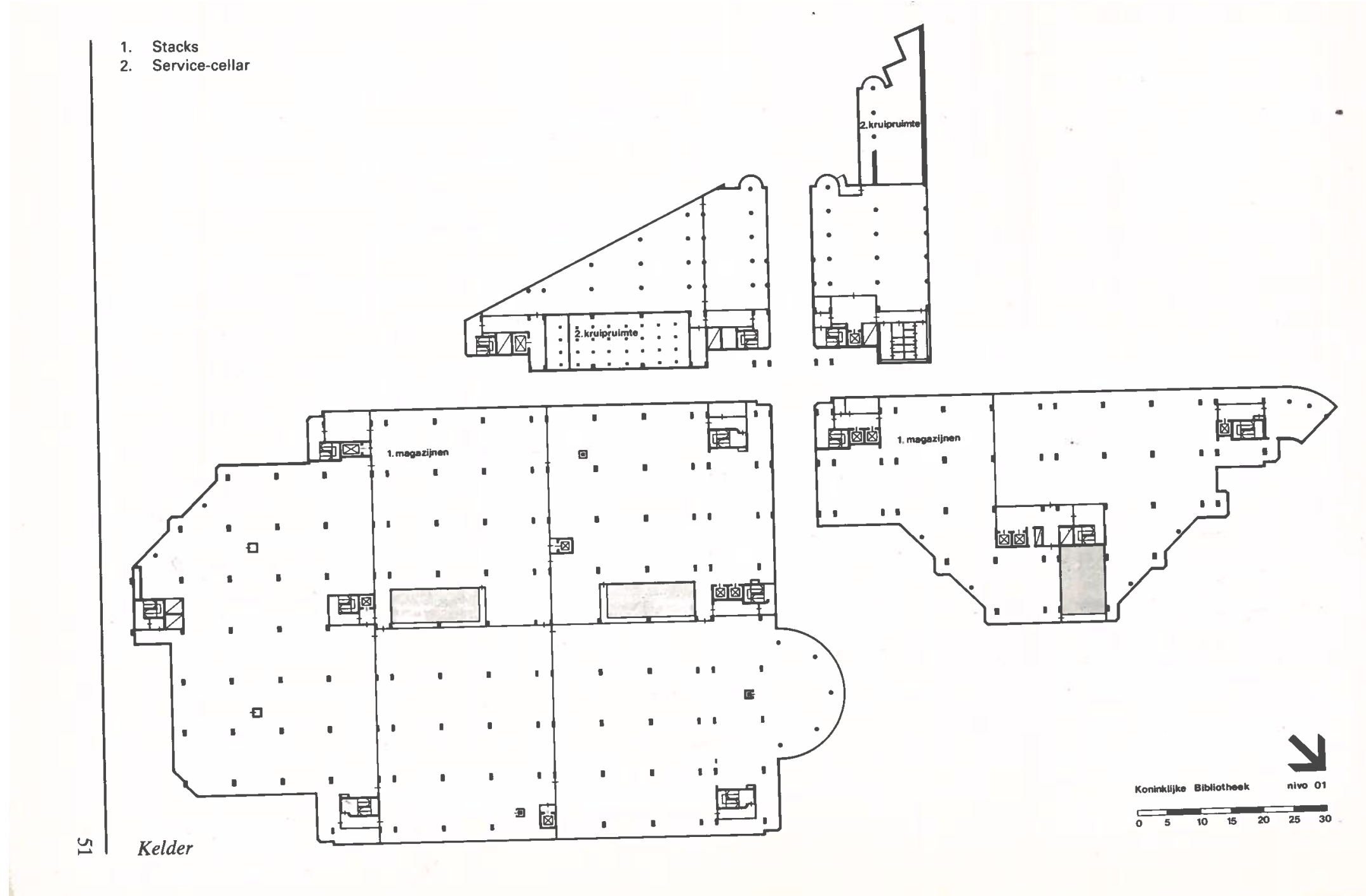


*types of value
(pereira roders,
2007; speckens,
2010; tarrafa and
pereira roders,
2011)*

HERITAGE VALUES KB

SCIENTIFIC
WORKMANSHIP
TECHNOLOGICAL
CONCEPTUAL
[RIBA,1904]

ECONOMIC
USE
NON-USE
ENTERTAINMENT
ALLEGORICAL
[COE,1966]



*strong and open structure
(Image: OD 205)*



*'rain coat' facade
(Own image)*

HISTORIC
EDUCATIONAL
HISTORIC-ARTISTIC
HISTORIC-CONCEPTUAL
SYMBOLIC
ARCHAEOLOGICAL
[SPAB,1877]

AGE
WORKMANSHIP
EXISTENTIAL
MATURITY
[SPAB,1877]

ECOLOGICAL
SPIRITUAL
ESSENTIAL
EXISTENTIAL
[COE,1975]

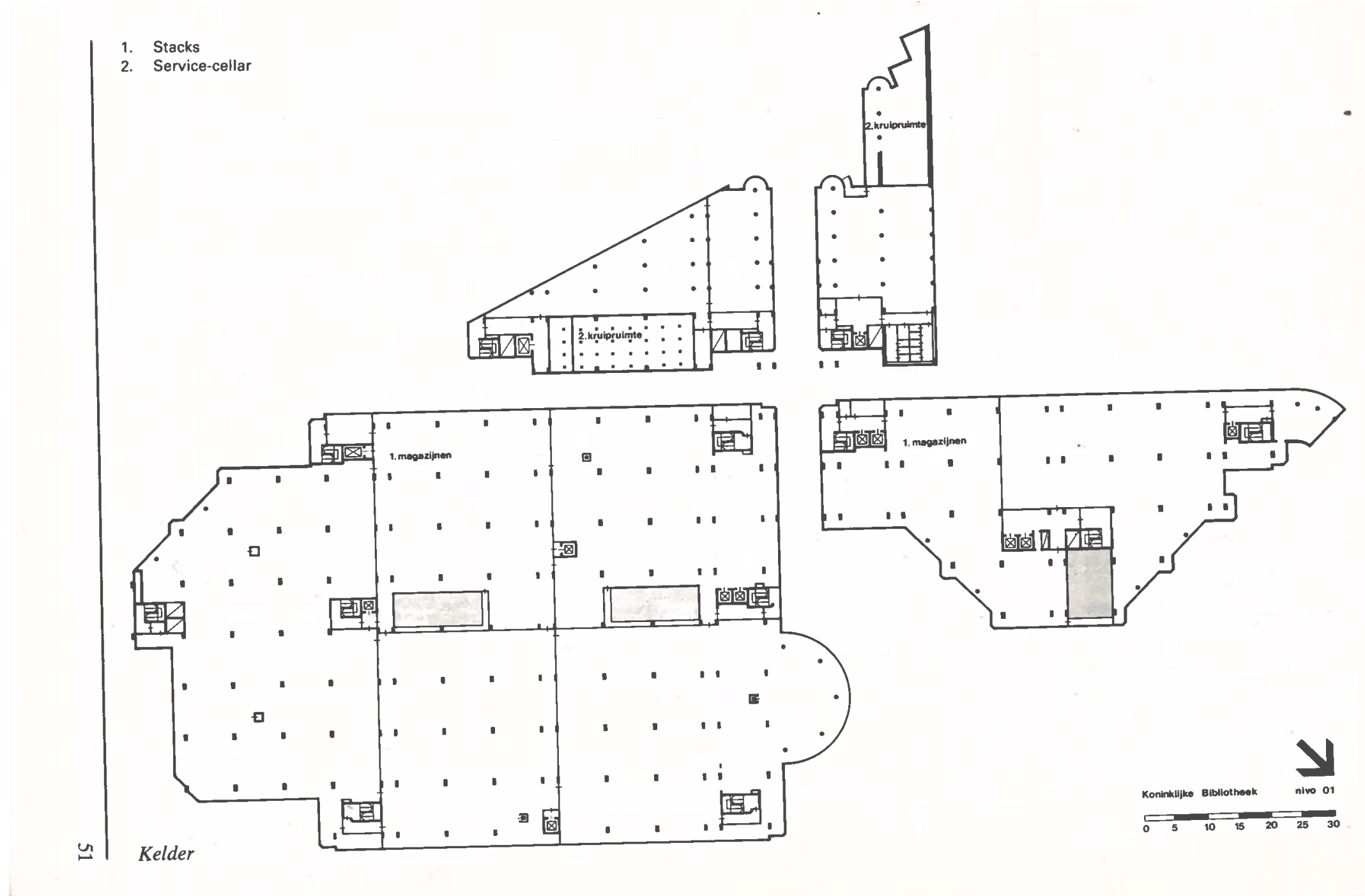
SCIENTIFIC
WORKMANSHIP
TECHNOLOGICAL
CONCEPTUAL
[RIBA,1904]

AESTHETICAL
ARTISTIC
NOTABLE
CONCEPTUAL
EVIDENTIAL
[SPAB,1877]

HERITAGE VALUES KB

SCIENTIFIC
WORKMANSHIP
TECHNOLOGICAL
CONCEPTUAL
[RIBA,1904]

ECONOMIC
USE
NON-USE
ENTERTAINMENT
ALLEGORICAL
[COE,1966]



HISTORIC
EDUCATIONAL
HISTORIC-ARTISTIC
HISTORIC-CONCEPTUAL
SYMBOLIC
ARCHAEOLOGICAL
[SPAB,1877]

AGE
WORKMANSHIP
EXISTENTIAL
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TECHNOLOGICAL
CONCEPTUAL
[RIBA,1904]

AESTHETICAL
ARTISTIC
NOTABLE
CONCEPTUAL
EVIDENTIAL
[SPAB,1877]

strong and open structure
difficult to remove
(Image: OD 205)

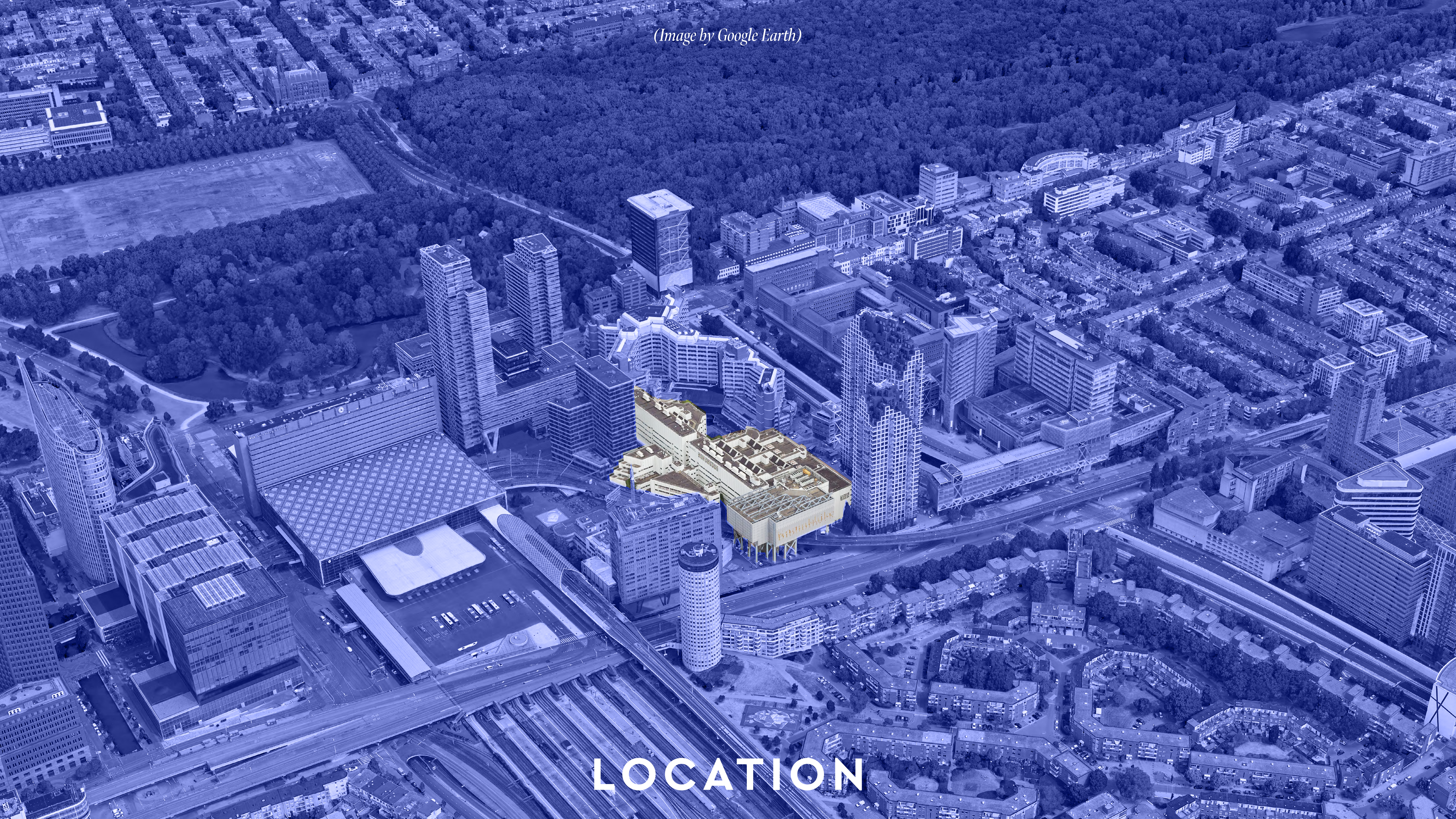
'rain coat' facade
designed for keeping books rather than people (dark interior)
(Own image)

HERITAGE CHALLENGES KB

ANALYSIS

site soundscape

(Image by Google Earth)



LOCATION

Tens of thousands of residents of The Hague live in the noise: 'Bad for health'

Lot van Bree 6 maart, 06:00 • Aangepast 6 maart, 11:30 • 3 minuten leestijd

The original article was created in Dutch (NL) by our editorial staff. This article is automatically translated by an algorithm and might contain errors due to this.



(Van Bree, 2025)

Gek van verschrikkelijk gepiep in nieuwe HTM-trams: 'Het geluid gaat door merg en been'

Sommige tramreizigers in Den Haag worden er helemaal gek van: het gepiep in de nieuwe trams van stadsvervoerder HTM. Het geluid zou zelfs zo erg zijn dat sommige passagiers eerder uitstappen. „Waarom rijden bestuurders niet meteen terug met zo'n tram?”

Ilah Rubio

6 mei 2022, 12:02

(Rubio, 2022)



Foto: The Roofs 2 staat zeer dicht op de Koninklijke Bibliotheek (DHC).

Nog meer lawaaioverlast bij woontorens Utrechtsebaan

De geluidsoverlast voor bewoners van de twee hoge woontorens The Roofs komt van alle kanten. “Je komt niet tot rust en bent uiteindelijk constant moe.”

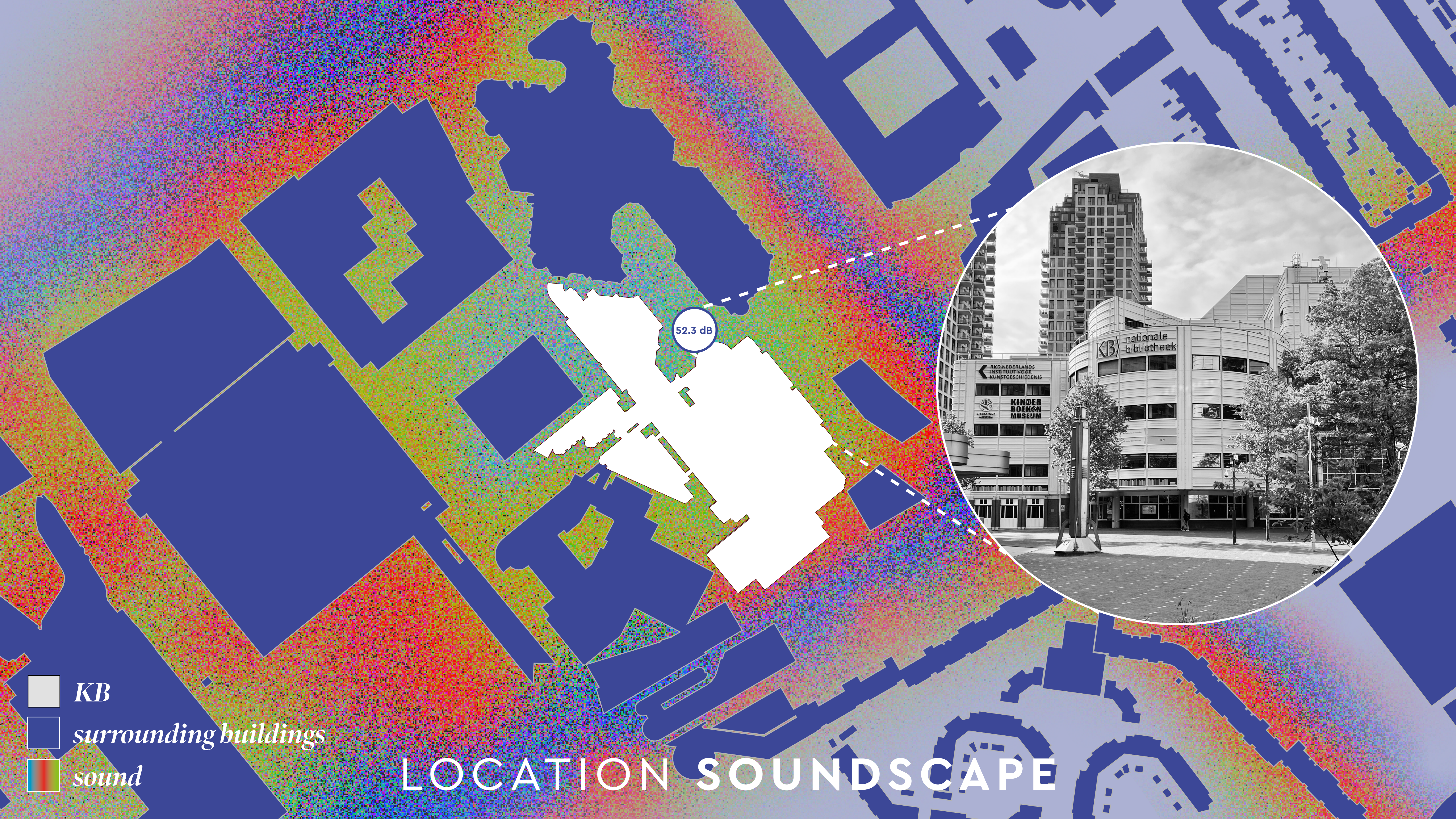
(Rosenberg, 2024)

AUDITORY CONTEXT KB



-  *KB*
-  *surrounding buildings*
-  *sound*

LOCATION SOUNDSCAPE



52.3 dB



-  *KB*
-  *surrounding buildings*
-  *sound*

LOCATION SOUNDSCAPE



-  *KB*
-  *surrounding buildings*
-  *sound*

LOCATION SOUNDSCAPE

68.0 dB





- KB
- surrounding buildings
- sound

66.6 dB

LOCATION SOUNDSCAPE



-  *KB*
-  *surrounding buildings*
-  *sound*

LOCATION SOUNDSCAPE

61.3 dB



SOURCE	ANNUAL AVERAGE EXPOSURE	JUSTIFICATION	NIGHTTIME EXPOSURE	JUSTIFICATION
ROAD TRAFFIC	53 dB L _{DEN}	10% SERIOUS NOISE POLLUTION AT 53,3 DB L _{DEN}	45 dB L _{NIGHT}	3% SERIOUS NOISE POLLUTION AT 45,4 dB L _{NIGHT}
RAIL TRAFFIC	54 dB L _{DEN}	10% SERIOUS NOISE POLLUTION AT 53,7 DB L _{DEN}	44 dB L _{NIGHT}	3% SERIOUS NOISE POLLUTION AT 43,7 dB L _{NIGHT}
AIR TRAFFIC	45 dB L _{DEN}	10% SERIOUS NOISE POLLUTION AT 45,4 DB L _{DEN}	40 dB L _{NIGHT}	11% SERIOUS NOISE POLLUTION AT 40 dB L _{NIGHT}

ENVIRONMENTAL NOISE GUIDELINES

(Gezondheidsraad, 1999).

Temporary exposure to noise can lead to...



ANNOYANCE



**SLEEP
DISTURBANCE**



**DISRUPTION
TO DAILY
ACTIVITIES**

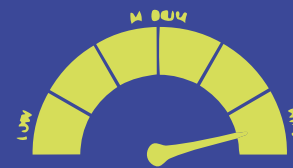


**STRESS
RESPONSES**

Chronic exposure to to...



**HIGH BLOOD
PRESSURE**



**ELEVATED
LEVELS
OF CORTISOL**

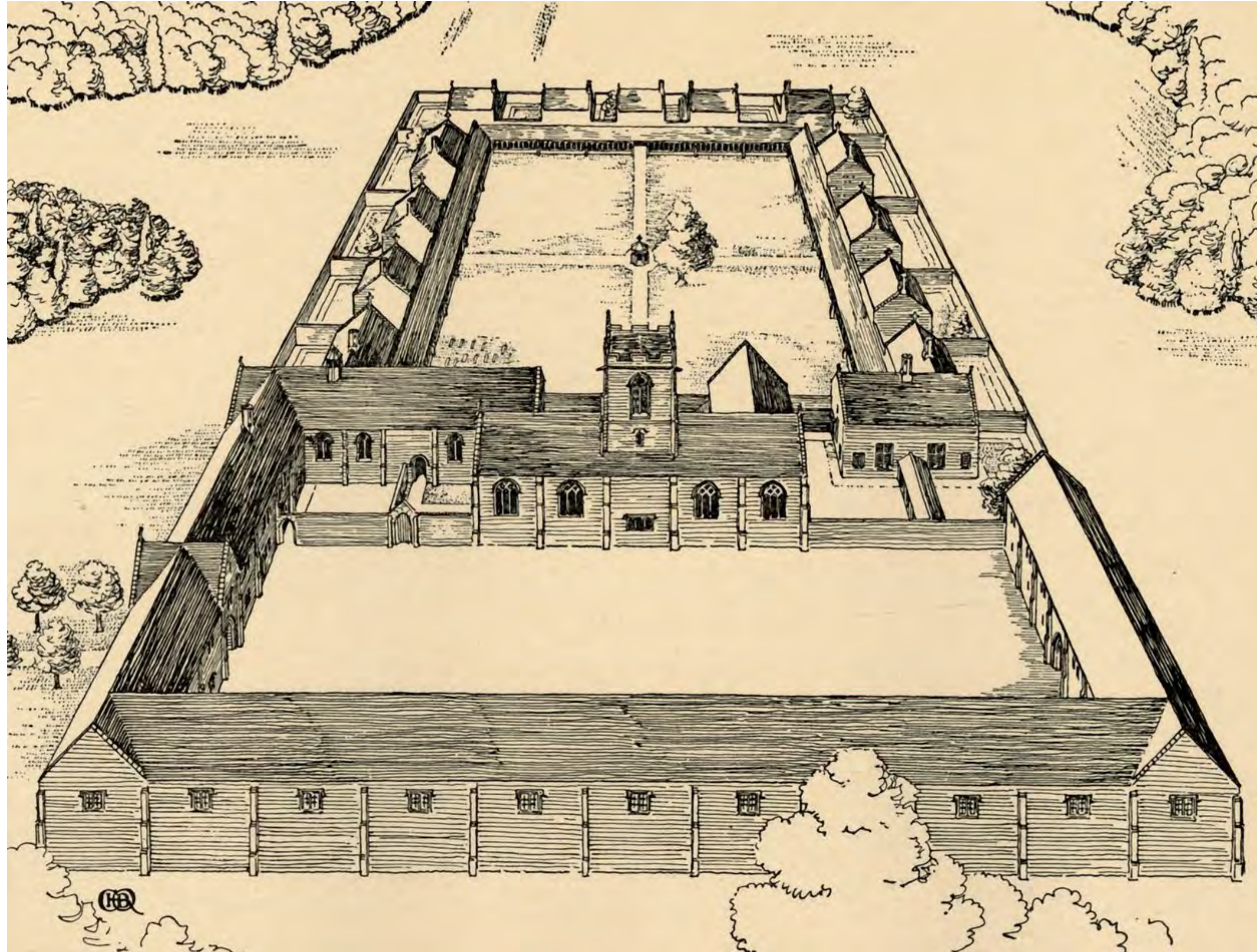


**RISK OF
CARDIOVASCULAR DISEASES**

NOISE HEALTH EFFECTS

How can a building bring silence in a loud environment?

REFERENCE SILENT WAY OF LIVING



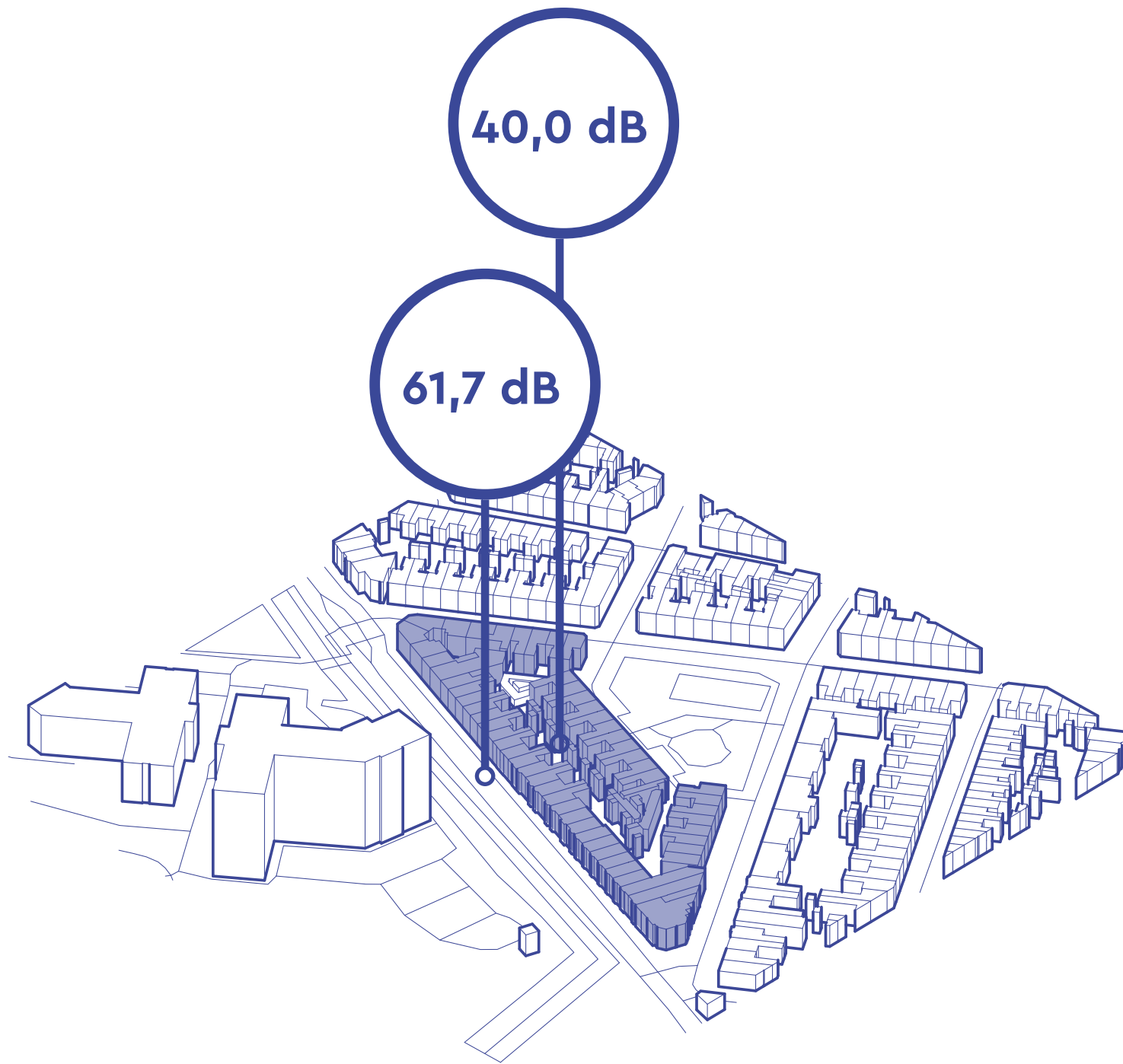
Carthusian Monastery, drawn in 1931 by Charles Henry Bourne Quennell

REFERENCE SERPENTINE GALLERY PAVILION 2011 / PETER ZUMTHOR



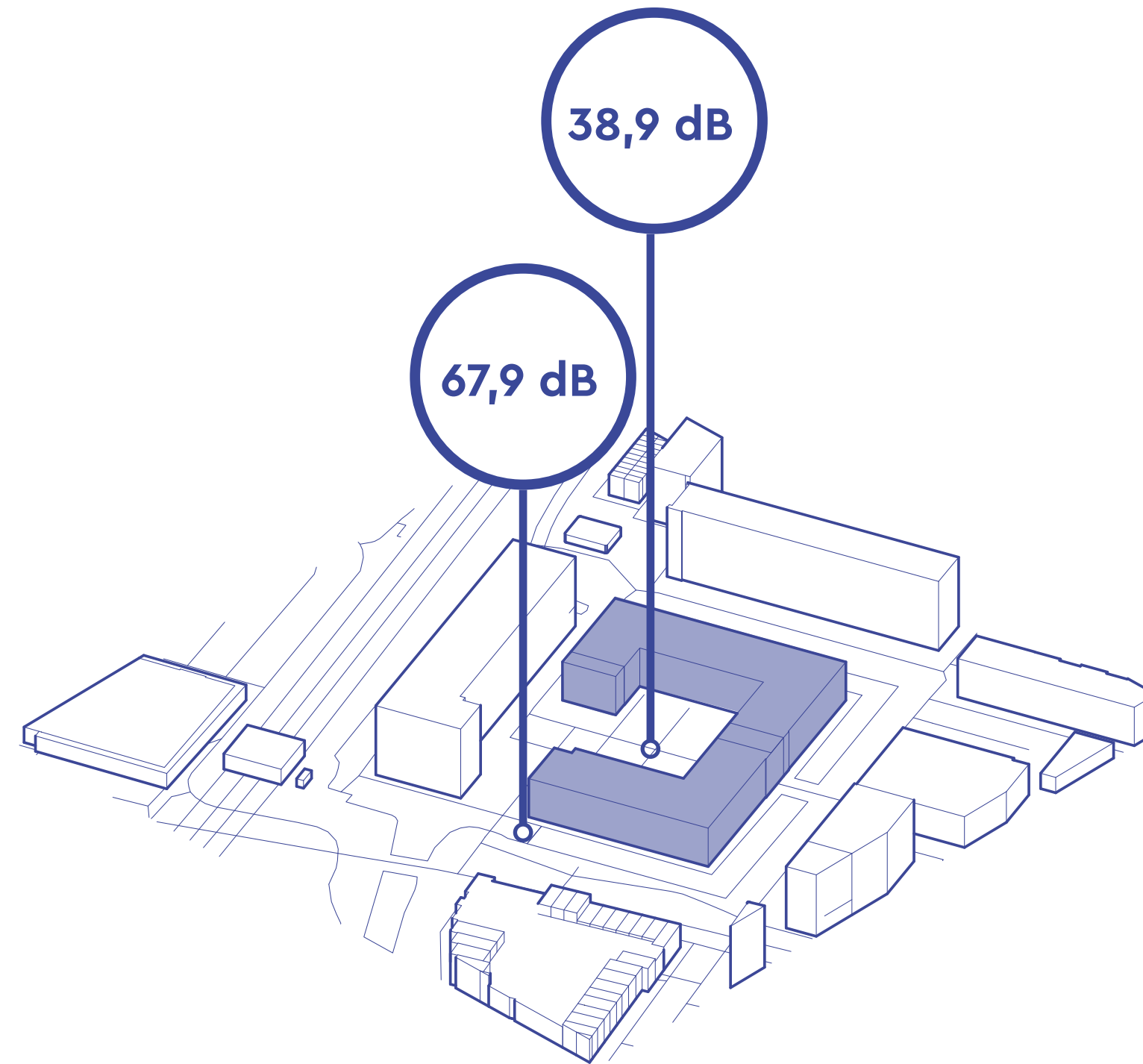
Serpentine Pavilion by Peter Zumthor, 2011

COURTYARDS IN DELFT



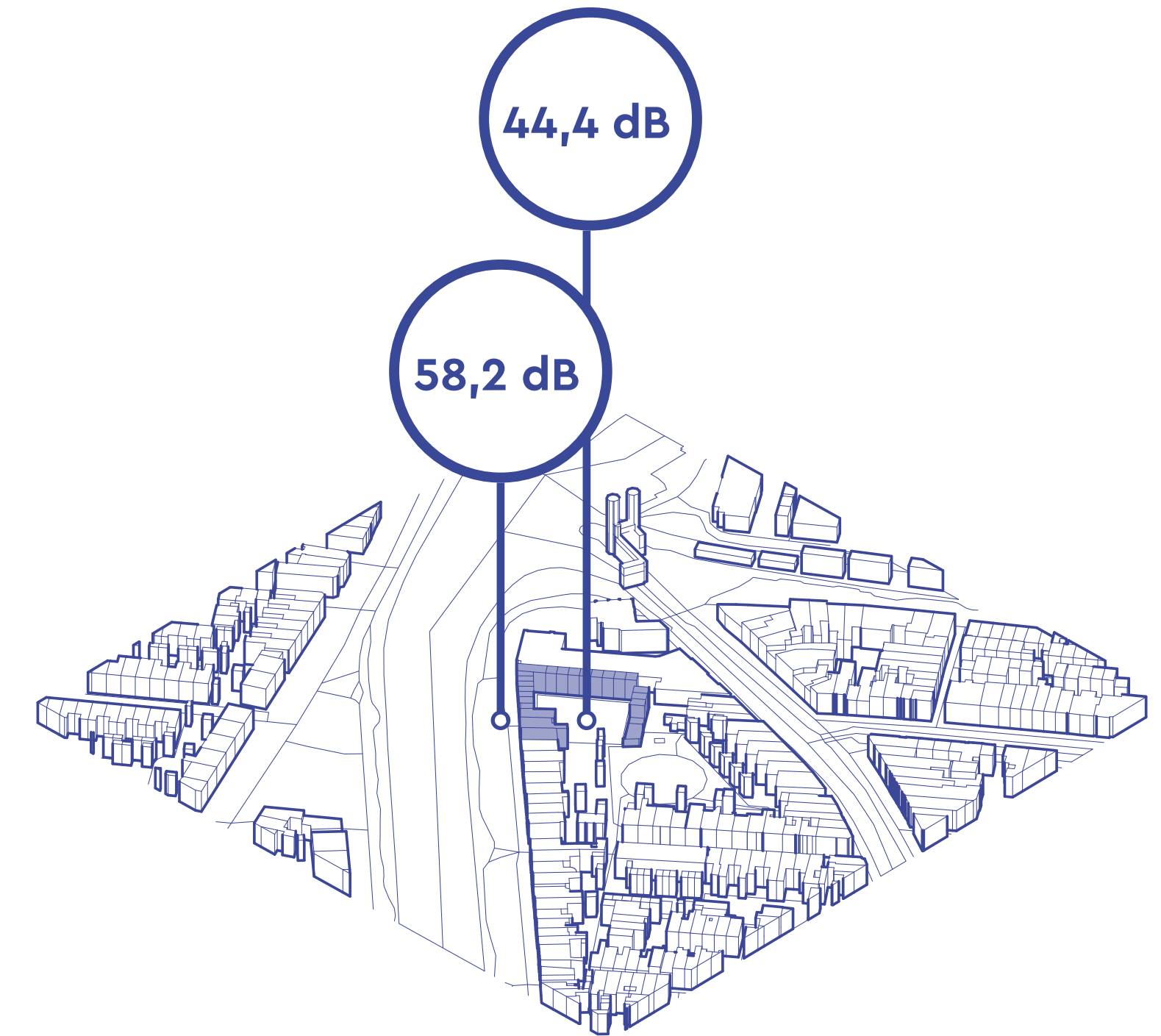
DELFGAUWSEWEG

21,7 dB difference



X-RAY

29 dB difference



KLAEUWSHOFJE

13,8 dB difference



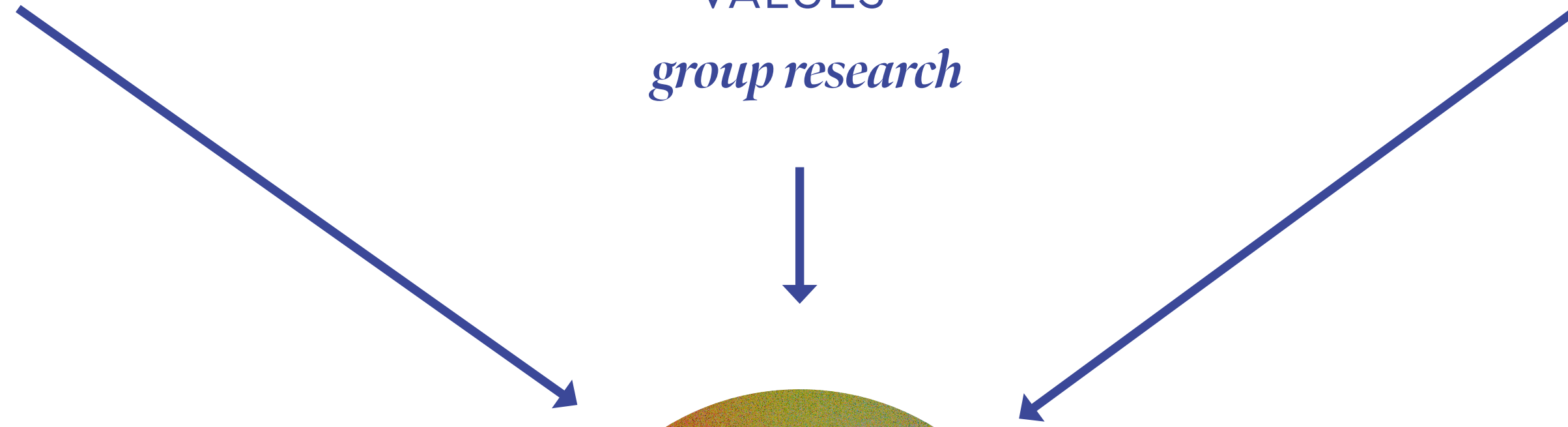
**WHISHES
OF KB'S PEOPLE**
group research



**HERITAGE
VALUES**
group research



**SOUNDSCAPE
RESEARCH**
*literature review
case studies
expert interviews*



RESEARCH & DESIGN



1

*Redesign for people
instead of books*



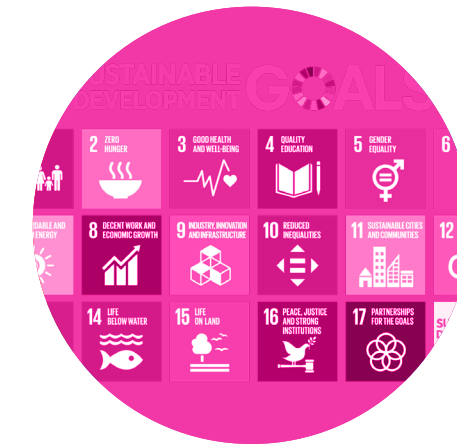
2

*Protect valued skin +
structure where possible*



3

*Design for sound on all
scales*

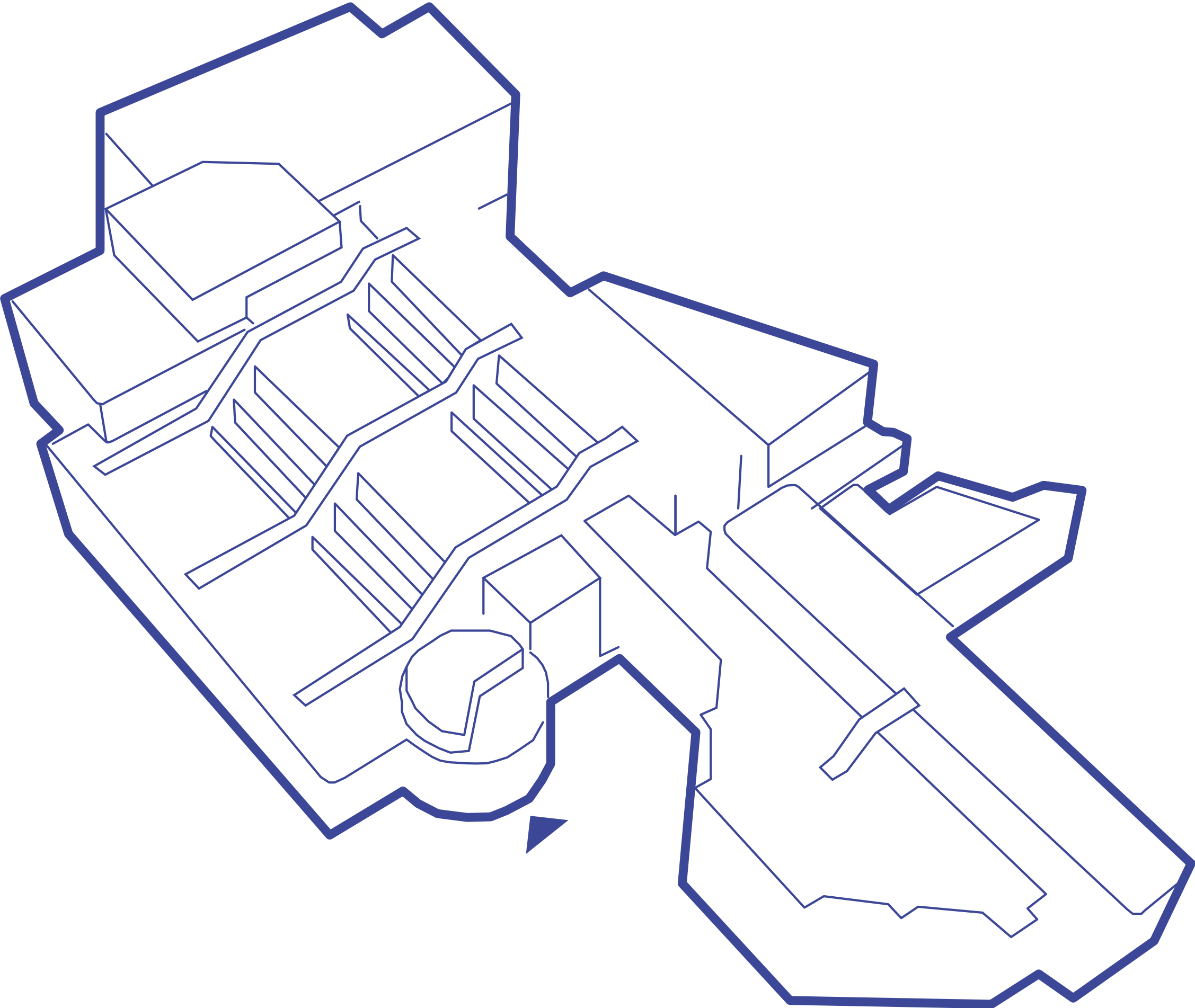


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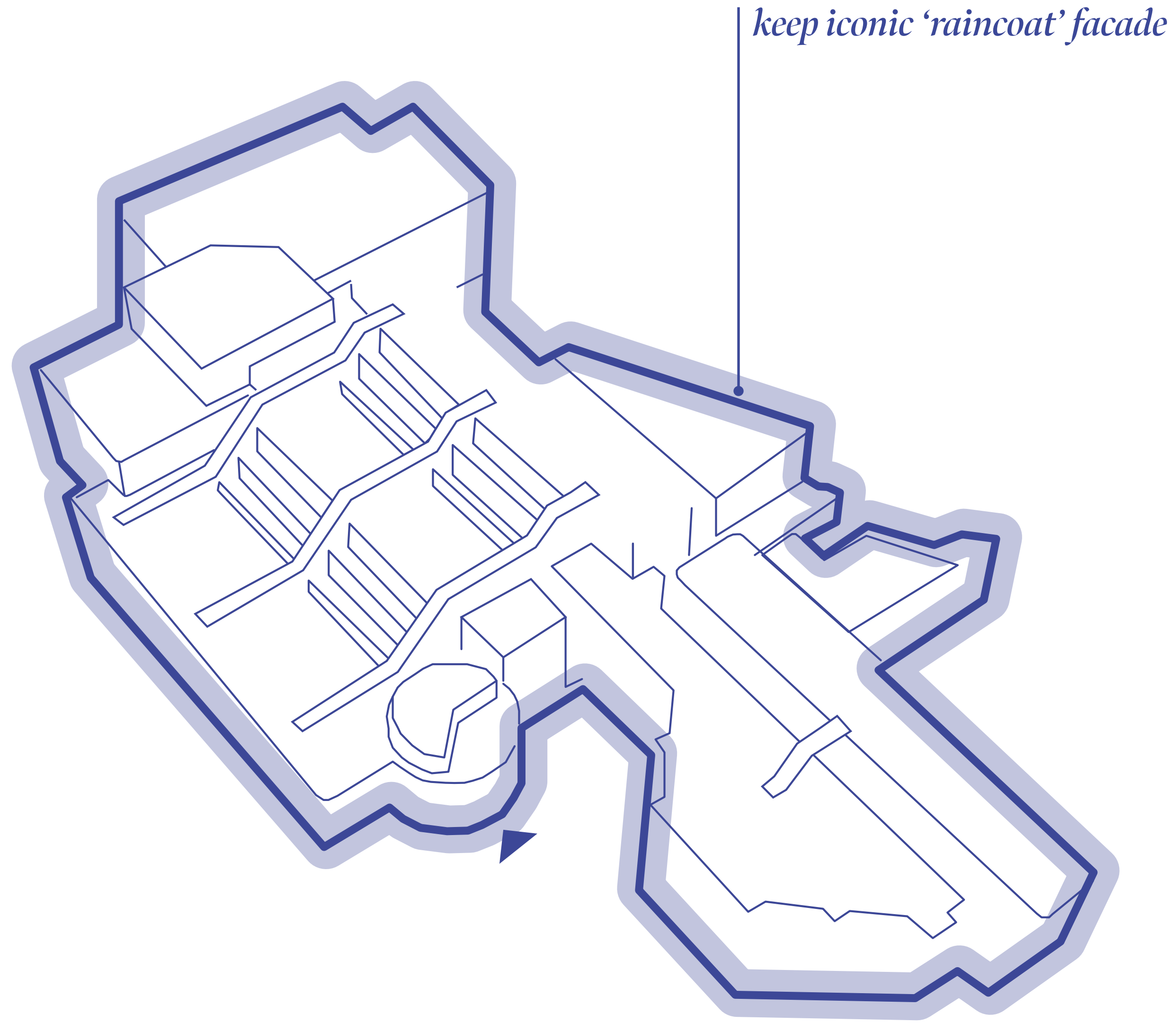
*Contribute to the UN
Sustainable Development
goals*

DESIGN GOALS

DESIGN CONCEPT



EXISTING BUILDING

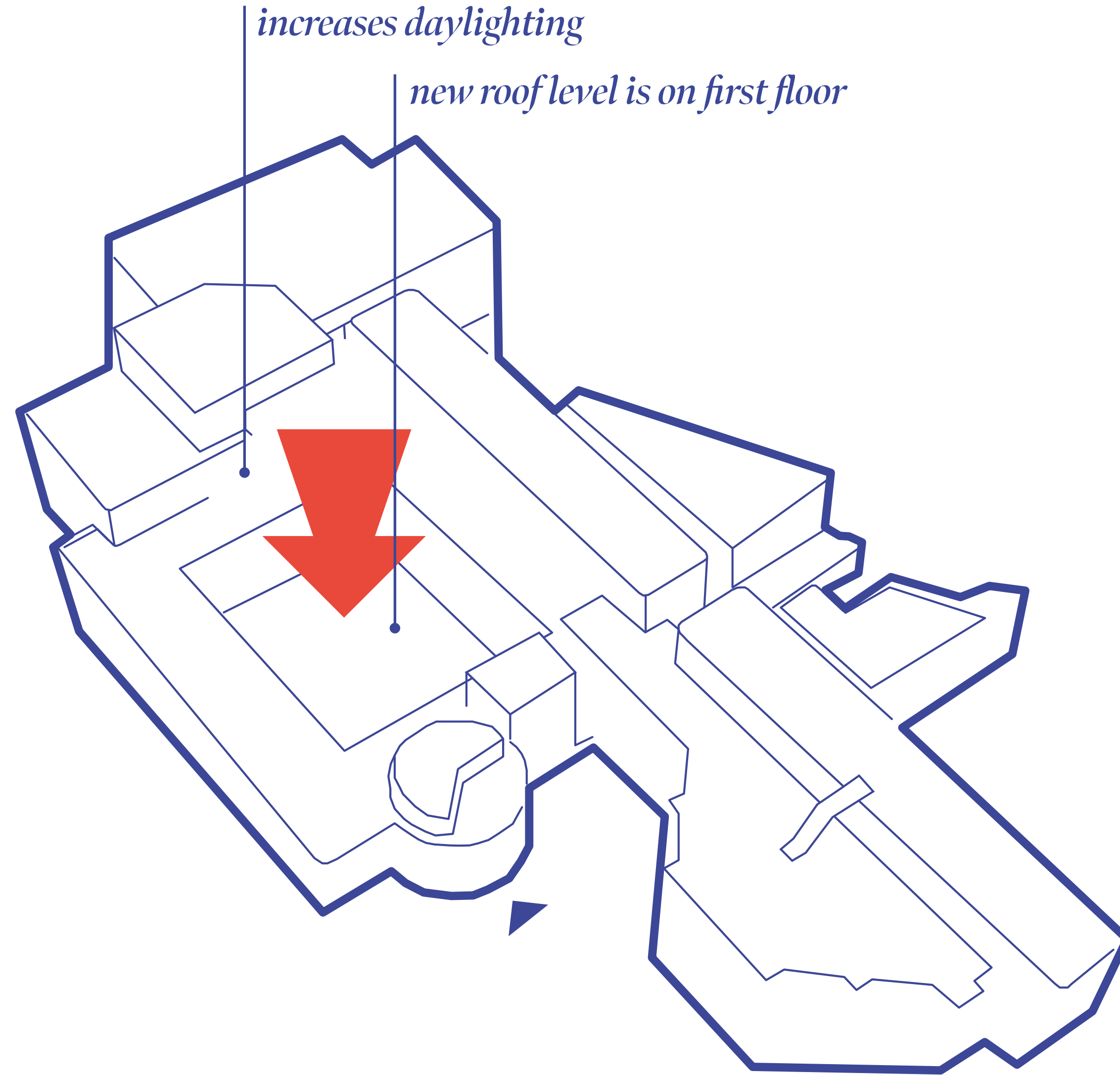


keep iconic 'raincoat' facade

KEEP HERITAGE SKIN

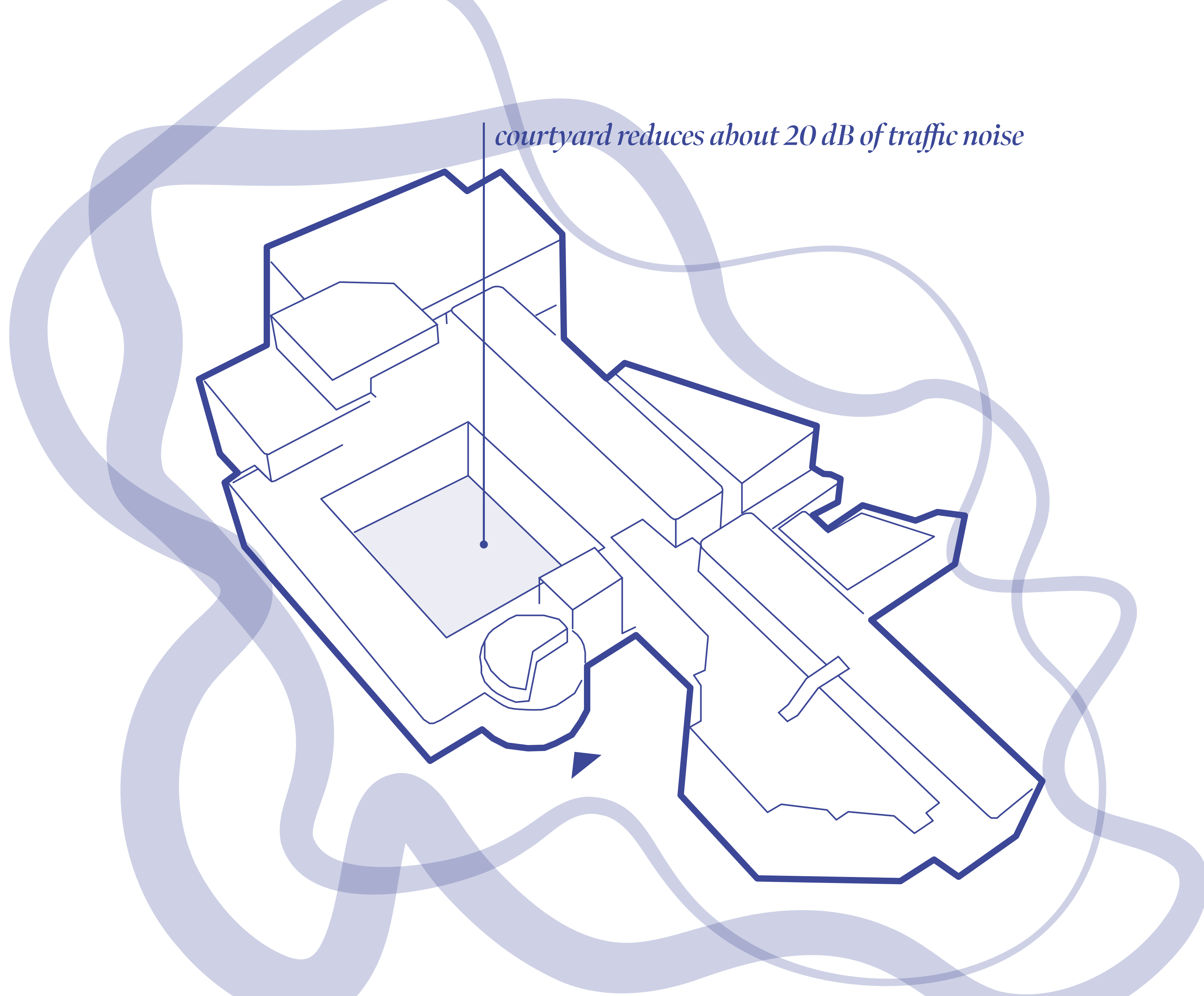


LOUD CITY SOUNDSCAPE

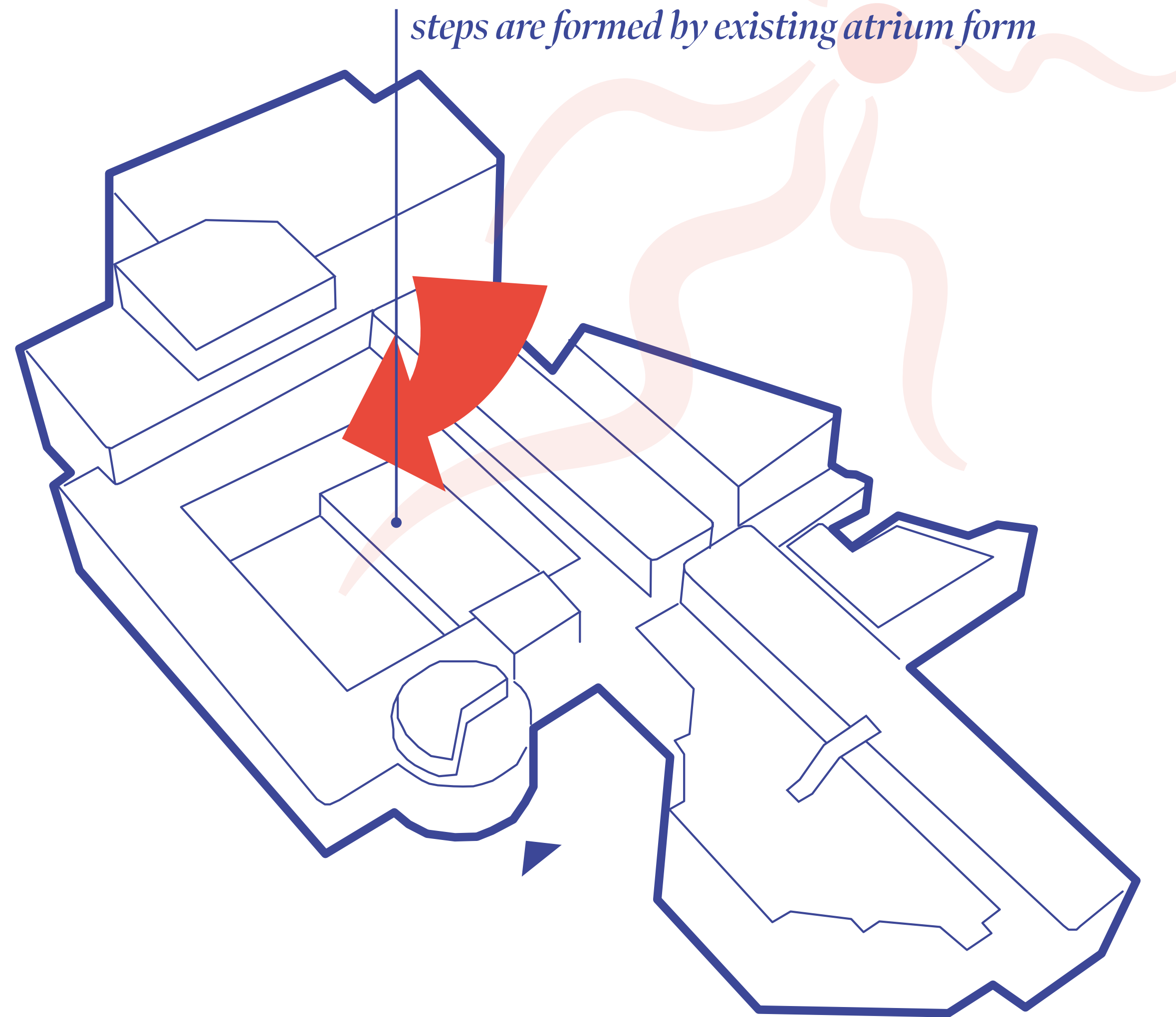


CREATE QUIET COURTYARD

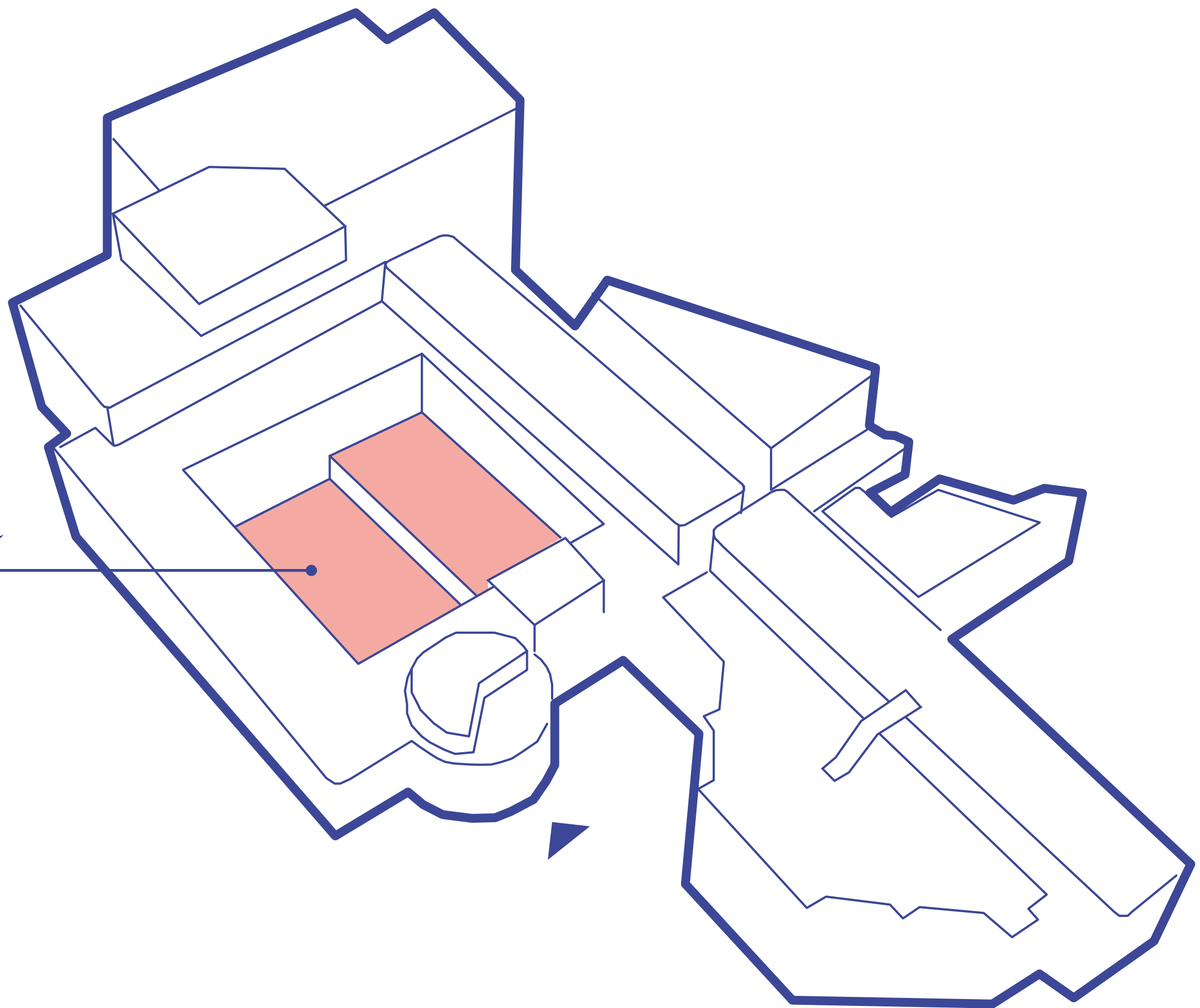
courtyard reduces about 20 dB of traffic noise



CONTRAST IN SOUNDSCAPE

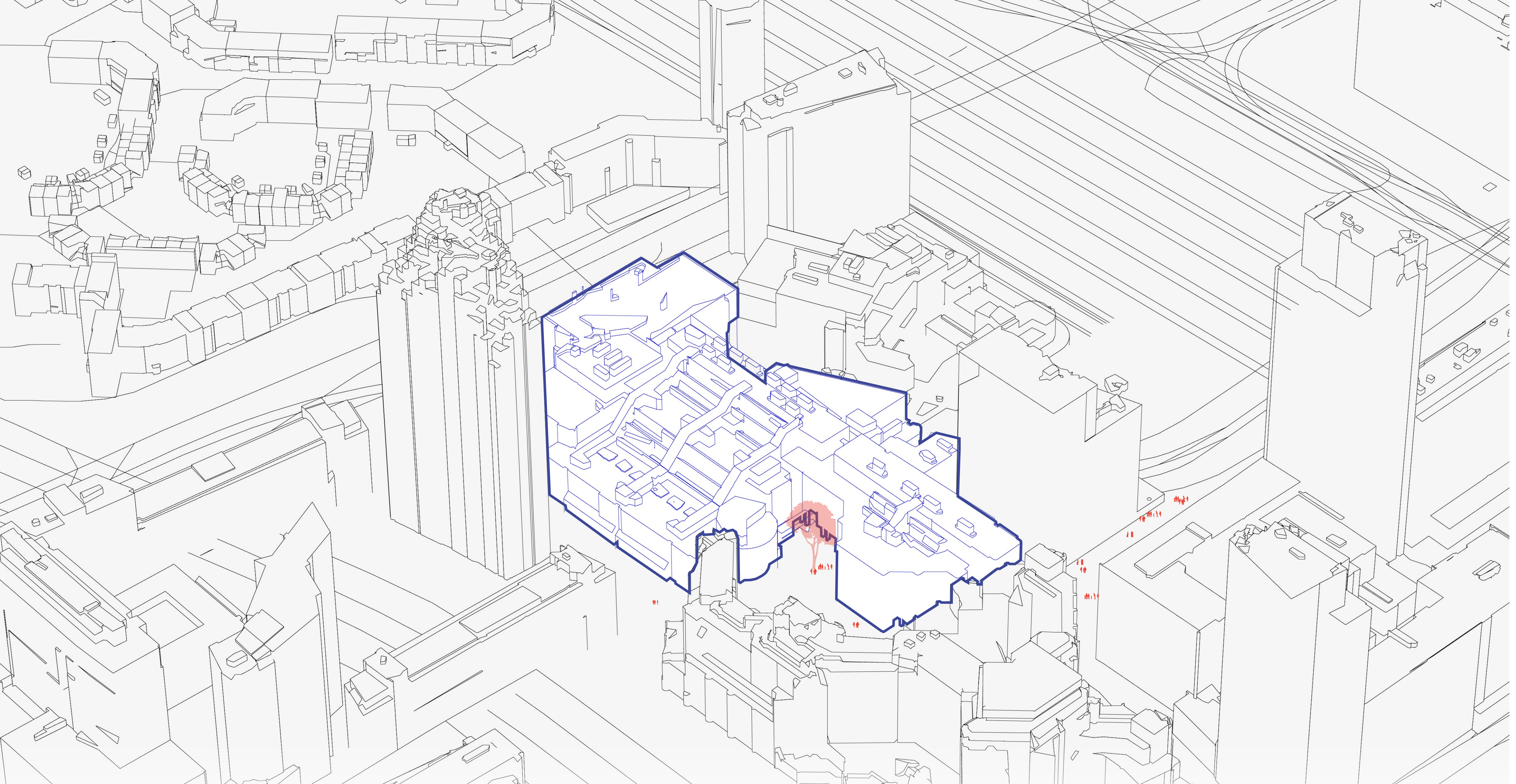


MAXIMIZE INSOLATION

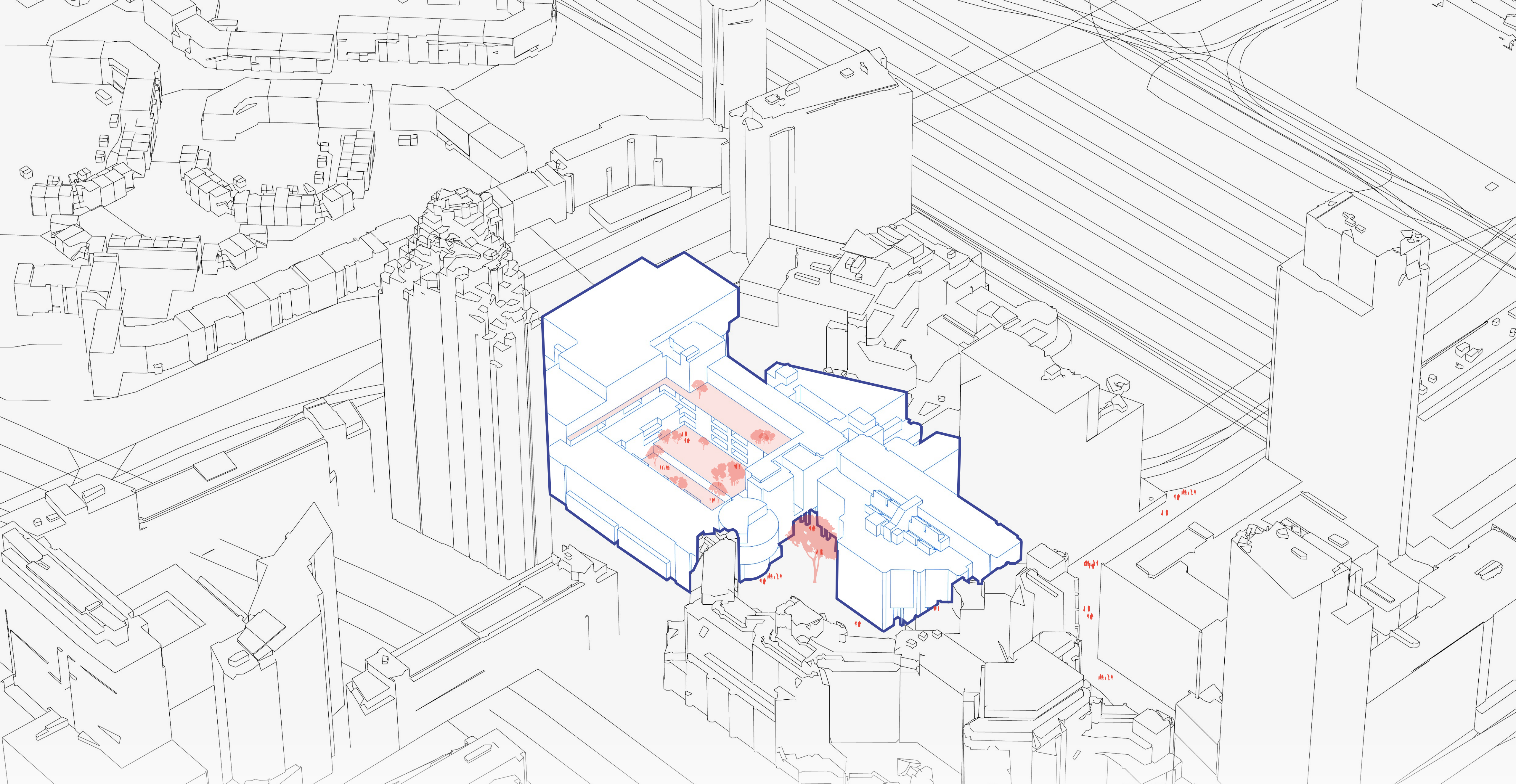


*public 'escape' from city noise
contributes to **social value** of building*

GROWING THE GARDEN



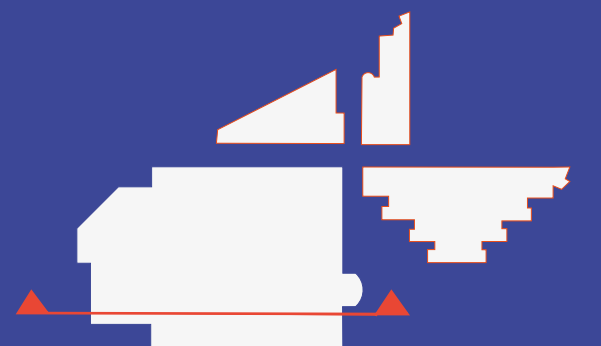
OVERVIEW EXISTING BUILDING FORM



OVERVIEW NEW BUILDING FORM

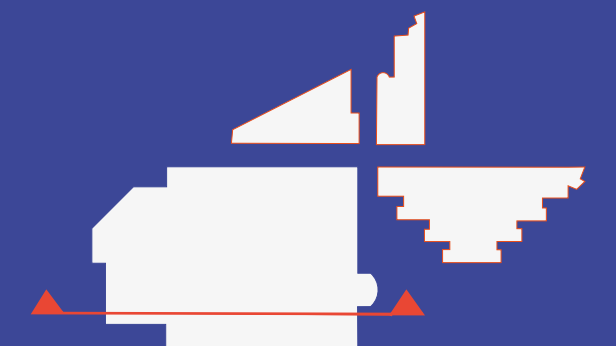


URBAN SECTION EXISTING





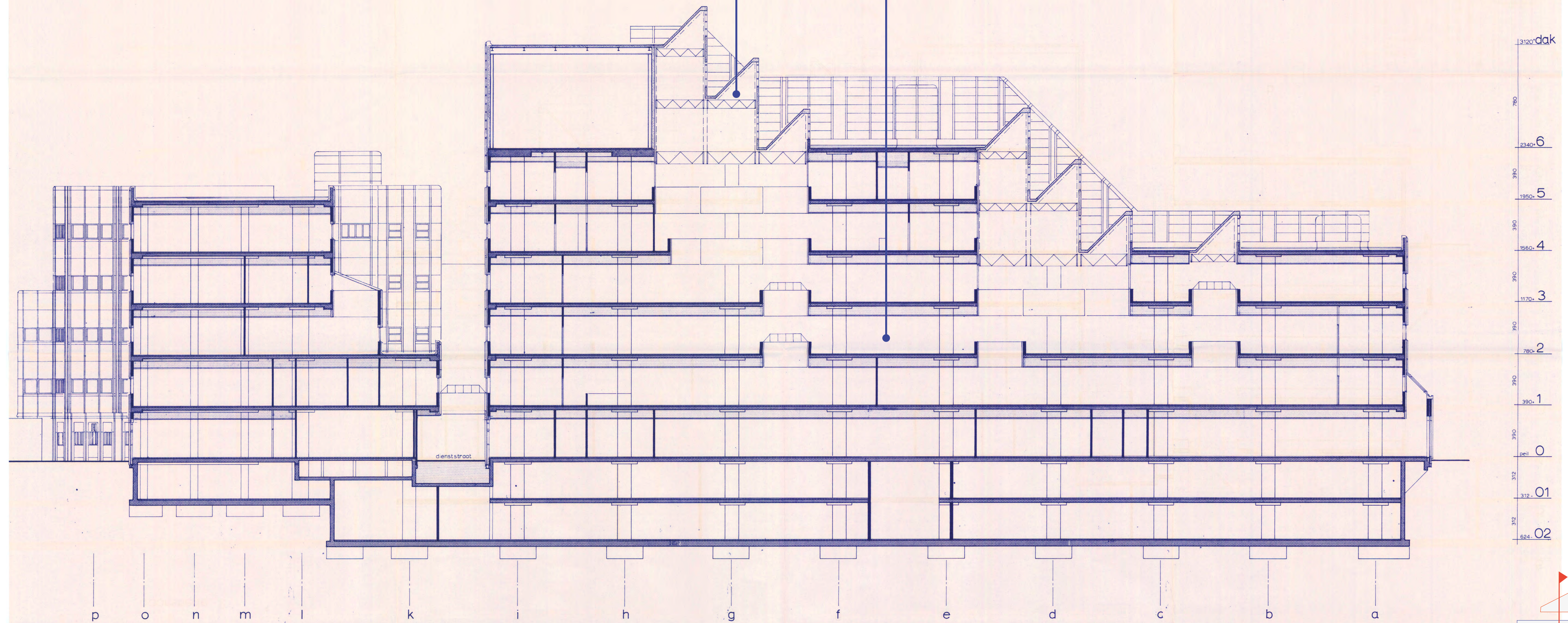
URBAN SECTION NEW



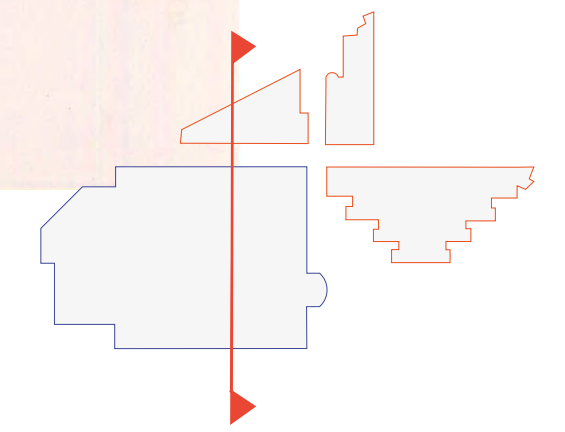
2253_075

skylights towards north give little daylight

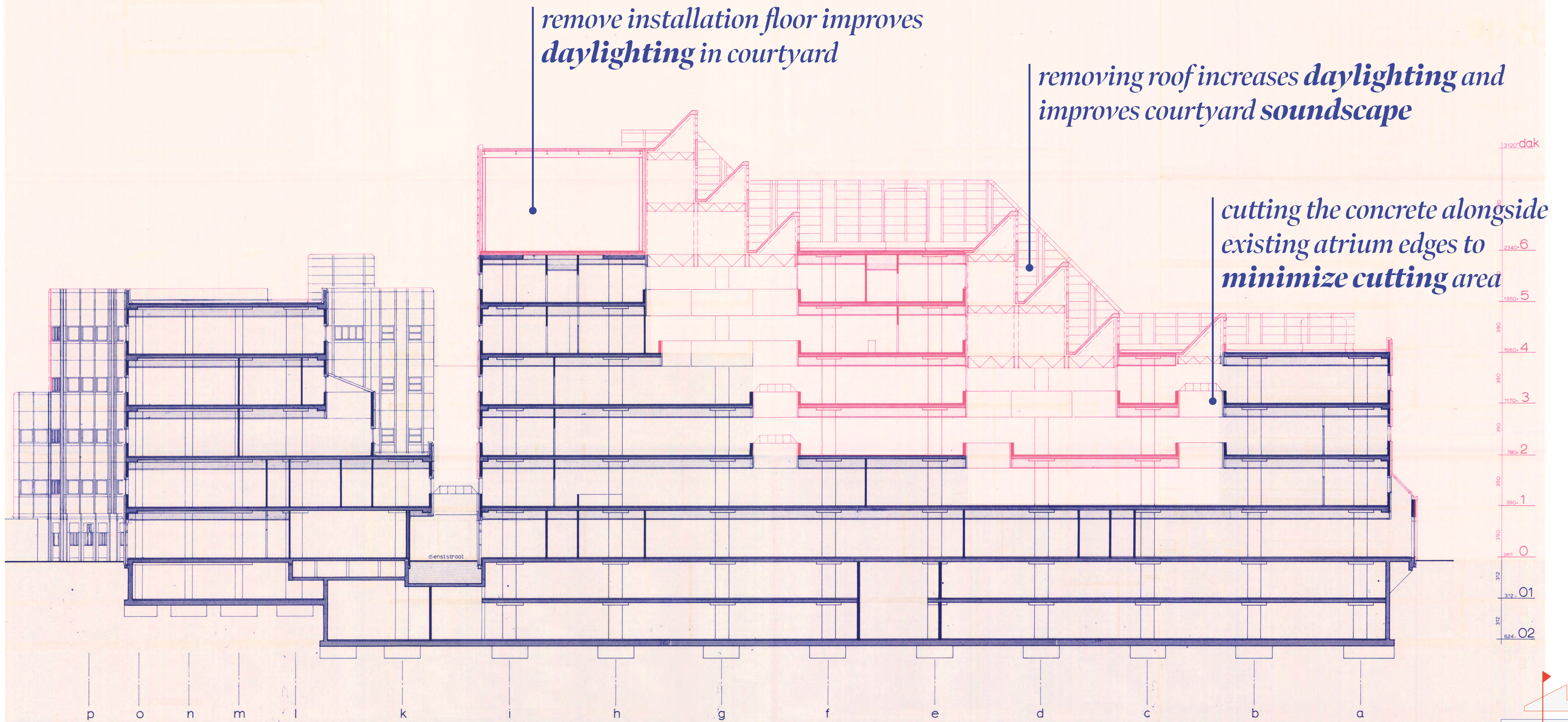
no connection to outside



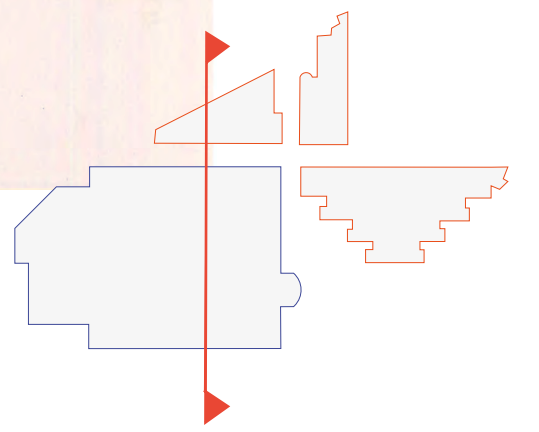
EXISTING SECTION



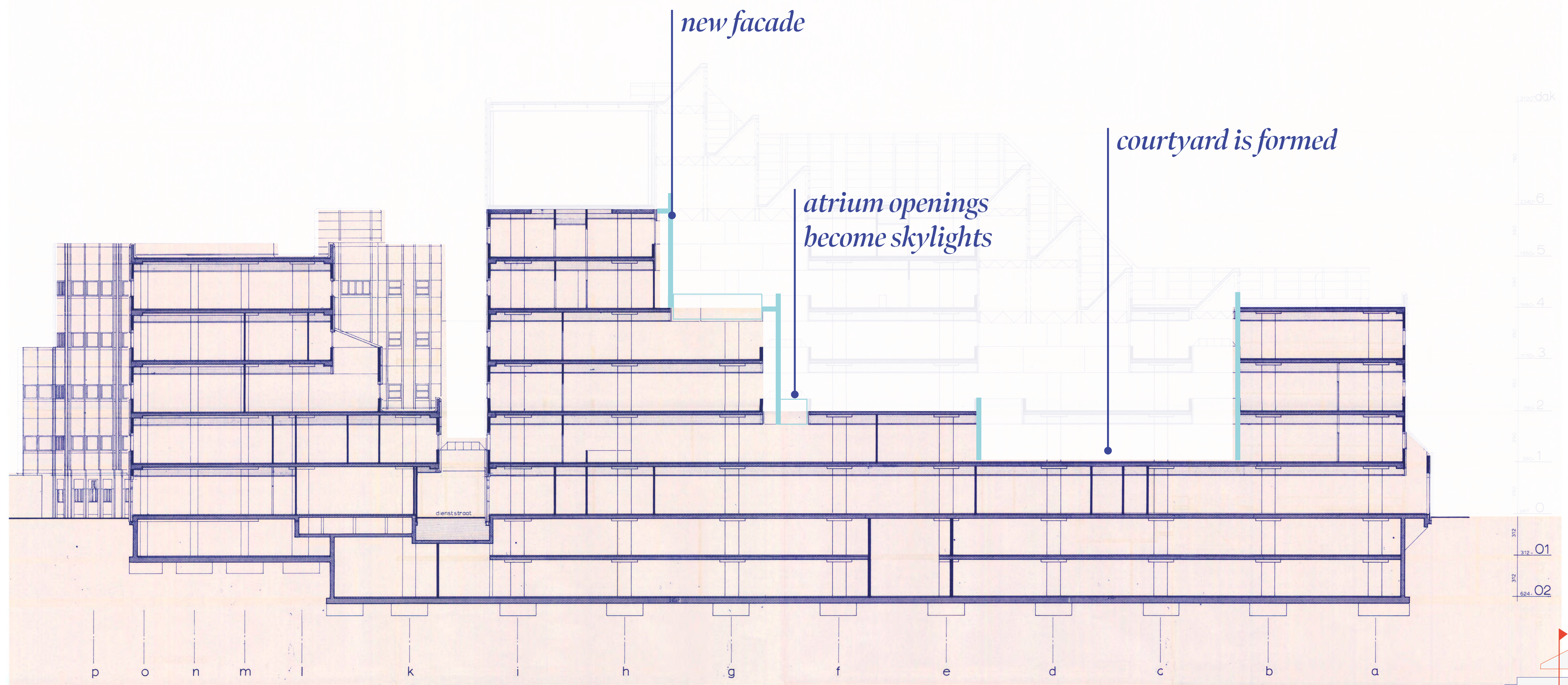
2253_075



PROPOSED REMOVAL



22.53_025

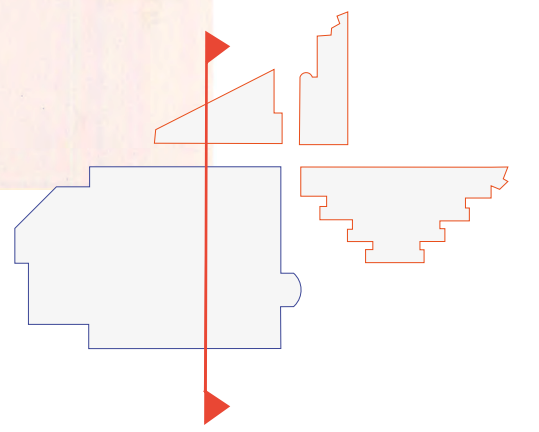


new facade

*atrium openings
become skylights*

courtyard is formed

NEW ELEMENTS

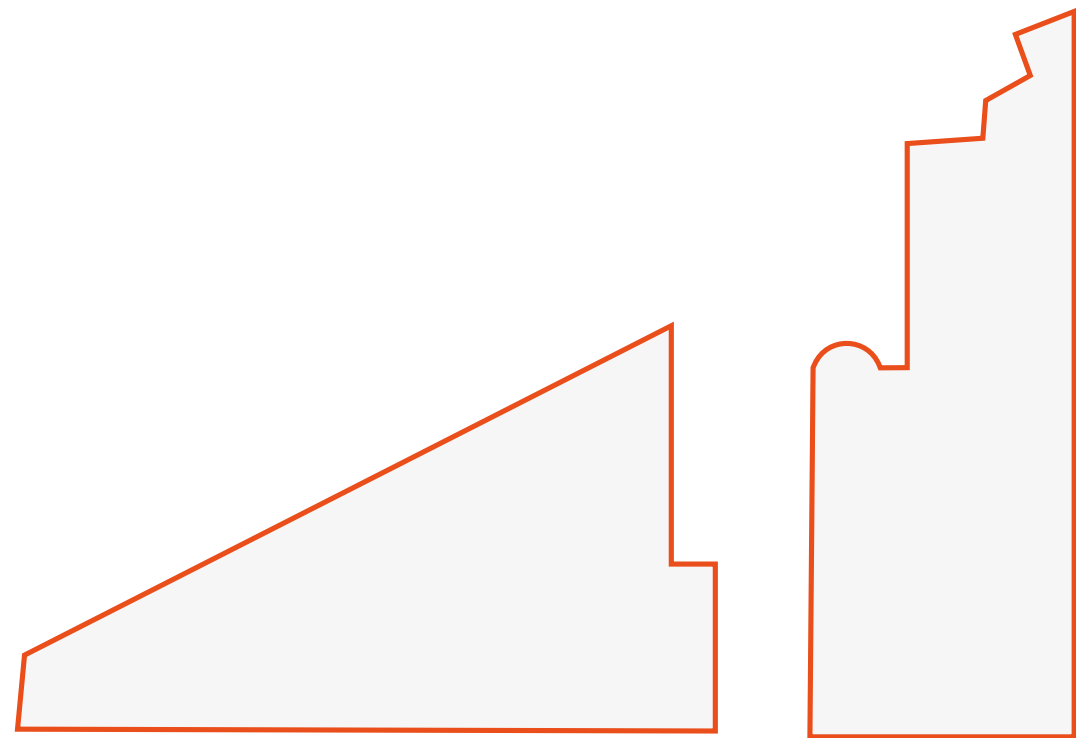




atrium openings become skylights

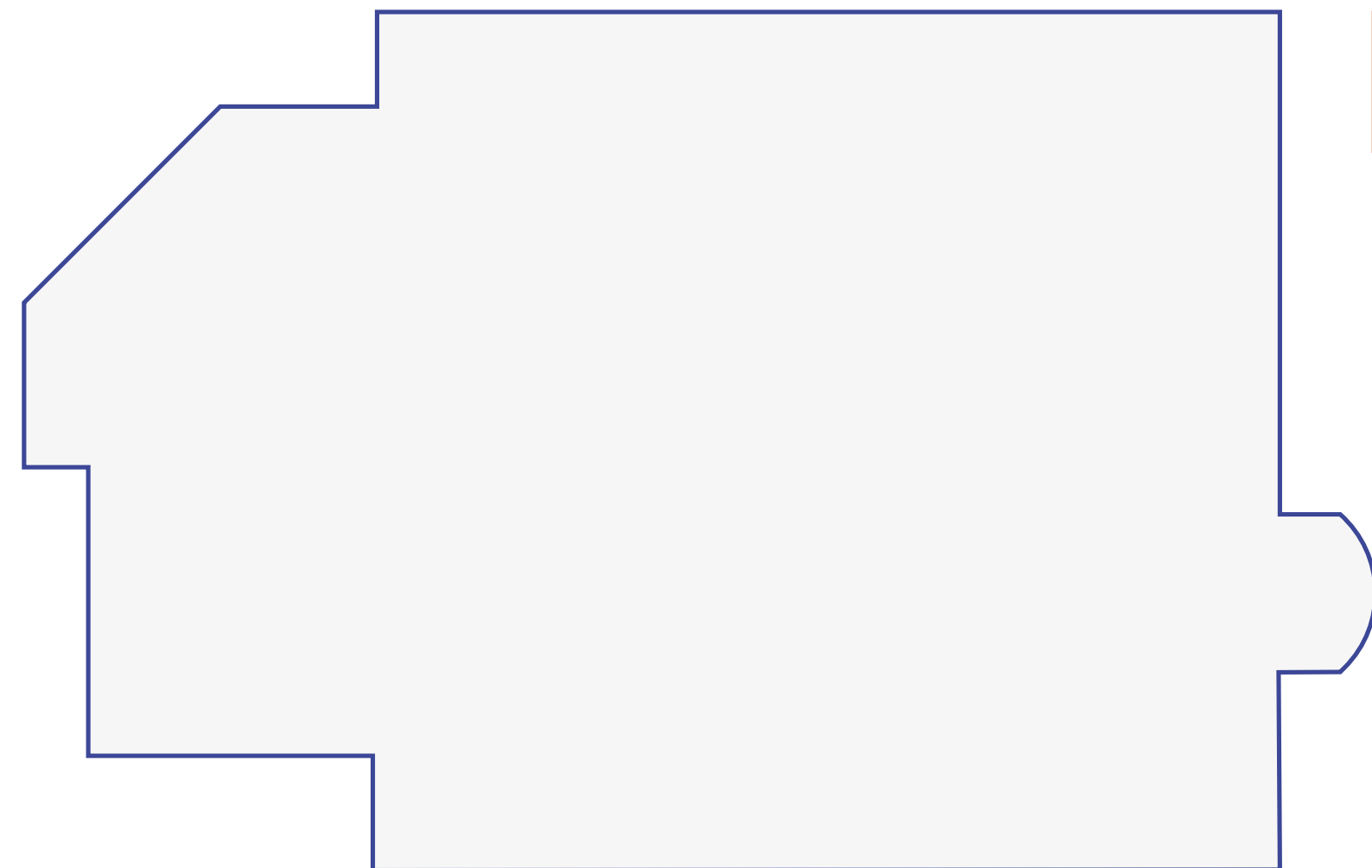
NEW ELEMENTS

**GYM &
OFFICE SPACE** | **PART D**
13.700m²

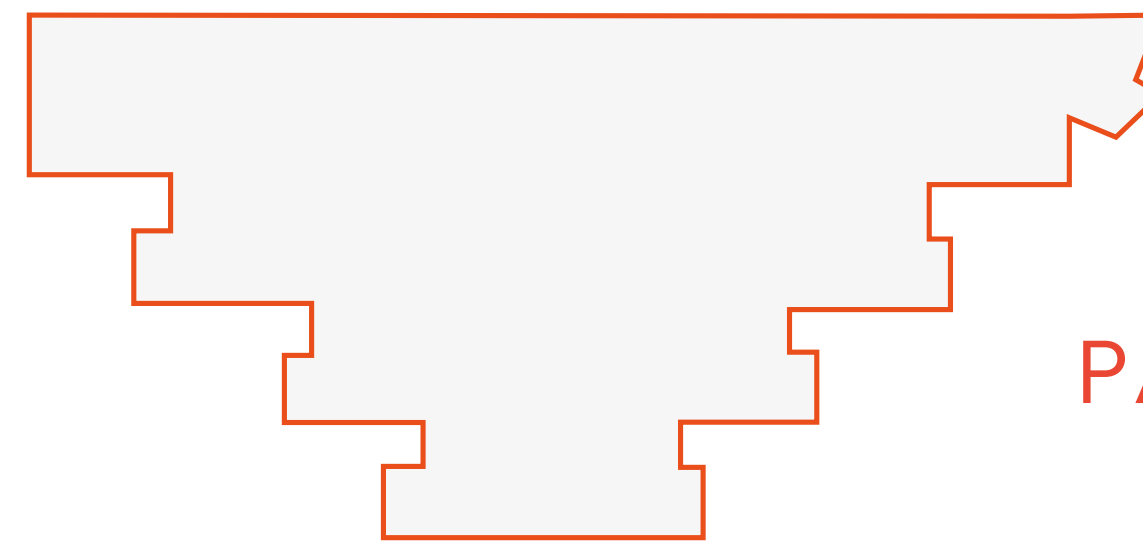


PART A | **BISTRO &
OFFICE SPACE**
2.500m²

THE LIBRARY | **PART B**
35.000m²

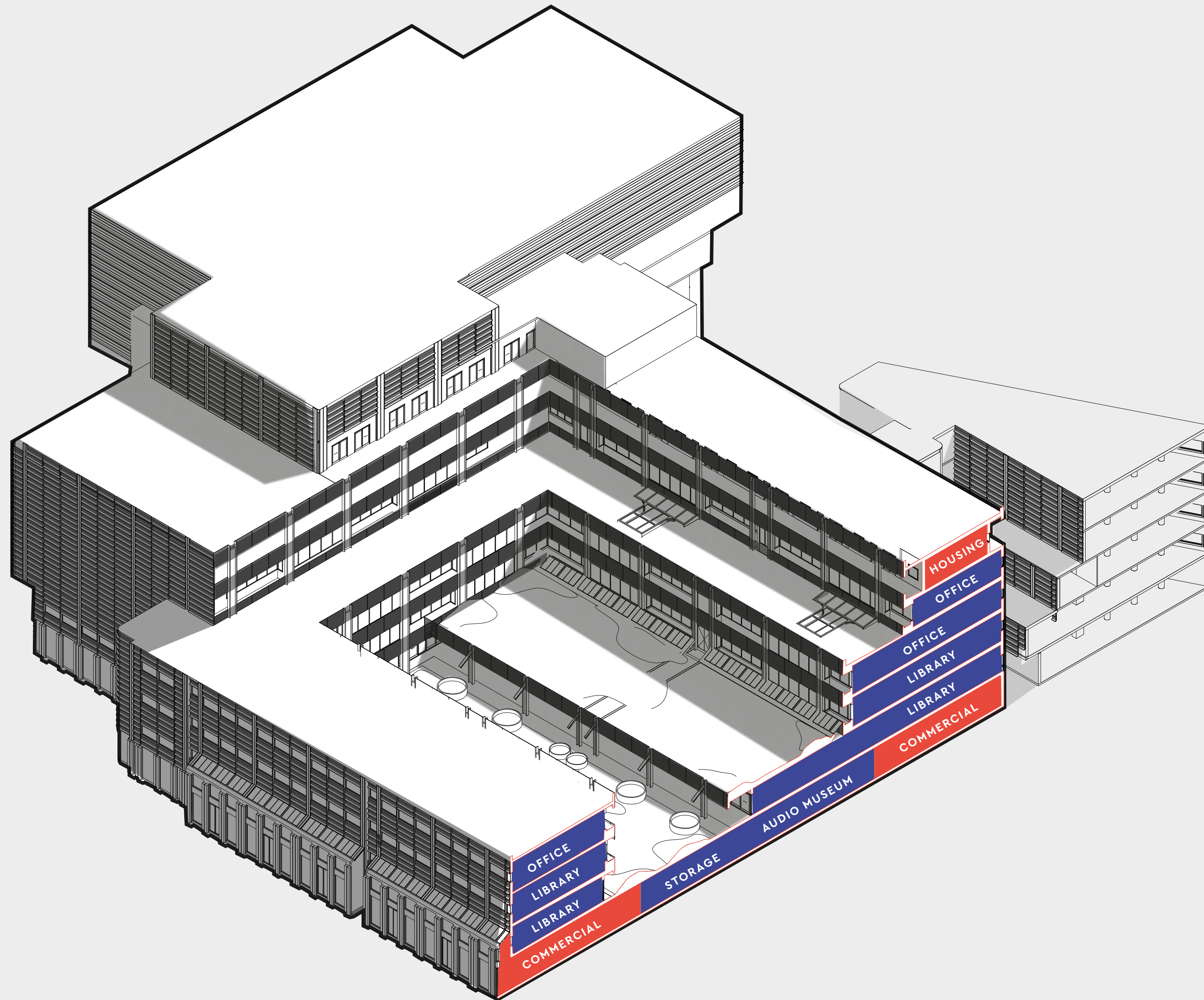


PART I | **COMMERCIAL SPACE
& DWELLINGS**
13.700m²



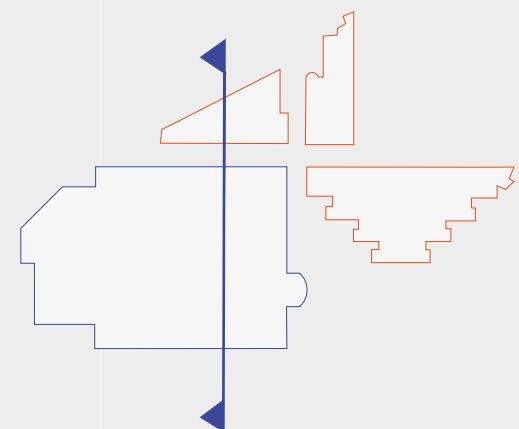
- KB
- NEW PROGRAMME

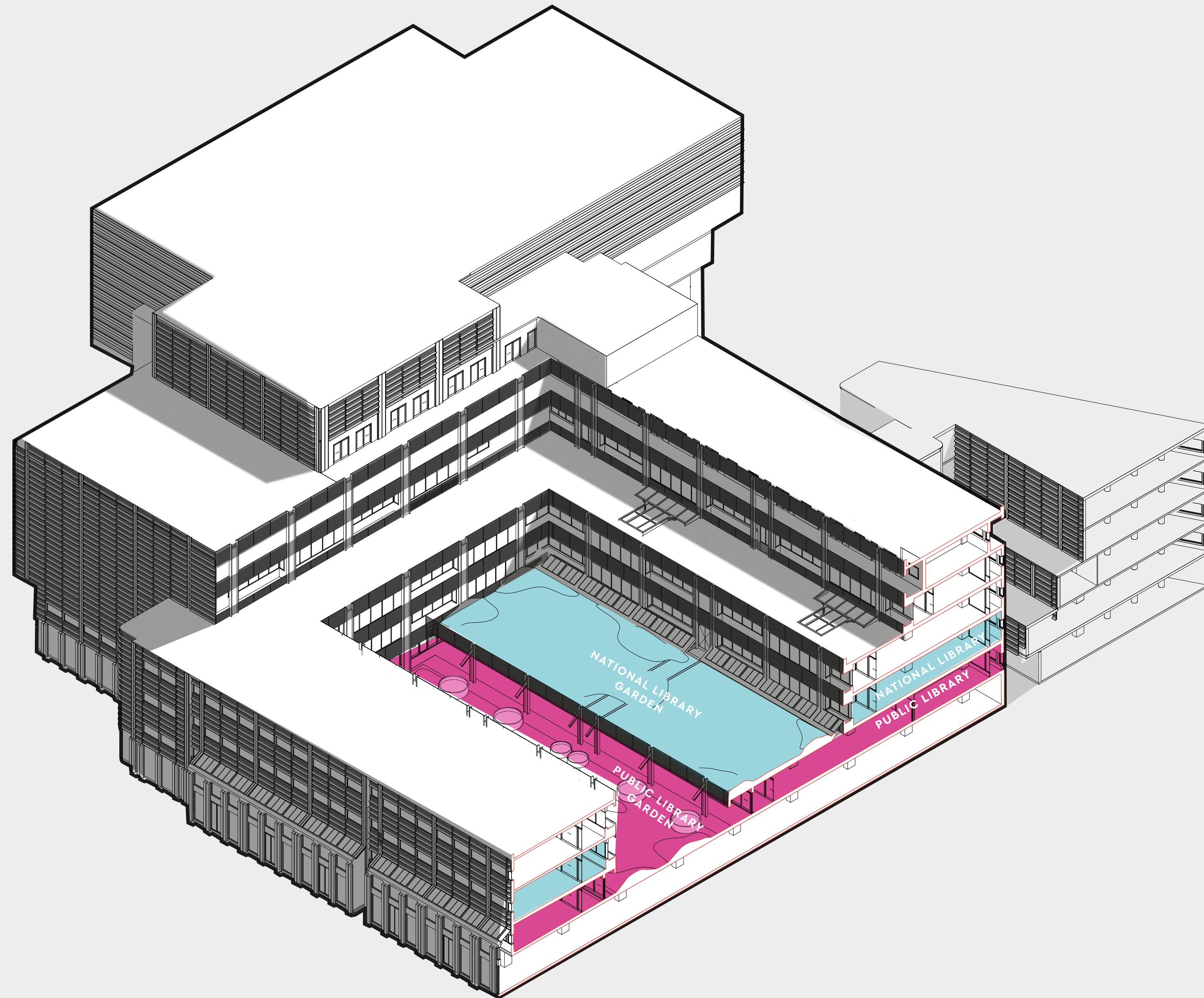
PROGRAMME



- KB
- NEW PROGRAMME

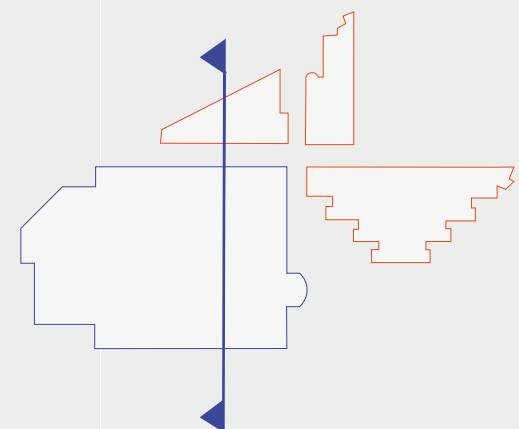
FUNCTIONS IN SECTION





- PUBLIC LIBRARY
- NATIONAL LIBRARY

FUNCTIONS IN SECTION

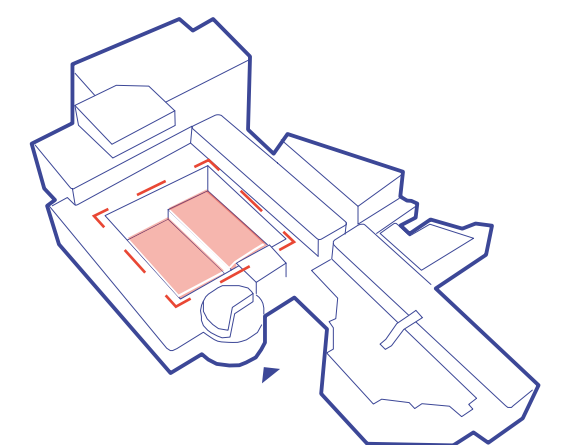
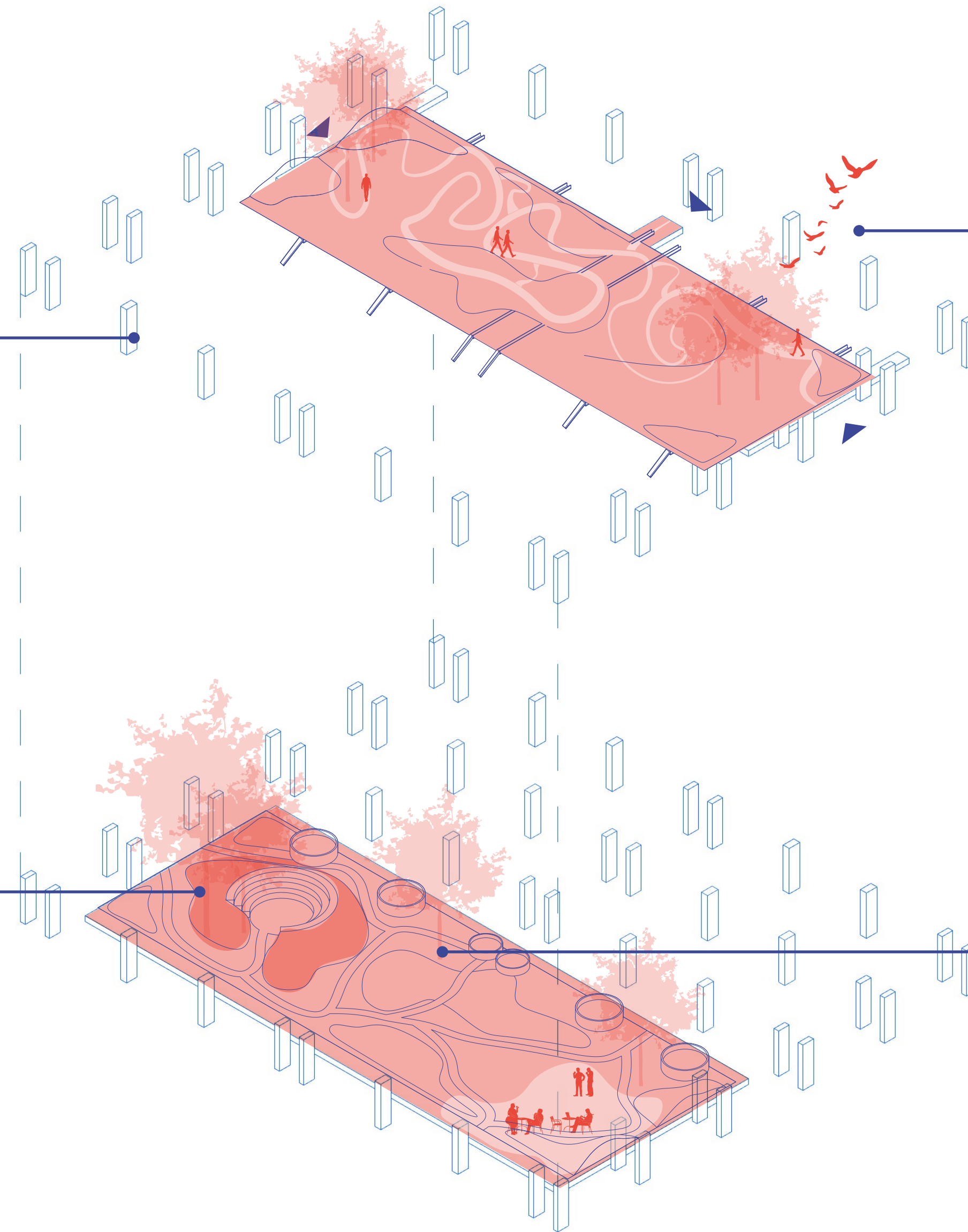


a roof garden makes optimal usage of the strong construction (1000 kg/m²)

A green courtyard attracts animals (birds, insects) which contributes to the Hague's biodiversity

plants, trees and water help the city cool down during warm days

greenery absorbs sound, contributing to a calm atmosphere



● SOUNDSCAPE ELEMENT

THE SOUND GARDENS



grass



sand



wood



metal



birds



rain water



terrace sounds

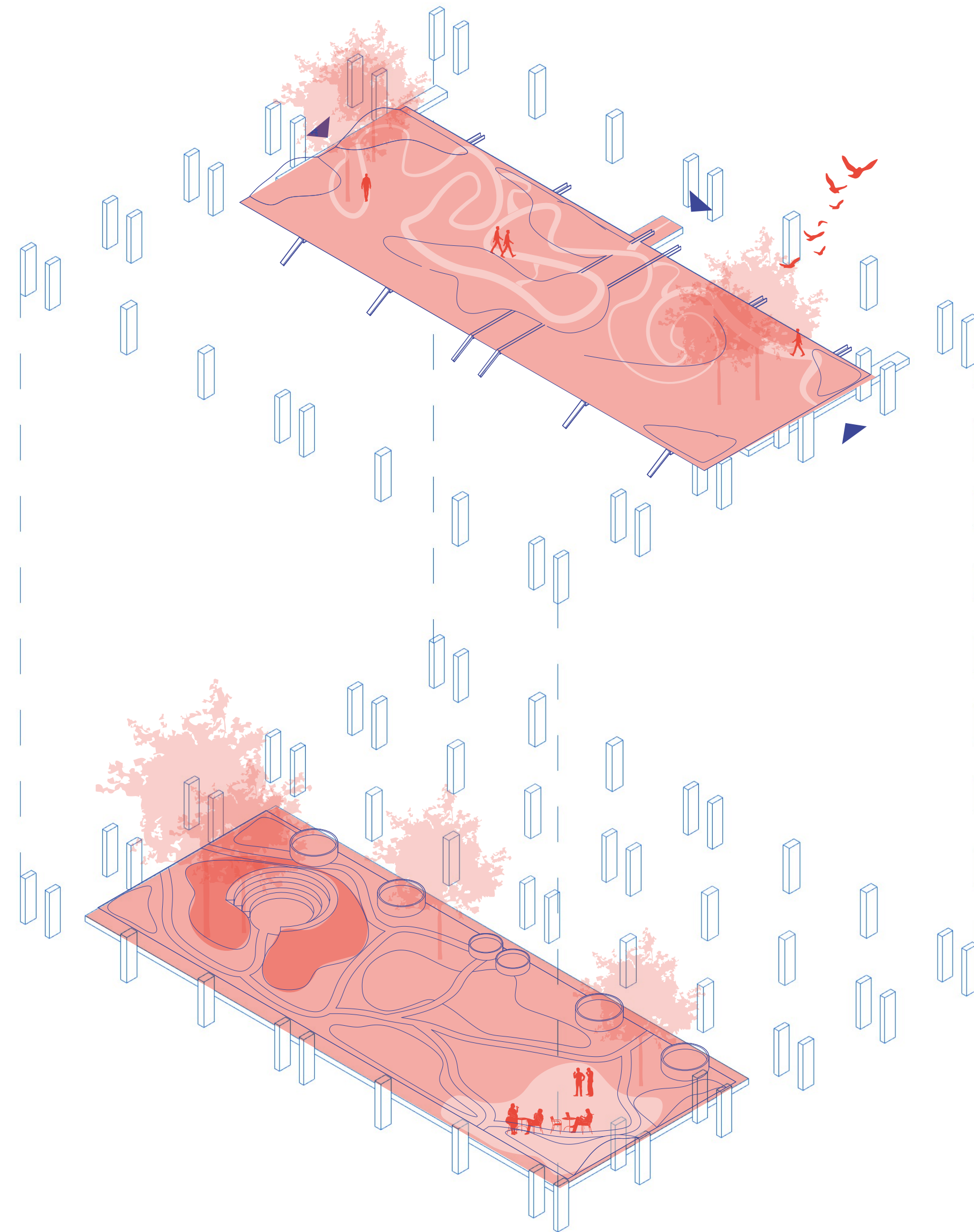


chatter



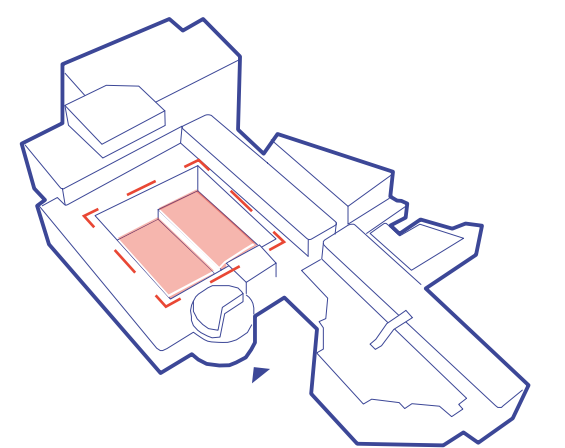
rain drops

● SOUNDSCAPE ELEMENT



2 HIGHER GARDEN
SOUND WALKS
CONTEMPLATION
MOVEMENT

1 LOWER GARDEN
CAFÉ TERRACE
MEETING SPOT
READING PLACES
LONGER STAYS



GARDEN PROGRAMME

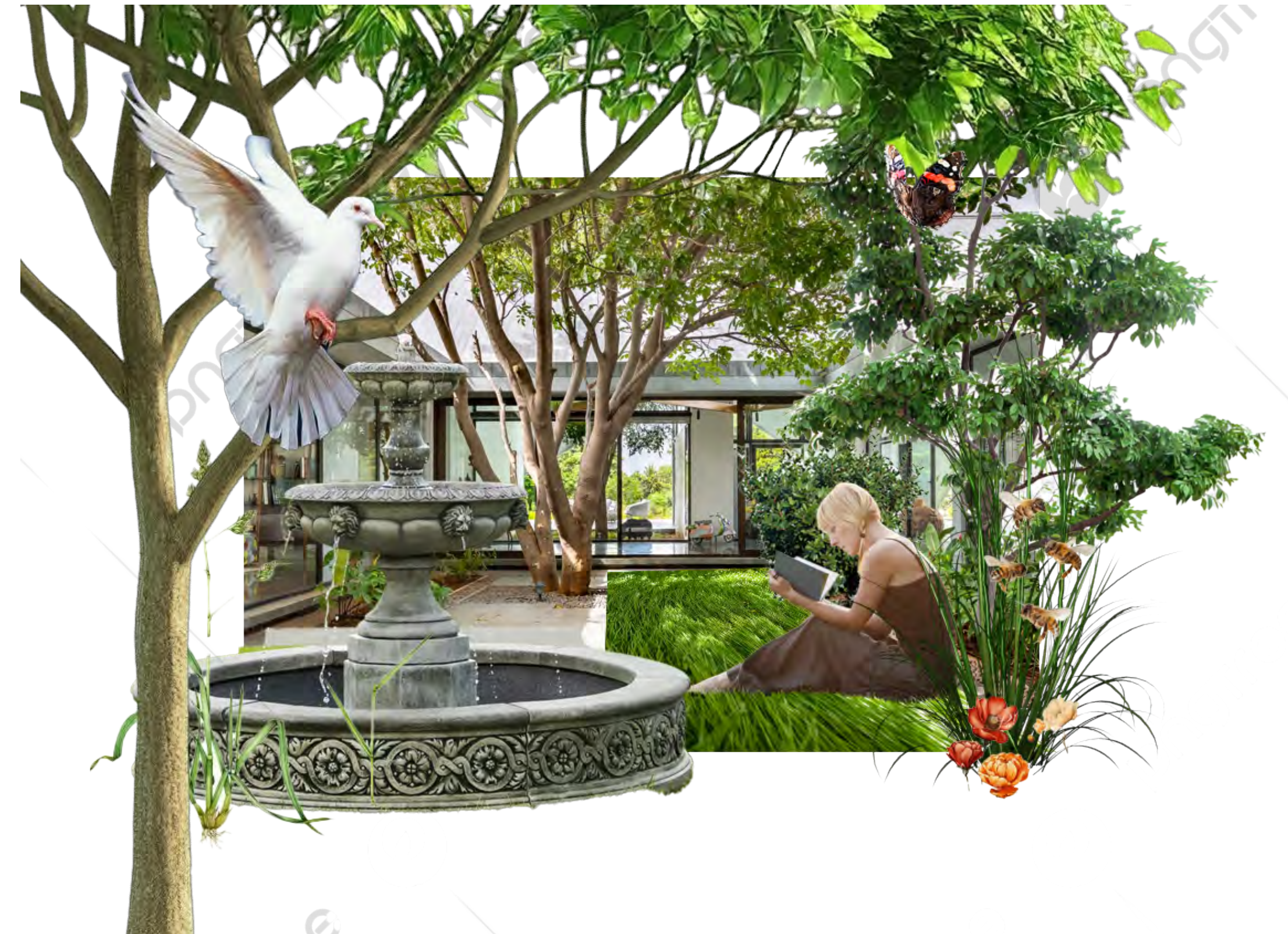


gutters are part of soundscape

GUTTERS

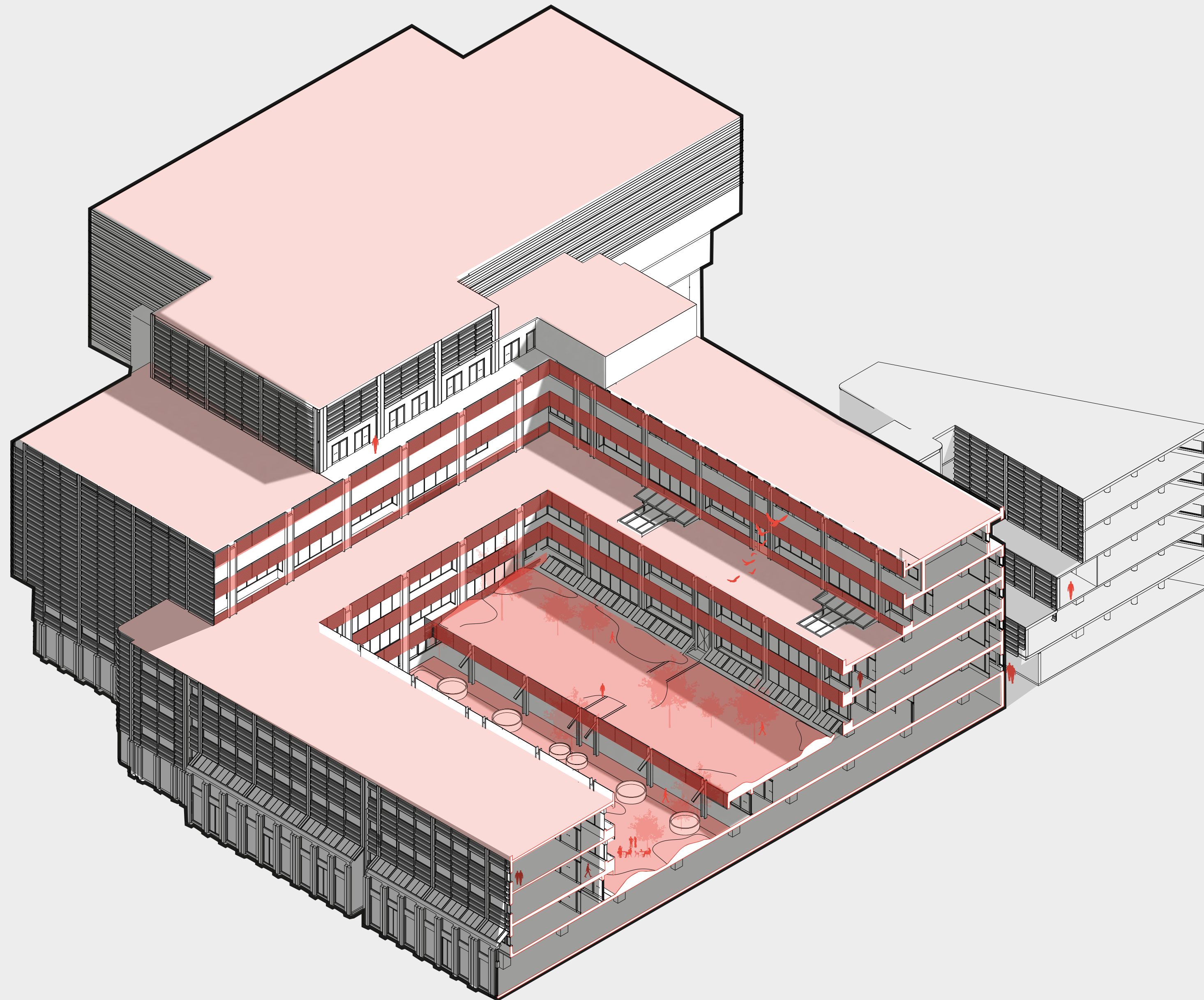


city



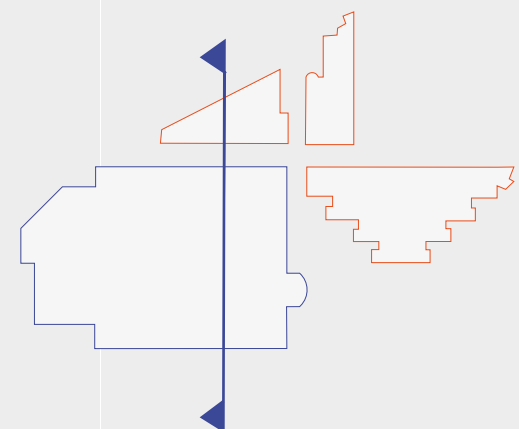
sound garden

SOUNDSCAPE CONTRAST

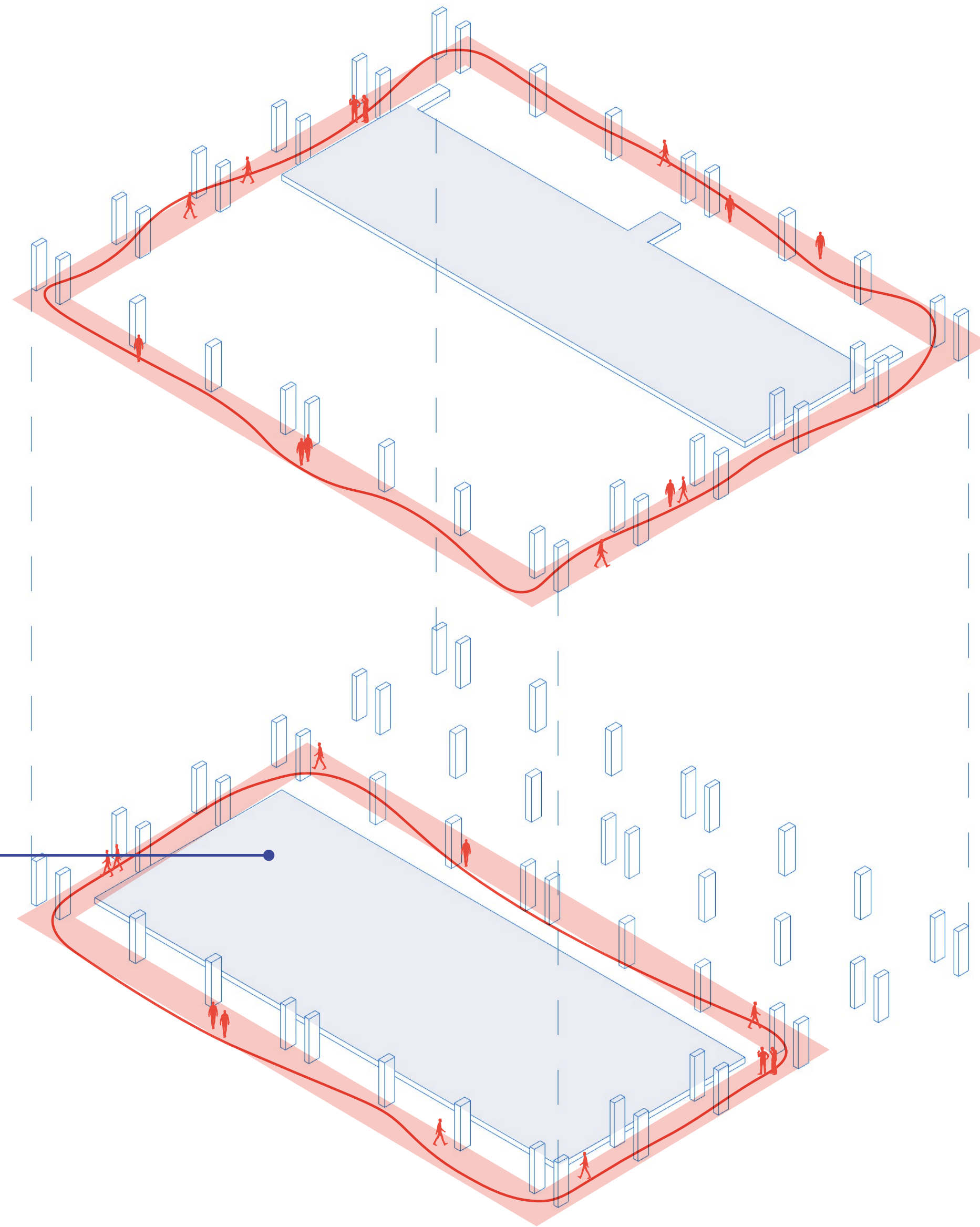


● SOUNDSCAPE ELEMENT

GARDENS IN SECTION

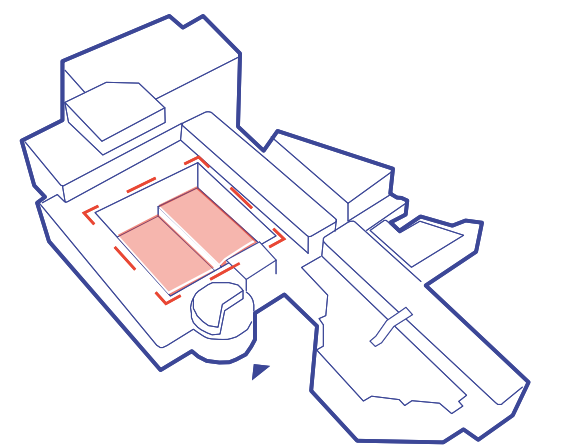


garden becomes orientation point for users

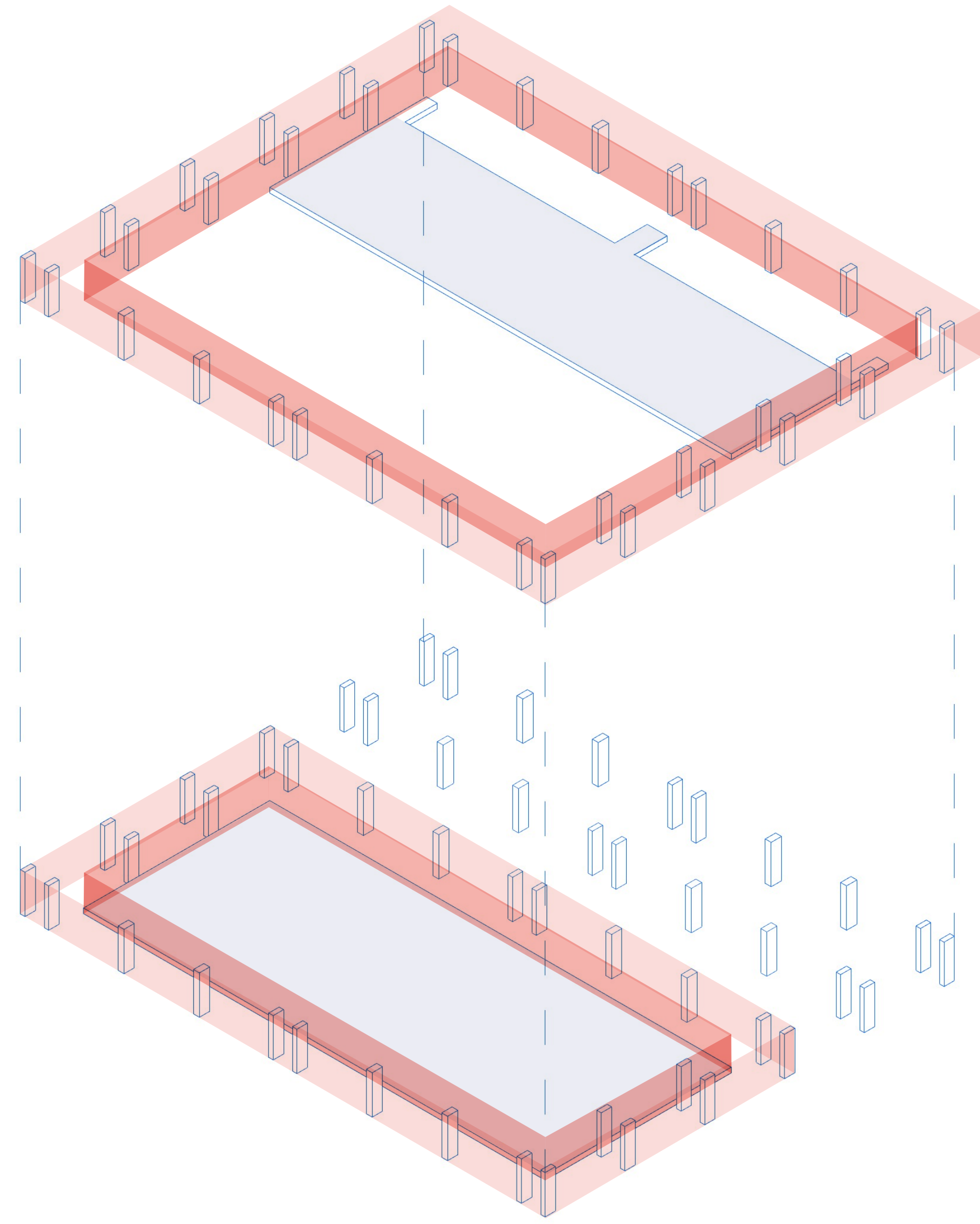


2 **HIGHER GARDEN**
NATIONAL LIBRARY
CONCENTRATION WORKSPACES

1 **LOWER GARDEN**
PUBLIC LIBRARY
CAFÉ
RESTAURANT

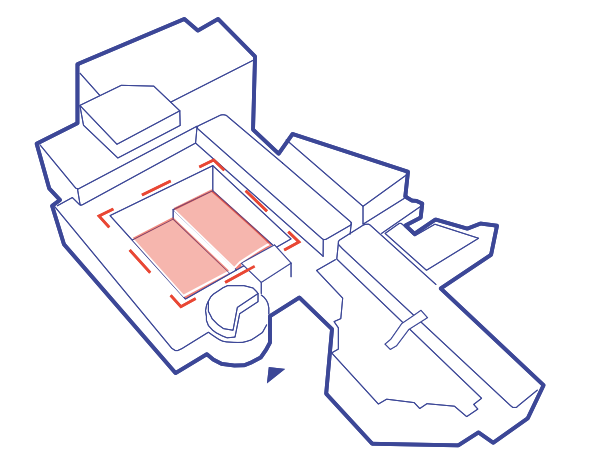


CIRCULATION



2 **HIGHER GARDEN**
NATIONAL LIBRARY
CONCENTRATION WORKSPACES

1 **LOWER GARDEN**
PUBLIC LIBRARY
CAFÉ
RESTAURANT



CLIMATE AND SOUNDSCAPE BUFFER



outside

overhang

bufferzone

inside

TRANSITION LIBRARY TO GARDEN



planter

bench

TRANSITION LIBRARY TO GARDEN



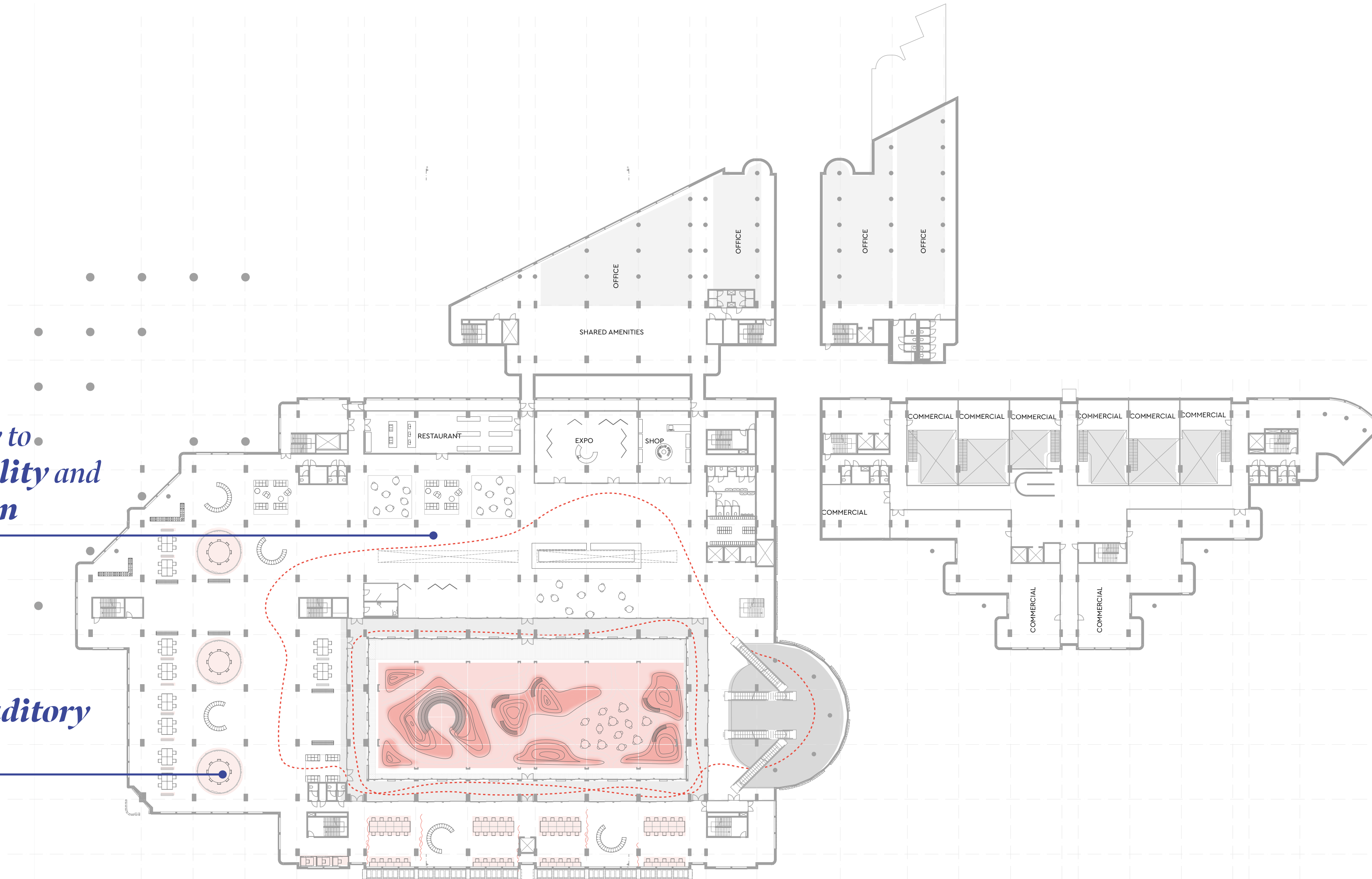
bench

planter

TRANSITION OUTDOOR TO INDOOR

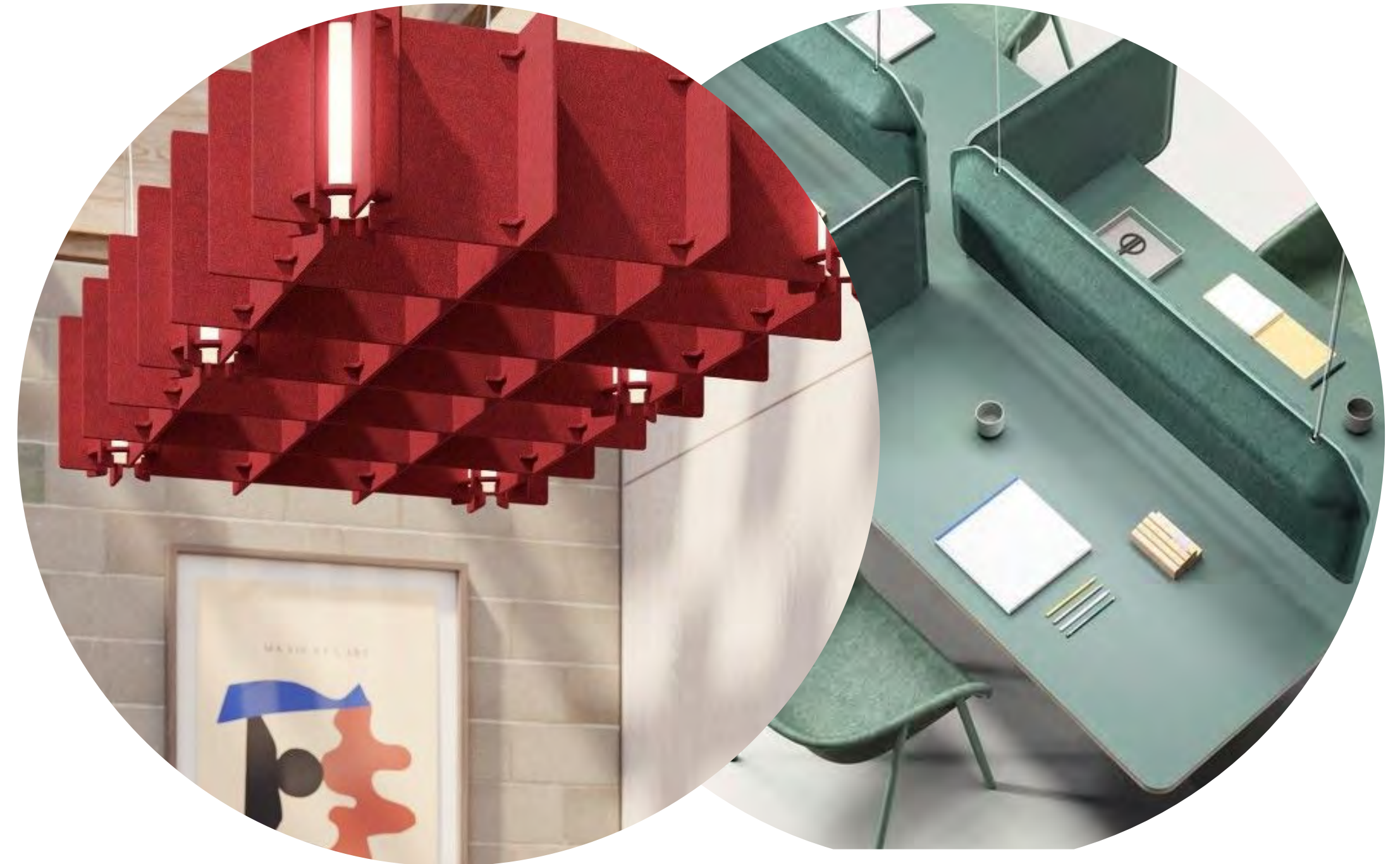
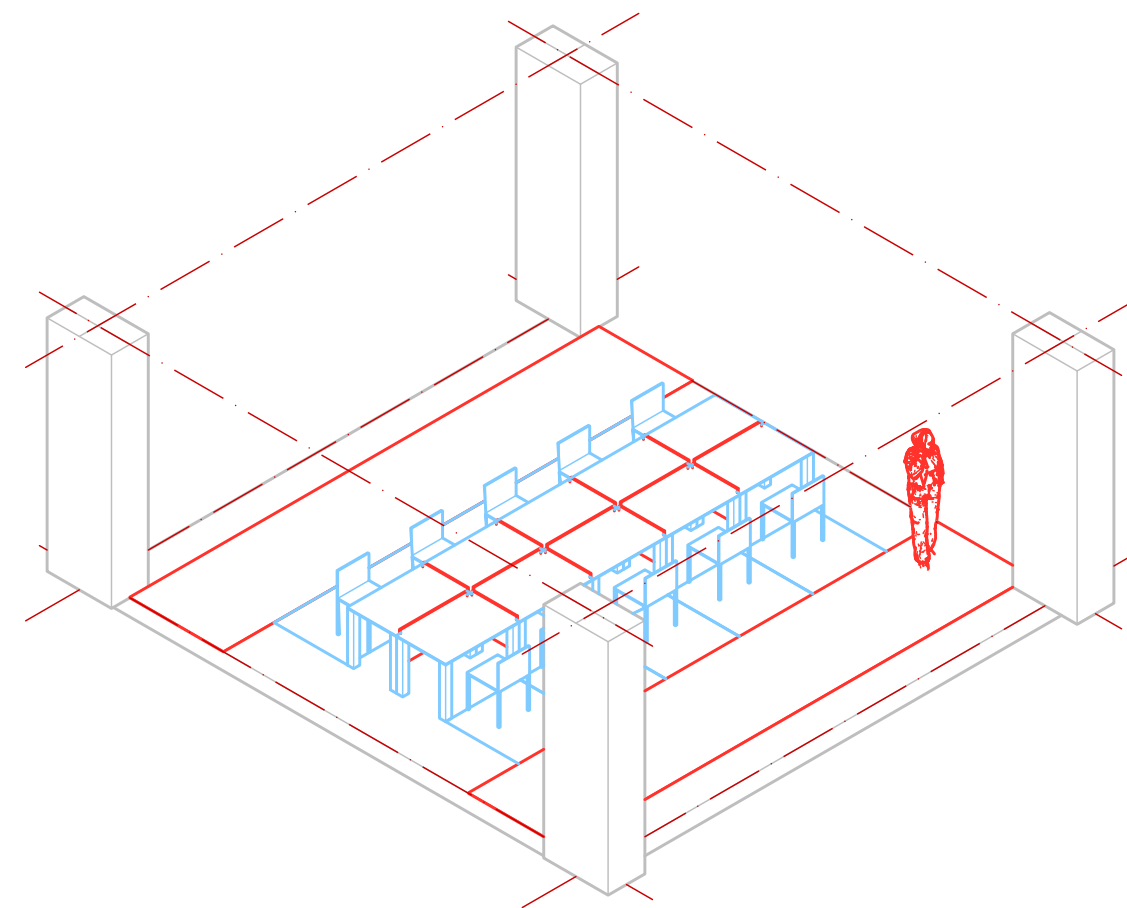
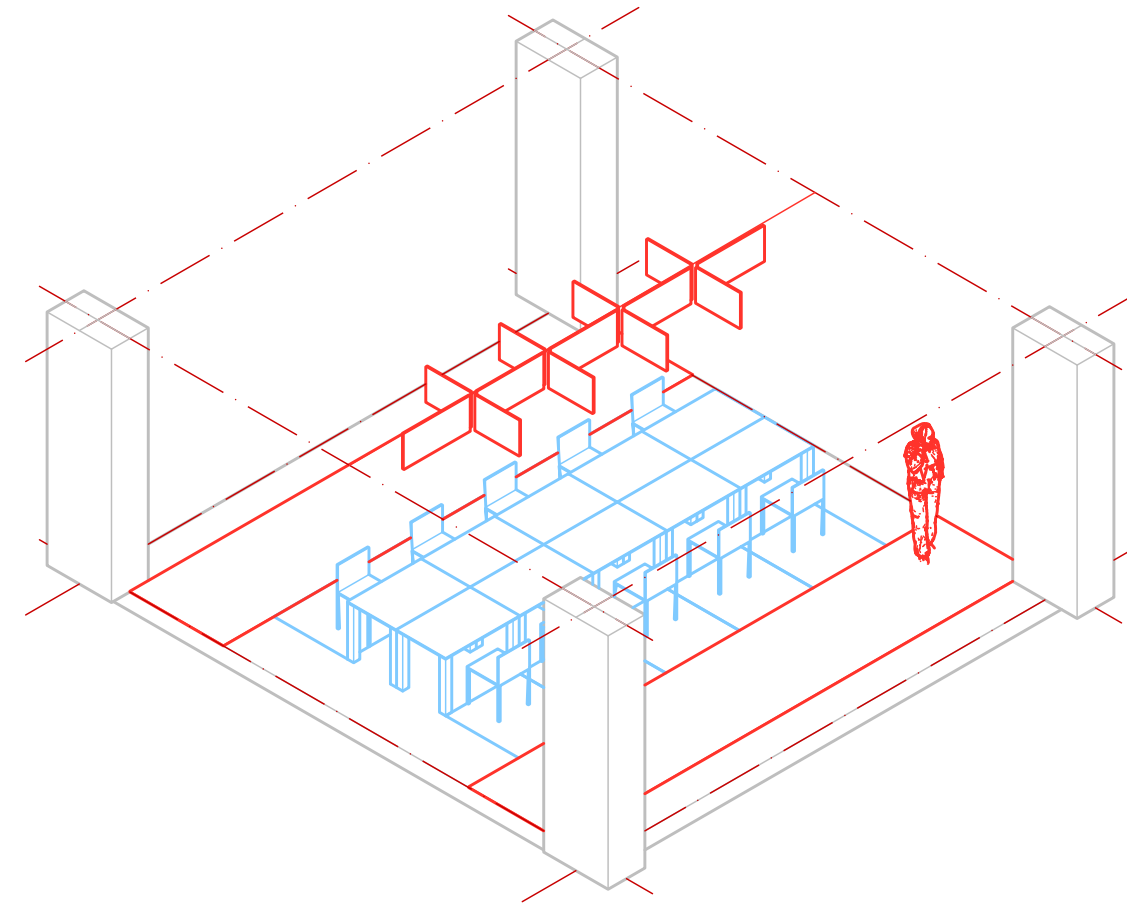
*open plan- strategy to
increase accessibility and
social interaction*

*soundblocks for auditory
adaptability*



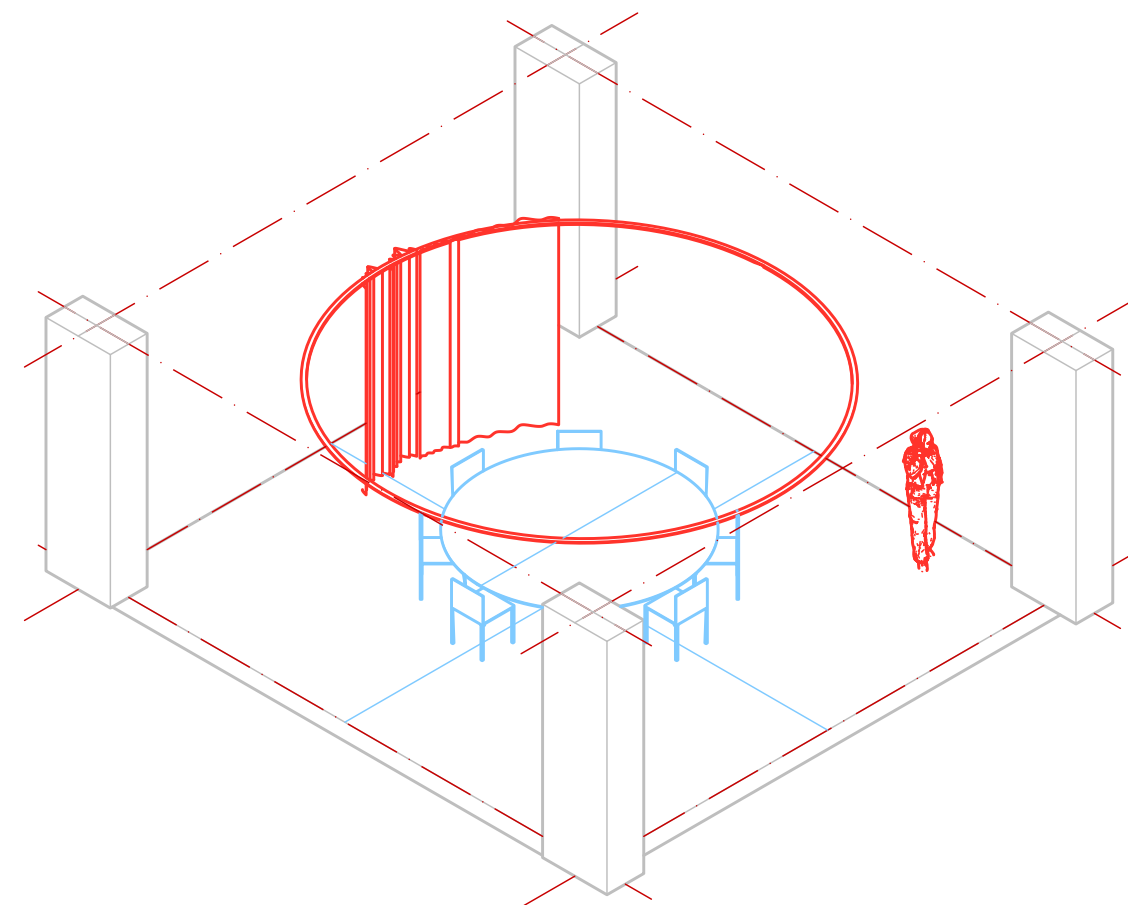
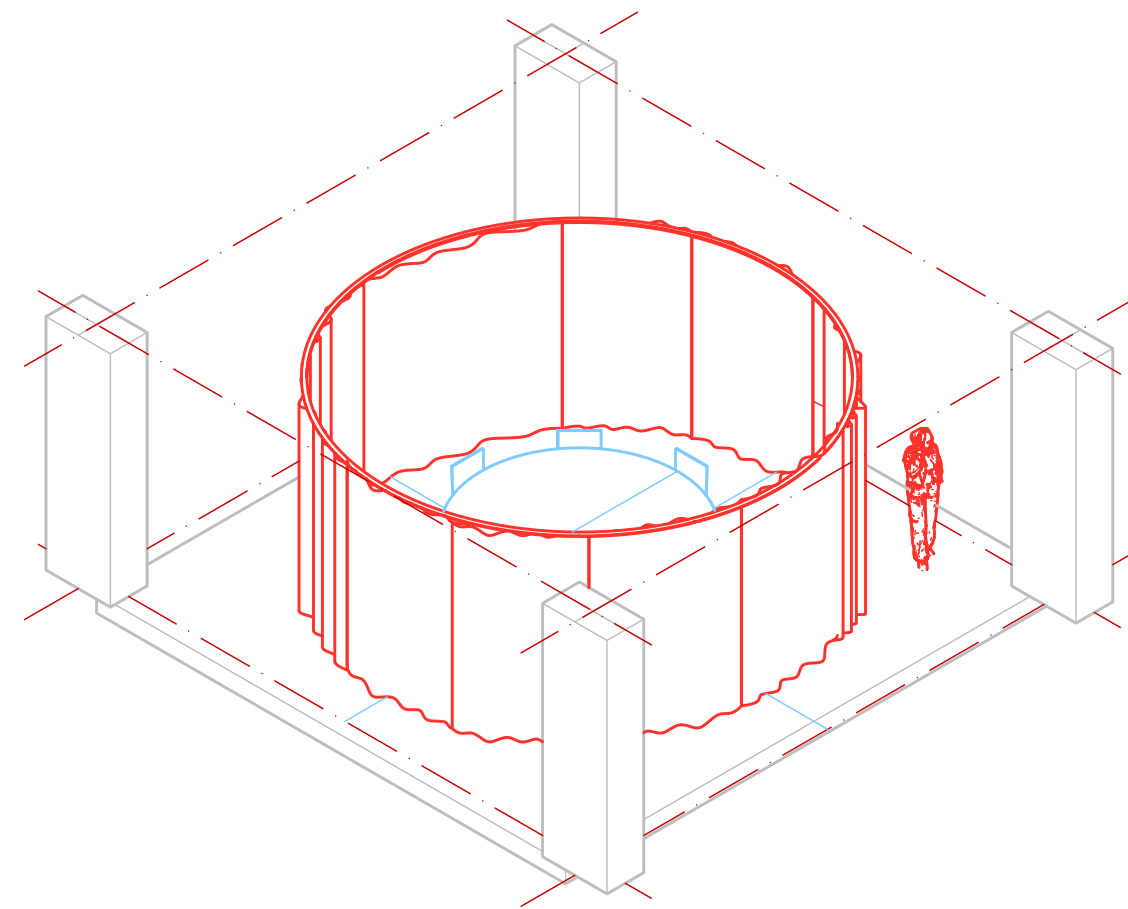
● SOUNDSCAPE ELEMENT

FIRST FLOOR



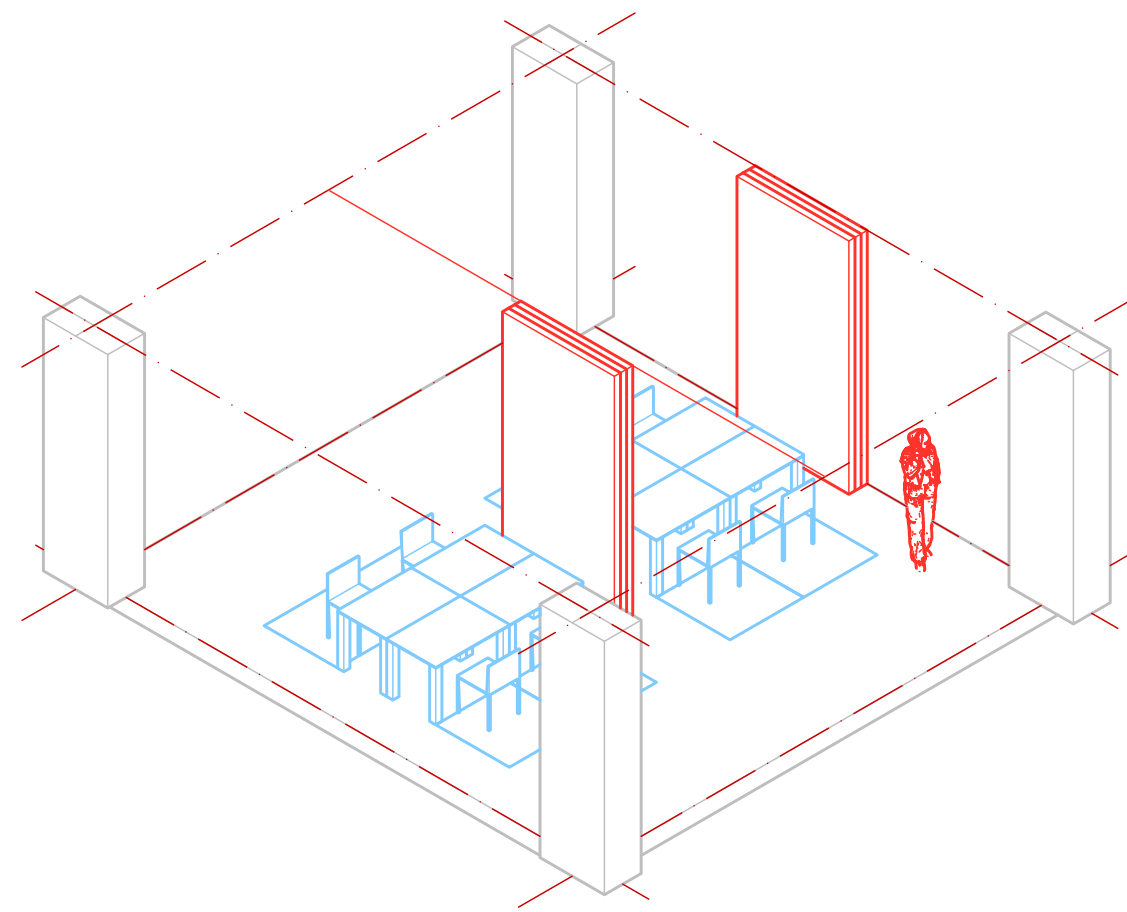
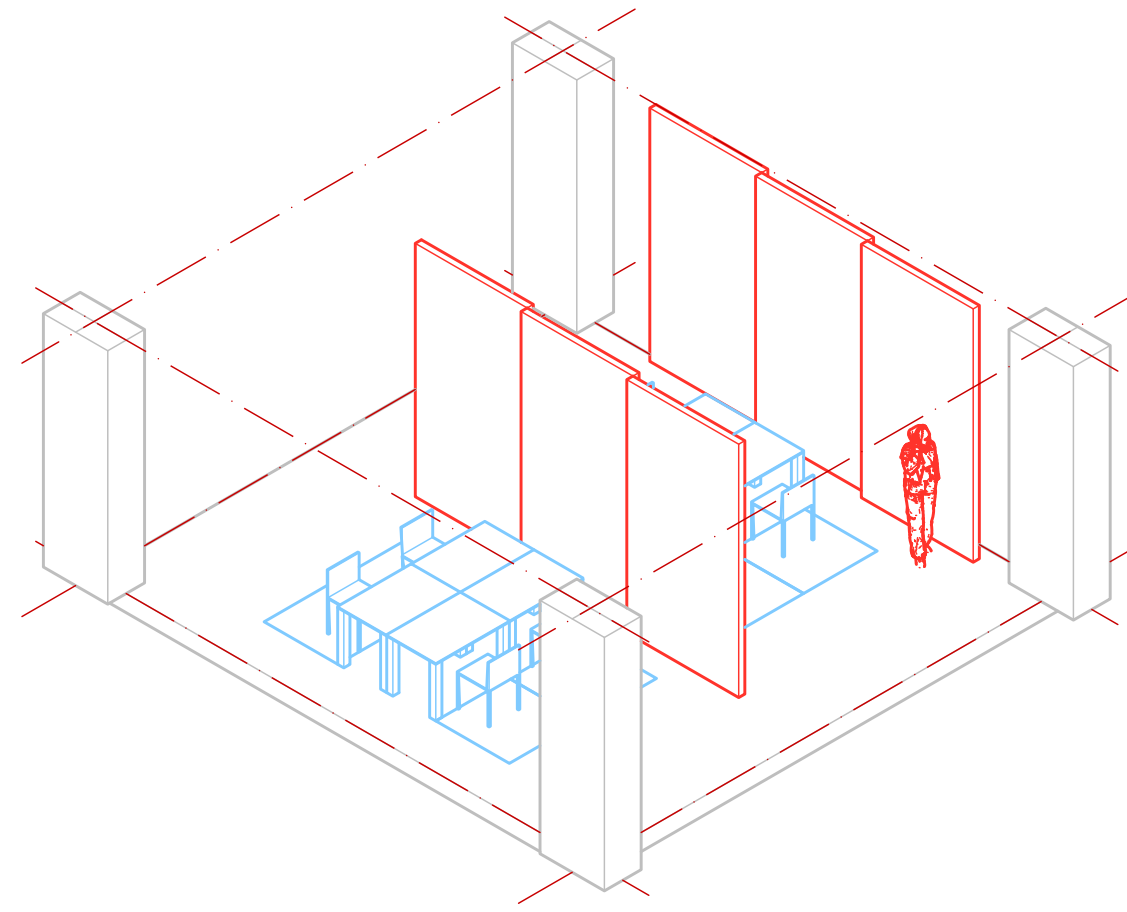
reference image

SOUND BLOCK CONCENTRATION



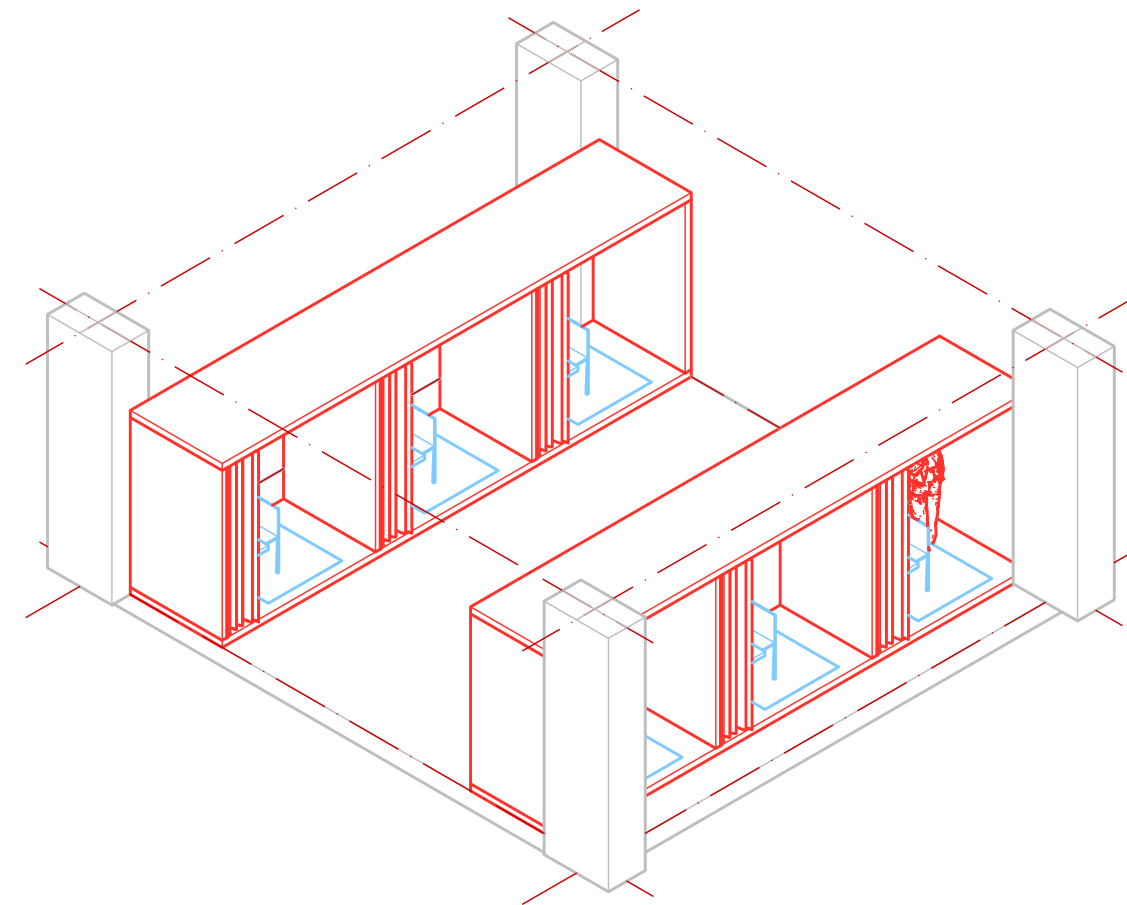
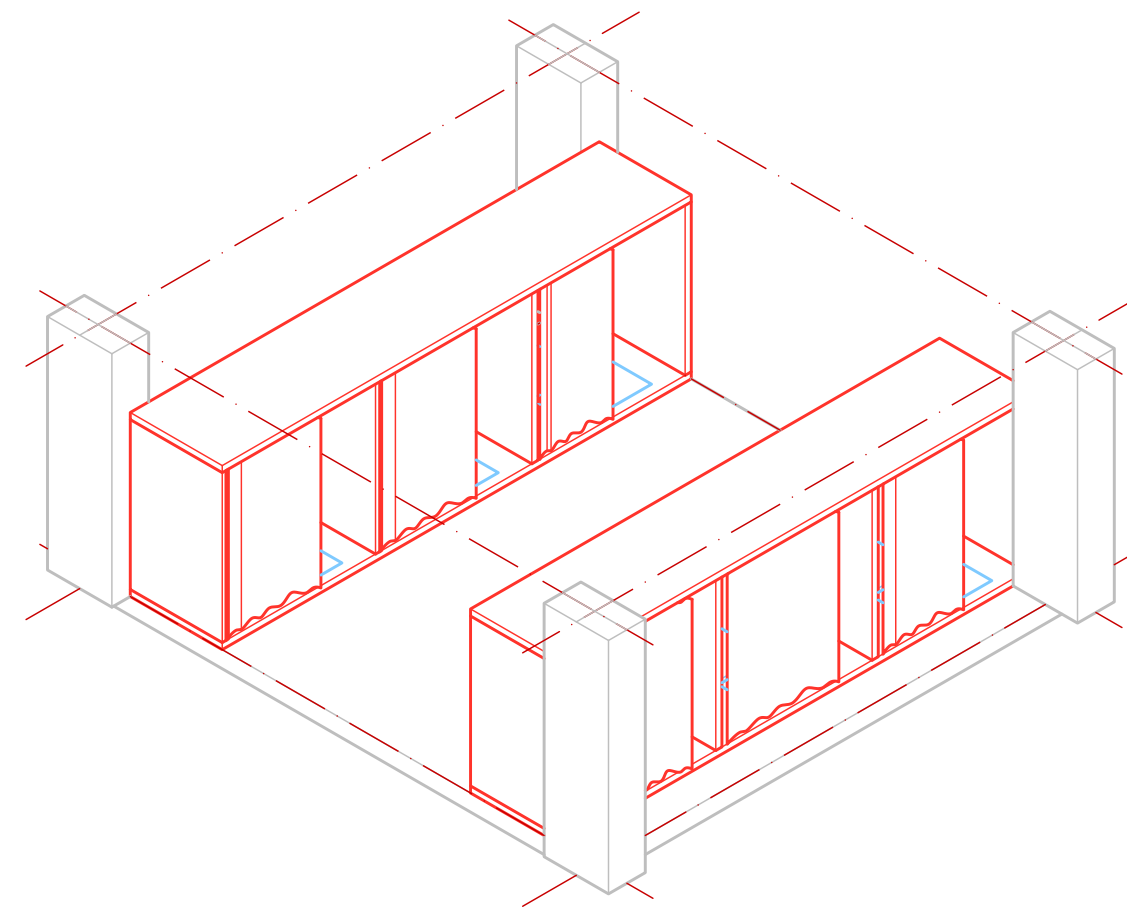
reference image

SOUND BLOCK MEETING



reference image

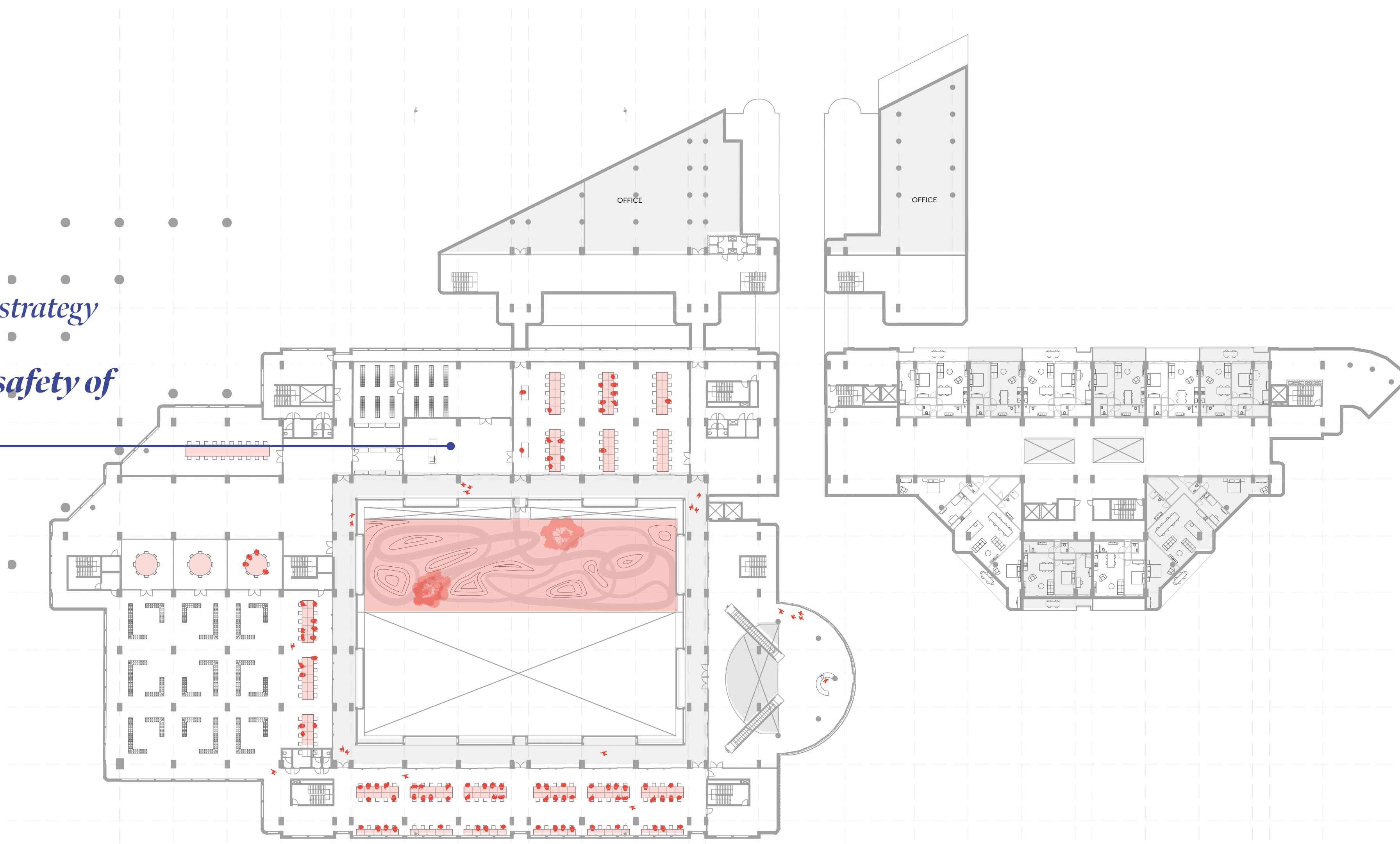
SOUND BLOCK GROUPWORK



reference image

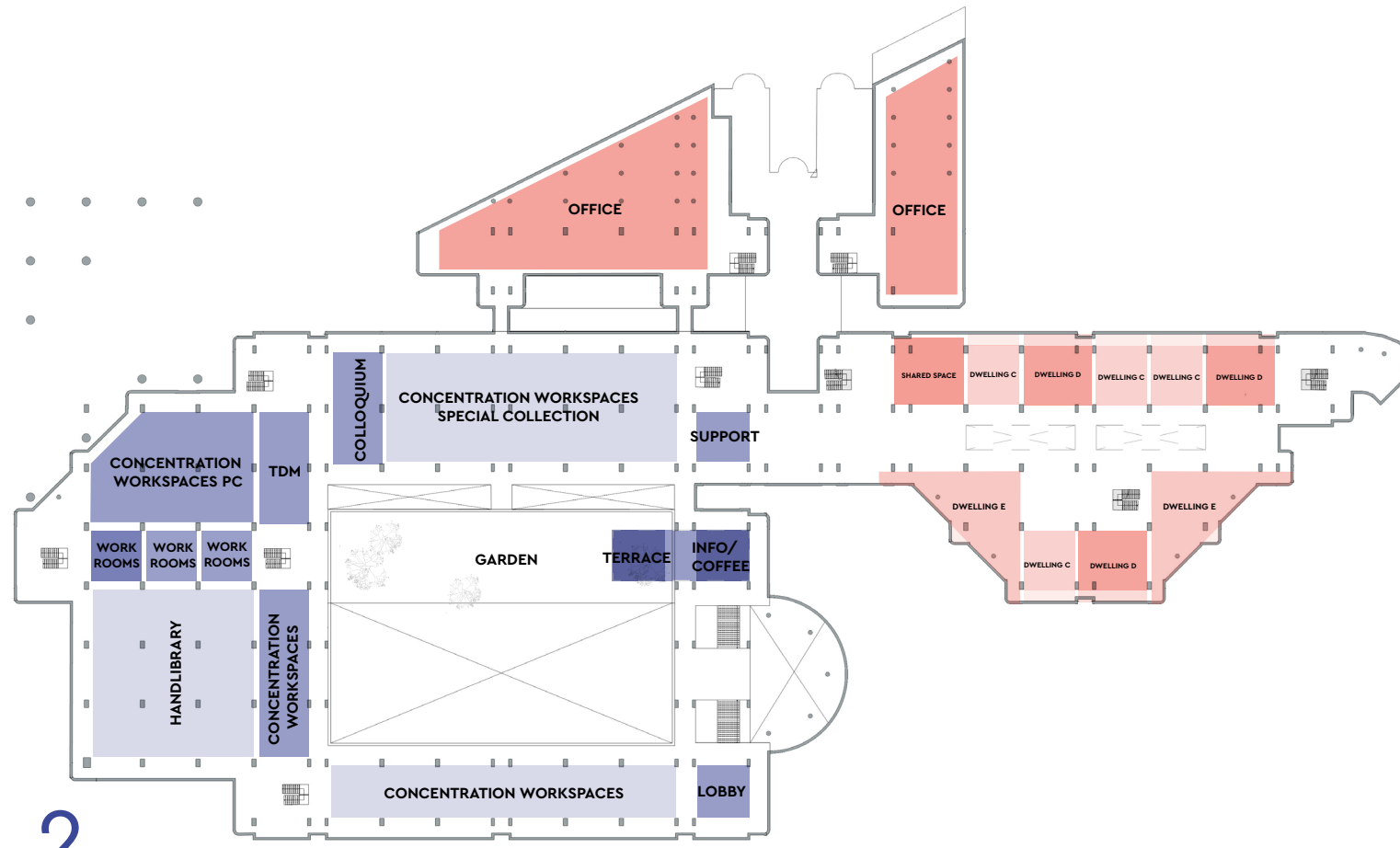
SOUND BLOCK ONLINE MEETING

*lightly seperated - strategy
to increase sound
absorbtion and safety of
valuabke books*

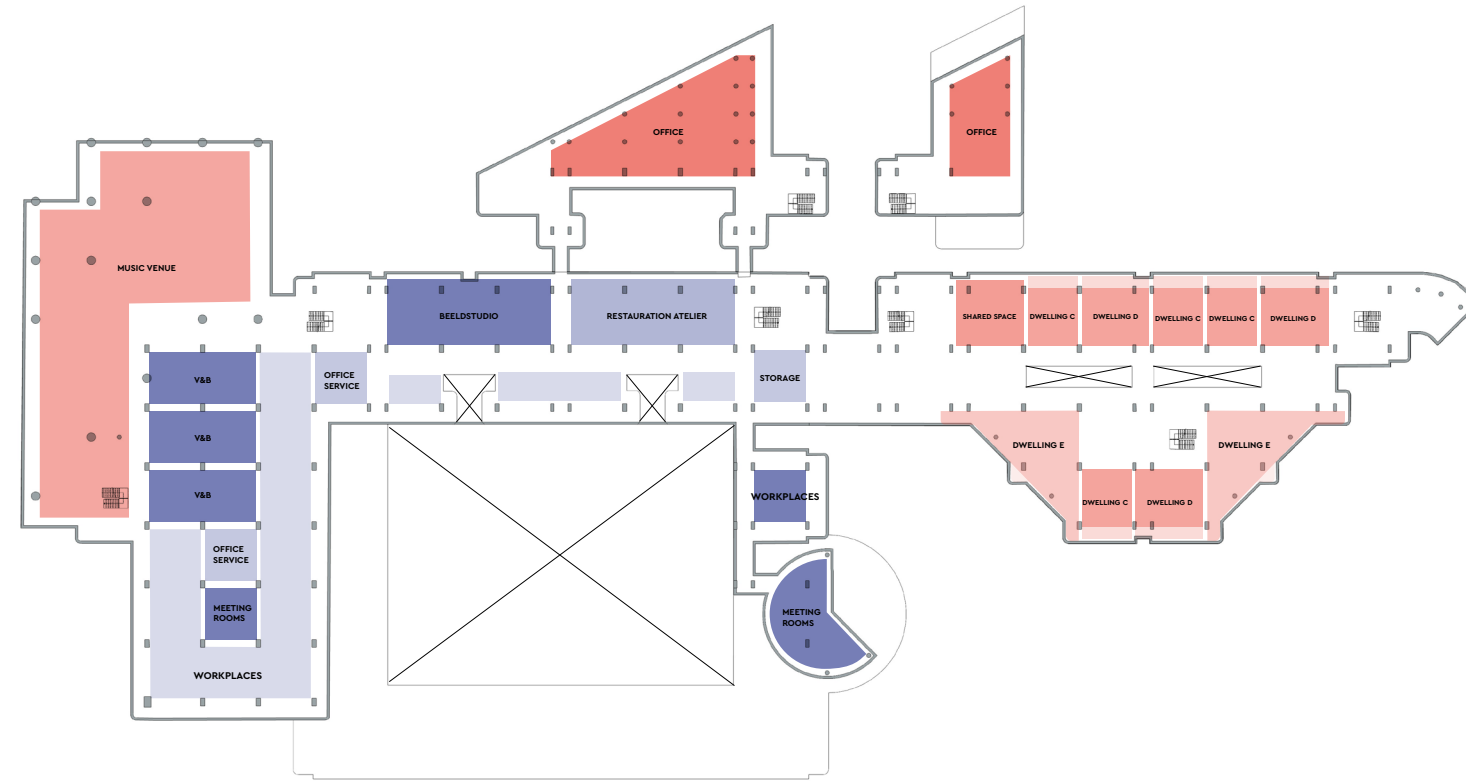


● SOUNDSCAPE ELEMENT

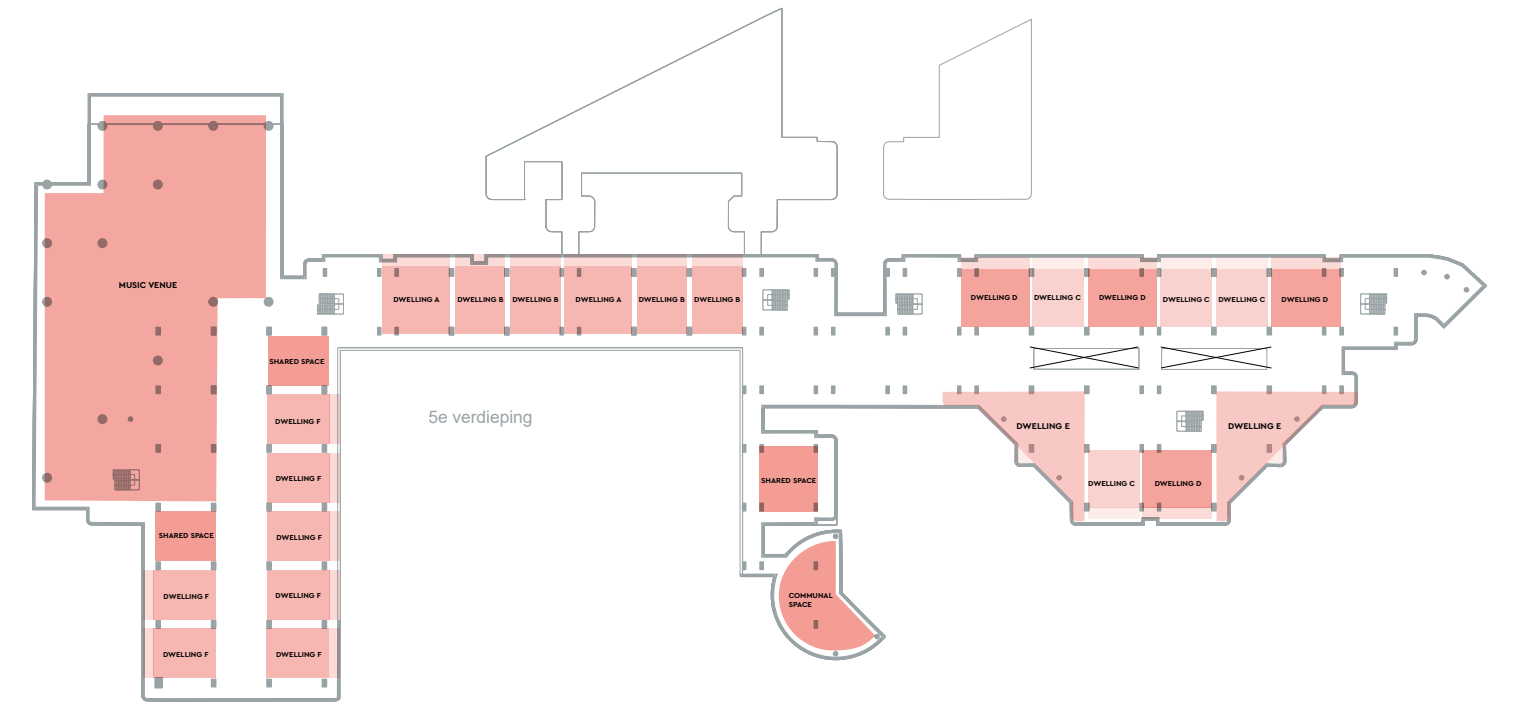
SECOND FLOOR



2.



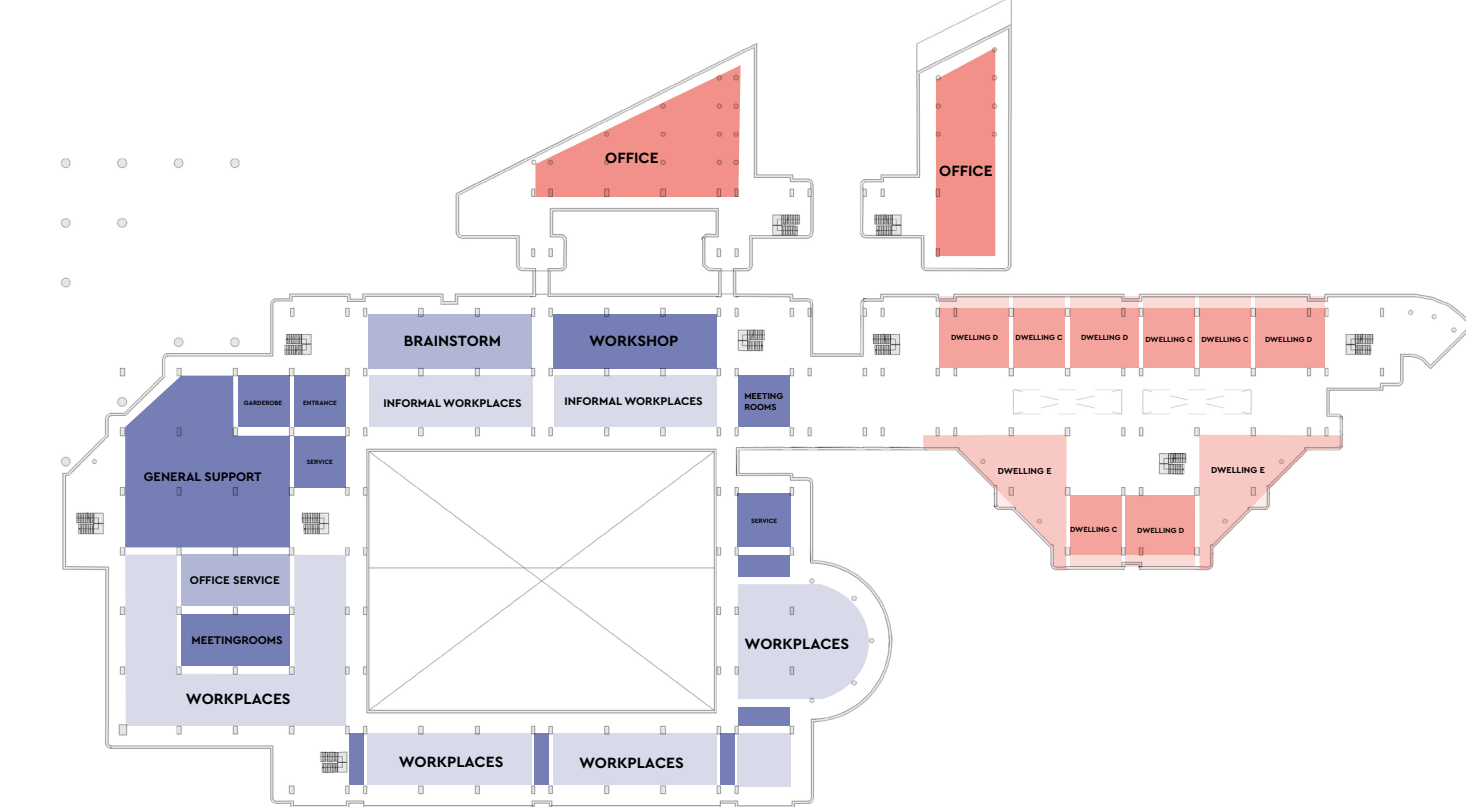
4.



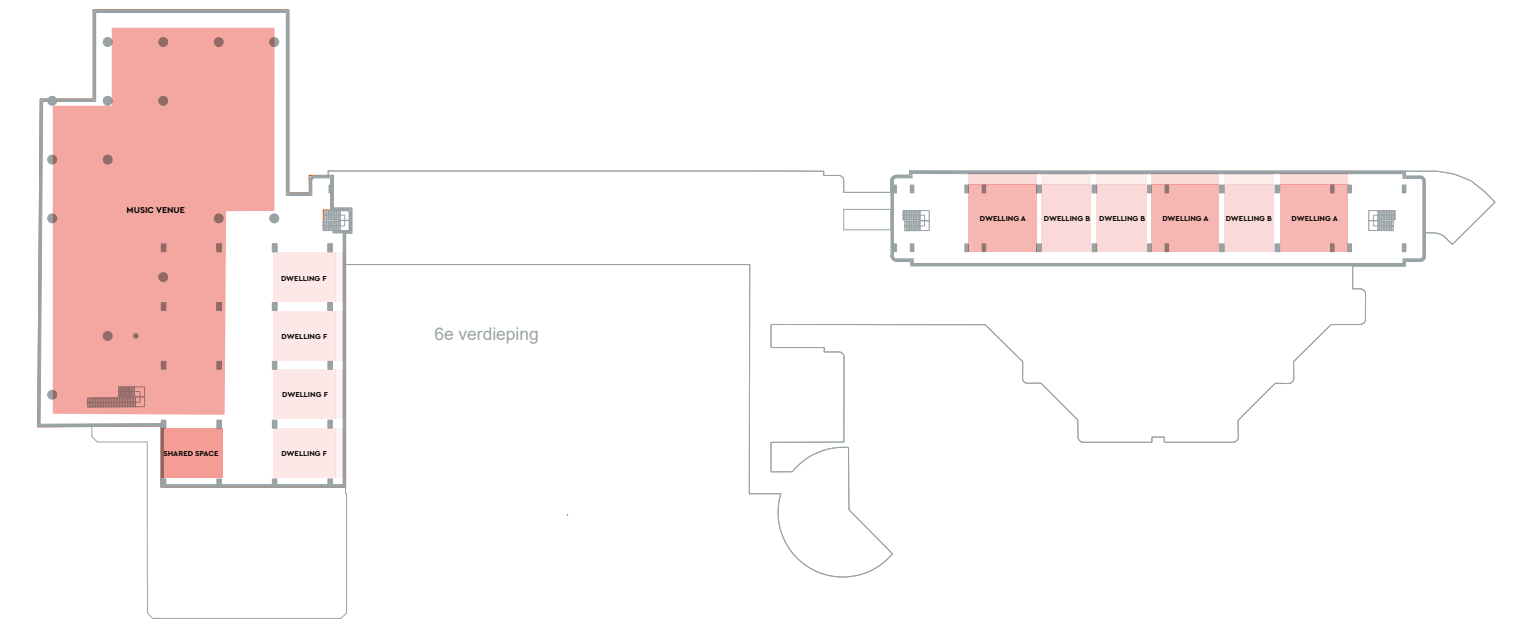
5.



1.



3.



6.

- KB
- NEW PROGRAMME

MASTERPLAN



courtyard

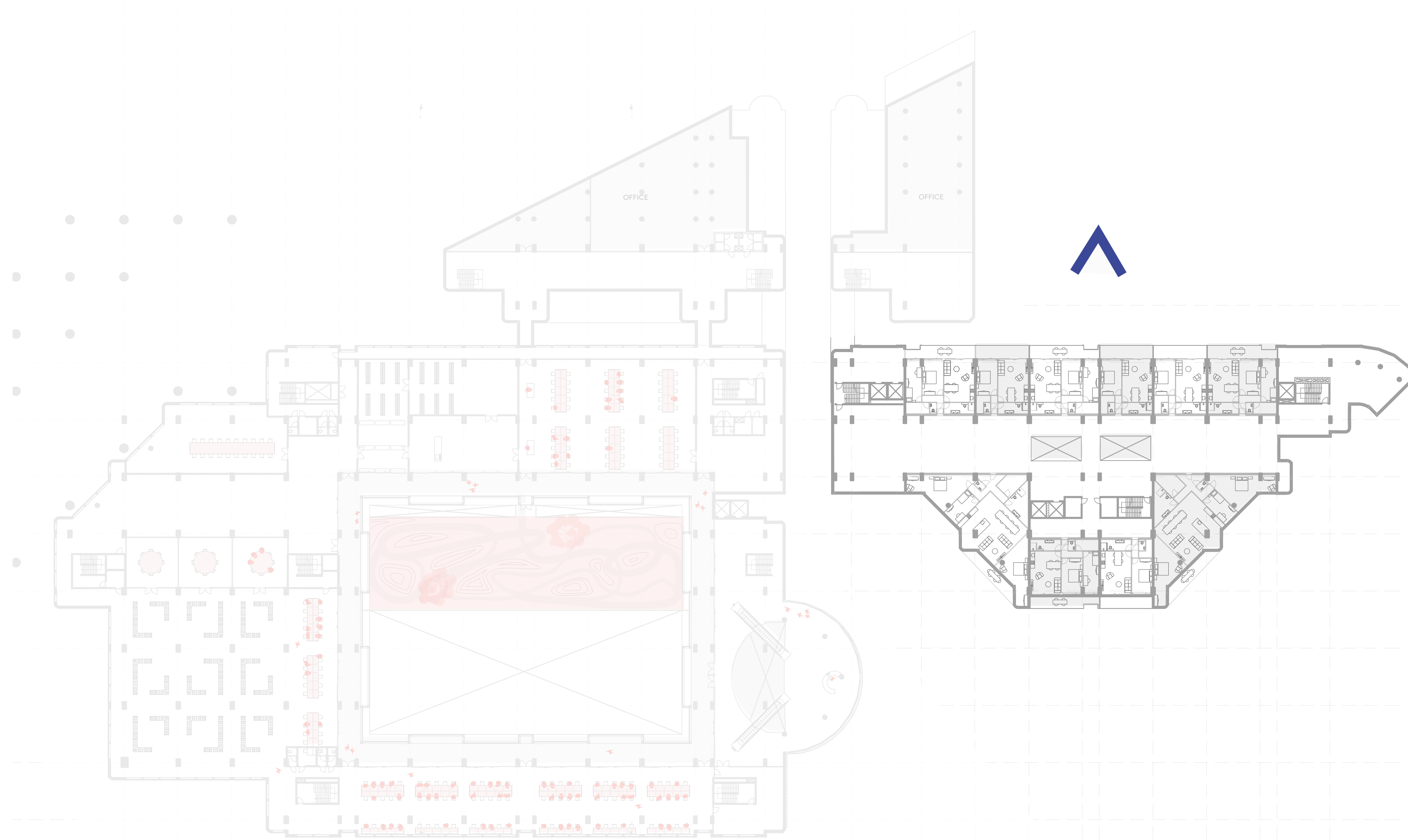
*same
rythm*

*gutter
at grid
line*

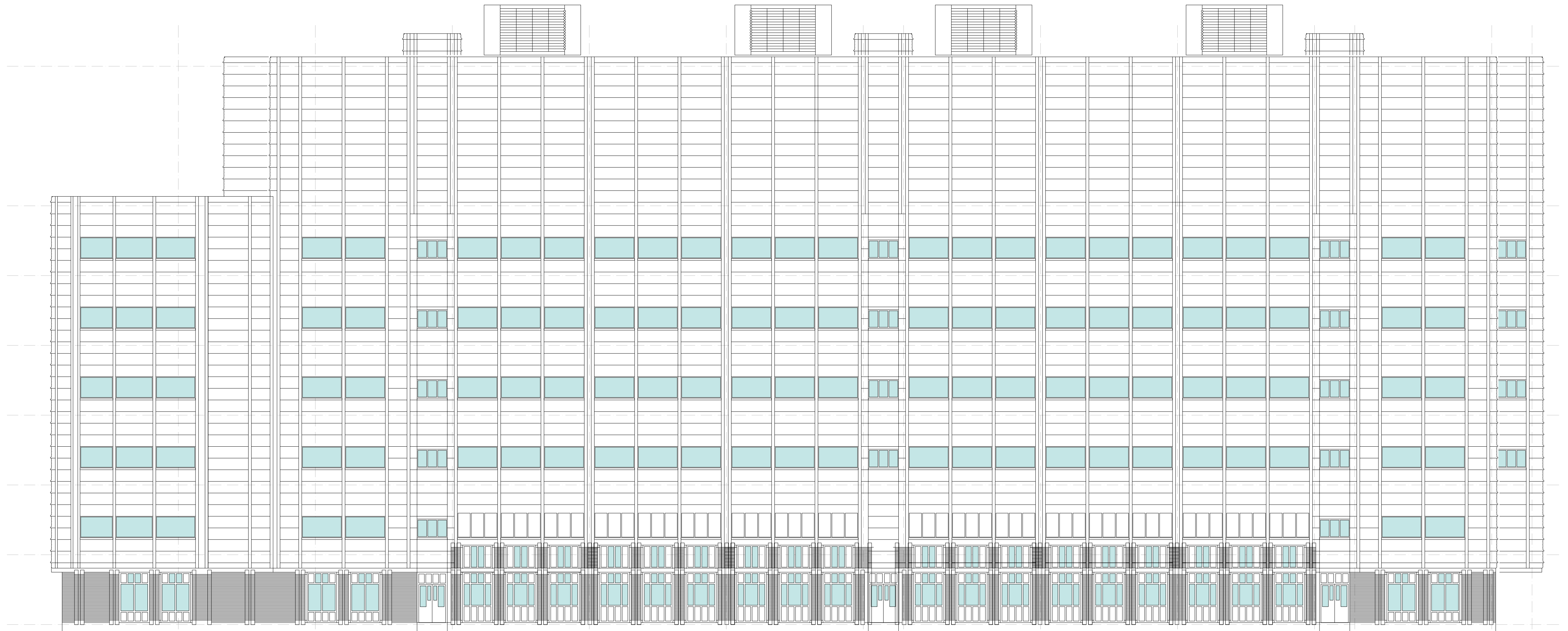


street side

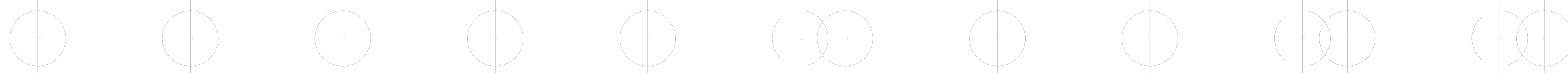
FACADES



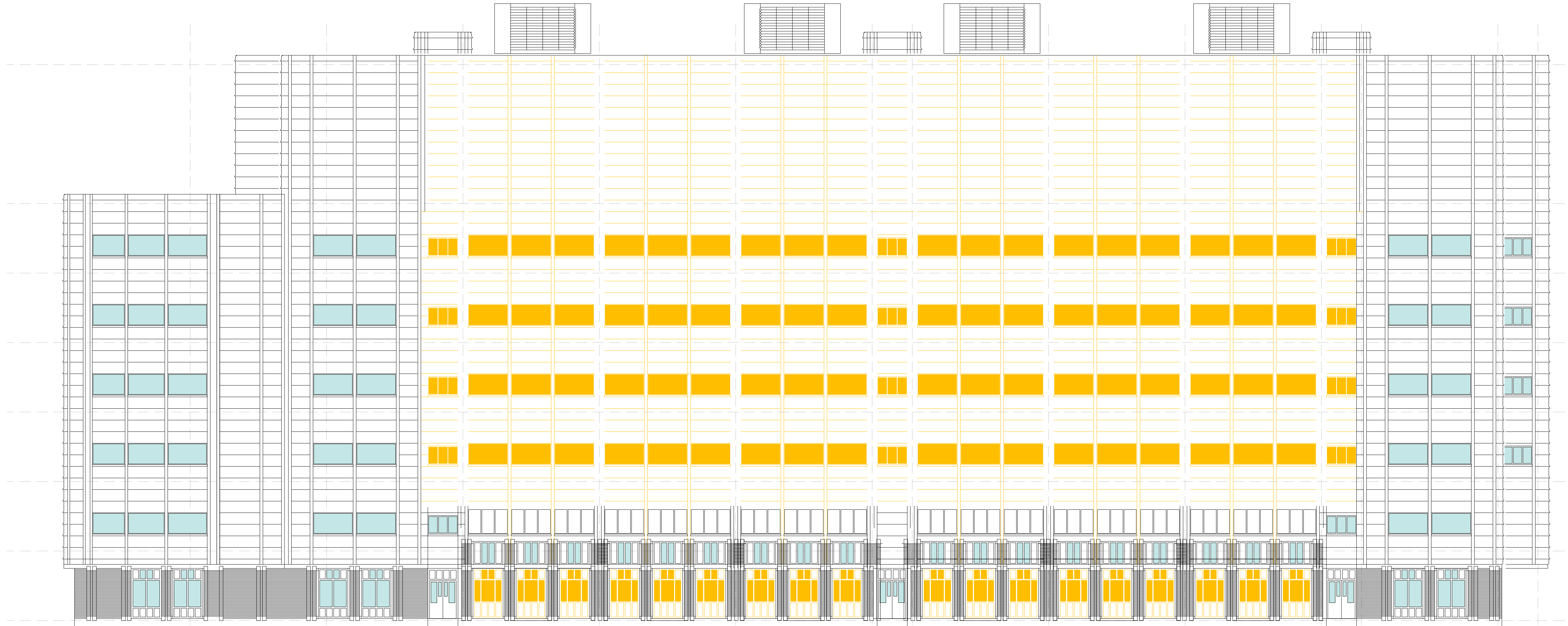
FACADES



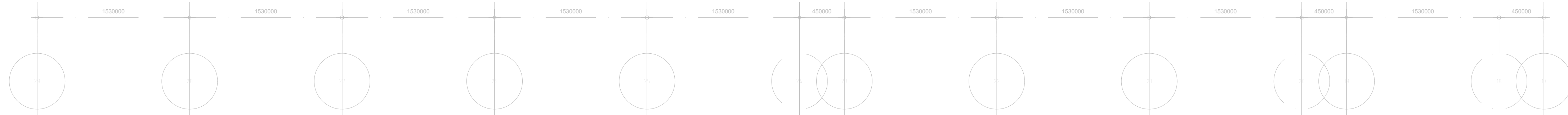
1530000 1530000 1530000 1530000 1530000 450000 1530000 1530000 1530000 450000 1530000 450000



FACADE PART I EXISTING



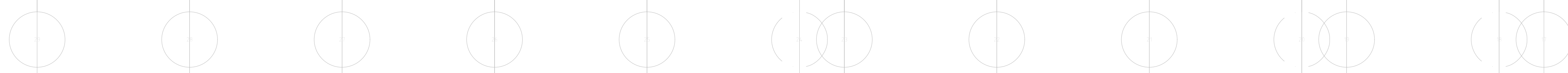
FACADE PART I REMOVE



FACADE PART I ADD



1530000 1530000 1530000 1530000 1530000 450000 1530000 1530000 1530000 450000 1530000 450000



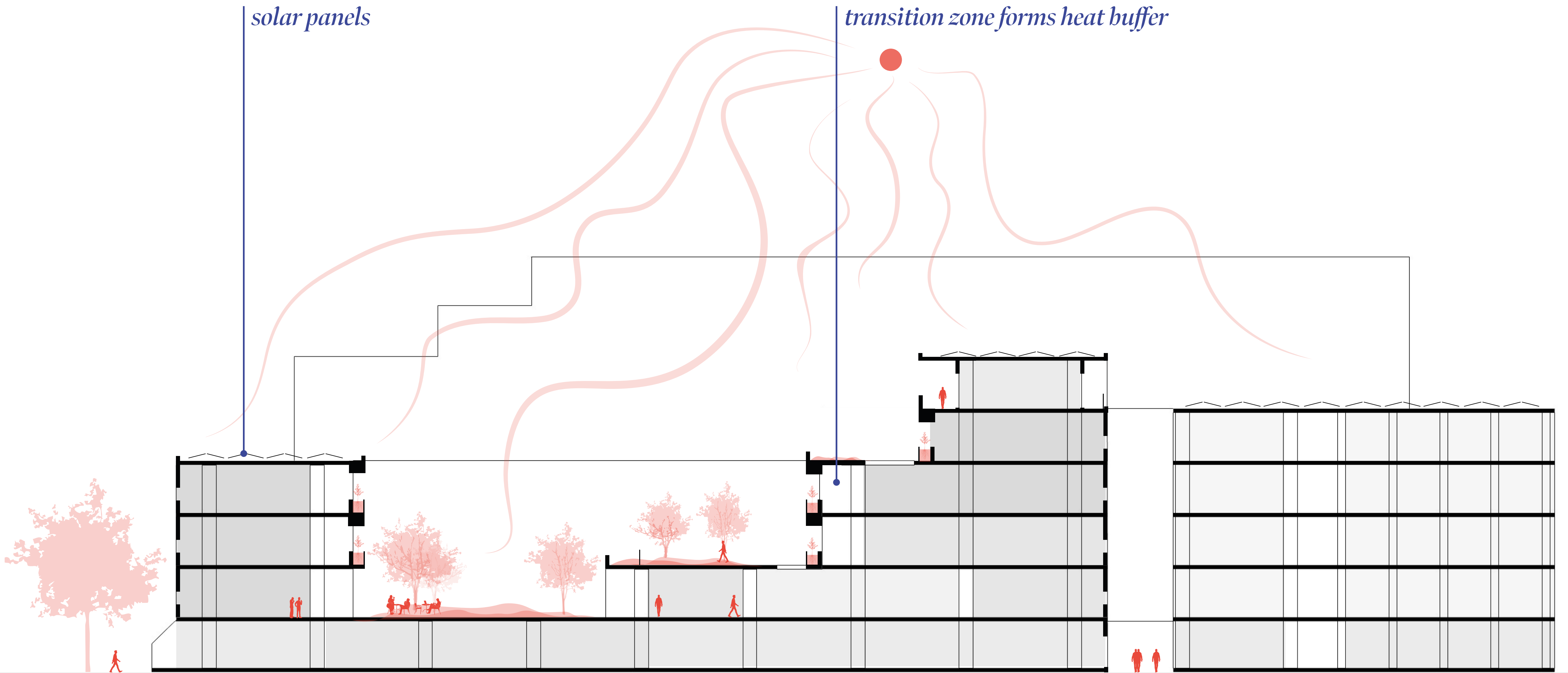
FACADE PART I NEW

BUILDING TECHNOLOGY

technical systems and fragment

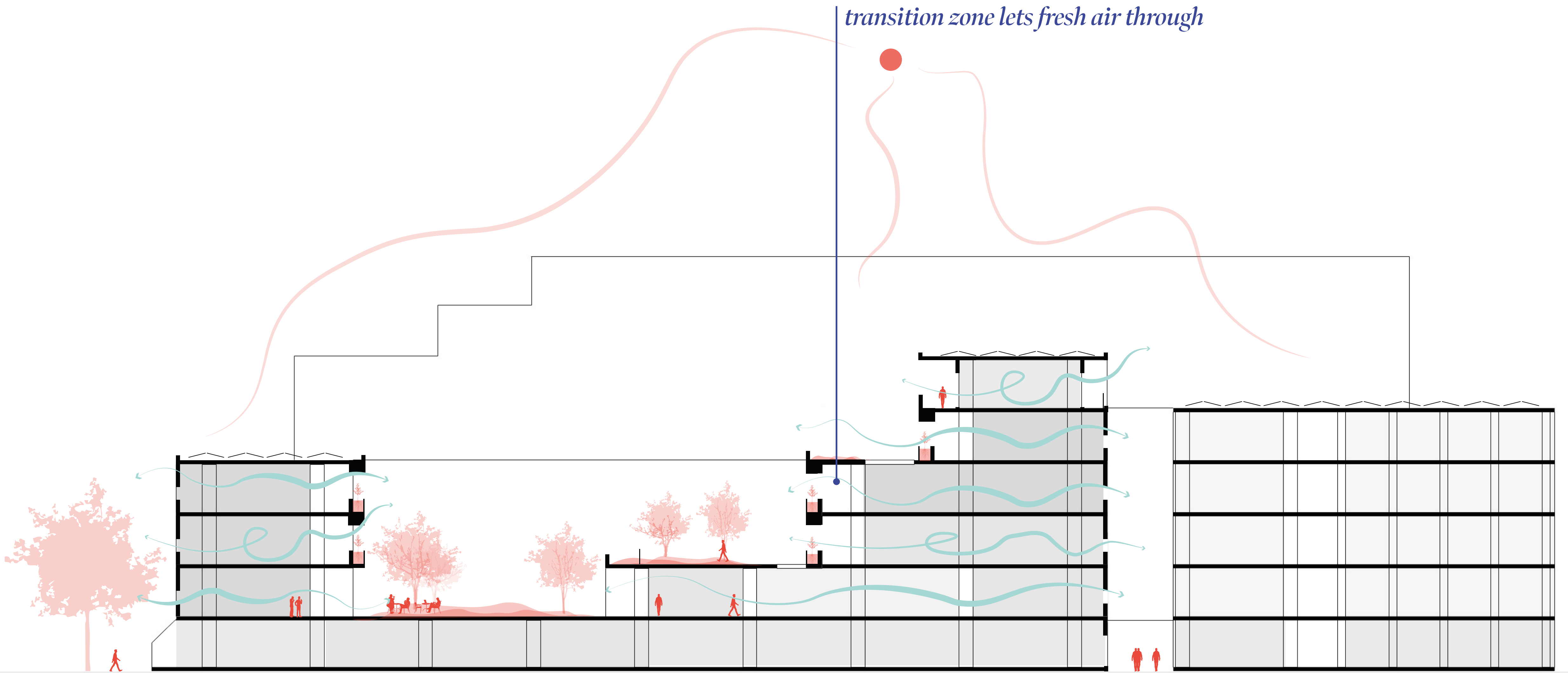
solar panels

transition zone forms heat buffer

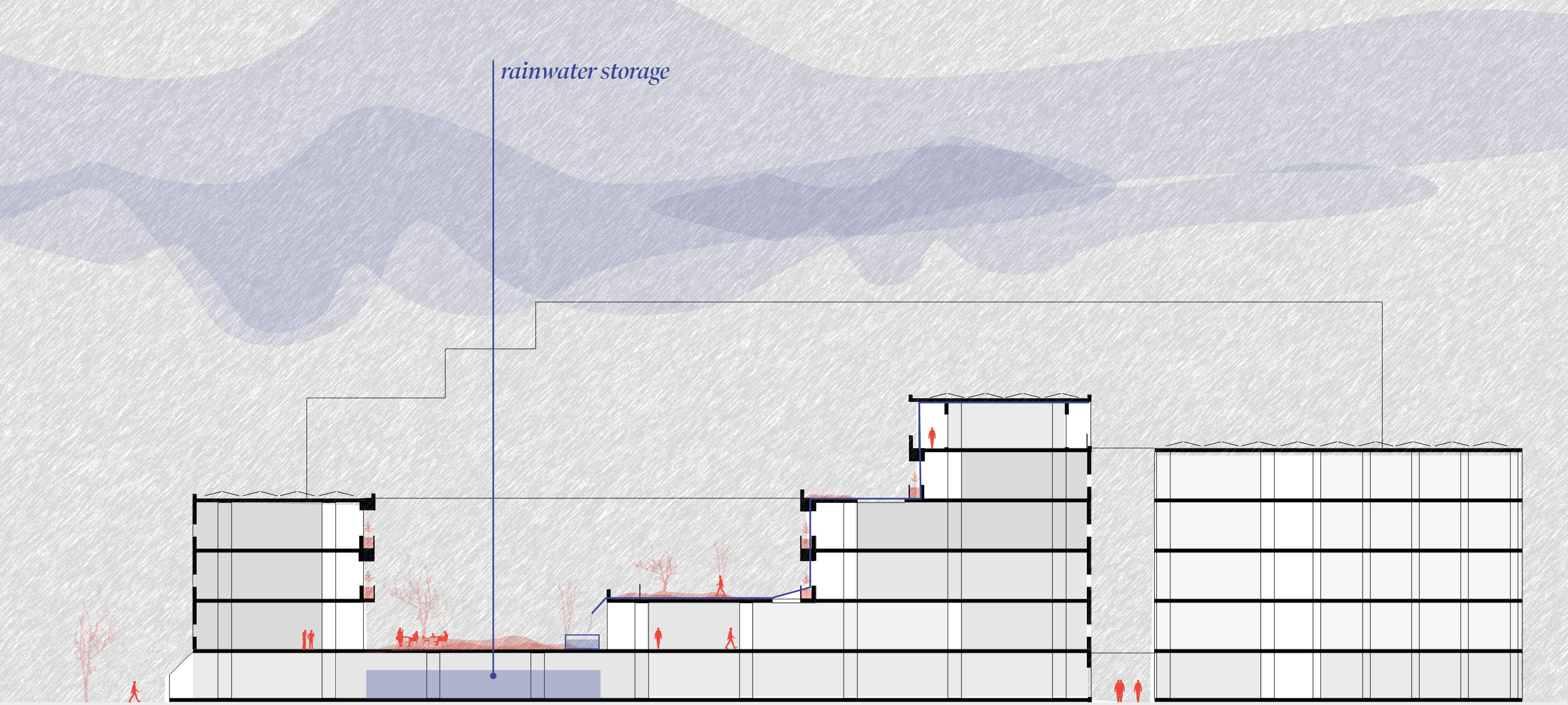


CLIMATE SYSTEM SUMMER

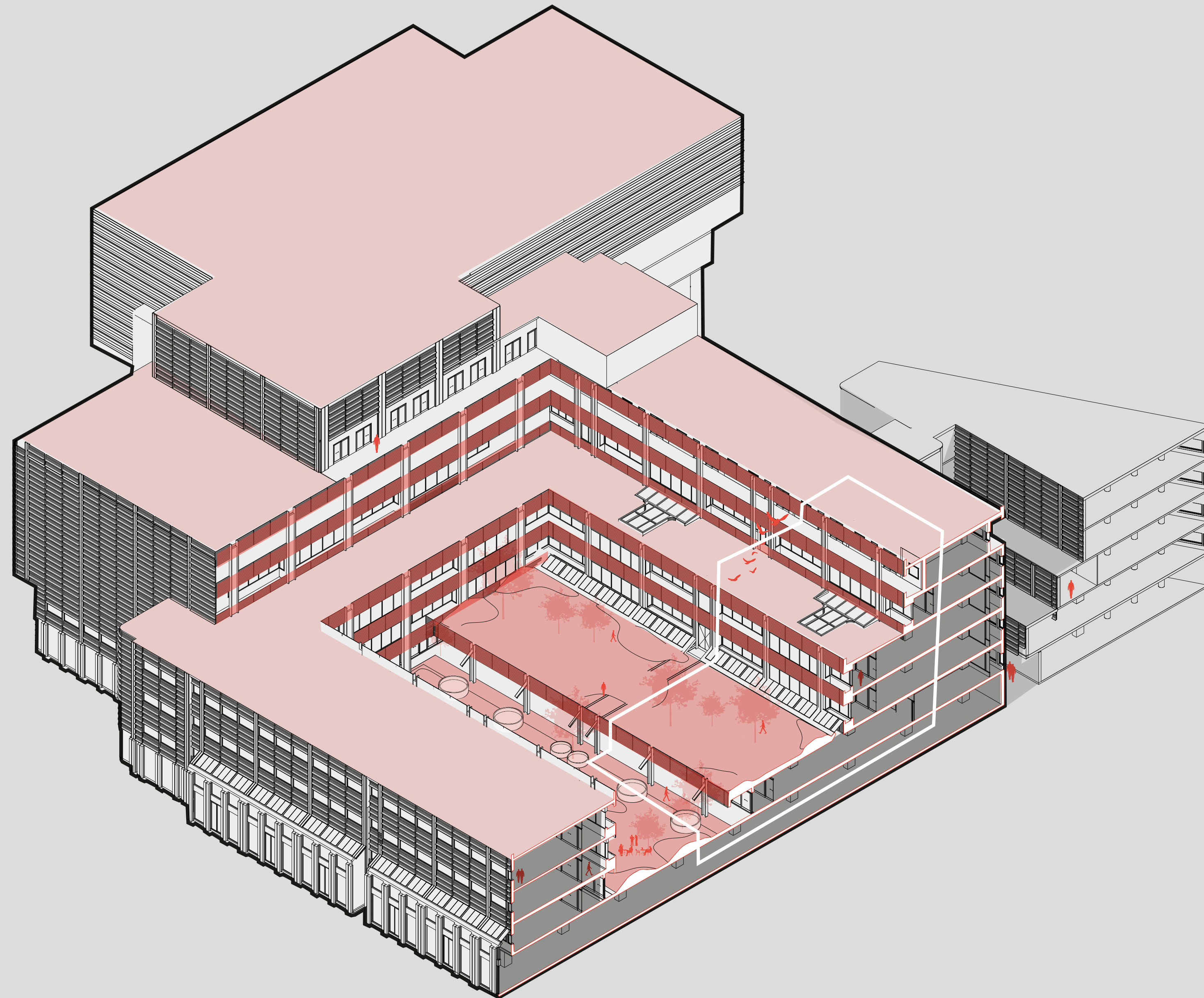
transition zone lets fresh air through



CLIMATE SYSTEM **SPRING/AUTUMN**



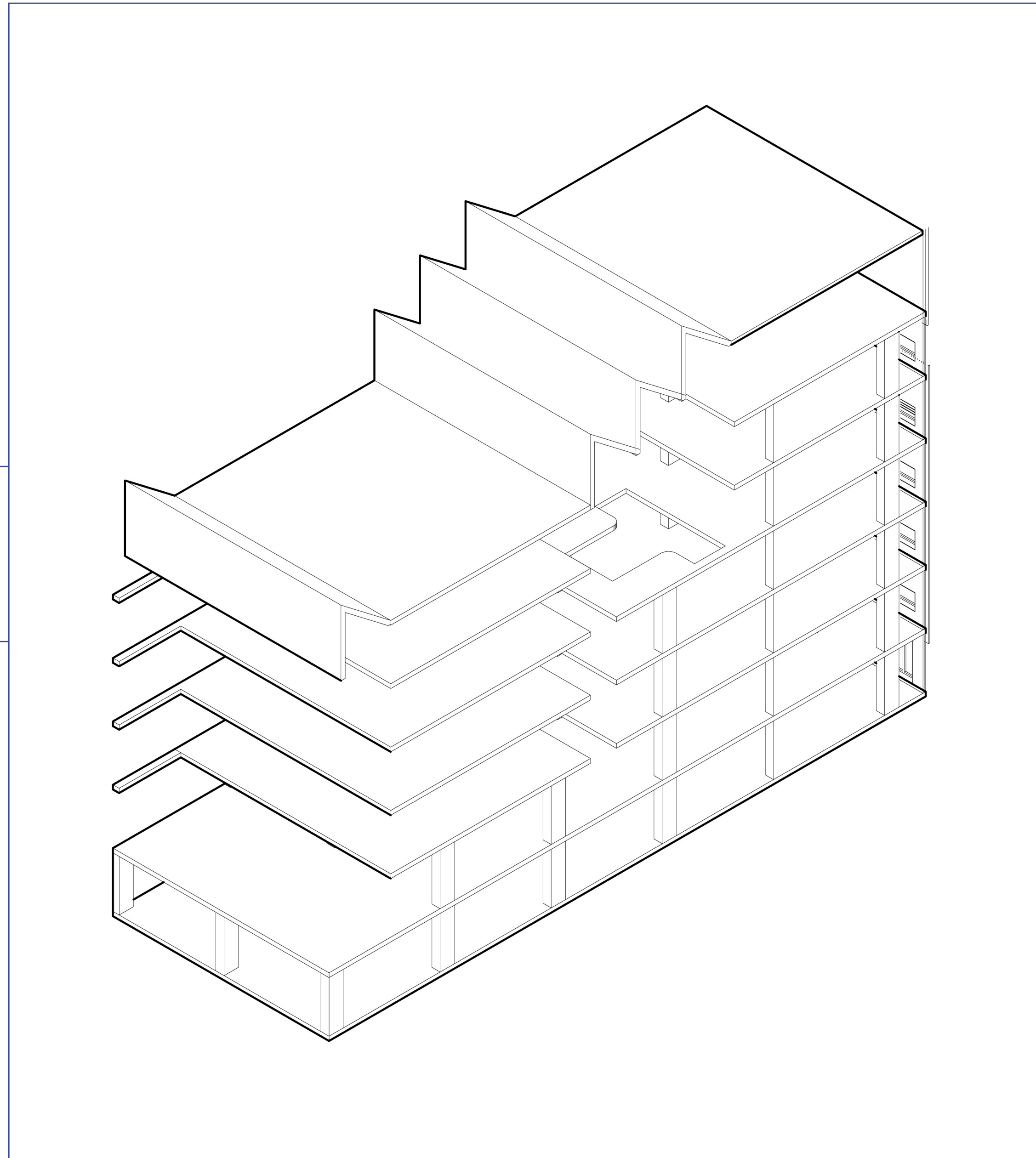
CLIMATE SYSTEM WINTER



FRAGMENT LOCATION

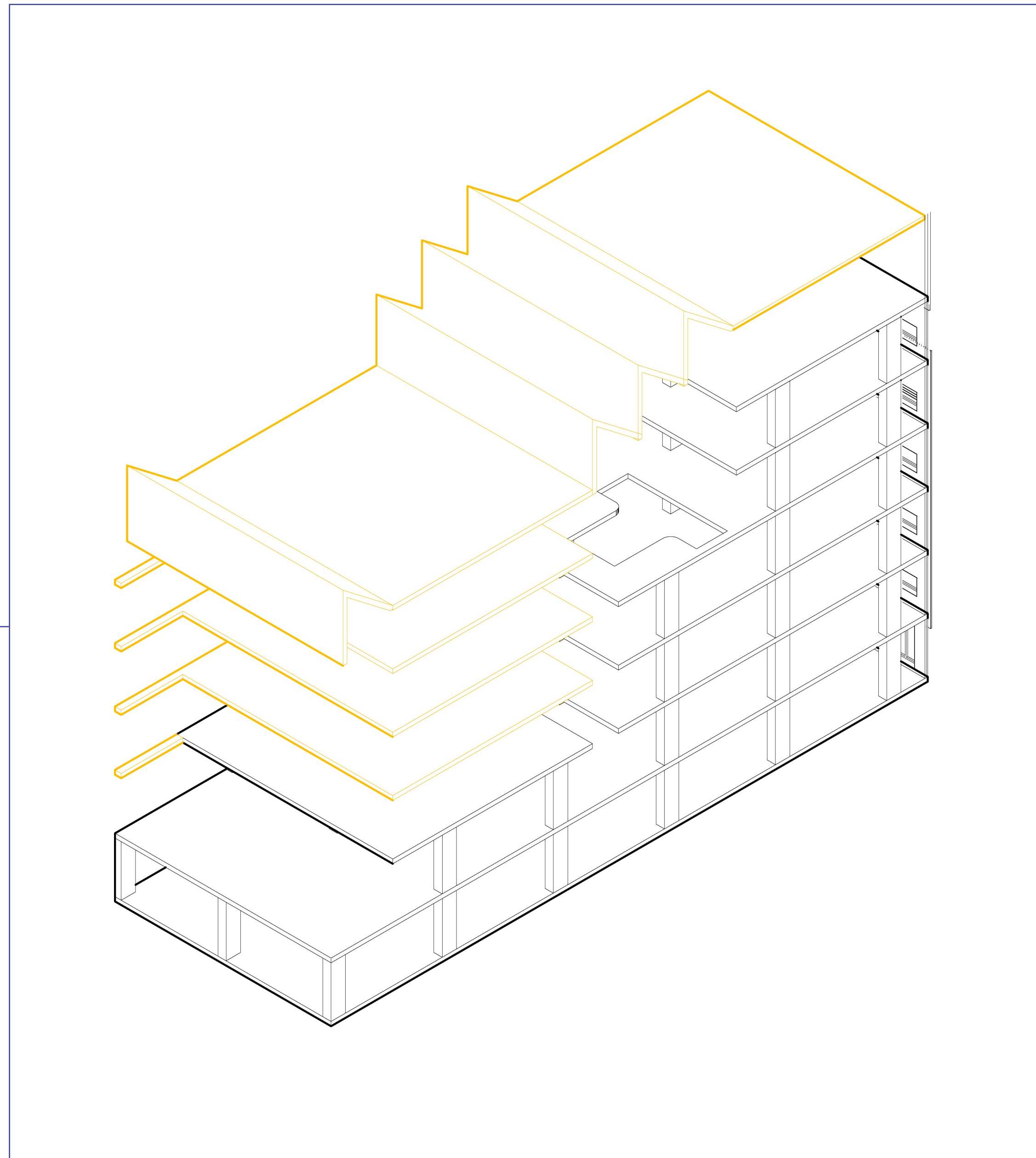
roof has steel construction

existing structure
1939 m³ concrete



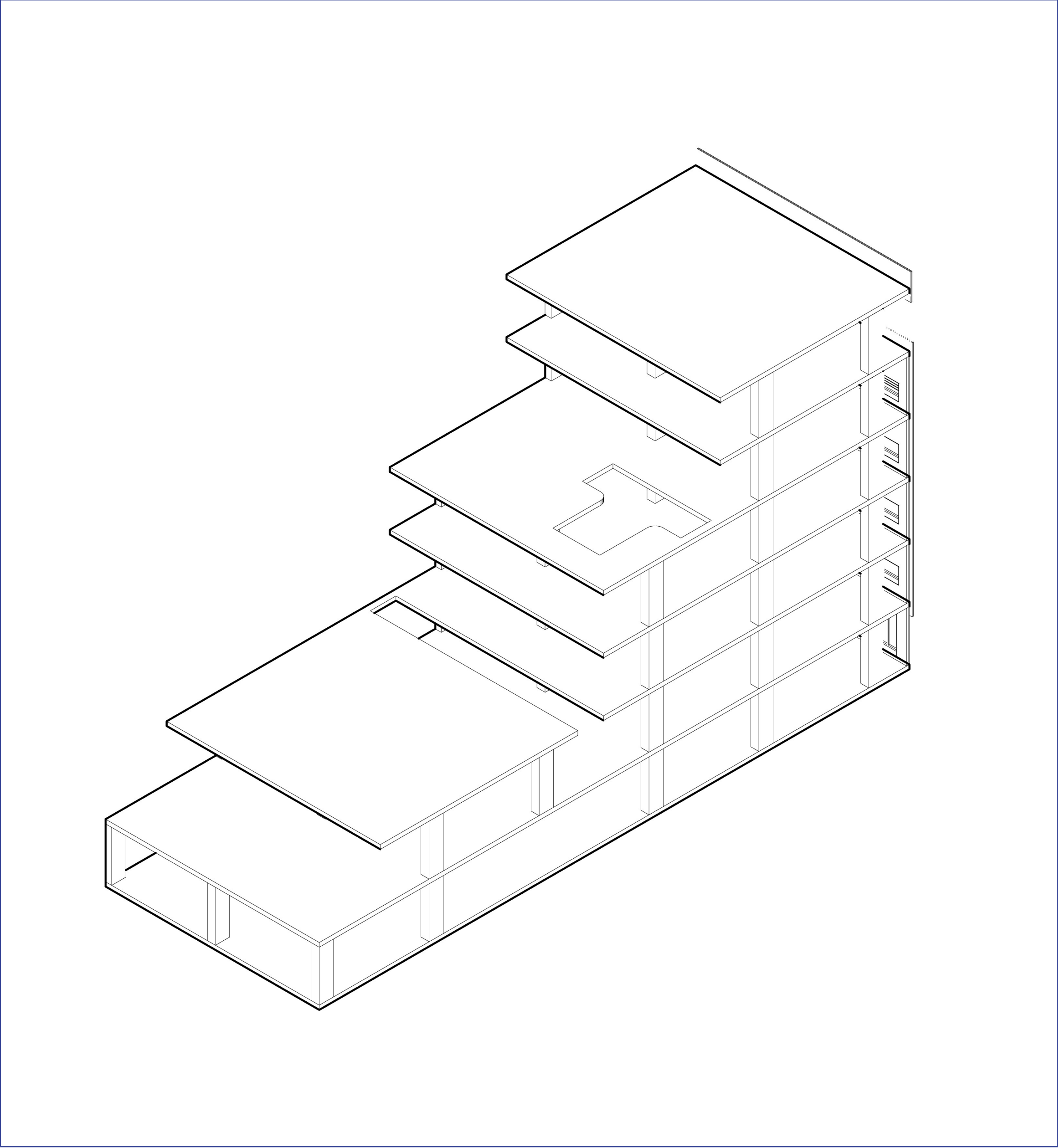
*1564m³ concrete
81% re-use*

*existing facade surface
75% re-use*

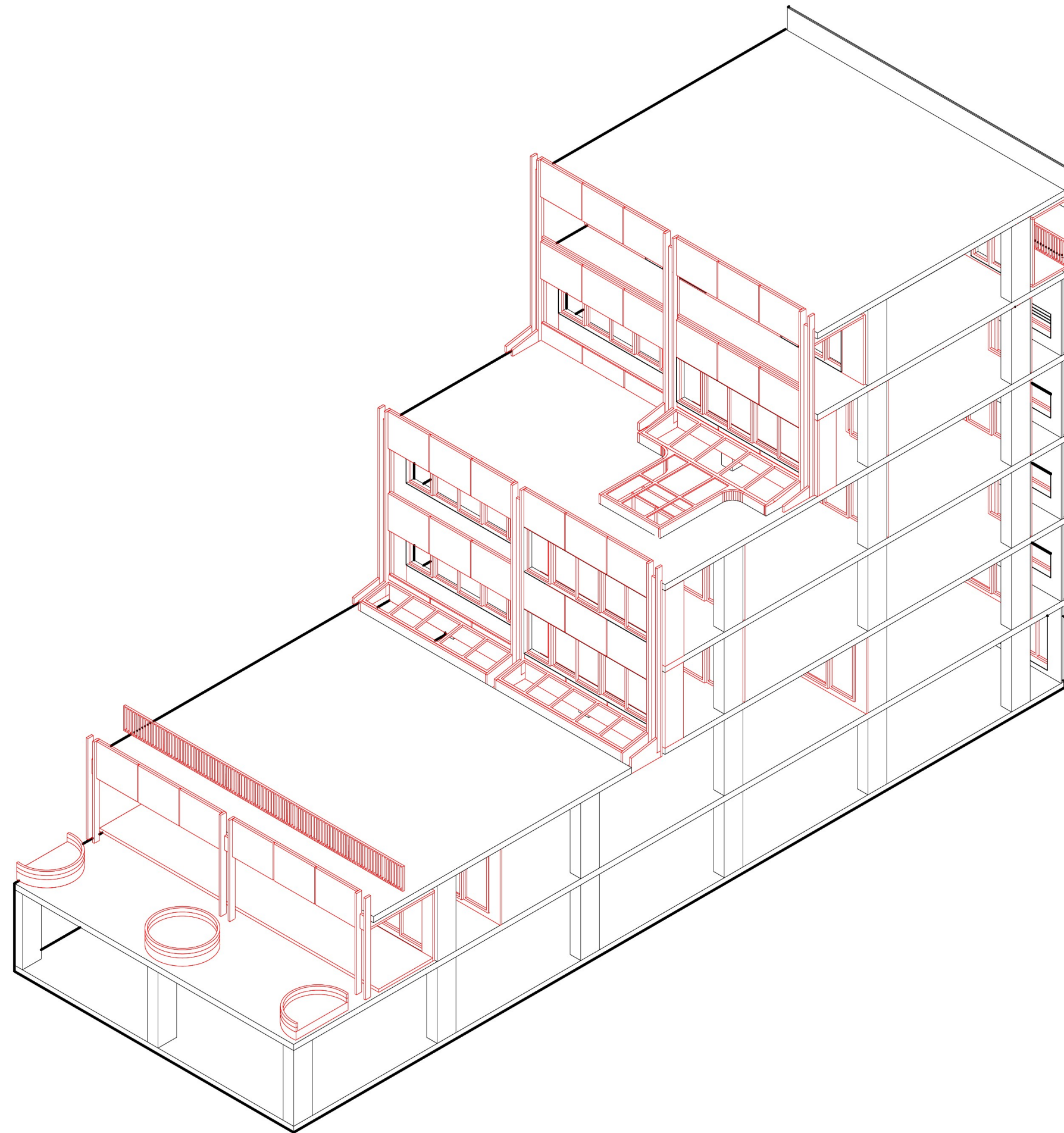


● REMOVE

● KEEP

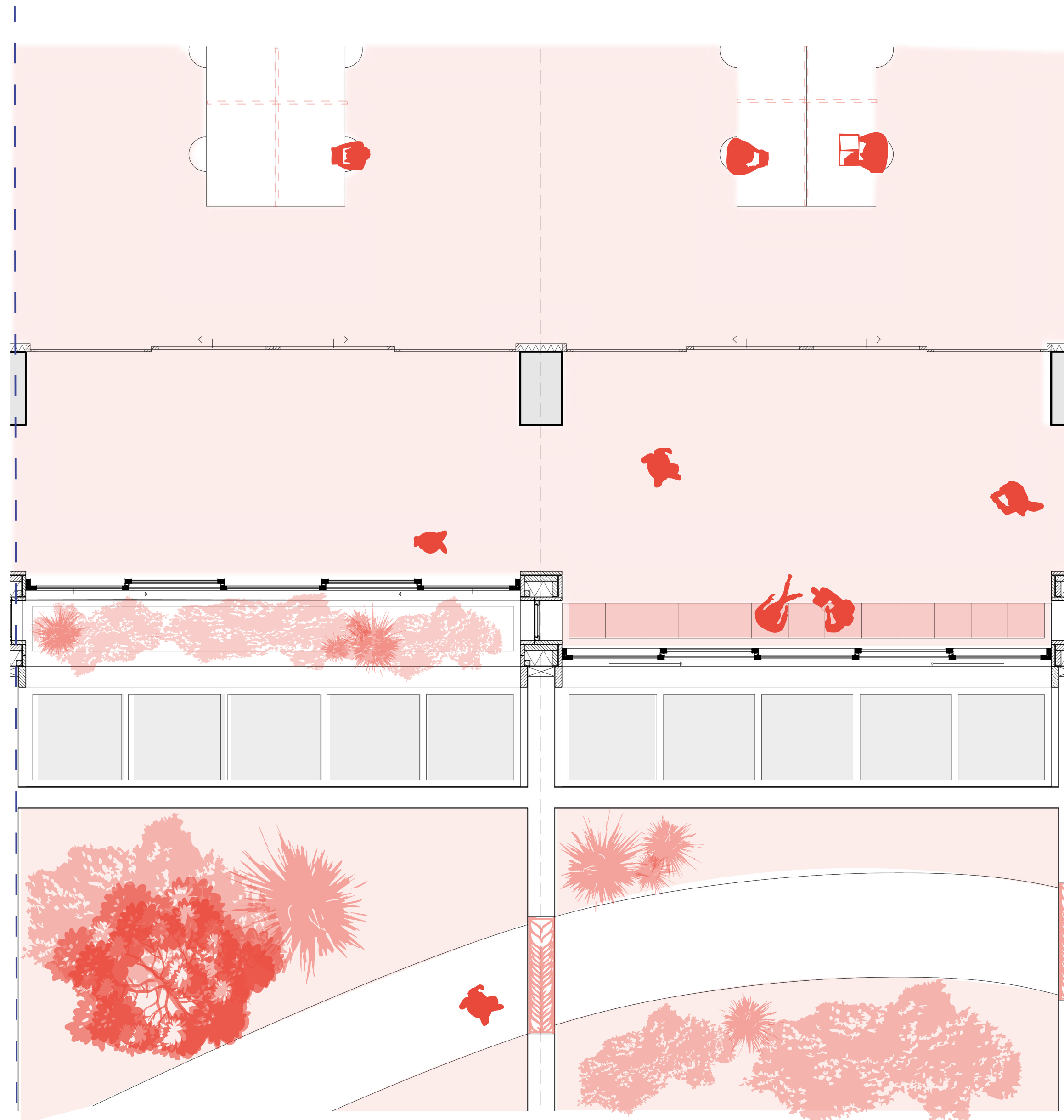


adding new facade area:
385 m²



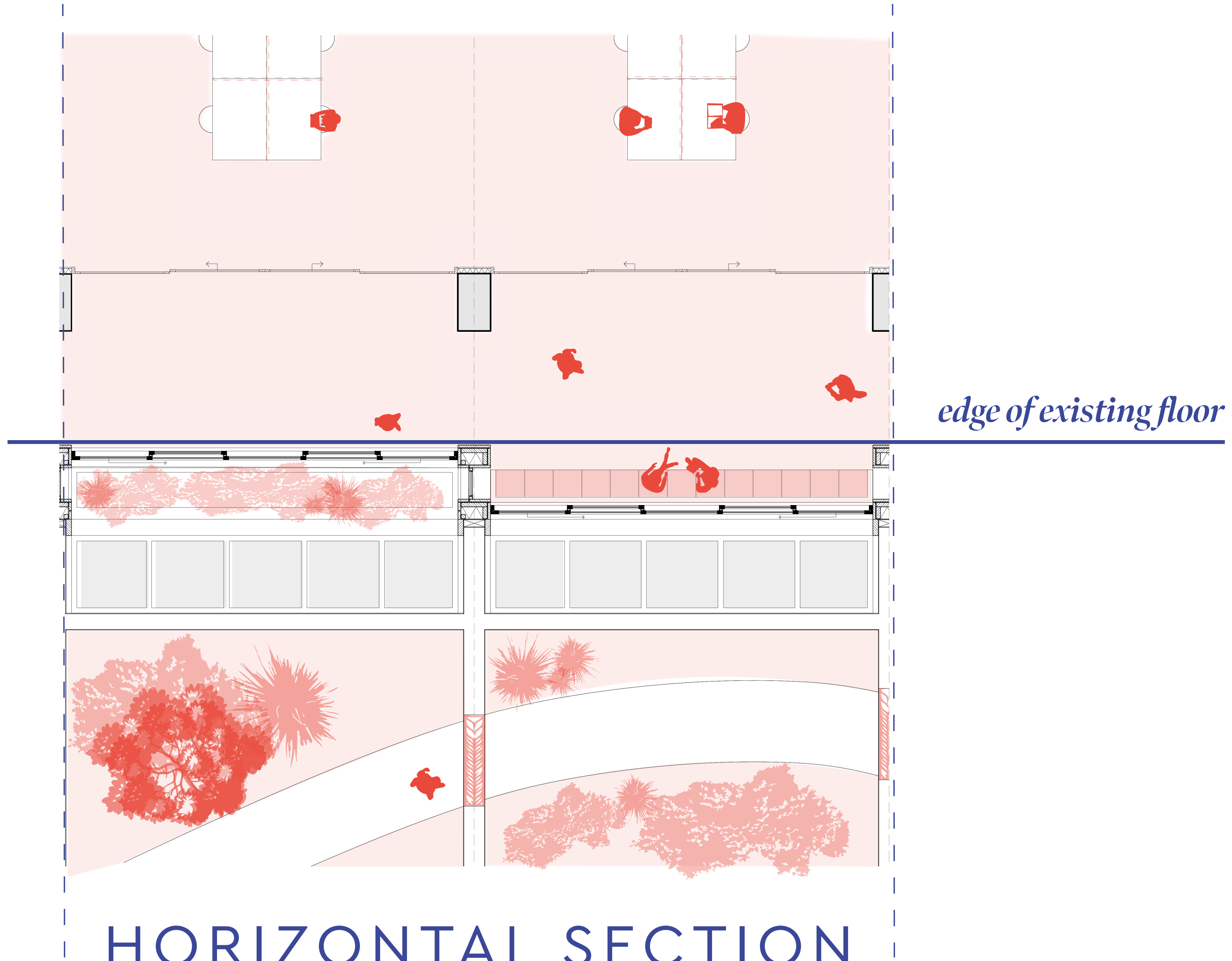
● ADD

● KEEP



● SOUNDSCAPE ELEMENT

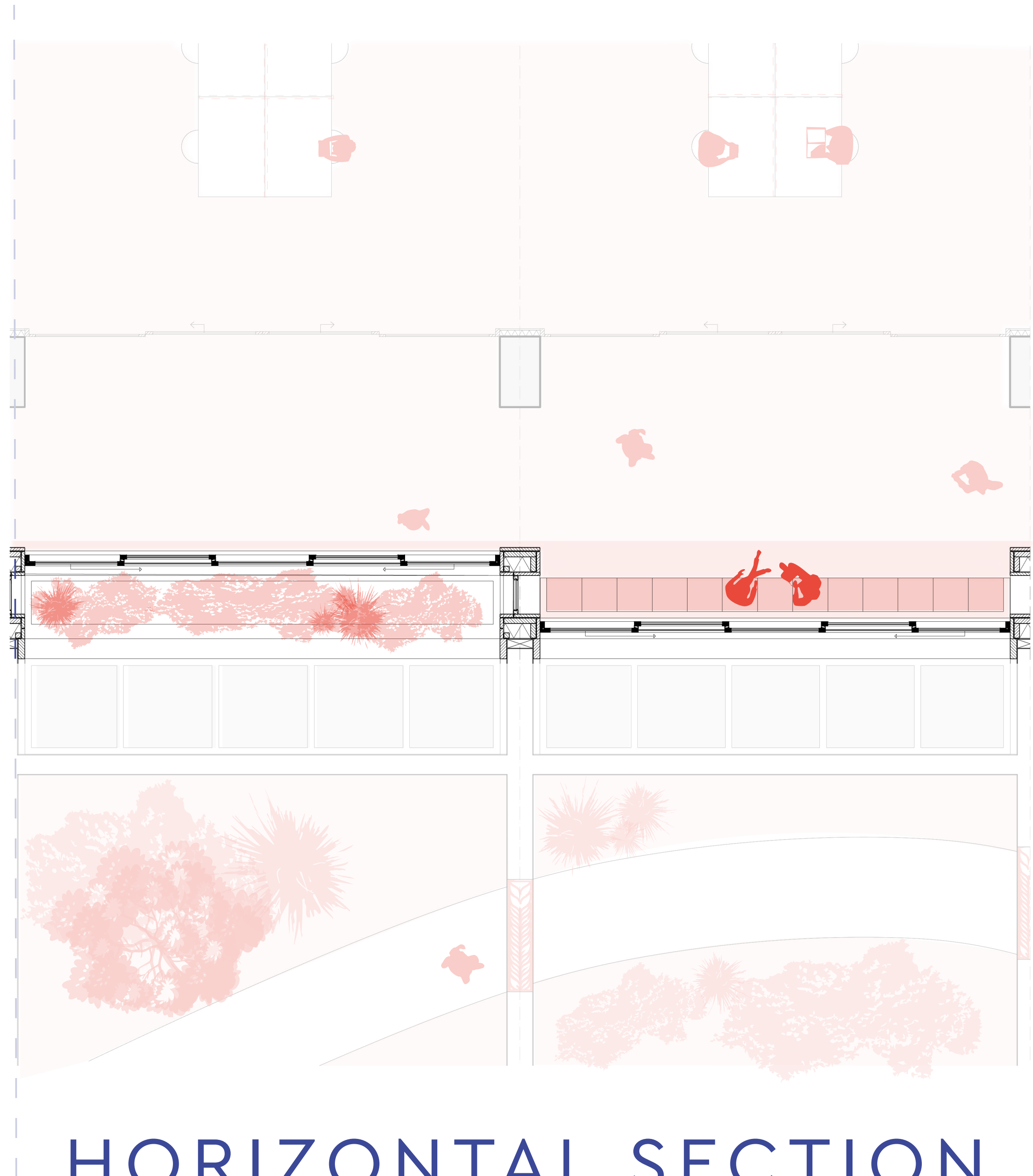
HORIZONTAL SECTION



edge of existing floor

● SOUNDSCAPE ELEMENT

HORIZONTAL SECTION

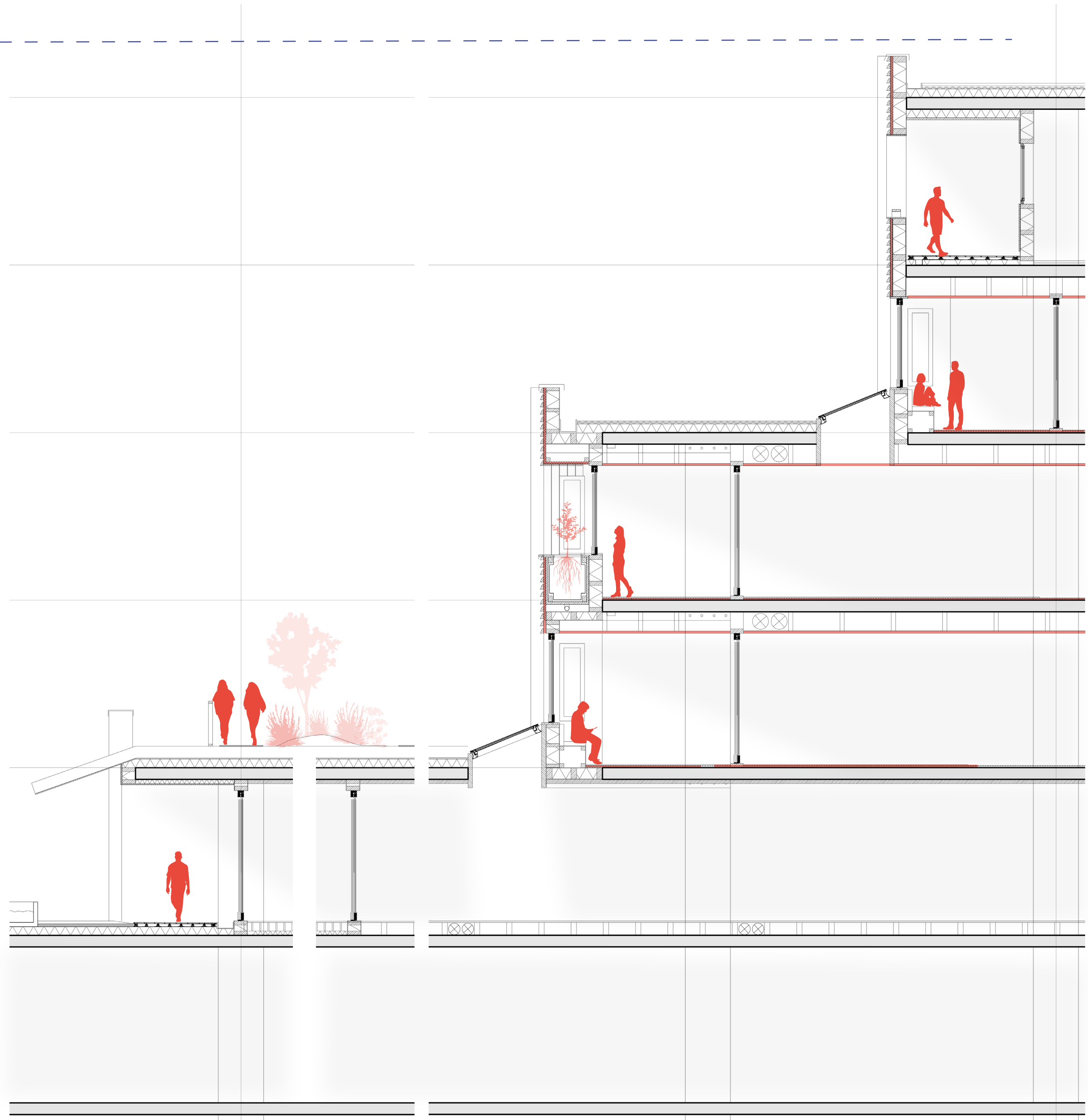
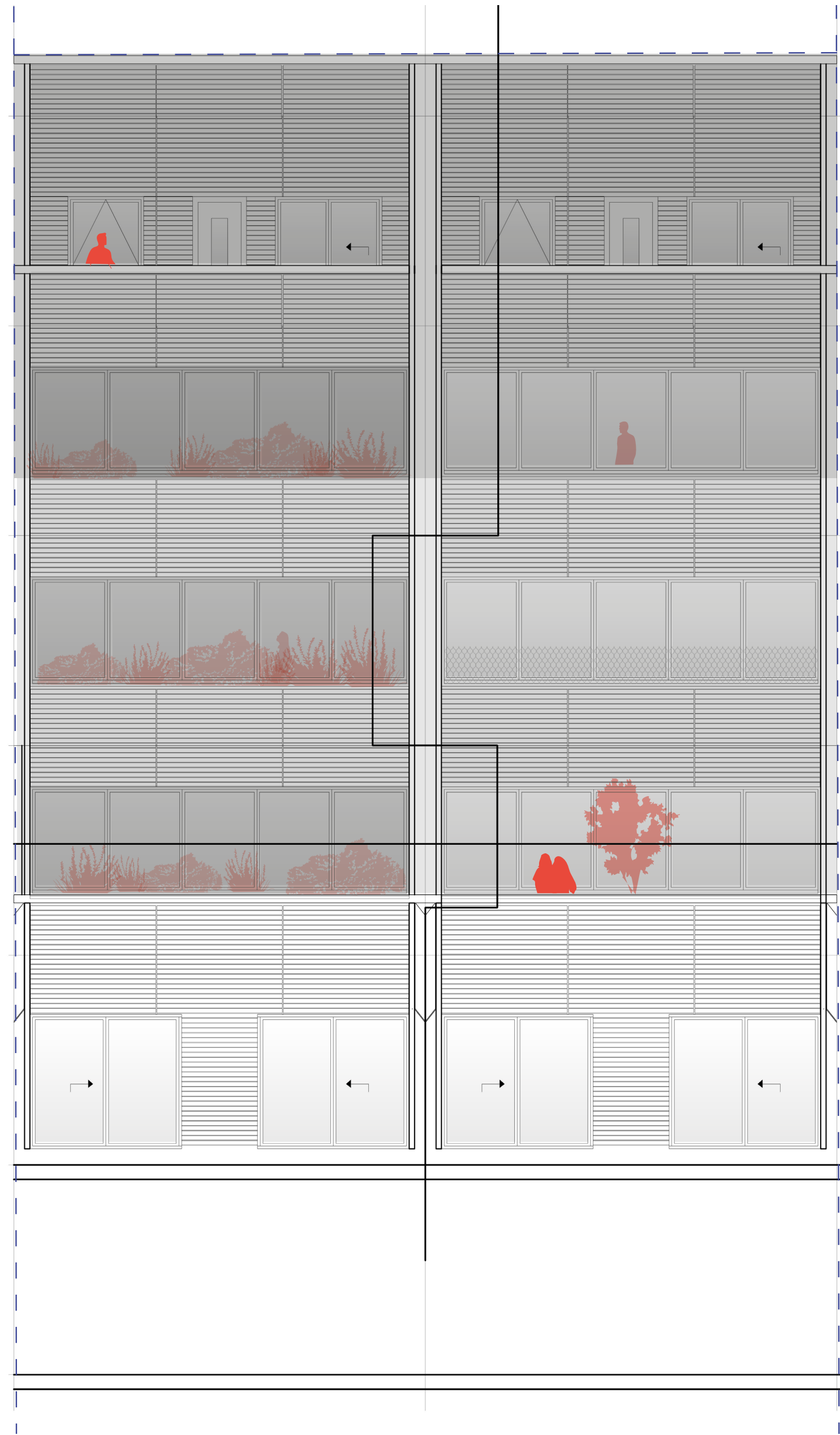


add 1 meter



● SOUNDSCAPE ELEMENT

HORIZONTAL SECTION

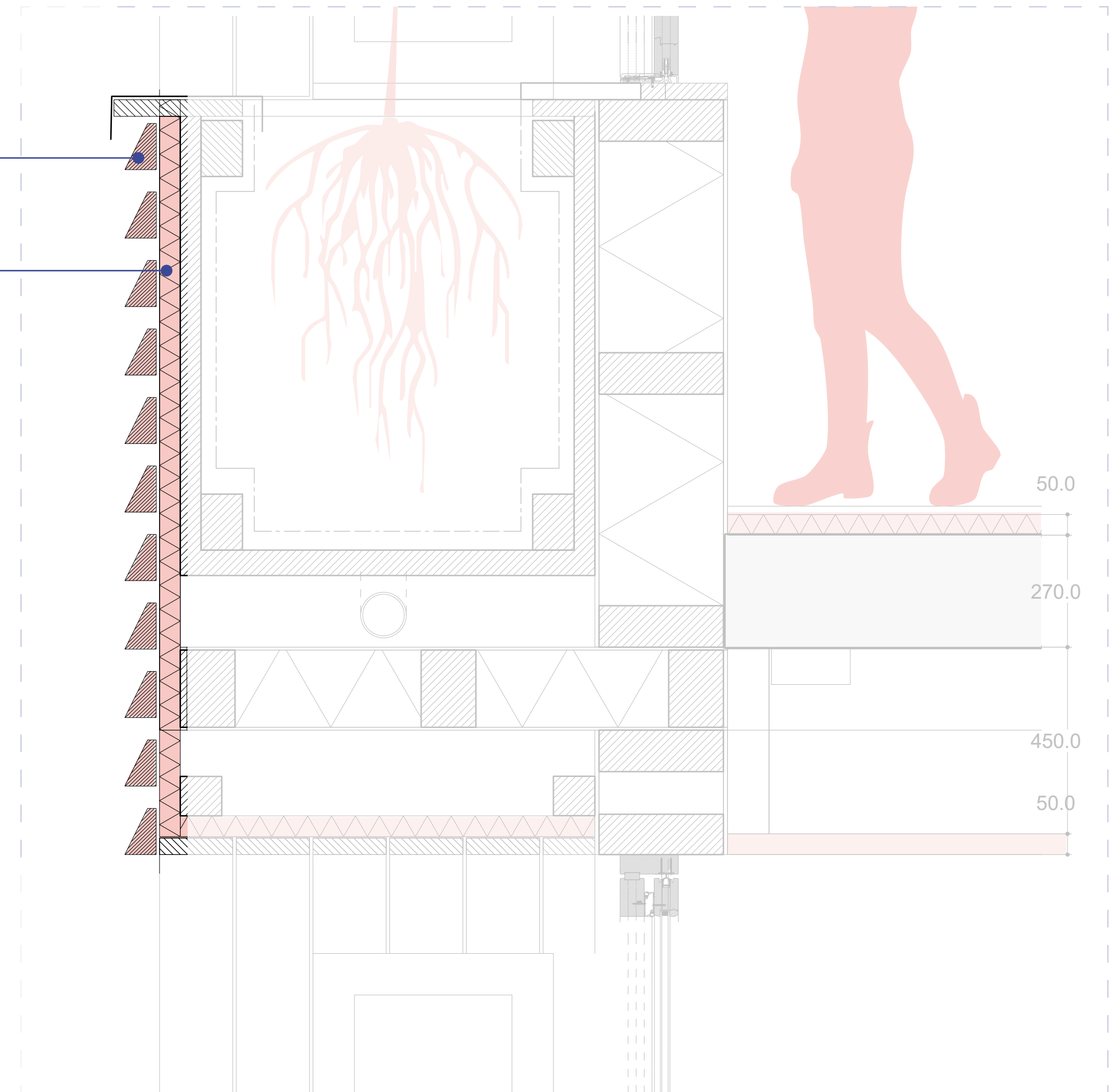


● SOUNDSCAPE ELEMENT

FRAGMENT

sound reflecting layer

sound absorbing layer



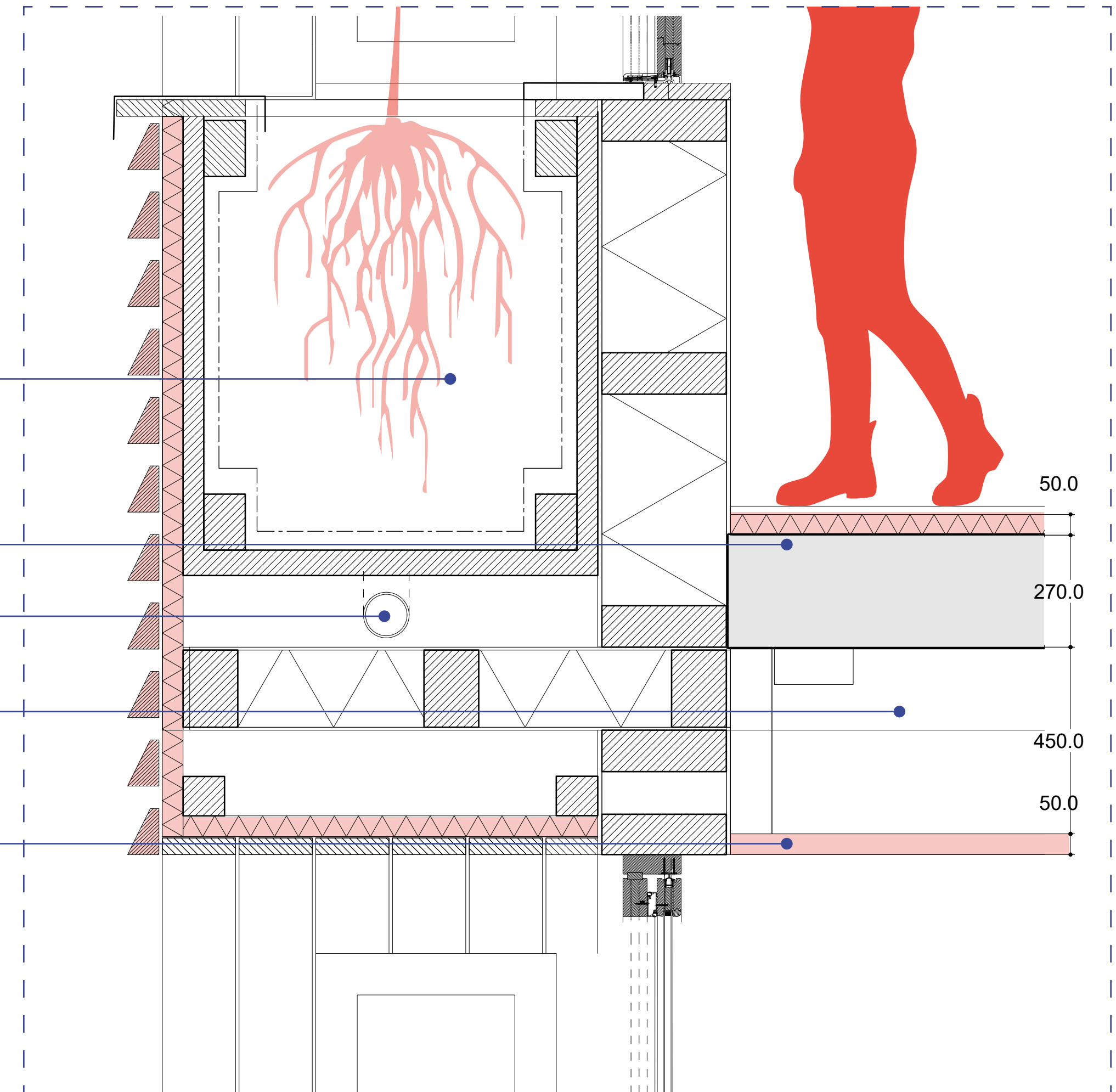
planter

existing floor

rainwater drainage

added structural beam

lowered acoustic ceiling

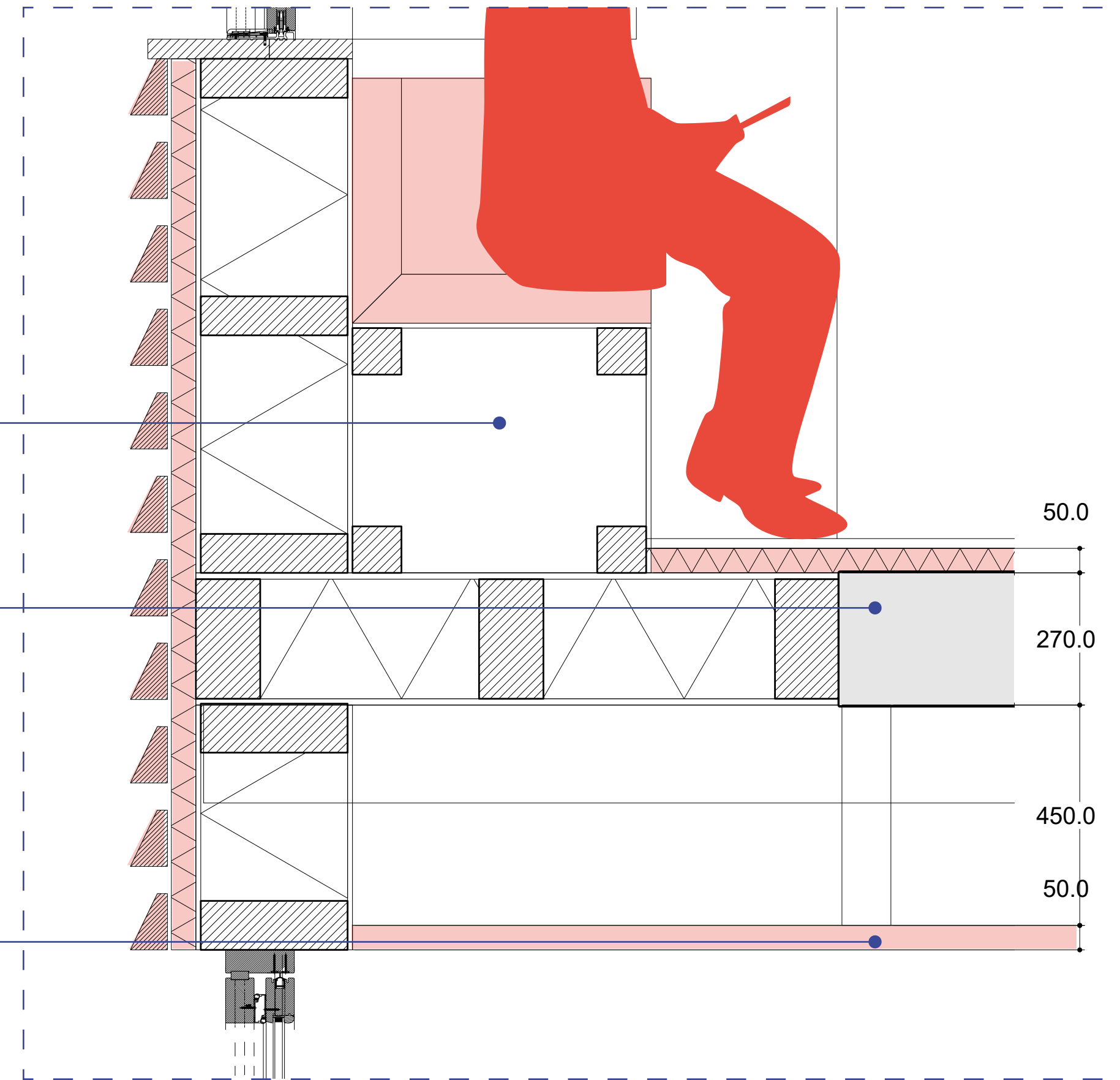


DETAIL 1 PLANTER

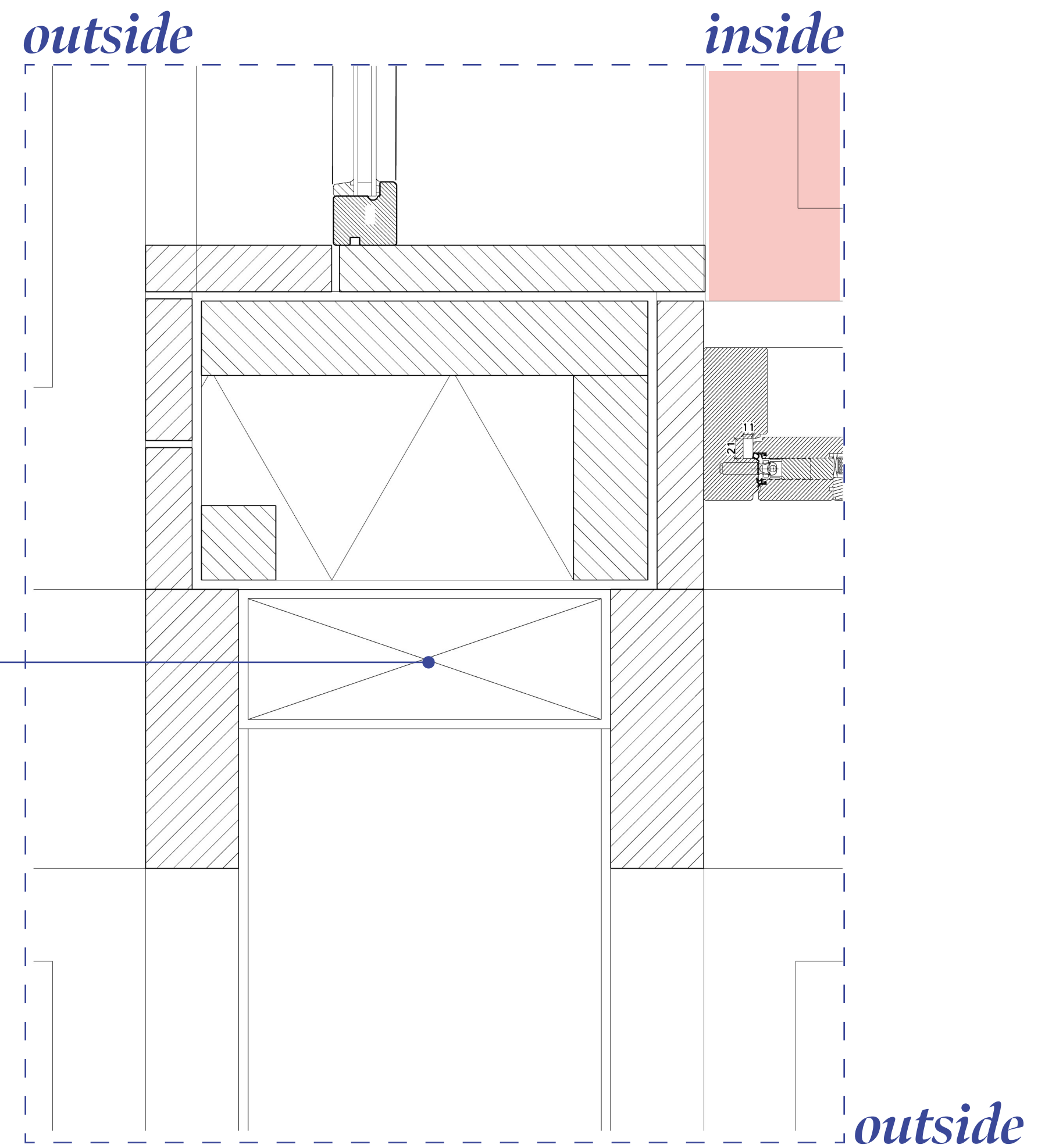
built-in bench

existing floor

lowered acoustic ceiling



rainwater drainage



A WALK THROUGH KB



ERIC

*21 years old
history student
lives in a student house in Leiden*



RACHEL

*71 years old
pensioner
lives in a apartment next door*



MAX

*32 years old
consultant
lives in KB*

MEET THE USERS

I walked from my apartment



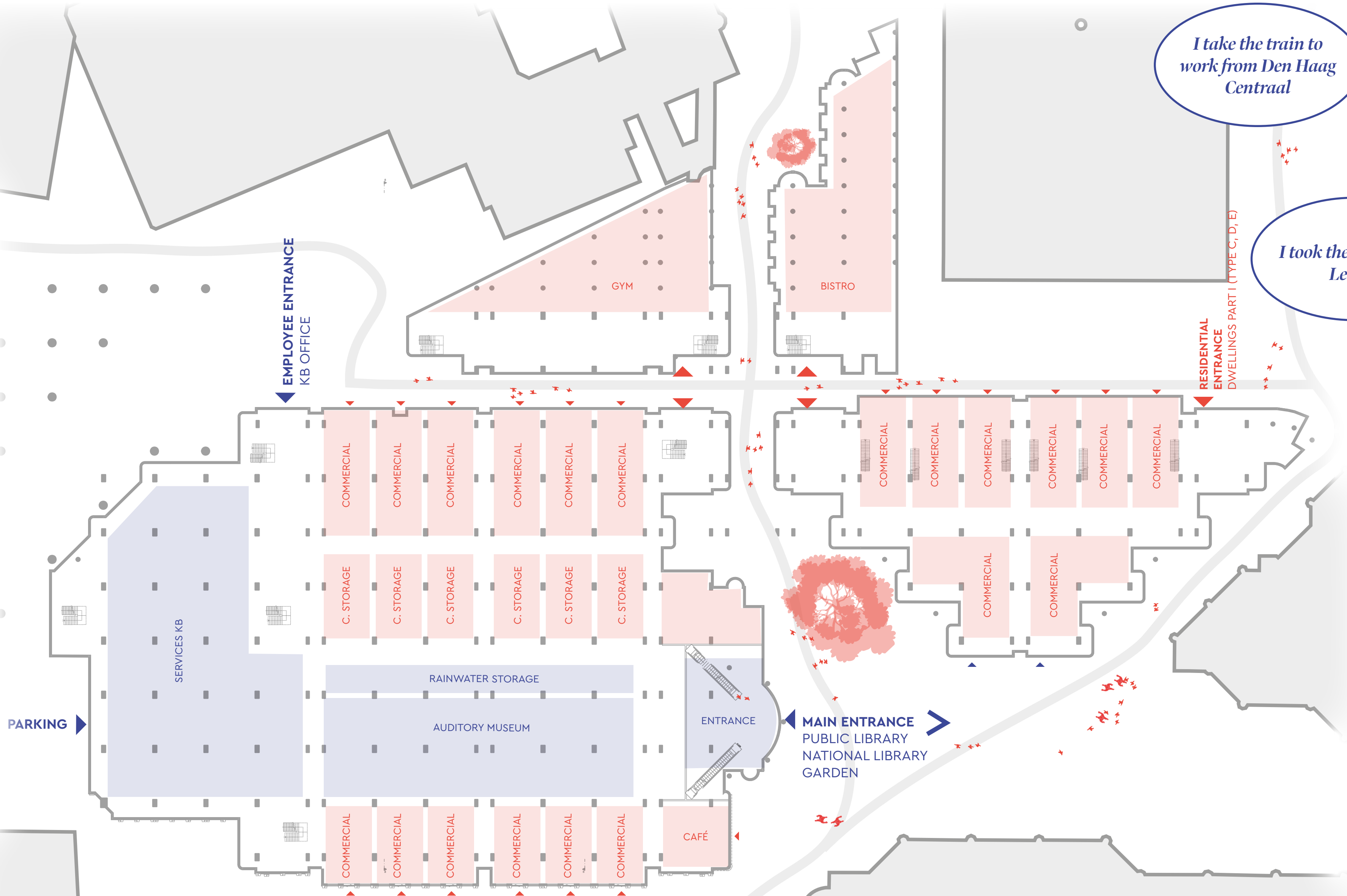
I take the train to work from Den Haag Centraal



I took the train from Leiden



- KB
- OTHER PROGRAMME



GROUND FLOOR



KCB nationale
bibliotheek

relocated entrance for improved visibility



sightline to garden

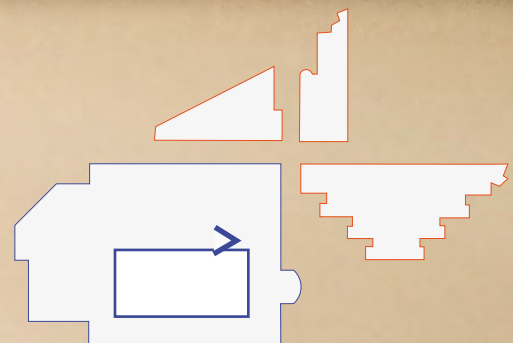
KB } nationale
bibliotheek



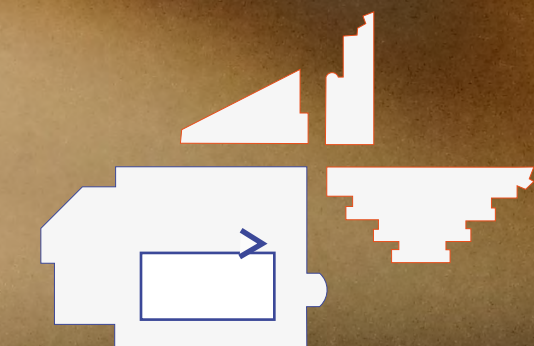
skylight from previous atrium void

*I would like to have
some coffee*

coffee bar



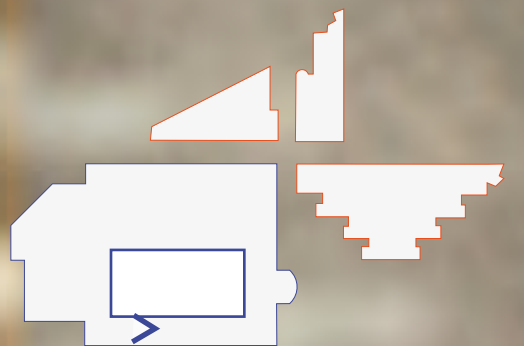
I am looking for a quiet spot to read today's newspaper



*This sounds nice, but
I see the sun begins to
shine in the garden...*



*curtains as flexible, sound
absorbing dividers*



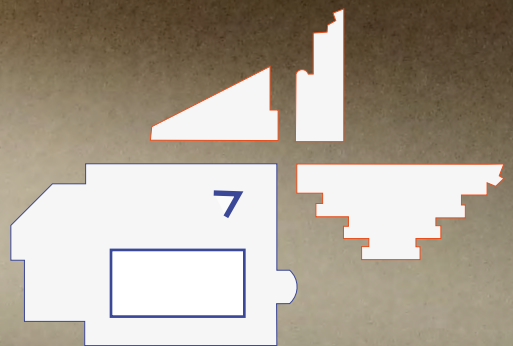
perfect spot!



public library soundgarden



Let's go look for a place to study.



Time for a break!

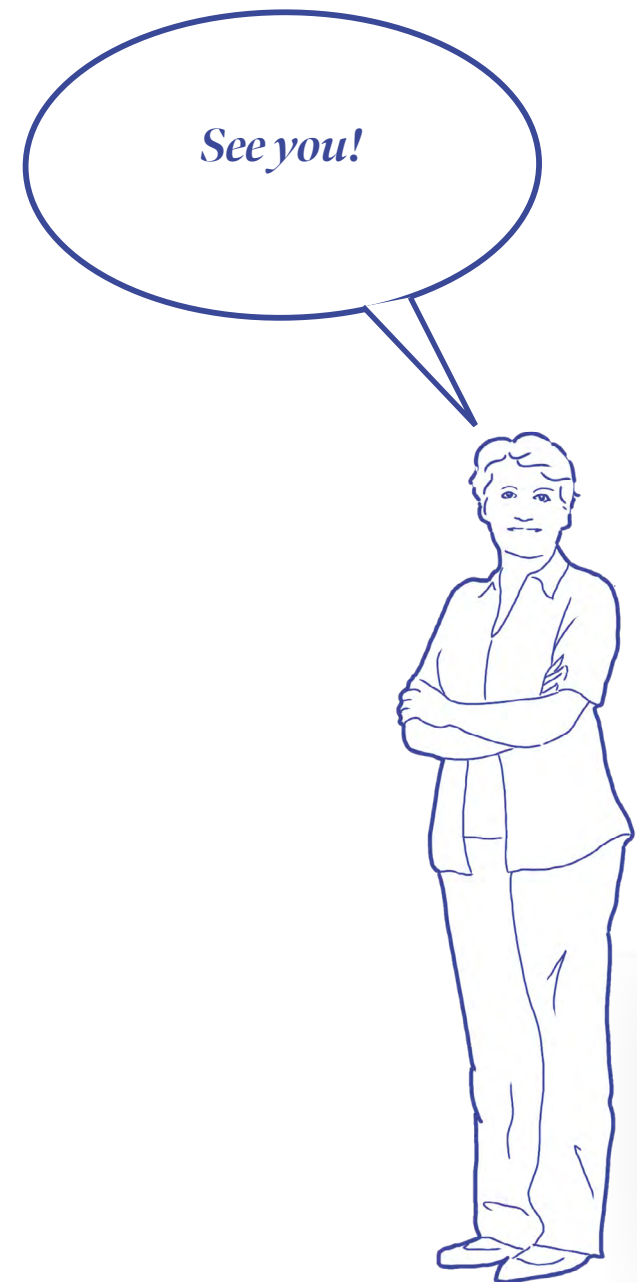
buffer and circulation zone



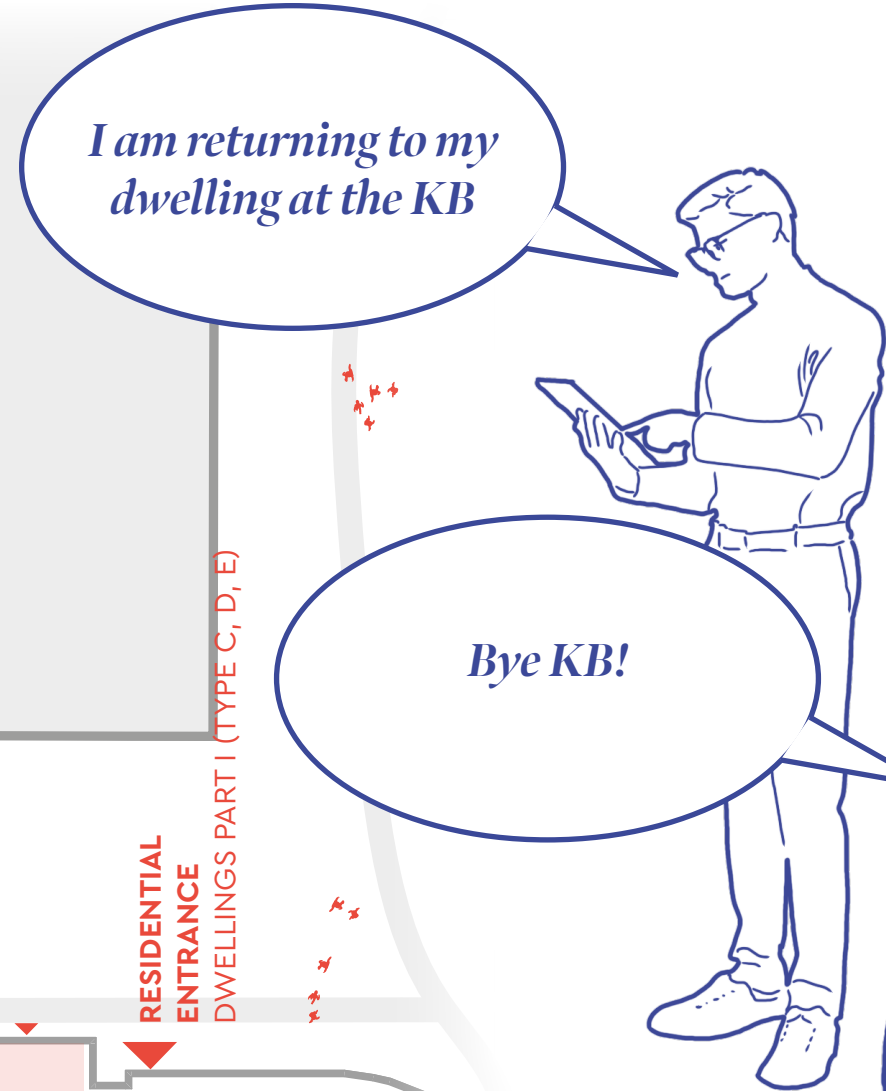
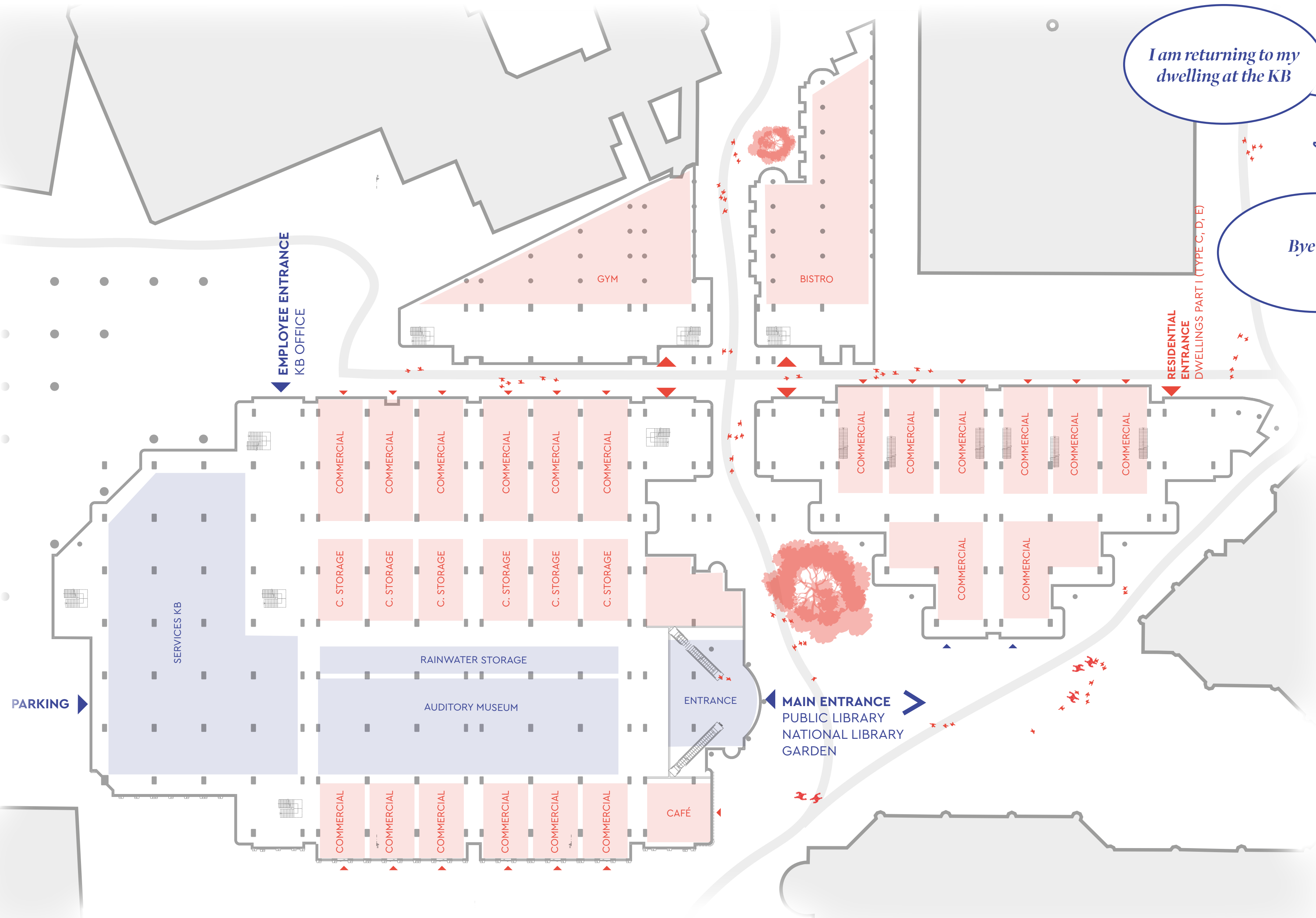


path in sound garden

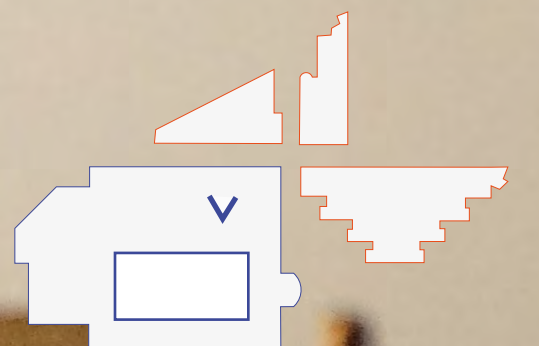


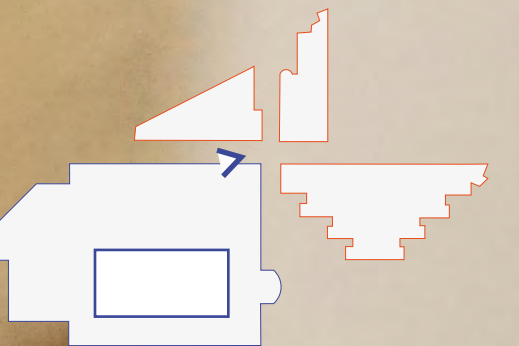


- KB
- NEW PROGRAMME



GROUND FLOOR





TO CONCLUDE

looking back



1

*Redesign for people
instead of books*



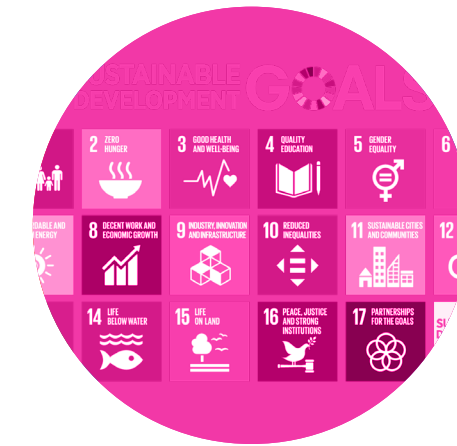
2

*Protect valued skin +
structure where possible*



3

*Design for sound on all
scales*

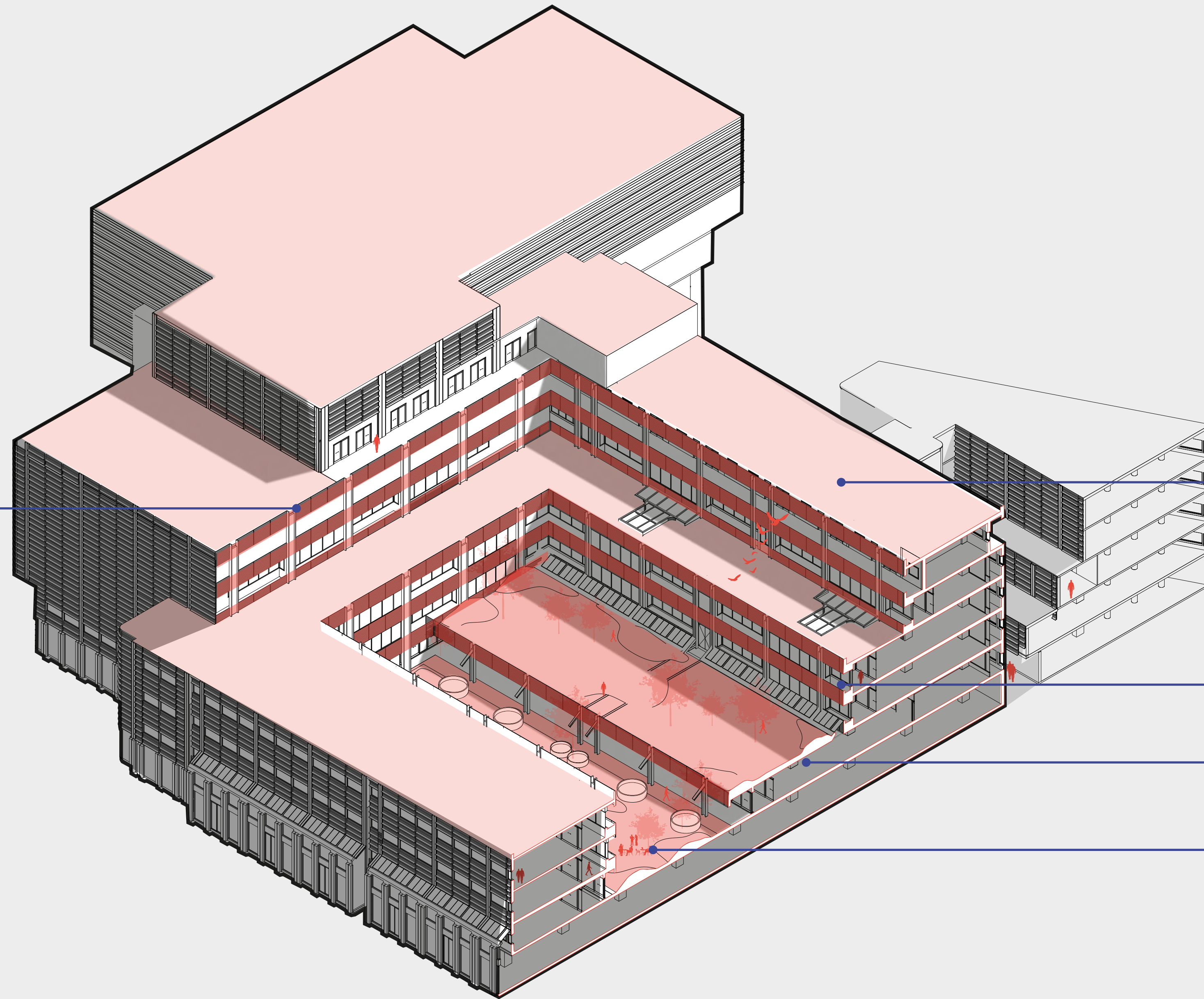


4

*Contribute to the UN
Sustainable Development
goals*

DESIGN GOALS

create 70 dwellings



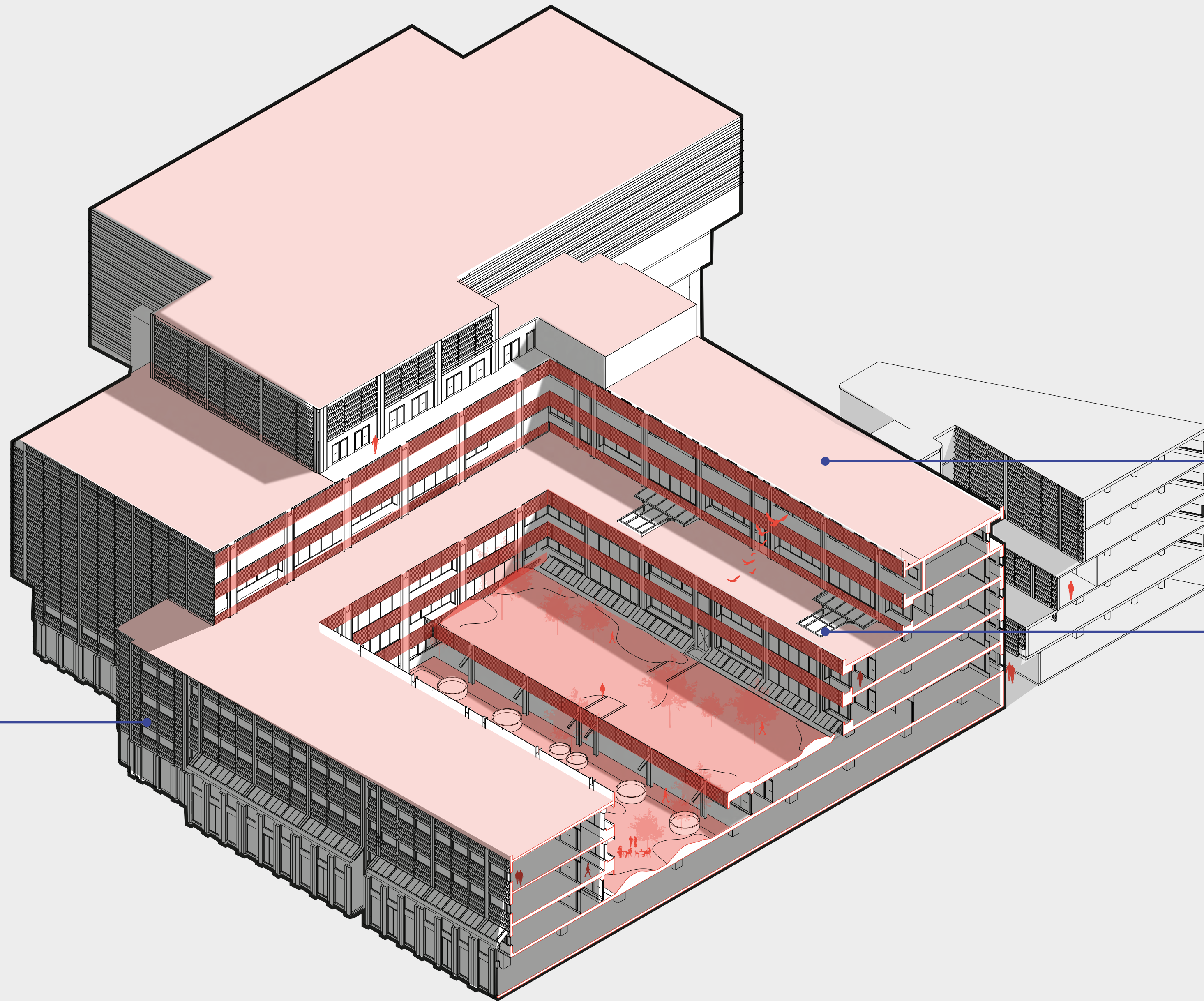
increased daylighting

increased wayfinding

new public library floor

public soundgardens



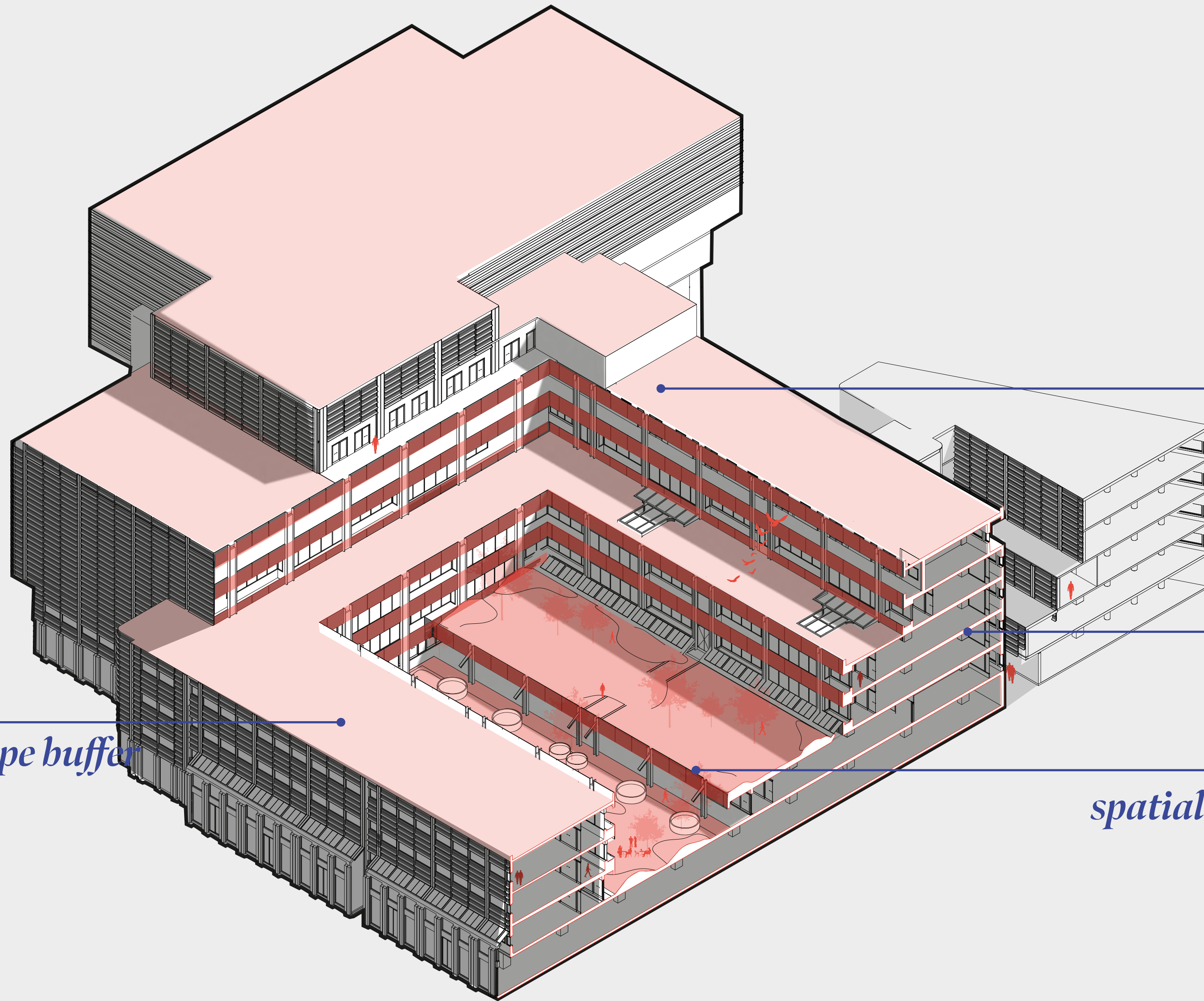


keep valued skin

courtyard facade reflects existing facade

atrium shapes visible as skylights





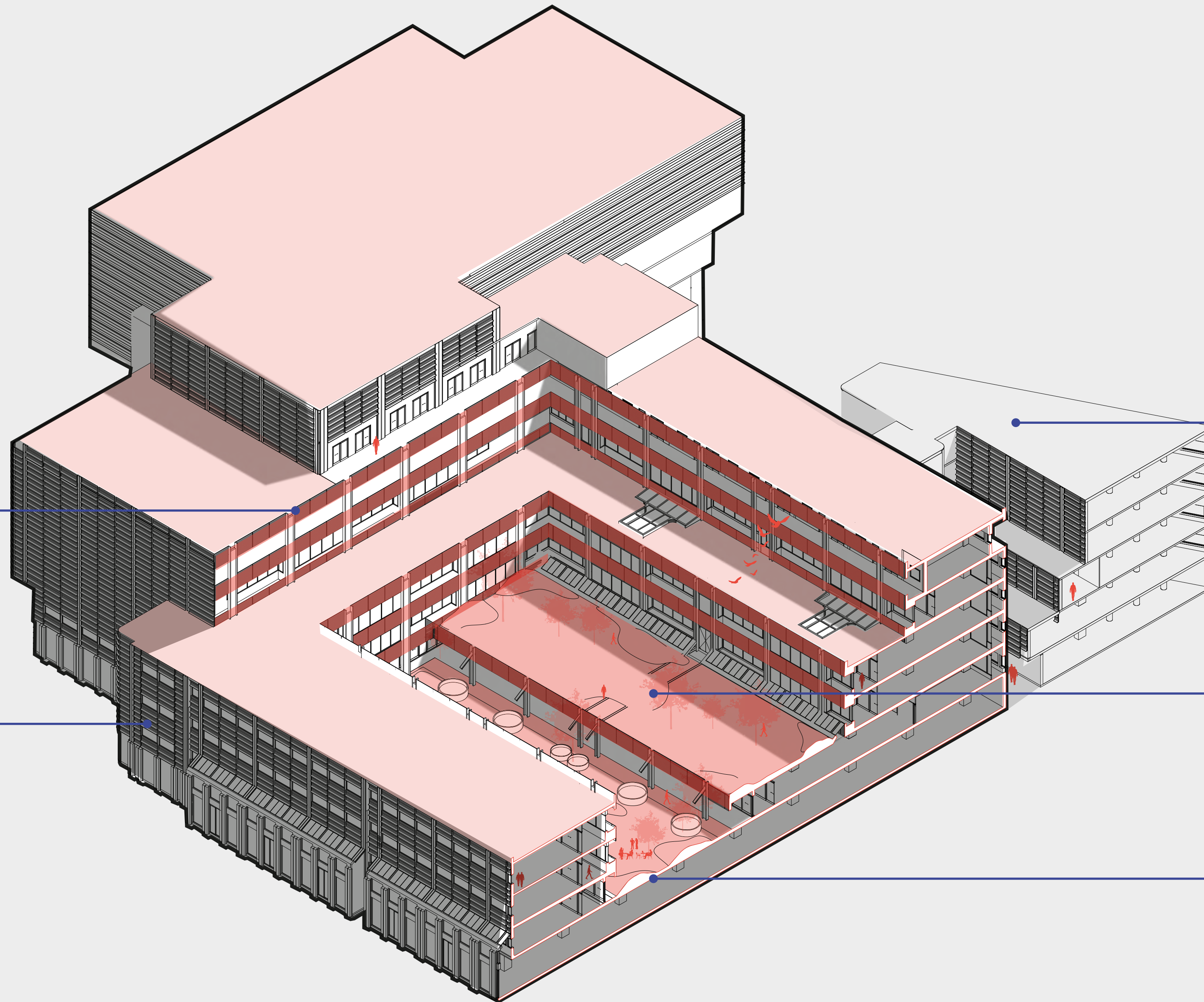
*design sound reflecting +
absorbing facade*

create sounblocks

spatial plans according to toolbox

use building as soundscape buffer





create 70 dwellings



keep heritage skin



solar powered



create green courtyard



collect + re-use rainwater



SOUNDSCAPING THE FUTURE LIBRARY

Explorations of the auditory library experience



Special thanks to:

*Uta Pottgiesser
Emeline Lin
Paddy Tomesen*

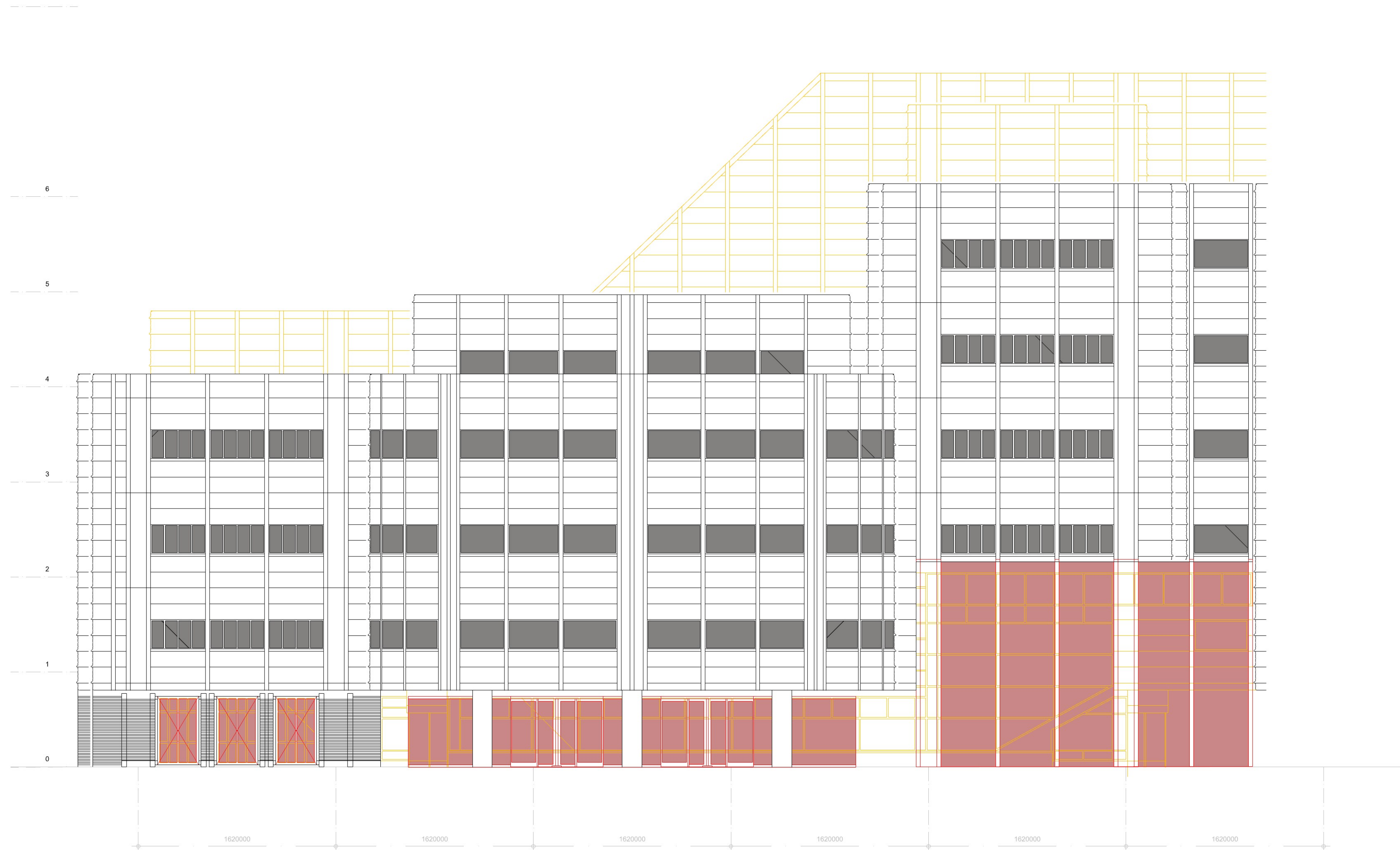
Ava, Cor & Daaf



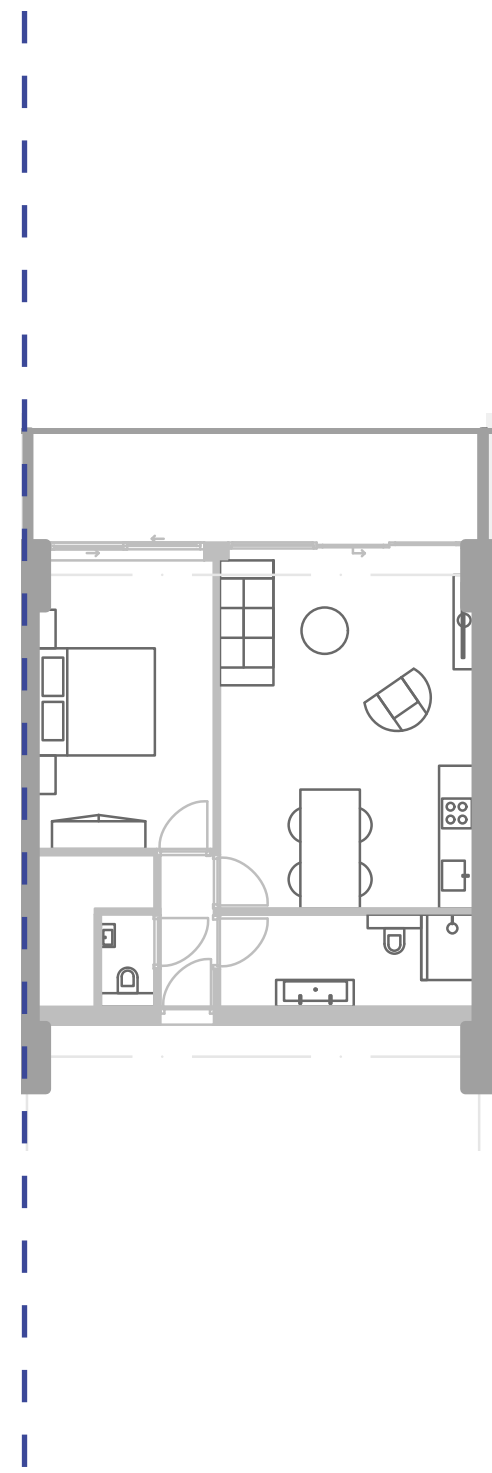
FACADE / ENTRANCE EXISTING



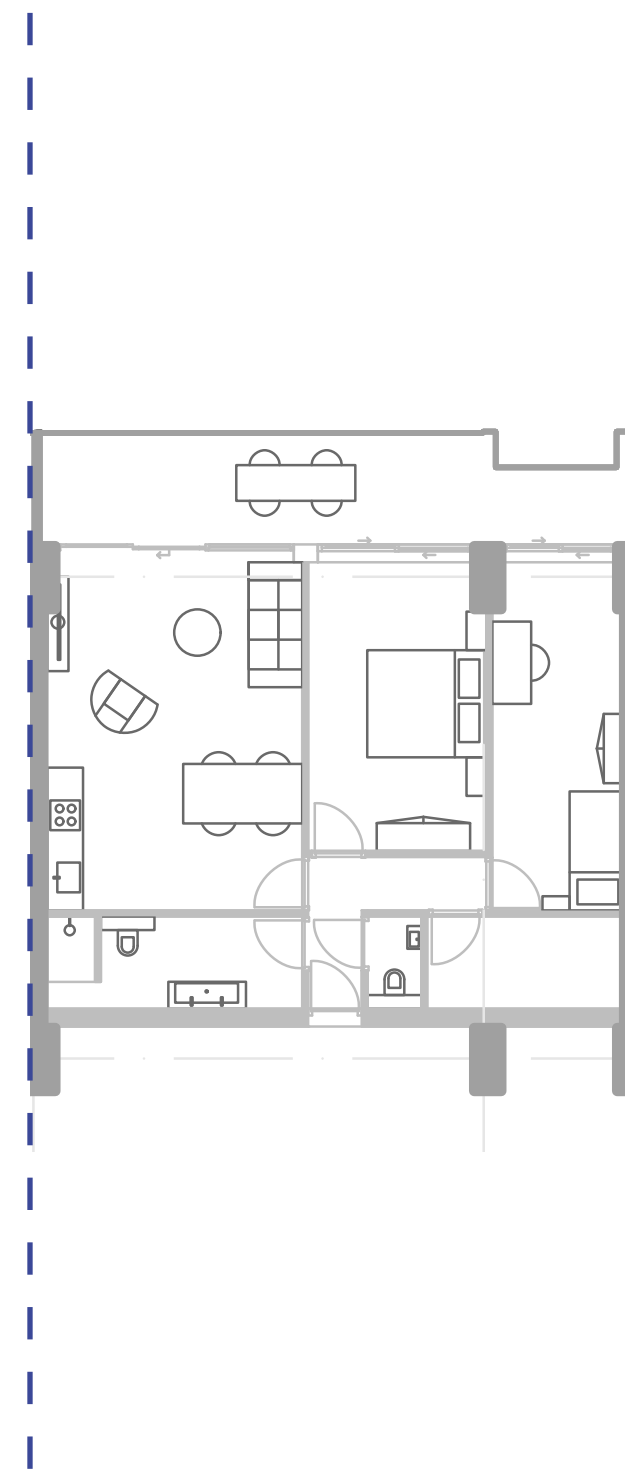
FACADE / ENTRANCE REMOVE PARTS



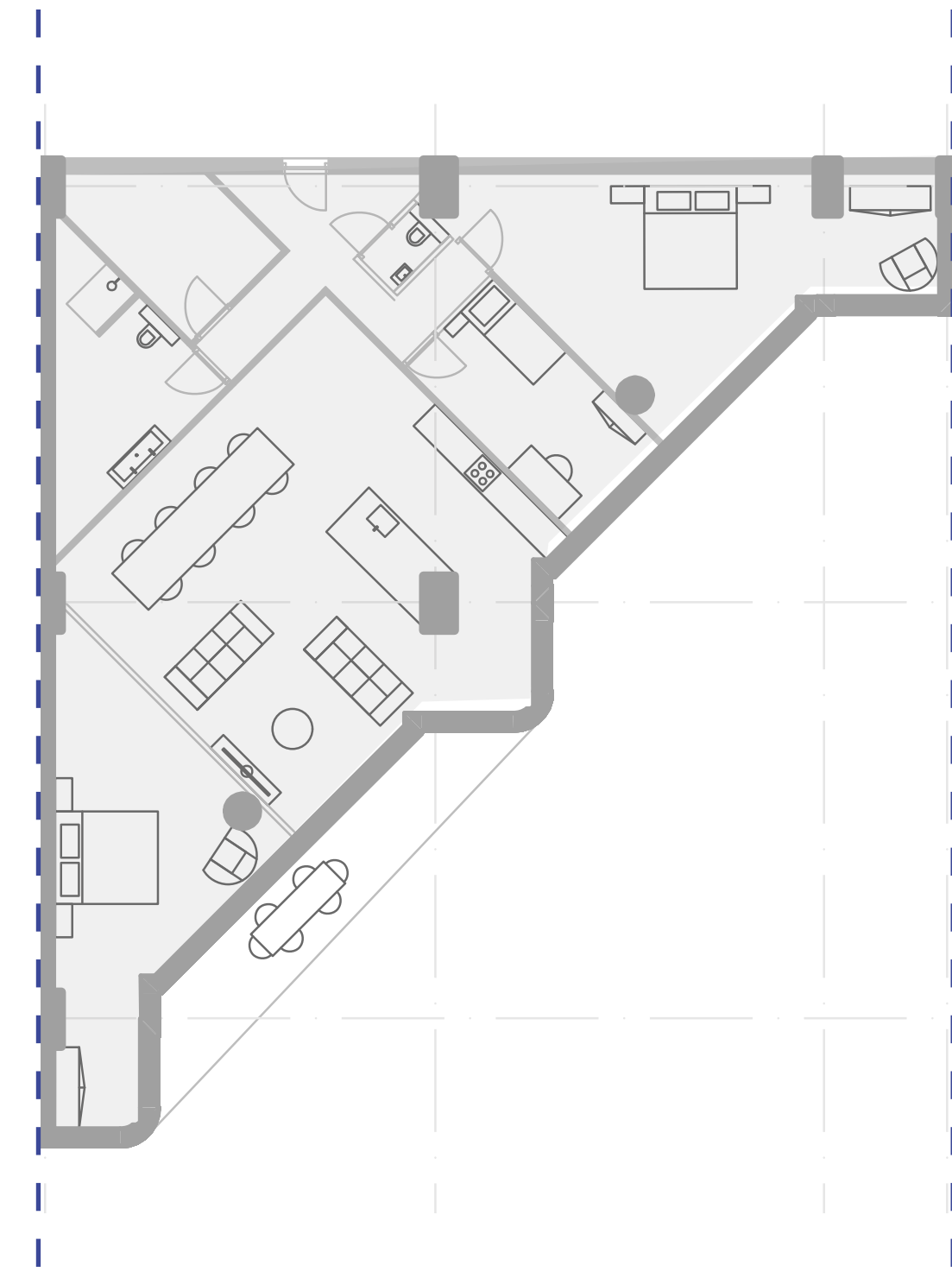
FACADE / ENTRANCE RENOVATION PLAN



TYPE C
60 m²
1 bedroom



TYPE D
75 m²
2 bedrooms



TYPE E
130 m²
3 bedrooms

DWELLING FLOORPLANS

“In a **quiet** world, building acoustics flourished as an **art of sonic invention**. In a **noisy** world it becomes merely the skill of **muting** internal shuffles and **isolating** incursions from the turbulent environment beyond.”

– R. Murray Schafer