NIET NIEUW WEST

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24-06-2024

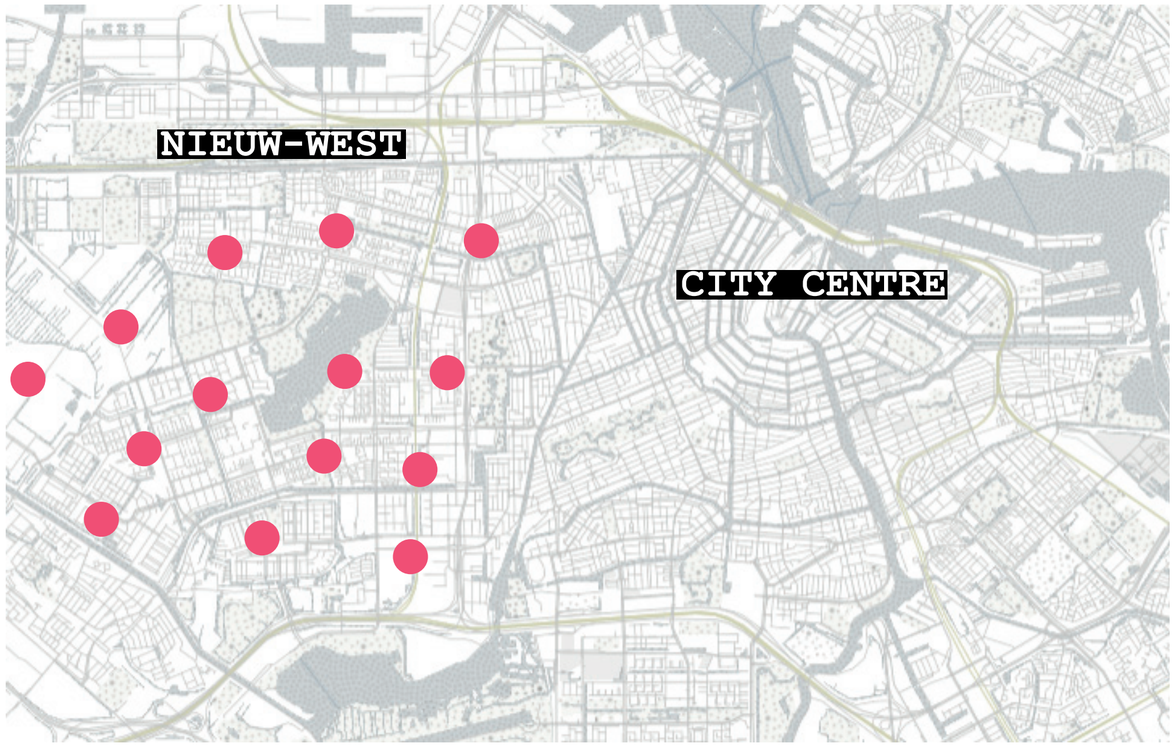
A RADICALLY CIRCULAR TRANSFORMATION STRATEGY FOR A POST-WAR PORCHFLAT ENSEMBLE

AR3AH105 Graduation Studio Adapting 20th Century

INTRODUCTION

Renewal development in Amsterdam Nieuw West

Planned / current reconstruction development



(City of Amsterdam, new development in Nieuw West. 2023)

INTRODUCTION

- *General Expansian Plan (AUP) 1939*
- *+- 1950 start development*
- *Modernist ideas about living*
- *“Light, Air, and Space”*
- *Development of dwelling typologies*

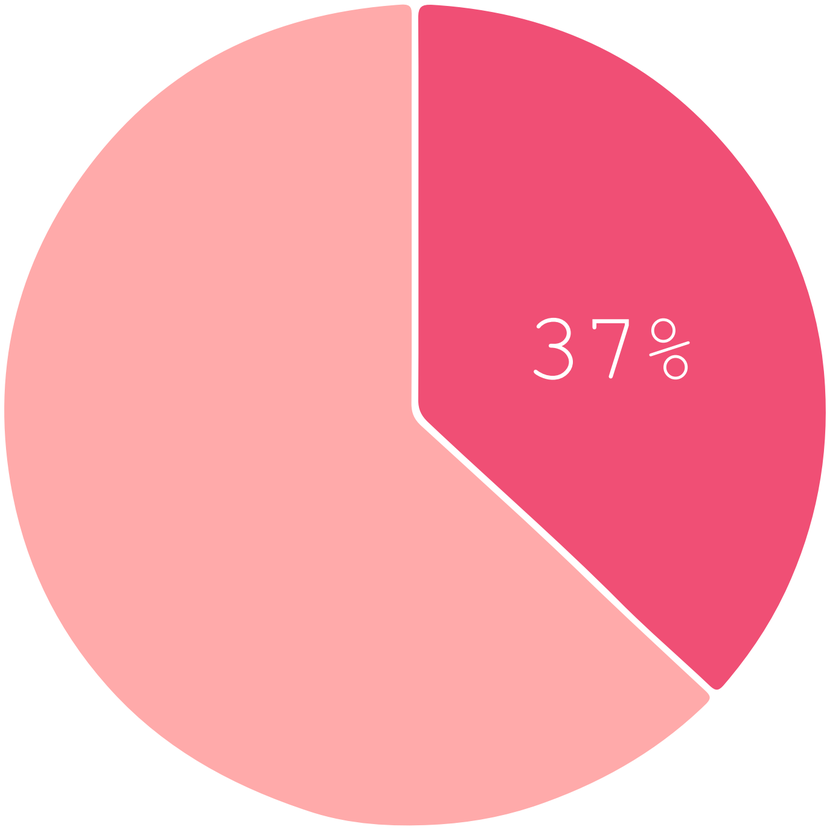
INTRODUCTION

Renewal development in Amsterdam Nieuw West

- *original flats are demolished*
- *replaced with new construction*
- *energy efficient*
- *more housing*

INTRODUCTION

Greenhouse gas emissions

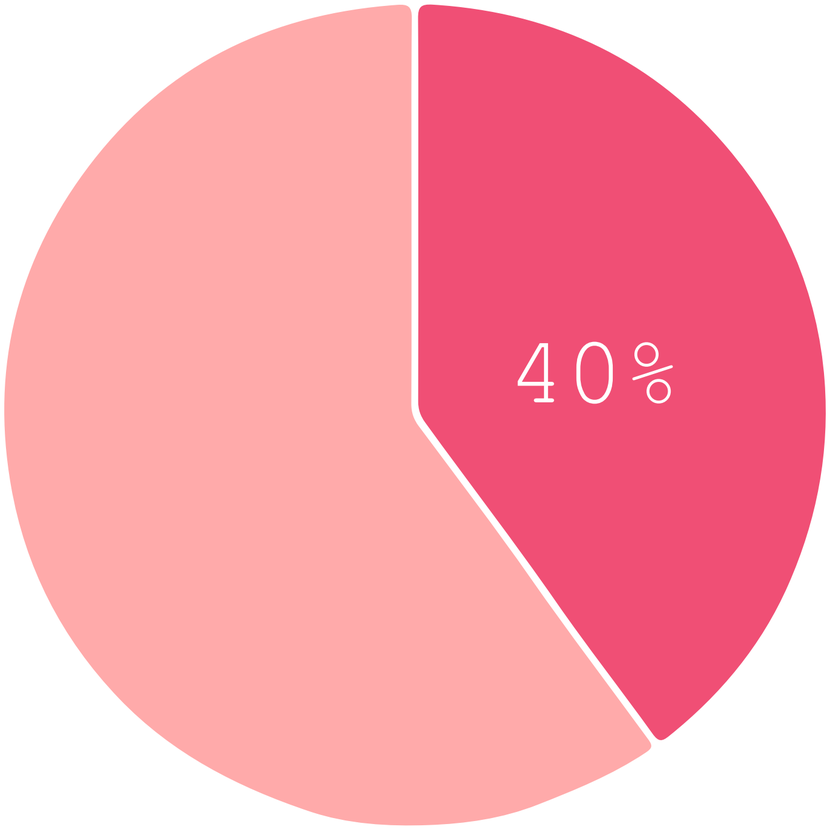


Globally, the building industry accounted for 37% of all energy and process-related CO_2 emissions in 2021

(UNEP – UN Environment Programme, 2022)

INTRODUCTION

Greenhouse gas emissions



40% of these emmissions are related to the production of building materials:
the "embodied carbon"
(This is 15% of all global CO_2 emmissions)

(UNEP - UN Environment Programme, 2022)

INTRODUCTION

Resource depletion

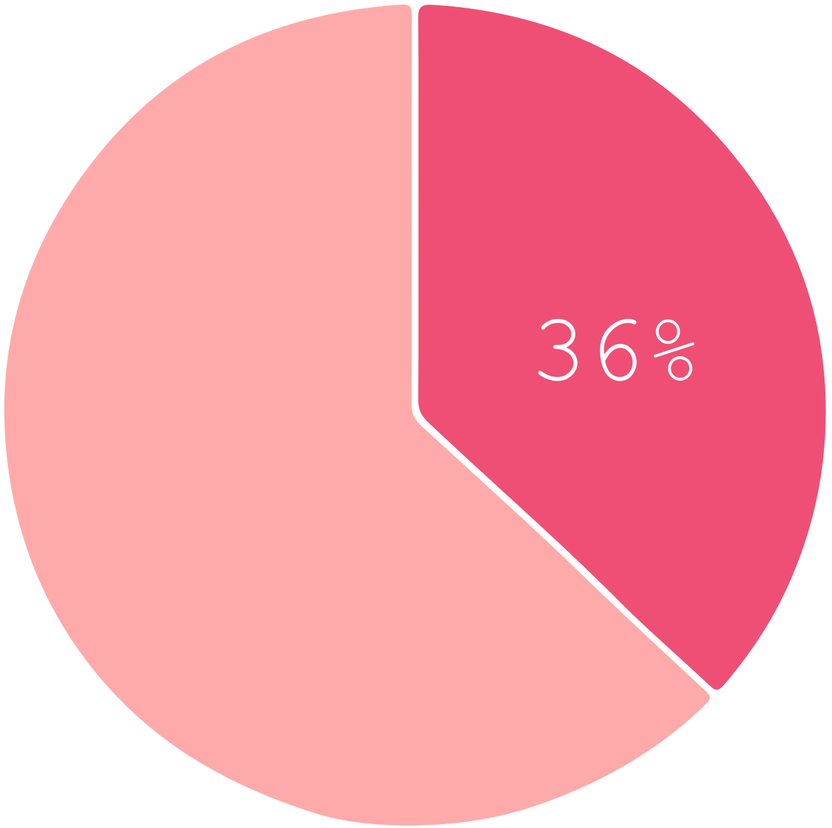
1.7 Earths

Ever since 1970 we have been extracting more resources from the earth than it can regenerate and every year we extract even more than the year before.

(Earth Overshoot Day, 2023)

INTRODUCTION

Waste production



The building industry is also responsible for 36% of all solid waste in Europe.

(Weghmann & Public Service International Research Unit, 2023)

INTRODUCTION

*Drastically **lowering the production rate of new building materials** will make a positive impact on the building industry's share of embodied carbon emissions and resource use.*
***Lowering our demolition rate** will inherently mean lower waste production.*

PROBLEM STATEMENT

The building industry faces a paradoxical challenge

Drastically lower the production rate of new building materials

Growing housing demand

Need for renewal in the current stock

CIRCULAR STRATEGIES

Building with reclaimed materials

Boschgaard. Superuse Studios (2023)

Preserving building structures

Hof van Descartes. Ymere (2023)

RESEARCH QUESTION

Main research question

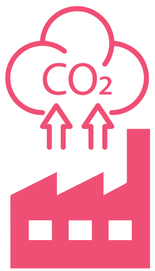
"How can renovation with reclaimed materials become a feasible alternative to reconstruction of the current housing stock?"

RESEARCH QUESTION

“What are effective strategies of mitigating the embodied carbon and production energy in a renovation / transformation project?”

RESEARCH QUESTION

"What are effective strategies of mitigating the embodied carbon and primary production energy in a renovation / transformation project?"

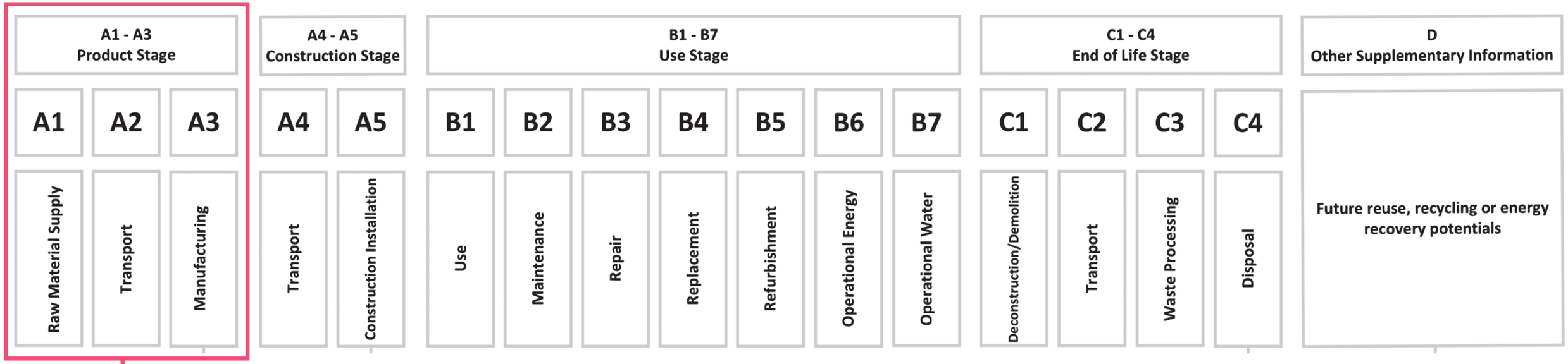


Embodied carbon = EC

Primary Production Energy = PPE

RESEARCH

Life Cycle Analysis



Circular Ecology. (2023, 24 april). EN15804 Modules explained – Circular Ecology

Module A1-A3: 'Product Stage'

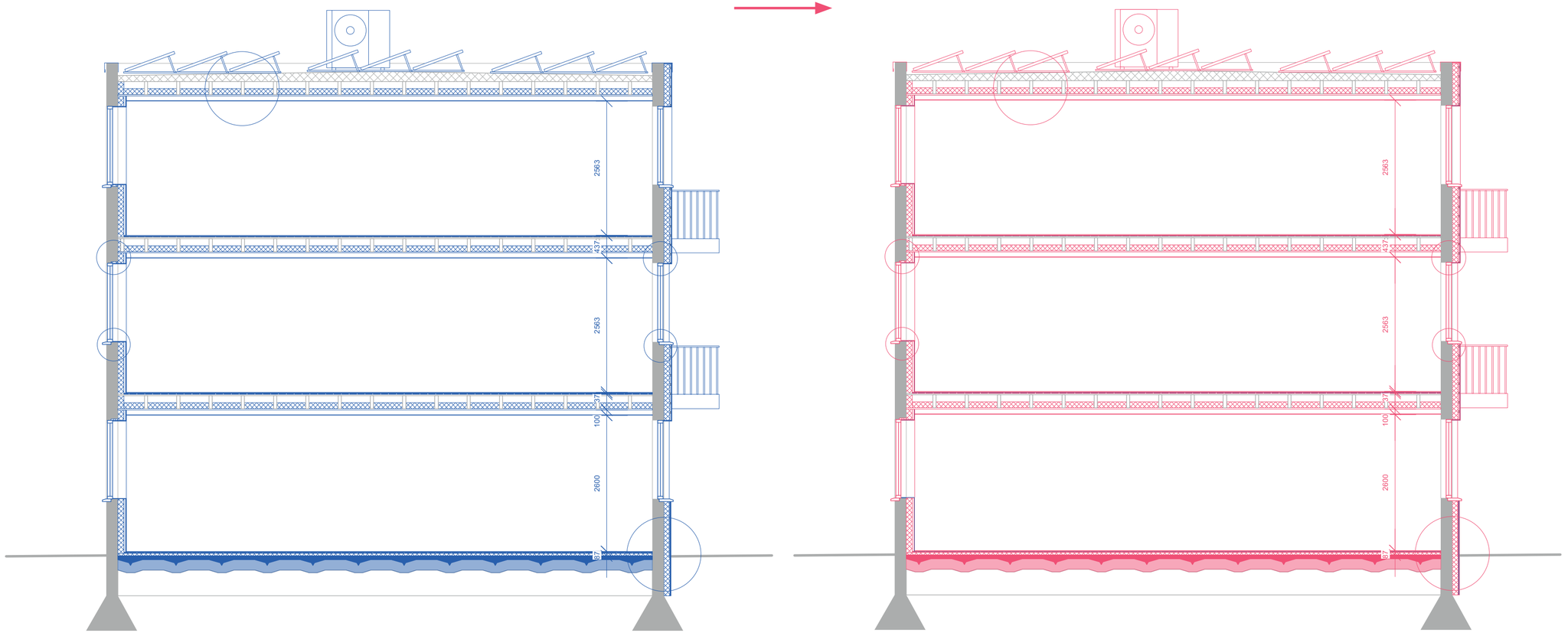
RESEARCH

Casestudy Comparison

Conventional renovation design

Design research

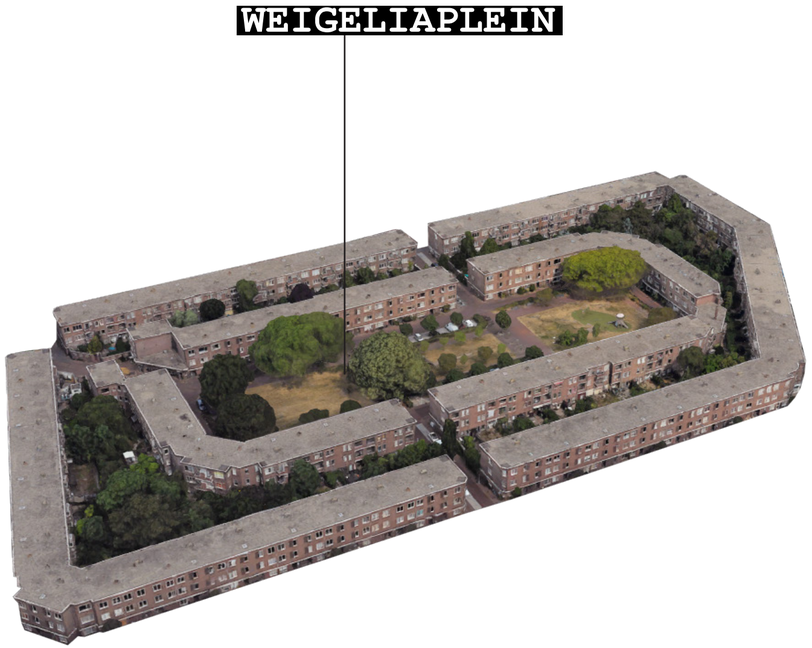
Circular alternative

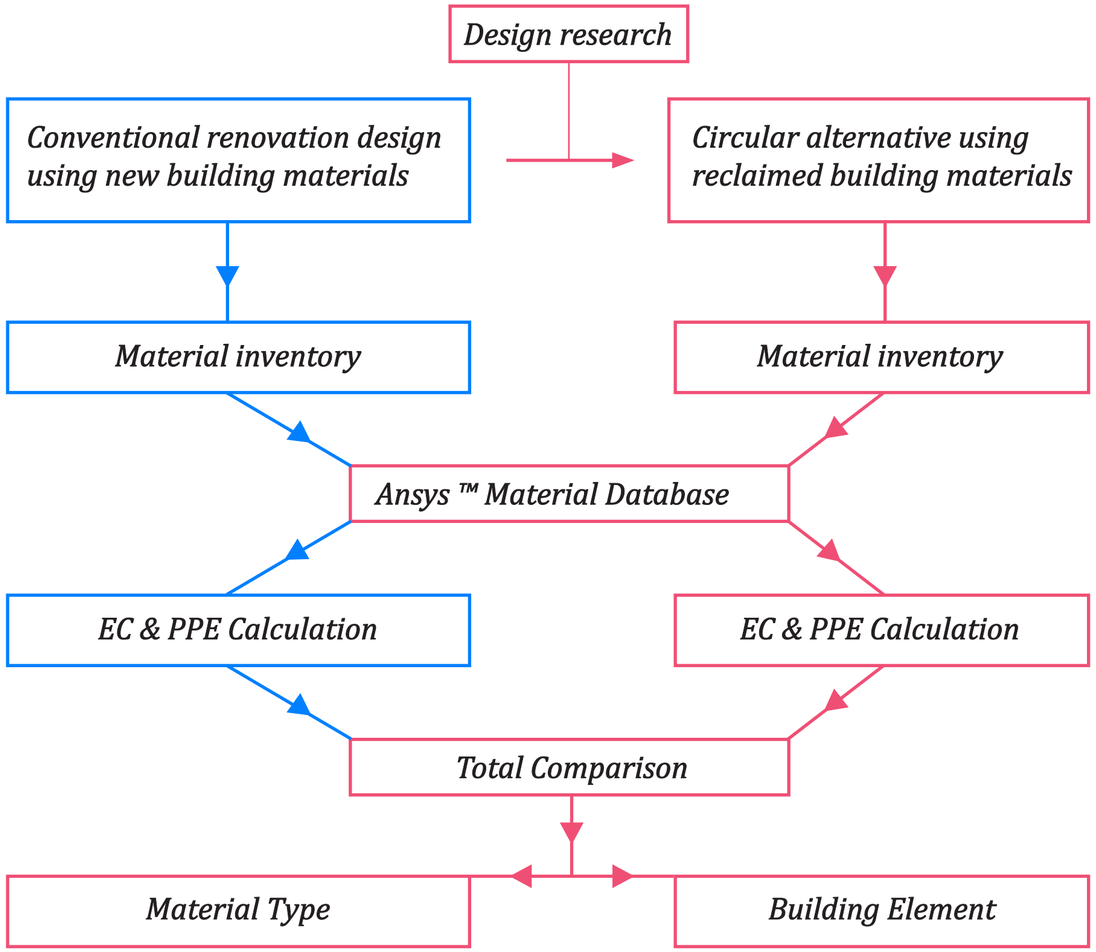


Jongert et al. (2023) section renovation design Superuse Studios

RESEARCH

Casestudy Comparison





RESEARCH

Results

Total CO_2-eq and energy savings

CO_2-eq savings

764.246 kg CO_2-eq

x 78

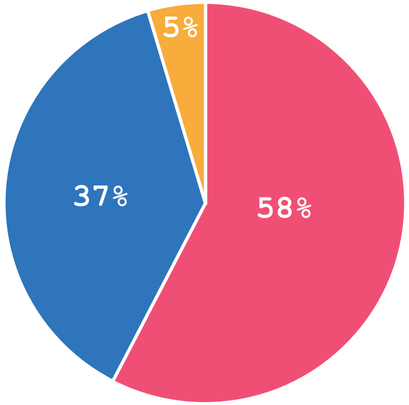
Energy savings

13.310.097 MJ

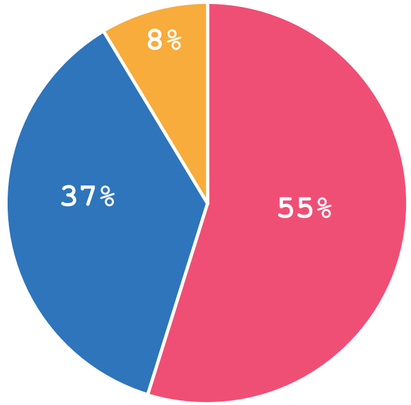
3.5 years (400 app.)

Comparison result per material type

CO_2-eq savings



Energy savings



Insulation

Finishing (plate material)

Window frames

Conclusion

"What are effective strategies of mitigating the embodied carbon and primary production energy in a renovation / transformation project?"

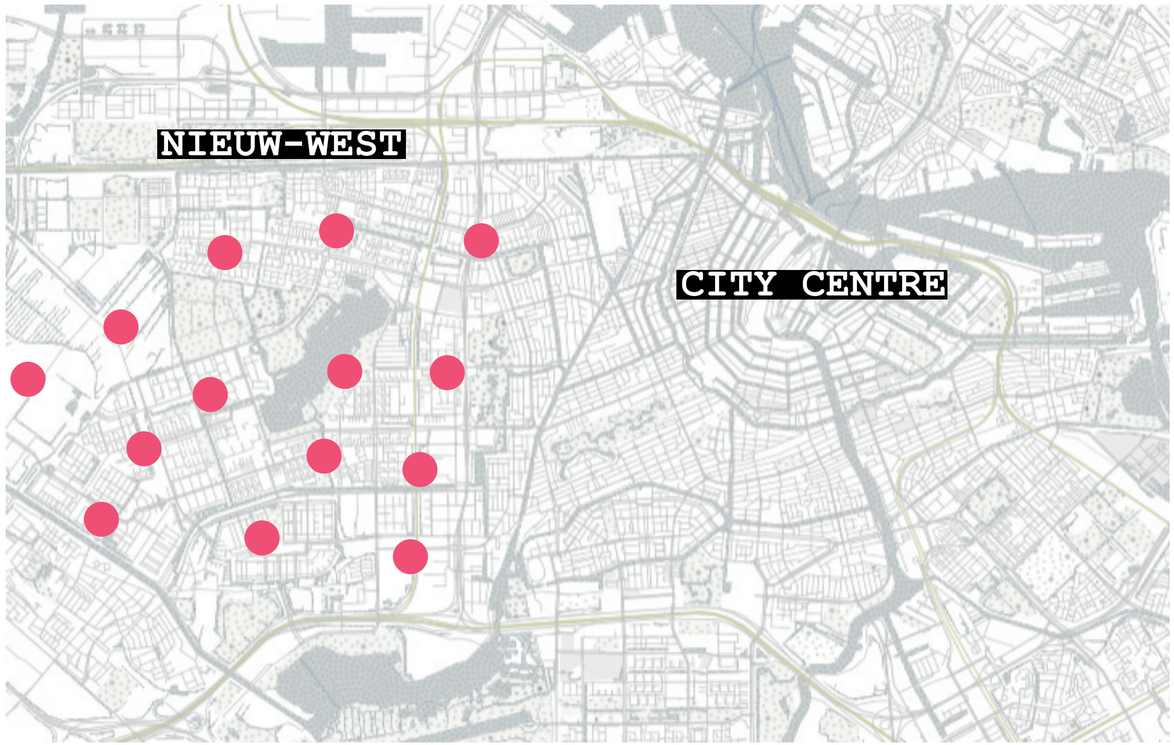
- *Applying reclaimed insulation materials showed highest potential of mitigating embodied carbon and energy use*
- *Applying reclaimed finishing material showed second highest potential of mitigating embodied carbon and energy use*

RESEARCH → **DESIGN**

DESIGN CASE

Renewal development in Amsterdam Nieuw West

Planned / current reconstruction development



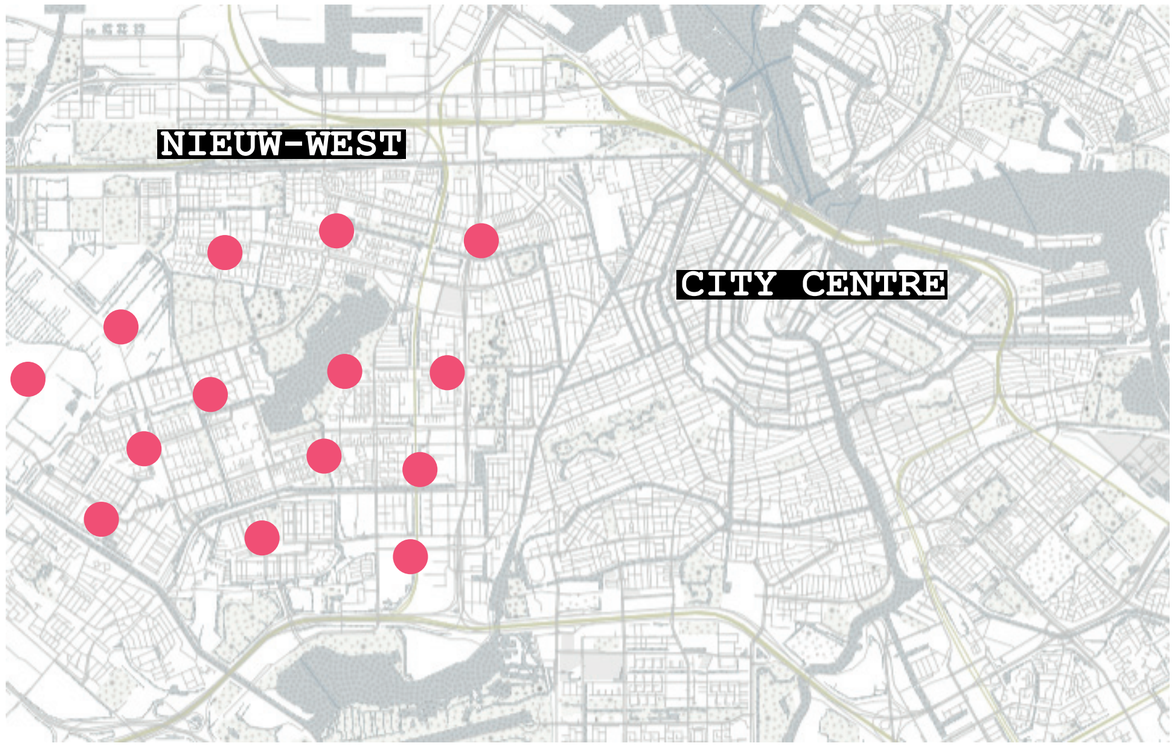
(City of Amsterdam, new development in Nieuw West. 2023)

DESIGN CASE

Renewal development in Amsterdam Nieuw West

Design Casestudy Choice

Find a residential block with a representative typology to adress and design an alternative to the mass demolition in the Amsterdam Nieuw West area.



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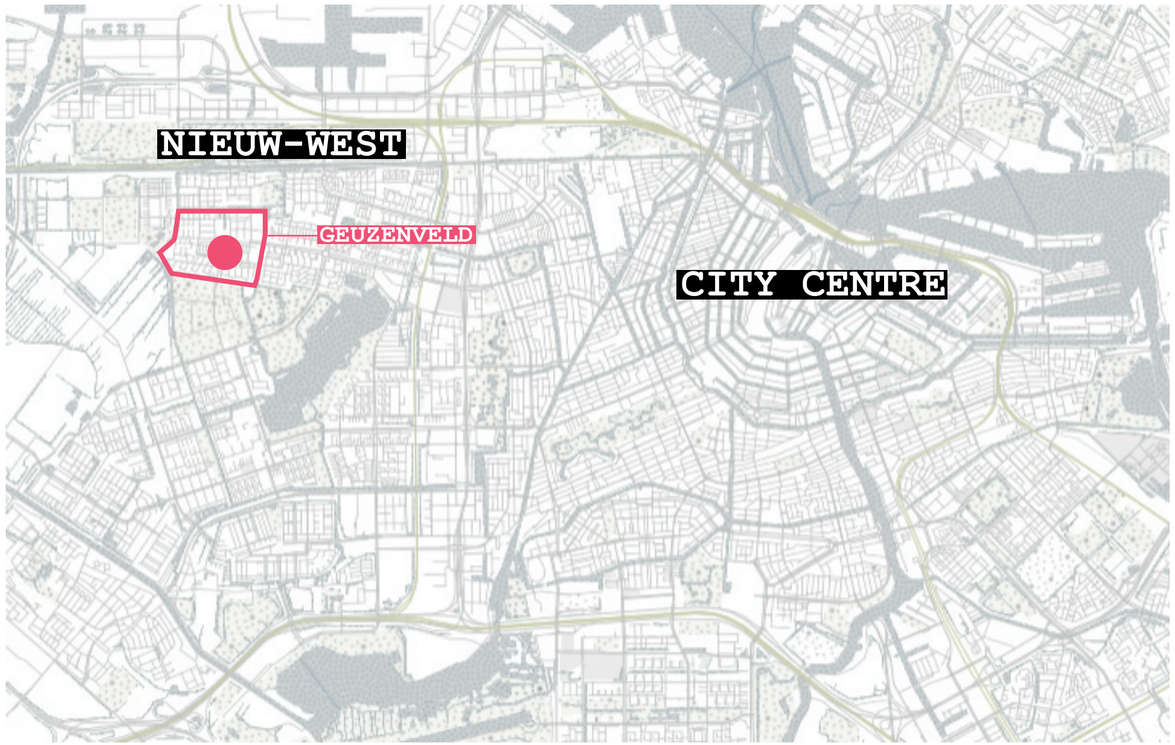
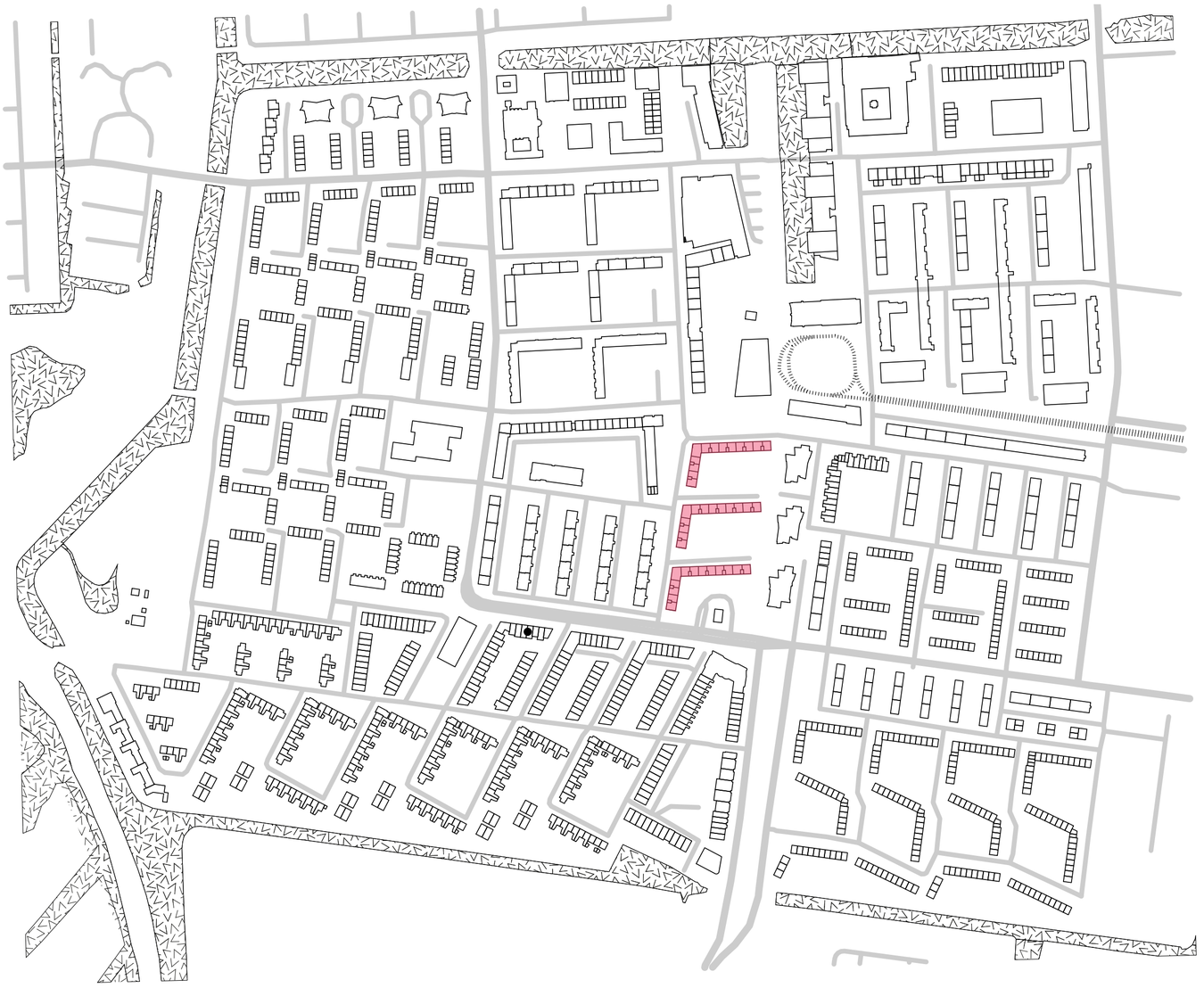


(City of Amsterdam, new development in Nieuw West. 2023)

DESIGN CASE

Urban context: Geuzenveld



DESIGN CASE

'VanTijen' flats

Year: 1954
Architect: Willem van Tijen
Integral part of the AUP

Representative typology

- Midrise porchflat
- Courtyard ensemble

Relevant study case

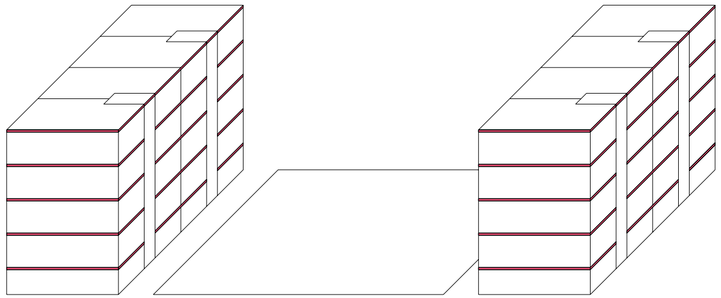
- Recently (2021) demolished

Unique

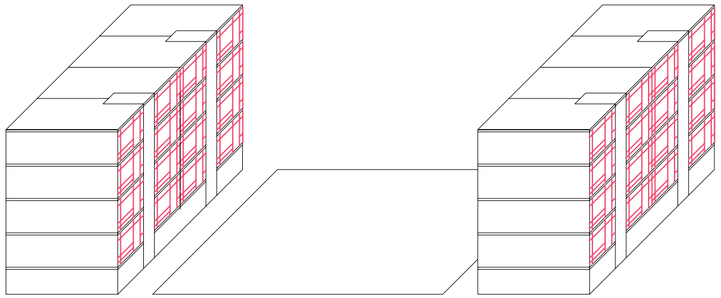
- Beauty in subtle details and architectural expression

VALUES BUILDING LEVEL

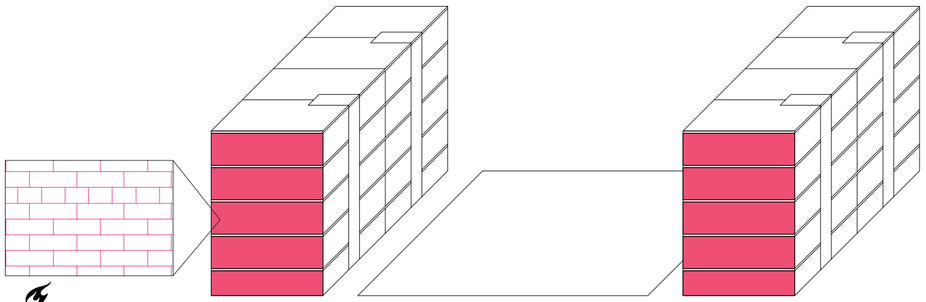
Protruding floor elements as architectural accent



Floor-to-floor window frames as facade elements
Creating rithm and architectural language

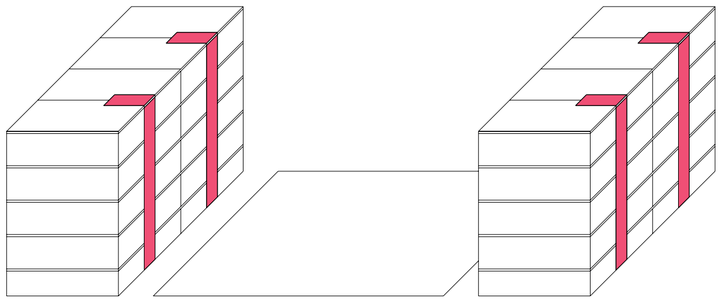


Masonry appearance



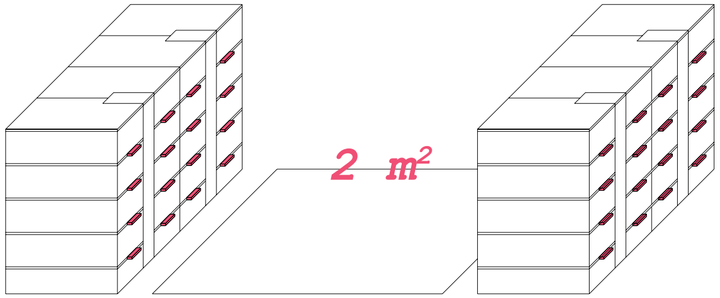
VALUES BUILDING LEVEL

Stairwells as access route, visible elements
stabilizing structural elements

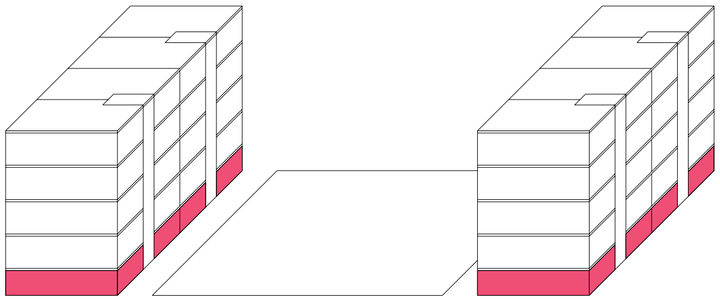


ISSUES BUILDING LEVEL

Very limited private outdoor space

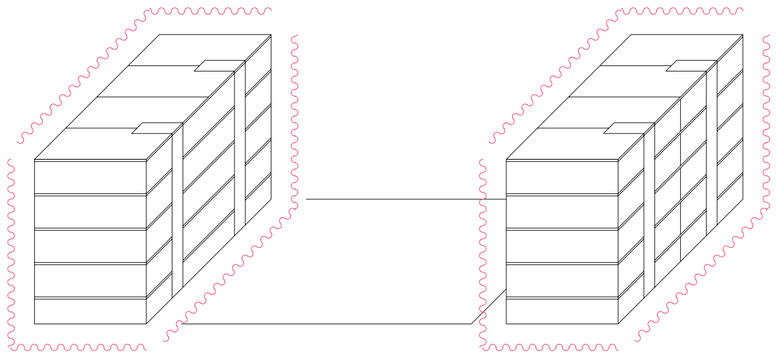


Low and closed-off plinth neglecting its direct context

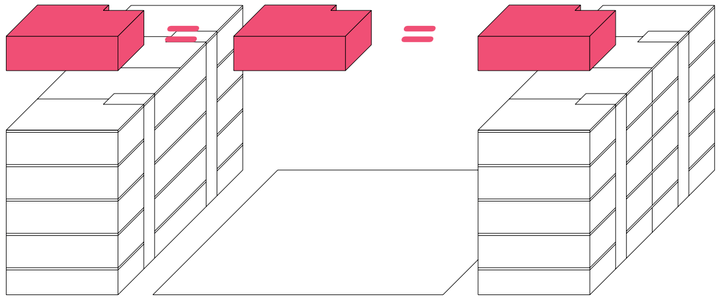


ISSUES BUILDING LEVEL

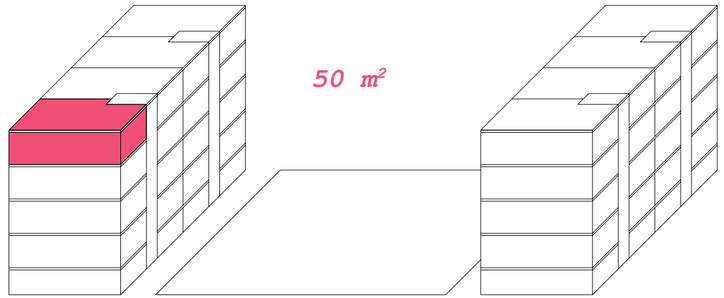
High in energy use due to poor insulation



Low variety in dwelling types



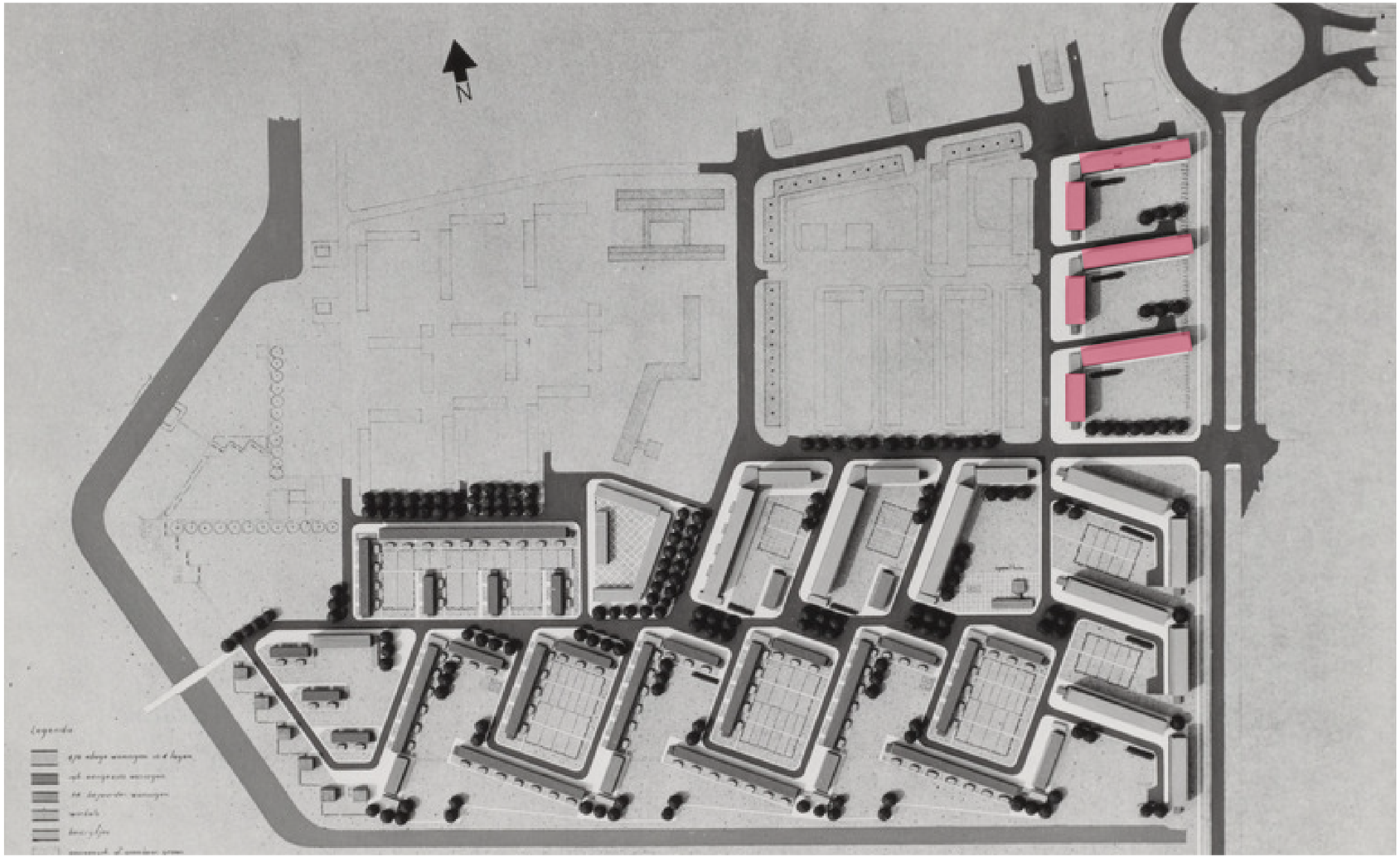
Small dwellings

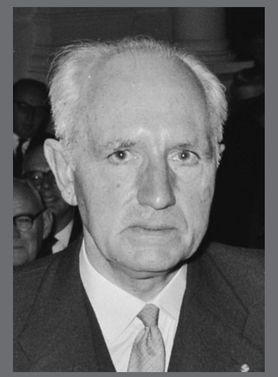


DESIGN CASE

'VanTijen' flats

Masterplan model 1952





Willem van Tijen

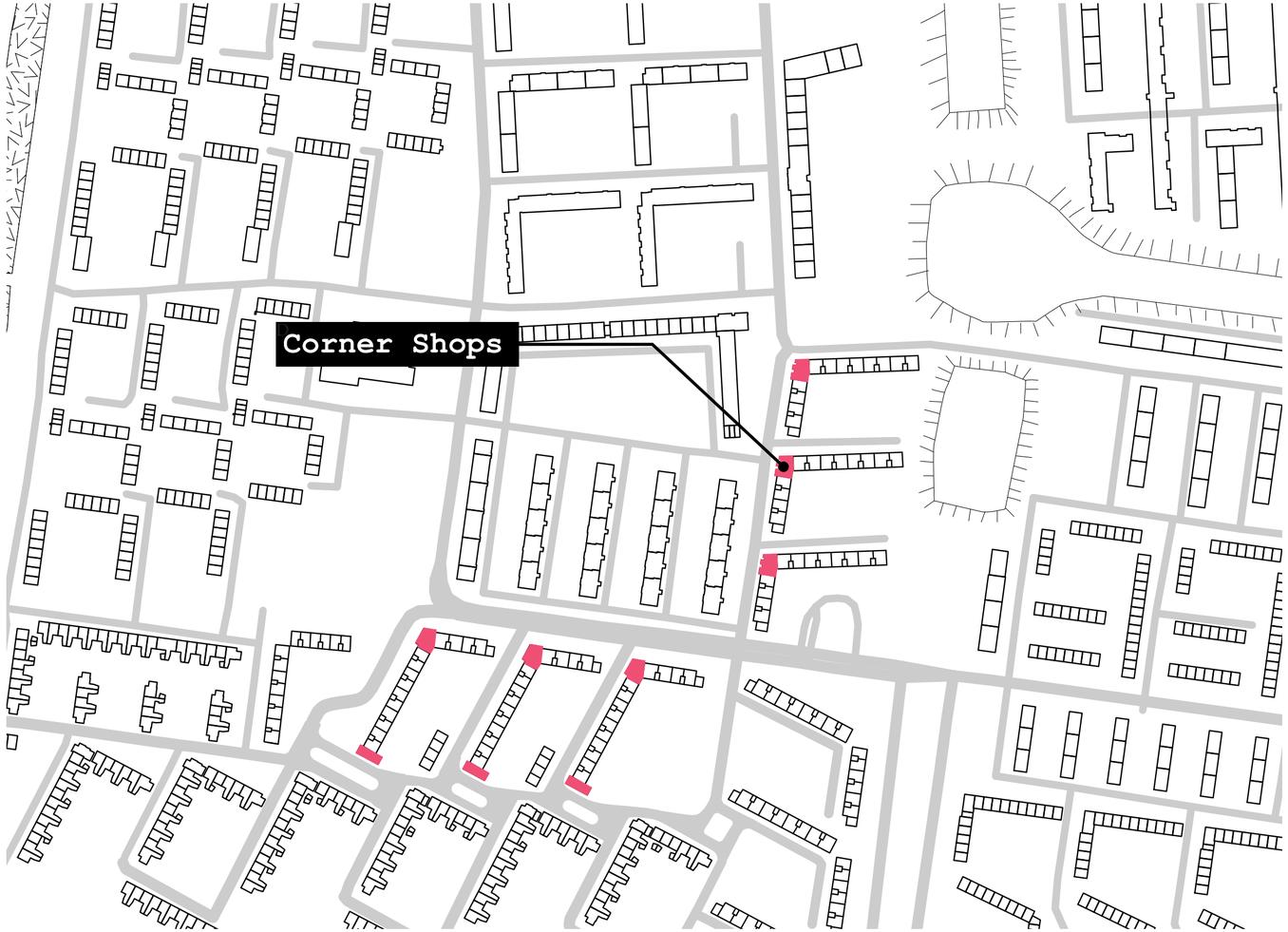
(1894-1974)

Bergpolderflat (1933) Rotterdam

DESIGN CASE

Social vision:
cornershops as social functionality within housing ensembles

Urban context 1954



URBAN INVENTORY

Urban context 2021

Commercial

Leisure

Social

Education

Sports

Main roads

Tram stop

Bus stop

Car parking

TUDelft

CLIMATE ANALYSIS

Experienced Temperature on a 'hot' summer day

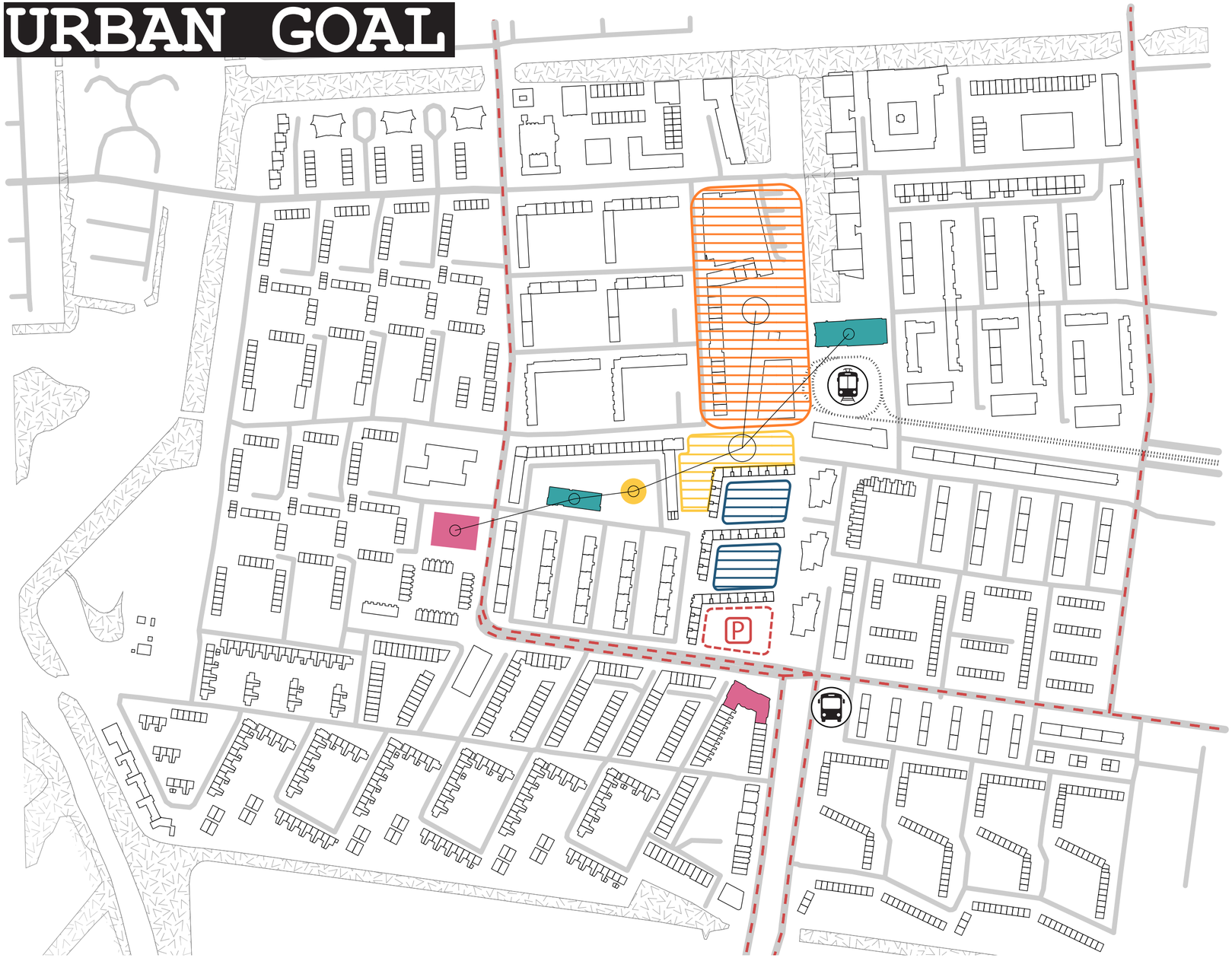
Source: Klimaateffect Atlas 2023

CLIMATE ANALYSIS

Water Nuisance by heavy rainfall

Source: Klimaateffect Atlas 2023

URBAN GOAL



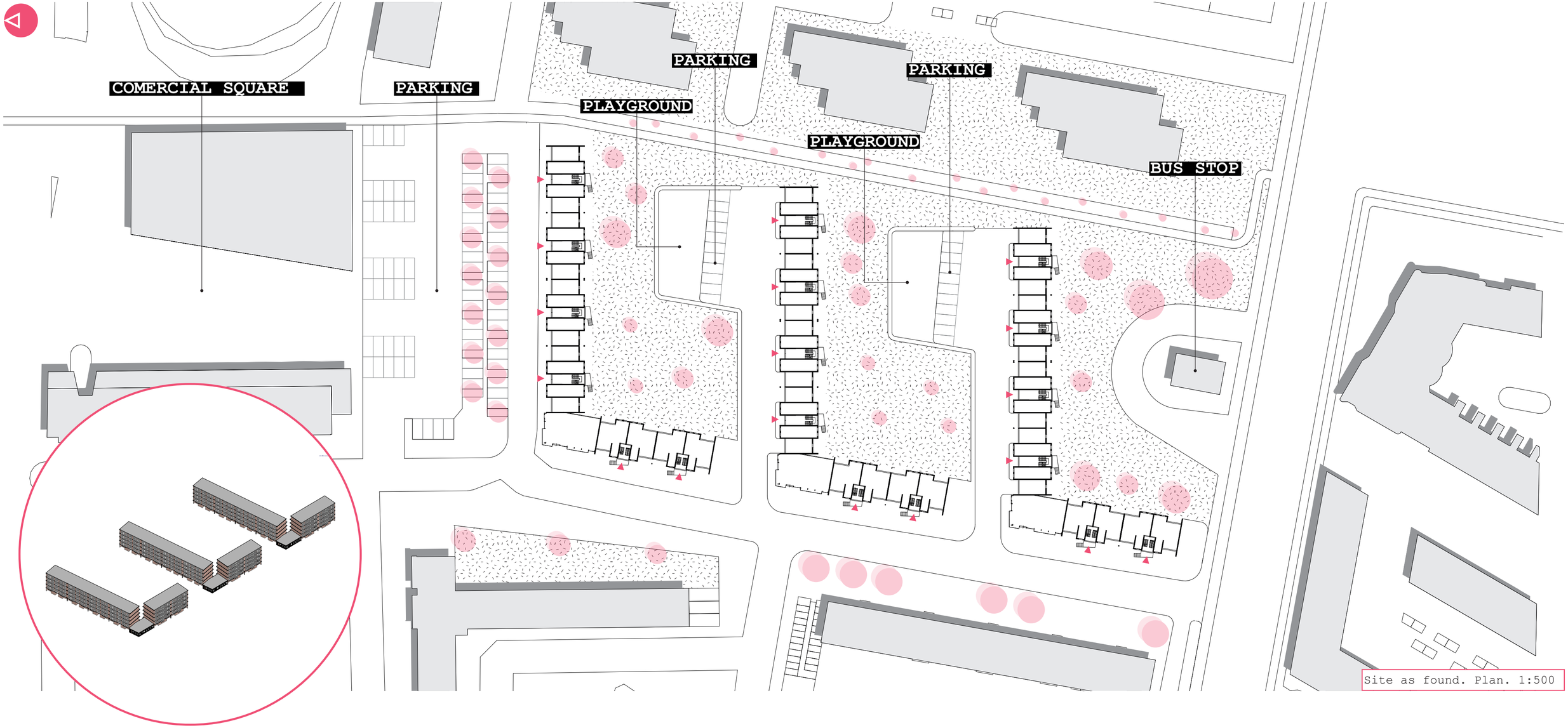
Social

‘Create a socially activated neighborhood centre by introducing new public space and accomodating leisure opportunities which connects to the existing commercial square’

Environmental

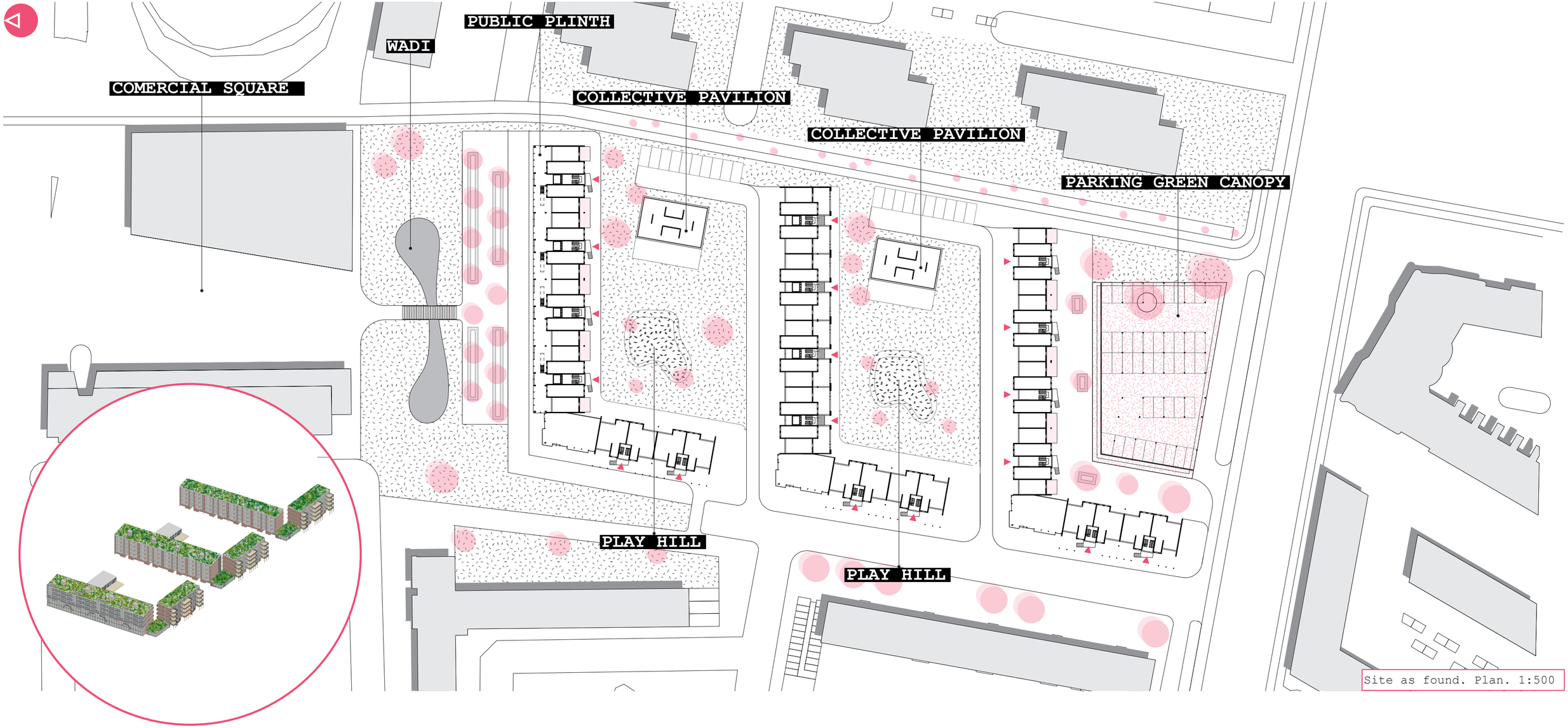
‘Provide water retention and cooling down urban heat island effect’

SITE-AS-FOUND



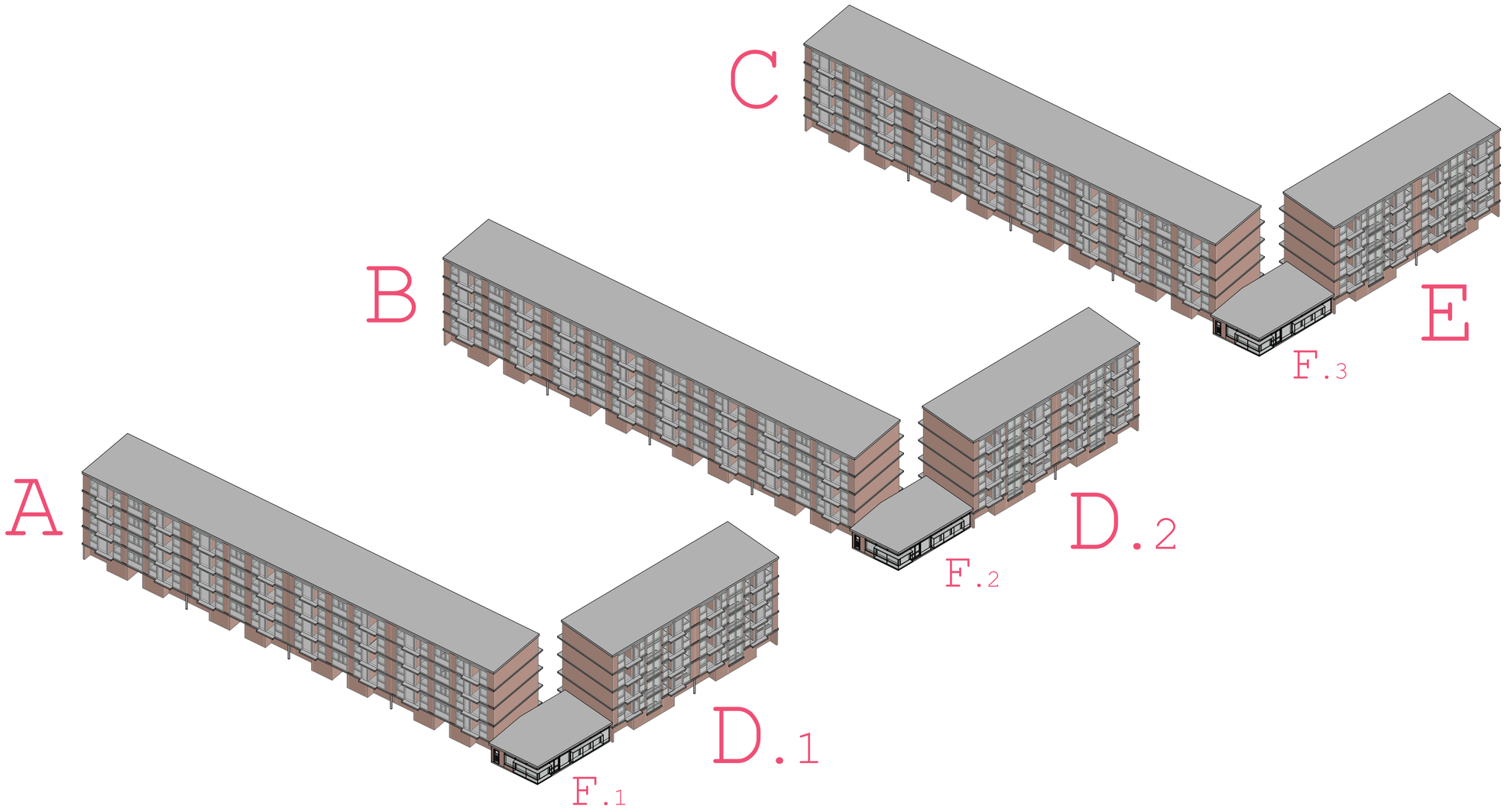
Site as found. Plan. 1:500

MASTERPLAN

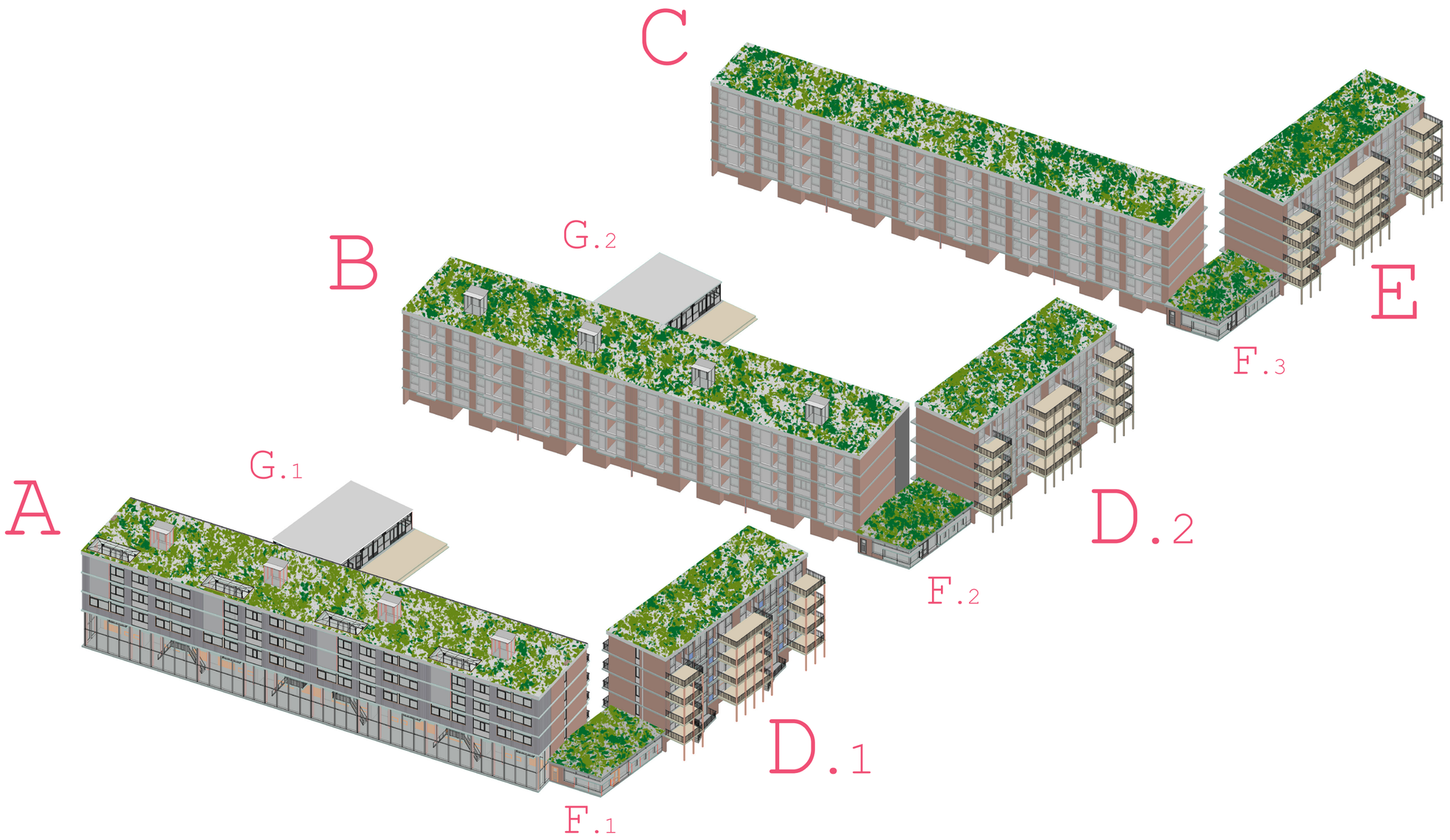


Site as found. Plan. 1:500

BUILDINGS-AS-FOUND



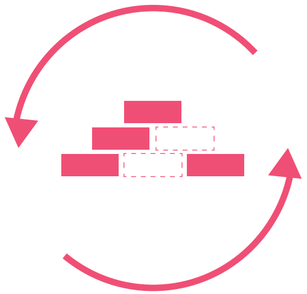
BUILDINGS-DESIGN



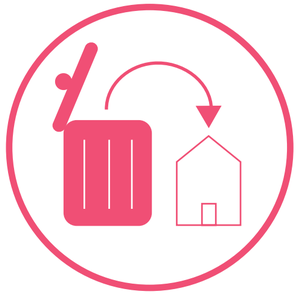
TRANSFORMATION STRATEGY

1. **PRESERVE**

2. **REUSE**



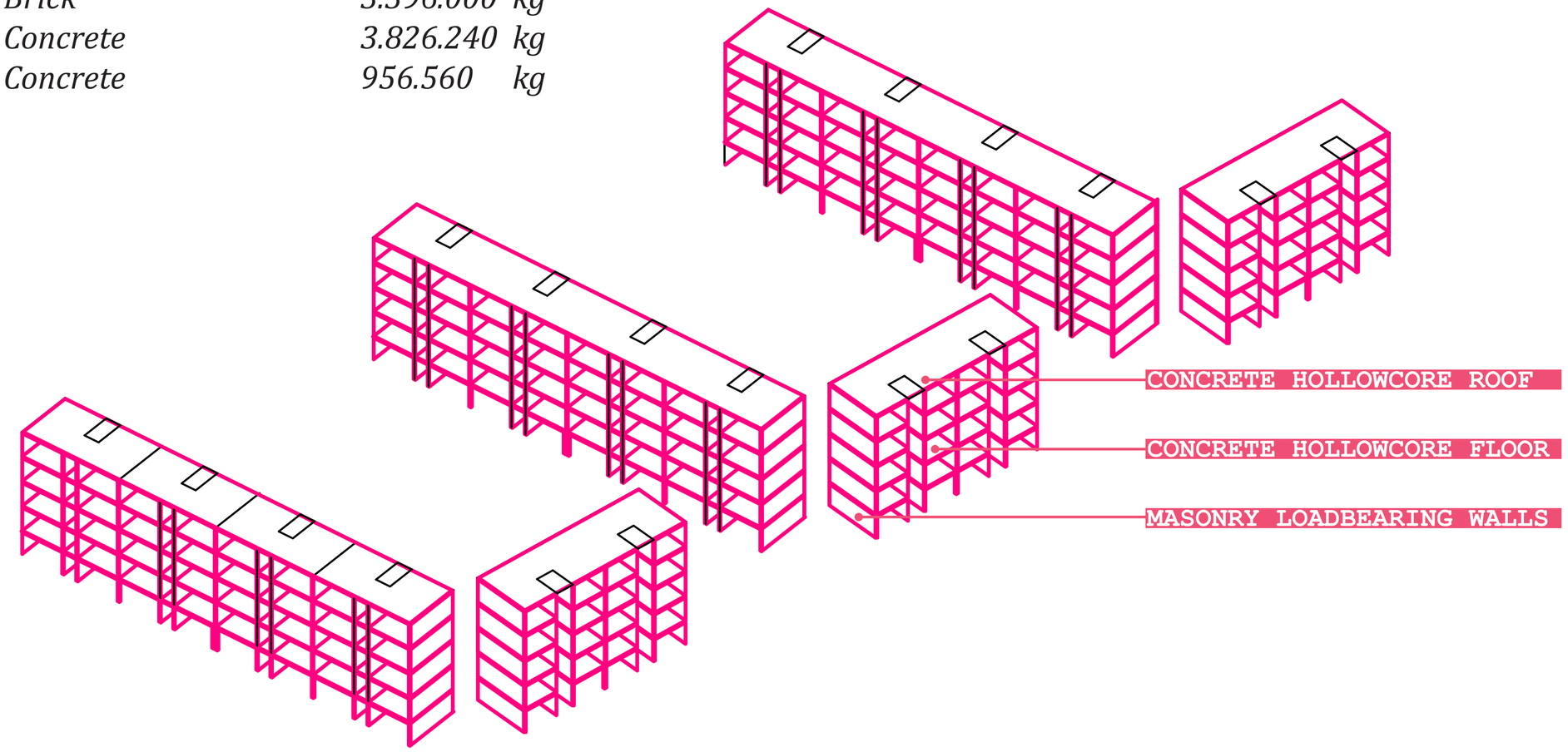
3. **RECLAIM**



PRESERVE

Full casco preservation

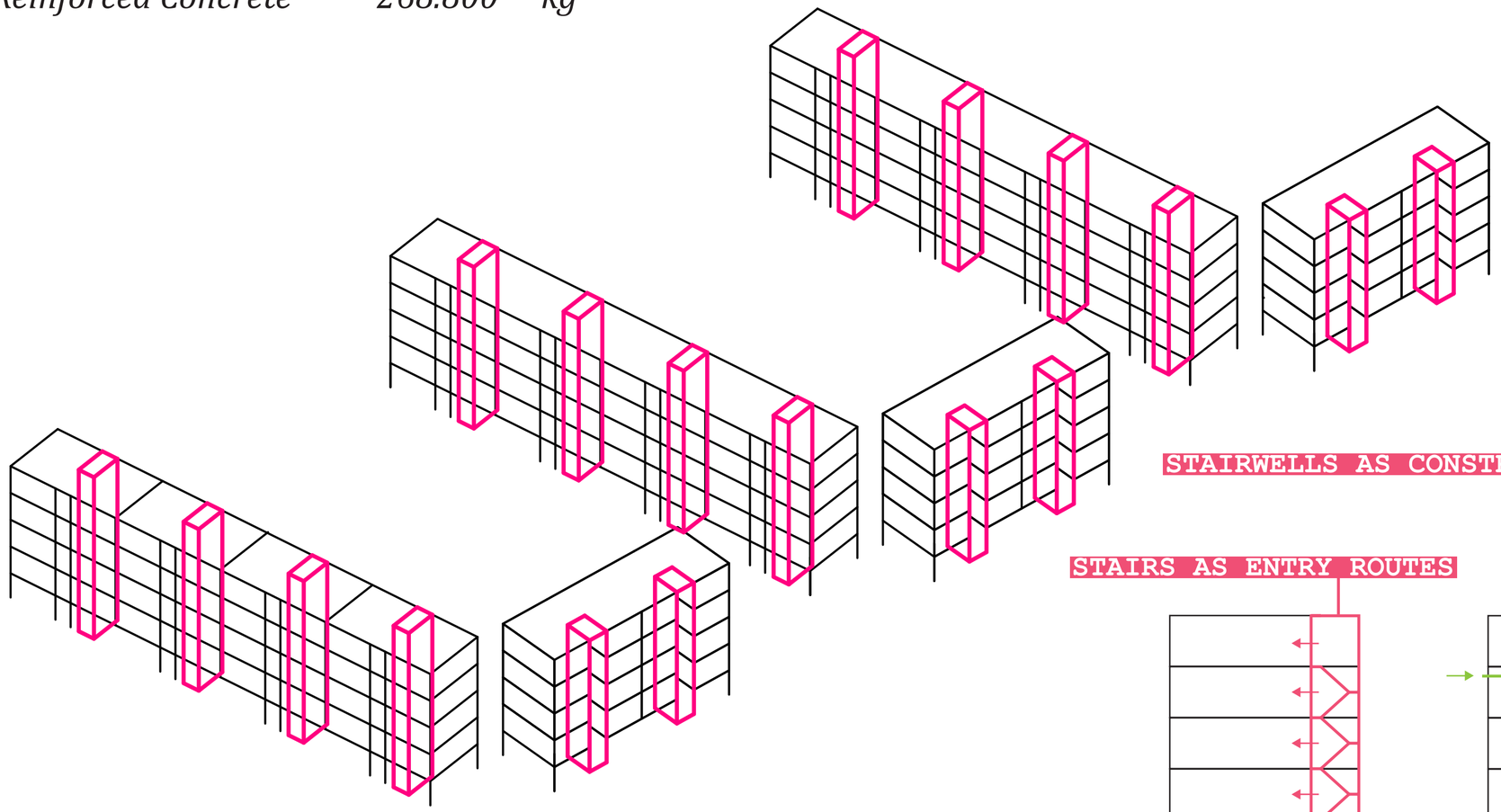
Building element	***Material***	***Mass***
Loadbearing walls	*Brick*	*3.396.000 kg*
Floors	*Concrete*	*3.826.240 kg*
Roofs	*Concrete*	*956.560 kg*

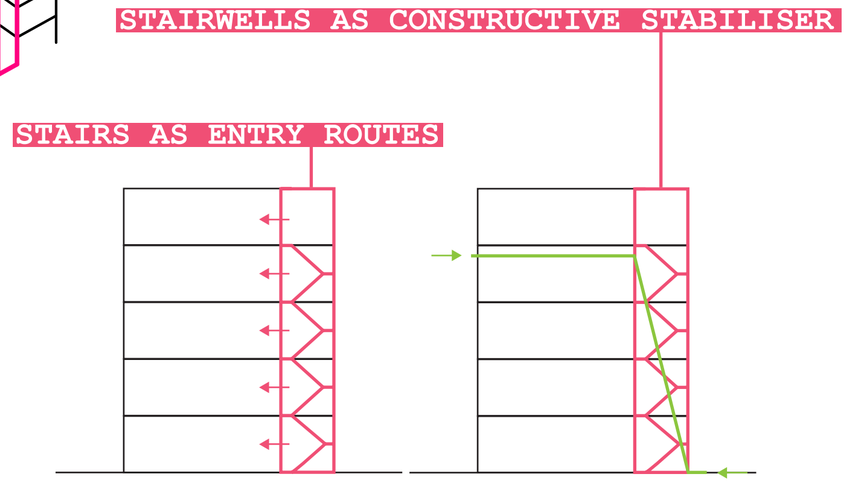


PRESERVE

Preservation of stairwells

Building element	***Material***	***Mass***
Stairs	*Reinforced Concrete*	*268.800 kg*

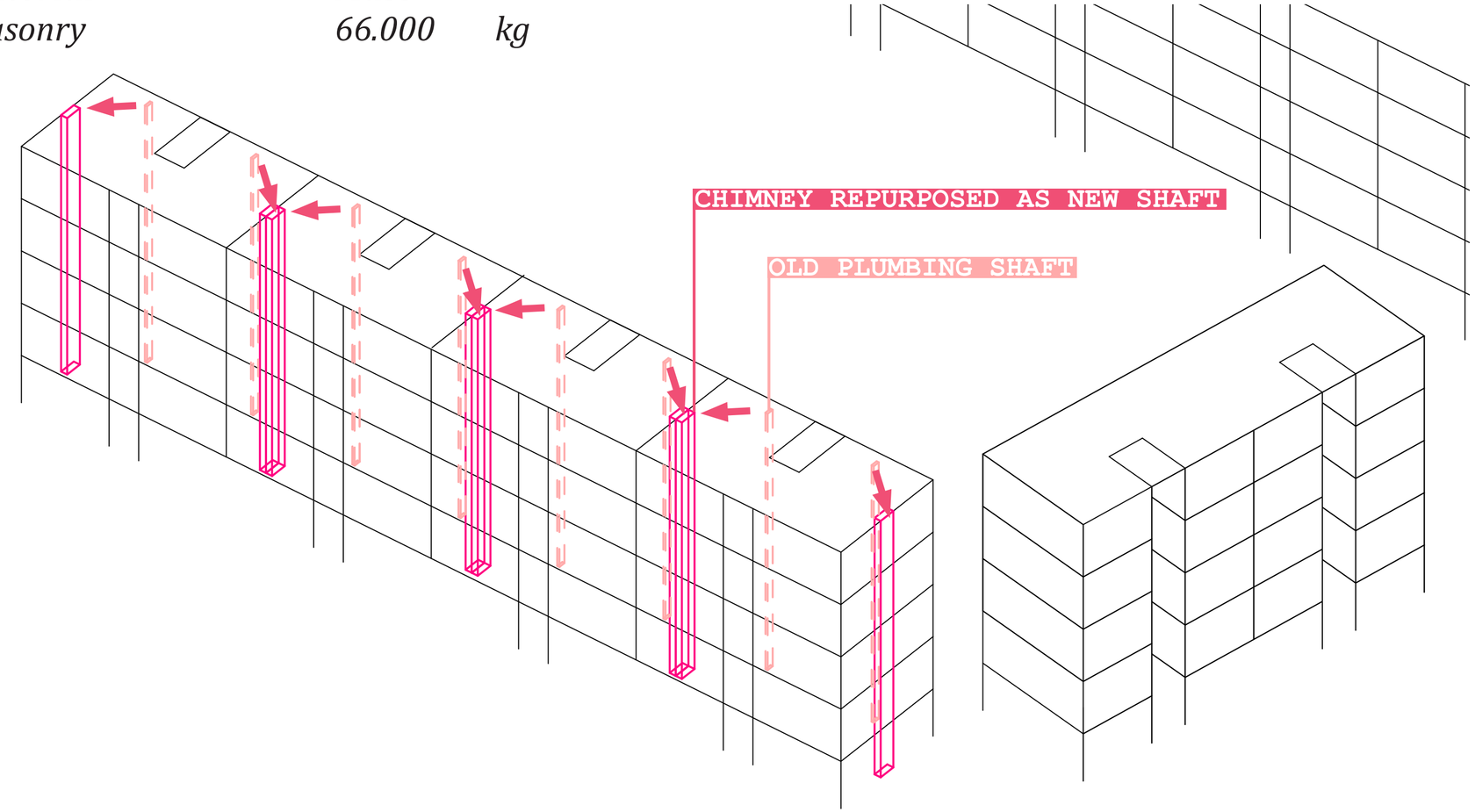




PRESERVE

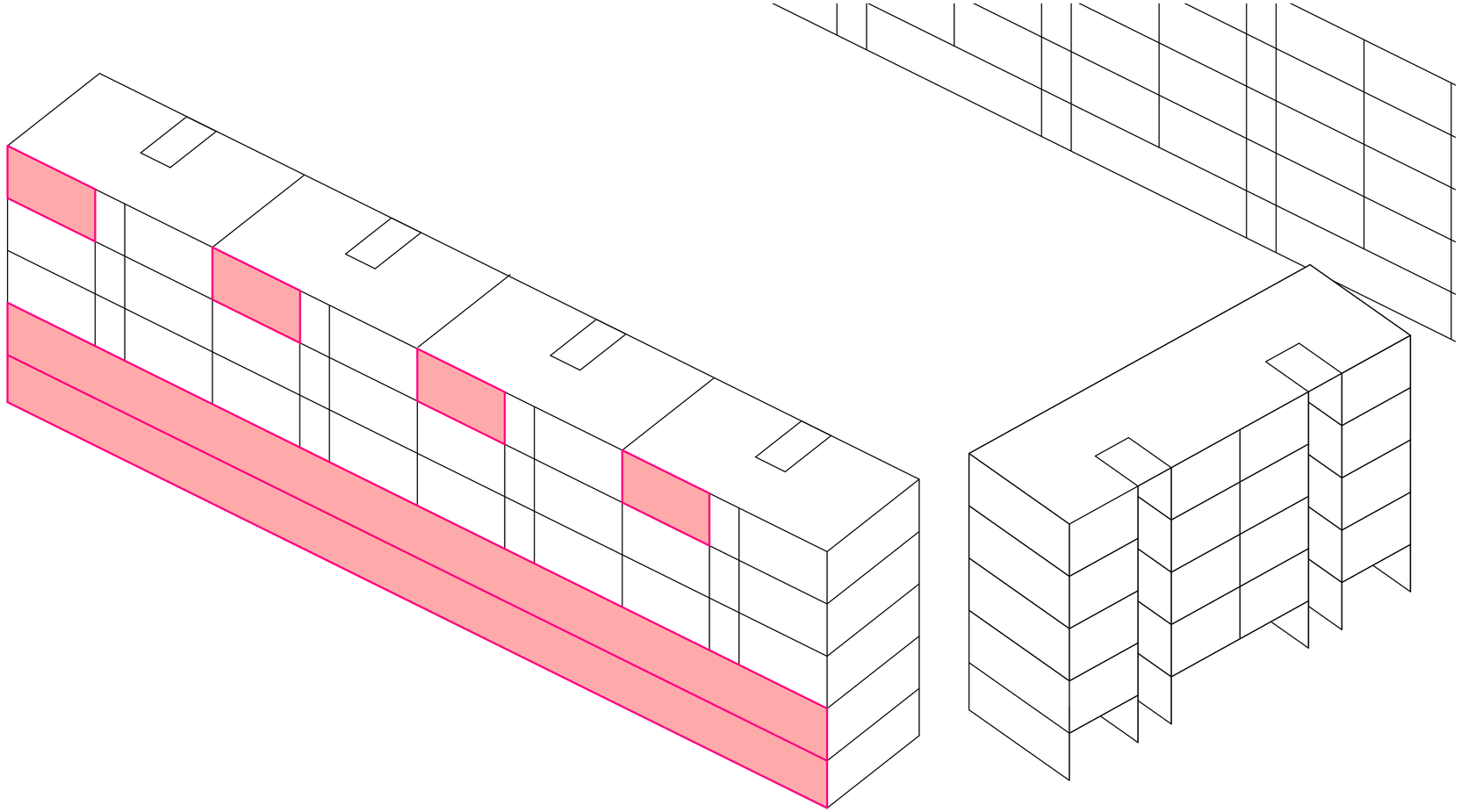
Chimneys repurposed as plumbing shafts

Building element	***Material***	***Mass***	
Chimney -> Shaft	*Masonry*	*66.000*	*kg*

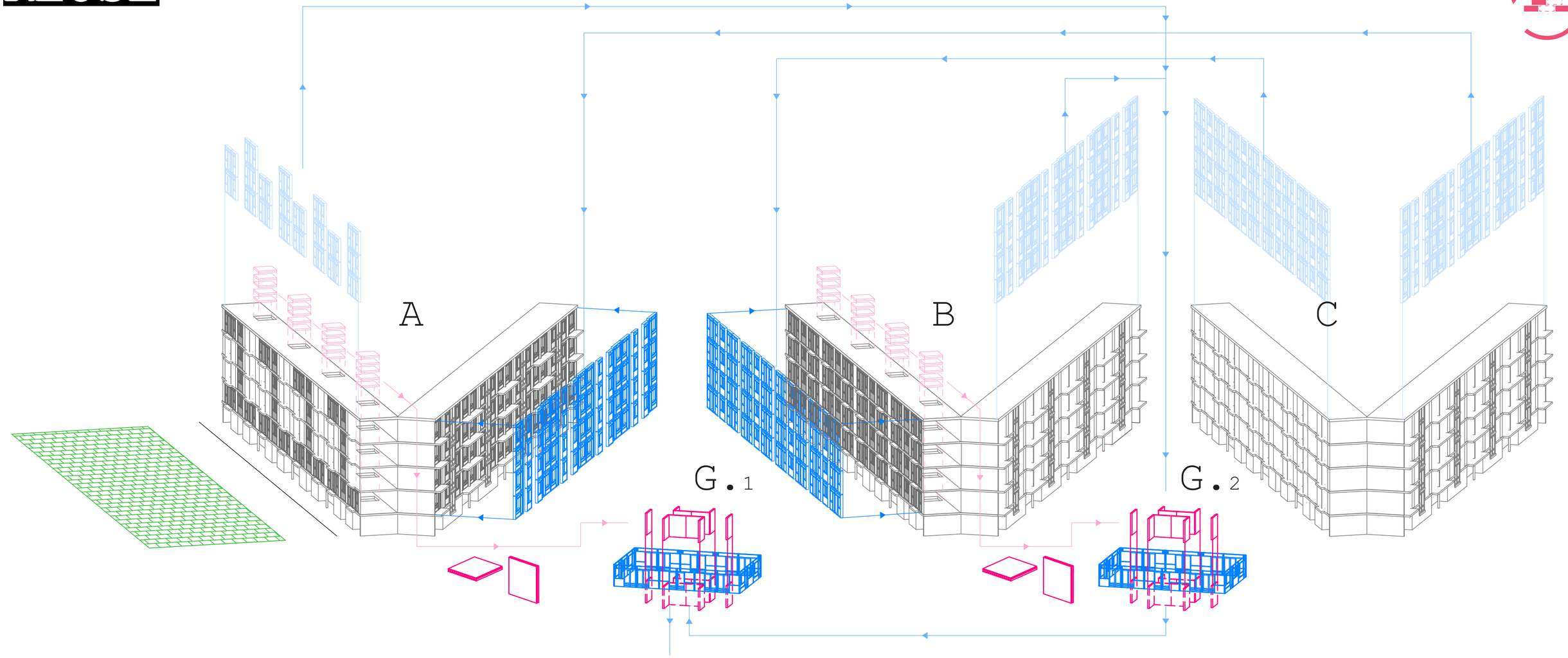


PRESERVE

Indicated facade appearance fully preserved

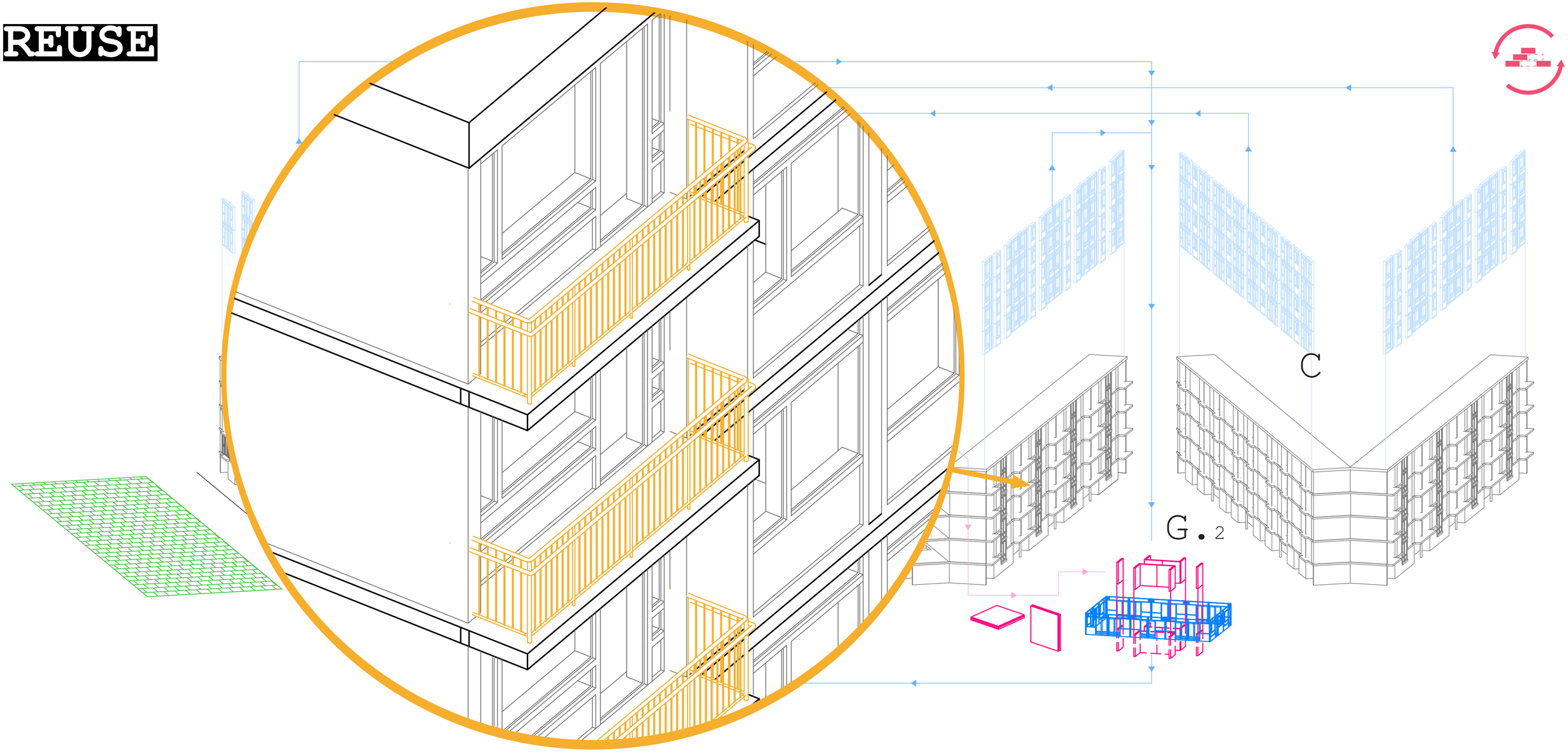


REUSE



Window frames *Floorslabs* *Pavement bricks* *Balcony railings*

REUSE

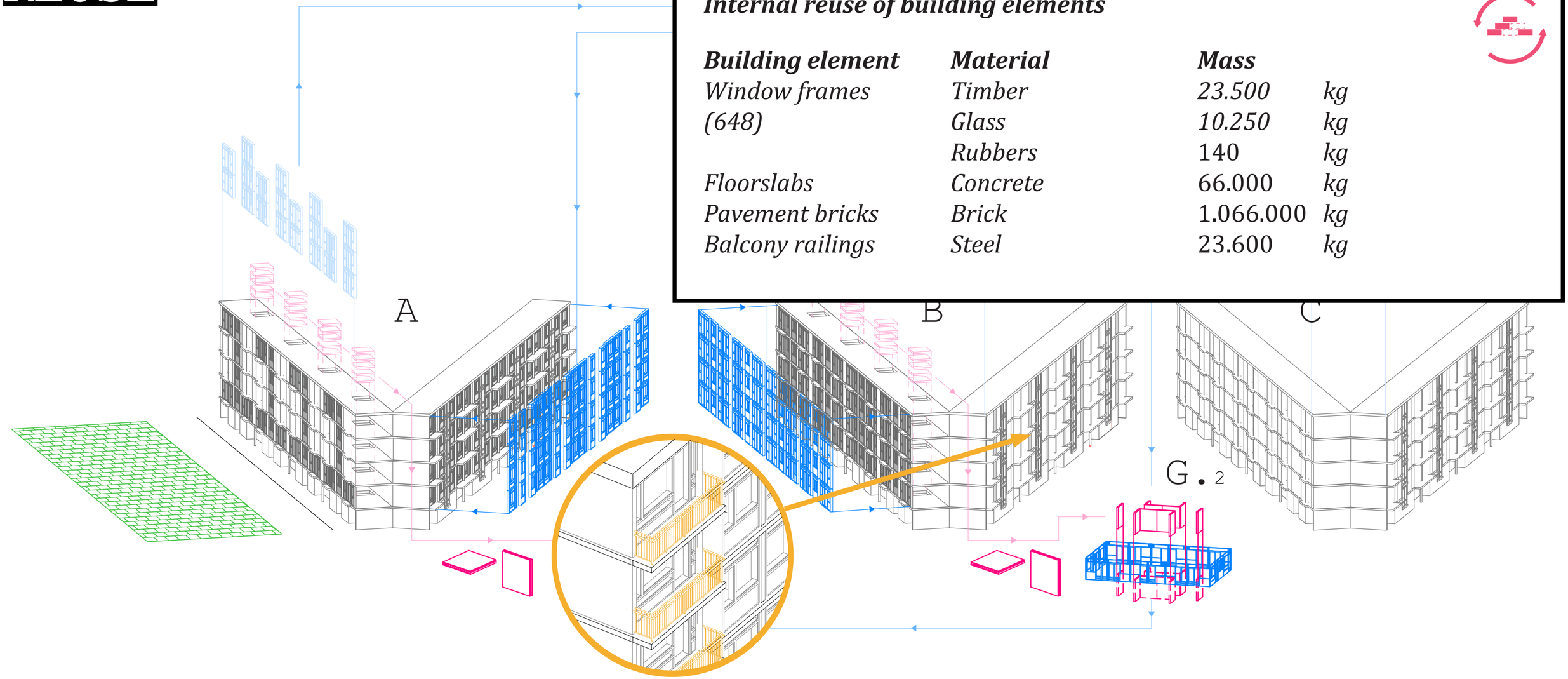


Window frames *Floorslabs* *Pavement bricks* *Balcony railings*

REUSE

Internal reuse of building elements

Building element	***Material***	***Mass***	
Window frames	*Timber*	*23.500*	*kg*
(648)	*Glass*	*10.250*	*kg*
	Rubbers	140	*kg*
Floorslabs	*Concrete*	66.000	*kg*
Pavement bricks	*Brick*	1.066.000	*kg*
Balcony railings	*Steel*	23.600	*kg*

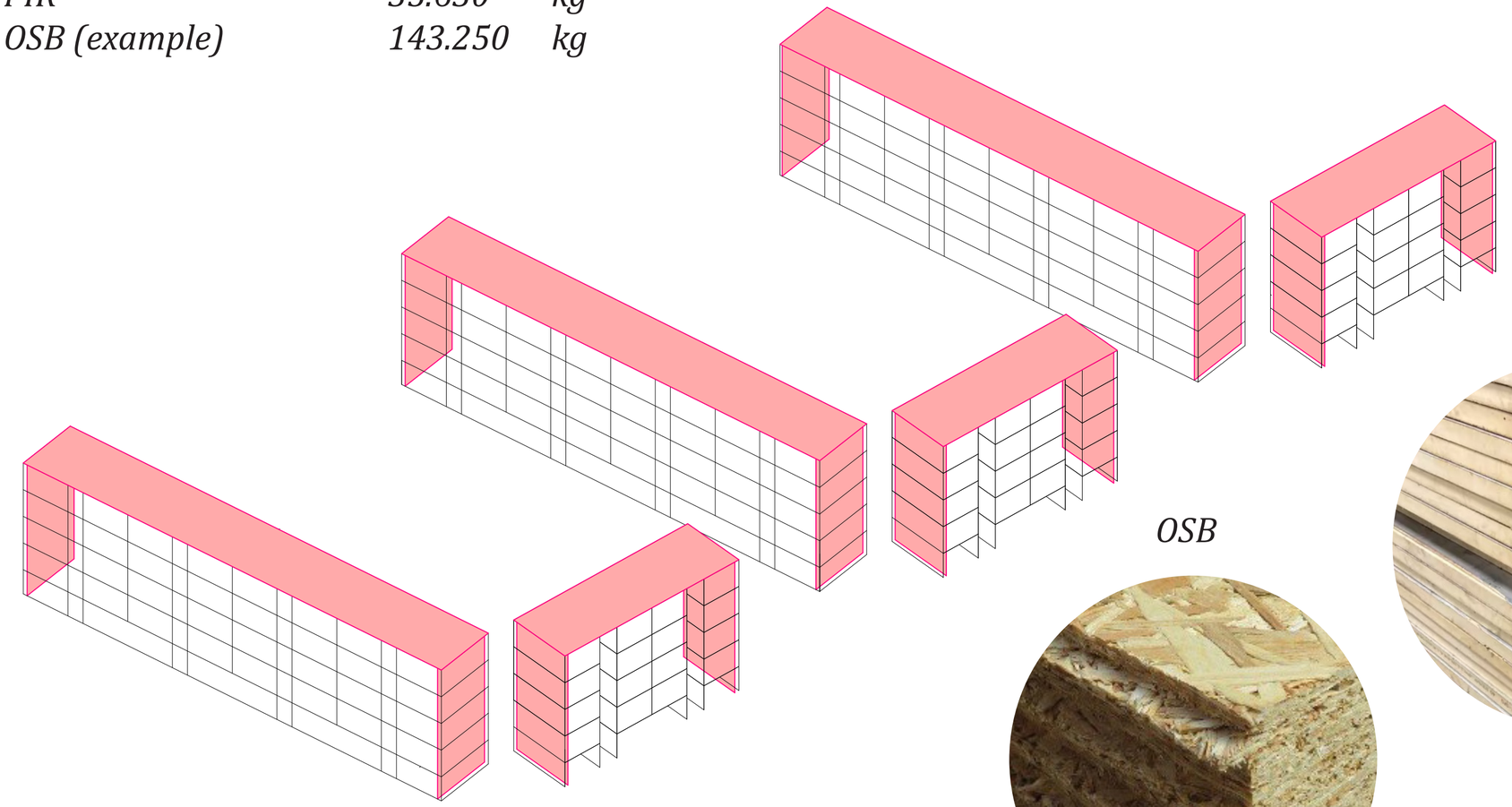


Window frames *Floorslabs* *Pavement bricks* *Balcony railings*

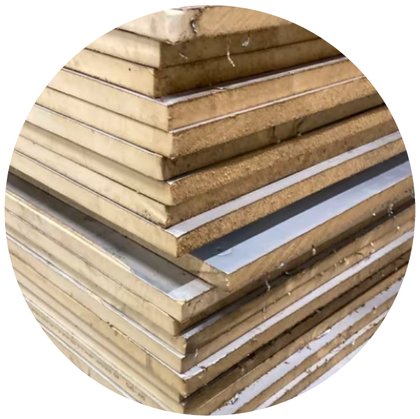
RECLAIM

Insulation package

Building element	***Material***	***Mass***	
Insulation	*PIR*	*35.630*	*kg*
Finishing	*OSB (example)*	*143.250*	*kg*



PIR

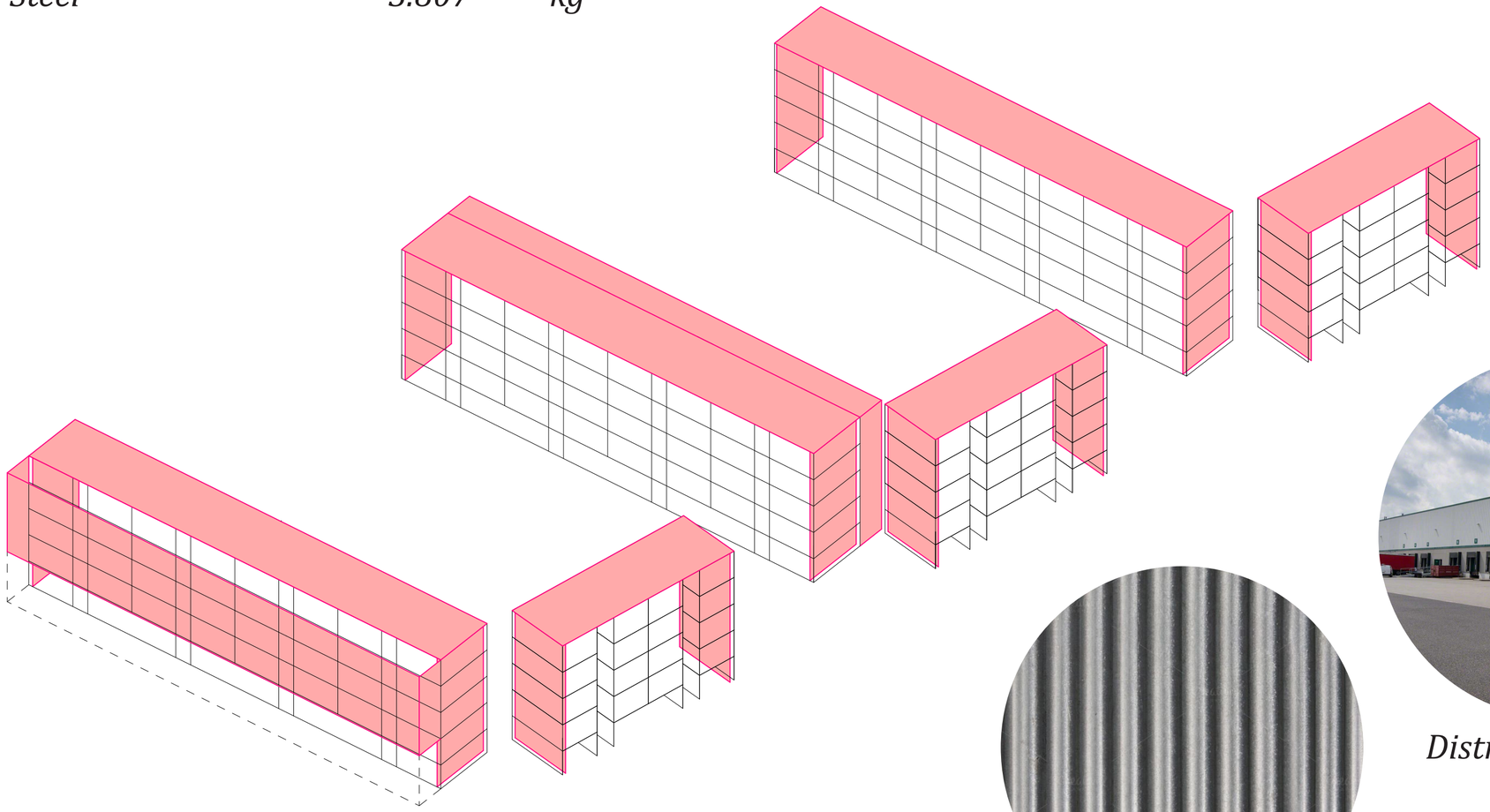


OSB

RECLAIM

Facade cladding extension

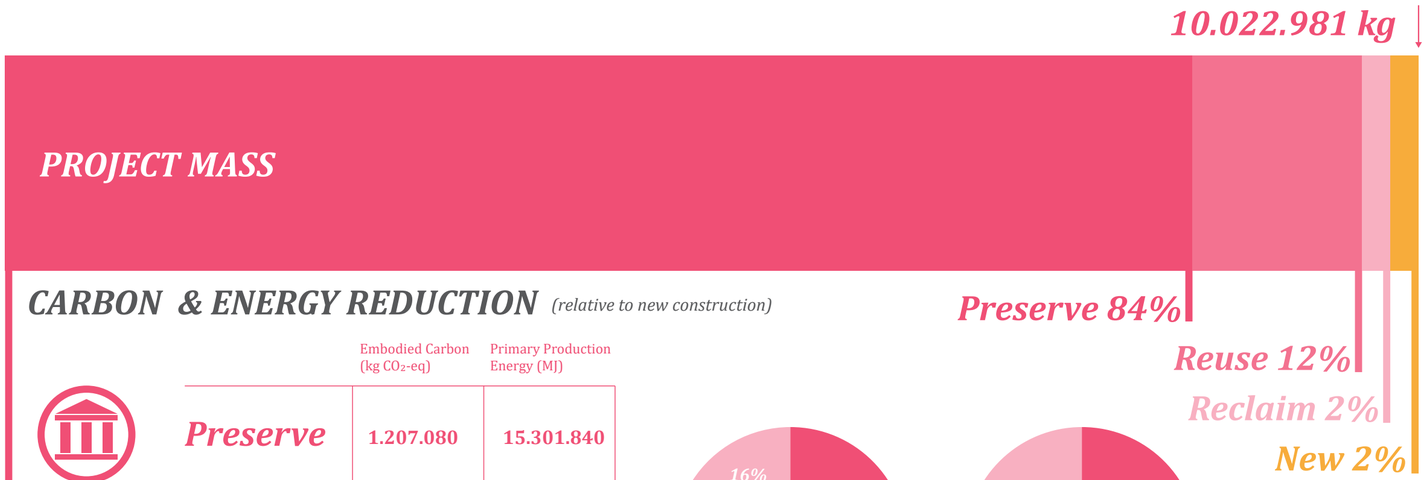
Building element	***Material***	***Mass***	
Facade cladding	*Steel*	*3.807*	*kg*



Distribution Centres

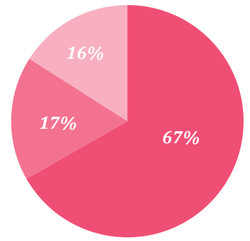
Corrugated Steel

IMPACT

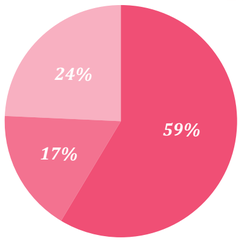


CARBON & ENERGY REDUCTION *(relative to new construction)*

	Embodied Carbon (kg CO_2-eq)	Primary Production Energy (MJ)
Preserve	1.207.080	15.301.840
Reuse	312.600	4.470.075
Reclaim	289.071	6.341.004



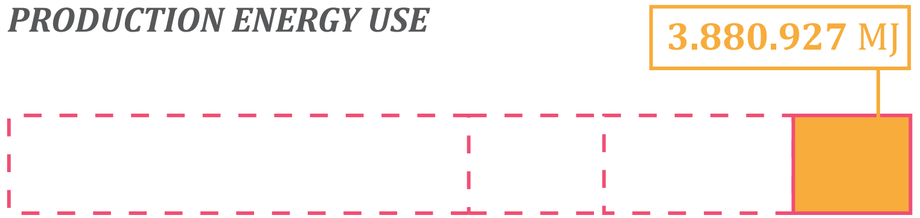
Carbon reduction by strategy



Energy reduction by strategy

CARBON EMISSION

PRODUCTION ENERGY USE



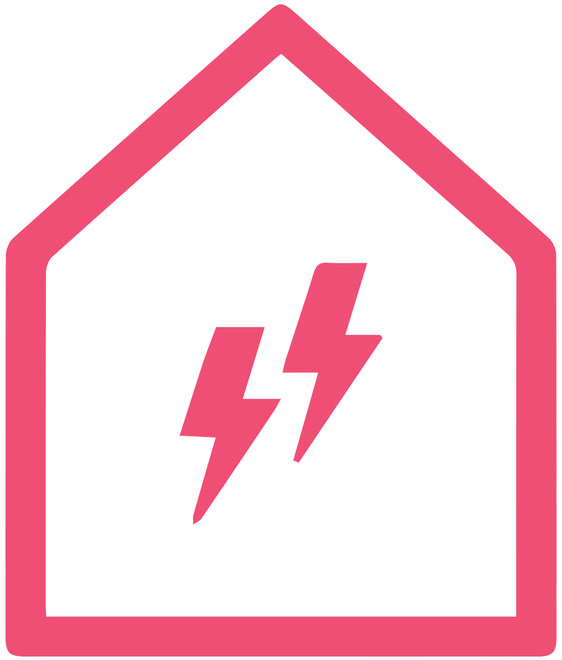
IMPACT

1.808.751 kg CO_2-eq

x 185

IMPACT

26.122.919 MJ



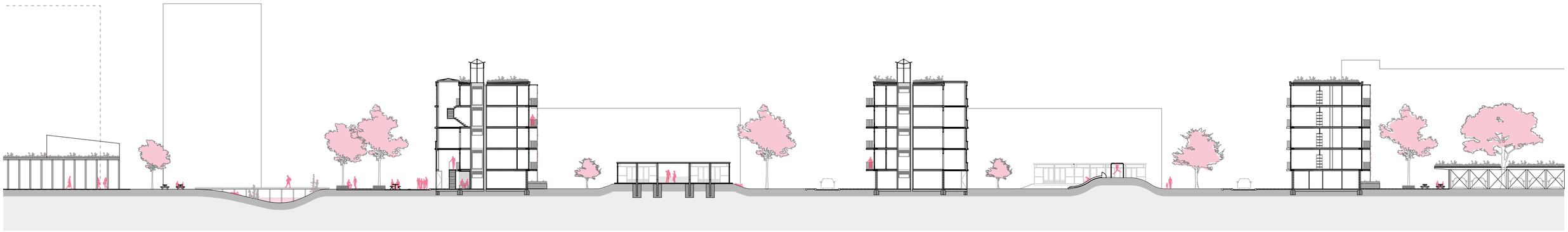
13 years

140 appartments

DESIGN

Masterplan in section

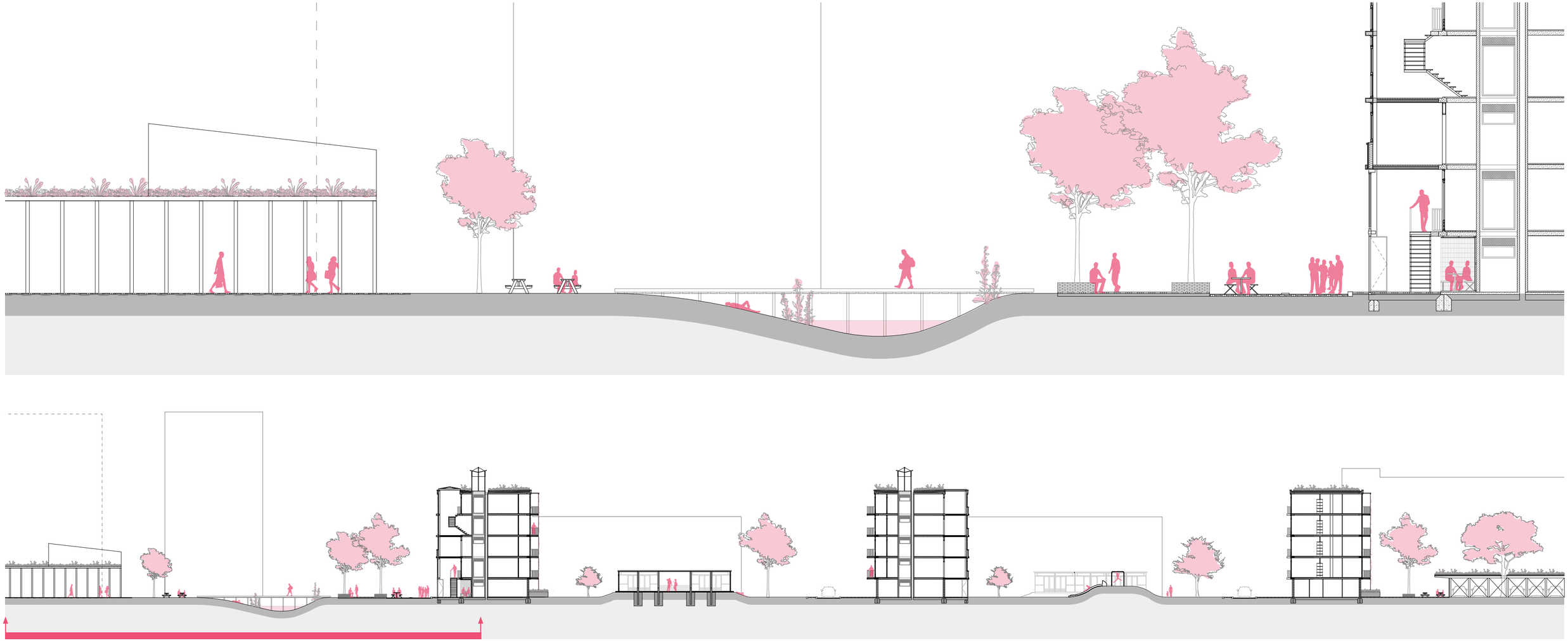
Situation



Urban section (A'A)

DESIGN

Public Green Space



DESIGN

Public plinth / Leisure Street

DESIGN

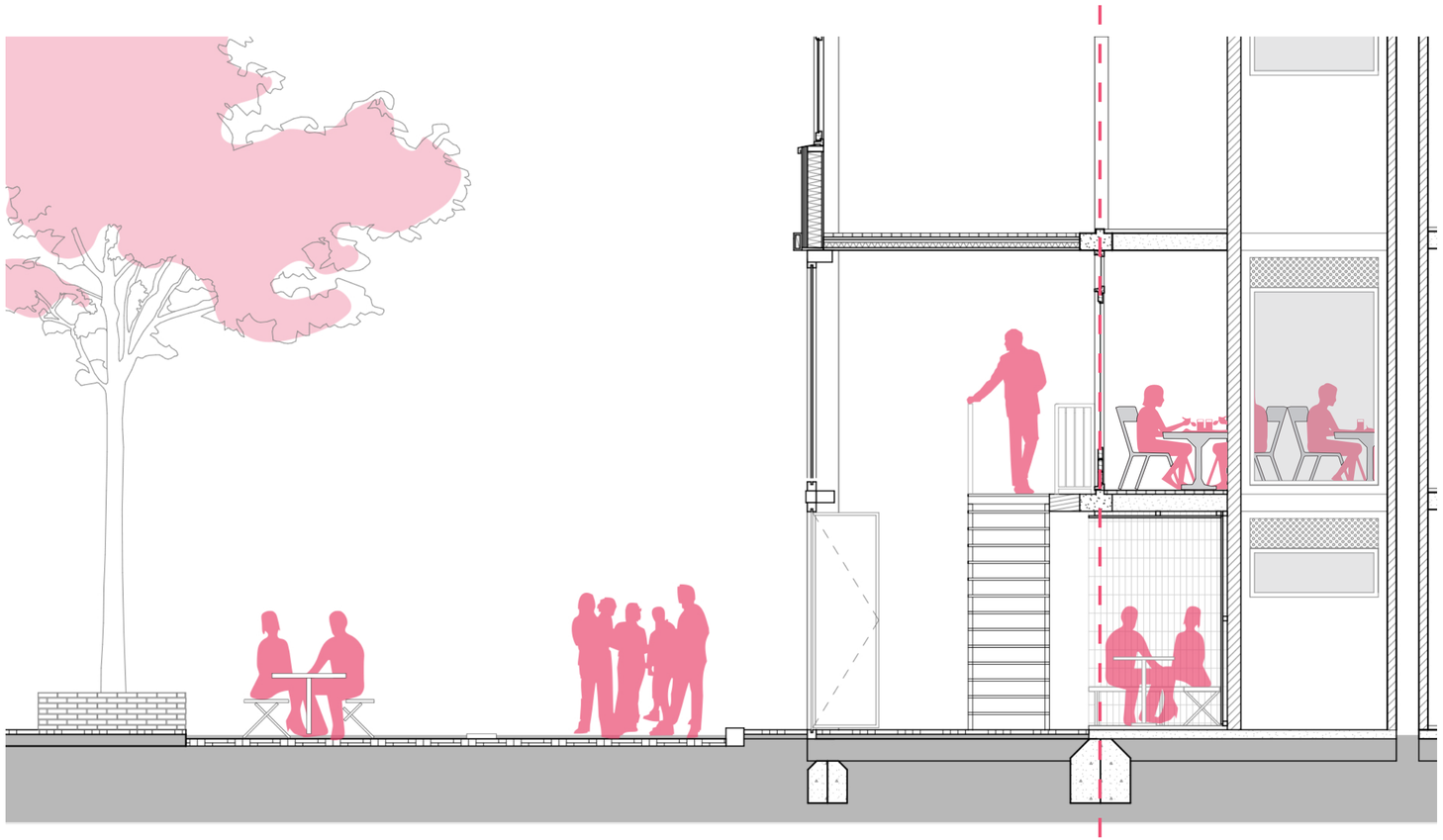
as found → design

DESIGN

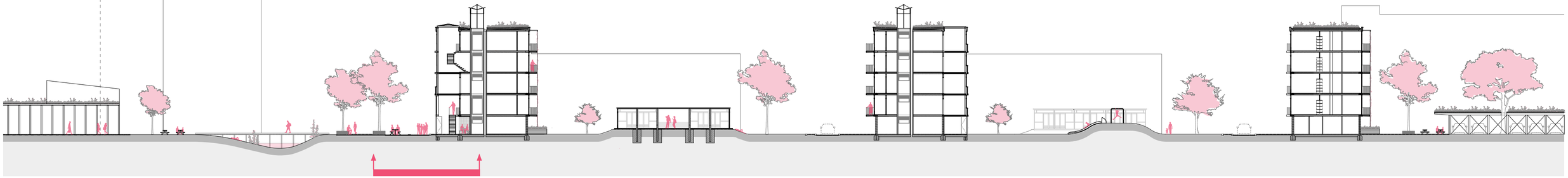
as found → design

DESIGN

Public plinth
Leisure possibilities

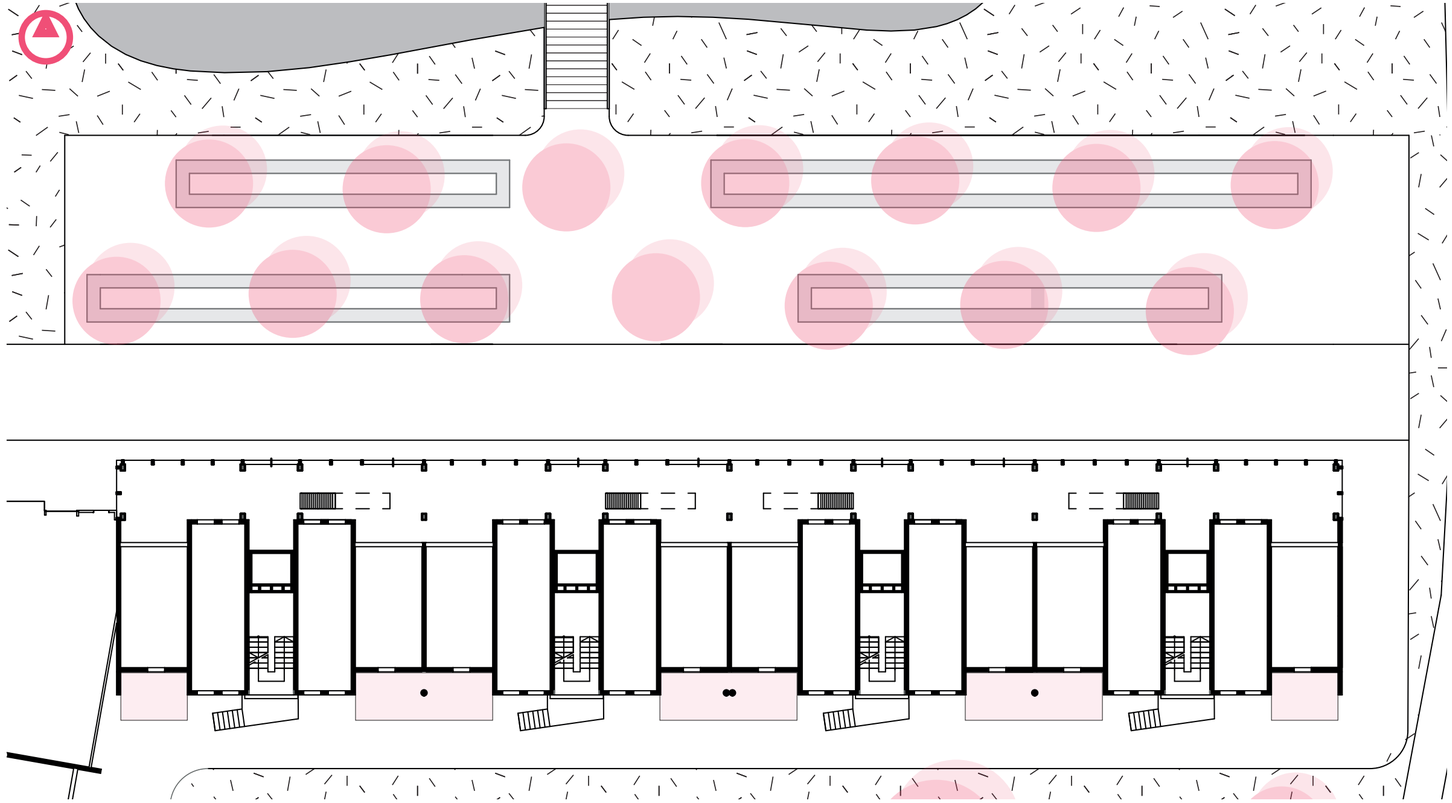


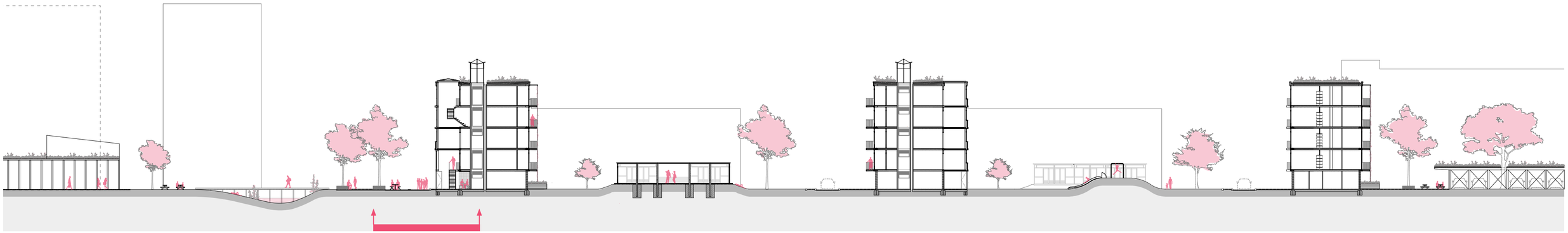
Boundary line. Old facade



DESIGN

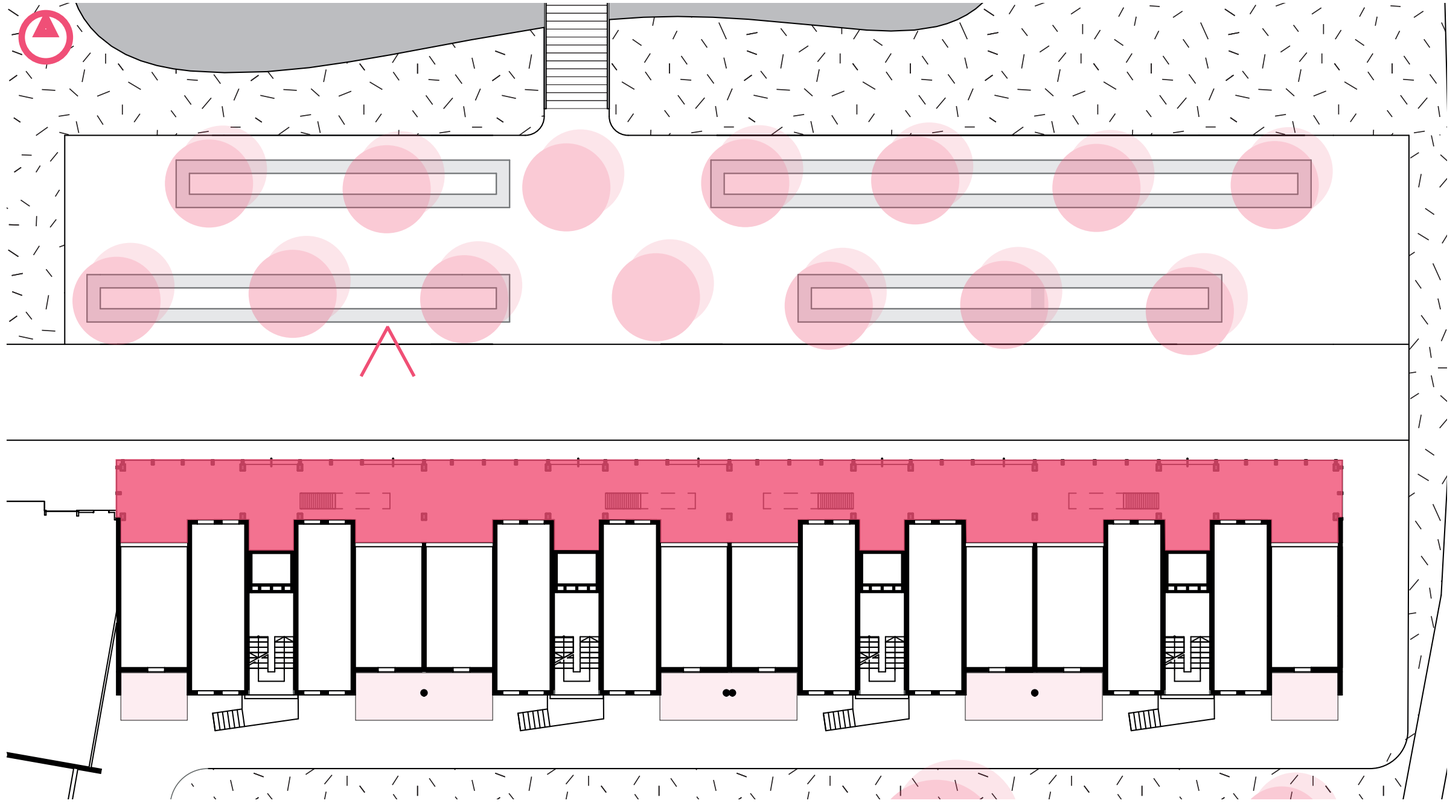
Public plinth
Leisure possibilities

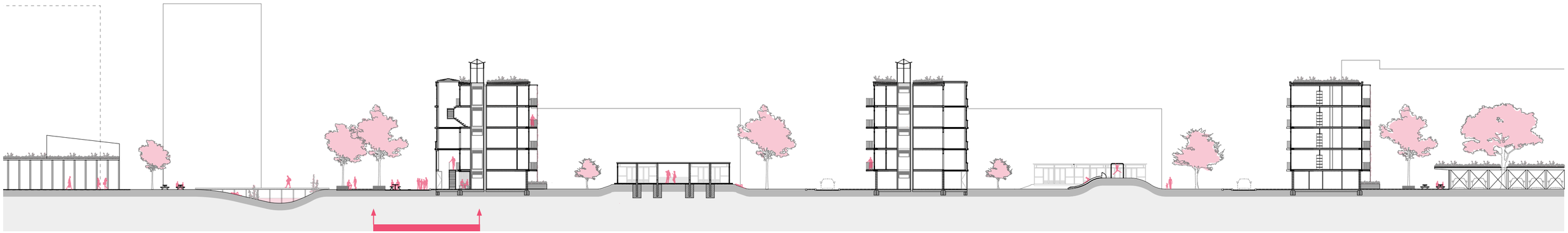




DESIGN

Public plinth
Leisure possibilities

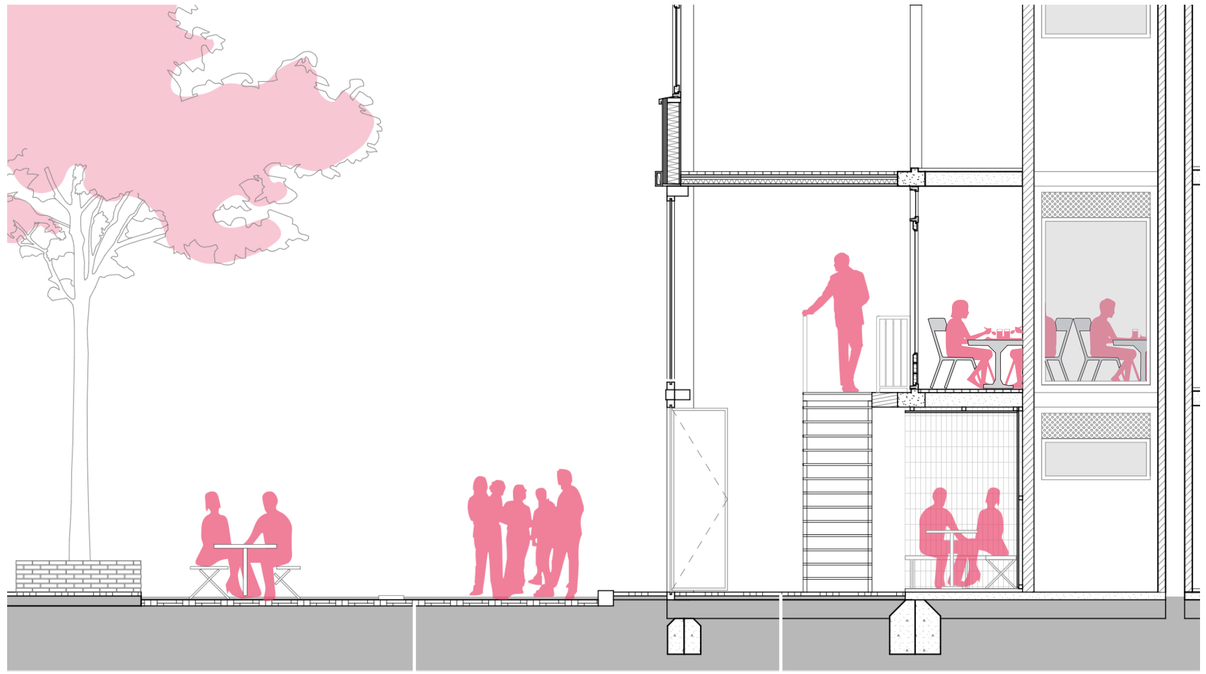


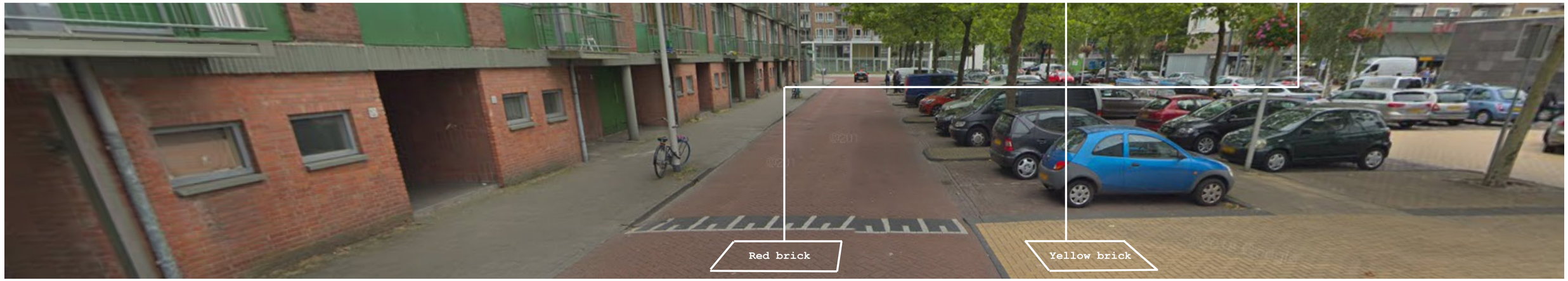


DESIGN

Public plinth
Leisure possibilities

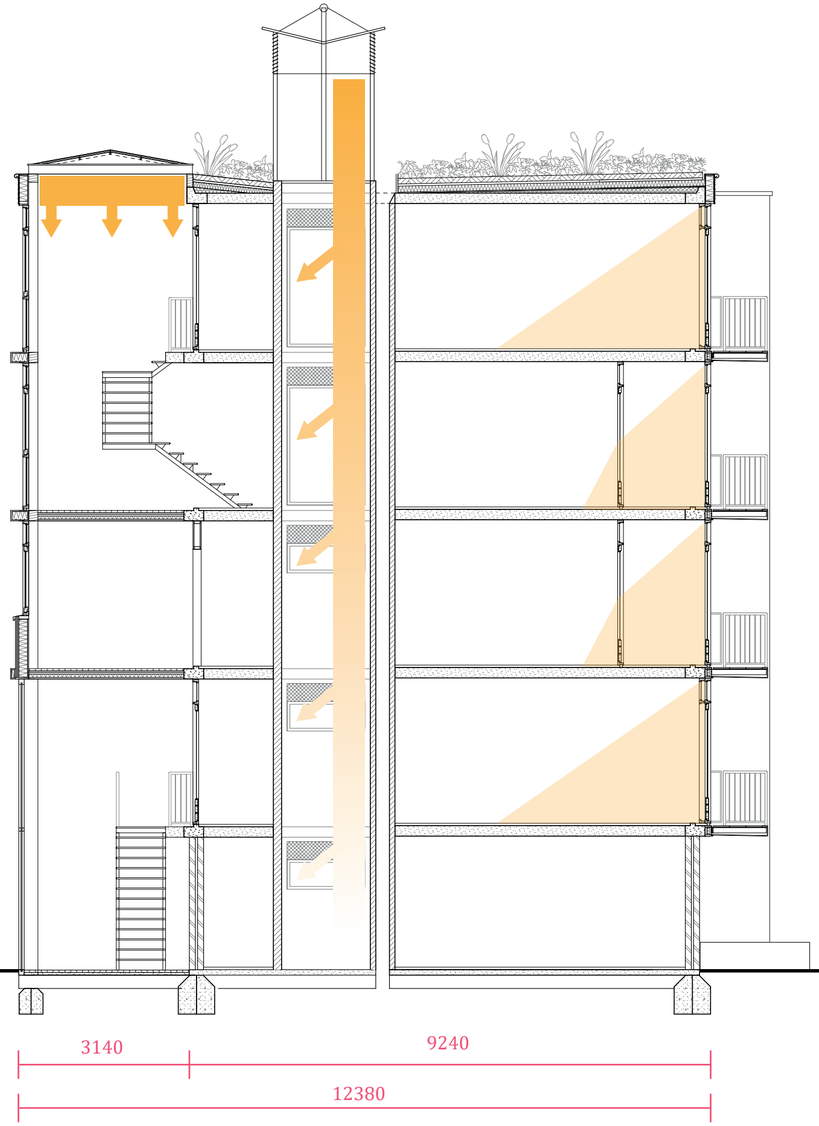
DESIGN





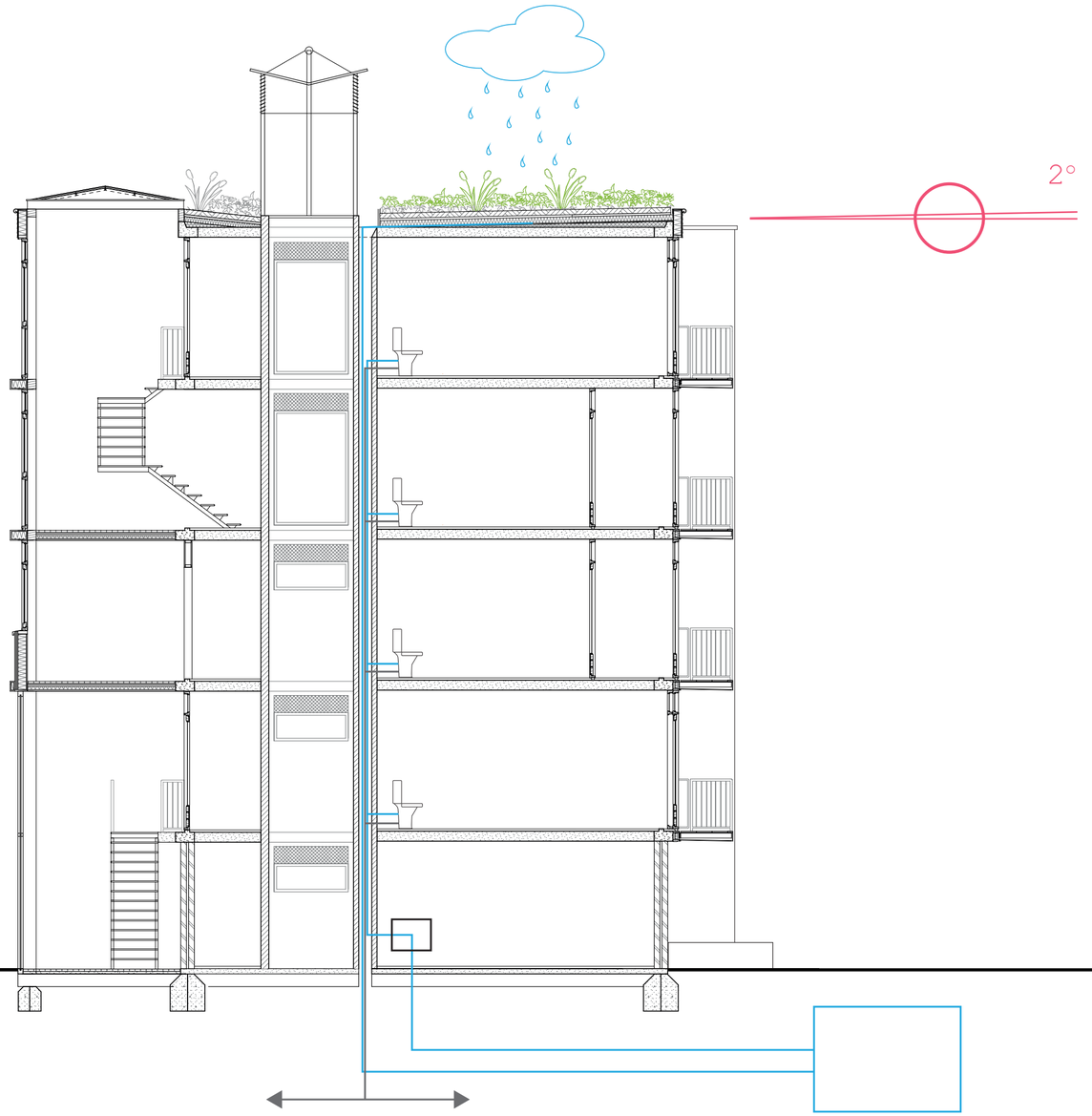
BUILDING TECHNOLOGY

LIGHT



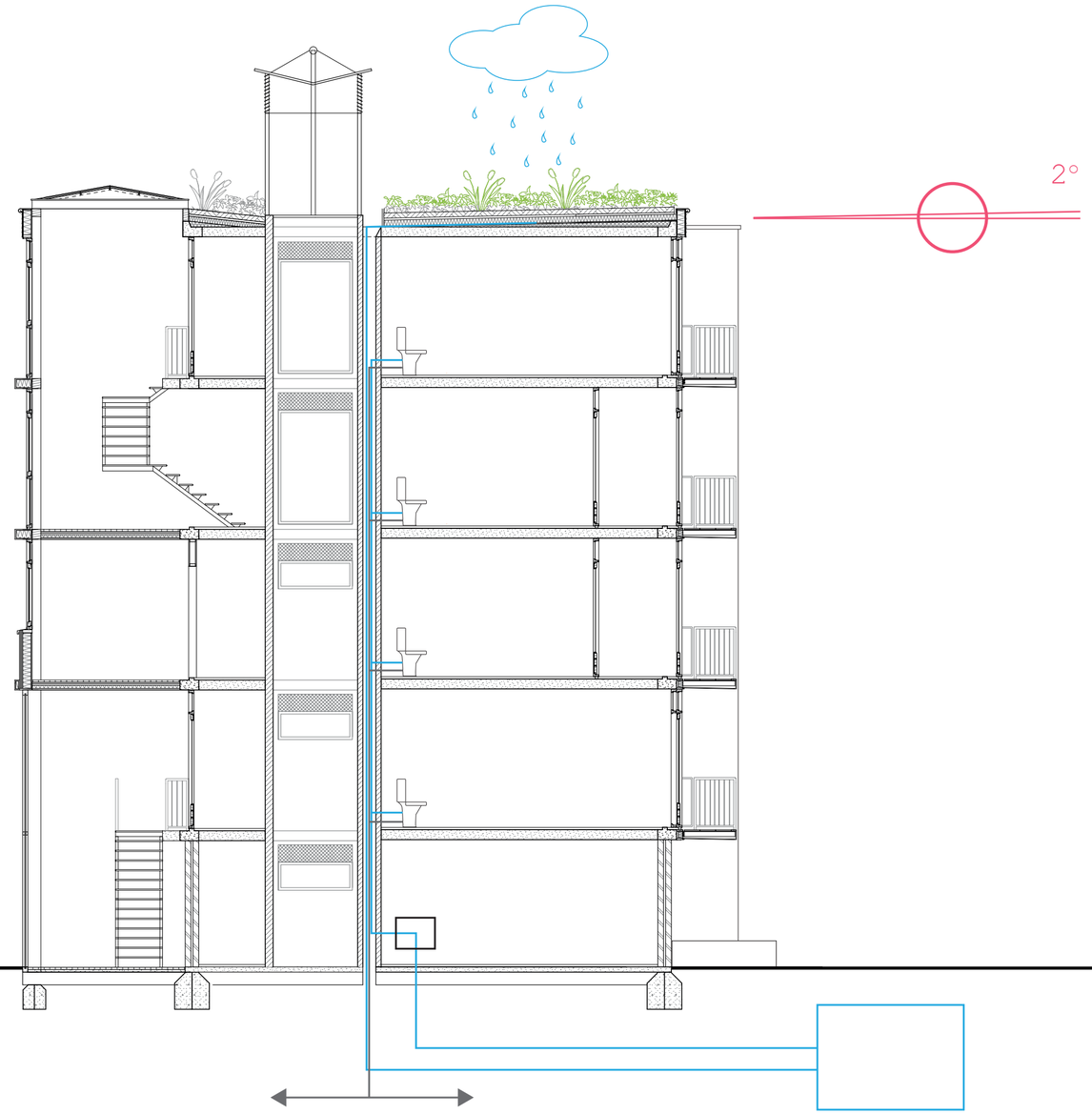
BUILDING TECHNOLOGY

WATER



BUILDING TECHNOLOGY

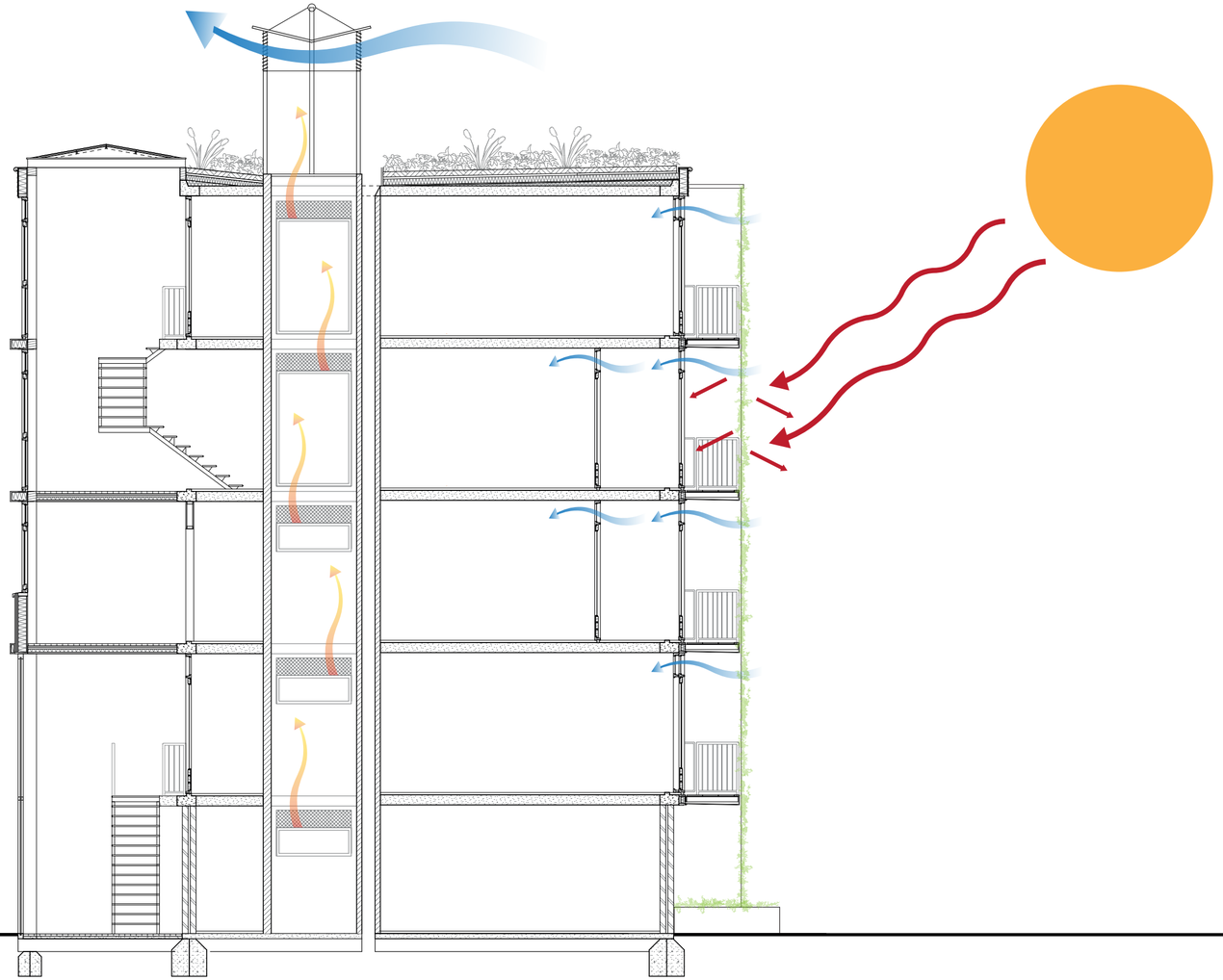
WATER



BUILDING TECHNOLOGY

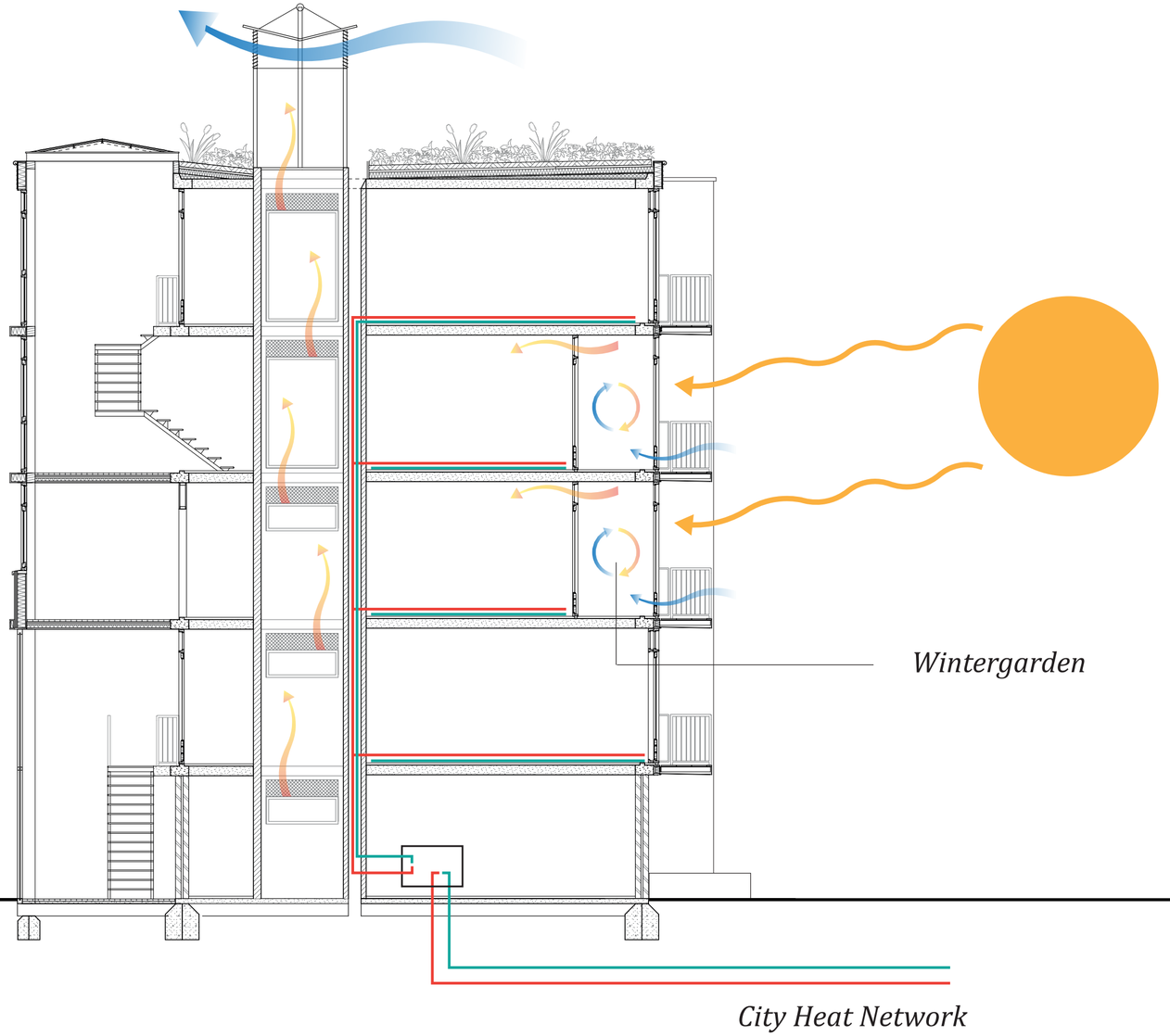
VENTILATION AND NATURAL OUTDOOR SHADING

SUMMER



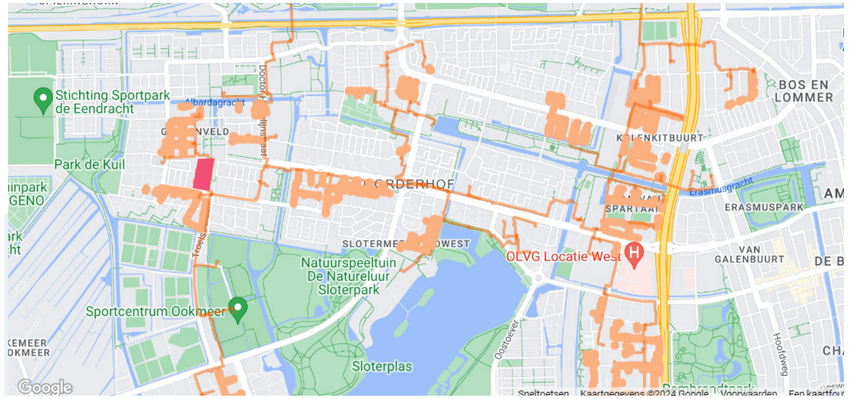
BUILDING TECHNOLOGY

VENTILATION AND HEATING
WINTER



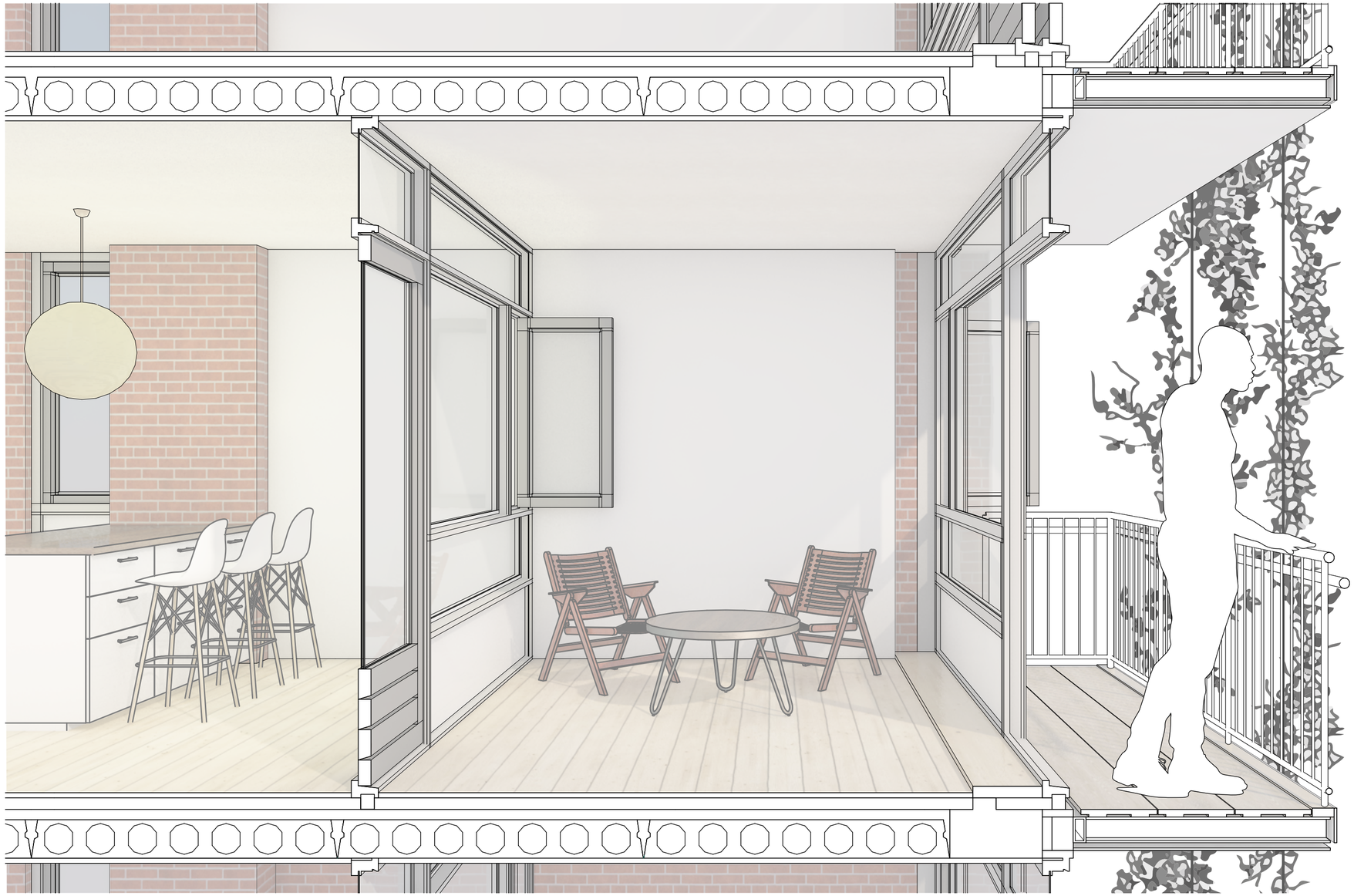
BUILDING TECHNOLOGY

VENTILATION AND HEATING WINTER



DESIGN

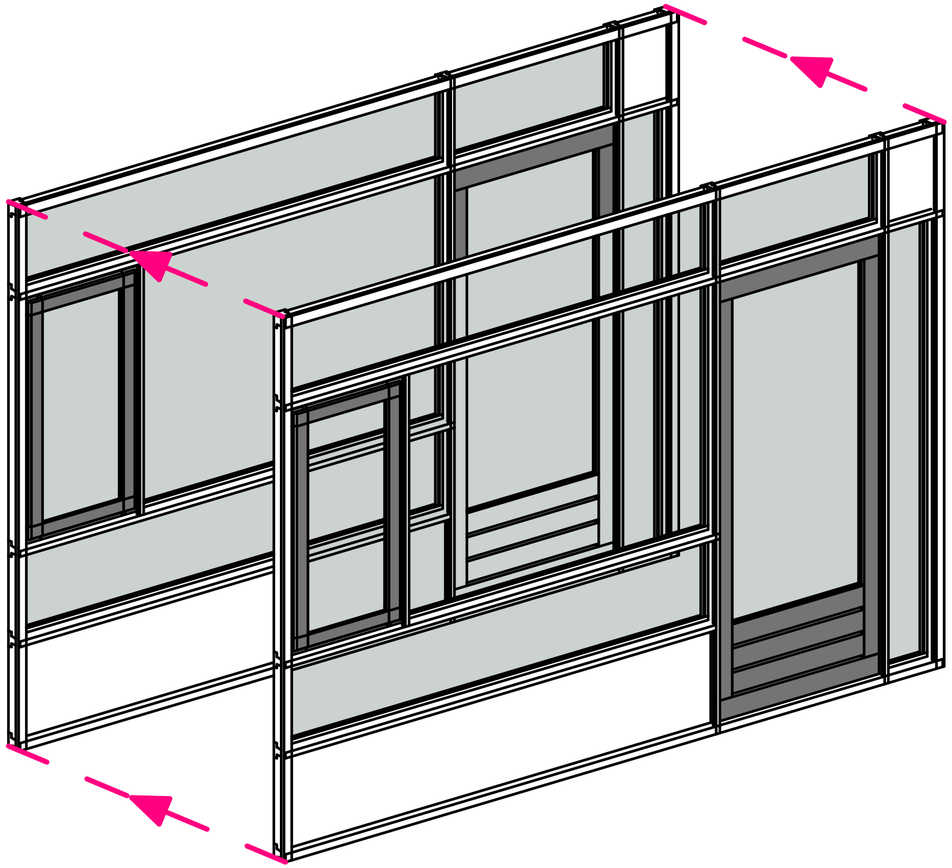
Wintergarden
Interior
perspective

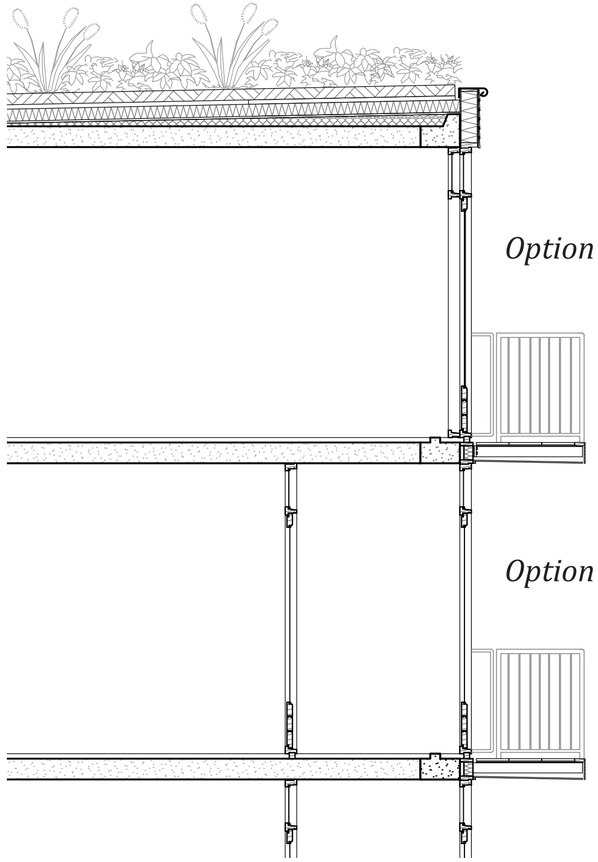


BUILDING TECHNOLOGY

The challenges of reuse

Stacking the window frames





Option 1: direct stack.

Option 2: wintergarden

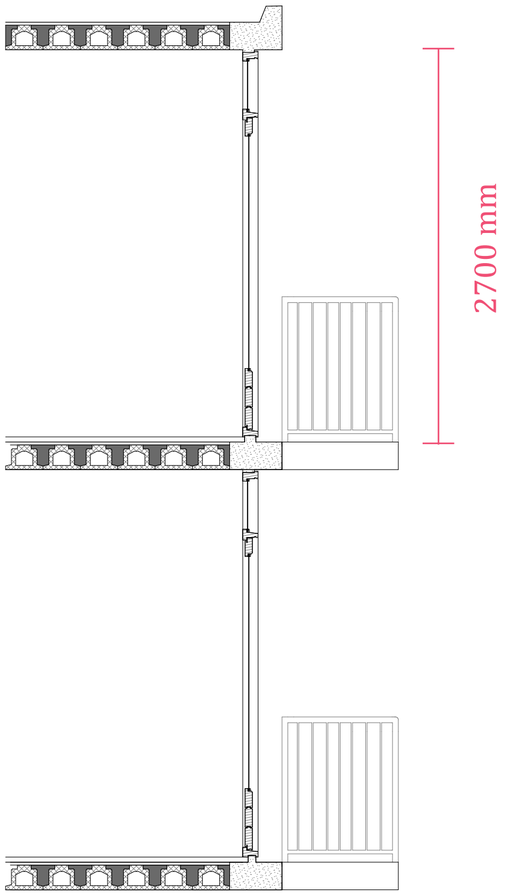
BUILDING TECHNOLOGY

The challenges of reuse

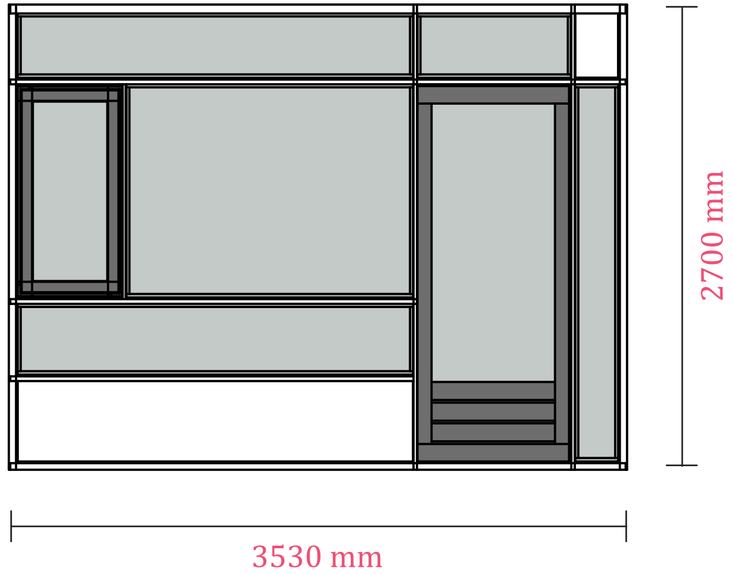
Preserving the window frames

Historical photograph of facade fragment. Seen in the picture are the storey-high windowframes that lead to the balcony.

Facade section of responing facade fragment. Building as found.



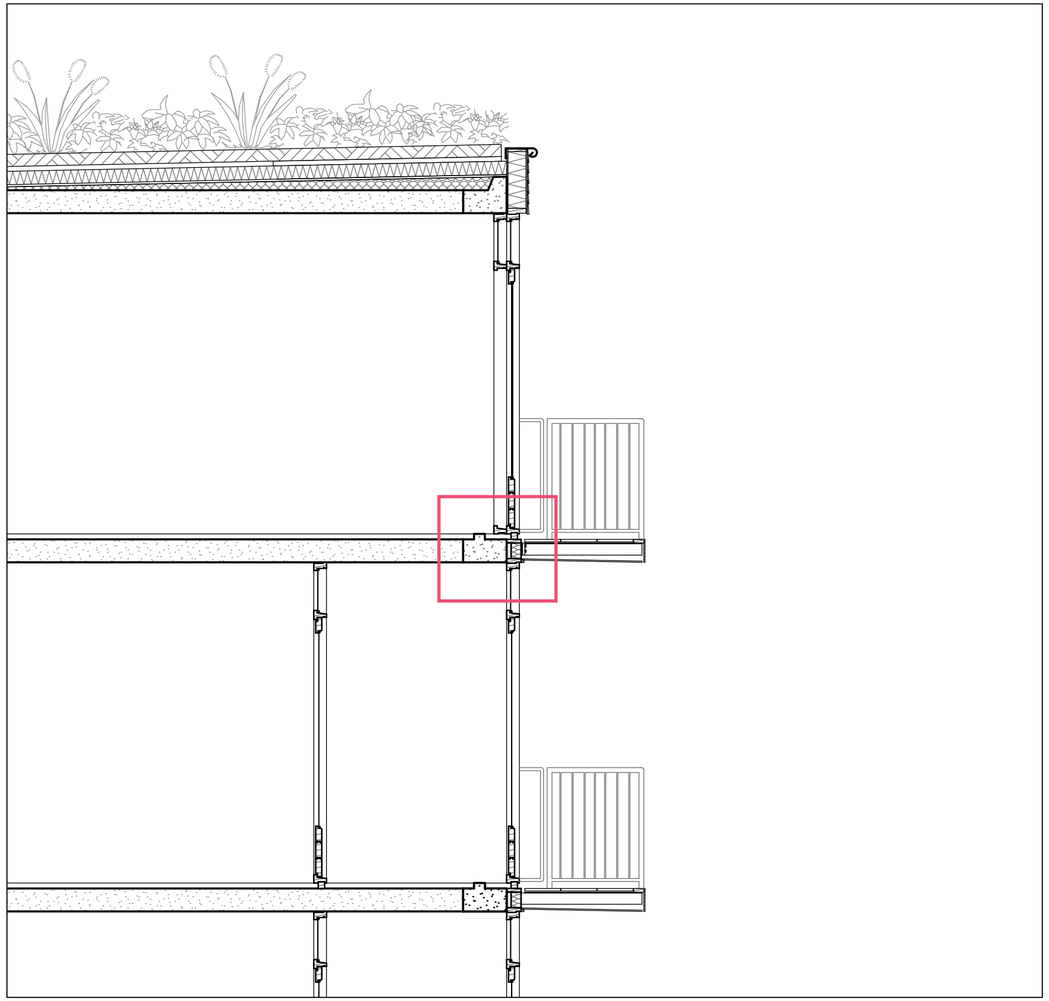
Front-view elevation of storey high window frame.

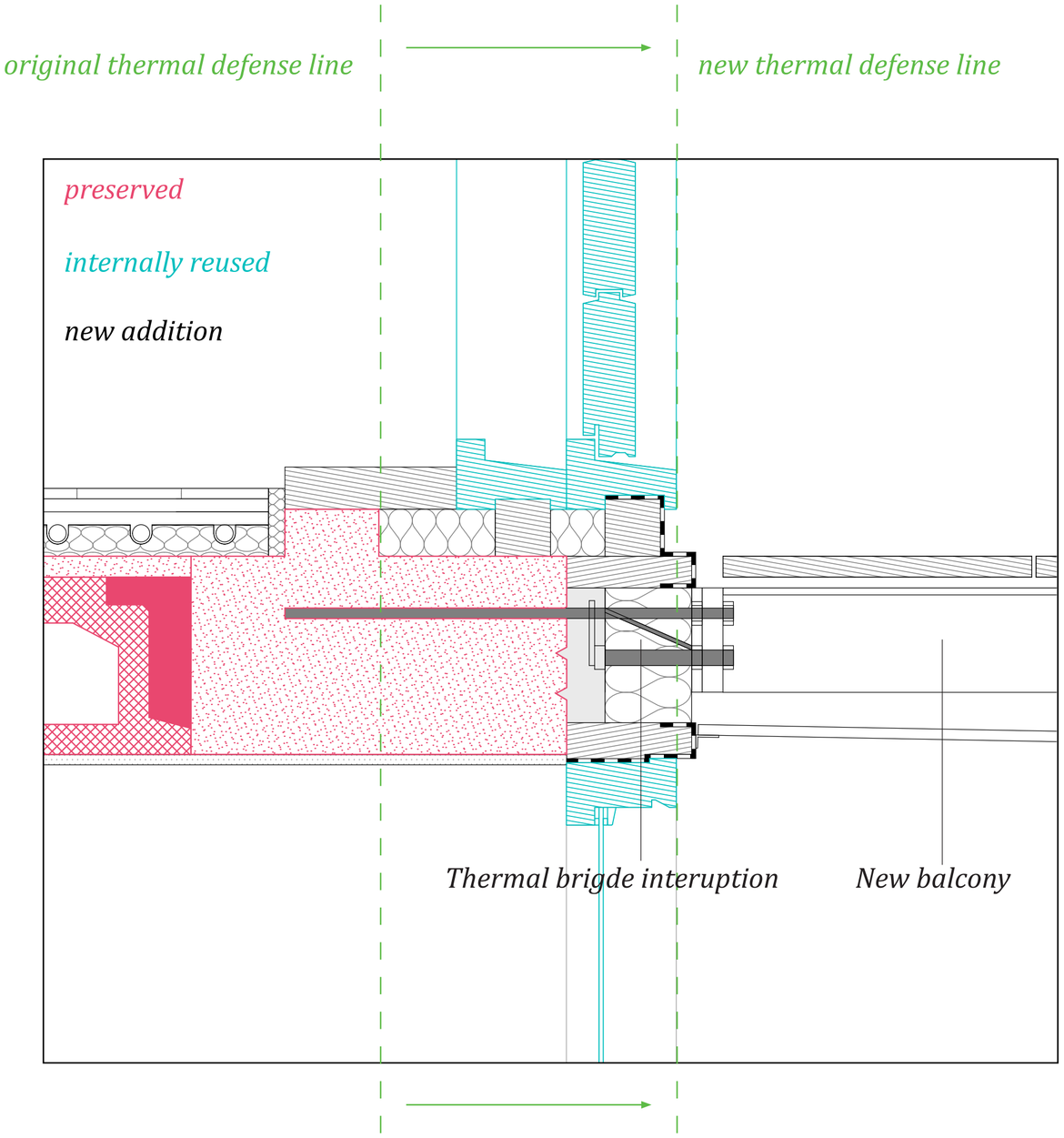


BUILDING TECHNOLOGY

The challenges of reuse

Preserving the window frames

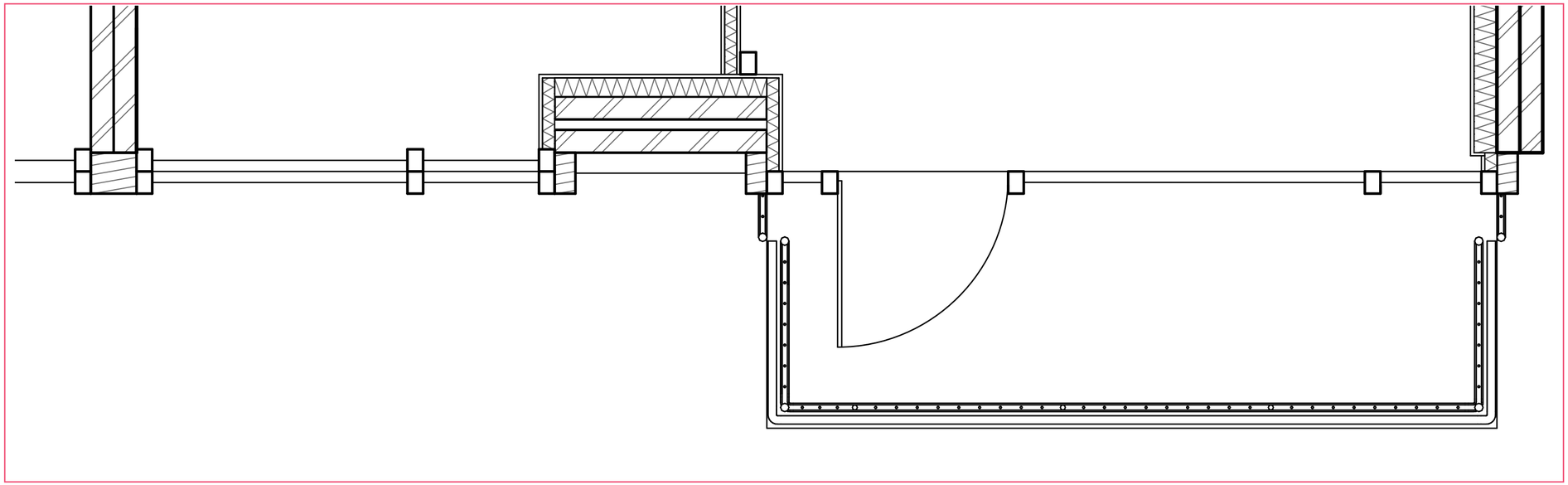




BUILDING TECHNOLOGY

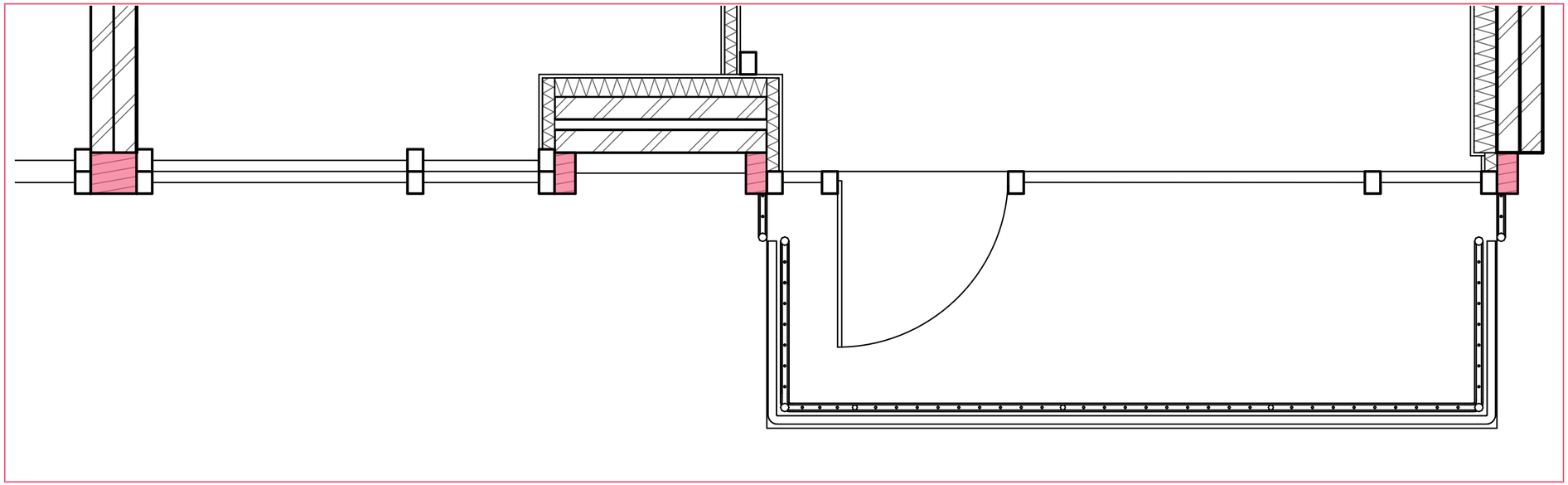
The challenges of reuse

Need for additional timber framing



The challenges of reuse

Need for additional timber framing

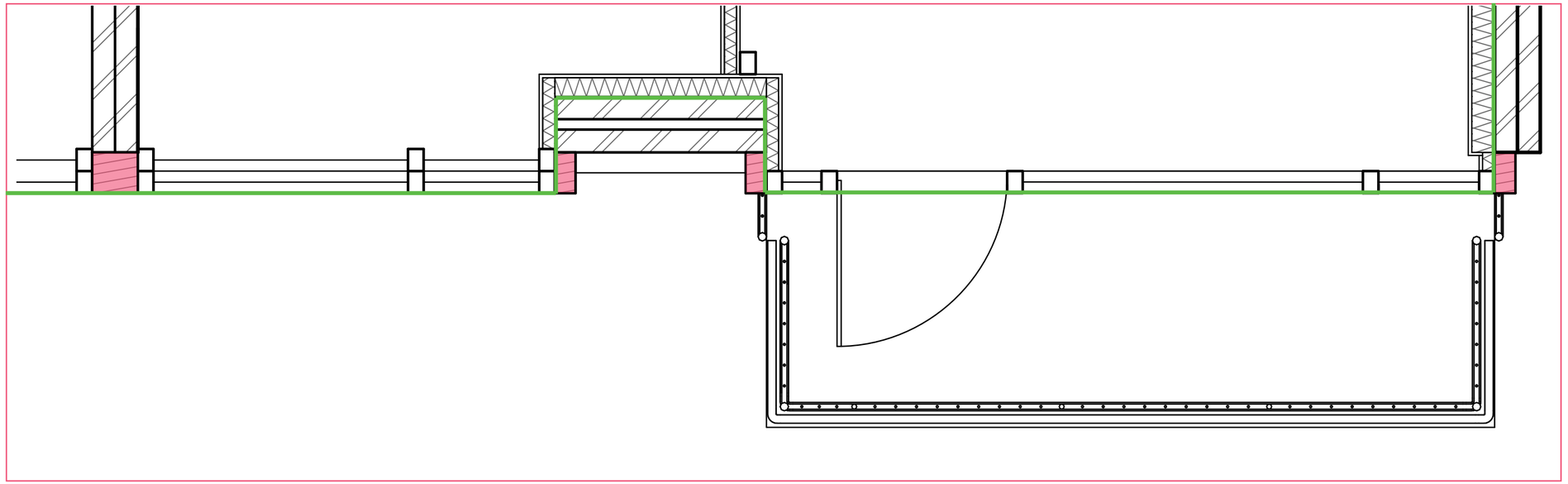


additional framing

BUILDING TECHNOLOGY

The challenges of reuse

Need for additional timber framing



additional framing

new thermal defense line

BUILDING TECHNOLOGY

The challenges of reuse

Need for additional timber framing

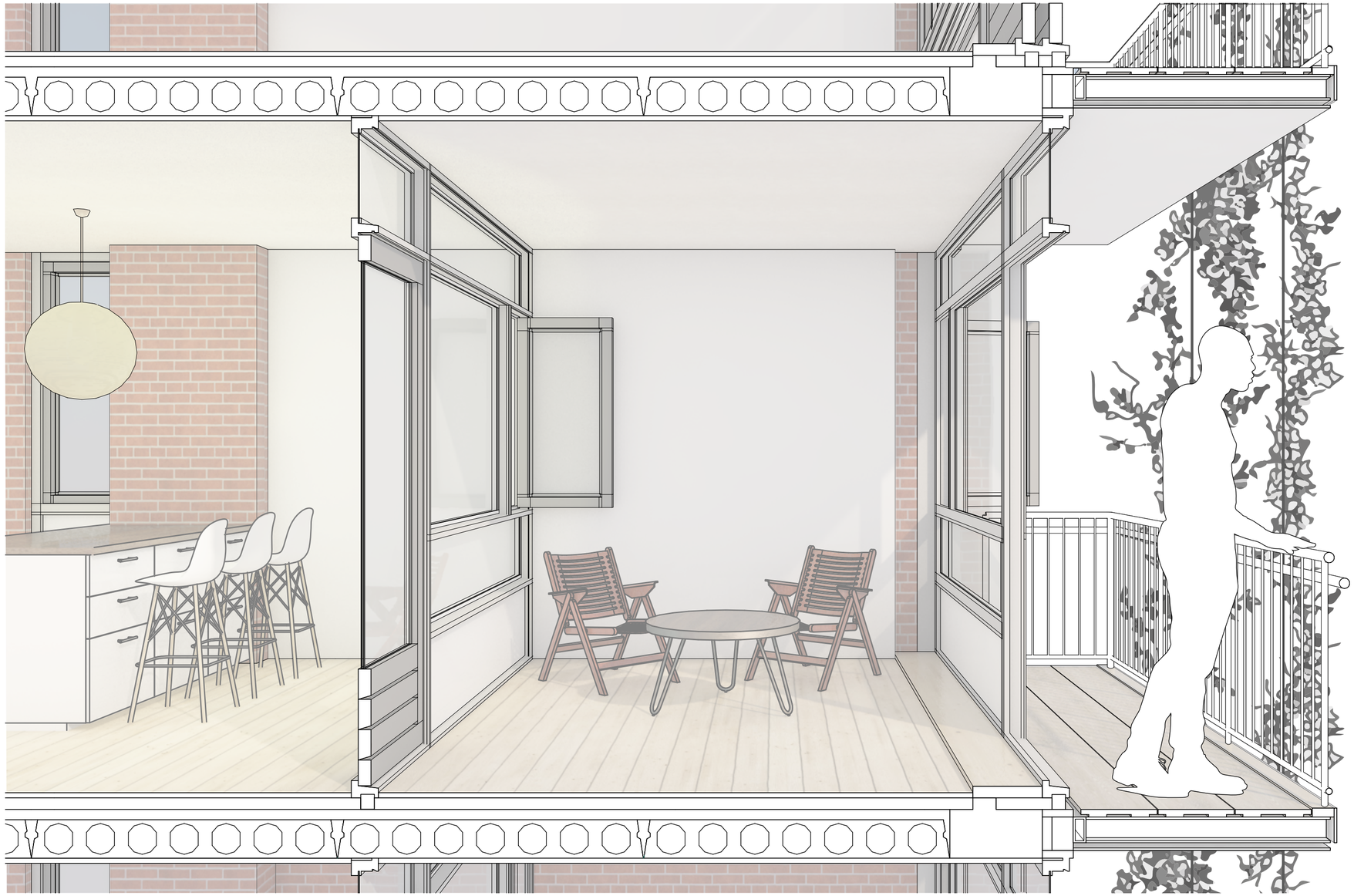
masonry wall visibility

facade as-found

facade as-built

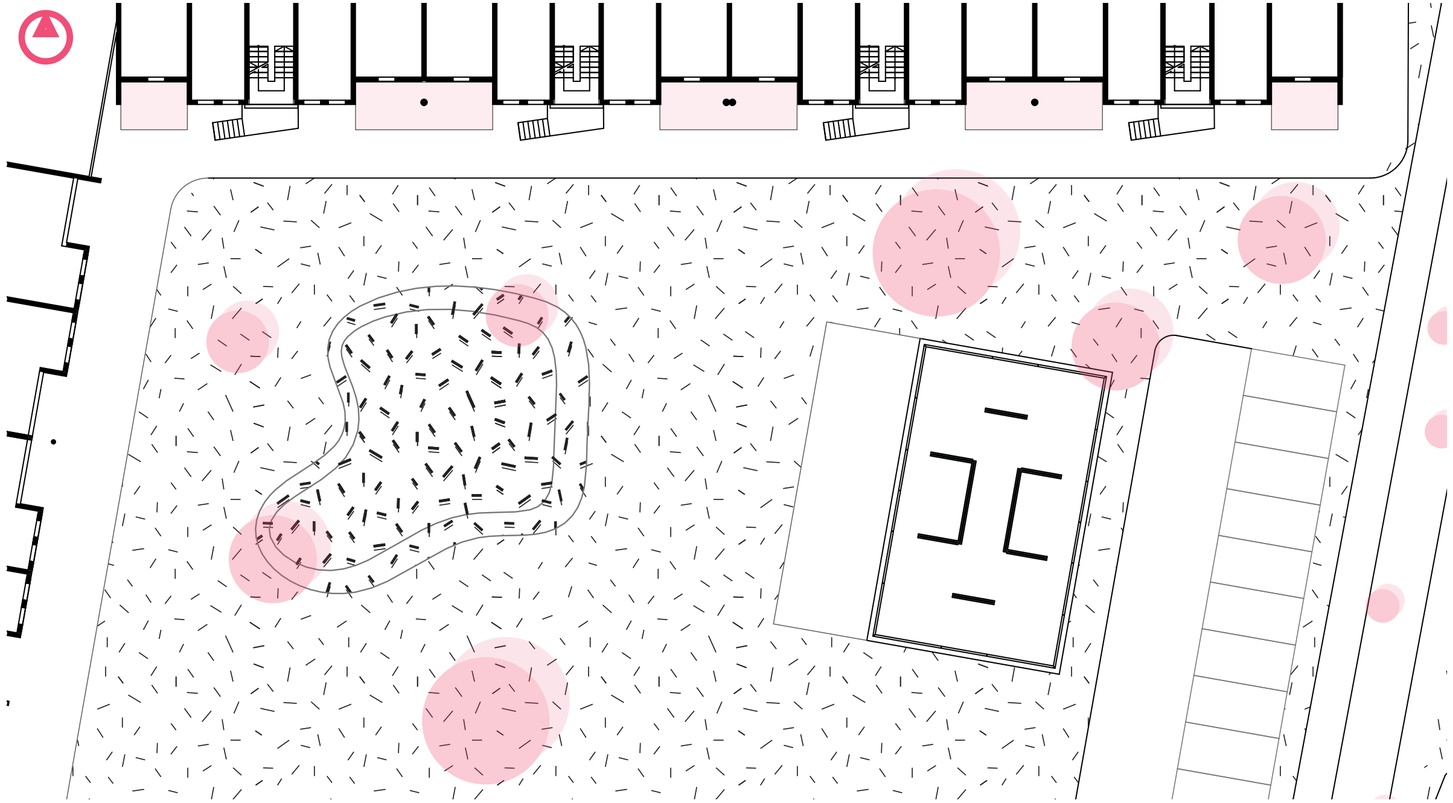
DESIGN

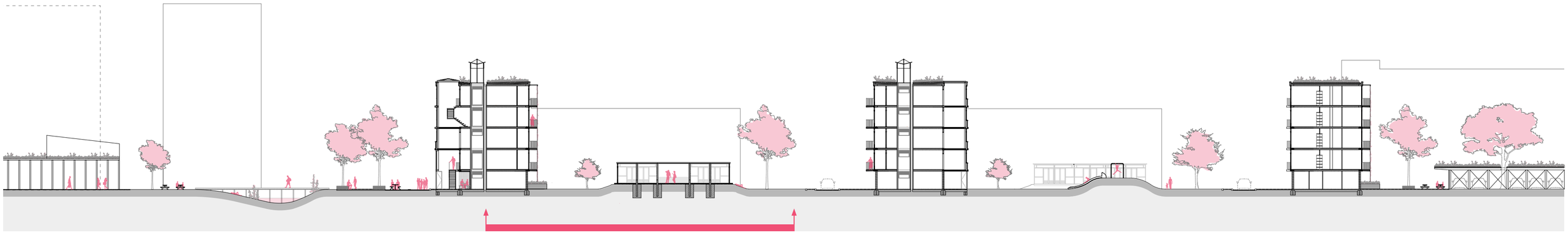
Wintergarden
Interior
perspective



DESIGN

Collective courtyard
Heritage facade





DESIGN

Collective courtyard
Heritage facade

WINTER

DESIGN

Collective courtyard
Collective pavilion

SUMMER

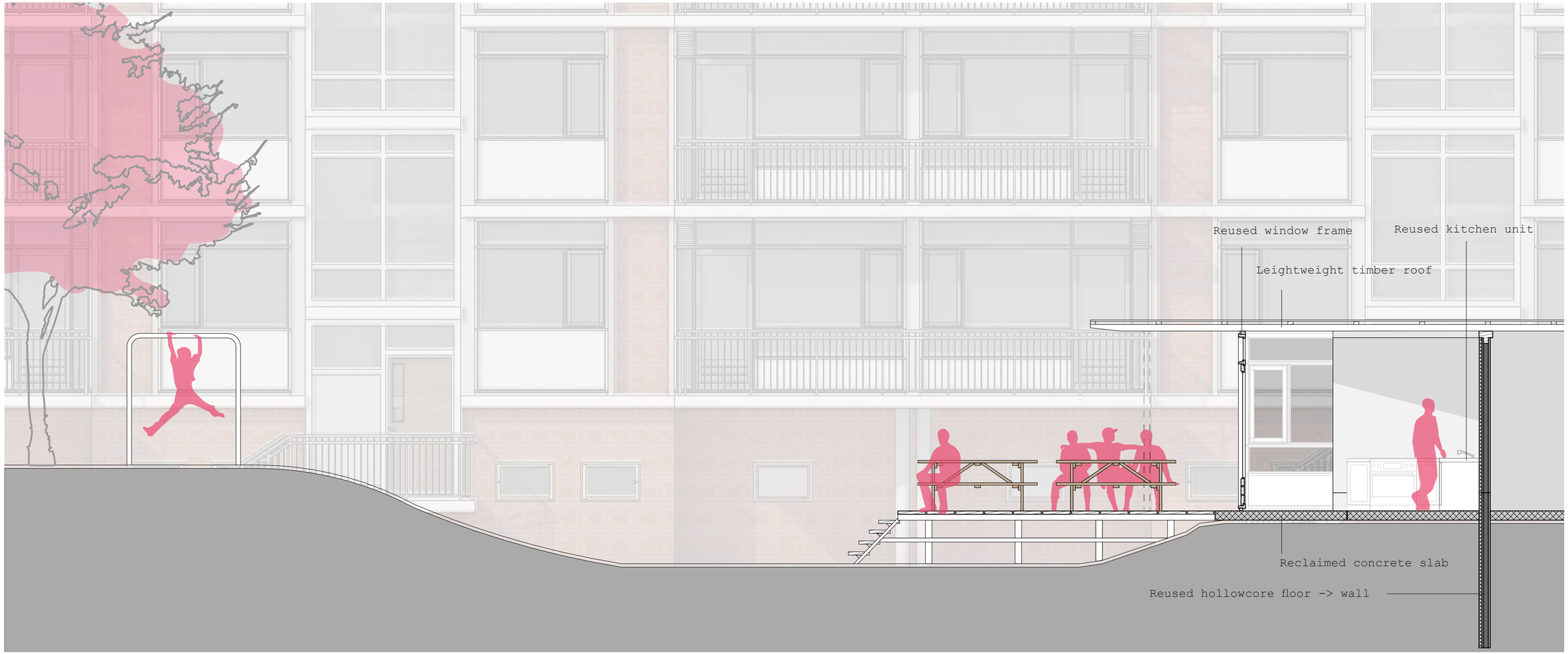
DESIGN

Collective courtyard
Collecive pavilion

SUMMER

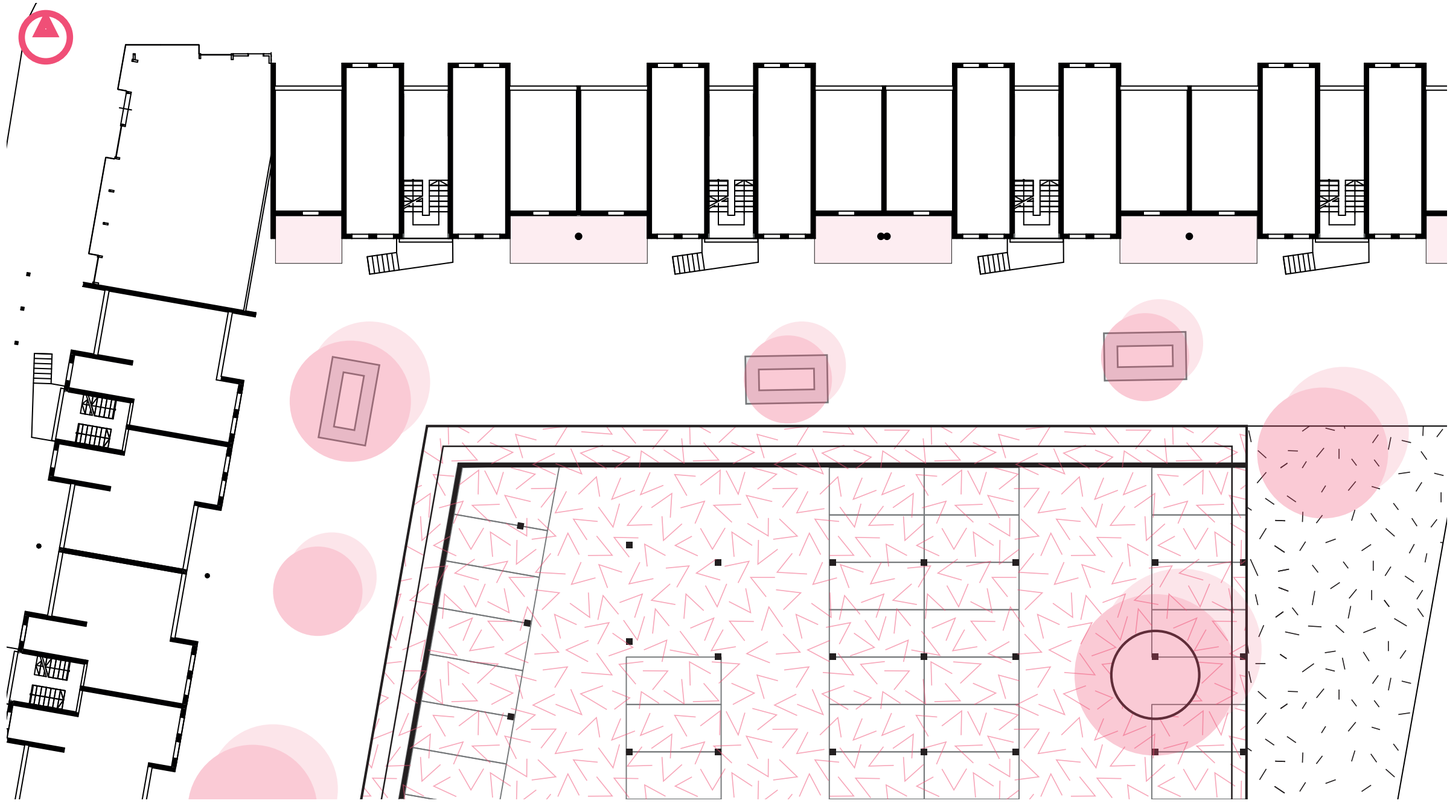
DESIGN

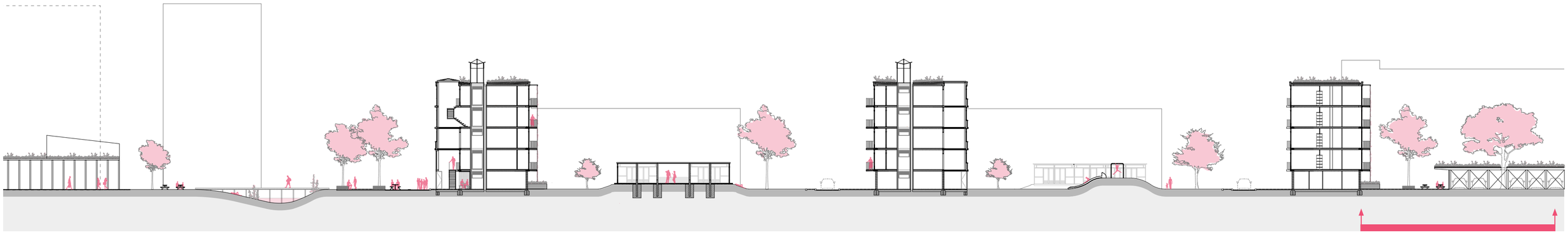
Collective courtyard
Collective pavilion



DESIGN

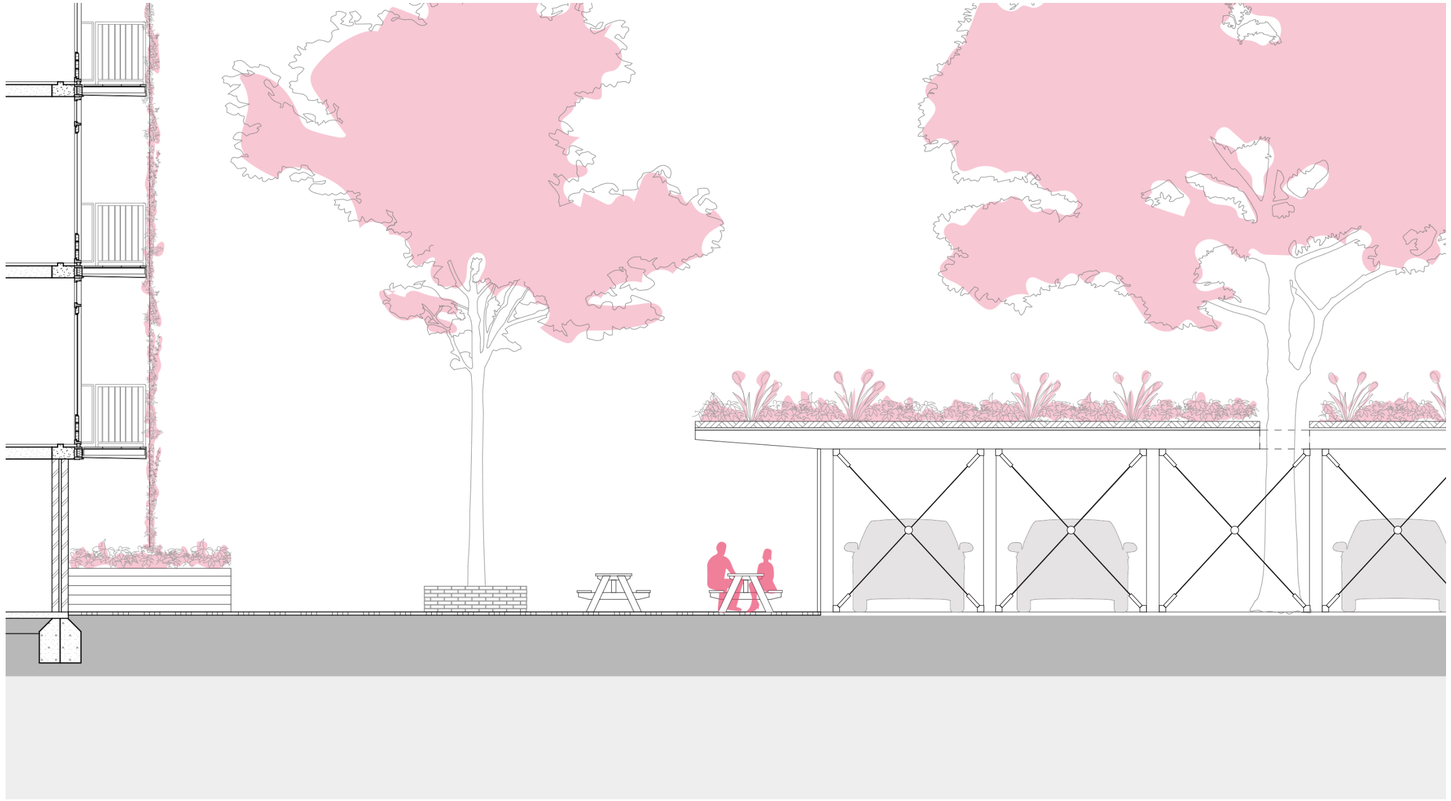
Collective backyard
Parking

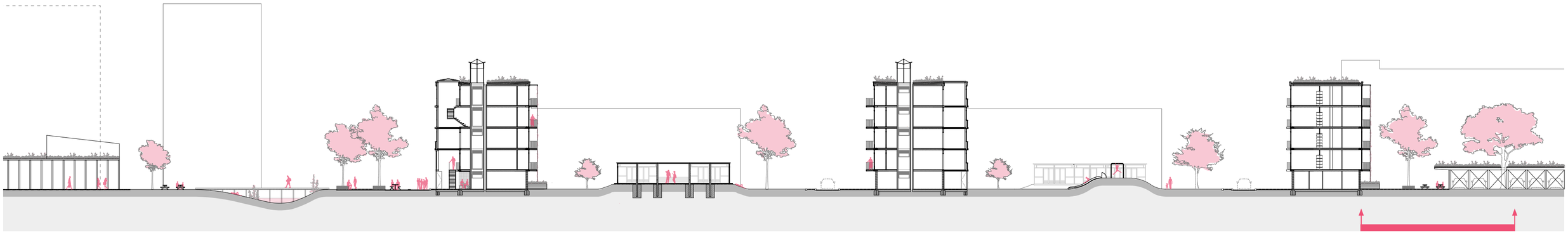




DESIGN

Collective backyard
Parking





CONCLUSION

1.808.751 kg CO_2-eq

x 185

26.122.919 MJ

13 years

140 appartments

NIET NIEUW WEST

Thijs von Barnau Sythoff

24-06-2024

A RADICALLY CIRCULAR TRANSFORMATION STRATEGY FOR A POST-WAR PORCHFLAT ENSEMBLE

AR3AH105 Graduation Studio Adapting 20th Century