INDUSTRIAL (R)EVOLUTION
REVITALIZATION OF INDUSTRIAL BUILDINGS
IN AUSTRIA AND THE UNITED STATES OF AMERICA

STEFAN SCHERMAIER, BSc.
Fachhochschule Joanneum, Graz.
California State University, San Luis Obispo.

Research Proposal commisioned by the Austrian Marshall Plan Foundation.

Abstract

The topic of reusing existing building fabric is becoming a more and more important sector of architecture and city planning. The change from an economy based on industrial production towards a knowledge and research based society happening over large parts of the western hemisphere has lead to the question of how to handle the heritage of abandoned industrial buildings and their infrastructure. This research paper engages in the subject and compares Austrian and American approaches to the built environment with the goal of combining the gained insights in an examplary design proposal.

Die Revitalisierung und Wiederverwendung von bestehenden Gebäuden wird ein immer wichtigeres Feld in der Architektur und dem Städtebau. Der Wandel der Industriegesellschaft hin zu einer Dienstleistungsgesellschaft, der sich in den letzten Jahrzehnten über weite Teile der westlichen Hemisphäre vollzogen hat, führt zu der Frage, wie dem industriellen Erbe begegnet werden sollte. Diese Forschungsarbeit vergleicht Österreichische und Amerikanische Ansätze mit dem Ziel, die Erkenntnisse in einer exemplarischen Entwurfsarbeit darzulegen.

Acknowledgements

I want to thank the Austrian Marshall Plan Foundation for making my stay in the United States possible.

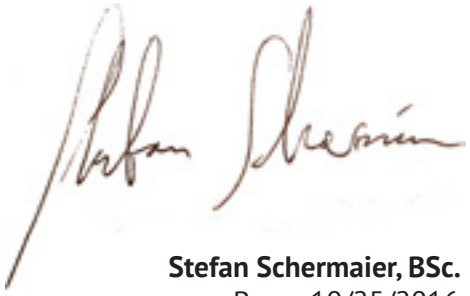
My supervisor, Arch. DI Wolfgang Schmied, head of the Architecture Department at the FH Joanneum Graz, for his valuable advice.

My friends and family, especially my parents, without whom I would not be where I am today.

Statutory Declaration

I hereby declare that the present research proposal was composed by myself and that the work contained herein is my own. I also confirm that I have only used the specified resources. All formulations and concepts taken verbatim or in substance from printed or unprinted material or from the Internet have been cited according to the rules of good scientific practice and indicated by footnotes or other exact references to the original source.

Ich erkläre ehrenwörtlich, dass ich die vorliegende Forschungsarbeit selbstständig angefertigt und die mit ihr verbundenen Tätigkeiten selbst erbracht habe. Ich erkläre weiters, dass ich keine anderen als die angegebenen Hilfsmittel benutzt habe. Alle aus gedruckten, ungedruckten oder dem Internet im Wortlaut oder im wesentlichen Inhalt übernommenen Formlierungen und Konzepte sind gemäß den Regeln für gutes wissenschaftliches Arbeiten zitiert und durch Fußnoten bzw. durch andere genaue Quellenangaben gekennzeichnet.



Stefan Schermaier, BSc.
Bonn, 10/25/2016

Table of Content

INTRODUCTION

Revitalization and adaptive reuse are subjects that concerns multiple levels of our built environment – from the city, down to a city's district, to neighborhoods, streets and finally to the building and its components. In my work, I want to show these different layers of revitalization and work myself through them from the big towards the small scale, starting with the city and ending up at the building and its components.

Due to the history of the United States, their built heritage is mostly limited to the era of the Industrial Revolution. Therefore, the proposal will focus on the abandoned buildings that are remaining from that time on both sides of the Atlantic - being factories, warehouses and industrial infrastructure.

The first chapter will explore the challenges that American and Austrian cities and their industries are facing throughout their turn away from a production-based economy. In the second chapter I will investigate the basic decision that society has to face when coping with the existing built heritage: what to preserve and what to replace? The third chapter will take the issue to the scale of the industrial building itself, investigating its features and possibilities that it offers. The fourth chapter presents the practical ways in which these possibilities can be used, investigating design strategies and technical tactics. In the fifth chapter, I will present Austrian and American case studies as possible solutions. The sixth chapter will start off the exemplary design proposal by an analysis of the chosen site and its surroundings. The seventh and eight chapter will then explain the concept and the execution of the design idea.
x
I will often take a look back at the history, since it offers many insights through which we can understand the present in a much better way. At the same time, understanding these historic developments also allows conclusions about future developments. As the Prussian philosopher Wilhelm von Humboldt eloquently put it: "Nur wer die Vergangenheit kennt, hat eine Zukunft" ("Only those who know the past have a future"). Using this line in the sense of architecture, I would like to put it like this: Only those who know the past can design a future.

Context

Since the past decades, countries all over the world, but especially in continents of the western hemisphere like North America and Europe, have changed from an industrial based to a service and knowledge based society. “Economic growth today is powered no longer principally by raw materials, great waterways and railroad lines, or giant factories but by the places that have the richest clusterings of people who come together in dense ecosystems, generating ideas and products faster than they can elsewhere.”[1]

Resulting from that trend, many formerly monofunctional areas of industrial production lost their purpose and became abandoned. This change is confronting the disciplines of architecture and city planning with new challenges. At the same time, these abandoned factories, warehouses and their infrastructure contain great possibilities, since they come with a high potential for reuses of various kinds. Changing these sites into new living components of the urban fabric by giving them new ideas is a phenomenon that is seen in many of these countries nowadays.[2]

The knowledge based society requires a smaller scale with more flexibility and variability. It does not need big production halls, but smaller units that allow changing functions and collaboration patterns through flexible configurations and sizes. “This type of economy requires diverse, compact and networked urban structures and buildings types for which inner-city harbor, industrial and railway sites are perfectly suited.”[3]

It is worth investigating these chances that the economic change is containing. While abandonment is generally perceived as a negative portrayal of decline, every end can become a new start. And especially the discipline of architecture that is designing the environment we all live in is challenged to recognize and utilize the included possibilities of our built industrial heritage.

[1] Florida, R.: The Death and Life of Great Industrial Cities. In: Kapp, P. H. and Armstrong, P. J. (editors): SynergiCity. Reinventing The Postindustrial City. Urbana/Chicago/Springfield: University of Illinois Press, 2012. Page 6. Subsequently referred to as “Kapp, P. H. and Armstrong, P. J.”

[2] See: Baum, M.: City as Loft. In: Baum, M. and Christiaanse, K. (editors): City as Loft.Adaptive Reuse as a Resource for Sustainable Urban Development. Zürich: ETH Zürich: GTA Verlag, 2012. Page 11. Subsequently referred to as “Baum, M. and Christiaanse, K.”

[3] Baum, Martina: City as Loft. In: Baum, Martina and Christiaanse, Kees (2012). Page 24.

Definitions

When approaching the topic of existing fabric in architecture, one soon gets confronted with an abundance of terms and expressions. Preservation, conservation, conversion, restoration, renovation or adaption are just a few of those. There are not just a lot of different words expressing similar things, but also it appears that every person, every author has their own understanding of these terms. I will try to put the existing expressions in categories, to bring some clarity to the subject.

Preservation

Preservation is the basic preamble, describing that an existing structure is not being completely demolished, but entirely or partly maintained through targeted actions. However, it is difficult to draw the line between what can be entirely maintained (kept) and at which point an existing substance is actually being altered. Technically, every act of preservation also changes the substance in some way. I want to separate the two terms by focusing on their effects. If something is "kept", the goal is to retain the original character and function – meaning that actions like restoration, renovation, reproduction or reconstruction fall under this term. This strict sense of preservation is usually applied to structures of historic significance – monuments, where the original character needs to be maintained and visible alterations of the existing substance are not desirable.

"Change" or "adaption" on the other hand means that the building is being changed to a different kind of character or to accommodate different functions. This can also include the demolition of certain parts of the building, while it is still considered as preservation, since the design is working with what is existing. The "change" or "adaption" term therefore includes conversion, transformation, extension, addition, subdivision or combination and these expressions will be further explored in this chapter. Industrial buildings usually offer little features that are of historic significance, but are predestined to be altered and adapted. Therefore, in this work I will not focus on strict preservation measures (the "keep" side), but mainly on adaptions and changes of the original substance.[4]

Revitalization

The term "revitalization" is not limited in its meaning to just architecture and city planning, but generally describes the act of revival and strengthening, of bringing life and vitality back to something that has been left unused or abandoned. The expression itself does not suggest how this revival is supposed to take place, therefore also the demolition and replacement of existing structures can be seen as revitalizing actions. Yet it is generally perceived as a preserving way of treating the built heritage and often associated with a similar sense as adaptive reuse.

[4] See: Cramer, J. and Breitling, S.: Architecture in Existing Fabric. Planning, Design, Building. Basel; Boston: Birkhäuser, 2007. Page 101. Subsequently referred to as "Cramer, J. and Breitling, S."

Adaptive Reuse

Adaptive Reuse or conversion means that a building has lost its original purpose and is brought to new life through a change of its use and a change of its character according to this new use. It is not just about putting new functions in an old shell, but it takes the building to a new level by creating the impression that it has now reached its true purpose. At the same time, it does not lead to the final stage of a building's evolution, but it becomes a part of it.

It gives the building a second life. The old fabric serves as a framework and the traces of its history support the newly established functions.[5] In return, the new uses should support the continuous understanding and interpretation of the building's heritage.

Adaptive reuse is moving between the extremes of demolition and preservation. Between replacing a building or turning it into a museum. The challenge for architects is to explore these extremes and to create something that becomes a functioning part of the long history of the site.[6] Architectural construction measures that fall under this term are explained in the following.

Subdivision

Subdividing a building means to introduce new, space dividing measures to the existing fabric to allow new or different uses. It basically includes walls or floors that are being put inside the existing shell, while the overall form and substance of the building is not being altered.[7]

Transformation/Conversion

Transformation or conversion is going a step further than subdivision. While the overall form of the building is still being maintained, there are some significant changes being made to the substance in order to accommodate the desired uses.[8]

Often times, the intersections between old and new become less readable and the physical changes being made are subtle, making it not obvious that the building got transformed to a new appearance. It might even appear to be an entirely new building or as if the old

Fig. 1: Subdivision

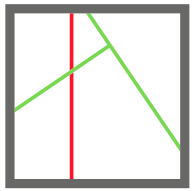


Fig. 2: Transformation/Conversion

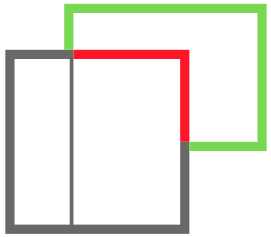


Fig. 3: Addition/Extension

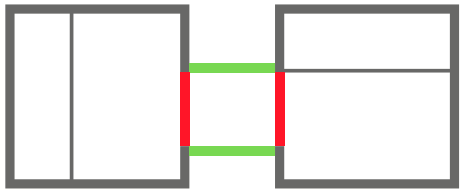


Fig. 4: Combination

[5] See: Jäger, F. P.: Conversion. In: Jäger, F. P. (editor): Old & New: Design Manual for Revitalizing Existing Buildings. Basel: Birkhäuser, 2010. Page 130. Subsequently referred to as "Jäger, F. P."

[6] See: Clark, J. et al.: Adaptive Reuse of Industrial Heritage. Opportunities & Challenges. Melbourne: Heritage Council of Victoria, 2013. Page 6. Subsequently referred to as: "Clark, J. et al."

[7] See: Cramer, J. and Breitling, S. Page 119.

[8] See: Cramer, J. and Breitling, S. Page 119.

fabric has not been changed at all. However, functionally, the building's purpose may change dramatically and can now serve different uses.[9]

Addition/Extension

The term "addition" integrates a wide range of design and con-struction possibilities such as en- larging, extending, adding stories, integrating or supplementing. By adding new elements to the existing fabric, new uses become possible, more space is generated and the building's appearance changes. The boundaries between old and new remain clearly readable, while the contrast between them creates a new unity. It offers unexpected and therefore exciting spatial sequences, rough transitions and reveals the layers of the building's history.[10]

Combination

Combining something means to a create a connection between two formerly separated parts. In the case of architecture in existing fabric, it describes the connection of two or more existing buildings to become one single unit.
It can be a quite challenging adaption measure, since often times neighboring buildings were erected with different floor levels or require other kinds of special solutions. A possible way to overcome such problems can for example by the intelligent placement of a new staircase as the connecting element.[11]

[9] See: Jäger, F. P.: Transformation. In: Jäger, F. P. Page 66.

[10] See: Jäger, F. P.: Addition. In: Jäger, F. P. Page 16.

[11] See: Cramer, J. and Breitling, S. Page 119.

CHAPTER 1

INDUSTRY AND THE CITY

To approach the topic of reusing abandoned industry, one needs to investigate the overall context of the subject, being the city and its history. Knowing about how the cities and their industries in both the United States and Austria developed during time is the key to understanding the challenges that they are facing today. And this understanding should again be a prerequisite of any intervention planned to happen in a city's fabric, in order to reach results that become a sustainable part of the location's development.

The cities of Central Europe and the United States share similarities and are at the same time quite different in many ways. They developed in very different times and were therefore faced with different requirements leading to different qualities and issues. Comparing them allows insights in the people's mentalities and offers the understanding of which characteristics and conditions are necessary to create a good environment for us humans to live in.

1.1. American Cities

American cities are young, since it was not until a little more 600 years ago that the Europeans rediscovered the continent and started to spread over it in the following centuries.

The metro-polises of today were founded at places that were easy to reach, along waterways like Rivers and the Atlantic and Pacific Ocean. Other than European cities, whose foundations reach back to times where other location specific factors might have played a role, American cities were focused on their infrastructure from very early on.

Fig. 5: Ford Motor Company assembly plant in Highland Park (Detroit, Michigan) around 1910.

During the 19th century, a transportation network of canals and railroads was spread over the continent and the cities and their industries grew as being a part of it and also depended on it. Besides the oldest cities like New York and Boston that were founded on the shores of the Atlantic, cities started growing also further inside the mainland. They were founded and grew while the Industrial Revolution was happening and its innovations came up all over the western hemisphere.[12]

1.1.1. Importance of the Industry

The industry shaped the American cities. The importance of Detroit as a city of automobile industries for example was based on a single industrial plant – the Detroit Dry Dock that provided education to young automotive entrepreneurs like Henry Ford or the Dodge Brothers. In the following decades, Detroit became the center of automobile mass production and by the 1950's, it was one of the most productive places in the world.

The emergence of the car soon led to decreasing costs of transportation. This sudden high mobility had two decisive effects: Firstly, the people started to move and commute – they preferred to live in cities with milder climate, nicer surroundings and better neighborhoods. Colder cities started to go into decline.

Secondly, the industry was not limited to a specific place anymore, but was now free to move to locations where the wages of their employees and other costs were lower. Many companies left – to other cities or even other countries and continents.[13]

1.1.2. Suburbanization/Urban Sprawl

The cities were more and more reconfigured to fit this new method of transportation. Highways were built to provide fast access to the downtown districts that became encircled with freeways. Buildings were demolished to create space for surface parking. Networks of one-way streets were introduced to speed up the traffic

[12] See: Glaeser, E.: The Historical Vitality of Cities. In: Wachter, S. M. and Zeuli, K. A. (editors): The City in the Twenty-First Century: Revitalizing American Cities. Philadelphia: University of Pennsylvania Press, 2013. Page 8 et seqq. Subsequently referred to as: "Wachter, S. M. and Zeuli, K. A."

[13] See: Glaeser, E.: The Historical Vitality of Cities. In: Wachter, S. M. and Zeuli, K. A. Page 8 et seqq.

Fig. 6: Freeways running through a suburb in Los Angeles.

flow. Unintentionally, by fitting downtown to the car, the urban planners of the early 20th century destroyed the complex urban fabric of the city. The classic downtown as the very center of a city began to disappear.[14]

Beginning after World War II, new developments were mostly focused on the greenfield. The land outside of the city in the suburbs was cheap and because of the highways, there was still a fast connection to the city available.[15] The trend to leave for the suburbs was also supported by car and construction companies as well as real-estate developers, who all anticipated a whole lifetime of profit due to that new trend.[16] The result is what is known as suburbanization or urban sprawl: a pattern of – usually single-family home – developments with very low density of buildings and depending on the car as the basis of mobility.[17]

Following with the people that moved out to the suburbs, many of the original downtown functions followed. Stores and markets were the first ones to leave the city, following their customers. New "fake downtowns" in the form of shopping malls took over the role of the city center in the suburbs.[18] What remained downtown was emptying stores and houses due to suburbanization and emptying factories due to globalization.[19]

1.1.3. **Urban Renewal Efforts**

To counteract the slow death of the cities, urban renewal programs were set in place starting in the 1960's, to revitalize downtown. Investors were recruited with the mission of giving the city a "face lift". They built superblocks and skyscrapers of glass and steel to accommodate new office, commerce and retail functions. While these projects managed to energize parts of downtown, they still failed to stimulate a wider spreading growth of the inner city. Also, the sudden supply of office and retail space grew faster than the actual demand, resulting in vacancies and the demolition of buildings with lower quality. After all, the urban renewal programs failed, also because the suburbs had become too attractive and downtown could no longer compete with that.

As a next attempt to solve the problem, city leaders tried to

[14] See: Birch, E. L.: Downtown in the "New American City". In: The Annals of the American Academy of Political and Social Science, Vol. 626, The Shape of the New American City (November, 2009), Pages 134 to 153. Thousand Oaks: Sage Publications, Inc. in association with the American Academy of Political and Social Science, 2009. Page 138. Subsequently referred to as: "Birch, E. L."

[15] See: Gillem, M. and Hedrick, V.: Making Postindustrial Cities Livable. In: Kapp, P. H. and Armstrong, P. J. Page 79.

[16] See: Gallagher, J.: Revolution Detroit. Detroit: Wayne State University Press, 2013. Page 5. Subsequently referred to as: "Gallagher, J."

[17] See: Gillem, M. and Hedrick, V.: Making Postindustrial Cities Livable. In: Kapp, P. H. and Armstrong, P. J. Page 79 et seqq.

[18] See: Birch, E. L. Page 138.

[19] See: Gallagher, J. Page 5 et seqq.

implement housing functions and supported institutions like universities, museums, concert halls or hospitals that should exist adjunct to the office buildings. Examples like that can be found in Cleveland, where the University Circle, five miles away from the business district, forms a second downtown and includes a row of cultural venues.

The efforts led to many improvements for sure, but the original downtown, where people could stroll around and be entertained, where the city was fit to a human scale, had gotten lost and given up to the car.[20]

Fig. 7: The abandoned Packard plant in Detroit.

1.1.4. **Current Situation**

After all, the industrial cities of the United States have been declining for over half a century. Globalization made especially China the new factory of the world. Significant changes in production like advancing automation and robotization contributed to the slow death of the cities along the so called "Rustbelt". Meaning the area around the Great Lakes, including States like Michigan, Indiana, Illinois, Ohio, Pennsylvania, New York, New Jersey and also parts of Canada, where a majority of cities relied on heavy industry.

Few cities managed to turn their economies towards knowledge, service and creativity and are not suffering the same decline. Chicago and Toronto are two of those.
What is interesting to see is that only few of the former aggressive "top-down" efforts initiated by city leaders brought significant improvements, but that it is now the more community-based, organic "bottom-up" efforts of creatives, that manage to develop functioning strategies for the cities.[21]

The former industrial quarters now offer an excellent framework to accommodate the new kind of industry coming up. There a millions of square meters available in the abandoned factories connected by good infrastructure with roads and even railroads and waterways. They provide the opportunity for new venues taking place and can turn into lively places of new, innovative and creative economic production.[22]

[20] See: Birch, E. L. Page 139 et seqq.

[21] See: Florida, R.: The Death and Life of Great Industrial Cities. In: Kapp, P. H. and Armstrong, P. J. Page 6 et seqq.

[22] See: Kapp, P. H. and Armstrong, P. J.: Introduction. In: Kapp, P. H. and Armstrong, P. J. Page 9 et seqq.

1.2. Austrian Cities

Other than American cities, the cities of Central Europe are a lot older. Many originate from ancient Roman settlements – in Austria and Germany mainly military camps and fortresses along the borders of the Roman Empire, the rivers of Rhine and Danube.

During the Middle Ages, many of these old settlements grew to become important towns – like Cologne, Trier or Vienna. Innovations in agriculture led to a strong growth of the population that again led to growing cities and the establishments of many new cities. The medieval city also provided an environment of legal security, granting its citizens jurisdiction as well as market and custom rights. The latter made merchants and craftsmen a new important class of population.

The city boundaries and therefore the delimitation of a legal framework were marked by the city wall. Usually these walls had a round shape to keep them as short and cheap as possible. At the same time, they constrained the growing city inside, which led to a very compact city structure and buildings growing over several stories.[23]

Fig. 8: The densely grown city structure of Salzburg.

1.2.1. Uncontrolled Growth

The Industrial Revolution brought another wave of technological progress and again an accompanying growth of the population. Factories were erected, the people moved from the countryside to the city in hope of a work place and therefore led to an explosion of the cities' populations. The historic city structures could of course take neither this sudden growth nor the new requirements of factories and warehouses, it was simply too dense and compact to accommodate these new functions. The new industrial and residential zones therefore developed around the old town and made the cities expand.

This – initially - uncontrolled growth soon led to multiple problems. Sufficient housing could not be provided which led to the emergence of slums with bad sanitary

[23] See: Küster, H. Geschichte der Landschaft in Mitteleuropa: von der Eiszeit bis zur Gegenwart. München: C.H. Beck Verlag, 1999. Page 197.

conditions and social problems. As a reaction, new settlements were erected and the people strived to improve their living and also housing conditions.

The development of a new middle class in society as well as the emergence of motorized mobility intensified the spatial growth of the Central European cities. Similar to the United States, suburbanization also started to come up in Austria. Additionally, during World War II, many historic centers got lost, also destroying the point of identification that connected the people to the city centers. At the same time, the centrifugal tendencies of urban development continued to dominate. The car changed the requirements of the economy – it was no longer bound to the city center that was easy to reach for everyone, but could now happen detached from it out on the green field.[24]

1.2.2. Shopping Malls - The Death of the City Center?

One of the results of this detachment are shopping malls. Originally being an US-American invention, they also became popular in Europe, providing a mix of functions that the city centers with their limited space and – for the car – poor infrastructural connections could not compete with. The shopping malls have shown to have very destructive effects on the centers of – especially smaller - Central European cities. They provide large spaces for internationally operating companies and their assortments, taking away the foundation of the small scale, traditional branches of trade and crafts in the center. Fig. 9 shows the example of the Varena in Vöcklabruck (Upper Austria); a shopping mall that has been creating vacancy in the city center about 2km away.

Fig. 9: The Varena shopping center in Vöcklabruck - built for the car.

Even though this trend soon became quite obvious, the legal conditions in Austria were not strict enough to control and contain the ongoing erection of new malls and retail parks. The laws of spatial planning got changed in the past years, but nevertheless there are still new shopping malls opening their gates up to this day. After all, and even though the concurrence of the e-commerce (retail via the internet) is constantly increasing, creating space for retail functions is still a very profitable option in the real-estate game – a fact that unfortunately also effects political decisions making.[25]

[24] See: Oelschlägel, D. Aktuelle Probleme der Stadtentwicklung in Europa. The author's manuscript for a presentation at the 10th anniversary symposium of the Sächsische Sozialakademie in Chemnitz on 01/11/2002.

[25] See: Seiß, R. Konsumtempel kannibalisieren sich gegenseitig. In: Interview with derStandard.at (November 29th, 2013). Vienna: Standard Verlagsgesellschaft m.b.H., 2013.

1.2.3. **Current Situation**

This political laxity is not only a problem in things of shopping malls and retail parks, but effects the general spatial planning in Austria. The challenges that Austrian cities are facing today therefore come to a considerable share from lacking consequence in urban and spatial planning. Every day, close to 50 acres of greenfield in Austria are being covered with new buildings – a lot of that amount being single family homes, that have to be provided with infrastructure paid by the general public. And still, the erection of these developments and therefore the ongoing process of suburbanization and urban sprawl is still subsidized by the state.[26]

At the same time, the weakening industry is leaving its mark on the regions that formerly relied on it. Especially northern Styria and parts of Carinthia where heavy industry contributed to the economic boom happening after World War II are today struggling with migration and abandoned industrial and residential buildings. The younger people are attracted by the bigger, growing towns that are offering job opportunities. Many start a career there and end up building their residence in a single-family home suburb rather than moving back home.

The migration is leading to the overaging of the population left in the smaller industrial cities. More money has to be invested in retirement homes and fostering and less is left for other investments that would be important for the development of the region. The result is a downward spiral since these regions become less and less attractive for young people and new investments.[27]

Fig. 10: Eisenerz; shaped by the mining industry and Austria's city with oldest population on average.

[26] See: Seiß, R. Land der Zersiedler. In: Die Presse (December 7th, 2007). Vienna: "Die Presse" Verlags-Gesellschaft m.b.H. Co KG, 2007.

[27] See: Hoffmann, C. Die Steirer und ihre Krise. In: WienerZeitung.at (October 19th, 2015). Vienna: Wiener Zeitung GmbH, 2015.

1.3. Similarities and Differences

The effects of the ending era of producing industrialism are clearly influencing the urban environments of both Austria and the United States of America. The focus of the industry has shifted to other countries – especially Eastern Europe and Asia, leaving the factories and their infrastructure abandoned and tearing holes in the urban fabric.

Fig. 11: Broad, straight roadways in the center of Los Angeles, optimized for the car.

Fig. 12: Dense, grown and walkable street structure of Graz, Austria.

However, the resulting impact and the consequences of these damages are – at first sight - not as drastic in the big Austrian cities. Also due to their history, the cities of Central Europe were able to deal with the change from a production to a knowledge-based society in a better way than American cities, since their centers had grown before and were therefore also able to function after the industrial era. The factories were – generally spoken – never as significant for the urban fabric and its survival as it is the case with the much younger cities of North America, where the industry was a major part in the early development of the city.

1.3.1. Infrastructure and Mentality

As a side effect of the American city developing and growing throughout the industrial age, also its infrastructure is fit to this era, creating a much higher level of mobility in the population. The consequence of high mobility though is the absence of emotional connections and identifications with specific places. A fact that be-comes quite obvious when realizing that the average American changes his/her place of residence every two years and even moves to a different state every eight years. Without the identification to a specific environment though, there is also little appreciation existing for the qualities of a local area.[28]

The high mobility created a cluster of mainly monofunctional uses, separating the different urban functions like living, shopping, working or leisure into different buildings and even different parts and districts of the city. A system that developed because of the car and is now depending on the car.

The European city on the other hand provides a tradition of mixed uses within little space. The medieval structure, restricted in its growth by the city wall led to a high density of many different functions, creating a strong urban fabric. Limited space required the built environment to be fit perfectly to the human body and its needs. The city structure is walkable, it

[28] See: Lichtenberger, E. and Aerni, K. Die europäische und die amerikanische Stadt. Modelle, Probleme, Entwicklungstendenzen. In: Berner Geographische Mitteilungen. Mitteilungen der Geographischen Gesellschaft Bern und Jahresbericht des Geographischen Institutes der Universität Bern (1975). Köniz: Lang Druck AG, 1975.

is easily read and understandable, it allows orientation and remains comprehensible. And it is this resulting human scale, that creates the attractiveness of the medieval city.

1.3.2. Learning from the Past?

It is not for nothing that the shopping malls were invented by an Austrian (the architect Victor Gruen) and became this popular in the United States. They provide an imitation of the dense, mixed use structure existing in European cities. They are a compensation of the existing lack of high quality urban space in many American cities. They are a refuge for humans from an environment that has been shaped by the car and is now considered unattractive.

Fig. 13: Industrial buildings and infrastructure near downtown Cleveland.

Back in Europe, the same kind of malls out in the periphery of the cities have disruptive effects on the inner centers that they are trying to imitate. Now that it is quite obvious that the people are in need of these high quality spaces and are searching for the attractiveness of a human scaled functionality, the question arises of what can be changed for the better?

Looking at the past developments, the slow death of city centers in both Austria as well as the United States, it becomes clear that the urban renewal efforts focused on the city centers were the right approach but often failed to find the needed balance for a sustainable and long-lasting urban vitality. Urbanity does not arise from the simple presence of many people in a certain place, as the failed efforts of introducing monofunctional office and commercial uses in the centers of the American cities have shown. What is needed to create vitality is the superposition, the overlapping of many different uses that is also attracting many different kinds of people and leading to interaction between the people and their environment.

Creating this mix of functions is not easy, but the change of the production-based towards a knowledge-based society comes with many possibilities for the cities. Industrial buildings that are - especially in American cities – positioned right at the center provide plenty of space and infrastructure for new ideas. In the future, the formerly declining cities of the Rust Belt could become new vibrant places and attractive environments for creatives that are using their built environment to turn it into something new.

CHAPTER 2

DEMOLITION OR PRESERVATION?

Facing the built environment of the former production-based industry, the question becomes on how to handle this heritage. The basic decision in this context, is whether to demolish it, meaning to raze what's existent and possibly replacing it with something new, or to preserve it, meaning to put actions in place that make in some way use of what is existent.

Demolitions can be separated according to them being either product or problem driven. A product driven demolition is based on a specific idea to use the site in an economically more efficient way by replacing the old structure with a new one. These sort of demolitions are highly dependent on the economic situation, meaning the market condition including legal requirements and the location of the site.

A problem-driven demolition on the other hand is focused on the existing structure itself and it being considered as the source of a certain problem. Demolishing the presumed source of the problem is expected to solve it. A demolition driven by a problem is less based on given objective conditions, but depends more on how a structure is being perceived and what it is associated with.[29]

For historically significant buildings, there usually are well defined preservation laws, that dictate to which extend demolitions, replacements or changes are allowed. Industrial buildings though do usually not fall under these laws, since they are rarely considered historically important landmarks or monuments. It is therefore important to investigate the different aspects and ways in which the decision between replacing and preserving effects our cities and the built environment.

[29] See: Mallach, A.: Demolition and preservation in shrinking US industrial cities. In: Building Research & Information. Volume 39, Issue 4 (2011), Pages 380 to 394. Philadelphia: Taylor and Francis Group, 2011. Page 381. Subsequently referred to as: "Mallach, A."

2.1. Historical Aspects

2.1.1. Preservation - a "Modern" Idea?

Demolitions have been common practice throughout history, reaching from violent destructions during wars to replacements enforced by rulers to make room for new palaces.[30] However, after the Classical Antiquity, preservation and working with existing fabric started to become the rule. Reusing existing structures like the remaining ruins after the collapse of the Roman Empire was the more economic and practical way of building. Entirely new buildings were considered as not worth the investment when an old one could be kept in use with comparably little effort.[31]

One example is the city of Split in today's Croatia. The people living in the nearby town of Salona fled from the invasion of Germanic tribes and transformed Emperor Diocletian's palace into the town center of a new city.[32]
In Italian towns like Vicenza, Florence or Lucca, people used the abandoned amphitheaters as a skeleton for new dwellings. The exterior shell served as a city wall while the substructure underneath the seating rows offered protected living space. The same applies to the Marcellus Theater in Rome, where new houses were even put on top of the existing structure.[33]

Fig. 14: The Marcellus Theater in Rome (Italy) – an early example of reuse of existing fabric.

Aside from economic reasons, some buildings were connected with a certain value due to religious or political symbolism and therefore considered sacrosanct and got preserved and reused throughout the ages. Examples for that are the remaining structures of roman temples all over Europe that were reused as frameworks for new Christian churches, literally depicting the trend of a new monotheistic religion taking the place of the polytheistic one.[34]

Also for political rulers, reusing older buildings was a natural way for them to justify their position. They used the existing architecture to present themselves "(...) as the legitimate successors of earlier ruling linages."[35]

Throughout the Baroque age during the 18th century, many churches across Europe were refitted and refurnished to fit the ideals of this time. A famous architect was

[30] See: Mallach, A. Page 381.

[31] See: Jäger, F. P.: In Dialogue between Epochs. In: Jäger, F. P. Page 7.

[32] See: Christiaanse, K.: Traces of the City as Loft. In: Baum, M. and Christiaanse, K. Page 16.

[33] See: Jäger-Klein, C.: Conversions in Urban History. In: Baum, M. and Christiaanse, K. Page 57 et seqq.

[34] See: Jäger, F. P.: In Dialogue between Epochs. In: Jäger, F. P. Page 7.

[35] Jäger-Klein, C.: Conversions in Urban History. In: Baum, M. and Christiaanse, K. Page 61.

Fig. 15: Demolition of medieval districts in Paris around 1870.

Franz Ignatz Michael Neumann, who designed solutions for the medieval cathedrals of Speyer and Bamberg that are seen as part of the greatest achievements of this time.[36]

2.1.2. **Industry is changing the Game**

With the beginning of the Industri-al Revolution, during the 19th century and the beginning of the Modern era, preservation increas-ingly lost its meaning, while demolition became more and more important. The problem driven demolition was invented when the Industrial Revolution led to serious sanitation issues as a consequence of the rapidly growing cities. This new trend can be marked by famous major demolition plans like the reconfiguration of Paris by Baron Haussmann.

Following Haussmann's plan, over 12,000 buildings were demolished. 85 miles of new, straight and direct roadways were cut through the city, replacing the grown, meandering urban structure dating from medieval times. Along with the new roads, a new sewage system, parks, sidewalks, streetlights and landmarks like the Halle Centrale or the Opera were erected.

The new layout allowed an economically efficient infrastructure with fast transportation within the city. However, the main purpose of the reconfiguration was the controllability of the population in a military sense and the elimination of working class quarters that were seen as unhealthy slums.[37]

2.1.3. **Modernism and Demolitions**

In the 20th century, architects of the modernist era considered demolition as a tool to fit the cities to the coming age of machines and motorized mobility. Historic building traditions were seen as a constraint on architectural creativity and therefore preser-vation was not considered an appropriate architectural tool. Buildings should have a limited lifetime and be replaced to make room for new innovations, so that the built environment can recreate itself and adjust to the technological developments

[36] See: Cramer, J. and Breitling, S. Page 16.

[37] Filler, M.: Architecture View; Baron Haussmann, Urban Designer Par Excellence. In: The New York Times (March 24, 1991). New York City: The New York Times Company, 1991.

of the time.[38] Le Corbusier's Plan Voisin for example proposed the demolition of large parts of Paris' districts on the right bank of the Seine. His idea that was not actually realized, sought to erect motorways running through green parks with villas for the wealthy and high-rise towers for the poorer population.[39]

2.1.4. **Preservation Laws**

Demolition remained being the prioritized tool in urban redevelopment. But beginning early on in the second half of the past century, the German speaking countries of central Europe were the first ones to establish the governmental landmark preser-vation laws, after a good part of the built heritage had gotten lost in World War II due to aerial warfare. They took over a pioneering role and by today, over two-thirds of construction activities in countries like Austria and Germany are being executed on existing buildings.[40]

Internationally, the Venice Charter was put in place in 1964 and defined guidelines for conservation of historic architecture. The paper's main message is that the built heritage is irreplaceable, therefore valuable and must be preserved for future generations. It is still a basis of building preservation today.[41]

On the other hand, in many parts of the world, the situation often looks very different. China for example is erasing its built heritage. During the preparation of the Olympic Summer Games of 2008 in Beijing, historic residential districts were demolished only to be replaced with new Stadiums and facilities for the games lasting a few weeks.[42] Other parts of the world, like South and Central America as well as the Arab world have only recently started to create an awareness for their historic buildings and architectural traditions. And even in North America, working with the existing fabric has not yet become an established practice.[43]

[38] See: Cramer, J. and Breitling, S. Page 21.

[39] See: Mallach, A. Page 381.

[40] See: Jäger, F. P.: In Dialogue between Epochs. In: Jäger, F. P. Page 8.

[41] See: Cramer, J. and Breitling, S. Page 21.

[42] See: Yardley, J.: Olympics Imperil Historic Beijing Neighborhood. In: The New York Times (July 12, 2006). New York City: The New York Times Company, 2006.

[43] Jäger, F. P.: In Dialogue between Epochs. In: Jäger, F. P. Page 9.

2.2. Economical Aspects

The question, whether preserving or replacing a building will be the cheaper option for a client can of course not be generally answered, since it very much depends on the location and condition of the existing building and the new uses and functions that are expected to be accommodated on the site in the future.[44]

2.2.1. Using Opportunities

However, using existing fabric offers a number of chances that can be taken. Restrictions due to the local building law for example might make replacing and a new construction less feasible. For example, a new construction might not get approved in the same extend due to changes in the legal conditions that happened after the erection of the original building.[45] Meaning that the size permitted for a proposed building might be less than already provided by the existing fabric. In that case, it will be beneficial for the owner/client to make use of the existing building and maximize the floor space by preserving it. Also, demolitions are often expensive, wasteful and even dangerous, because hazardous and contaminated substances might be disrupted and set free. The presence of such substances, the form of construction and close proximity of neighboring buildings influence the costs of demolitions and can contribute to them not being feasible.[46]

Fig. 16: Demolition of an industrial building in Coventry (England). The existent value of the brickwork which would be expensive to create nowadays is lost.

2.2.2. Advantages in the Construction Process

Construction-wise, money and energy can be saved since the building, its components and materials (for example the foundations, basic services and load-bearing structure) are already existing and the high costs of the initial production can be saved. Also, existing struc-

[44] See: Brückner, C. et al.: "A Gift from the Past". (Interview with F. P. Jäger). In: Jäger, F. P. Page 12.

[45] See: Bone-Winkel, S. and Matheis, H.: The Economic Aspects of Real-Estate Development. In: Baum, M. and Christiaanse, K. Page 85 et seqq.

[46] See: Douglas, J.: Building Adaption. Second Edition. Amsterdam/Oxford: Elsevier/Butterworth-Heinemann, 2006. Page 15. Subsequently referred to as "Douglas, J."

tures offer the possibility of a step-wise progress of the conversion, meaning that "the floor space only has to be converted when a specific tenant has been decided. This means that investments that may not correspond to a future tenant's requirements can be avoided."[47] As an example, the load bearing structure of an old building might be intact and therefore allow the progress of both the interior fit-out and the installation of a new roof at the same time. The changes and improvements can happen flexibly and at very high speeds, since the basic framework is existent.[48]

2.2.3. Considering Environmental Sustainablity

Reusing and adapting existing buildings, components and materials are important sustainability criterions. The energy consumption of production and transportation as well as the generation of waste can be minimized compared to demolition and erecting a new building. Therefore, in some ways preservation can be considered as the ultimate form of recycling, since the material value and the energy saved in the material and the construction is being reused.[49]

Also the existing fabric itself might offer advantages. Thicker and more solid walls like the two-foot masonry walls of many industrial or warehouse buildings contribute to a relatively high thermal capacity with slow thermal response. Also the natural lighting and ventilation as well as small openings can lead to a high potential in energy savings.[50]

2.2.4. The Designer's Side

For the architect on the other side, working on a smaller scale project in existing fabric can often lead to a higher required effort with little monetary reward, since a lot of time consuming detail work might be necessary.[51]

Therefore, many designers shy away from preservation projects, preferring economically more feasible new constructions on the green field, where standardized solutions and details can be applied.

[47] See: Bone-Winkel, S. and Matheis, H.: The Economic Aspects of Real-Estate Development. In: Baum, M. and Christiaanse, K. Page 85.

[48] See: Bone-Winkel, S. and Matheis, H.: The Economic Aspects of Real-Estate Development. In: Baum, M. and Christiaanse, K. Page 87.

[49] See: Kapp, P. H.: Historic Preservation. The Foundation of SynergiCity. In: Kapp, P. H. and Armstrong, P. J. Page 36 et seqq.

[50] See: Douglas, J. Page 15 et seqq.

[51] See: Brückner, C. et al.: "A Gift from the Past". (Interview with F. P. Jäger). In: Jäger, F. P. Page 12.

2.3. Social Aspects

2.3.1. A Matter of Taste?

The public opinion about what is worth to be preserved and what should be demolished is closely connected to its culture, the values associated with it and also the attitude towards their history, especially the point in time that a building originates from. However, every individual of a culture, nation, region, city and even neighborhood will still think differently and will have different ideas about what should be preserved or not.[52] For example, whereas "people who from their aesthetic perspective prize the ruins of buildings in older industrial cities as ruins, the struggling family that lives near those ruins is likely to see them very differently. Their feelings about the abandoned property next door are unlikely to be driven by an aesthetic appreciation of the beauty of decay."[53]

2.3.2. Social Benefits

Also socially, preservation offers a number of advantages. Other than economic or environmental facts, these social benefits are not directly measurable. It is only the effects and impacts that preservations have on the urban fabric, that become obvious and readable. "(...) sensitive adaption schemes such as the reuse of disused industrial buildings (...) can bring back life to run-down urban areas. The successful adaption (...) of a redundant property can offer hope to a community devastated by the loss of traditional industries."[54]

2.3.3. Creating Identity

Existing buildings are always witnesses to the past and therefore in some way also part of the location's identity. And it is not just prestigious buildings like palaces, castles and churches that shape the urban fabric, but also everyday buildings of production, trading and living. "These buildings also contribute just as much to identification and orientation and equally represent a social value.

Fig. 17: Zeche Zollverein in Essen (Germany): successfully reusing the structure has converted the public opinion about it and turned it into an important cultural venue.

[52] See: Mallach, A. Page 384.

[53] Mallach, A. Page 384.

[54] Douglas, J. Page 16.

If the existing buildings are appropriately converted, they can remain as an active part of the urban structure and as a node in the network of relationships, interlacing and movement in the urban space. These locations thus also have relational value."[55] Neighborhoods and streets that create urbanity consist of buildings, that have existed, changed and modified over time. They can be seen as a "family" of buildings that are connected to each other and interdependent.[56] Preserving them through adaptive reuse by giving them new and different uses also expresses continuation.[57]

At the same time, there is a danger of "over-preservation". Turning a city or neighborhood into a museum by making too many of its buildings historic artefacts will not help the ultimate goal of a vital area either.[58]

[55] Baum, M.: City as Loft. In: Baum, M. and Christiaanse, K. Page 10.

[56] See: Woodcock, D. G.: Introduction. In: Austin, R. L.: Adaptive Reuse. Issues and Case Studies in Building Preservation. New York: Van Nostrand Reinhold Company, 1988. Page 8. Subsequently referred to as "Austin, R. L."

[57] See: Schneider, J.: Introduction Europe. In: Baum, M. and Christiaanse, K. Page 98.

[58] See: Mallach, A. Page 383.

2.4. The Attemt of an Answer

For reaching the goal of a lively city, neighborhood and a functioning building, both demolition as well as preservation must be considered as tools of urban and architectural planning. The challenge is to find path in the middle, where there is a balance between these two.

2.4.1 Individual Decision-Making

Out in the field, the decision will ultimately and majorly depend on the particular building that a project is concerned with. A build-ing might have reached the very end of its life and no repair and maintenance measure might lead to an improvement of the existing condition, making a demolition inevitable. At the same time, this is often likely to become an excuse made out of laziness and rejection of the more complex task of preserving and reusing the building.[59]

Fig. 18: A building from the 19th century in Baltimore (Maryland) being replaced with parking lots for a new facility. Economic interests destroying components of identity and urbanity.

2.4.2. The Designer's Sensibility

Also, many decisions in planning and urban development are met by single institutions or persons with economic interests – private property ownership or profit seeking. These decisions often conflict with the nature of the city itself – an organic, living fabric.[60]

Therefore, Architects and planners are challenged with understanding this fabric, reading it, gaining the right insights and influencing the decisions that are being made. The important elements of the existing built fabric need to be discovered - buildings, that contribute to the identity of certain place. "Ultimately, the decisions on what to preserve and what to demolish must flow from a deeper understanding of what best furthers the vitality of the urban organism."[61] And who if not us architects are the ones who can gain this understanding by reading the urban fabric and understanding the possibilities of abandoned industrial buildings? It ultimately requires the sensitivity and intuition of the designer to find the right balance while considering the different aspects that should be involved in the decision.

[59] See: Cramer, J. and Breitling, S. Page 134.

[60] See: Mallach, A. Page 383.

[61] Mallach, A. Page 383.

CHAPTER 3

INDUSTRY AND THE BUILDING

After exploring the historic urban contexts of our cities and the available tools of working with our built environment, it is now time to investigate the industrial heritage itself. This heritage is not limited to the factory as the most obvious component, but also includes warehouses and other spaces for the storing of goods, mining facilities, residential and office buildings connected to the industrial use and quite importantly also the infrastructure connected to it, including rail-, waterways and streets.

The development of these indus-trial structures has been a constant process, heavily influenced by the technologic innovations happening, but also by architects, engineers and designers working with the styles of their times. This development has resulted in an important chapter of architectural history and a rich heritage of buildings shaped by their manufacturing industrial use, containing significant character-istics and possibilities that will be explored in this chapter.

3.1. History of Industrial Architecture

The Industrial Revolution happening in the late 18th and early 19th century had quite a strong impact on architecture. Before, the focus of design and construction work lay on ecclesiastical, military or public buildings and emphasizing the power of politic leaders and nobility.[62]

3.1.1. Style and Technology

Early on in this revolution, the newly invented steam engines bore the unknown. They were loud and many people considered them as intimidating and fearsome – not only because of their appear-ance, but also since they often represented a threat to their workplace. Therefore, the early factory buildings were designed to give the new technology a familiar coating. By choosing classical styles, the architects of these buildings sought to create continuity and to give the people something they could relate to. At the same, they reflected the newly gained power of the industrialists, by creating a stylistic connection to the historic buildings of leaders and the upper class.[63]

England, from where the industrial revolution started to spread over the world, was at that time the leading innovator also in things of constructive engineering and the architecture of industrial buildings. In the early 19th century, the Prussian architect Karl Friedrich Schinkel toured the British Islands and brought new ideas back to the European mainland. He manifested his in-sights for example in his design for the Bauakademie in Berlin, one of the first constructions in Central Europe using a skeletal structure with a brickwork facade.[64]

Fig. 19: Flax mills near Leeds (England) that were given an Egyptian-styled facade.

Fig. 20: Schinkel's Bauakademie from 1836 introducing a new type of construction.

Over the years, the new ways of production, the steam-powered machines and automation facilities that became bigger, also required a new type of building: large-scale, hall like factories. Places designed for production. Architects abandoned the Classical dresses and made their buildings more functional, more fitting to the processes and machineries going on.[65]

3.1.2. Innovations

While many influences originated from the side of industry and its solutions for technical or func-tional challenges, it was also archi-

[62] See: Aitchison, M.: Industrial Architecture, Past and Present. In: Aitchison, Mathew (editor). Ashgate Studies in Architecture. The Architecture of Industry. Changing Paradigms in Industrial Building and Planning. Farnham: Routledge, 2016. Page 1 et seqq. Subsequently referred to as "Aitchison, M."

[63] See: Darley, G.: Factory. London: Reaktion Books Ltd., 2003. Page 16. Subsequently referred to as "Darley, G."

[64] See: Aitchison, M.: Industrial Architecture, Past and Present. In: Aitchison, M. Page 3.

[65] See: Darley, G. Page 16.

Fig. 21: The Fagus Factory by Walter Gropius and Adolf Meyer opened in 1913, being an early example of Modern architecture. The glas facade and especially the corner detail without a load bearing element were revolutionary.

Fig. 22: The AEG Turbinenfabrik from 1909 is still being used today by the Siemens company for its original purpose.

tects' ideas and designs that shaped the way factories worked and were conceptualized. Looking at the Fagus Factory in Germany by Walter Gropius and Adolf Meyer from 1911, or other manufacturing facilities of the subsequent Bauhaus era, it becomes obvious that this exchange of two different disciplines was very fruitful, leading to innovations on both sides. Industrial buildings therefore even play an important role in the history and development of Modern architecture.
At the beginning of the 20th century, with the upcoming of the automobile, Henry Ford introduced the moving assembly line, which again boosted the productivity of the industry and created new challenges for modern factory buildings. Albert and Julius Kahn in collaboration with Ernest Wilby designed the Highland Park for Henry Ford's company and set a new standard for this kind of large-scale production complexes.

In Europe, Peter Behrens and his design for the AEG Turbinenfabrik marked the final turn from the classicistic styles of industrial buildings towards a high functional reinterpretation of the factory and its processes.[66]

The progress of industrial development also brought new construction materials like steel, lightweight metals and plastics, which again influenced the industrial buildings that now became lighter. Steel constructions with aluminum claddings allowed a fast and simple construction as well as replacement and alteration, resulting in low costs.

[66] See: Aitchison, M.: Industrial Architecture, Past and Present. In: Aitchison, M. Page 1 et seqq.

Fig. 23: Silicon Valley near San Jose (California, United States): an area of high-tech computer and communication industries shaped by large, low-rise production halls as well as office and research facilities.

3.1.3. Industrial Buildings Today

Even though the forms of industries have changed over the course of the past century, their interplay with architecture is still existent. Nowadays, architects do not design plants of heavy industry any longer, but are focused on the "New Economy" meaning high-tech industries taking place in areas like the Silicon Valley in California, that are no longer focused on the production of goods, but especially web-based services. An example of this new, more research and high technology focused industrial buildings is the Apple Campus 2 by Norman Foster & Partners.[67]

[67] See: Aitchison, M.: Industrial Architecture, Past and Present. In: Aitchison, M. Page 5 et seqq.

3.2. Characteristics

3.2.1. Constructive Characteristics

Industrial buildings usually share similar characteristics that make them very valuable in the sense of finding possible reuse options. They provide large open spaces with little subdivisions. Tall columns creating high ceilings are arranged along consistent grids. They bear the loads of the roof or upper floors that are resting on beams.

The first industrial buildings from the 18th and early 19th century were usually constructed with wrought or cast iron members forming an internal frame and load bearing brick, stone or timber walls creating a very solid and structurally robust construction.[68] Large windows were placed in regular intervals to provide sunlight inside the production halls. Wood was used for the story floors until it was replaced by the more fireproof brick vaults resting on cast or wrought iron beams.

Fig. 24: The steel skeleton structure of a railway station in Scranton (Pennsylvania, United States) being clad with a limestone facade in 1907.

In the early 20th century, cast and wrought iron members were replaced by the newly invented steel, which became the material mostly used for factory and warehouse buildings. Reinforced concrete was also often used, both in pre-cast or in-situ form, but did not reach the same efficiency as steel.

By the end of World War II, lightweight claddings supported by skeletal steel frame constructions had replaced the solid load-bearing walls of bricks or stone. Due to this much more lightweight form of construction, both the load-bearing as well as the thermal capacities are usually a lot lower compared to older examples. Also, these new factory and warehouse buildings were arranged more horizontally, often consisting of only a single story and stretching over a larger footprint.[69]

3.2.2. Contamination

One of the most difficult challenges that industrial sites and buildings come with are possible contaminations and the presence of hazardous substances such as asbestos. Both the building itself as well as the former industrial uses and the abandonment over a long period of time, can contain and create various toxins in the ground or the building fabric. Such sites are referred to as “Brownfields”, describing an area where contamination hinders the progress of reuse. The contaminations that bear possible risks for the human health are an important reason why little investments have been made in abandoned industry. The necessary cleanups are complex and therefore expensive, which makes industrial sites particularly unattractive.

[68] See: Cantacuzino, S.: Re-Architecture. Old Buildings/New Uses. New York: Abbeville Press, 1989. Page 128. Subsequently referred to as: “Cantacuzino, S.”

[69] See: Douglas, J. Page 169.

Fig. 25: Contamination due to improper disposal of oil barrels.

Finding parties that can be held responsible and liable for the contamination is often impossible, since former owners or users that caused the contamination are difficult to identify. Companies that once owned or operated an industrial site might not exist any longer and so the question arises about who has to pay for the complex remediation.
At the same time, new investors fear possible liabilities they might have to face when deciding to reuse an industrial site. The resulting costs that can arise from unpredictable problems lead to a very high risk that few are willing to accept.

The legislator, being the general public is challenged to create a framework that fosters the reuse and redevelopment of brownfields. New investments can be supported through tax incentives or funding. Clear legal conditions regarding the liability issues make risks predictable and remediation and reuse possible.[70]

3.2.3. Emotional Characteristics

Also the emotional properties, meaning the ideas, feelings and attitude about an abandoned industrial site are of importance. The brownfield itself represents a past form of how we humans used space. The fact that we left it behind and let it fall into decay shows human failure. This is creating a special kind of atmosphere of both repulsion, threat and even fear, but also fascination and attraction. In some ways, brownfields can be seen as a mirror, showing an abandoned, chaotic downside to a society focused on consumption and creating a harsh contrast to the shiny world of mass media that we pretend to live in. They might even appear threatening since they so directly confront us with our society's failures.

In addition to this burden of negative emotions connected to a site, the abandonment can result in quite tangible issues. Often times they become venues where homeless seek to find a place to live, where illegal businesses can be settled without law enforcement getting ahold of it, where young people can act out experimental forms of self-fulfillment or where dog-owners let their pets go about their own business. Abandonment always harbors this danger of letting the site become a zone free from any form of order.[71]

The way in which a brownfield's atmosphere is ultimately perceived depends on the single individual. Whereas many will treat it with despite, other people like the creative minds of artist will be more likely to interpret the emotional characteristics of abandoned industry as a chance and possibility rather than a threat. They will see the chaos as a new starting point for new ideas and chances that can take place.[72]

[70] See: Hula, R. C. et al.: Reclaiming Brownfields: A Comparative Analysis of Adaptive Reuse of Contaminated Properties. Farnham, Surrey, England; Burlington, VT: Ashgate, 2012. Page 1 et seqq. Subsequently referred to as: "Hula, R. C. et al."

[71] See: Hasse, J.: Brownfields – Characteristics and Atmosphere. In: Baum, M. and Christiaanse, K. Page 56.

[72] See: Hasse, J.: Brownfields – Characteristics and Atmosphere. In: Baum, M. and Christiaanse, K. Page 52 et seqq.

3.3. Possibilities

Industrial buildings offer a wide range of possibilities, that reuse projects can use and turn into new strengths. These possibilities include both technical, architectural advantages as well as emotional properties, meaning characteristics that make an existing factory or warehouse a significant component of the urban fabric and its history.

3.3.1. Constructive Opportunities

Construction wise, the tall floor to ceiling heights are an important feature of industrial buildings. They provide plenty of room for retrofitting like the addition of electrical or plumbing systems in an elevated floor.[73] Wide, open fabrication halls with little separations, generous scales and the repetitive sequences of columns allow the flexibility that the new lifestyles and industries of today require. They are an existing framework that can accommodate new features, a screen on which new ideas can be projected. "They can accept both programmatic and semantic changes, and this openness allows them to remain living, dynamic and also unique components in the city's structure."[74] Additionally, the whole set of necessary infrastructures like water and sewer lines, electricity, streets and sidewalks and often rail- and waterways are available and have once been paid for.[75]

3.3.2. Social Opportunities

Since they had a great importance in earlier times through providing workplaces for a big part of the population, industrial buildings are strongly related to a location's context. "In the course of their existence, the factories changed cities and gave rise to new lifestyles."[76] This heritage, the ways in which a building was once used, the processes happening there and the people working there, is reflected in the architecture and its specific features and elements. They tell the story of a place and contribute to its identity, making the building closely connected to its environment. While other buildings from the past 100 to 150 years share stylistic principles that are more or less the same all over the world, these places of production that were mainly focused on their functionality, are much closer connected to the context in which they exist and evolved.[77]

As negatively afflicted as this connection to the context might be because of how it changed during time, it still comes with a chance, containing properties that can be used to become new strong components of the urban fabric. Successful reuse projects have shown to have very positive effects on neighborhoods and entire districts, creating new values out of a difficult heritage.

[73] See: Kapp, P. H.: Historic Preservation. The Foundation of Synergicity. In: Kapp, P. H. and Armstrong, P. J. Page 37.

[74] Baum, M.: City as Loft. In: Baum, M. and Christiaanse, K. Page 8.

[75] See: Kapp, P. H.: Historic Preservation. The Foundation of Synergicity. In: Kapp, P. H. and Armstrong, P. J. Page 37.

[76] Baum, M.: City as Loft. In: Baum, M. and Christiaanse, K. Page 10.

[77] See: Baum, M.: City as Loft. In: Baum, M. and Christiaanse, K. Page 8 et seqq.

3.4. Reuse of Industrial Buildings

3.4.1. Places for Creatives

What is interesting to see is that abandoned factory buildings have always attracted young artists and creatives. The lack of money and the need of a lot of space and good light, made the reuse of existing structures an obvious choice. Pablo Picasso for example lived in a former piano factory in Paris in his early years at the beginning of the 20th century. The Bauhaus college moved to an old telephone factory in Berlin and later to an old bakery in Chicago since they were being expelled by the Nazis during the 1930s. And the reuse of the industrial quarter in Lower Manhattan, New York City, and its transformation to the famous SoHo-District, where many young artists chose to live and which became the first famous revitalization of an industrial area.[78]

3.4.2. Creating Public Space

These reuses were mainly based on the spatial requirements that the artists found in the empty factory halls. On the other side, the "Potteries Thinkbelt" designed by Cedric Price in the early 1960s, was one of the first projects that also focused on the aesthetic value of an industrial building and its potential to serve as a public space creating an environment for technological and social innovations.[79] His unbuilt design describes the transformation of former ceramic factories at the coal fields of Staffordshire to an open campus and innovation center. He used the existing buildings for public learning spaces that could be reconfigured to allow different uses like student and staff housing. The buildings would be connected by the existing rails that had been used for transporting the coal to the

Fig. 26: Cast-iron buildings of the SoHo district in Manhattan (New York, United States), formerly containing commercial uses and small factories and later being reused by artists.

[78] See: Christiaanse, K.: Traces of the City as Loft. In: Baum, M. and Christiaanse, K. Page 15 et seqq.

[79] See: Christiaanse, K.: Traces of the City as Loft. In: Baum, M. and Christiaanse, K. Page 17.

potteries. The rails would serve for transportation through rail-buses that at the same time could turn into moveable learning and work spaces.[80] The design represents the first step that took the idea of reusing industrial sites to a public and urban scale.[81]

3.4.3. Bottom-Up and Top-Down

The new social movements with upcoming subculture groups of the 60s and 70s also used former industrial buildings, often occupied them also for residential purposes. They represent the beginning of the "bottom-up" approach of reusing abandoned industry by occupying and transforming it trying to reach a public benefit. On the other side, also the first "top-down" efforts took place, being more focused on personal benefits of the developers – a remarkable one being the conversion of a cement factory into the residence and office of architect Ricardo Bofill in Barcelona.

Fig. 27: Ricardo Bofill's "La Fabrica" in Barcelona (Spain). A reused cement factory turned into his private residence and office.

3.4.4. Becoming Common Practice

Consecutively, the idea of bringing industrial buildings to a new live has become more and more popular and common which also mixed the boundaries between strict "bottom-up" or "top-down" approaches. Architects managed to bring both commercial interests as well as the participation of culturally active groups together.

Fig. 28: Entrance to the Museum at the reused coal mining complex Zeche Zollverein in Essen (Germany) by Architect Heinrich Böll.

The largest project of urban renewal working with abandoned industry took place in Germany beginning at the end of the 1980s, when a government-supported effort was started to revitalize the Ruhr area – a former large-scale coal mining region. Many former activists of new movements now held positions of political significance and contributed to the success of this project. Similar to the idea of the Potteries Thinkbelt, the abandoned coalmines and steel factories were transformed into new public, educational and recreational centers and the polluted landscapes around them were being renaturalized.

Today, the reuse of industrial buildings has become an important business of the real-estate branch. And due to the fundamental change away from the "Fordist" era of production based industry, it is facing entirely new possibilities which can result in a renaissance of this building type.[82]

[80] See: Martin, D.: The Thinkbelt: The University That Never Was. In: Discover Society (Issue 10, July 1, 2014). Bristol: Policy Press, 2014.

[81] See: Christiaanse, K.: Traces of the City as Loft. In: Baum, M. and Christiaanse, K. Page 15 et seqq.

[82] See: Christiaanse, K.: Traces of the City as Loft. In: Baum, M. and Christiaanse, K. Page 18 et seqq.

CHAPTER 4

HOW TO: REVITALIZATION AND ADAPTIVE REUSE

This chapter will investigate how the heritage of redundant and abandoned industrial structures can be actually used, revitalized and turned into new living components. The two sides that the discipline of architecture is combining – the technological and the creative requirements are being needed and have to be brought together to ultimately reach the goal of a lively city resulting from a successful revitalization.

The process to get there can be a quite laborious one, designs that are working with an existing structure are usually more complex, time-consuming and challenging compared to new buildings. But, if the necessary effort is being invested, the work will pay off, as already existing examples in cities all around the world have shown.

4.1. The Mission

4.1.1. The Goal of Urbanity

The goal of revitalization is to bring vitality back to the city, neighborhood and the building itself. It is the people, that are the city and that create this vitality through their creativity, their innovation and the way they envision and implement change.[83] "Thus, the route to urban vitality lies in adopting policies that help people to thrive and to innovate; in other words, the route to revitalization lies in promoting human capital."[84]
Architecture has the chance to contribute promoting this capital. Places that attract people and motivate them to become active parts of their environment can change neighborhoods and changed neighborhoods can change the city.

Especially places and buildings that have a history bear this possibility. People emotionally relate to their built environment. They project memories on the existing fabric around them and get connected to it. Especially industrial buildings that have particularly shaped the environment of our cities contain these connections (as elaborated in the previous chapter). Their existing fabric therefore comes with a wealth of qualities that are there to be discovered and used.

Fig. 29: The turbine hall of a former powerstation in London (England) now accomodating the Tate Modern Gallery. A successful reuse project creating a place of urban vitality.

4.1.2. The Challenge

The challenge of reusing an abandoned industrial building is to overcome its obsolescence, meaning that the new use that is being implemented has to ensure its future life. While the range of possible new uses is close to unlimited, there will be restrictions dictated by the building itself, it's form of construction and also the location and surroundings that it is situated in and the legal conditions connected to it.[85]

Architecture, as a unique combination of both technical and artistic aspects, is challenged to provide solutions for these tasks. Finding the design idea, the func-

[83] See: Glaeser, E. In: Wachter, S. M. and Zeuli, K. A. Page 7.

[84] Glaeser, E. In: Wachter, S. M. and Zeuli, K. A. Page 7.

[85] See: Douglas, J. Page 146.

tions, uses, and the form for a building is the one side. Creating a functioning structure that can serve as an accommodation for these functions is the other.

Approaching a design for the existing fabric can be quite different from what it is for new buildings. While it is of course necessary to still stick to planning and building regulations as well as technical requirements, there is also the existing condition and configuration that must be taken in consideration and that needs to be implemented in the future design. With all the chances that existing buildings come with, there will also be a lot of defects and problems that make the task a quite complex one. The planning process therefore also can be a very lengthy and challenging one.[86]

The clients, architects and engineers, but in case of existing fabric also – and quite importantly – the authorities for building preservation, must work closely together as a team in order to reach good results. The comprehensive assessment, providing the necessary information basis for further decisions, is essential. Every part of the team needs to contribute to this assessment, since it eliminates the risk of the unknown for everyone.[87]

In the end, the challenge is to come to a result that is respecting the past as well as the present and future, while creating a balance between tradition, technical and practical requirements and a contemporary architectural expression.[88]

[86] See: Cramer, J. and Breitling, S. Page 10.

[87] See: Rabun, J. S.: Structural Analysis of Historic Buildings. Restoration, Preservation, and Adaptive Reuse Applications for Architects and Engineers. New York: Wiley, 2000. Page 1. Subsequently referred to as "Rabun, J. S."

[88] See: Cramer, J. and Breitling, S. Page 12.

4.2. Design Approach

4.2.1. Analysis

A detailed analysis is the foundation of any design approach, regardless if the project is about the reuse of an abandoned factory or if it is happening out on the green field. The insights gained from this analysis will determine the parameters that the new idea has to consider.

Firstly, the building and its context need to be understood in complex ways. This includes the surroundings, the urban fabric, the neighborhood that the building is embedded in and the spatial relations and connections - meaning view axes and walk ways towards, from and within the site. Especially for finding the future uses, knowing the surrounding and its requirements that a design can fulfill is essential.
These are requirements that every planning process has to consider, regardless if the design is happening in existing fabric or on a free/cleared site. What becomes particularly important in the case of reusing an existing building though, is the connection to the past. This adds another dimension to the analysis, since every existing structure comes with a history that has to be understood and consecutively considered. Especially in the case of industrial buildings, there will be evidence of former functions, people, materials, machines, work flows and processes. The architect is challenged to discover them and through this understanding laying the foundation for a successful design.[89] Especially this historic analysis will require a high level of investigation. It is safe to say, that there is more initial analytic work to do when approaching existing fabric than it would be the case with a new building on the green field. And consecutively, also the parameters that the design has to react to will be more complex, which can also become a strength for the design though.

Fig. 30: A former machine factory in Hamburg (Germany) revitalized to become a culture- and event center. The traces of former usage have been intentionally preserved.

[89] See: Clark, J. et al. Page 6.

In the end, the analysis as a foundation for the design, for its new uses and the architectonic expression that is to be chose, has to make a statement about the values of the existing fabric. The strengths that are worth to be preserved and made use off need to be discovered.[90]

4.2.2. New Functions

Clients might have fix ideas about what the new uses should be like, but it is important and the architect's duty to go beyond that. Good architecture rarely happens when just based on client requirements. "You look at the building and its location, free of the impositions of the task at hand, in other words independently of the intended spatial program and the ideas of the client. You want to see what you will actually find there."[91] The possibilities that a building and its surroundings offer need to be used and this should be the basis for finding the future functions. Pressing a certain idea into an existing form does not work without damaging the form and will most likely not lead to a good result. It is important to explore how the chances, features and values of a building can be best used and brought to the fore – for both the expression that is sought for as well as how to use the structure.[92]

As shown before, industrial buildings offer a broad range of possibilities. Their open and repetitive structure allows the accommodation of various new functions since any needed architectural action can easily be implemented. This flexibility makes it even more important to take the site's location and surroundings in consideration. Many decisions regarding the use of space might be decided based on economic feasibility studies and how to make the most profit of the available square meters. But when working in an urban fabric as it is the case with many abandoned factories, it is the designer's responsibility to decide whether these decisions will contribute to the vitality and the urbanity of the place. A continuing dictation of purely economic interests has shown to be not sustainable, harmful to the urban fabric and might ultimately lead to the next future abandonment.

4.2.3. Architectonic Expression

Other than in the case of new buildings, the architectonic expression of a design for an existing building depends on how the new relates to

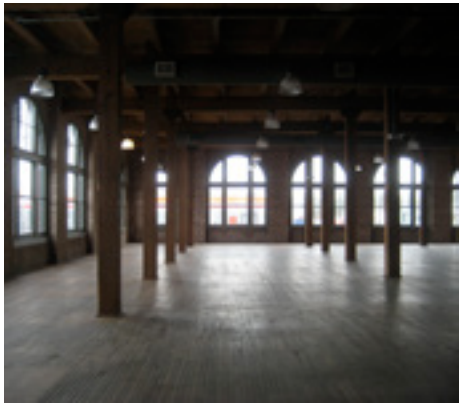


Fig. 31: The hall-like structure of many factories and warehouses allowing a broad range of possible new uses.

Fig. 32: A modern story addition creating both contrast and at the same time visually completing the building at the top.

[90] See: Brückner, C. et al.: "A Gift from the Past". (Interview with F. P. Jäger). In: Jäger, F. P. Page 12.

[91] Brückner, C. et al.: "A Gift from the Past". (Interview with F. P. Jäger). In: Jäger, F. P. Page 11.

[92] See: Cramer, J. and Breitling, S. Page 31.

the old. The architect has to decide how this relationship should be created. Are the interventions visible? Do new additions connect or differentiate to what's existent? Do they create a clear contrast or are they being integrated and become less readable?[93] It is a basic decision whether the dialogue, the relationship between the old and new is rather directed with or against each other. The architect is challenged to read the building's character within its context and come to the conclusion of how the intervention should look like.[94]

This "reading" to find strengths and the values of an existing building and especially coming to the conclusion of how to interpret them using modern means requires sensitivity on the designers' side. There are infinite possibilities between harmonization and contrasting and there is no "recipe" or "law" that is generally applicable. Looking at existing case studies can help to get insights and finding the appropriate level of intervention.

Fig. 33: Brutal Contrast: a deconstructivist addition to the Art Museum from 1922 in Akron (Ohio, United States).

4.2.3.1. The Devil is in the Details

Finding the idea for the intended expression is the one side, the other is to create a design that makes this intention visible. This actual execution is where the quality of an idea is ultimately decided. While in a new building, an appealing concept might distract from weaknesses in the execution, an intervention in an existing building and its realization has to be perfectly to the point. And while when planning a new building, the construction details are often standardized and repetitive from project to project, working on old buildings will require individual elaboration perfectly fit to the existing substance.

Industrial buildings from the past century have the advantage of relatively consistent and accurate dimensions in things of their structural grid, wall thicknesses or openings. Older buildings on the other side have usually not been erected following specific plans and are therefore a lot more inconsistent in their dimensions, making it necessary that detail plans are created for practically every single situation. Even though this can be a very laborious and time-consuming task, the architect should not leave the problem to other planners or the contractor, just like he or her would not delegate decisions regarding the architectural design. Ultimately the result will pay off and show the quality of the design and the one who is responsible for it. Architects like Carlo Scarpa have become true masters in the design of these individual details.[95]

4.2.3.2. The Importance of the Intersection

Especially the point of intersection between old existing fabric and what is newly added is of particular importance in the planning process. Many of the questions asked before concerning the intended architectonic expression are being answered when the design of this intersection is decided. "The

[93] See: Cramer, J. and Breitling, S. Page 137.

[94] See: Meixner, C. et al.: "A Gift from the Past". (Interview with F. P. Jäger). In: Jäger, F. P. Page 12.

[95] See: Cramer, J. and Breitling, S. Page 159 et seqq.

way in which the new and the old are brought together determines whether the existing building plays a leading or a supporting role."[96]

The joint makes this decision immediately visible by showing how the architect decided to react to this separating point between past and present. In many ways, this point will decide the quality of the overall design. Both the existing as well as the new parts might be designed very well, but the success of the "whole picture" will ultimately depend on the joint, the point of intersection where both sides meet and where it becomes visible if the architect failed or succeeded with his idea of bringing them together. It therefore is a quite critical point for the entire design that requires careful treatment and detailed planning work.

The current perception in architecture is to value the existing fabric by differentiating what has been added by choosing more or less strong contrasts and delineating the two sides rather than imitating and trying to continue the old. One common way is to use glass as a connecting element, since it creates a visible gap but is still connecting in a subtle, light and transparent way. Another possibility is to create a so called shadow line, meaning a small gap separating two components and/or different materiality and therefore showing a clear, yet simple delimitation.[97]

4.2.3.3. Creating a New "Whole"

Ultimately, a well-designed combination of old and new will create – to say it with the words of Aristotle - a new whole that becomes even more than the sum of its parts. The contrasting combination of different levels from different times creates unexpected situations that will encourage the users to engage with them and ultimately lead to the emergence of creativity. It is not only the architectural advantages that make the reuse of industrial building attractive – it is also this new reality resulting from the clash of different times, different materiality and surfaces and also different or often even opposing former and new uses.[98]

[96] Cramer, J. and Breitling, S. Page 151.

[97] See: Cramer, J. and Breitling, S. Page 151 et seqq.

[98] See: Armborst, T. et al.: From Soho to SumCity. In: Baum, M. and Christiaanse, K. Page 41 et seqq.

4.3. Technical Approach

4.3.1. Security and Protection

As mentioned earlier, the planning process of revitalizations can be a lengthy one. The existing building that is the object of the revitalization project can very often bear defects that can lead to destructive effects over the time of the project preparation (for example a small leaky part in the roof can have devastating effects due to water penetration over the time of a few months that is required for planning). Therefore, it is important to find and fix possible defects. These repair measures will not be final solution for the design, but they should stop the process of decay over the time of planning and secure the building before the construction work can start. This also includes measures against defects inflicted by humans – like vandalism.[99]

4.3.2. Documentation and History

As a first step of the planning process itself, it is essential to find and organize every bit of information that is available of the building and its history. Understanding the existing fabric, its structure and the changes that were made throughout its existence are the basis for a successful investigation. The more can be discovered in this analyzing phase and in existing plans, the more time and therefore money can be saved instead of difficult and resource consuming material and detail investigations later on in the project. At the same time, it is important to check the discovered material against the actual existing building, since the documentation of possible changes might not have happened or gotten lost throughout the past.[100]

Also, the time in which the building was erected or changed needs to be considered, since methods and materials of course changed in the history of Architecture. "For new buildings we have at our disposal a comprehensive body of regulations, standards, structural theories, and measuring methods for building components, connecting methods, materials, etc. The regulatory instruments applicable today have only limited relevance, if any, for older buildings. Builders in the past had their own rules and regulations which they followed more or less thoroughly. When assessing a building, we therefore can not avoid taking into account the standards and regulations in force at the time of the construction."[101] Taking a look into the history of construction is therefore a necessary step, since it offers a deeper understanding.

4.3.3. Diagnosis

In the second step, the existing fabric is being evaluated. Possible problems or defects are being examined. "Here, it is important to distinguish between the cause and effect of defects."[102] While defects might sometimes have seemingly obvious causes, it is dangerous to jump to fast conclusions. Detailed investigation and understanding of the defect in its context is necessary to create the basis for finding a constructive solution.
The basic considerations that are necessary concern the structure and

[99] See: Cramer, J. and Breitling, S. Page 29 et seqq.

[100] See: Hempel, R.: Structural Check for the Building's Skeleton. Working on Existing Buildings - Experience Gained by a Structural Engineer. In: Jäger, F. P. Page 140 et seqq.

[101] Hempel, R.: Structural Check for the Building's Skeleton. Working on Existing Buildings - Experience Gained by a Structural Engineer. In: Jäger, F. P. Page 141.

[102] Hempel, R.: Structural Check for the Building's Skeleton. Working on Existing Buildings - Experience Gained by a Structural Engineer. In: Jäger, F. P. Page 141.

the construction type. The load-bearing system and the materials used for it are being evaluated. In many cases of industrial buildings, the system is easily readable (since it was not necessary to hide structural elements), but in others, it might be less obvious. In that case, understanding the architectural style or approximate age of the construction might also allow conclusions concerning the used systems, construction methods and materials that can be expected within a building.[103]

4.3.3.1. Walk-Around and Walk-Through

Practically, the diagnosis consists of detailed inspections (walk-around and walk-through). Every square meter of the building is being examined critically from the foundation to the roof. The organization of these inspections is very important, since random approaches to find flaws will not provide the full necessary understanding.

The walk-around is an inspection of the building from the outside, focusing on the facades. Sketching and photographing helps to identify problems like evidence of settlement or cracks in the outer walls. Also the condition of possible openings (windows and doors) can be checked.

The walk-through is the continuation of the walk-around on the inside. Interior construction elements are being assessed, structural damages need to be discovered and evaluated. At the same time, the walk-through provides information concerning the interior space's compatibility for future uses.

Generally, there are three forms of damages that can be found: human-inflicted damages; inherent damages on building components due to moisture and pervasive structural damages such as the settlement of foundations or fire damages.[104]

4.3.3.2. Structure

Generally, the load-bearing structures of historic industrial buildings are comparably "simple" and straightforward – meaning that they are not bearing unusually high compression or tension forces. Architects and engineers only recently (with the help of computers) started to exploit the laws of physics, whereas in history, constructions and dimensions were mainly based on experience.

The investigation of the structure needs to be especially precise, since little alterations on load-bearing components that have not been identified as such before, can have devastating effects. The structural survey focusses on identifying these components and describing their characteristics, condition and capacities. Usually, there are assessments of standard values for historic structural components available. Only in some cases, it will be necessary to investigate the actual performance of a certain component and its material.

However, even more important than examining individual characteristics is the understanding of the overall structure and how all its parts work together and depend on each other. Also, difficult situations can occur when the structural system has experienced alterations before and these changes led to defects and consecutively to structural weaknesses. Depicting the structure and these possible changes in a specific structural plan showing historic developments can help to gain the full understanding

[103] See: Rabun, J. S. Page 27.

[104] See: Rabun, J. S. Page 32 et seqq.

Fig. 34: The Fahle building in Tallinn (Estonia) and its addition of several stories on top of an old paper factory showing the possibilities of an intact load bearing structure of an industrial building.

of the building's structure and its condition.

Defects of the structure will usually show through cracks or distortions, since those are indicators for movement that is happening within the structure. For example, vertical cracks across a bricked wall can be an indication for shearing forces due to uneven load distribution caused by settlement. While not all movements are necessarily a problem, the indicators should still be analyzed carefully. Systematically documenting them and also monitoring them over a longer period of time will help to understand the actual problems and their causes.[105]

4.3.3.3. **Material**

Defects of materials can be another reason for structural issues. Timber constructions can suffer from fungal or insect infestation, metals in steel constructions or also as reinforcement for concrete suffer from corrosion and bricks from aggressive salt compounds due to moisture. Of course it is not only the material of the load-bearing structure that needs to be examined, but also of the building shell and especially joints, fittings and fixtures (for example windows).

While many defects or damages and can be detected through indications showing on visible surfaces, it might also be necessary in some cases, to take samples from within a material or use technologies to "see" hidden layers. One of those is thermography, which is typically used to detect heat losses, but that can also make hidden structures visible through differences in the temperatures of materials within the wall or ceiling.

If these non-destructive methods and the analysis of historic documentation are not sufficient to gain enough insight in a building component, it can become necessary to "open up the patient". Since these kind of measures require a certain degree of destruction, they should be decided upon, handled and executed with care.[106]

[105] See: Cramer, J. and Breitling, S. Page 83 et seqq.

4.3.4. Therapy

The third and last step is about finding the right solutions for the problems that were found. Solving the defects of the existing fabric is again the basis for a successful design, since they might influence the appearance of the building and its components. Therefore, this step is the intersection of the Architect's and Architectural Engineer's work, since the given fabric with the necessary constructive measures and the intended design with its new uses will influence each other.[107]
If the diagnosis was done in a comprehensive manner, it will be possible to actually "cure" the origin of the problems found. If only the damage, meaning the effect of a problem is being repaired, but the actual cause is still existent (possibly because it has not been discovered), it will lead to further repairs in the future. This again shows how essential the diagnosis, research and investigation work is when approaching existing buildings.[108]

The question arises on how to actually execute the therapy. Of course it is not possible to proclaim technical solutions that will be appropriate for any building and its defects, but as a basic suggestion on how to treat existing substance technically, the response is the same as it is in things of the design: "with sensitivity".

Fig. 35: Corroding metal on the silos of an abandoned factory.

4.3.4.1. Introducing New Elements

One needs to remember that there are changes that have happened in the history of a buildings already and that probably will continue to happen in the future. It is likely, that the current measures being taken will not be the last, and that they will only become a little part in the evolution of the building. Considering this, it becomes obvious that a farsighted view is necessary.

For defects this means that the repair of damaged components should be preferred over their replacement. Choosing an additive approach, for example supporting a weak wooden beam with a light steel construction rather than removing and replacing it entirely will not only preserve existing

[106] See: Cramer, J. and Breitling, S. Page 72.

[107] See: Hempel, R.: Structural Check for the Building's Skeleton. Working on Existing Buildings - Experience Gained by a Structural Engineer. In: Jäger, F. P. Page 140 et seqq.

[108] See: Cramer, J. and Breitling, S. Page 86.

material, but might also be the more economic decision. Removals and replacements, especially when it comes to the load-bearing structure always bear the danger of possible collateral damages, which makes them quite complex and hazardous.

And for changes other than such vital repair measures, like partitions, building services or other elements that are needed for new uses, it is also worth considering addition and to design them in a way that they can be removed again later. Making an architectural action reversible pays tribute to the existing substance and values it.[109]

While this appreciation of an existing structure is of course good and necessary and the points mentioned here are worth to be considered, they should not become a constraint. Again, it is in the designer's responsibility to decide about the actual value of a building and its components. And in many cases, a more assertive approach also technically and construction wise might lead to the better architectural solution. While, when it comes to reusing a medieval building, reversibility might be the more appropriate approach, in things of an abandoned industrial building that is probably of less historic value, it will be necessary to consider more significant measures.

4.3.4.2. Choosing the Right Materials

Choosing the right material for a repair measure or a newly added component is both a matter of the design as well as the construction technique. Because in the end, it is about the appearance, but even more importantly the new material also needs to be compatible with what is existent. Mistakes happen, when the properties of an existing material are not known well enough.

Industrial buildings from the past century and their brickwork constructions for example were usually held together by lime mortar – a cavernous material that allows diffusion and therefore absorbs and releases humidity. These days, the more common mortars are cement mortars that create a quite solid compound with little porosity. If now, in the course of a repair measure, no attention is being paid to the different properties of these mortars and the consistent cement mortar is applied on a porous compound, humidity will be trapped inside, ultimately penetrating the bricks and corroding them.[110]

Therefore, sufficient knowledge about material properties is important and again this knowledge must make its way from the designer's office to the construction site and to the worker executing the measure. After all, a design will be only as good as its execution. Detailed planning and descriptions can ensure a good communication between all parties and can ultimately lead to good results.

[109] See: Cramer, J. and Breitling, S. Page 167 et seqq.

[110] See: Cramer, J. and Breitling, S. Page 166.

4.4. Conclusion

The points of this chapter have shown the complexity that a reuse proposal comes with. While every architectural enterprise is a network of multiple aspects influencing each other, revitalizations harbor an additional constraining layer being the existing fabric and the specifications that it comes with.Erecting a new building on the green field might allow statements regarding various aspects such as the orientation, how to arrange functions or how to solve technical details. But given the additional layer of the existing fabric, these considerations soon have to be discarded.

Ultimately, there is no "recipe" or guideline of how an adaptive reuse project can be lead to success. While it is already dangerous to propose general solutions technical wise, it is impossible to suggest design measures that can be applied on every industrial building.
The existing fabric will always offer unique possibilities and problems that require attention, investigation and well-considered solutions. Looking at examples from all around the world executed by various architects and engineers, it clearly shows that the more investigation and work on detailed solutions was being put into the proposal, the more successful it ultimately turned out to become.

The designer is challenged to be a perfectionist that has to consider the whole context and the little construction detail at the same time. Comprehensiveness can therefore be seen as keyword. Every aspect of a proposal that is not being considered and elaborated can be either a missed chance or -even worse - a future problem.
But if the necessary effort is being put into the consequent execution of an idea, the results have shown to lead to good architecture and positive effects on the building in its context. The case studies in the following chapter will mention a few of these examples.

CHAPTER 5

CASE STUDIES

The following case studies present examples of reused factories, warehouses and industrial infrastructure, showing the wide range of possibilities that these structures have to offer. Three projects were accomplished in the United States and another three in Austria, with differences and similarities in their approaches on both sides of the Atlantic. They are also depicting different grades of architectonic interventions, reaching from only repair measures to major additions of new components.

Legend

Time:

Present

Past

Usage:

Factory

Warehouse

Railway

Gasometer

Residential

Office/Administration

Event/Conference

Shopping

Culture/Museum

Restaurant

Workshop

Park

5.1. Stern Building San Francisco, California

The Stern Building is part of the Levi's Plaza, an ensemble of several buildings accommodating offices, shops, restaurants and the Levi Strauss & Co. company headquarter. It is located in the northeast of San Francisco and was originally called the Italian Swiss Colony building, since it was erected in 1903 by the Italian Swiss Colony Wine Company. It was used as a warehouse for wine and also housed offices for the company. The location right at the waterfront of the San Francisco Bay and the railroad tracks that formerly ran directly by the building allowed the quick loading of wines on the ships and trains going to the East Coast.[111]

The building was erected as a steel construction cladded with thick brick walls that were needed to create a good climate for the wine storing inside. This strong structure allowed to withstand the devastating earthquake and the following fire of 1906, that had destroyed large parts of the city.

Although the Prohibition ended the usage of the building as a wine storage, it was furthermore used as a warehouse for different companies until the late 1970s. At that time, redevelopment plans were considered for the waterfront of San Francisco seeking to demolish the existing historic warehouses and replacing them with modern commercial and residential complexes. A preservation movement gaining track in the city prevented these plans with the idea of preserving some of the historic industrial buildings.

The Levi Strauss & Co. company then made the building a part of their Levi's Plaza that was erected in 1980 and renamed it after one of their directors, resulting in the name "Stern Building". Intensive repair measures, a reconfiguration of the interior and the addition of a 5th floor on the roof had to be put in place to prepare the building for the new office uses. The biggest challenge was the development of the south façade facing the plaza, since it had been a blank wall, because of a former neighboring building. The architects decided to not reconstruct the façade, but extracted the forms, alignments and rhythms of the other facades, ultimately creating a very self-consistent design and a good example of architectural design sensitivity in existing fabric.[112]

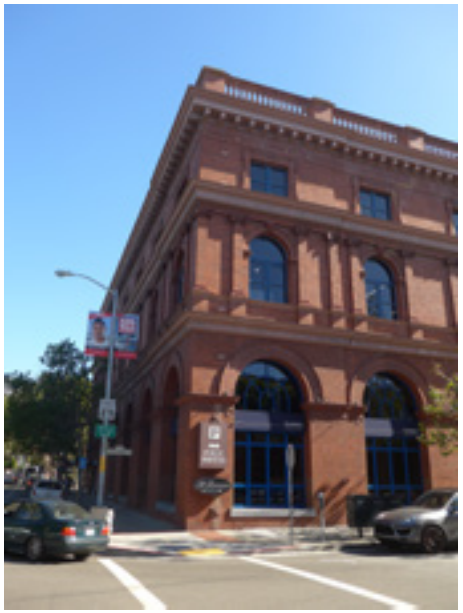
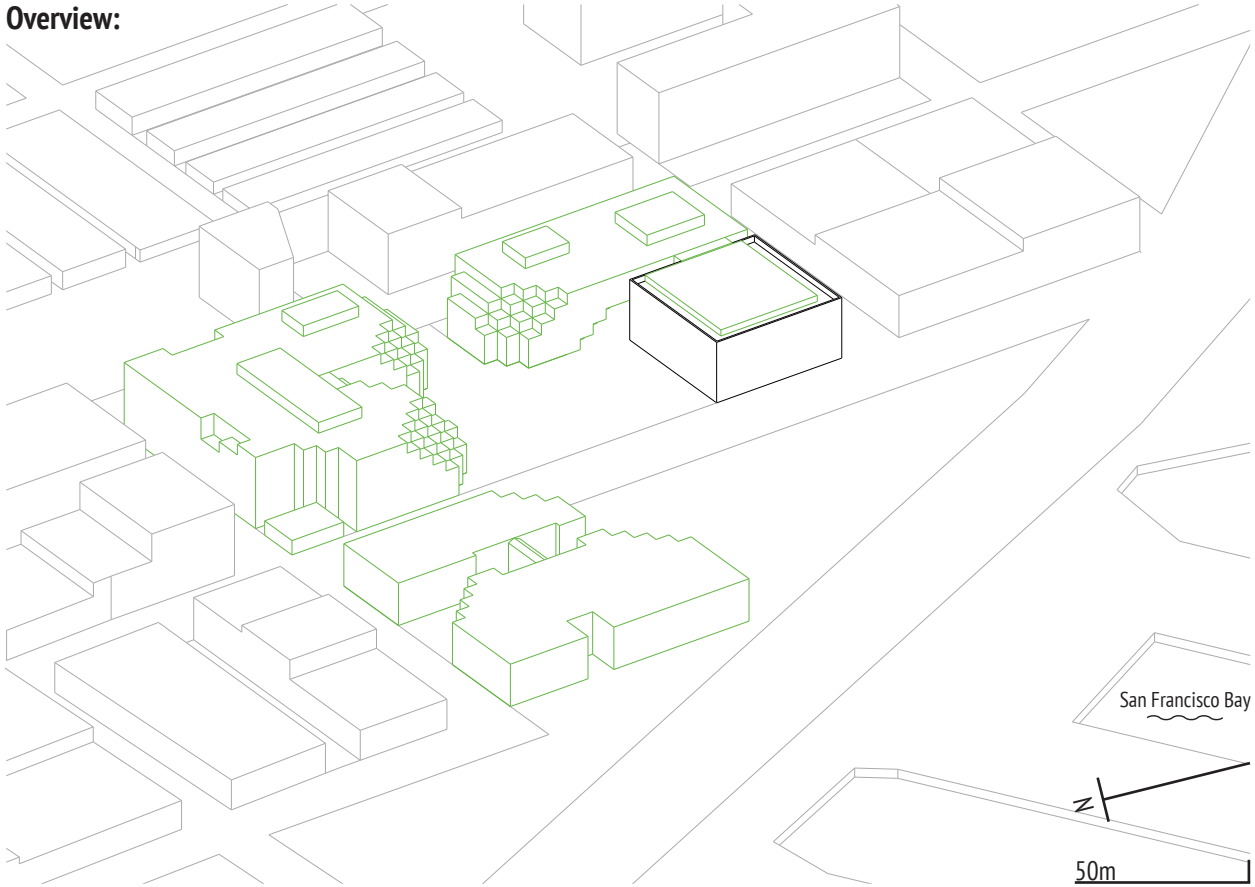


Fig. 36: The north-east corner showing the original ornate brickwork facade.

[111] See: Petrin, K.: Italian Swiss Colony. In: The Semaphore No. 198 (Spring 2012). San Francisco: Telegraph Hill Dwellers, 2012.

[112] See: Austin, R. L. Page 80 et seqq.

Overview:



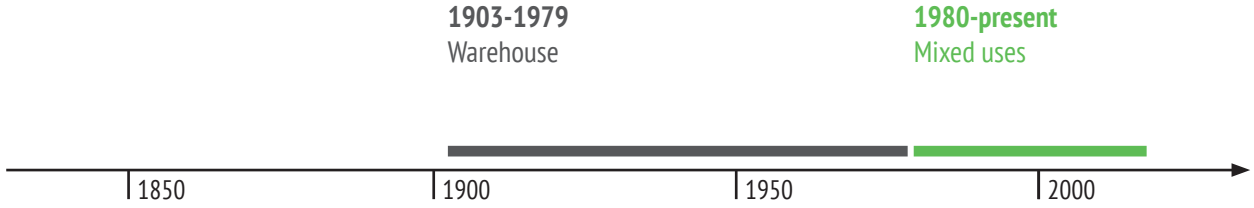
Location:

Usage:

Intervention:

Addition

Timeline:



5.2. Highline New York City, New York

The High Line in New York a public park and recreation area. The structure is dating from the 1930s, when in the course of an urban renewal program, the need of a separation of street and rail traffic had arisen. The goal was to increase the flow of the traffic on the ground and allow the transport of goods directly to the warehouses by elevating the railway. The result was an over 20km long steel structure with a height of 8m and a width of 20m.

When the production declined and the transport of goods was more and more shifting from the rail to the road, the High Line was no longer needed. Large parts were demolished and also the remaining section between the 34th and Gansevoort Street was to be replaced for new building land. But in the late 1990s, a community-based campaign called "Friends of the High Line" managed to stop the demolition and proposed reusing the structure. The idea became popular, creating enough financial foundation to start a revitalization project.

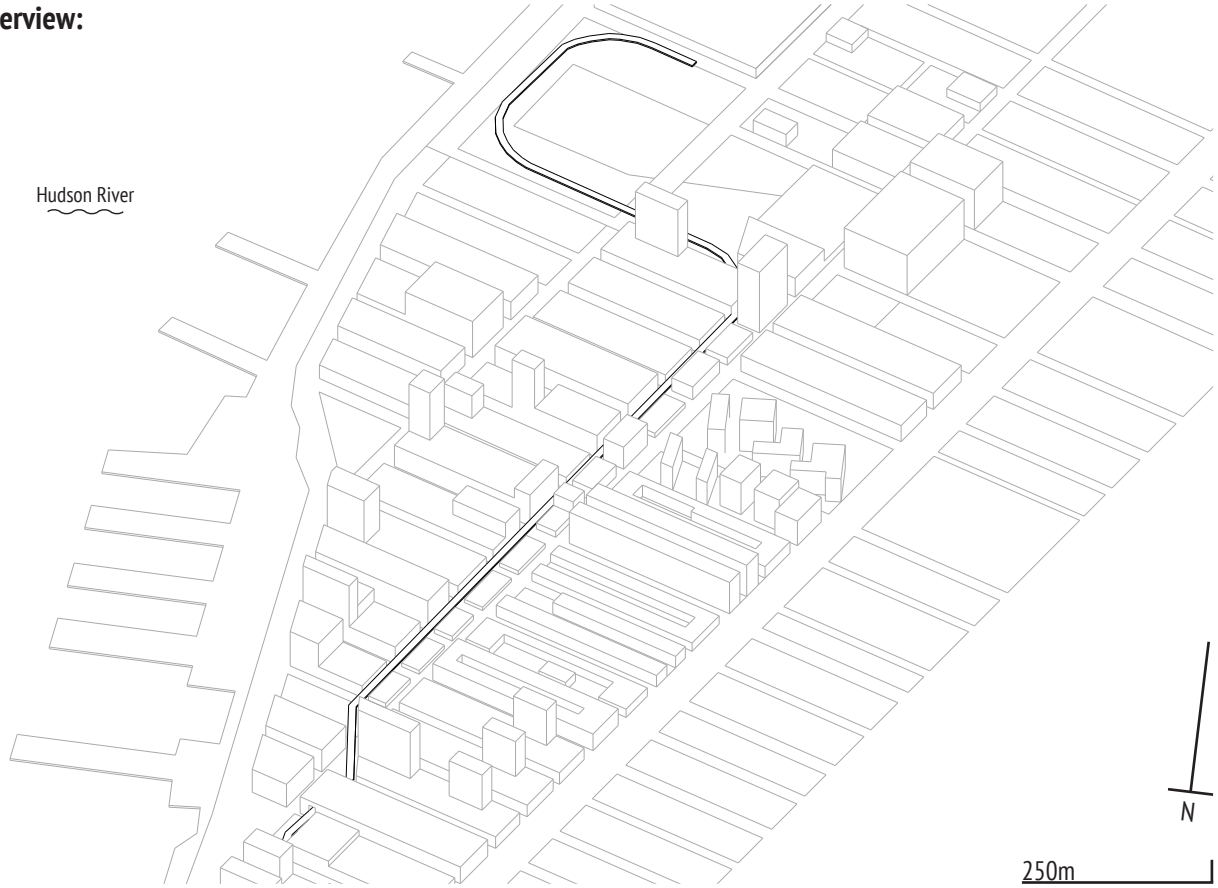
The design of the park was decided in an architectural competition, it proposed a combination of park, promenade, meeting-points and stages. Construction works started in 2006, completing the park over the whole length of the remaining 2.3km in three stages until 2014. The High Line has since become a vibrant public space, also influencing and stimulating adjacent areas.

This project shows that the adaptive reuse of abandoned industry does not only have to be applied on actual industrial buildings like factories or warehouses, but also the infrastructure that is connected to them. It has become a model for an idea that has since been applied in other cities as well.[113]

Fig. 37: Combining newly added walkways, plants and the existing rails.

[113] See: Armborst, T. et al.: The Highline, New York. In: Baum, M. and Christiaanse, K. Page 321 et seqq.

Overview:



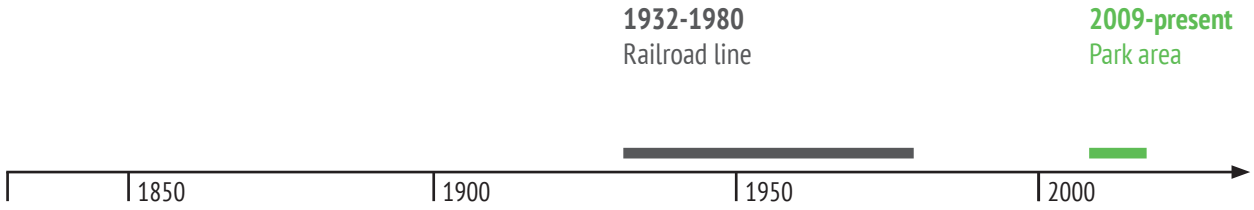
Location:

Usage:

Intervention:

Transformation

Timeline:



5.3. Boott Mills Lowell, Massachusetts

The Boott Mills in Lowell are an example of a former textile factory that has been converted to accommodate mixed uses including apartments, offices, a museum and a visitor center. It is part of the Lowell National Historical Park that is paying tribute to Lowell being one of the first industrial cities in America. The city developed throughout the industrial revolution, when various textile mills were erected along the Merrimack River, using its waterpower to operate the weaving machines. The oldest buildings in the ensemble of the Boott Mills date back to the 1830s and the complex kept developing and growing until the early 20th century. The resulting ensemble therefore depicts the evolution of the industry and the technological progress in its architecture.[114]

Fig. 38: The complex is surrounded by canals that were needed to create the waterpower in the early days of the mills.

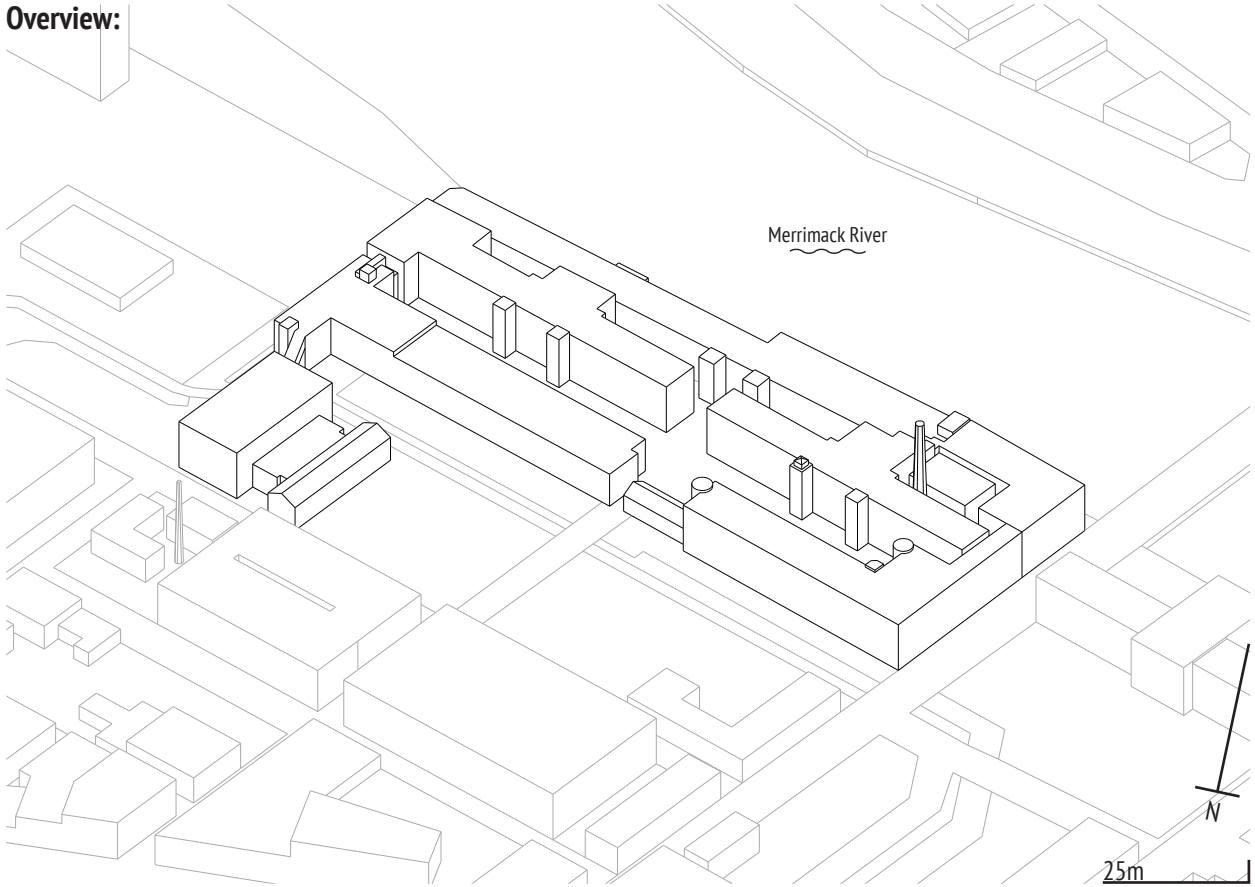
As most industrial cities though, by the middle of the century Lowell started to go in decline and the Boott Mills ceased their operations in 1958. Due to the historic significance of the town, the National Historical Park was established in the late 1970s and since the building ensemble of the Boott Mills had been well preserved, they soon became part of the National Park and therefore a protected historical landmark.

The city of Lowell and a cooperation of private investors sought to spur the re-development of the area, leading to the adaptive reuse of the Boott Mills starting in the early 1980s. The Boott Mills therefore are an example of industry that became a landmark and whose historic significance has led to its preservation and reuse.[115]

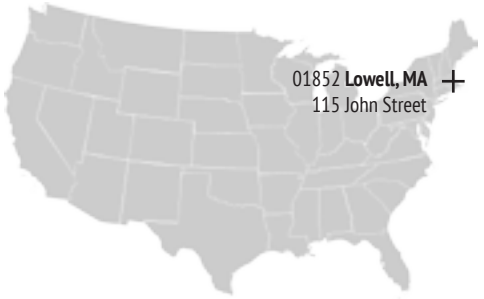
[114] See: The History of Boott Cotton Mills. Official hompage of The Apartments at Boott Mills.

[115] See: Cantacuzino, S. Page 132 et seqq.

Overview:



Location:



Usage:

Intervention:

Subdivision, Transformation

Timeline:

5.4. Seifenfabrik Graz, Styria

The "Seifenfabrik" is a multipurpose event hall in the Jakomini district of Graz, located by the river Mur.

The site was established in the early 1870s as a plant that would collect the sewage waters of the city and use them to produce agricultural fertilizers. Before, the waste waters of the city had run into the Mur or were saved in tanks, which of course created bad smells and polluted the river. When the works on a canal system for the city started in the 1920s, the production was shelved. A new owner converted the site into a chemical plant, but the factory never went in production.

In the course of World War II, the main brick building got hit by a bomb, which ended anticipated usage.[116] Soon after, a new owner took over the building and turned it into a soap factory (leading the the designation "Seifenfabrik"). This probably also had to do with the abatement of the odor nuisance resulting from the former manure extracts.
The plant was closed in 1997 and remained vacant for several years, only used sporadically by artists and gymnasts making use of the high ceilings. After a group of investors decided to revitalize the site in 2001, in 2003, repair measures, minor demolitions and additions were realized to turn the building into an event area.[117]

Today, the site consists of four large event halls that are grouped around a foyer, which is the only newly erected addition in the course of the reuse proposal. The prominent multistory extraction hall that was added to the ensemble in 1917 also accommodates a seminar room on the upper floor.[118]

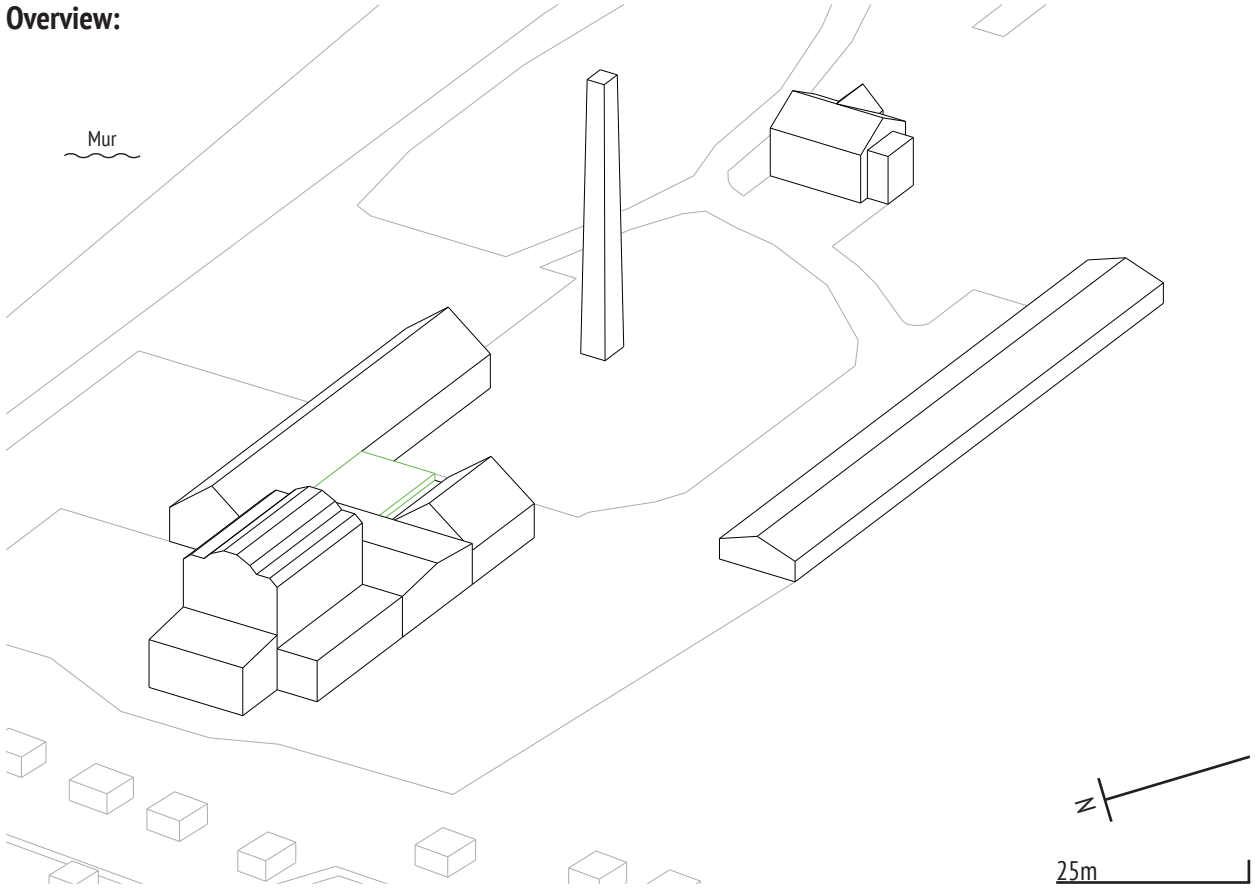
Fig. 39: The prominent multistory extraction hall added in 1917.

[116] Die Geschichte der Seifenfabrik. Official Homepage of the Seifenfabrik.

[117] See: Engele, R.: Pecunia non olet: Geld stinkt nicht, hieß es auch in Graz. In: Contribution to the column "Damals in Graz" in the Styrian version of the Kleine Zeitung. Online via the Austria-Forum database.

[118] Die Geschichte der Seifenfabrik. Official Homepage of the Seifenfabrik.

Overview:



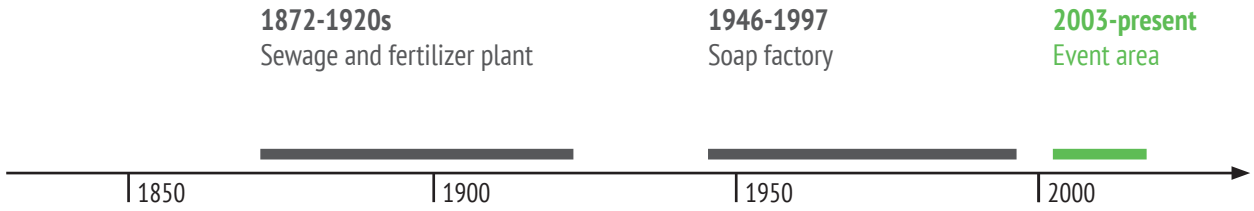
Location:

Usage:

Intervention:

Transformation, Addition

Timeline:



5.5. Gasometer Vienna

Fig. 40: Brickwork facades of the four gasometers seen from south east.

The four gasometers in the 11th district of Vienna were erected in 1896 as part of the "Gaswerk Simmering". The plant produced city gas from coal that was needed for the street lightning as well as heating and cooking.

The gasometers were so called telescope gas tanks, consisting of an adjustable steel construction. The brickwork that is still remaining today was only a beautification measure hiding the industrial look of the steel that was considered unattractive.[119]

Between 1969 and 1978, the city switched from using coal gas (city gas) to natural gas and also electrified street lightning, making the gas tanks redundant so that they were closed in 1985. While many other gasometers around the city were demolished, these four tanks were preserved because of their brickworks and were even declared historic monuments.

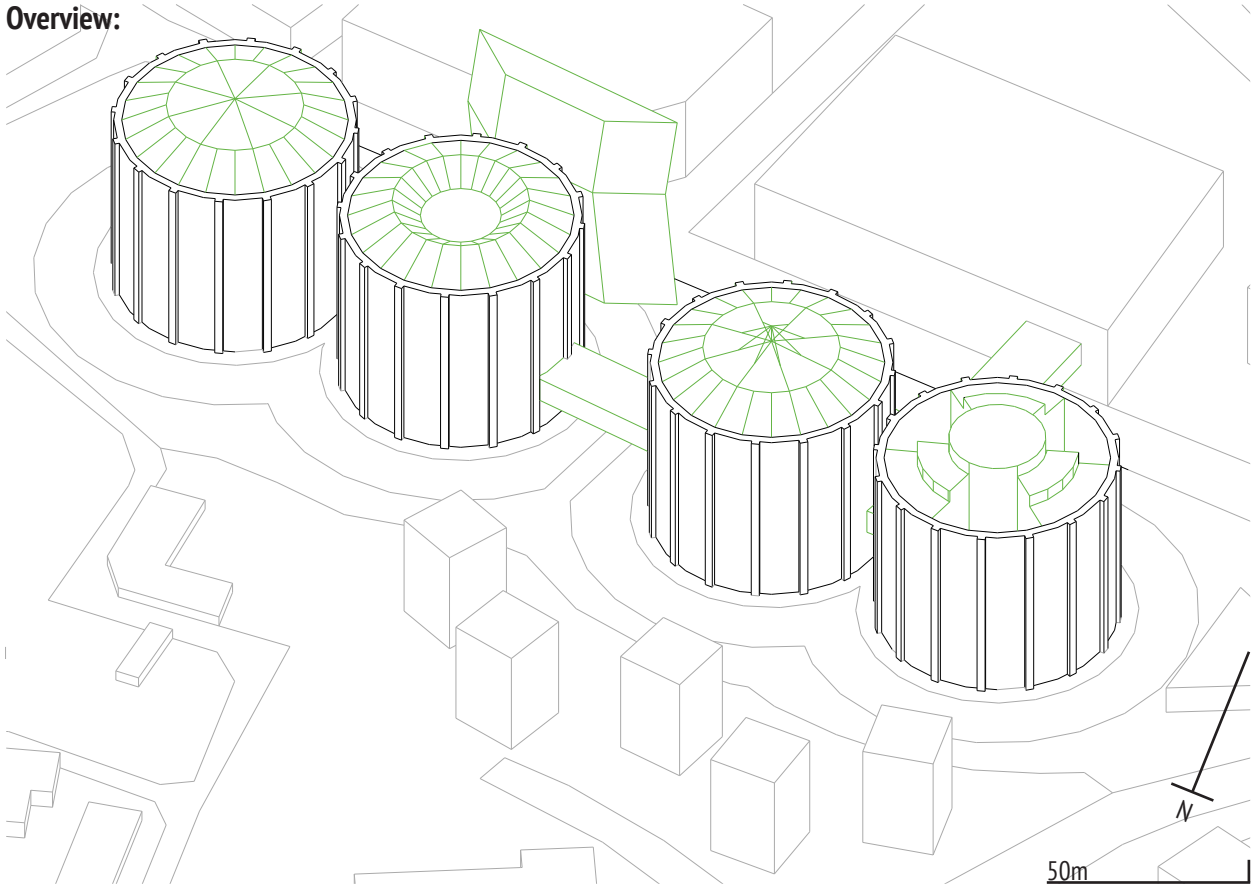
In the following years the site served as a film set, exhibition hall and party location before in 1996, the city of Vienna decided to revitalize the structures with a concept of mixed uses mainly focused on living. The architect's offices of Jean Nouvel, Coop Himmelb(l)au, Manfred Wehdorn and Wilhelm Holzbauer each got to design the reuse for one of the tanks.

Besides over 600 apartments, the revitalized site also features student dorms, a shopping mall, offices and event halls. While all other added elements were primarily placed inside the circular structures, Coop Himmelb(l)au designed the "shield" – an 18 story building – located on the north side of Gasometer B to create additional space.[120]

[119] See: Technik der Gasometer und des Gaswerks. Official Homepage of the Vienna Gasometers.

[120] See: Die Geschichte der Gasometer und des Gaswerks Wien-Simmering. Official Homepage of the Vienna Gasometers.

Overview:



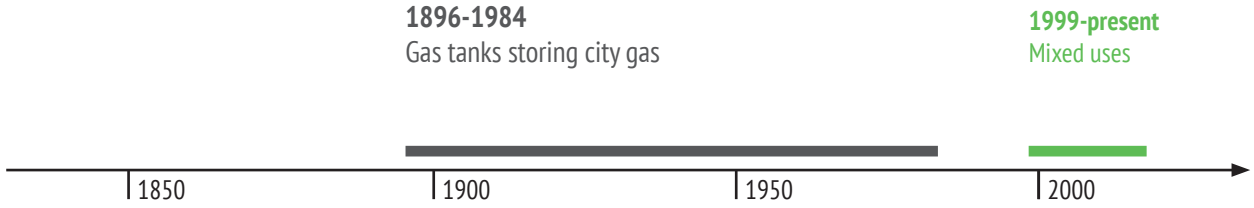
Location:

Usage:

Intervention:

Addition, Transformation, Combination

Timeline:



5.6. Werkstätten und Kulturhaus Vienna

The building ensemble of the WUK (Werkstätten- und Kulturhaus, meaning Workshop and Culture Building) in Vienna was originally built as an engine factory for locomotives around the middle of the 19th century. After the crash of the Viennese stock market in 1873, the company suffering from the economic consequences was forced to close.

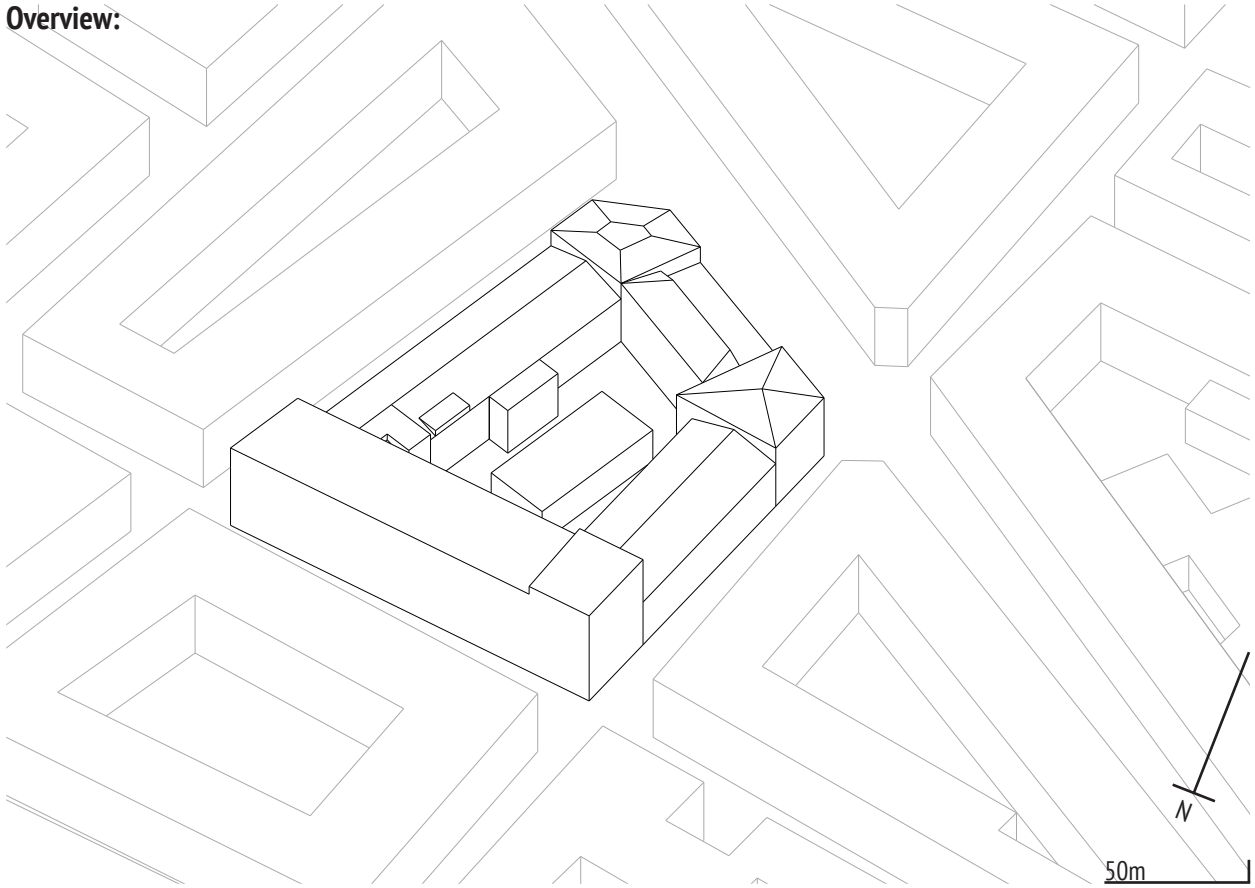
After a few years, the buildings were taken over by the TGM (Technology and Trades Museum) and exhibitions, research and teaching took the place of the former manufacturing industry. This utilization lasted for almost a hundred years until the TGM moved to a new building, leaving the ensemble abandoned.
While a demolition was considered, various parts of the population formed a bottom-up effort to preserve the buildings and to turn them into a sociocultural center. The campaign resulted in activists temporarily occupying the buildings, which ultimately led to political and administrative bodies accepting the idea. The initiative became a platform for open usage supporting artistic, political and social projects and turned the former factory into one of the city's most important and vibrant cultural sites.

The WUK is not an example of significant architectonic interventions, since besides repair measures there were little to none changes or additions happening to the original structure. But this case study shows on the one side how bottom-up efforts can lead to the creation of brilliantly functioning components of the city, revitalizing not only the site itself but also having a positive impact on the overall urban fabric. On the other side, the change of usage happening already in the 19th century shows that the idea of reusing industrial sites has always existed and taken place and is not an invention of the past 50 years.[121]

Fig. 41: The inner court of the ensemble.

[121] See: Schneider, J.: WUK Werkstätten- und Kulturhaus, Vienna. In: Baum, M. and Christiaanse, K. Page 173.

Overview:



Location:

Usage:

Intervention:

Transformation

Timeline:

5.7. Comparison

It is interesting to see the broad range of reused industrial structures and the different approaches in financing, usage and design that are being applied to a type of building and infrastructure that has similar features all around the world. It shows the various options and possibilities that abandoned industries offer. Considering the success of each of the examples mentioned, the basic insight gained from their examination should be to think twice about the demolition of what is existent in our built environment.

Architecturally, the interventions that happened in the case of the Gasometers depict a quite radical approach compared to the American examples of both the Stern Building as well as Boott Mills, where the interventions are very subtle. Without judging the qualities of the architect's designs for the gas tanks, they still stand for a different attitude that might be based on a longer tradition and experience of reusing and redesigning old buildings. This different attitude is not limited to the designers, but more importantly to the population.
In Europe, the combination of old and new styles has reached acceptance and appreciation and became common practice. In America on the other side, the rich architectural history and culture of European cities is not existent. Therefore, the attitude towards the built heritage and the environment is a different one with less appreciation and openness for abandoned buildings like factories and warehouses, that were not built to be beautiful and representative but functional. Looking at more recent projects like the Highline, it becomes obvious that the originally European approach is more and more applied also in the United States of America.

When considering the impact of the reuse projects on their urban environment, the examples that were initiated through community efforts (the Highline and the WUK) are the ones with the most positive effects on their cities. The Highline is used by thousands of people every day being a popular venue for inhabitants and tourists at the same time. And there is the WUK on the other side, that has sustained its importance for the district and the entire city already over several decades. This realization, that in many cases, the people themselves living in their urban environment know what is best for their city and not investors that are primarily seeking profits, should be considered by authorities, developers and planners.

CHAPTER 6

DESIGN PROJECT: ANALYSIS

The design proposal that will conclude the insights gained in the research done and merge it into an examplarily project, will start off by the analysis of the chosen object and its surroundings.

For every project in architecture, the analysis sets the basis and creates the framework and context for the design - in the functional, architectural and technical sense.
It is therefore a task that concerns multiple different levels. The following points will explore this complex and extensive challenge and will uncover chances for the consequtive design proposal.

6.1. Finding the Object

The object chosen to be used for the design is the abandoned Warner & Swasey factory in Cleveland, Ohio. After my research stay in California, I had the chance to visit this area at Lake Erie, a city in the middle of the Rust Belt that has particularly suffered from the decline of the producing industrial sector.

I visited three different abandoned factories within the city while seeing many more on my way through it. The decision to choose the Warner & Swasey Building mainly happened due to it's outstanding architecture, its interesting location within the city's urban fabric and the fact, that it was the only example that was easily accessible.

Unfortunately it was not possible to obtain plan material like floorplans, sections or elevations of the building. Usually in this case, a detailed site measuring would be necessary to create the basis for a precise draft and the consequtive execution. Since I had neither the resources nor the permission for these measurements, my plans are based on measures and the pictures taken in the process of examining the complex. Since the general load-bearing structure of the building is repetitive and easy to understand and reproduce in drawings, I still managed to create sufficiently accurate plan material that will serve the purpose of the (fictional) proposal that will be executed in the following chapters.

Fig. 42: The former factory of the Richman Brothers Company and....

Fig. 43: The abandoned Joseph & Feiss factory, being two other examples of abandoned industry in Cleveland.

6.2. Warner & Swasey Building Cleveland, Ohio

The complex of the former Warner & Swasey company was a factory used for the production of lathes - meaning the processing of metal materials by shaping them through rotation. The factory produced the machines for such operations called turret lathes as well as other machines parts, telescopes and armament parts for guns, tanks, ships and planes during the two World Wars.

The factory is located about 3km east of Cleveland downtown and was opened in 1910, replacing an earlier factory of the Warner & Swasey Company from the 1880s. During the World Wars and throughout the economic boom of the 1950s and 1960s, the factory was one of the most important workplaces in Cleveland with about 7000 employees.

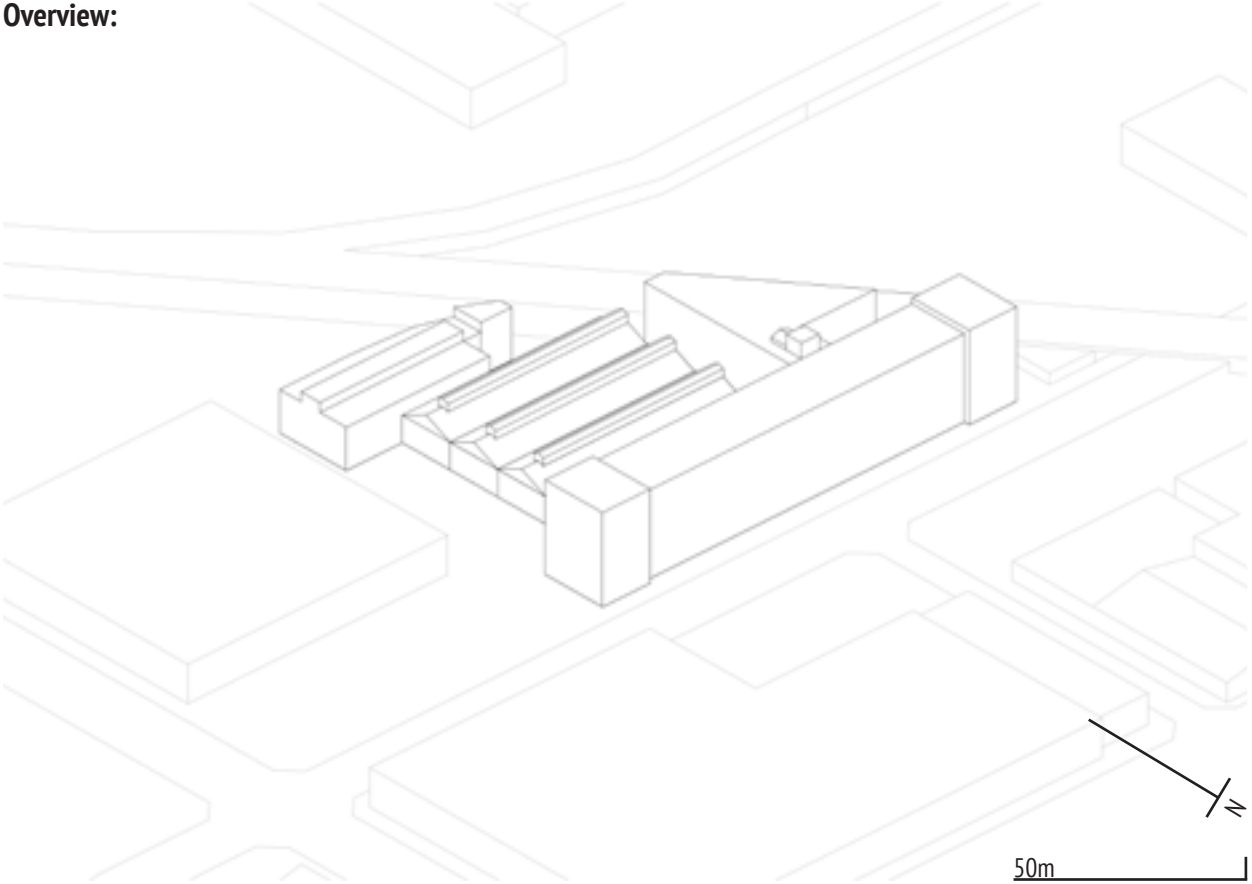
Following the industrial upheavals of the second half of the past century and the accompanying decline of the industrial cities, also the Warner & Swasey Company went in regression. By the 1980s, only a few hundred workers were still employed, before the factory finally closed its gates in 1985.[122]

Fig. 44: The 122m long south facade of the main building of the Warner & Swasey Complex, facing Carnegie Avenue.

The complex was taken over by the city of Cleveland in 1991, but has still been left abandoned for over three decades until the present day. There have been several efforts to attract developers and spur the reuse of the site, but none of those has yet come to fruition.[123]
The complex itself is architecturally valuable and would offer a wide range of revitalization options, yet its location in a poorer part of the city and resulting social tensions in these neighborhoods might be part of reason for its ongoing abandonment.

[122] See: Dubelko, J.: Warner and Swasey Building. In: Cleveland Historical. Cleveland: Center for Public History and Digital Humanities at Cleveland State University.
[123] Miller, J.: Bid in for Warner & Swasey site. In: Crain's Cleveland Business (November 28th, 2005). Cleveland: Crain Communications Inc., 2005. Subsequently referred to as: "Miller, J."

Overview:



Location:

Timeline:

Usage:

6.3. City of Cleveland

Before investigating the complex in more detail, we will take a step back to analyze the coherences of the site in the context of the city.

The map on the right is showing the zoning program of the city of Cleveland. It depicts the processes happening in most industrial based cities of North America. The producing industries formed a belt around the city center, being mainly focussed on areas of good infrastructural connections - in the case of Cleveland, those are mainly the shores towards Lake Erie and the Cuyahoga river, as well as areas connected to the railway network winding through the city.

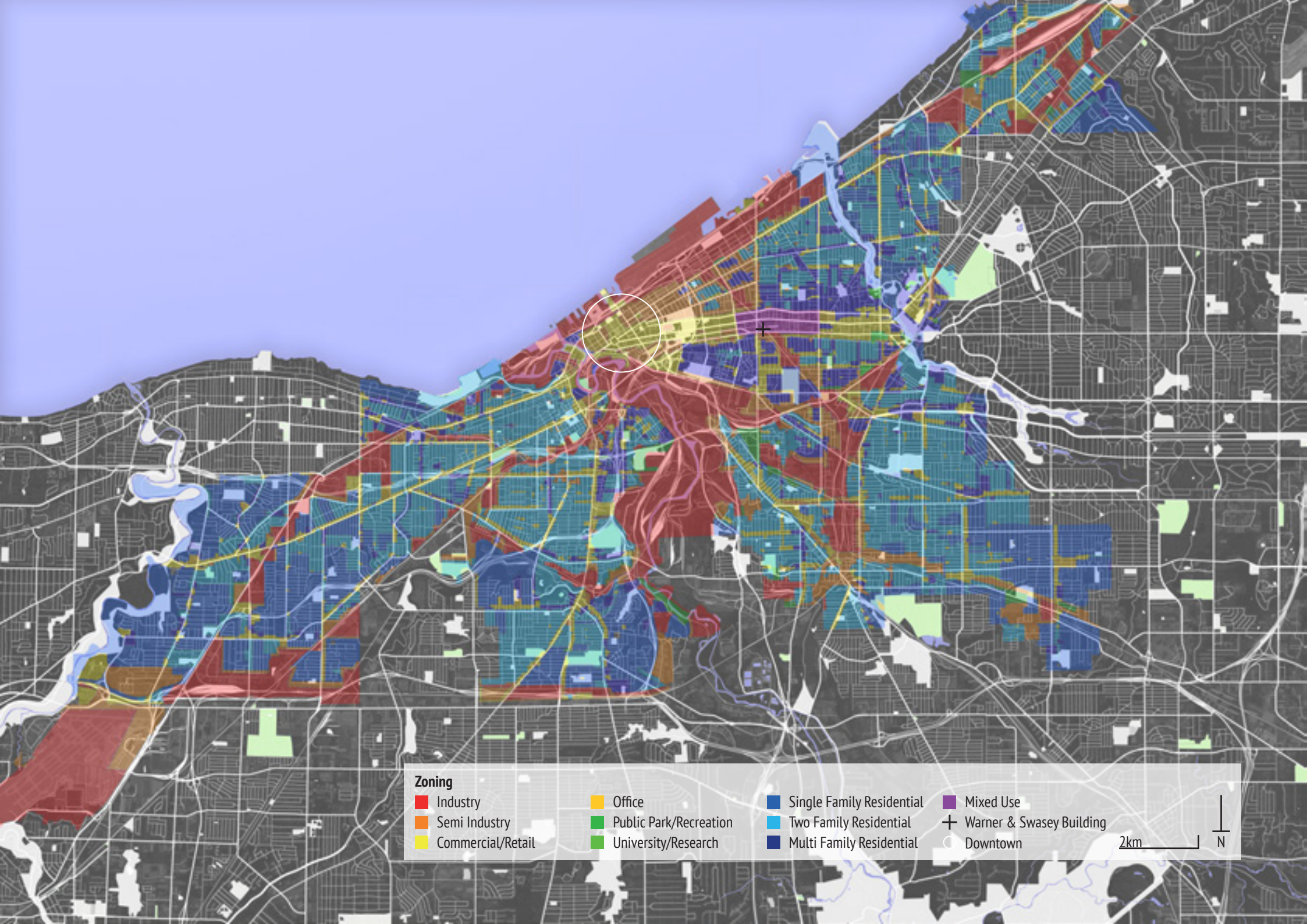
Downtown is an area shaped by the urban renewal efforts following the industrial decline. It consists of several highrise buildings accomo-dating commercial and office functions and major parking lots for people coming in from the suburbs. Only few residential areas can be found in the inner city center itself.

Fig. 45: The neoclassical Terminal Tower completed in 1930, once being the second highest building in the world, surrounded by younger buildings of the international style and parking lots.

Outside the industrial belt, large areas are covered with single- and two-family homes, resulting in a low building density. Relatively few neighborhoods accomodate more dense forms of residential buildings like multi-family homes.

The residential functions are supported by commcerial and retail zones mostly located along the streets cutting through the districts.

The area around the Warner & Swasey site is the only one issued as a mixed use zone. This can be interpreted as the city's effort to foster the developement in this area with the goal of creating a connecting element between the two polarities of the city that will explored in the following chapter.


Zoning
Industry
Semi Industry
Commercial/Retail
Office
Public Park/Recreation
University/Research
Single Family Residential
Two Family Residential
Multi Family Residential
Mixed Use
Warner & Swasey Building
Downtown
2km
N

6.4. Centrality

The city of Cleveland is marked by two seperated city centers. There is the original downtown at the shores of Lake Erie and the Cuyahoga River on the one side, and the University Circle located about 7km east of downtown on the other. The two centers are connected by three major roads: Chester, Euclid and Carnegie Avenue.

The map on the right also shows the consequence of suburbanization, resulting in many minor city centers spreading over a large area. Despite the strong suburbanization, Cleveland has managed to revalue Downtown by investing in public venues like the stadiums for the local basket-, base- and football team and museums like the Great Lakes Science Center or the Rock n' Roll Hall of fame.

The University Circle on the other side resulted from two universities and private institutions settling away from the original downtown. It became one of America's most important centers for education, arts and culture.[124]

[124] See: History (of the University Circle). Official Homepage of the University Circle Inc.

As in many other big American cities, the downtown area of Cleveland is majorly marked by commerical and office buildings as well as more recently erected event and sports facilities as well as museums.

Downtown

Fig. 46: Downtown Cleveland

The Warner & Swasey complex is located half way between the two city centers on Carnegie Avenue, being one of the most important connecting axes. The location is therefore of great importance and potential and can contribute to the unification of the two centralities.

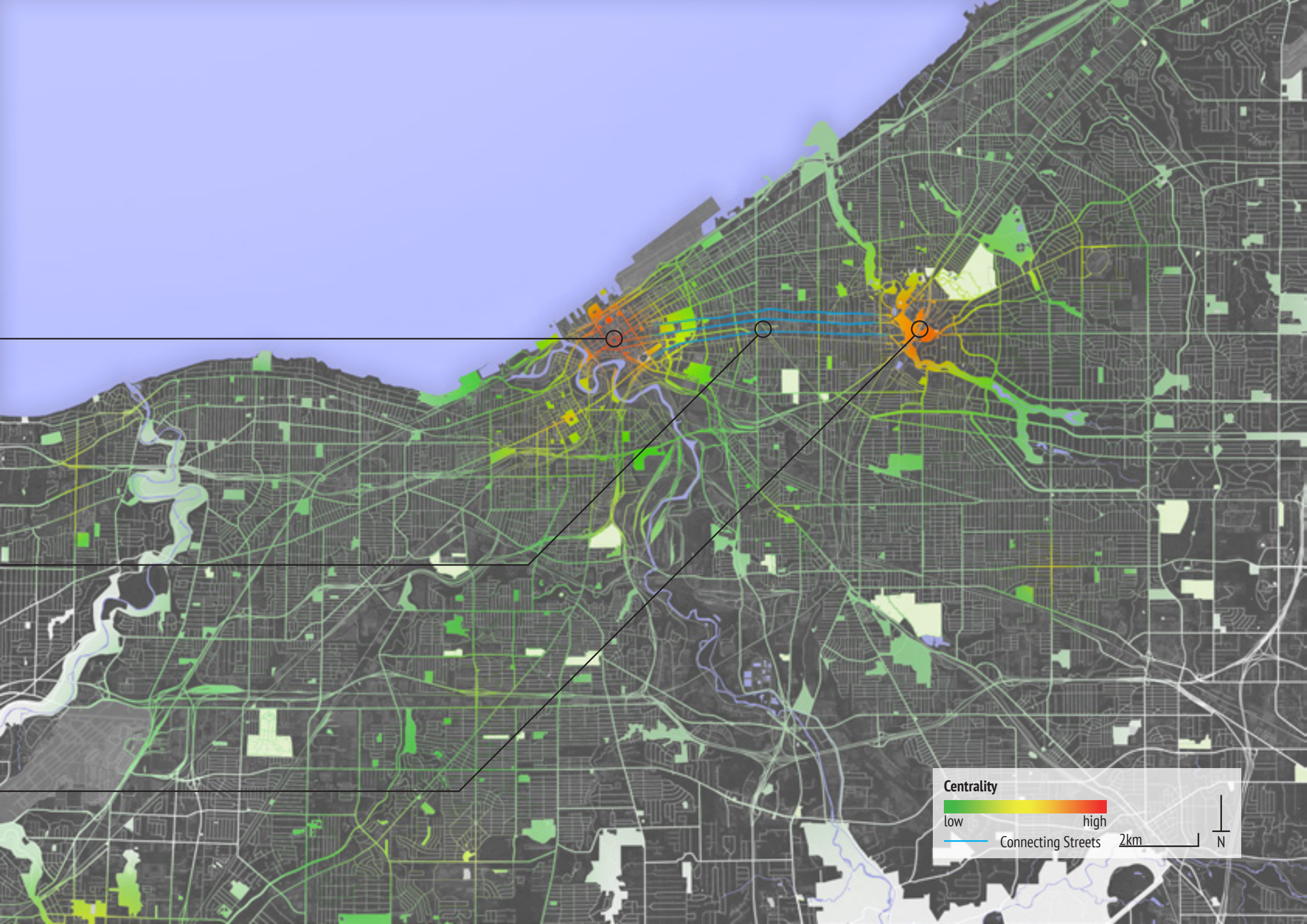
Warner & Swasey Building

Fig. 47: The Warner & Swasey Building

The University Circle has developed to become the cultural center of the city. It accomodates university and school complexes, research facilities, libraries, museums, concert halls and parks.

University Circle

Fig. 48: The Museum of Modern Art


Centrality
low
high
Connecting Streets
2km
N

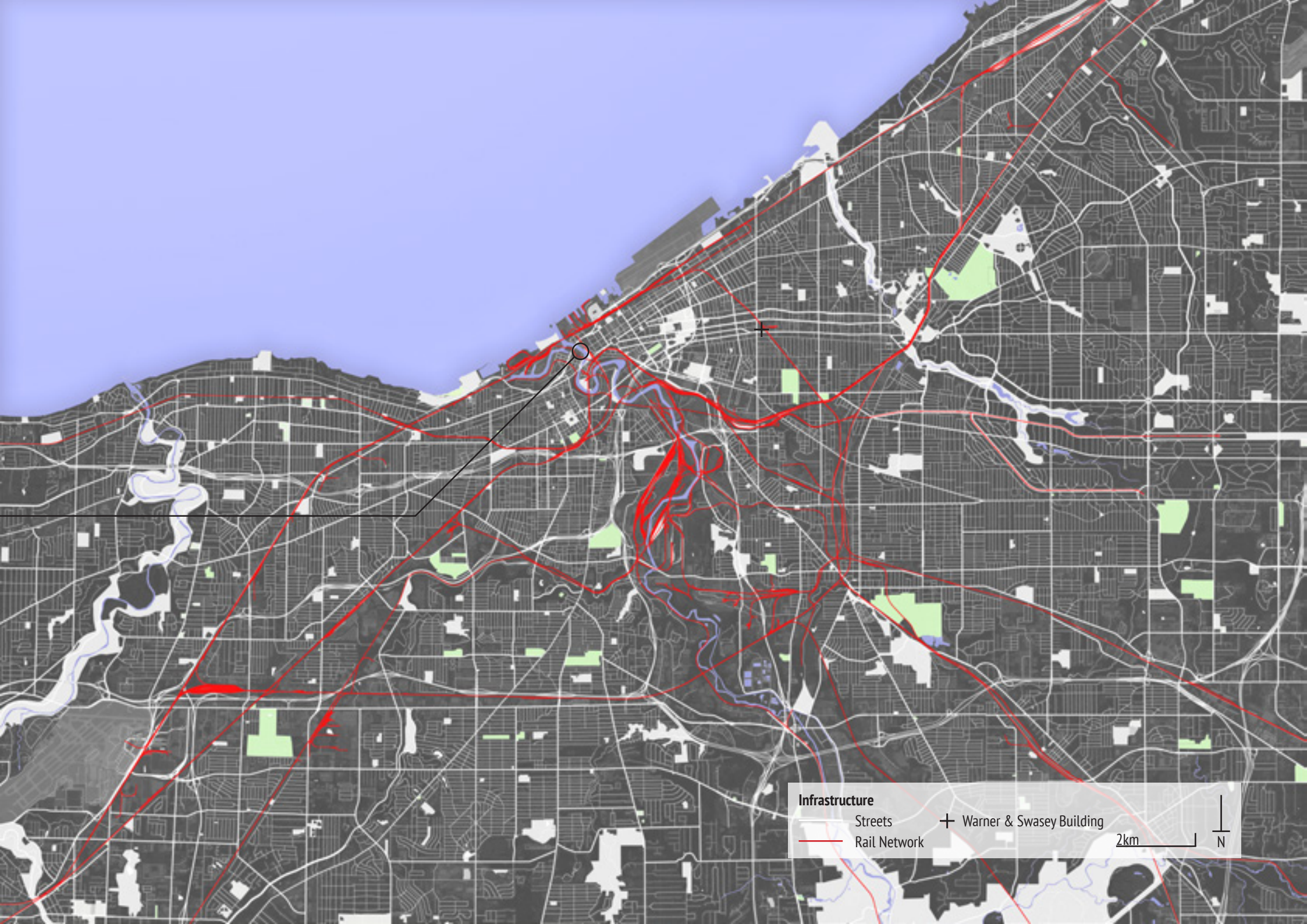
6.5. Infrastructure

The map is showing the infrastructural networks spanning across the city. The rail network is particularly distinctive and connects large parts of the city. It developed alongside the industrial quarters that were required to be connected within the city itself and of course with the other major industrial cities around the Great Lakes.

Also the Warner & Swasey Building is located directly at a railroad line and probably used it for the delivery of coals needed for the production process.

The rails are still in use today although the frequency of trains declined with the many factories closing over the past decades.
This existing infrastructure offers a range of possibilities, since it directly connects large parts of the city - a feature, that has to be considered when thinking about revitalization and how it can affect the city also outside of the site's or the neighborhood's boundaries.

Fig. 49: Bridges spanning over the Cuyahoga River depicting the large infrastructural dimensions.


Infrastructure
Streets
Rail Network
Warner & Swasey Building
2km
N

6.6. Site Surrounding

When taking a closer look at the surrounding of the site and the different functions that it includes, the importance of the three streets connecting Downtown and the University Circle becomes obvious. Especially Euclid and Chester Avenue are flanked by multiple commercial institutions whereas residential areas are located along smaller side streets.

Inside the radius of 500m around the Warner & Swasey Building, the area is particularly shaped by factories and warehouses, many of which are abandoned.
The decline of the industry has also affected the neighboring residential areas that are marked by intense abandonment as well. Ongoing demolitions have led to almost entirely cleared blocks that are now being recaptured by nature.

The resulting holes in the urban fabric have created an urban wasteland along many side streets, which clearly shows the existing imbalance between the the two, dense city centers on the one side, and the neighborhoods between them on the other. The site of the Warner & Swasey Buidling is therefore in a critical position with the potential of filling the hole and creating a balance affecting the entire city.

Considering the functions existing in the surrounding will be the basis for the new functions implemented in the proposal. The goal will be to find uses that can support the neighborhood and not lead to further abandonment. The strong abandonment of residential areas for example, shows that implementing housing will most likely not fullfill the needs of the area. Whereas on the other side, the density of cultural venues and parks is relatively low in the area, which can be a chance for the design.

The zoning plan shown in the previous chapter allows mixed uses and therefore a broad range of options that can be used to create an ideal addition to the urban fabric.

Fig. 50: Abandoned factories, warehouses and empty sites along Carnegie Avenue.

Fig. 51: Largely cleared blocks of former residential developments south of the site.


East 40th Street
East 55th Street
East 79th Street
Chester Avenue
Euclid Avenue
Carnegie Avenue
Cedar Avenue
250m
500m
750m
1000m
1250m
Infrastructure
Residential
Municipial Services
Education
Health Services
Retail
Religious Institution
Factory
Crafts/Production
Office/Organisation
Warehouse
Cultural Institution
Gastronomy
200m
N

6.7. The Site

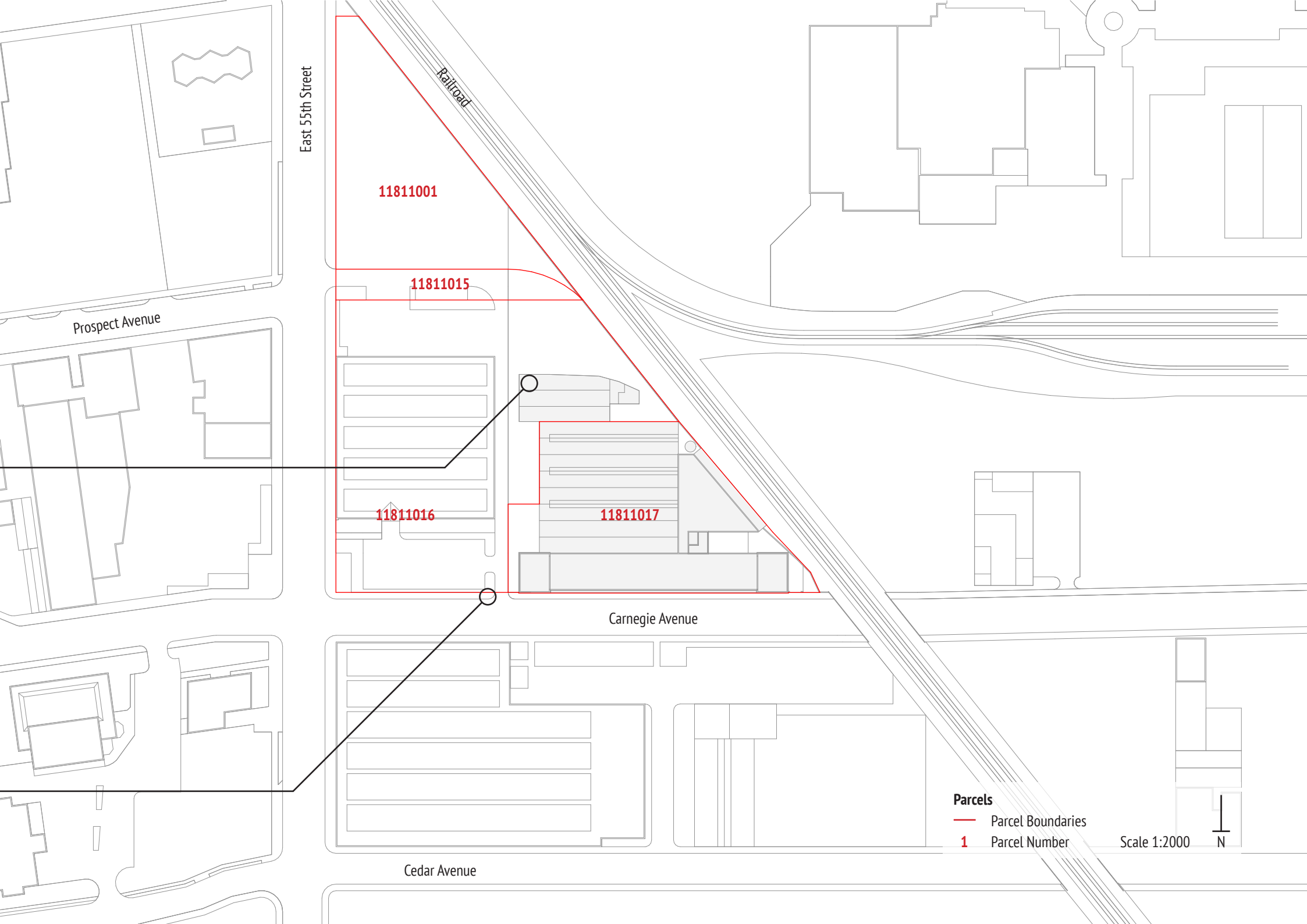
The Site consists of four parcels in the Central Distric of the city. The main part of the abandoned building is located in the parcel 11811017, with the striking brickwork building facing Carnegie Avenue towards the south. The northern part of the complex belongs to parcel 11811016.

Considering the appearance of this building, especially the large openings at the level of the second floor, indicate an addition that has later gotten demolished.
The clean bricks and their contrast to the weathered ones on the west facade also show the former existence of an extension towards the west. This building part probably got removed in the course of the erection of the new neighboring building in the same parcel, which is the only component of the site that is in use.

The two smaller parcels in the north are undeveloped and currently used as parking lots and storage area.

Fig. 52: The north facade of north building indicating a former addition to the complex that has gotten removed.

Fig. 53: Carnegie Avenue running west towards downtown.


East 55th Street
Railroad
11811001
11811015
Prospect Avenue
11811016
11811017
Carnegie Avenue
Cedar Avenue
Parcels
Parcel Boundaries
1 Parcel Number
Scale 1:2000
N

The newly erected building in the west that has replaced a former part of the complex accomodates a municipial garage and car mechanic working with vehicles for the police, ambulance and firefighter department. The institution is also making use of the parking lots in the north and south of the building.

In the south, across Carnegie Avenue, the neighboring hall-like buildings accomodate the waste collection of the City of Cleveland and next to that, a private self-storage and relocation service.

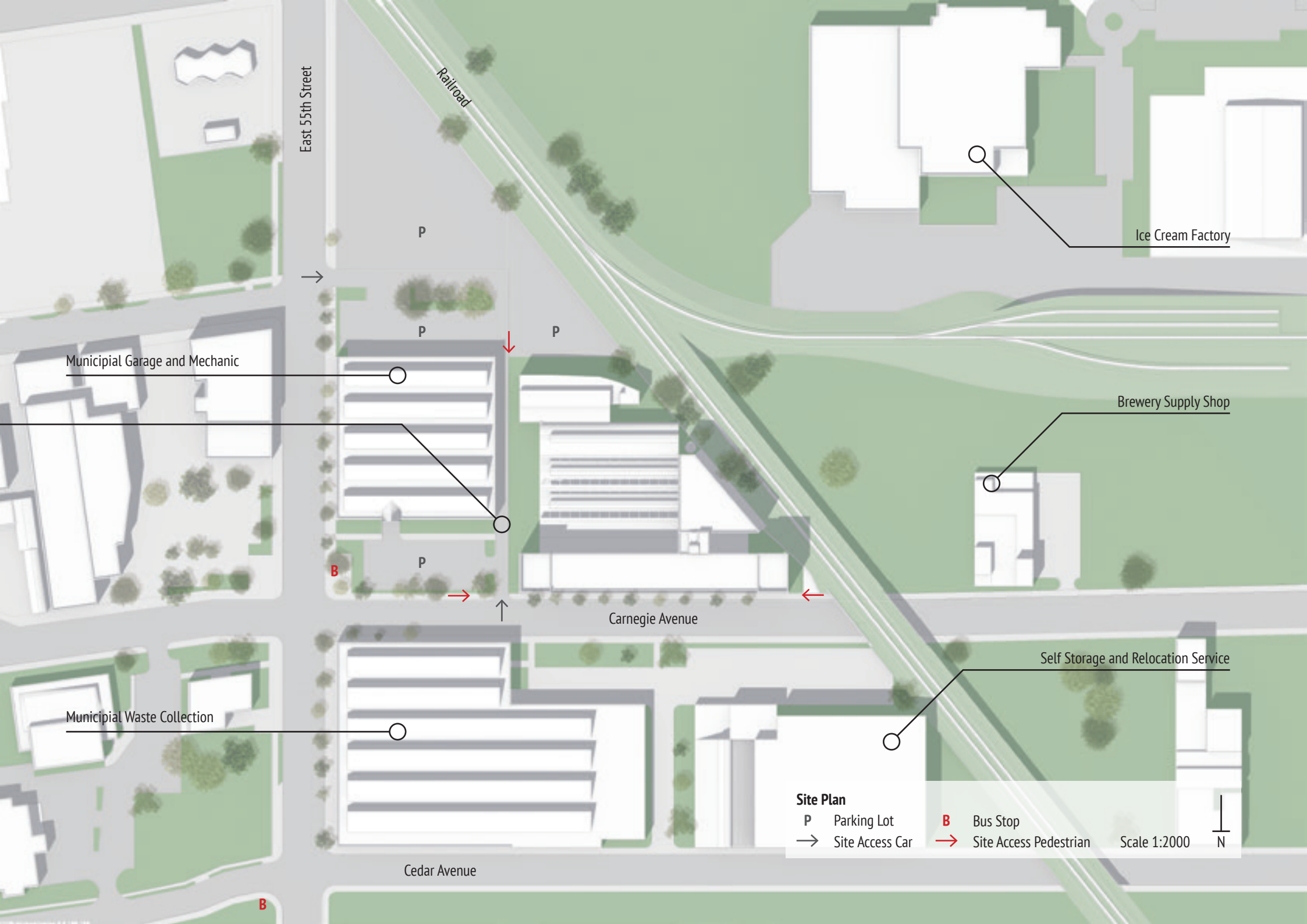
The two-lane railroad running in north-western direction towards Lake Erie is passing the site in close vicinity of the building and is crossing Carnegie Avenue near the south-eastern corner of the complex. Cargo trains probably once stopped right by the Warner & Swasey Building to deliver material and resources.

Across the railroad embankment in the east, there is a brewery supply shop selling ingredients and equipments for beer production, located in a former warehouse building.

And in the north east of the site, a complex for ice cream production is situated alongside an extension of the railroad.

Fig. 54: The connecting street between the abandoned complex (right) and the car mechanic/garage building (left).

While public transport is well developed along Euclid Avenue in the north as well as along Cedar Avenue in the south, there are only few stations on Carnegie Avenue. And while there is a bus stop close by the site on East 55th Street, a future use will still require parking on the site, for which the cleared northern parcels provide plenty of space.


East 55th Street
Railroad
Ice Cream Factory
Municipal Garage and Mechanic
Brewery Supply Shop
Carnegie Avenue
Self Storage and Relocation Service
Municipal Waste Collection
Cedar Avenue
P
B
Site Plan
P Parking Lot
Site Access Car
B Bus Stop
Site Access Pedestrian
Scale 1:2000
N

6.8. The Complex

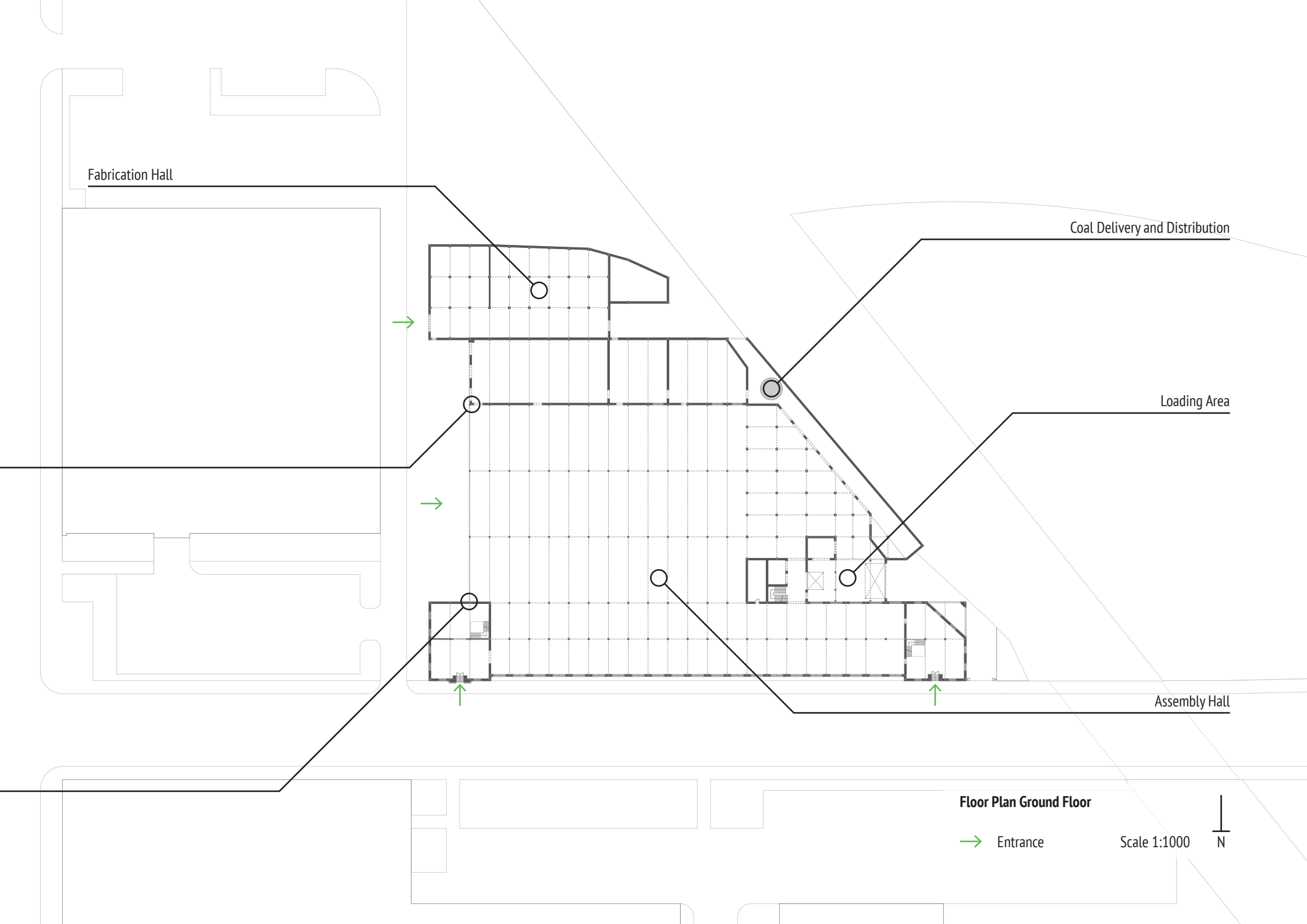
The Warner & Swasey Building complex basically consists of three remaining building parts. The main building in the south includes the attached north wing with an angled facade towards the railroad. The building is reaching over five upper stories, creating a total height of around 24,0m, as well as a basement, resulting in a total floor space of about 17.000m².

Attached and enclosed by the main building is the former assembly hall opening up towards west. Its open structure with a height of about 7,0m covers an area of close to 3.500m².

In the north, this hall is completed by what occurs to be a former fabrication hall that accomodated boilers and larger machines. The building consists of a high ground floor with a ceiling height of about 7,0m and two upper floors that did not seem accessible - possibly due to the demolition of its former extensions towards the north and west. The fabrication hall including the two upper stories create a floor area of about another 2.200m².

Fig. 55: The steel structure of the former assembly hall seen from the outside (from western direction). The aisle on the very left shows brick walls on the inside that were later induced.

Fig. 56: The connection of the assembly hall to the main building.


Fabrication Hall
Coal Delivery and Distribution
Loading Area
Assembly Hall
Floor Plan Ground Floor
Entrance
Scale 1:1000
N

Therefore, the total floor area of all floors combined totalizes to about 22.700m².

6.8.1. **Structure**

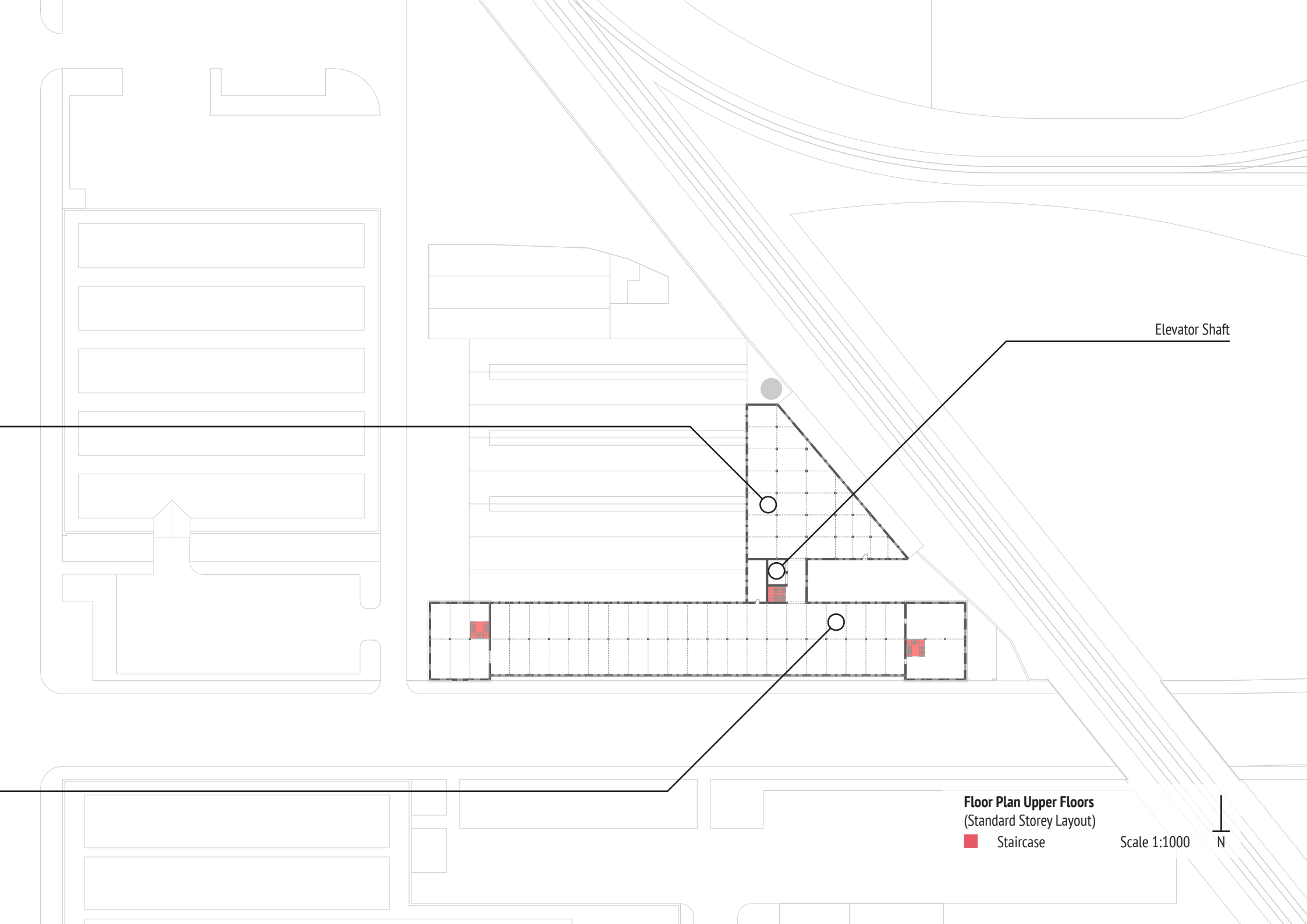
The assembly hall is erected as a steel structure. Frameworks forming a gabled roof are resting on I-beams that are arranged in a grid of 4,50/15,0m. The structure creates four aisles with three of them opening up towards the west, while the northern one is fitout with internal brick walls that were most likely added in a later alteration of the building and are not of structural significance.

The main building as well as the fabrication hall consist of a load-bearing structure made from reinforced concrete and are covered on the outside with brickwork facades. Concrete columns form a grid of 4,50/8,0m. The floors are resting on a grid of concrete beams as seen in Fig. 57 and 58.

Three staircases, located at the ends of the main building and at the transition towards the north wing including a large elevator shaft, allow the access of the upper levels and the basement.

Fig. 57: On the first floor of the northern wing of the main building. The hall was probably used for storage and office related purposes.

Fig. 58: Inside the main building on ground floor level, showing the open structure.



Floor Plan Upper Floors
(Standard Storey Layout)

Staircase

Scale 1:1000

N

6.8.2. **Architecture**

Concerning the architectonic style and expression, the south facade of the main building towards Carnegie Avenue is of particular significance. Referring to the Beaux-Arts style that signifies many American buildings of the early 20th century, the architect of the building sought to give the rational concrete structure on the inside a classical face towards the outside.
The main building therefore did not just have a functional, but also a representative use for the company, showing an impressive 122m long facade with ornamental elements to the public (see the southern elevation on the following page).

In contrast to the expensive south facade, the north facade is already a lot less elaborated. And looking at the assembly hall and especially the fabrication building, the representative significance of the building is taking a back seat. Here, the raw functionality of production processes determines the architecture without being attached to styles and ornaments (see the western elevation and the section).

Fig. 59: The elaborated portal of the south facade.

Fig. 60: Damages in the brickwork of the western face of the main building.

6.7.3. **Condition**

Considering the abandonment of the site over a period of 30 years, the building - and especially its most significant components like the load bearing structure - generally occur to be in good condition. As a developer working on a reuse proposal back in 2005 stated: "Structurally, it's a fortress."[125] Damages of the brickwork as shown in Fig. 60 are not particularly significant in this context, since it has no decisive effects on the overall structure.

The steel structure of the assembly hall is confronted with corrosion due to missing parts of the

[125] Shorey, J. D. In: Miller, J.

Elevation South Scale 1:500

Section Stairs North Scale 1:500

Elevation West Scale 1:500

roof. The resulting damages would have to be regarded and examined seperately and in detail. Judging the general appearance, the progression of the corrosion occurs to not effect the stability of the structure yet, which would make the surface treatment and new coating of the components sufficient in order to save the structure.

A major task in the process of reusing the building will be the removal of debris and former fitouts that can no longer be used. This includes a large number of defect windows. Since the glass of practically every window has been removed or destroy by vandalism during the long time of abandonment, also their frames have severly suffered.

6.7.3. **Contamination**

In the process of the preparations to revitalize the site, there were hazarduous materials found in the building such as asbestos. The city of Cleveland invested around $1,3 million Dollar to remediate the components, remove barriers and therefore spur the attractiveness of the site for investors.[126]

Fig. 61: Corrosion of the steel structure in the assembly hall.

Fig. 62: Debris of former fitout.

[126] See: McFee, M. J.: Cleveland seeks bids for Warner & Swasey complex in Midtown, after 2010 rehab deal fizzles. In: The Plain Dealer (January 17th, 2014). Cleveland: Advance Digital, 2014.

CHAPTER 7

DESIGN PROJECT: CONCEPT

The analysis discovered both challenging issues as well as yielding chances that the design for the Warner & Swasey Building has to consider. The following chapters will engage in creating the concept that reacts to the given circumstances, finds solutions and makes use of opportunities.

There are different approaches regarding a design proposal. I will work out the new functions for the proposal before engaging in finding the form that can accomodate them. At the same time, good architecture is not only a functional building, but there is also an artistic aspect to it, meaning that the form itself becomes a function as well. And especially for the goal of creating a vibrant urbanity in the city, architecture is challenged to create identity through its appearance. Therefore, the process of designing is not a purely linear one, but more of a network with multiple aspects of the concept influencing each other.

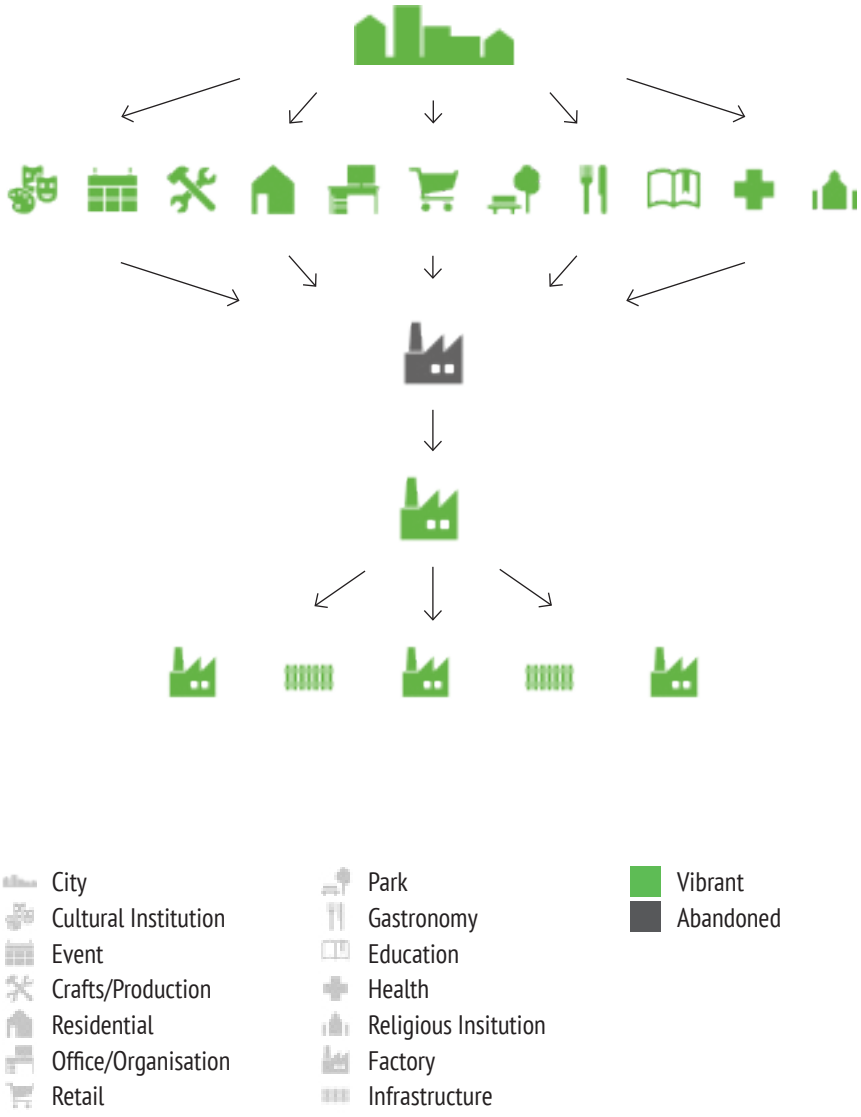
The following points will explain my approach and its functional and architectural aspects before presenting the architectural solution in the final chapter.

7.1. New Functions

7.1.1. Basic Idea

The basic idea of this proposal for the Warner & Swasey Building is to look at the functions and especially the dense superimposition of functions in a vibrant city and apply those on the abandoned factory building. This means to choose functions that are missing in the surrounding area and bringing them together in the complex. Creating this multifunctional space of dense overlays will ultimately transform the building to become a vibrant center in itself.
The resulting gentrification of the site will have positive effects on the surrounding area, increasing attractivity of the neighborhood, revaluing property and spurring growth to close the gap between Downtown and the University Circle.

As an additional step, the idea extends to other abandoned industrial buildings around the city. Applying the concept on more examples will create a network of new vibrant centers that be connected by the existing infastructure.

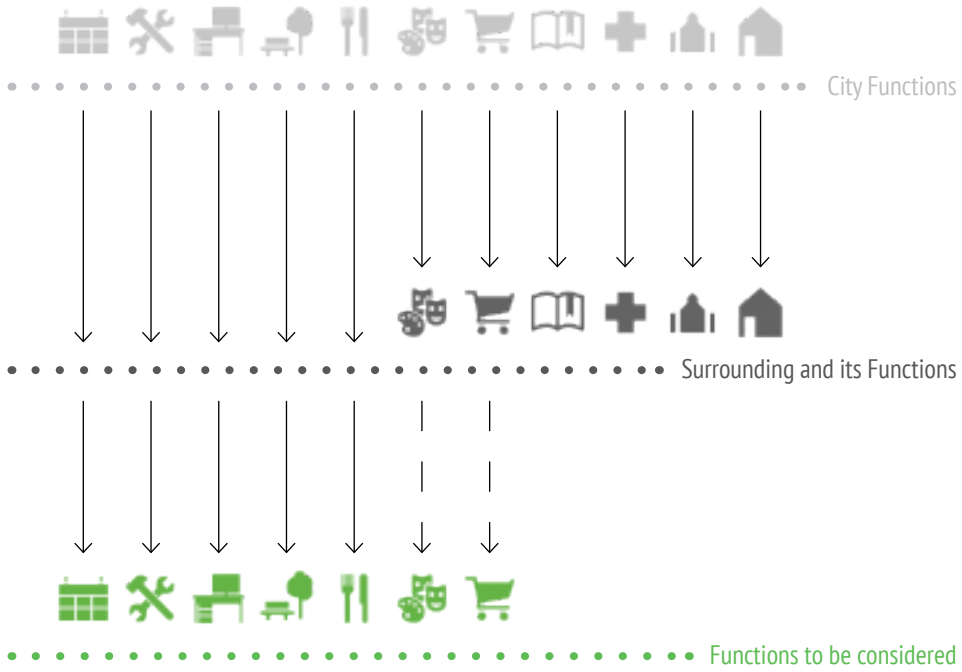


7.1.2. Considering the Surroundings

As mentioned before and already in the analysis of the surrounding, not all functions that are combined in a city can or should be implemented in the proposal for the Warner & Swasey Building. It is especially here, where the already existing uses in the surrounding of the site and even the overall city play a decisive role for the concept.

Therefore, the residential function needs to be discarded. Considering the low building density in the residential areas around the site, it becomes obvious that the demand for housing space in the area is low and that creating additional residences on the Warner & Swasey site will not result in high utilization.
In return, a successful revitalization of the site that promotes human capital can lead to a future resettlement of people in the area.

The same realization concerning the residential function also applies to health and religious institutions as well as educational buildings, of which plenty are already existent in the area and the demand for additional space is therefore not existent.



Considering the University Circle being the cultural center of the city, located only a few kilometers east of the site, choosing the integration of cultural venues needs to be considered carefully. While the University Circle combines several museums and concert halls, leaving little demand for additional space being assigned to this usage, there are other forms of public venues and institutions that might fill a gap in the current situation.

A similiar approach can be applied on the retail function. There already are shops and sales institutions existing in the area, many of them being focussed on hardware supply and providing resources as a support for the industrial uses. But there are few shops that are focussed on the general public providing foods and goods of daily needs. It is the shopping centers that took this downtown function out to the suburbs. The reuse project for the abandoned industrial site has the potential to bring this function back to the city.

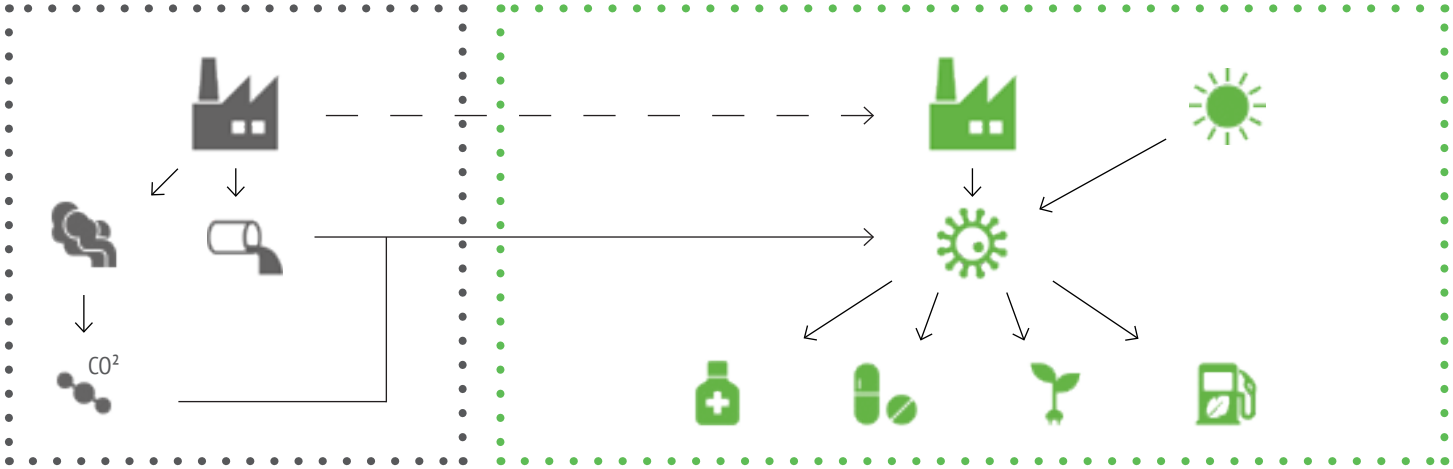
7.1.3. **Considering the History**

Another aspect that needs to be considered already in the phase of finding new uses, is the history, the past functions of the site. The Warner & Swasey Building complex is lined by former fabrication and machines, a heavy industry.
A new industrial function could pick up and develop this heritage, interpreting it in a new and different way. This new industrial function could pick up aspects of the former one, while being completely different in itself.

Based on this thought, the idea of a microalgae production came up. In the past years, companies and start-ups began to develop technologies to produce algas in industrial dimensions. Their intentions are based on the realization that these aquatic plants produce large amounts of biomass while only requiring water, carbon dioxide and sunlight to run photosynthesis and grow.
The algas produce proteins, vitamins, minerals and trace elements that can be used by food and pharmaceutical industries. They have the ability to filter certain elements from polluted water and can therefore support purification. And even the remaining biomass can be used for a number of purposes such as biofuel and the production of methane through fermentation.

Until the discovery of the alga's possibilities, corn and rapeseed were considered the key for a biological production of goods and energy. Their downside is the consumption of large agricultural areas. Algas do not require these areas, since water, carbon dioxid and sunlight is available practically everywhere - for example on the large rooftop area of abandoned industrial buildings.

The former heavy industries produced large amounts of carbon dioxid and polluted the Cuyahoga River as well as Lake Erie, using the developing technology of microalgea production and therefore putting a new form of industrial usage in place that can help remedy the damages of the former one is an interesting approach and will be considered in the design.

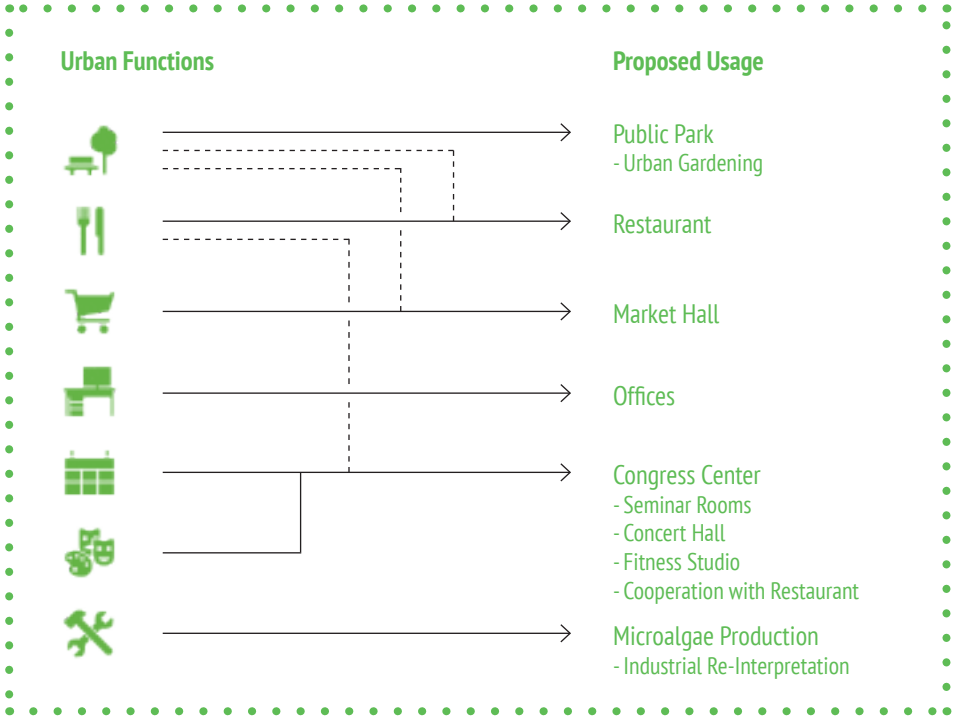


7.1.4. Specifying the Functions

The design will combine a mix of the different uses explored on the previous pages and as suggested by the Planning Department of the City of Cleveland through their zoning plan.
More specifically, the concept seeks to create an urban public space consisting of a park with public gardens and a neighboring restaurant and market hall. Offices, which can generate a high rentability in the real estate business will be located on upper floors in combination with a congress center, providing seminar rooms and lecture/concert halls as well as a fitness studio. The congress center will combine the levels of office and organisational usage on the one side and the function as a public venue for events and cultural institutions on the other side. It can therefore become a valuable addition between Downtown and University Circle.

The microalgea production on the other side will draw the bow from the industrial usage of the past to the present and therefore implementing the craft/production function. In connection with this algae production, the connection to the railroad as the existing industrial infrastructure that is spread over the entire city becomes important. The network can be used to transport the resulting biomass material. If executed on other abandoned factories, the railroad will become an connecting element opening the gates for a newly interpreted industrial usage.

The large roof area that can collect a lot of sunlight will be used as the location for the bio reactors producing the algae. They will consist of transparent tubes containing water, in which the algae cells can develop. The tubes will allow indirect sunlight to fall in an stimulate the photosynthesis and growth of the cells.



7.2. List of Required Spatialities

In the following, the chosen functions are translated into actual spatialities, creating a list of rooms that will be needed to allow the desired new uses.

Public Park

Raised Beds as Cultivated Area
Equipment Storage
Outside Area of Restaurant.
Walkways
Planting of Trees

Restaurant

Organisation:
Kitchen
Storage
Bath- and Changing Rooms

Guests:
Bar
In- and Outside Seating Area
Bathrooms

Market Hall

Storage and Loading Area
Bath-, Changing- and Recreation Rooms for Staff
Flexible Sales Areas

Offices:

Reception/Secretary Office
Kitchen
Restrooms
Recreational Spaces
Different Office Configurations (Combination of Open-Space and Single Offices)
Archive/Storage

Congress Center:

Organisation:
Reception/Secretary Office
Side Offices
Storages
Bathrooms

Congress:
Multi-Use Area
Flexible Seminar Area
Lecture/Concert Hall
Waiting/Recreational Spaces

Fitness Studio:
Reception/Counter
Bar/Kitchen
Seating Area
Bath- and Changing Rooms
Recreational Spaces
Warm-Up/Cardio Area
Workout Area
Stretch/Gymnastics Area
Flexible Course and Training Areas

Microalgae Production:

Organisation:
Reception
Offices
Laboratory
Bath- and Changing Rooms

Production:
Storage Tanks for Biomass
Bio-Reactors
Pumps and Water Treatment
Sedimenter and Dehydration Machines
Storage Tanks for Supplements

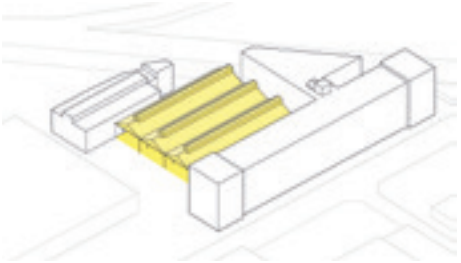
7.3. Positioning

The open steel structure of the former assembly hall will serve as the framework for the new public park.

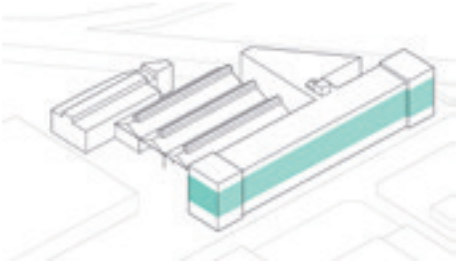
This park will become the central element and public square from which people will have access to the different buildings.
Coming in from the main entrance area in the west, the congress center will be located on the other side of the park in the north wing of the main building. The fifth floor of the main buidling will accomodate the fitness studio.

The restaurant and shops will be located on the ground floor level of the main building, opening up towards the park and also with access coming in from Carnegie Avenue. The offices will be set up on the upper floors.

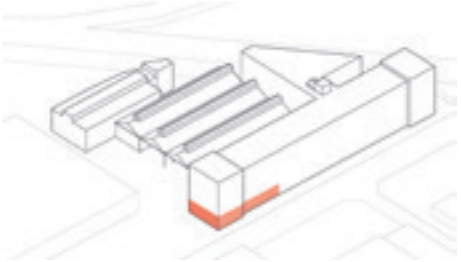
On the other side, in the former fabrication hall, the production and distribution facilities for the algae production will be situated.



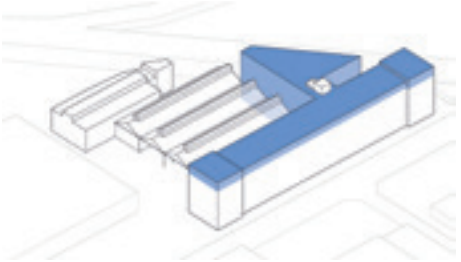
Public Park



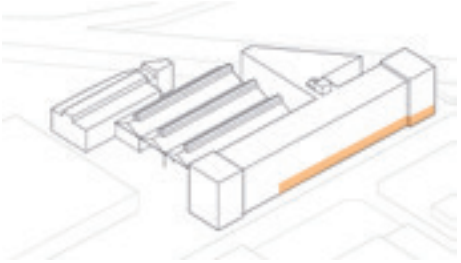
Offices



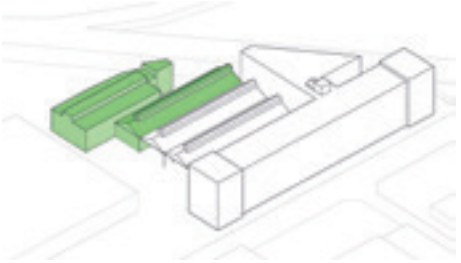
Restaurant



Congress Center



Shop



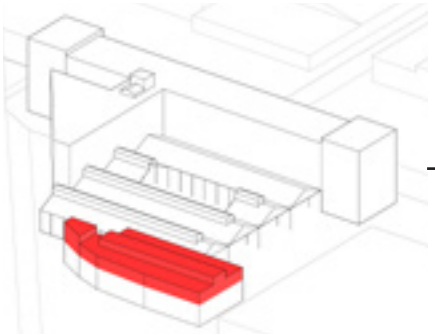
Microalgae Production

7.4. Architectonic Expression

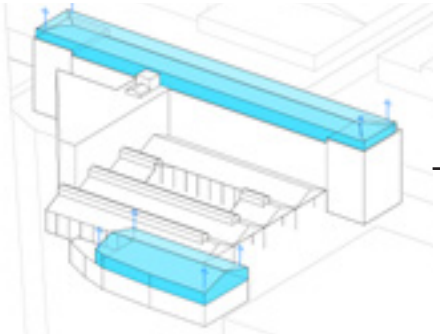
The basic intention in things of the architecture of the buidling is to reduce demolitions as far as possible. The existing fabric is in considerably good condition and especially the main building with its elaborated south facade is worth to be preserved.
The interventions are reduced to what is necessary for the accomodation of the new functions.

Especially the new microalgae production requires visible changes of the building fabric. To accomodate the bio-reactors that need to be exposed to light, but at the same time should be protected from the heat of the full solar radiation, translucent shells - comparable to greenhouses - are placed on the roofs of the main building and the former fabrication hall. Translucent materials like multiwall sheets made from PVC create a diffuse and consistent light inside the shell, and provides shelter for the glas tubes of the bio-reactors.

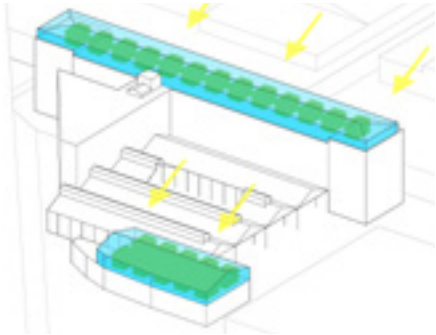
The translucent material requires the roofs of the additions to be sloped, since - if executed as a flat roof - they would not be able to bear the forces of snow without an expensive structure supporting them. While on the building of the fabrication hall, the slope is being used to visually continue the roof structure of the assembly hall, on the main building, this kind of sloped roof would not go along with the existing block-like building. Therefore, the slope of the shell is a slighter one, that will not be seen when looking at the building from the ground.
The shell itself will appear as a translucent block on top of the long brick building, that is slightly set back from the current facades. It will create a strong contrast of materiality and a light visual finish on top of the building.



Removal of the upper two floors of the fabrication hall and replacing it with a translucent "shell".

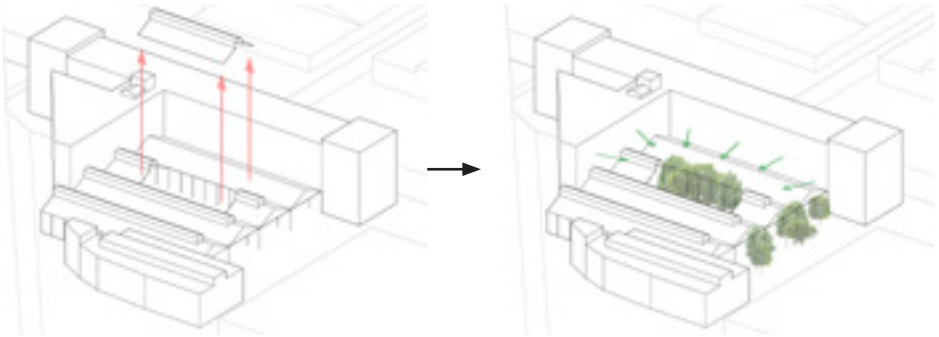


Also the main building is being extended with this shell, creating a contrast to the brick structure and visually completing the building.



The translucent additions create indirect sunlight for the bio-reactors of the algae production.

The assembly hall accomodating the new public park is being cut open. The middle section of the central aisle is being removed to make room for the park and its plants. Growing trees that will reach over the height of the remaining structure will break the horizontal seperation currently existing because of the roof and will visually connect the park with the upper floors.



Removing the roof of the assembly hall allows plants to grow.

It creates the center of the public park, allows insights and therefore connects the upper floors with the park as well.

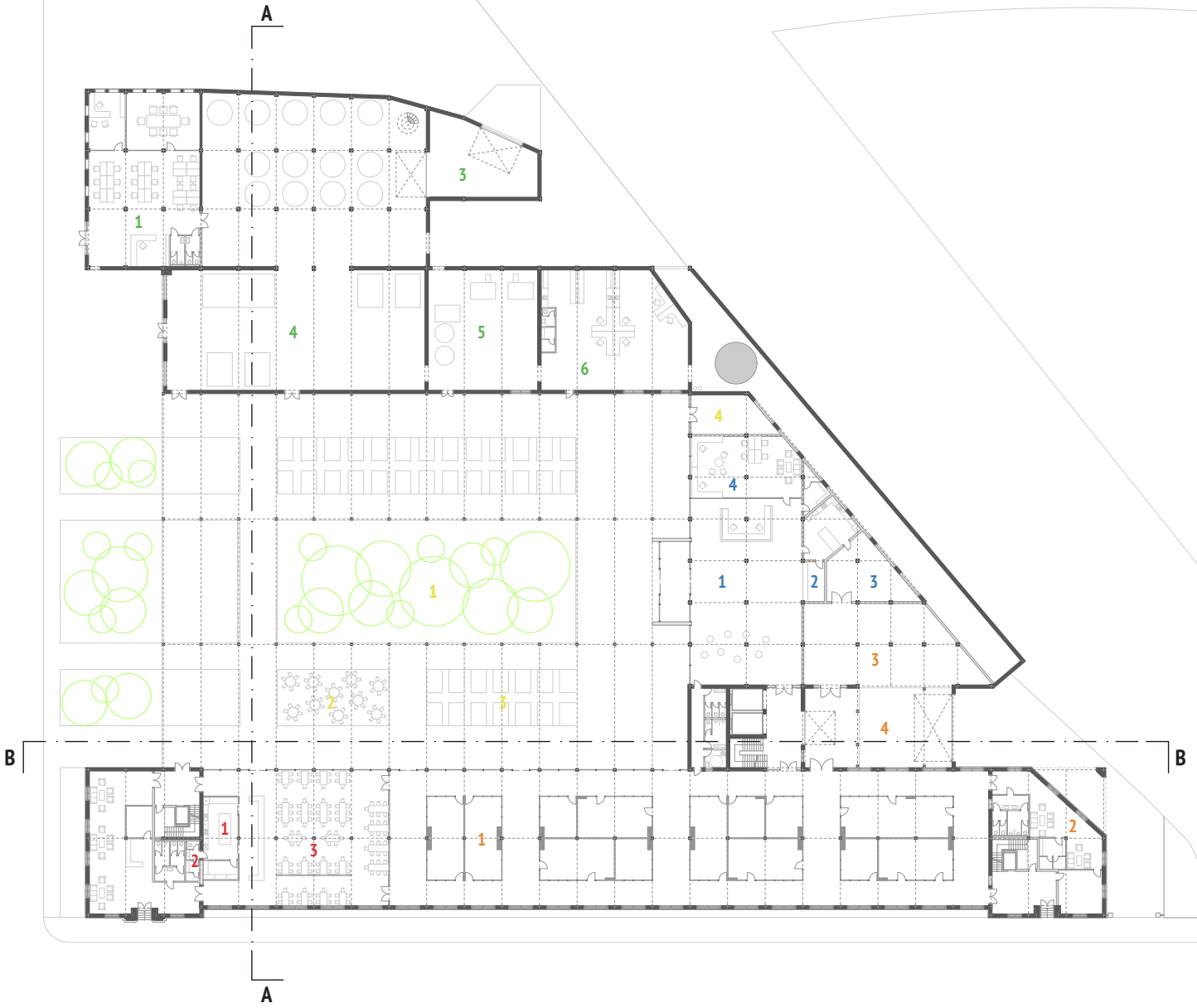
CHAPTER 8

DESIGN PROJECT: PROPOSAL

The presentation of the proposal being the final chapter will show the concluding plan material.

After an overview over the floorplans in the scale of 1:750, the spatialities will be shown and explained in more detail, completed by elevations and sections of the final design.
Visualizations will give an impression and taste of what the completed project could look like. They are not a perfect simulation of the future appearance of the building, but are a more artistic attempt to create a certain emotion that the proposal seeks to achieve.

8.1. Floorplans 1:750



1 Tree Plantation
2 Outdoor Seating
3 Urban Gardening
4 Equipment Storage

1 Kitchen/Storage
2 Bath-/Changing Room
3 Indoor Seating

1 Flexible Sales Area
2 Bath-/Changing-/Break Room
3 Storage
4 Loading Dock

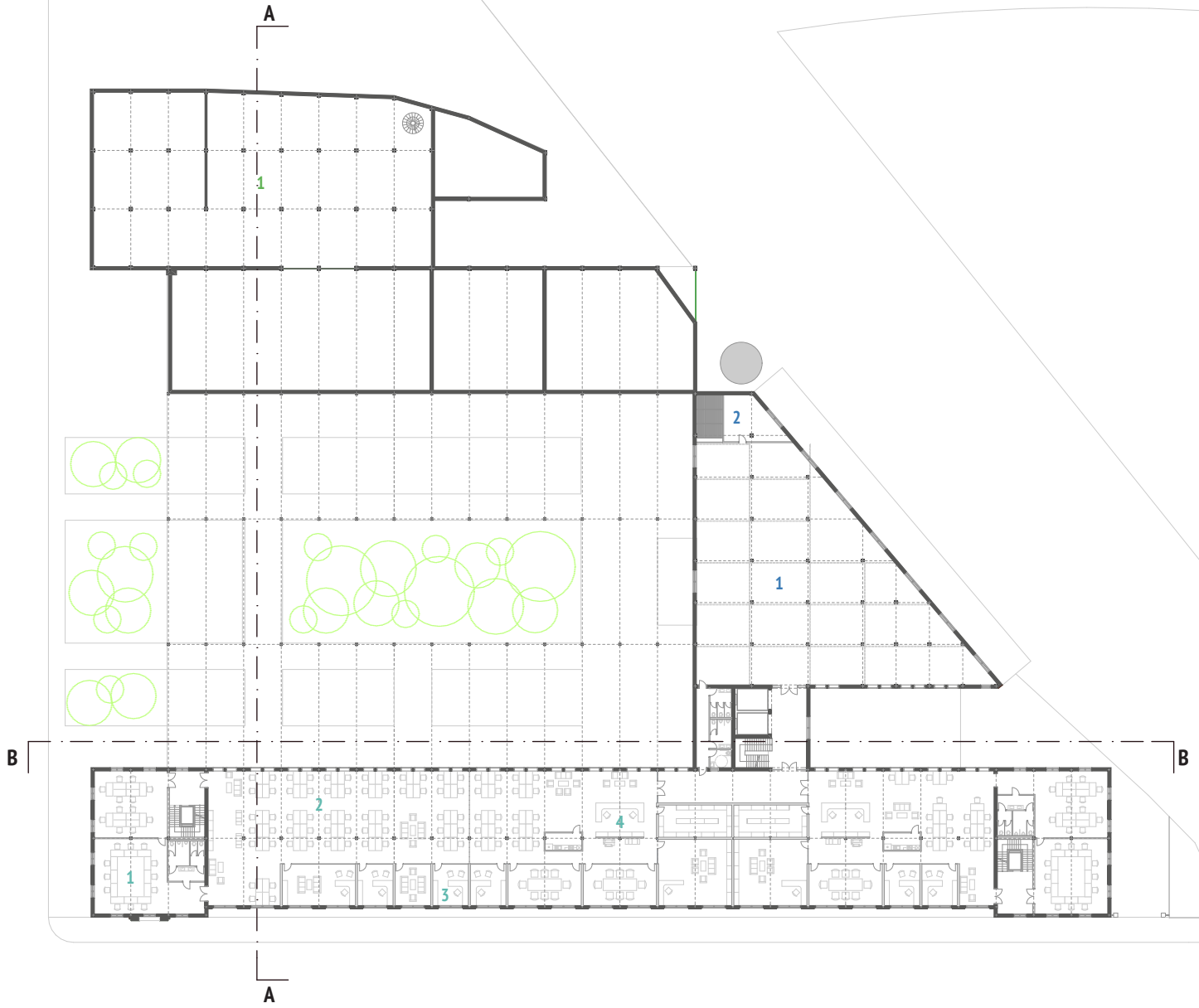
1 Foyer/Reception
2 Bar/Kitchen
3 Storage
4 Office

1 Reception/Office
2 Biomass Storage
3 Loading Dock
4 Dehydration/Extraction
5 Pumps/Water Treatment
6 Laboratory

Ground Floor
Floor Plan

Scale 1:750

N



1 Conference Room
2 Open-Space Typology
3 Single Office Typology
4 Reception/Secretary

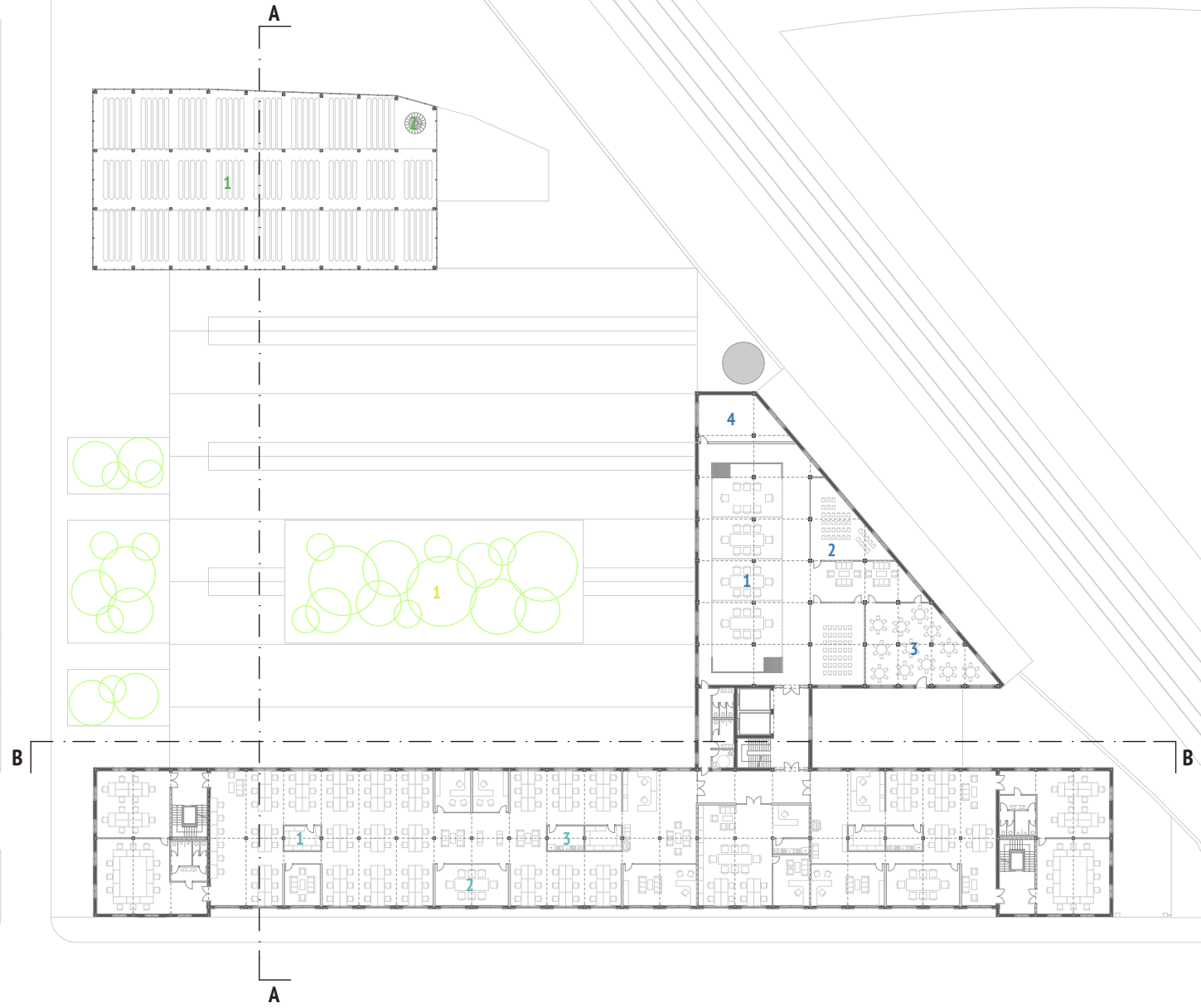
1 Multi-Use Area
2 Storage (Moveable Walls)

1 Plenum (High Ceiling of Ground Floor)

1st Floor
Floor Plan

Scale 1:750

N



1 Roof Opening (Trees)

1 Archive
2 Conference Room
3 Kitchen

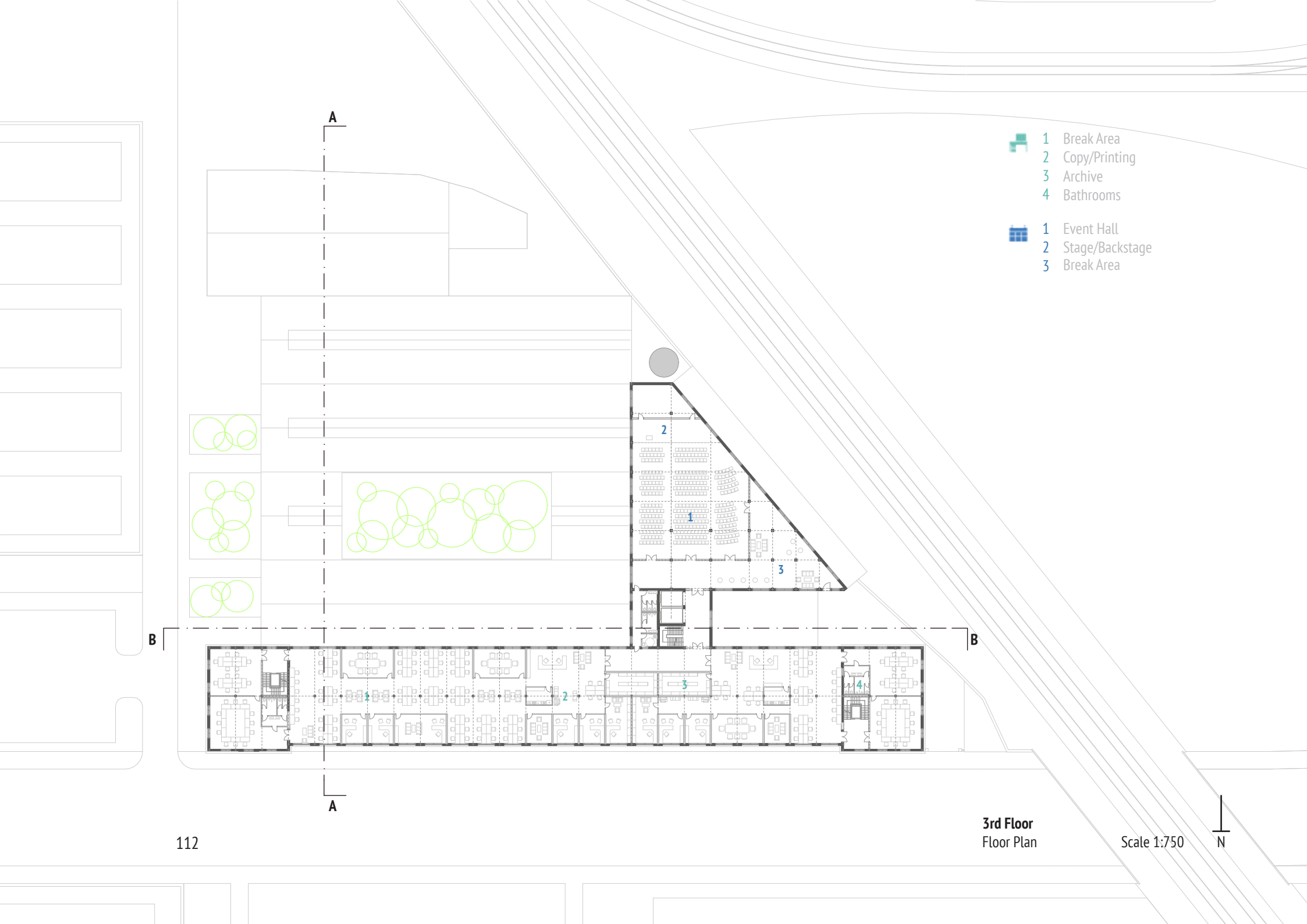
1 Flexible Seminar Area
2 Lecture Room
3 Collaboration Area
4 Storage

1 Bio-Reactors
2 Staircase

2nd Floor
Floor Plan

Scale 1:750

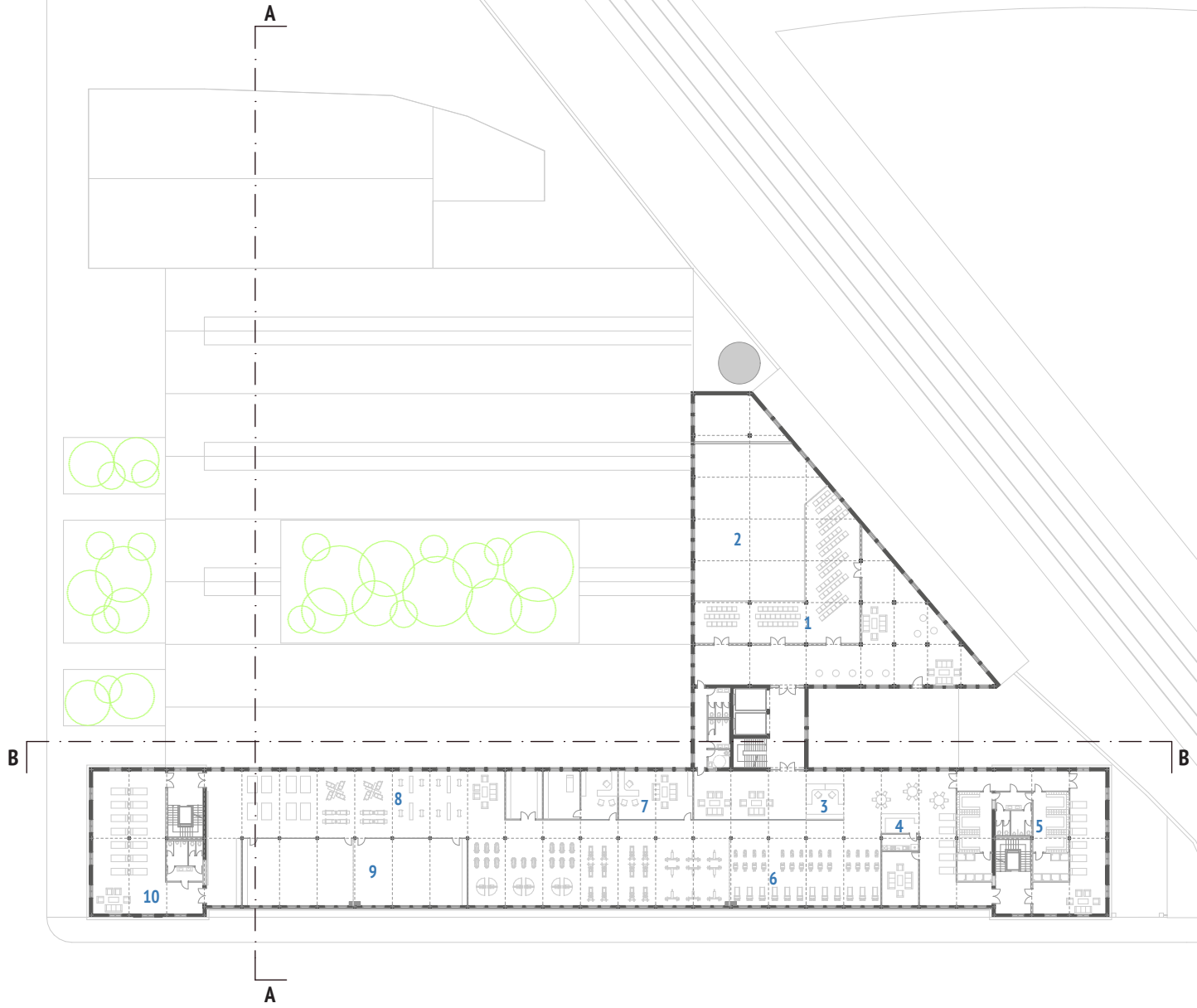
N



3rd Floor
Floor Plan

Scale 1:750

N

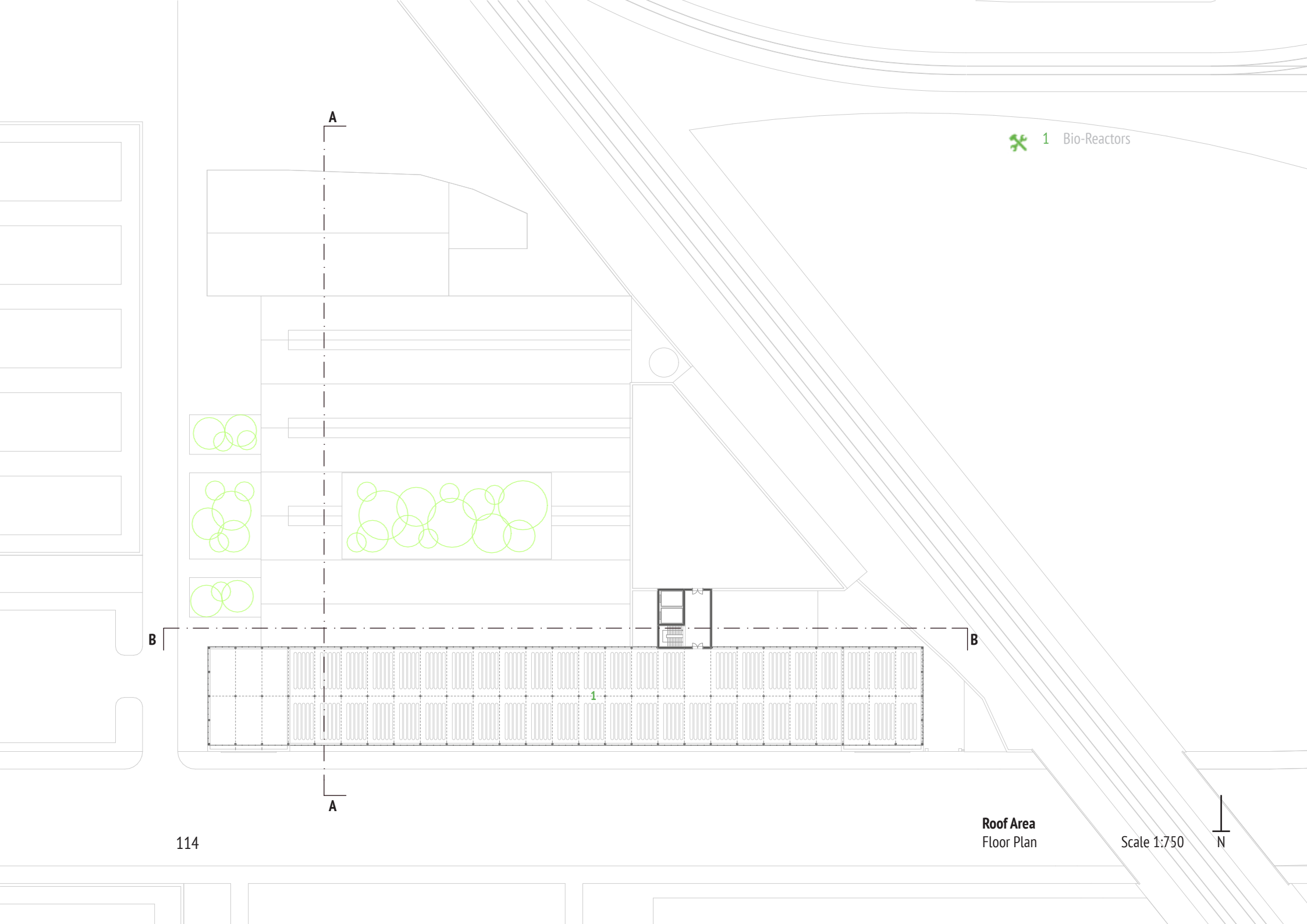


1 Gallery
2 Plenum
3 Reception/Counter
4 Bar/Kitchen
5 Changing Room/Shower
6 Warm-Up
7 Office
8 Work-Out
9 Flexible Course Rooms
10 Recreation

4th Floor
Floor Plan

Scale 1:750

N



Roof Area
Floor Plan

Scale 1:750

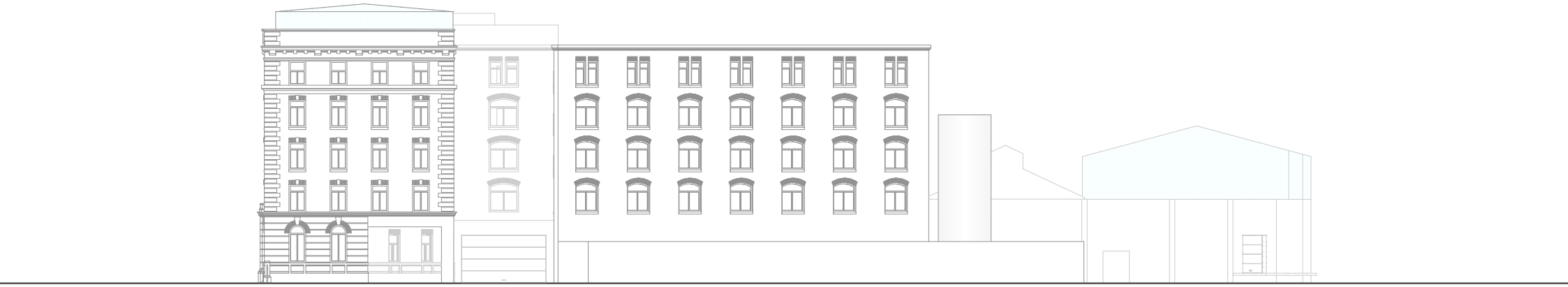
N

8.2. Sections

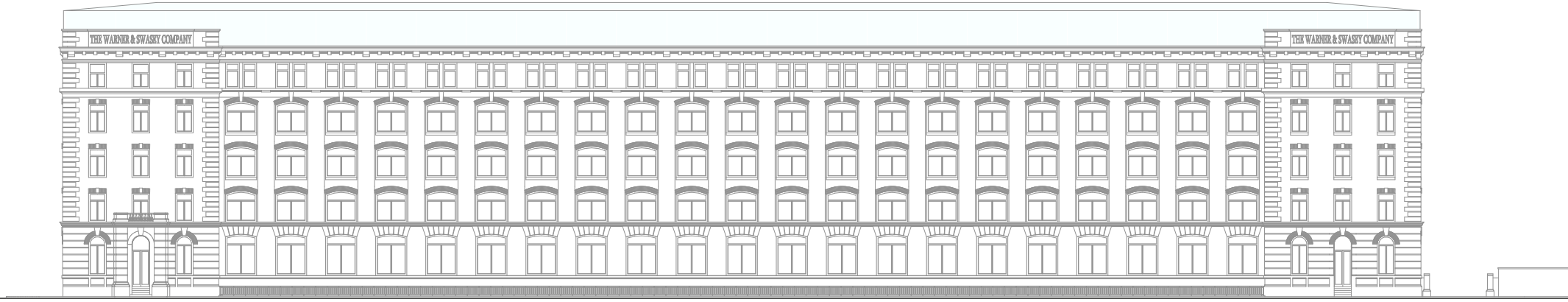
A-A
Section Scale 1:500

B-B
Section Scale 1:500

8.3. Elevations



East
Elevation Scale 1:500

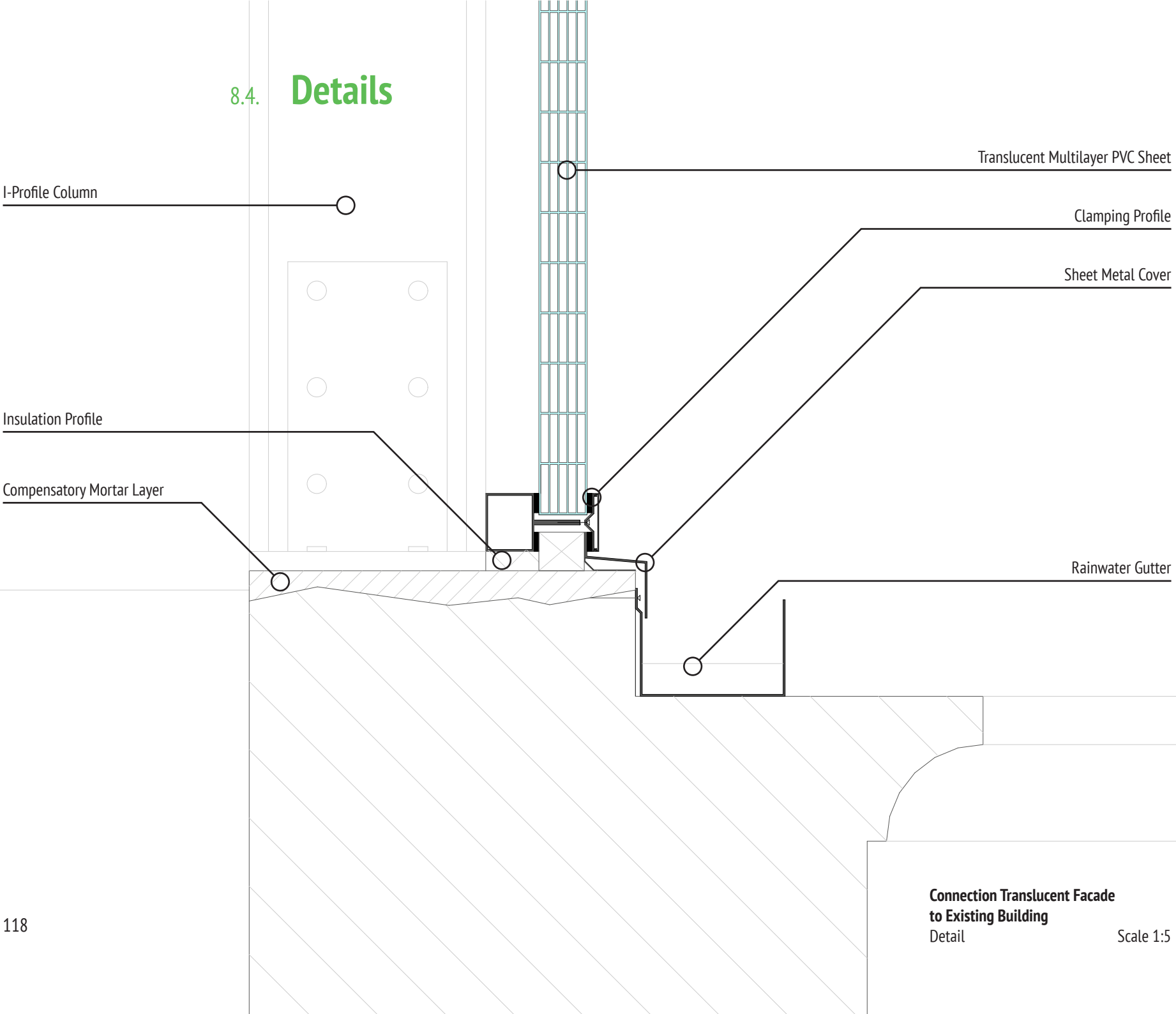


South
Elevation Scale 1:500

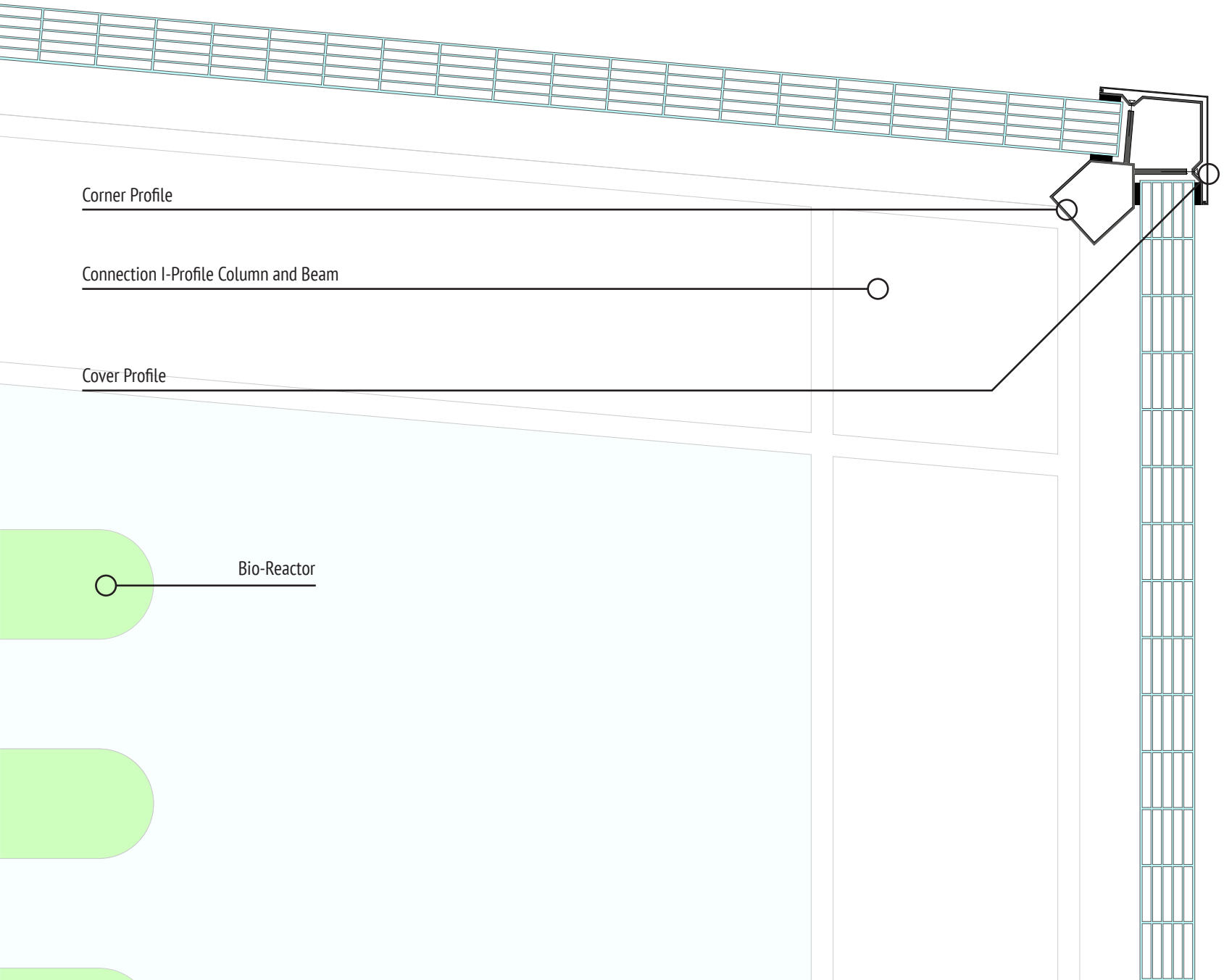
West
Elevation Scale 1:500

North
Elevation Scale 1:500

8.4. Details



Connection Translucent Facade to Existing Building
Detail Scale 1:5



Corner Connection of Translucent Facade
Detail Scale 1:5

8.5. Visualizations

Outside View on a Morning in Fall
Visualization

Public Park on a Summer Day
Visualization

8.6. Conclusion

The final proposal depicts a possible scenario of adaptive reuse for the Warner & Swasey Building in Cleveland. The insights from the research done in the previous chapters was used to develop and elaborate on this idea.
It combines multiple different uses with the the goal of creating a component for the surrounding neighborhood and the entire city that has yet been missing. The main goal of this intention is to promote human capital by adapting the functionality of the thriving structure of European inner cities and apply it on the factory. Creating a dense overlay of functions that are not yet existent in the neighborhood will lead to a higher frequency of people spending time in the area and will ultimately affect the surrounding. By bringing urbanity to the area, it will be possible to close the gap between the two centralities of the city, boosting the importance of the connecting streets and fostering the redevelopment of other abandoned sites

Architecturally, the proposal adds the volume of the translucent green house structure on top of the brick building. The block adapts the shape of the existing building and the structure and rythm of the long south facade, but creates a simplyfied, abstract version of it, setting a clear architectural statement. The strong contrast of the materials gives the new element lightness - the difference is clearly readable, yet the relation of new and old is not a hostile one. The translucent block becomes a hovering body that gives the existing brick building a new finish.

Inside the ensemble, the new park becomes a central square. The removal of parts of the roof allows all floors to relate to this space. The market hall and restaurant make use of the sheltered outdoor area, turning the site into a new public center.

The interiors are designed to create a high efficiency and sustainablity in their usage and maintenance. Facilities that require special fittings like bathrooms and kitchens are located in similiar places on each floor to reduce the costs of building services.
Many room configurations are adaptable to allow adjustments for changing forms of usage and the requirements of future tenants.

Demolitions are kept to a minimum. The open structure of the existing building does not require fundamental changes and therefore the interventions can be mostly limited to the interior fitout and addition of elements that are not bearing loads.
The building infrastructure is being reused, meaning that the access to all floors can be ensured by the existing stairways and the existing elevator shaft.

All in all, the proposal tries to keep construction costs low while still creating an architectural statement. The great condition and architecture of the existing fabric allows this idea to develop into a quite possible scenario for the reuse of the site.

SOURCES

Literature

Aitchison, Mathew (editor). Ashgate Studies in Architecture.The Architecture of Industry. Changing Paradigms in Industrial Building and Planning. Farnham: Routledge, 2016.
- Aitchison, M.: Industrial Architecture, Past and Present. Pages 1 to 8.

Austin, R. L. (editor): Adaptive Reuse. Issues and Case Studies in Building Preservation. New York: Van Nostrand Reinhold Company, 1988.
- Woodcock, D. G.: Introduction. Pages 7 to 10.

Baum, M. and **Christiaanse**, K. (editors): City as Loft. Adaptive Reuse as a Resource for Sustainable Urban Development. Zürich: ETH Zürich: GTA Verlag, 2012.
- **Armborst**, T. et al.: From Soho to SumCity. Pages 32 to 38.
- **Armborst**, T. et al.: The Highline, New York. Pages 321 to 325.
- **Baum**, M.: City as Loft. Pages 8 to 13.
- **Christiaanse**, K.: Traces of the City as Loft. Pages 14 to 24.
- **Bone-Winkel**, S. and **Matheis**, H.: The Economic Aspects of Real-Estate Development. Pages 82 to 88.
- **Hasse**, J.: Brownfields – Characteristics and Atmosphere. Pages 52 to 58.
- **Jäger-Klein**, C.: Conversions in Urban History. Pages 59 to 66.
- **Schneider**, J.: Introduction Europe. 98 to 100.
- **Schneider**, J.: WUK Werkstätten- und Kulturhaus, Vienna. Pages 173 to 177.

Birch, E. L.: Downtown in the "New American City". In: The Annals of the American Academy of Political and Social Science, Vol. 626, The Shape of the New American City (November, 2009), Pages 134 to 153. Thousand Oaks: Sage Publications, Inc. in association with the American Academy of Political and Social Science, 2009.

Cantacuzino, S.: Re-Architecture. Old Buildings/New Uses. New York: Abbeville Press, 1989.

Clark, J. et al.: Adaptive Reuse of Industrial Heritage. Opportunities & Challenges. Melbourne: Heritage Council of Victoria, 2013.

Darley, G.: Factory. London: Reaktion Books Ltd., 2003.

Die Geschichte der Gasometer und des Gaswerks Wien-Simmering. Official Homepage of the Vienna Gasometers.
Retrieved from URL:
http://www.wiener-gasometer.at/de/geschichte
On: 09/06/2016

Die Geschichte der Seifenfabrik. Official Homepage of the Seifenfabrik.
Retrieved from URL:
http://seifenfabrik.info/main/location/geschichte/
On: 09/06/2016

Douglas, J.: Building Adaption. Second Edition. Amsterdam/Oxford: Elsevier/Butterworth-Heinemann, 2006.

Dubelko, J.: Warner and Swasey Building. In: Cleveland Historical. Cleveland: Center for Public History and Digital Humanities at Cleveland State University.
Retrieved from URL:
http://clevelandhistorical.org/items/show/623
On: 10/03/2016

Engele, R.: Pecunia non olet: Geld stinkt nicht, hieß es auch in Graz. In: Contribution to the column "Damals in Graz" in the Styrian version of the Kleine Zeitung. Online via the Austria-Forum database.
Retrieved from URL:
http://austria-forum.org/af/Wissenssammlungen/Damals_in_der_Steiermark/Pecunia_non_olet
On: 09/06/2016

Filler, M.: Architecture View; Baron Haussmann, Urban Designer Par Excellence. In: The New York Times (March 24, 1991). New York City: The New York Times Company, 1991.
Retrieved from URL:
http://www.nytimes.com/1991/03/24/arts/architecture-view-baron-haussmann-urban-designer-par-excellence.html?pagewanted=all
On: 05/03/2016

Kapp, P. H. and Armstrong, P. J. (editors): SynergiCity. Reinventing The Postindustrial City. Urbana/Chicago/Springfield: University of Illinois Press, 2012.
- **Florida**, R.: The Death and Life of Great Industrial Cities. Pages 7 and 8.
- **Gillem**, M. and **Hedrick**, V.: Making Postindustrial Cities Livable. Pages 79 to 91.
- **Kapp**, P. H.: Historic Preservation. The Foundation of SynergiCity. Pages 28 to 39.
- **Kapp**, P. H. and **Armstrong**, P. J.: Introduction. Pages 9 to 13.

Gallagher, J.: Revolution Detroit. Detroit: Wayne State University Press, 2013.

History (of the University Circle). Official Homepage of the University Circle Inc.
Retrieved from URL:
http://www.universitycircle.org/history
On: 10/04/2016

Hoffmann, C. Die Steirer und ihre Krise. In: WienerZeitung.at (October 19th, 2015). Vienna: Wiener Zeitung GmbH, 2015.
Retrieved from URL:
http://www.wienerzeitung.at/beilagen/wienerjournal/781297_Die-Steirer-und-ihre-Krise.html
On: 08/22/2016

Hula, R. C. et al.: Reclaiming Brownfields: A Comparative Analysis of Adaptive Reuse of Contaminated Properties. Farnham, Surrey, England; Burlington, VT: Ashgate, 2012.

Jäger, F. P. (editor): Old & New: Design Manual for Revitalizing Existing Buildings. Basel: Birkhäuser, 2010.
- **Brückner**, C.; **Meixner**, C. et al.: "A Gift from the Past." (Interview with F. P. Jäger). Pages 11 to 15.
- **Hempel**, R.: Structural Check for the Building's Skeleton. Working on Existing Buildings - Experience Gained by a Structural Engineer. Pages 140 to 147.
- **Jäger**, F.P.: Addition. Page 16 to 17.
- **Jäger**, F. P.: Conversion. Pages 130 to 131.
- **Jäger**, F. P.: In Dialogue between Epochs. Pages 7 to 10.
- **Jäger,** F.P.: Transformation. Pages 66 to 67

Küster, H. Geschichte der Landschaft in Mitteleuropa: von der Eiszeit bis zur Gegenwart. München: C.H. Beck Verlag, 1999.

Lichtenberger, E. and **Aerni**, K: Die europäische und die amerikanische Stadt. Modelle, Probleme, Entwicklungstendenzen. In: Berner Geographische Mitteilungen: Mitteilungen der Geographischen Gesellschaft Bern und Jahresbericht des Geographischen Institutes der Universität Bern (1975). Köniz: Lang Druck AG, 1975.

Mallach, A.: Demolition and preservation in shrinking US industrial cities. In: Building Research & Information. Volume 39, Issue 4 (2011), Pages 380 to 394. Philadelphia: Taylor and Francis Group, 2011.

Martin, D.: The Thinkbelt: The University That Never Was. In: Discover Society (Issue 10, July 1, 2014). Bristol: Policy Press, 2014.
Retrieved from URL:
http://discoversociety.org/2014/07/01/the-thinkbelt-the-university-that-never-was/
On: 06/02/2016

McFee, M. J.: Cleveland seeks bids for Warner & Swasey complex in Midtown, after 2010 rehab deal fizzles. In: The Plain Dealer (January 17th, 2014). Cleveland: Advance Digital, 2014.
Retrieved from URL:
http://www.cleveland.com/business/index.ssf/2014/01/cleveland_seeks_bids_for_warne.html
On: 10/09/2016

Miller, J.: Bid in for Warner & Swasey site. In: Crain's Cleveland Business (November 28th, 2005). Cleveland: Crain Communications Inc.
Retrieved from URL:
http://www.crainscleveland.com/article/20051128/SUB/51123031/bid-in-for-warner-swasey-site
On: 10/04/2016
- **Shorey**, J. D. (Interview)

Oelschlägel, D. Aktuelle Probleme der Stadtentwicklung in Europa. The author's manuscript for a presentation at the 10th anniversary symposium of the Sächsische Sozialakademie in Chemnitz on 01/11/2002.
Retrieved from URL:
http://www.stadtteilarbeit.de/themen/integriertestadtteilentwicklung/allgemeinestheorien/219-aktuelle-probleme-stadtentwicklung.html#7
On: 08/17/2016

Petrin, K.: Italian Swiss Colony. In: The Semaphore No. 198 (Spring 2012). San Francisco: Telegraph Hill Dwellers, 2012.
Retrieved from URL:
http://www.thd.org/wp-content/uploads/2011/04/Semaphore_Issue-198.pdf
On: 09/07/2016

Rabun, J. S.: Structural Analysis of Historic Buildings. Restoration, Preservation, and Adaptive Reuse Applications for Architects and Engineers. New York: Wiley, 2000.

Seiß, R. Konsumtempel kannibalisieren sich gegenseitig. In: Interview with derStandard.at (November 29th, 2013). Vienna: Standard Verlagsgesellschaft m.b.H., 2013.
Retrieved from URL:
http://derstandard.at/1385169309701/Konsumtempel-kannibalisieren-sich-gegenseitig
On: 08/19/2016

Seiß, R. Land der Zersiedler. In: Die Presse (December 7th, 2007). Vienna: "Die Presse" Verlags-Gesellschaft m.b.H. Co KG, 2007.
Retrieved from URL:
http://diepresse.com/home/spectrum/zeichenderzeit/347963/Land-der-Zersiedler
On: 08/19/2016

Technik der Gasometer und des Gaswerks. Official Homepage of the Vienna Gasometers.
Retrieved from URL:
http://www.wiener-gasometer.at/de/technik
On: 09/06/2016

The History of Boott Cotton Mills. Official hompage of The Apartments at Boott Mills.
Retrieved from URL:
http://www.boottmills.com/history-of-boott-cotton-mills
On: 09/07/2016

Wachter, S. M. and **Zeuli**, K. A. (editors): The City in the Twenty-First Century: Revitalizing American Cities. Philadelphia: University of Pennsylvania Press, 2013.
- Glaeser, E.: The Historical Vitality of Cities. Pages 7 to 25.

Yardley, J.: Olympics Imperil Historic Beijing Neighborhood. In: The New York Times (July 12, 2006). New York City: The New York Times Company, 2006.
Retrieved from URL:
http://www.nytimes.com/2006/07/12/world/asia/12beijing.html?pagewanted=all&_r=0
On: 05/16/2016

Figures

Fig. 1-4:
Self Made Graphics.

Fig. 5:
Ford Motor Company assembly plant in Highland Park (Detroit, Michigan) around 1910.
Wikipedia Commons
(https://en.wikipedia.org/wiki/Detroit#/media/File:Change_of_work_shift_at_Ford_Motor_Company.jpg)

Fig. 6:
Freeways running through a suburb in Los Angeles.
Wikipedia Commons
(https://en.wikipedia.org/wiki/Urban_sprawl#/media/File:Los_Angeles_-_Echangeur_autoroute_110_105.JPG)

Fig. 7:
The abandoned Packard plant in Detroit.
Wikipedia Commons
(https://de.wikipedia.org/wiki/Detroit#/media/File:Abandoned_Packard_Automobile_Factory_Detroit_200.jpg)

Fig. 8:
The densely grown city structure of Salzburg.
Wikipedia Commons
(https://de.wikipedia.org/wiki/Liste_von_St%C3%A4dten_mit_historischem_Stadtkern#/media/File:SalzburgerAltstadt02b.jpg)

Fig. 9:
The Varena shopping center in Vöcklabruck - built for the car.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AVarena_Shopping.jpg)

Fig. 10:
Eisenerz, shaped by the mining industry and Austria's city with oldest population on average.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AEisenerz_(3).JPG)

Fig. 11 and 12:
Self Made Graphics.

Fig. 13:
Industrial buildings and infrastructure near downtown Cleveland.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ACleveland_from_Superior_Viaduct.jpg)

Fig. 14:
The Marcellus Theater in Rome (Italy) – an early example of reuse of existing fabric.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AMarcellus_theater_Rome.jpg)

Fig. 15:
Demolition of medieval districts in Paris around 1870.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AP._Emonts_-_Demolition_of_Butte_des_Moulins_for_Avenue_de_l'Op%C3%A9ra.jpg)

Fig. 16:
Demolition of an industrial building in Coventry (England). The existent value of the brickwork which would be expensive to create nowadays is lost.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ADemolition_dust_coventry_14n07.jpg)

Fig. 17:
Zeche Zollverein in Essen (Germany): Reusing the structure has converted the public opinion about it and turned it into an important cultural venue.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3A02-MIRROR_PROJECT_Zeche_Zollverein_Essen.jpg)

Fig. 18:
A building from the 19th century in Baltimore (Maryland) being demolished to be replaced with parking lots for a new facility. Economic interests destroying components of identity and urbanity.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AKelsoHome_SE.jpg)

Fig. 19:
Flax mills near Leeds, England were given an Egyptian-styled façade.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ATemple_Works.jpg)

Fig. 20:
Schinkel's Bauakademie from 1836 introducing a new type of construction.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AM_Bauakademie_Berlin_1888.jpg)

Fig. 21:
The Fagus Factory by Walter Gropius and Adolf Meyer opened in 1913, being an early example of Modern architecture. The glas facade and especially the corner detail without a load bearing element were revolutionary.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AFagus_Gropius_Hauptgebaeude_200705_wiki_front.jpg)

Fig. 22:
The AEG Turbinenfabrik by Peter Behrens is still being used today by the Siemens company for its original purpose.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AAEG_by_Peter_Behrens.jpg)

Fig. 23:
Silicon Valley near San Jose (California, United States): an area of high-tech computer and communication industries shaped by large, low-rise production halls as well as office and research facilities.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ASiliconvalley.JPG)

Fig. 24:
The steel skeleton structure of a railway station in Scranton (Pennsylvania, United States) being clad with a limestone facade in 1907.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ALackawanna_Scranton_station_under_construction_1907.png)

Fig. 25:
Contamination due to improper disposal of oil barrels.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AUmweltbelastung_durch_Industrie%C3%B6le_in_Industriebrache_2.jpg)

Fig. 26:
Cast-iron buildings of the SoHo district in Manhattan (New York, United States), formerly containing commercial uses and small factories.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ASoHo_Cast_Iron_Historic_District_034.JPG)

Fig. 27:
Ricardo Bofill's "La Fabrica" in Barcelona (Spain). A reused cement factory turned into his private residence and office.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ARicardo_Bofill_Taller_de_arquitectura_La_Fabrica_Barcelona_Spain.jpg)

Fig. 28:
Entrance to the Museum at the reused coal mining complex Zollverein in Essen (Germany) by Architect Heinrich Böll.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AZeche_Zollverein_Essen_Okt10_007.jpg)

Fig. 29:
The turbine hall of a former powerstation in London (England) now accomodating the Tate Modern Gallery. A successful reuse project creating a place of urban vitality.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ATate_modern_london_2001_03.jpg)

Fig. 30:
A former machine factory in Hamburg (Germany) revitalized to become a culture- and event center. The traces of former usage have been intentionally preserved.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AFabrik_Hamburg_innen_02.jpg)

Fig. 31:
The hall-like structure of many factories and warehouses allowing a broad range of possible new uses.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AChickletsFactoryNOLAMainHallEmpty2010.JPG)

Fig. 32:
A modern story addition creating both contrast and at the same time visually completing the building at the top.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ABerlin%2C_Mitte%2C_Behrenstra%C3%9Fe%2C_Humboldt-Carr%C3%A9.jpg)

Fig. 33:
Brutal Contrast: Coop Himmelb(l)au's deconstructivist addition to the Art Museum from 1922 in Akron (Ohio, United States).
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AKnight_building_at_Akron_Art_Museum_-_Flickr_-_Knight_Foundation.jpg)

Fig. 34:
The Fahle building in Tallinn (Estonia) and its addition of several stories on top of an old paper factory showing the possibilities of an intact load bearing structure of an industrial building.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AFahle.jpg)

Fig. 35:
Corroding metal on the silos of an abandoned factory.
Pixabay
(https://pixabay.com/p-1500882/?no_redirect)

Fig. 36:
The north-east corner showing the original ornate brickwork facade.
Self-made Photography.

Fig. 37:
Combining newly added walkways, plants and the existing rails.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ANY_High_Line02.jpg)

Fig. 38:
The complex is surrounded by canals that were needed to create the waterpower in the early days of the mills.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AMill_Building_(now_museum)%2C_Lowell%2C_Massachusetts.JPG)

Fig. 39:
The prominent multistory extraction hall added in 1917.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ASeifenfabrik.JPG)

Fig. 40:
Brickwork facades of the four gasometers seen from south east.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3ASimmering_(Wien)_-_Gasometer_(2).JPG)

Fig. 41:
The inner court of the ensemble.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AEhem._Siglsche_Lok.Fabrik_WUK_W%C3%A4hringerstr59_GstNr450-1_Alsergrund_Bild3.jpg)

Fig. 42:
Self-made Photography.

Fig. 43:
Self-made Photography.

Fig. 44:
The 122m long south facade of the main building of the Warner & Swasey Complex, facing Carnegie Avenue.
Self-made Photography.

Fig. 45:
The neoclassical Terminal Tower completed in 1930, once being the second highest building in the world, surrounded by younger buildings of the international style and parking lots.
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File:Terminal_Tower.jpg)

Fig. 46:
Downtown Cleveland
Wikipedia Commons
(https://commons.wikimedia.org/wiki/File%3AJacobs_Field_Cleveland.JPG)

Fig. 47:
The Warner & Swasey Building.
Self-Made Photography.

Fig. 48:
The Museum of Modern Art
Wikipedia Commons
(https://en.wikipedia.org/wiki/File:Cleveland_Museum_of_Art_atrium_expansion.jpg)

Fig. 49:
Bridges spanning over the Cuyahoga River depicting the large infrastructural dimensions.
Wikipedia Commons
(https://upload.wikimedia.org/wikipedia/commons/f/f1/Downtown_Cleveland.JPG)

Fig. 50:
Abandoned factories, warehouses and empty sites along Carnegie Avenue.
Google Earth

Fig. 51:
Largely cleared blocks of former residential developments south of the site.
Google Earth

Fig. 52:
The north facade of north building indicating a former addition to the complex that has gotten removed.
Self-made Photography.

Fig. 53:
Carnegie Avenue running west towards downtown.
Self-made Photography.

Fig. 54:
The connecting street between the abandoned complex (right) and the car mechanic/garage building (left).
Self-made Photography.

Fig. 55:
The steel structure of the former assembly hall seen from the outside (from western direction). The wing on the very left shows brick walls on the inside that were later induced.
Self-made Photography.

Fig. 56:
The connection of the assembly hall to the main building.
Self-made Photography.

Fig. 57:
On the first floor of the northern wing of the main building. The hall was probably used for storage and office related purposes.
Self-made Photography.

Fig. 58:
Inside the main building on ground floor level, showing the open structure.
Self-made Photography.

Fig. 59:
The elaborated portal of the south facade.
Self-made Photography.

Fig. 60:
Damages in the brickwork of the western face of the main building.
Self-made Photography.

Fig. 61:
Corrosion of the steel structure in the assembly hall.
Self-made Photography.

Fig. 62:
Debris of former fitout.
Self-made Photography.

Photographs, Figures, Graphics and Plans that are not seperately marked were created by the author.

Other

Piktograms
Noun Project (https://thenounproject.com/), by the following authors:
Alv Jørgen Bovolden,
David,
Edward Boatman,
Hamish Buchanan,
icon 54,
Icon Island,
Jamison Wieser,
Jory Raphael,
Krisada,
Michael Beno,
Nathaniel Smith,
Nicolas Morand,
Nut Chanut,
Picons.me,
Rflor,
Samy Menai,
Seona Kim,
Serkan Doğan,
Sitara Shah,
Thomas Helbig,
To Uyen,
Viktor Vorobyev

Maps:
Google Earth
(NOAA, Terra Metrics)

Snazzy Maps
(https://snazzymaps.com/)

GIS of the City of Cleveland Planning Commission
(http://planning.city.cleveland.oh.us/gis/cpc/basemap.jsp)

INDUSTRIAL (R)EVOLUTION

Revitalization of Industrial Buildings In Austria and the United States of America

Research Proposal by
STEFAN SCHERMAIER, BSc.