

P5
PRESENTATION



PALACE OF JUSTICE
AS ENERGETIC CATALYST IN ITS SURROUNDINGS

by Daan Reinders



INTRODUCTION

PROBLEM STATEMENT
OBJECTIVES
OVERALL DESIGN QUESTION



STRATEGY

URBAN ENERGY CHALLENGE
URBAN DESIGN
BUILDING ENERGY CHALLENGE
ARCHITECTURAL DESIGN



DESIGN

URBAN DESIGN
ARCHITECTURAL DESIGN
BUILDING TECHNOLOGY



IMPACT

THERMAL ENERGY
ELECTRICITY



CONCLUSION

An aerial photograph of a city, likely Amsterdam, showing a river in the upper left, a large canal in the lower left, and a dense urban area with various buildings, including a prominent church with a tall spire on the right. The image is overlaid with a semi-transparent green filter.

INTRODUCTION

CHALLENGES

OBJECTIVE

OVERALL DESIGN QUESTION

PARIS AGREEMENT 2050

PROBLEM



De maatregelen in het klimaatakkoord zijn waarschijnlijk niet genoeg om de klimaatdoelen te halen. Met de 600 voorstellen lijkt het belangrijkste doel van het akkoord, 49 procent minder uitstoot van broeikasgassen in 2030 ten opzichte van 1990, niet haalbaar. Dat staat in de doorrekening van het

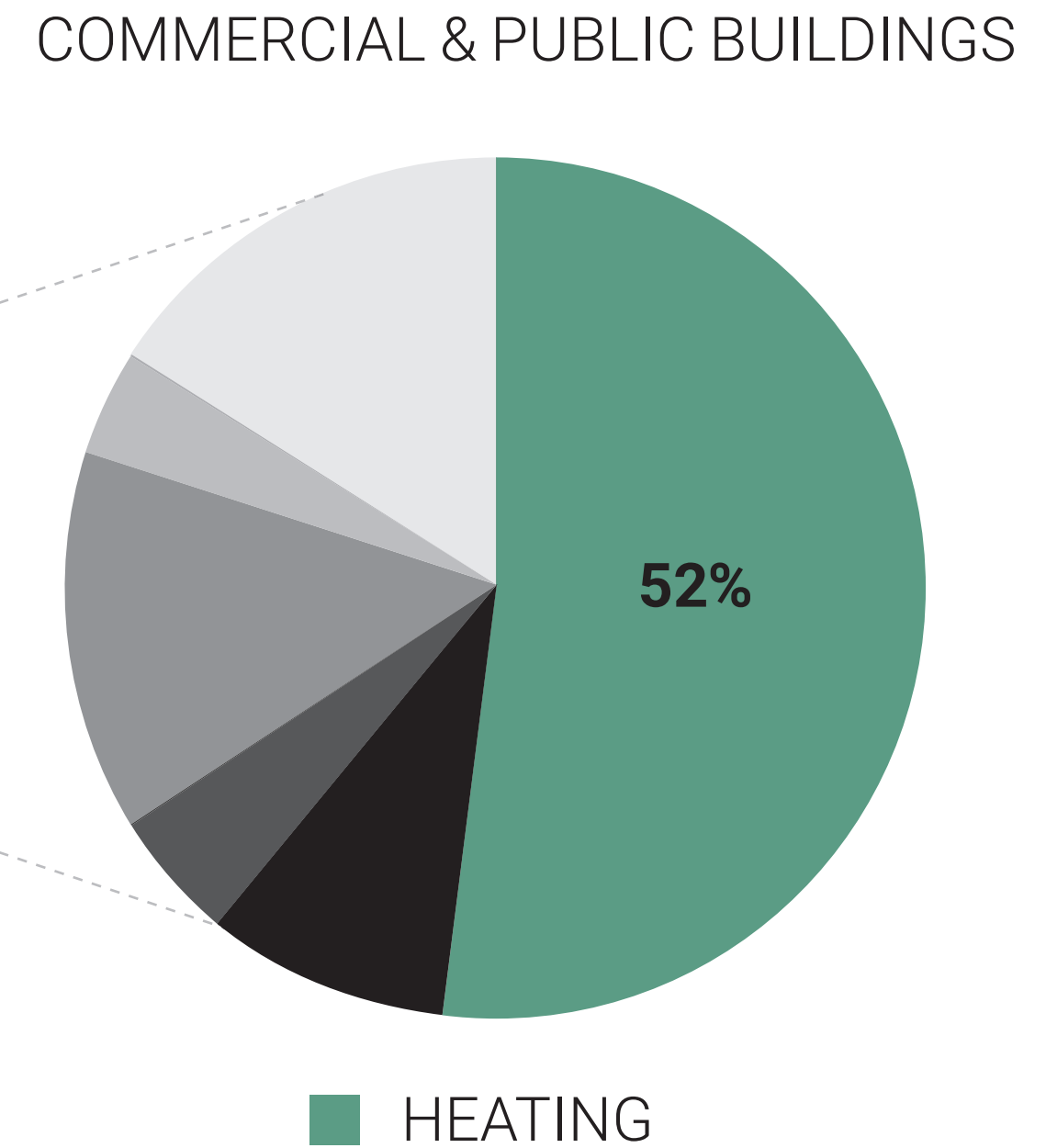
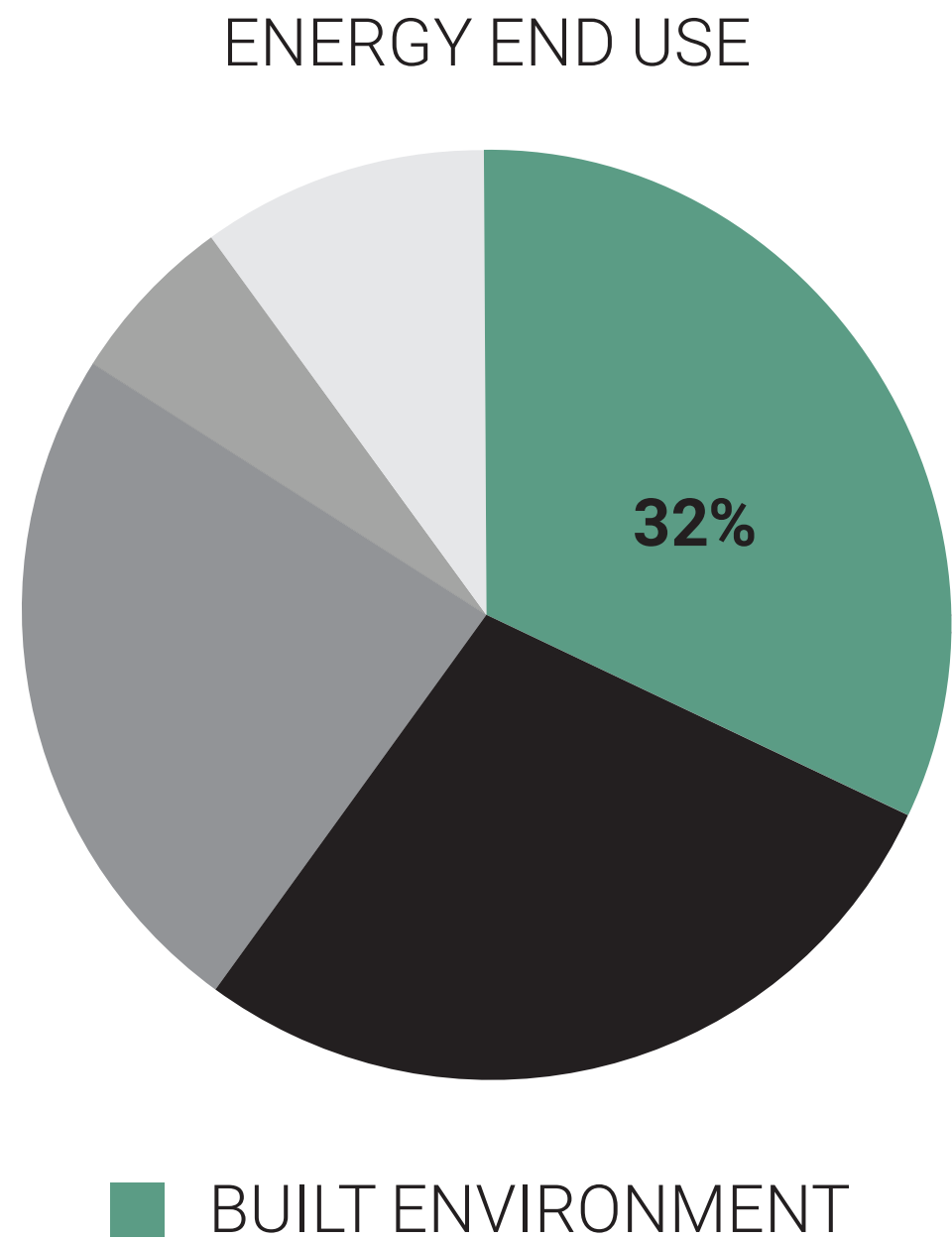
" [...] 49 procent minder uitstoot van broeikasgassen in 2030 ten opzichte van 1990 lijkt niet haalbaar."

procent minder dan in 1990, van daar weliswaar binnen, maar wordt waarschijnlijk niet gehaald. "Dat komt vooral door onzekerheden over verdere vormgeving van de afspraken, en over de manier waarop burgers en bedrijven zullen reageren op de voorgestelde beleidsprikkel."

De belangrijkste punten uit de doorrekening

- De maatregelen uit het klimaatakkoord zijn waarschijnlijk niet genoeg om de klimaatdoelen te realiseren
- De geschatte kosten van het klimaatakkoord zullen de komende tijd oplopen tot 1,6 à 1,9 miljard euro per jaar in 2030 en vallen daarmee lager uit dan geraamd
- Bedrijven moeten meer bijleggen dan huishoudens, die al veel moeten bijleggen onder de huidige plannen. Ondernemingen berekenen naar verwachting 80 procent van de kosten door aan de consument
- Lage en middeninkomeners zullen zonder compensatie naar verwachting meer meebetalen aan de

Source: NOS, 13-03-2019



URBAN ENERGY TRANSITION

CHALLENGE



Benno Boeters | maandag 1 juli 2019

Energie, Milieu & Duurzaamheid

'Ja, het lijkt eenvoudig. Warm water door een leiding laten lopen. De Romeinen deden het al. Maar het is dus héél complex.' Aldus een van de sprekers tijdens de jaarbijeenkomst van stichting Warmtenetwerk, op 12 juni in het Spoorwegmuseum, Utrecht. Het woord complex kwam die middag meerdere keren terug, net als 'chaos' en 'regelgeving'. Maar dat laatste begrip dan vaak in combinatie met 'je komt er niet uit' en 'trek je er niet teveel van aan, laten we maar gewoon beginnen'.

" Warmtenetten in tien jaar drie keer zo groot. [...] En met name de Innovatieagenda wordt 'een groot ding'."

grootschalige verspilling (te warm, raam open); een tweede-kamerlid noemde ze naar verluidt zelfs 'communistisch'. Maar een beetje kritische blik op de Nederlandse energieconsumptie leert dat ook hier heel veel warmte verloren gaat. Restwarmte uit de industrie en van de koelmachines in datacentra verdwijnt met bakken in de lucht - net als de CO₂ - of in het oppervlaktewater. We spoelen in huis met het douchewater warmte naar het riool. Van ons totale energieverbruik (elektriciteitscentrales, fabrieken, bedrijven, mobiliteit, gebouwen) gaat ongeveer de helft op aan warmte.

Er bestaan al decennia lang warmtenetten in Nederland; die noemden we stadsverwarming. Met de bouw van nieuwe cogeneratie-elektriciteitscentrales (warmte/krachtkoppeling) ging de energie-efficiëntie flink omhoog en kwam warm water beschikbaar. Zo ook bij afvalverbrandingsinstallaties. Dat aanbod leidde tot steeds meer stadsverwarmingsleidingen en aansluitingen. Het zijn op dit moment nog steeds dé bronnen voor warmtenetten. Zo'n 400.000 woningen zijn er anno 2019 op aangesloten. Gemeenten als Almere, Amsterdam, Ede, Arnhem, Lelystad, Leiden, Nijmegen en Rotterdam hebben een warmtenet. De aangesloten bewoners hebben meestal naast hun aansluiting een warmtewisselaar in huis die de temperatuur opkrikt. (Warm tapwater naar minstens 60 graden, ter voorkoming van legionella). In vergelijking met huishoudens met cv-ketels scheelt dit de helft in CO₂-uitstoot.

Nu het kabinet eind juni zijn 'appreciatie' van het Klimaatakkoord wereldkundig maakt, na de vertraging

Source: Technisch Weekblad, 01-07-2019



 **Renee van Hest**
redacteur  

Veel gemeenten sluiten nieuwbouwhuizen aan op warmtenetten met hoge temperatuur. Experts noemen dat onverstandig. Nieuwbouwhuizen zijn juist goed geïsoleerd en hebben nauwelijks zo'n hoge temperatuur warmte nodig.

"Van den Dobbелsteen denkt dat gemeenten in de problemen kunnen komen bij het gasloos maken van wijken, als ze de huidige praktijk doorzetten."

Rendabel

"We creëren nieuwe problemen voor de toekomst", zegt hoogleraar duurzaam bouwen Andy van den Dobbелsteen (TU Delft). "Als we deze hoge temperatuur warmtenetten uitrollen in nieuwbouwwijken dan weet je bijna zeker dat de oude wijken niet meer aangesloten worden op een warmtenet."

Source: NOS, 12-05-2020

EXISTING BUILDING STOCK

CHALLENGE



EXISTING BUILDING STOCK

OPPORTUNITY

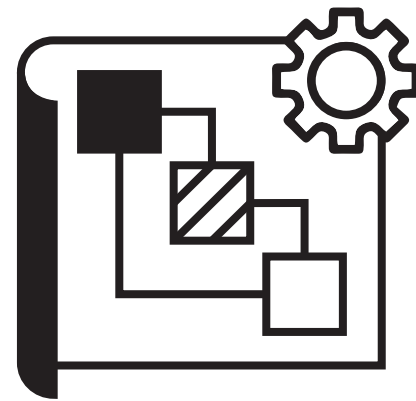


OVERVIEW

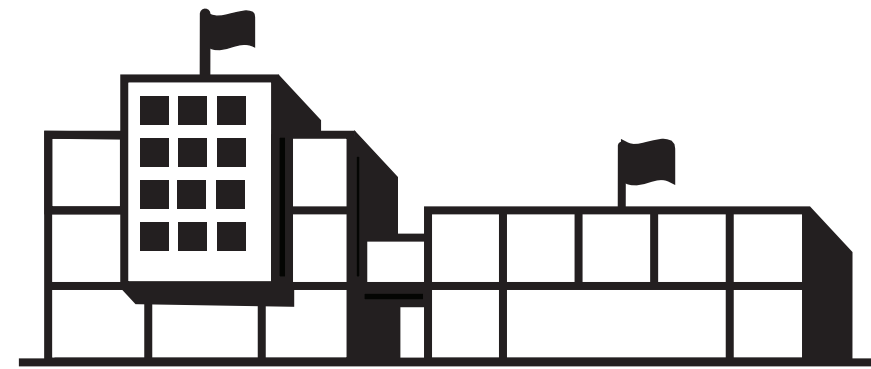
CHALLENGES



1
PARIS 2050



2
URBAN ENERGY
TRANSITION CHALLENGE



3
BUILDING RENOVATION
CHALLENGE

OVERALL DESIGN QUESTION

How can the typology of the **traditional Dutch office building** be renovated into a **zero-energy building**, using the **Palace of Justice and its surroundings** as an example?

A grayscale photograph of a city square. In the foreground, a man in a suit stands with his back to the camera, looking towards a large, multi-story building that is under renovation. The building is covered in scaffolding. To the left, there are older, more traditional buildings. The ground is paved with large, light-colored tiles. The overall atmosphere is one of urban development and architectural history.

STRATEGY

URBAN ENERGY

URBAN DESIGN

BUILDING ENERGY

ARCHITECTURAL DESIGN



STRATEGY

URBAN ENERGY

URBAN DESIGN

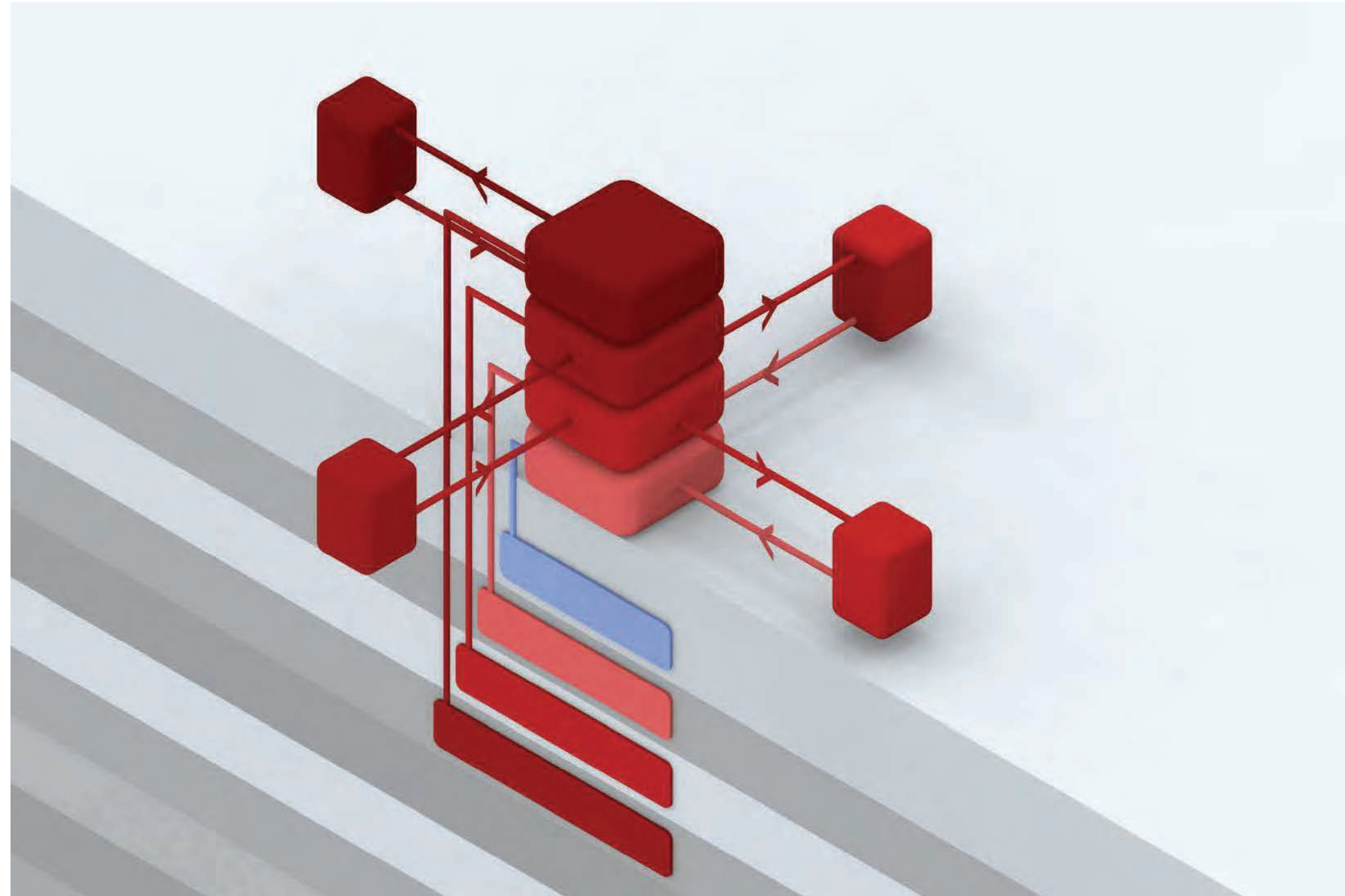
BUILDING ENERGY

ARCHITECTURAL DESIGN

URBAN ENERGY STRATEGY

CASCADING MACHINE



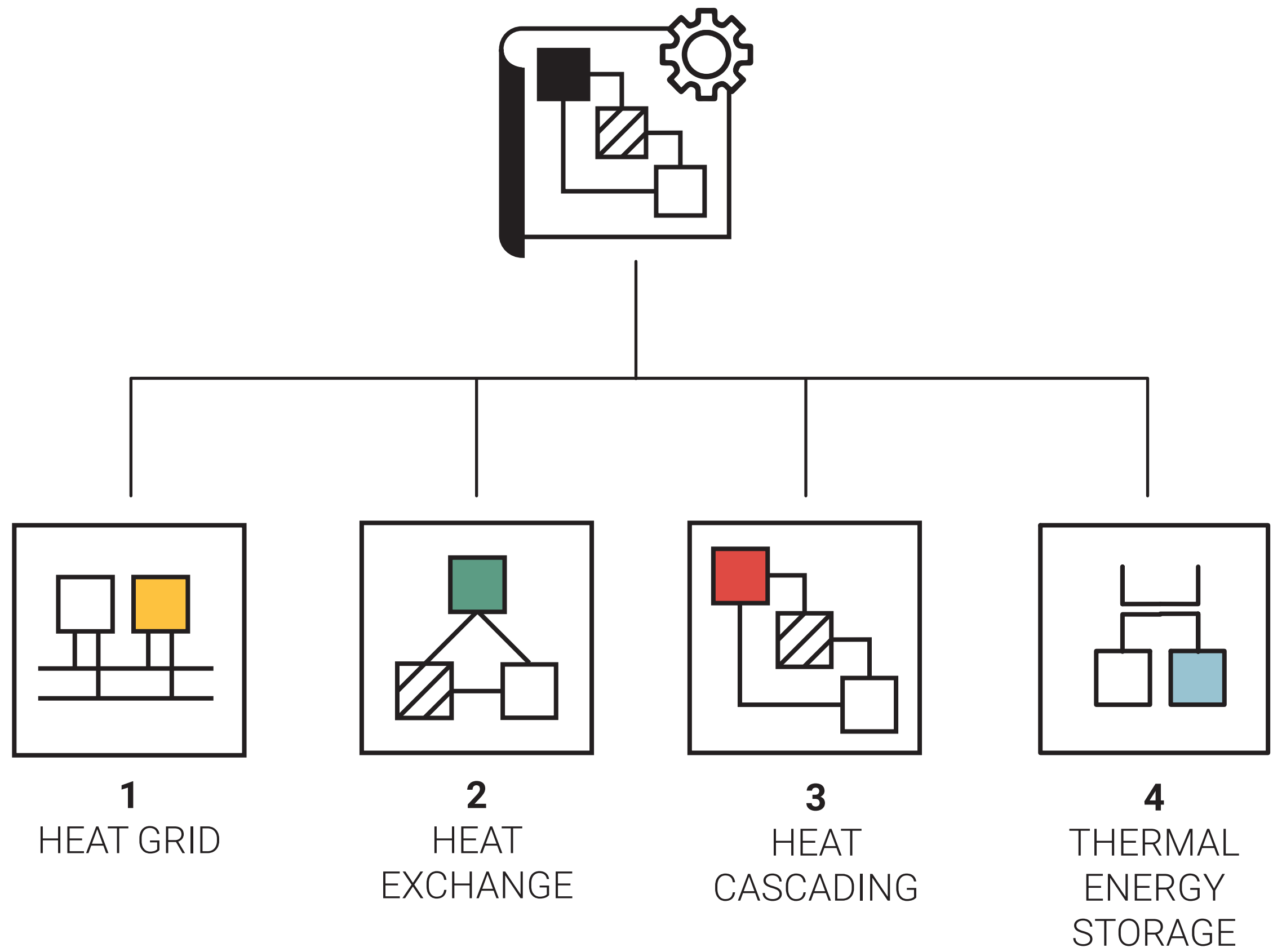


CONCEPT OF CASCADING MACHINE
RETURN FLOW FROM ONE FEED THE OTHER

What strategy can be developed to optimize a **sustainable collective energy system for heating** based on the principle of heat cascading and thermal energy storage, for a **cluster of buildings in Arnhem including the Palace of Justice**?

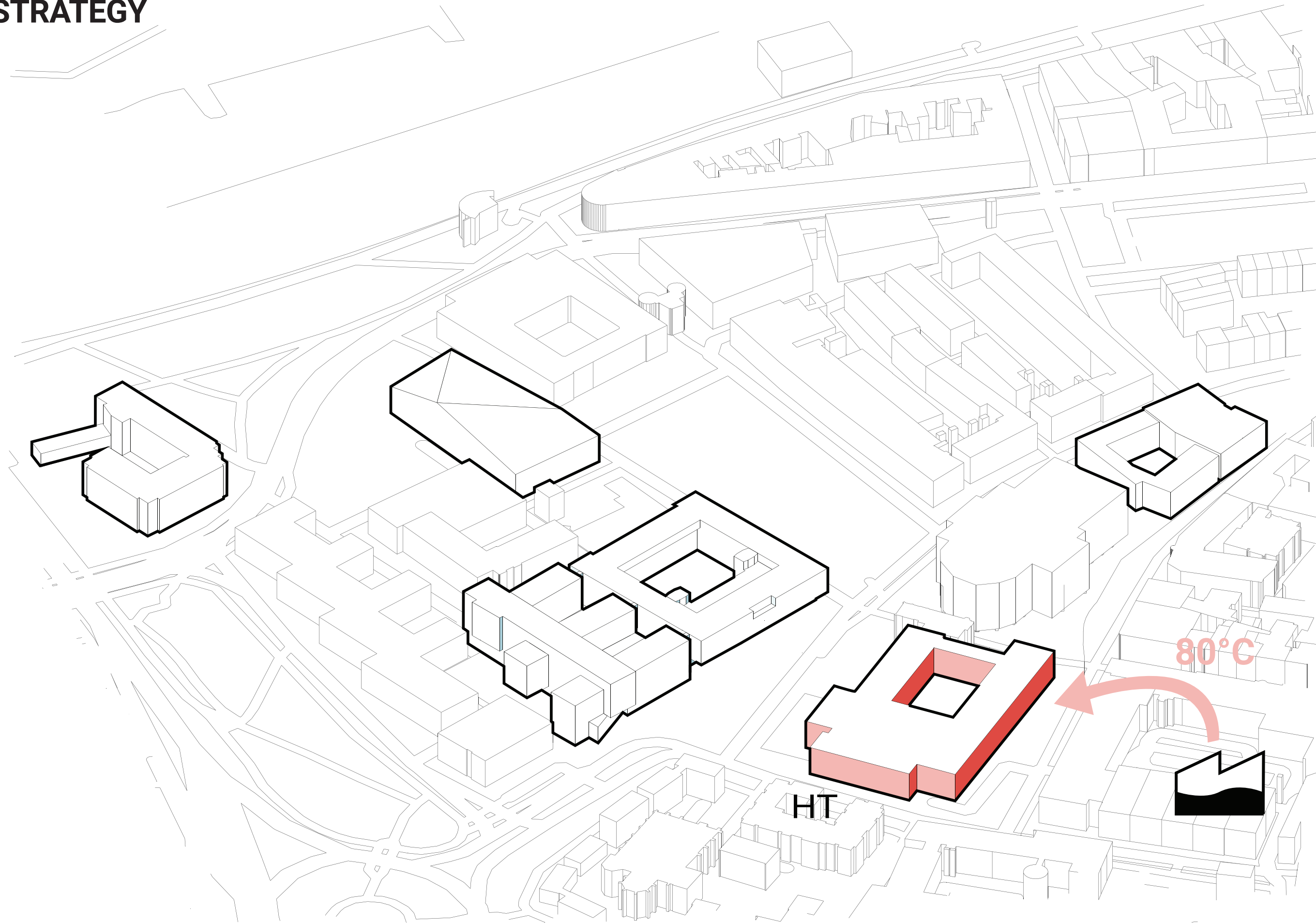
URBAN ENERGY STRATEGY

CASCADING MACHINE



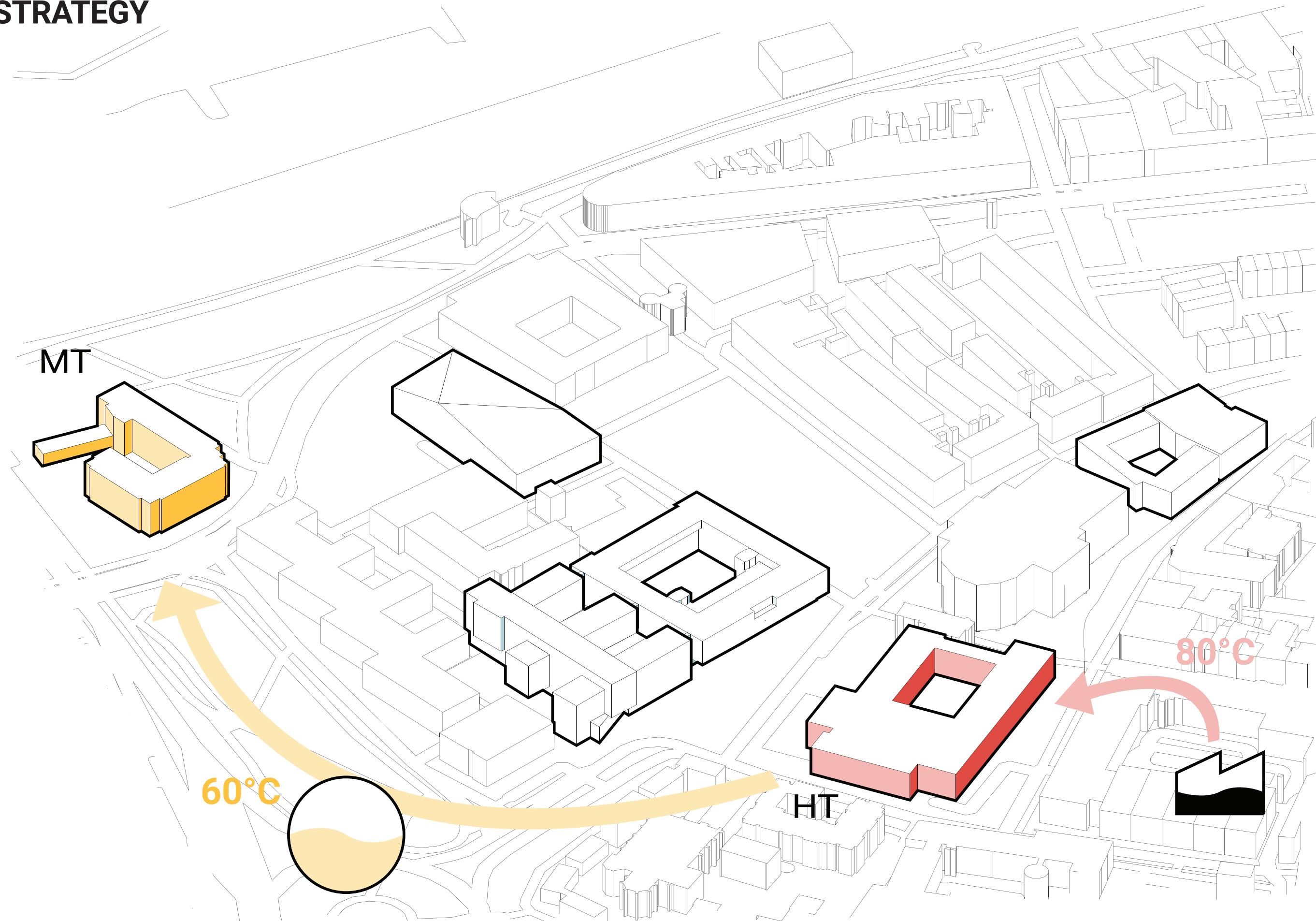
URBAN ENERGY STRATEGY

IMPLEMENTATION



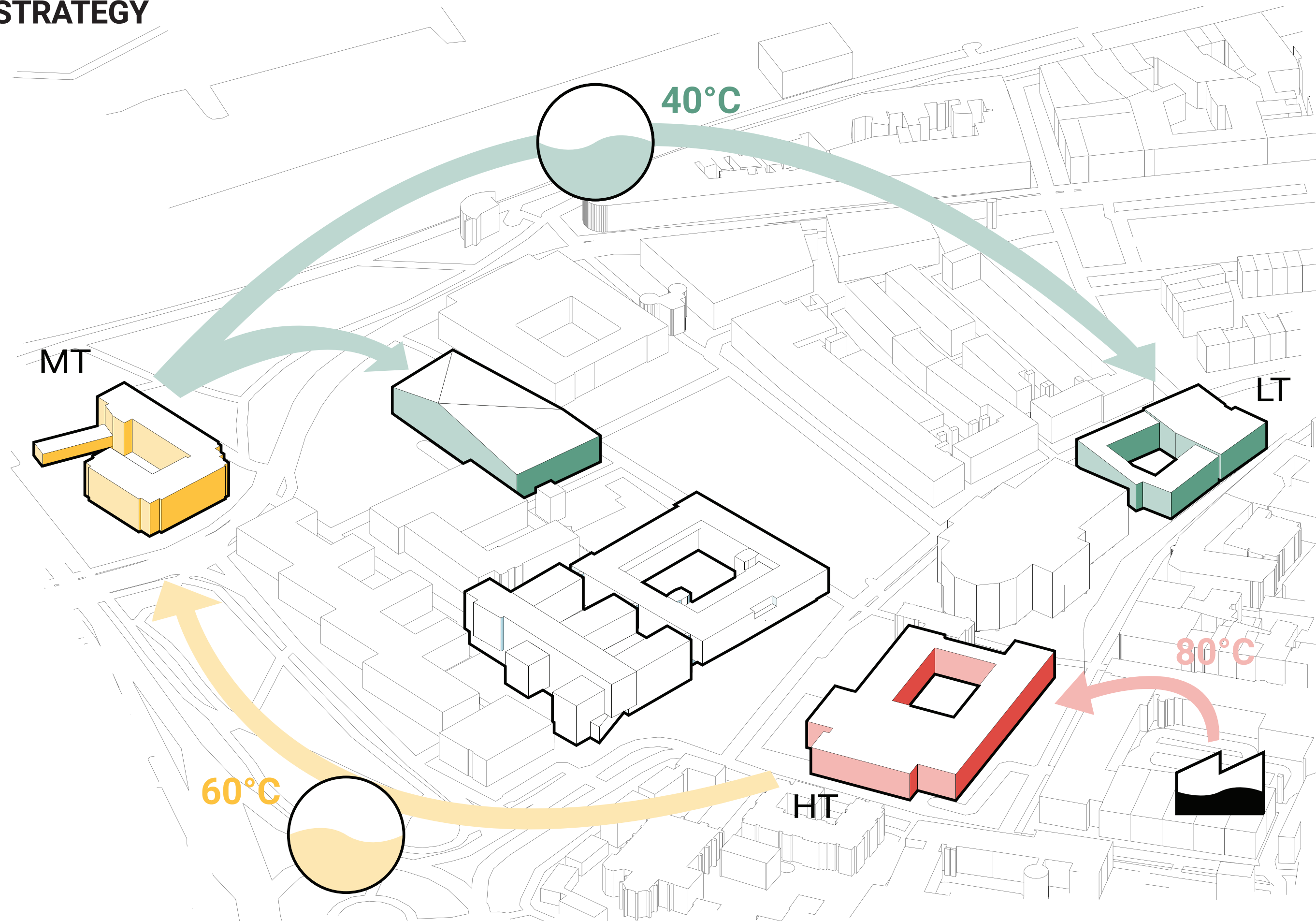
URBAN ENERGY STRATEGY

IMPLEMENTATION



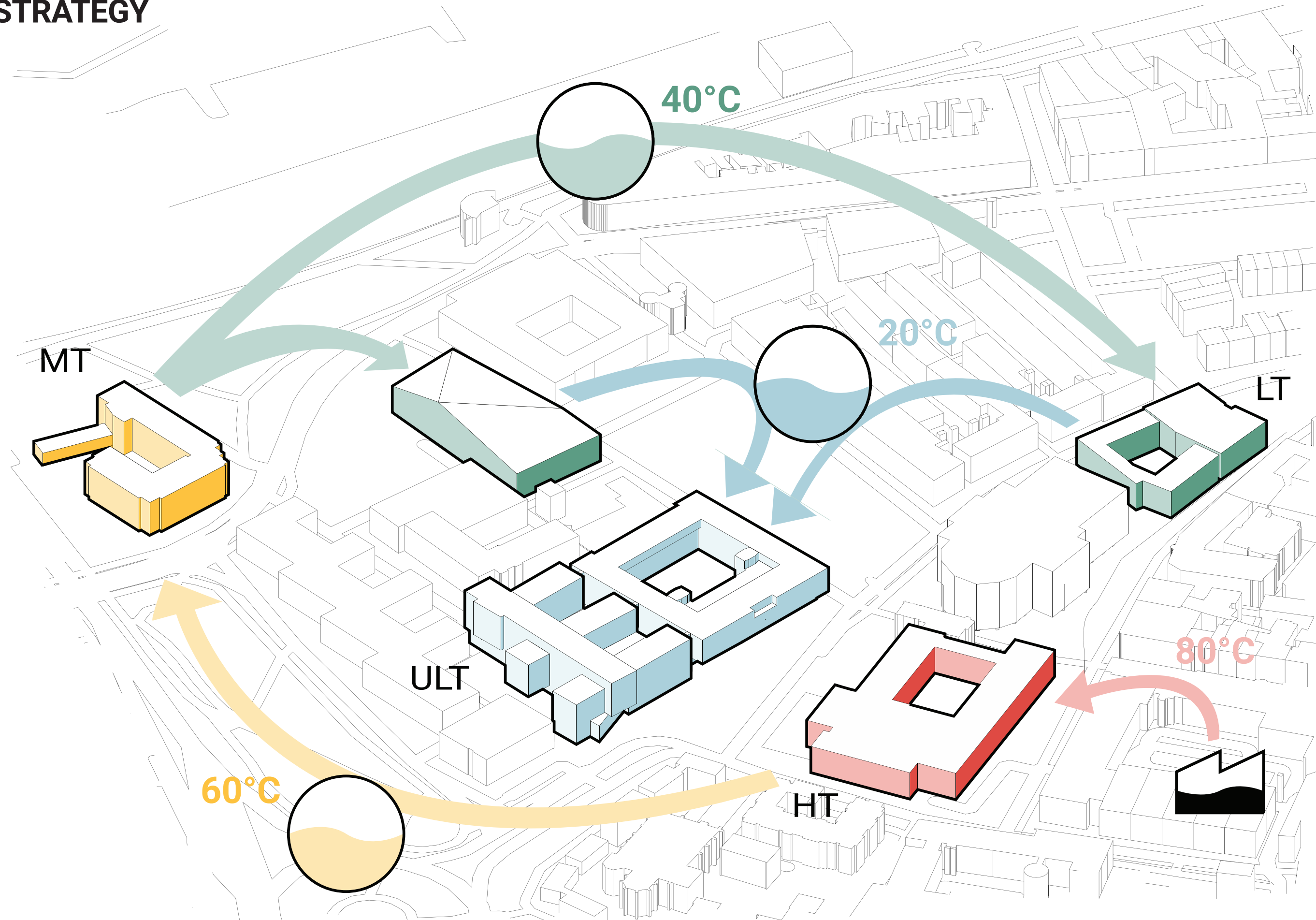
URBAN ENERGY STRATEGY

IMPLEMENTATION



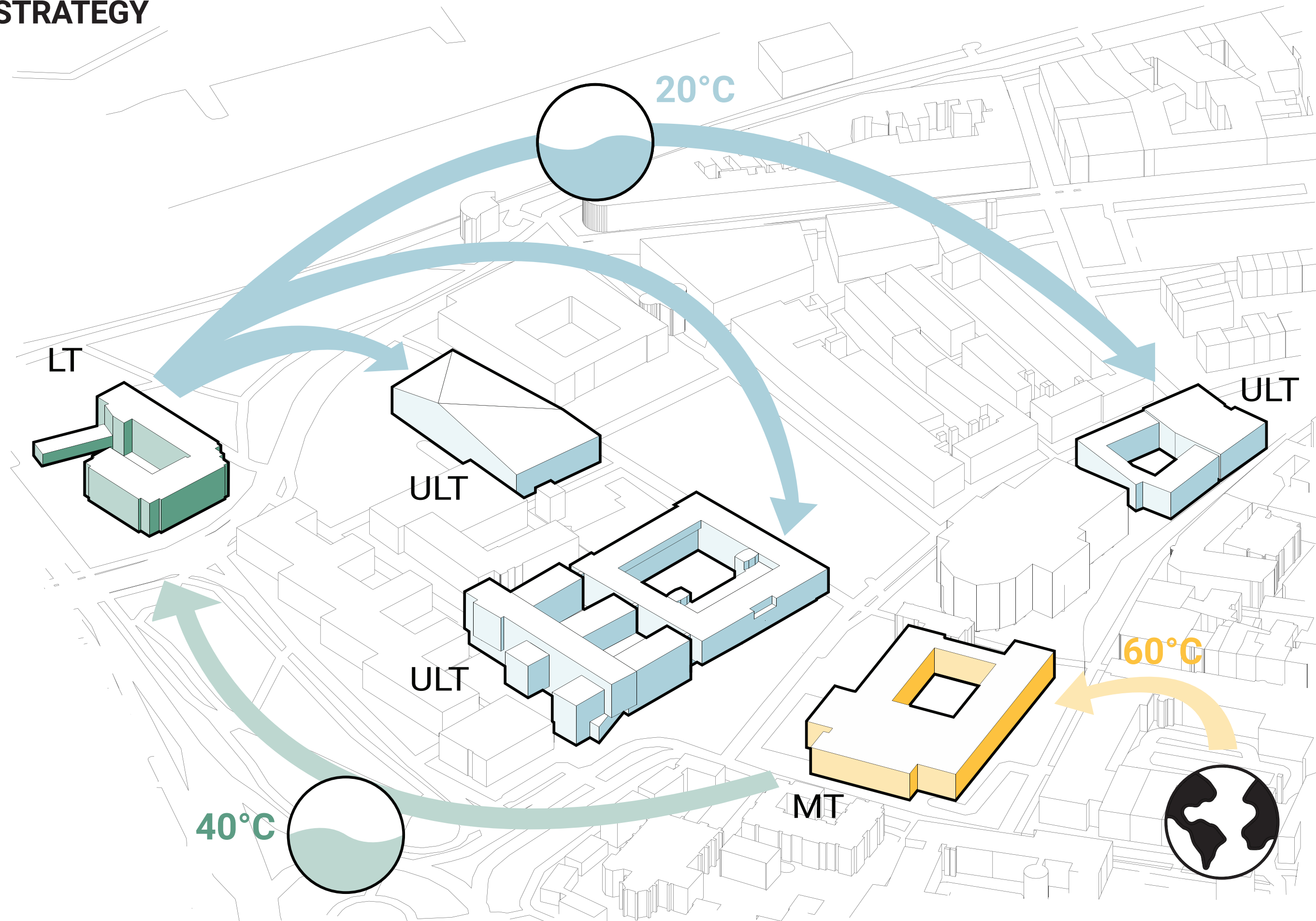
URBAN ENERGY STRATEGY

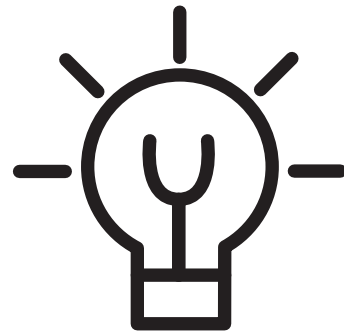
IMPLEMENTATION



URBAN ENERGY STRATEGY

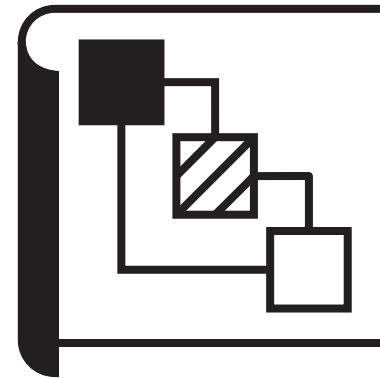
OPTIMIZATION





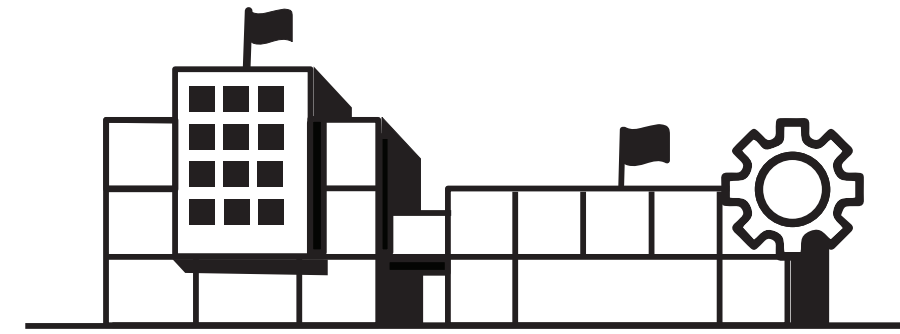
1

SMARTER WITH ENERGY
ON URBAN SCALE



2

PROVEN OPERATION
CASCADING MACHINE



3

TECHNICAL REQUIREMENTS
PALACE OF JUSTICE



STRATEGY

URBAN ENERGY

URBAN DESIGN

BUILDING ENERGY

ARCHITECTURAL DESIGN

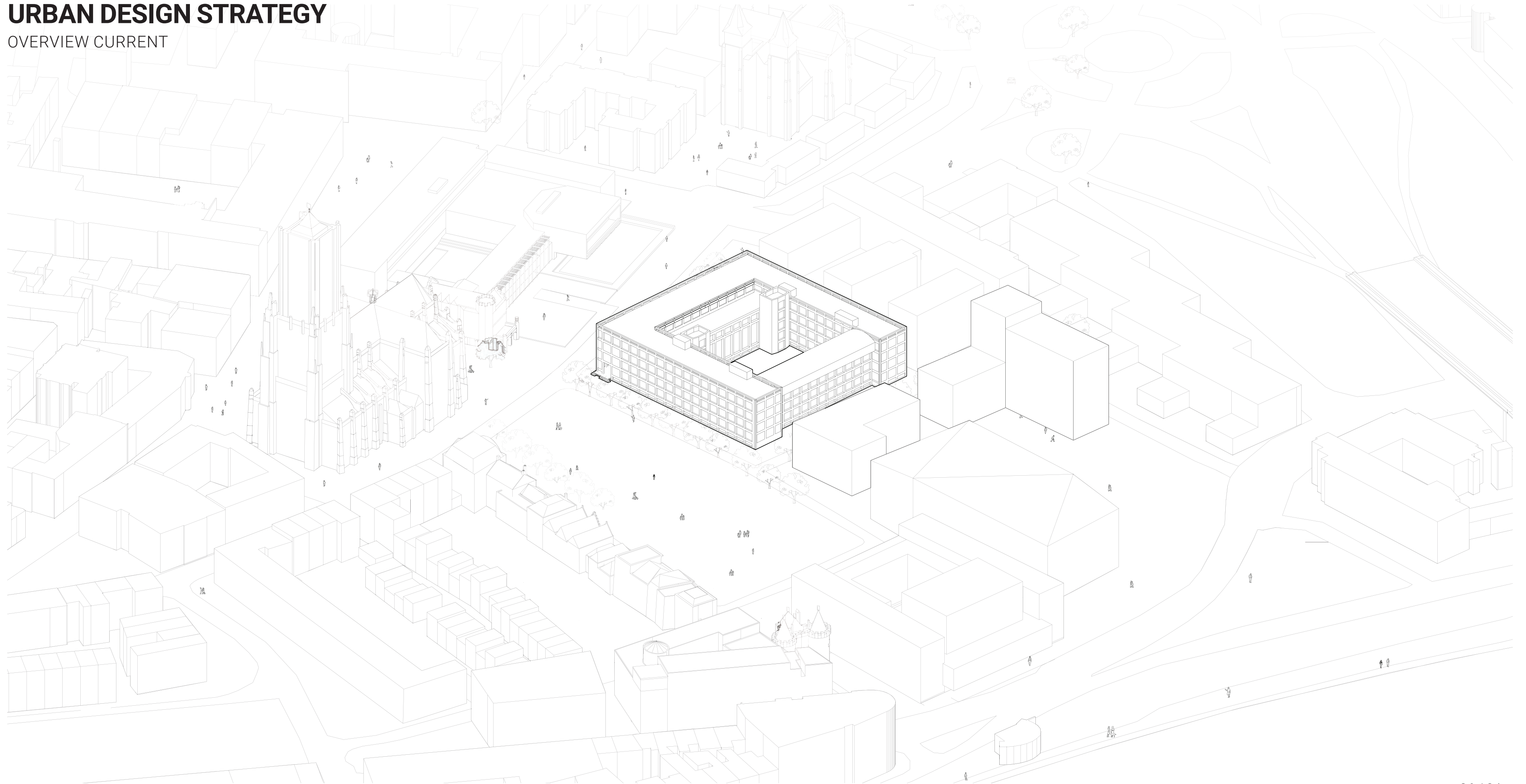
URBAN DESIGN STRATEGY

OVERVIEW CURRENT

*Justice must not only be done,
it must also be seen to be done.*

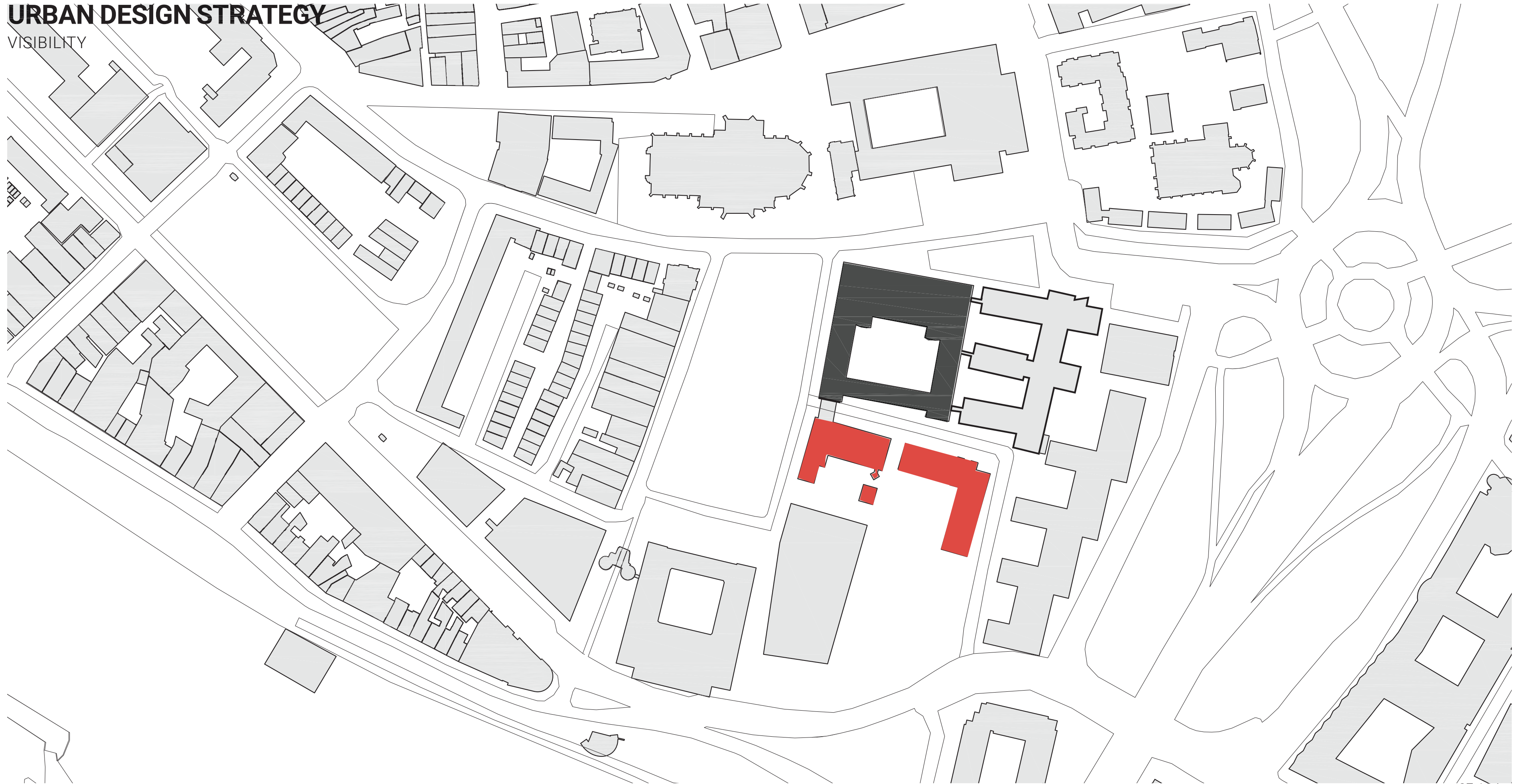
URBAN DESIGN STRATEGY

OVERVIEW CURRENT



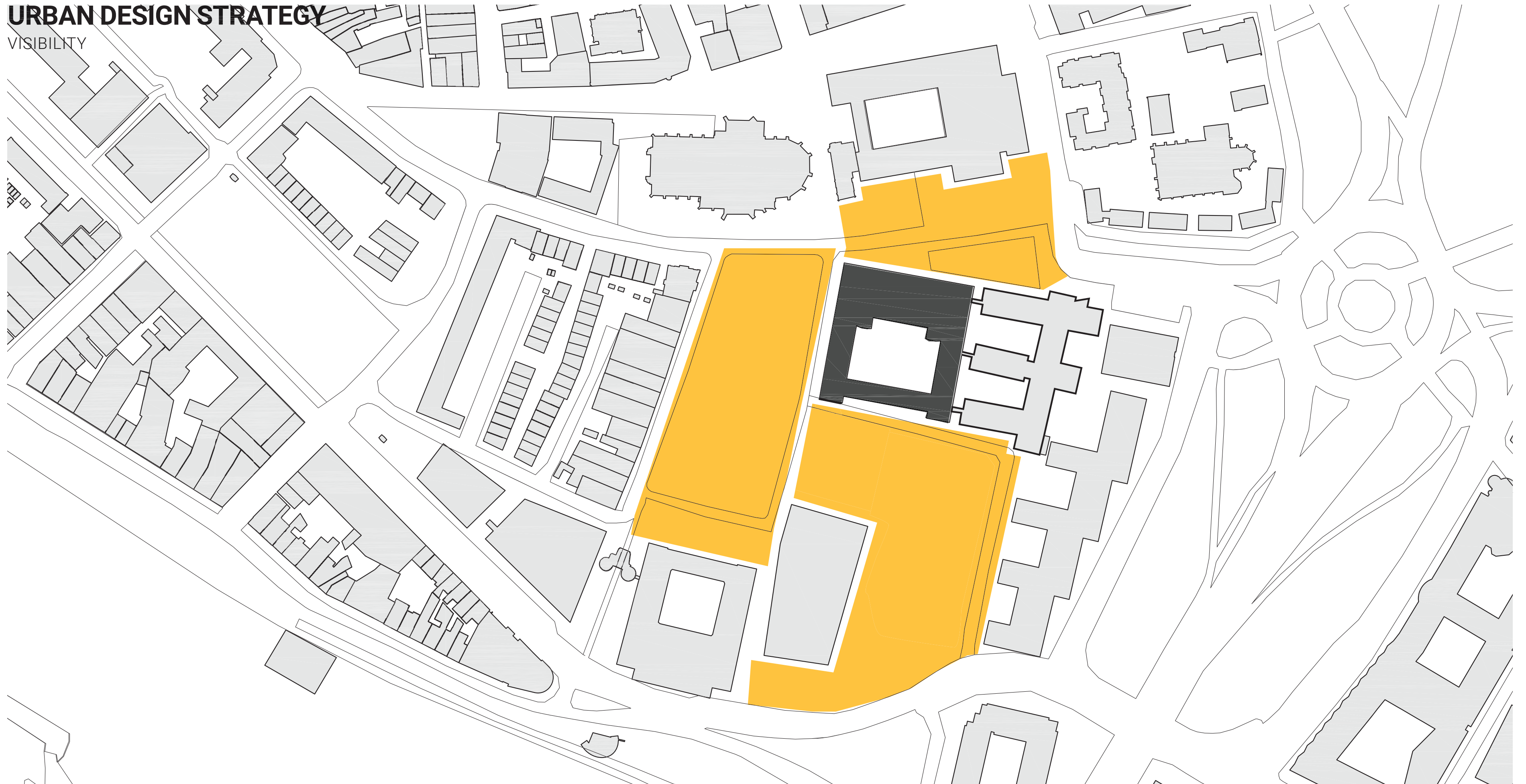
URBAN DESIGN STRATEGY

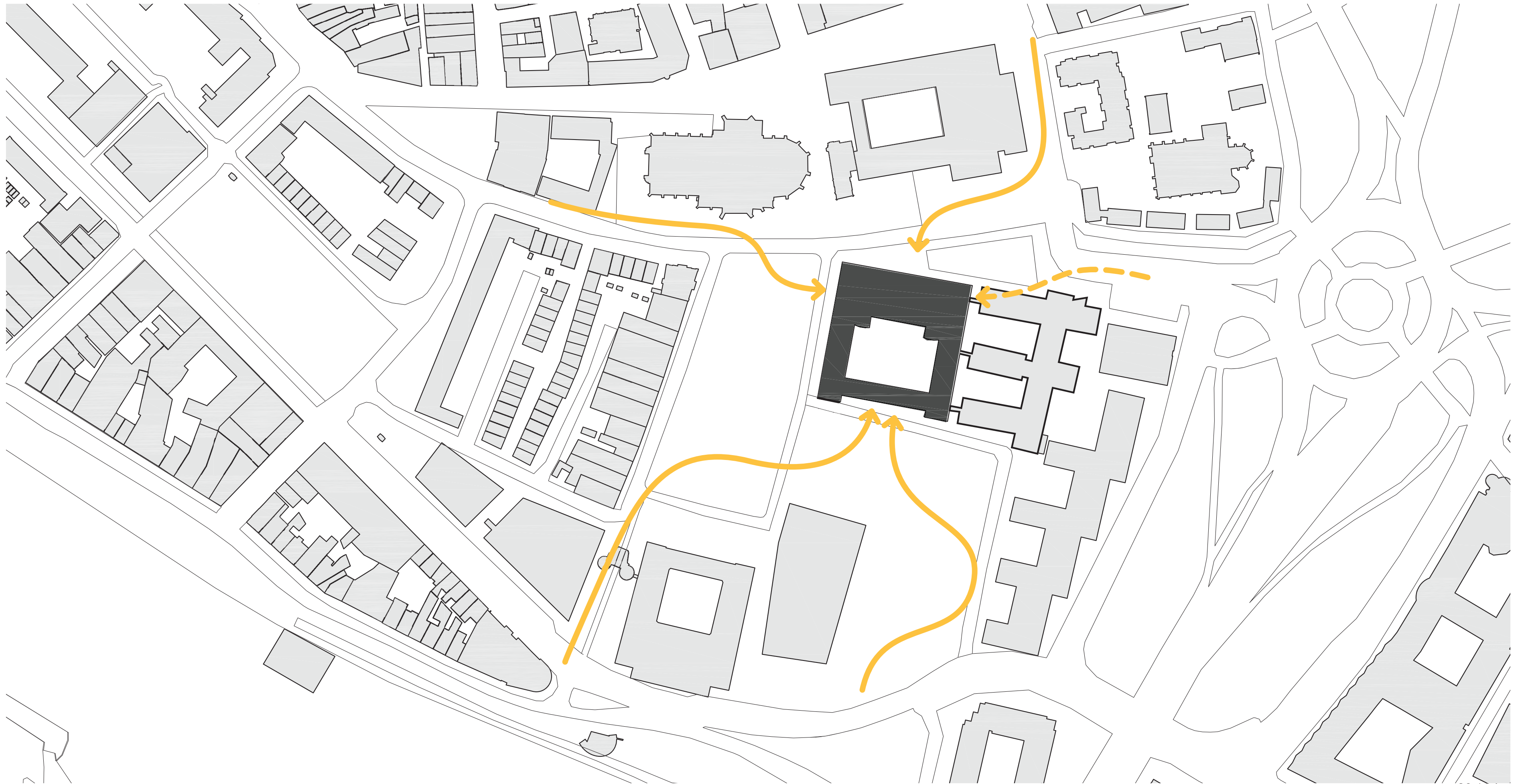
VISIBILITY



URBAN DESIGN STRATEGY

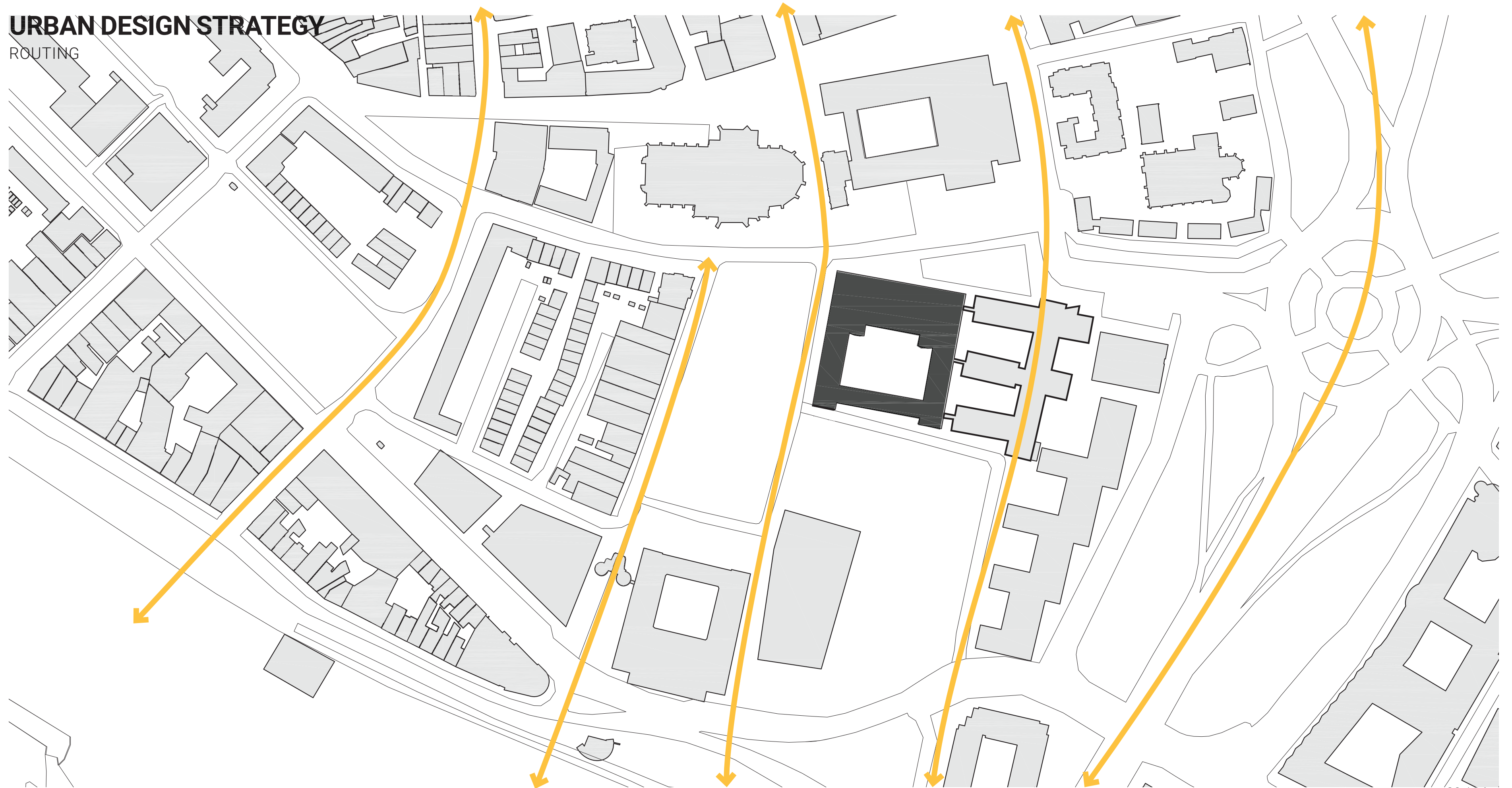
VISIBILITY





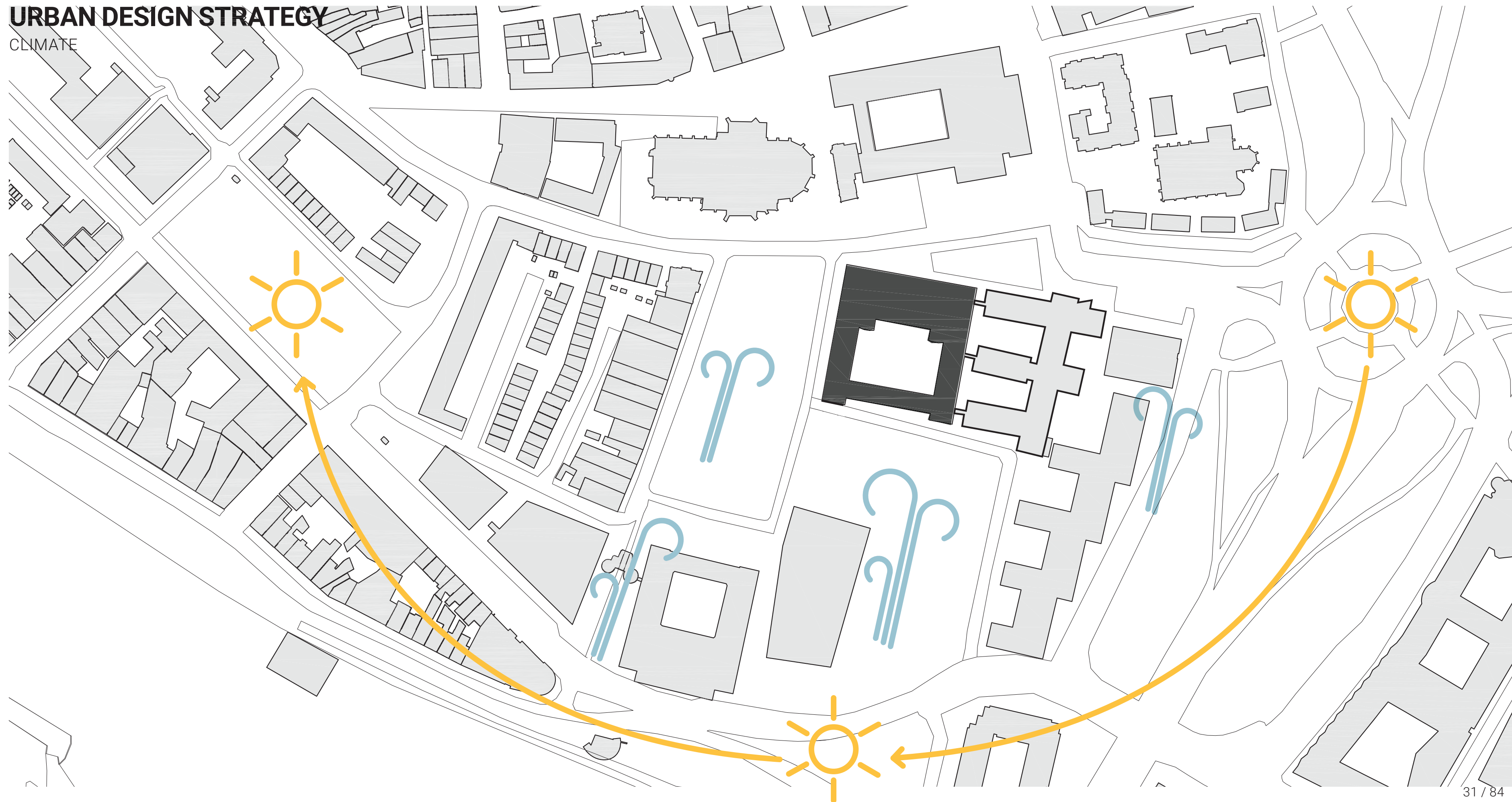
URBAN DESIGN STRATEGY

ROUTING



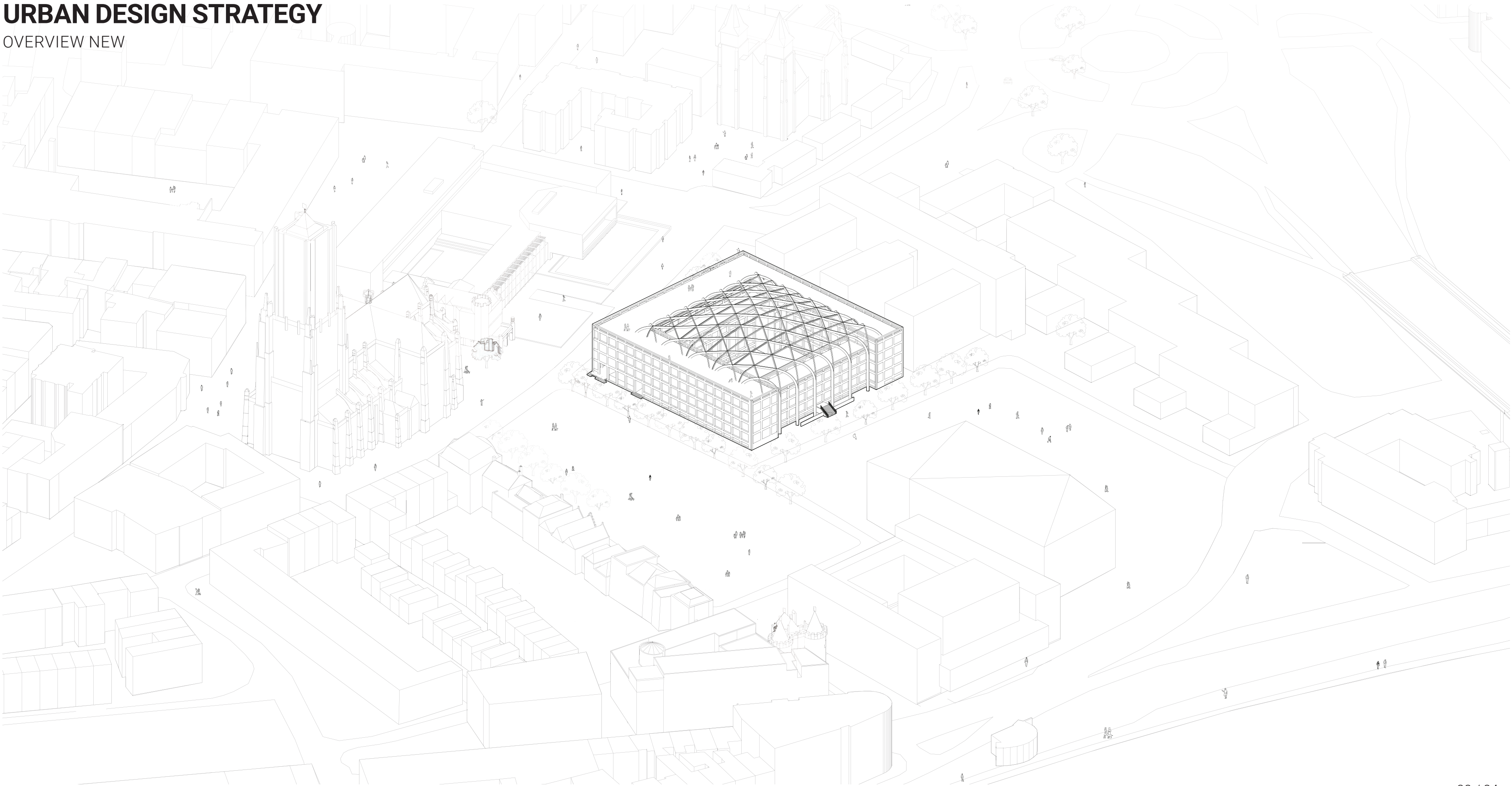
URBAN DESIGN STRATEGY

CLIMATE



URBAN DESIGN STRATEGY

OVERVIEW NEW



STRATEGY

URBAN ENERGY

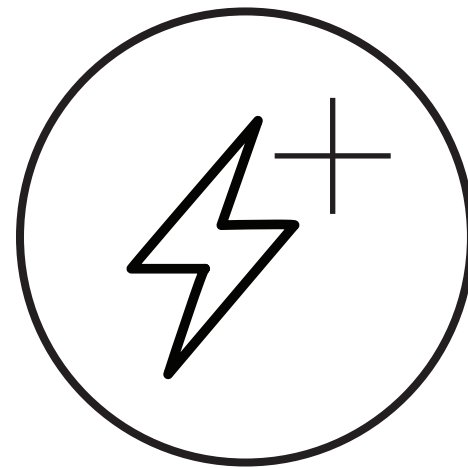
URBAN DESIGN

BUILDING ENERGY

ARCHITECTURAL DESIGN

BUILDING ENERGY STRATEGY

OVERVIEW



1
ZERO-ENERGY
BUILDING



2
NEW STEPPED
STRATEGY



3
SUSTAINABLE
MONUMENTALITY

REDUCE

INTERVENTIONS

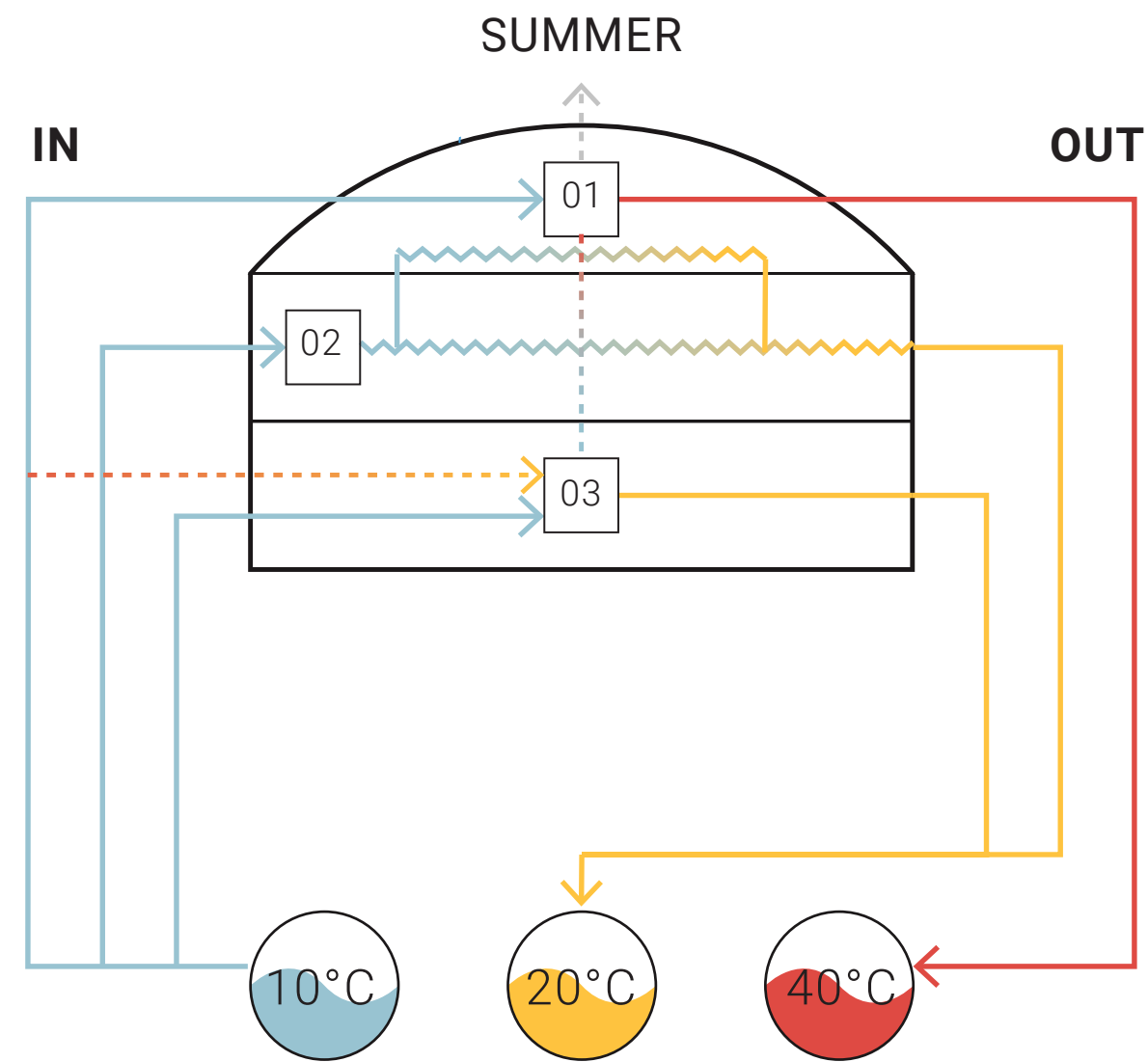
LOW TEMPERATURE
HEATING & COOLING

MULTIFUNCTIONAL
CLIMATE ROOF

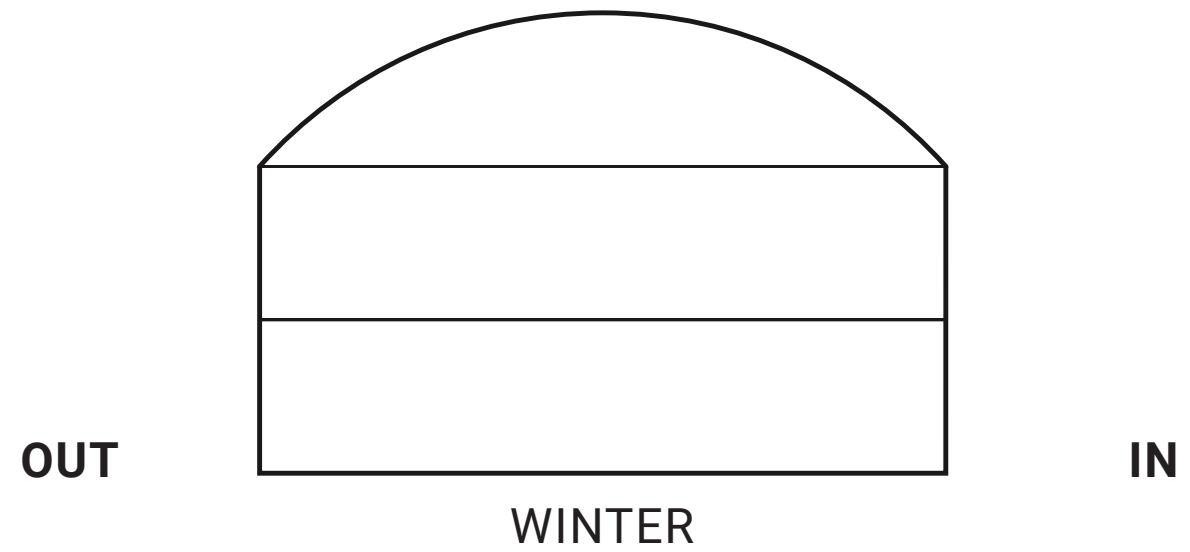
RENOVATED
FACADE

DOUBLE SKIN FACADE

RE-USE
THERMAL FLOWCHART

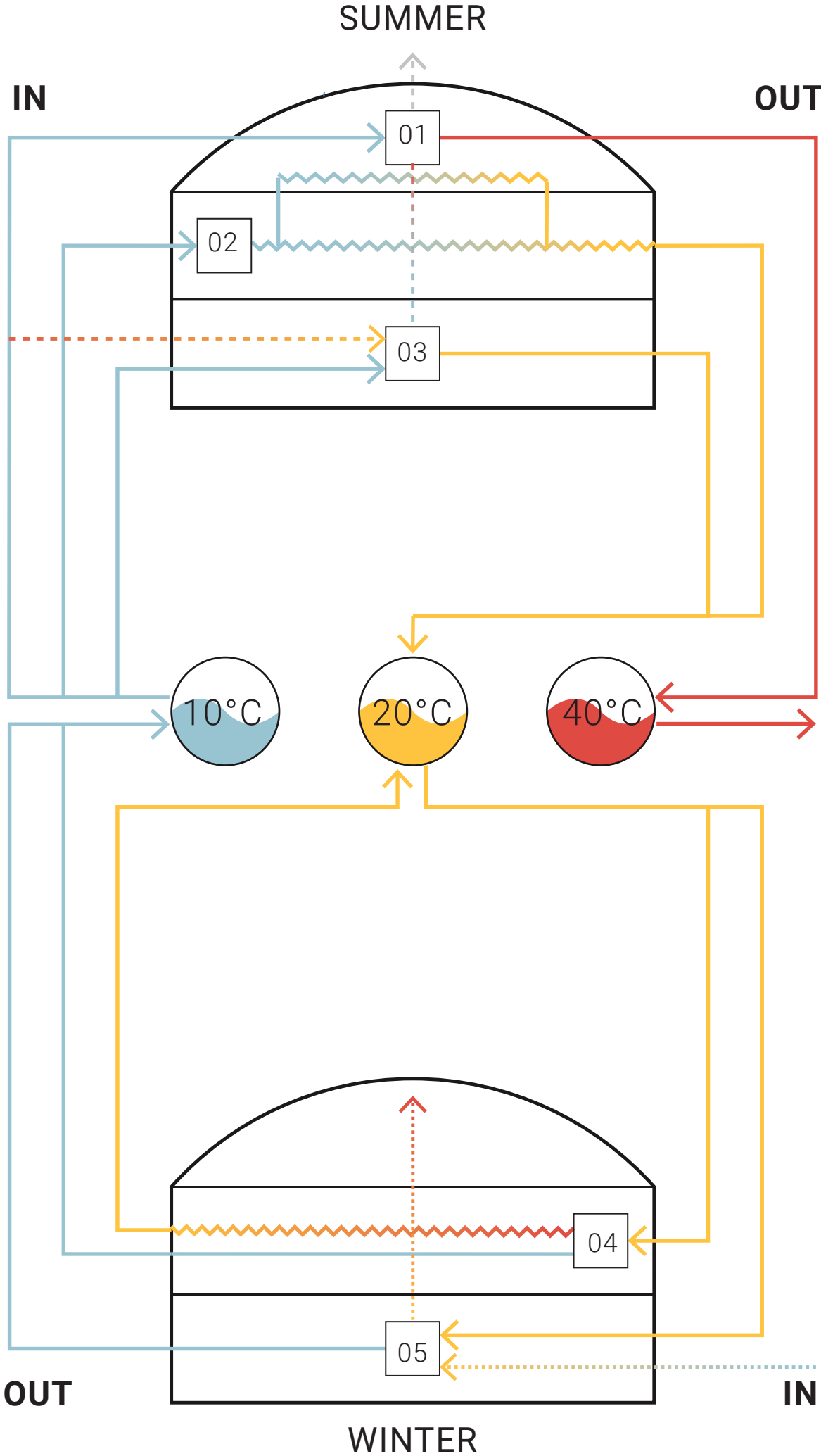


- LEGEND
- 01 *Fiwihex air-water heatexchanger*
- 02 *Floor cooling*
- 03 *Cooling ventilation air*



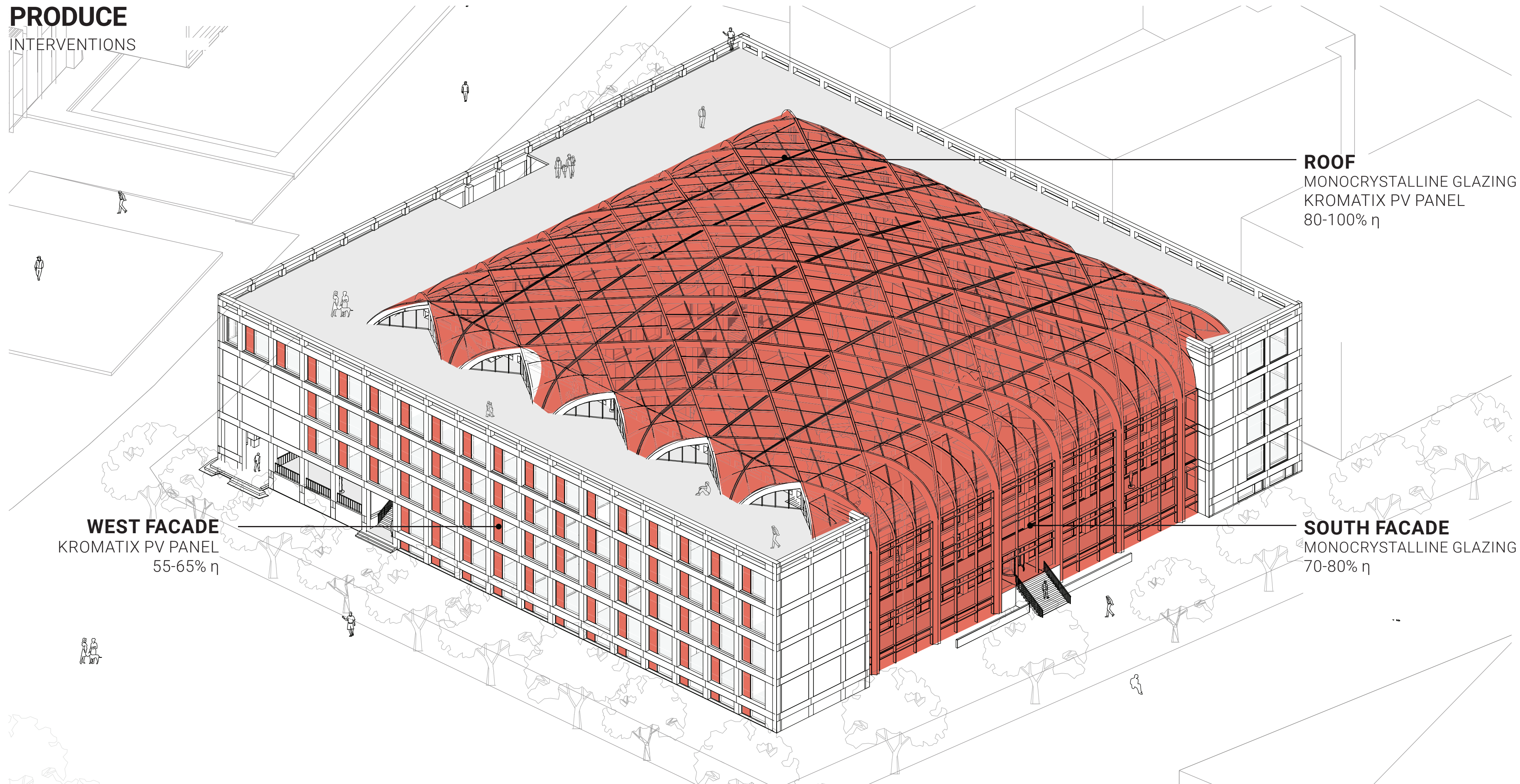
RE-USE
THERMAL FLOWCHART

- LEGEND
- 01 *Fiwihex air-water heatexchanger*
 - 02 *Floor cooling*
 - 03 *Cooling ventilation air*
 - 04 *Floor heating*
 - 05 *Heating ventilation air*



PRODUCE

INTERVENTIONS



ROOF
MONOCRYSTALLINE GLAZING
KROMATIX PV PANEL
80-100% η

WEST FACADE
KROMATIX PV PANEL
55-65% η

SOUTH FACADE
MONOCRYSTALLINE GLAZING
70-80% η



STRATEGY

URBAN ENERGY

URBAN DESIGN

BUILDING ENERGY

ARCHITECTURAL DESIGN

ARCHITECTURAL DESIGN

REPROGRAMMING



ARCHITECTURAL DESIGN
ROUTING



ARCHITECTURAL DESIGN
ROUTING



ARCHITECTURAL DESIGN

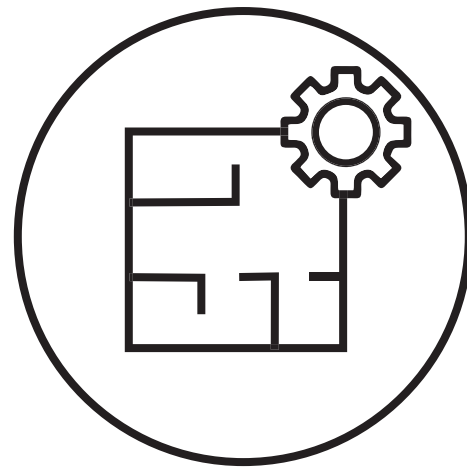
WORK ENVIRONMENT



ARCHITECTURAL DESIGN

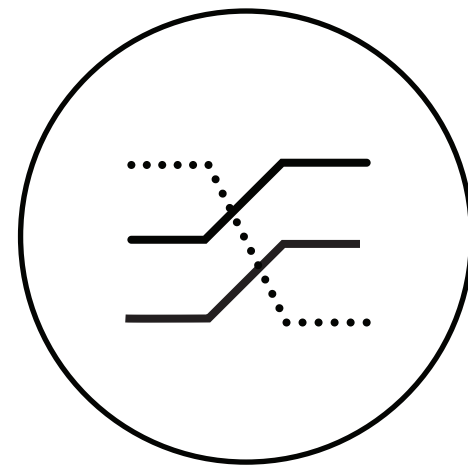
WORK ENVIRONMENT





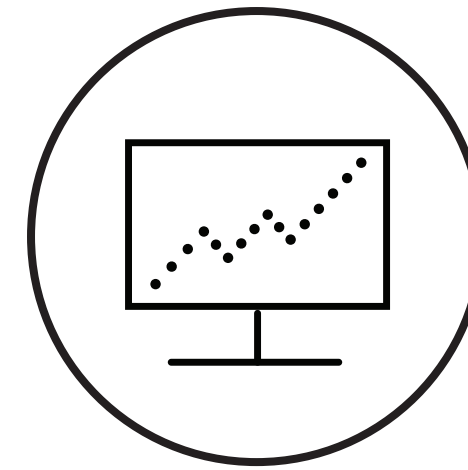
1

REPROGRAMMING



2

ROUTING

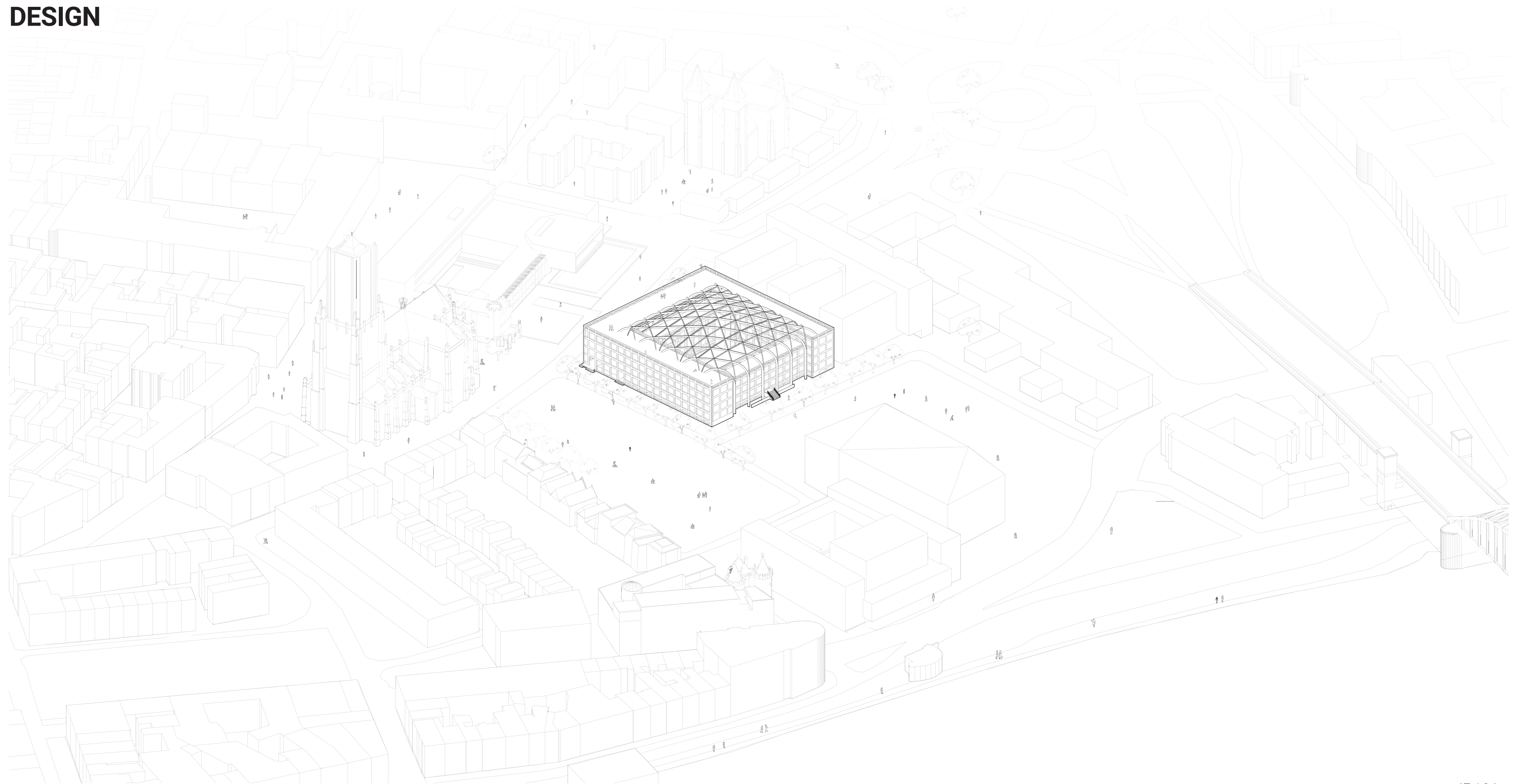


3

WORK ENVIRONMENT



DESIGN





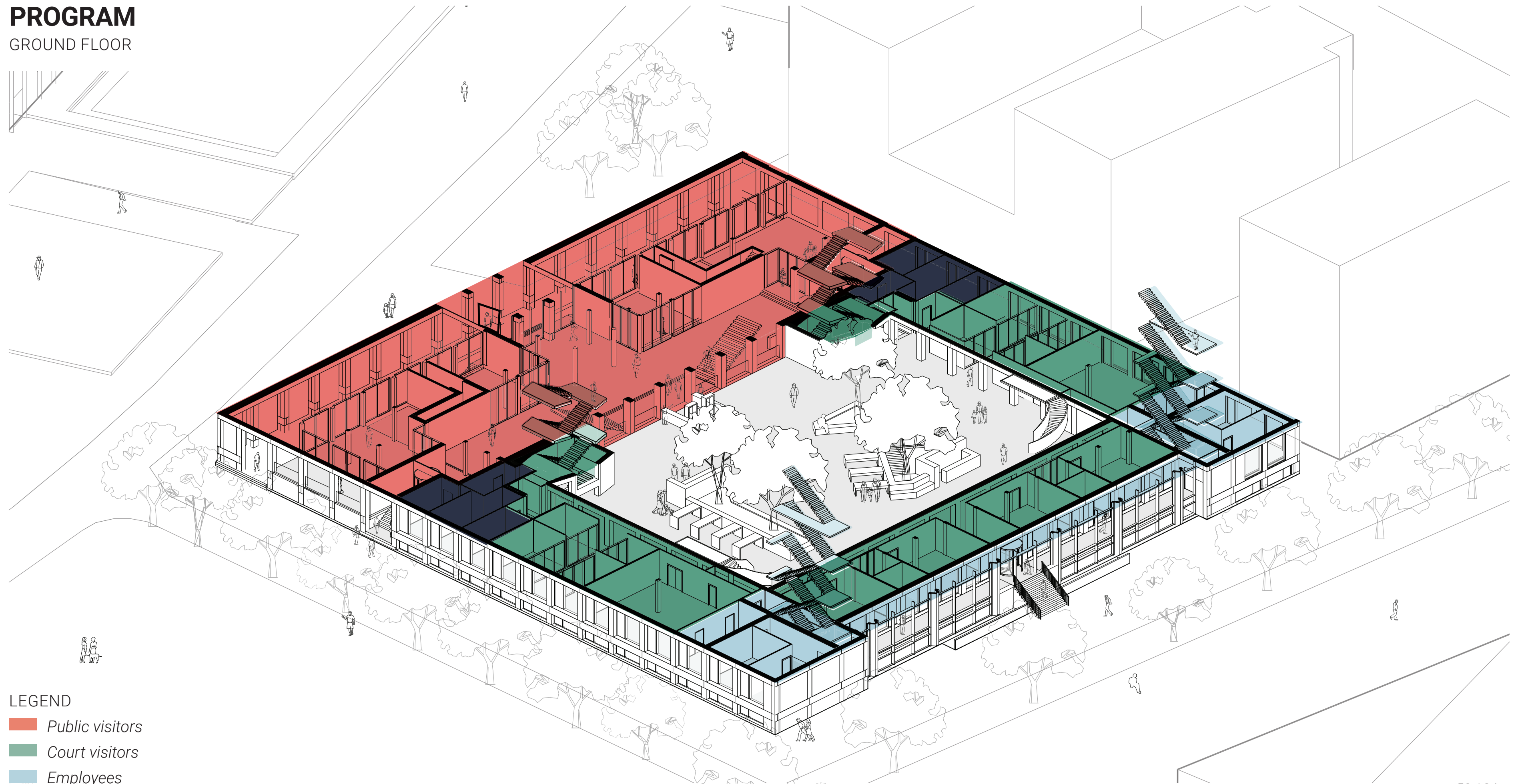
PALEIS VAN JUSTITIE



PALEIS VAN JUSTITIE

PROGRAM

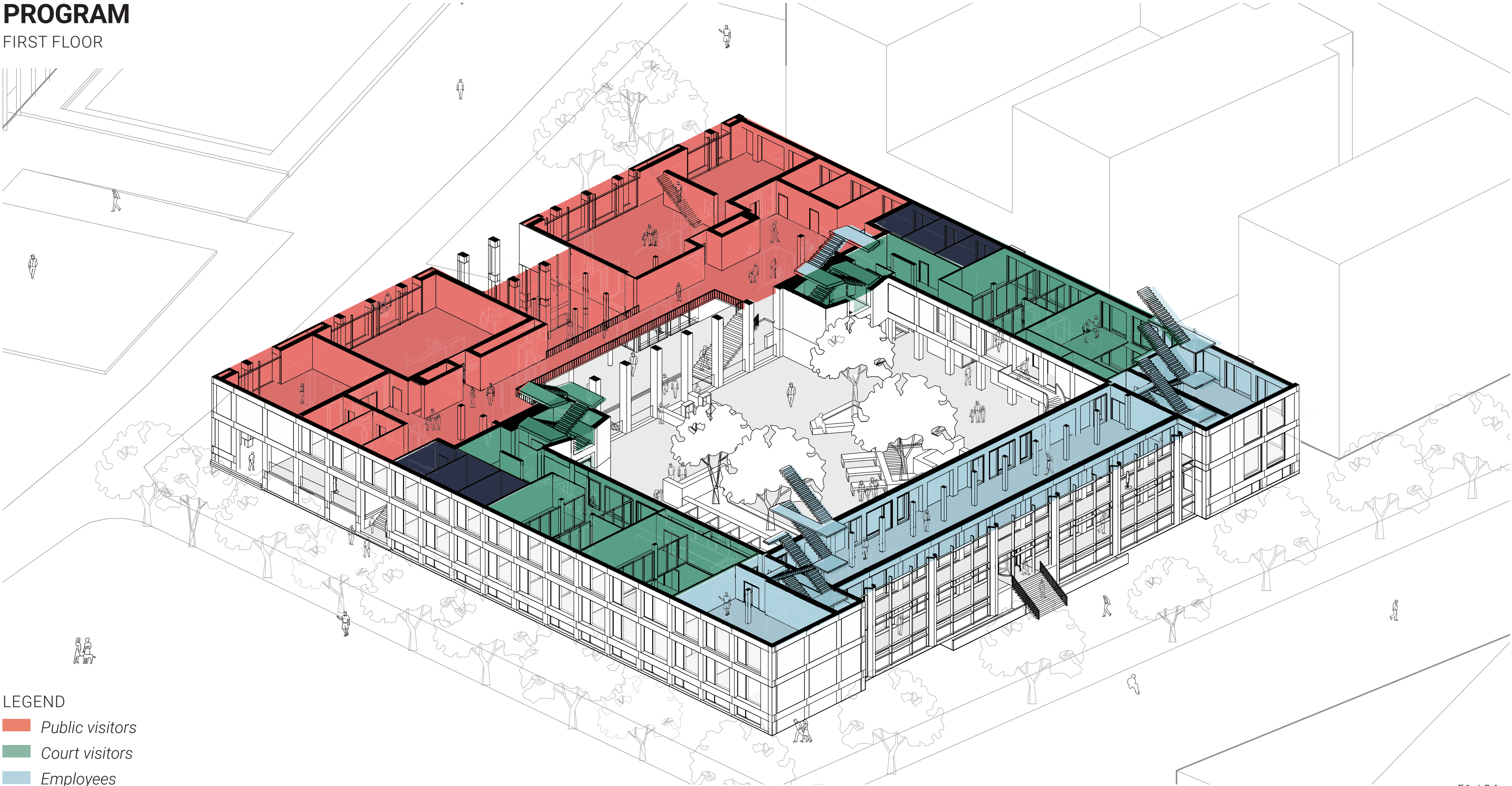
GROUND FLOOR



LEGEND

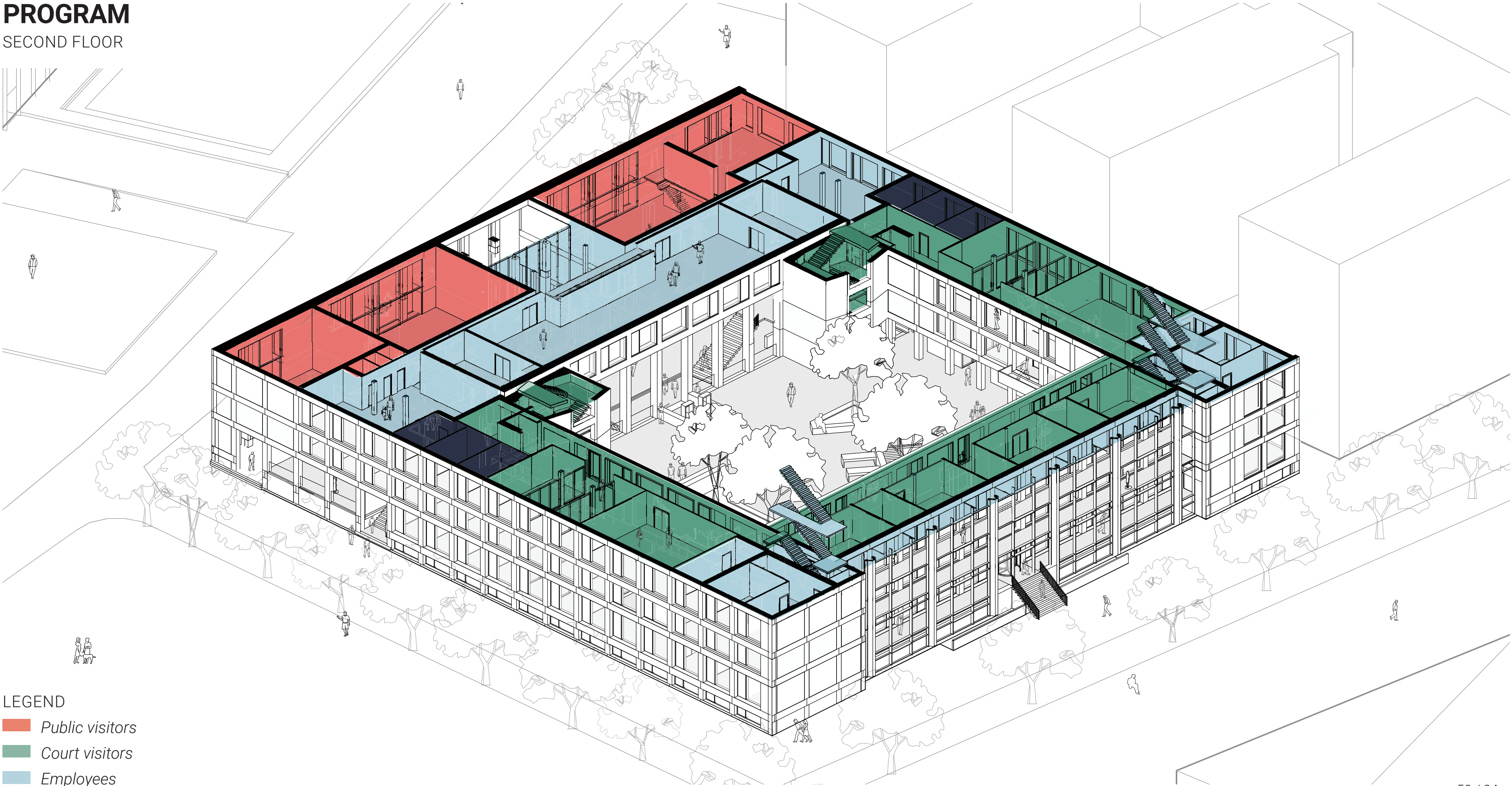
- Public visitors
- Court visitors
- Employees

PROGRAM
FIRST FLOOR



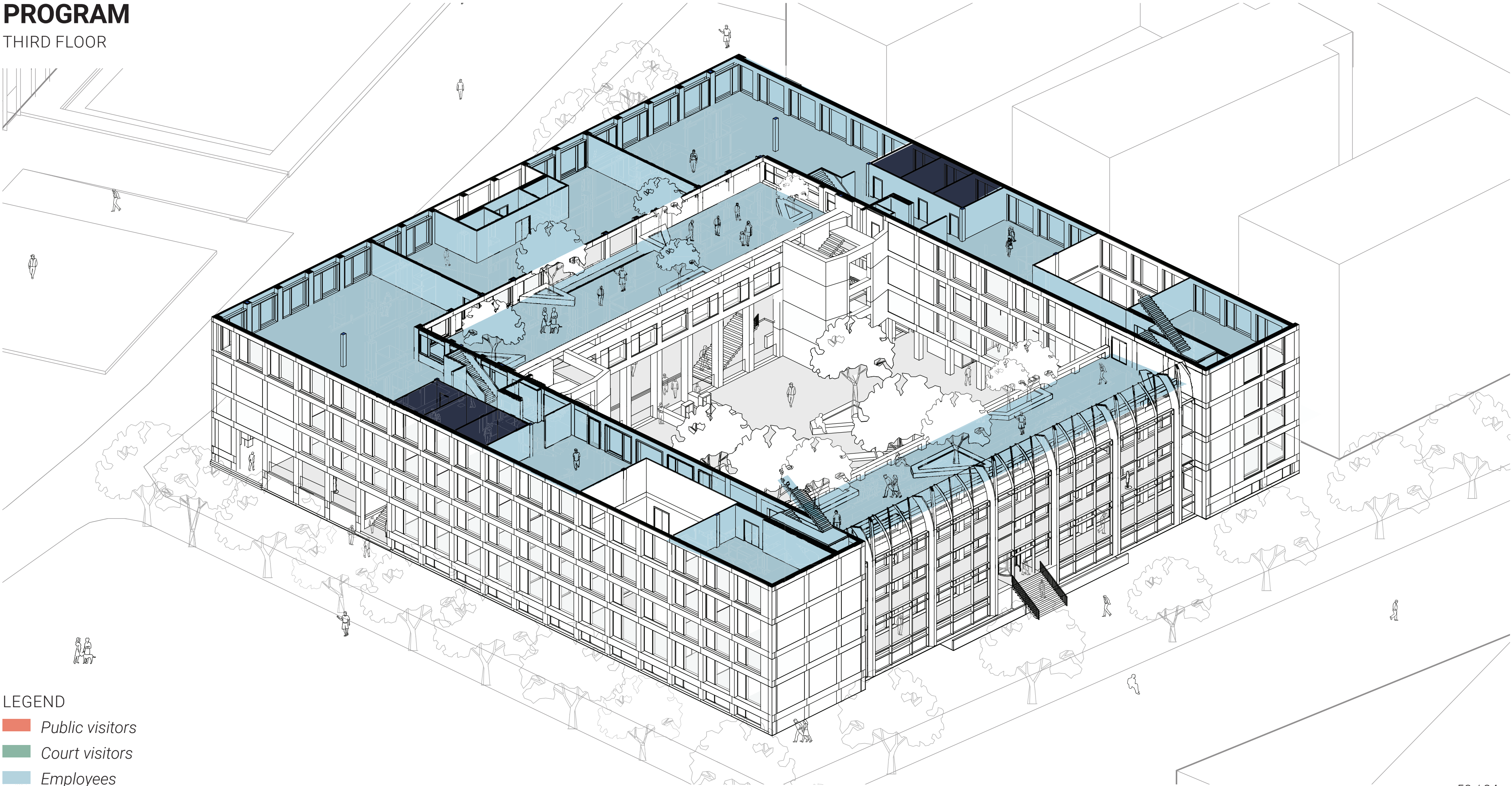
- LEGEND
- Public visitors
 - Court visitors
 - Employees

PROGRAM
SECOND FLOOR



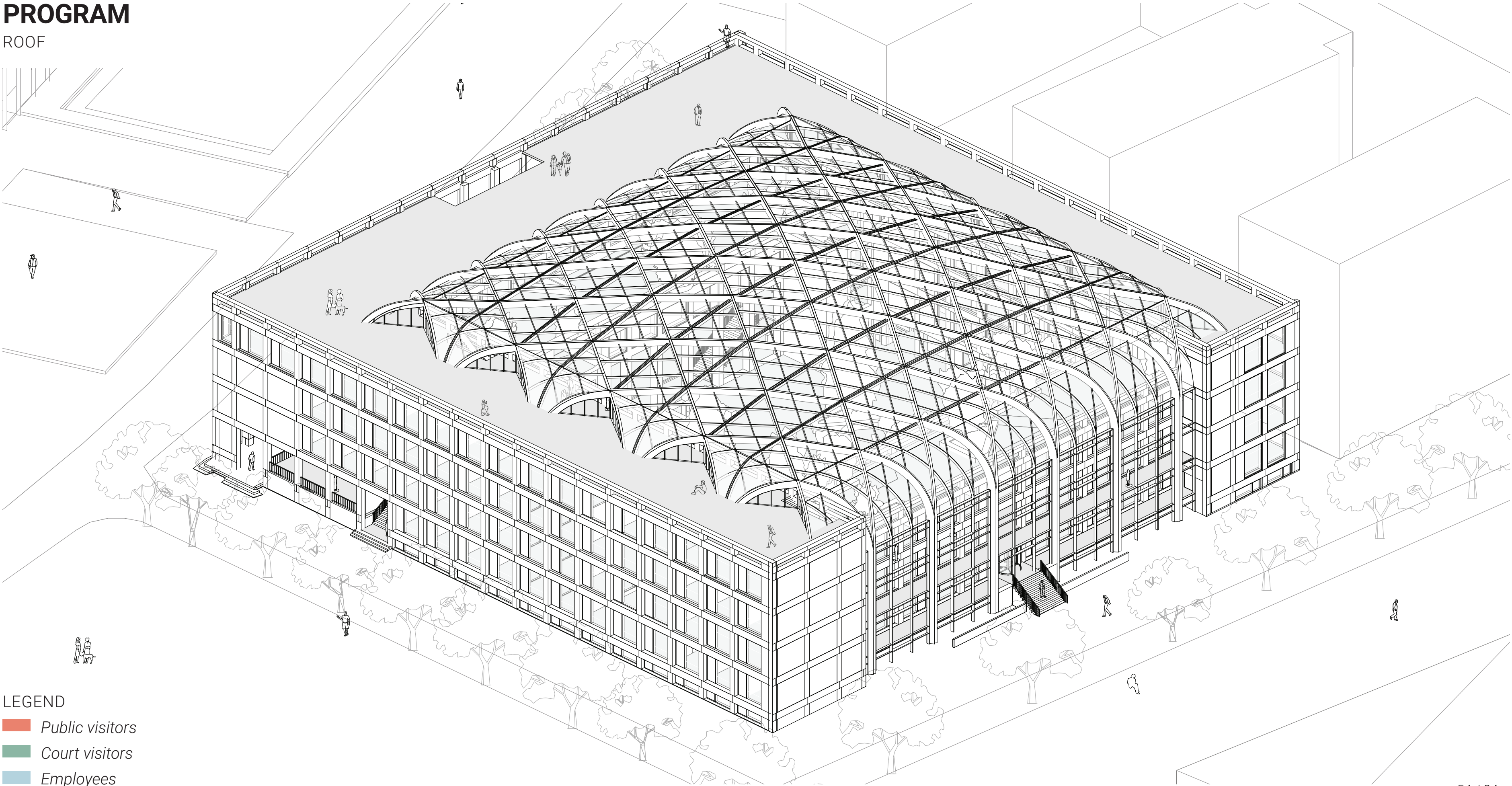
- LEGEND
- Public visitors
 - Court visitors
 - Employees

PROGRAM
THIRD FLOOR



- LEGEND
- Public visitors
 - Court visitors
 - Employees

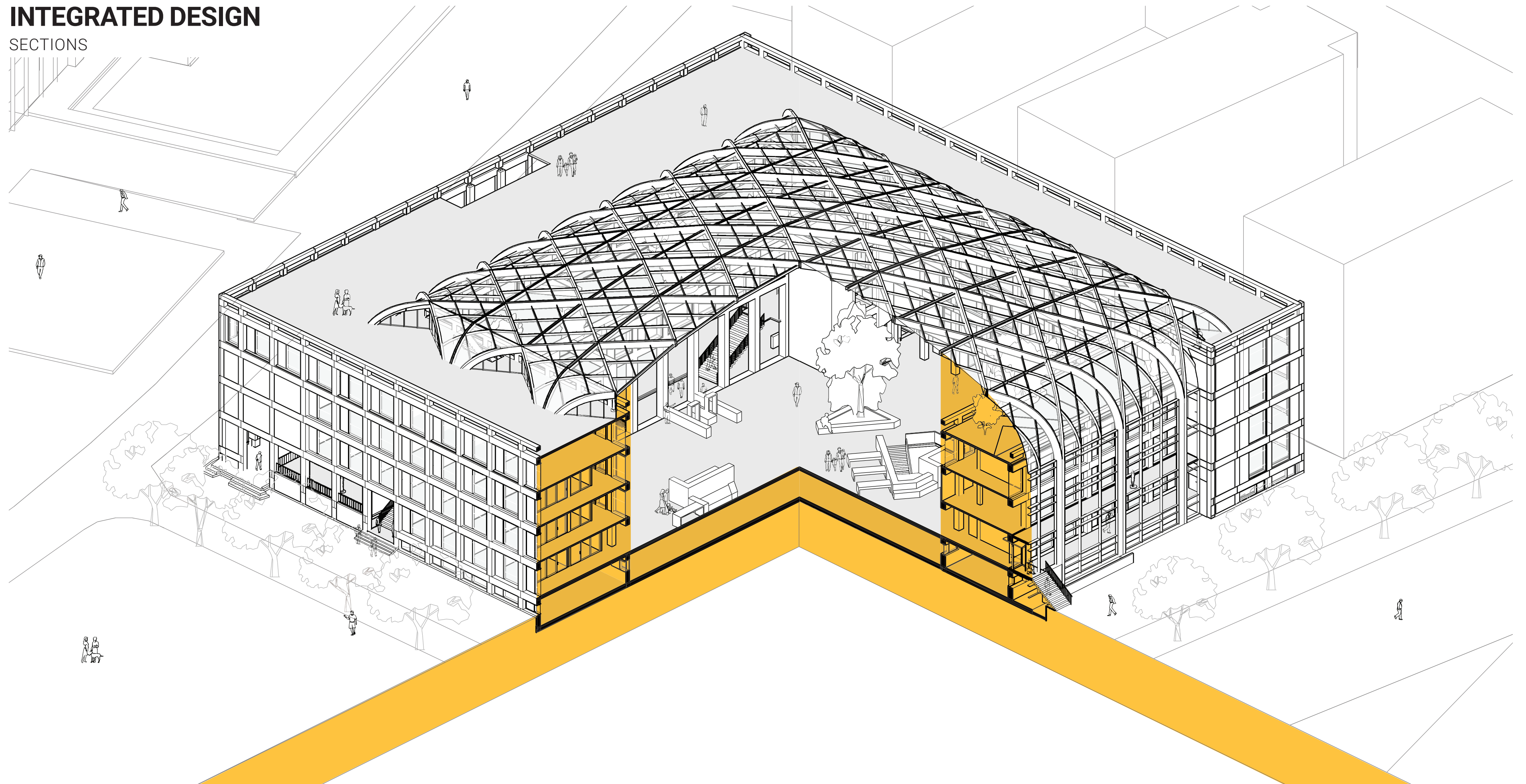
PROGRAM
ROOF



- LEGEND
- Public visitors
 - Court visitors
 - Employees

INTEGRATED DESIGN

SECTIONS



INTEGRATED DESIGN
OVERVIEW WEST FACADE



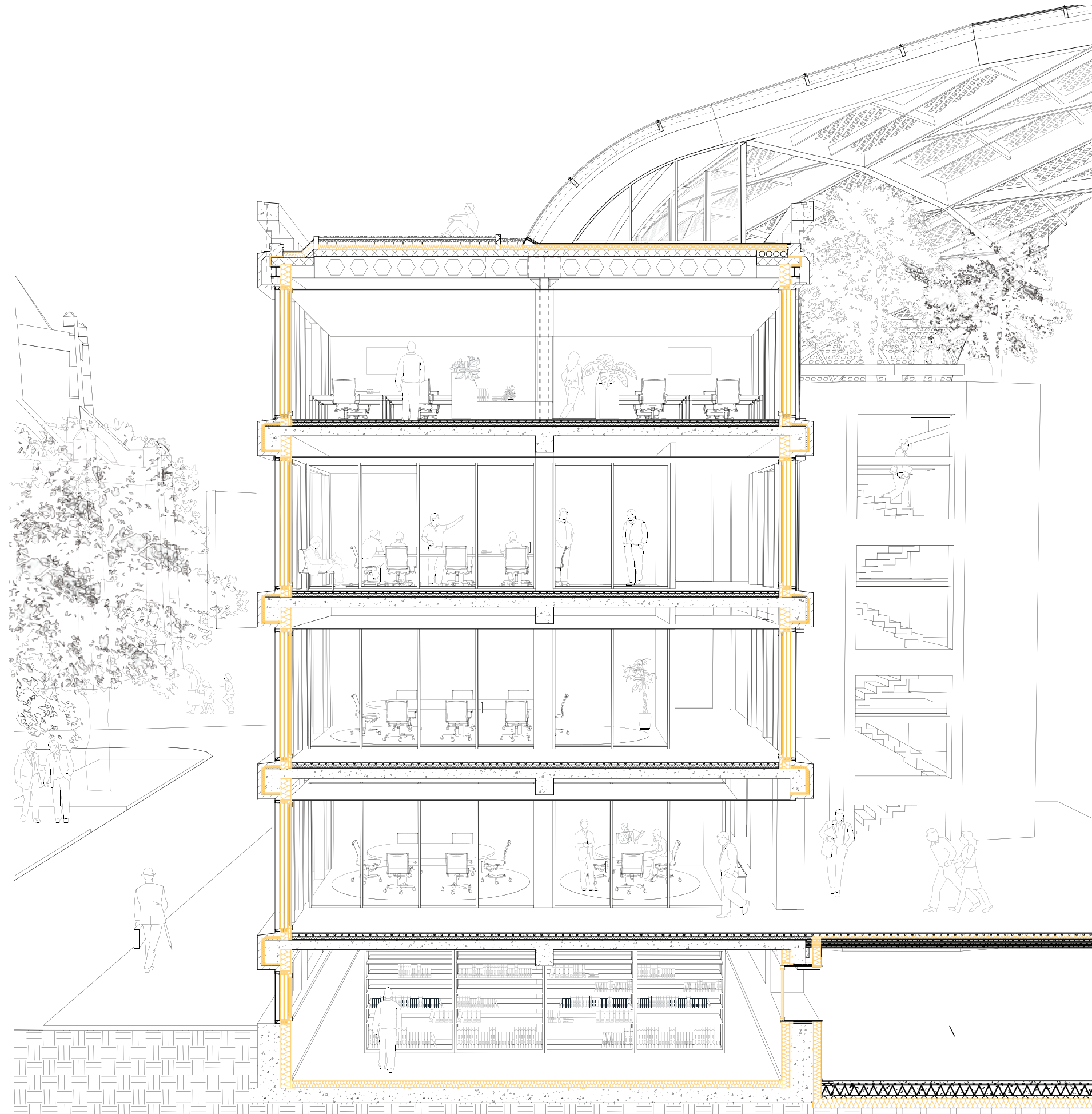
INTEGRATED DESIGN
CLIMATE ZONES





INTEGRATED DESIGN

FACADE RENOVATION



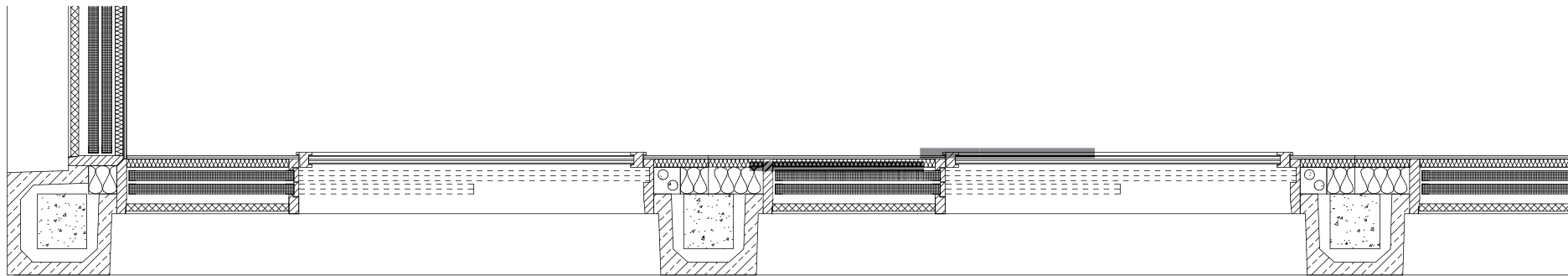
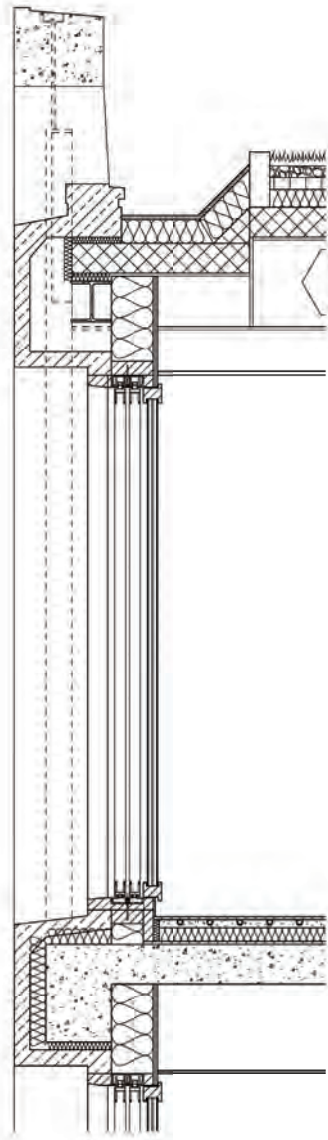


INTEGRATED DESIGN

FACADE RENOVATION

OPEN FACADE
OPTIMIZE DAYLIGHT ENTRANCE
AND VIEW

CLOSED FACADE
MINIMIZE HEAT TRANSFER
PREVENTS GLARE





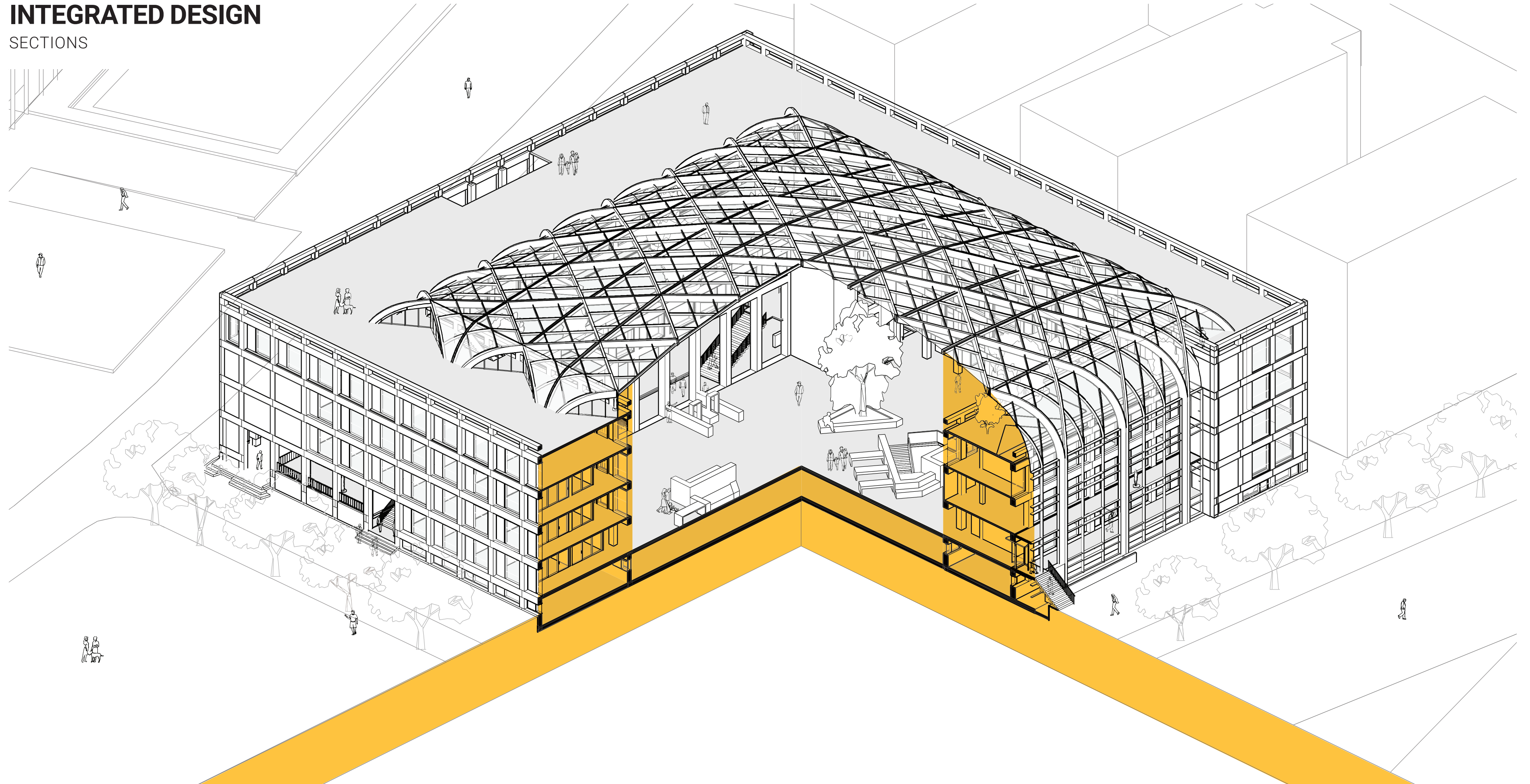
INTEGRATED DESIGN
BALCONY





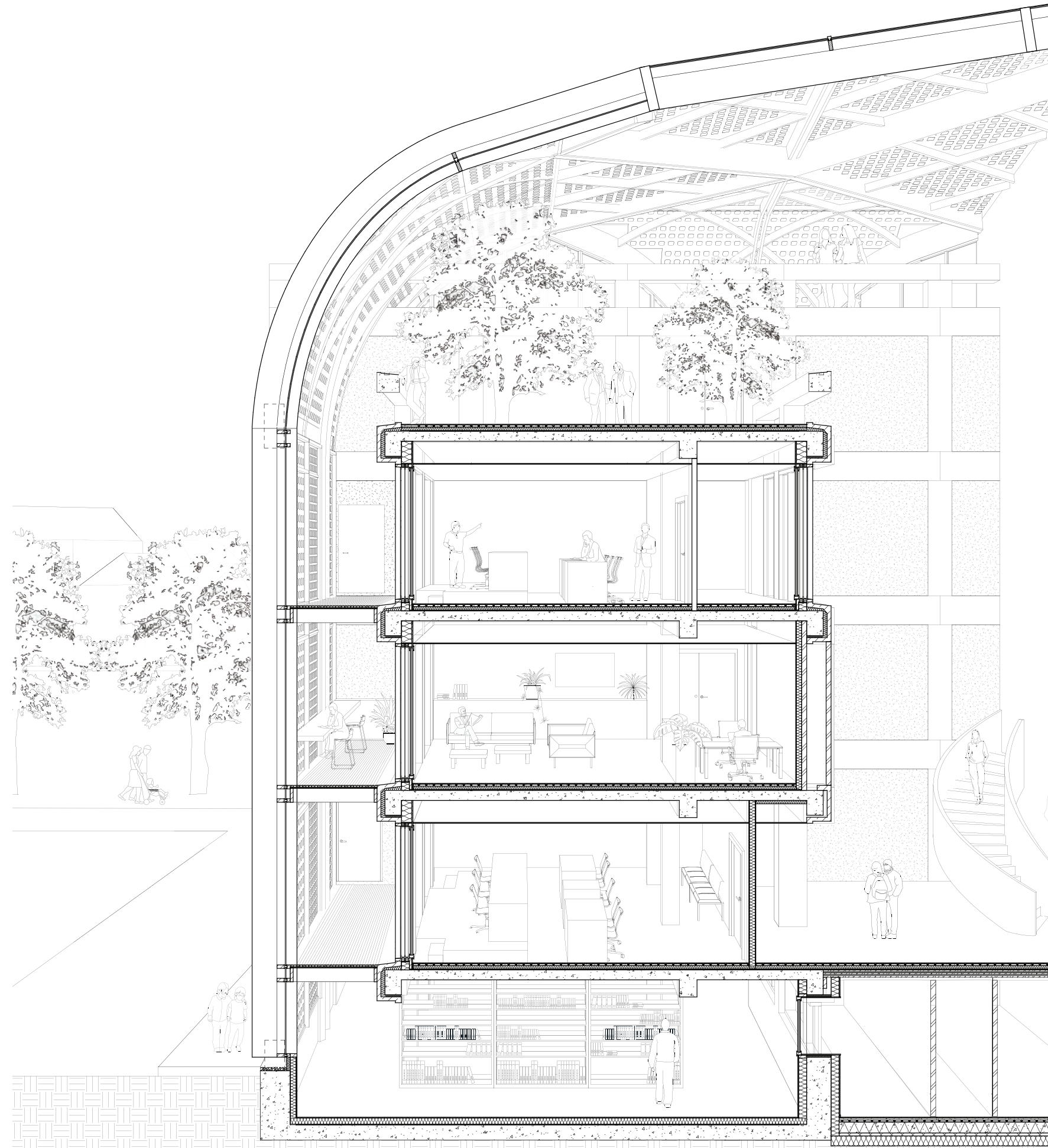
INTEGRATED DESIGN

SECTIONS



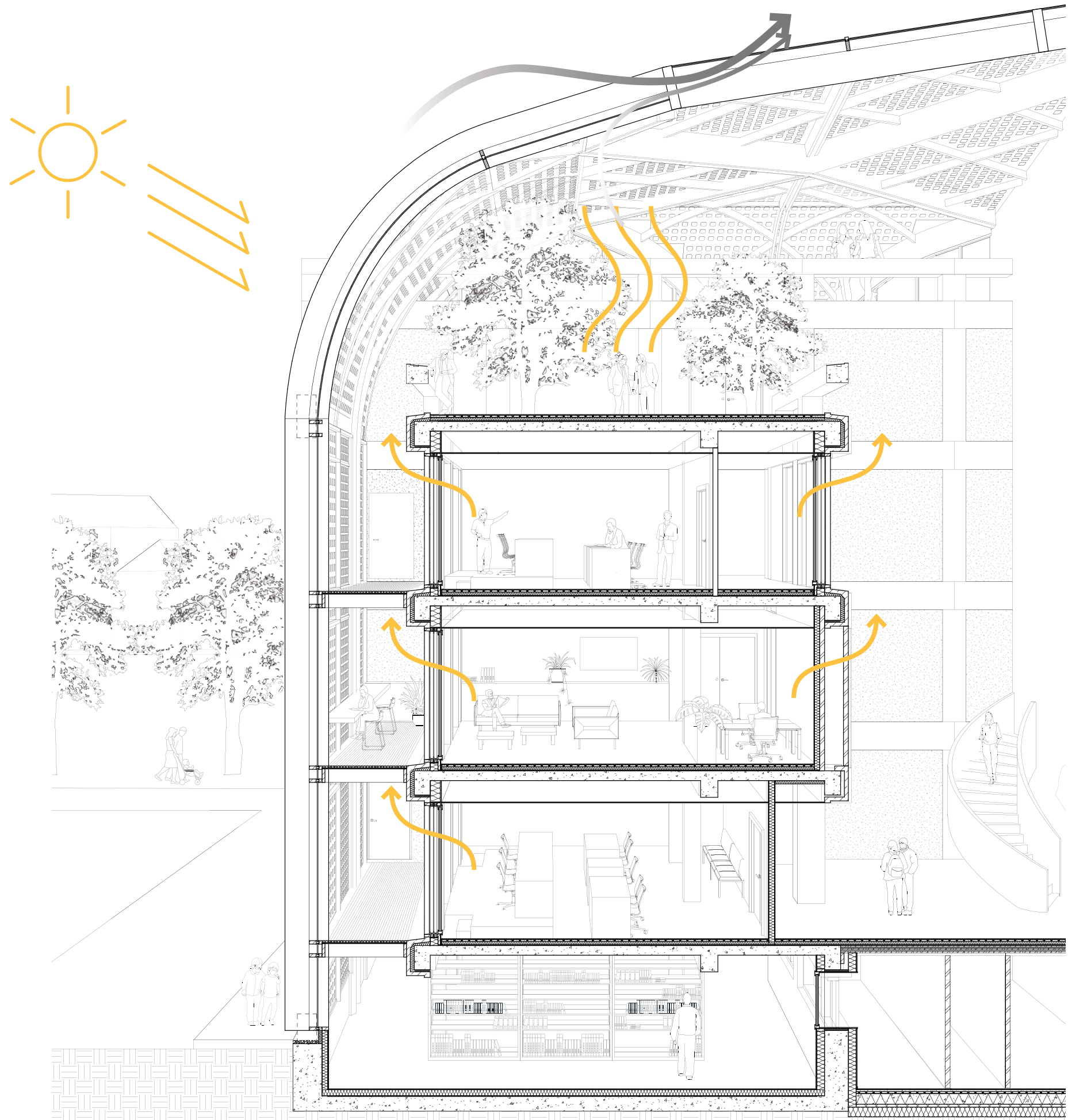
INTEGRATED DESIGN

OVERVIEW SOUTH FACADE



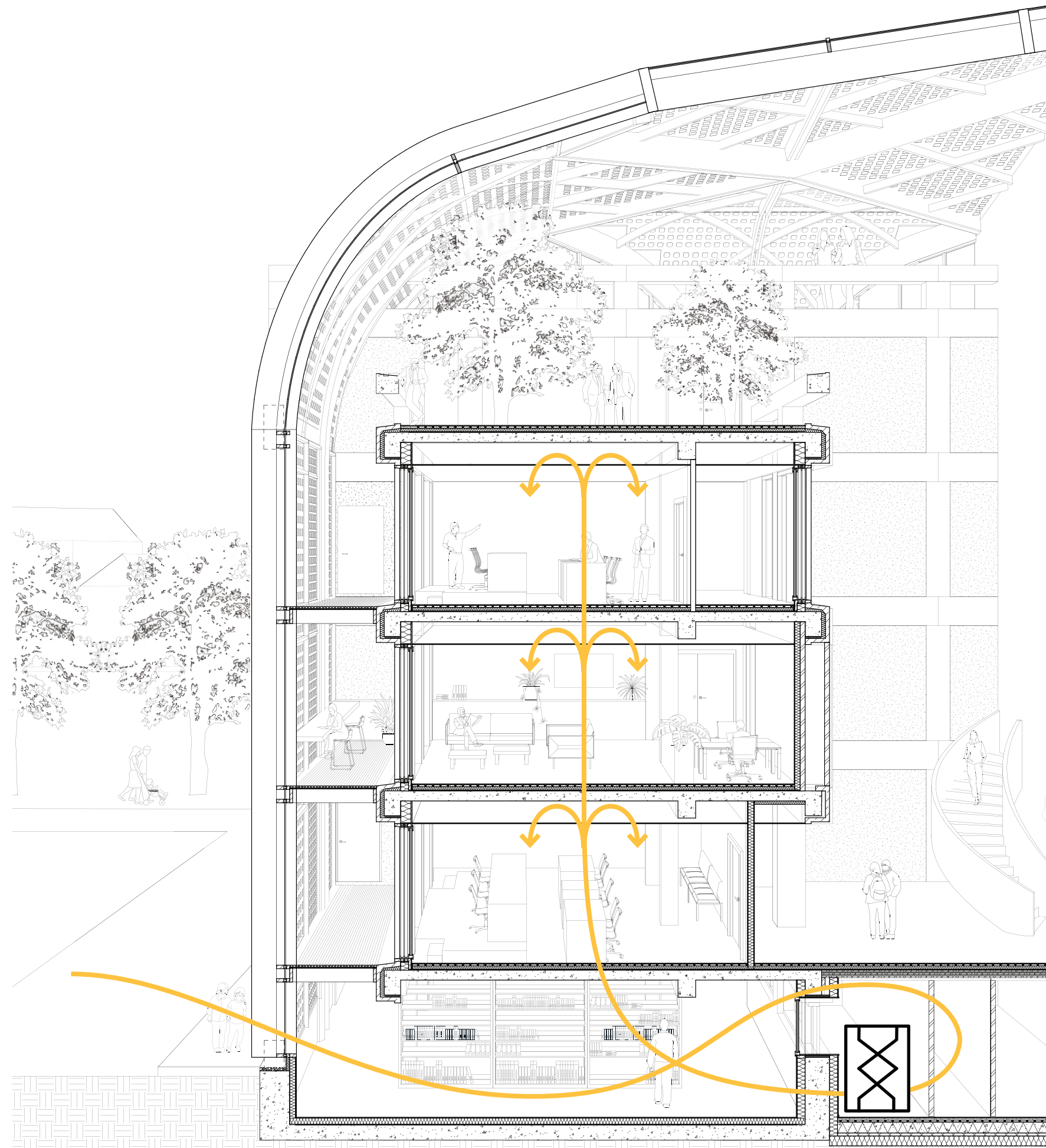


INTEGRATED DESIGN
WINTERGARDEN

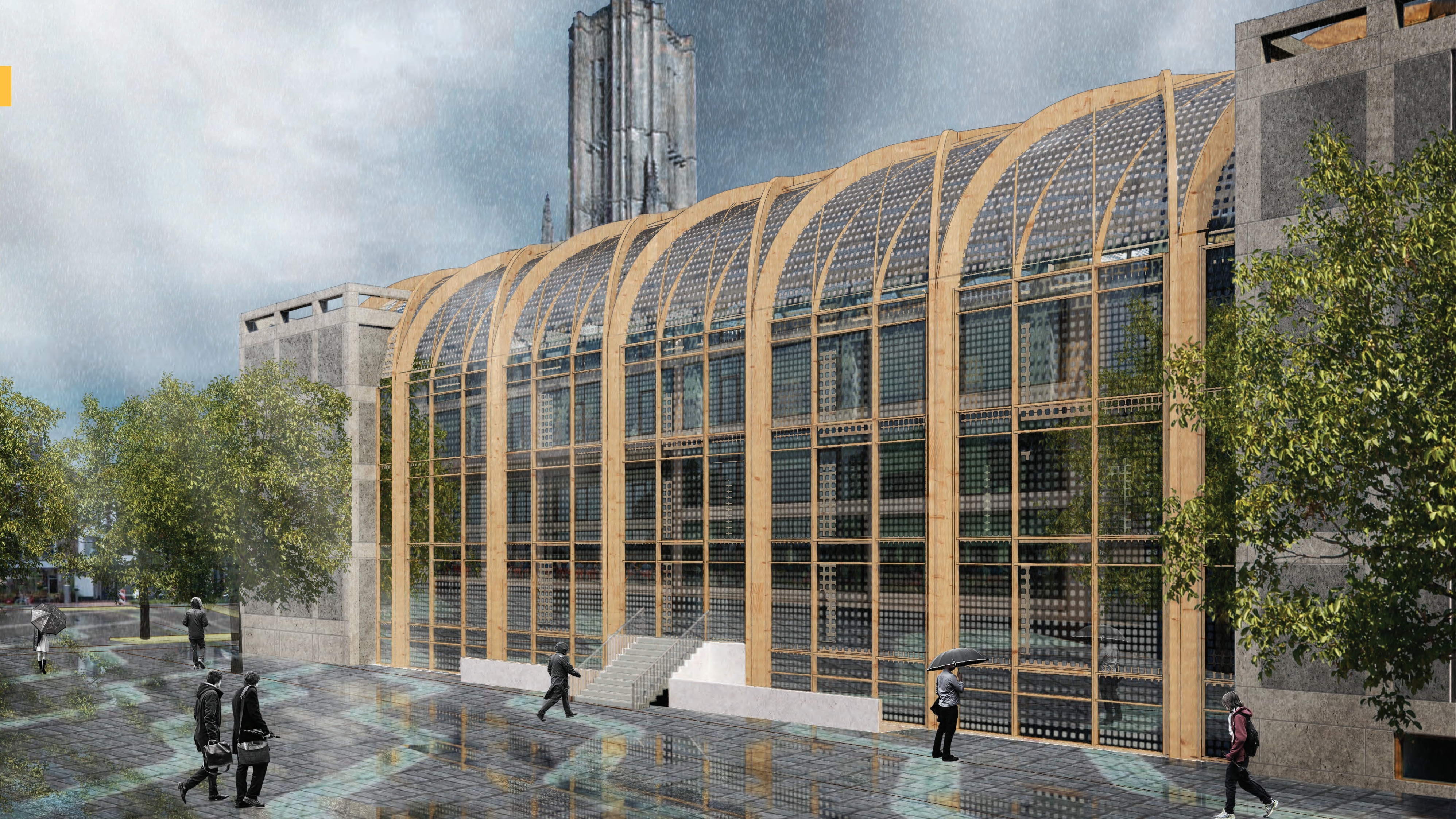


INTEGRATED DESIGN

CLIMATE INTERVENTIONS

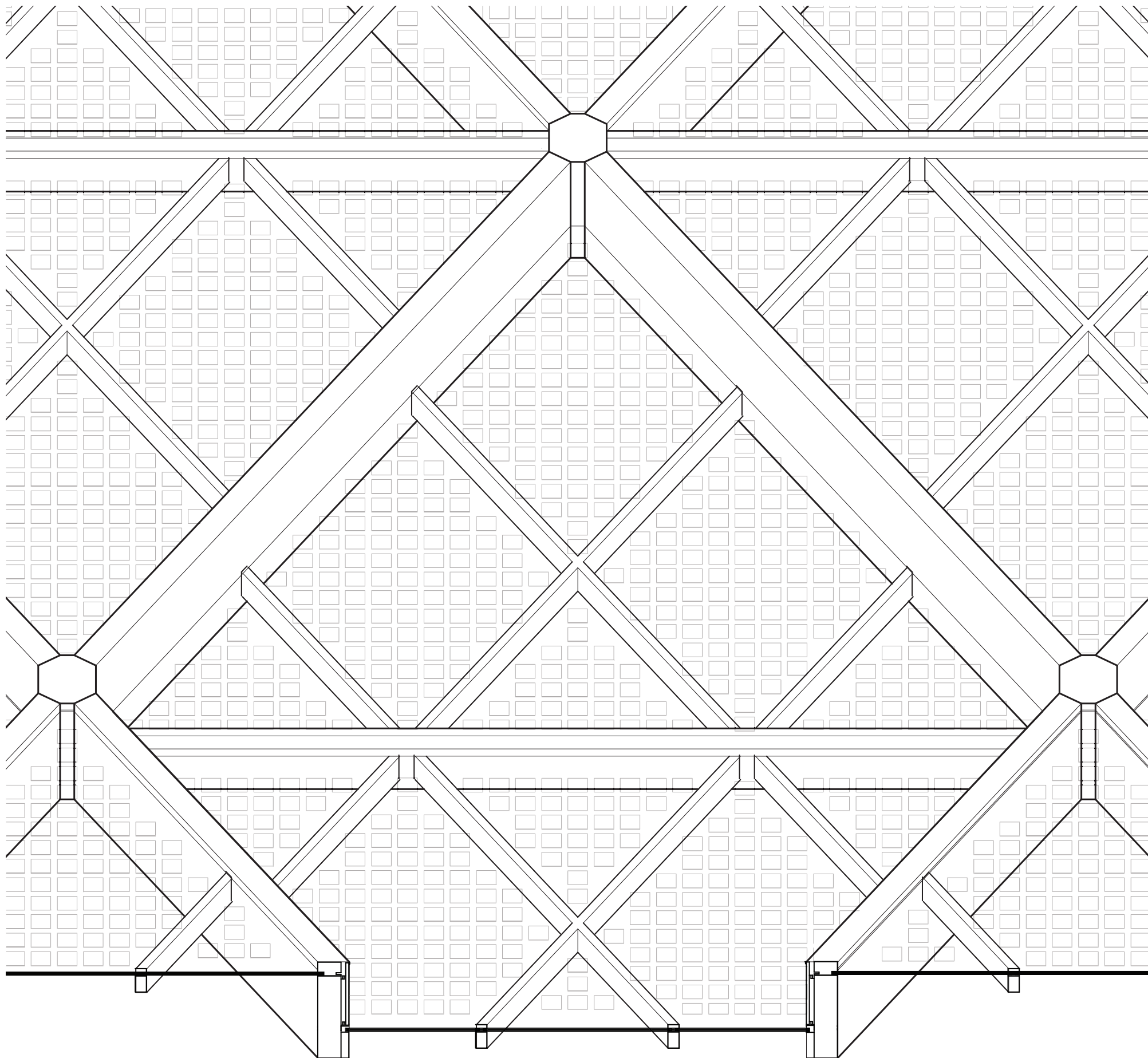






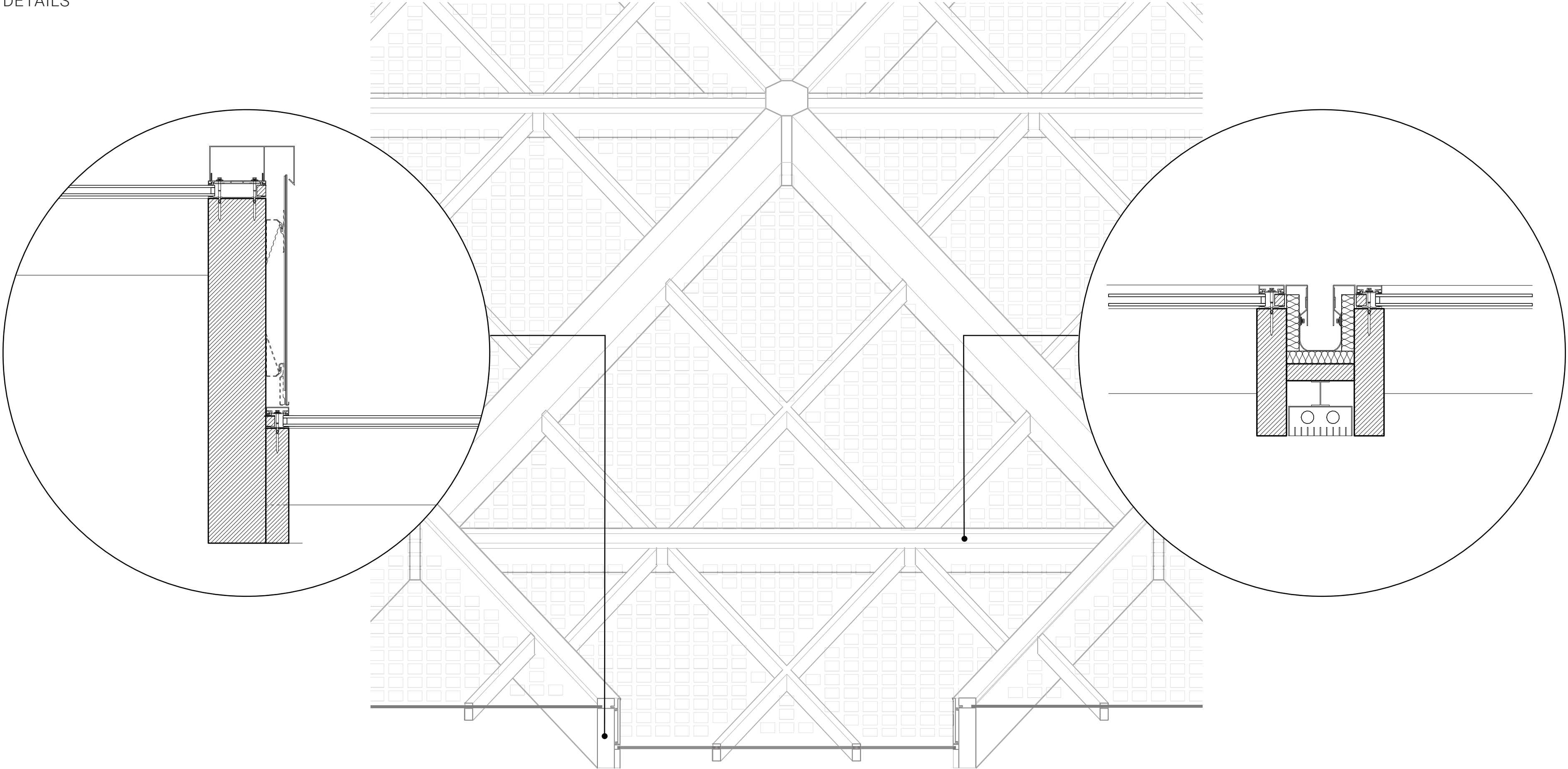
INTEGRATED DESIGN

ROOF



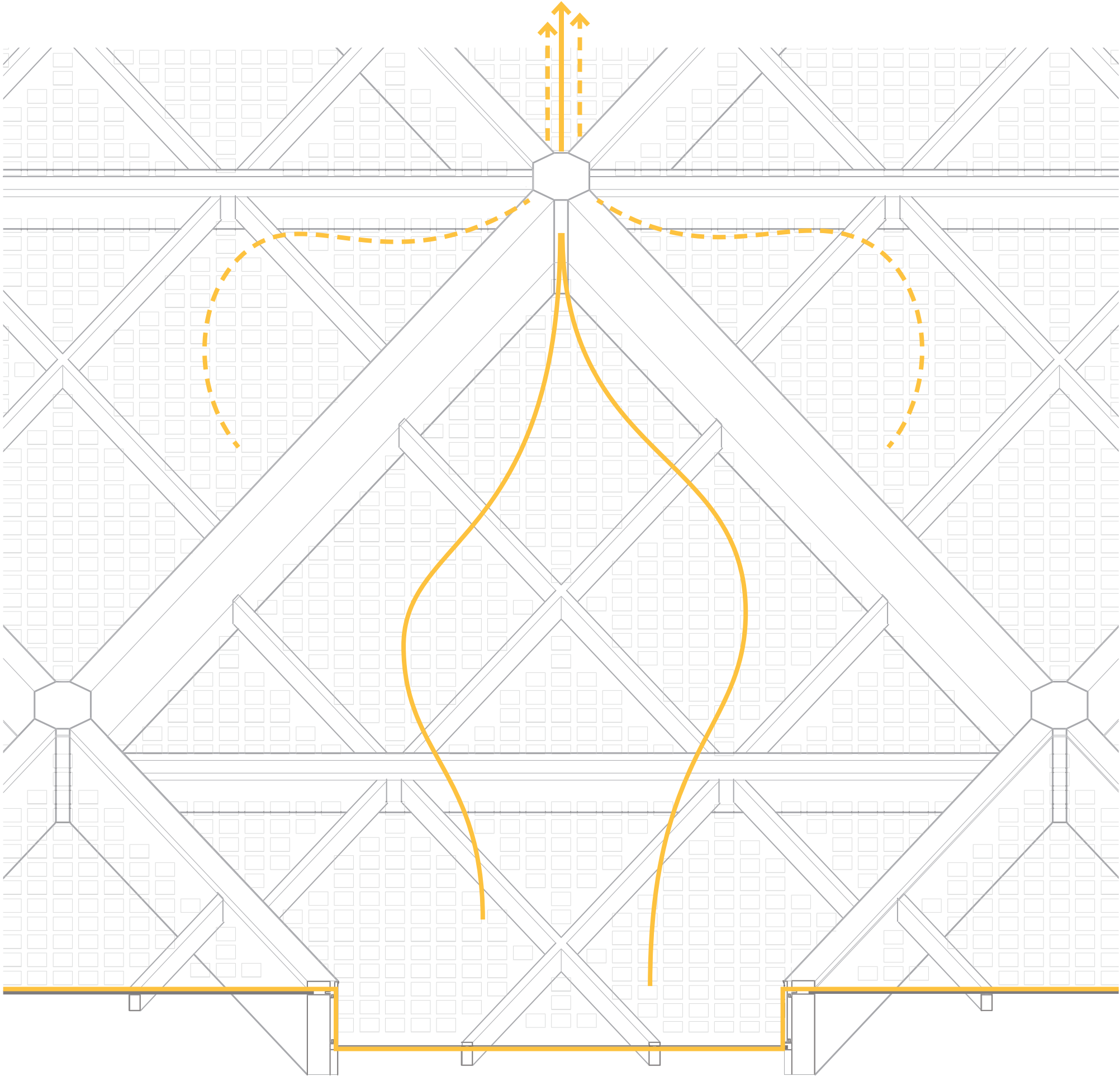
INTEGRATED DESIGN

DETAILS



INTEGRATED DESIGN

ROOF

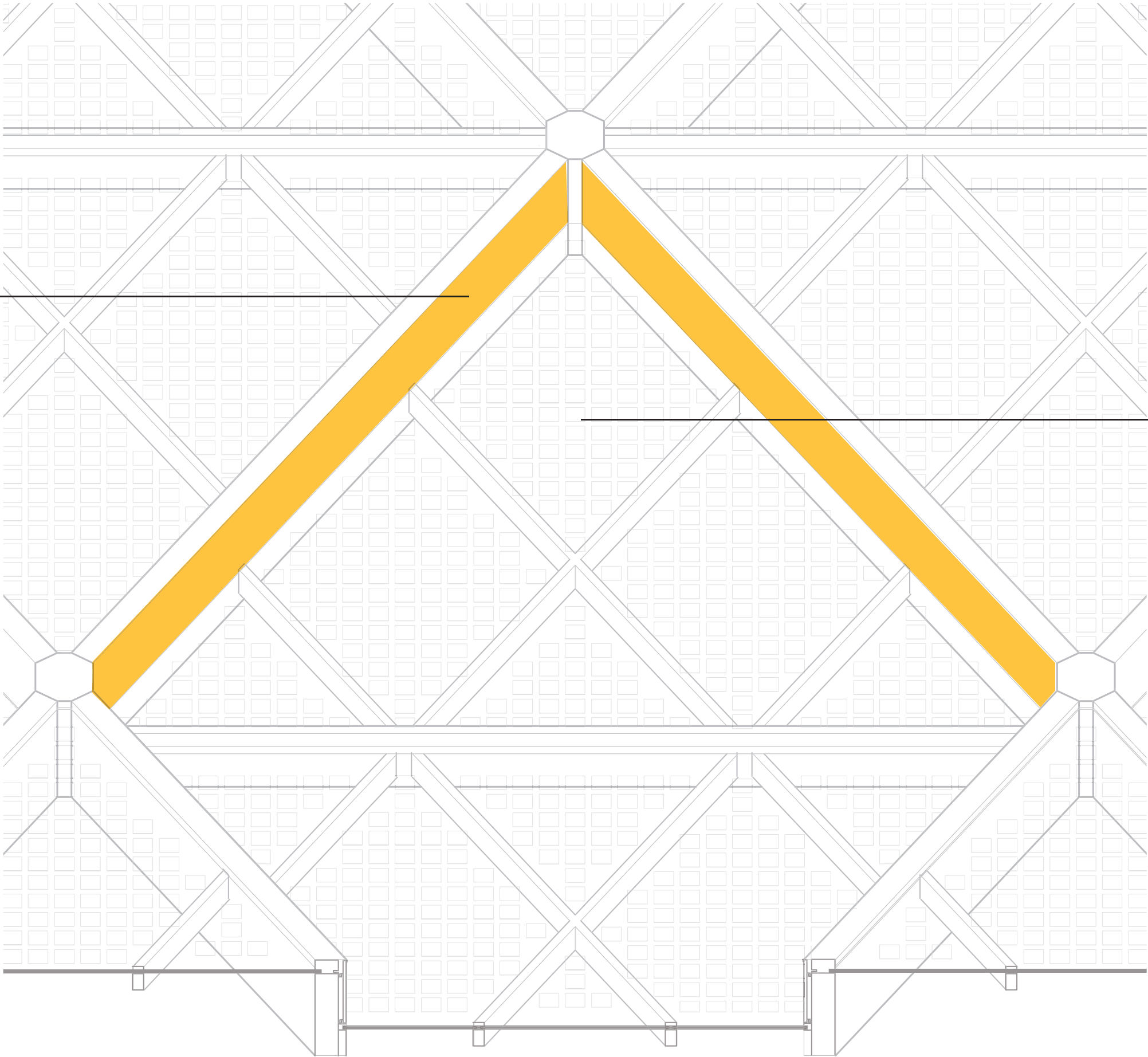


INTEGRATED DESIGN

SOLAR HARVESTING

KROMATIX PV PANEL
600 X 1100 MM (6X)
332 M²
70-80% η

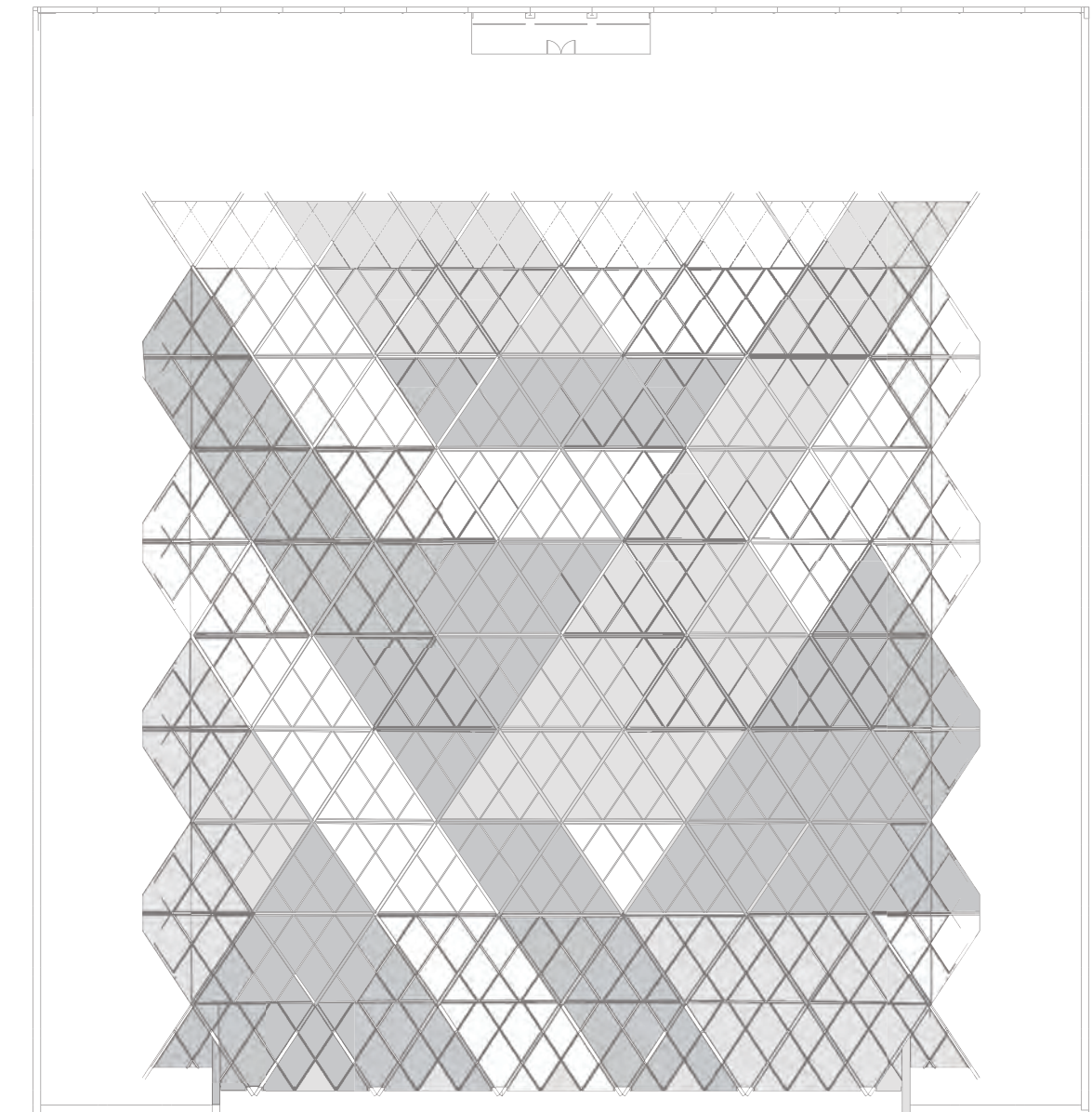
MONOCRYSTALLINE GLAZING
COVERAGE BY ORIENTATION
20 > 60%
TOTAL 2900 M²





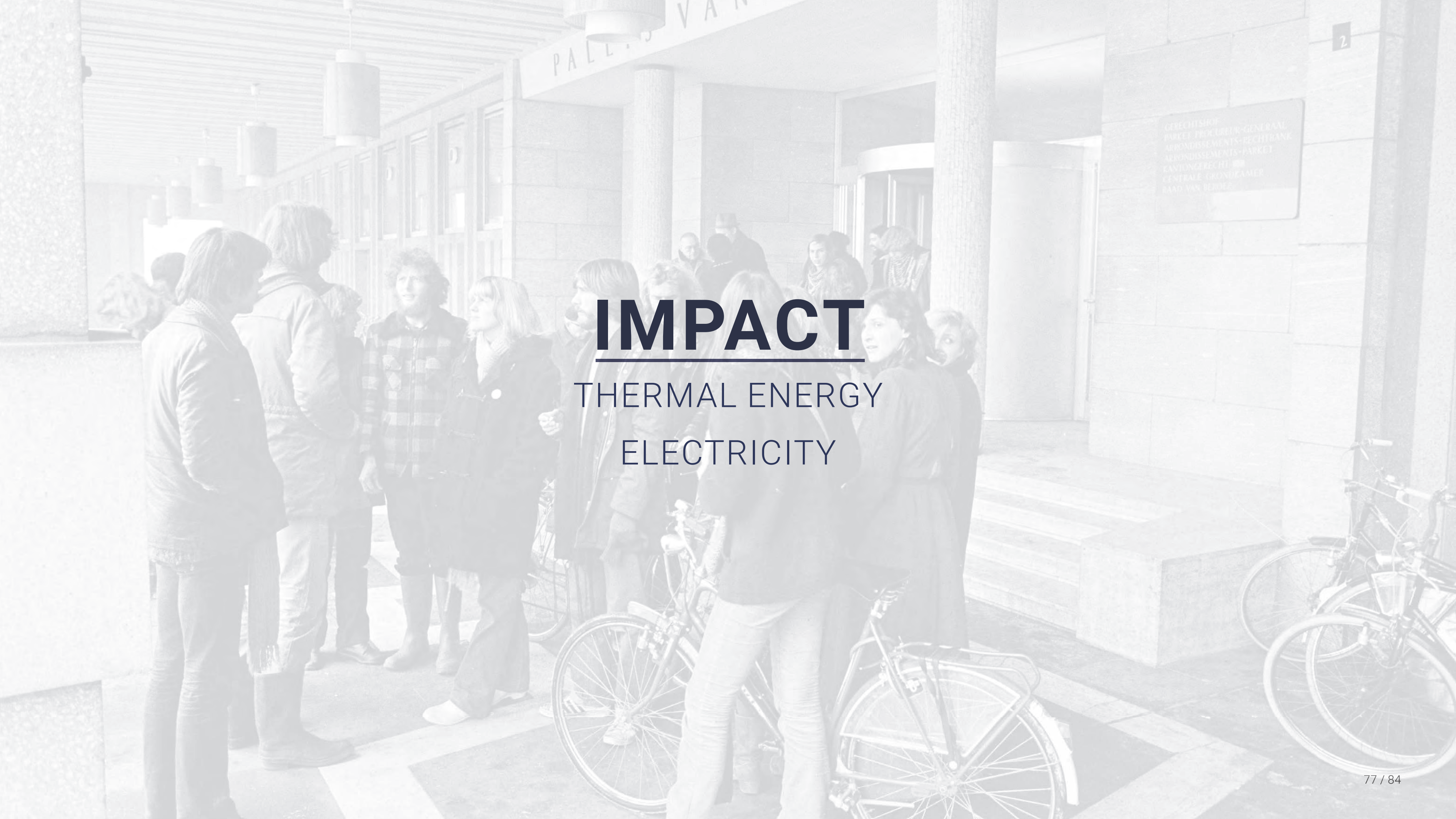
INTEGRATED DESIGN

ROOF



LEGEND

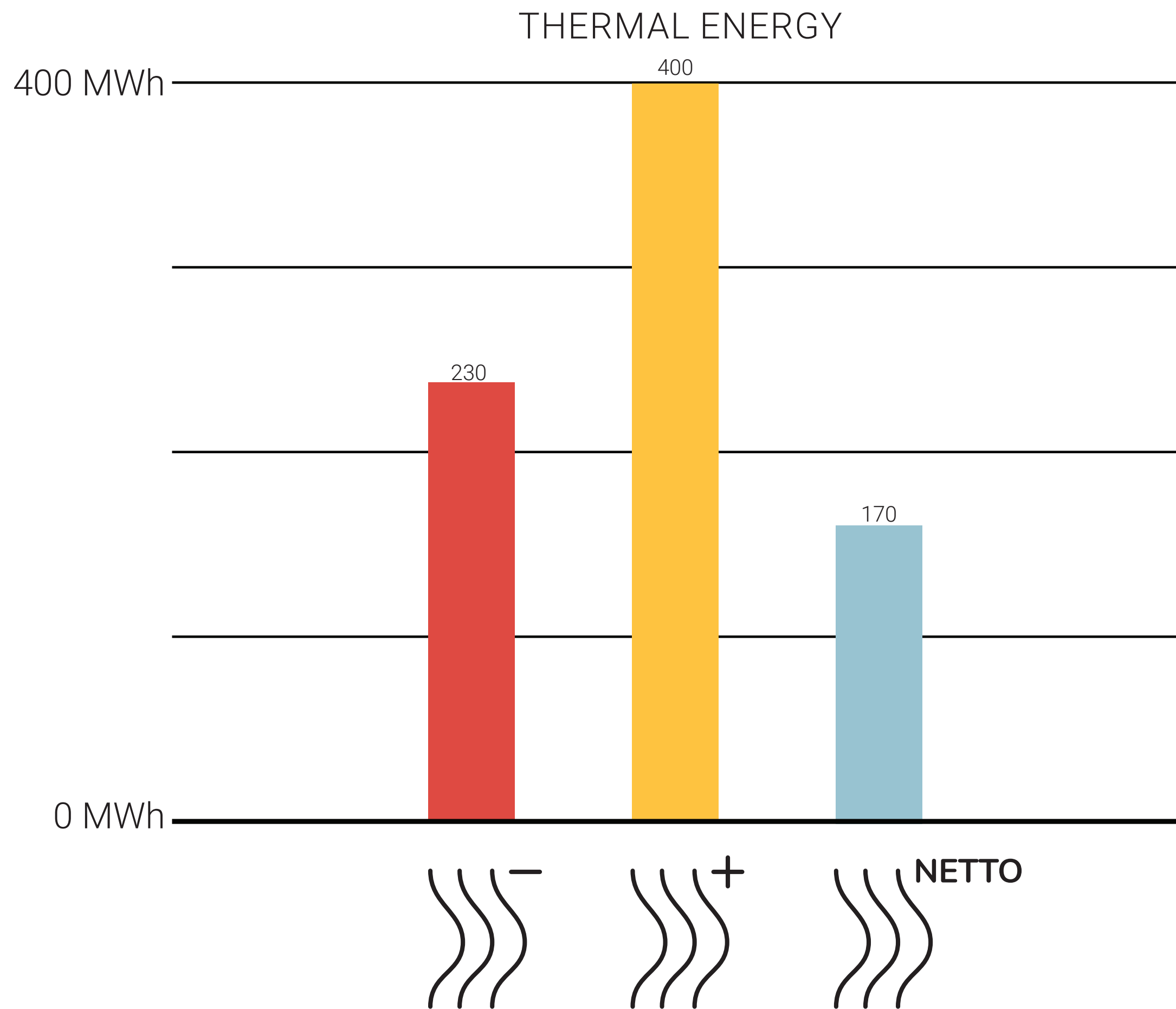
-  Dense
-  Semi-open
-  Open



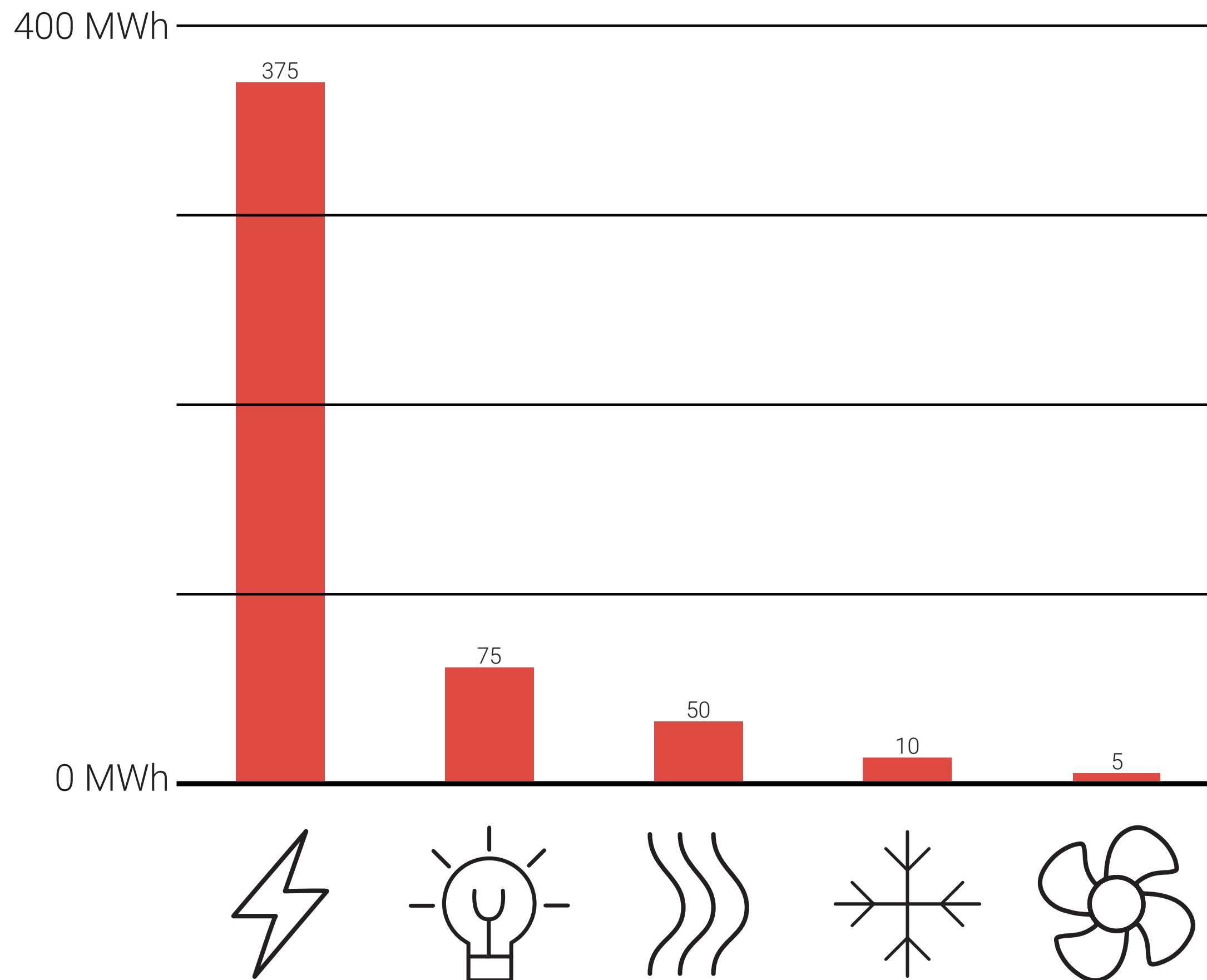
IMPACT

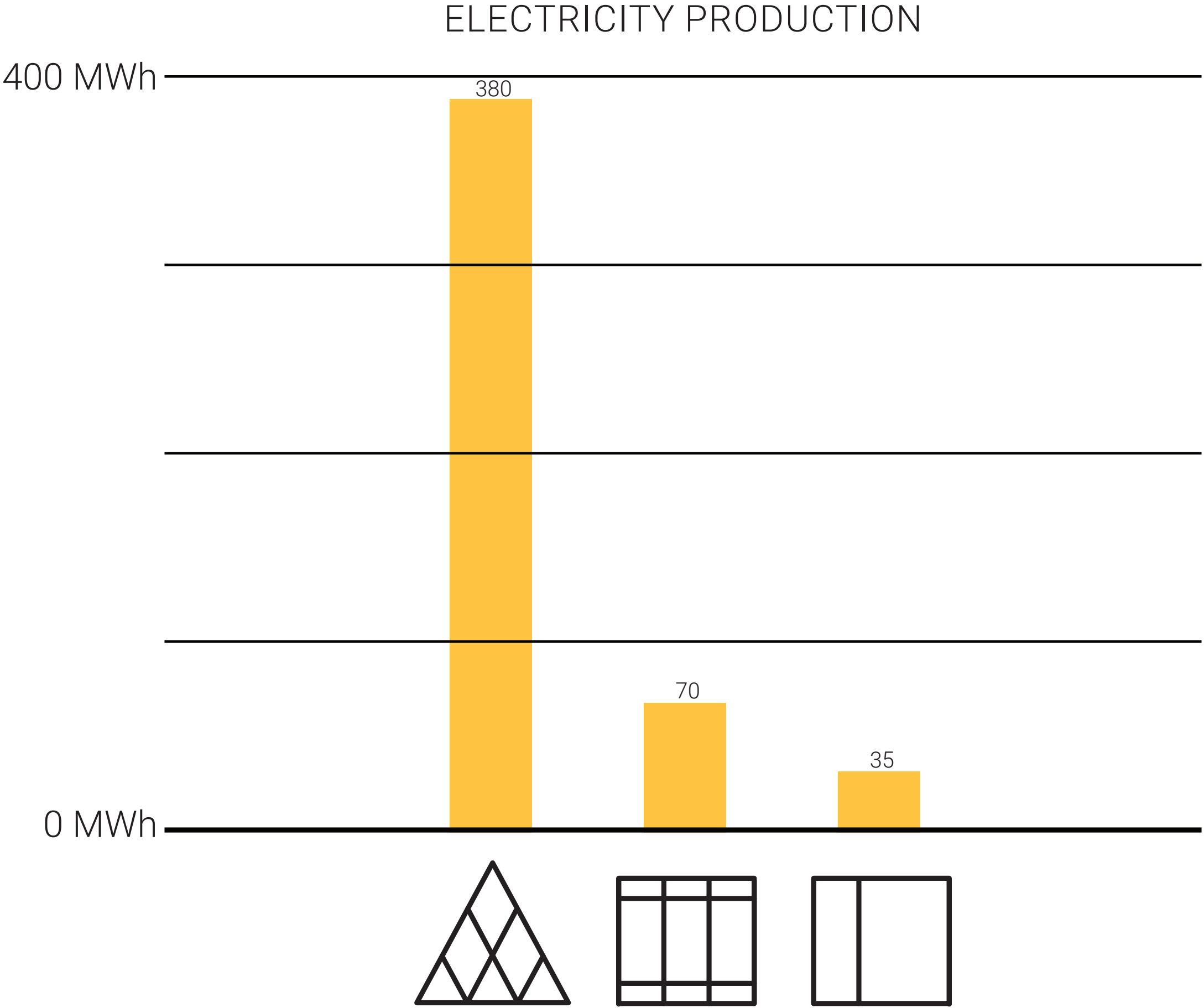
THERMAL ENERGY
ELECTRICITY

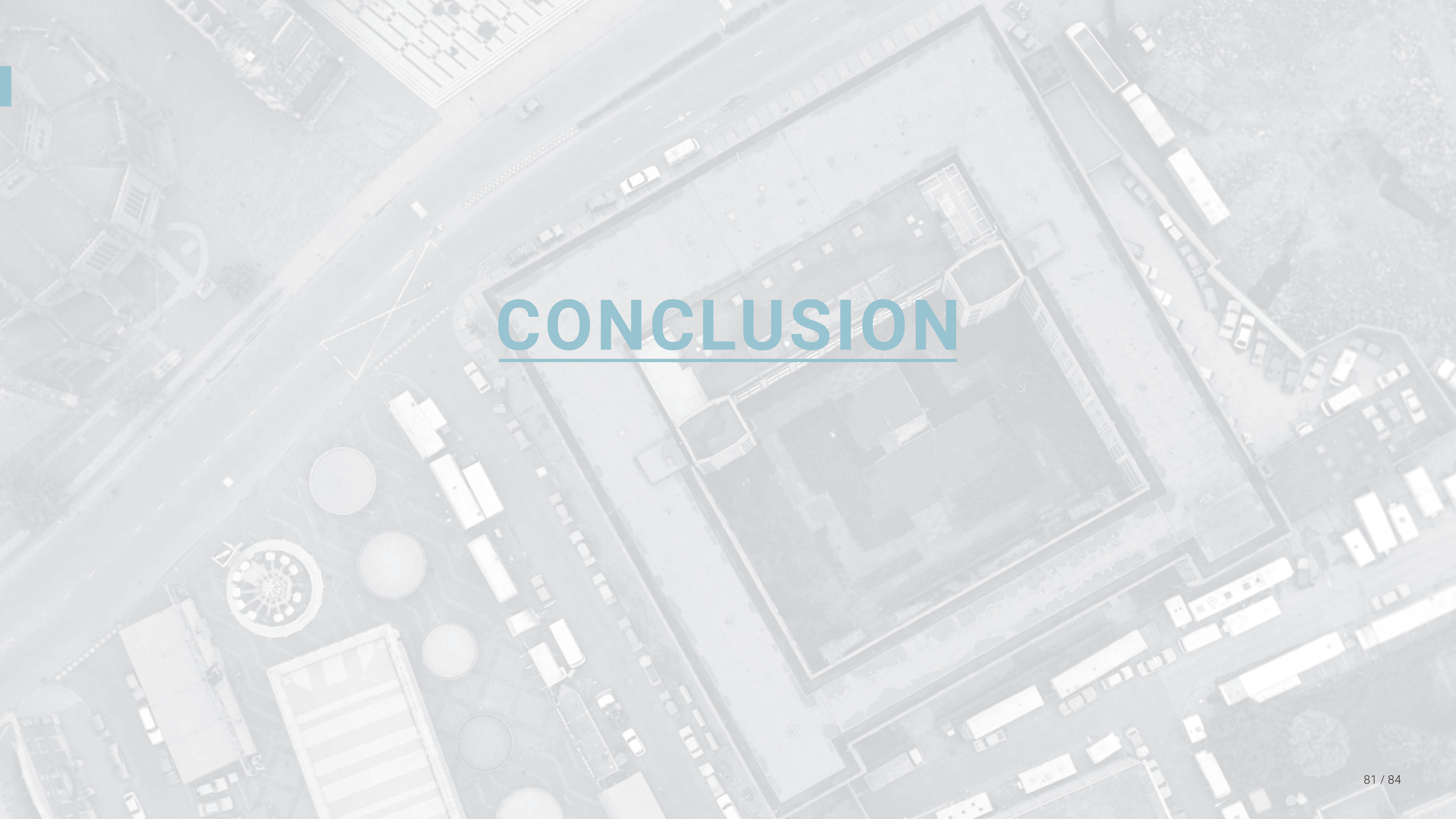
GERECHTSHOF
PARKET PROCUREUR-GENERAAL
ARRONDISSEMENTS-RECHTBANK
KANTONGERECHT
CENTRALE GRONDEAAR
RAAD VAN BEHOEF



ELECTRICITY CONSUMPTION

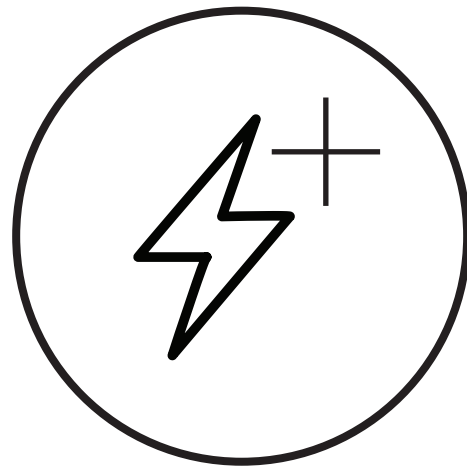




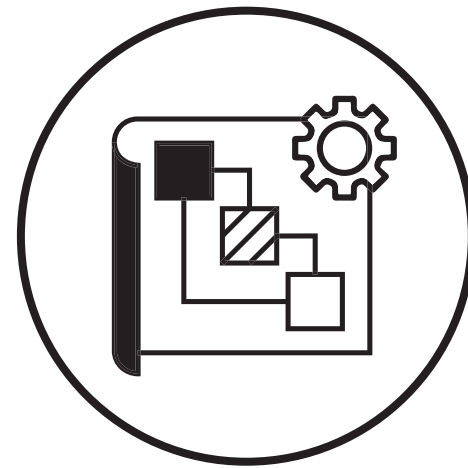
An aerial photograph of an industrial site, likely a refinery or chemical plant. The image shows several large, circular storage tanks in the lower-left quadrant, a large rectangular building with a flat roof in the center, and various pipes, roads, and smaller structures throughout the facility. The overall tone is muted and industrial.

CONCLUSION

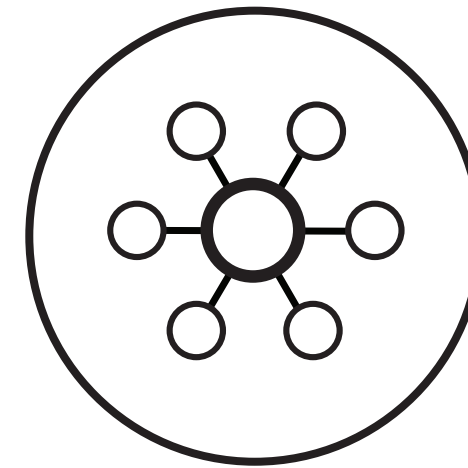
CONCLUSION



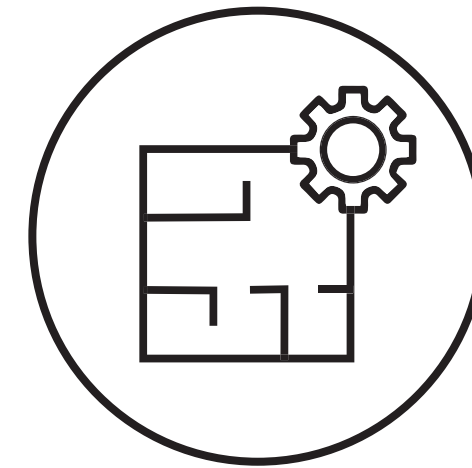
1
NZEB ELECTRICITY
ZEB THERMAL ENERGY



2
IMPLEMENTATION
SMART THERMAL
ENERGY SYSTEMS



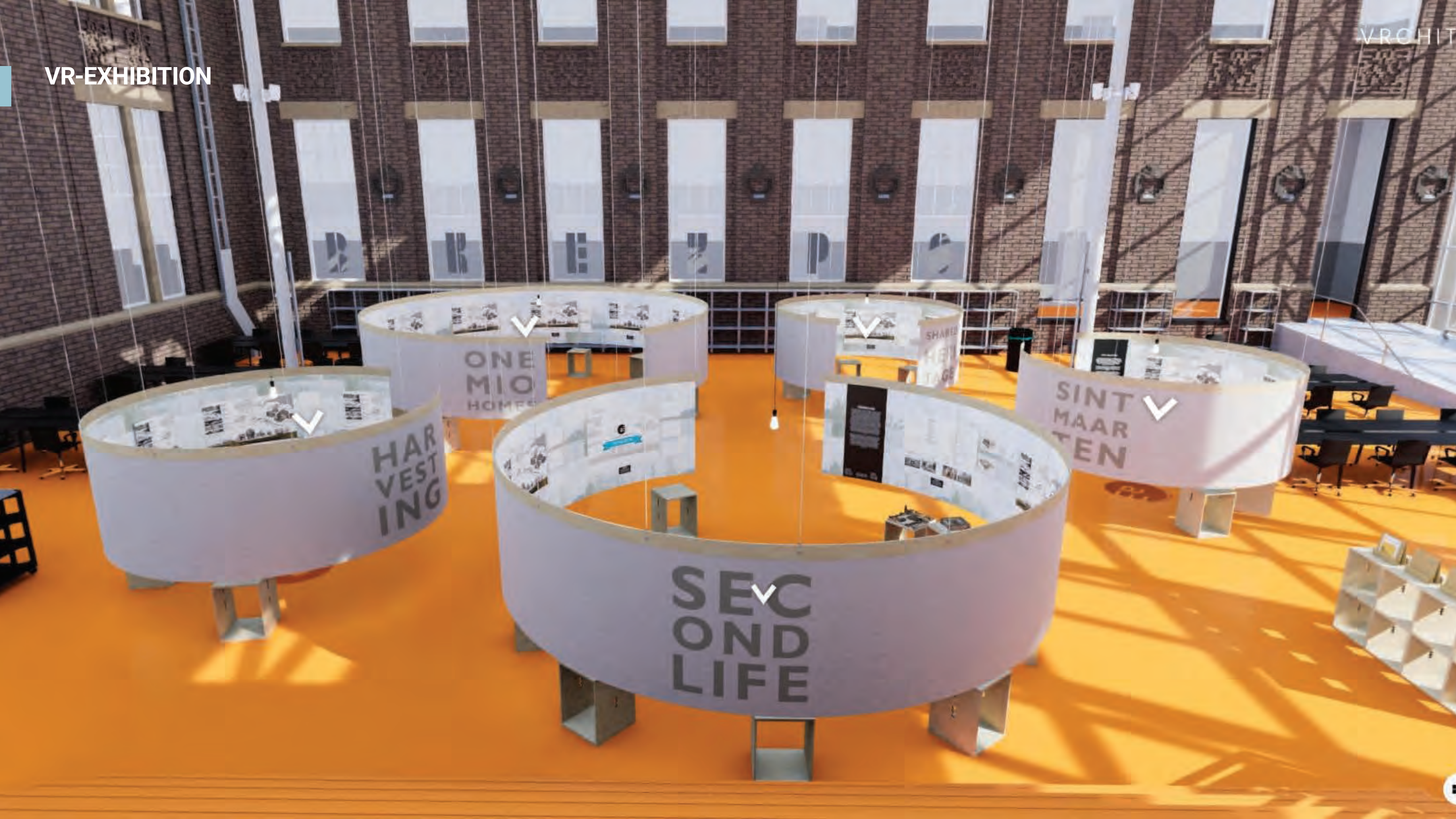
3
ACCESSIBLE
TRANSPARENT
BUILDING



4
PUBLIC FUNCTIONS
RE-PROGRAMMING

VR-EXHIBITION

VRCHIT





THANK YOU

