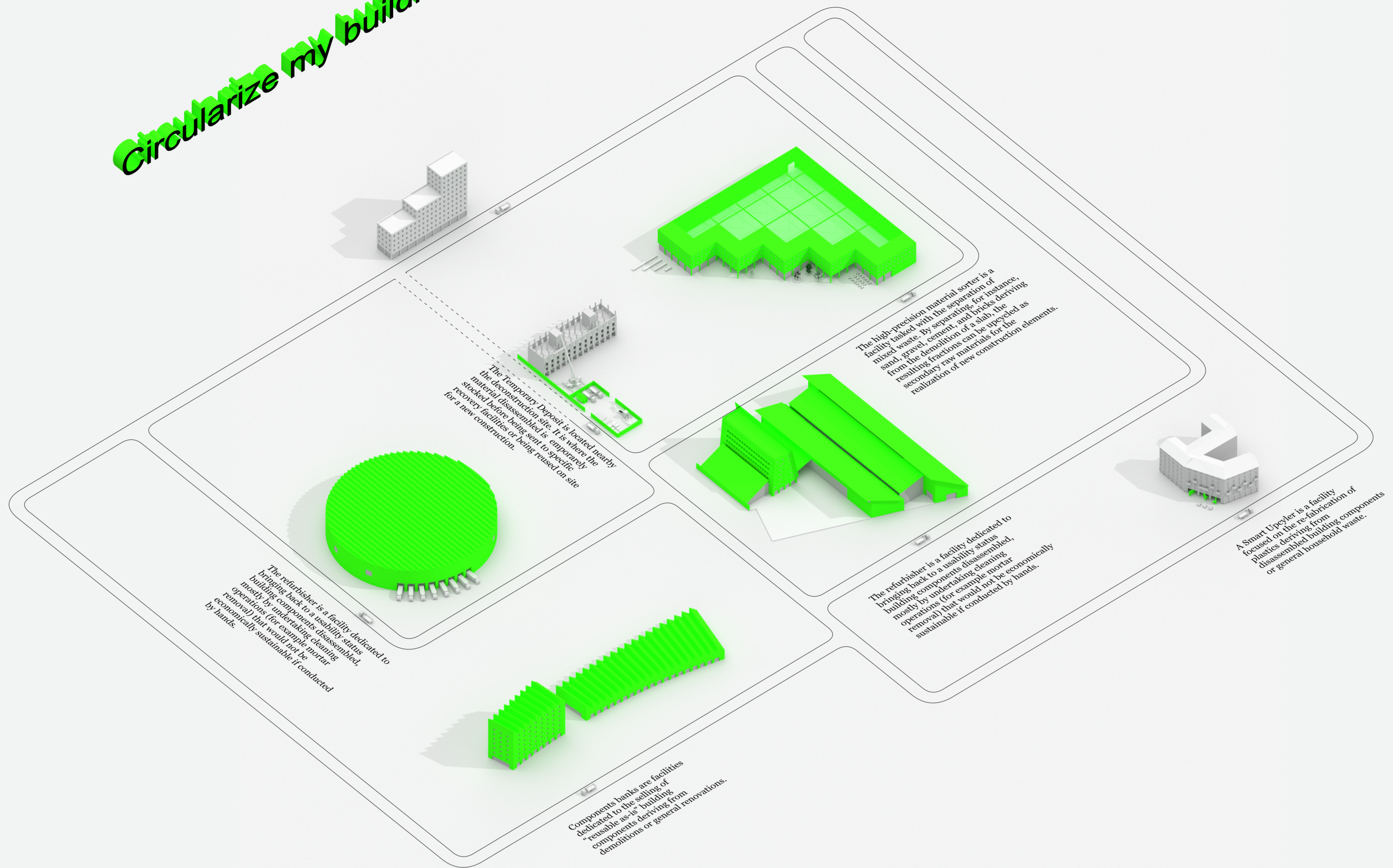


Circularize my building



Overall view of the six innovative facilities for a Circular Construction chain. Thanks to the Temporary storage, the Refurbisher, the High-precision Separator, the Material bank, the Bio-based Upcycler, and the Smart Upcycler, building components are within a closed loop.

The extraction of rapidly depleting natural sources, the consequent destruction of natural ecosystems and the production of CO₂ represent one of the main problems of contemporary society. Everything is aggravated by the demographic growth currently underway, which predicts an increase of 2 billion people by 2050¹ and by the fact that the current economic model is based on a linear system that generates products designed to become waste.

What is the role of architecture in this scenario?

The construction industry is responsible for generating 40% of urban solid waste² and exploiting a percentage of raw materials between 30 to 50 %³.

We have observed that in the Metropolitan City of Milan, this project area, more than 80% of construction waste starts to recover within the disposal centres.

However, what are the treatments carried out in them, and what are the reuse possibilities for secondary materials?

Circularize My Building the project highlights how the majority of flows are represented by low-quality mixed waste, whose reuse possibilities, after being processed by the disposal centers, are limited to road foundation.

The reasons for the inefficiency of the waste management system in Città Metropolitana can be found, as well as in the existing waste disposal infrastructure, not capable of recycling preserving quality of the materials, also in the inefficient demolition techniques and construction solutions, typical of the area, primarily responsible for the generation of

low quality waste.

How can we change these dynamics and make the construction industry in the Metropolitan City more sustainable?

Circularize My Building the project identifies, thanks to case studies and research consultations, three strategies for the adoption of a circular model in building industry, suitable for the context of Metropolitan City: selective demolition, reuse and high value recycle and design for disassembly. In order to make these strategies feasible, it is, however, necessary to introduce an adequate supporting infrastructure.

To reach this purpose, the work presented here aims to introduce six Innovative Facilities able to make the local construction industry circular. Among these new actors we can find the Temporary Deposit, where to stock dismantled materials temporarily on-site, dividing it basing on typology and destination; the High Precision Material Sorter, able to divide mixed waste into pure streams; the Component Bank, in which deconstructed materials are sold; the Refurbisher, where the components are cleaned from the mortar before reuse, the Smart Upcycler, a small scale facility involved in recycling plastic and, finally, the Bio-based Material Upcycler, which recycles bio-based materials from building industry and other supply chains.

The infrastructure is organized in the territory according to a widespread model, for which many medium-small sized facilities are preferable to few larger plants. The project aims to bring the city closer to these new environments of reuse and recovery, making them more accessi-

ble and extirpating the paradigms that would exile disposal activities to peripheral areas. The adoption of a widespread model allows obtaining better proximity between the facilities, the places of waste generation and the ultimate destinations of the materials treated, as well as greater resilience of the system, able to adapt quickly to market demands.

Finally, the thesis project aims to develop a pilot project on an architectural scale, which will represent a manifesto for the new circular infrastructure: Re-Tile.

The development of a pilot project is also an opportunity to define a planning model for innovative facilities, which consists in quantifying the demand for managed material, in its pre-sizing and in identifying the most favourable places for its settlement.

To be integrated into the urban context, Re-tile was designed adopting measures such as, for example, the visual permeability between exterior and interior, the creation of public spaces and the inclusion of a mixed program capable of making it attractive to the public. The architecture itself promotes the new circular supply chain, from compositional choices to technological solutions.

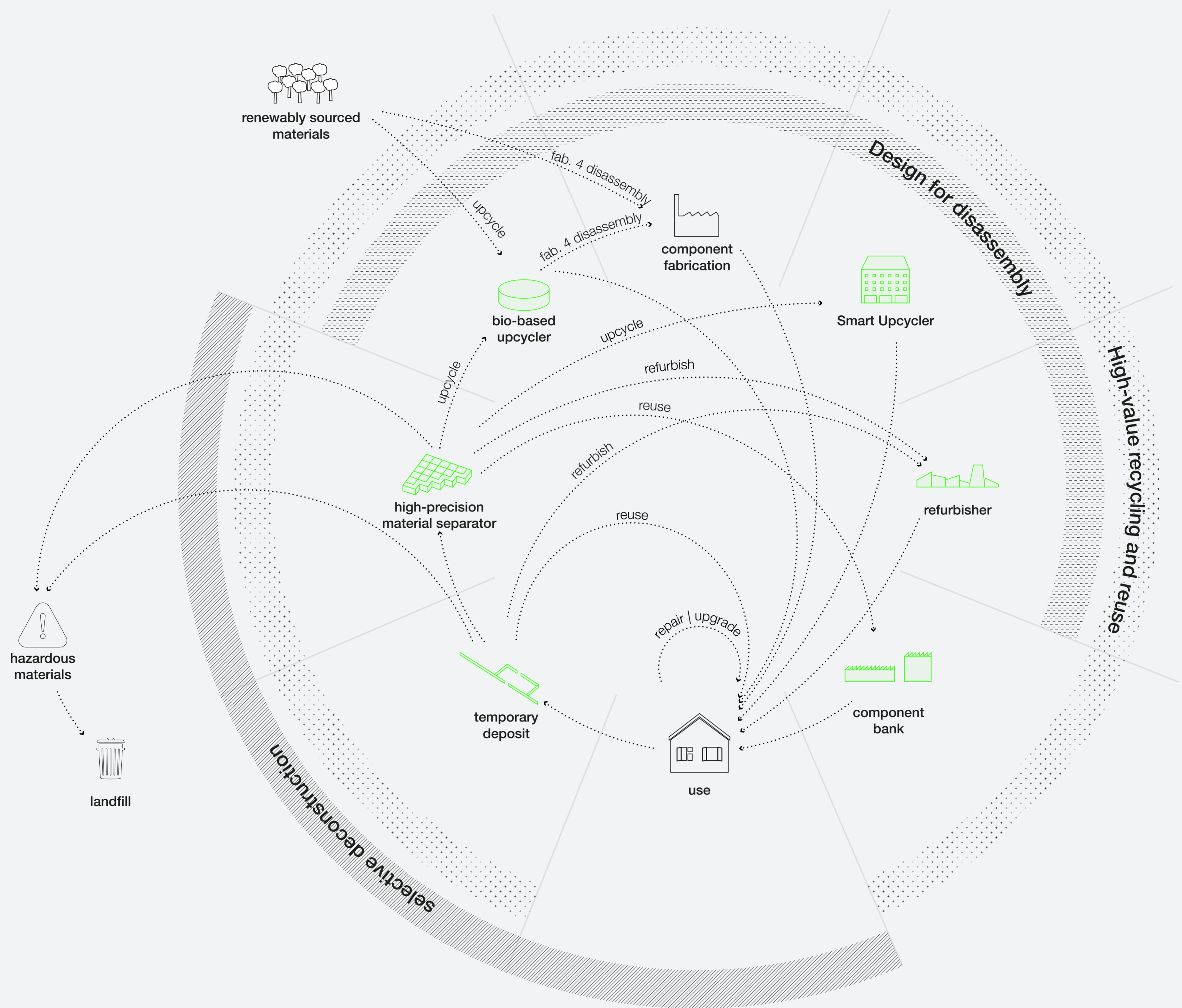
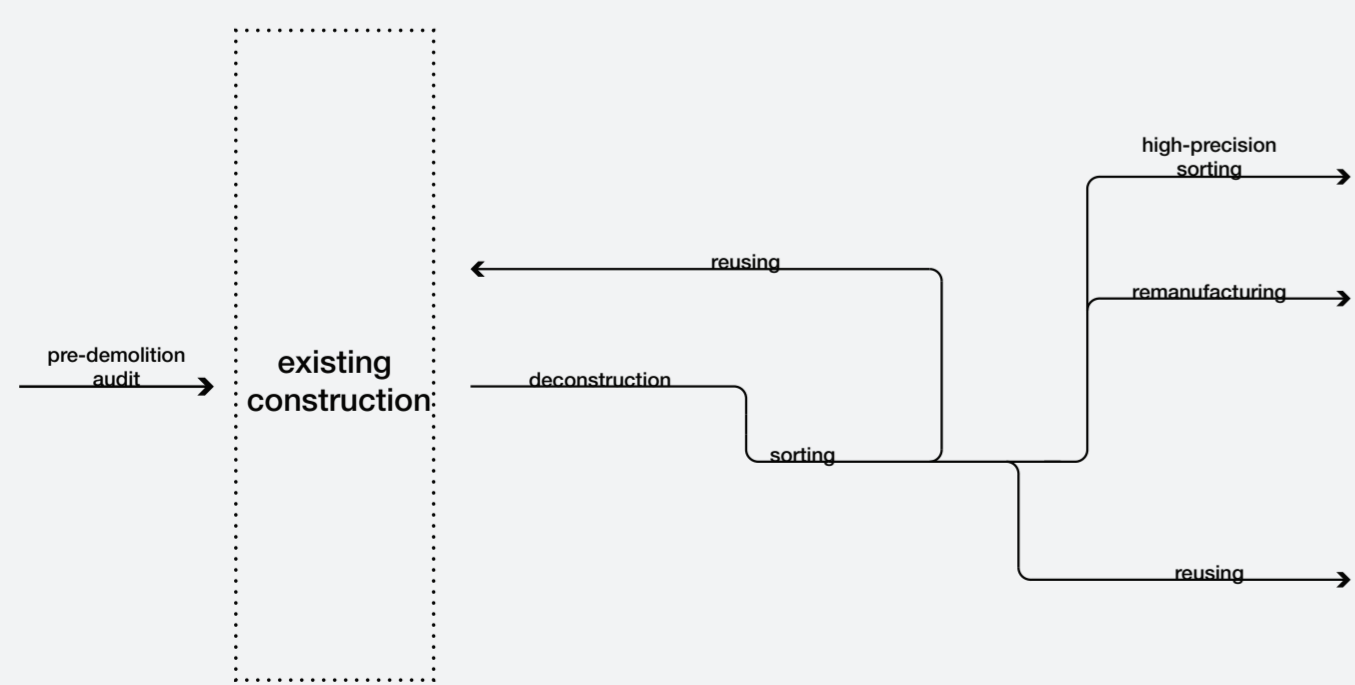


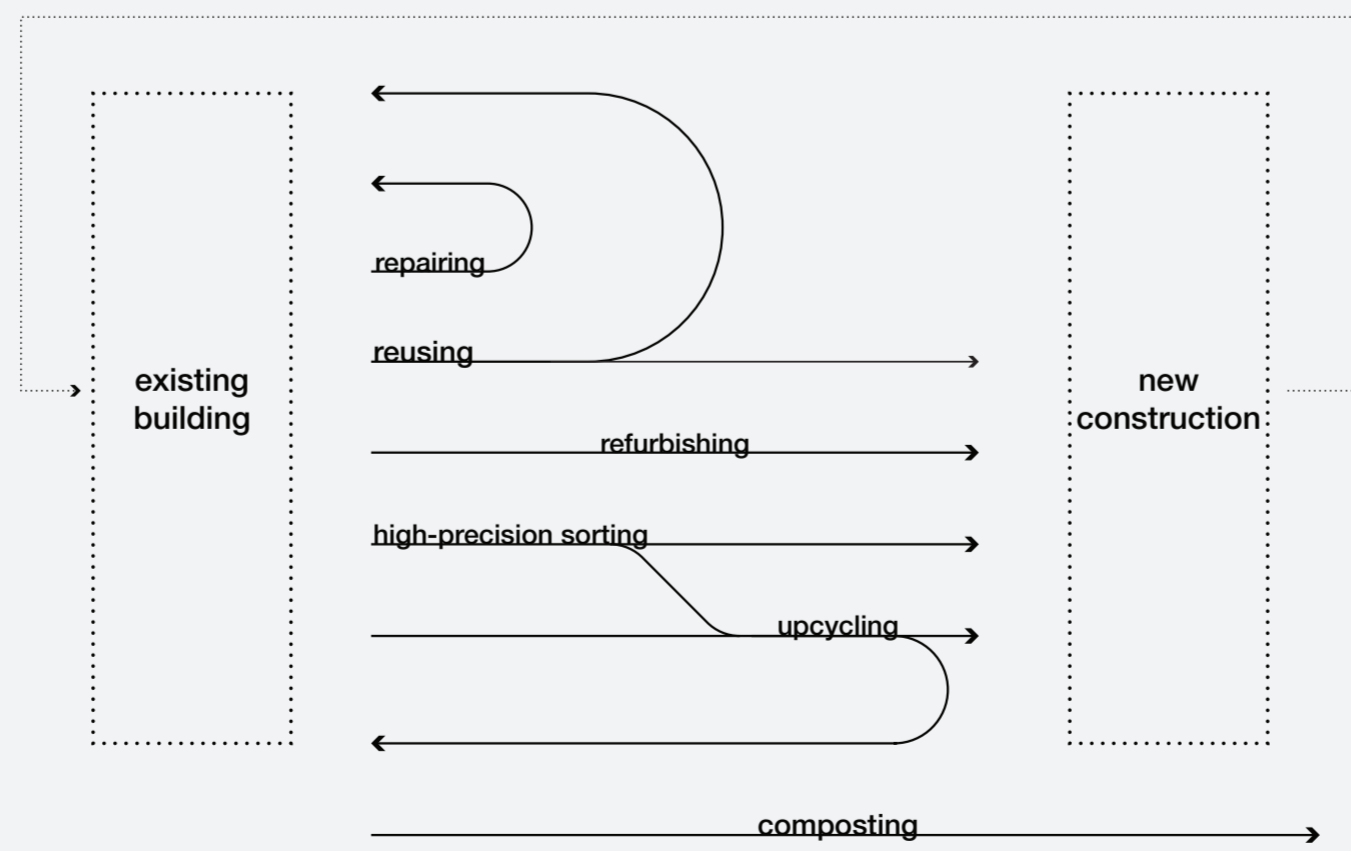
Diagram displaying the fluxes of materials within the proposed circular construction chain. The system relies on the operations performed by the innovative facilities, able to activate the 3 strategies proposed in Chapter 3 for Città Metropolitana

selective deconstruction



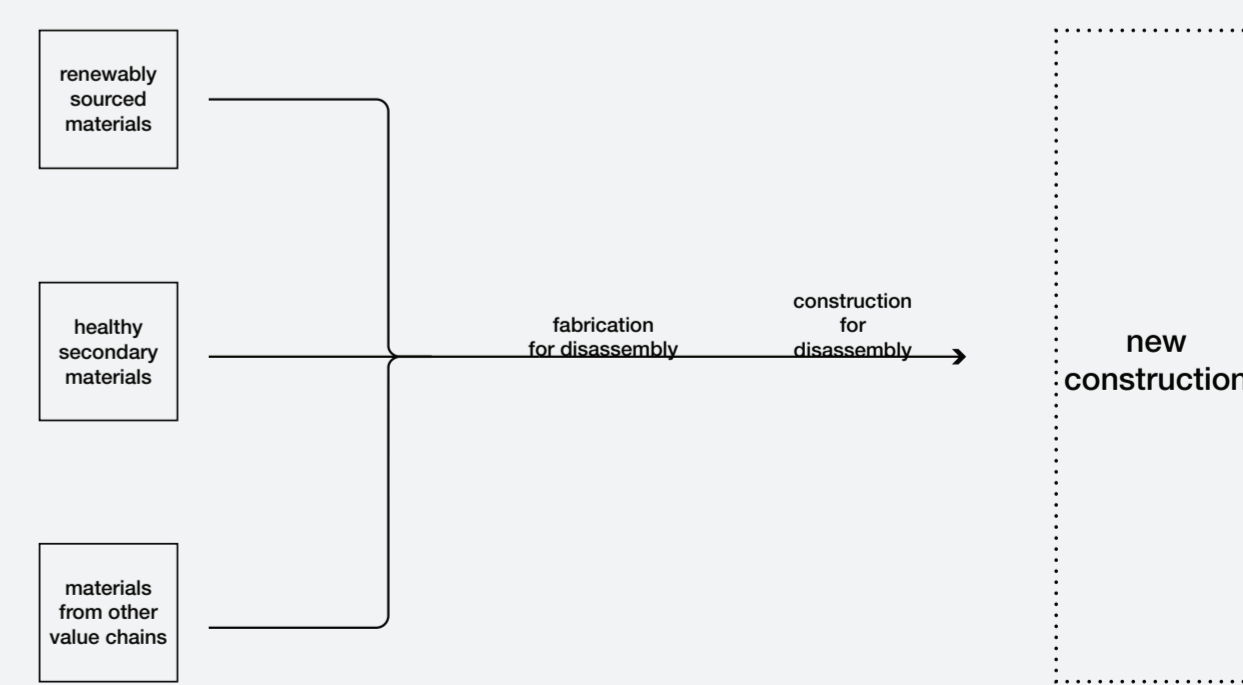
Diagrammatic representation of the Selective Deconstruction strategy

high-value recycling and reuse



Diagrammatic representation of the High-value Recycling and Reuse strategy

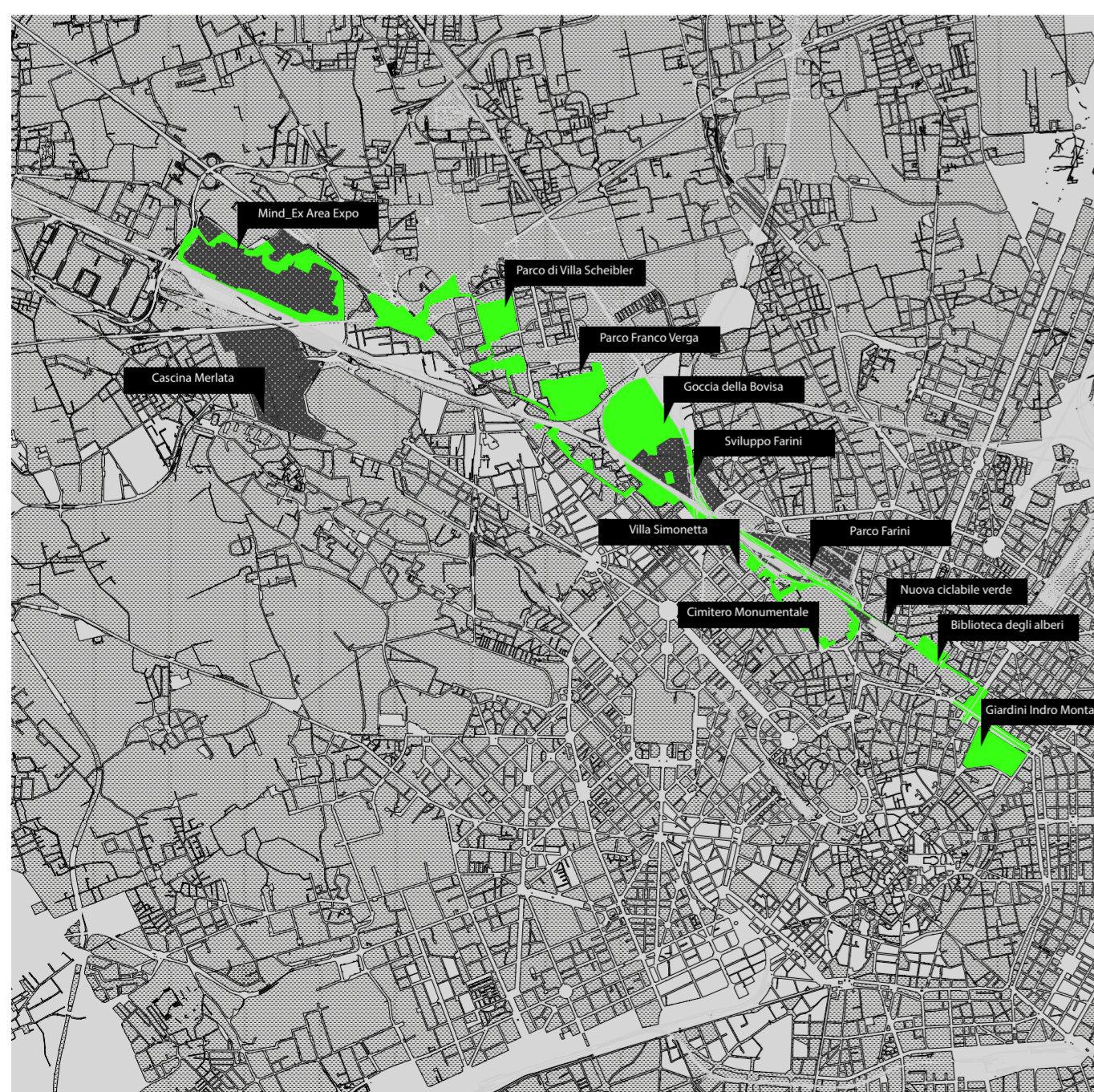
design for disassembly



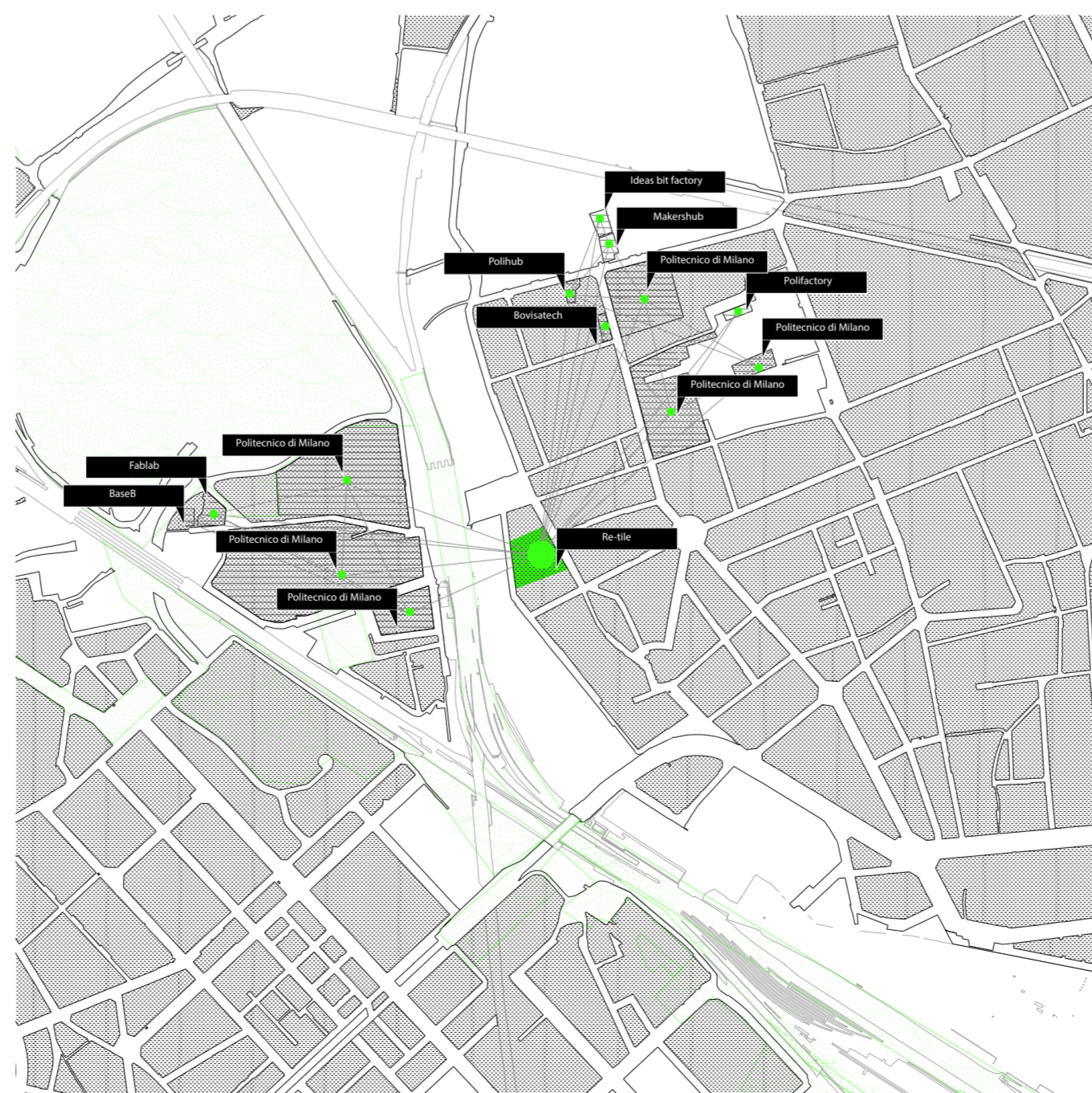
Diagrammatic representation of the Design for Disassembly strategy



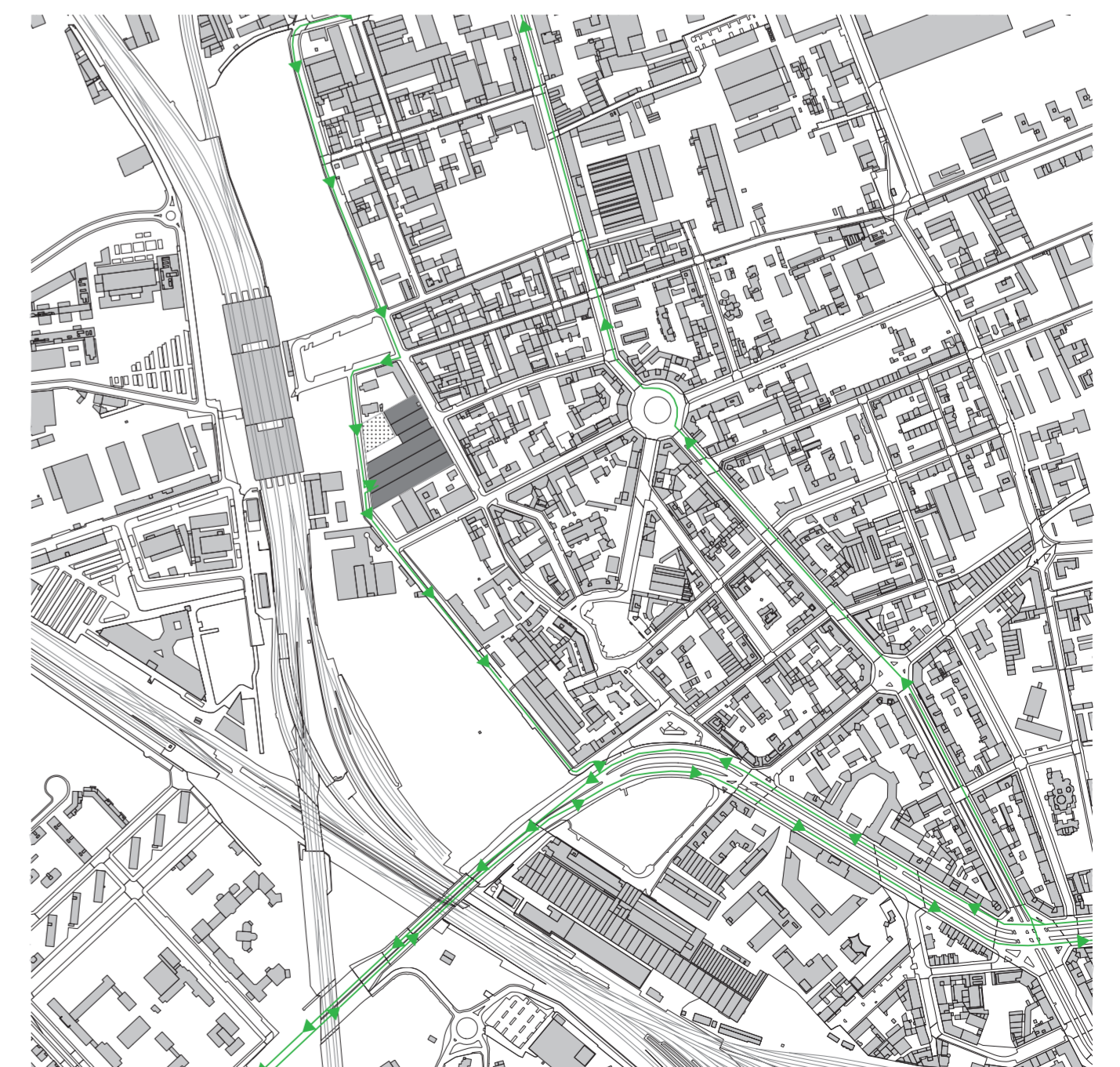
Re-Tile, view from Via Emilio Broglio. The pedestrian passage allows for the crossing of the plot in East-West direction.



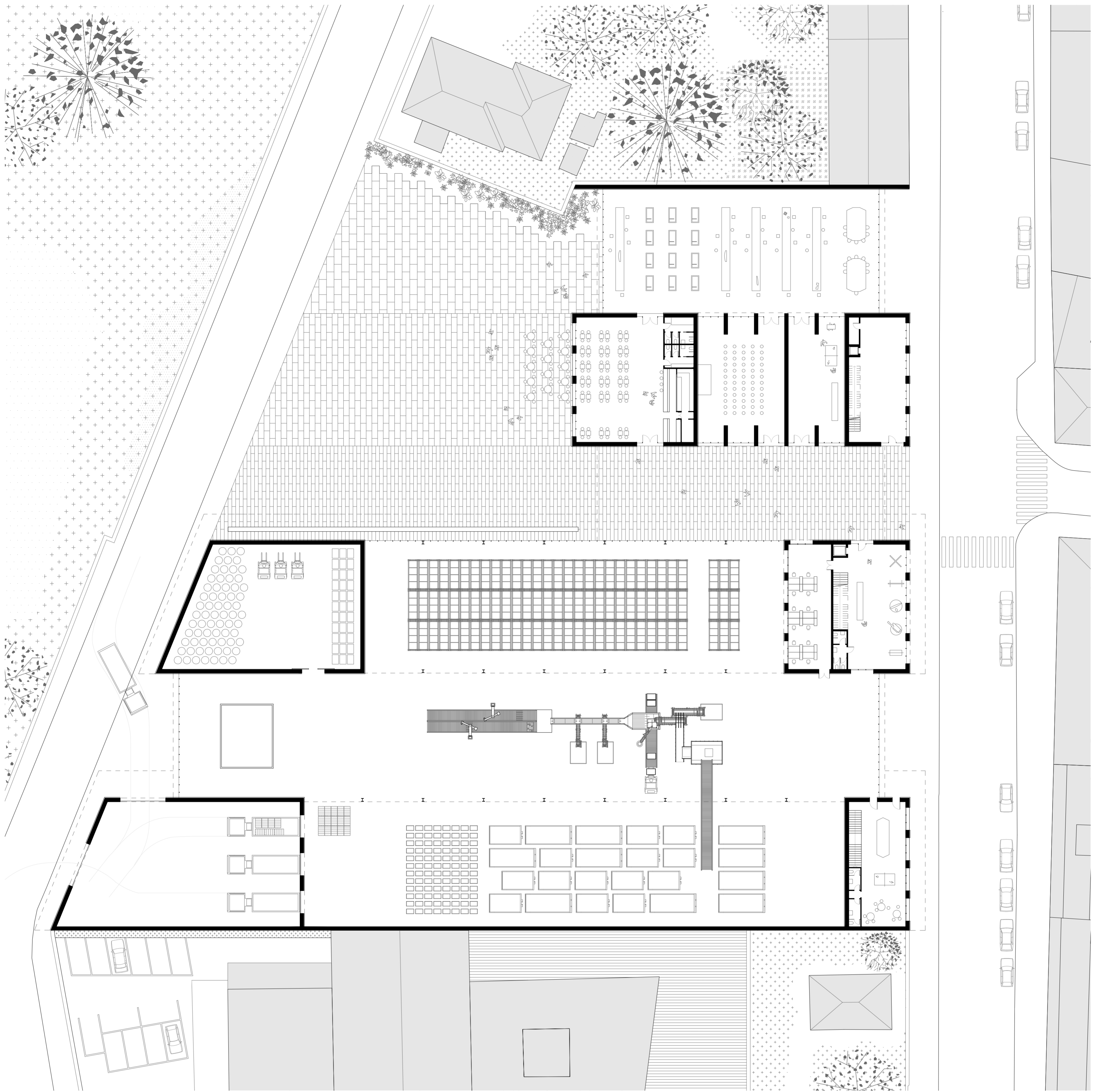
The project plot is part of an "innovation axis" going from Porta Nuova district to the Expo Area, and including several urban redevelopment projects. These areas will be linked in the future by a linear park forecasted by Milan's municipality Green Rays strategy.



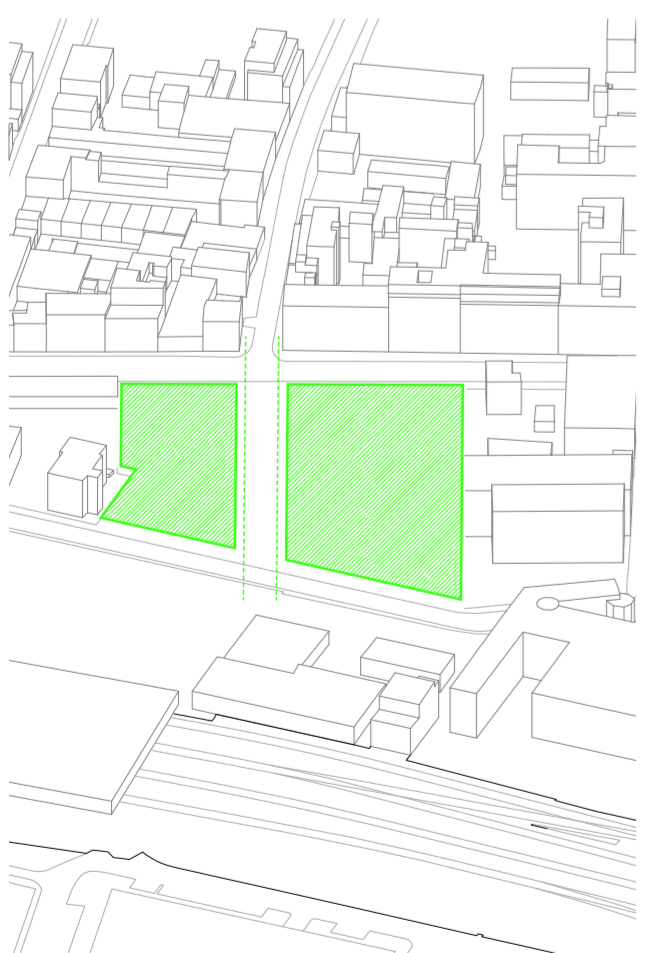
The presence of many innovation spaces in Bovisa allows for the potential establishment of synergies between Re-Tile and the local economic fabric.



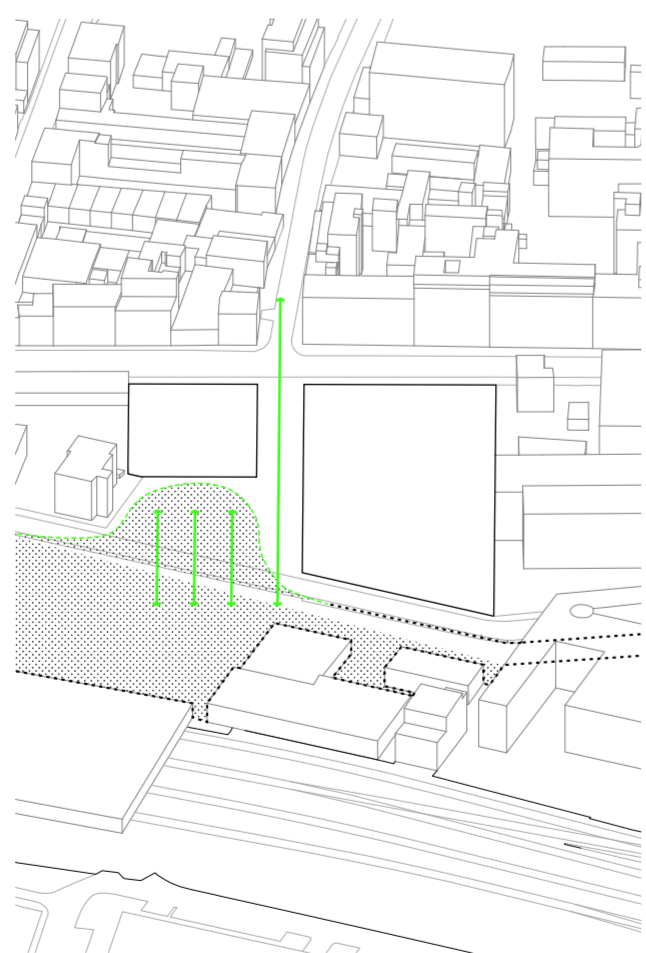
Project localization and forecasted truck route.



Re-Tile's groundfloor plan, scale 1:300



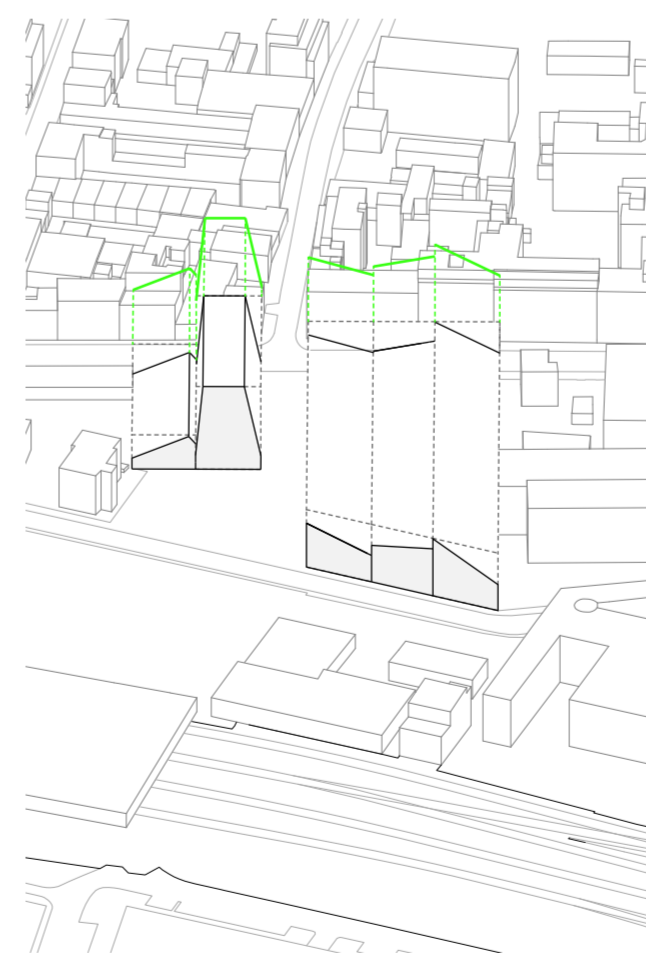
Concept diagram, step 1:
The plot is divided in two following the shape of the surrounding urban fabric.



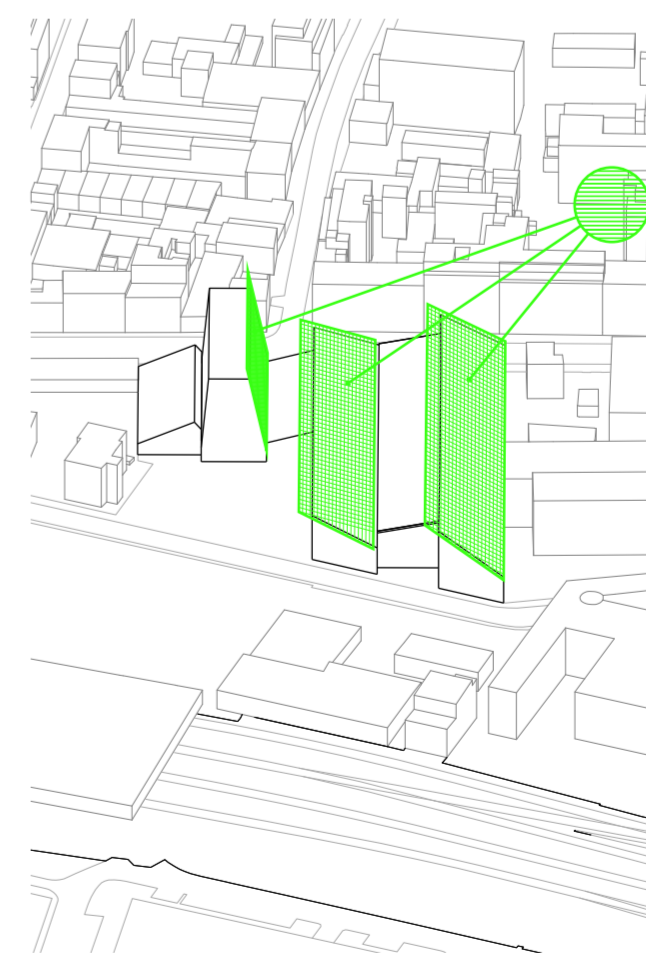
Concept diagram, step 2:
The division allows for the pedestrian permeability of the plot, in continuity with Via Emilio Broglio. A square is located in the North-West corner of the plot, generating potential interactions with the linear park expected by PGT and an appealing public space for the neighbourhood.



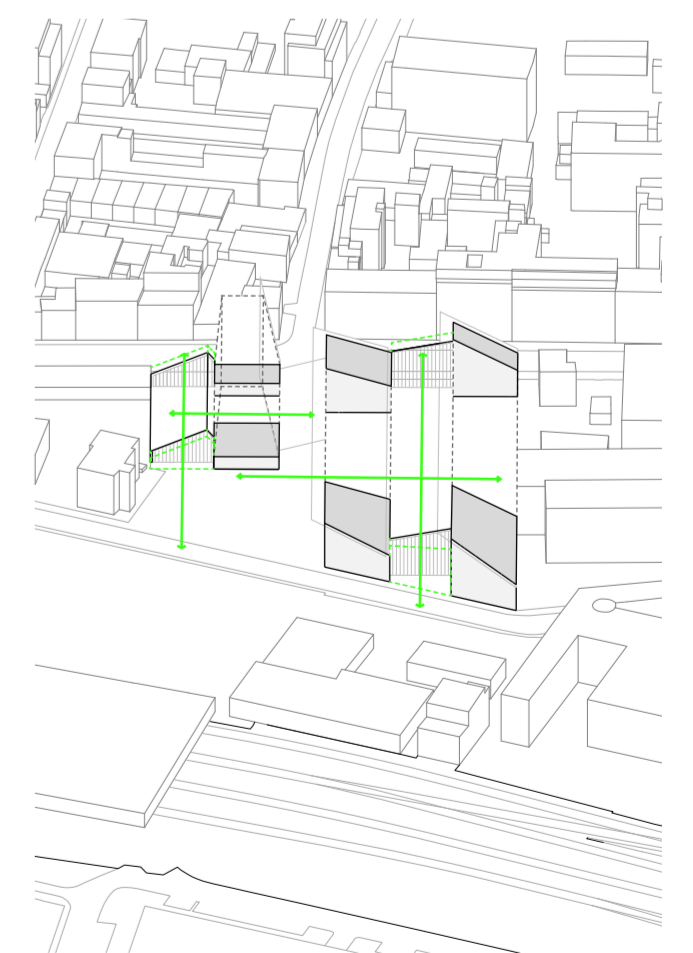
Concept diagram, step 3:
The program is distributed in stripes perpendicular to Via Bovisasca, on of the main road axes of the area, in order for each of the activities carried on at Re-Tile to become part of the urban realm.



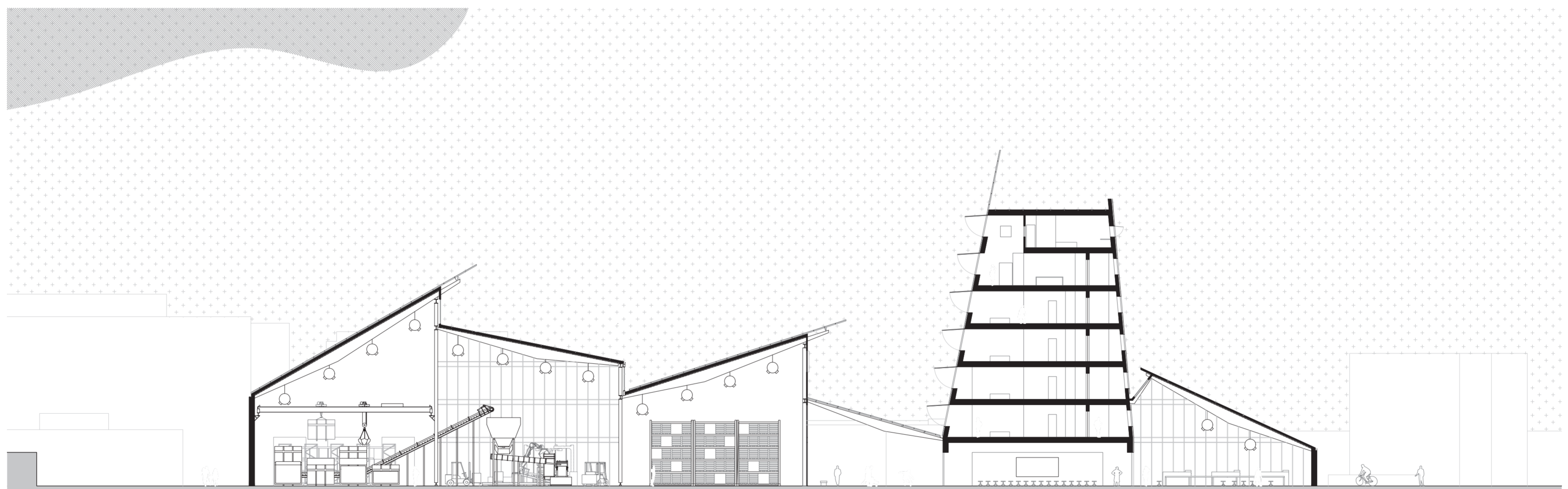
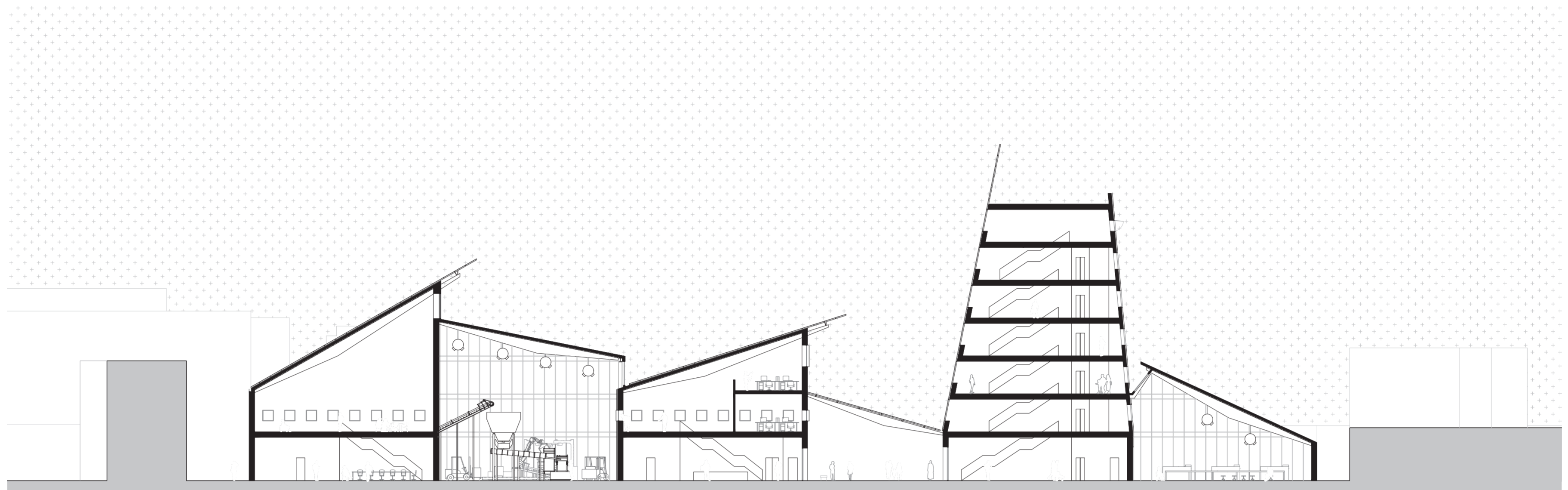
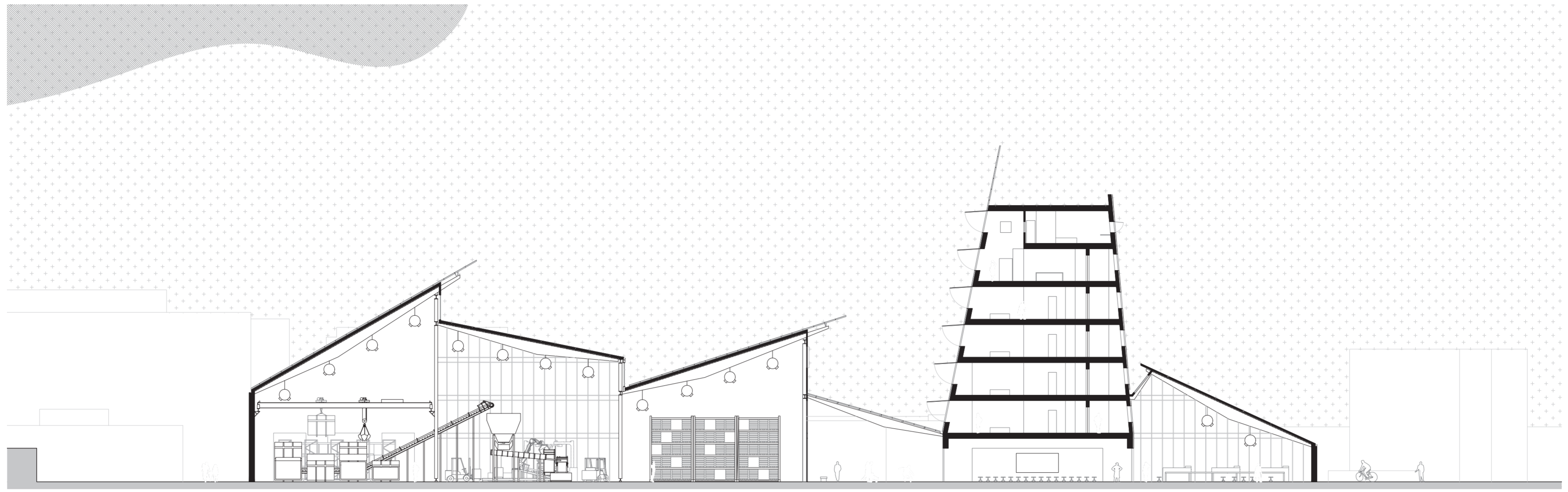
Concept diagram, step 4:
The volumes are sliced by oblique planes, generating sheds that resemble Bovisa's industrial architecture tradition.



Concept diagram, step 5:
The sheds inclination allow, for those that are South oriented, to become massive solar collectors, while letting diffused natural light coming in from the North side.



Concept diagram, step 6:
The most visually appealing activities are displayed to the city thanks to transparent enclosures. Moreover, the sense of permeability is further highlighted by pushing-in the envelope of the transparent sections.



From the top to the bottom:
 Transversal section, scale 1:300
 Elevation on Via Bovisasca, scale 1:300
 Transversal section, scale 1:300



WHAT?	WHY?	WHEN?	WHO?
0.1 Factory	Production site, space in which there's circulation of materials and processes	Mon-Fri 9/18	Workmen
0.2 Office Space	Administration space, mainly offices and related services	Mon-Fri 9/18	Officemen
0.3 Fablab	Workshop activities related to the topic of reuse of CDW. Sort of handicraft lab.	Tue-Sun 10/19	Students, expert, Bovisa community, children
0.4 Multifunctional area	A internal space in which having public conferences over the topic of circularity and waste management criticalities	Occasional Opening	Everybody

0.5 Showroom	Space inside the factory where are exposed the materials treated	According to factory open hours Mon-Fri 9/18	Everybody
0.6 Square	Public square to open the neighborhood to activities of Re-Tile	Always accessible	Bovisa neighborhood
0.7 Coffee shop	Small coffee shop available for the community	Mon-Sun 10/23	Bovisa neighborhood
0.8 residential area	Apartments of different sizes to obtain a multi-functional space and valorize the area	Private	Residents



Interior view of the factory area.

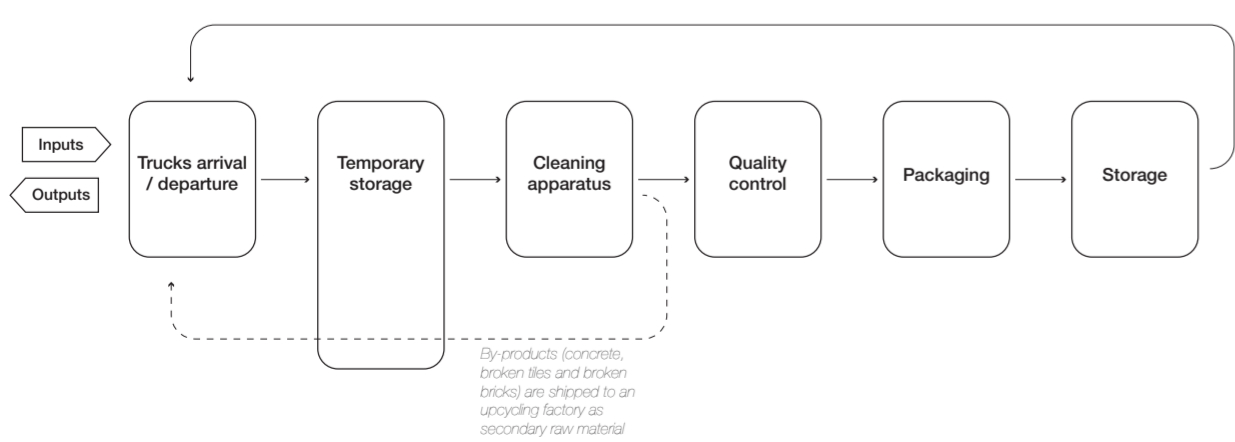
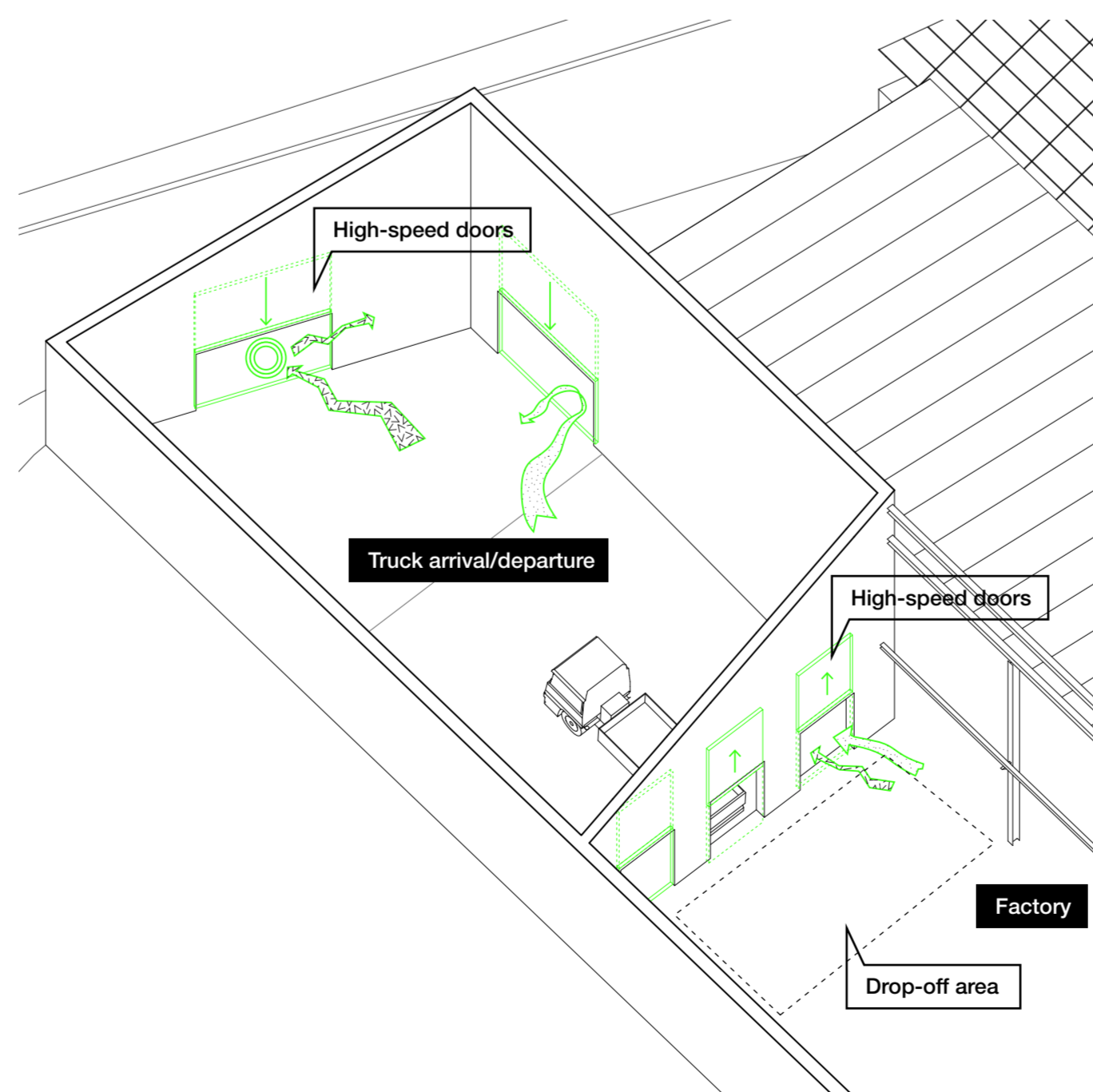
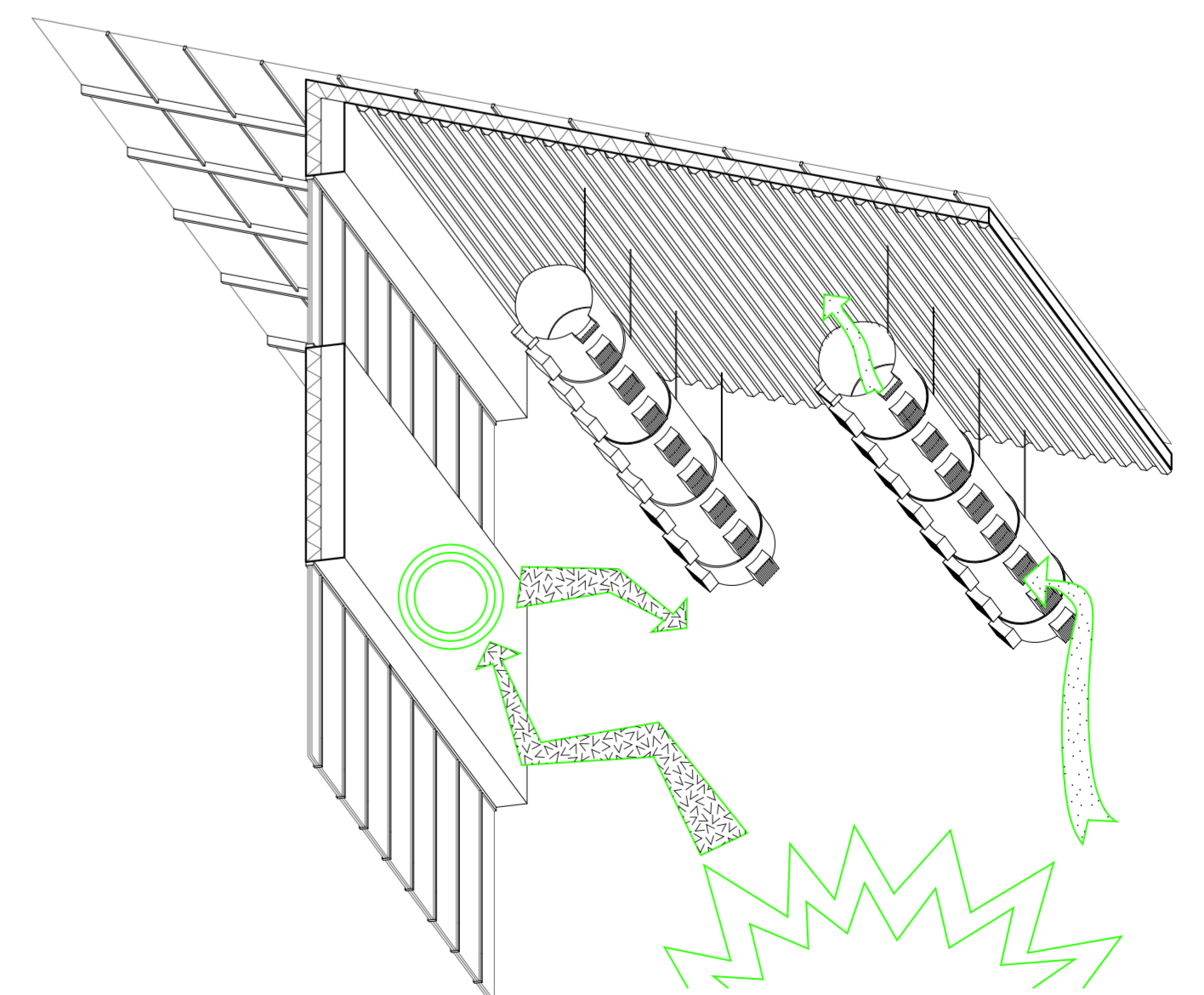


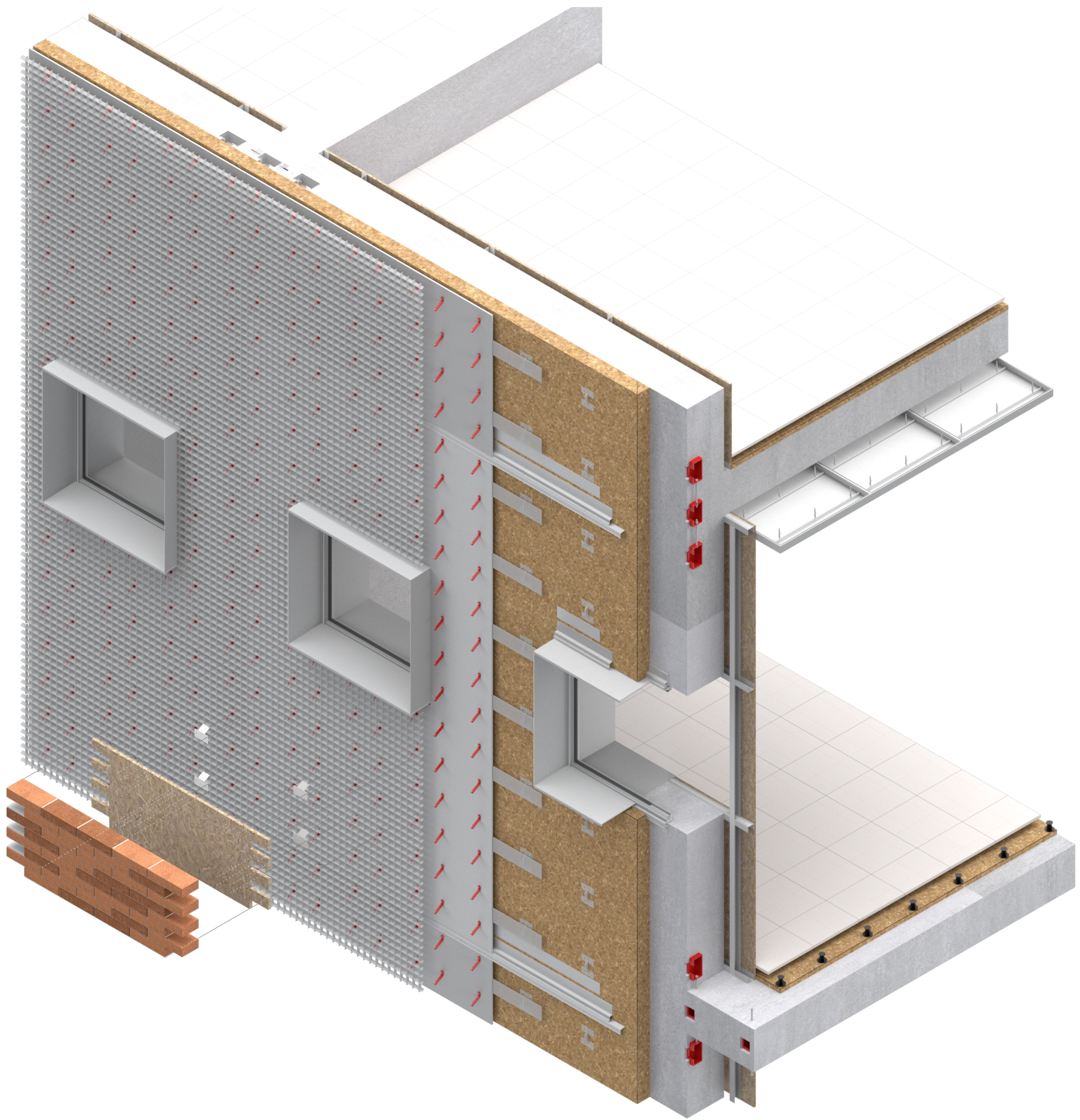
Diagram of the processes carried on inside the factory.



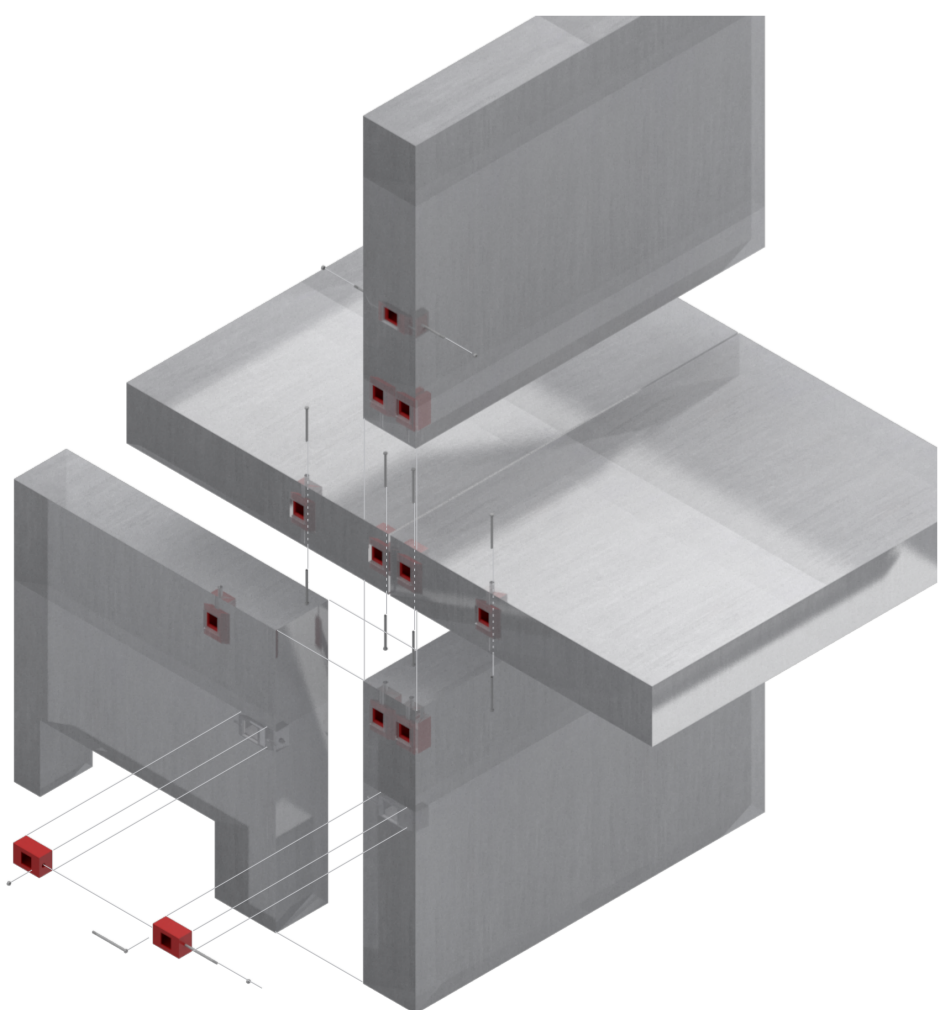
The gates separating the inside of the facility and the truck arrival and those separating the truck arrival and the outside of the facility are never opened simultaneously in order to avoid the escape of dust or noise from the building.



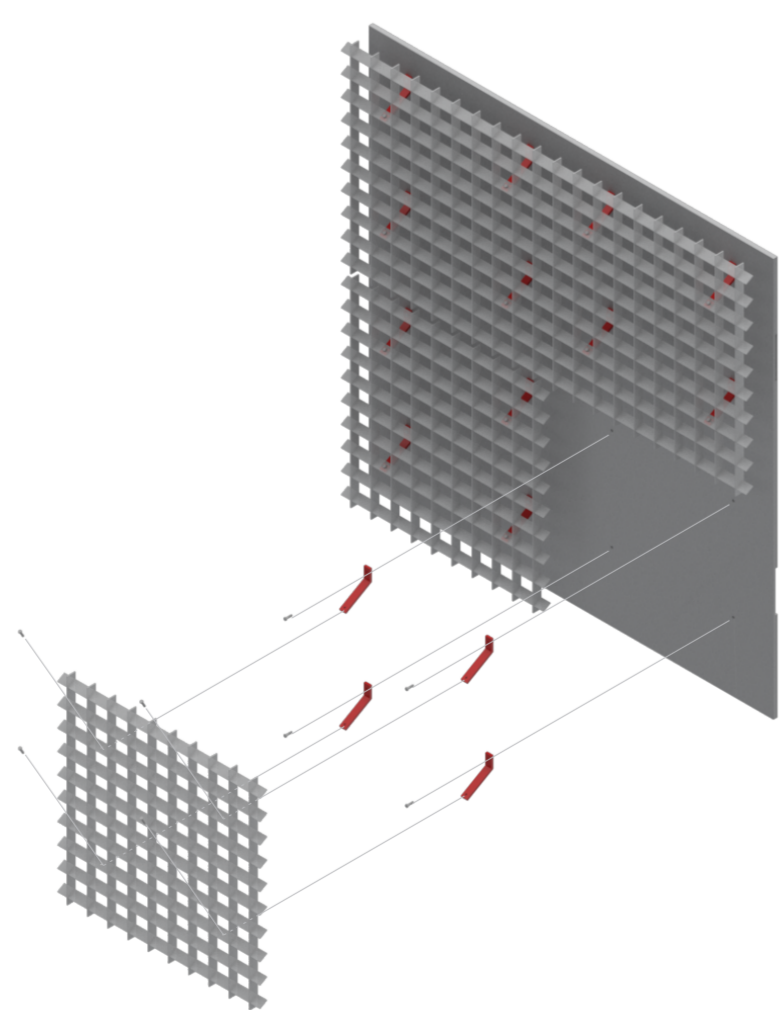
Proper insulation of the building envelope keeps noise inside the building. A mechanical ventilation system collects the dust, preventing it from escaping the building. The ventilation system keeps healthy working conditions inside the facility.



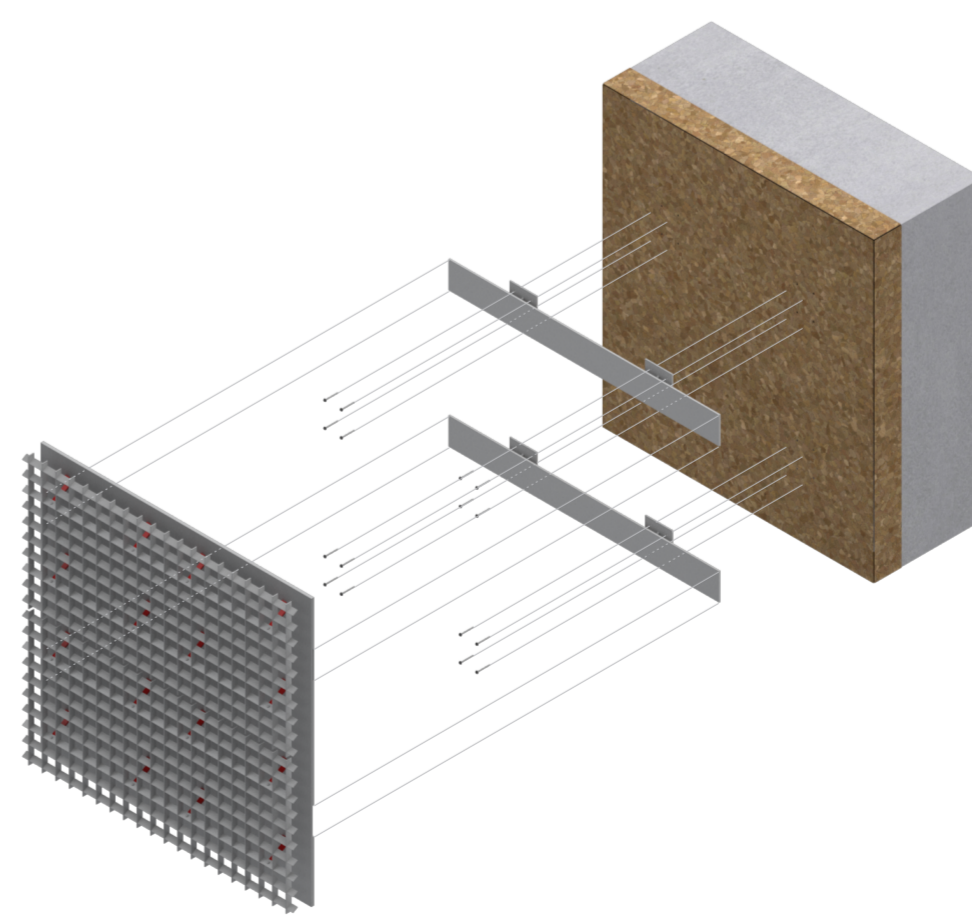
Interior view of the factory area.



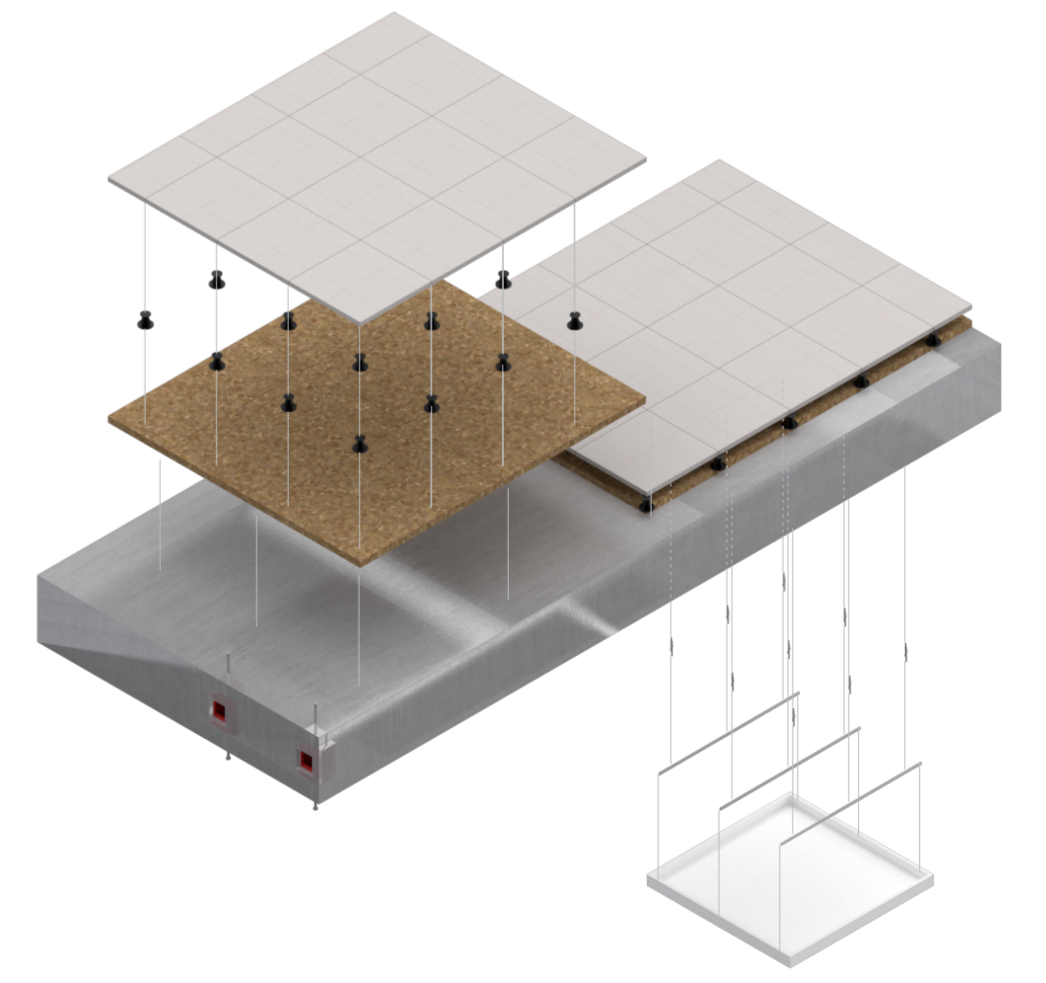
Prefabricated concrete walls, disassemblable connection system. The system relies on mechanical connections instead of casting the elements together.



Exploded axonometric of the connection between the electrofused steel grating and the aluminium panel. Each element measures 490x490mm and is held by steel clips screwed to the aluminium panel.



Assembly of the Aluminium panel on the prefabricated concrete wall.



Exploded axonometric of the bottom and top finishes of the slabs.