ADAPTIVE REUSE OF

SPRITFABRIKKEN

Master Thesis

MSc04 AAU Architecture

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TABLE OF CONTENTS

PREFACE

This project is developed by Group 44 during the 4th semester of Architecture MSc program at the Faculty of Architecture, Design and Media Technology of Aalborg University. The report is the outcome of the Project Module: Master's Thesis in Architectural Design Engineering. The project spanned three and a half months from the 10th of February to the 27th of May.

ABSTRACT

The purpose of this program is to present the master thesis theme, introduce the main subjects we are going to work with, as well as investigating ways and methods of approaching the rehabilitation of industrial buildings. Adaptive re-use strategies and examples are to be analyzed in the particular context of part of the old brewery, while considering urban strategies in a general master-plan of the area..

INTRODUCTION


f.001

Industrial Architecture has and still represents a big percentage of the built environment of Europe starting from the 19th century to the present. Representing a basis for modern architecture, industrial buildings have changed in size, form and density over time, mainly due to the changing needs of the industry.

Aalborg is one of the many cities in Europe where industrialization was thriving during the 19th century. Part of its history represents the iconic smoking chimneys of the factories which helped develop the city economically. While many of these factories have been closed down or moved outside the city, the industrial character of Aalborg is still felt through both still existing factory buildings as well as contemporary urban design. Aalborg Akvavit has been part of Aalborg's identity by producing the local drink, thus the building has been too, as a landmark of local pride. Considering the newly announced intention of moving the distillery production to Norway, the building will remain empty, just as many others of its kind, and the intention is to offer a re-use for the building.

The goal of this project is to gain deeper knowledge into residual architecture and how can one deal with it. An urban approach to this project is advised, as well as considerations of the existing site and functions present on the site.

TECTONICS

There's an ongoing debate since the 19th century about the intervention on historic buildings. Ruskin stated that these efforts should be restricted to preservation, he highly argued against the creation of something that never actually existed and *"a destruction out of which no remnants can be gathered: a destruction accompanied with false description of the thing destroyed."* [Ruskin, J. 2011, p 185] On the other hand Viollet-le-Duc, who is considered one of the first modern architects advocated for the latter approach. He supported restoration which is *"means to reestablish [a building] to a finished state, which may in fact never have actually existed at any given time."* [Viollet-le-Duc, E. 1990, p 195]

However only a few buildings have so deep historic background combined with architectural value, that is worth preserving without restoration. Fine example of the ones outside this group is the characteristic architecture which defines the atmosphere of settlements and cities. Altogether they represent the value which should not be eliminated in the favor of development, but certain elements of it may not be strong enough to stand on their own without refurbishment and reconnection to the city life. According to Semper's so called "Bekleidungstheorie" [Semper, G. 2004, Third section - Textile Art] this value is the reflection of culture and heritage (and the human desire to be surrounded by art and beauty), and it is related to the enclosure, the shell of the building. When the shell, the walls don't have any other function (e.g. weight bearing) than providing separation and protection from the outer world, they are regarded similar to textiles and woven materials by Semper, or as a surface to be covered by textiles (= representation of culture and zeitgeist) or have them hanged on. [Semper, G. 1989, p 103-104] In our case the old malt storage and silo building's external facades are strong and remarkable representatives of Danish industrial architecture and brickwork of the beginning of the 20th century.

There's another debate among the followers of Viollet-le-Duc about how humble and tectonic the rehabilitation should be. The contemporary phenomenon called "facadism" is a highly criticized method of handling historical buildings. It means that the only part of the building kept is the facade, but the internal structure of the building is demolished to give space to something new, only slightly related to the exterior. It's not only a question of attitude but also the denial of the tectonic theory. Which means it cannot result a proper building as there's no or limited communication between the inside and the outside and inevitably a new weight-bearing system is implemented to substitute the razed one and to support the new structure. So basically form doesn't follow function anymore, but there's a try (which usually at least partly failed) to fill the new needs into the old skin. Karl Bötticher, a German archaeologist and professor of tectonics argues that a building should be regarded as the junction (Junktur) of core-form (Kernform – core, structure) and art-form (Kunstform – outer membrane, shell). [Bötticher, K. 1874, Band 1] Thus the connections, joinings between the two cannot be neglected without endangering or nullifying the tectonic qualities of a certain building.

Many factory buildings (like the one chosen for this master thesis) lack weight-bearing walls, instead they are supported by a system of beams and columns which provide a more flexible conversion. However the architect should consider that as the old purpose has changed during the years, it will probably alter in the future as well. So refurbishment should retain the flexibility of the structure and benefit from tectonic qualities and not regarding them as an obstacle.

ADAPTIVE REUSE OF INDUSTRIAL BUILDINGS

"More often than we like to admit, we are not engaged in changing the world to some determined end. We are adapting responding to outside forces beyond our control, seeking to survive, to preserve something, to maintain some desired level of performance."
[Lynch, K. 2000, p 199]

Recycling has become part of our daily life, starting from plastic bottles to paper recycling, society nowadays is more and more oriented to achieving environmental sustainability. The adaptive reuse process changes a disused or ineffective building into a new one, but most often than not *"the function is the most obvious change, but other alterations may be made to the building itself such as the circulation route, the orientation, the relationships between spaces; additions may be built and other areas may be demolished."* [Brooker, 2004]

Many theories and concepts concern the adaptive reuse of historical buildings with regards to the impact on the heritage significance and why should the building have a heritage status. The general intent is to respect the building's heritage while adding a contemporary layer that provides value for the future. While developing the concept of adaptive reuse, militants in favor of discouraging facadism suggest that the new use should be both contemporary as well as compatible with its original use. [Adaptive Reuse – Environment and Heritage, pdf]

"The best way to conserve a heritage building, structure or site is to use it ... Adaptation links the past to the present and projects into the future."
[New Uses for Heritage Places]

The benefits and challenges of the adaptive reuse concept refer have an impact on an environmental, social and economic level. Not only there is the retention of the building's original embodied energy, which refers to the energy consumed by all of the processes associated with the production of the building, but on a social level, industrial heritage sites play an important role in the life of the community. They can be part of the local identity, either the building in itself, or its former use. Apart from the embodied energy savings, the new function plays an important part in the economic success of the adaptive reuse project. Human needs are in a continuous change, therefore one can hardly say when have they found a function or a need that would be in place forever. Different communities and individuals value industrial heritage differently, and the attitude taken depends on several issues, including the structure itself, the social context as well as discovering the values and strengths of the building to be preserved.

However, when reconverting an old building, several questions must be discussed. Various theoretical approaches have been developed over time. While Viollet-le-Duc argued that *"the best way to preserve a building is to find a use for it, and then to satisfy so well the needs dictated by that use that there will never be any further need to make any further changes in the building"*, John Ruskin favored for regular care and maintenance to ensure the preservation of historic buildings, claiming it is *"impossible, as impossible as to raise the dead, to restore anything that has ever been great or beautiful in architecture."* [Viollet-le-Duc, 1990], [Ruskin, 1849].

The need of authenticity and heritage is in continuous growth in the context of large scale globalization, and communities of people seek to preserve their values, in the search for an identity and a sense of belonging. European states have a great responsibility when it comes to the conservation of monuments from the past, mainly due to the great Industrialization period that overcame Europe in the19th centuries.

f.002

GENIUS LOCI VS ZEITGEIST

"The place, is the concrete manifestation of the world of life, and as an instrumental art, architecture is the art of place." [C.N. Schulz, 2000 p.17]

According to C.N. Schulz architecture is "the art of place". Initially a Roman concept, the meaning and signification of genius loci has changed during the course of history, while remaining a living reality. The spirit of the place is understood and explained in various different ways by different authors and artists. While Lawrence Durrell suggests that by experiencing the characters of the different countries one begins to understand the spirit of the place, other artists and writers have associated the sense of the place with the phenomena of everyday life. [C.N. Schulz, 1979]

The term Zeitgeist, frequently used by Heinrich Hübsch and his contemporaries in their texts, refers to the "spirit of the age". Similarly to genius loci, its definition and understanding can be interpreted in many ways. One can argue that we cannot talk about the spirit of the space without referring to a certain age or era as time and space coexist and form our present, past or future. The linking element between these concepts is the experience felt by the humans or in a bigger scale by the society, whose needs and values are in constant change.

The dialog between place and time is defined in modern architecture, according to Eisenman and it refers to a space/time phenomenon, where the space is defined by surfaces. In many of Mies van der Rohe's works one can notice the zeitgeist on the facades, as a contemporary expression of architecture, while the interior is characterized by the comfort of the home and the sense of space. The composition of the two is not tied to the place but to the phenomenon. [Eisenman-video lecture]

While in modern times the space and time is directly related to the plan and facade as comfort and innovation, the situation changes in contemporary times, when one can argue that place has lost its importance in the global capital. In an era when technology is at its highest, both media and accessibility make it easy for us to stay in touch, be informed and aware of the whole world, passing over the borders of our own city, country, or even continent. Replicas of famous buildings or even whole cities are no longer new, and one can experience a Dutch village in Japan, Austrian architecture in China or Chinese food in the USA. The need of constant newness and digital integration into architecture is changing the way we build in relation to the environment. While designing a building, the need of constant innovation could lead one to neglect the relation to the place, and the following question arises:

"How do you make a place when place is no longer of value in the capital society, and how do you make something of our time when 'of time' has nothing to do with space? "[Eisenman-video lecture]

The approach to these elements is a matter of choice and perception, and one could find arguments for both of them. Innovation and competitions are extremely important, since they lead to the progress of the society, but on the other hand, one cannot dismiss the need of identity and differentiation, both culturally and socially.


T.003

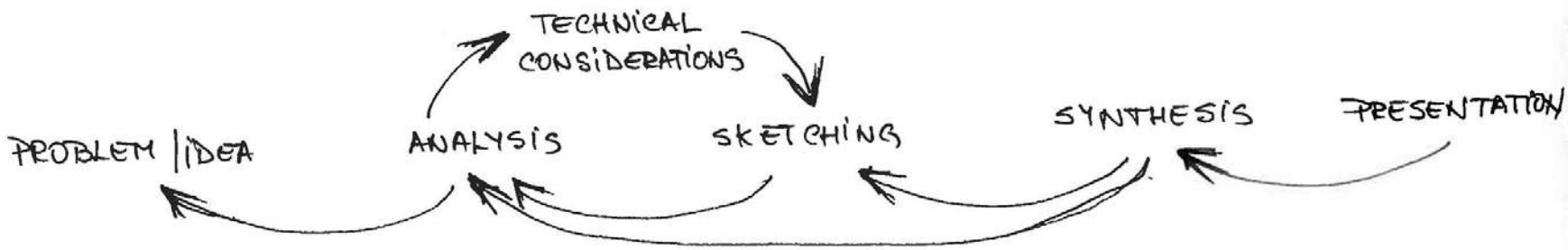
METHODOLOGY

The methodology used for this project relies on the method developed by Mary-Ann Knudstrup 'Integrated Design Process' which helps the designer cope with technical and aesthetic problems, and focuses on the creative element. Both in theory and practice the implementation of sustainable methods is made from the beginning of each project. Passive building principles are key elements in order to achieve efficient architecture. This theory relies on certain parameters to deal with, and to focus on, while at the same time, the more parameters one has the more time pressure exists. [Knudstrup, 2008]

Several steps are defined as stages of designing, starting with the idea/ problem, continuing with analysis and sketching, while ending with synthesis and presentation of the final product. Iteration plays an important role in achieving a suitable solution.

Starting with defining the problem, one has to consider building in the context of historical industrial buildings, now situated closer to the city center than its outskirts, with an improper function of the current community. In order to reintegrate the area and the buildings into the city's life, according to its needs, our approach to it was to document different stages of the building, old plans as well as dropped plans and intentions, by requesting official information and plans from the planning department. A visit to the site together with explaining the investor's idea, together with a meeting with ark Niels Thomas Birket-Smith from the municipality helped us understand both the scale of the intended project, as well as the city's intentions and needs.

While sketching the social aspect of sustainability has been a constant goal while designing the master plan and building up a program. Our architectural focus is the former storage building and by focusing on the tectonic aspects of the existing structure, our ideal is to understand it, learn from it and to implement the ideas into a new/extended part.



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f.005

ANALYSIS

7.1 LOCATION

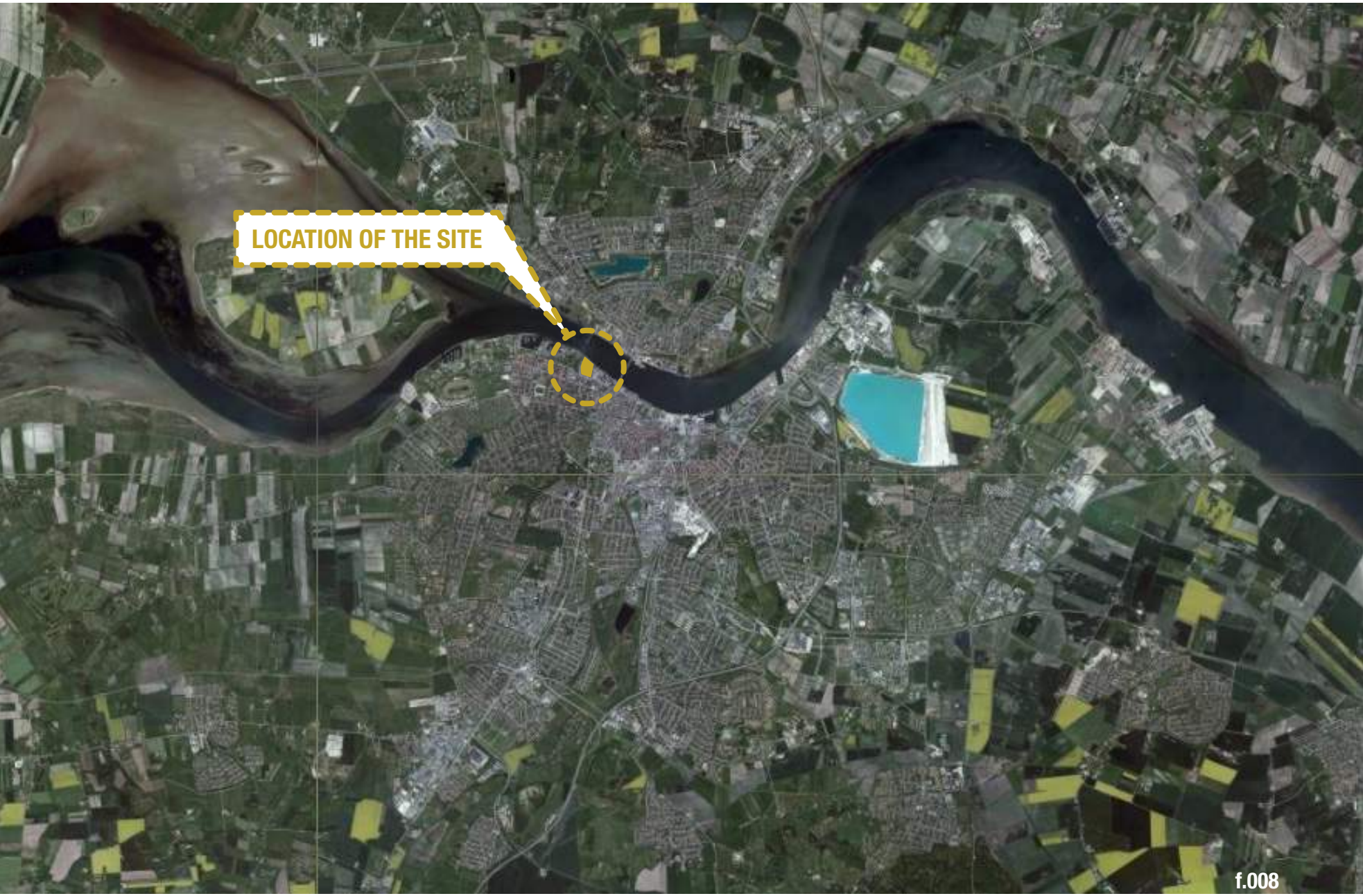
f.006

location of Denmark within Europe

other parts of the Danish Realm (Faroe Islands, Greenland)

f.007

location of Aalborg within Denmark



f.008

7.2 AALBORG WATERFRONT

Since the complex to be studied is directly connected to the fjord, one way of finding an urban approach towards this project is to analyze, compare and get directions from analyzing parts of the urban waterfront. The site is located in the transition area forming the Vestby and the city center and at the moment is an urban gap in the development of the area. Physical borders such as the railway as well as the Vestby train station is at the moment a separation, but different ways of approaching it could make it the departure point of the local development.


f.010

ZONE 01: **small bay + small fragmented housing.**

Situated in the north western part of the town, this area relates to the fjord by forming a small bay, for storing small sailing units. The housing in the area is divided into two types while seeing a difference between new housing units towards the fjord, and the old remaining area of small but close together homes in the east.


f.011

ZONE 02: **park + Aalborg Akvavit complex** (separated by the railway)

Located at the borderline of the railway, the park ends the small bay area pattern from the western part of the fjord, by entering the new urban center. The Akvavit complex seems to be on the transition area between the western city and the remodeled urban center and waterfront. The development of the area will influence both the character of the eastern part of railway, but also the further development of Vestby.

ZONE 03: **Utzon Center + A&D building + Opera House**

Consisting of the newly renovated waterfront, this area presents a 'cultural path' alongside the fjord, by including the Utzon Center, the A&D building, closing down with the Opera House (Musikkenshus) and Nordkraft towards the other part. While several pockets have been created in the fjord, in the central area, as part of a general urban plan, the limit with the fjord for the adjacent buildings has not been tampered with.

ZONE 04: **large industrial area with a bay**

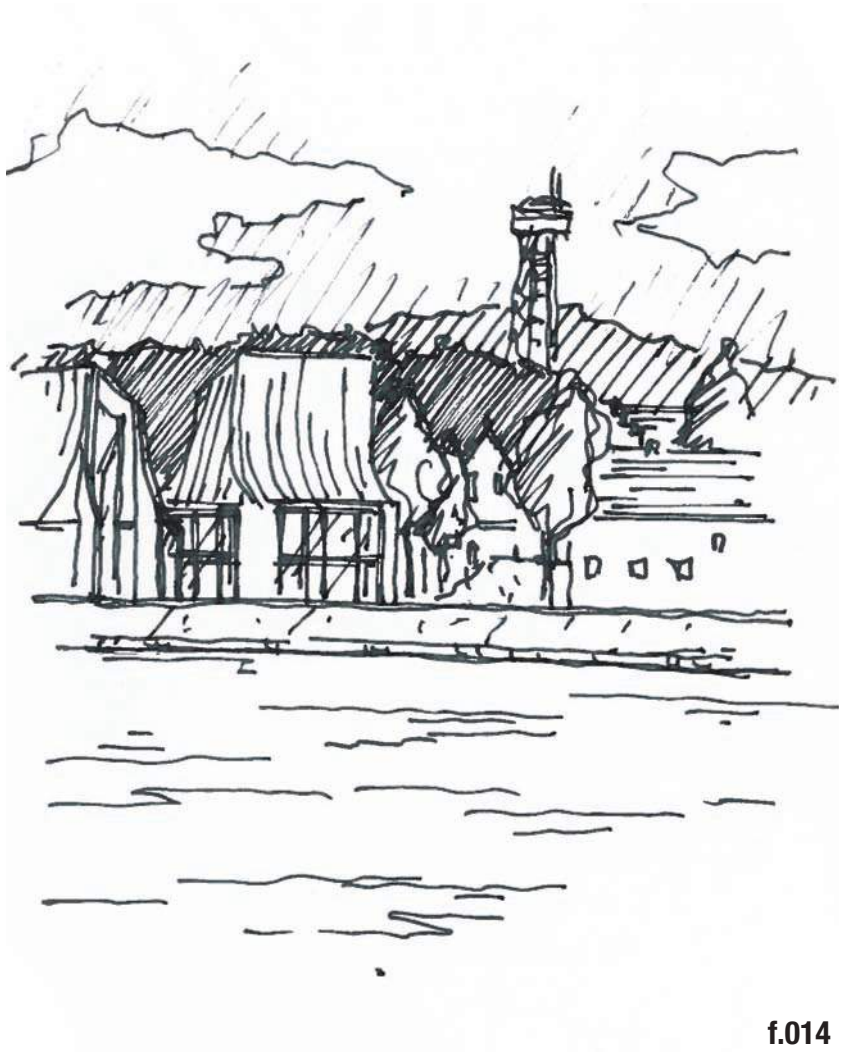
Situated in the eastern part of the city, this area still resides in industrial architecture, in big cement tubes across from Nordkraft. Also a reminiscent of the industrial area is the bay that was probably used for supply and transport. The industrial area continues farther into the eastern direction of the fjord, this alongside with the Akvavit complex are two areas that define the exit from the urban Aalborg into the Industrial Areas.

7.3 WHAT DOES AALBORG ALREADY HAVE?

Aalborg's placement in the narrowest point on the Limfjord has played an important part in its development, being considered an important harbor and therefore contributing to the city's industrialization. Aalborg tends to become more of a University center, but the industrial past is present throughout the city and contributes to its character. Particularly close to the waterfront, one can observe the industrial heritage of the city, even though industrial activities have decreased. This combined with the technology development lead to less needed space for industrial activities and more unused buildings. The need of change in function is obvious in this context and a contemporary layer is required in order to cope with the current needs of the community.

Several such examples exist already in the town, and functions have been adapted to fit cultural facilities and a small theatre in Nordkraft, to educational facilities in Toldbodgade and numerous housing reconversions.

In terms of culture Aalborg hosts various museums (Kunsten Museum, Aalborg Historical Museum, Lindholm Høje Viking Cemetery and Museum, Greyfriars Monastery Museum, Aalborg Defence and Garrison Museum, Akvavit Museum) as well as the recently inaugurated Musikkens Hus, or Utzon Center and Aalborg Theater, which contribute to the cultural life of the city. The number of students increases every year, this being supported by the continuous expansion of education facilities such as AAU, UCN, Aalborg Business School or the Tech College. Recreational and sports activities keep the city active and create opportunities of leisure, entertainment and health. The infrastructure is in continuous change and expansion. While the port and Limfjord consist of the fluvial transportation system, the railroad connects Aalborg to both the North and South Denmark. The port is supplied with rail tracks for all important terminals and areas. The most commonly used transportation method remains cycling, for which the city has cycle routes along car roads.



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7.4 THE CITY'S NEEDS AND FUTURE PLANS

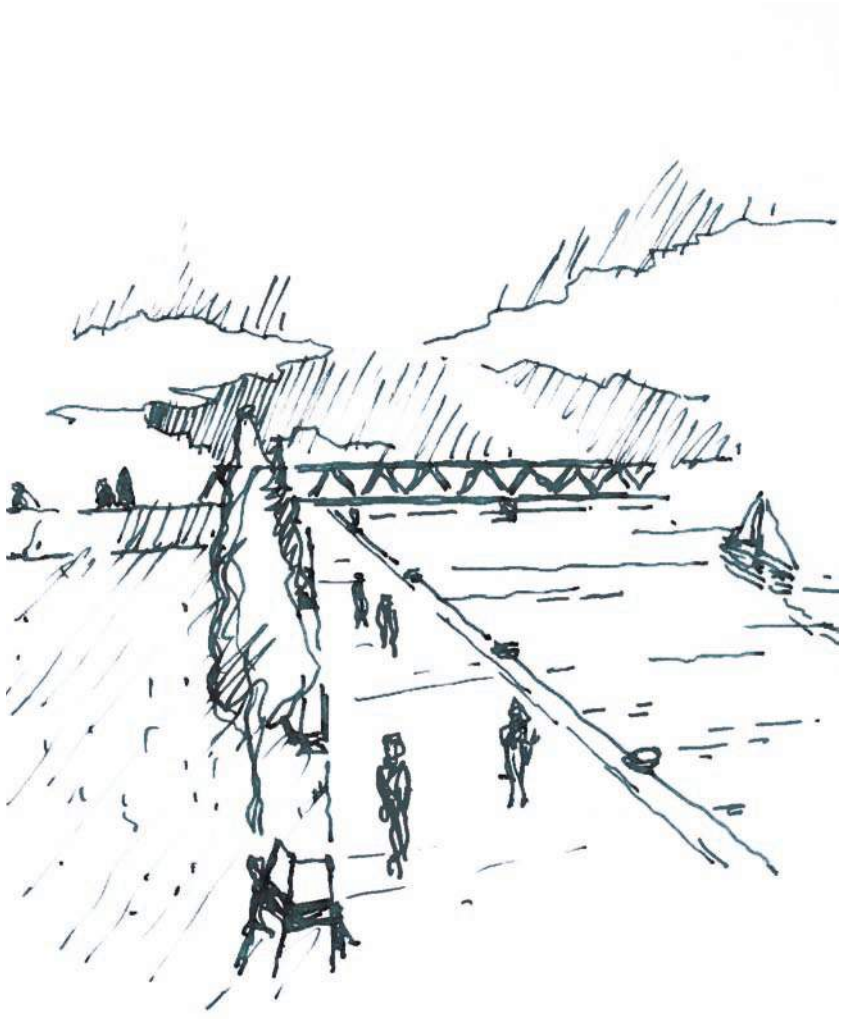
In order to understand the city's needs, very early in our process we have contacted architect Niels Thomas Birket-Smith from the Aalborg Kommune and the discussion with him about the development plan of the city and particularly the Akvavit Complex have been guiding intentions throughout our project.

It became clear the city's intentions of keeping the waterfront as an urban promenade for pedestrians and bikers, by not interfering with private areas, and at the same time the car traffic to be reduced in these areas. In terms of infrastructure, a suburban railway is planned from the Southern Hospital via AAU, Vestby until the Nordjyske Arena. Additional pedestrian and cycling paths are to be added to the railway bridge and plans are being made about extending the Vestby station to Strandvejen, the current Akvavit Complex.

Considering the current increase in the general population but mostly the constant shortage of dwellings and student dorms in Aalborg, housing units are to be built in order to provide for this need. A market for local producers and farmers should boost the city's economy and provide for services.

When referring to the former Spritfabrikken, the historical heritage should be preserved and adapted into several functions, such as a museum and exhibition hall in the small production buildings in the northern part of the site, while the main distillery is to be transformed into a hotel. The storage building should be adapted for new functions that would serve the Aalborg theatre as an extension.

A problem of the Northern part of the site is the constant rising water level, which leads to numerous flooding in the rainy season, and an intervention is required. Another challenge of this specific site represents the railway border of the park and how the transition should be dealt with.



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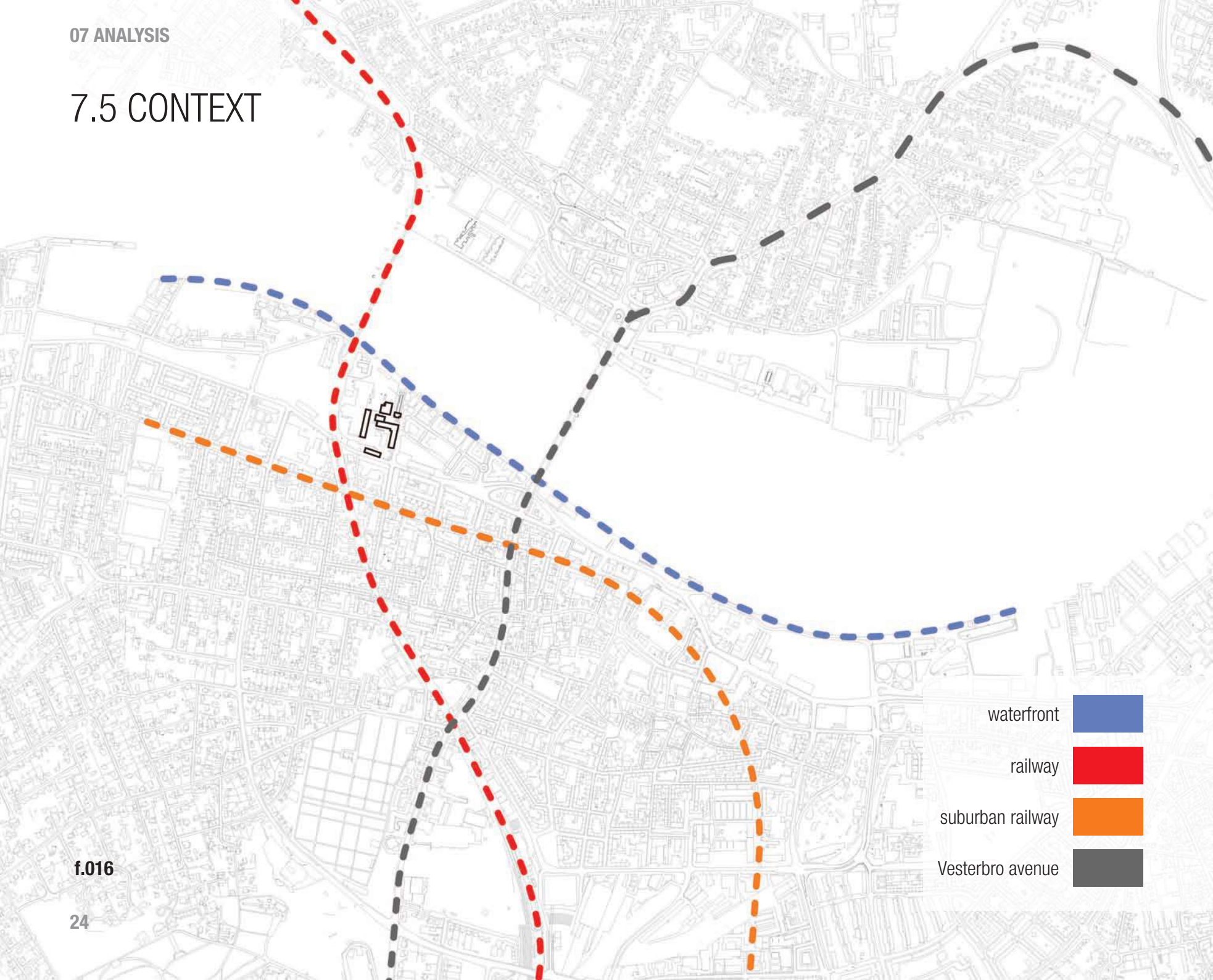
7.5 CONTEXT



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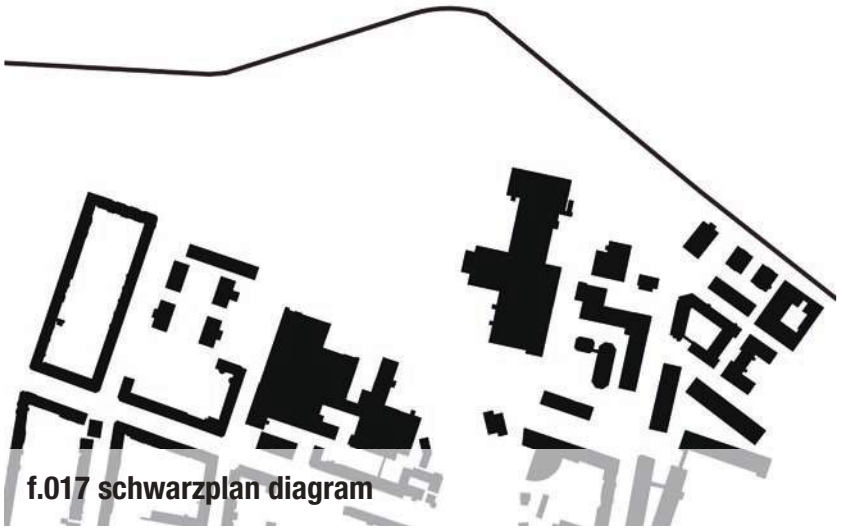
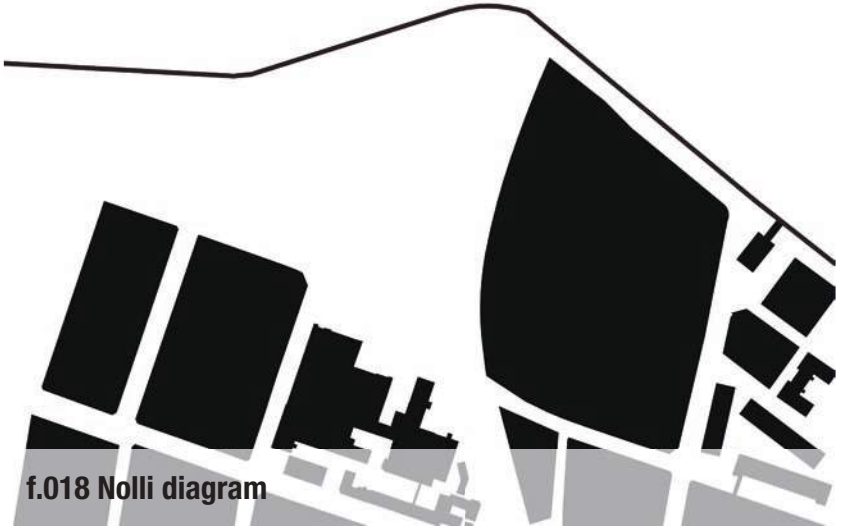
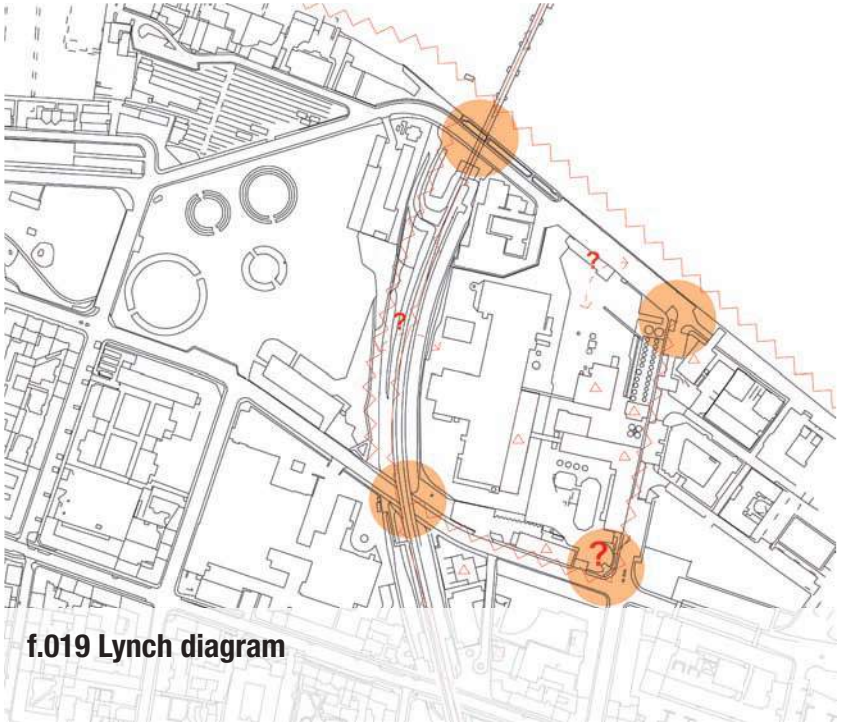


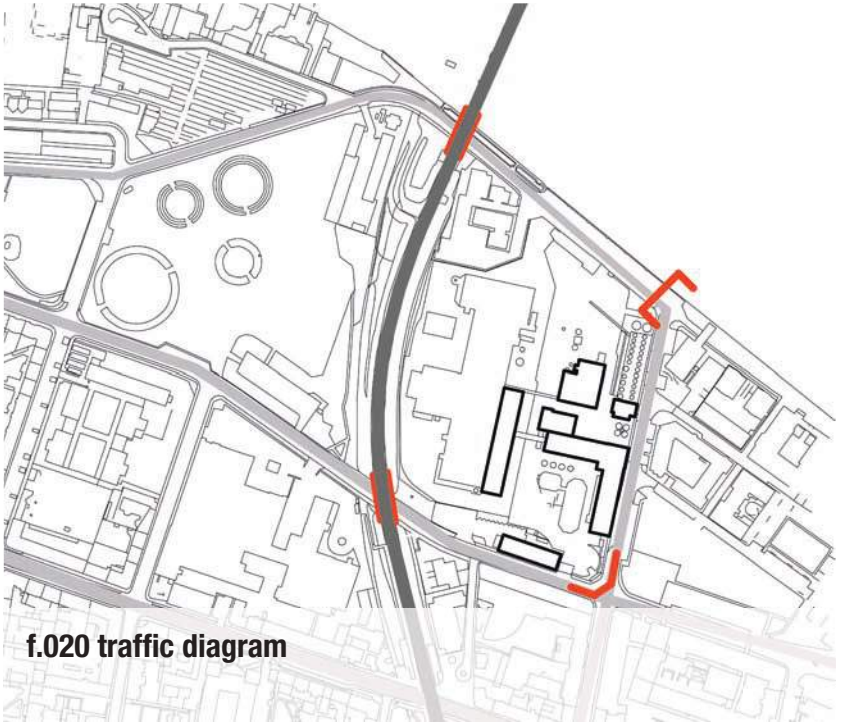
f.017 schwarzplan diagram



f.018 Nolli diagram



f.019 Lynch diagram



f.020 traffic diagram


f.021


f.022


f.023


f.024


f.025


f.026

the entrance gate

location

At the junction of Strandvejen and C.A. Olesens Gade, visible from many angles from the outside.

date

Built in the same time as the historical parts of the complex (1930s).

meaning / value

Since Aalborg Spritfabrikken has played an important part in defining the image of Aalborg throughout the century, one can assume it is part of the local identity. The entrance gate marks the transition towards an industrial atmosphere, part of Aalborg's history.

structure

brick, arch structure

condition

Materials and structure seem to be intact with no visible damage.

the historical (main) buildings

location

The buildings are located at the eastern part of the site, stretching from Strandvejen to Nybrogade. The visual impact is stronger from the direction of the latter street, as from the south the view is blocked by the brick fence separating the factory site from the rest of the city.

date

Built in the same time as the historical parts of the complex (1930s).

meaning / value

The distillery, storage, bottling plant etc. buildings are part of the national architectural heritage of Denmark. They represent the long tradition of industrialization in Aalborg and also high architectural value.

structure

reinforced concrete columns and beams structure with brick external walls

condition

The exterior has been rather well maintained, with a few atypical exceptions. The concrete silos have serious structural and quality problems.

the exterior metal tanks

location

Located towards the fjord, it opens up possibilities for connecting and integrating the waterfront in the project. The optimal perspective to them would be from the waterfront.

date

Although spirit tanks were installed when the factory opened, the current ones are more recent additions.

meaning / value

The value of the metal tanks would consist of a reminder of the former function of the site, as well as keeping the industrial character of the area and the city of Aalborg. They can be utilized as advertising space as well.

structure

high, large volume spirit storage tanks without major openings

condition

They are in good condition, so many of the will be transported to Norway for further use.

the chimney

location

Located in the North-Eastern part of the site, the chimney was at a certain point a functioning part of the distillery's production system. In terms of dimensions and proportions, the structure is visible from most Aalborg and Norresundby waterfronts, which gives it a landmark potential.

date

a late addition to the main distillery building

meaning / value

The former function of the chimney was evacuation of gases from the distillery, now it marks the site from afar.

structure

high, cylindrical steel structure

condition

nearly perfect

the bridge

location

Connecting the main part of the main factory building with the malt storage and the silos, the bridge is visible from the main entrance and the existing parking lot.

date

The bridge was added later, during one of the many refurbishments of the storage and silo building.

meaning / value

Both the bridge and other newer additions to the site retain the pattern of the circular windows as a consistent part of this factory's architecture. It plays an important role in the inner circulation of the buildings and also hosts the iconic clock of the complex. The cover of the structure is in quite poor condition, but with refurbishment it can maintain it's original function and it's elevated position may give a nice viewpoint to the city.

structure

steel truss covered with aluminium plates

condition

The bridge is in quite a bad condition, it needs complete refurbishment.

other buildings

location

mainly at the western / north-western part of the site

date

more recent additions, mainly from the '70s

meaning / value

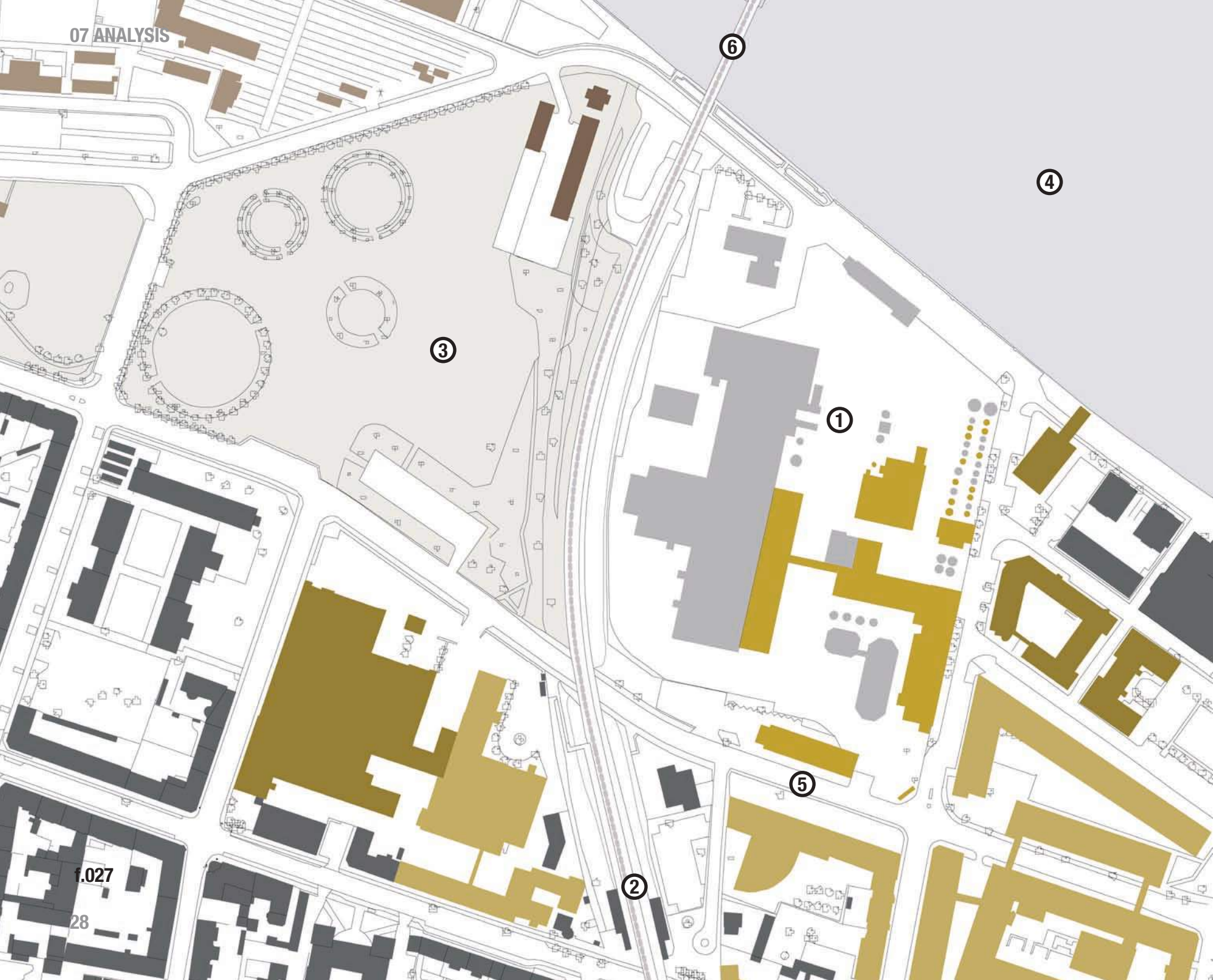
They don't represent any architectural value as they were just enhancement of the main buildings as the production increased during the years.

structure

mainly reinforced concrete column and beam structures

condition

Most of them are in average / good condition, so the reuse or recycling of their materials may be possible.


6
4
3
1
5
2

remaining historical buildings

buildings to be demolished

dwelling

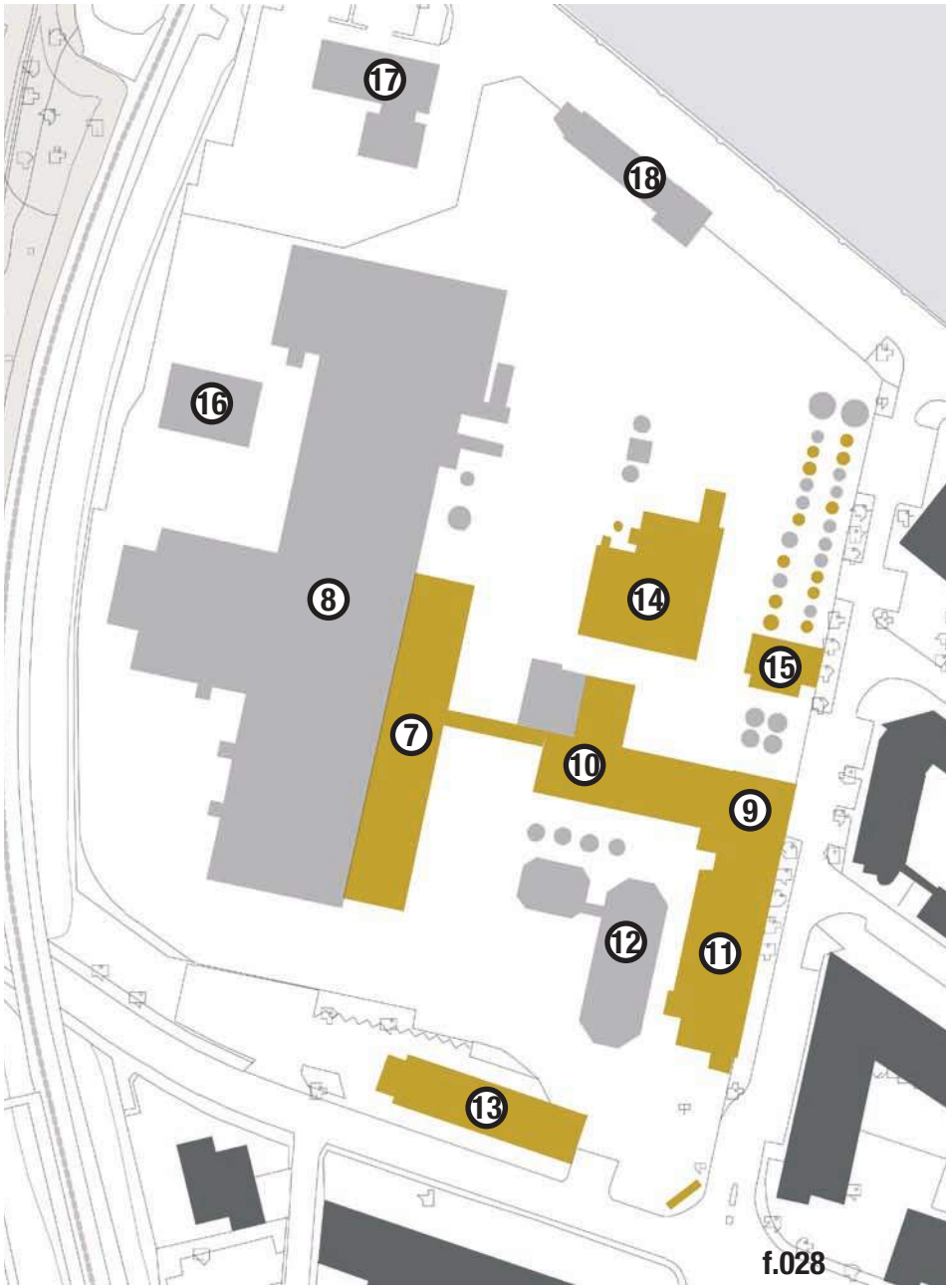
education

commerce

recreation

fire station

1. Akvavit complex
2. Vestby station
3. park
4. Limfjord
5. Strandvejen
6. railway bridge
7. malt storage and silos
8. packaging, chips factory
9. distillery tower
10. potato wash, processing
11. bottling plant
12. offices, security
13. office building
14. main distillery, chimney
15. tanks
16. storage
17. offices, storage
18. social room, garage

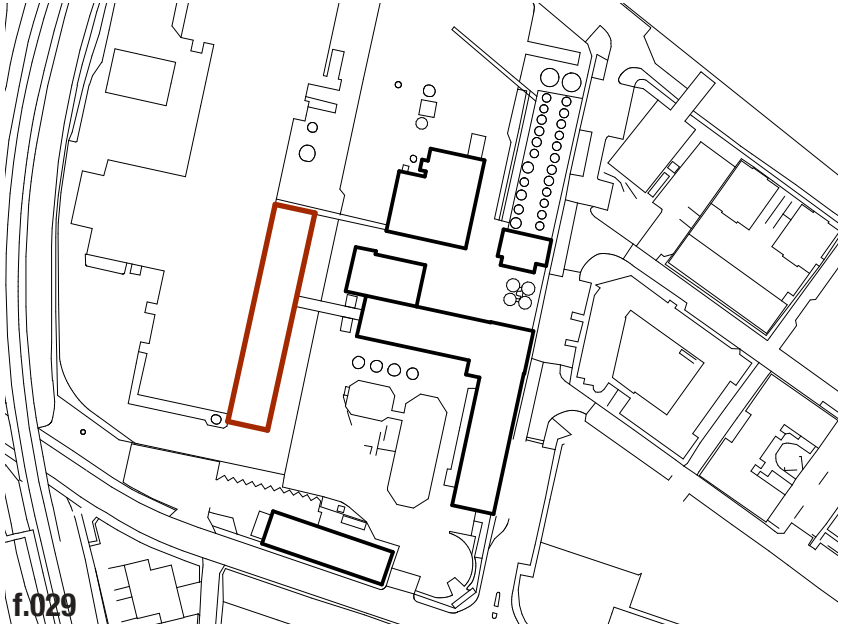


f.028

7.6 UNDERSTANDING THE BUILDING

The reason why people start thinking of reusing a building is *"because local people see vacant buildings for what they are – as opportunities. So groups should research and understand why it is important. It is necessary to research its architecture, check its condition and listing status, clarify any local or central government for information regarding possible projects. "* [Stratton, 2000]

While trying to understand the building complex and the way it used to function throughout times, one can conclude and take valuable positions regarding the main assets of the site and building complex. Several parts will be analyzed with regards to its location, function, dimensions, condition and value.

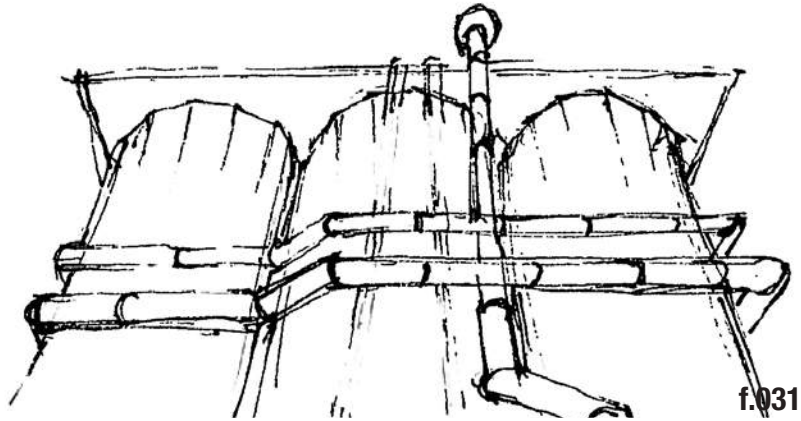


f.029


AALBORG AKVA
28

7.7 MATERIALS, ELEMENTS, MOTIFS

The architectural style of the historical buildings was strongly influenced by the German industrial architecture of the '30s. Although function was the main focus, aesthetics weren't neglected either. Red and yellow bricks are accompanied by concrete and metallic structures, ranging from pipes and pillars to the large silos. The most prominent motifs of the complex are the extensive brickwork framing the windows and the six pointed star decorating the round glass elements.



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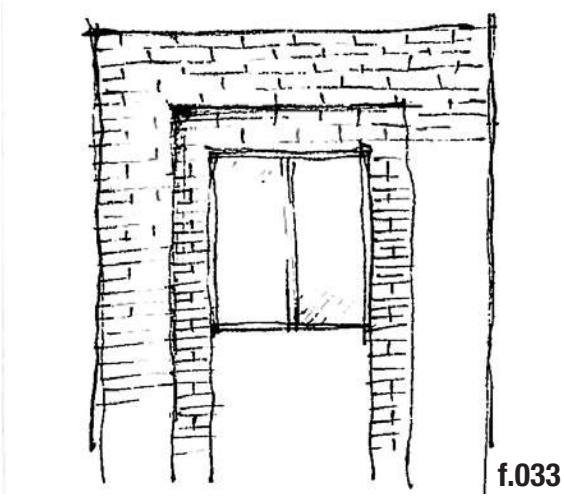
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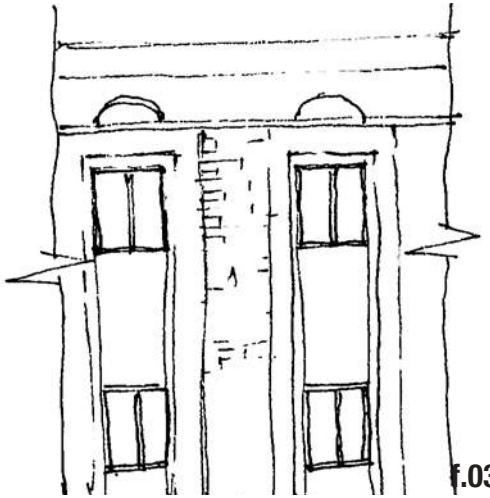
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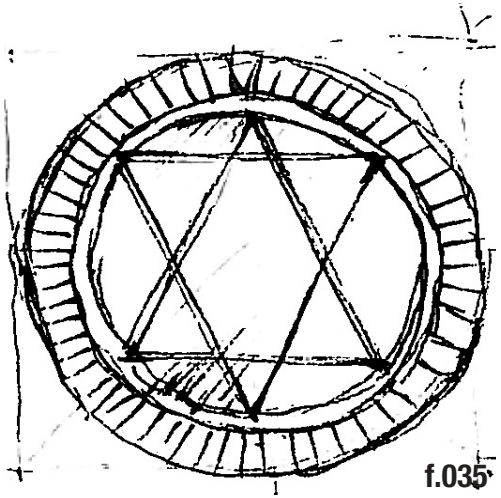
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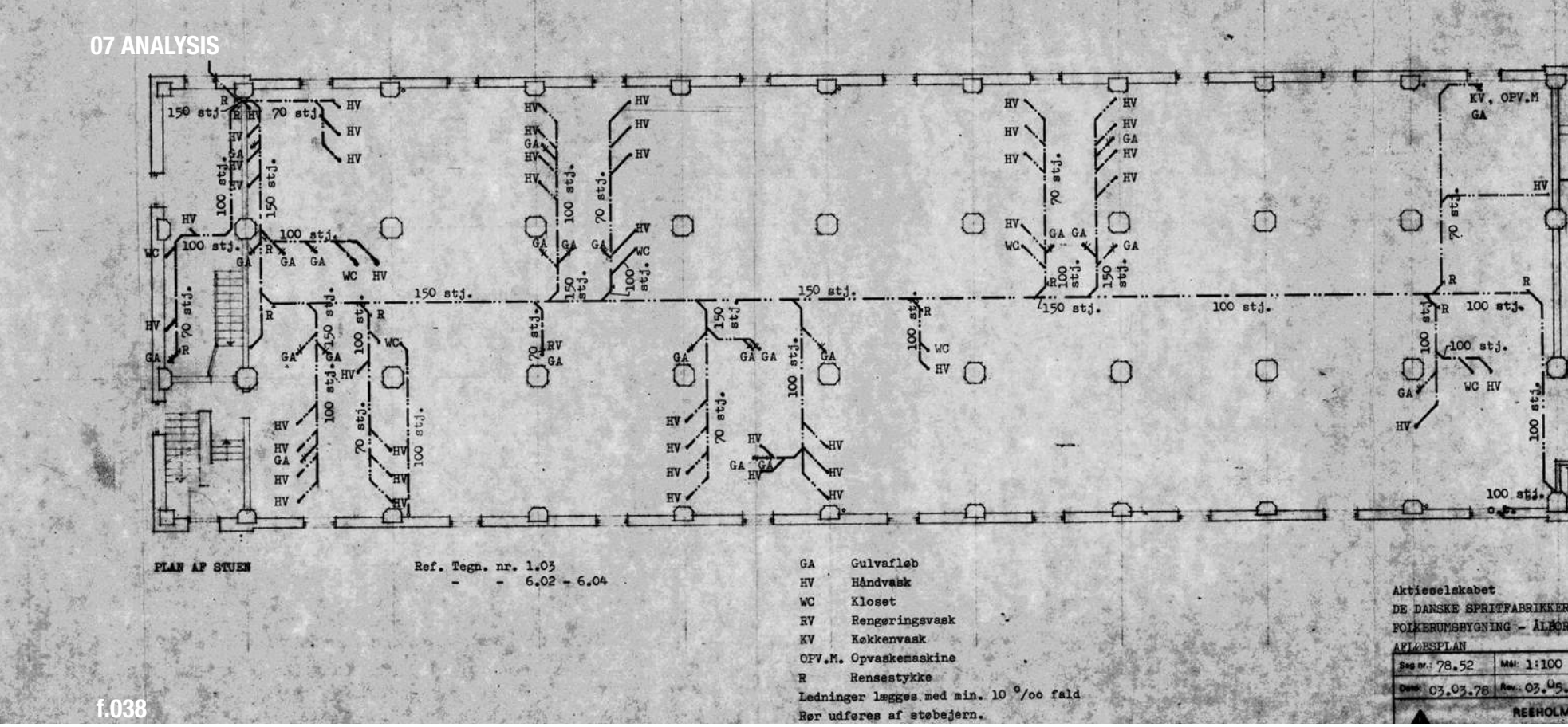

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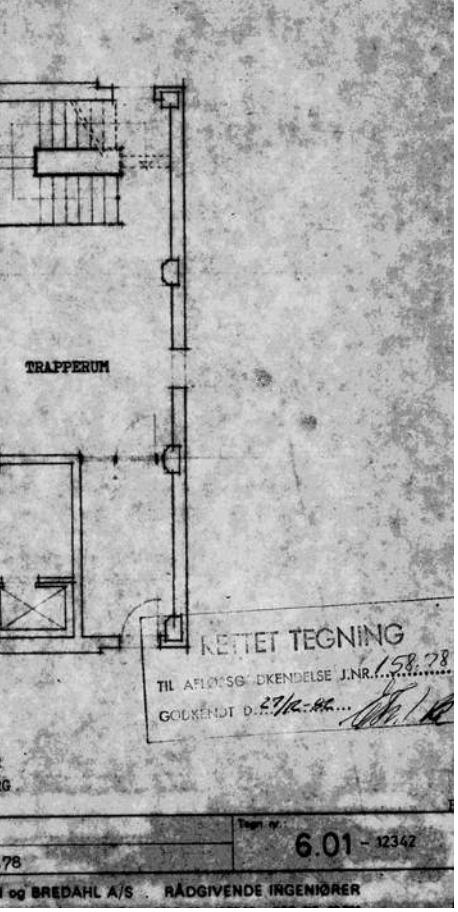
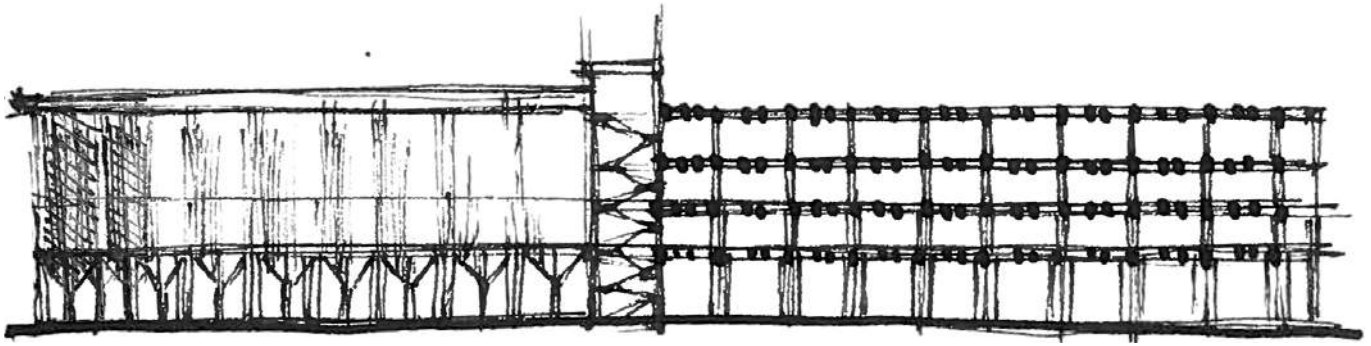
7.8 STRUCTURAL EVALUATION

The building to analyze is a former storage unit, consistent of two main parts. The main part is divided into four floors, connected to the northern part consistent of storage silos. The ground floor of this second part however resembles more to the main part by continuing the same facade pattern, even though the structural columns are doubled in order to sustain the weight of the silos and high loads. The general grid of the building is made out of main beams intersected with secondary transversal beams every 5 meters, connection supported by columns. A main characteristic of this particular structure is the differentiation in section of the column according to the floor and height. This particular aspect gives the building tectonic authenticity, while contrasting with the brick facade as a wrapper, without any structural purpose. Additionally we can find secondary beams in the transversal direction every 1,6 meters, and their sole purpose is to support the floor above.





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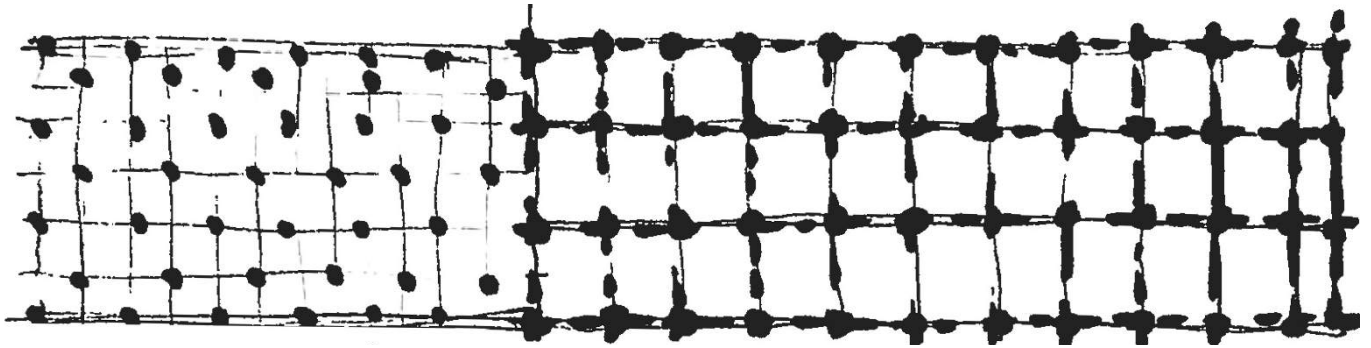

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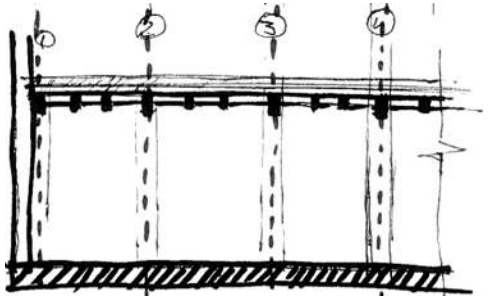

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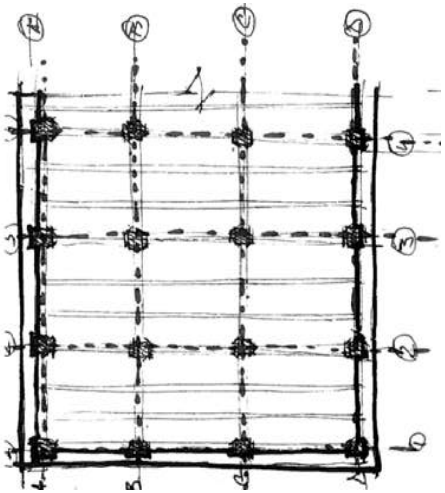

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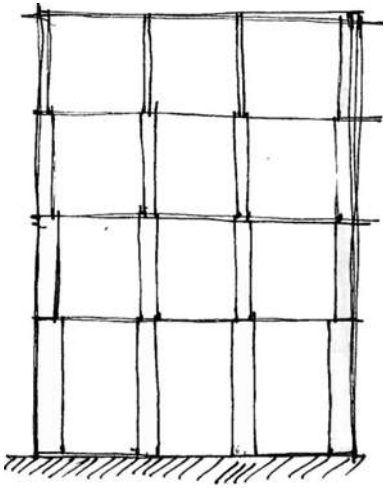

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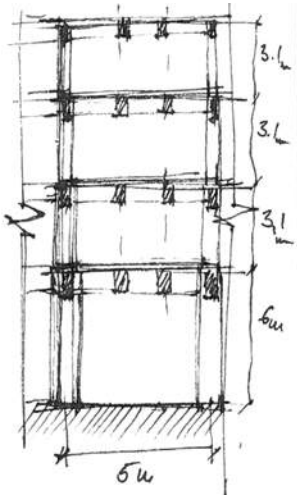

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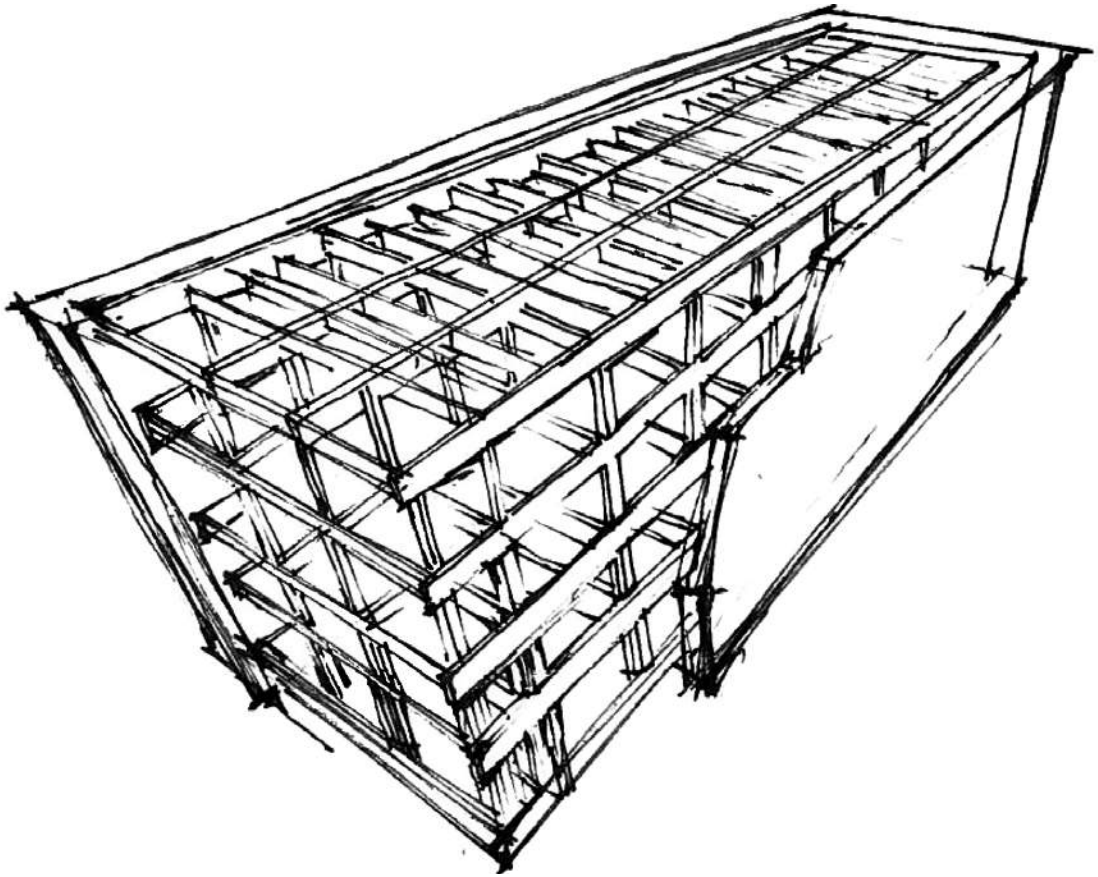

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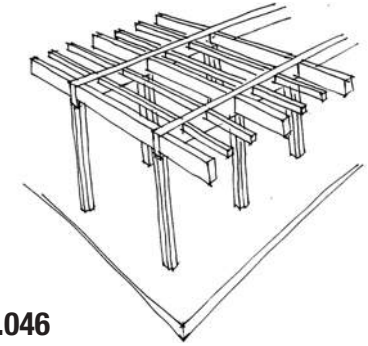

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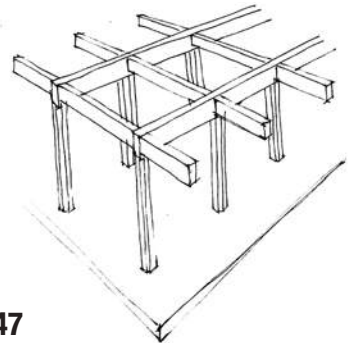


f.047

"Structure is not about framing or making skeleton but about giving meaning to connectivity." [online]
- Cecil Balmond

Another challenge one could face while dealing with an adaptive reuse project is to assess the existing structurally and find the 'initial bare structure', in order to expose its qualities and strength. One might argue that the secondary transversal beams do not play an important role in the structure, therefore creating an argument for removing them.

f.048

Several of our decisions were based on the conclusions drawn from our meeting with Niels Thomas Birket-Smith, as we were given an insight into both plans of the city, as well as crucial details concerning the building in question itself. As a consequence, preserving the silos as well as the structure below, it would be a questionable matter since the quality of the existing concrete is quite low, and one might face the challenge of making more efforts in preserving them to an extent to which it would become not feasible both functionally and structurally.

f.049

CASE STUDIES

f.050 Carlsberg City

f.051 Carlsberg City

f.052 Ceres Byen

f.053 Domino Culture Factory

Domino Culture Factory

Program: exhibition, restaurant, gallery, promenade, marina, education, theater, community center, hotel and conference space, affordable housing
Size: 149,600 m^2
Location: Brooklyn, NY, USA
Architect: Holm Architecture Office


f.054

Domino Sugar Factory in the Williamsburg neighborhood of Brooklyn, New York opened in 1856, and it was the sugar processing center of the US before it closed in 2004. The proposal for the rehabilitation combines public and private programming to revive the abandoned factory and to create a cultural-educational hub for the local communities (and visitors) and provide recreation by opening the waterfront for the public. The project includes also a social housing part.

Divided into two zones, educational, community and touristic buildings at the southern part of the site and also a green energy technology center, publicly accessible private museum space, exhibition center and a theater at the northern part. The entire site is accessible to the public, the buildings are linked together by large green areas, a new waterfront boardwalk and sculpture park. Not only a marina is developed at the waterfront but also a ferry stop as part of a bigger development in the city: with various stops a ferry line will connect various cultural destinations along the river.

To decrease the ecological footprint of the complex, photo-voltaic panels are implemented along with publicly accessible green roofs. The heating and cooling system uses geothermal energy, and the site benefits from the power of the wind and waves.


f.055

f.056

f.057

Carlsberg City

Program: commerce, housing, education, cultural spaces, urban park, parking
Size: 330,000 m^2
Location: Copenhagen, Denmark
Architect: Henning Larsen Architects

The complex of Carslberg breweries was an emblematic part of Copenhagen for 150 years, until it was relocated outside the city. The proposal for revival of the area is based on sustainability - both on building and master plan level. Thus, the buildings and outdoor spaces of the area are dimensioned and designed on the basis of various studies of wind and sunlight conditions as well as the effect and value of materials.

Environmental sustainability is also reached through an objective of low energy and CO2 neutral operation of the buildings, the connection to public transport, the implementation of underground parking and the protection to the vulnerable participants (pedestrians and bikers) of traffic. There is much emphasis on the human scale. This priority has forced other priorities backwards, such as car traffic efficiency. This is part of a greater trend which is picking up pace globally.

The plans focus on retaining the “wildness” of the site. The old brewery grew and developed during one and a half century, so there are parts built in various time period, so the area lacks a unified image. The new buildings are intended to contribute to this visual and functional diversity, thus creating more natural urban area rather than a strictly planned quater of the city. This architectural approach and the numerous cultural and recreational functions help to create the Soho of Northern Europe.

Ceres Byen

Program: commerce, housing, education, cultural spaces, urban park, parking
Size: 146,000 m^2
Location: Aarhus, Denmark
Architect: C. F. Møller Architects


f.058

The old brewery, founded in 1856, formerly the property of Ceres (hence the name of the project) was closed in 2008. A long time gap in the urban fabric, the site is being developed into a multifunctional, yet mainly residential area in the city of Aarhus.

The adjacency to the river and the cultural center developed in the old train yard to the south-east and the potential of being the connection between the surrounding attractive neighborhoods made it important area of urban development. The open air museum called The Old Town and the central public and green spaces along the river till lake Brabrand increase its value further.

The main target group of the project were young couples (with or without children) and students. This means the residential spaces consist primarily of two and three bedroom apartments which are easy to share. Most of the buildings have courtyards which offer green, recreational spaces to its residents.

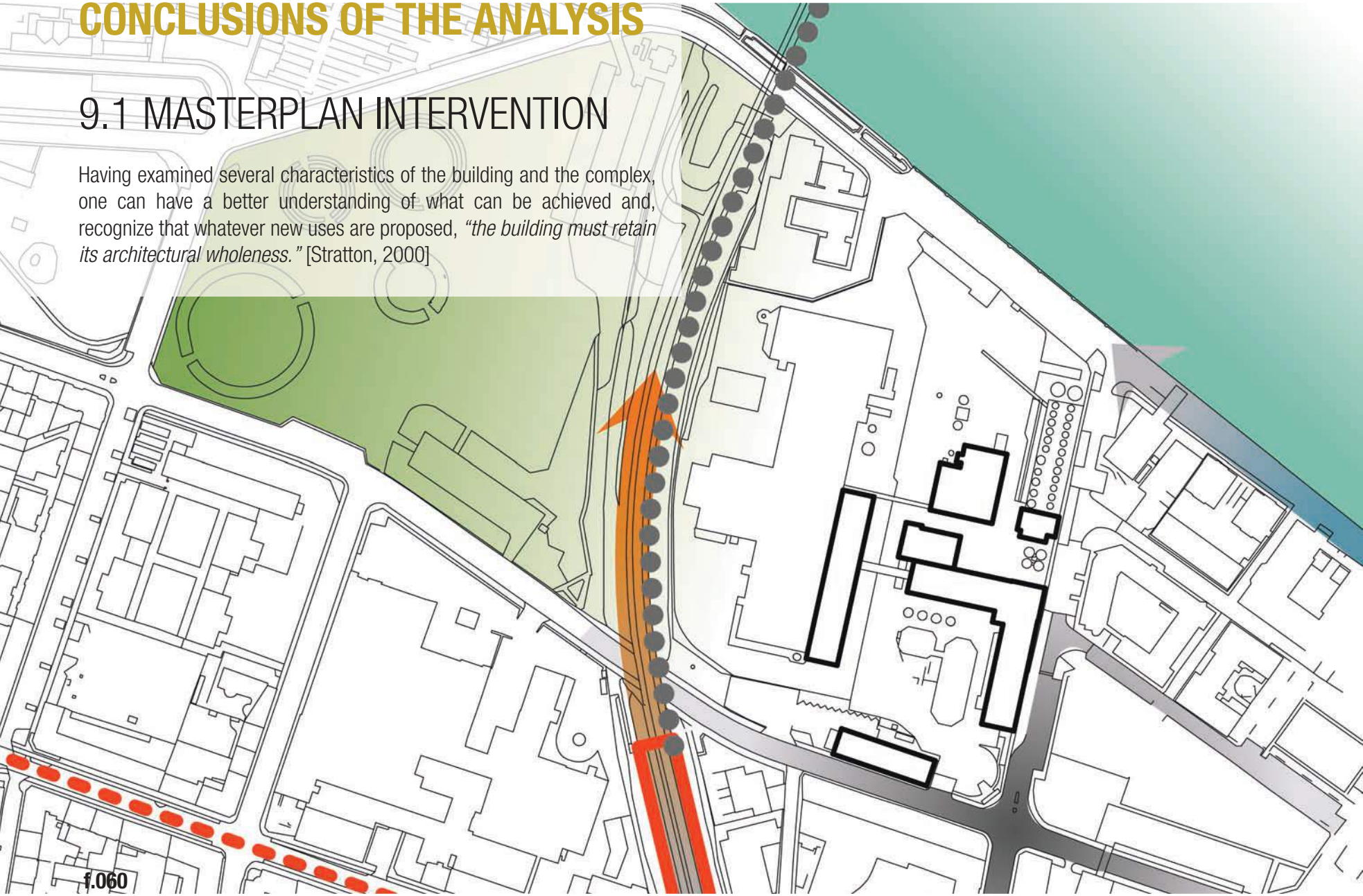
The remaining historical buildings and the aim of connectivity within the site and in the broader environment as well resulted in a sequence of urban spaces, squares and green areas. The large garden of the Ceres brewery was closed to the public for a long time. According to the development plan it will open again to serve the community as a new park.

f.059

CONCLUSIONS OF THE ANALYSIS

9.1 MASTERPLAN INTERVENTION

Having examined several characteristics of the building and the complex, one can have a better understanding of what can be achieved and, recognize that whatever new uses are proposed, *"the building must retain its architectural wholeness."* [Stratton, 2000]



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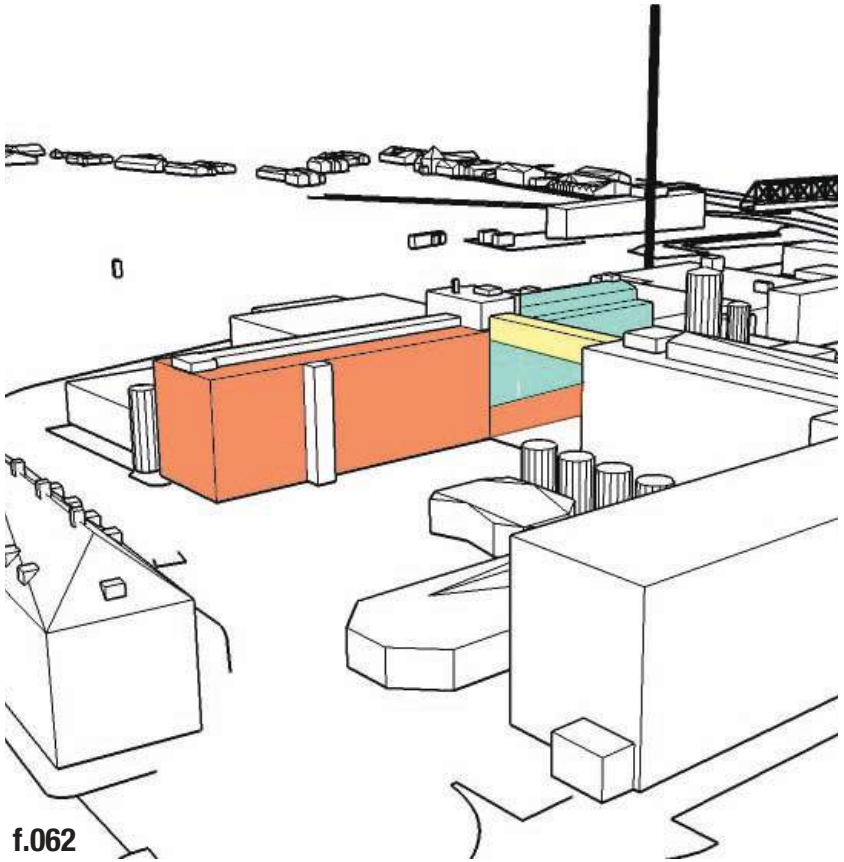
9.2 BUILDING REUSE

The building we are approaching is a former storage unit, was used for community functions at a point in its history. Is dates back with the entire complex, and it is consisted of a main part, approximately half the size of the entire building, and the other part with the silos. There is an important connection to the old distillery and bottling buildings, made out of a bridge that keeps the complex's symbols.



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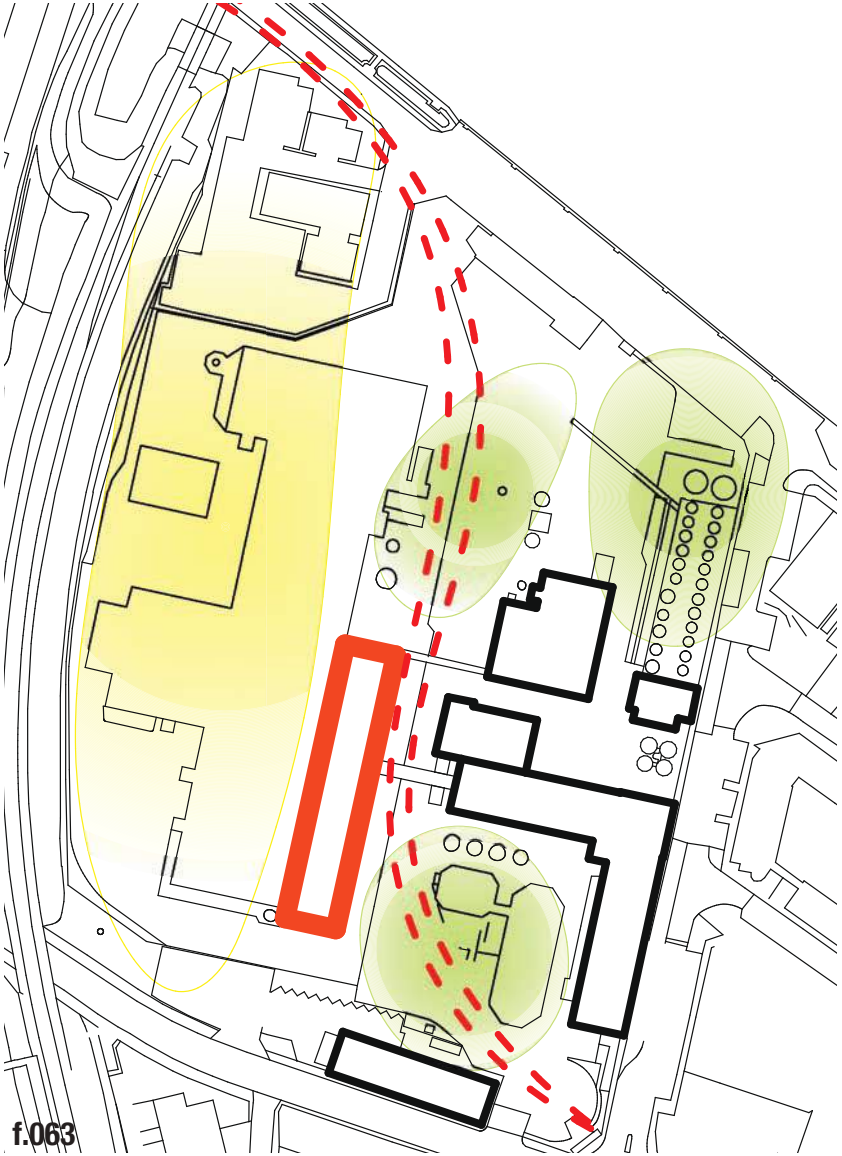

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Building Components

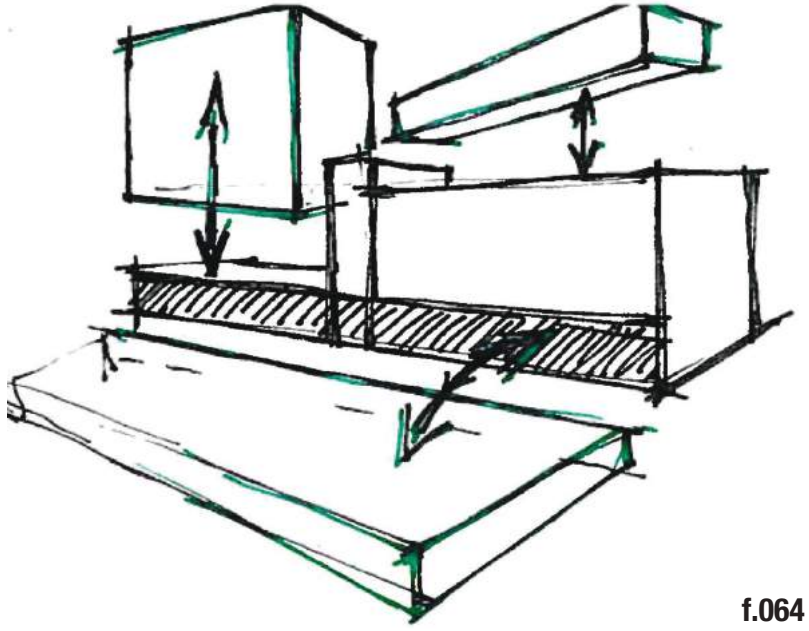
The storage building is made out of several parts. Firstly, there is the main building, the southern part, which separates from the silos through a staircase. At the 4th level the storage unit is connected to the main distillery through a metal bridge. The structure is made out of vertical and horizontal elements, columns and beams their dimensioning being related to the height in the building, therefore the loads. The brick facade is not true to the interior structure, the exterior being treated in a different fashion than the interior. However, there are several architectural motives that keep recurring , which are the brick pattern used, with two different types of brick, but also the circular window which is often used in in-height elements.

Materials

The main materials used in this complex are brick, reinforced concrete and metal. The brick facade with apparent columns is made out of two colors of brick. The octagonal reinforced concrete columns change their dimension and shape according to the level, reaching an octagonal shape and wide dimensions on ground floor, to almost squared shape and regular dimension on last floor. Metal is used for the bridge's structure, by using profiled metal beams, but also in the frame of the windows, metal is used.

Addition to the building

Considering the stages that the complex and the silo building have been through one must consider all those while thinking of possible options for creating extensions. While the intention is to be honest to the building and its history, by demolishing the silos and the more recent storage building certain surfaces remain uncovered. The way we choose to treat those surfaces should complete the concept and enhance the tectonic aspect of reconverting a building. While considering the ground floor, the staircase and the storage unit (A, B, C) as consistent part of the building to re-use, there are three possible extensions to be discussed. Whether keeping the last floor addition or making a new one (D) is still a question, the space previously occupied by the silos (E) is a valid solution for extending and connecting to the northern part of the site. Through the demolishing of the newer storage addition (F), we are left with the facade of the ground floor uncovered. The wish is to connect to the future function of the train station, therefore an extension cold be justifiable in this direction.



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9.3 USER PROFILES

Students
primary needs: culture, recreation, sports, housing, interaction

It would be foolish to ignore the nearby educational facilities and their students int he process of making the program for the site. AAU, UCN and the Technical High School of Aalborg has faculties just across the street east to the site. And while the educational services are given, the recreational, community and sports facilities of the schools are located quite far from this location. Providing these activities to the students and also the chance to participate int he city's cultural life would benefit them and the community of Aalborg as well.

Passengers
primary needs: transportation, recreation, shopping, parking

Developing the small Vestby railway station into more important transport hub will attract more tourists and commuters to the area. By giving the possibility of passing the time in a comfortable space while waiting will bring a sizable group of people to the side, giving them the option to avoid the Central station. This waiting time can be connected to cultural and recreational activities in the local facilities and also boosts commerce in the area.

The new investments of the city like the introduction of a suburban railway (from the south-eastern hospital via the university campus to the Vestby) with a direct connection to Vestby station on Kastetvej and implementation of biker and pedestrian lanes on the railway bridge further increases the number of passengers and their needs as well such as bike and car parking, which the plan should fulfill.

Employees
primary needs: catering, shopping, sports

There are many offices and other work places in the surrounding area, but the employees needs are more or less ignored. Giving them the possibility to do their shopping after work, to have a lunch and to release stress by various (mainly sports) activities can make the facilities popular and also profitable. Such an investment in the area is not only good for the new ventures but also raises the value of the nearby estates.

Local residents
primary needs: recreation, culture, sports, interaction, housing

Currently the promenade at the waterfront is blocked by a parking lot. Removing it will open up the site to the one of the most popular recreational venue of Aalborg. Creating a multi-functional, community oriented place within the old factory will give many options for the local residents to satisfy their diverse needs: culture, entertainment, creative activity, shopping and recreation.

The shortage of housing in Aalborg is a longtime problem. So newly built dwellings are always welcomed by the increasing number of inhabitants in the city.

Tourists
primary needs: culture, recreation, shopping, accommodation, transportation

The recent years there's a steady increase in interesting new cultures venues in Aalborg in accordance with the city's transformation from industrial to a servicing and cultural location. Although till now the Vestby was mainly left out from these developments. The unique location of the distillery has the chance to connect to the main cultural and recreational vein of the city, the waterfront promenade. Benefiting from the already good and developing transportation hub of Vestby station, it is one of the goals to make the site the number one stop for the tourists.

However the cultural and recreational features of the site are not enough to fulfill their needs. So the development of a hotel/hostel is also planned.

Local farmers
primary needs: shopping, interaction, transportation

Sustainability of agricultural production is not only reducing or eliminating artificial products from the cultivation or using water wise methods and reusable energy. Shortening the distance of transportation contributes to it greatly. Current theories define this distance in 30 kilometers. Giving space to a farmers market will introduce more quality food to city and also creates a stronger connection between rural and urban populations.

Conclusions

Users can be classified by the length of the term they would use certain services of the complex. This depends on the users' relation to it and also the kind of services they avail themselves of.

Long term users are going to be the residents of the new dwellings and the employees of the facilities. Although the members of the latter group won't live there, they would spend a considerable amount of their time on the site for a longer period of time. This group benefits from the site's location, the public transportation and the commercial services primarily, but may use the various other functions of the development.

Medium term users are the people who are temporary users, but use certain facilities for a longer period of time. For example tourists staying in the hotel and hostel, users of the makerspace or the students who constantly but not continuously contacting the site (e.g. for events, sports etc.). Their primary needs are more focused, in many cases limited to a certain function, but they may also interact with the commercial, recreational, and cultural services and the transport hub (especially the tourists).

Short term users contacting the site for only one specific function in most of the cases. They are mainly commuters and passengers, vendors and farmers, customers and visitors of the cultural facilities or events.

The relations can be user-user, user-function and function-function. These interactions support the idea of social sustainability.

It is also clear that the planned Vestby transport hub will be really important for not just the site and it's users but the city as well.

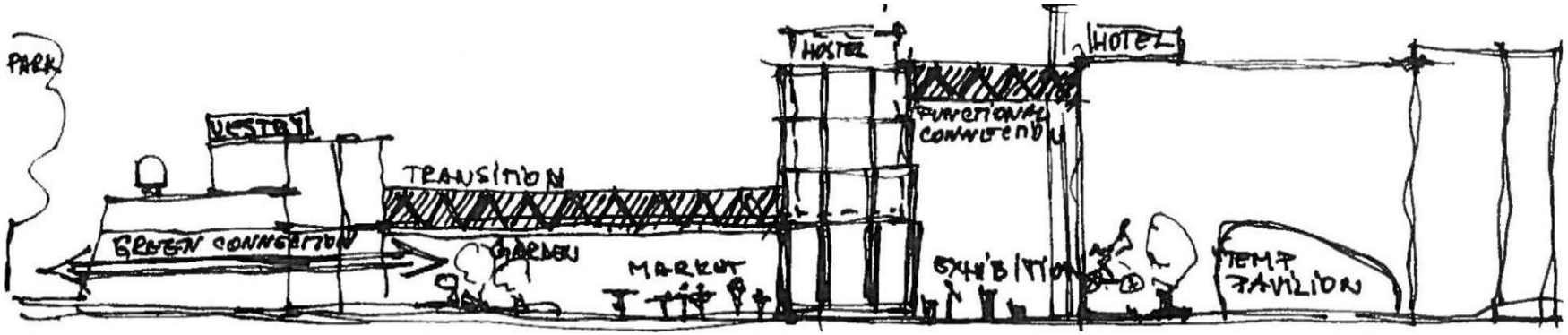
9.4 PROGRAM

Social sustainability can roughly be defined as a condition within communities, and a process within communities that can achieve that condition through mechanisms to allow it to fulfill its own needs where possible through community action.
[http://www.unisa.edu.au/Documents/EASS/HRI/working-papers/wp27.pdf]

The program consists of a variety of functions connected in a way that it would lead up to a proper functioning of the interconnected spaces, either by appealing to the same users, by sharing certain spaces or by creating space for exchanging products. In the program scheme one can observe how several functions should fulfill the area, in order to accomplish a sustainable city area, economically, socially and environmentally.

The Vestby Station as a function involves both the transportation itself, which could provide for both the market and the hotel as well as for the housing area, but other functions are needed as well to provide for the passengers, such as cafés, shops and other functions. A connection is intended with the re-used silo building, which hosts a community center, focusing on creative activities, by offering workshop spaces, makerspaces and space for exhibiting. While referring to the same user group, an extension providing a hostel is planned instead of the silos, while maintaining the functional connection to the hotel, hosted by the main distillery building. A market in the area could not only provide for the future housing area, but in a larger scale from the whole neighborhood and nonetheless could benefit from the affiliation with the train station, by encouraging local producers. Other urban areas are planned in order to preserve the public character of the waterfront, as well as to preserve the courtyards of the Akvavit complex as originally planned.

The program of the old storage building is to create a community system in which a bigger looser function sustains several workshop variations and start up businesses, which themselves are vital to the well functioning of the building. This interdependency however is just a theory without the actual community involvement in such ‘maker’s centers’, due to practical oriented vision of such spaces. In this matter, a variety of possibilities and programs to engage the society both young and old, is crucial to reach its full potential. Flexibility and adaptability are key issues when organizing the space and functions.



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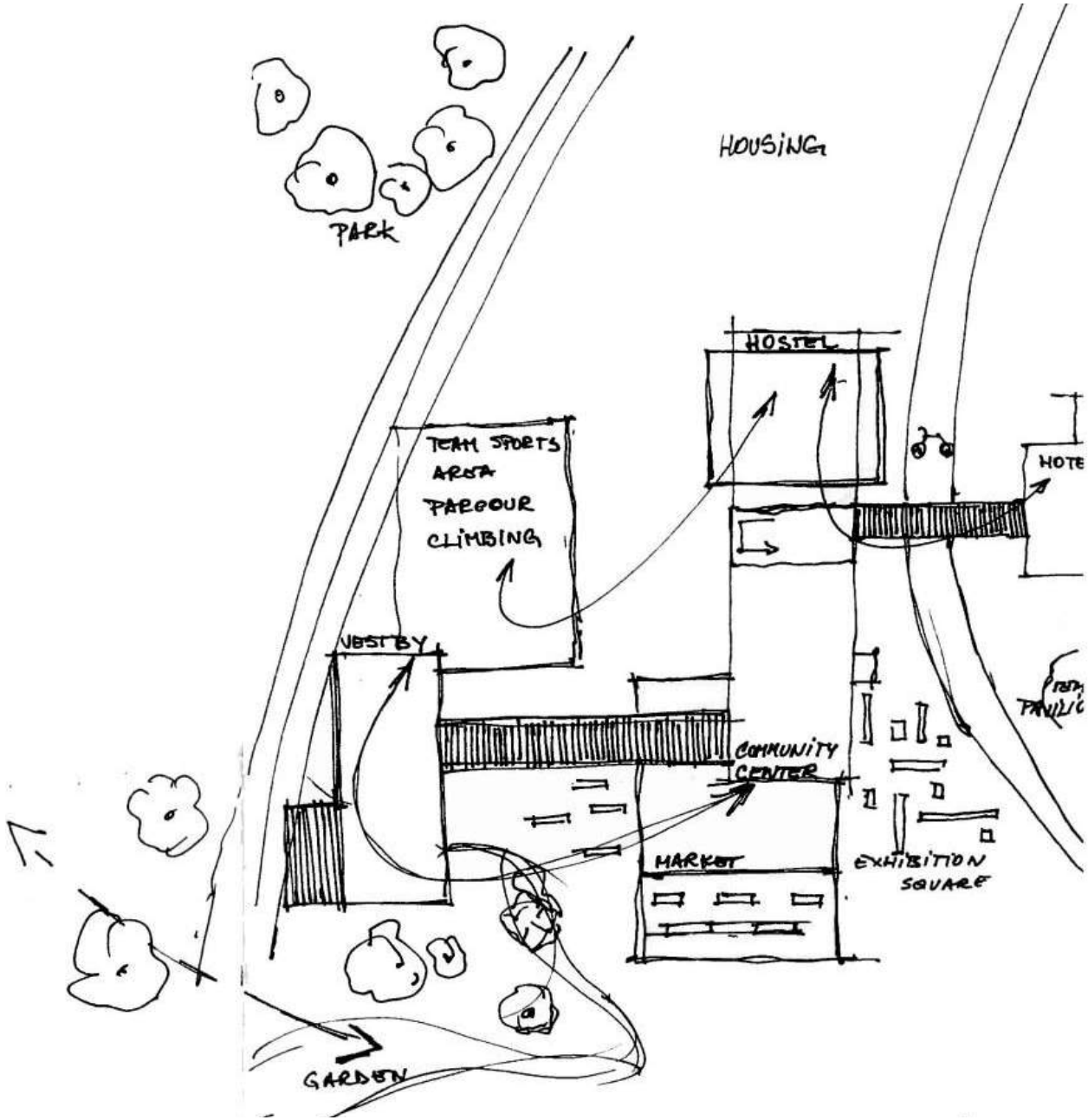
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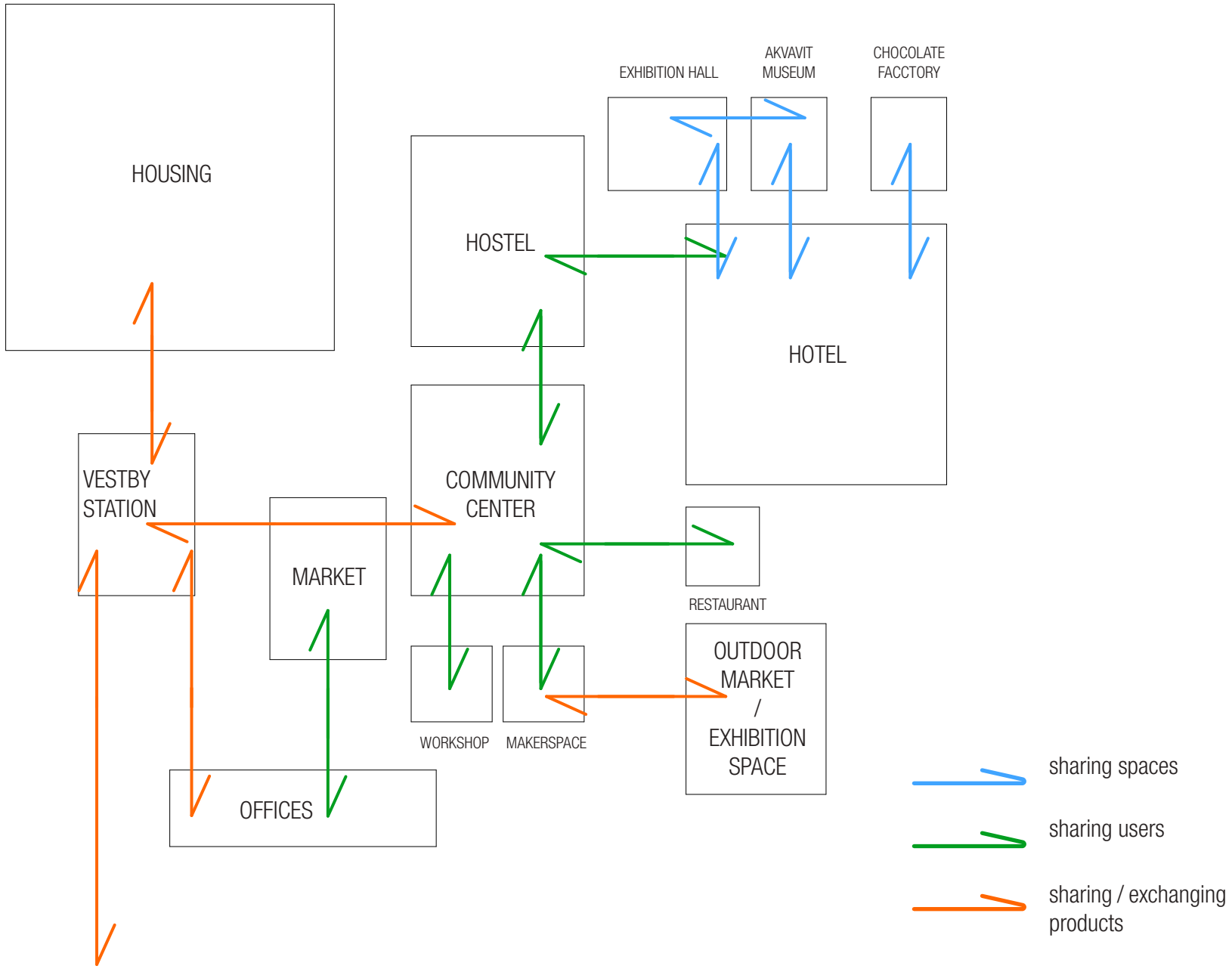
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HOSTEL
HOTEL
VESTBY STATION
MARKET
COMMUNITY CENTER
RESTAURANT
WORKSHOP
MAKERSPACE
OUTDOOR MARKET / EXHIBITION SPACE
OFFICES
sharing spaces
sharing users
sharing / exchanging products

f.067

9.5 SPECIAL FUNCTIONS

Makerspace

Numerous definitions can be found for the concept of a makerspace, while one can say that a makerspace is a physical location where people gather to share resources and knowledge, work on projects, network and build. [Makerspaces, 2013 pdf], on a more general level, one can also argue that they refer to places where like-minded people gather to work on personal projects, share tools and knowledge driven by the will to create.

While knowledge, research, innovation, learning and entrepreneurial spirit are crucial to long term economic growth, places that foster innovation and creativity can sustain economic growth. [Benton, 2013 pdf]. Therefore, the function as well as the flexibility and adaptability of a space determine its future success or failure in the economic department. The function and the concept behind the makerspace is by definition a social sustainable idea, by encouraging people to create, to produce, in fields where sharing big or expensive tools make it easier to develop ideas. It encourages people to interact, transfer knowledge and be productive.

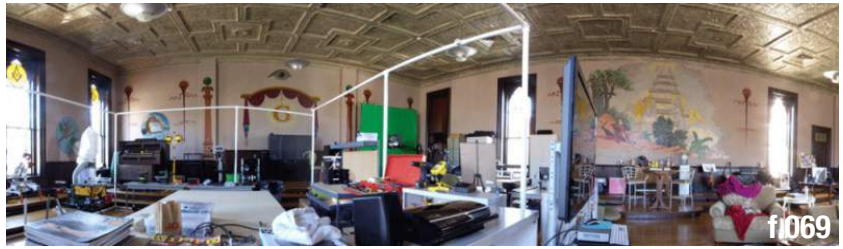
Example 01: NOD Makerspace

An inspiring example of a recently opened maker's center is a reconversion of one floor of an industrial building, in Bucharest. The project came at the initiative of a young and interdisciplinary team, whose goal was to create a space where people with a special interest in electronics and crafting field could share tools and ideas. A variety of tools and specialized spaces are available for daily use, while on a bigger level this concept relies on knowledge transfer events.

f.068

Example 02: 7Hill Makerspace

Located in Georgia, USA, this recently inaugurated makerspace reveals other aspects of this concept, from the variety of tools which implies interdisciplinary, until the variety of spaces one can find in a big open space. Each corner has its own decoration and purpose, while many common spaces and socializing areas gives it a different note.



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Market

As settlements grow, the normally weekly market days became more frequent, leading to the establishment of permanent market halls. With the advancement of transportation and preservation methods, supermarkets appeared, creating a strong competition to traditional markets.

Nowadays marketplaces are usually the source of healthy, organic food, the products of local farmers and artisans. Considering sustainability, the best option is to limit the radius of an imaginary circle to 30 kilometers around the town the market is located in to minimize the ecological footprint and cost of transportation, and to boost the local economy.

But as more and more supermarkets and convenience stores specialized in organic goods appear, the marketplaces have to reconsider their strategies. A contemporary market tries to create a direct encounter between the local farmers, artisans and their customers. The goal is to buy the product directly from the producer. And not only raw goods, but also in the form of simple meals. Sustainability is also supported by the theory of “seasonalism”, which means that certain products available only when they can be grown naturally.

This adaptation is not limited to the vendors’ goods, but also can be experienced in the organization of such contemporary facilities. While most of the spaces in the market hall are rented for longer period of time by specific sellers, there are certain areas inside and outside which can host seasonal events and weekend markets.

Example 01: Torvehallerne *(literally: food market)*
The market hall in Copenhagen, Denmark is built on the site of the old vegetable market. The building honors the formal language of its historical counterparts, but was designed to accommodate all the functions a contemporary market has to.


f.070

Example 02: Belvárosi Piac *(literally: inner city market)*
Located in Budapest, Hungary, the market hall was built in the last years of the 19th century. A classic cast iron columns and beams structure, the building gave a lot of possibilities for the refurbishment. Focusing on the organic and artisan products, the market also sports a mezzanine which hosts small dining places. Their ingredients are provided by the vendors of the ground floor, thus creating a strong cooperation and an always seasonal menu.


f.071

Vestby transport hub

Transport hubs do not only serve as a common station for numerous public transport vehicles, they also provide the possibility to change from one kind of transportation to another.

Commuters can leave their cars there and use public transport to avoid the heavy traffic of the inner cities. Other passengers can arrive to the station by train for example and then switch to walking or biking, or transfer from it to buses or trams.

Example: Blaak station

The Blaak hub serves the local metro line and buses of the city of Rotterdam, Netherlands, and the railway as well and it has a large bicycle parking protected by its iconic roof. As a transport hub it generates sizable traffic, so it was a natural choice of the city to benefit from it. The nearby square hosts a temporary market or events, while the new Blaak Market has opened last year. Connecting such an important transport node could easily create visitors to the nearby facilities of the city, and can also reduce the cost of transportation (e.g. for the market) significantly.


f.072

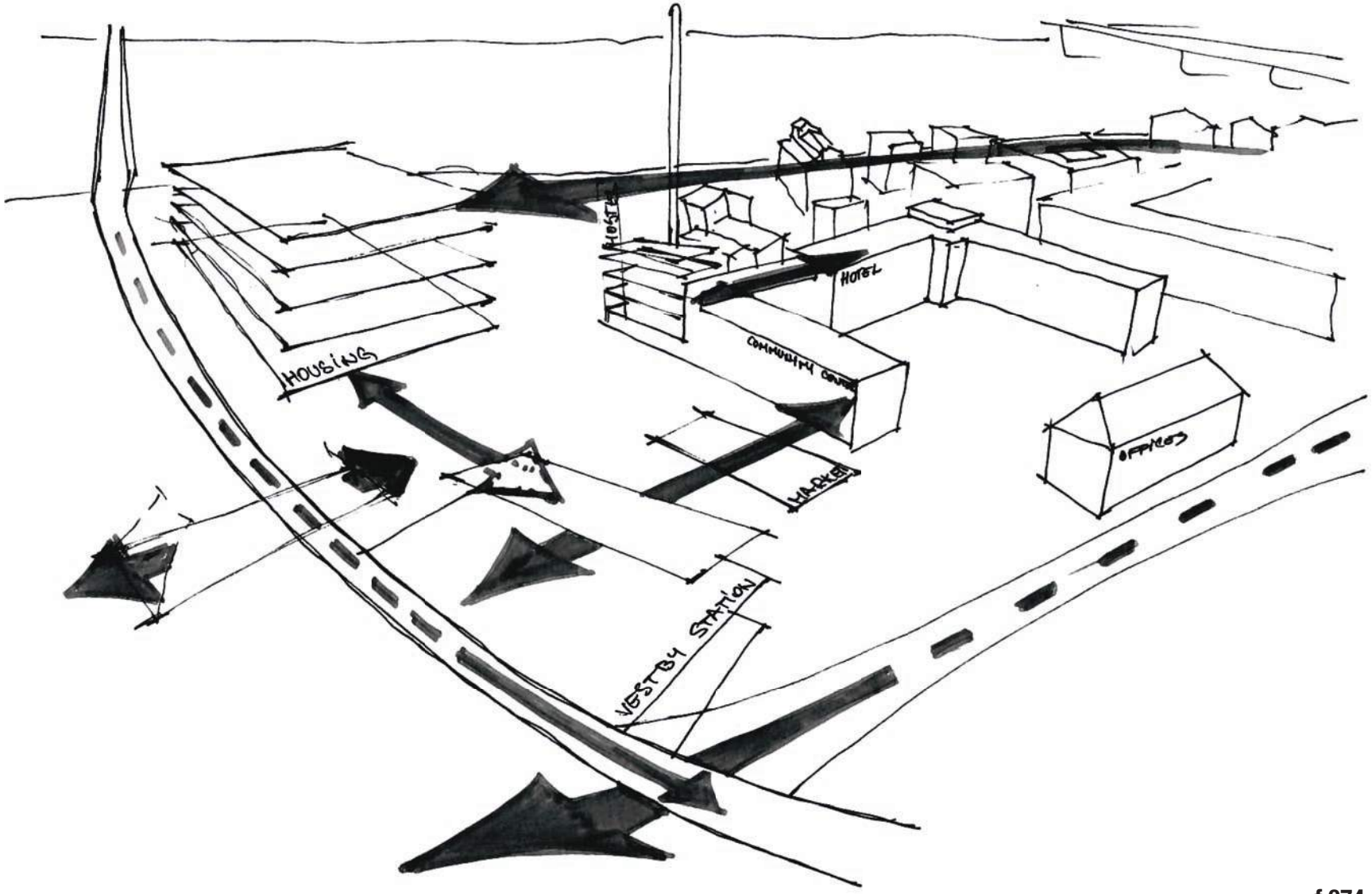

f.073

VISION

The intention through this project is to get an insight into industrial architecture re-use, and to investigate and find ways to integrate new structures within old ones. The initial Akvavit complex is to be restored and reused in order to fit the current needs of Aalborg inhabitants.

While many functions are going to be proposed for this project, the goal is to find a way of connecting them in a socially and economically sustainable fashion. These functions should not only share the same space, or area, but also sustain each other by appealing to the same user group, by encouraging connection and collaboration between functions.

The focus of the project however being the former storage unit, our vision for this is to reintegrate it into the city, by offering a program that appeals to the community, and would create future opportunities for the city.



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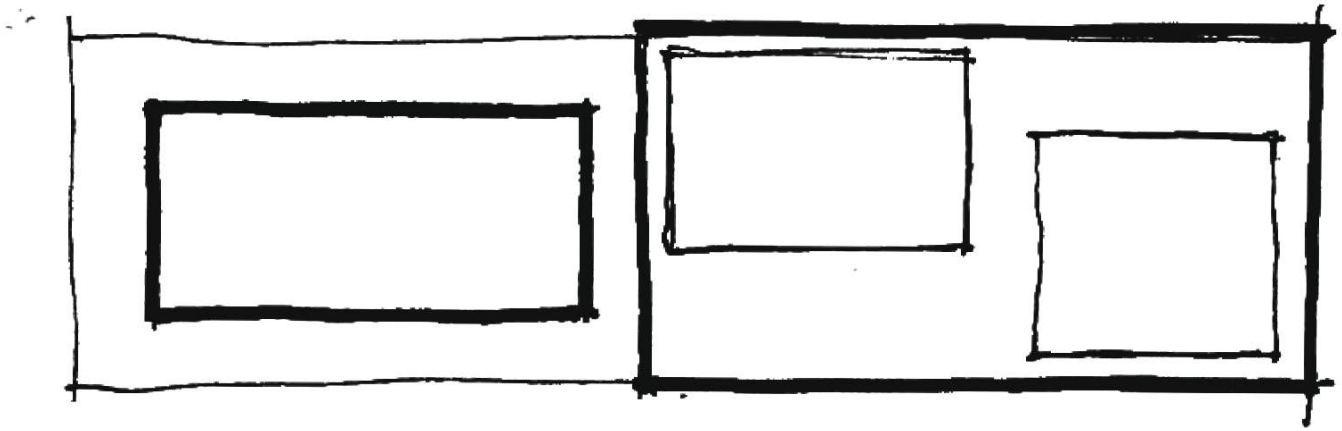
CONCEPT

Throughout our theoretical research on tectonics and adaptive reuse, we have encountered repeatedly the idea of being true to the intended purpose of each element, creating a clear separation between them, while making them work as a whole.

As the existing building was intended from the beginning, the structure is completely independent from the covering facade. By keeping this concept on a functional level, we treated each function as individual, while being part of the whole.

Either boxes within a common space, or a big box surrounded by a lighter circulation area, the idea of grouping the function and treating the elements separately is consistent throughout the project.



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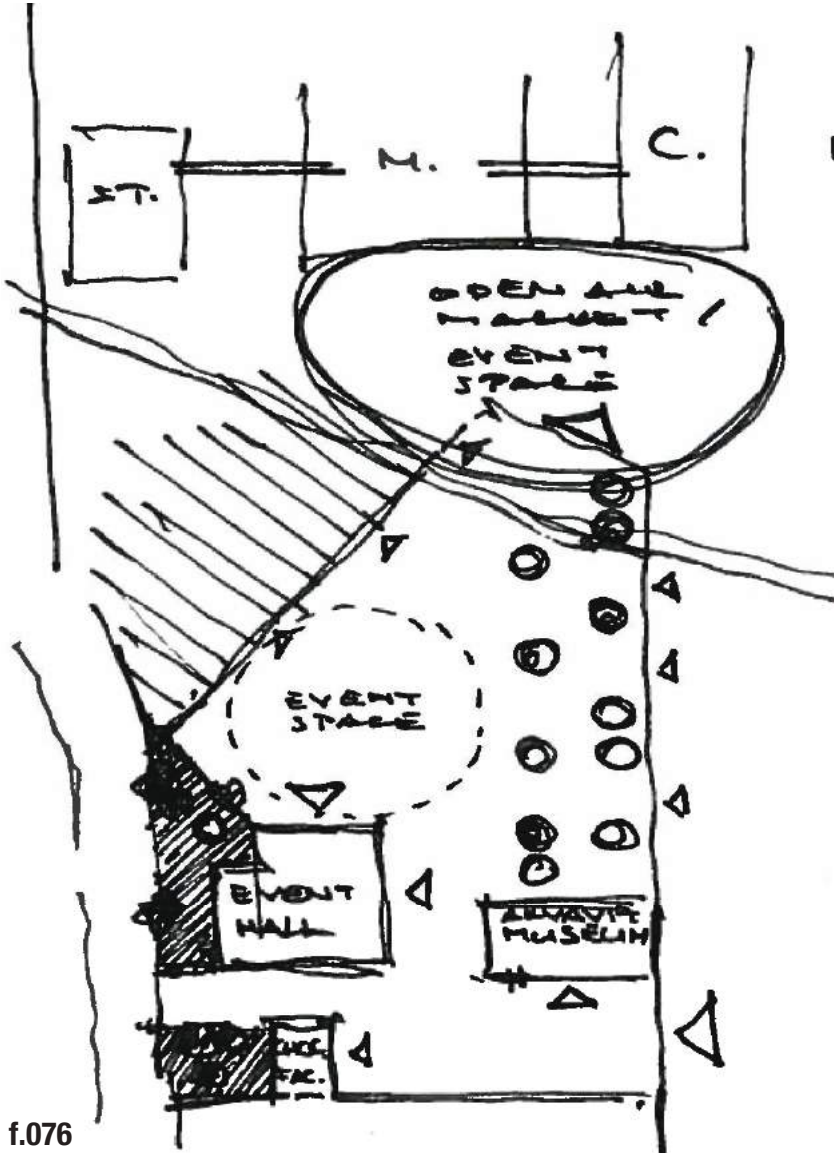
PROCESS



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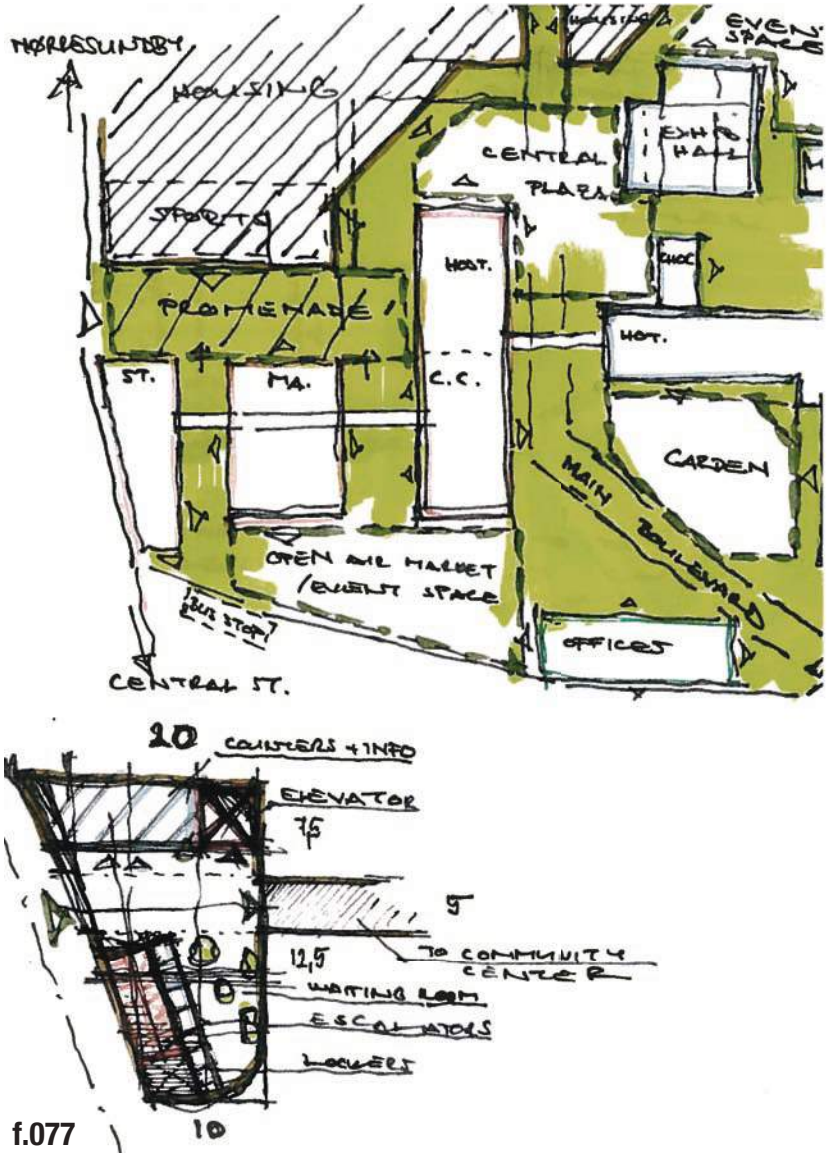

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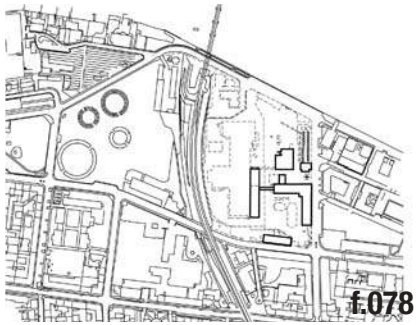
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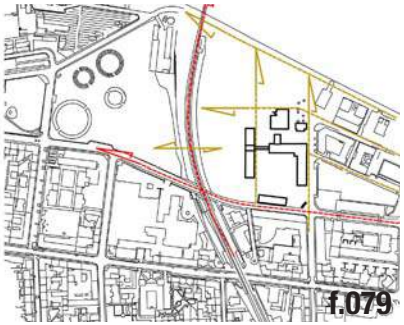
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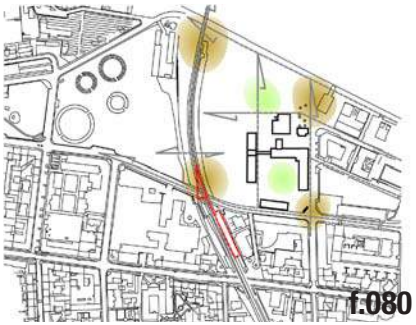
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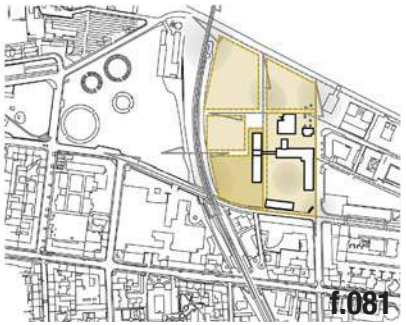
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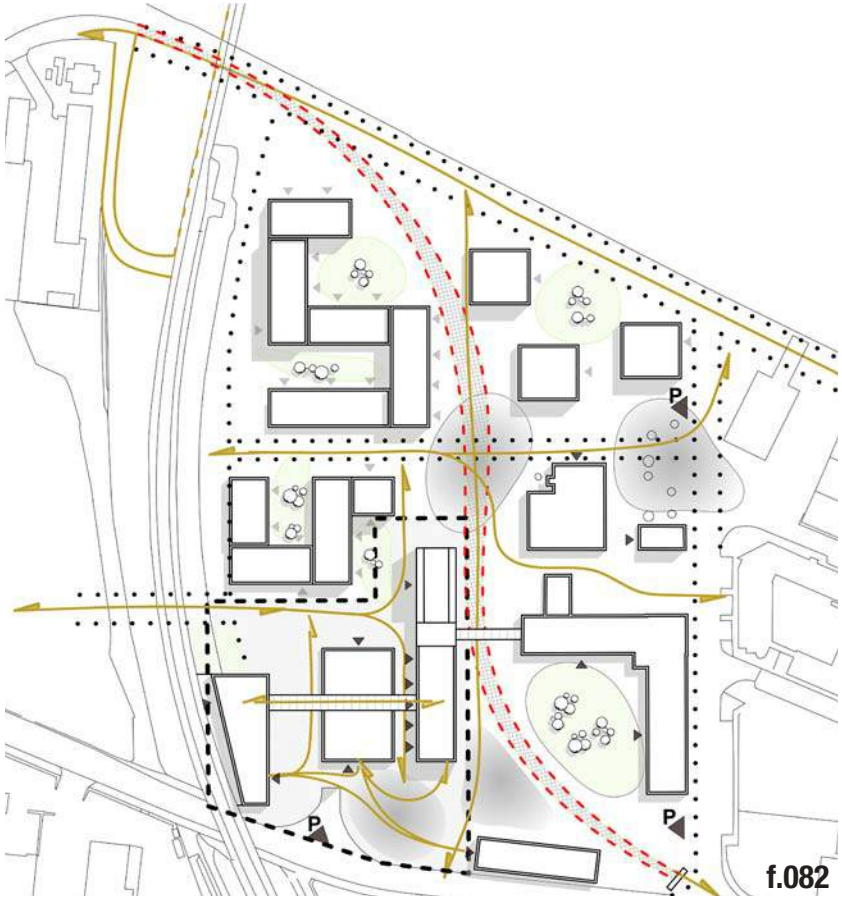

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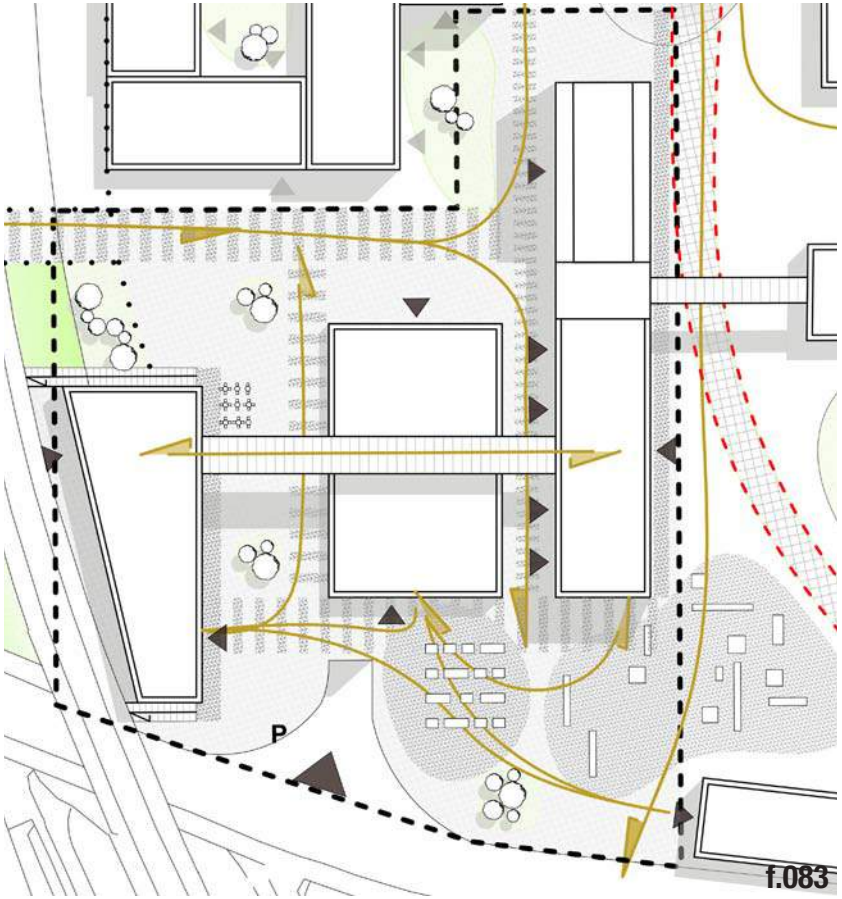

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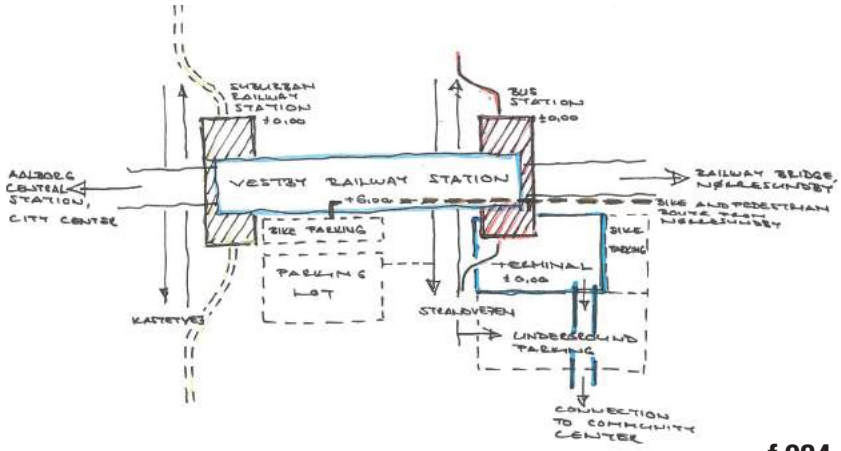
12.1 TRANSPORT HUB

After the interview with Niels Thomas Birket-Smith, it became evident, that the city has illustrious plans to improve its public transport network. The light railway on Kastetvej creates an east-west axis, while and the pedestrian and bike lane additions to the railway bridge (Jernbanebroen over Limfjorden) a north-south one. The Akvavit complex and the current Vestby station just lies in the origin of these two. Both Kastetvej and Strandvejen have bus traffic. The surrounding area includes various middle and upper level educational facilities, the language school (Aalborg Sprogskolen), the job center, and with the rehabilitation of the site, various cultural, commercial and community functions and even a hotel and a hostel will appear.

A transport hub would be able to host the bus stops on the two roads and the stations of the light and regular railway, creating an easy and convenient connection between them. With a new underground parking is to be built on the Akvavit site, the traffic load on the city center would be reduced, and the two small parking lots nearby can be eliminated, giving space to green areas. The bicycle traffic would be served with enlarged and safe bike parking spaces and new ramps and freight elevators connected to the bike lanes going to and coming from the direction of Nørresundby. As the number of passengers increase, so do their needs. Thus the hub provides baggage lockers, a ticket and information office, restrooms on the upper level and various commercial services on the ground floor. A direct connection to the market and the community / hostel building makes the access easier for the locals, the tourists and also for the people working in these facilities.



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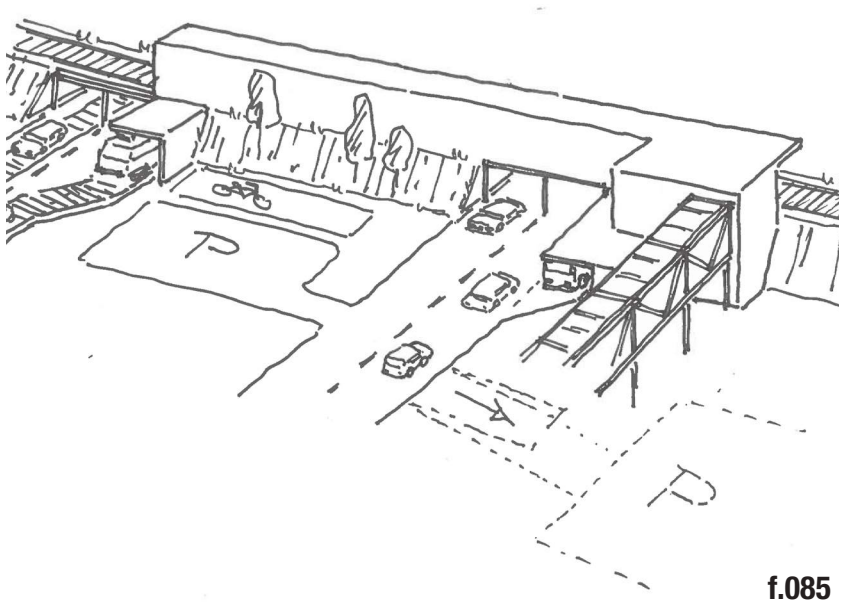

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12.2 BRIDGE

The bridge connecting the main distillery building and the old malt storage and silo building fifteen meters above ground level is an iconic part of the complex, even though it's a more recent addition. It served as a reference to the new pedestrian bridge that would be constructed between the transport hub and the community building, using the same structure which is made of steel beams and angled columns, called a Warren truss. It serves as the main access from the station, with a connection to the market in the middle of it. Directly binding the three facilities together, it makes the connection much more convenient, especially in harsh weather. The structure's walls are covered with insulated glazing to avoid the unnecessary use of artificial lighting and to provide a nice view to the surrounding site. The old metal sheet cover of the other bridge will be removed and replaced in the same manner, not just to improve the thermal conditions but to transform the service way into a panorama bridge, to benefit from the fifteen meters height above ground.

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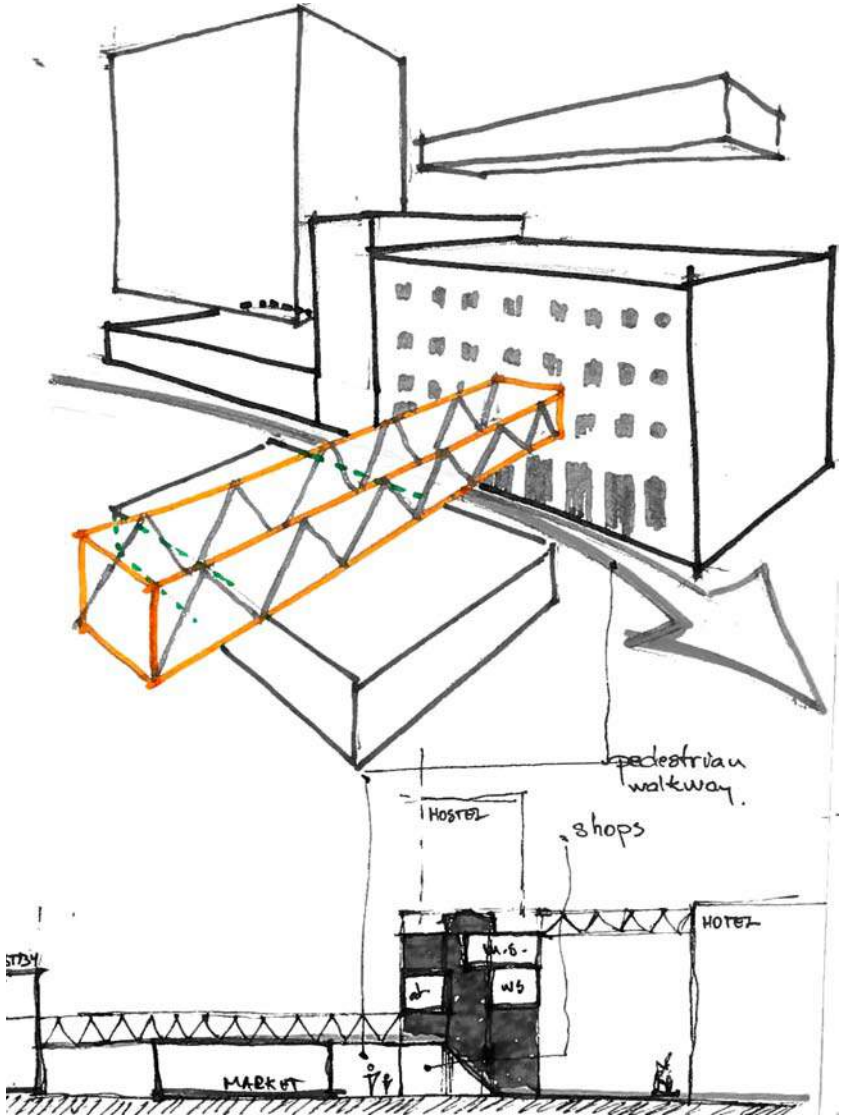

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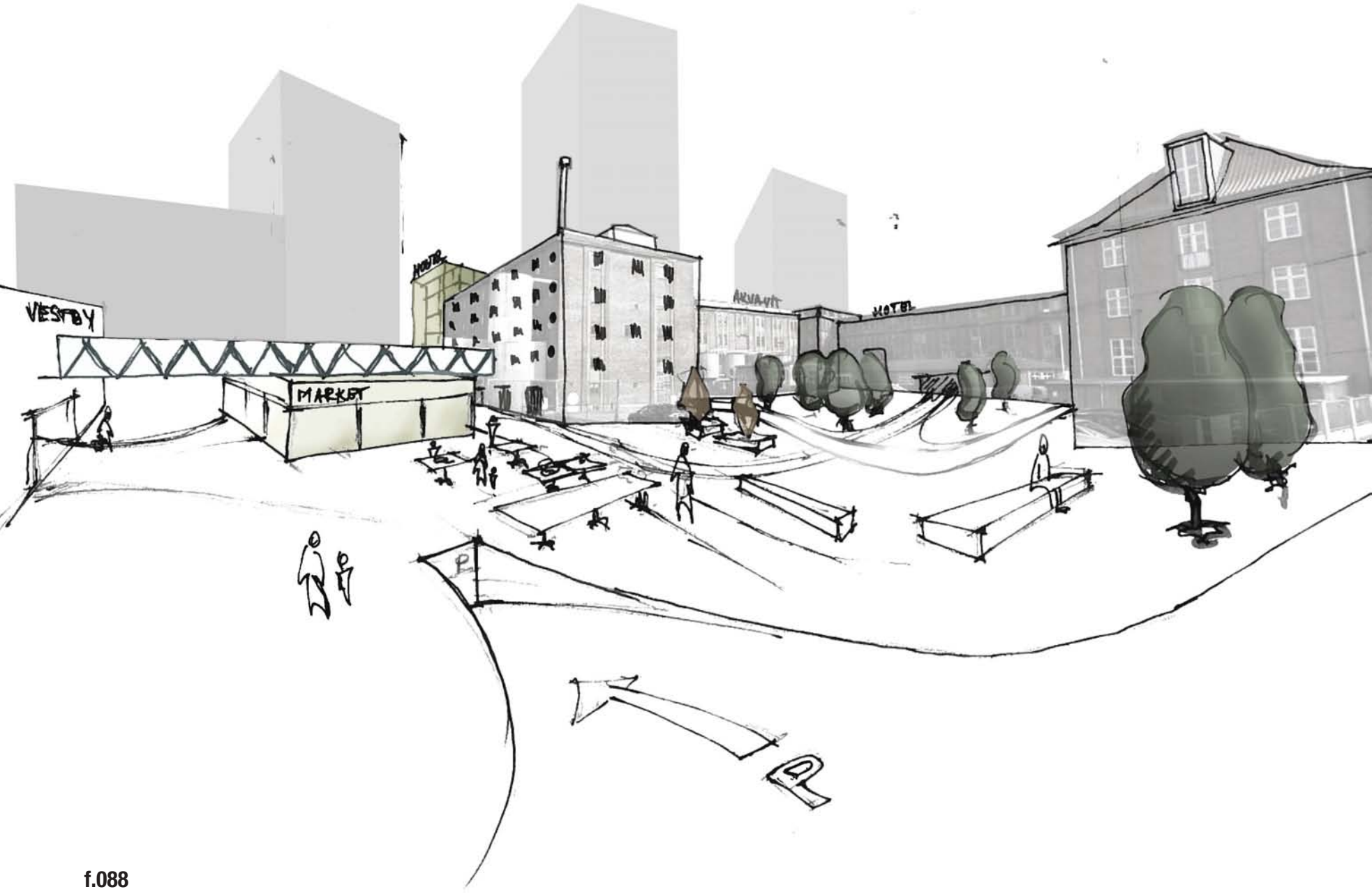

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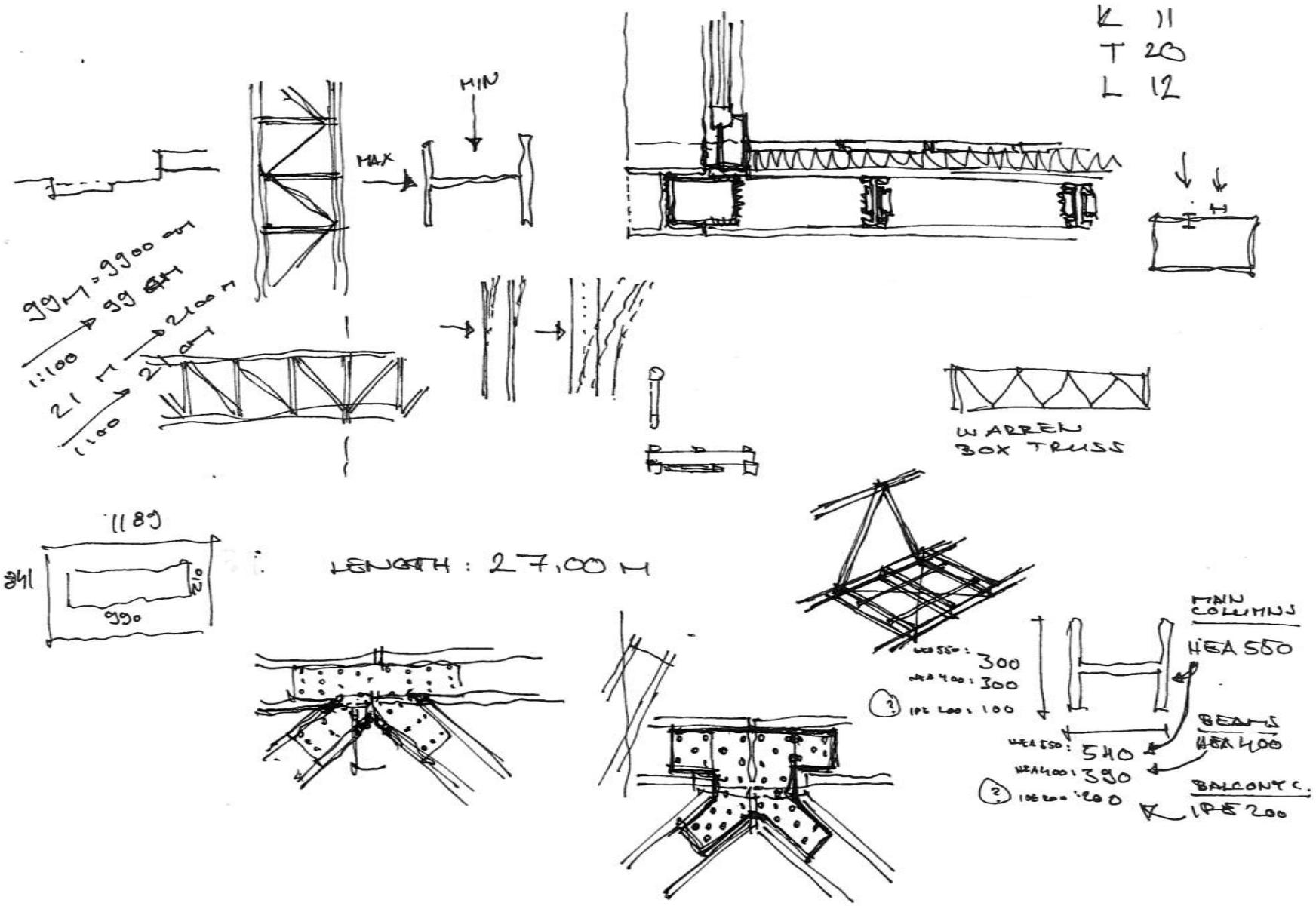
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BEAMS
HEA 400
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BALCONY
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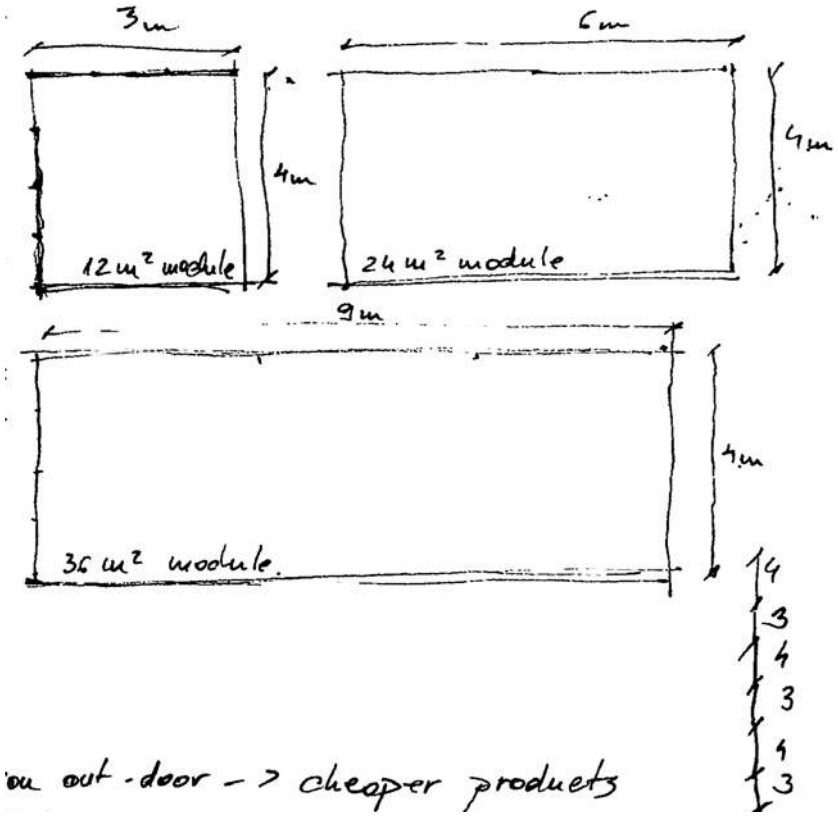
12.3 MARKET

A market in the area is both the city's intentions, but also part of our vision for the area. The market would benefit from the closeness to the train station, by encouraging local producers to either rent a permanent space in the interior market or occasionally in the exterior market. The existence of both interior and exterior market is crucial in order to give the buyer diversity in both products and prices.



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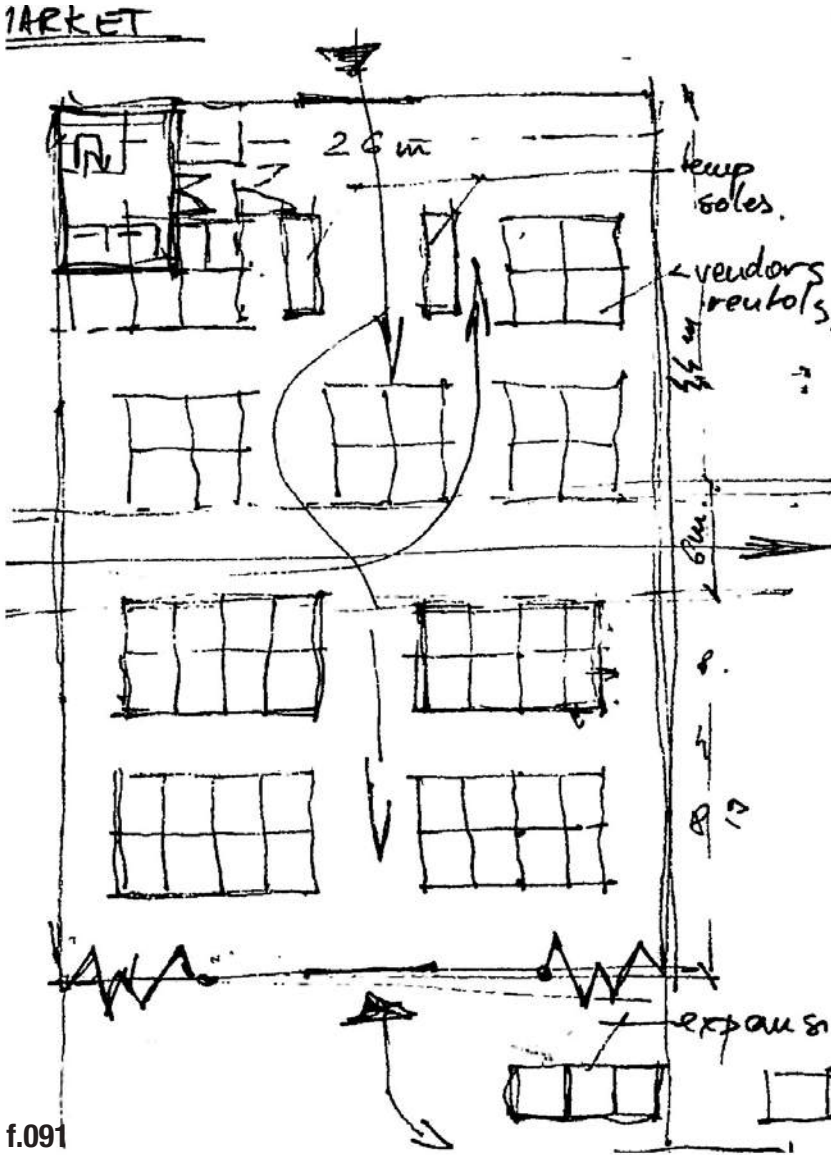

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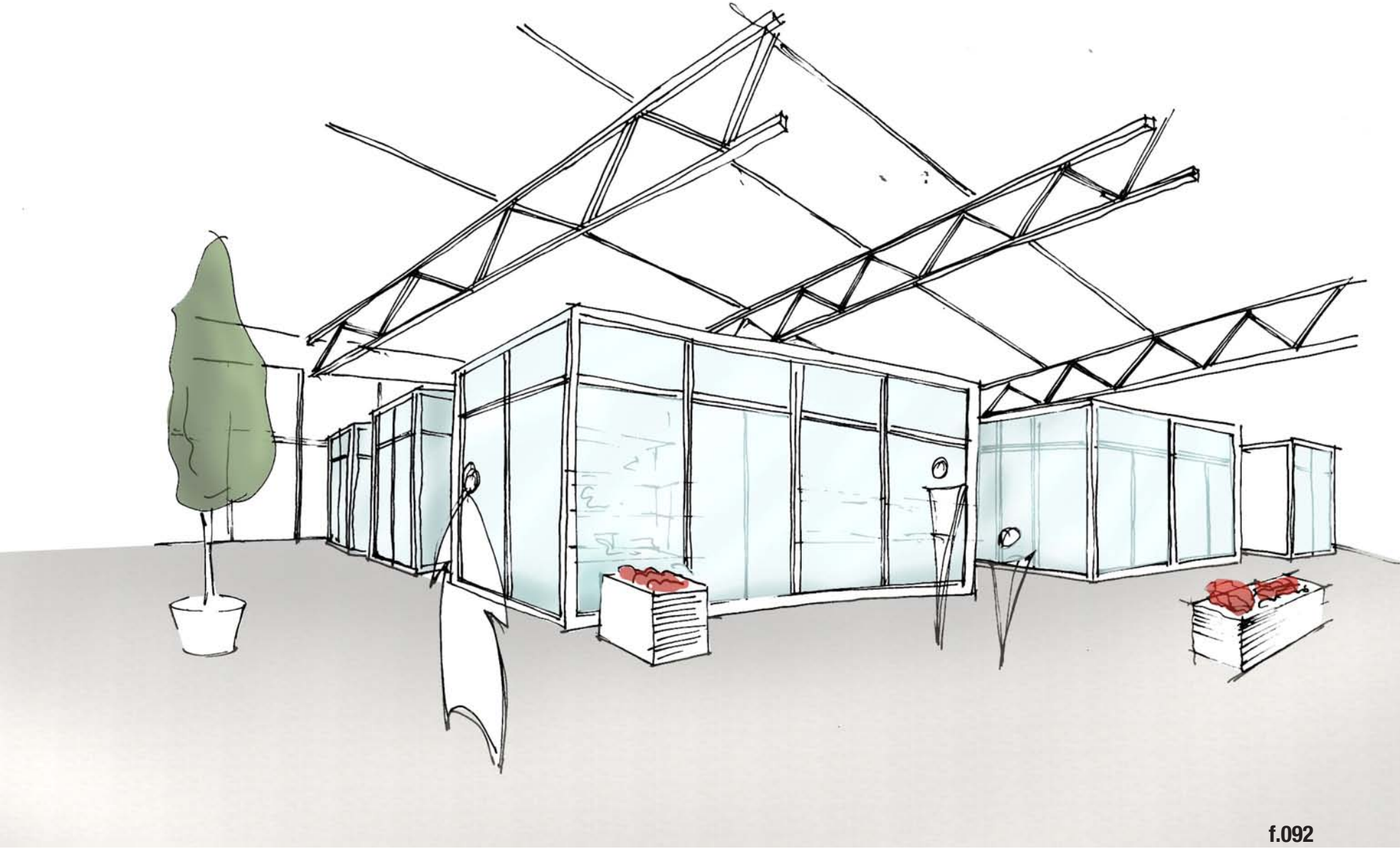

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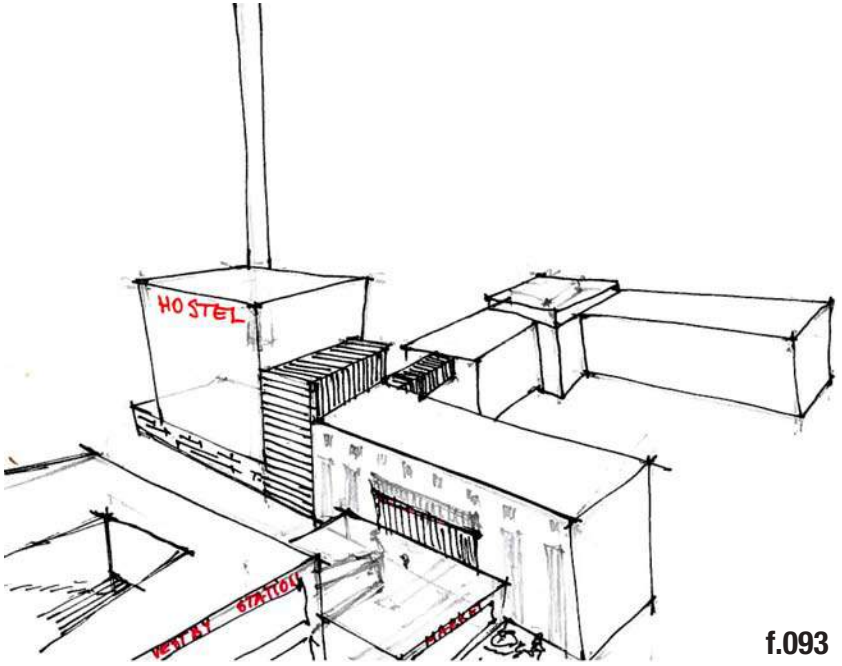
12.4 COMMUNITY BUILDING

Entrance and Multifunctional space

The height of the ground floor of the building is of six meters, which represents an advantage in considering ways to add value to the space. While considering the tectonics qualities of the building and the structure itself, a consistent idea was to undress the structure and exposing. Several ideas have been sketched in order to achieve that, while deciding to remove the floor between the first levels, adding more depth and height, while at the same time adding value to the space. Accessing the building from the first floor was a consistent idea which would allow us to expose the structure by creating double height rooms.



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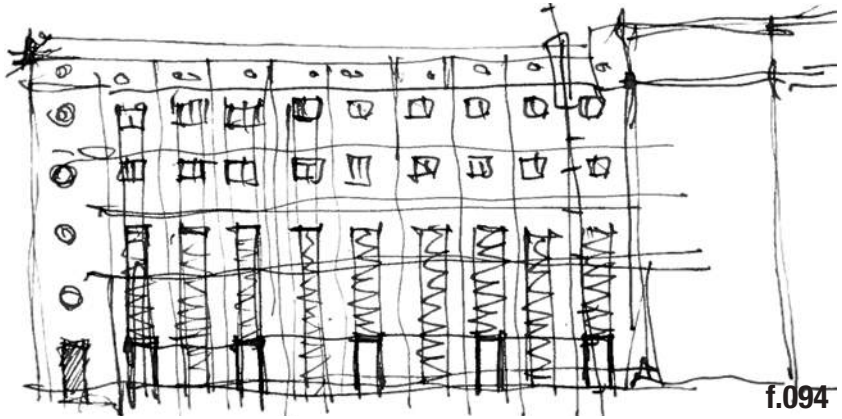

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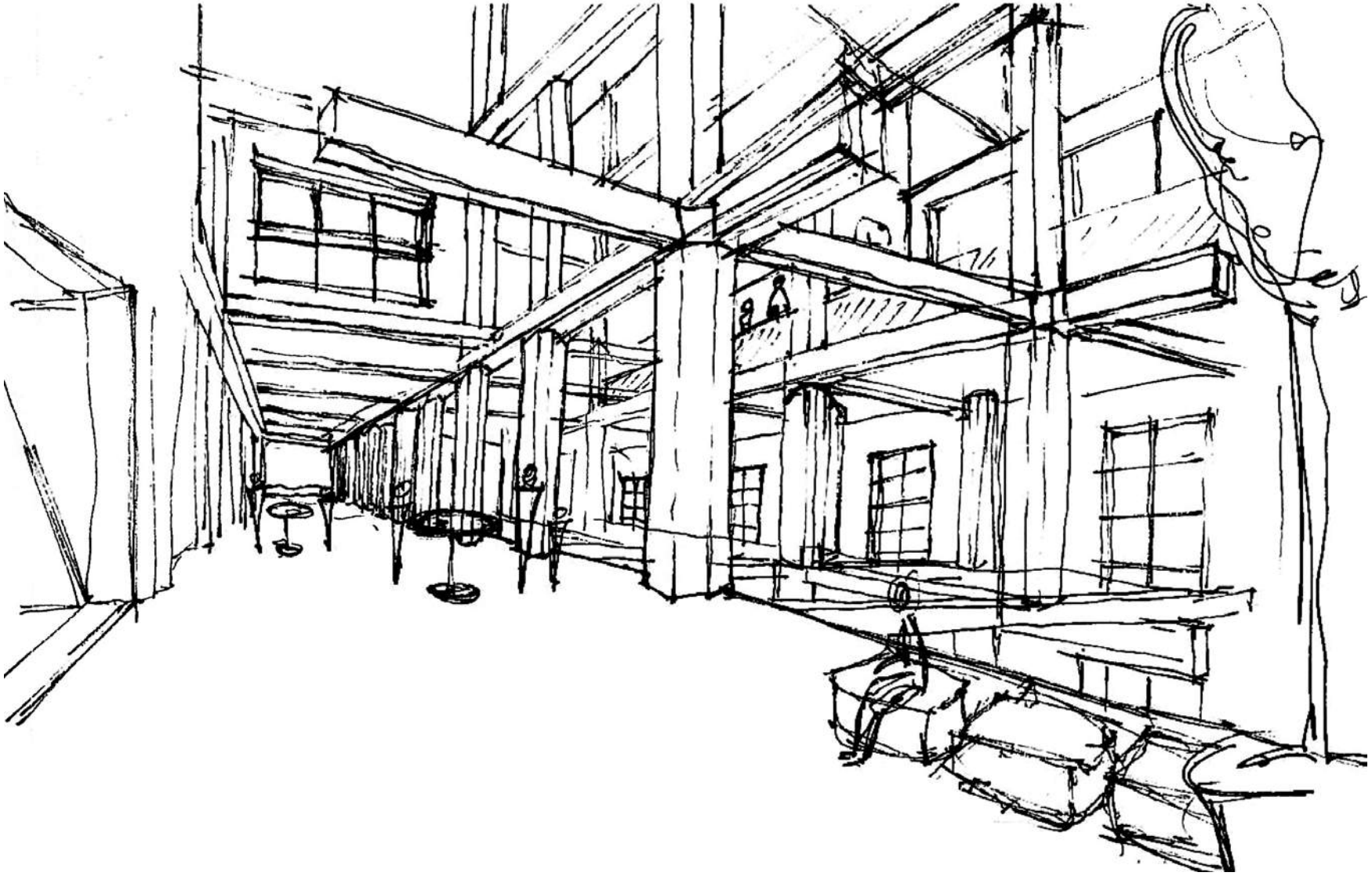

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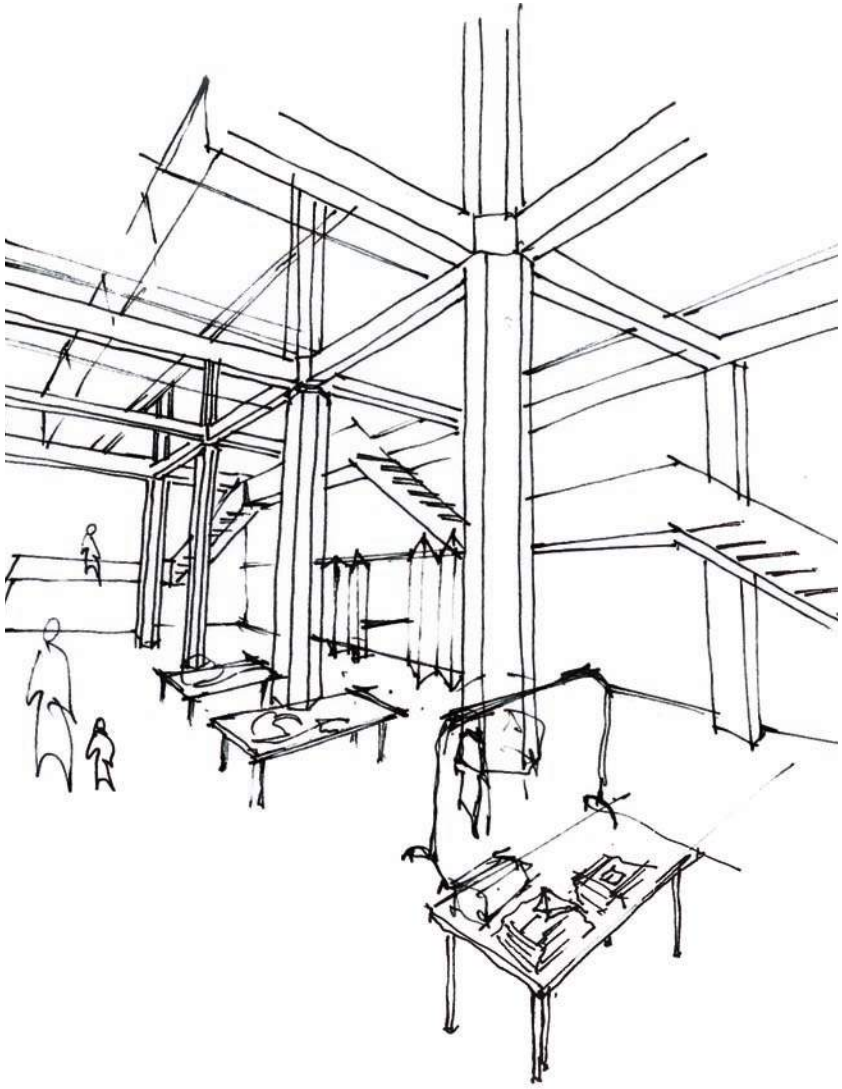

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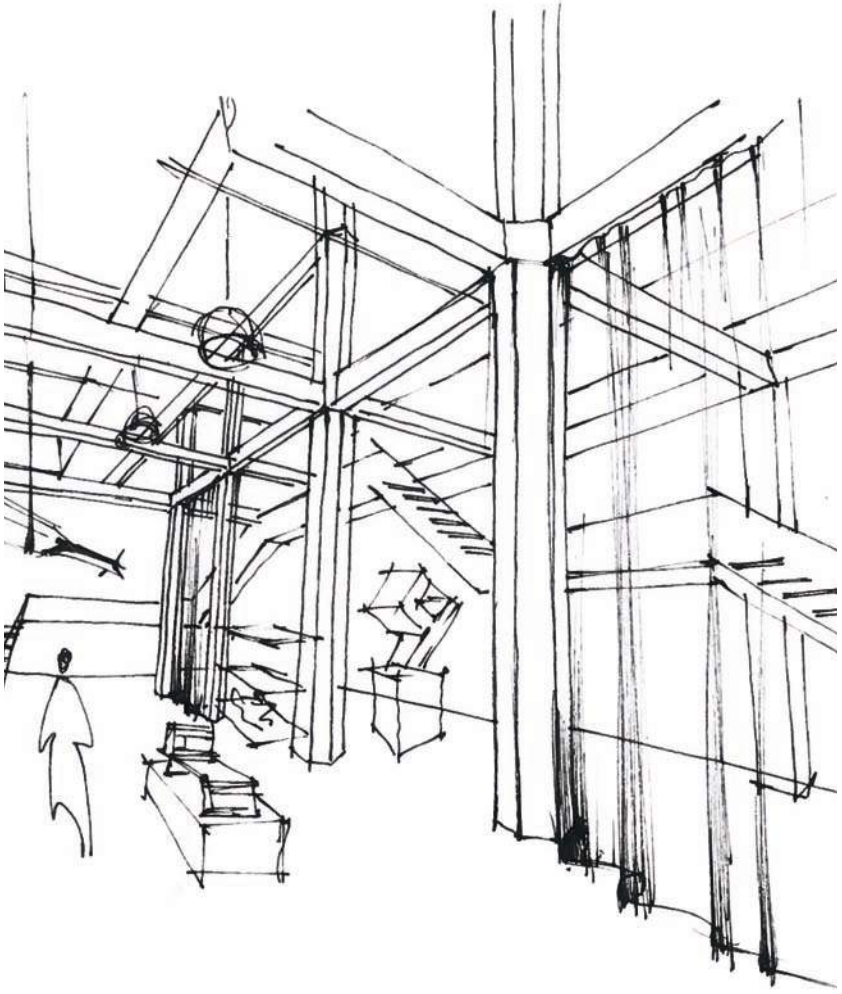
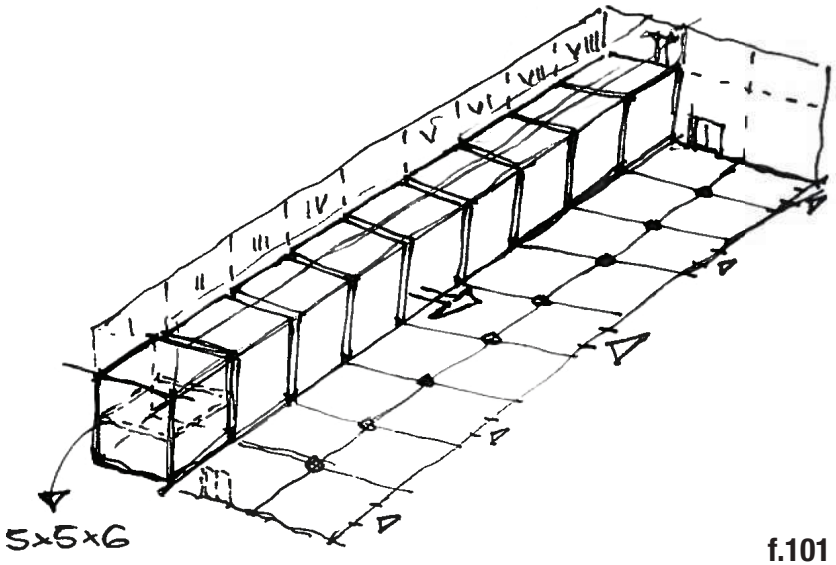


f.097

Ateliers

The ateliers are placed on the bottom floor, on the facade with the former extension. Each of them consists of one or more 5/5 squares of space, according to the structure. The purpose of placing them on the ground floor is to re-expose the facade of the building by creating a walking path close to it, thus exposing and giving business opportunities for the spaces situated there. The height of the ground floor became a problem in this kind of space, therefore diving it horizontally and earning more space became an idea.



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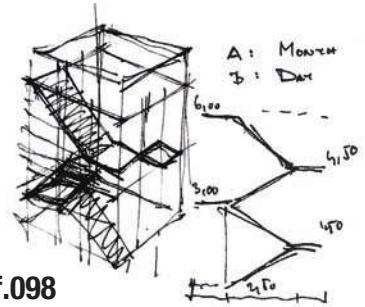

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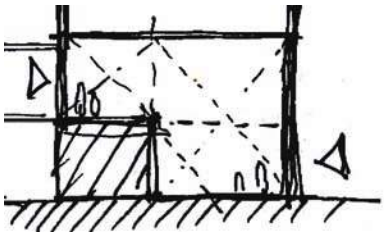

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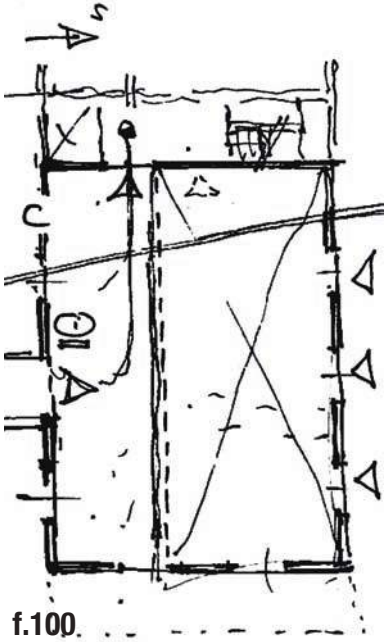

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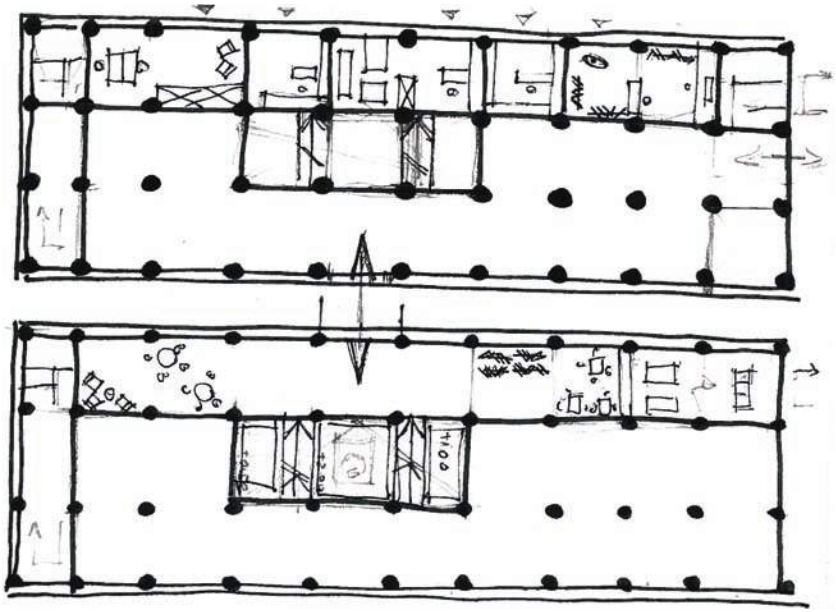

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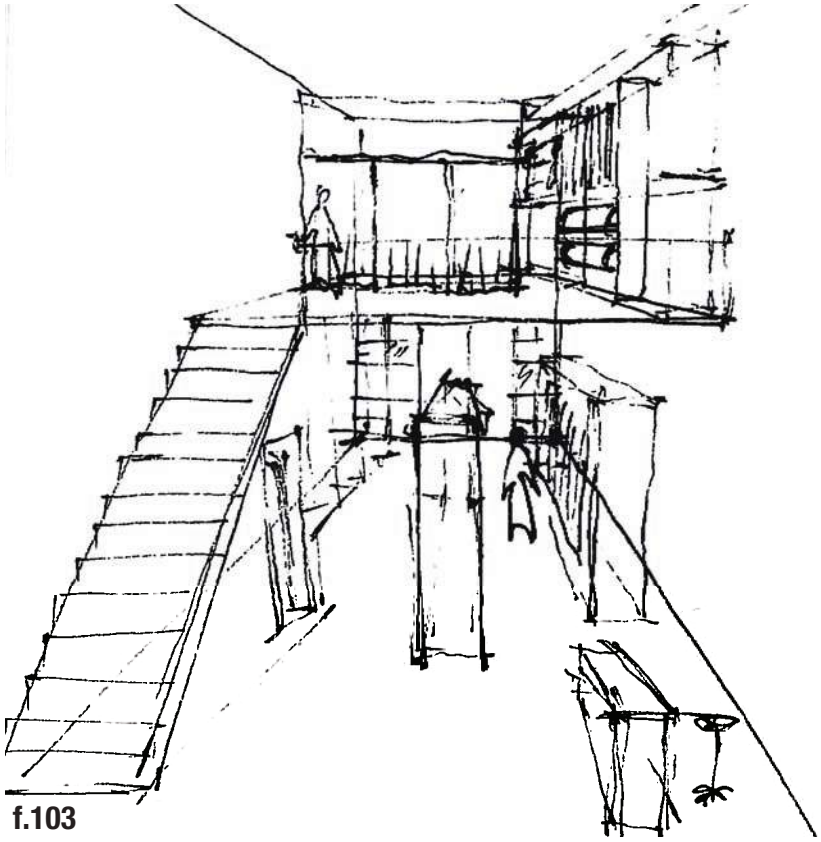

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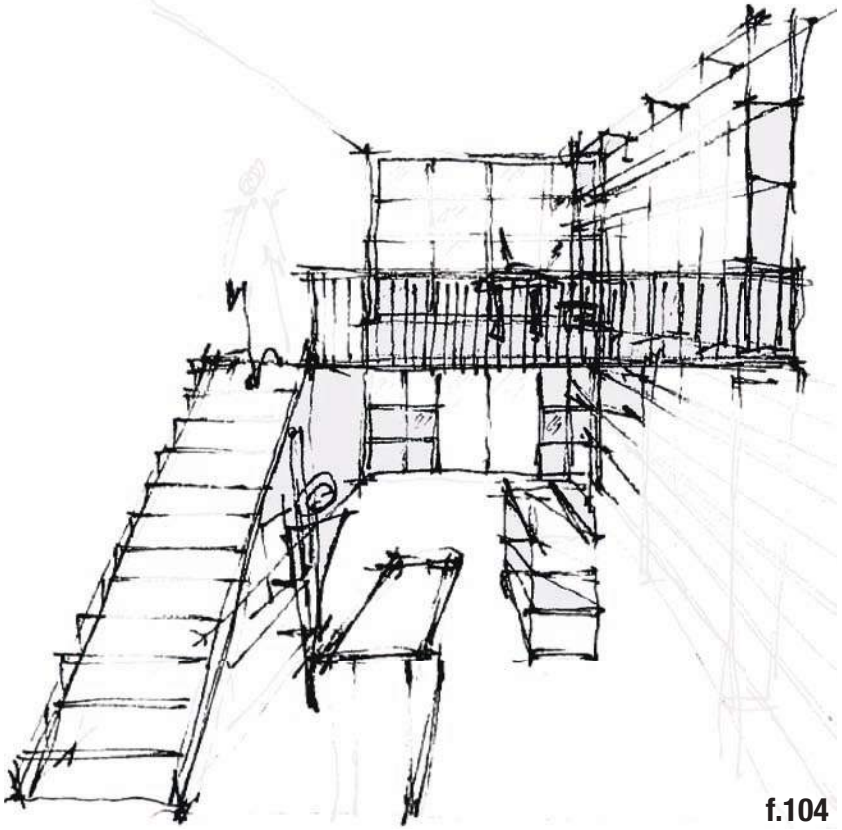

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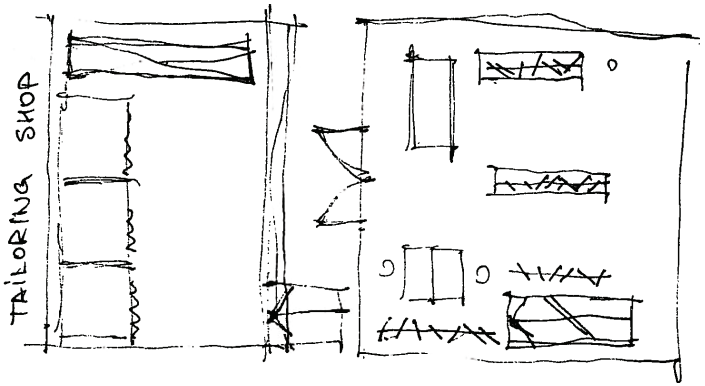

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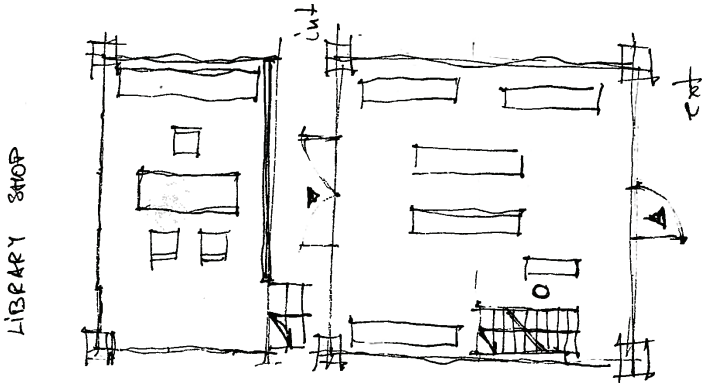


f.106

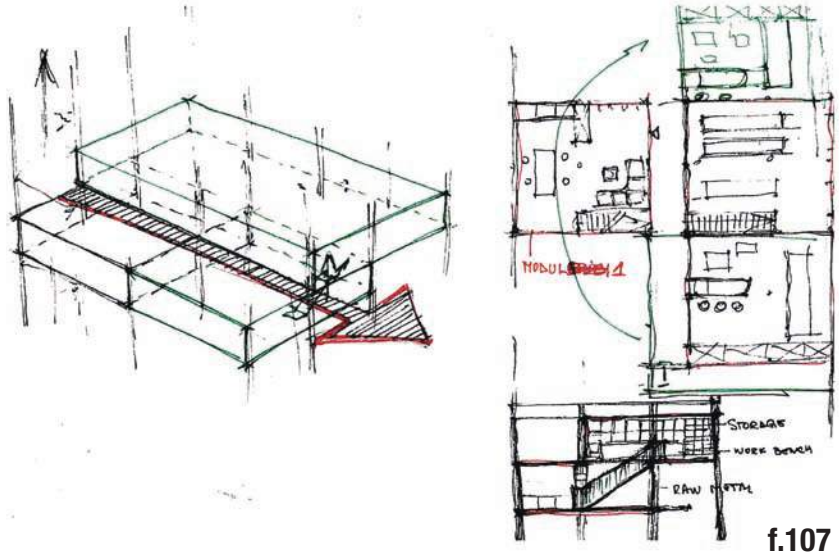
Makerspace

The makerspace represents an important part of the functionality of the building on a conceptual level. The existing grid of the structure has been a departure point in our process of creating modular and flexible plan suggestions.

The enclosure of the space in boxes comes as a sustainable solution of solving the thermal issues of the building. One of the entrances is designed at the 2nd level with a living room area, while separating the working area upstairs. Further enclosures inside the 'box' are considered in order to ensure acoustic performance.

An important aspect to be considered while designing is the type of tools they can use in this type of space, their dimensions as well as special characteristics which could provoke noise and ventilation issues. For this matter, while initially the intention was to create a big maker's center, grouping of the functions and tools became necessary.

Flexibility of the space is an important issue to be considered, in order to provide space for a diversity of activities.



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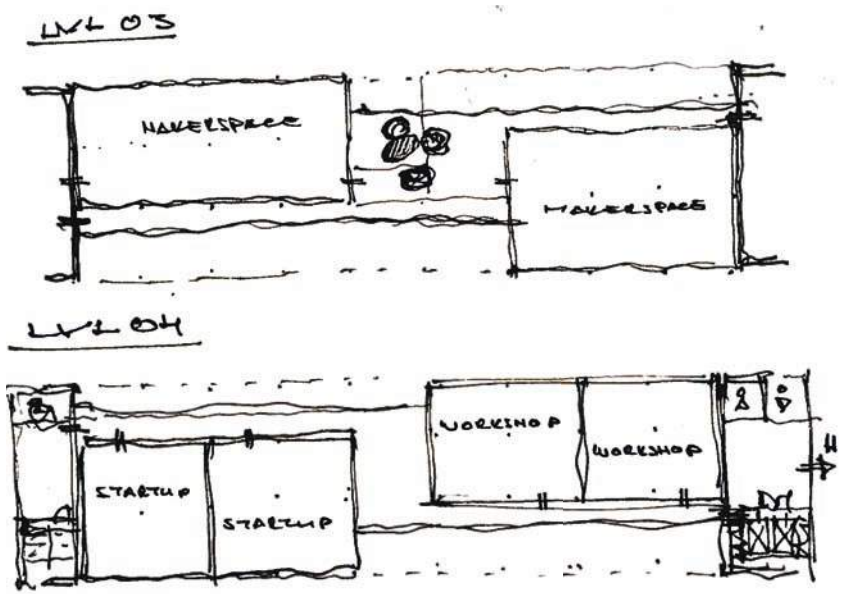

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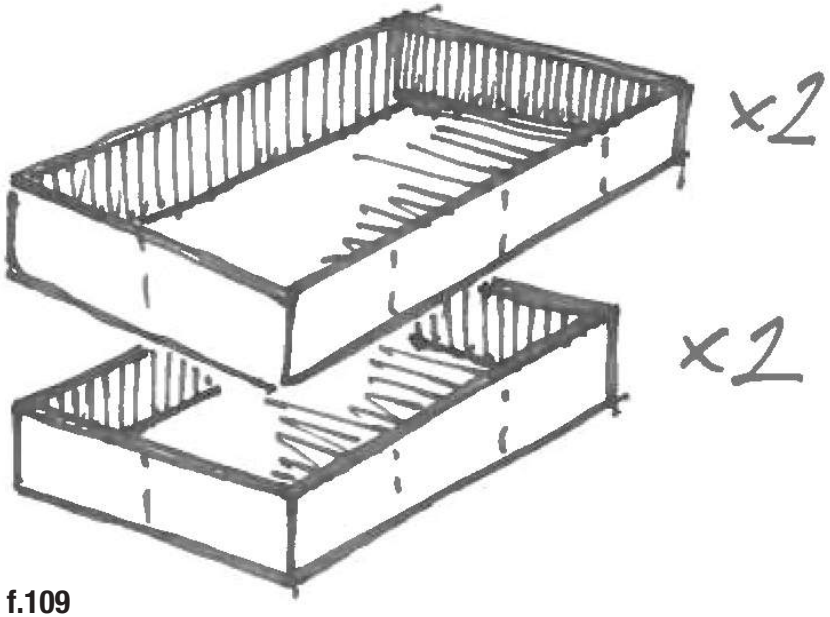

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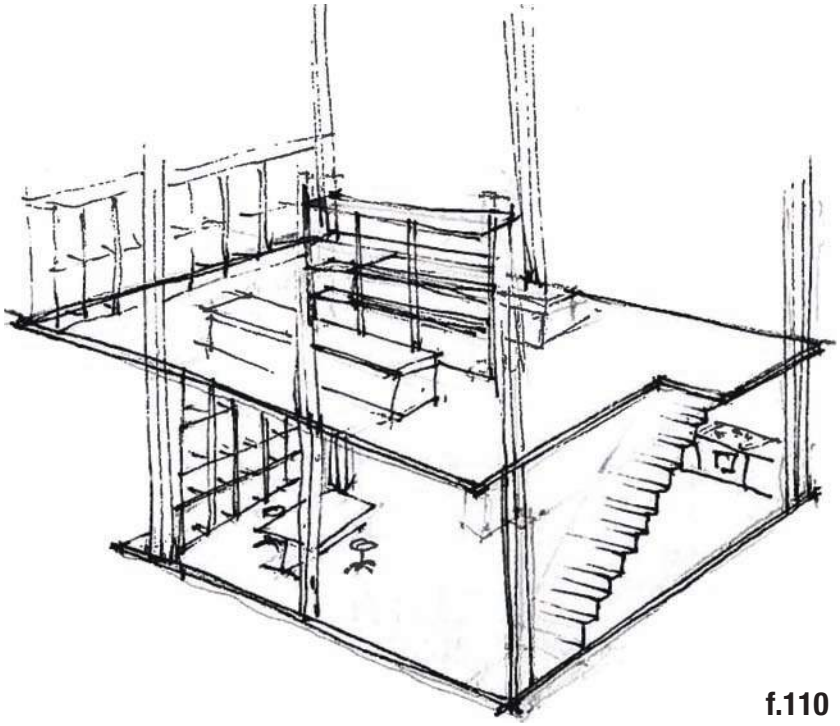

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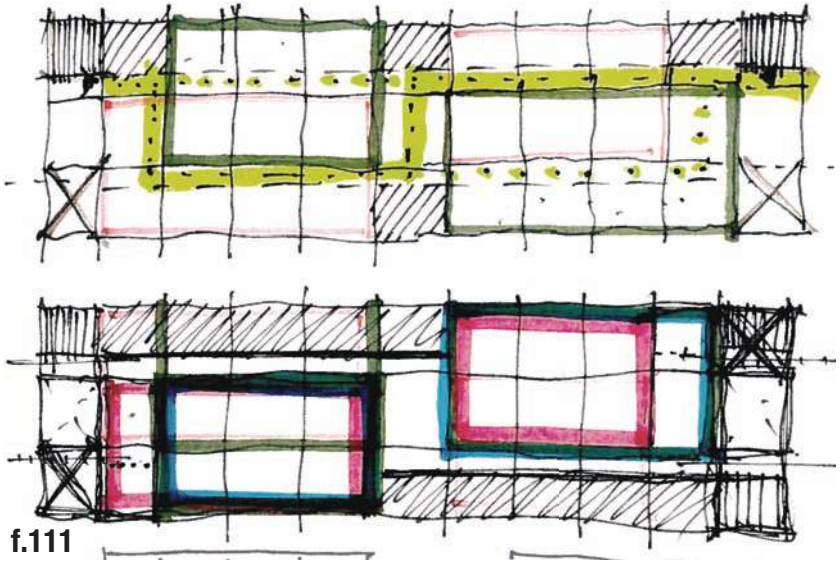

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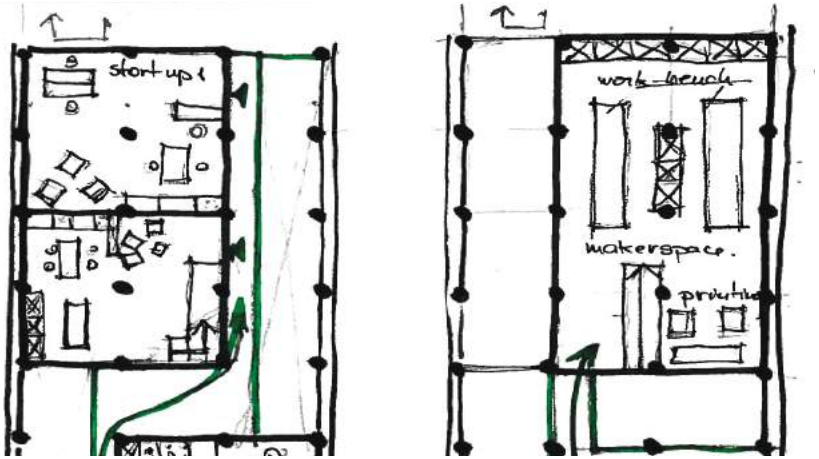

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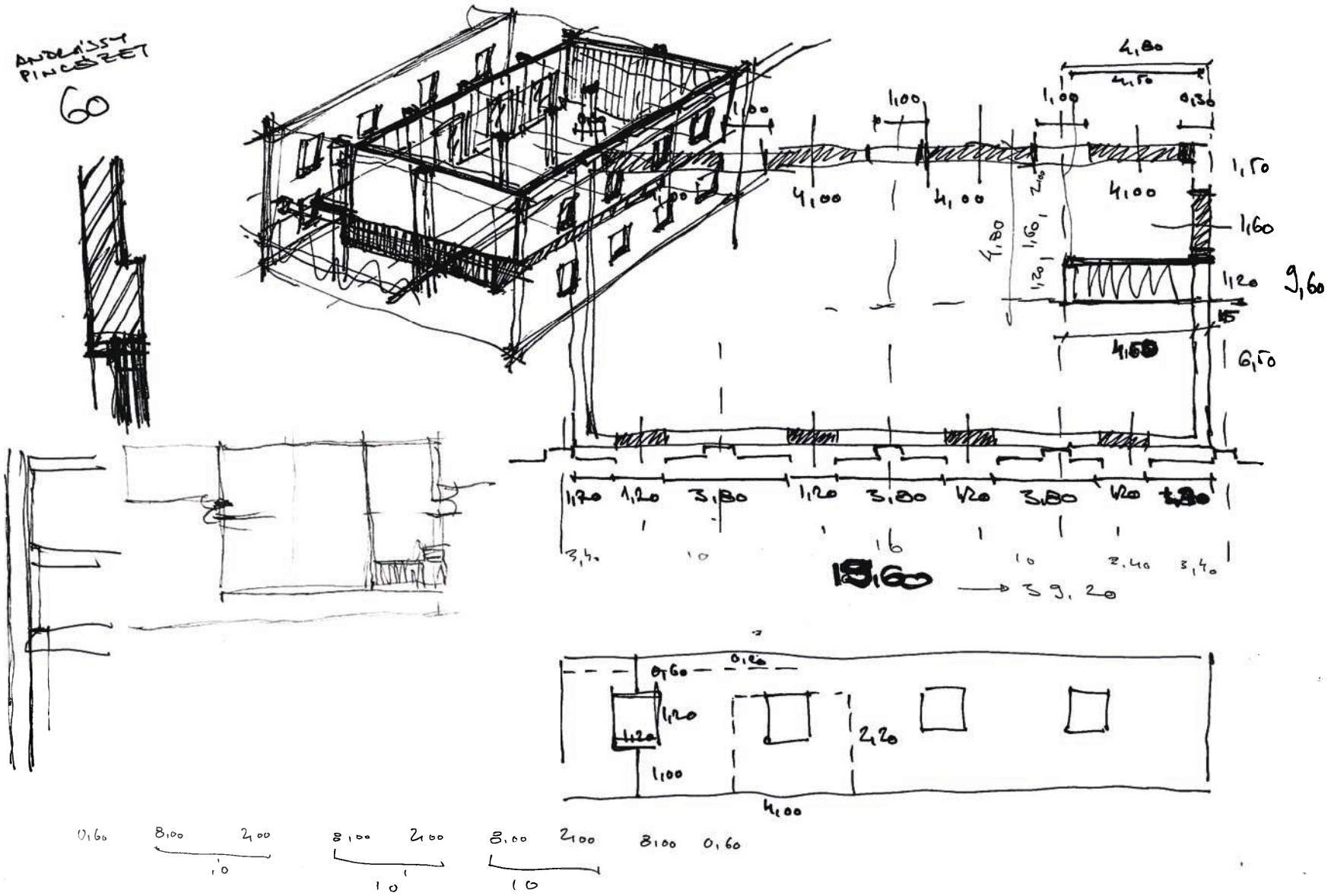
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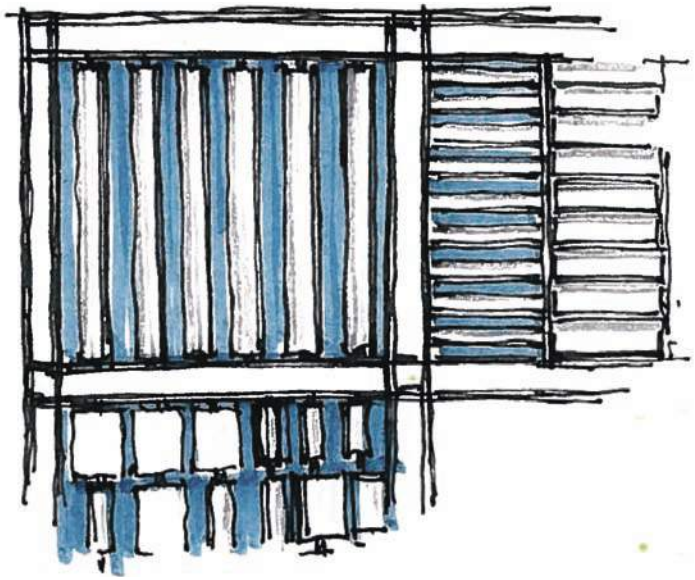
12.5 HOSTEL

Facade

The historical ground floor facade runs horizontally along the full length of the building, but the upper levels show different interpretation of the same principle on each side of the central staircase. The external walls have no other function than separating the internal space from the outside, while the primary functions are placed in boxes. The fire-resistant paint treated surfaces of the steel structure is visible on the facades, but the most striking element on it is the system of solar shades. These perforated steel louvers regulate the interior temperature of the glass box-like envelope of the hostel, ranging in color from the grayish stainless steel to the reddish and brownish corten steel. The facade is in a constant change as the sensor-coordinated automatics adjust the angles of the shadings.



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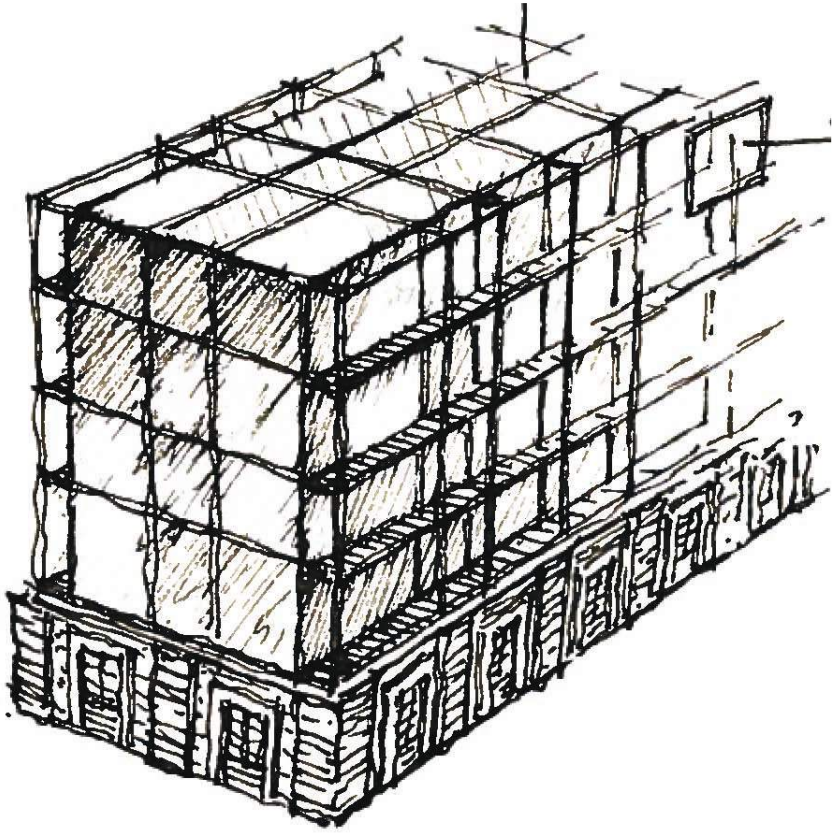
Layout

While trying to learn from the old building and implement it to the new extension, several options have been considered. The main concept of it was to attach the rooms to a central core of the building, while leaving the exterior free for circulation.



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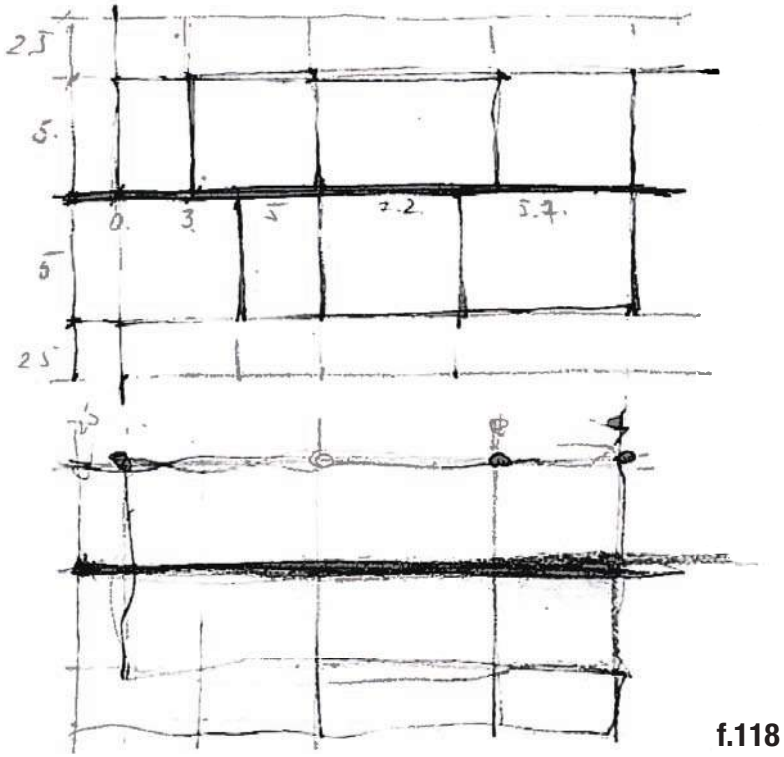

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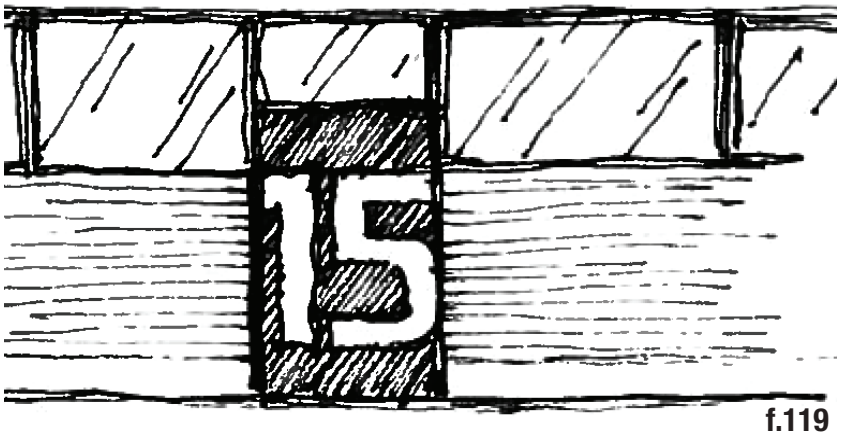

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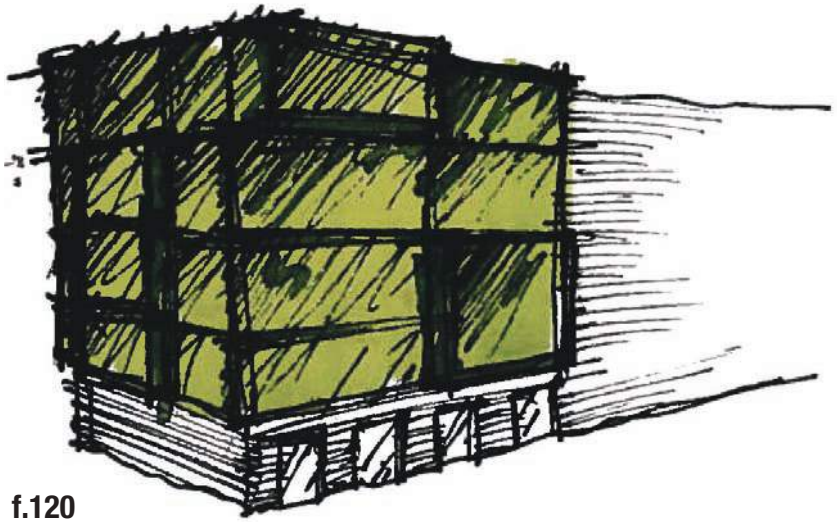

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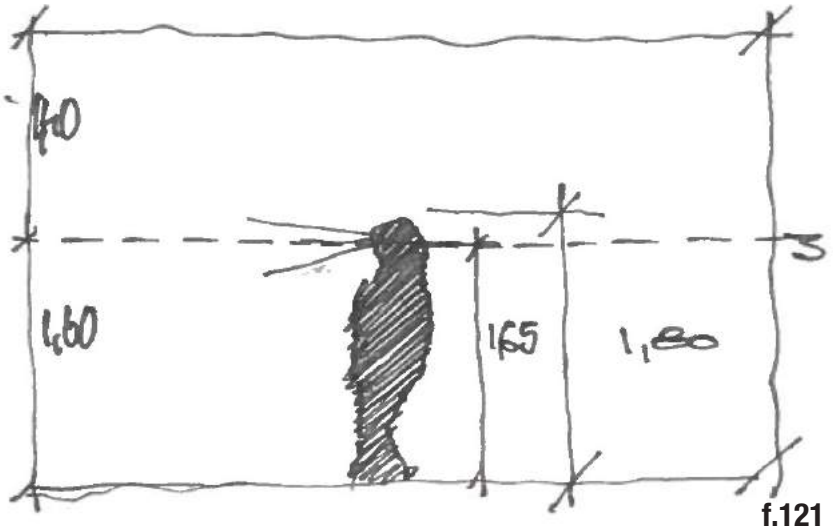

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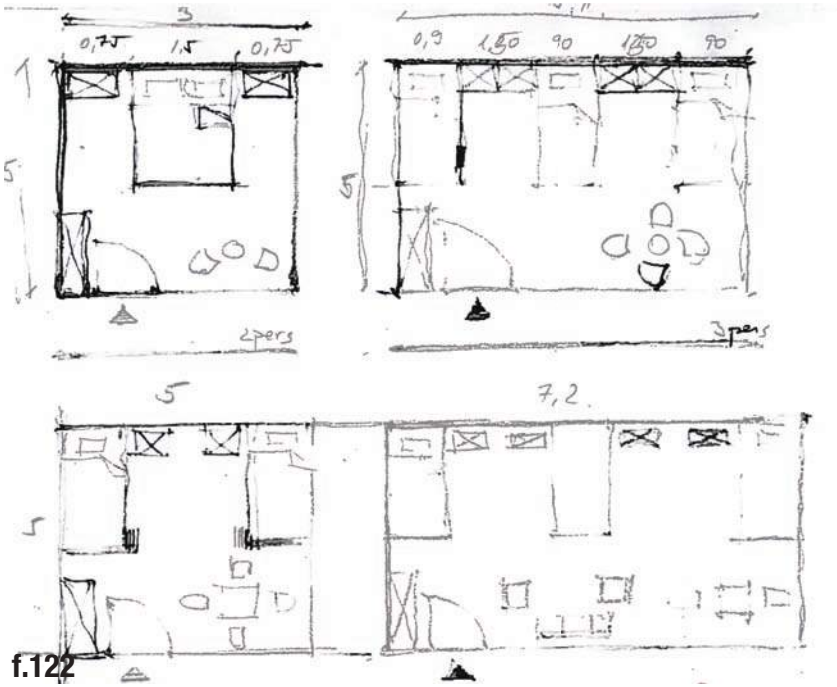

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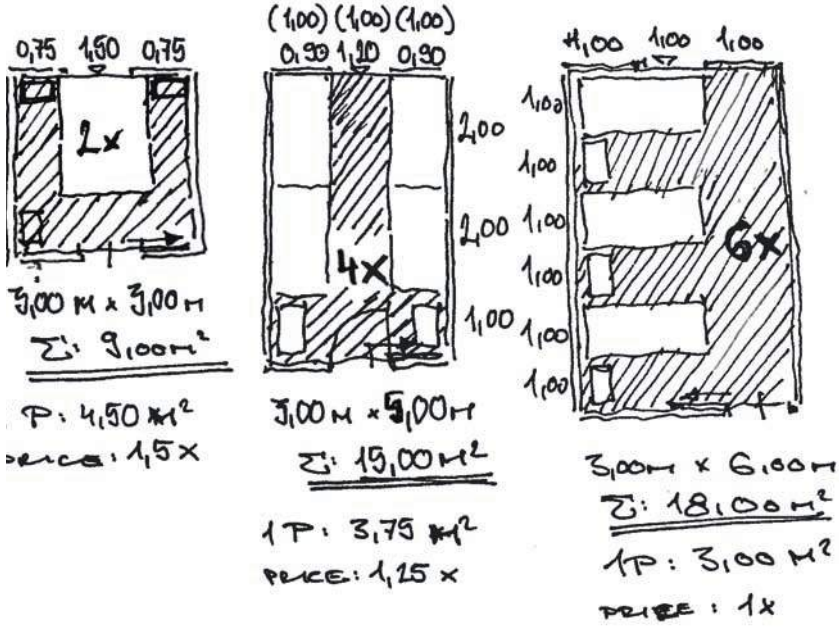
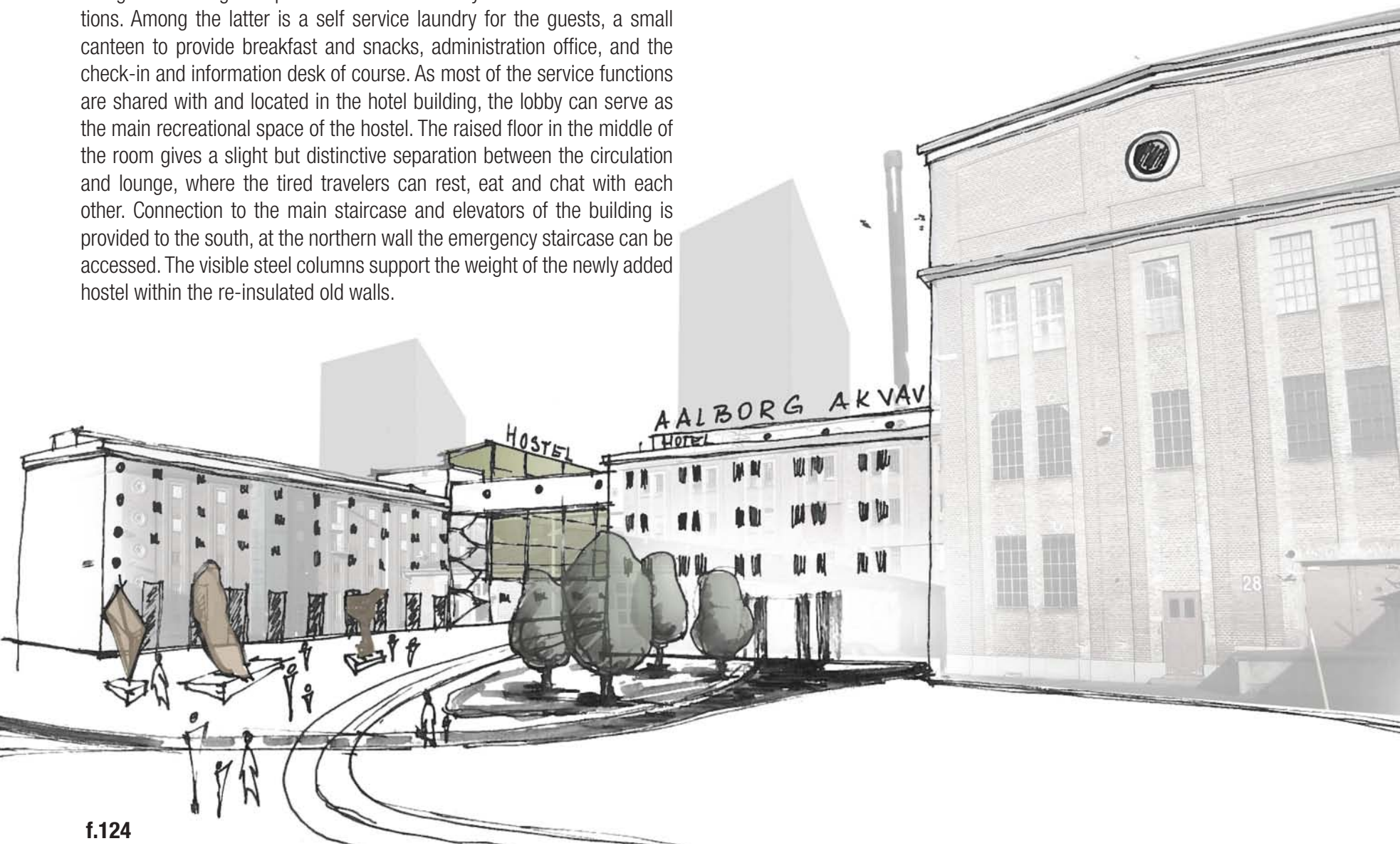


f.123

Ground floor

The ground floor gives space to the hostel's lobby and several other functions. Among the latter is a self service laundry for the guests, a small canteen to provide breakfast and snacks, administration office, and the check-in and information desk of course. As most of the service functions are shared with and located in the hotel building, the lobby can serve as the main recreational space of the hostel. The raised floor in the middle of the room gives a slight but distinctive separation between the circulation and lounge, where the tired travelers can rest, eat and chat with each other. Connection to the main staircase and elevators of the building is provided to the south, at the northern wall the emergency staircase can be accessed. The visible steel columns support the weight of the newly added hostel within the re-insulated old walls.



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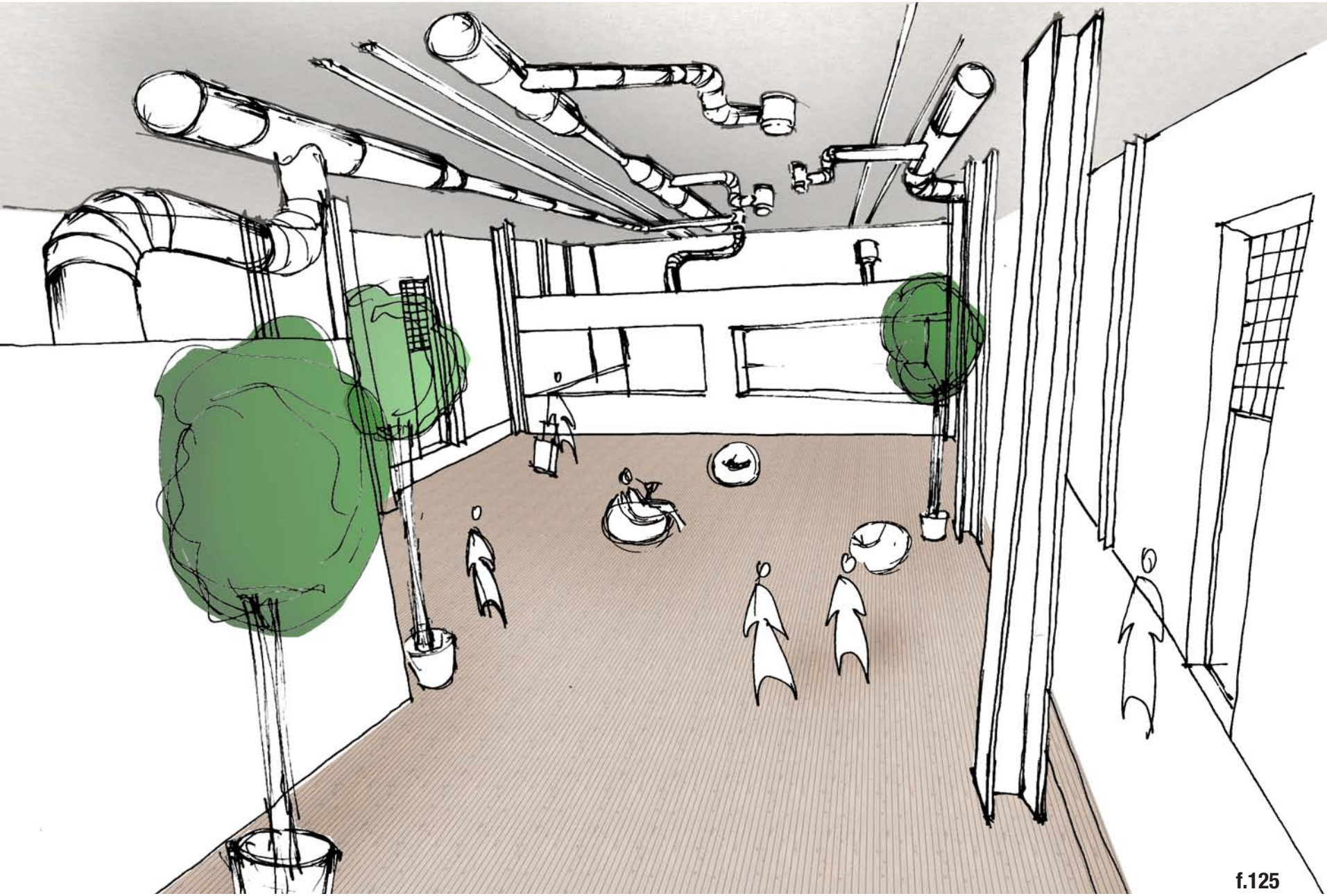


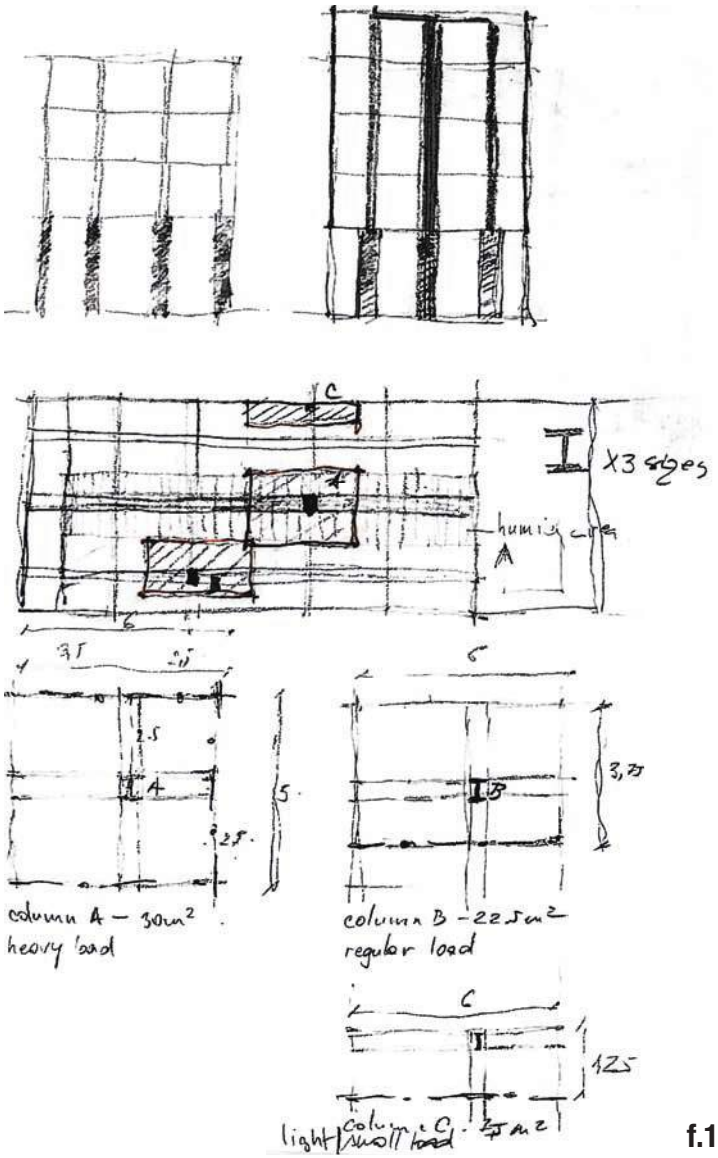
f.125

STRUCTURAL ANALYSIS

General description

In the context of building an extension and giving a new meaning to a heritage site, one must define an approach and goal for the end result. Part of our synopsis was from the very beginning the ideal of understanding and learning from the existing structure and its qualities while developing a new use and function.

The material used for the extension of the old storage unit is steel using different profiles such as HEA, U, IPE, UPE etc. While having in mind the tectonic principle used in the reinforced concrete structure of the main building, which relied on using different sections of elements according to the height, floor and loads, the principle of the additional building is to concentrate the heavy loads in the center of the building while keeping the exterior area as a circulation route and a lighter structure. By exposing the light structure and making it part of the whole steel structure, we intend to integrate the tectonic theory into our project



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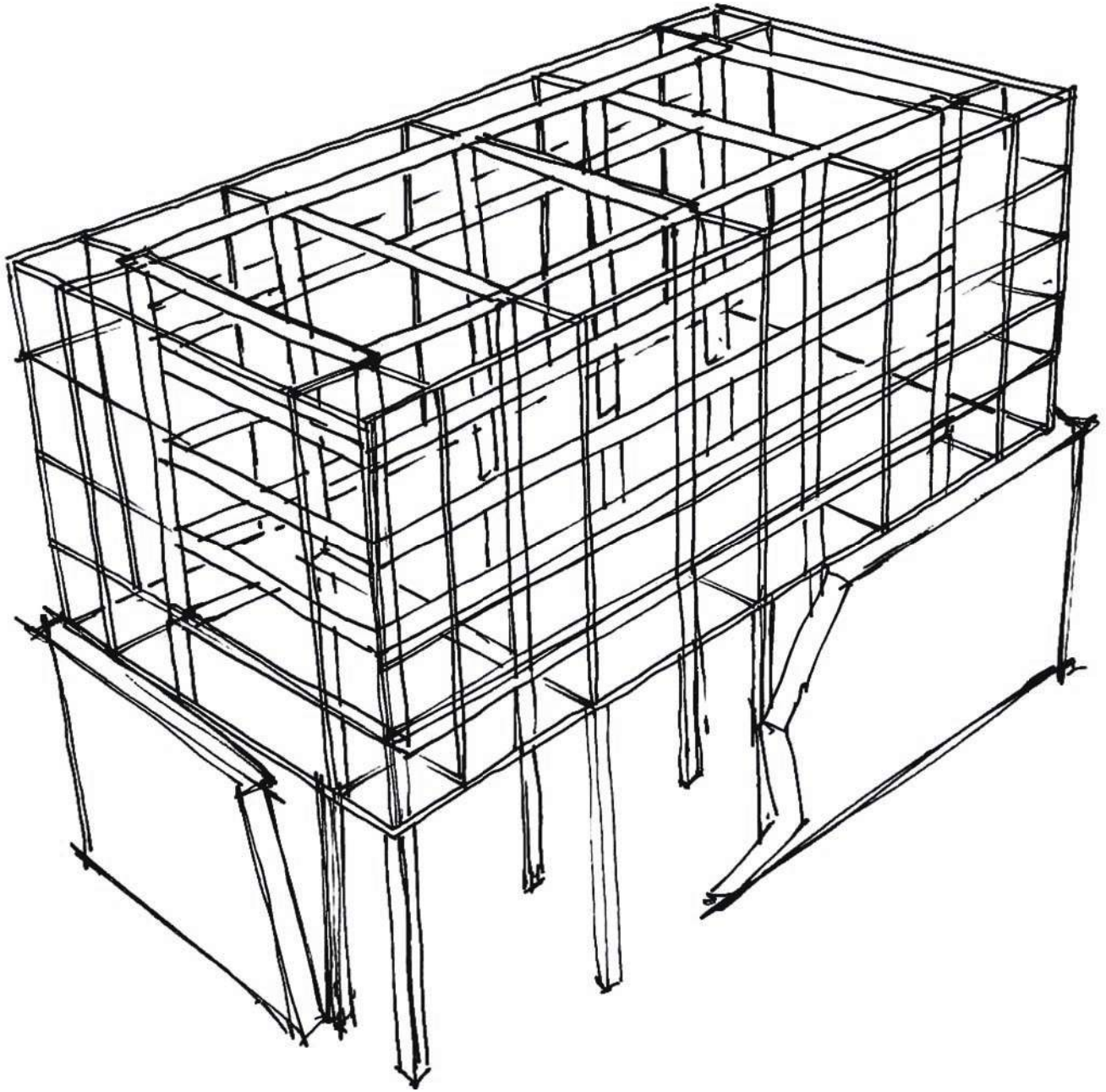

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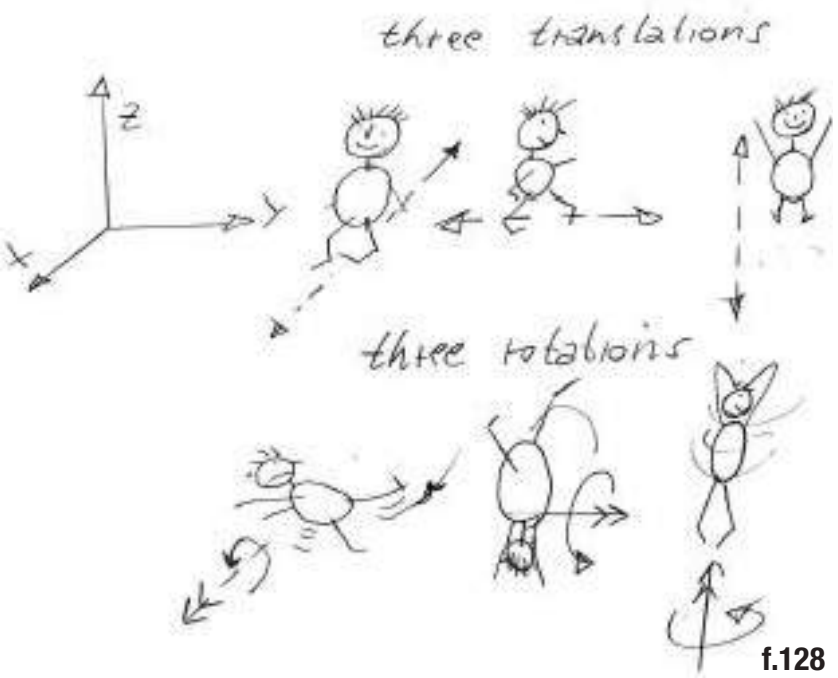
Supports

When analyzing the whole 3D structure of the hostel, several connection types were possible. Firstly, the bottom connection form a separate case, since they connect directly to the foundation. Secondly we have another group of connection to be considered, which are the ones close to the existing building, and weather we should connect to it literally becomes a question. Thirdly, all the other connections are calculated as hinges, since the calculations are made for the worst case scenario. The bottom supports are 6 meters in height, therefore the big buckling of the column requires a fixed connection to the bottom part. The structure has been calculated as independent from the existing building.



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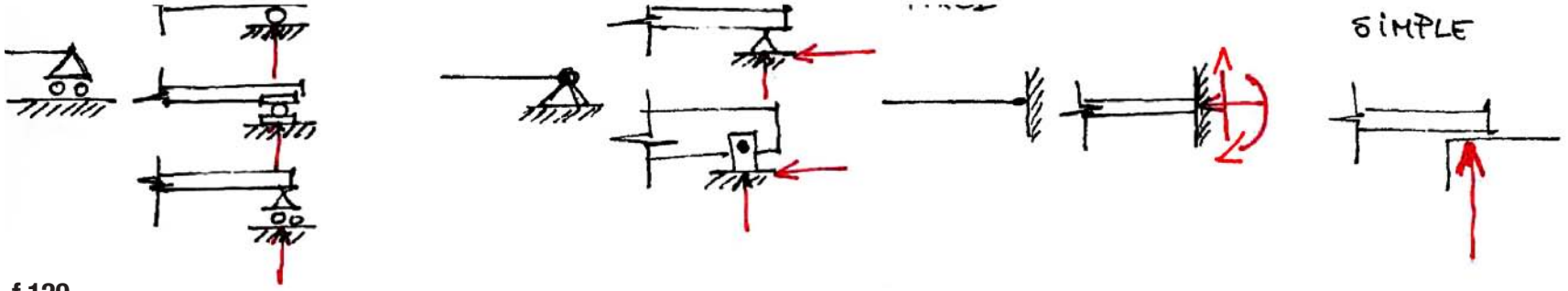

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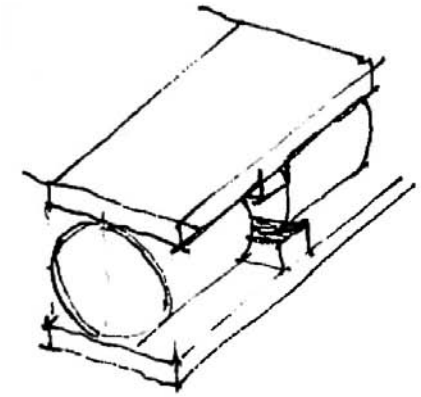

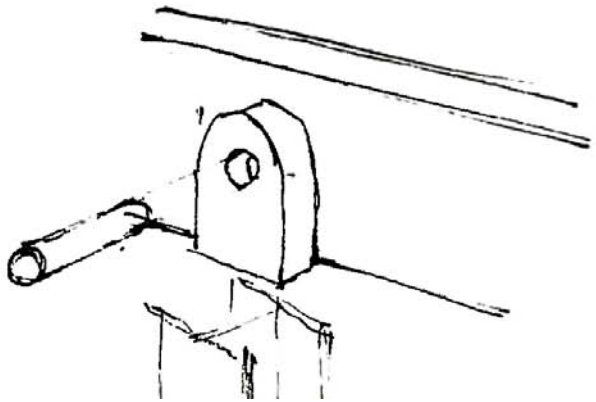

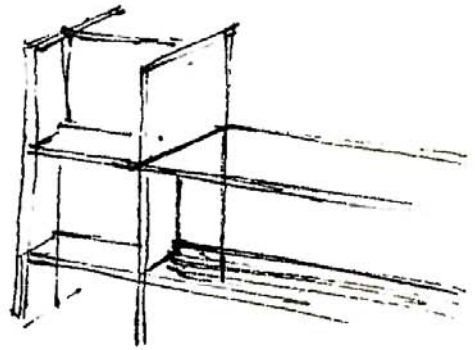

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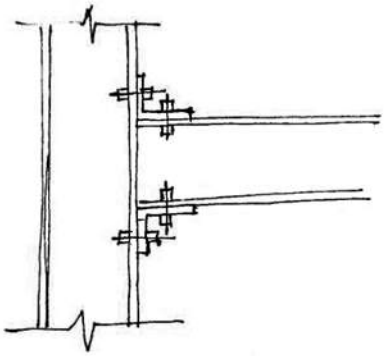

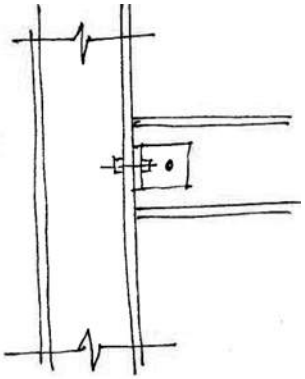

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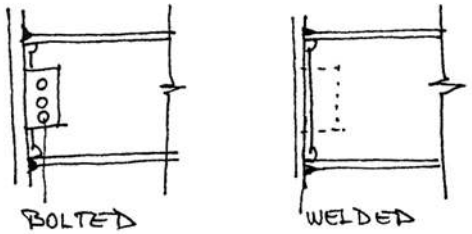

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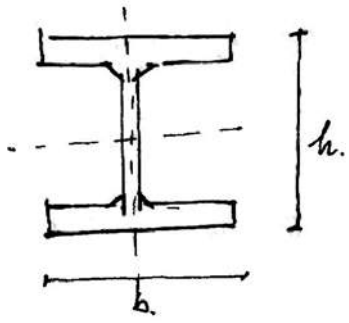

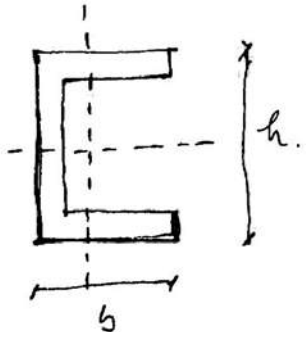

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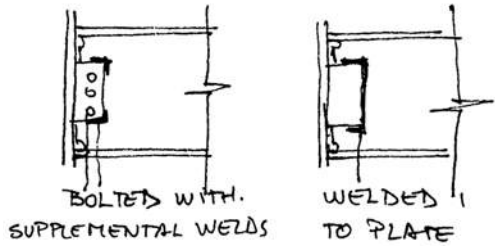


f.134

In order to calculate the exact dimensions of the structure forming the building, we have simplified the calculation by evaluating one vertical frame of the several repeating ones.

Designing the structure and evaluating the result is a process of several stages and each modification was made on conclusion drawn from the previous idea. In the following iterative frames our approach towards several elements has changed, this resulting in adding or removing parts of it. In an initial phase of the sketching part, vertical loads only have been considered, while giving all the elements the same size. The goal of these investigations was to find an argument for assigning different section profiles to the structure's elements, according to its imposed loads. The loads characteristic to the building frame consist of two facades applied as point loads, interior and exterior equipment load uniformly distributed on the beams, as well as uniform live loads such as wind or snow load.

Frame 01

The initial idea was to emphasize the fact that all the heavy weight of the building is placed in its core and theoretically it would have to support the biggest surface of the floor, therefore the idea was to separate the structure vertically by creating thicker frame in the middle continuing with middle size frames defining the shape of the building, and exposing the thinner structure of the circulation path. After analyzing such a model one can observe how because of the facade loads being applied locally are heavier and influence most the structure, and the middle column does not tend to play the intended role. The deformation however is small and the structure is rigid.

Frame 02

As a second step of the structural design process, the middle column was eliminated, while keeping the other frames with different dimensions. The span between the middle columns is 10 meters, therefore a bigger displacement is visible as well as tension in the middle of the beam and compression towards its connection with the column, to which buckling is transmitted.

Frame 03

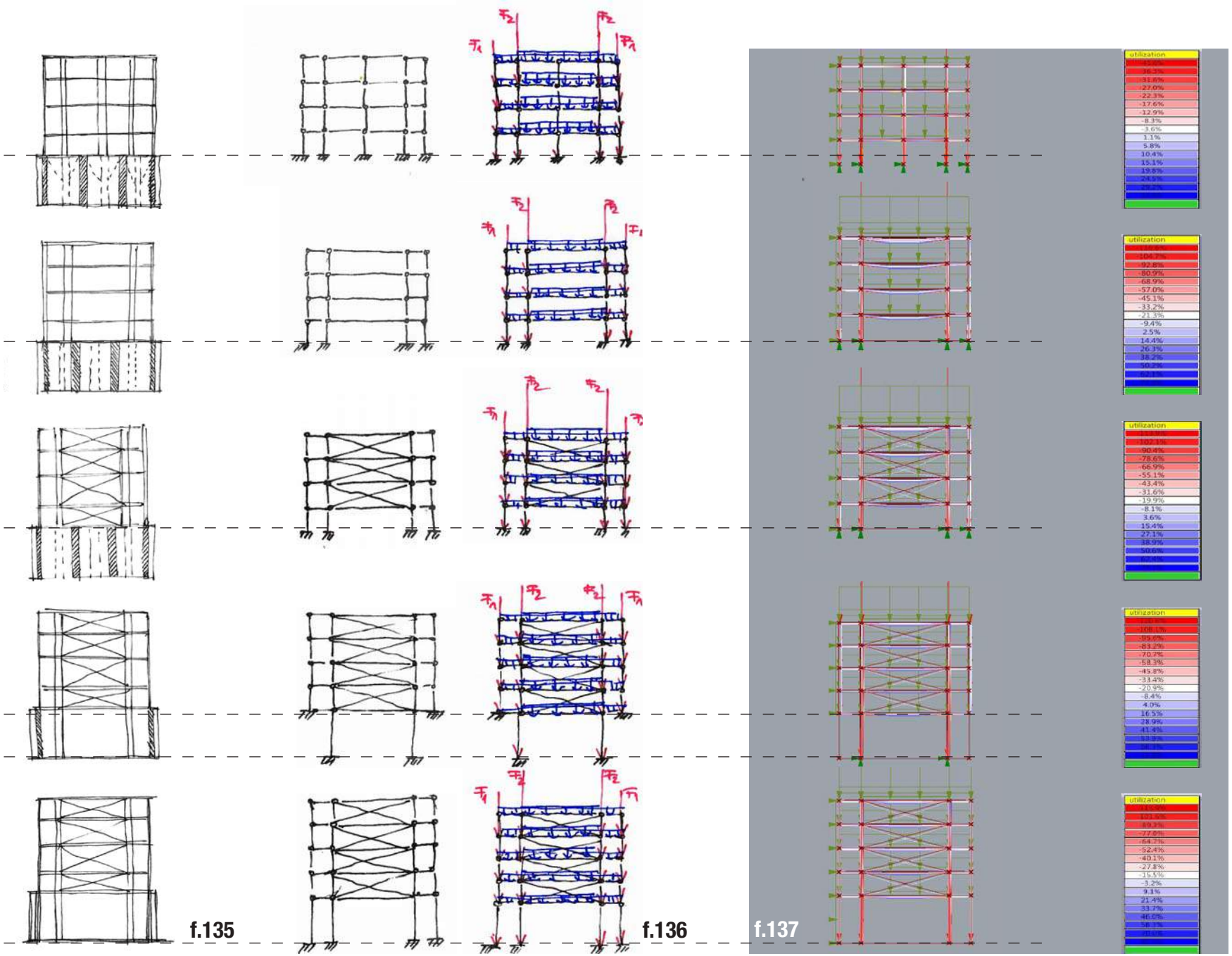
A third and important step was to assure the structure in the horizontal direction, by putting in wind crosses connecting the interior supports. The bottom part supports remain fixed, while the other are hinges. The displacement is noticeable smaller and the structure becomes more stable in the horizontal direction.

Frame 04

After evaluation the condition of the current structure on the ground floor, and after being told that the concrete used while building it was of poor quality, a decision had to be made weather to keep the old structure. In the first phase we decided to keep the existing concrete columns which are connected to the facade, and replace the other one by extending the existing structure below. The steel column connection with the foundation is considered fixed, as well as the steel connection with the concrete column on the facade. Due to the height of the ground floor of 6 meters, the utilization is bigger in the bottom columns, due to buckling.

Frame 05

In order to give the structure more stability and to be true to the concept of keeping the facade and structure as separate elements, a decision was made to keep the ground floor facade while building a continuous steel structure. Due to their fixed connection and height, the ground floor columns are the most solicited, therefore further investigations regarding exact dimensions will be made by exporting the structure to Robot and optimizing it.



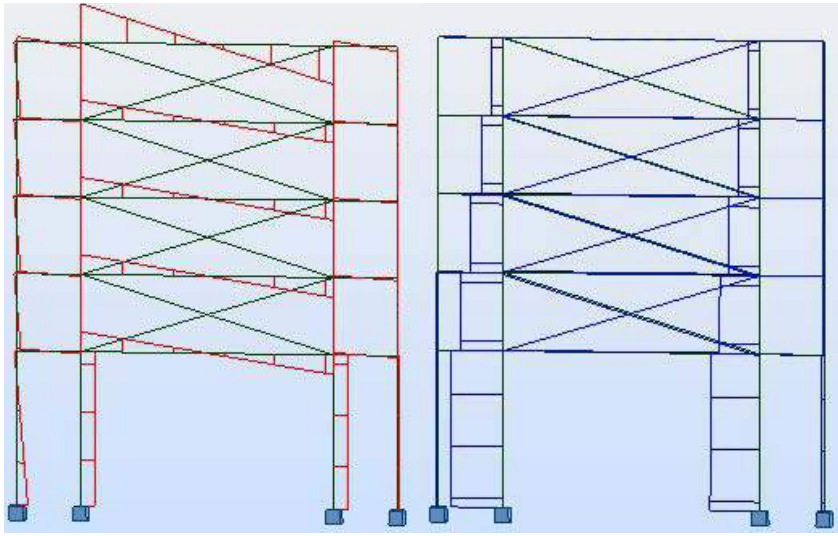
f.135 f.136 f.137

Optimizing the structure - Robot

The purpose of using Robot analysis was to find the right type of profiles for our structure and assess its members. Several options have been tried out, while aiming for a bigger ratio. Tools such as Grasshopper have been used for the pre-analysis of the structure, while further exporting the structure in Robot has lead us to an optimization of the member dimensions.

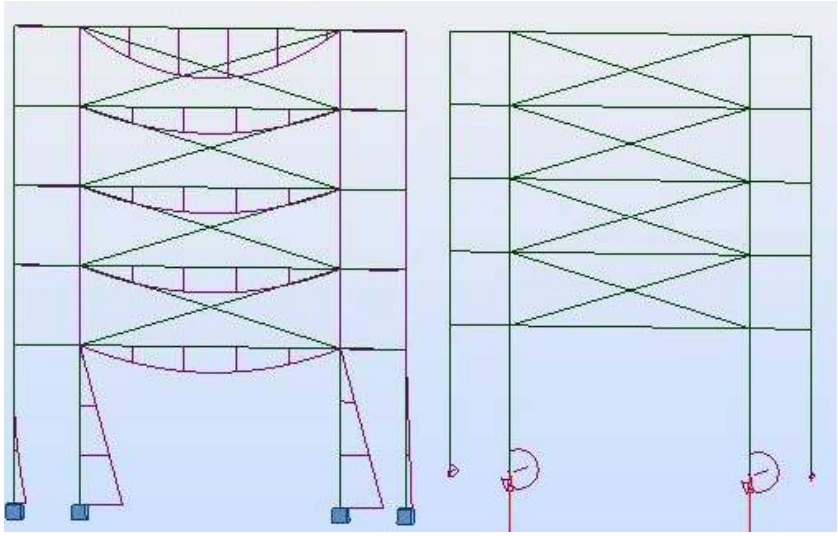
In the results diagrams one can see both the axial stress and the shear stress as results of vertical and horizontal loads. Moments occur at the bottom fixed part which are transmitted to the foundation. The reactions show the forces corresponding to each element, as well as the moments, where one can see the bigger moments at the bottom of the middle columns, and smaller ones at the other fixed connections.

Profiles HEA 300 were used for the main columns, with HEA 260 for the middle beams, which are continued with UPE 100 profiles for both the smaller beams and the exterior columns, except for the exterior columns of the ground floor, for which a UPE 220 profile is used.



f.138 vertical forces

f.139 horizontal forces



f.140 moments

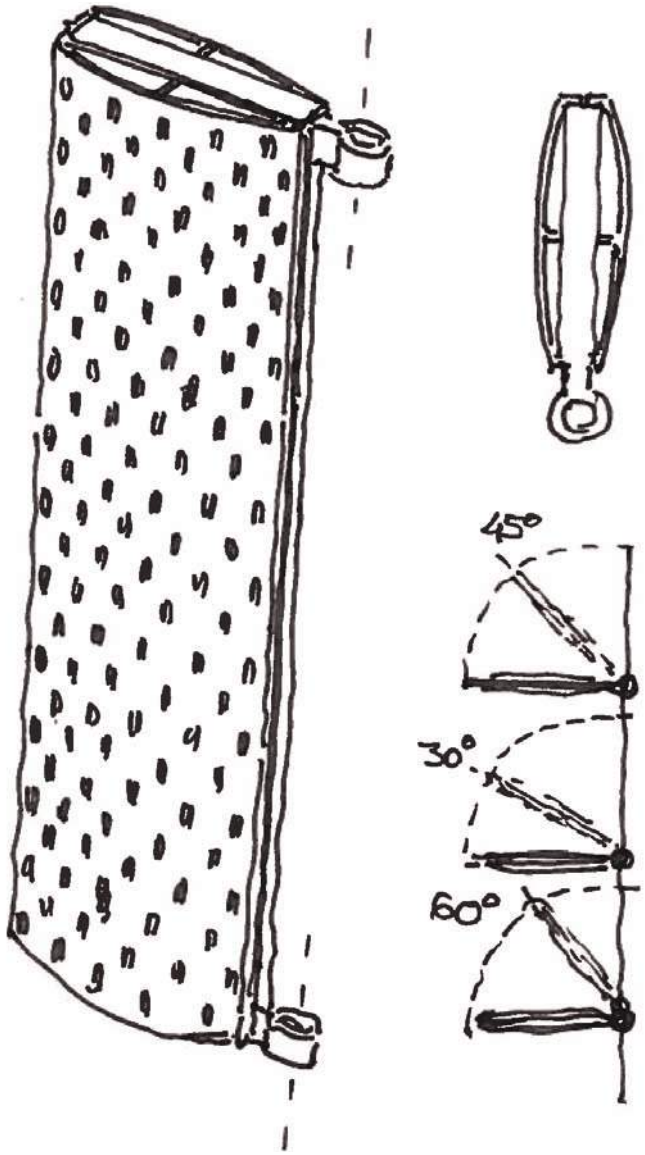
f.141 reactions

SUSTAINABLE SOLUTIONS

Even though the building has been functioning as a workspace for eight decades, the current conditions are not suitable for the newly implemented functions. Thermal and acoustic conditions represent the two main issues. The planned activities were separated according to the duration and noise level, so the most sensitive ones were placed in thermally and acoustically insulated boxes (the makerspace, the startup offices and the workshop). The lightweight structures improve the thermal conditions significantly while providing a soundproof environment for the louder activities and blocking the noise coming from the community space of the first two floors. The building envelope was also improved by the renovation of the existing windows and the addition of another layer of high-tech ones. The refurbishment included anti-reverberant acoustic plaster applied on the walls.

A new addition to the building, the hostel is built by using steel columns and beams. To eliminate the acoustic issues and cold bridges, thick layers of mineral wool insulation were applied. The unheated corridor surrounding the rooms provides a two meter thick layer of air gap further improving the thermal qualities of the rooms. The glass box like structure is prone to overheating, so external solar shading was implemented. With sensors constantly monitoring the external and internal conditions, this automated system can effectively regulate the heat-balance of the building, thus significantly reducing the energy used on ventilation and heating.

To provide energy to the mechanical ventilation systems, solar panels were added to roof. Connecting the building and the whole complex to district heating and the Danish power grid, makes the energy utilization even more effective.



f.142

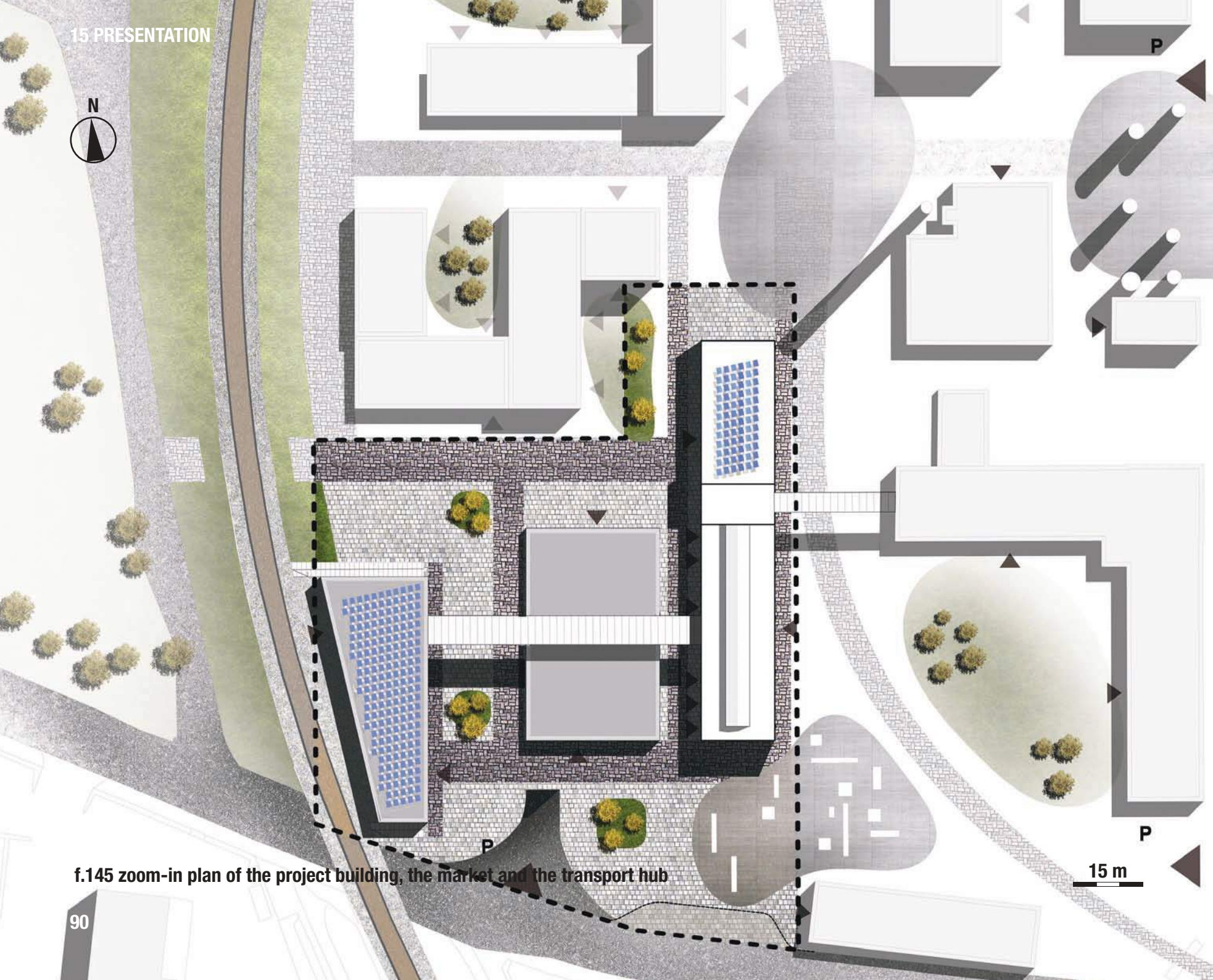
PRESENTATION

f.143 bird's eye view of the site - project building highlighted

15.1 MASTERPLAN

The masterplan shows general intentions towards this site, and our vision for this particular complex of buildings. On a zoomed out level, the suggested buildings are placed according to the masterplan intentions, while not detailing them. Zooming in on the detailing area, one can see that the focus of the project is the former silo/storage building, while the train station, the market and the bridge suggested remain on a sketching level.

masterplan of the site f.144



f.145 zoom-in plan of the project building, the market and the transport hub

15.2 BUILDING OVERVIEW

The new intervention on the old facade is minimal, while trying to be humble and true to the existing heritage. Minimal interventions have been made, however, such as extending the windows from the ground floor all the way down, in order to get more visibility from the outside in, and many entrances have been suggested. The facade of the extension relates to the old building by using a simple, clear and modest architectural language. The steel structure is visible at the exterior, in an attempt to be honest to the structure and tectonic theories.

visualization - view from the northwest f.146

15 m

western facade f.147

f.146 visualization - view from th southwest

15 m

eastern facade f.149

15 m

southern facade f.150

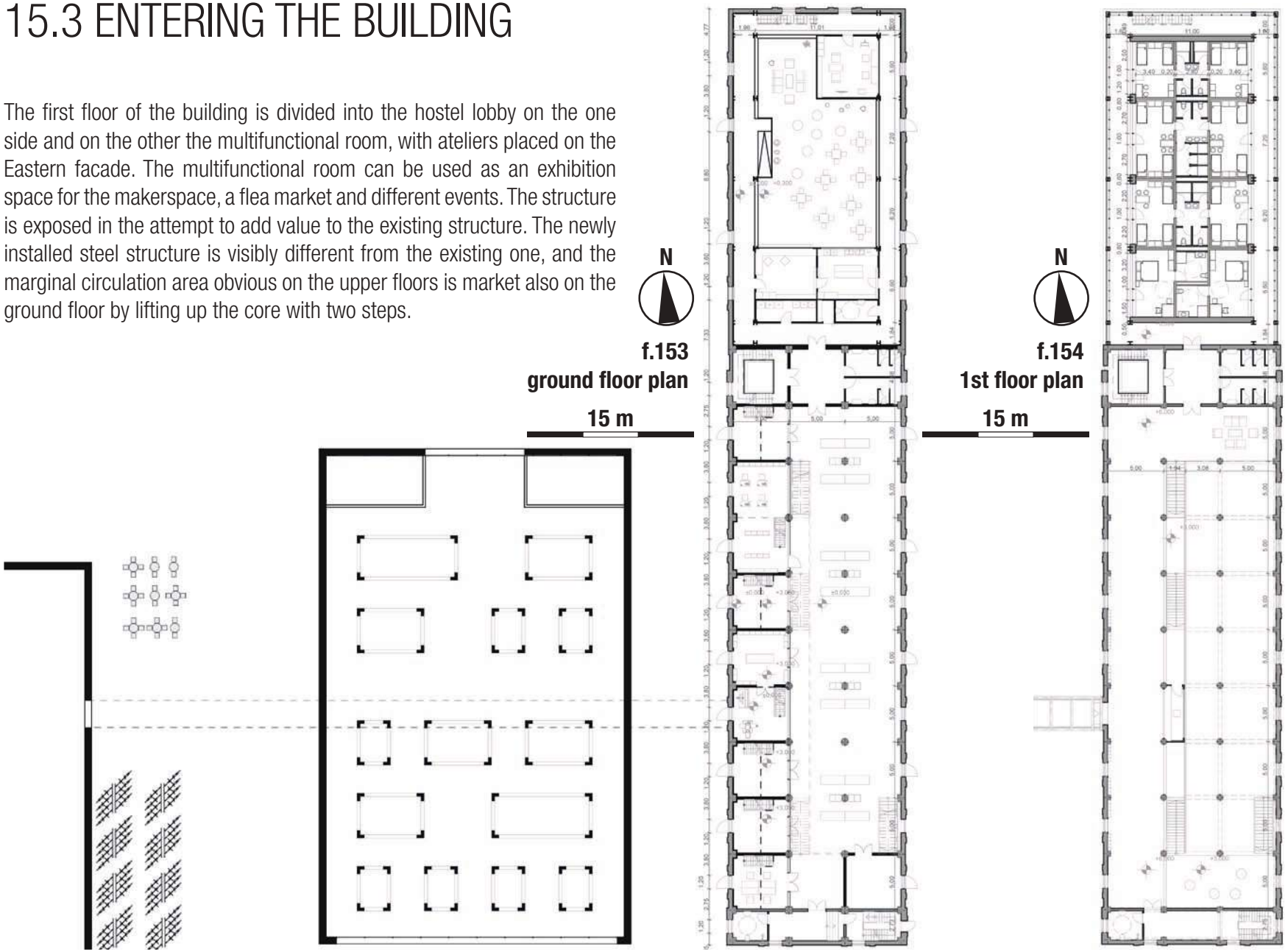
15 m

northern facade f.151

f.152 visualization - main community space

15.3 ENTERING THE BUILDING

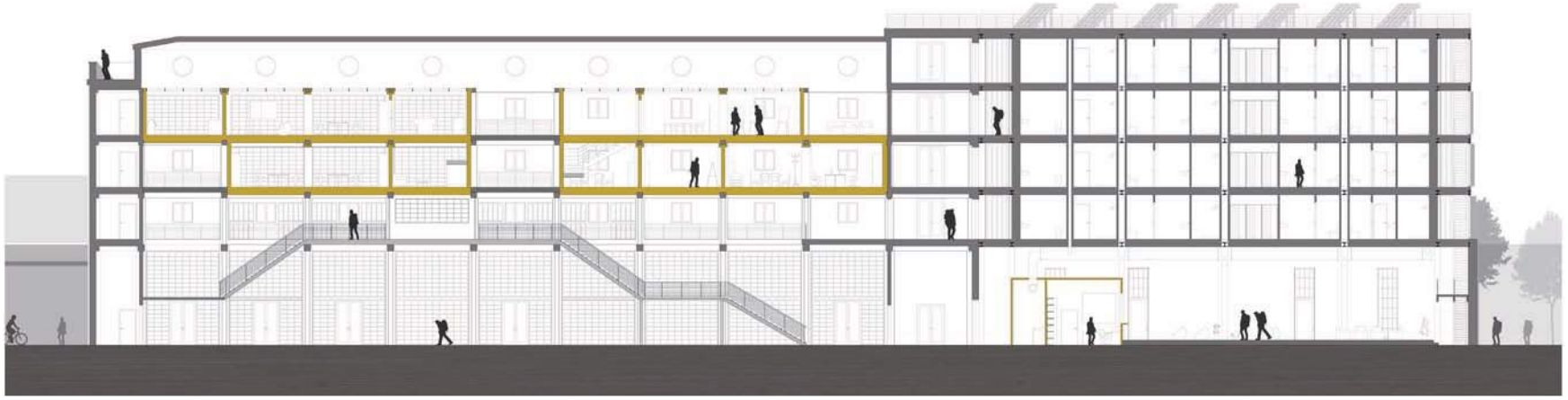
The first floor of the building is divided into the hostel lobby on the one side and on the other the multifunctional room, with ateliers placed on the Eastern facade. The multifunctional room can be used as an exhibition space for the makerspace, a flea market and different events. The structure is exposed in the attempt to add value to the existing structure. The newly installed steel structure is visibly different from the existing one, and the marginal circulation area obvious on the upper floors is market also on the ground floor by lifting up the core with two steps.



f.153
ground floor plan

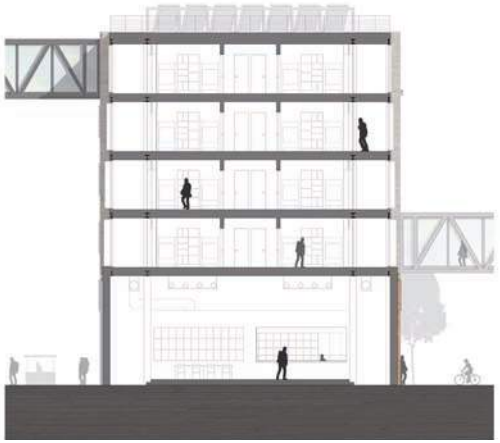
f.154
1st floor plan

f.155 visualization - main community space



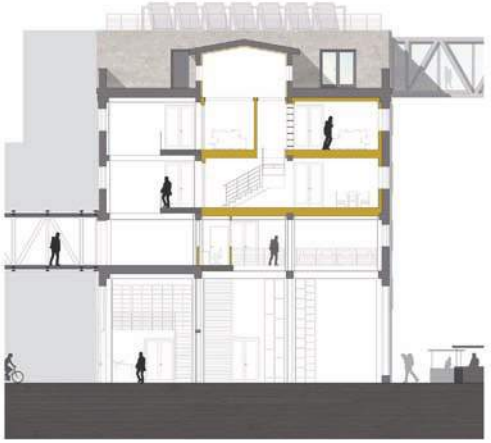
15 m

longitudinal section f.156



15 m

transversal section - hostel f.157



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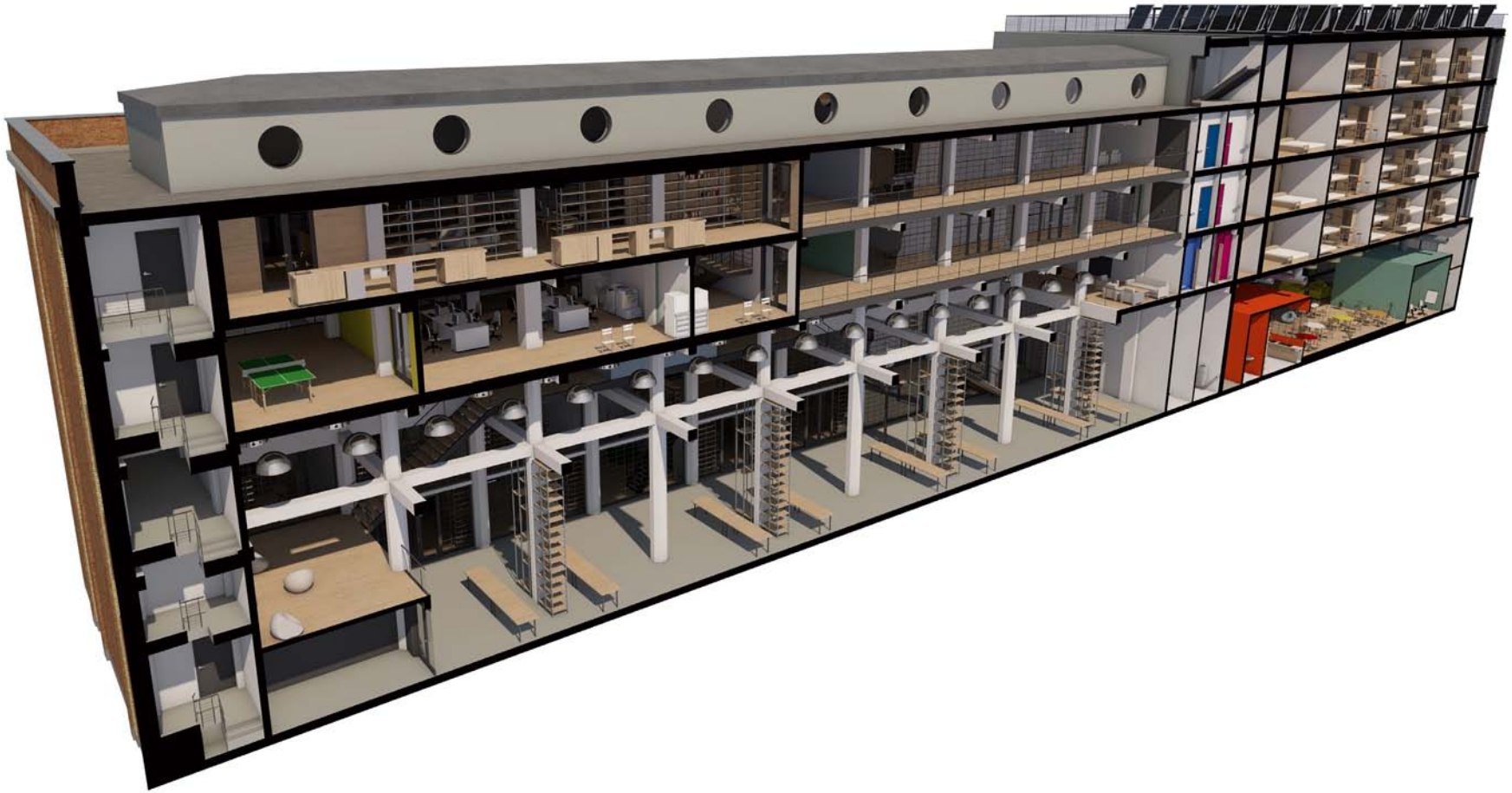
transversal section - community building f.158



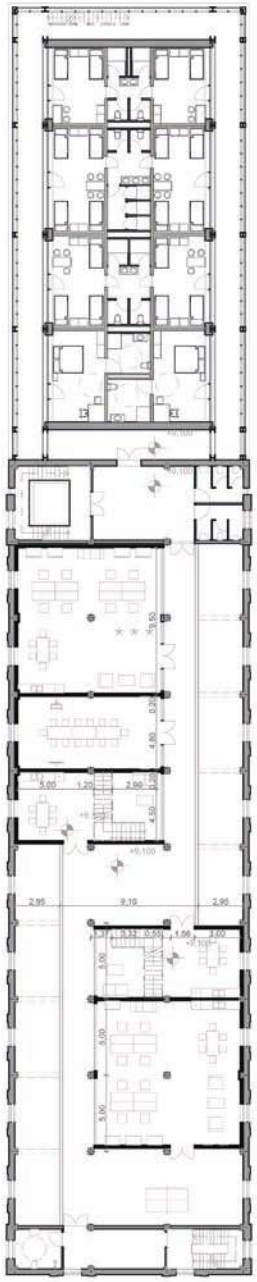
f.159 longitudinal 3D section

15.4 SPECIAL FUNCTIONS

The second and third level of the community building are reserved for the makerspace, the workshop as well as the start-up business spaces. The hostel floors are identical from the 1st floor to the 4th, with minor modifications on the 5th level, where a technical room for the solar panels has been installed. The layout of the rooms depend on the number of persons, varying from 2 to 8 persons per room. The circulation is kept on the exterior corridors.

visualization - makerspace f.160

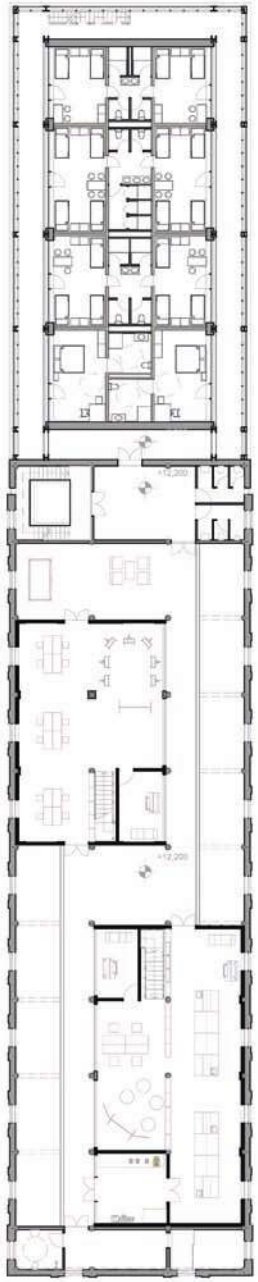
f.161 3D double section



N

15 m

f.162
2nd floor plan



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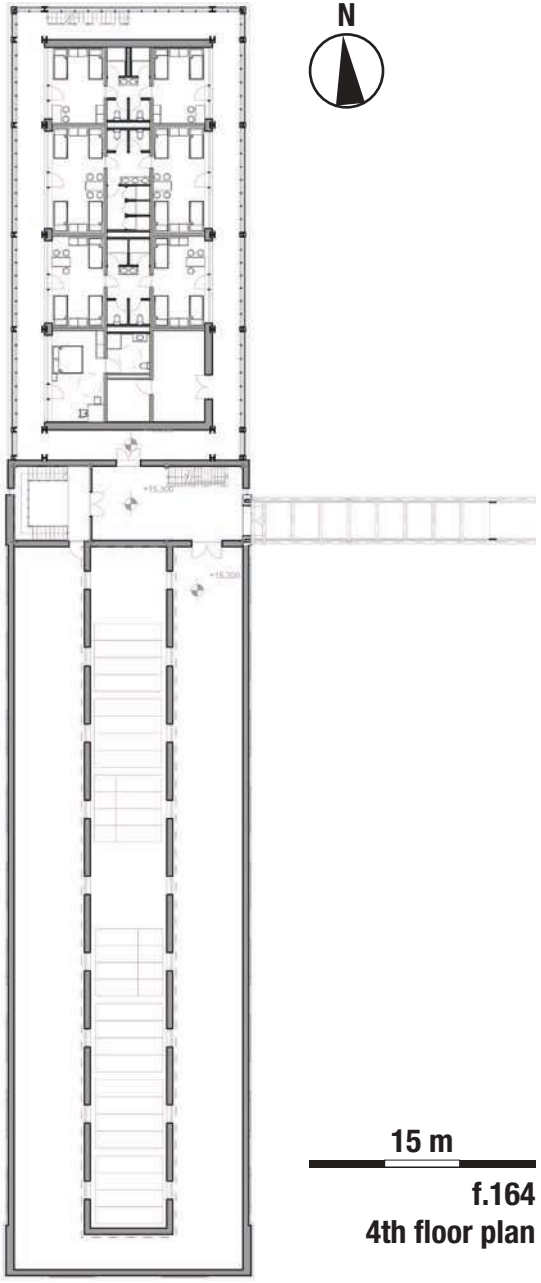
f.163
3rd floor plan



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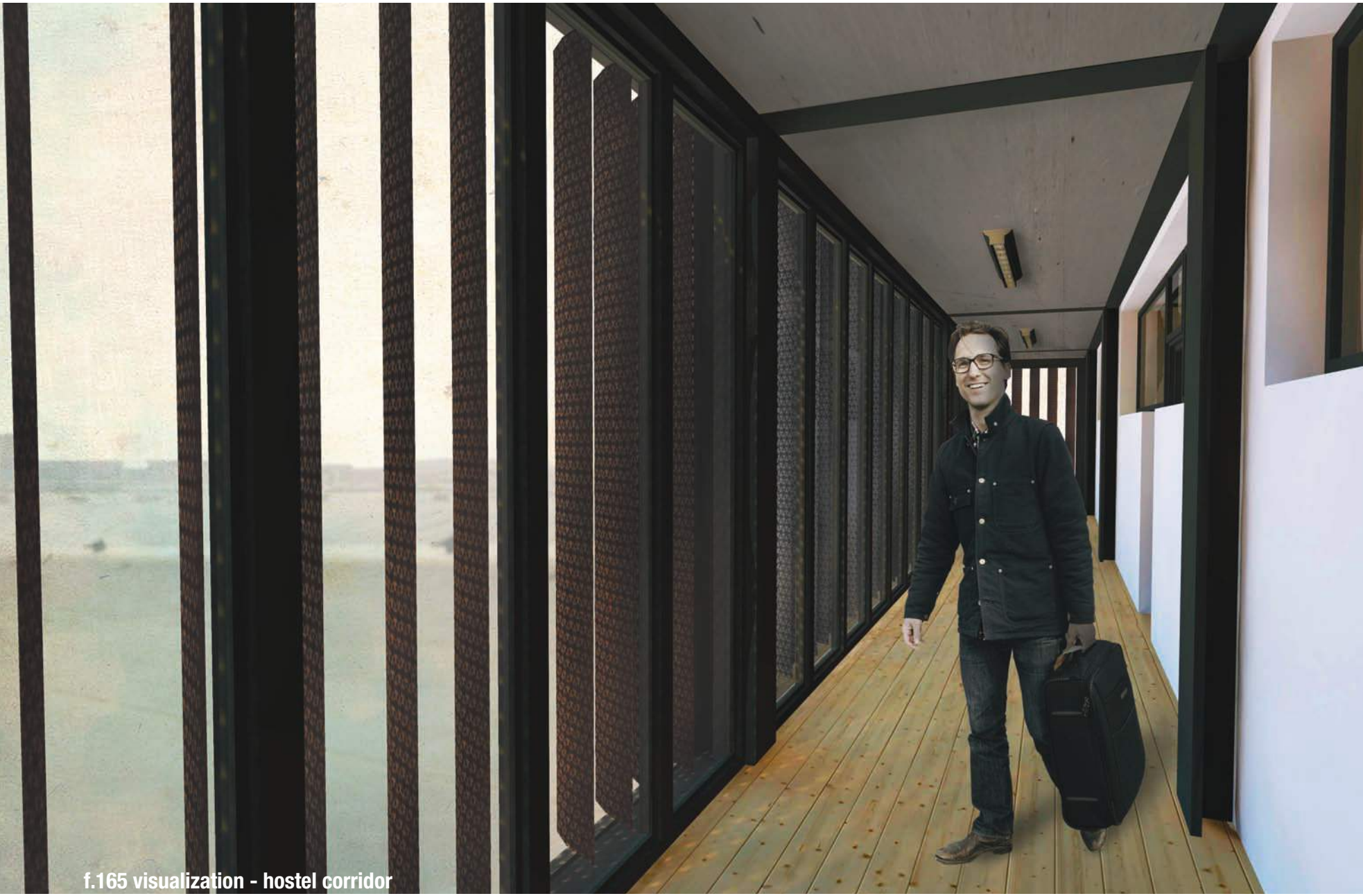
f.164
4th floor plan



f.165 visualization - hostel corridor

CONCLUSION

The size of the former Akvavit complex as well as the current undefined area where it is situated, lead us to develop a masterplan as a general vision for the district. Our vision is to ensure the functional and social sustainability of the misused site, while keeping a balance and creating a connection between community and cultural functions, dwelling, retail and the city's infrastructure.

The challenges we face working with this topic include adaptive reuse methods and theories while building in the context of industrial heritage site. The purpose of the project however is to investigate adaptive reuse possibilities as well as contemporary connections to heritage buildings. While the main function of the community center is to promote social and interdisciplinary actions, this specific building represents our intention of reintegrating activities and communities of a valuable site into the city. Our general attitude towards this type of both urban and architectural interventions is a humble one.

The idea of separation of the elements of a building is found in many theories, while being associated with space-time dialog or just considered true to its function, and in this project we tried to merge social goals

REFLECTIONS

Reflecting upon the theme and intended project, one can find many different solutions to a problem. The solution we chose to pursue could also be improved on many levels, functional, design wise or structurally. Different structural design solutions could be implemented, as well as improving the existing one and as any other design project, the iterations could continue endlessly. However the humble attitude towards the surrounding heritage site we considered to be of great value, as well as the social sustainability aspect of the functional arrangement.

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f.068 Received as email attachment from the operators of NOD makerspace, Bucharest, Romania.
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f.001 - f.003, f.005, f.030, f.032, f.036 - f.038
Received as email attachment from the developer of the site, A. Enggaard A/S, Svenstrup, Denmark.

f.004, f.014 - f.015, f.031, f.033 - f.035, f.039 - f.049, f.064 - f.066, f.074 - f.075, f.084 - f.0127, f.0129 - f.136, f.142
Hand drawings made by Group 44 during the 4th semester Architecture MSc.

f.006 - f.013
Screenshots taken from Google Maps.

f.016 - f.020, f.027 - f.029, f.060 - f.063, f.067, f.078 - f.083, f.143 - f.168
Digital images made by Group 44 during the 4th semester Architecture MSc.

f.021 - f.026
Photos taken by Group 44 during the 4th semester Architecture MSc.

f.128
Diagram taken from Karamba manual.

f.137
Screenshots taken from Grasshopper.

f.138 - f.141
Screenshots taken form Autodesk Robot.

ANNEX

ANNEX 01 : HAND CALCULATIONS

WIND LOAD :

BASIC VALUES :

$v_b = c_{dir} \times c_{season} \times v_{b,0}$

// v_b - basic wind velocity

// c_{dir} - directional factor (1.0)

// c_{season} - seasonal factor (1.0)

// $v_{b,0}$ - fundamental value of the basic wind velocity

DK: $v_b = 27 m/s$

$c_{dir} = 1.0$

BASIC VELOCITY PRESSURE

$q_b = \frac{1}{2} \times \rho_{air} \times v_b^2$

// $\rho_{air} = 1.25 kg/m^3$

$\Rightarrow q_b = \frac{1}{2} \times 1,25 \times 27^2 = 455,62 N/m^2$

PEAK PRESSURE

$q_p(z) = [1 + 7 I_v(z)] \times \frac{1}{2} \times \rho \times v_m(z)^2$

$\Rightarrow$ calculation of $v_m(z)$ - mean wind velocity

$v_m(z) = c_r(z) \times c_0(z) \times v_b$

orography f. roughness f.

$c_r(z) = k_r \times \ln\left(\frac{z}{z_0}\right)$ $z_{min} \le z \le z_{max}$ z_0 - roughness factor, k_r - terrain factor

$k_r = 0,19 \times \left(\frac{z_0}{z_{0,II}}\right)^{0,07}$ terrain category II $\Rightarrow z_{0,II} = 0,05$

$z_{min} = 2 m$

$z_{max} = 200 m$

$\Rightarrow$ calculation of $I_v(z)$ - turbulence intensity

$I_v = \frac{k_l}{c_0(z) \times \ln(z/z_0)}$ $\left.\begin{matrix} k_l = 1 \\ z = 12,4 \end{matrix}\right\} \Rightarrow$

$q_p(z) = \left[1 + \frac{7 k_l}{c_0(z) \cdot \ln(z/z_0)}\right] \times \frac{1}{2} \times \rho \times v_b^2 \times \left(k_r \times \ln\left(\frac{z}{z_0}\right)\right)$

basic pressure | wind profile

$q_p(z) = \left[1 + \frac{7}{\ln(12,4/0,05)}\right] \times \frac{1}{2} \times 1.25 \times 27^2 \times \left\{0,19 \times \left(\frac{0,05}{0,05}\right)^{0,07} \times \ln(12,4/0,05)\right\}^2$

$q_p(z) = \left[1 + \frac{7}{5,51}\right] \times 455,6 \times (0,19 \times 5,51)^2$

$q_p(z) = (1 + 1.27) \times 455.6 \times 1.08 = 1116,94 N/m^2$

$q_p(z) = 1,1 kN/m^2$.

$(c_{pe} + c_{pi}) \times q_p(z) \times s$

$(0,7 + 0,2) \times 1.1 \times 6,5 = 1.09 kN/m^2$.

$1.09 \times 6,5 = 6,435 kN/m$.

SNOW LOAD :

$s = \mu_i \times C_e \times C_t \times s_k$

// μ_i - roof slope coefficient
// C_e - exposure coefficient (1.0)
// C_t - thermal coefficient (1.0)
// s_k - characteristic value of ground snow load for the relevant altitude
// $0° \leq \alpha \leq 30° \Rightarrow \mu_i = 0.8$

- SNOW LOAD ON THE GROUND

$s_k = (0,264 \times 2 - 0,002) \times \left[1 + \left(\frac{A}{256}\right)^2\right] kN/m^2$

// 2 - zone number (2)
// A - altitude above sea level A = 10m

$s_k = (0,264 \times 2 - 0,002) \times \left[1 + \left(\frac{10}{256}\right)^2\right]$

$s_k = 0,526 \times (1 + 0,0009)$

$s_k = 0,526\ kN/m^2$.

~~- SNOW LOAD ON AN INTE~~

- SNOW LOAD ON THE ROOF

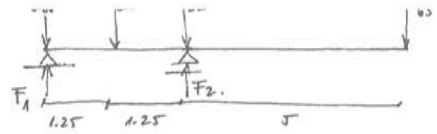
$s = 0.8 \times 1 \times 1 \times 0,526$

$s = 0,421\ kN/m^2$

//Spacing = 6,5m =>

=> SNOW LOAD FOR AN INTERNAL FRAME :

$s = 0,421 \times 6,5 = 2,73\ kN/m$.



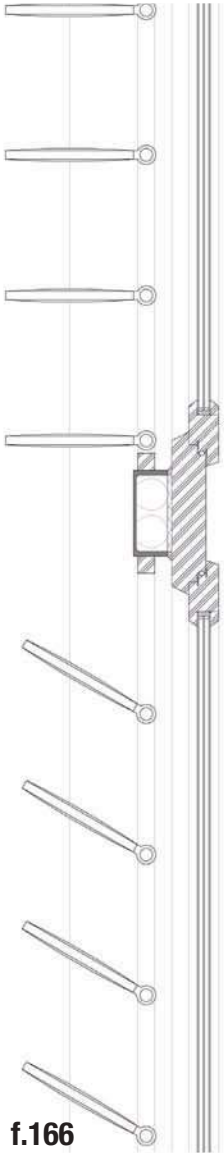
$0 = -0,35 \times 2.5 + F_1 \times 2.5 - 32.5 \times 1.25 + 65 \times 5$

$0 = -0.875 + 2.5 F_1 - 40.62 + 650$

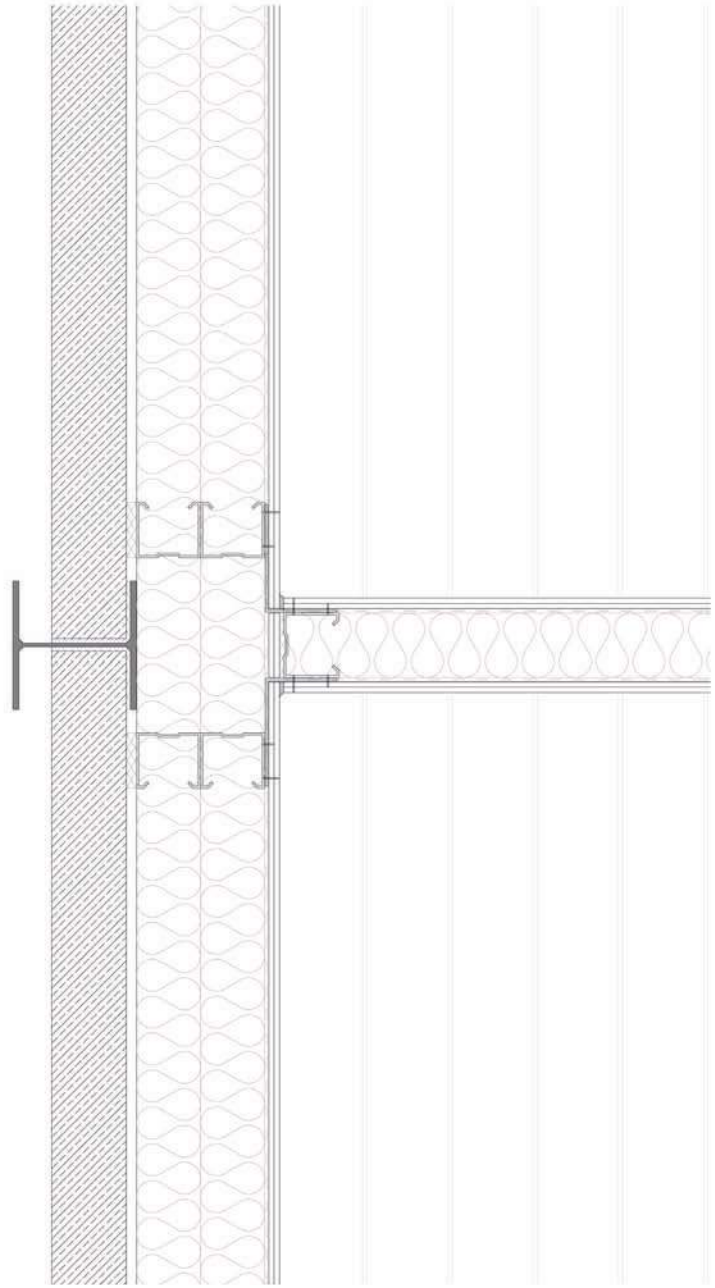
$F_1 = -113.40\ kN$

$F_1 + F_2 = 129,89\ kN \Rightarrow F_2 = 243,29\ kN$.

ANNEX 02 : DETAILS



f.166



Wall section of boxed functions in the community building

LAYER ORDER 01: MAIN WALL (from the corridor to the inside)
- paint
- 175 mm reinforced concrete stabilizing wall
- 150 mm mineral wool insulation (150 mm steel frame)
- 150 mm mineral wool insulation (150 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

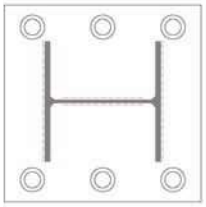
- U-value (total): 0,12 W/m^{2}K

LAYER ORDER 02: INTERNAL WALL
- paint
- 2 x 12,5 mm fire resistant plasterboard
- perforated absorptive surface
- 100 mm mineral wool insulation (100 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

- U-value (total): 0,33 W/m^{2}K
- airborne acoustic insulation: 55 dB
- impact acoustic insulation: 43 dB

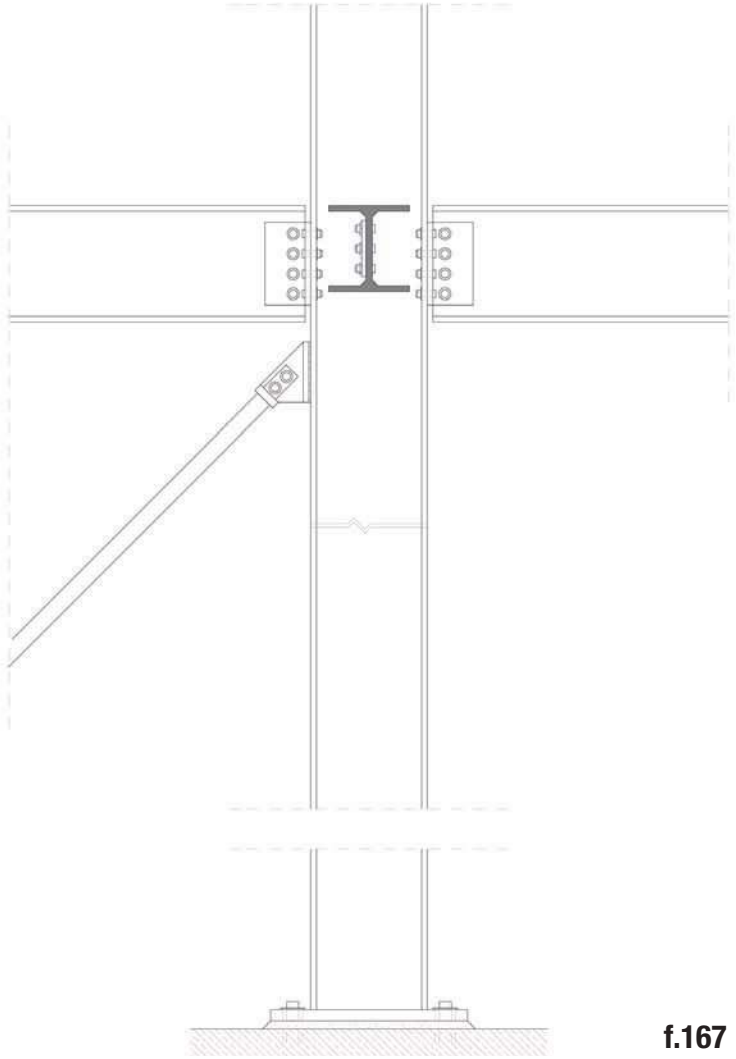
LAYER ORDER 03: EXTERNAL WALL (from the outside to the inside)
- automatic, perforated, steel solar shading system
- triple glazed, insulated, wooden window

- U-value (total): 0,91 W/m^{2}K

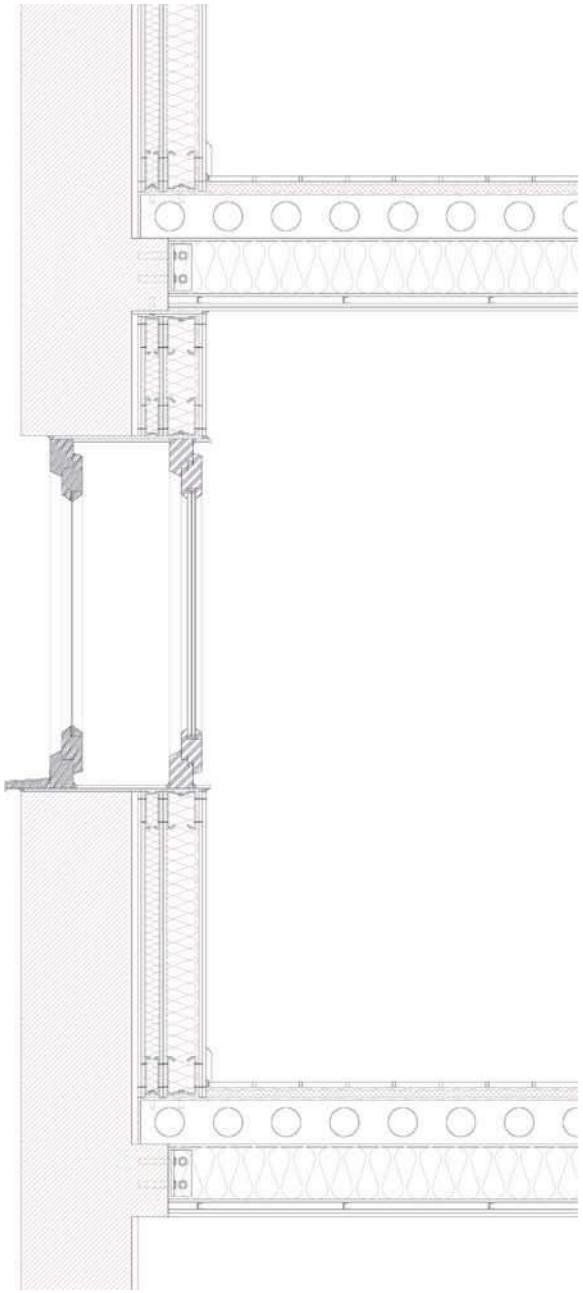


Hinged joint of steel beams and column

- bolted, one-sided joints
- wind cross
- column welding far underneath the joint
- fixed bottom joint



f.167



f.168

Wall section of boxed functions in the community building

LAYER ORDER 01: WALL (from the outside to the inside)
- 380 mm brick wall
- 20 mm acoustic plaster
- 2 x 12,5 mm fire resistant plasterboard
- 50 mm mineral wool insulation (50 mm steel frame)
- 2 x 12,5 mm fire resistant plasterboard
- 100 mm mineral wool insulation (100 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

- U-value (total): 0,20 W/m^{2}K
- U value of the brick wall: 1,51 W/m^{2}K
- U-value of the single glazed, not insulated, wooden window: 4,8 W/m^{2}K
- U-value of the triple glazed, insulated, wooden window: 0,91 W/m^{2}K
- airborne acoustic insulation: 59 dB
- impact acoustic insulation: 47 dB

LAYER ORDER 02: FLOOR (from the top to the bottom)
- 18 mm floorboard
- stabilizing film
- 25 mm mineral wool insulation
- soundproofing mat
- 150 mm precast, hollow concrete panel
- 180 mm mineral wool insulation (200 mm steel secondary beam)
- 25 mm railing + air gap
- 2 x 12,5 mm fire resistant plasterboard
- paint

- airborne acoustic insulation: 58 dB
- impact acoustic insulation: 60 dB
- U-value (total): 0,16 W/m^{2}K

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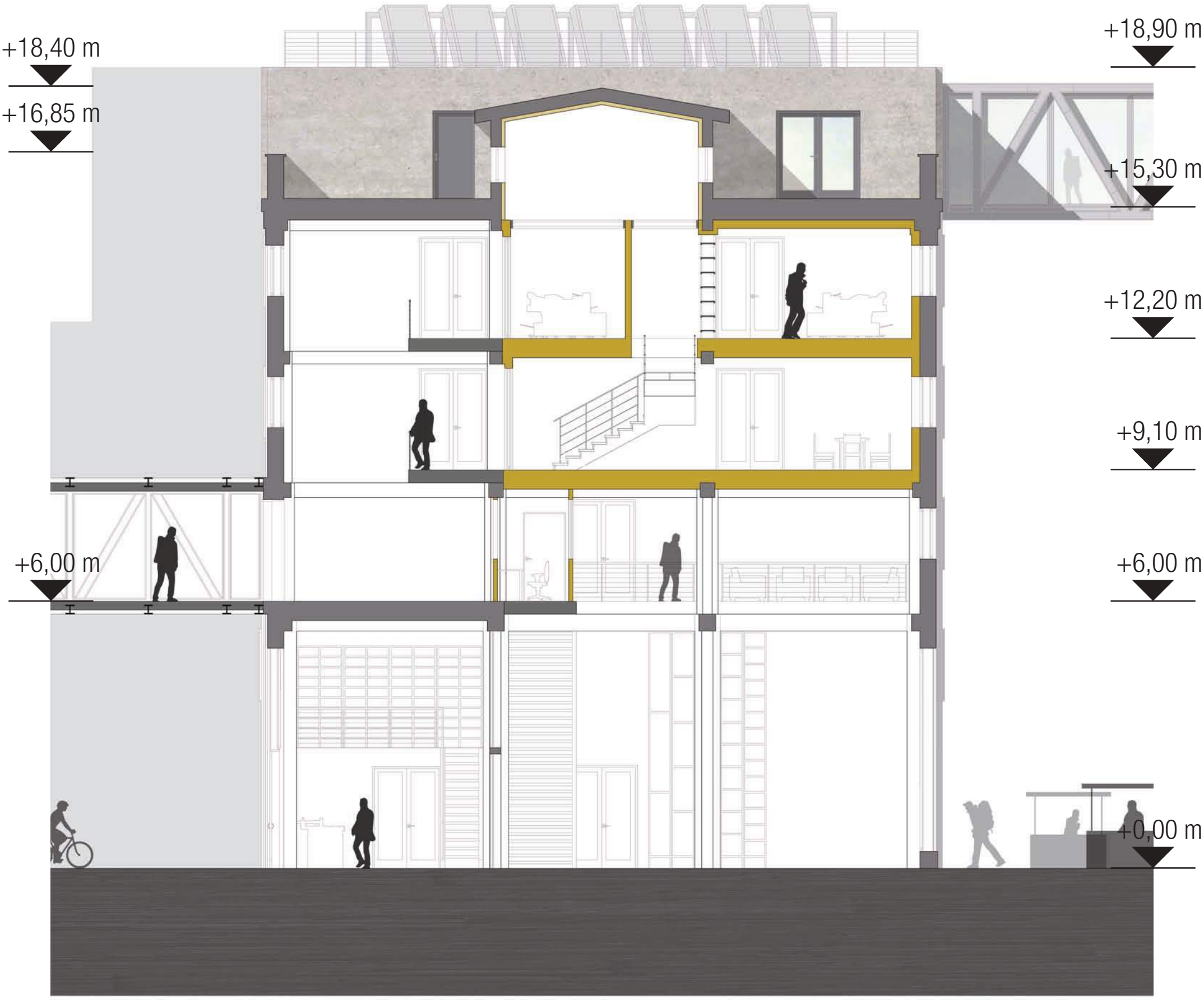
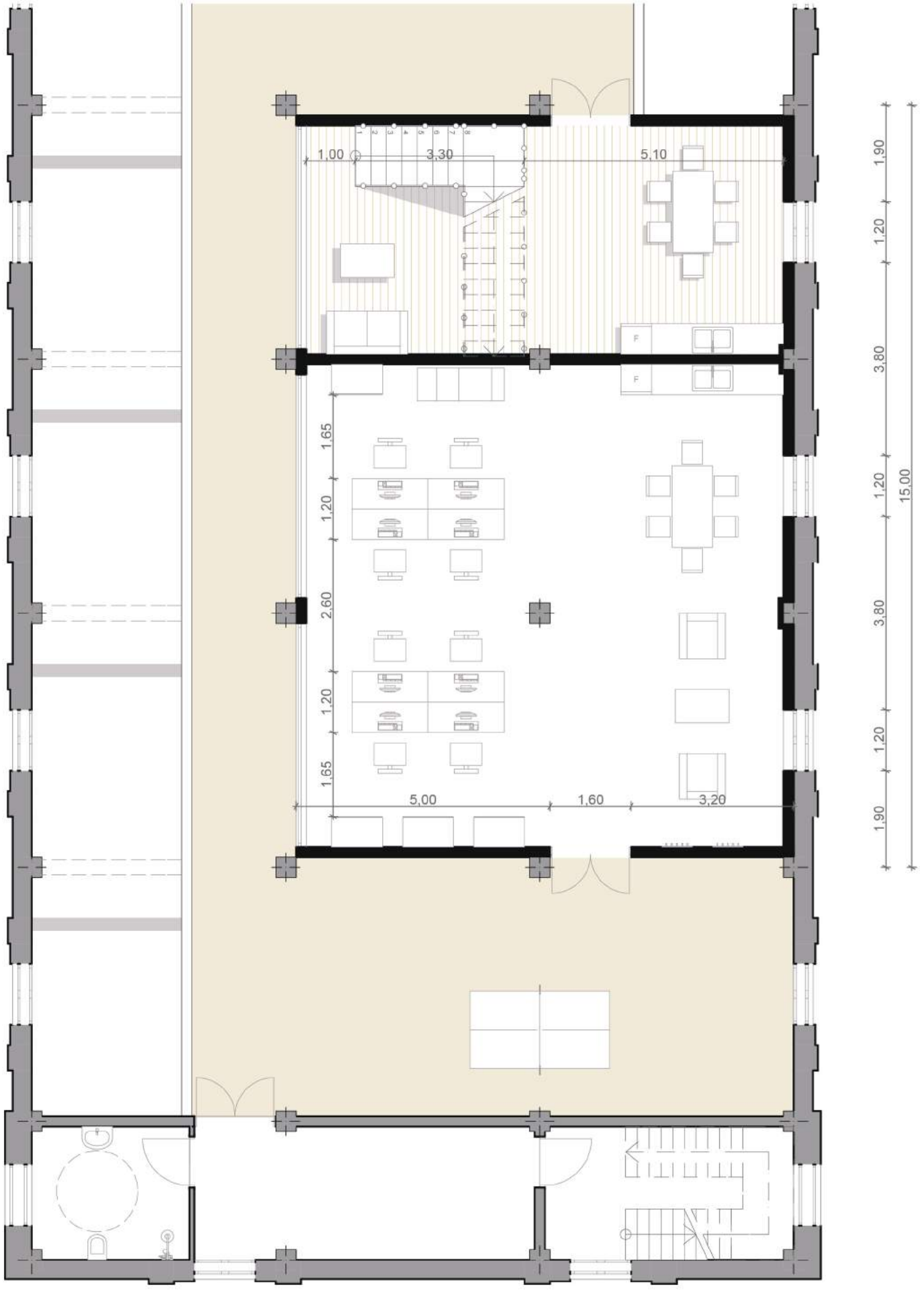
TRANSVERSAL SECTION - HOSTEL 1:100



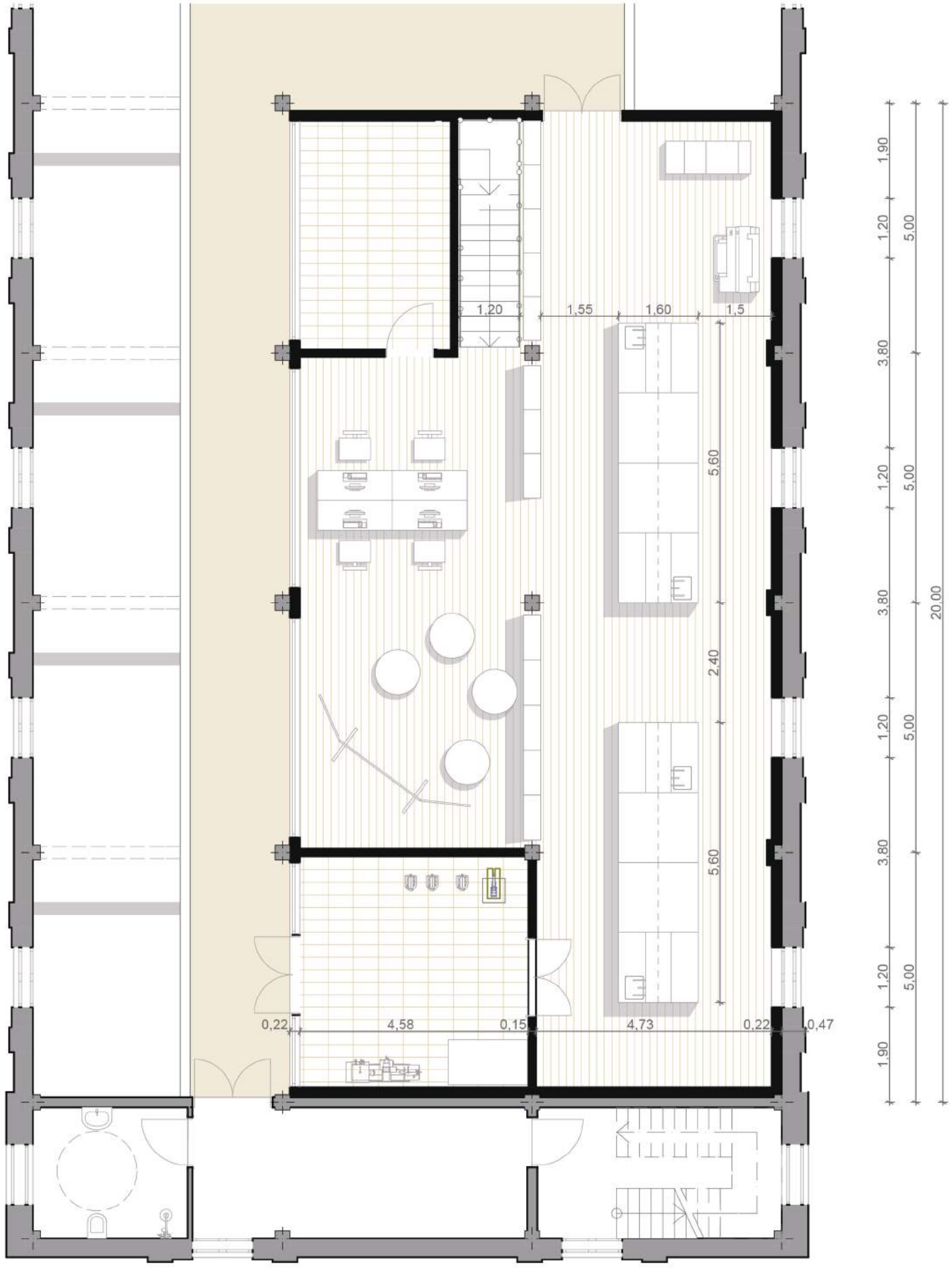
TRANSVERSAL SECTION - HOSTEL 1:100

FLOOR PLANS - MAKERSPACE 1:100

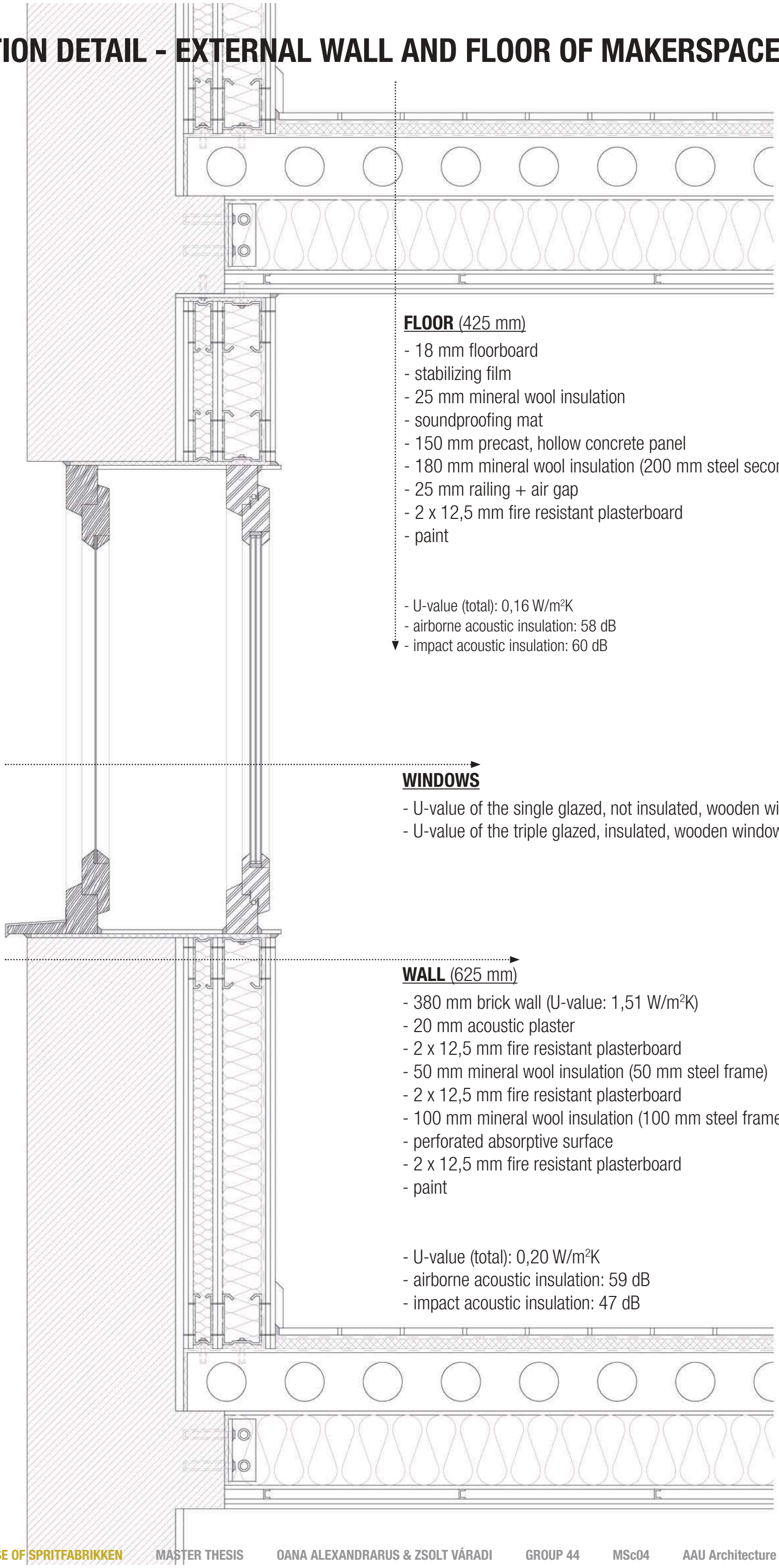
LEVEL 01 (3rd floor) Entrance + Startup Office



LEVEL 02 (4th floor) Makerspace



SECTION DETAIL - EXTERNAL WALL AND FLOOR OF MAKERSPACE 1:10



FLOOR (425 mm)

- 18 mm floorboard
- stabilizing film
- 25 mm mineral wool insulation
- soundproofing mat
- 150 mm precast, hollow concrete panel
- 180 mm mineral wool insulation (200 mm steel secondary beam)
- 25 mm railing + air gap
- 2 x 12,5 mm fire resistant plasterboard
- paint

- U-value (total): 0,16 W/m^{2}K
- airborne acoustic insulation: 58 dB
- impact acoustic insulation: 60 dB

WINDOWS

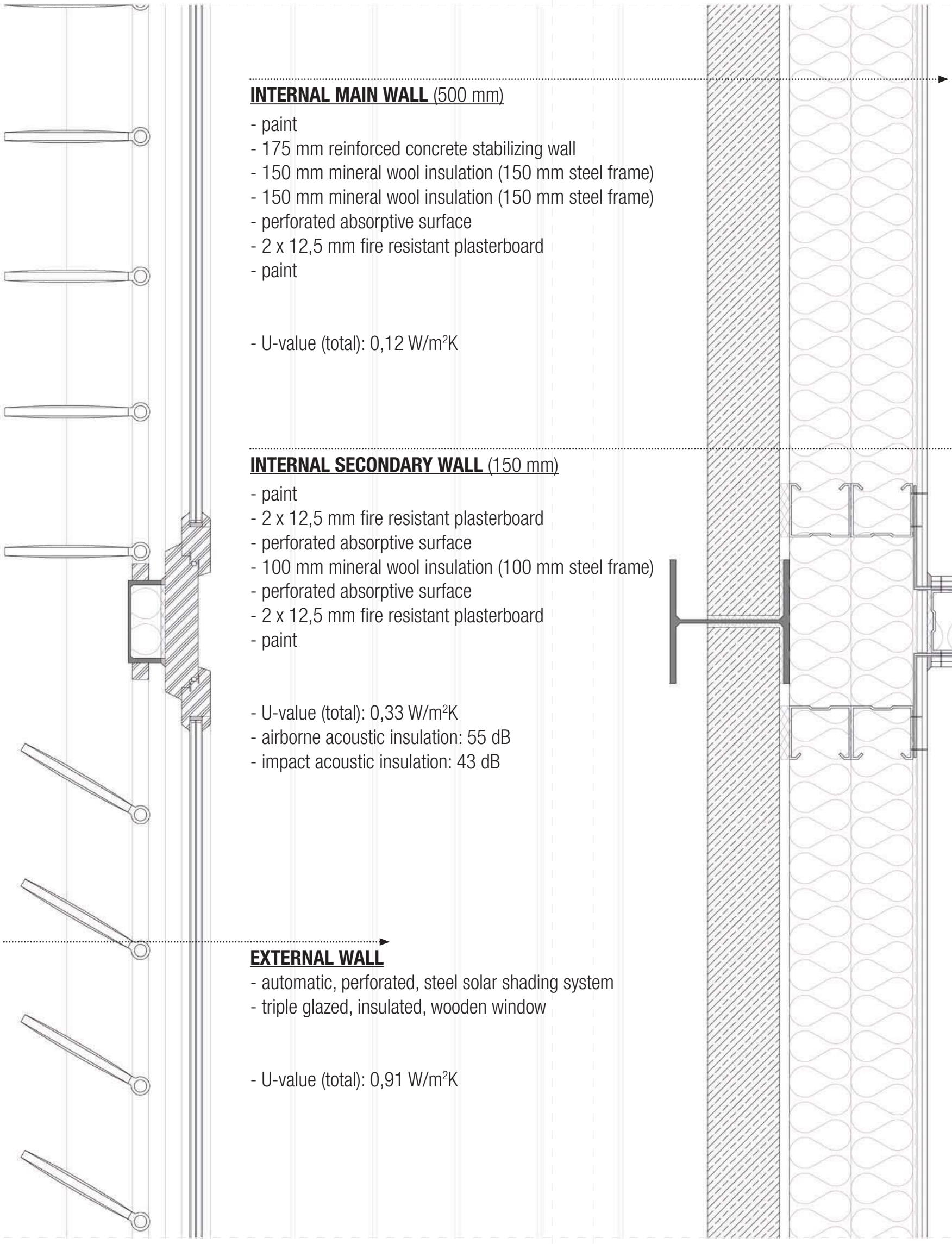
- U-value of the single glazed, not insulated, wooden window: 4,8 W/m^{2}K
- U-value of the triple glazed, insulated, wooden window: 0,91 W/m^{2}K

WALL (625 mm)

- 380 mm brick wall (U-value: 1,51 W/m^{2}K)
- 20 mm acoustic plaster
- 2 x 12,5 mm fire resistant plasterboard
- 50 mm mineral wool insulation (50 mm steel frame)
- 2 x 12,5 mm fire resistant plasterboard
- 100 mm mineral wool insulation (100 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

- U-value (total): 0,20 W/m^{2}K
- airborne acoustic insulation: 59 dB
- impact acoustic insulation: 47 dB

PLAN DETAIL - EXTERNAL AND INTERNAL WALL OF HOSTEL 1:10



INTERNAL MAIN WALL (500 mm)

- paint
- 175 mm reinforced concrete stabilizing wall
- 150 mm mineral wool insulation (150 mm steel frame)
- 150 mm mineral wool insulation (150 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

- U-value (total): 0,12 W/m^{2}K

INTERNAL SECONDARY WALL (150 mm)

- paint
- 2 x 12,5 mm fire resistant plasterboard
- perforated absorptive surface
- 100 mm mineral wool insulation (100 mm steel frame)
- perforated absorptive surface
- 2 x 12,5 mm fire resistant plasterboard
- paint

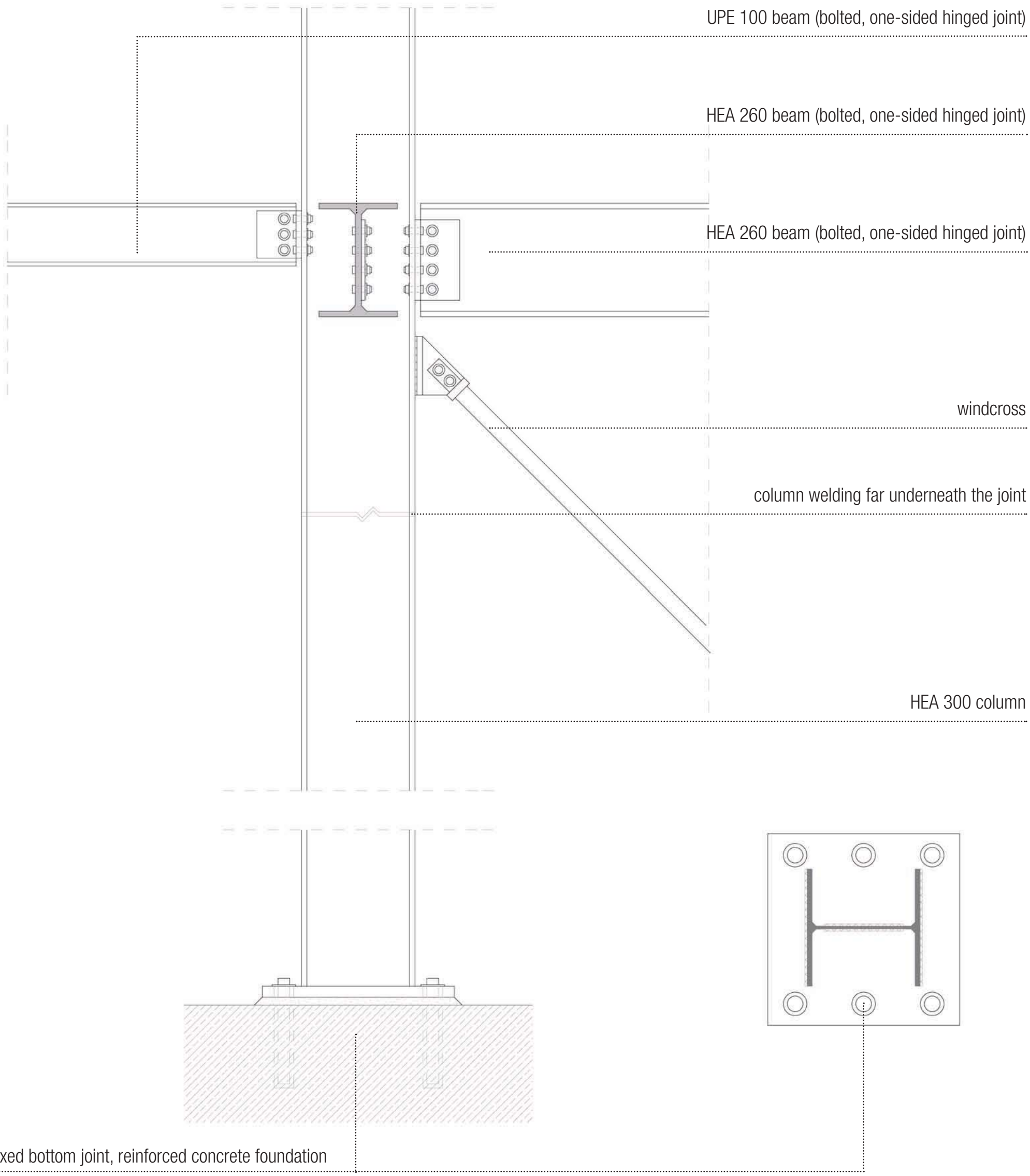
- U-value (total): 0,33 W/m^{2}K
- airborne acoustic insulation: 55 dB
- impact acoustic insulation: 43 dB

EXTERNAL WALL

- automatic, perforated, steel solar shading system
- triple glazed, insulated, wooden window

- U-value (total): 0,91 W/m^{2}K

DETAIL - HINGED JOINT AND FIXED FOUNDATION OF STEEL COLUMN 1:10



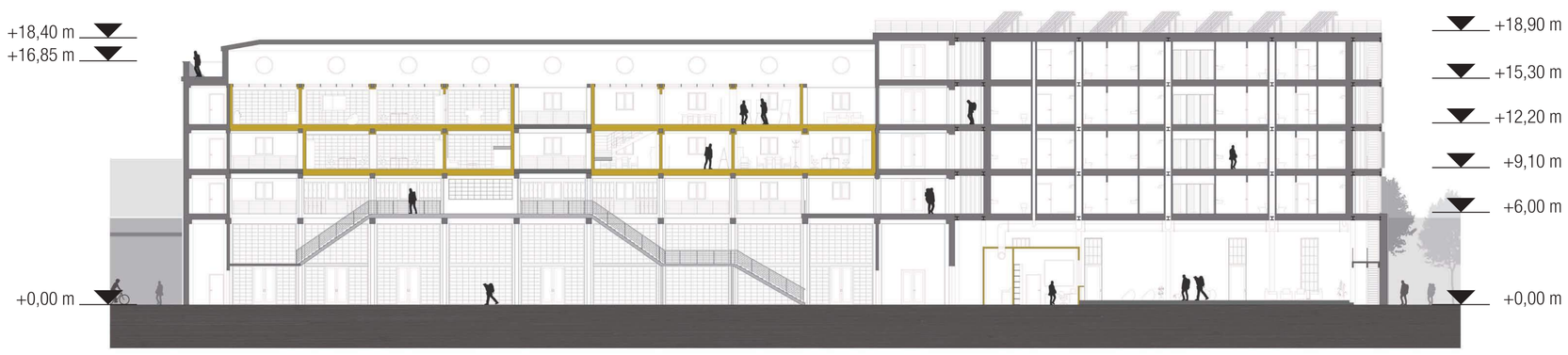
SITE PLAN 1:500

EASTERN FACADE 1:200

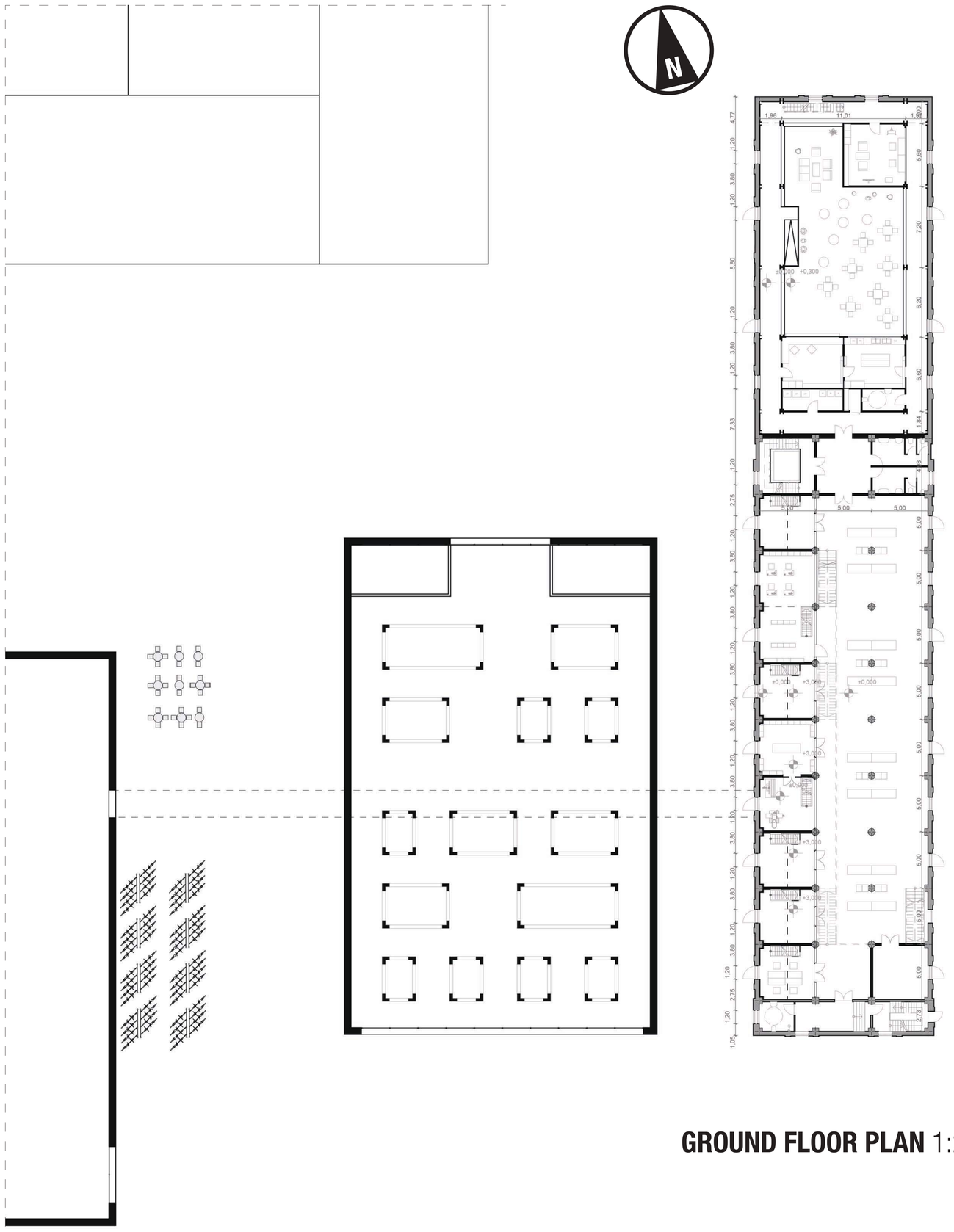
NORTHERN FACADE 1:200

WESTERN FACADE 1:200

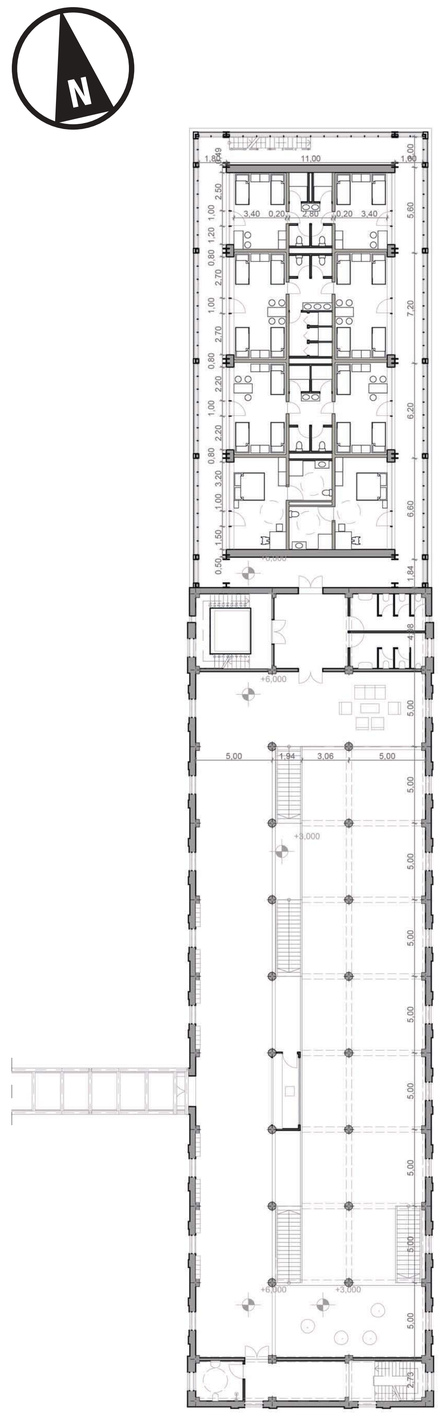
SOUTHERN FACADE 1:200



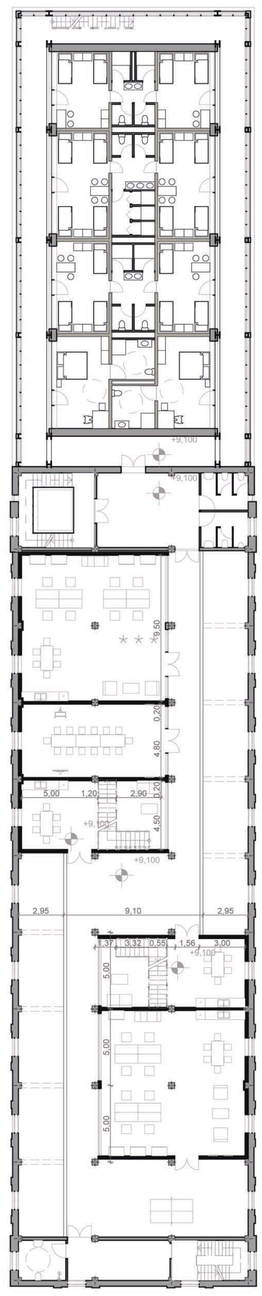
LONGITUDINAL SECTION 1:200



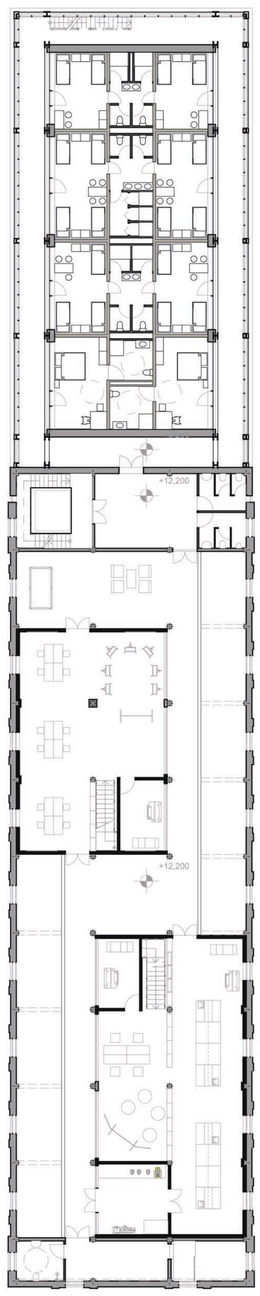
GROUND FLOOR PLAN 1:200



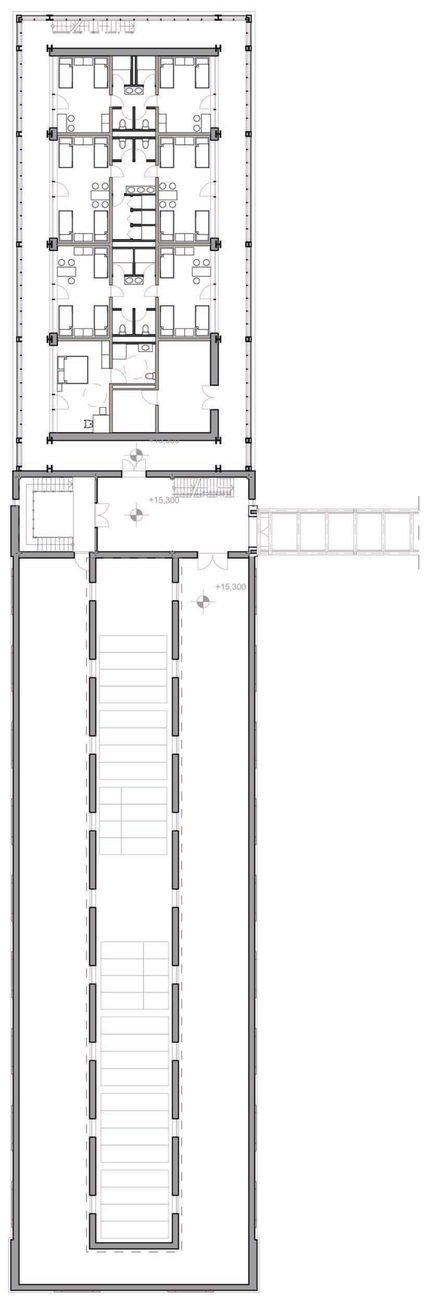
1ST FLOOR PLAN 1:200



2ND FLOOR PLAN 1:200



3RD FLOOR PLAN 1:200



4TH FLOOR PLAN 1:200