

Migration of idea of temporality in architecture

# GALLERY OF TEMPORALITIES

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Change is an inevitable process in every environment. Nothing ever is stagnant. Even the perceived consistency is only a step, a current state of being. Temporality is apparent in architecture, despite the firm and rigid structures of the buildings. Cities, districts, neighborhoods change too. And so did the area around Pleinweg in Rotterdam. Once, a historic center of the southern part of the city. Vibrant, busy, with eloquent culture, unique society, and blooming businesses. Now – largely forgotten, a blurry shadow of old prestige. The decreasing importance created an outflow of businesses; the buildings became empty, and streets quiet. Society has been divided. And nothing good can be said about the plans for the future. It is the surrounding areas, into which the investments are being made. They will grow, but the old South is not included. And this therefore is the very motivation for the project – to create a vision, in which the areas surrounding Pleinweg are brought back to their former glory.

With all of the changes happening so quickly around the district, permeability is necessary to achieve temporality. And temporality in this sense is needed as an acknowledgement of the everchanging character of the environment. Nothing is ever set in stone. Provided solutions must withstand the trial of time.

The project proposed in this chapter was developed based on the research about the temporality of architecture, with the case study of Rotterdam South. Considering the intertwined relation between time and space factors, idea arose to use this dependency in the search for the solution on architectural and urban scales.

Initial investigation of the location showed a large disproportion and lack of stability in the area as a greater whole. The spots around the port and commercial district seemed to flourish, while the extensive housing layer in between continues to grow stagnant. Therefore, the research question was established as: ***How to achieve optimal stability in permanent network of temporality states?*** Methodology for that research was based on gathering the knowledge on history and future of the area,

and juxtaposing it with the existing conditions. The analysis of historical background on the location unraveled the importance of Pleinweg street, that was the commercial center of the Southern Rotterdam till the 1970s. Then, a rapid change of trends in retail experience caused movement of business owners towards a shopping center as a complex within one building. Currently, this shopping center, together with Ahoy event venue, are envisioned as a future of Rotterdam and many plans and investments are ongoing there. Similarly, the other end of the street leads towards the waterfront where large scale, industry-based economy is prevalent and a new park is being constructed.

However, the in-between zone is fenced off by infrastructure from the clusters themselves and thus has no ability to benefit from the spill-over from the economic zones, and thus, continues to deteriorate. The site chosen for intervention is located therefore along Pleinweg street and aims at dissolving of the border. By bridging the gap between those antagonistic areas, the project could be a catalyst allowing for the spillover and step by step, urban revival. It should be noted that the primary function of the project is cultural. However, in order to achieve that, a commercial function is needed. For example, this can be seen by the small local businesses, bringing people together, and binding the different functionalities envisioned in the design.

The approach is a conclusion of the research into similar temporality cases, which suggested that permeability is a key factor in achieving the balance of the temporalities. Such approach towards the stability focuses on enabling and increasing the permeability of the existing urban border and creating an incentive for crossing it, as a first step of its dissolution. Therefore, instead of trying to introduce renovation of enormous housing stock, it spotlights the middle ground, and investigates the possibilities of making it attractive.

Such project plays an important role within the broader strategy, proposed by the group for the south of Rotterdam. It connects previously mentioned areas of prosperity and projects focused on their growth, and creates





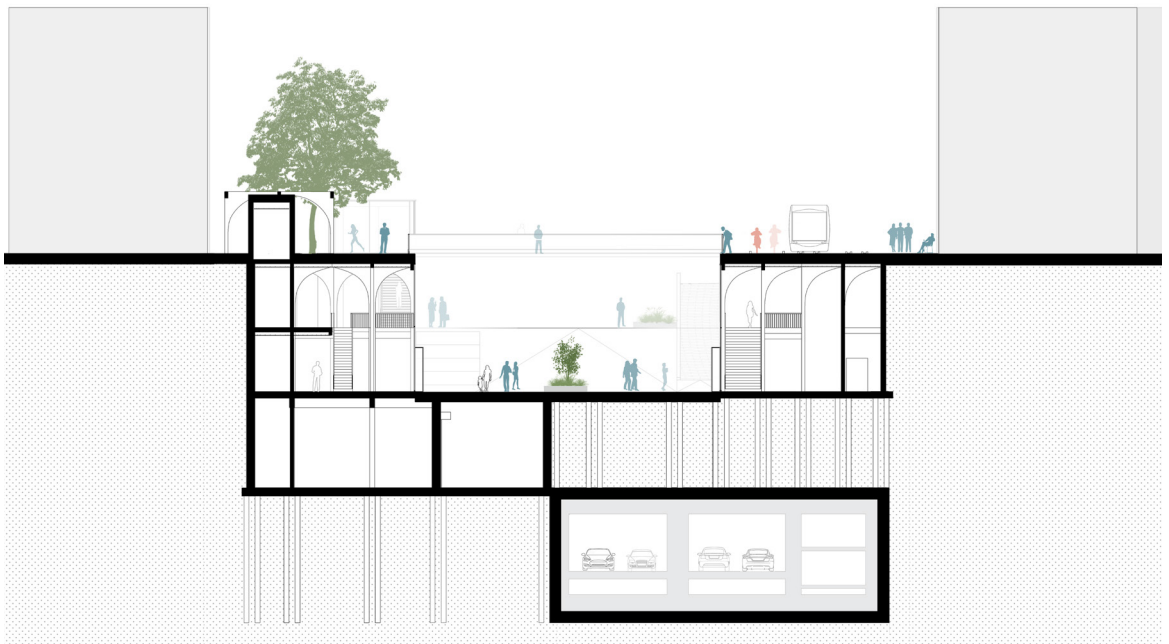
Project's location within strategy

a gradient with solutions focused very locally. The intervention is also a part of suggested cultural district, acting as its experimental and informal axis. In this way, both individual and group goals are met, as project act as a catalyst for both introductory and reoccurring temporality. A significant shift in the priorities of usability can be seen in the proposed car tunnel. The intervention assumes moving a significant part of the traffic underground. In this way, the priority is given more towards the pedestrians, cyclists – but also those only strolling the streets. In this way, the importance of the local spirit and connection with the society is achieved.

Permeability is considered a key component for temporality. In a sense, temporality in architecture is preparing the design for varying future scenarios. Speculations and forecasts can of course be made, but a certain flexibility and adaptability of the design allows for the consideration of the unknown factors, and subsequent adaptation transformation to a new reality. The design includes architectural solutions defined for the long term future, but also ones with a short term scope. In this way,

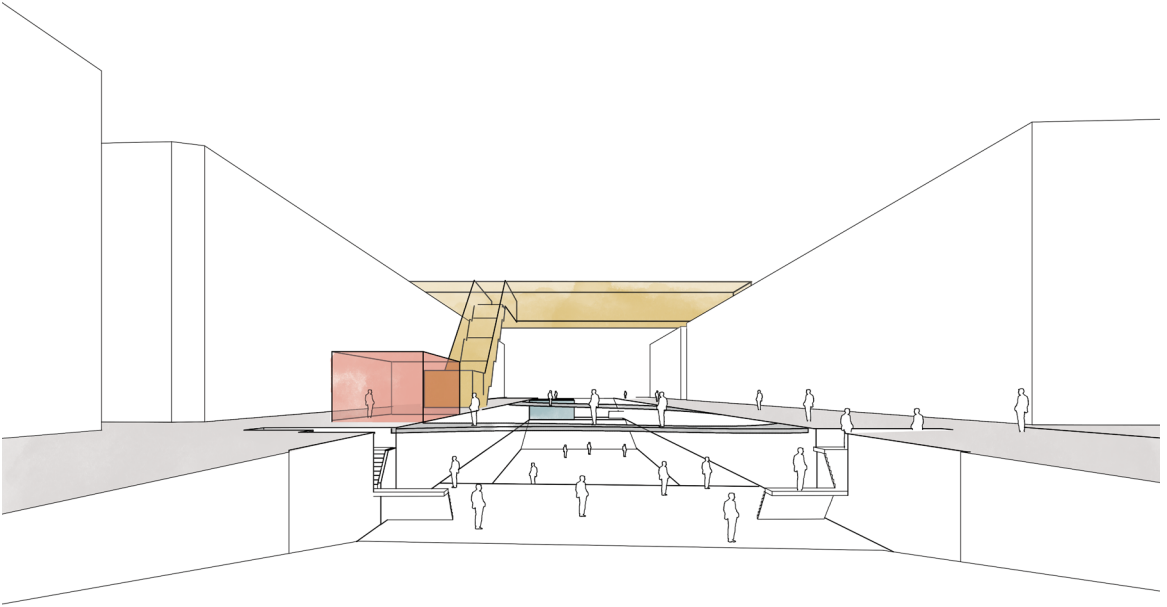
a general trend and direction is given, with the additional possibility of metamorphosis. Such approach also creates the possibility of adaptation of the interior spaces. In the short term, the curiosity creating architecture is present. It is meant to invite people from afar to step into the unknown. However, the long term approach establishes a platform for different activities and events, which will encourage visitors to check out the area more occasionally – not only once.

Discovering and analyzing solutions for bordered urban districts is relevant not only on the Rotterdam scale. With globally growing rates of vacancy and rising difficulty to predict the future needs on the construction market, the search for an efficient regeneration of the neighborhoods is equally important on international scale.



Concept of urban intervention





Concept of the variations of ground level

## **Design Brief**

Proposed project aims at providing incentive for visitors and introducing them towards this forgotten area, and therefore allow the local businesses to steadily become a part of prosperity zone. Therefore, the design brief focuses on the temporality of the region.

The first pillar is establishing the link between Ahoy of the future and its greatly overlooked past. It concentrates on combining the event spaces of glocal character, with main focus dedicated towards designing the exhibition spaces that could be complementary to the Ahoy conference center. Thus, exhibition space that could display the venue's history could prove as an important element of joining the past and the future. The second element is focusing on outbrining the once prevalent commercial side of Pleinweg. The design includes the consumption and retail areas, as an allurements for the visitors of the district for Ahoy events. Providing facilities that could prolong the visit and boost the local economy would be the first step of this introduction. Moreover, dedicating spaces towards the retail of more experimental nature would allow the extension of the shopping district. At the current stage, the present shopping spaces are rarely dissimilar, providing little versatility in terms of both design and usage.

## **Site concept**

The chosen site has to be distinguishable as permeable from the economic zones towards the housing districts, as well as within those housing districts themselves. This means that the permeability must be regarded as a feasibility component, being directly responsible for the area's development.

The greatest challenge in the conducted studies on building form and volume turned out to be the design that will not result in further urban borders and social inequalities. That is why, options were developed and evaluated based on their visibility, access points and routing qualities. Moreover, current high crime statistics could potentially decrease, by introduction of permeability as visibility in the night hours.

The most feasible scenario provides a building volume immersed in the ground and

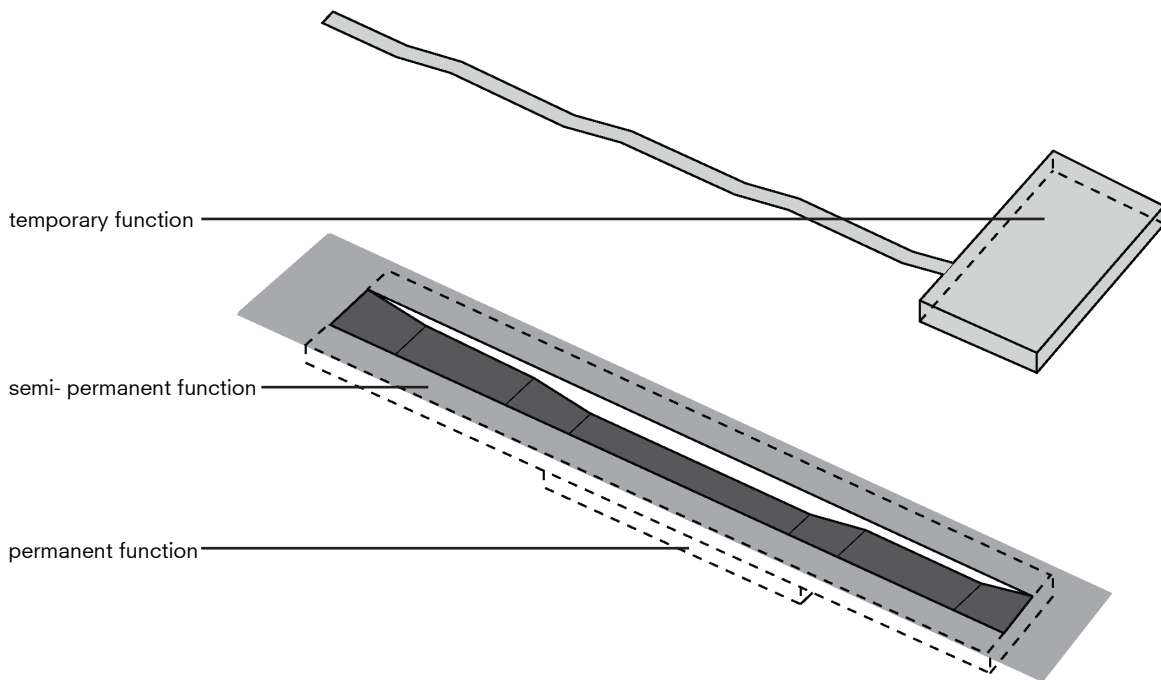
manipulates of the notion of the ground, by providing an additional path through the exposed underground valley. The volume is divided functionally based on its temporality as well, the very temporary elements positioned above all permanent, on top of the existing housing block, while the most permanent volume is proposed entirely below the ground level.

## **Program concept**

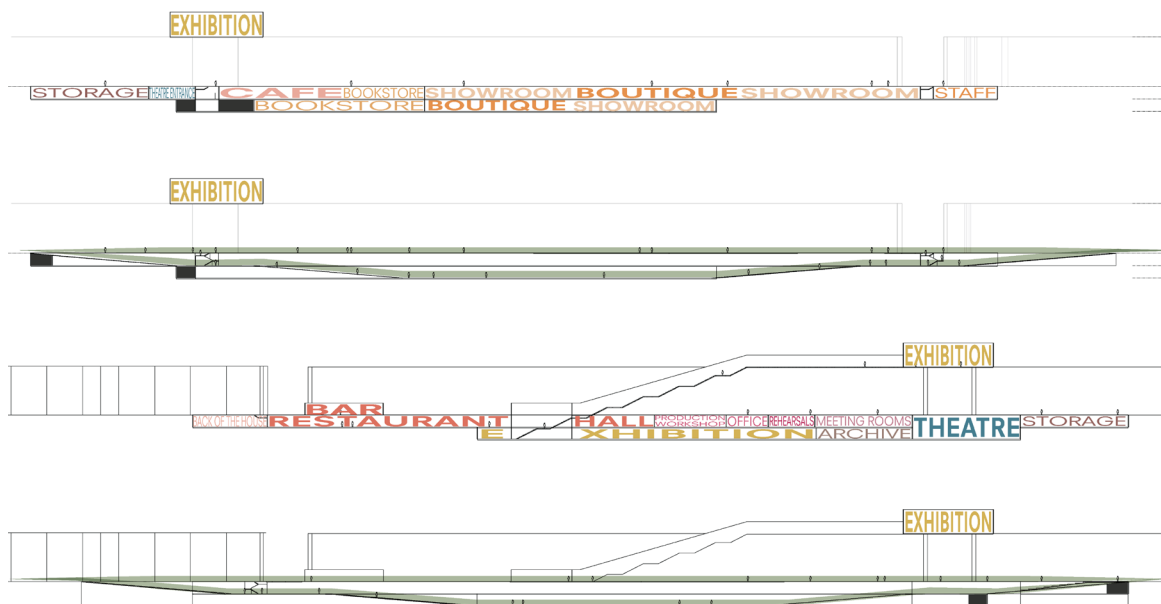
The fundamental precept chosen as an incentive for exploration of the area is based on establishing a link between the visitors and their closest vicinity. It can be said that the commercial program is enabling the cultural and social side. One should keep in mind the trade that was once ongoing in the area; local vendors were a common sight and a remarkable feature of the Pleinweg. Therefore, commercial facilities should be in short distance of the current shopping district and should be visible immediately to attract as many consumers as possible. The permeability is also a factor here, as ease of access should be of highest priority in order not to obstruct the flow. The businesses as well as their surroundings should stay connected with each other, allowing for the creation of dialog in the open space, and the ability to meander between them. On the other hand, the cultural services are usually planned in advance and could be located further from the center, and thus in a quieter part of the boulevard. Furthermore, in order to facilitate the temporality of the area, the temporary volume created by the pop up boxes can easily be dismantled and positioned in a different part of the city to obtain the same effect, whenever it becomes obsolete as the initial temporality is finally achieved.

Moreover, such program has to be an integral, but not intrusive part of the boulevard to allow the pedestrians to fully enjoy a newly proposed green boulevard and invite the community to use it daily. That is why, the routing is divided into uninterrupted lane for daily quick passage with link towards the public transport network, and a curiosity route that by the invites to interact and observe

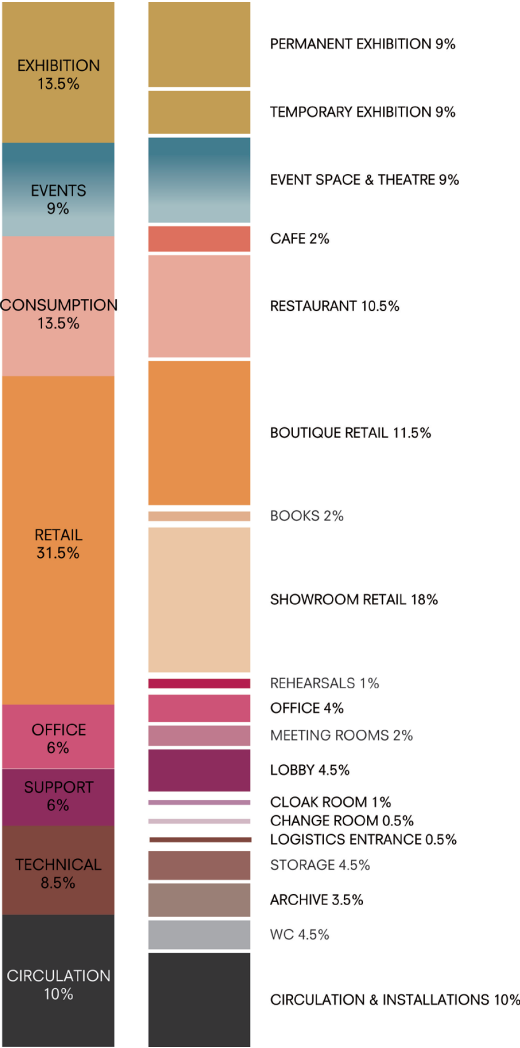




Volumetric division based on temporality



Programmatic section

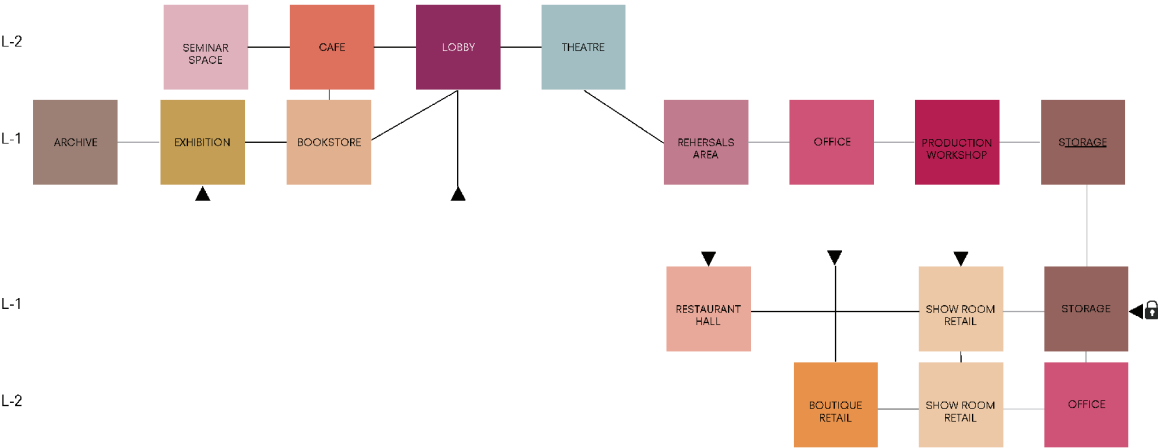


activities inside. Considering the logistics, as the space is being dedicated for the locals and their activities, all support features must be constructed in such way in order not to obstruct the functionality of the area. The logistics should therefore be embedded in the ground, and hence connected to the accessible car tunnel.

Concept definition

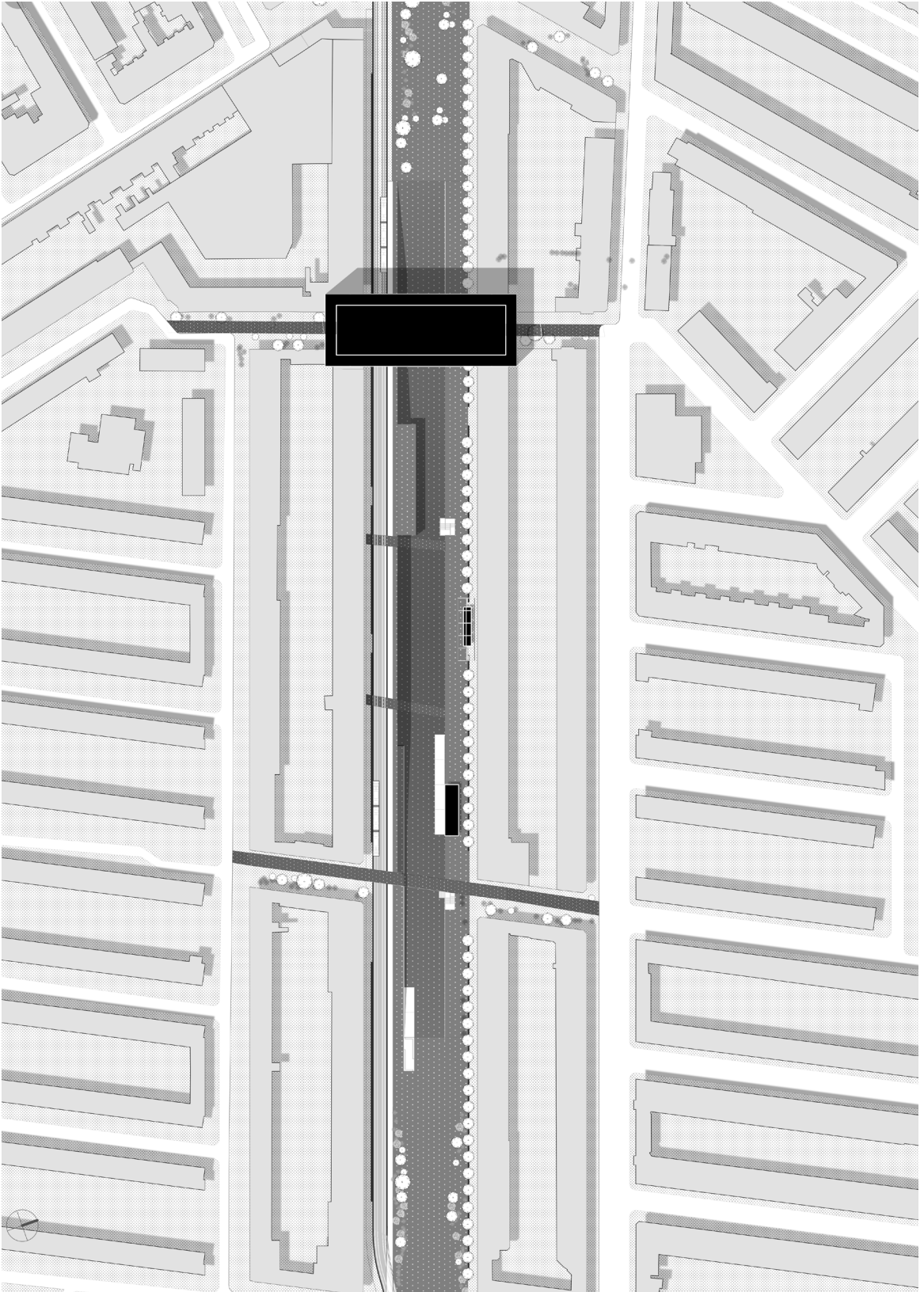
From the variable influencing the specific partial concepts, a general vision can be derived, which combines the design ambitions and visions. The chosen location will act in accordance with the proposed ideas, functioning as a catalyst for said developments. Glocal character of the location should be a primary assumption in order to prevent radical environment changes. Similarly, the accent should be placed on the assurance of inclusivity among visitors and residents. The permeability of the location must also be carried out as maintaining good visibility through the boulevard and the site for safety reasons. Display of architectural temporality should be accomplished at human scale to highlight its importance. What is more, the initial temporality is expressed as the above ground volume, which attracts the visitors. Its more permanent functionality is revealed with the underground structure.

Program bar



Relations scheme





Site plan

## DESIGN

The final design relies on three crucial experience points.

The first one is establishing the introduction and allurements to activities for those, who just entered the boulevard. Therefore, the lively restaurant terrace established on the ground level of the boulevard acts as a beacon from afar. From there, the visitors are likely to continue their trip in direction of the main restaurant hall, which is directly connected with the retail by a large, two-story foyer. Furthermore, this zone joins not only the main consumption areas, but also extends them towards the underground square, which is the second point of importance. The façade of the underground area becomes more transparent and translucent towards the middle. In this way, the focal point of the enclosure is being established. Accordingly, the principle for this spot is to set up the very heart of the building specifically as a backdrop for the public plaza, with a variety of scenarios for inside-outside scenarios, depending on the occasion. For example, the theatre events can be oriented towards the interior audience, nonetheless the square visitors can participate as last row viewers. Such scenario is possible due to the seamless transition from theatre seating into tiered seating, with a movable facade in between. Furthermore, the elevation façade is meant to reveal the contents of the structure, and encourage potential visitors to come inside. The “blackbox” effect is therefore held back, increasing the transparency and hence permeability. Finally, the façade of the hanging box creates the everchanging appearance with the soft robotic systems.

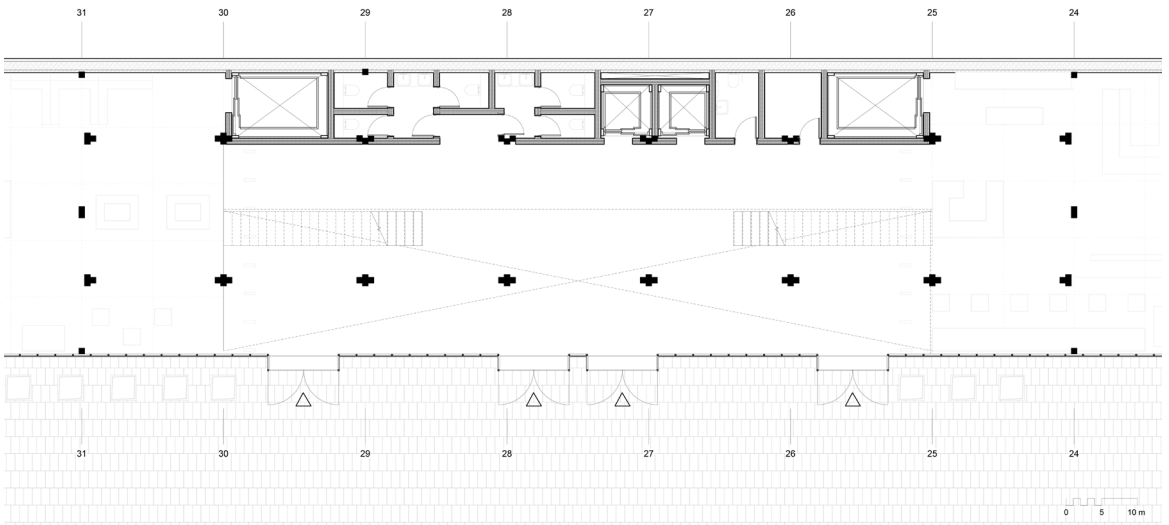
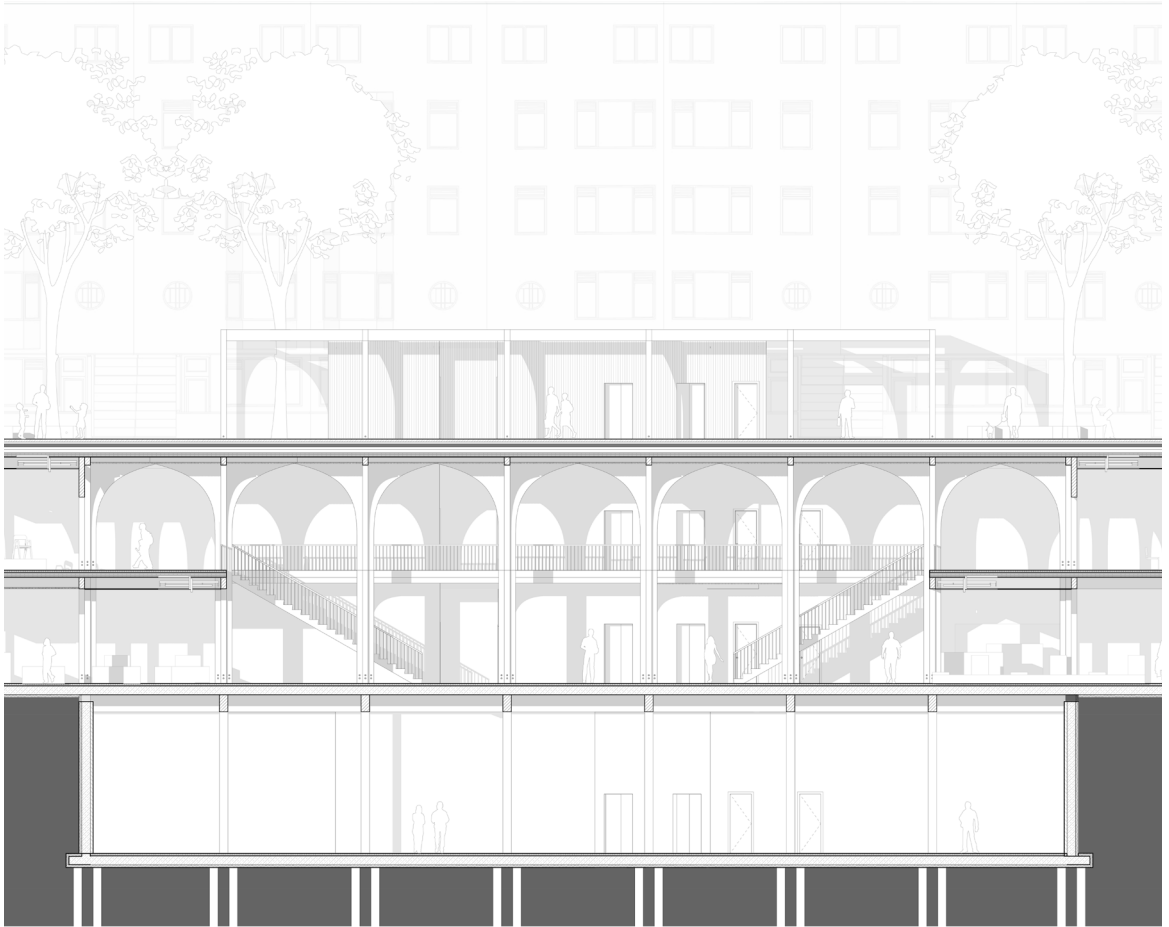
The most crucial access points are

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respectively positioned in the indicated plaza, marking it not only as the centre of the public boulevard, but also the core of the immersed in the landscape building. Last but not least, the interaction point aims at encouraging to explore the boulevard behind the building. The more experimental character of the second part of the boulevard is introduced by the temporary gallery, in a form of large scale installation relying on existing housing blocks. Therefore, the central staircase towards the sky exhibition starts directly on the curiosity route of boulevard. In addition, the design includes the viewpoint at its peak, which outlines all ongoing activities and performances, with waterfront park looming on the horizon. Similarly, the pop-up hanging box contains the terrace overlooking the port and waterfront, the boulevard, as well as the northern portions of Rotterdam.

To summarize, the goal of the sequence is to first establish strong magnetism from the prosperity zone, that will guide and introduce the new extension of the existing cultural center. Consequently, when the connection with the boulevard is already established, the intention is to lead the visitors towards the central square and invite them to spend time there, by both interior and exterior activities. The last objective is to provide a step-by-step transformation of the scenery, where more space can be dedicated towards recreation in the urban green. Nevertheless, the experience for pedestrians approaching from the waterfront is contrary—they follow the gradual transition from the more organic and nature dedicated surrounding, towards increasingly urban lively city center.





Building envelope fragment

## Materialization

By considering the materials used for the development of the project, a closer look can be taken at their functionality and how they fit within the framework of the design. In general, the materials applied in the beginning of the valley are meant to mark the entrance and invite people in. Nevertheless, as the visitors walk into the structure, the façade becomes more transparent. The idea of creating the gradient towards completely translucent main underground square is derived from the concept of permeability, as one can experience the influence of several factors from a single standpoint. This allows for generating the idea of inclusivity.

Another key aspect of the materialization is the use of soft robotics, in a form of thermochromics and chemo-responsive hydrogels. These futuristic implementations show great potential in optimizing the conditions of the environment in which they are placed. Particularly, the soft robotics used in the underground area have a specific purpose of providing guidance to the visitors. Furthermore, they are being

used as a signaling system to inform about the level connections. Similar approach was used with the soft robotics in the façade of the floating exhibition volume. However, their purpose is more engaging; these are meant to be representative and playful, interesting to interact with. The hydrogels work on the basis of capturing and releasing moisture from air via polymorphic materials. They act as a active, yet maintenance-free cooling system within the façade of the building. In the morning, these materials are able to absorb the dew moisture, and then release it during the warmer parts of the day.

The notion of gradual immersion and connection with the environment is further perpetuated with the use of four different transparent materials, being the fiberglass, polycarbonate, plastic corrugated sheets, and glass adapted for reflectance. Their ability to pass light through at different rates enables the transparency of the structure to vary in different points, also providing the possibility of observing the internal structure from the outside.



Soft robotics system providing a night attraction on the boulevard

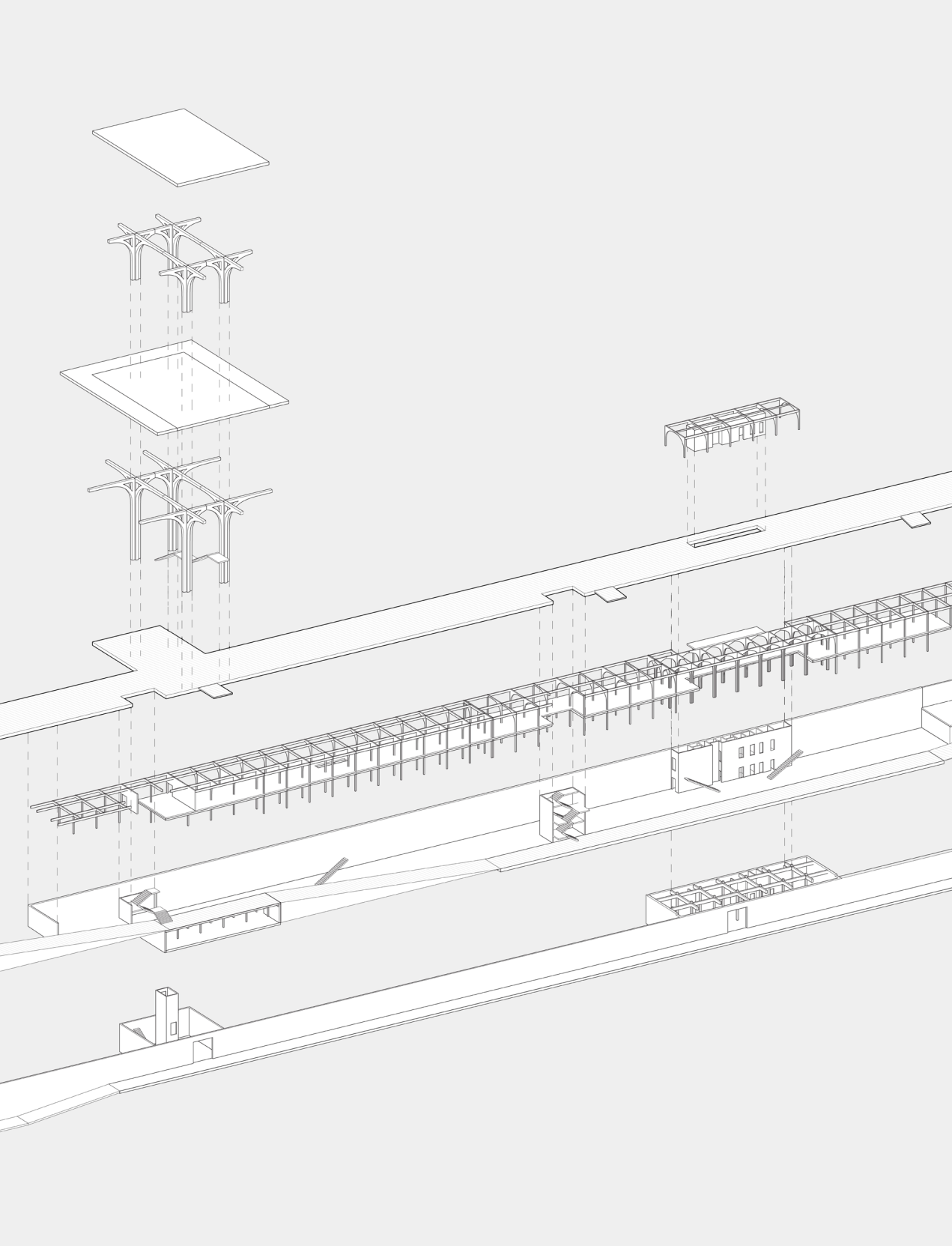


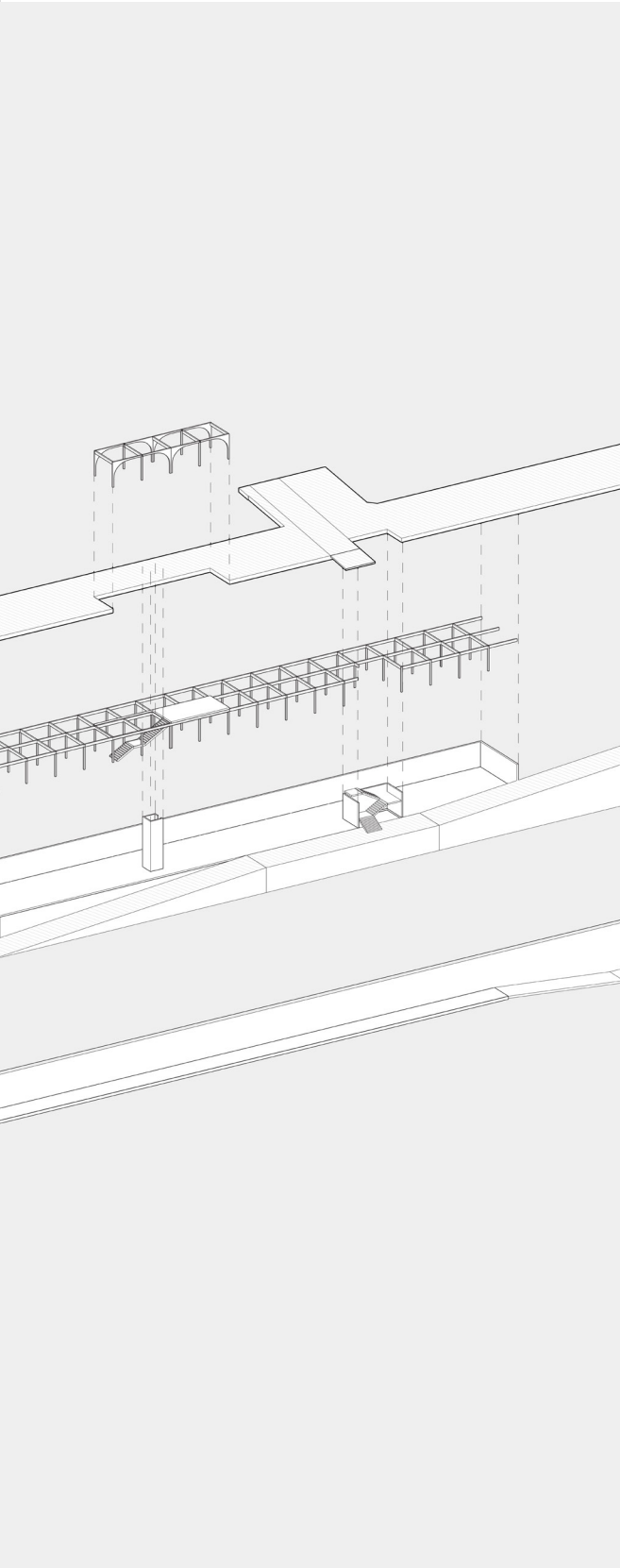


Night guidance system by soft robotics facade elements









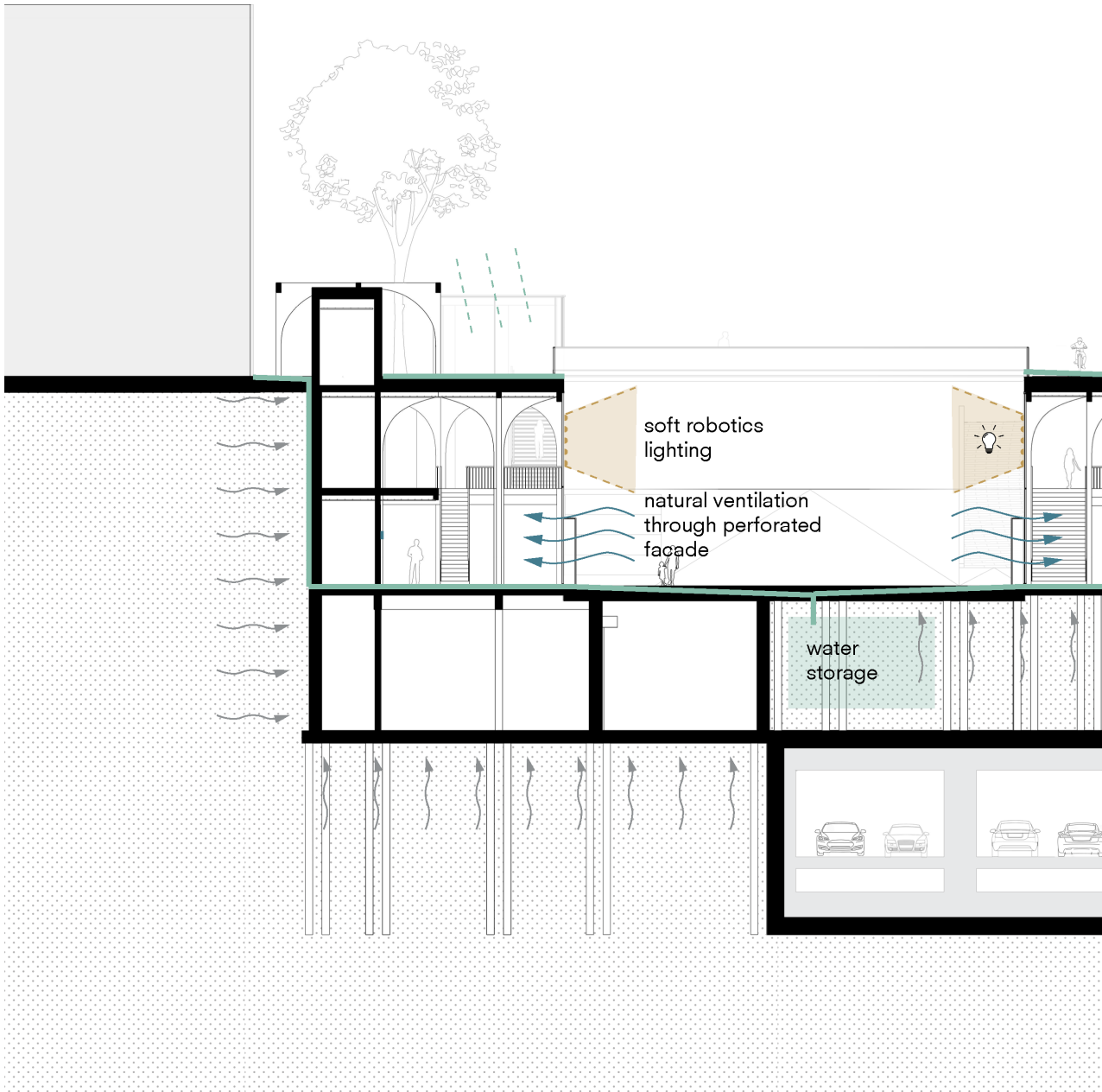
## Structure concept

The structure concept has been developed to reflect the idea of timelessness within the building. In architecture, this notion provides the viewer with a unique feeling of not knowing, when the structure was created. To achieve that, the arched column structure has been chosen in several configurations in order to give each space a unique and individual feeling. The individual arches seemingly change directions through the whole structure, providing a sense of uniformity. The materials of facade reflect on temporality features, enabling the perception of movement and change. In comparison, the structure reflects on the timeless nature of the design. These structures, being present throughout the history of mankind, are not possible to be singularly assigned to an era, from which they may come from.

Timeless design achieved with the structure concept fits within the notion of temporality through permeability. The user does not need to have a presupposition, and therefore a certain approach of where are they heading. Instead, they become immersed in the design, making them feel as they have already been there. The structure is organized with a principle, where a concrete basin provides the outer shell, directly embedded in the landscape. On such a base, the timber structure with a grid of 5x5m is placed. Then, the roof of the building is constructed and seamlessly integrated with boulevard pavement, hiding from the users where the actual volume ends. Lastly, the facade elements are attached from the side and kept independent.

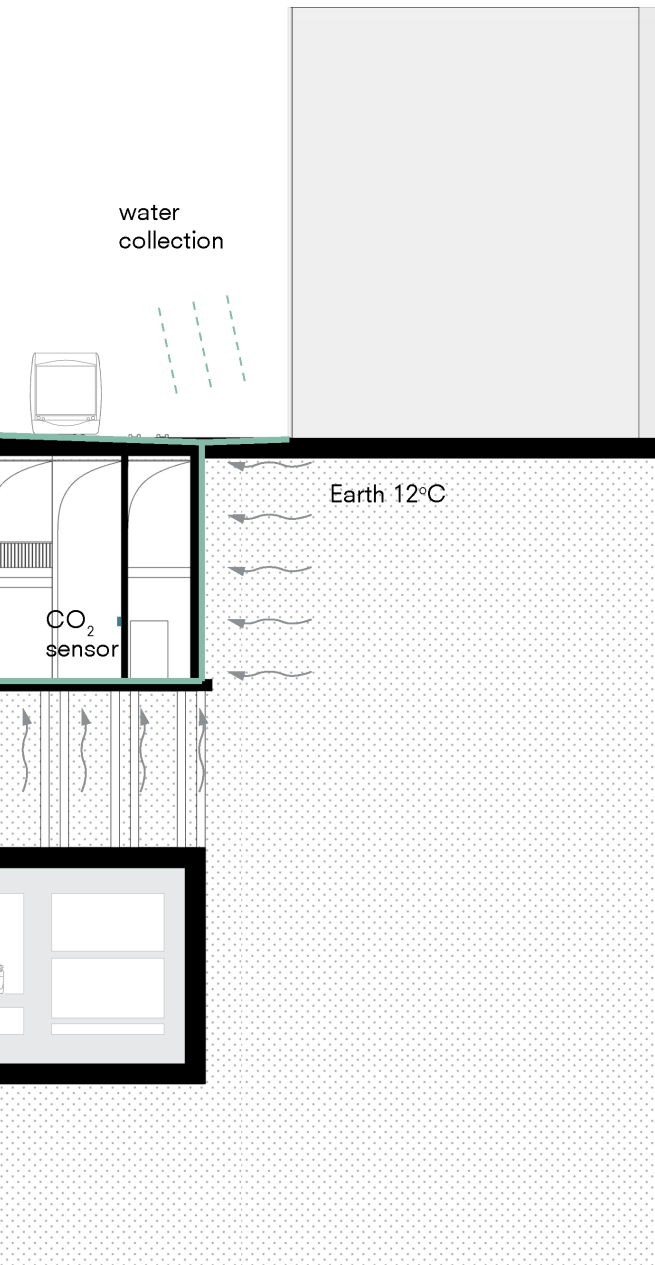
On the other hand, the timed and rather short lifecycle of the pop-up box is arranged differently. For uncomplicated assemblance and dissemblance, it has been designed to be entirely independent from the underground volume, including the absence of a foundation. When it becomes obsolete, the pop-up can be moved to another place, to serve the purpose elsewhere.

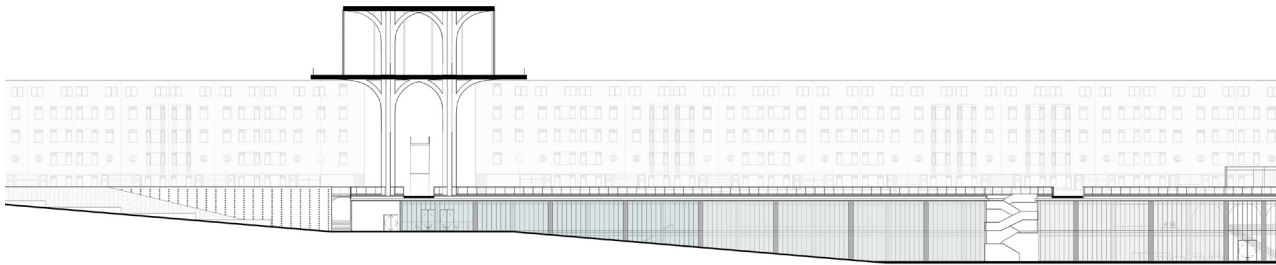




## Climate design

To focus on the climactic design, several notions were addressed. Firstly, the inseparable architectural and urban interventions provide a large contribution to decrease the temperature of the surface, and minimize the heat island effect. With the replacement of large asphalt layer with greenery and sustainable paving materials, these climate improvements can be achieved. The majority of car movement is brought underground. Likewise, water collection systems will be integrated both on the boulevard and underground valley level. The collected water can be stored and reused within the building, as well as for other necessities, i.e. watering the greenery. From the perspective of energy efficiency, the proposed soft dynamics systems react accordingly to the weather conditions. The thermochromic effect of the material is used to regulate the temperature levels, both underground and within the box. Moreover, it works as an integrated lighting system of urban scale, hence little additional lighting is necessary. The sheltered underground volume also allows for energy savings by stabilizing the temperature stable throughout the year. The ventilation is achieved through small facade pieces, hidden behind grilled ceilings from dowel laminated timber. The mechanical installation's purpose is to ensure full user comfort without compromising the vaults created by structure. The facade is constructed with a repeatable grid, in which a small portion is dedicated towards the ventilation. Behind the perforated panels are elements that can be adjusted and in this way provide comfortable natural ventilation in the summer. CO<sub>2</sub> sensors are added within the building, which will activate the ventilation when the levels are too high. Additionally the HVAC system is implemented, hidden behind the suspended grilled ceiling made out of dowel laminated timber. In this way, the installations are not visible to the users. With the natural ventilation provided and with heat recovery system, the costs are kept low, and the mechanical system is used only as a secondary solution, making it more energy efficient.

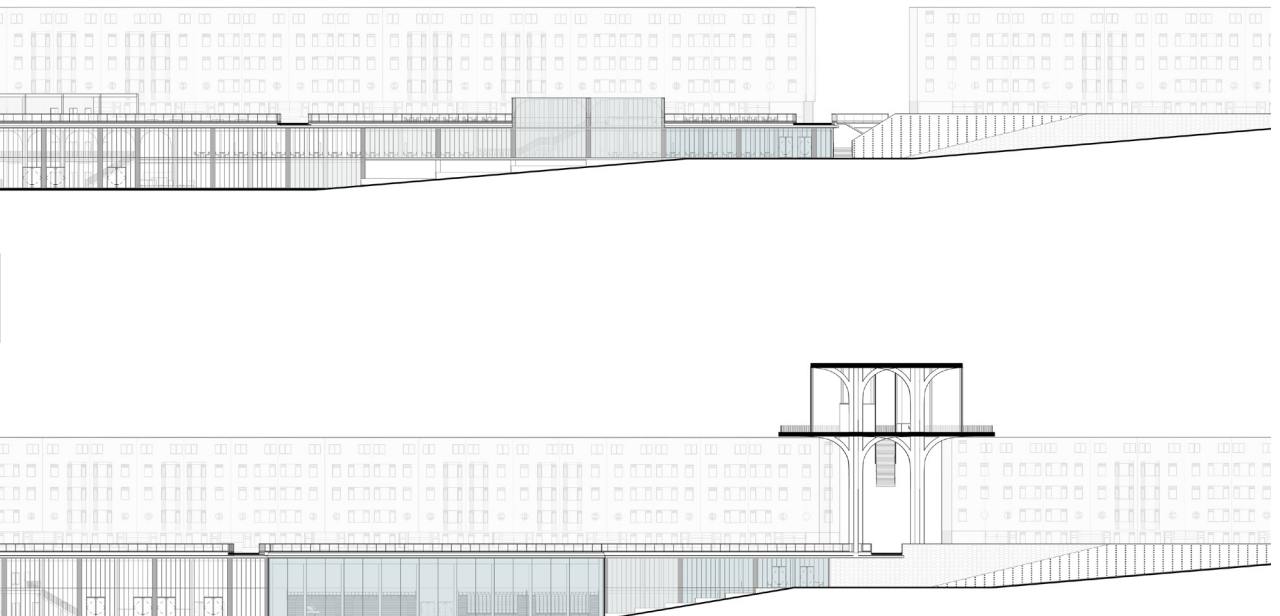




### Conclusion

The report provided a walkthrough description of the undertaken steps, which had led to the final design. It has shown how the migration of ideas in the architectural contexts can be carried out, and how it influences the design and concept definition. The proposed project has been developed with the consideration of the migration of temporality and realized as a direct solution for the case study performed in the Rotterdam South.

To provide an exhaustive project description, multiple angles of analysis were considered, such as the materialization, structure concept, and climate design. Having performed thorough examinations, the overall design provides a tailor-made, suitable package of solutions that reflect the social and environmental requirements and necessities. An accent placed on the permeability of the design further allows for the project to become both timeproof and timeless.







Theatre with permeable connection to public square

## **The relationship between research and design**

The research for the project consisted of the multiperspective analysis of the location. The focal points of the research contained detailed evaluation of the building typologies, local infrastructure, and the socio-economic aspects influencing the area. It has been concluded that the more efficient way to achieve improvements in the neighborhood would be to create a catalyst project, rather than conducting a top-down demolition and rebuilding of the housing stock. Further decay of the area and subsequent vacancy would result in decline of such severe degree that the renovation would no longer be feasible.

During the research phase, the concepts of permeability and temporality have been defined. It has been deduced that one of the key factors influencing the state of the area are the ever-present urban borders and further divisions. This meant that in order to translate the concepts of permeability and temporality into architectural design, an accent must be placed on the notions of transparency and

translucency. With such approach, both the visible and invisible borders could have been eliminated, allowing for a more consistent flow, or migration, of people, notions, and ideas.

The relationship between the two stages can finally be seen in the necessary adaptations of the design, which will allow it to retain its features, such as permeability, in the future. Similarly, the area must grow and adapt to its community in the upcoming years. Designing for the future is a complex process, due to the inability to accurately predict the changing variables. Therefore, the flexibility of the design can be seen in its openness and ability to transform. The changes, despite being significant, can conveniently be modified. Moreover, the solutions provided are not cross-dependent – one can function without the other. Another example is the temporal pavilion, which can be relocated, if a need appears.



Multi level food court impression

## The relationship between your graduation topic and studio topic

The common theme seen across the graduation and studio topics has been the concept of migration. Within the studio theme, migration of ideas has been analyzed from the architectural perspective. In its most basic definitions, migration has been defined as the “movement from one part of something to another” (Hornby, 2010)<sup>1</sup>. What has been deduced is that ideas in the architectural realm require the existence of time and space. Their location as well as movement can therefore be tracked. Hence, a rationale is constructed, describing the idea of multiplication of architectural concepts with variable alterations in time and space. This further translates into the possibility of distinction of architectural features, which manifest themselves as specific to the design location and global trends (Boxel et al., 2019, p.10-11)<sup>2</sup>.

The graduation theme draws from the concepts analyzed in the studio topic. By focusing the scope of the study, the general theme became the migration of the idea of temporality in architecture. The migration of temporality manifests itself both in time (i.e.

the biyearly conversions of the Architecture Biennale in Venice) and space (seen in the transformations of the World Fair events). In the same manner, these concepts can be analyzed on the local scale, in this case within Rotterdam-Zuid. Migration of ideas allowed to more competently understand the factors influencing the permanent temporality states, as well as provided a basis upon which the applications to this problem could be implemented.

Similarly, by observing the transition of the temporality ideas through time and space, the solutions developed in the graduation topic could have been effectively adjusted to the environment, within which they were carried out. It became crucial to develop a permeable connection on the border between the opposing states, so the spill-over effect would influence the surroundings of the future city center on Zuidplein. Therefore, by examining these migrations of temporalities within the researched area, the most significant variables could have been denoted, as the ones having the greatest effect on the permeability.





Showroom retail area with individual brands stands

## **The relationship between methodology of the studio and method chosen**

The method chosen for the project consisted of four individual stages. The first half of the project was devoted to research, while the latter considered the design stages. Research started with the analysis of global trends, providing necessary definitions, and concepts. In the second part of the research phase, a more local approach was taken. During this phase, on site analysis was performed, and the previously found global trends were juxtaposed with the more localized notions. In this way, a clear indication of trends and characteristics was developed. This knowledge was essential to conduct the conceptual design effectively. Having finalized the two more theoretical and research based phases, the project was followed with the application of the research by the development of the conceptual design. The application was focused on maximizing the impact on both local and global scales. Simultaneously, the volumetric design has been conducted. After the finalization of the primary design stage, a more defined architectural vision was defined, with the consideration of specific implementations

concluded from the research. It was crucial in this stage to provide more defined architectural solutions and address the issues that were arising throughout the process. Moreover, it was during this stage, when the applications were viewed from a wider perspective and approved in the face of the broader view.

Considering the overarching methodology of the Complex Studio, the research-by-design allowed to not only provide a general overview of the crucial points and issues in the early stages of the project. The main advantage of such method is the multiperspective analysis of the provided solutions, as well as the necessity of testing them from several angles, already during the design phase. A major obstacle that projects face is the inability of defining the design aspects from all the required perspectives. The methodology however places the designed solution on multiple levels, zooming in on the building, site, as well as the city itself. The use of these perspectives is therefore critical should one be willing to provide a feasible solution that matches the conditions on all the stages.



Interactive exhibition concept overlooking the public walkway

## **The relationship between the graduation project and the wider social, profession and scientific relevance**

By analyzing the global trends, one notion seems to stand out clearly among the others. Our dependency on urbanization, the growing sizes and numbers of cities throughout the world continue to increase (Zhang, 2015)<sup>3</sup>. It is practically certain that these global trends will affect cities like Rotterdam, and hence it becomes increasingly important to develop strategies and designs that can withstand these forthcoming changes. The area of Rotterdam-Zuid has been somewhat forgotten and requires plentiful of attention, especially in the face of growing reliance on the effective city planning. Confronting the problems of high crime rates, marginalization, and division is crucial, should the area develop and become a unified district with the other local areas. A city like Rotterdam cannot simply afford to have a secluded, largely vacant area, while its other districts become overpopulated.

Vacancy itself is another global trend, which should be acknowledged. It becomes more apparent as the buildings grow old and become unusable, and therefore vacant. However, instead of focusing on solutions to renovate and restore dated constructions, new ones are built in other places – providing

the much needed functionality, yet completely omitting the old sites. Again, by considering the increasing importance of the cities, new solutions to the vacancy problems have to be recognized. Creating new structures is only a short term solution, as the urban sprawl is not a unlimited option. Moreover, forgetting about the old districts causes further inequalities, as seen in the example of Rotterdam-Zuid.

Finally, the social importance of preserving the global character of the area should be highlighted. With the ever-expanding cities and constant influx of new trends, notions, and ideas, one should still feel at home within the local area. On the other hand comes the necessity of development, providing solutions and opportunities to the residents, hence the emphasis of the global nature of the environment. A well thought-out urban solution joins the two vastly different world, providing both a framework for development, as well as a regional feel for the community. In case of the Rotterdam-Zuid, this approach becomes especially significant due to the residential nature of the majority of the area combined with several influential places of interest for the locals and visitors.





Impression of foyer for cultural wing

## The ethical issues and dilemmas you may have encountered during graduation

When considering substantial changes of the local environment, the impact of the proposed developments affects the local societies from multiple angles. It has to be realized that a significant alteration of the surroundings impacts the perception, behavior, and emotions of the residents, as well as the visitors (SELL & ZUBE, 1986)<sup>3</sup>. This project proposes a considerable change with all of its restructuring, adaptation, and improvement. It therefore became crucial that the ethical scope and value structure would be imposed as a focal point and an underlying structure of all of the proposed changes.

These values are manifested in the specific objectives of the design, which include the primary aspects of increasing safety, decreasing inequalities, divisions, and protecting the local spirit of the area. It has been shown that due to its urban nature, high crime rates and inequality were predominant. By implementing the design changes, not only the area would gain the discussed architectural and urban values – with these

alterations, the decrease of crime and inequalities should become a reality. This assumption of keeping the architectural goals parallel with high ethical standards has been realized at all of the design stages in order to ensure their cohesion throughout the levels. Architect's goal should not to be to pursue what's expedient. Rather, the clear definition and promotion of ethically sound solutions should be of outmost importance.

Yet another ethical dilemma invoked in this study was the correlation of the local community needs with the design process. The proposed adaptations would result in an increase of the number of visitors, creating a shift in the current local spirit. One may argue that what is best for the community, may not be necessarily best for a local as an individual. However, a preceding analysis of the factors shaping the current image of the district concluded that the economic, social, environmental statuses cannot be improved without removing the invisible urban borders and addressing the issues of permanent temporality.

<sup>1</sup> Boxel, E. van, Koreman, K., & Zones Urbaines Sensibles, Z. (2019). City of Permanent Temporality. Nai010.

<sup>2</sup> Hornby, A. S., In Turnbull, J., In Lea, D., In Parkinson, D., In Phillips, P., & In Ashby, M. (2010). Oxford advanced learner's dictionary of current English.

<sup>3</sup> Sell, J., & Zube, E. (1986). Perception of and response to en-

vironmental change. *Journal of Architectural and Planning Research*, 3(1), 33-54. Retrieved May 13, 2021, from <http://www.jstor.org/stable/43028786>

<sup>4</sup> Zhang, Xing Quan. (2015). The Trends, Promises and Challenges of Urbanization in the World. *Habitat International*. 54. 10.1016/j.habitatint.2015.11.018.