

P5

Gerjan Agterhuis - 4497309 - 30/06/2021

Architectural design crossovers: City of the future

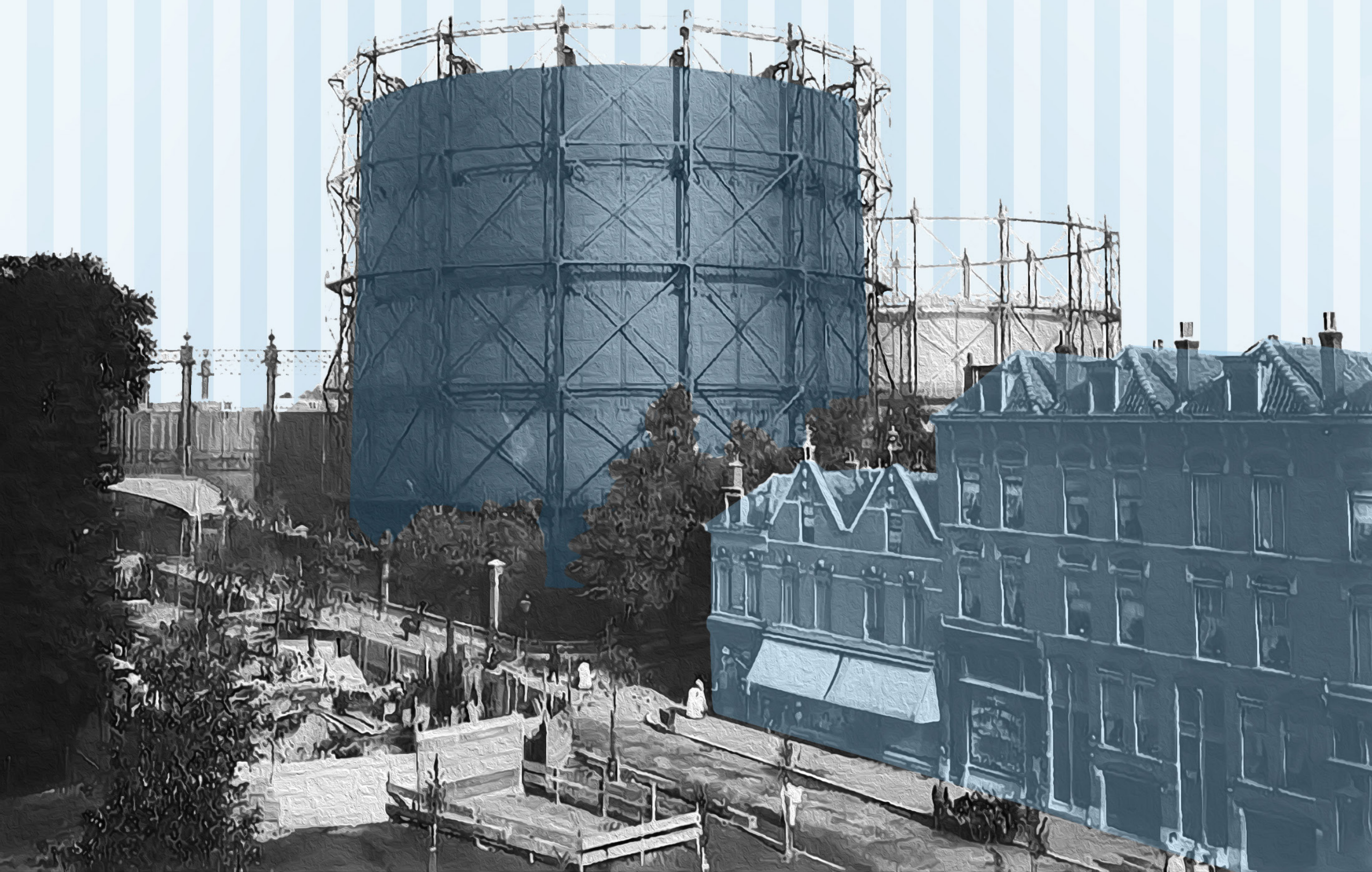


Image 1 - Front page

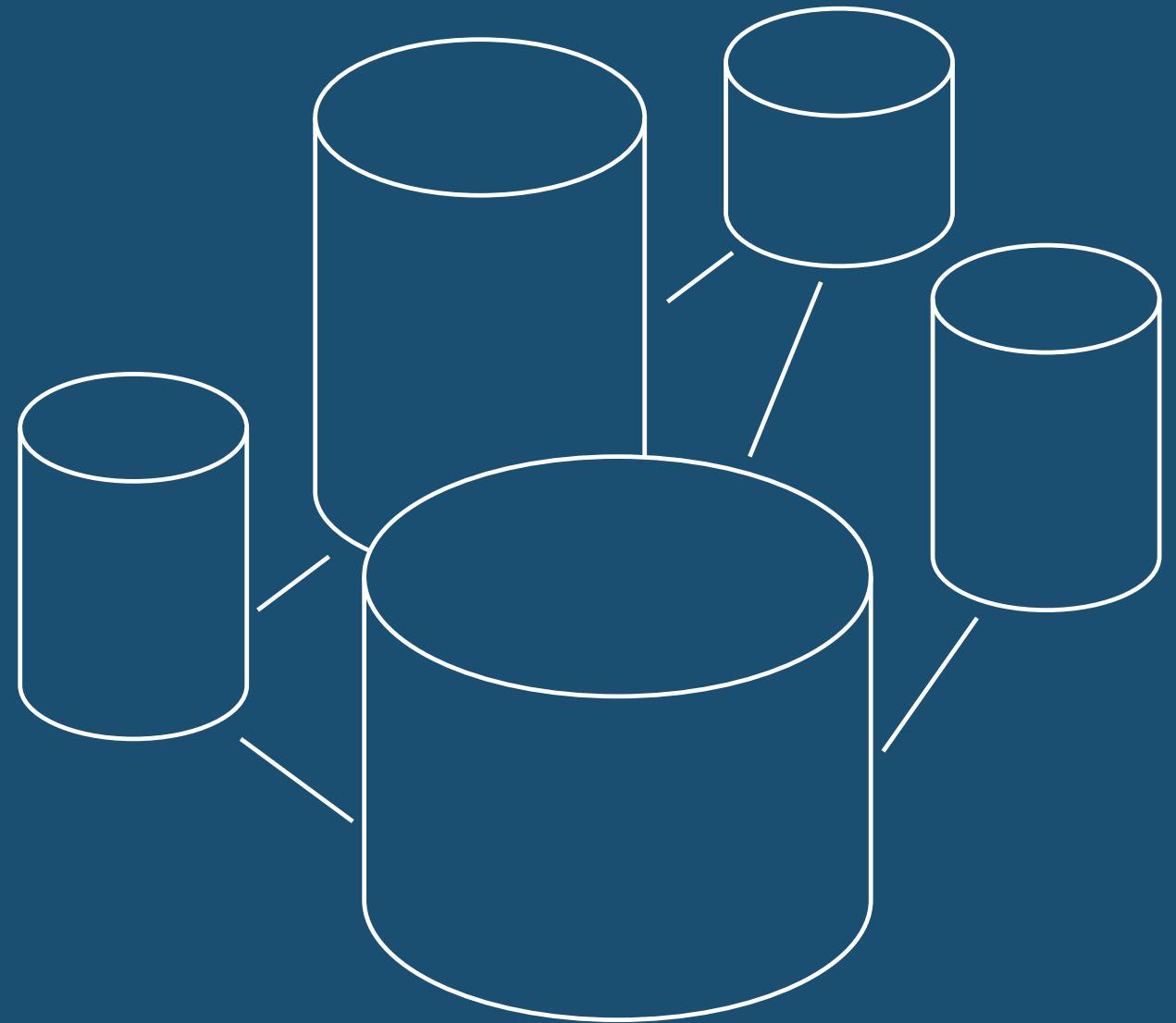
Energy in the city

Photo - edited

[View of the Gas silo on the F.
aan de Lusthofstraat. Taken
from the gas factory on the
Oostzeedijk, 02 October 1908]

- Research
 - Theory
 - Strategy
 - Location analysis
- Design
- Building technology
 - Construction
 - Climate
 - Detail
- Energy system

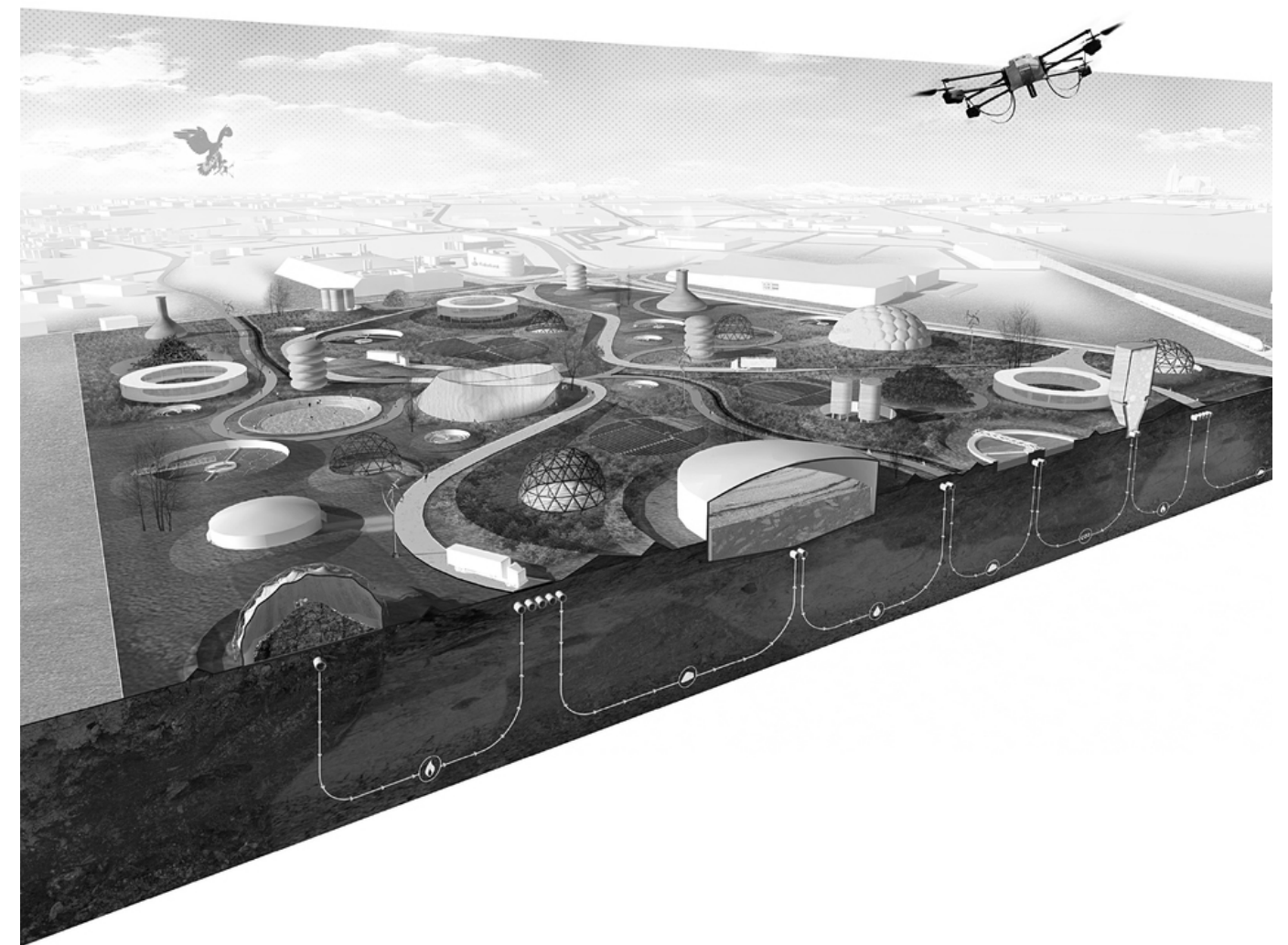
Research



Problem statement

*Image 2: Green tech park concept
(Studio Marco Vermeulen)*

- *“As of 2011, more than 52% of the global population lives in urban areas. In 2006, urban areas accounted for 67–76% of energy use and 71–76% of energy-related CO₂ emissions. By 2050, the urban population is expected to increase to 5.6–7.1 billion, or 64–69% of world population” (IPCC)*
- *“The sheer quantity of renewable energy that needs to be generated to sustain humanity may require us to regard, at least conceptually, every landscape as an energy landscape” (Stermke, S., & van den Dobbelsteen, A., 2012)*
- Paris 2050



- The Netherlands as one of the worst performing countries in the EU
- Complexity of population density

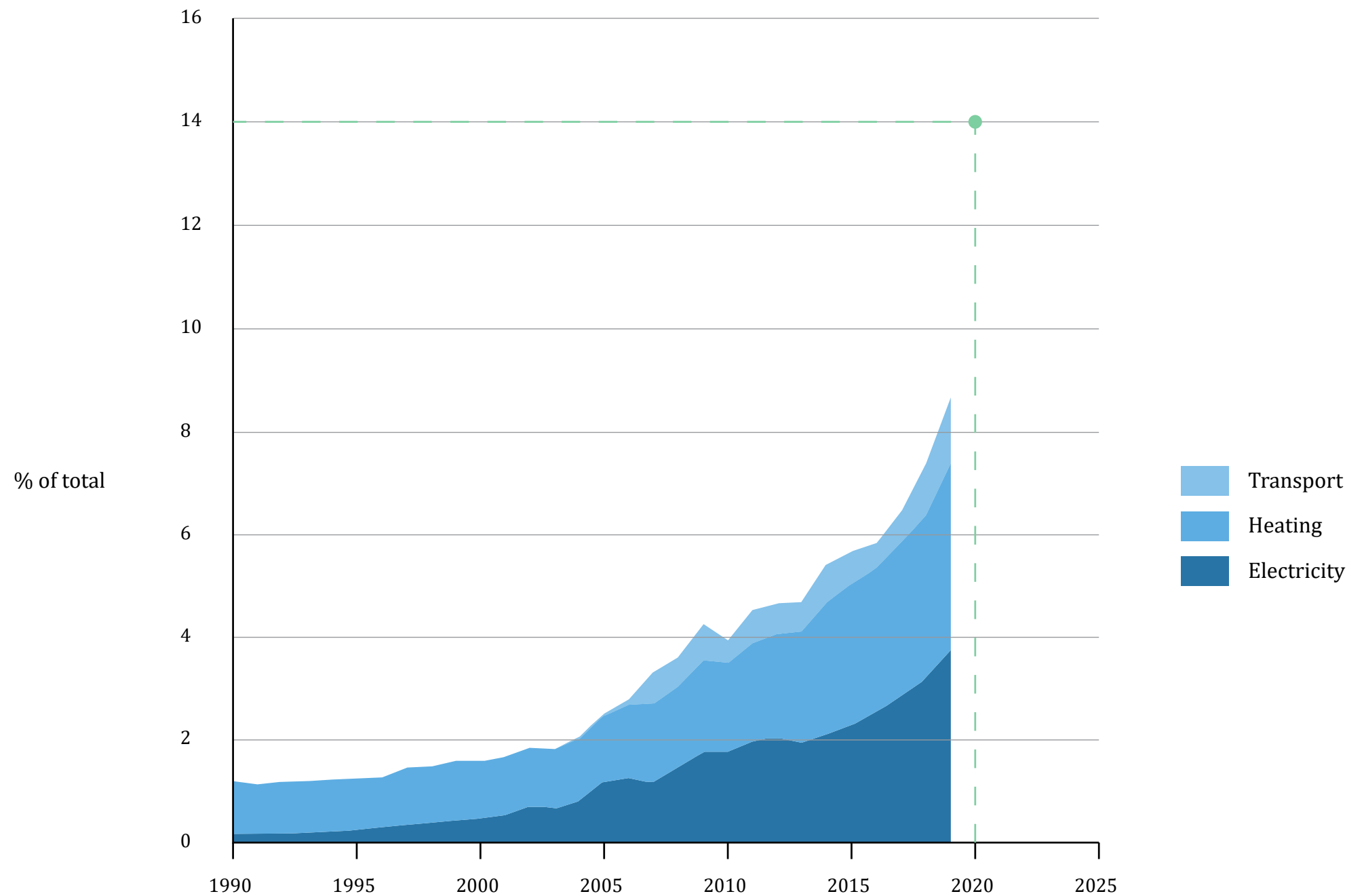
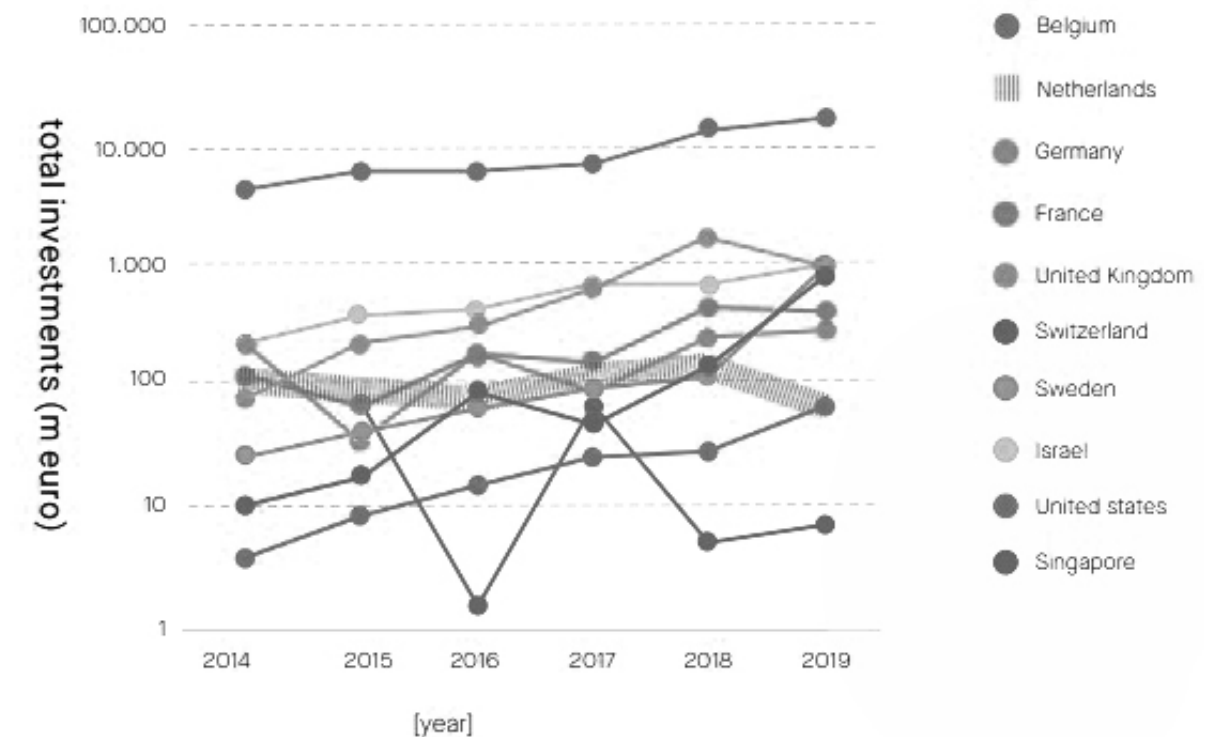


Image 4: Total investment in start-ups in energy sector









- Growing desire to fulfil the energy demand with renewable energy
- Grid relies on centralized energy systems
- Rising cost of energy
- Net-positive architecture > Urban self-sustainability
- Maturing renewable energy production technologies
- Clean energy production earmarked as one of the promising economic fields for the recovering economy in a post-Covid economy by European Commission

Investments per year in energy sector










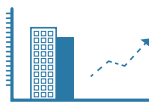
*How can sustainable energy systems
be integrated in urban areas through
spatial planning and design?*

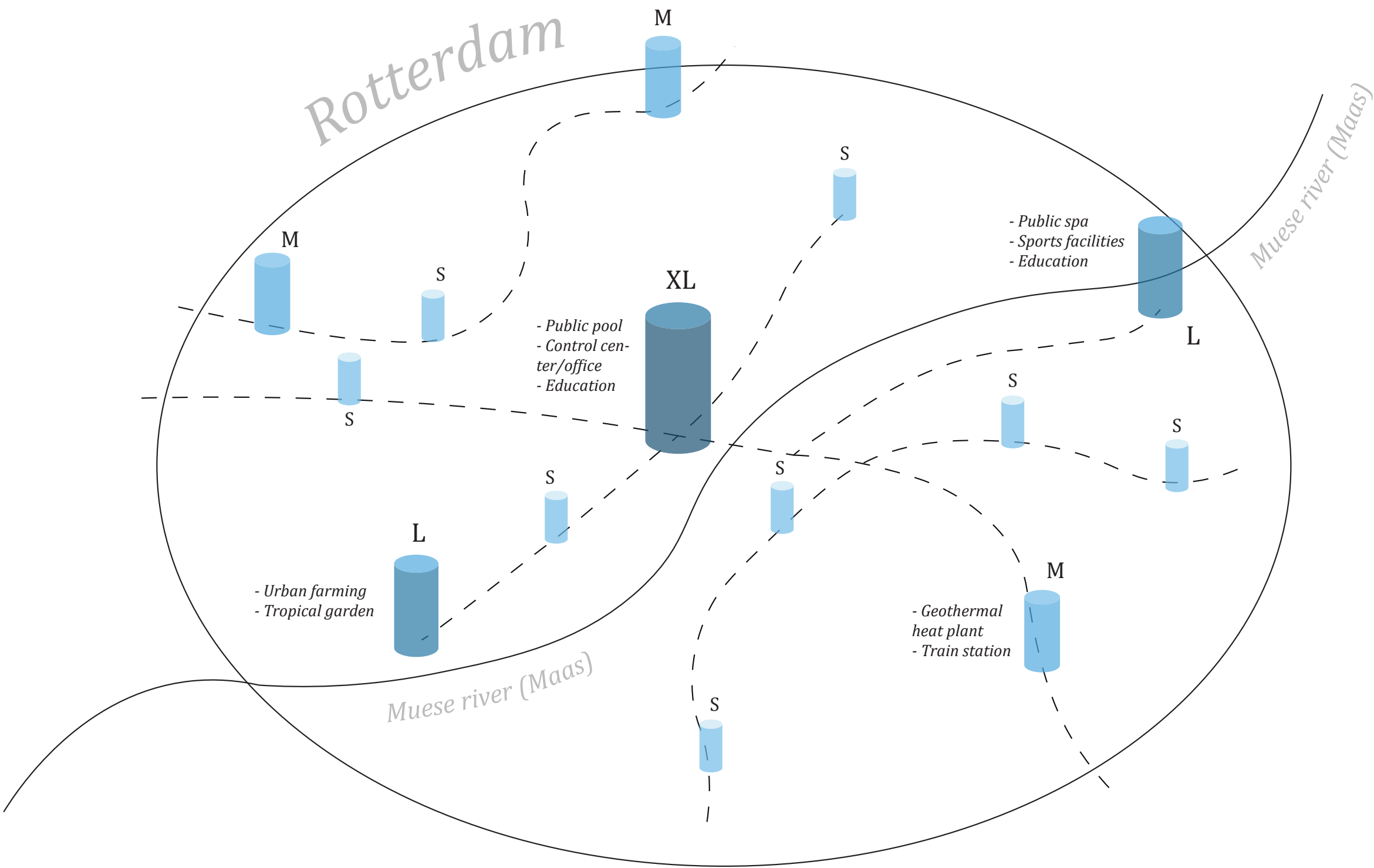
Image 5: Position paper conclusions

Public life

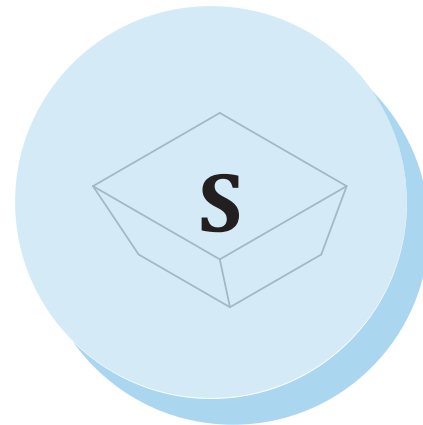
	Cultural develop-ments/change	(Vezzoli et al., 2018)
	Alteration in daily routines / processes	(Vezzoli et al., 2018)
	Education	(Miller et al., 2013; Vezzoli et al., 2018)
	Economic structures (which prefer green energy)	(Miller et al., 2013; Vezzoli et al., 2018)
	Innovation	(Miller et al., 2013)
	Regulatory institutions	(Miller et al., 2013; Feldpausch-Parker et al., 2019)
	Public debate / Publicness around energy systems	(Fahy, 2020)
	Overcoming psycholo-gical boundaries	(Scheer, 2005; Hoffman & Henn, 2008)

Urban design

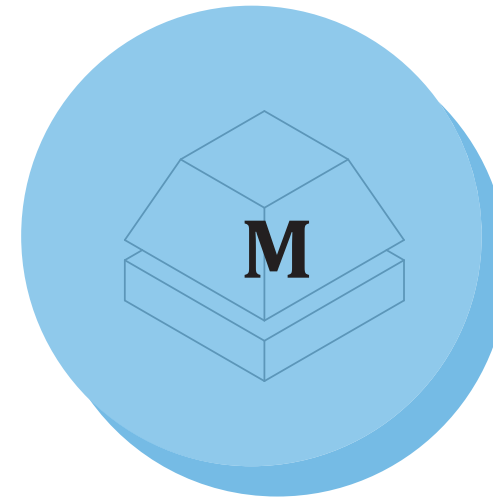
	Building envelop performance	(Zanon & Verones, 2013)
	Urban morphology	(Zanon & Verones, 2013; Vandevyvere & Stremke, 2012)
	Compactness	(Zanon & Verones, 2013)
	Orientation	(Vandevyvere & Stremke, 2012)
	Exchange of heat between functions	(Vandevyvere & Stremke, 2012)
	Integration of decen-tralized plants for district heating	(Vandevyvere & Stremke, 2012)
	Application of geother-mal/deep soil heat in larger building blocks	(Vandevyvere & Stremke, 2012)
	Mix of functions	(Stremke & Van den Dobbelsteen, 2012)
	Integration with urban functions (as city branding strategy)	(Sijmons et al., 2014)
	Area development	(Daamen & Van der Linden, 2020)



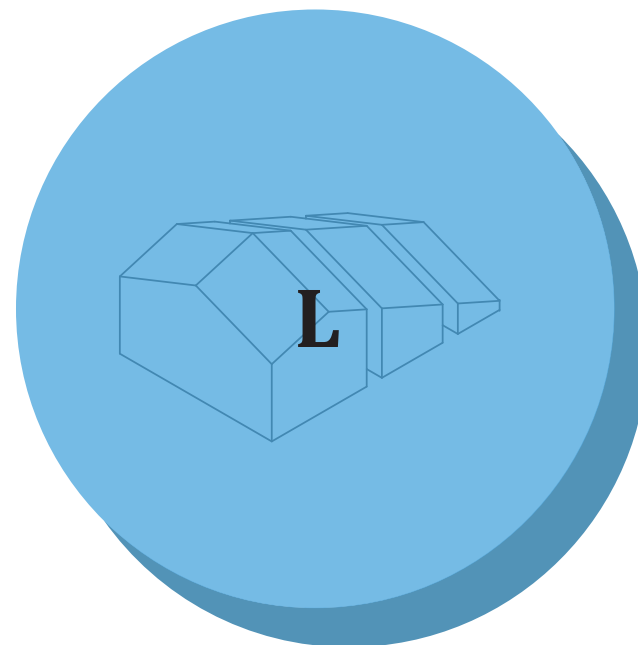
- Focus on envelop design
- Integration through morphological adaptation



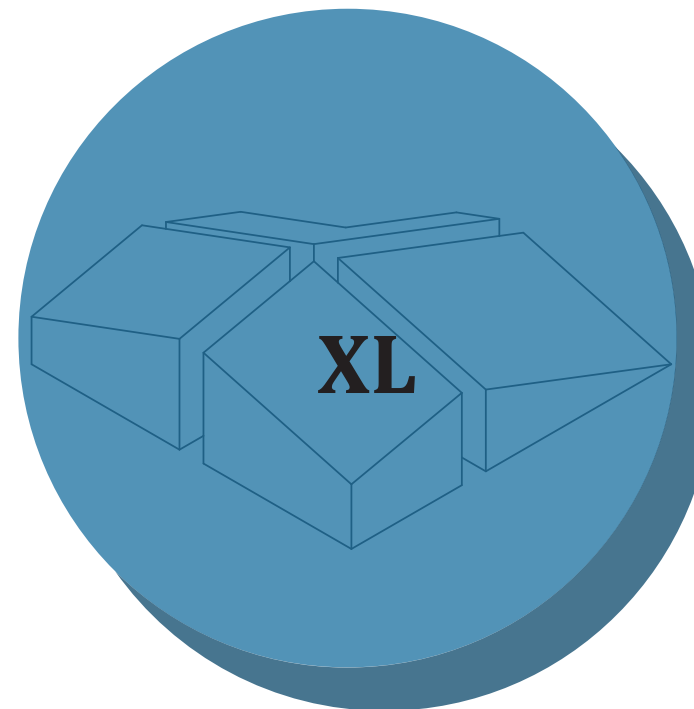
- Focus on compactness
- Complementary neighbourhood functions



- Focus on appropriateness and local initiatives
- Publicness around perimeter



- Focus on public interiors
- Energy experience
- Urban functions



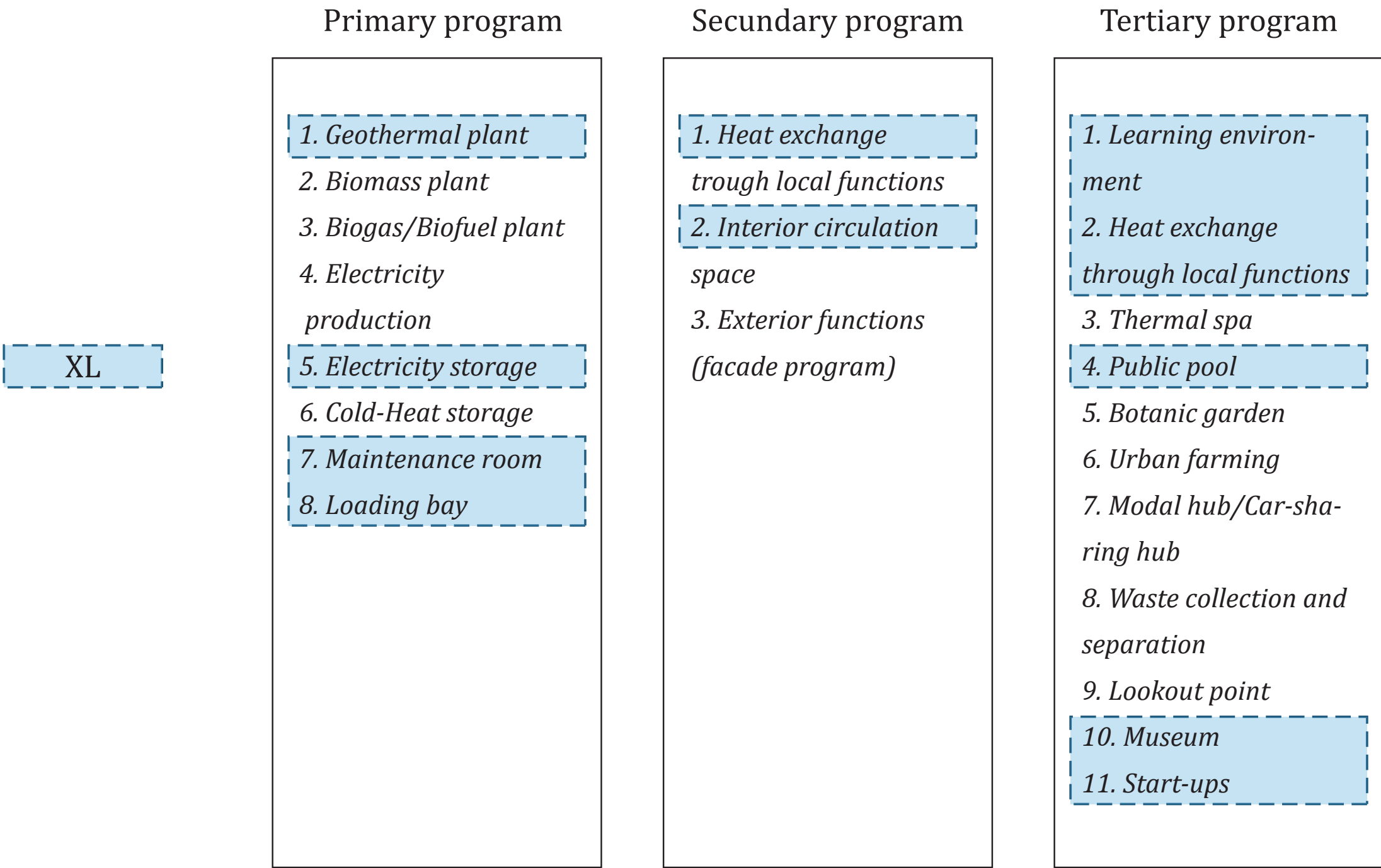
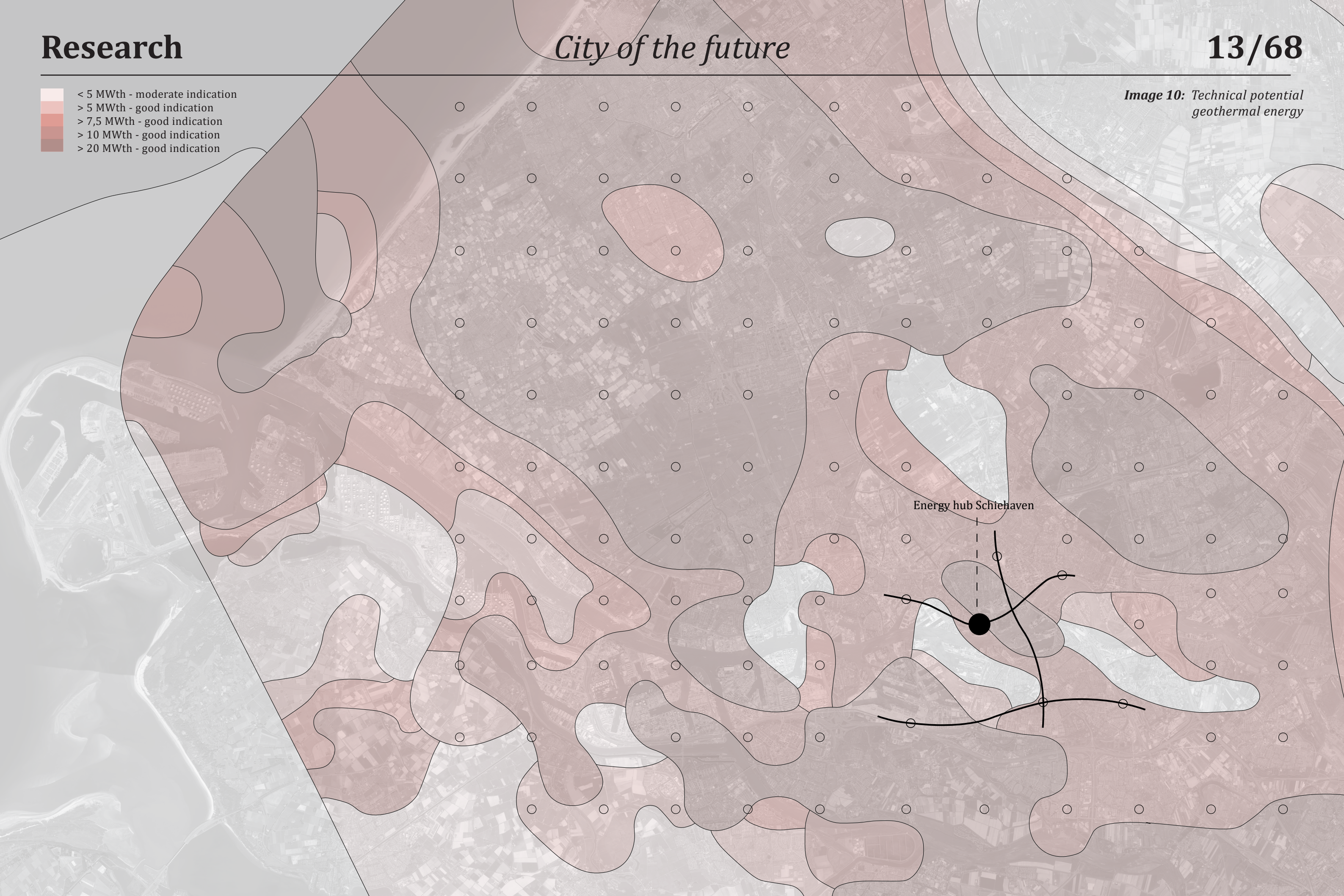


Image 9: Schiehaven (Source: Google Earth)



- < 5 MWth - moderate indication
- > 5 MWth - good indication
- > 7,5 MWth - good indication
- > 10 MWth - good indication
- > 20 MWth - good indication

Image 10: Technical potential
geothermal energy



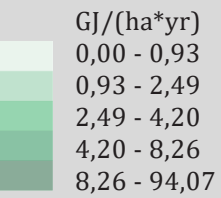
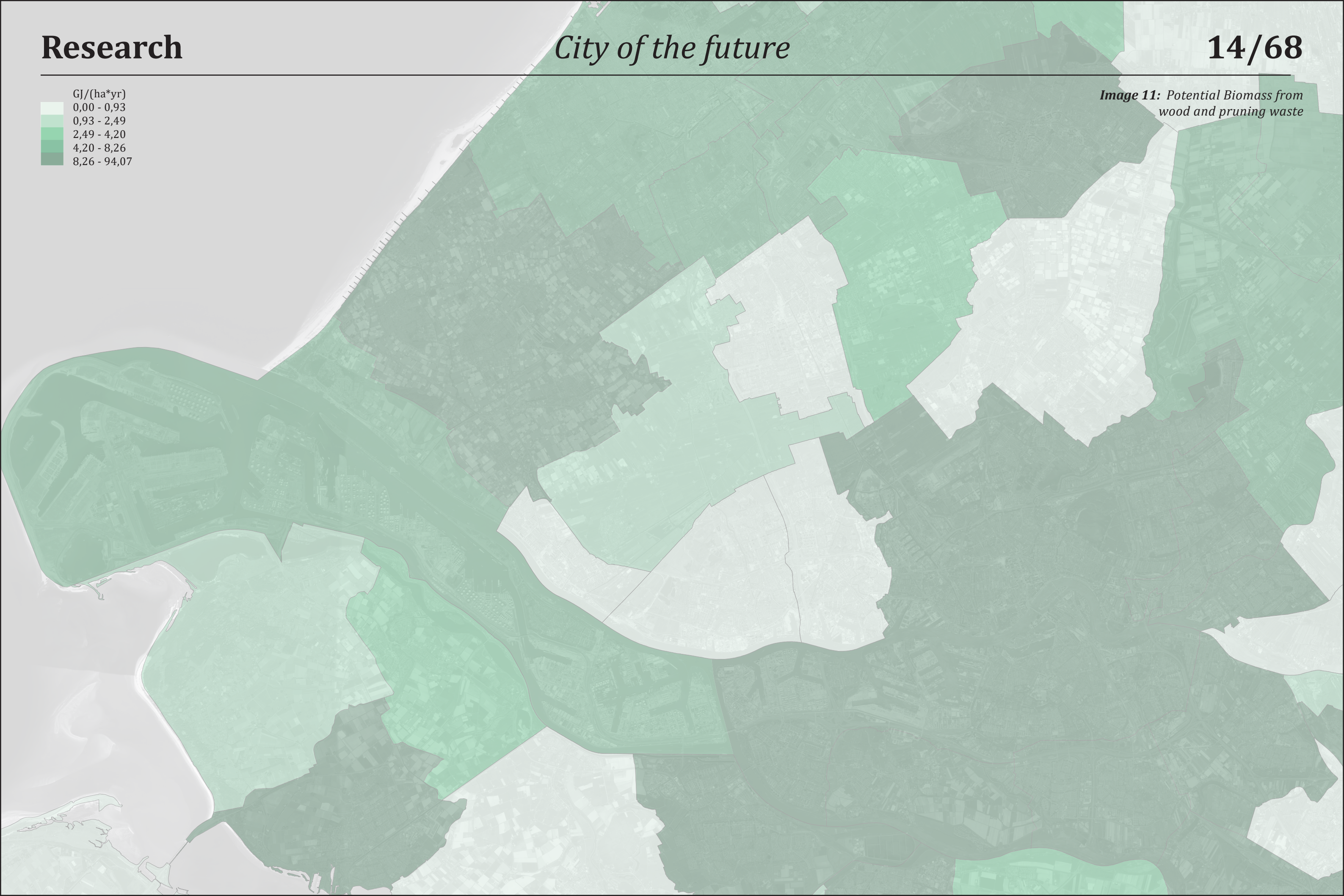


Image 11: Potential Biomass from wood and pruning waste



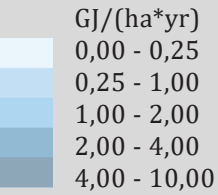
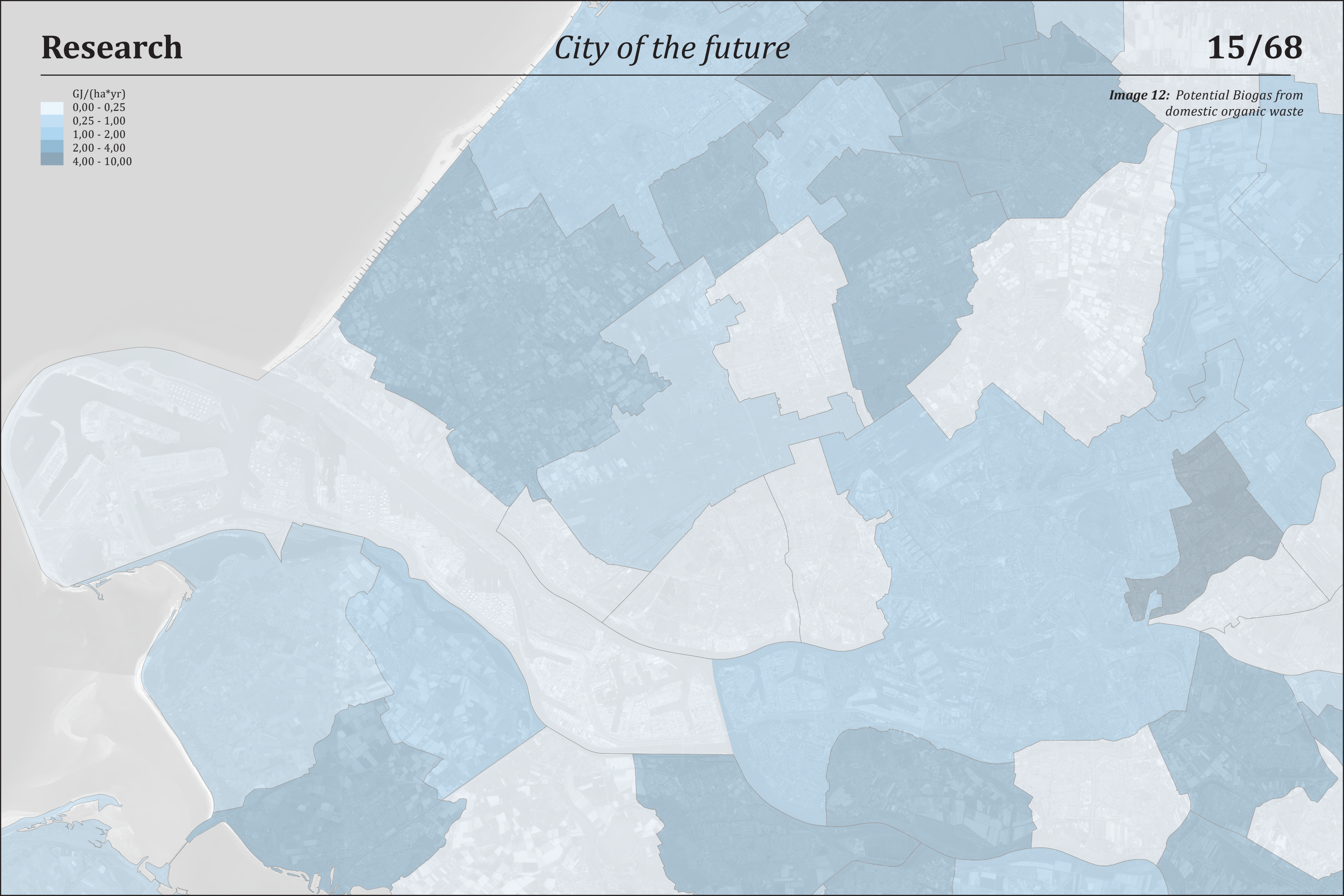
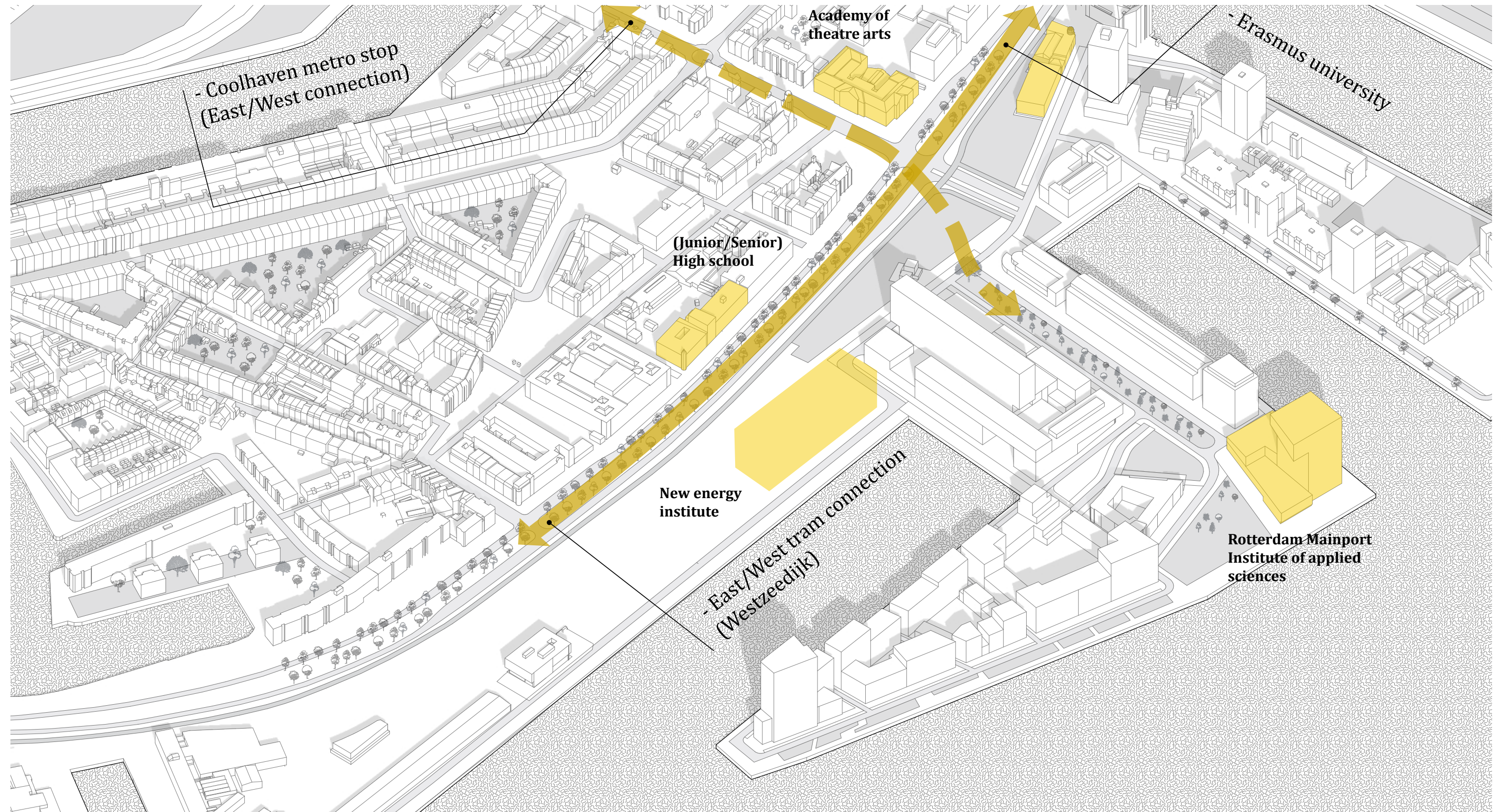
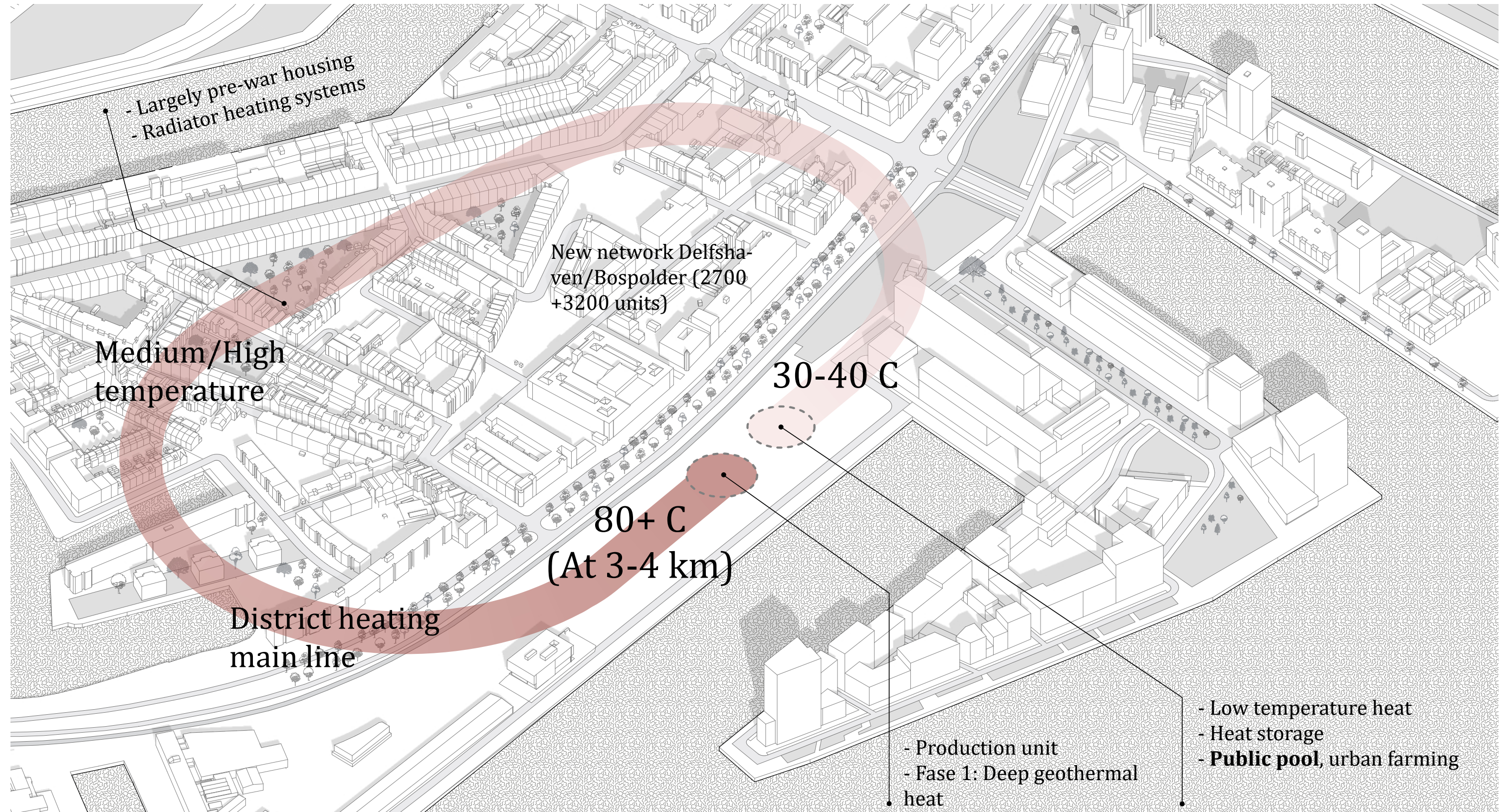
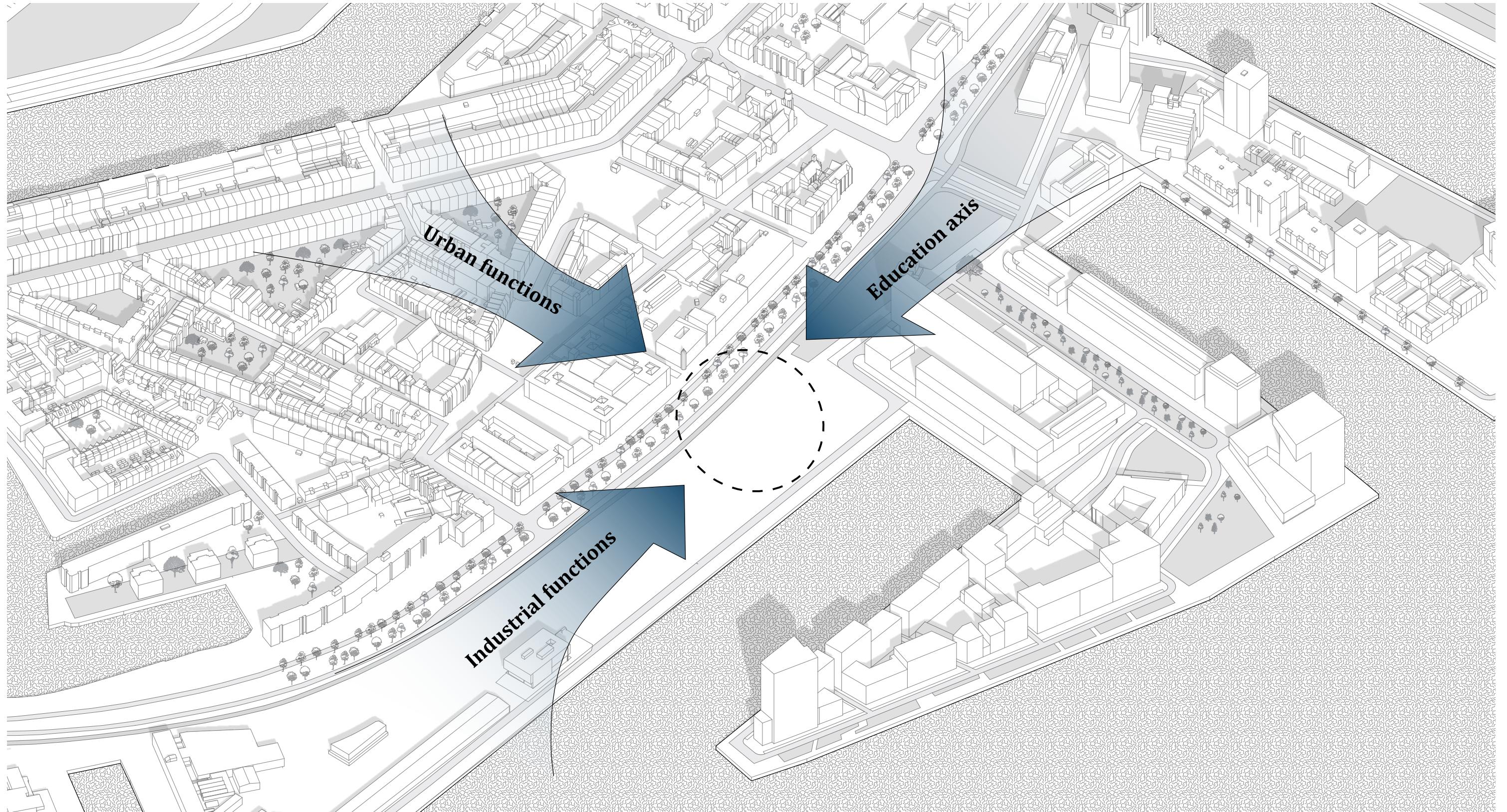


Image 12: Potential Biogas from domestic organic waste









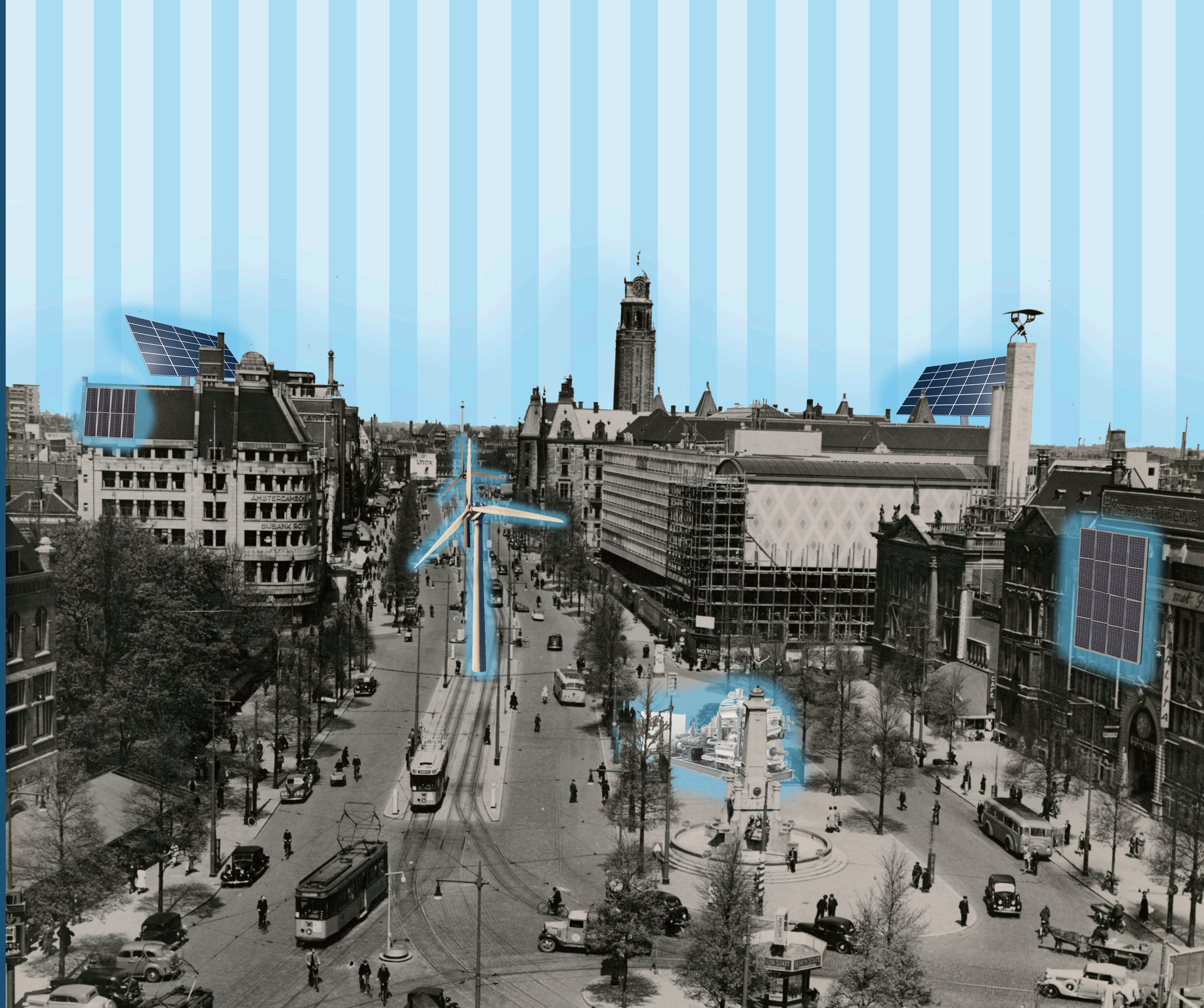
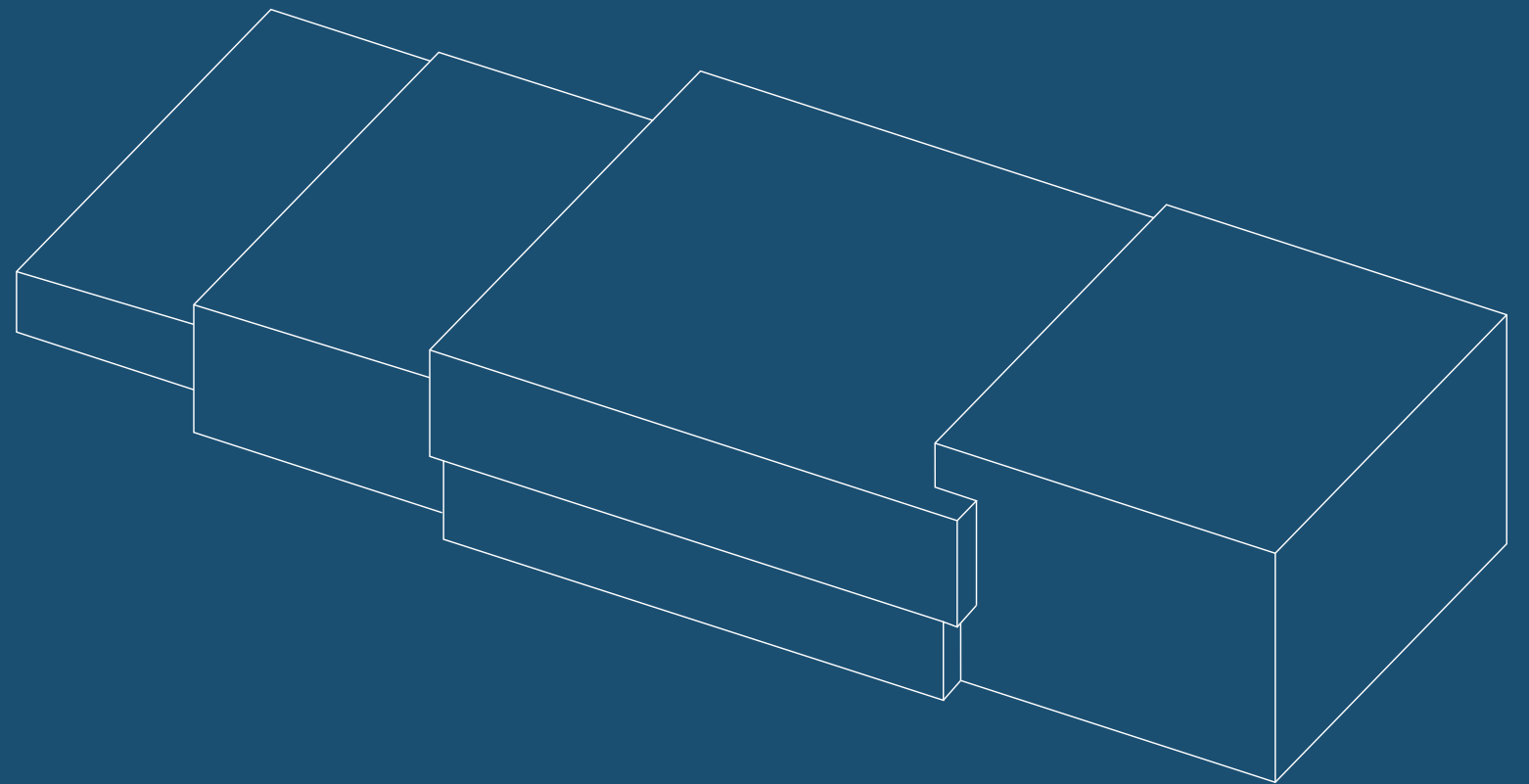
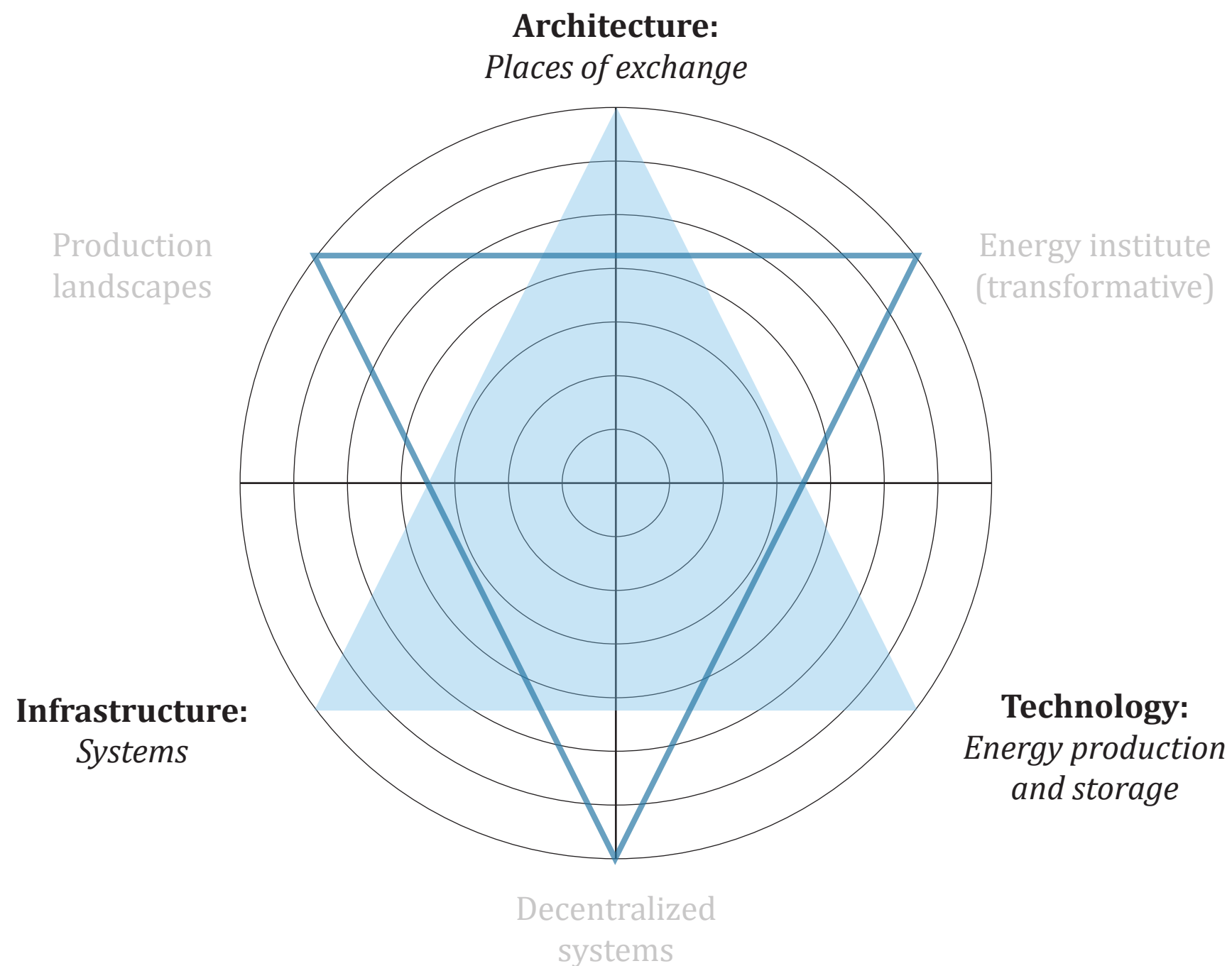


Image 16
Energy in the city
Photo - edited
[View of the Gas silo on the F.
aan de Lusthofstraat. Taken
from the gas factory on the
Oostzeedijk, 02 October 1908]

Design





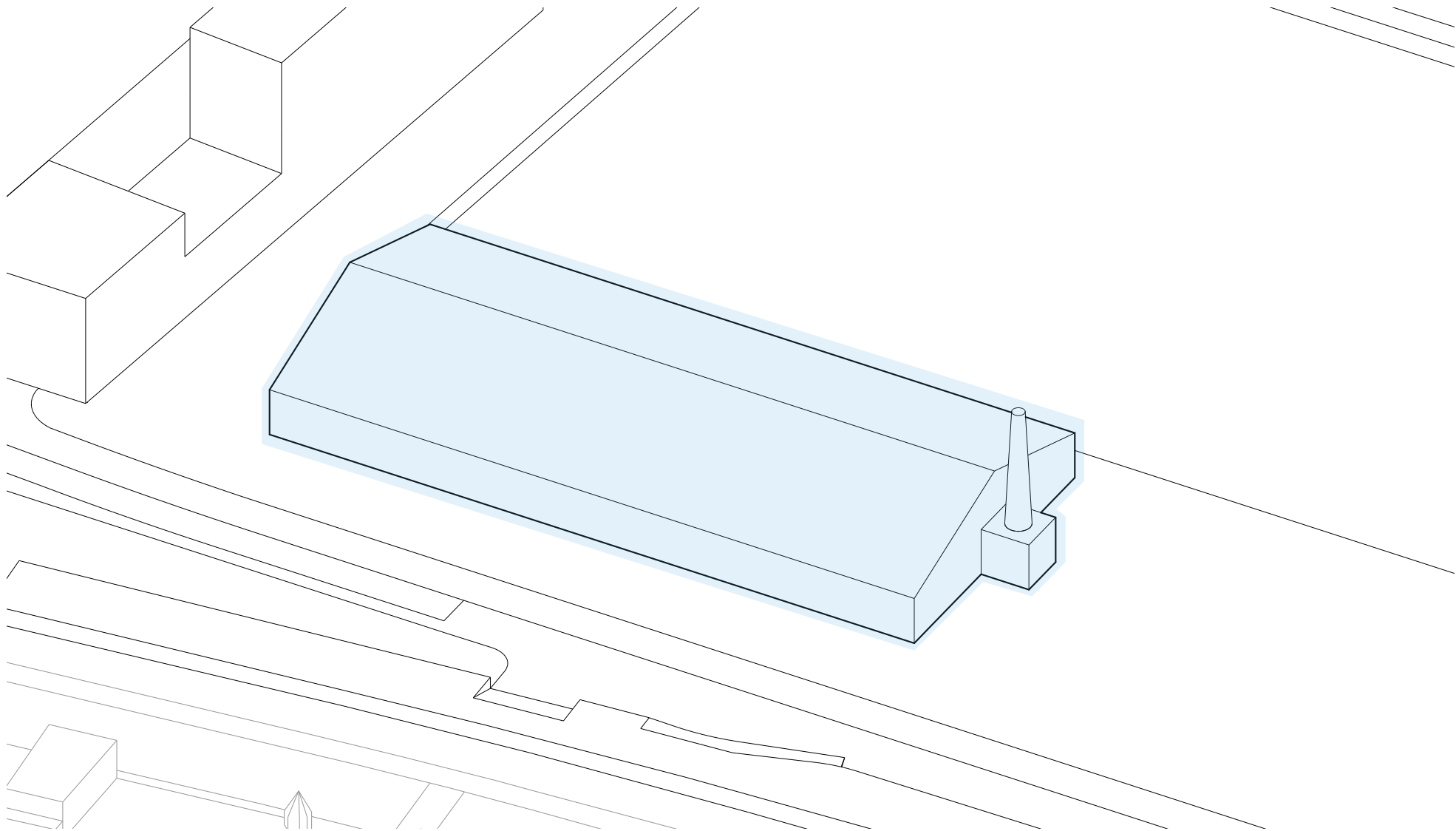
Decentralized energy systems

- 1. Interweaving of public functions and private/production space*
- 2. Development of cold to hot is visible*
- 3. Making clear the paths of the energy systems and making the installations insightful for visitors*

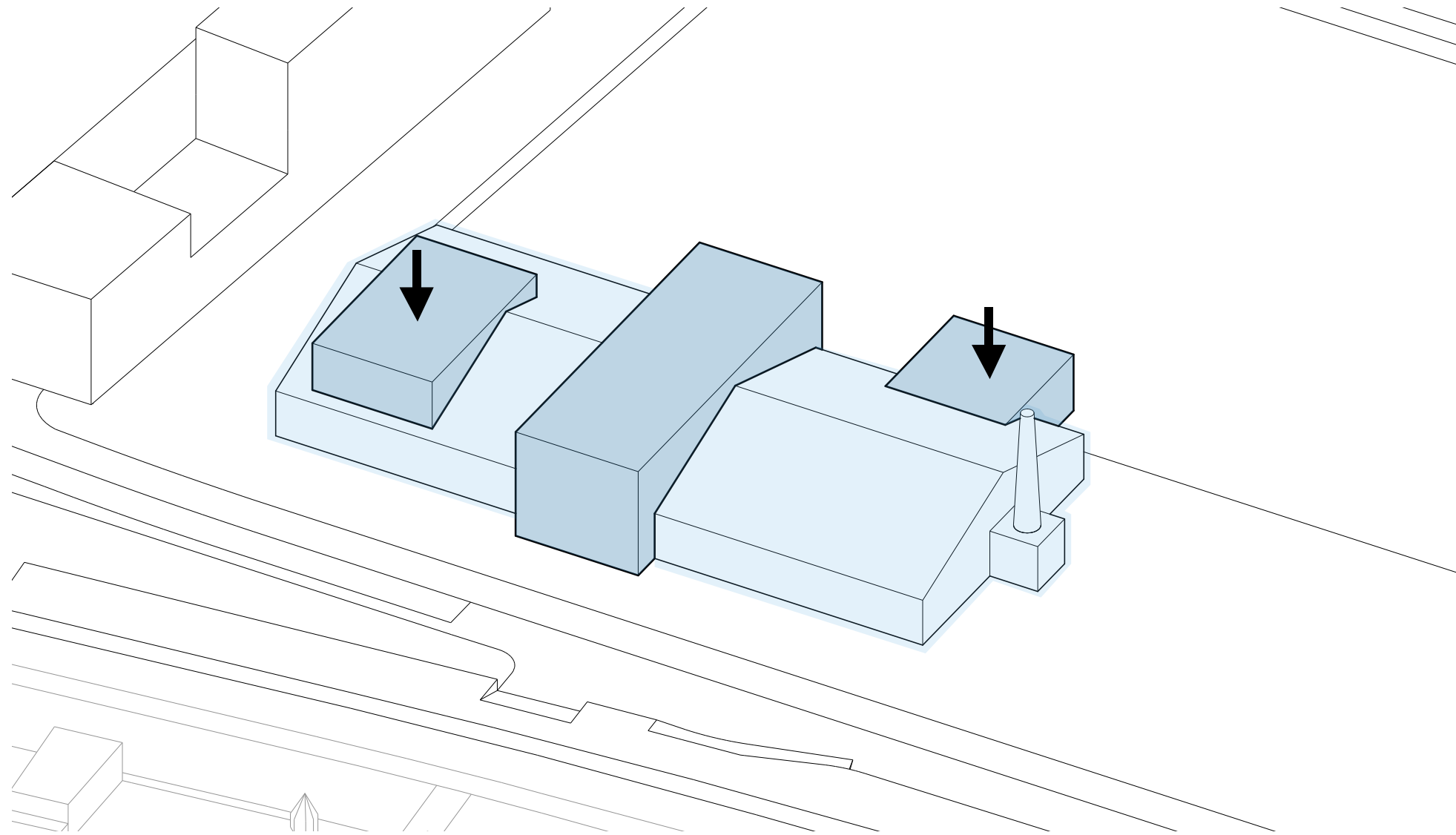
Decentralized system management, Learning environment

Representative architecture (Representation on regional scale)

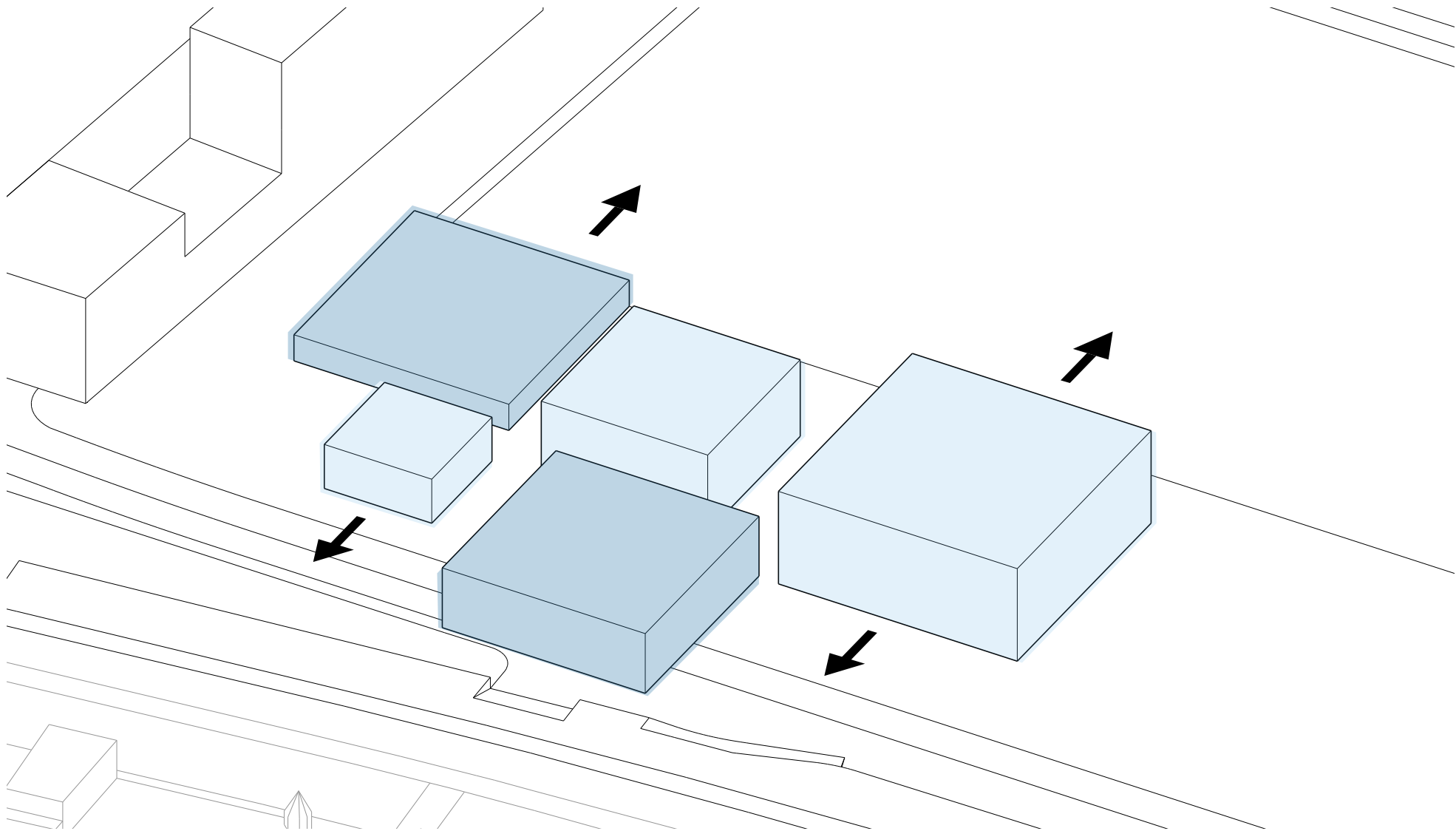
Production landscape, interaction with public, history of production in Rotterdam



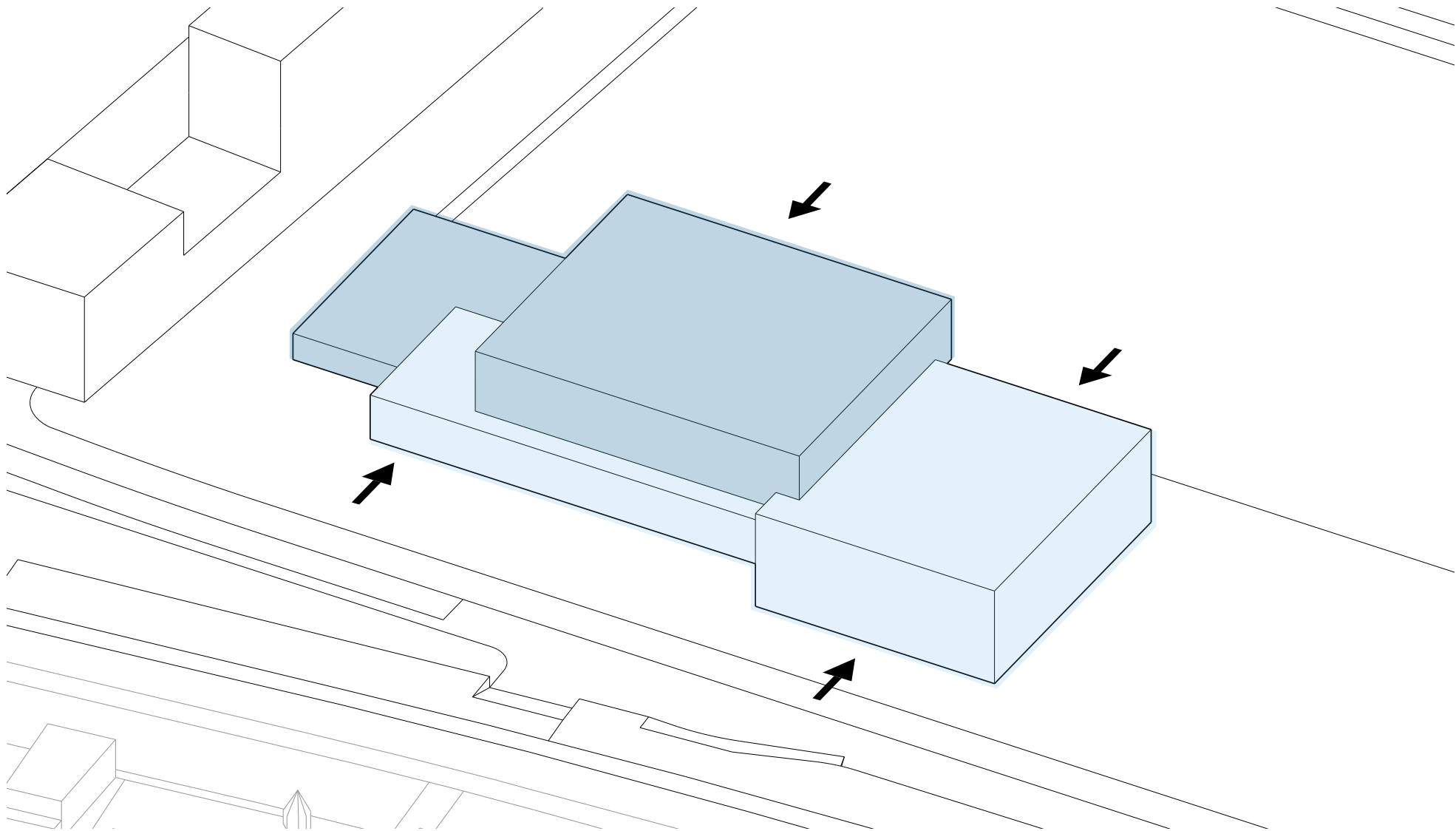
The traditional warehouse shape



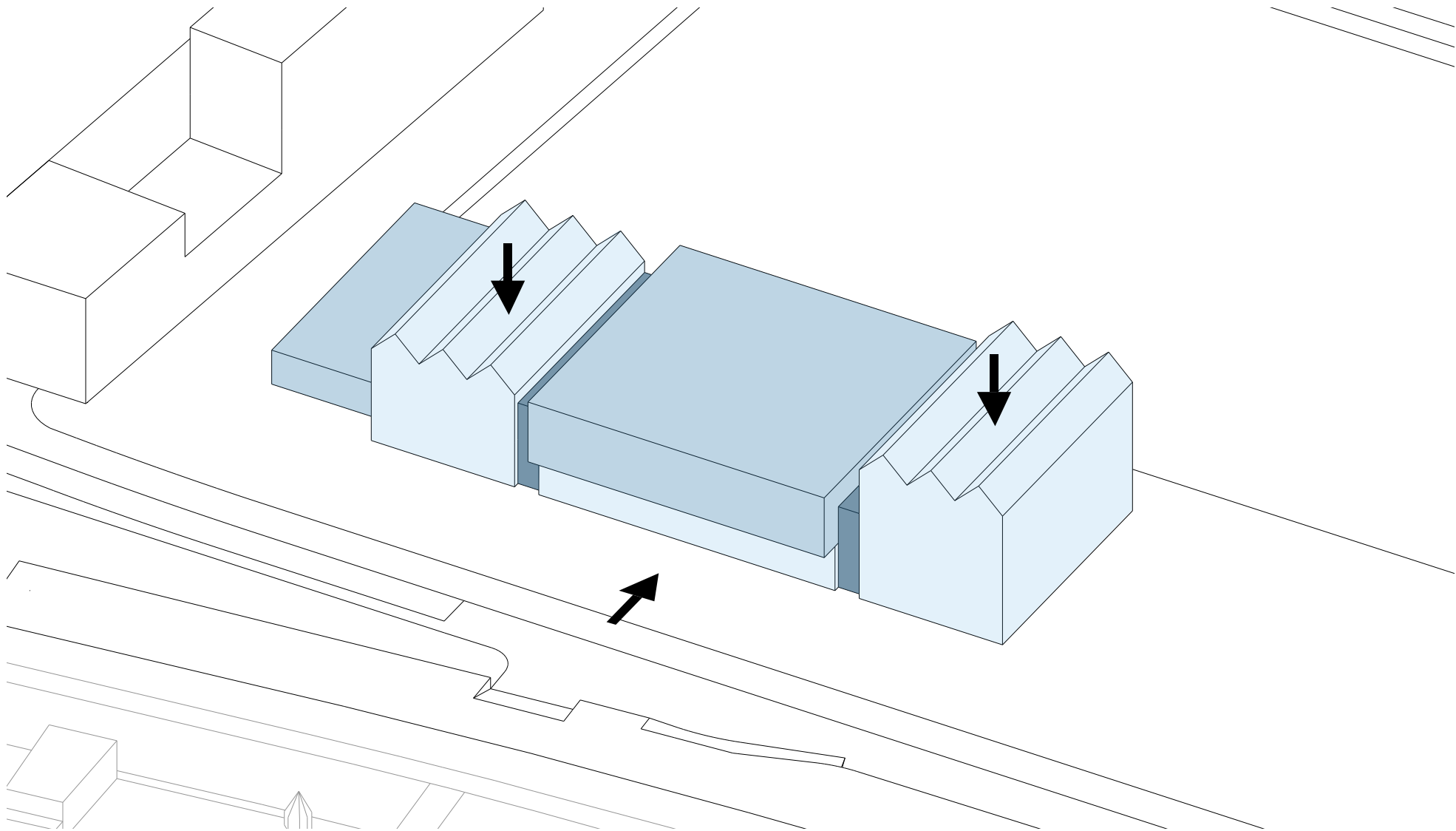
The introduction of public program and secondary energy systems



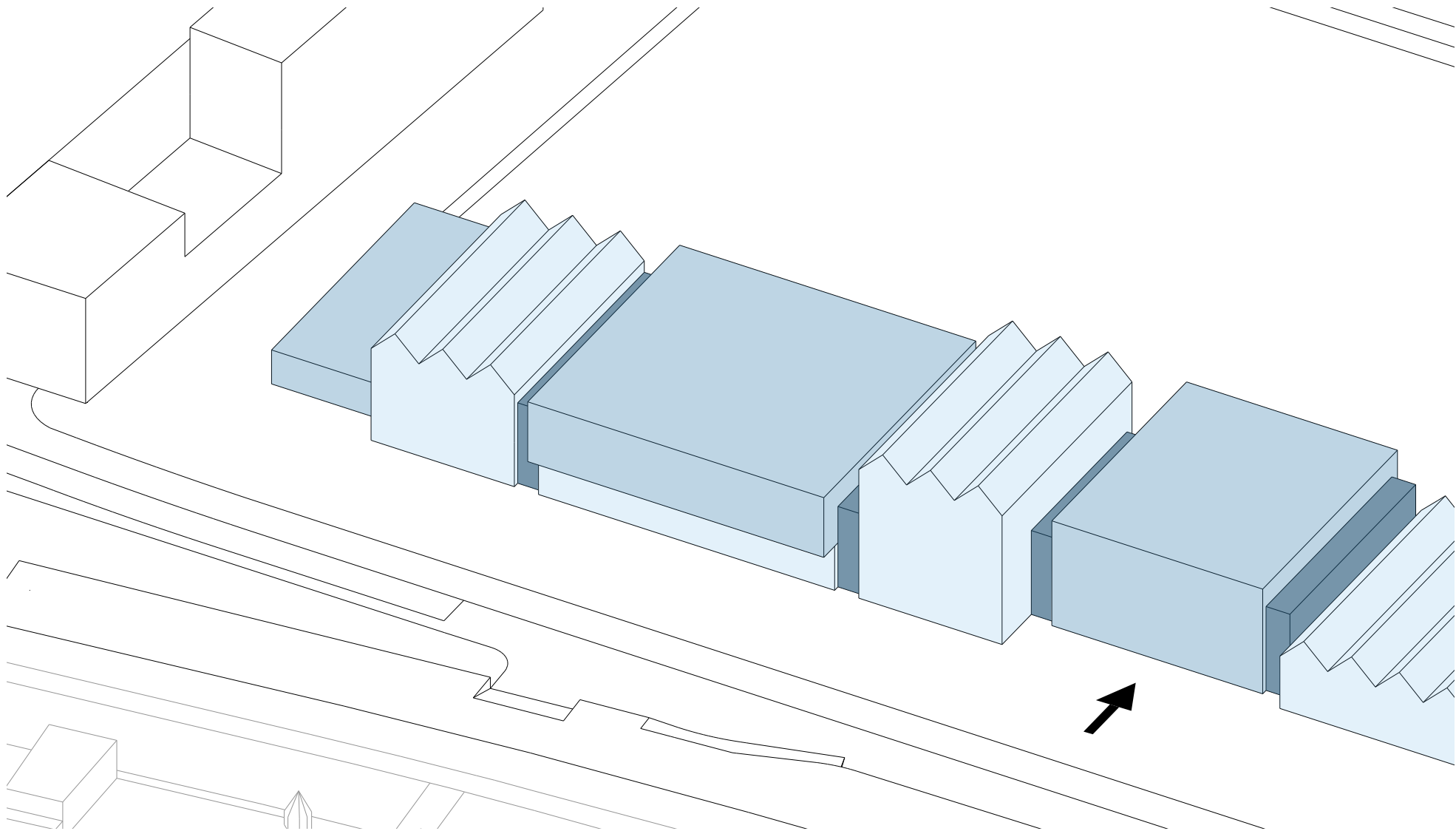
Re-organization of the primary functions



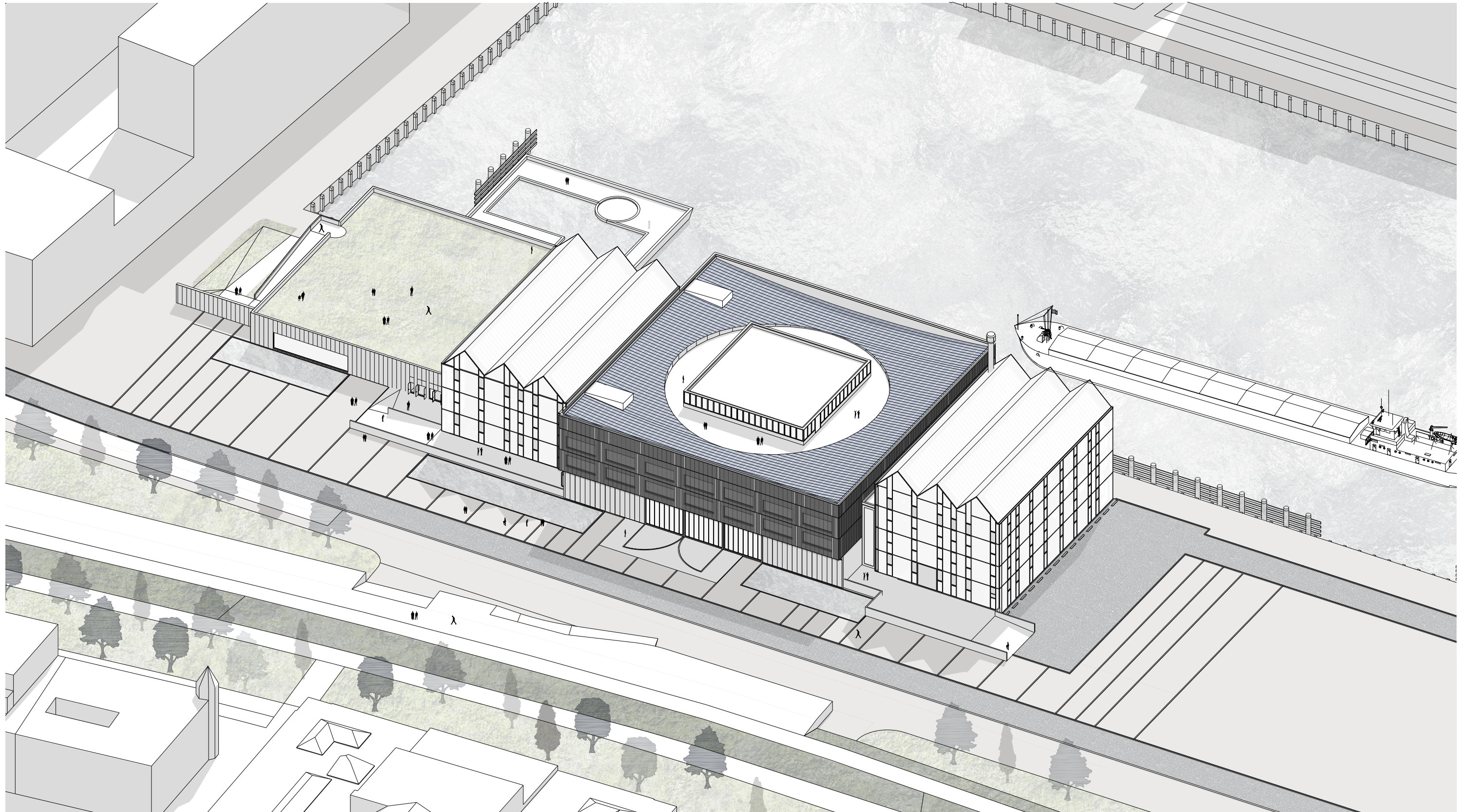
Stacking and intersection

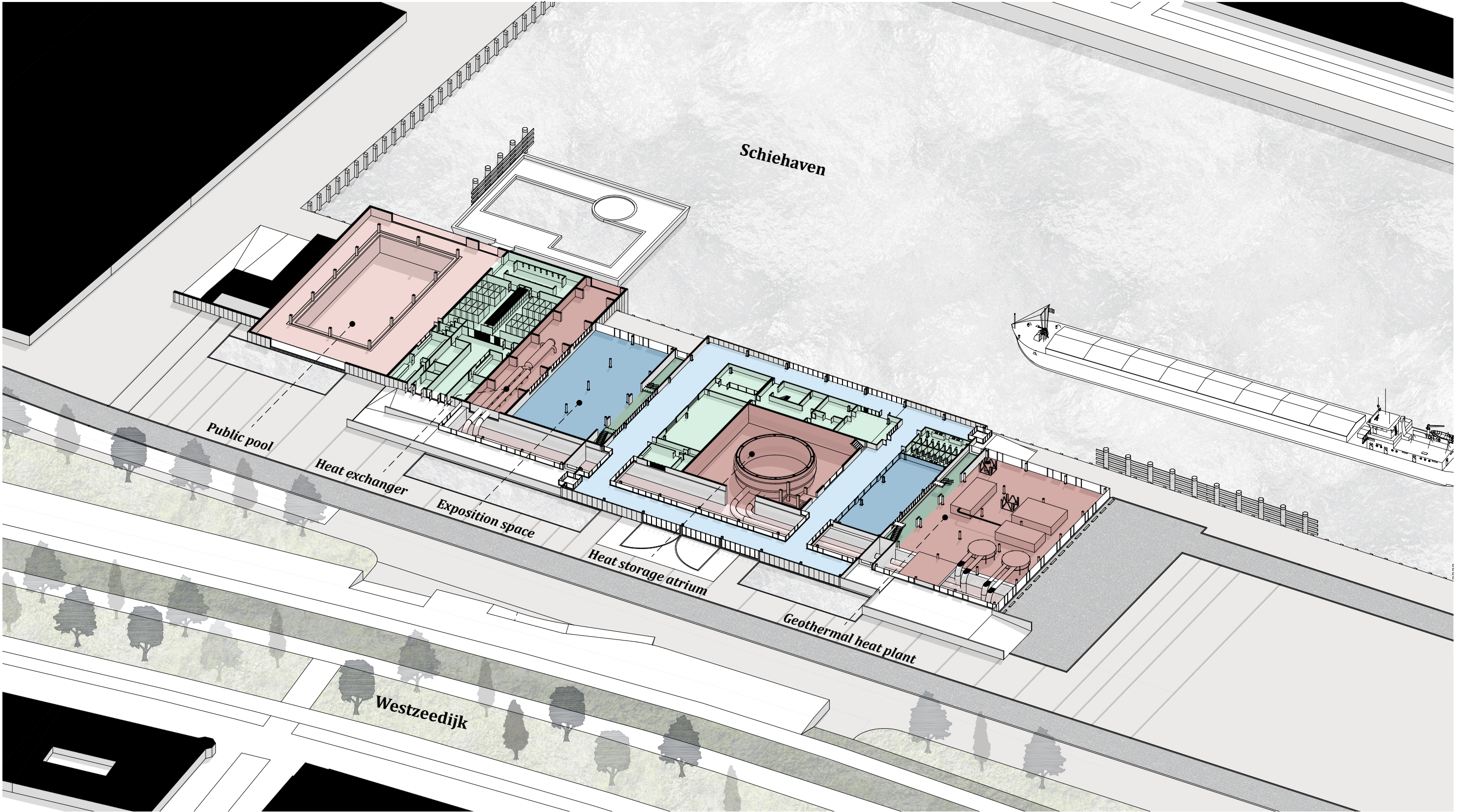


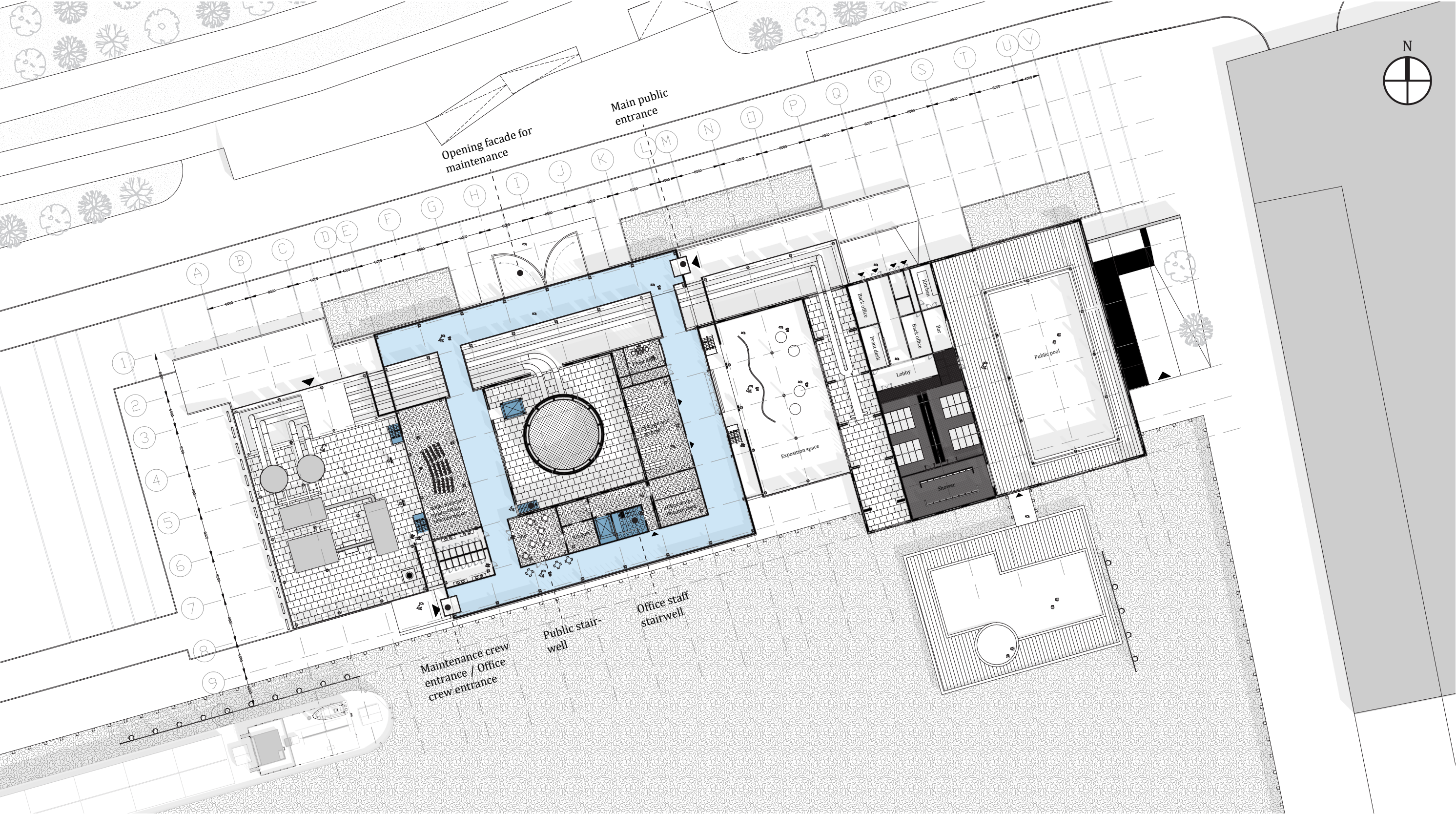
Recreating the representative facade

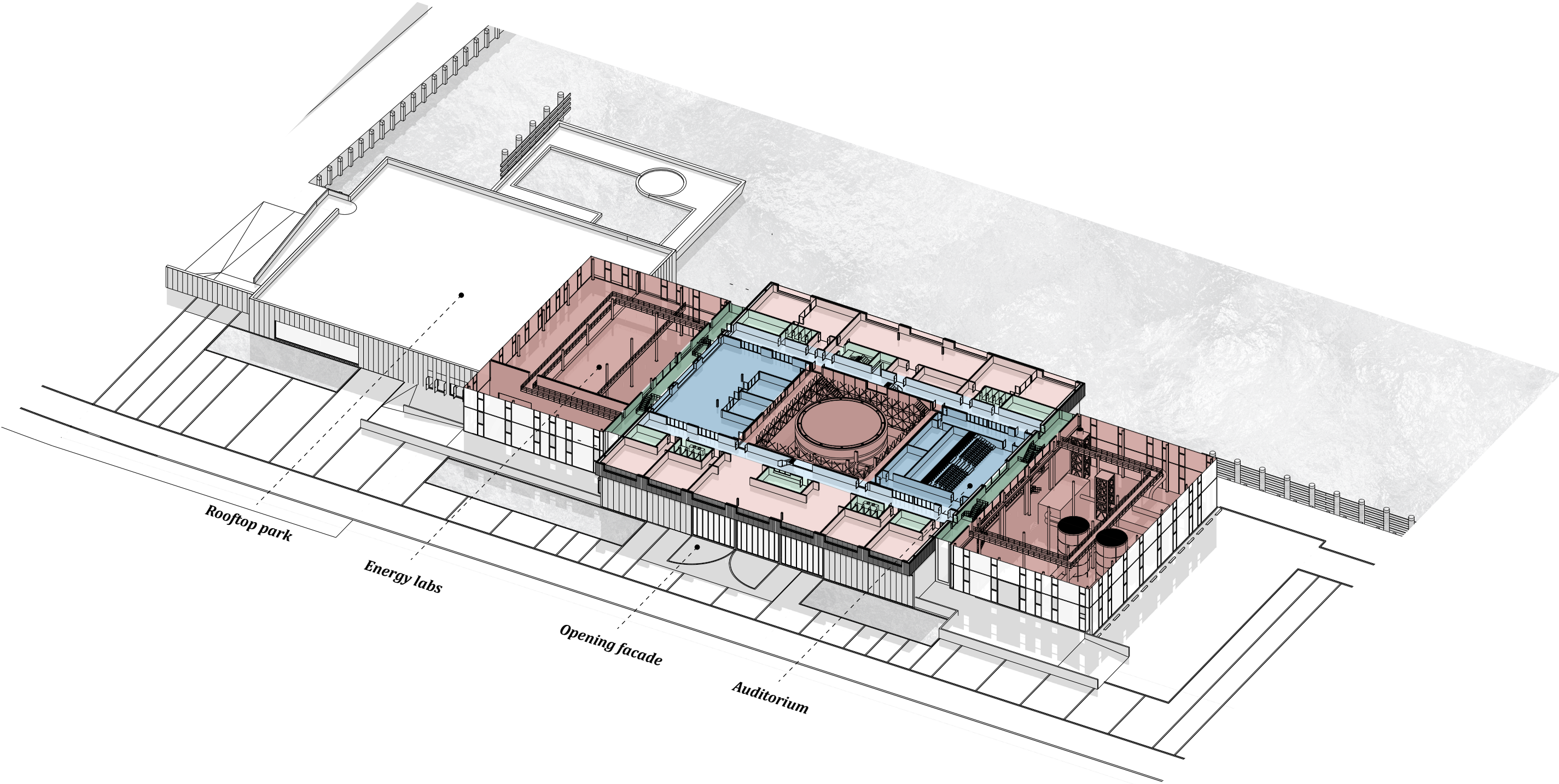


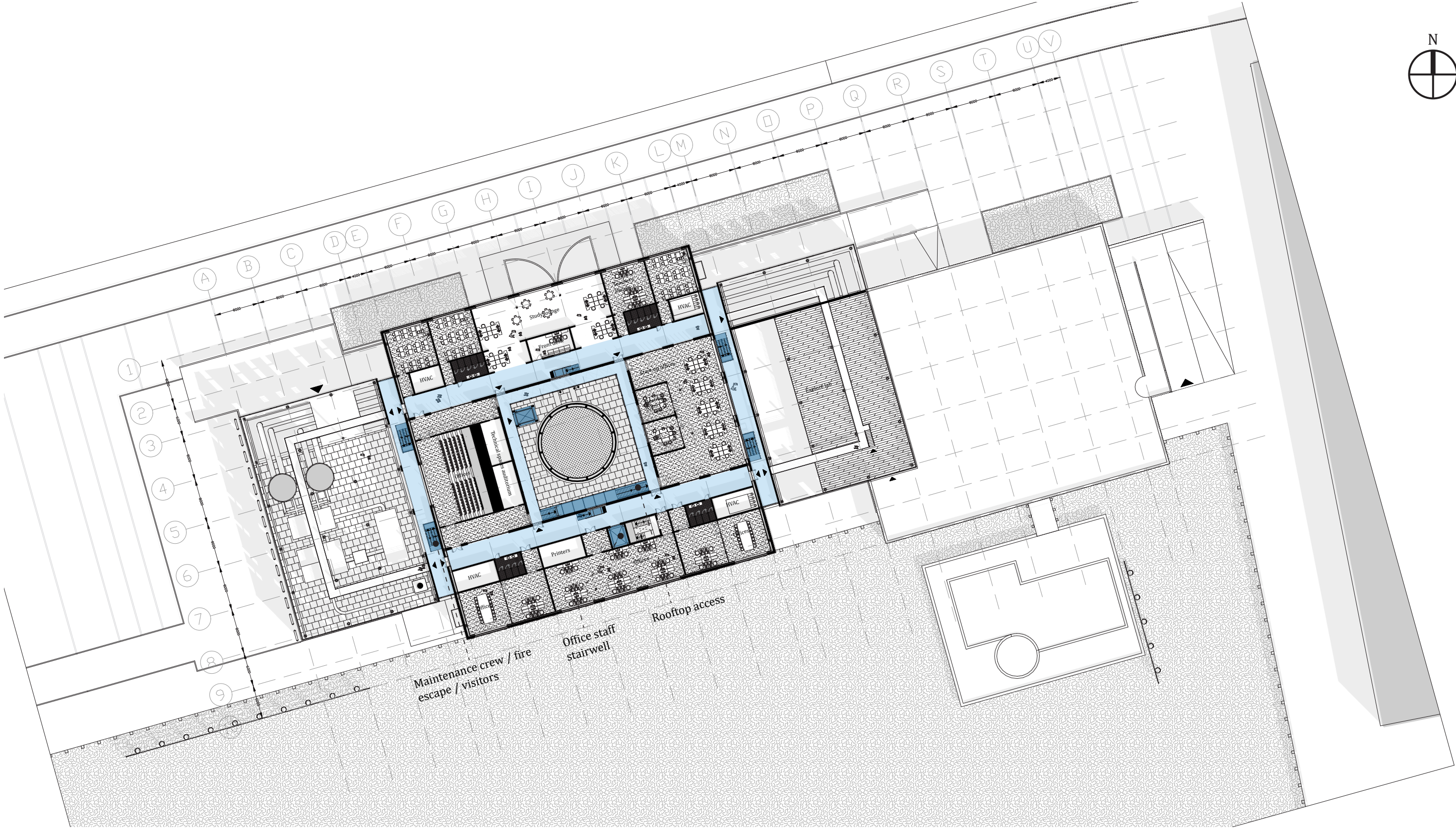
Recreating the representative facade

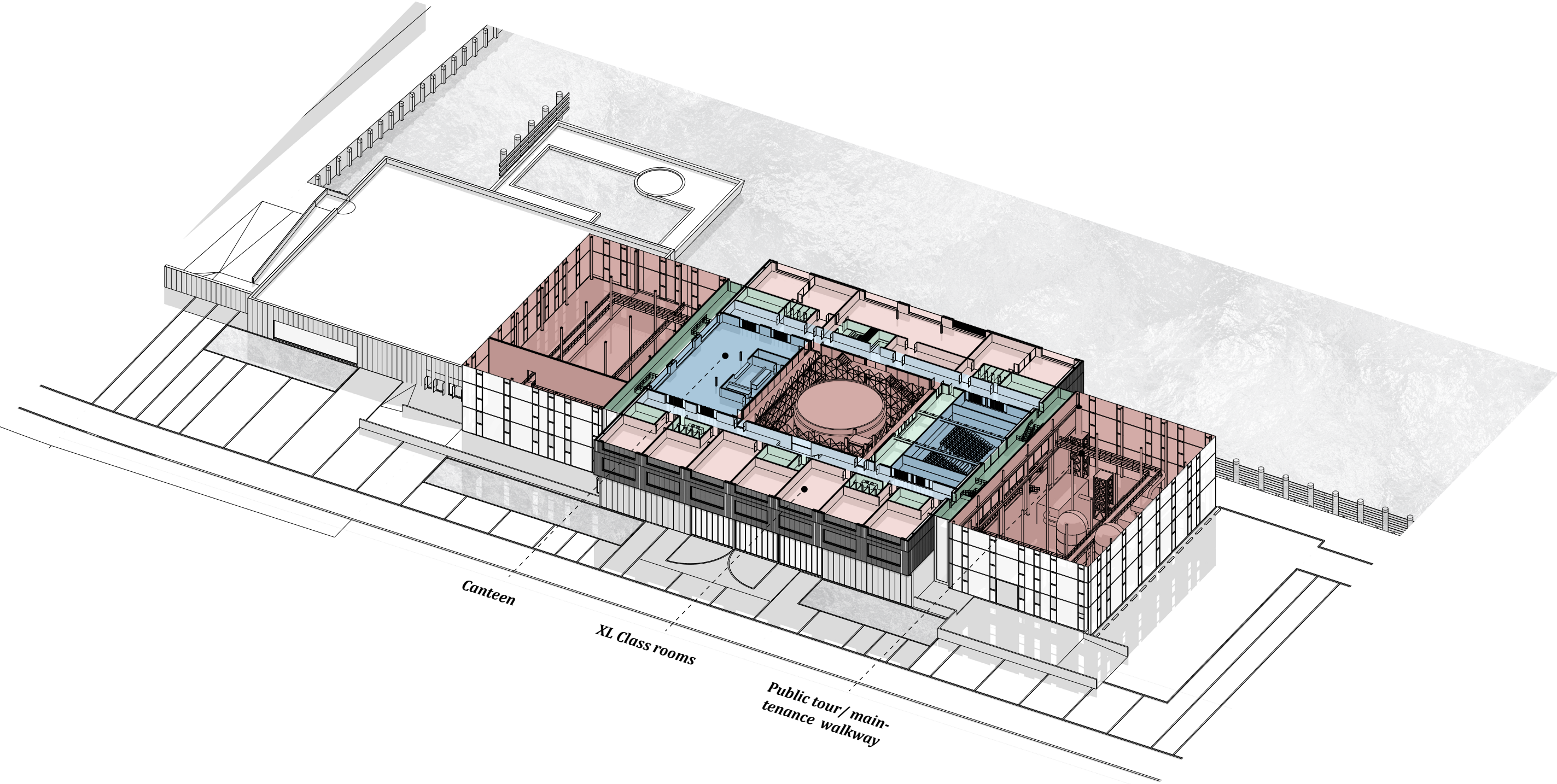












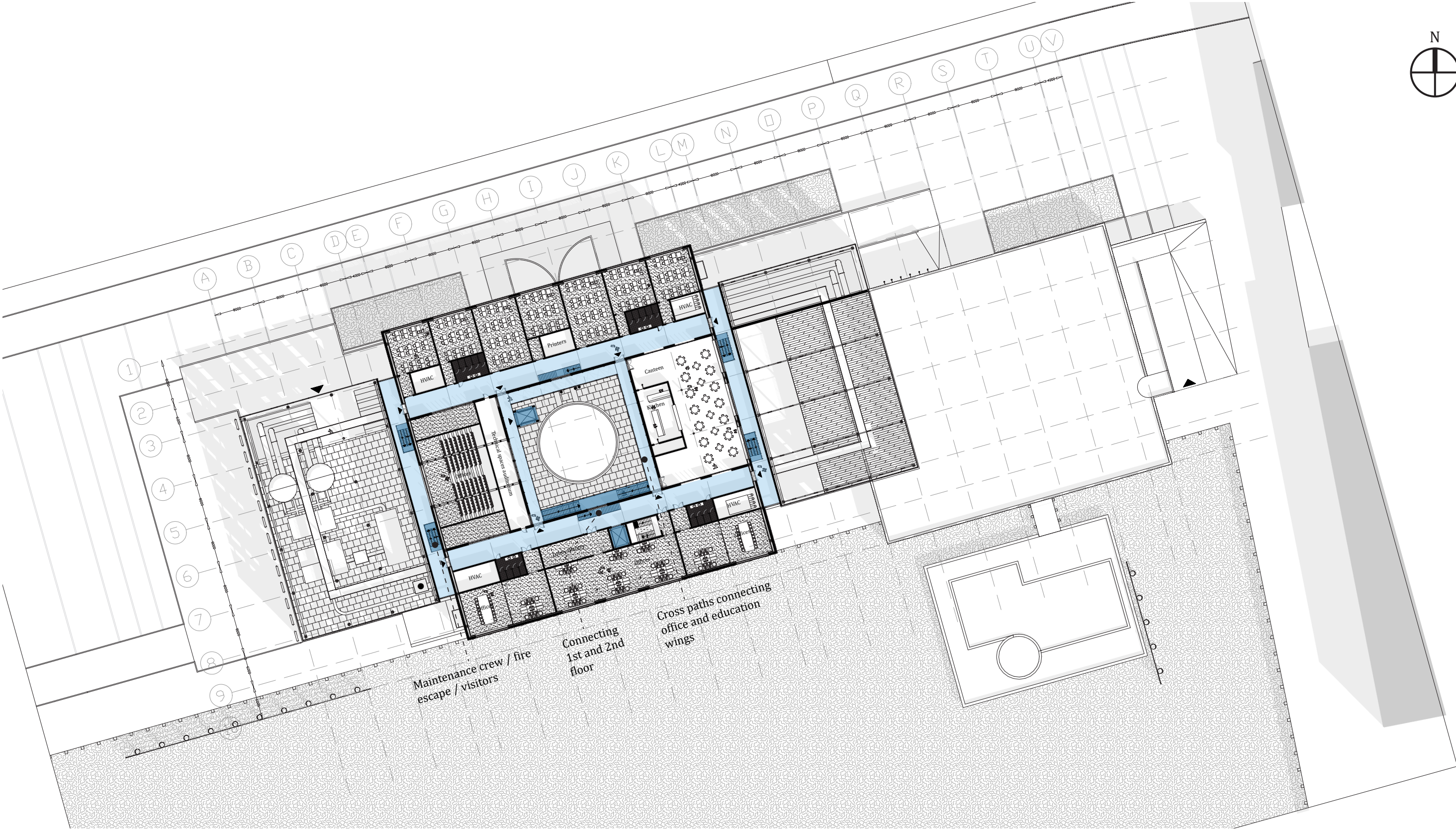


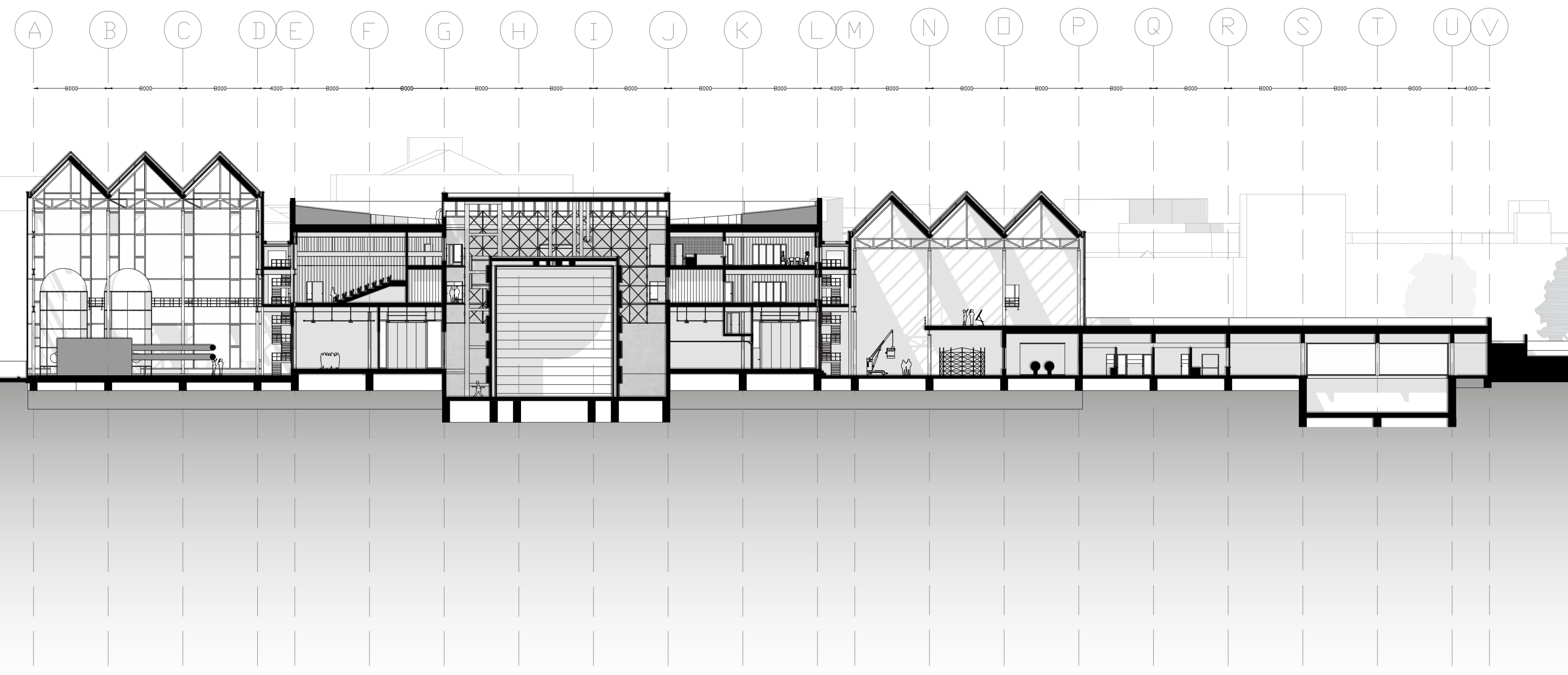
Image 32: Front entrance (North facade)

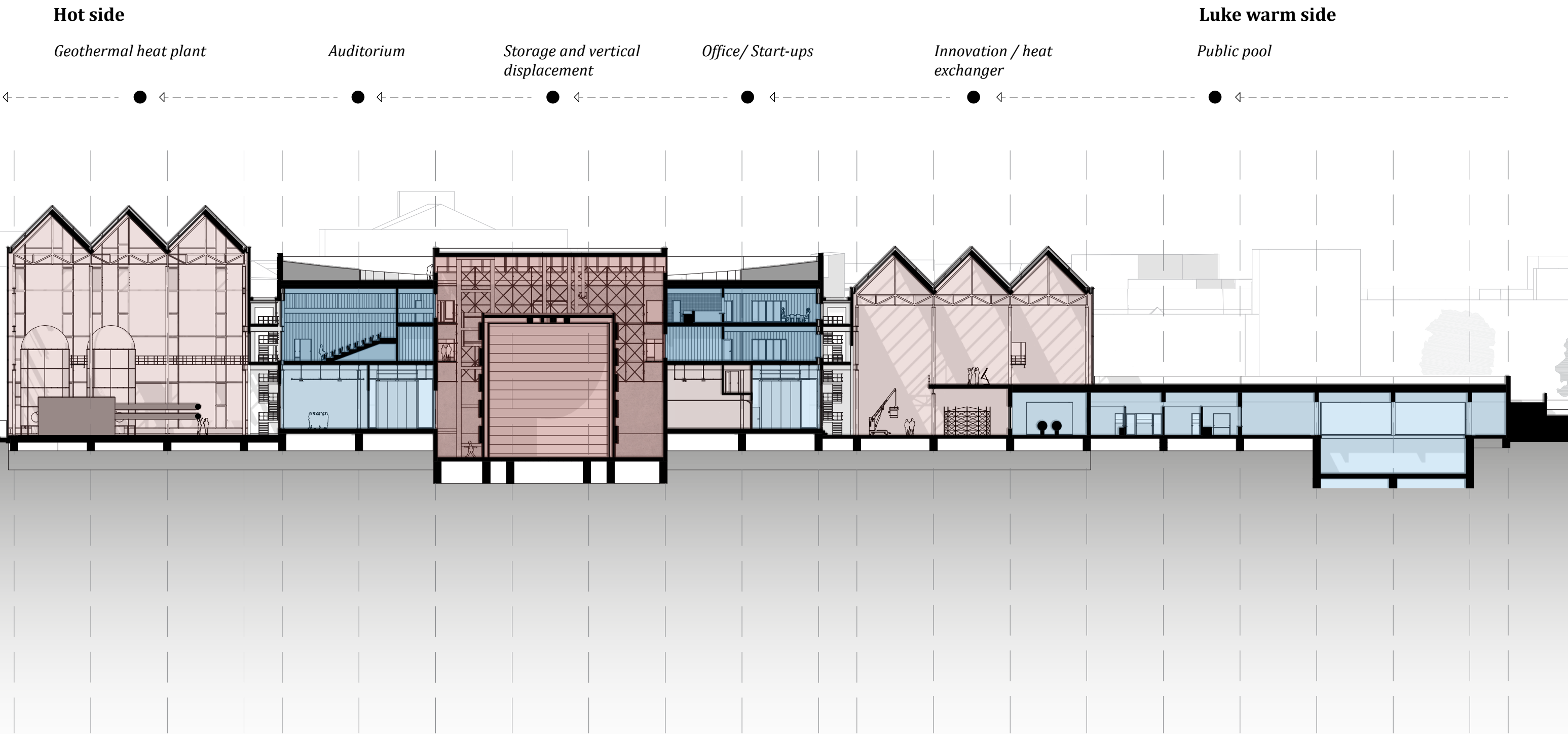


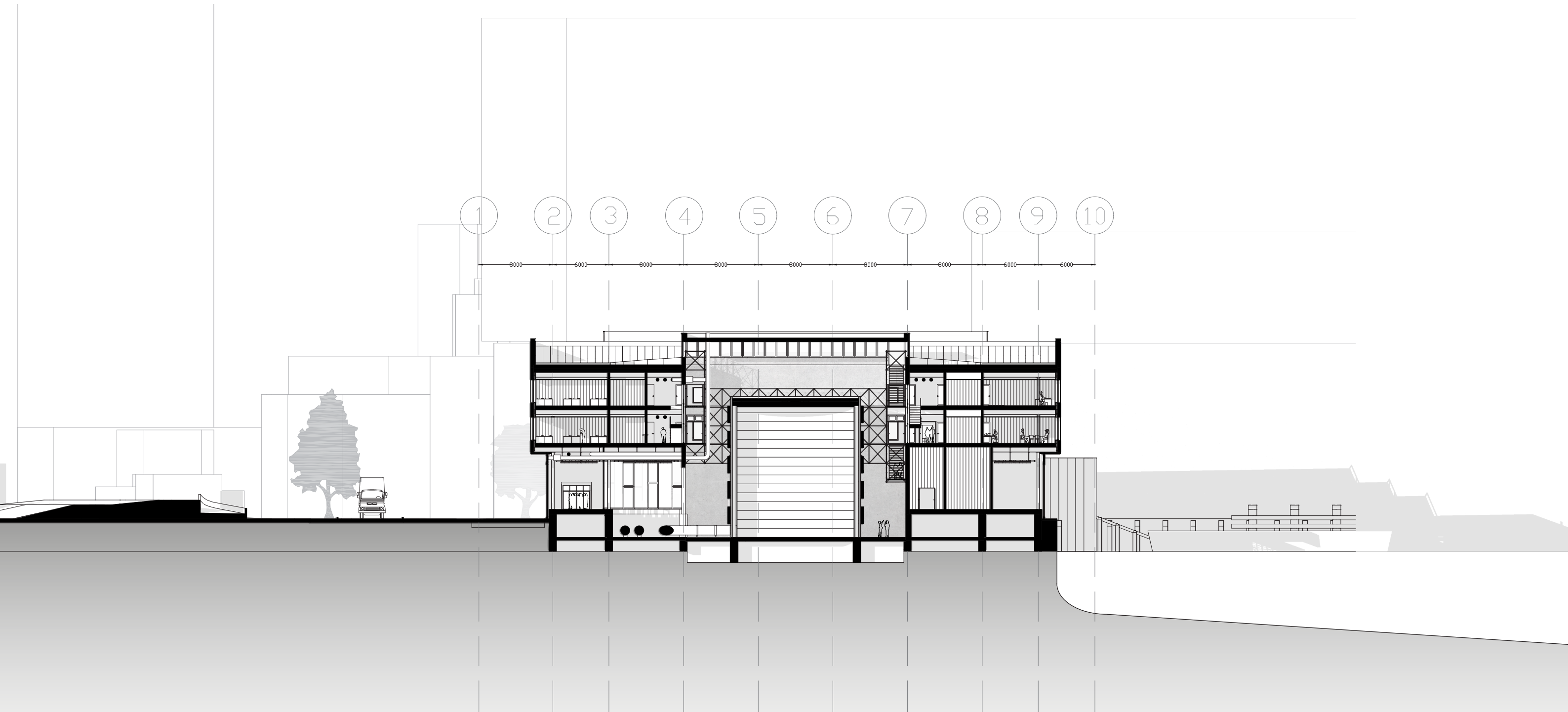


Image 34: Crew entrance (South facade)









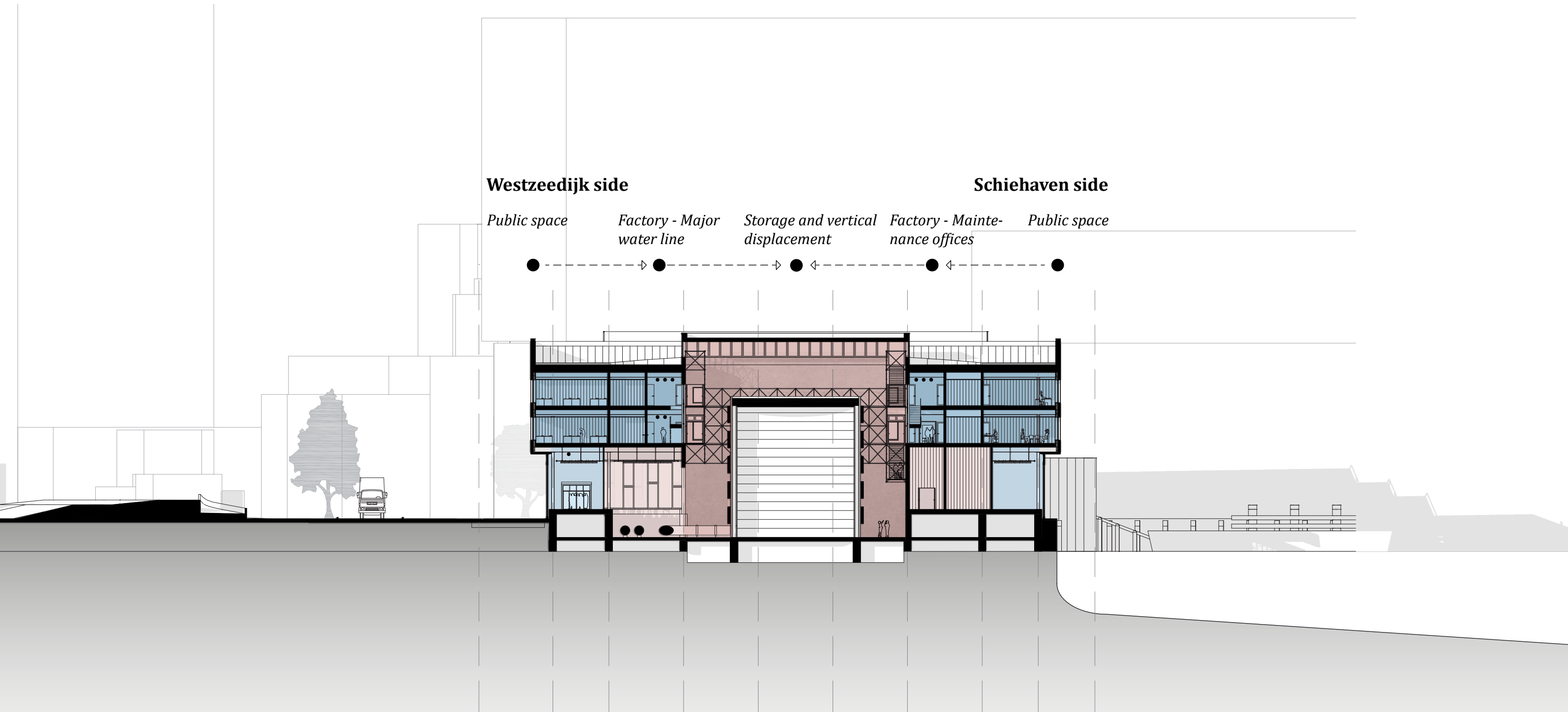




Image 40: View on infill section



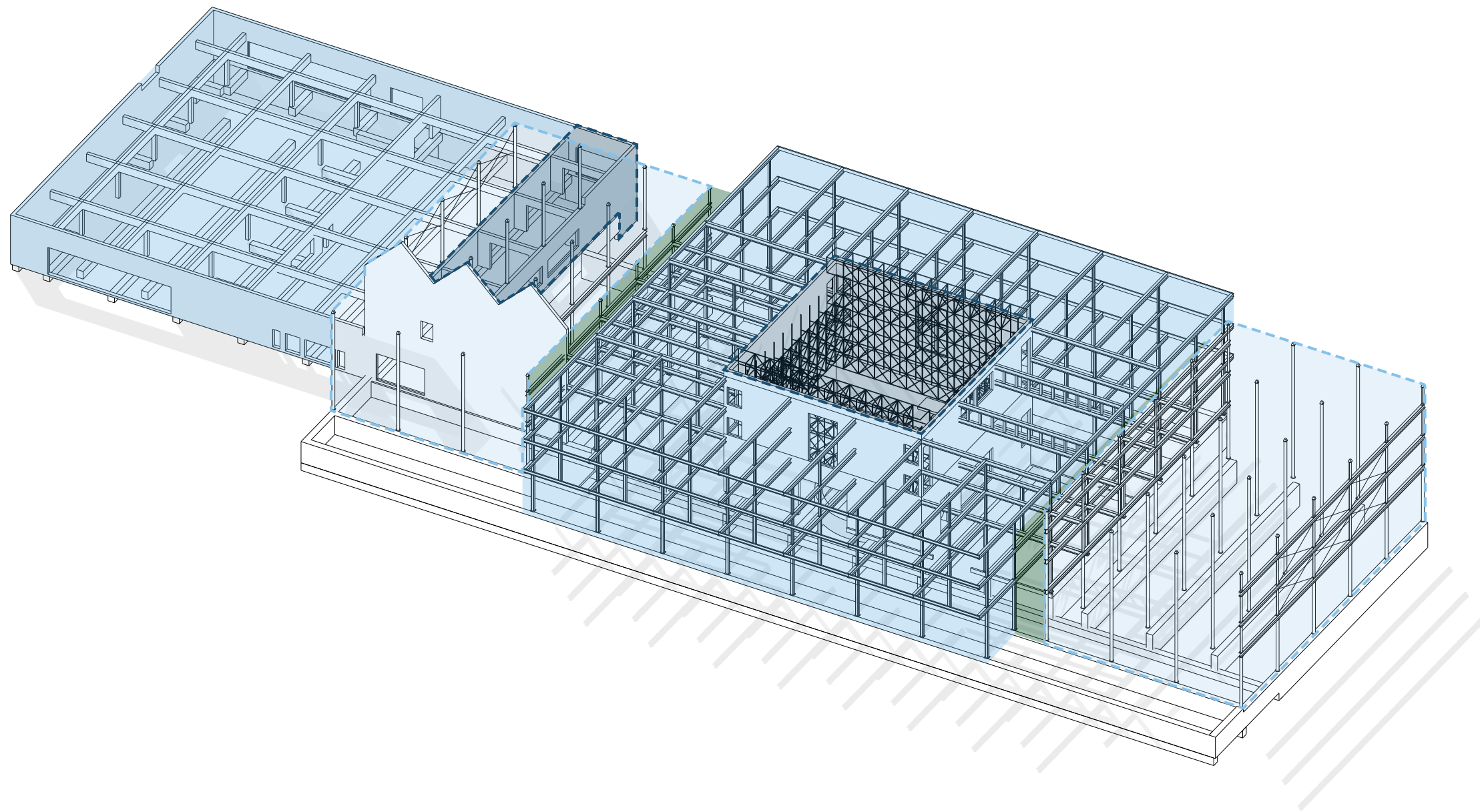
Image 41: View from Westzeedijk (North facade)



Building technology



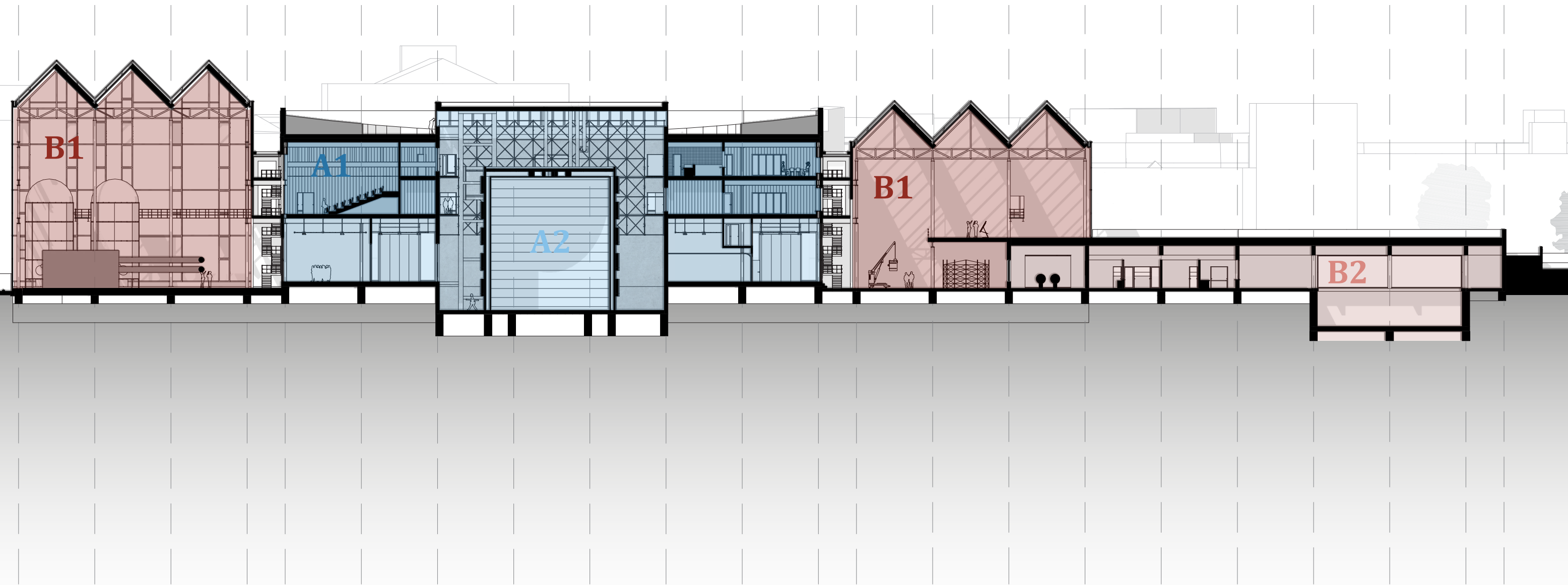
- Concrete (situ cast, prefab)
- Column and truss (glass and opaque)
- Steel structure

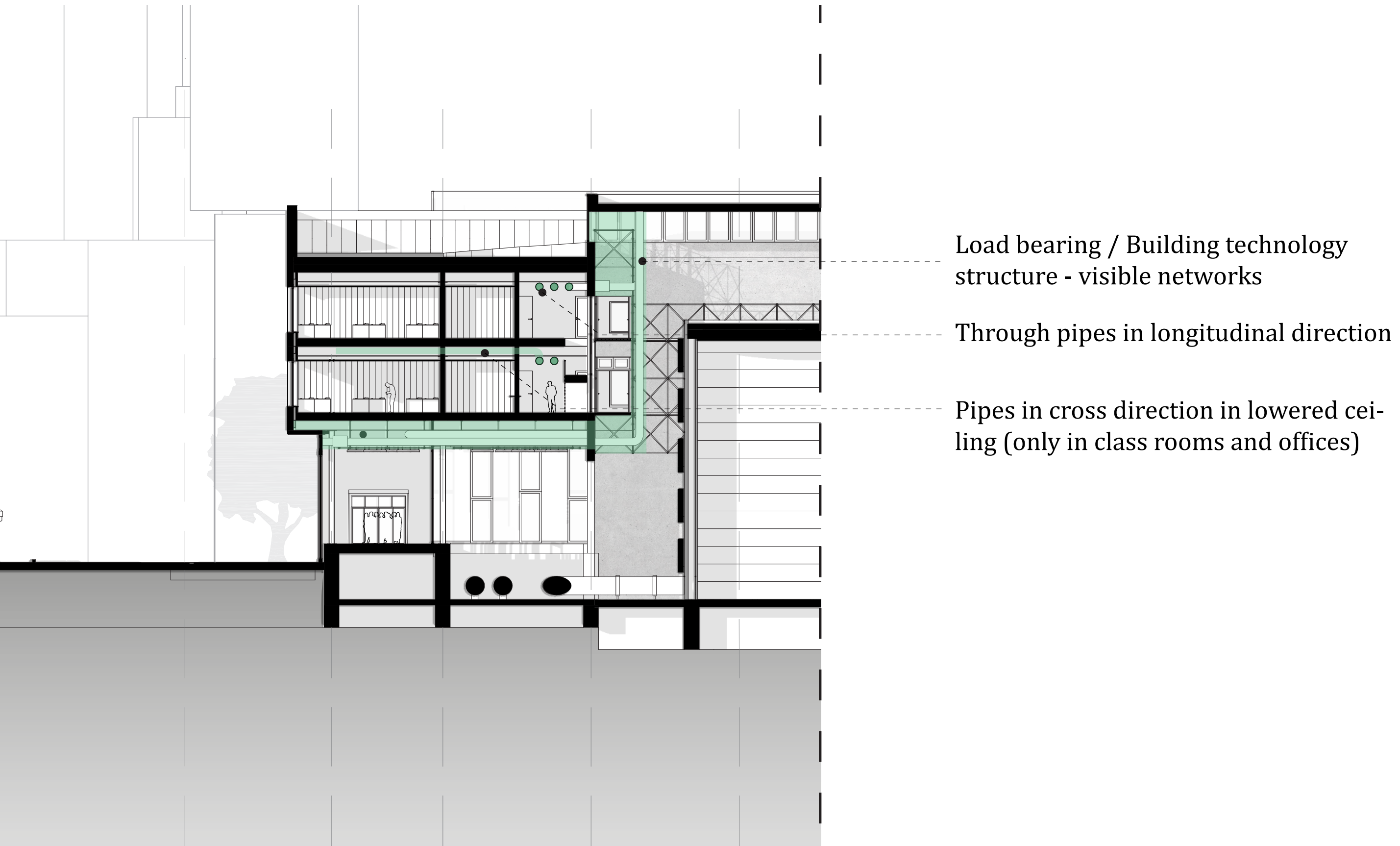


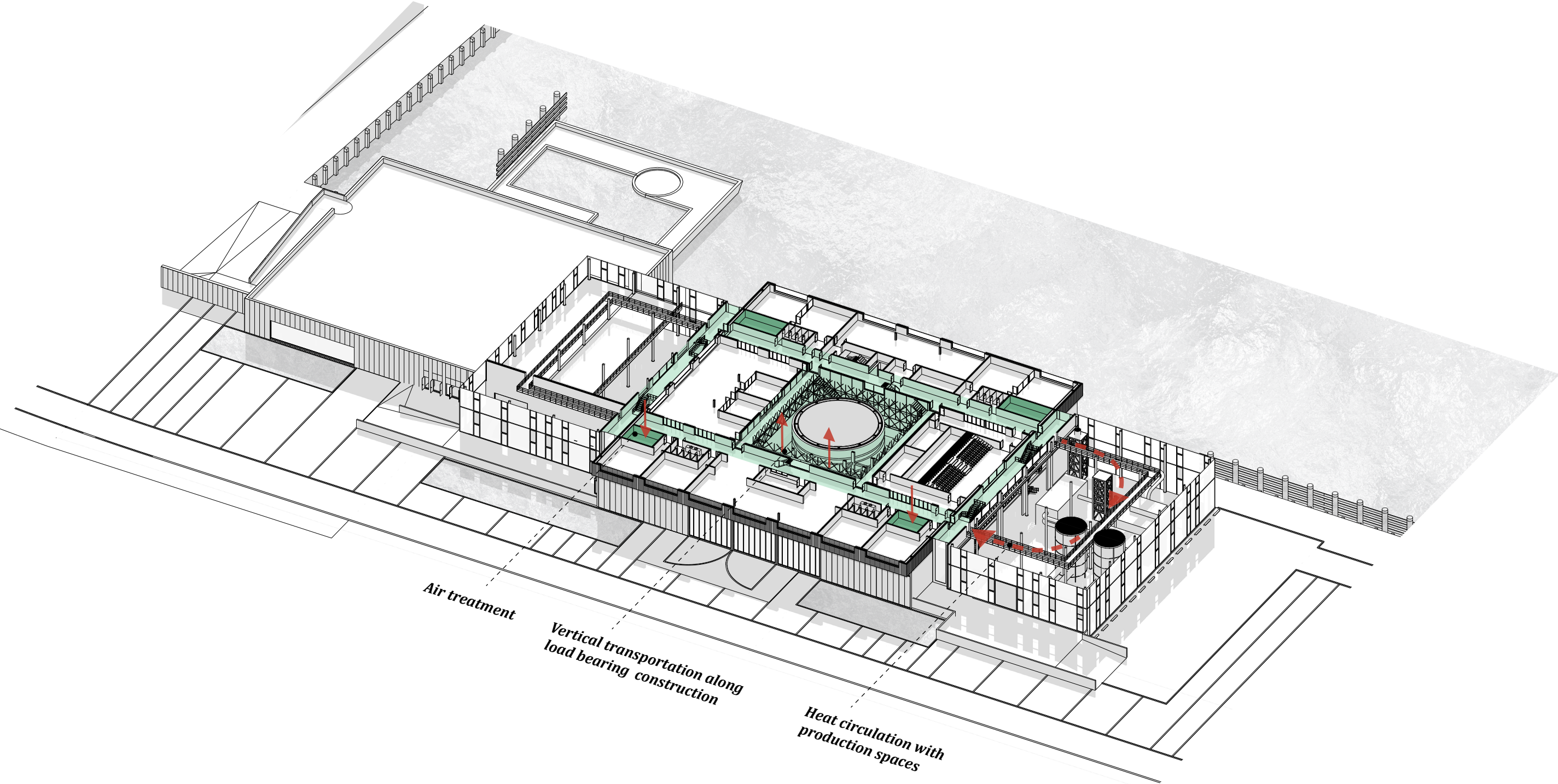
Climate zones

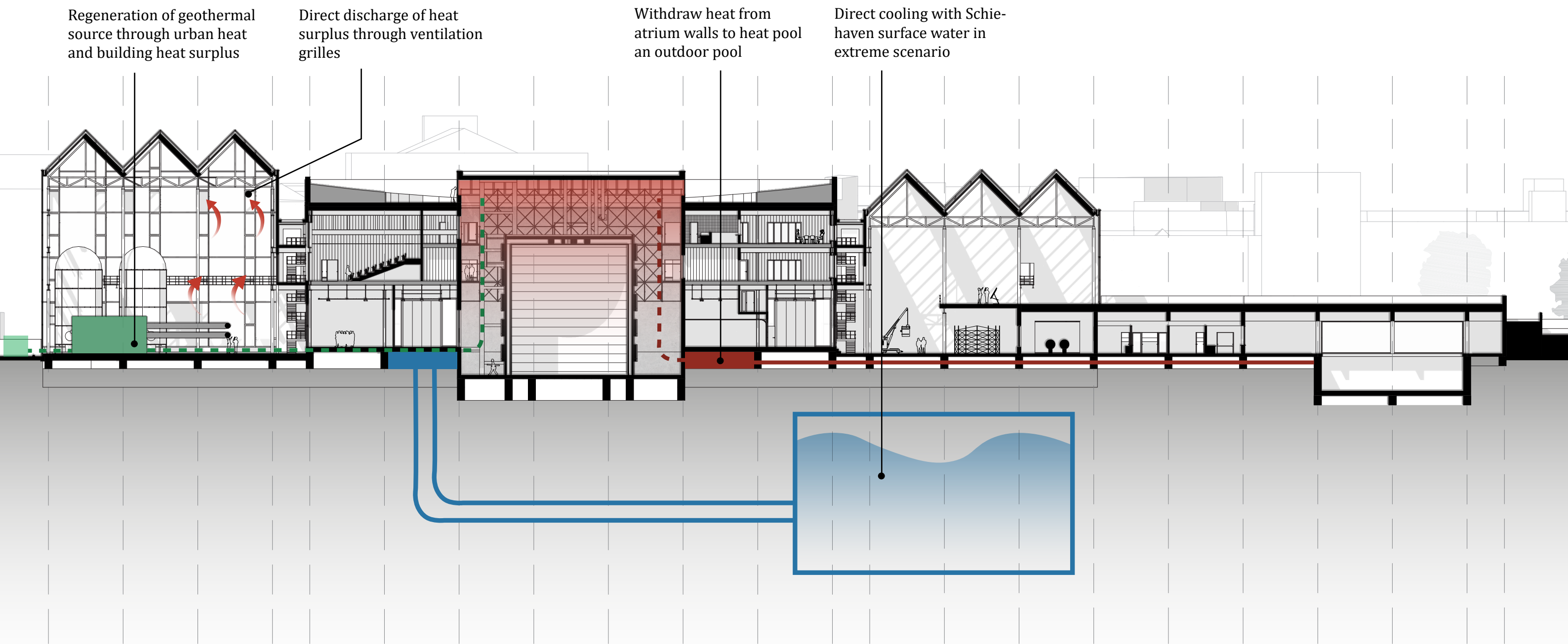
Image 43: Zones in section

- A1 Office and education
- A2 Public space
- B1 Factory climate
- B2 Public swimming pool









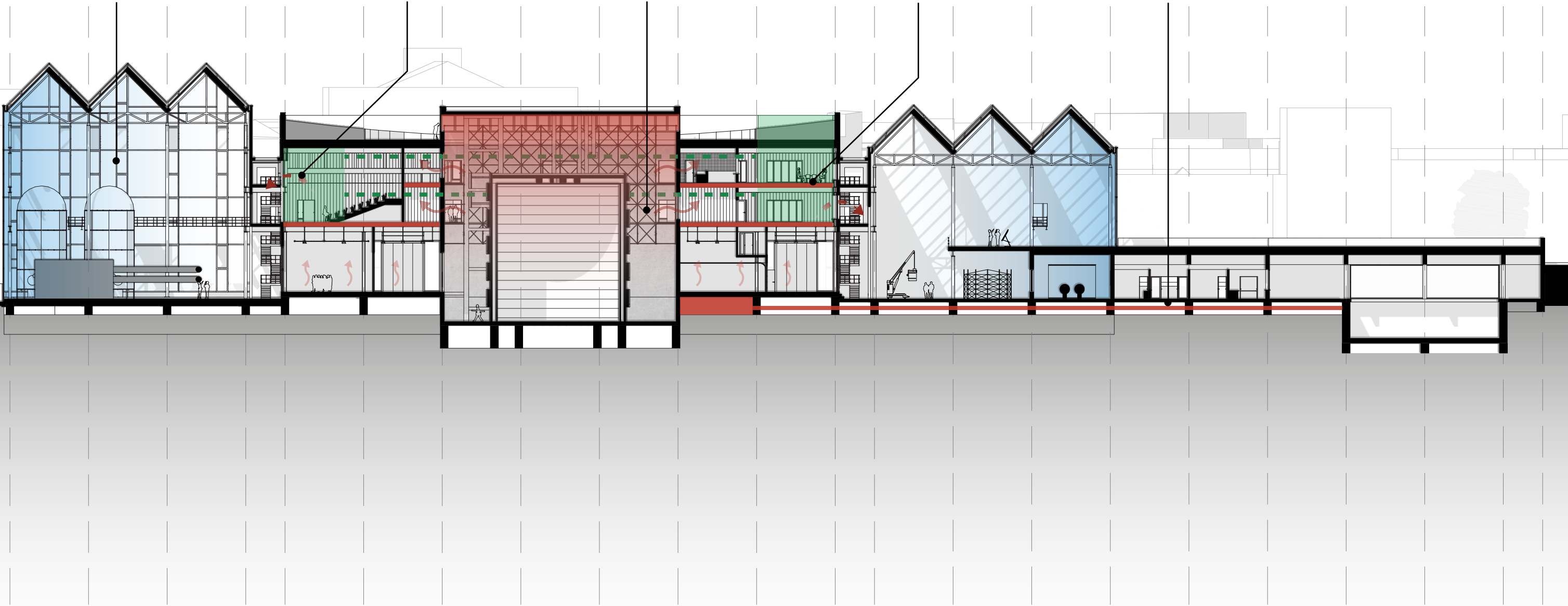
Greenhouse winter climate:
12-15C, to maintain a wor-
kable environment

Discharge of waste air to
boost production units cli-
mate to a min. of 12-15 C

Heat from heat storage atrium
indirectly exchanged to
office and education

Floor heating integrated
in compression layer in
office and education

Low temperature return
circuit supports public
pool and ground floor



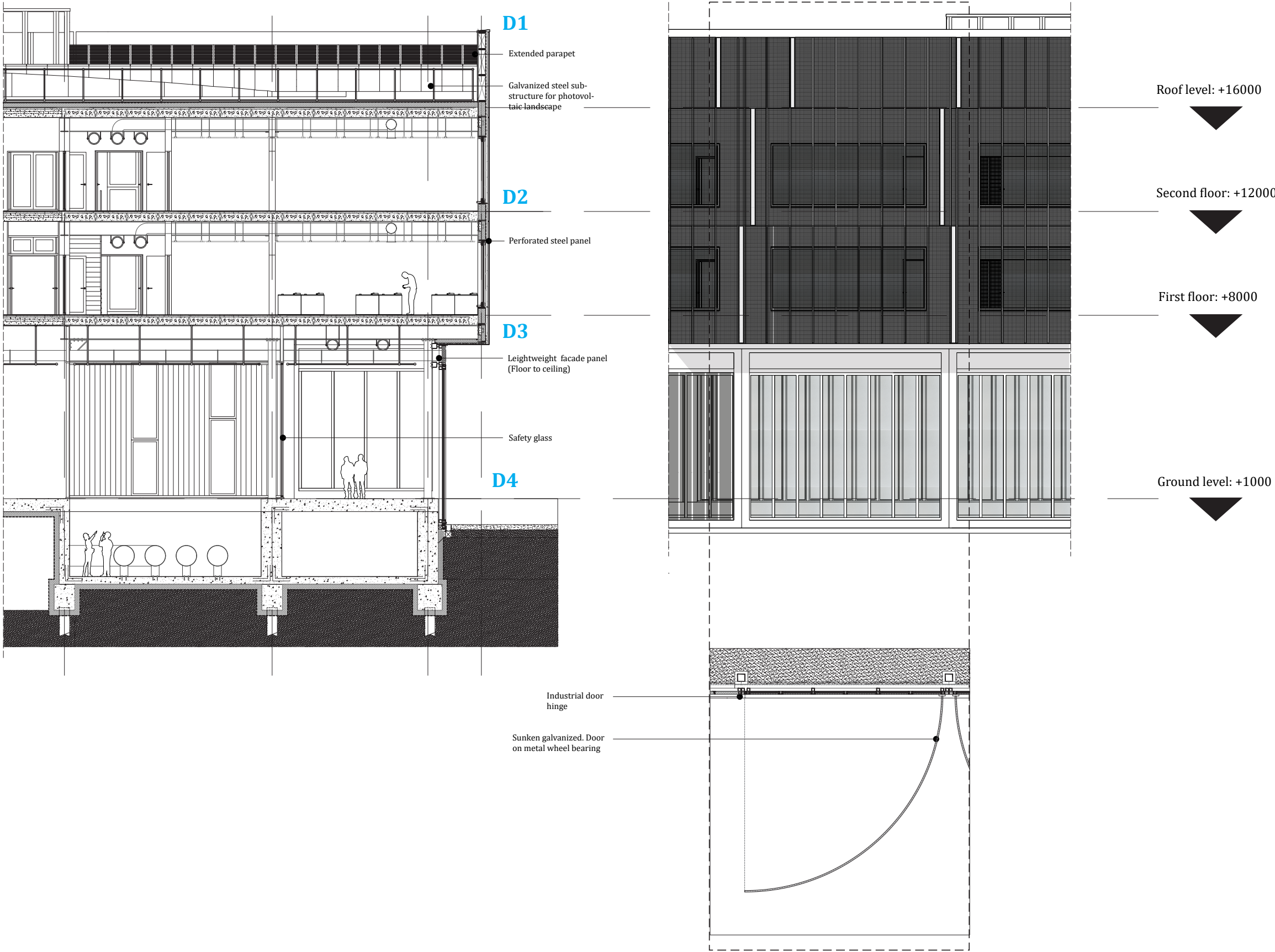


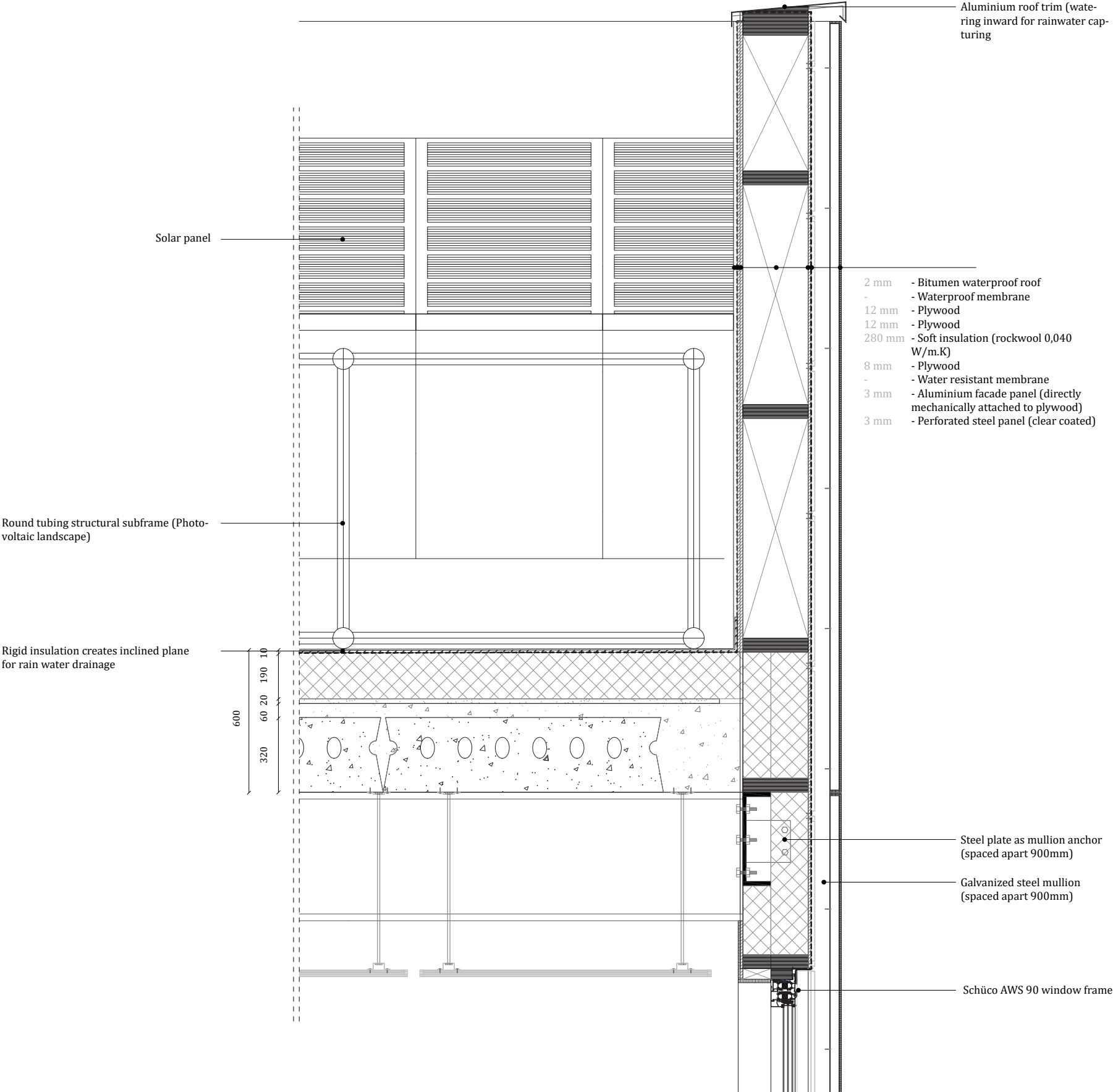
Image 49 North facade



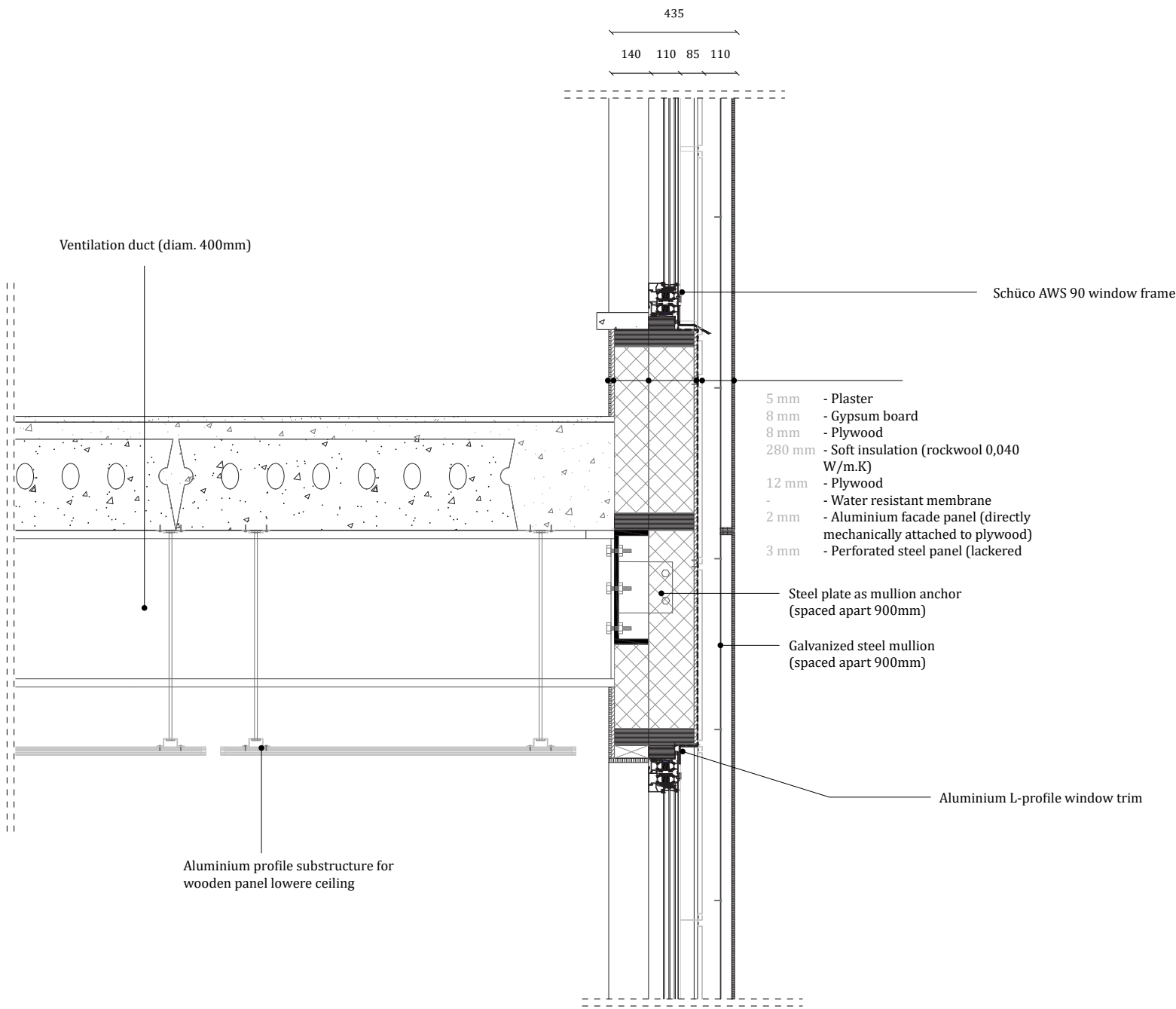
Image 50: Interior walkway



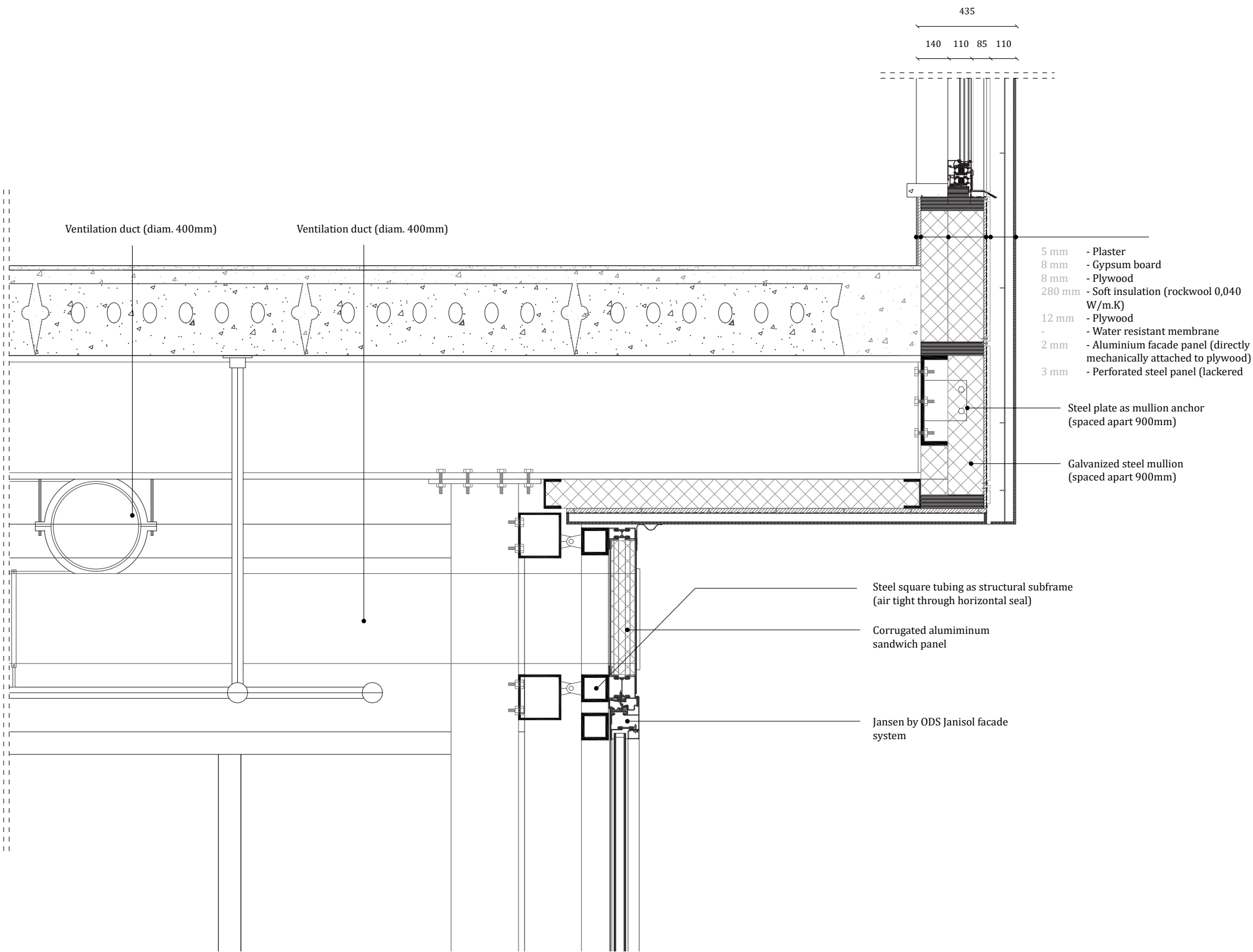
D1

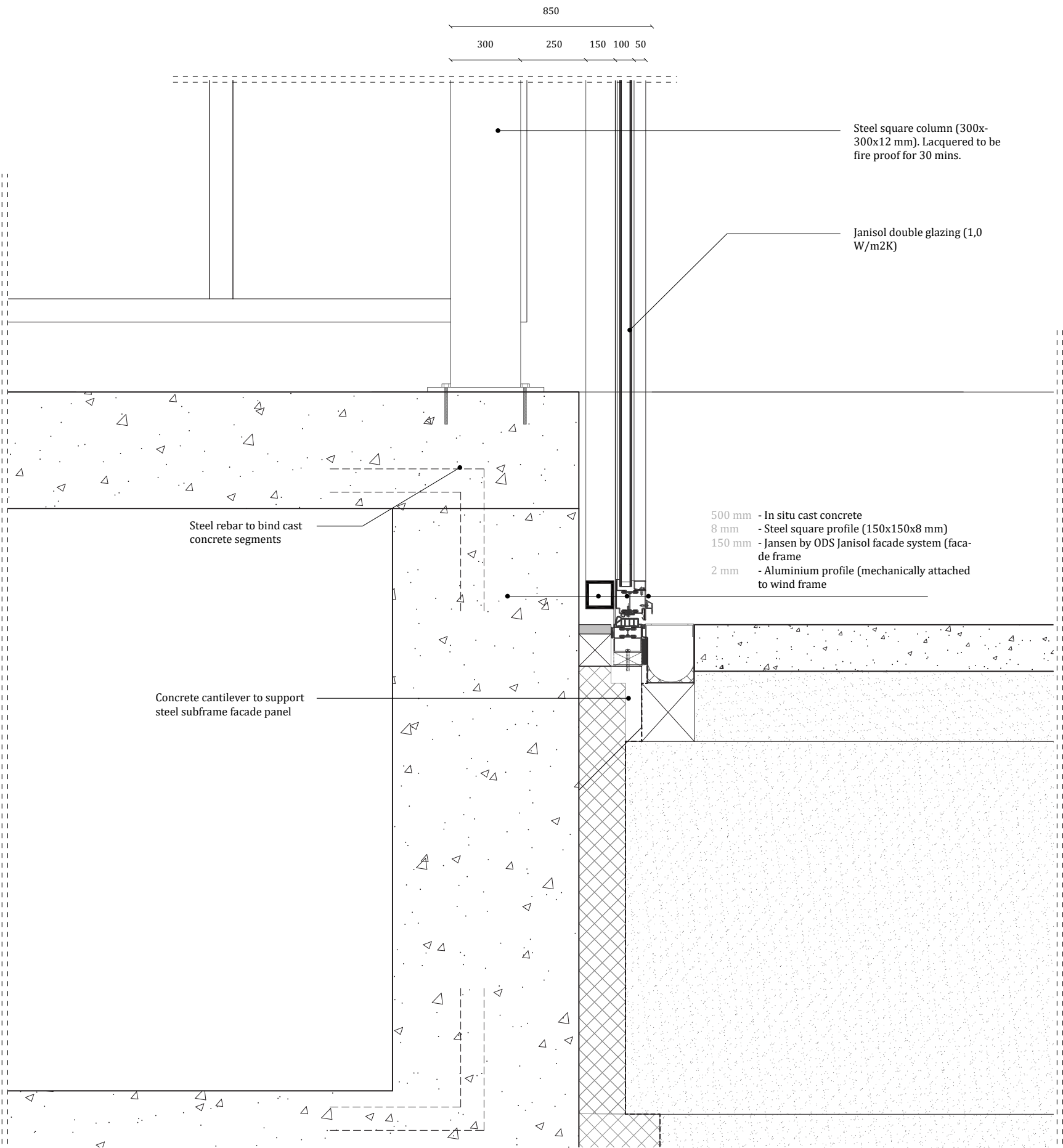


D2

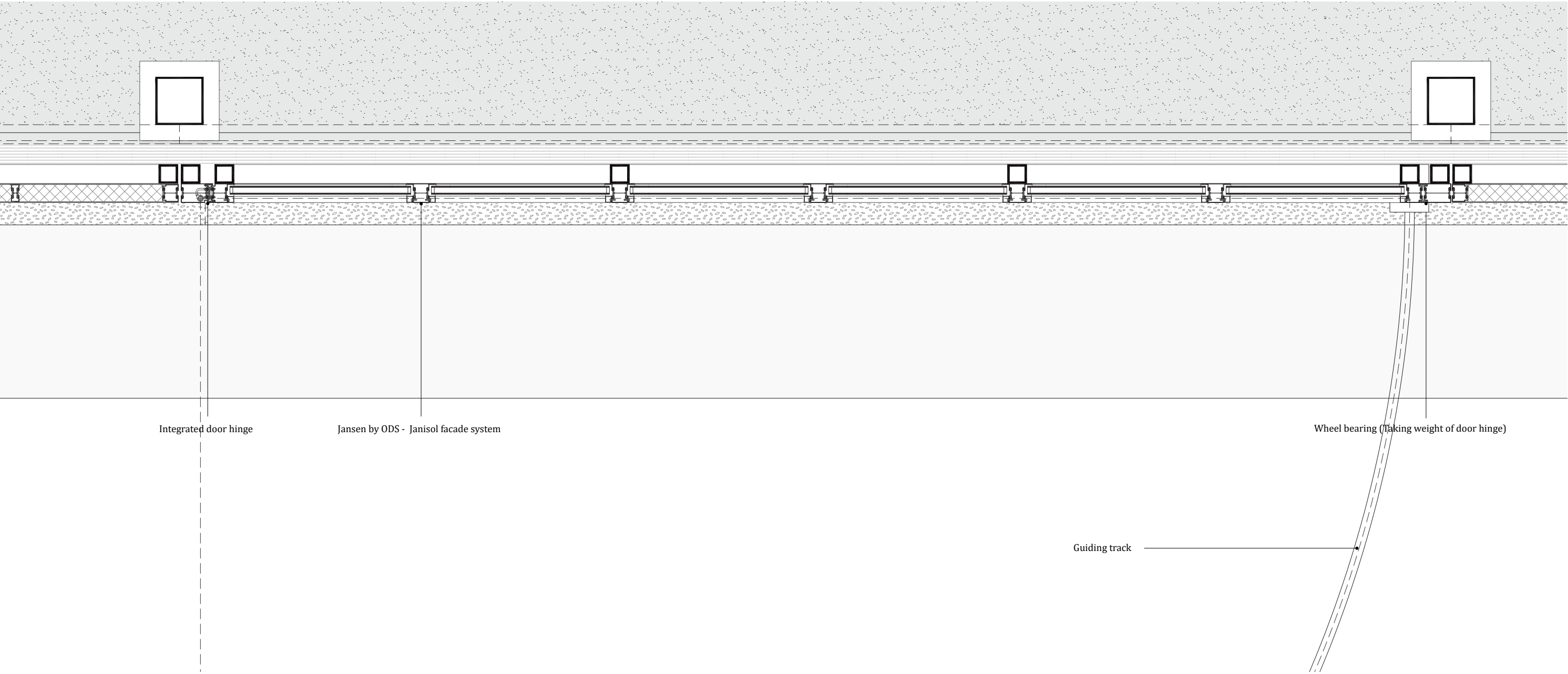


D3





D4



Relevant elements

Image 56: Perspective section



Building technology - Truss like ceiling system as flexible infrastructure space

Factorization - standardized window frame

Basement - expansion opportunities

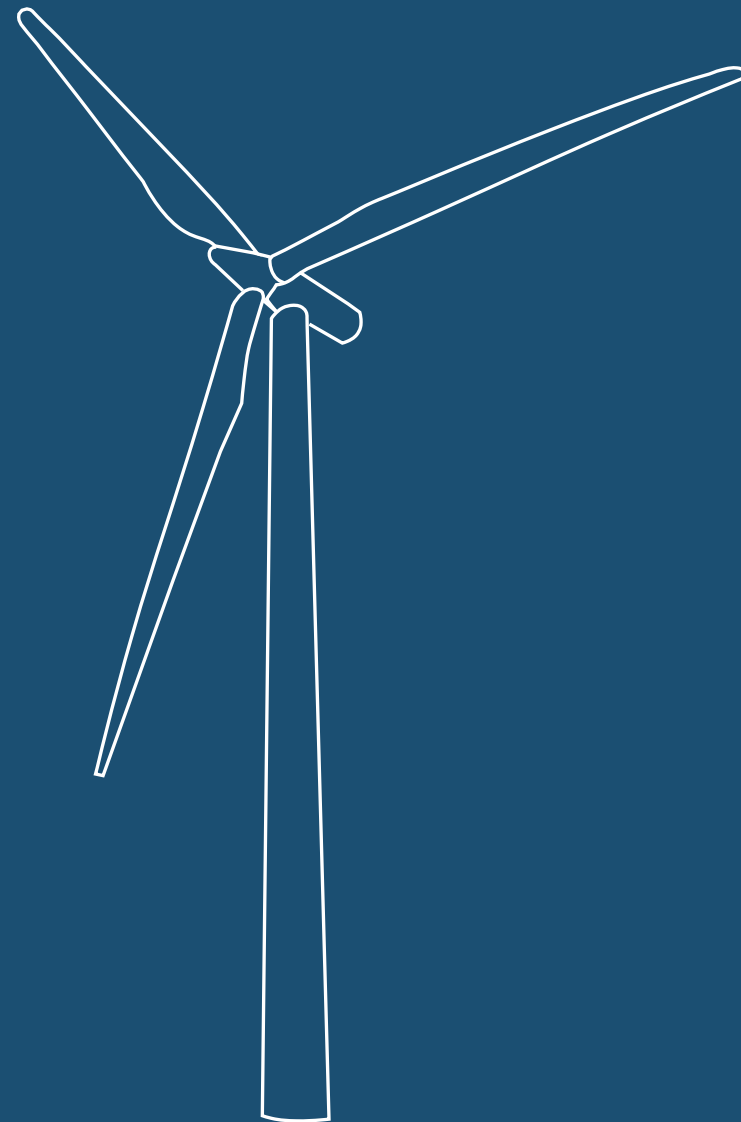
Public space as education spaces - Colour coded pipes and cables

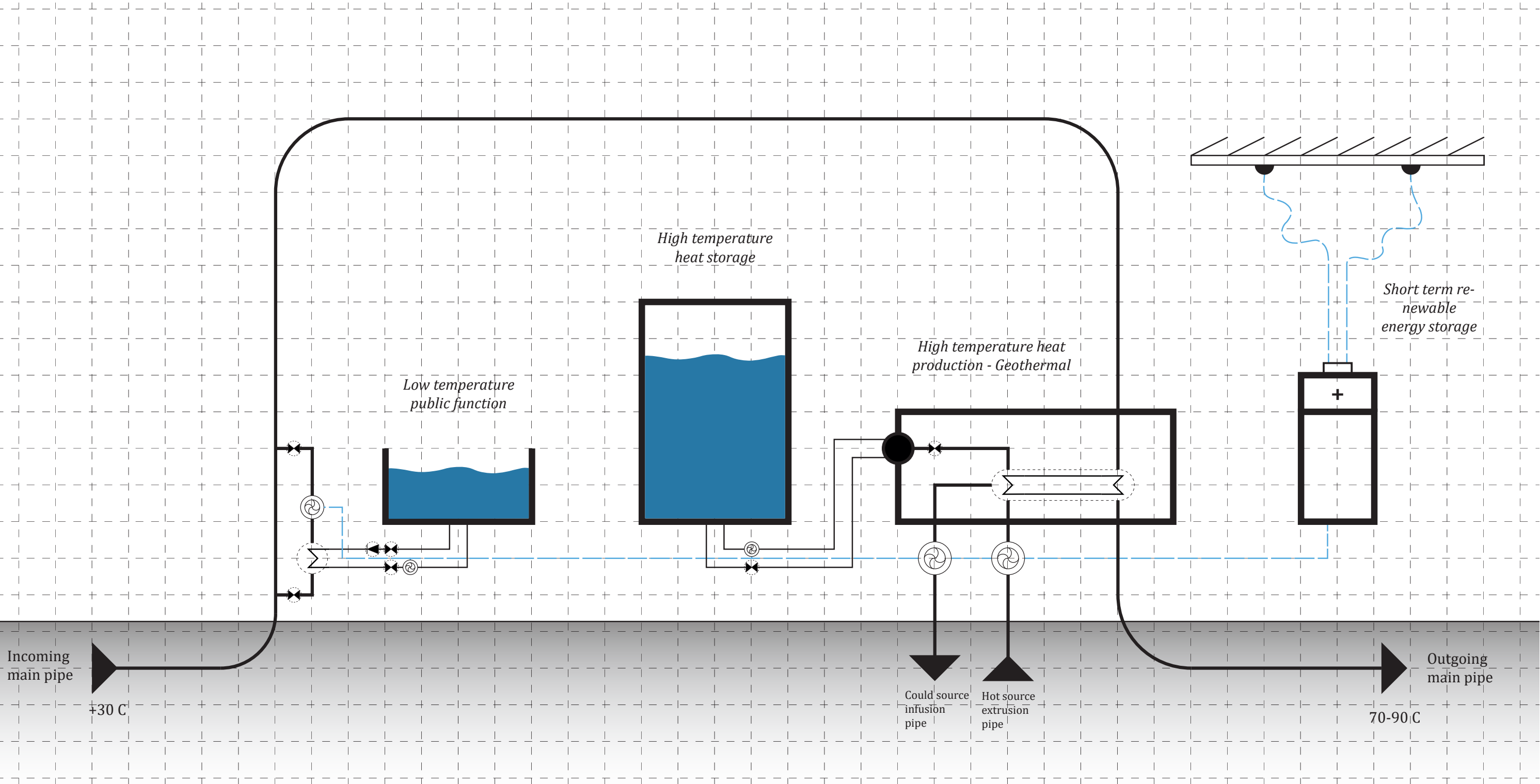
Factorization - Standardized facade panel (removable, movable, replaceable)

Image 57: Eastern wing ground floor



Energy





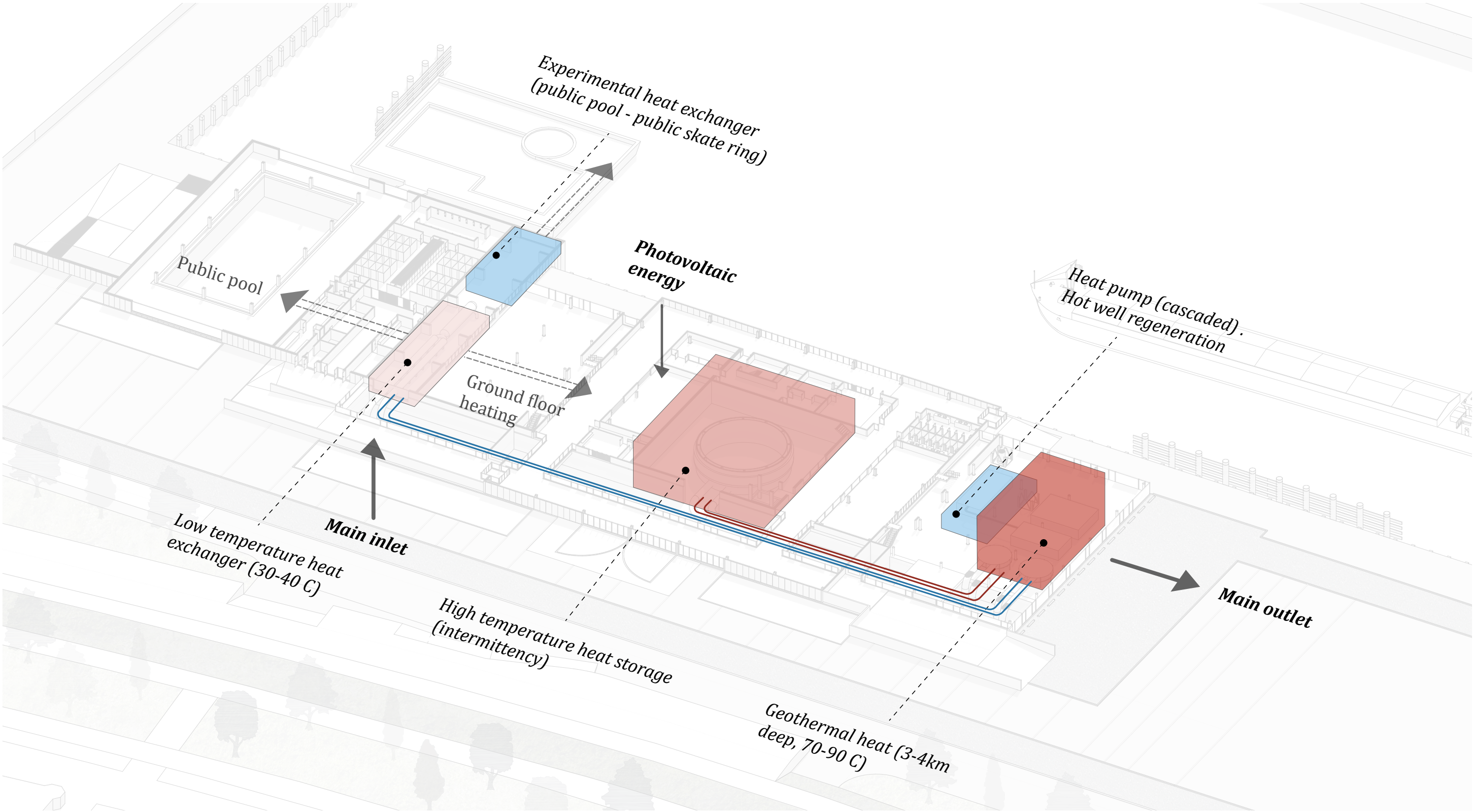


Image 60: Geothermal production unit



P5

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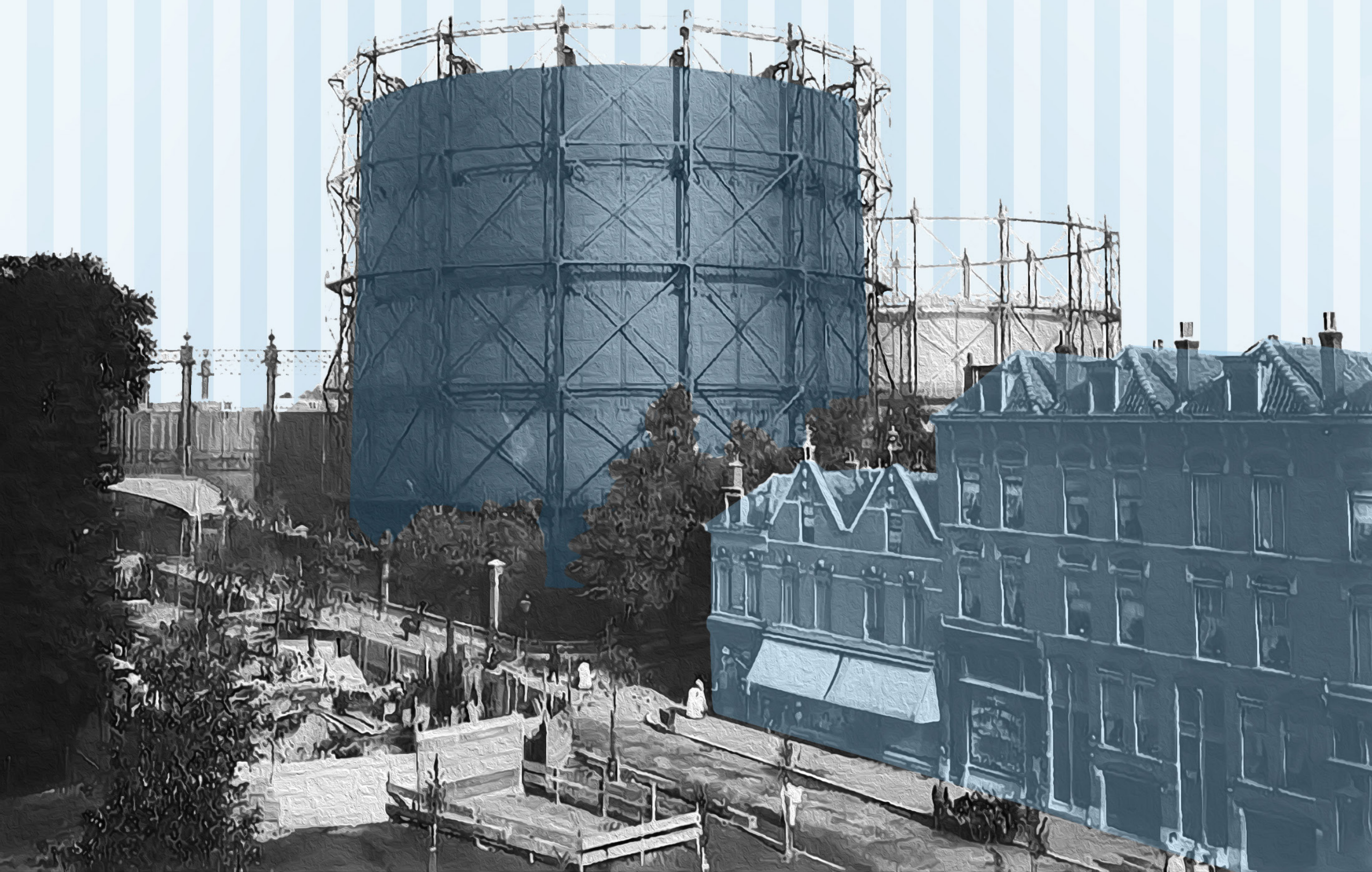


Image 61 - Closing page
Energy in the city
Photo - edited
[View of the Gas silo on the F.
aan de Lusthofstraat. Taken
from the gas factory on the
Oostzeedijk, 02 October 1908]



Questions?