

**MASTER**

**Energy boost  
urban renewal through cultural activity**

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# ENERGY BOOST

Urban renewal through  
Cultural activity

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DATE:  
2016 - 2017

GRADUATION STUDIO:  
Transformation - from Industrial  
site to Cultural Identity

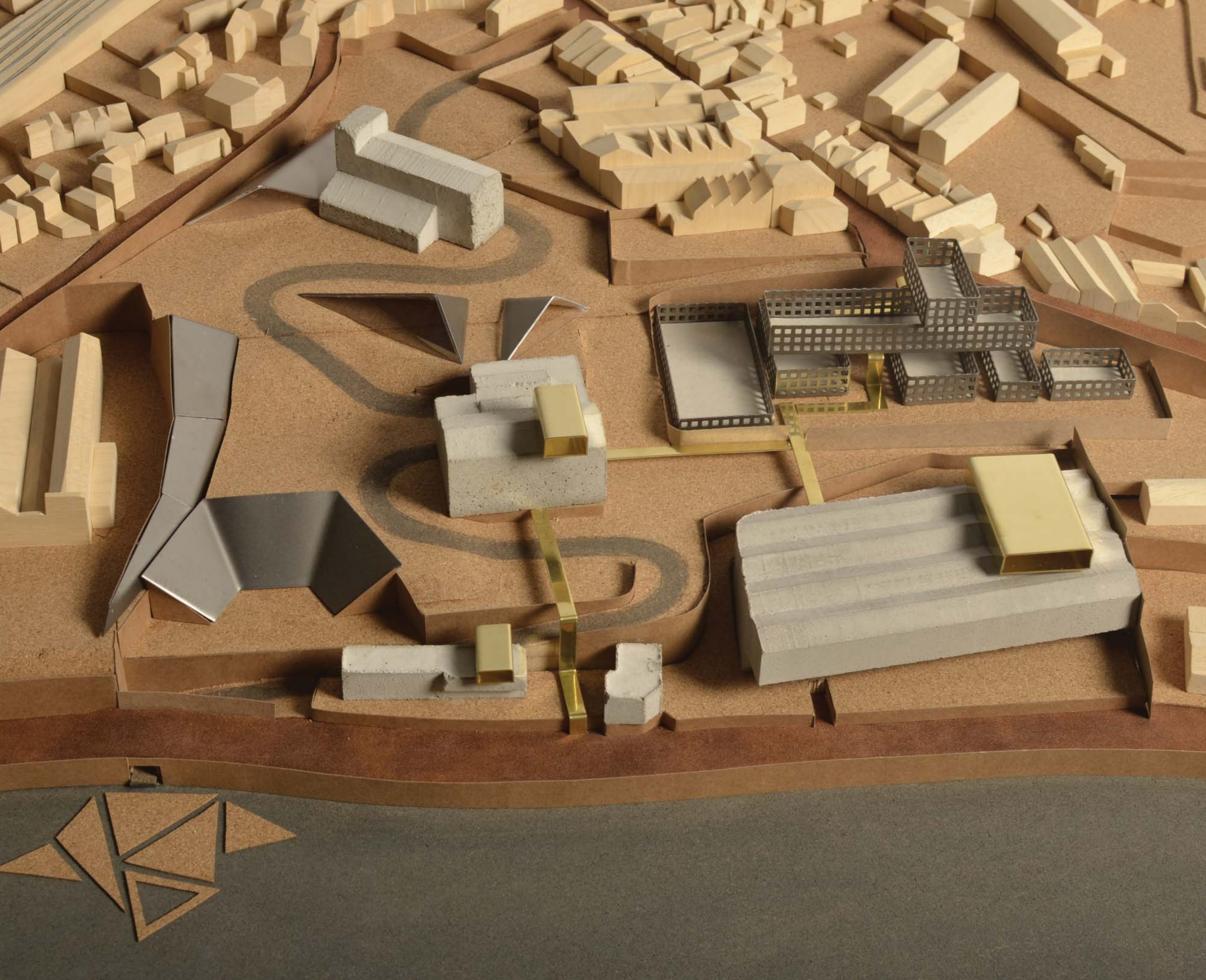
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University of Technology  
Eindhoven



1  
Central Termica do Freixo  
by night





## SUMMARY

### Powerboost

Porto has many districts with bad living conditions. Campanhã, located in the east of Porto, is one them. This district has a high crime rate and poor living conditions. These problems are caused by the low education level of the inhabitants and high unemployment rate. Inhabitants of Campanhã are trapped in a cycle of poverty.

They have to develop themselves to break this cycle. The transformation of the Central Termica do Freixo into a community centre is used as a mechanism to trigger individual and community development. It is used as a catalyst to improve the social and economic conditions in Campanhã.

In this community centre the various buildings are connected by two routes: the body route and the mind route. The body route focuses on physical development and connects the urban farm, urban gym, and the market. The mind route develops the mind through art education and connects the media arts centre, performance arts centre, visual arts centre, the gallery, and the amphitheatre.

Keywords: living conditions, transformation, community centre, development, body, and mind



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# INTRODUCTION

All over the world, abandoned industrial buildings occupy valuable land without providing a valuable function. In the past, these buildings were often demolished and replaced. Today, modern sentiment often leads to transformation of these buildings taking into account its formal function, its role in the society and its physical occurrence (Boyd, 2006).

The graduation studio 'Transformation - from Industrial Site to Cultural Identity' investigated the unique qualities and challenges of Industrial Buildings, and identifies the possibilities of transforming these buildings in the cultural buildings of the future; a transformation from highly protected industrial space to highly public cultural space.

This graduation project began with a case study research to develop new knowledge about transformations from Industrial Site to Cultural Identity affected by historical events. This has resulted in a timeline with 30 projects and five project timelines. In these timelines, connections between historical, political, economic events and the factories are made. The connections are visualised

in several scales. This exercise was followed by a joint mapping exercise. This has resulted in a selection of abandoned industrial sites all over the world.

The 'Central Termica do Freixo' has been chosen as the project location for this graduation report. This abandoned power plant is located in Campanhã, in the city centre of Porto. This district is known for its social problems, caused by the number of social housing. Transforming the Central Termica do Freixo into a community centre could improve the living conditions in the district. The rich history of the Central Termica do Freixo is used to create a sustainable future.

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2  
Model of masterplan  
  
3  
Electricity pylon  
  
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4  
Waterfront Central  
Termica do Freixo







# READING GUIDE



This graduation report is divided in four parts: DEFINITIONS, ANALYSIS, CONCEPT and DESIGN.

DEFINITIONS: the graduation studio "From Industrial site to Cultural Identity" focusses on two definitions: Cultural Identity and Transformation. These two definitions are introduced and defined in the first part of the report.

ANALYSIS: the second part of this graduation report examines the historical development of Porto, Campanhã, and in particular the development of the Central Termica do Freixo. The current situation in Campanhã and the Central Termica do Freixo is described. This results in a problem statement and a design question.

CONCEPT: the concept is discussed in this part of the report. The program of the design is defined in combination with the effect that the program has on the problem statement.

DESIGN: the remaining part of the graduation report examines the transformation of the Central Termica do Freixo. From a large scale to a small scale: the detailing. The research question is answered and followed by a reflection.





# DEFINITIONS



# DEFINITIONS

## CULTURAL IDENTITY

Cultural Identity is a social construction that creates groups and connections based on shared systems of symbolic verbal and non-verbal behaviour. These systems are meaningful to the members of the group, therefore members of a group identify and associate with each other. Members of a groups could share gender, generation, spiritual interests, class, nationality, locality, ethnicity. They can be part of multiple cultural identities (Fong & Chuang, 2004; WWR, 2007).

## TRANSFORMATION

Transformation is a change into a form different from its own. The word transformation comes from the Greek word 'Metamorphoo', which can be defined as a change in appearance without losing the connection with its formal appearance. The change is affected by the past and a base for the future.



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5  
Façade main building Central  
Termica do Freixo  
  
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6  
Ceramic tiles  
  
7  
Cultural identity  
  
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8  
Diorama, transformation







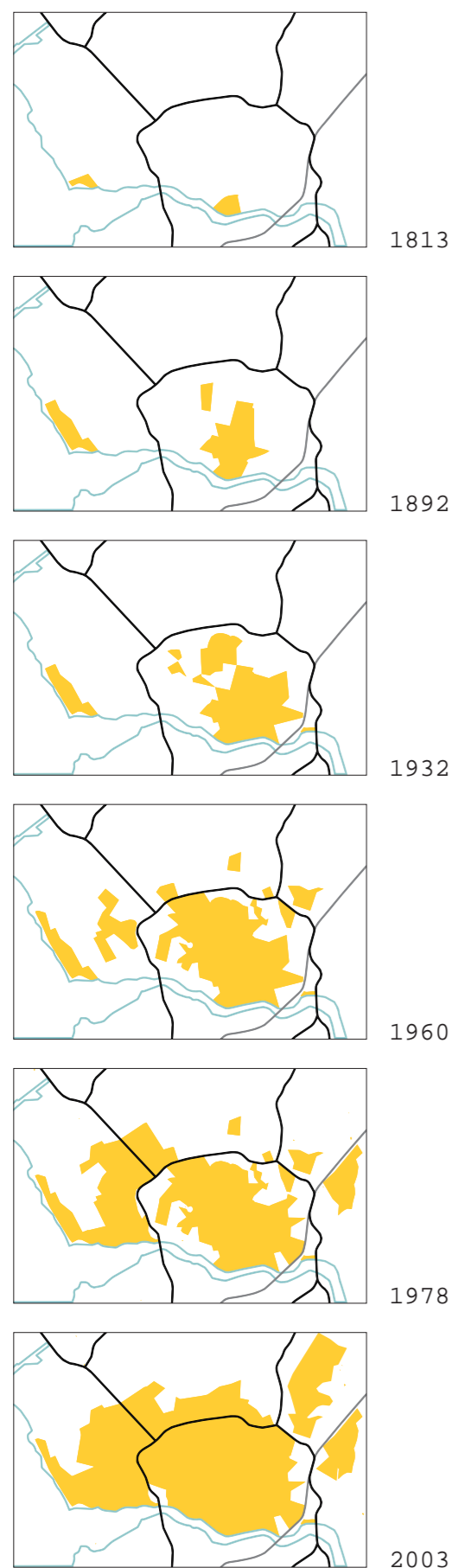


ANALYSIS



# HISTORY

## Industry in Porto



Porto's historical centre dates back to the late Bronze Age (8th century before Christ). The city is built on a platform surrounded by steep slopes that descend into the Douro river. This location provided the city with good defensive conditions. The first city wall was built in the third century. Over the centuries, this wall has shifted several times in order to accommodate the growth of the city.

Until the middle of the eighteenth century, urban development was limited due to the boundaries of the Muralha Fernandinas (city wall). For this reason, the Muralha Fernandinas was gradually demolished. The city changed considerably in the second half of the eighteenth century due to the rapid population growth and an increase in commercial and maritime activities. ("History of porto," n.d.)

Throughout the eighteenth century, Porto played a key role in connecting the Douro region with international markets. The Port wines were transported to Porto in Rabelo boats along the Douro river. In 1703, Portugal and England signed the Treaty of Methuen, which allowed the English

to import Portuguese wine without taxes and Portugal could import English textiles without taxes. As a result of this treaty, Port wines became more popular in England ("History of Douro wines", 2011). The number of industrial activities grew rapidly, especially in the districts of Bonfim, Massarelos, Cedofeita, and Matosinhos. The reorganization of the urban structure was influenced by changes in the infrastructure. In 1806, the Pontoon Bridge opened, the Suspension Bridge in 1843, the Maria Pia Bridge in 1877, and the Luis I Bridge in 1886. The central railway station of Porto was also built during this period.

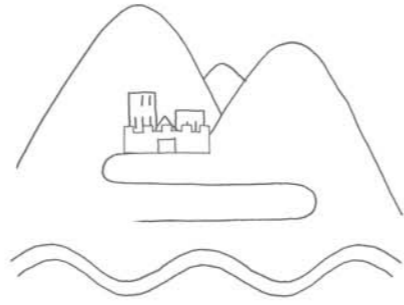
The textile industry occupied an important place in the economy of Porto and mainly took place in workshops at home, sometimes with a few employees. The rise of industrial factories led to large scale textile production in Porto. The increased number of factories and the growth in population was the reason why the real estate market was under pressure. Urban restructuring was needed. Large factories moved from the city centre to the west of Porto and settled around the Avenue da Boavista. This created an industrial centre with spinners, dyers, and weavers

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9  
Ceramic tiles  
  
10  
Maps historical  
development of Porto  
  
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11  
History of Porto

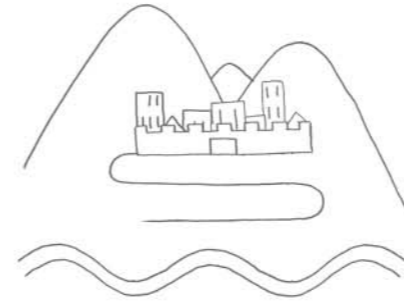




Historical centre dates back to the late Bronze age



First city wall was built in the third century



The wall has shifted several times in order to accommodate the growth



1703 Portugal and England signed the Treaty of Methuen



Large factories moved to the west



Rapid population growth, large number of people moved from the country side to Porto



The rise of the industrial factories



Rapid population growth and an increase in commercial and maritime activities



The rich families moved to large house in the north of the city



New type of cottage; the Ilhas, populated by unskilled workers



The living conditions deteriorated, this resulted in a significant increase in the mortality rate



To improve the living conditions in the city, many social housing were built



(Magalhaes, 1992.) Transport was important for the increased industrial production. The port of Leixoes ensured the supply of large quantities of cotton (Rodrigues, 2009).

Also families moved to other districts in the city of Porto. The rich families that traditionally lived in the city centre moved to large houses with gardens or small farms in the north of the city. The empty houses they left behind were rented to migrants. In the second half of the nineteenth century, the situation in the city deteriorated due to the rapid population growth and the large number of people that had moved from the countryside. This led to the construction of a new type of cottage; the Ilhas. Ilhas are similar to the back-to-back houses in the United Kingdom and the Dumbell homes in New York. With a façade of four meters wide, a floor area of 16 m<sup>2</sup>, one window and a door, these houses were built in the yards of middle-class homes. The houses were linked together in rows of 10 to 12. Narrow corridors among the middle class houses provided access to the street. Most Ilhas were built between 1864 and 1900 and populated by unskilled workers. In 1885, 19,460 people were living in 531 Ilhas (Zilhão, 2014). This number increased dramatically in the following years. In 1899, 50,000 people lived in 1048 Ilhas (Rodrigues, 2009). The living conditions in the Ilhas were very bad. There was a lack of sanitation, no running water, and there prevailed many different diseases, such as

tuberculosis, cholera, bubonic plague, and typhus. This resulted in a significant increase in the mortality rate in the city. The outbreak of the bubonic plague made sure officials became more aware of the problems in the Ilhas.

In order to eliminate the Ilhas, various resettlement plans were carried out in the city. The plans' Plano Salubridade das Ilhas "(1956) and" Plano Melhoramentos do Porto "(1956-1966) were an attempt to improve the living conditions in the city. But the problem remains, only a part of the Ilhas have been demolished, there are still populated Ilhas homes in the current centre of Porto (Rodrigues, 2009).

Between the thirties and the seventies of the twentieth century, much social housing was for the working class. Many social houses were built to solve problems with the housing needs. These social housing were mainly built in the districts of Campanhã, Paranhos, Cedofeita, Aldoar and Matosinhos (Rodrigues, 2009).



12  
Ilhas Porto



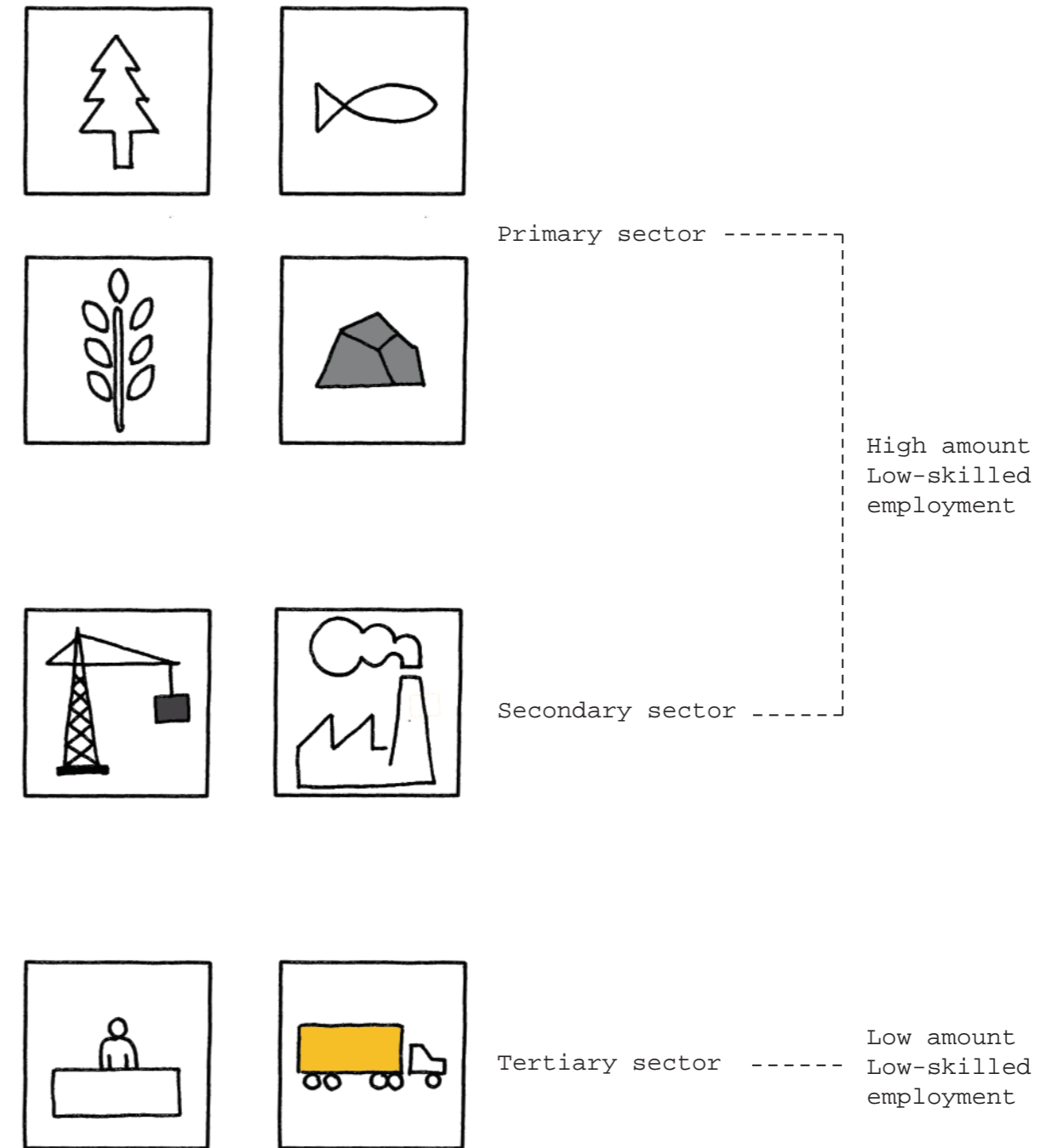
# CAMPANHÃ

The district of Campanhã is located in the east of Porto. The construction of the Campanhã station and the Maria Pia bridge had an important influence on the development of this district. The Maria Pia bridge and the Campanhã station opened in 1877. Trade with southern Portugal became easier. This resulted in an increased flow of raw materials and finished products. Campanhã developed into an industrial centre. This activated the urbanization of the environment. Between 1930 and 1970, many social houses were built in this district for the working class. In addition to these social housing, many Ilhas were built. The living conditions in these Ilhas were unsanitary and often lead to serious problems. A part of these Ilhas still exists today in Campanhã (Correia Fernandes, 2015).

The de-industrialization started in the seventies of the last century. Many industries closed or moved to the periphery. The current situation in Campanhã attends a higher percentage of low-skilled adults. This results in a high unemployment rate. These low skilled adults mainly dependent on the low-skilled jobs in the primary and secondary sector

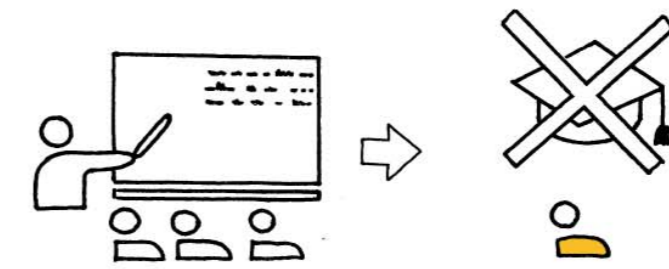
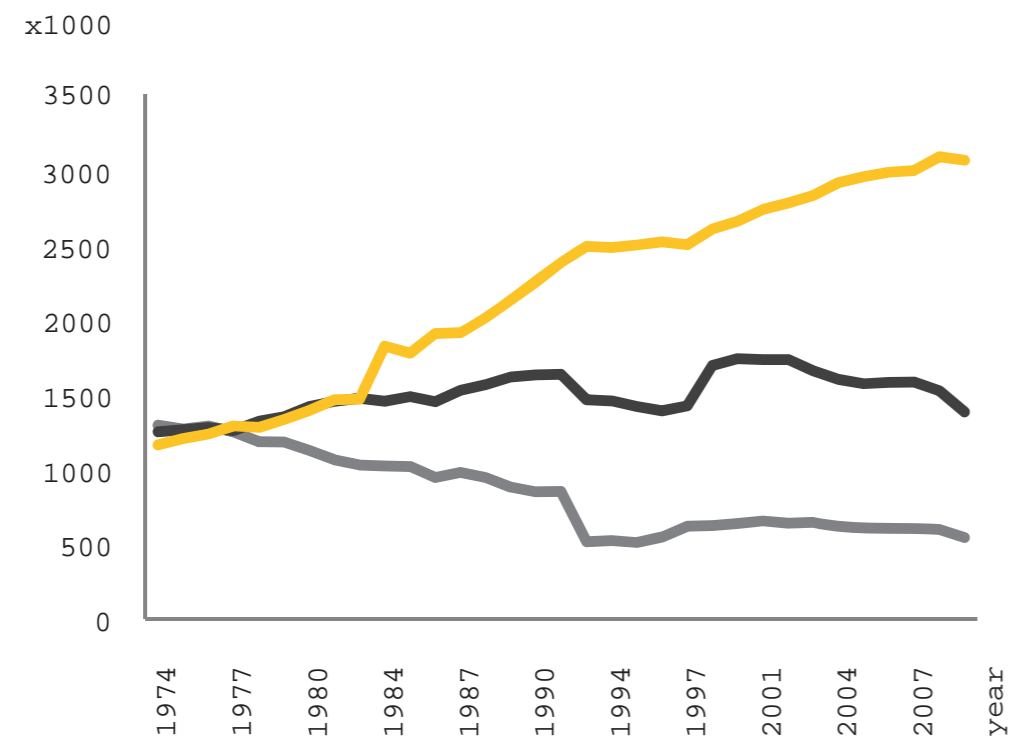
of the Portuguese economy. The primary sector is an economical sector that makes direct use of natural resources such as farming, forestry, agriculture, fishing and mining. The secondary sector produces manufactured goods. In the last decades, economic activity has shifted from manufacturing to service industries, the third sector (Alves, 2012). This has resulted in the loss of traditional employment and the social structures they supported (Landry, Greene, Matarasso & Bianchini, 1996). This change has brought long-term unemployment for many inhabitants of Campanhã (Guerra, 2002). Opportunities for self-development in the lower-paid and less skilled section of the labour market are limited. This 'underclass' is trapped in a cycle of poverty (Landry, Greene, Matarasso, and Bianchini, 1996).

The local population faces low incomes, a high unemployment rate, bad social conditions, a high crime rate, prostitution, arson, violence, drug use, and trafficking. There is a lack of facilities, the conditions are bad, the houses are dilapidated, and there is a high dependence on social support (Guerra, 2002).

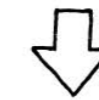




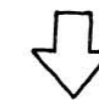
Employed population by sectors of economic activity



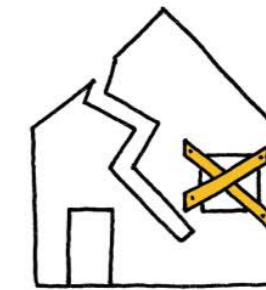
Low-skilled



High unemployment rate



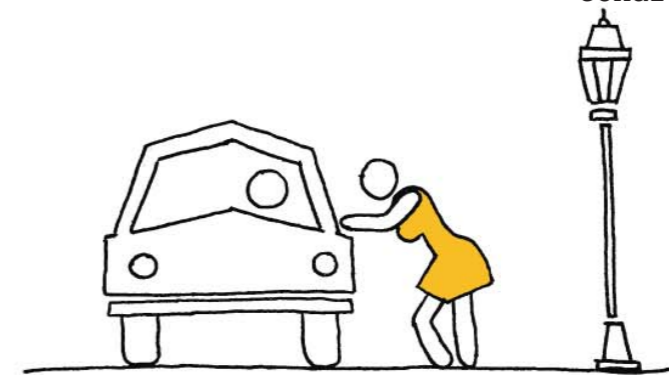
Drugs use



Bad housing conditions



Arson



Prostitution



Violence

14  
Employed population by sectors of economic activity

15  
Social problems in Campanhã

-->  
16  
Map railway zone scale 1:5000



# CAMPANHÃ

## Railway zone

The area around the Campanhã station is called the ARU Campanhã railway zone. The density of buildings in this area is high. A large part of these buildings are outdated and dilapidated. The railway zone is divided into two parts by the barrier formed by the railway infrastructure. There is only one road to traverse the railway structure, this is the Rua do Freixo. In other places, it is only possible to cross the railway via pedestrian walkways. The barrier results in a fragmented urban fabric. This fragmentation leads to social exclusion (Correia Fernandes, 2015).

In the south of the ARU Campanhã railway zone is Freixo an area located near the Douro river. The de-industrialization of the 1970 is visible in this area. One of the relics is the Central Termica do Freixo, the building complex that is currently owned by Energias de Portugal.

The social problems in the Campanhã district lead to the following research question:

How can the Central Termica do Freixo be transformed into a Community Centre, that contributes to a positive change in the living conditions and the daily functioning of the population?





# HISTORY

## Central Termica do Freixo



The transition to electricity had a major impact on the urban, economic, and industrial development. Until the twenties of the last century, the energy sector was characterized by private initiatives for internal use. Many industrial companies possessed a power plant. This changed in the twenties of this century. In 1926, a coup took place in Portugal, and after this coup the energy sector started to develop. Standardization of energy prizes led to the closure of many private initiatives.

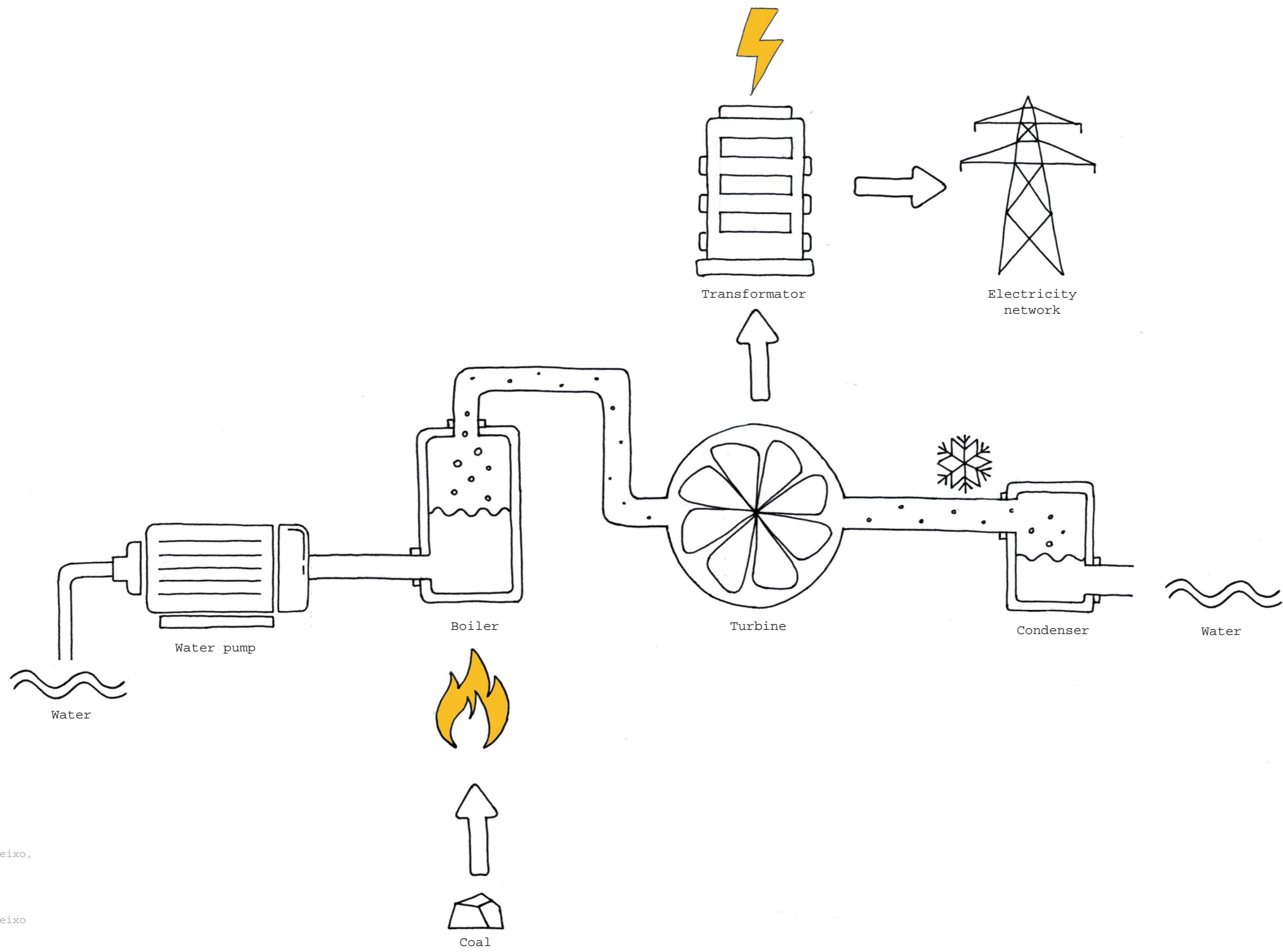
The first electricity sub-station in Freixo was built in 1919 by the Spanish company Electra Del Lima. This sub-station consisted of one transformer. The Spanish company started a partnership with the União Eléctrica Portuguesa. This cooperation ensured that the small sub-station developed into the Central termica do Freixo (Porto Sombrio, 2008). Central termica do Freixo was a power plant where electricity was generated from coal. The plant was located near the Douro river. The location near the Douro river was carefully chosen, far from the city centre of Porto. The Douro river ensured the supply of coal and the water from the river was used for the production of steam.

The municipality of Porto and the União Eléctrica Portuguesa signed a contract in 1923 in which they agreed that the electricity in Porto would be provided by the Lindoso network. Through large waterfalls in the Lima river, electricity was generated by hydro-electric power stations. In the summer, drought affected the supply of electricity, due to discontinuation in the water flow. To guarantee a continuous electricity supply during the year, the Central Termica do Freixo was built in 1926 near the Douro river in the Campanhã district. The power plant was designed by José Bernardo Corte Real.

In the period from 1922 to 1930, the demand for electricity was growing rapidly, particularly in industry. The electricity network and the number of substations expanded significantly. The capacity of the Central Termica do Freixo was extended in 1930 by installing an additional turbine, a pump, and an evaporator. Furthermore, a new water tank and various workshops were built.

In 1940, the sales of electricity fell during the national recession. This was a result of decreased industrial activities during the war and obtaining foreign fuels





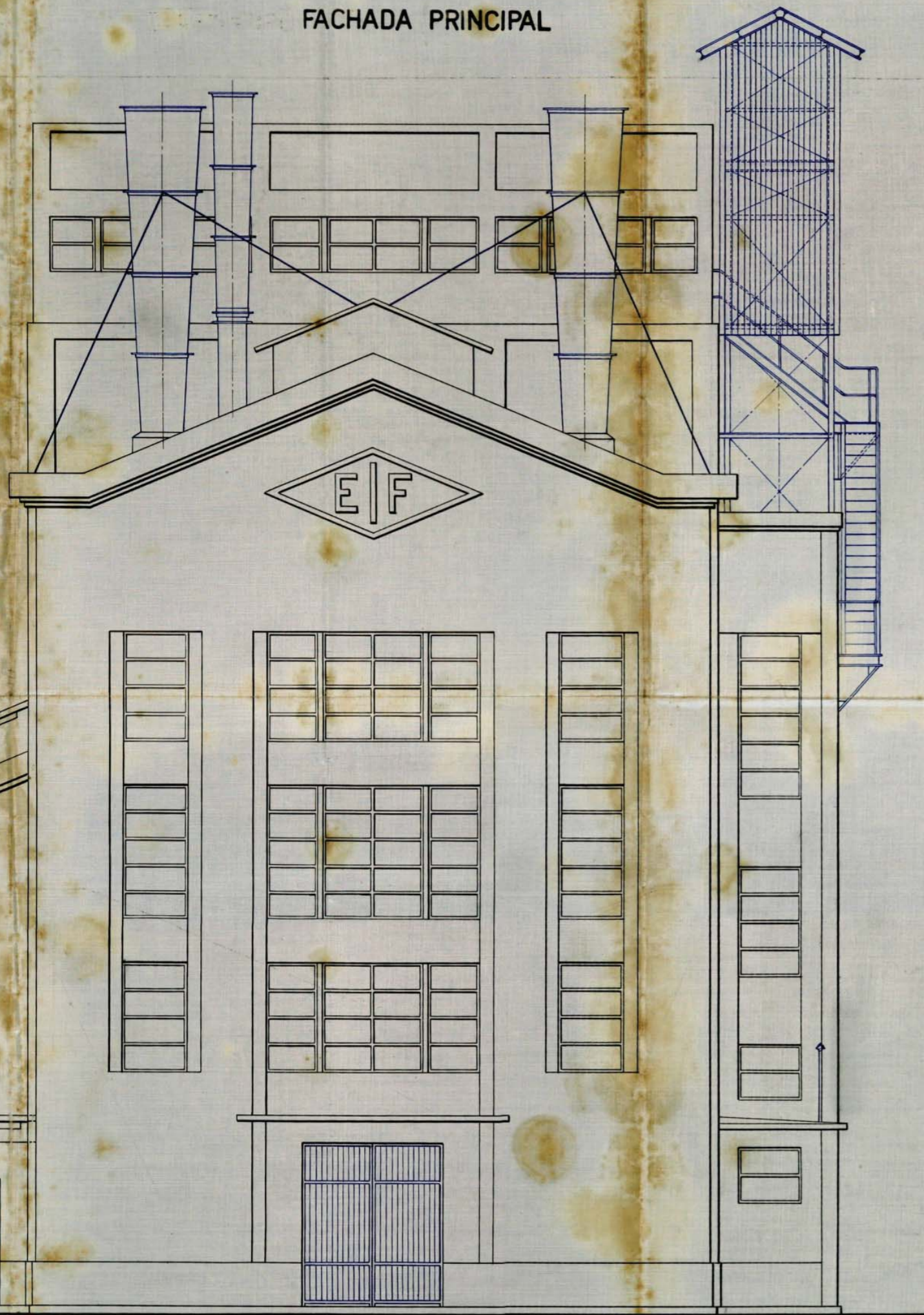
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 17  
 Central Termica do Freixo,  
 1923

18  
 Production process  
 Central Termica do Freixo

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 19  
 Drawing from the historical  
 archive of Porto, 1947

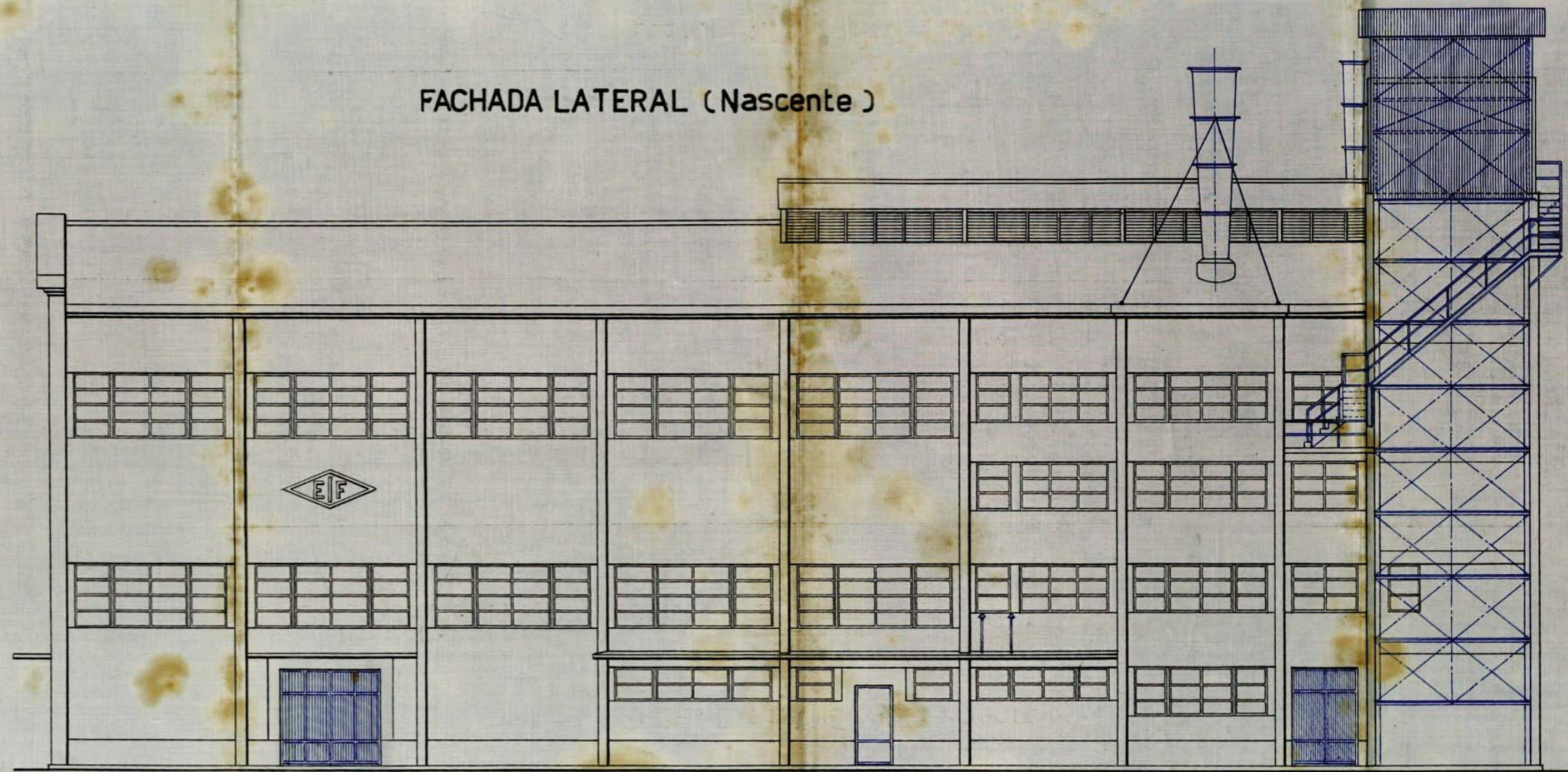


FACHADA PRINCIPAL



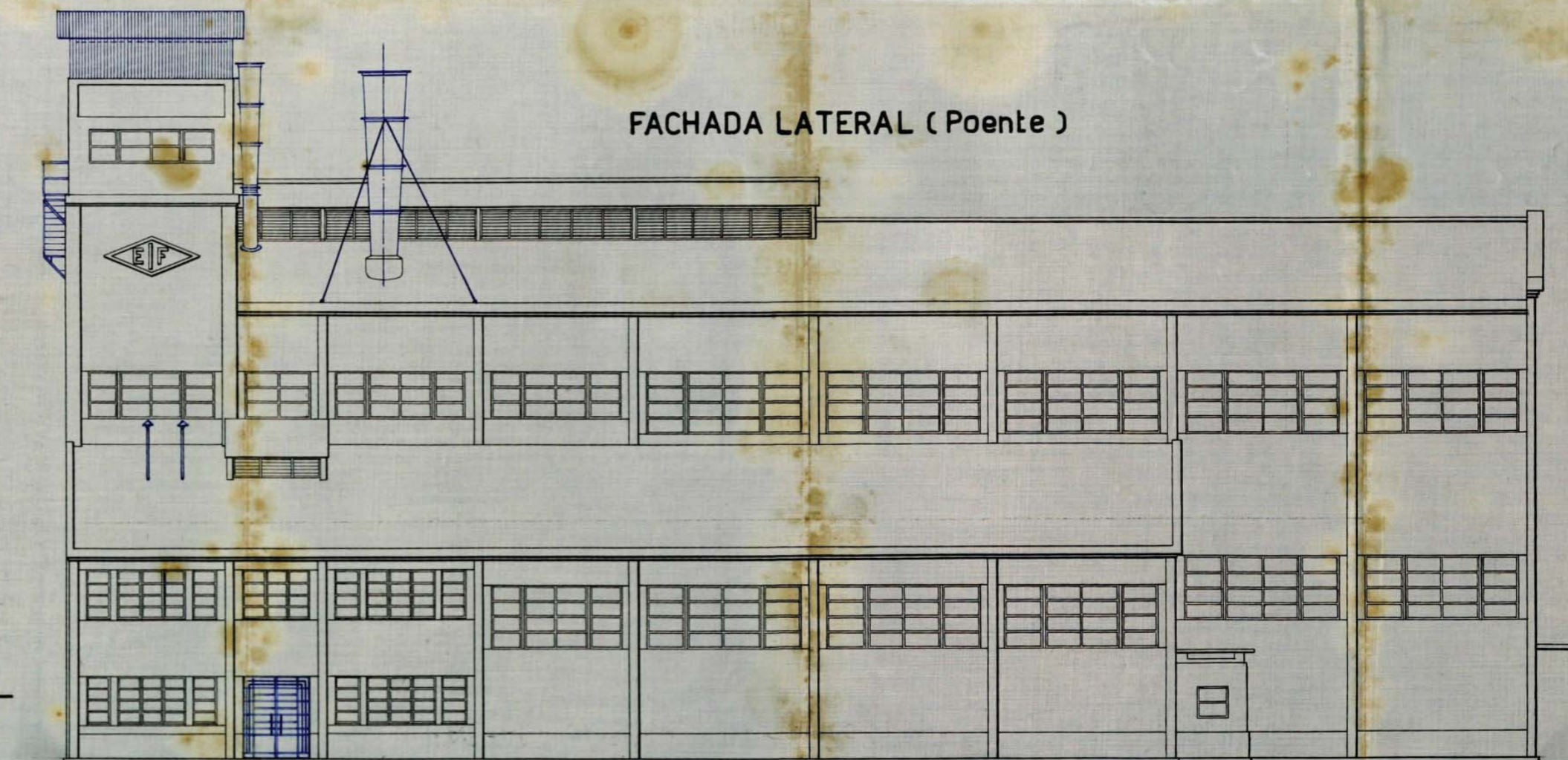
Escala=1:50

FACHADA LATERAL (Nascente)



Escala=1:100

FACHADA LATERAL (Poente)

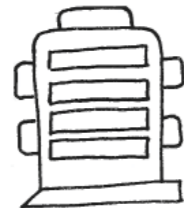


Escala=1:100









First sub-station was built in 1919



The Spanish company started a partnership with the União Eléctrica Portuguesa



The municipality of Porto and the União Eléctrica Portuguesa signed a contract in 1923



The Central Termica do Freixo was built in 1926 near the Douro river



The sales fell during the national recession 1940



The capacity of the Central Termica do Freixo was extended in 1930



Demand for electricity was growing rapidly 1922-1930



Electricity was generated from coal



Central Termica do Freixo stopped generating electricity



Renovations were carried out 1958-1963



Explosion EIF in 1974



The revolution of 25 April 1974 changed the political, social and economic situation in Portugal.

<--  
20  
Drawing from the historical archive of Porto, 1972

21  
History of Central Termica do Freixo



became more difficult. Despite these conditions, the União Eléctrica Portuguesa continued to invest in the networks and power stations.

At the end of the forties of the twentieth century, the Portuguese Government promoted an incentive policy to produce plastics, calcium carbide, fertilizers, and ferroalloys. In the north of the industrial site, an electrochemical factory, the Empresa Industrial do Freixo, was built. The electricity which was not sold on the market was used for the production of calcium carbide and ferroalloys. For this process two electric ovens were used (Braga Sampaio Luz, 2008). Calcium carbide is a compound which had various industrial applications, but it was mainly used for the production of acetylene gas, which was used in lamps. In addition to the Empresa Industrial do Freixo building, several outbuildings were built: workshops, offices, laboratories, locker rooms, showers, and various storage rooms for raw materials. Empresa Industrial do Freixo closed in 1974 after an explosion in the factory (Porto Sombrio, 2008).

The company offered social support within the Campanhã district to improve the living conditions. There were social services for employees and local residents. The company paid for meals at various schools in the area. They organized holiday camps for 460 children every year. The União Eléctrica Portuguesa offered medical support, educated local





residents about tuberculosis and paid for professional development of its employees. Employees received subsidies for sickness, death, marriage ceremonies and anniversaries. (Braga Sampaio Luz, 2008).

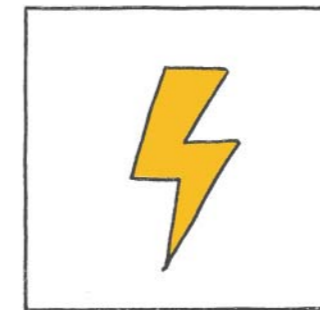
In the fifties of the twentieth century, more and more electricity was generated in the hydroelectric power station of Lindoso. The maintenance- and repair coast of the Central Termica do Freixo brought high costs. The outdated system of the Central Termica do Freixo and the opening of a new power plant, the Termica the Tapada do Outeiro, ensured that the Central Termica do Freixo stopped generating electricity.

After liquidating the power station, the equipment responsible for the receipt and distribution of electricity continued to function. Between 1958 and 1963, renovations and additions were carried out. New workshops, tool rooms, and warehouses were built. At the end of the sixties of the twentieth century, a new operating system was introduced and the control room was fully computerized. The renovation resulted in a partial demolition of the north facade of the main building and a reconstruction with

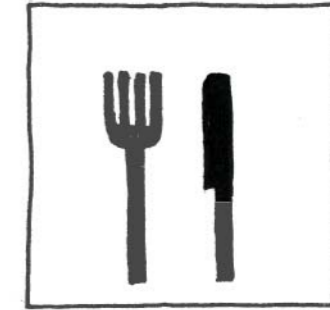
a more modern architecture style. A new functional layout was created (Braga Sampaio Luz, 2008).

The revolution of 25 April 1974 changed the political, social, and economic situation in Portugal. The electricity sector was nationalized, which led to groupings of existing companies and to the closure of the Central Termica do Freixo in 1975. The discontinuation of the industrial activities also meant the end of the social support within the Campanhã district (Porto Sombrio, 2008).

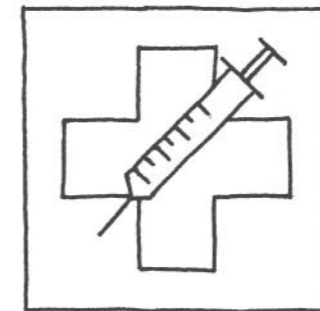
<--  
 22  
 Airplane picture Central  
 Termica do Freixo, 1939  
 23  
 Program Central  
 Termica do Freixo  
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 24  
 Abandoned Central  
 Termica do Freixo, 2016



Power plant



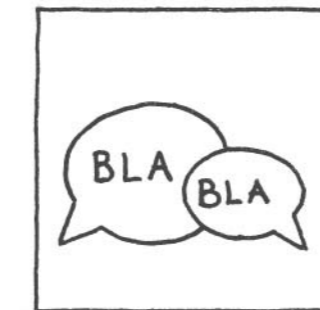
Cantine



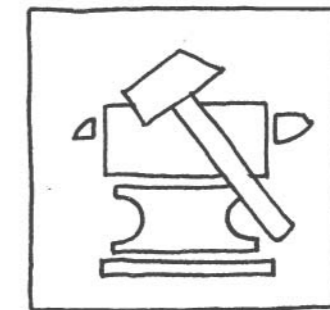
Medical centre



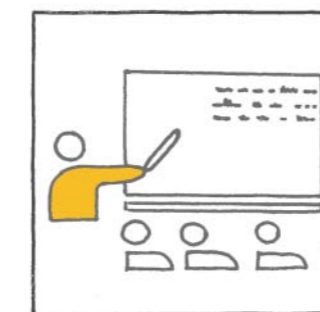
Chemical industry



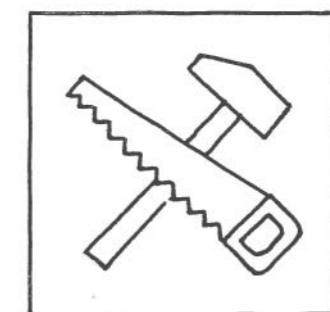
Social area



Metal workshop



Education



Wood workshop











# CURRENT SITUATION

## Central Termica do Freixo

The Central Termica do Freixo an industrial site along the Douro river has been abandoned since 1975. The slopes near the Douro river are very steep. This results in a height difference of 37 meter, from the river to the highest part of the site.

The Central Termica do Freixo is enclosed by three main streets: Avenida do Paiva Couceiro, Travessa do Freixo, and Rua do Freixo. The Rua do Freixo is located on the north-east side of the industrial site. This street connects the east side of the railway zone to the west side. The Central Termica do Freixo and Rua do Freixo are predominantly separated by the industrial buildings along the Rua do Freixo. There is only one entrance to the area from this side, number 6 in the map on page 50, the former main entrance of the Central Termica do Freixo. The Travessa do Freixo is a dead-end street for cars. It is not possible to enter the industrial site by way of this street.

The number of entrances is restricted at the northern side of the industrial site. This results in a closed character of this side. The south side of the Central Termica do Freixo has a

much more open character. It is not surrounded by buildings and has multiple entrances.

There are eight buildings scattered over the site. Building A is situated on Avenida de Paiva Couceiro. This building was used as a canteen in the first years after construction. The building was later converted into office space. The structural condition of this building is good.

Alongside the former canteen is the pump house, building B on the map. Part of the roof has collapsed and the building has no longer windows. The building with the largest footprint is building C. This building is located near the Avenida de Paiva Couceiro and consists of two floors. The building was used as a workshop. The ground floor of this building is partially built into the ground.

The function of building D is unknown. The structural condition of building D is bad. A large part of the first floor and the roof has collapsed.

The electricity was generated in the central building, building E on the map. The right part of the building dates from the early



A. Canteen



B. Pumphouse



C. Workshop



D. Function unknown



E. Powerplant



F. Empresa Industrial do Freixo

<--  
 25  
 Industrial site Central  
 Termica do Freixo  
 scale 1:1000  
 26  
 Buildings Central  
 Termica do Freixo  
 -->  
 27  
 Interior buildings  
 Central Termica do  
 Freixo





A. Interior canteen



B. Interior pumphouse



1. Entrance waterfront



2. Entrance Avenida de Paiva Couceirol



C. Interior workshop



D. Interior



3. Entrance Rua de Sabrosa



4. Entrance



E. Interior Powerplant



F. Interior Empresa Industrial do Freixo



5. Entrance Rua do Freixo



6. Entrance Rua do Freixo



years of the Central Termica do Freixo. The turbines and generators were located in this part of the building. These machines are no longer present. The left part of the building has been renovated in the seventies of the twentieth century. The central buildings is visible from all sides of the site, through its central location on the site.

The Empresa Industrial do Freixo building, building F on the map, was abandoned after an explosion in the building in 1974. This

explosion damaged several floors. The ground floor is covered with debris of the former electric furnace. This building is the tallest building on the industrial site.

The industrial site was bigger than it is today. Former office spaces, garages and the hospital were already transformed. This transformed part of the Central Termica do Freixo is used by CACE Cultural do Porto. A place where cultural entrepreneurs can rent a business space to start a business.



I. Rua do Freixo



II. Harbour



III: Railway



IV. Railway



V. Central Termica Do Freixo



VI. Travessa do Freixo

<--  
 28  
 Termica do Freixo  
 29  
 Surroundings Central  
 Termica do Freixo  
 -->  
 30  
 Interior Empresa  
 Industrial do Freixo









SWESTHEED

COPIES  
DIED

MAKING  
ANSER

WOL

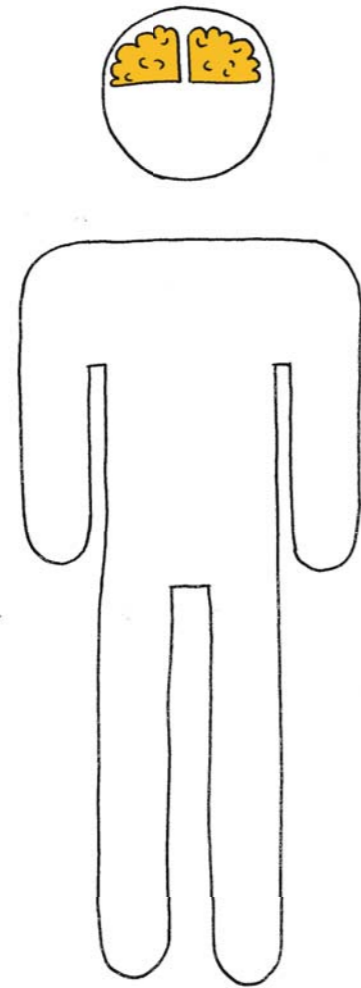


The image features a repeating pattern of square tiles. Each tile has a white background with a blue, ornate, symmetrical design. The design consists of intricate scrollwork and floral motifs. The tiles are arranged in a grid, with visible grout lines. A semi-transparent horizontal bar is overlaid across the center of the image, containing the word "CONCEPT" in a black, serif, all-caps font.

CONCEPT



# SELF-DEVELOPMENT

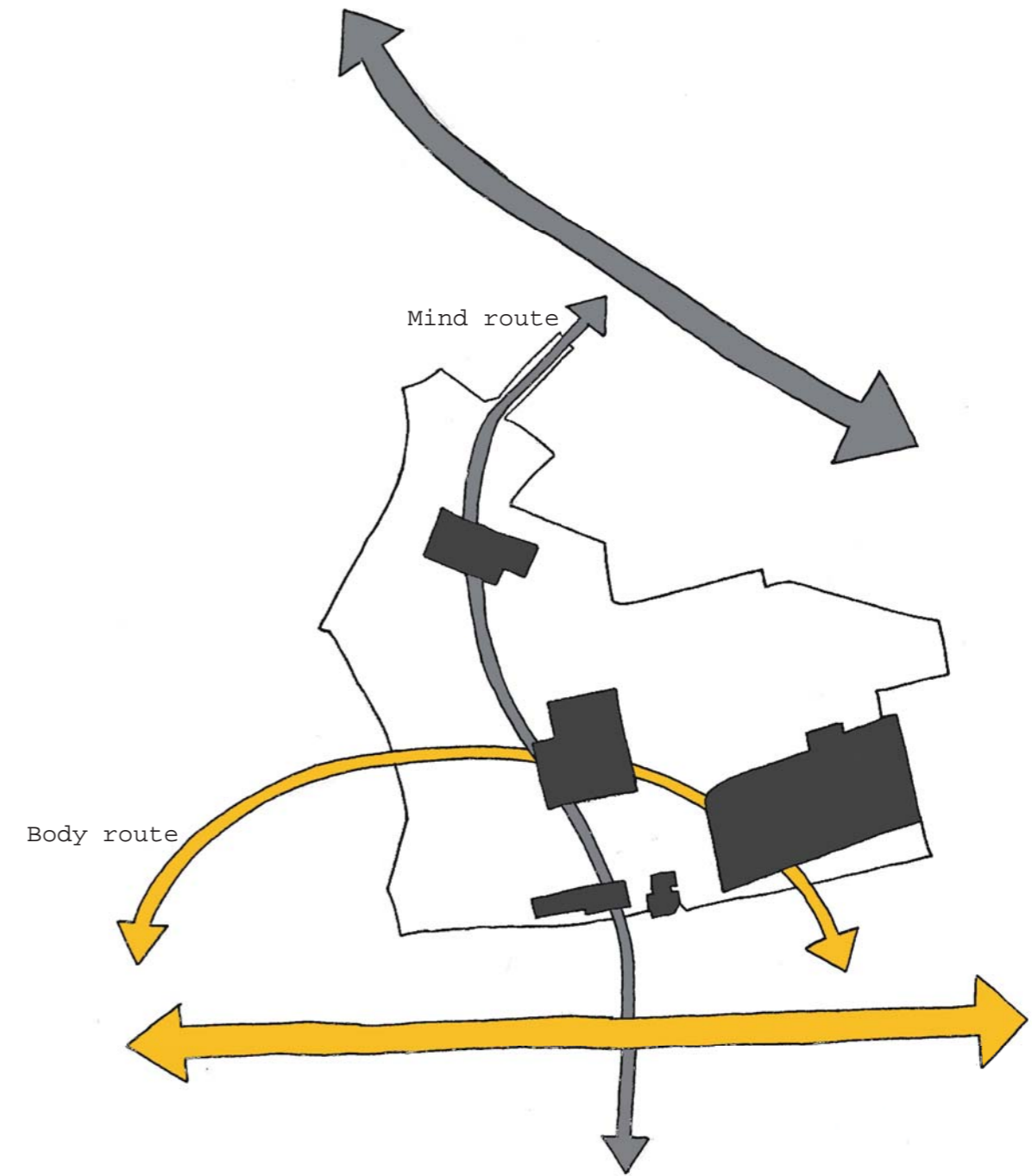


Inhabitants of Campanhã are trapped in a cycle of poverty, caused by the low level of education. Creating new opportunities is important to break the cycle of poverty. Inhabitants of Campanhã have to develop themselves to break this cycle. There are two focus points: the body and the mind.

The transformation of the Central Termica do Freixo into a community centre is used as a mechanism to

trigger individual and community development. It is used as a catalyst to improve the social and economic conditions in Campanhã. The community centre is a place for the people of Campanhã in which cultural, sports, and food events planned and spontaneous, can be enjoyed.

The height differences in the industrial site of the Central Termica do Freixo result in the



<-- <--  
31  
Industrial site  
Central Termica  
do Freixo

<--  
32  
Ceramic tiles

33  
Body and mind  
development

34  
Body and mind route

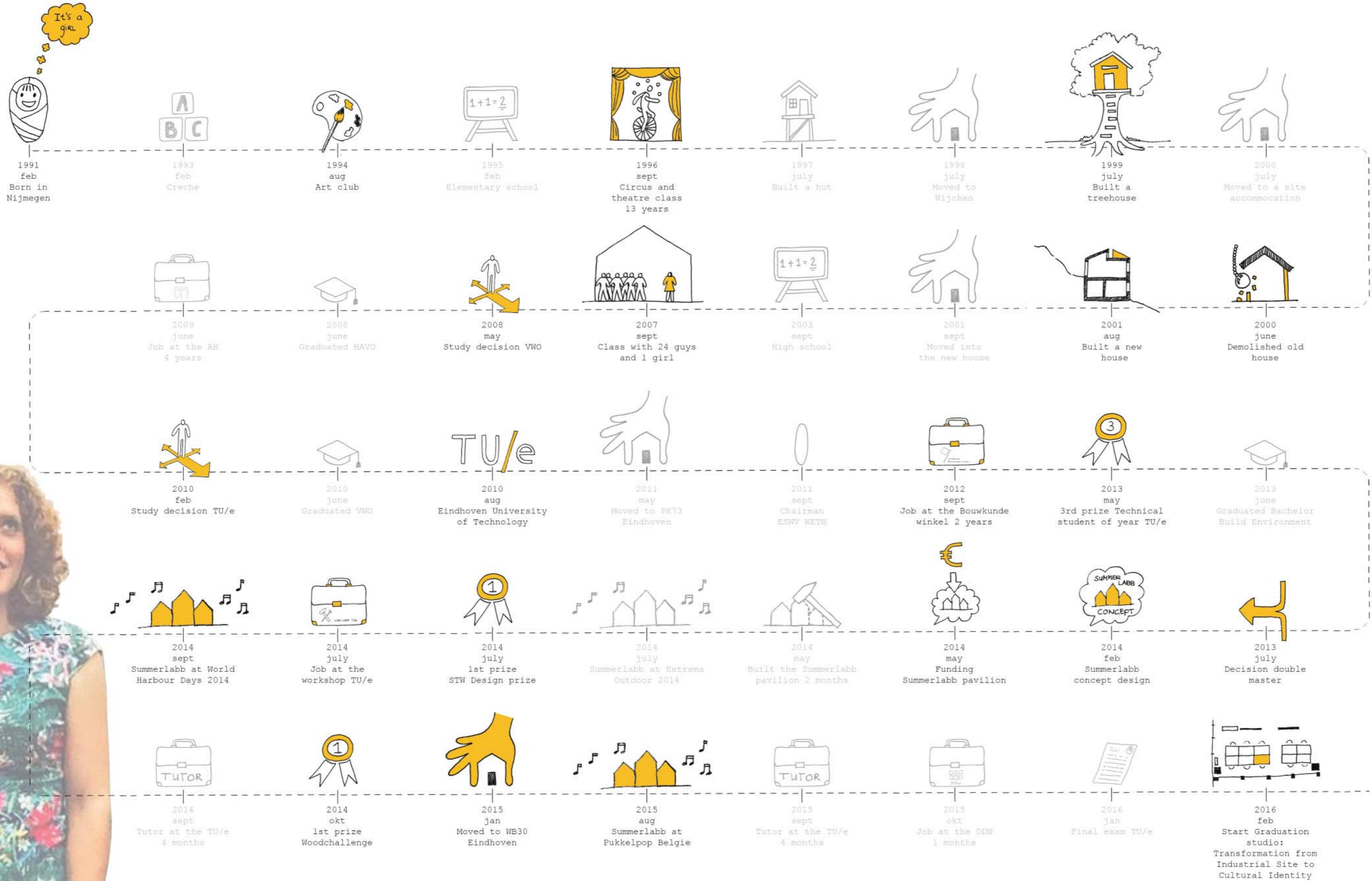
-->  
35  
Personal development

fragmentation of the site. In the new masterplan are these fragments connected by two routes: the body and the mind route. These two routes are connected to routes in the urban tissue. The Campanhã railway zone is better connected with the historic centre of Porto and the barrier formed by the railway infrastructure is reduced. In this community centre the various buildings are connected by two routes: the body route and the mind

route. The body route focuses on physical development and connects the urban farm, urban gym, and the market. The mind route develops the mind through art education and connects the media arts centre, performance arts centre, visual arts centre, the gallery, and the amphitheatre.

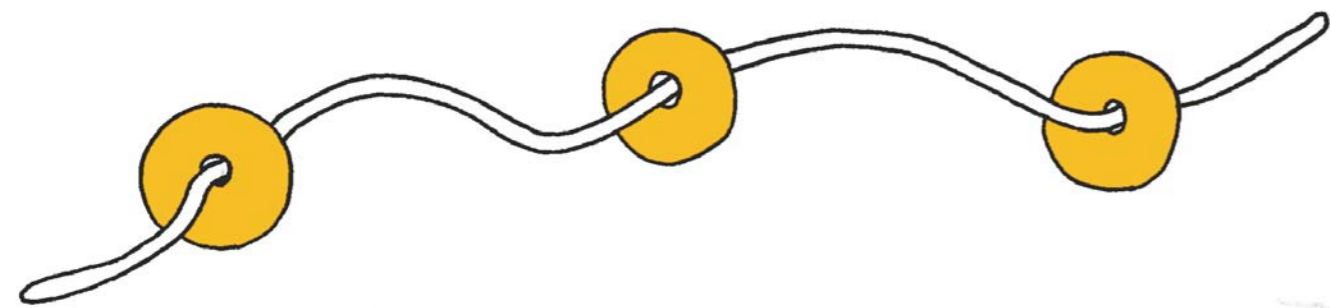


# MY PERSONAL DEVELOPMENT





# BODY ROUTE



The body route is connected to a running path that connects Campanhã to the sea along the Douro river. The body route focusses on the physical development of the inhabitants of Campanhã. Attention is paid to nutrition and movement. The body route connects several functions: an urban farm, an urban gym, cooking school, and the market.

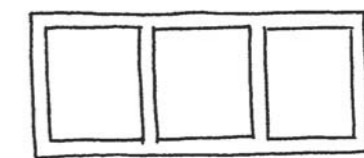
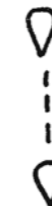
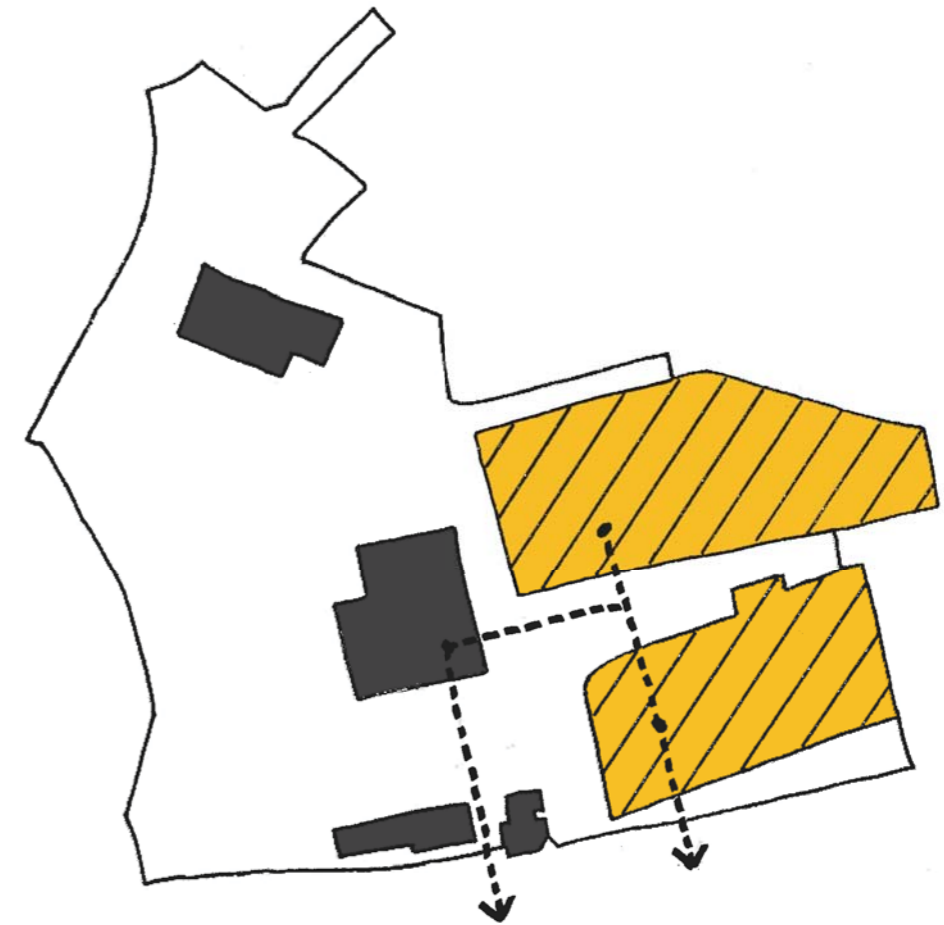
The route is direct and follows an orthogonal grid. Buildings that belong to the body route are strung together, as in a bead chain. A local grid is used in the

buildings, this can differ from the orthogonal grid.

The body route:

1. Direct, orthogonal grid
2. Above or cuts the landscape or buildings
3. Pile up volumes
4. Steel structure, vierendeel truss
5. Combination of old and new buildings

The following paragraphs describe the effect that the urban farm and gym could have on the social problems in Campanhã.



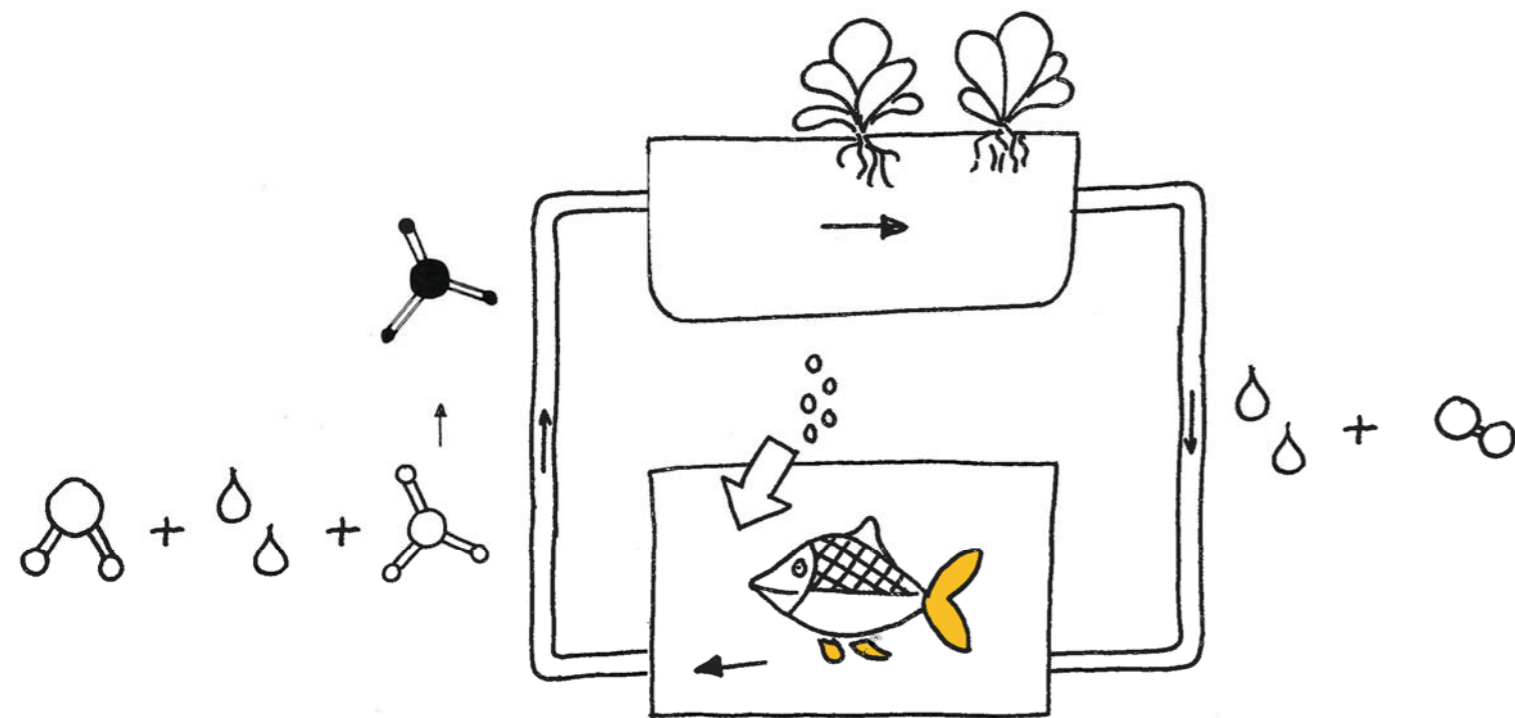
36  
Bead chain

-->  
37  
Body route



# URBAN FARM

## Aquaponics



The inhabitants of Campanhã are trapped in a cycle of poverty. This population with a low income has a higher risk of health problems. There is a link between food supply and health problems such as obesity, cardiovascular disease, and high blood pressure. The population with the lowest incomes have limited access to healthy food, health care, and other services. Limited access to food is influenced by several factors: the social-economic conditions, income inequality, infrastructure, and poverty (Breneman, Farrigan & Team, 2009).

Households with limited financial resources have more difficulty to obtain healthy food. Poverty due to a lack of income translates directly into a lack of food. The food choices of the poor, especially the ones who live in extreme poverty, are limited by their budget. People that live in poverty spend a large part of their income, 50 to 70 percent, on food. Urban agriculture could improve the food intake of Campanhã. The quality of food improves and the accessibility of inexpensive source of protein improves. Poor families involved in urban farming eat more vegetables than non-urban farmers in the same wealth

category. Urban farming is defined as the cultivation of vegetables, fruits, herbs, edible flowers and rearing of animals in urban areas. Urban farming has an impact on food security; it contributes to local economic development, poverty reduction, and social inclusion of the urban poor ("Urban agriculture: what and why", n.d.).

Initiating community food projects in Campanhã ensures that the community with low incomes develop their own food system. These community projects reduce the negative effects in the area: the communication between neighbors improves, access to affordable food is provided, and people learn about nutrition and the origin of the food. Food projects address the local need to improve the food security in the community. Ethnic foods can cause a strong bond between community members leading to solving community problems (Breneman, Farrigan & Team, 2009). Improving the access to healthy foods alone, without changing the consumption behavior, has little to no influence on health problems. Therefore, attention should be paid to food consumption ("Urban agriculture: what and why", n.d.). Residents of the district Campanhã can consult with a dietitian or



# URBAN GYM

join cooking classes in order to adjust their diet.

The richer class can also participate in the urban farm for physical and / or psychological relaxation. Recreational opportunities play a more important role than the production of food. Furthermore, the urban farm has also an educational function. Young people are brought in contact with animals and taught about ecology ("Urban agriculture: what and why", n.d.). There is an interaction between the ecological system and the economic system. Production and marketing are closely linked by the geographical location of the urban farm. This increases the efficiency of the food system and enables faster throughput. In addition to the economic benefits, the development of related micro-enterprises will be encouraged. These micro-enterprises are responsible for the packaging, processing, and the marketing. These entrepreneurs partly owe their existence to the urban farm ("Urban agriculture: what and why", n.d.?).

The intensity of the urban farm is enhanced by a high technological level. Aquaponics is a high-tech farming technology where fish and vegetables grow in a closed loop system. It is a system that combines hydroponics with aquacultures. Aquaculture is the raising of fish in a controlled system and hydroponic is soil-free farming. The fish live in the water purified

by the plants and the plants live off the fish waste. Fish produce waste that is high in ammonia, which is transformed by bacteria into nitrates and nitrites. These are used by the plants to grow. The systems cancel out each other's wastes. The addition of fish feed ensures a constant supply of nutrients to the system.

Various species of fish can be produced. The fish is harvested when it reaches a marketable size. This occurs after six weeks. The tank is replenished immediately (Rakocy, Masser & Losordo, 2006). The products produced in the urban farm are sold on the local market.



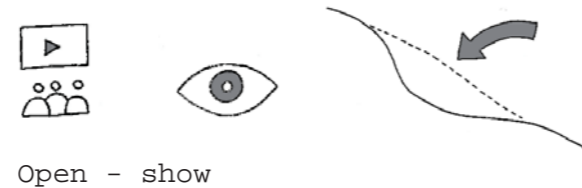
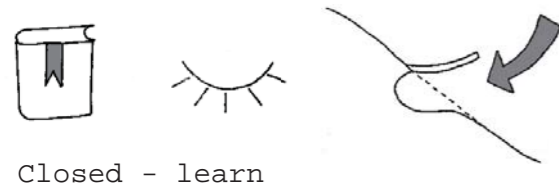
The social exclusion of inhabitants in Campanhã is caused by a combination of problems: unemployment, geographical location, low incomes, bad health, and crime. Sports activities contribute to the process of social inclusion. This can make a significant contribution to the urban rehabilitation of Campanhã. Sports bring individuals with common interests together. Social skills such as tolerance and cohesion are strengthened. In addition, sports also impose a positive effect on self-esteem, anxiety, depression, tension and stress,

self-confidence, energy level, and mood. Regular participation in sports activities reduces the risk of various diseases such as obesity, diabetes, hypertension, heart and vascular diseases.

The urban farm and the urban gym contribute to the improvement of the physical condition of the inhabitants of Campanhã. In addition, they play an important role in the mental health and the process of inclusion of the inhabitants of Campanhã (Bailey, 2007).



# MIND ROUTE



The mind route focusses on self-development through arts education. Arts will be used as a mechanism to trigger individual and community development. Activities that take place in this route are: music classes, dance classes, theatre classes, sculpture classes, paint classes, performances, and exhibitions. The mind route is a route that winds through the industrial site. The Campanhã district is connected with the water. The route is formed by a sequence of view corridors and existing buildings. The mind route is integrated into the landscape and is formed by the buildings and the topography of the industrial site.

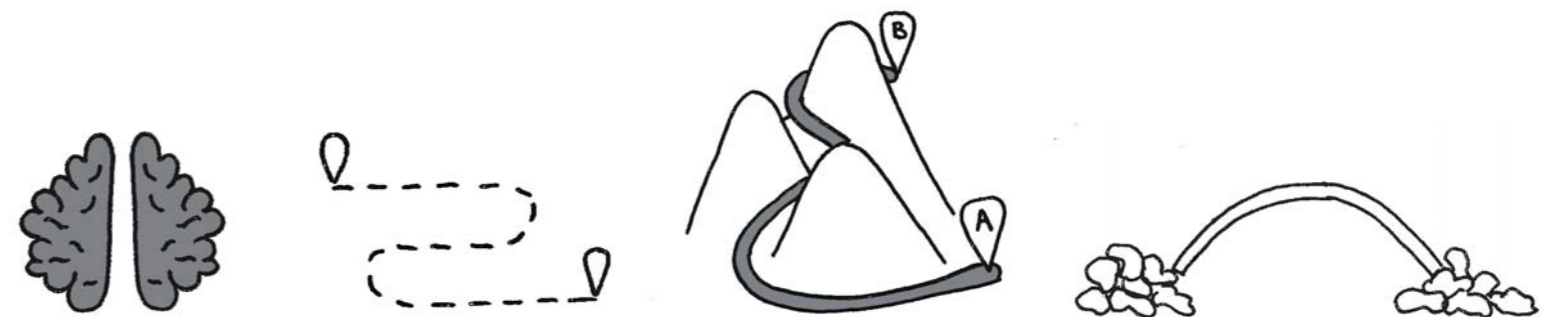
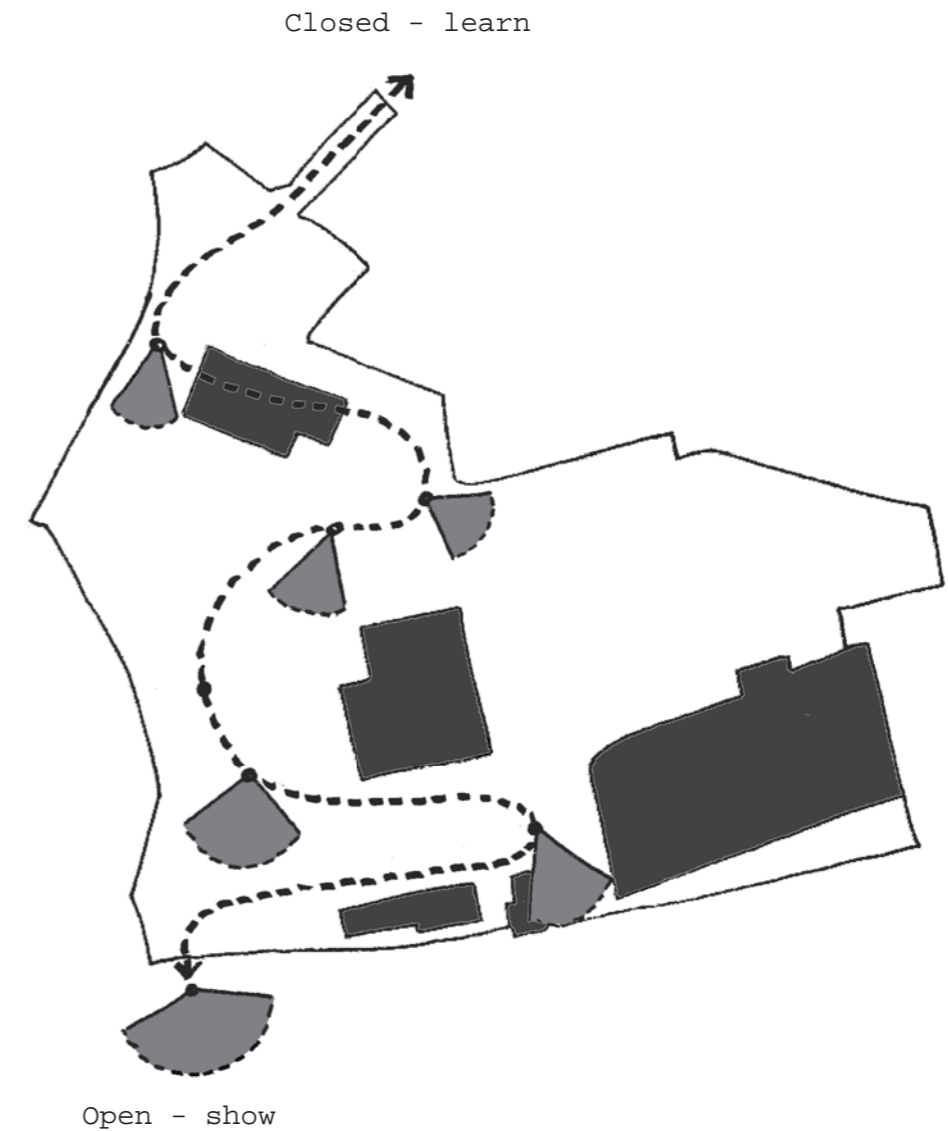
The industrial site is closed to the side of the Rua do Freixo. There is only one entrance at this side. The industrial site is accessible through a narrow passage between buildings. The side located next

to the water has more access points and is therefore easier to enter. At the closed part of the site, the educational cultural activities will take place. Participants in the cultural educational programs can develop their mind in this closed part in a protected environment. They can show the skills they have developed in the open part of the site.

The mind route:

1. Indirect, slopes
2. Integrated in the landscape
3. Fold the volumes
3. Steel structure, compression arch
4. Combination of old and new buildings

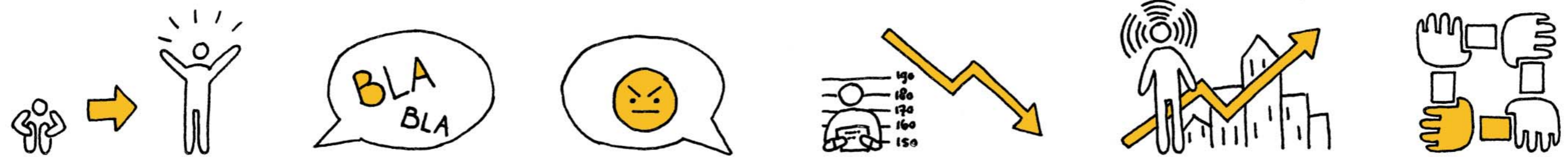
Buildings included in the mind route are the performance centre, media arts centre, visual arts centre, event centre, market and amphitheatre.



40  
Open - closed

41  
Mind route





People can participate in a cultural education program to develop the mind. This cultural education program helps people develop the mind through performance arts (theater and dance), music arts, visual arts (painting, sculpture, and decorative arts) and media arts. These art classes have an effect on the personal development: the personal confidence and life skills increase, the verbal

and non-verbal communication skills improve. In addition to the personal development of the inhabitants, arts projects can also contribute to urban renewal. Urban renewal in complex areas depends on social renewal. Art projects can strengthen the social cohesion within the inhabitants, change the way places are perceived, decrease the crime rate (Landry, Greene, Matarasso & Bianchini, 1996).

42  
Benefits arts projects

-->  
43  
View over the Douro river

-->  
44  
Preservation strategy



# PRESERVATION STRATEGY

Transformation Central  
Termica do Freixo



Building	Structural condition	Architectonical value	Historical value	New masterplan	Preservation Strategy
A	++	+-	+	+	+
B	+	+	++	+	+
C	+	+-	+-	+	+
D	-	+	+-	--	-
E	+	++	++	++	++
F	+-	++	++	+	++

There are four factors that affect the preservation strategy for the transformation of the Central Termica do Freixo: the structural condition, the architectural value, the historical value, and the way buildings fit into the new master plan. Based on these factors, a

table has been created in which buildings are assessed against the four factors.

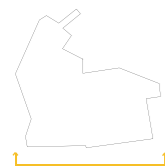
The building condition of building D is dilapidated and it blocks the view corridor created by the mind route. This building will be demolished.



The image features a repeating pattern of square tiles. Each tile has a white background with a blue, ornate, symmetrical design. The design consists of intricate scrollwork and floral motifs. The tiles are arranged in a grid, with visible grout lines. A semi-transparent horizontal bar is overlaid across the middle of the image, containing the word "DESIGN" in a black, serif font.

DESIGN





<--  
45  
Ceramic tiles Porto

46  
Elevation  
scale 1:500



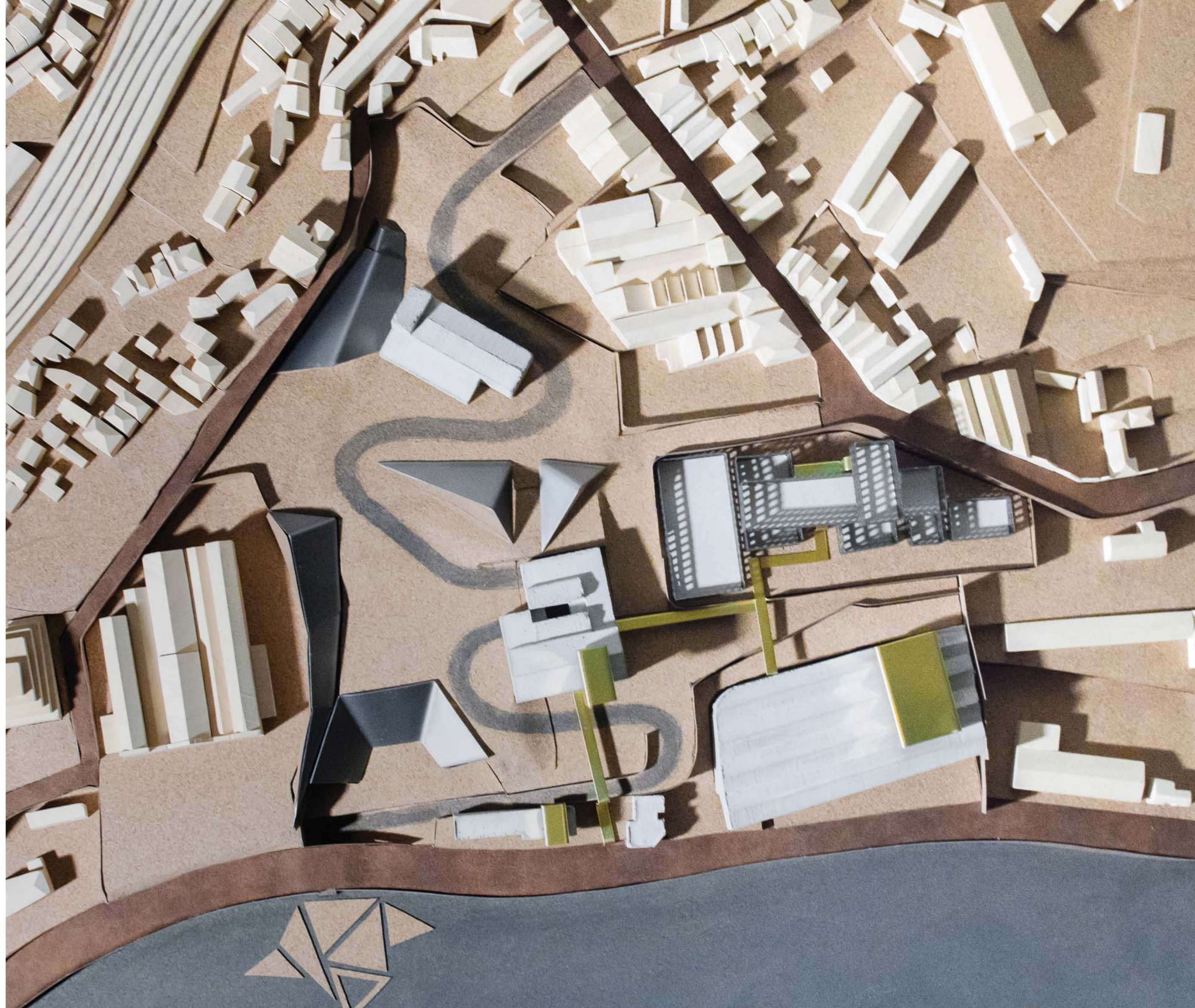
# MASTERPLAN

## Transformation

The new masterplan contains 10 buildings. The performance centre, media arts centre, visual arts centre, event centre, the market, the amphitheatre, the urban gym, the parking garage, the urban farm, and the cooking school. These buildings are connected by the two routes.

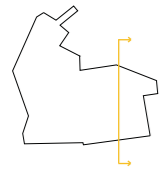
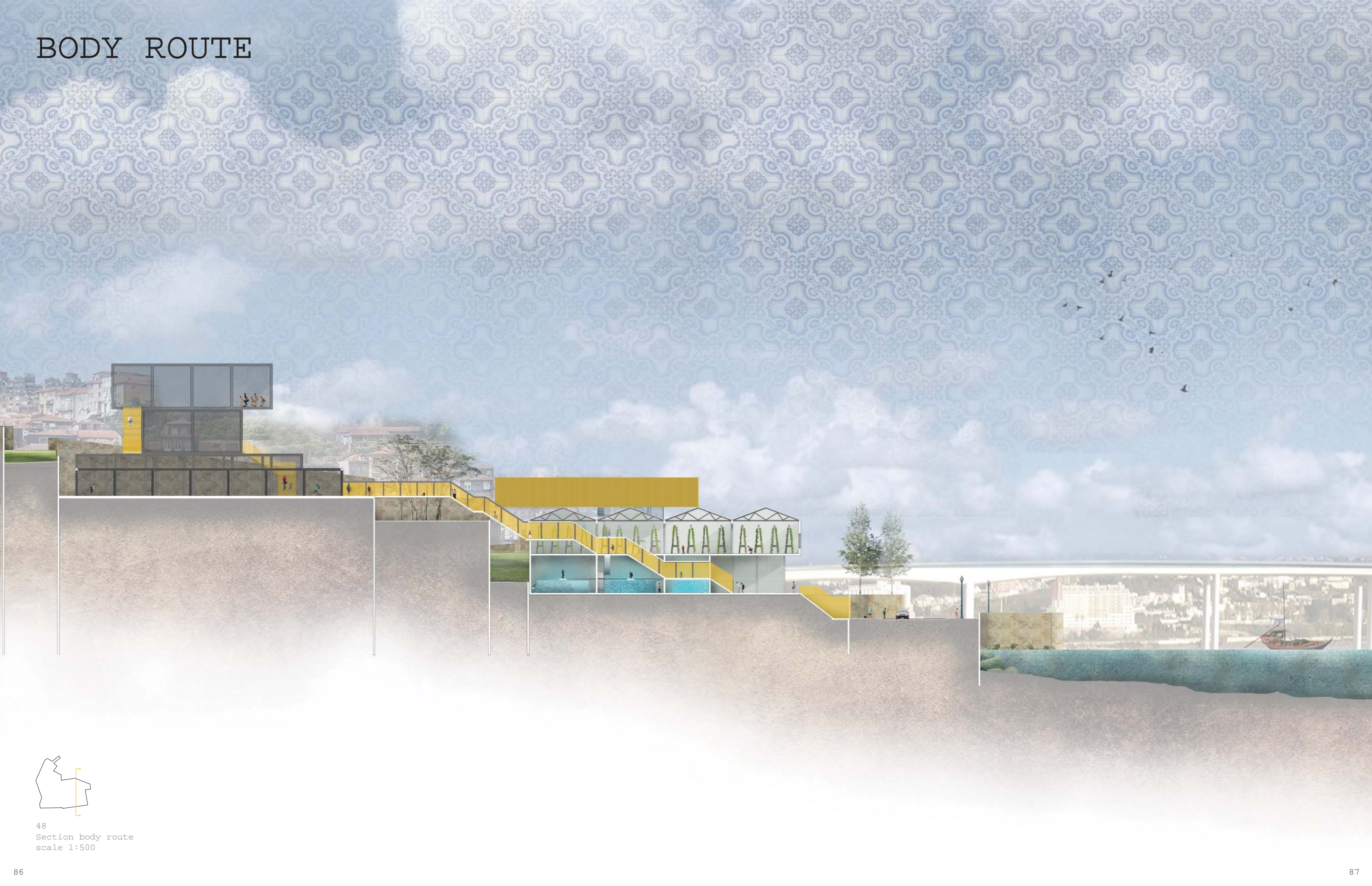
The grey path that winds through the site is the mind route. The body route is visualised by the messing. The existing buildings are constructed from concrete and the new volumes are constructed from steel and messing.

Five of these buildings are elaborated in more detail: the urban farm, the urban gym, the performance centre, the visual arts centre, and the market.





# BODY ROUTE



48  
Section body route  
scale 1:500





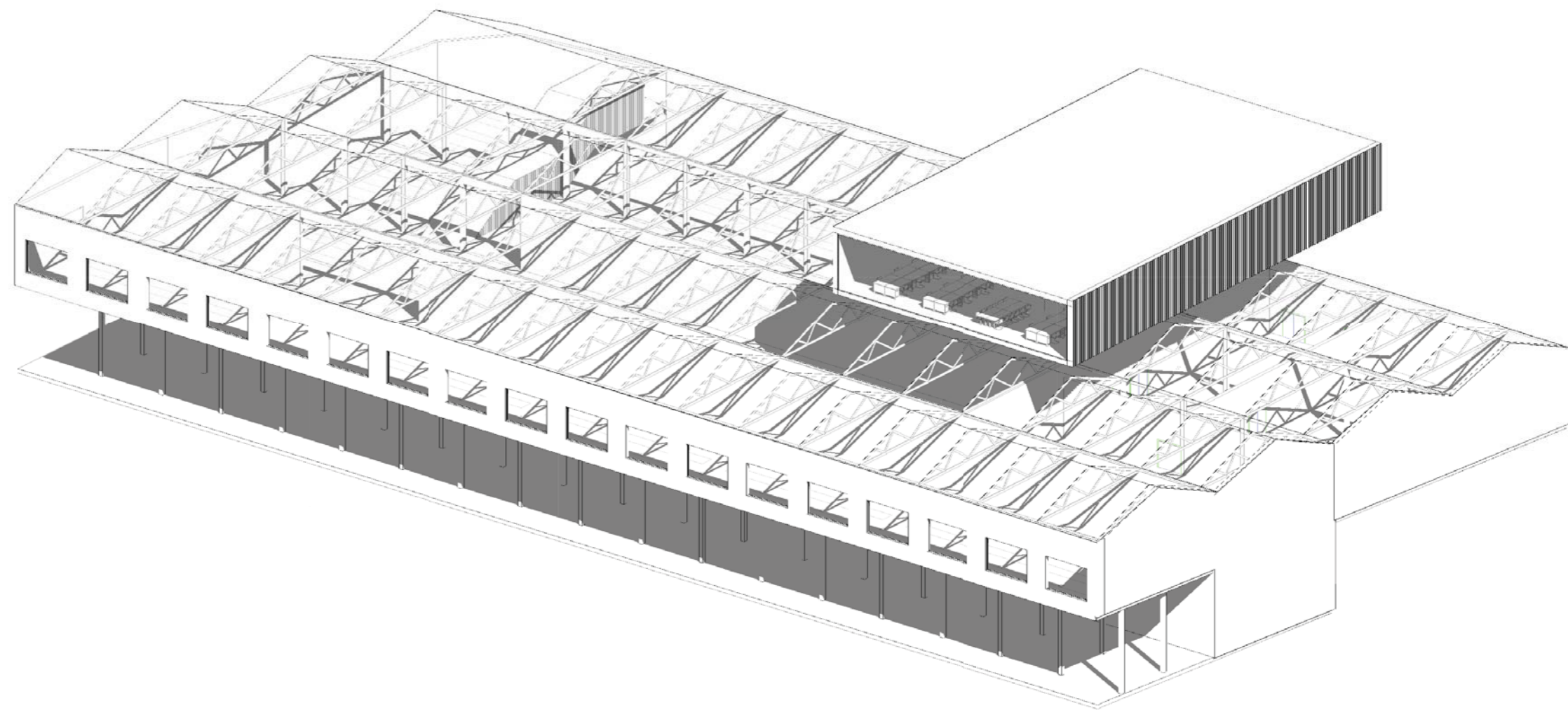


The body route runs through the urban farm, across the urban gym to the market. From the market, the body runs back through the cooking school to the water. The route is direct and follows an orthogonal grid. New volumes are added to the existing buildings.

The different buildings on the body route are connected by bridges. These bridges are made out of vierendeel trusses on both sides. The vierendeel trusses are covered with yellow lamellae on both sides. The yellow colour is derived from the tile panels that occur frequently in Porto.

#### URBAN FARM

Visitors of the body route cross the urban farm, which is located in the former workshop of the Central Termica do Freixo. A glass roof is added, this makes it possible to use the former workshop as an urban farm. Fish tanks containing aqua cultures are located on the ground floor and are lighted, so they are clearly visible for the visitors of the body route. The water from the aqua cultures runs through pipes to the hydroponics. Vegetables, fruits, herbs, and edible flowers are growing in this part of the urban farm. Residents of Campanhã can help in the urban farm in exchange for cheap food. On top of the urban farm an extra volume has been constructed. This volume contains the canteen and the control room for the urban farm. The body route continues towards the urban gym.

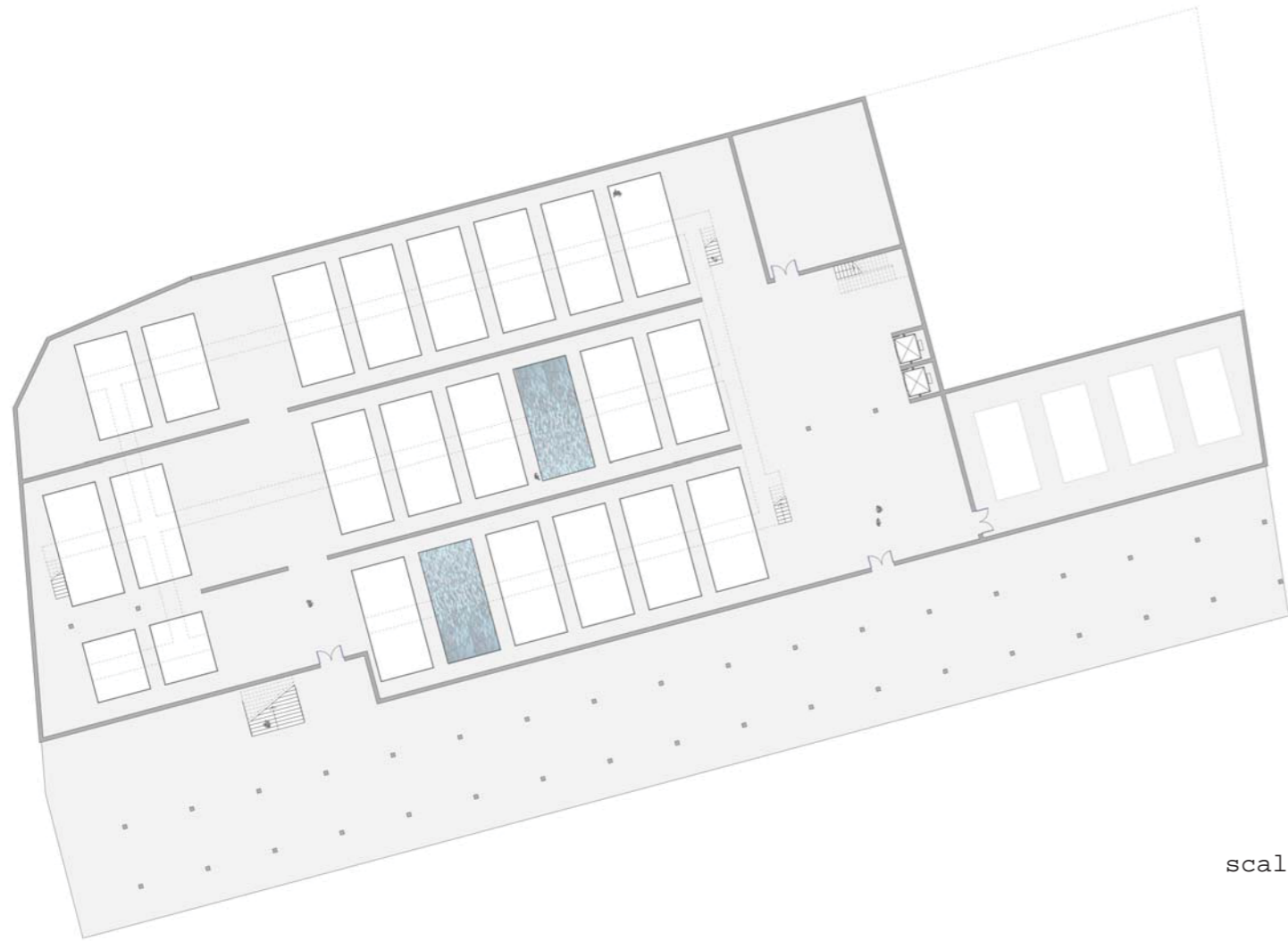


<--  
49  
Buildings included in  
the body route  
  
50  
Urban farm  
  
-->  
51  
Bridge covered with  
yellow lamellae





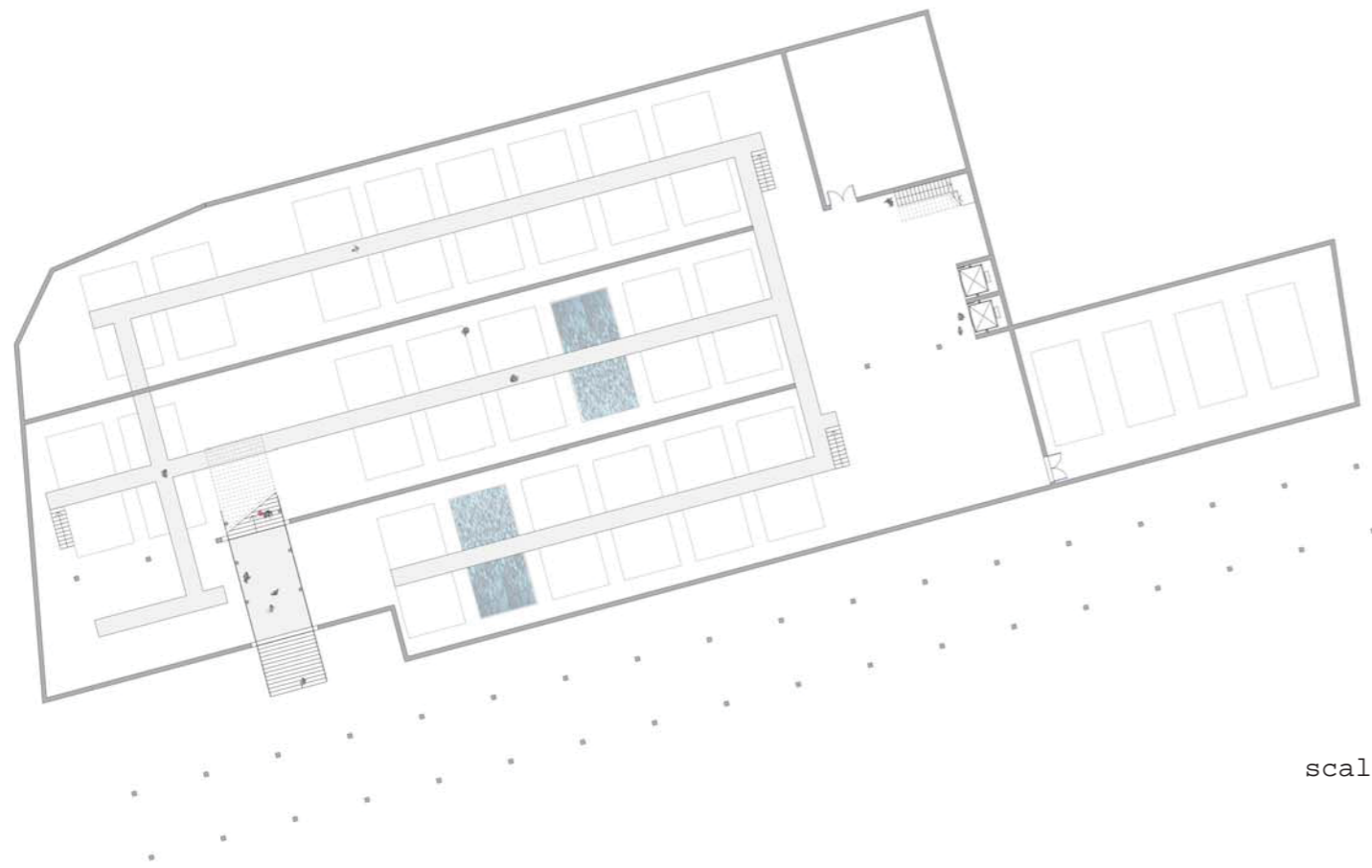




+0  
scale 1:500



+6500  
scale 1:500



+2500  
scale 1:500

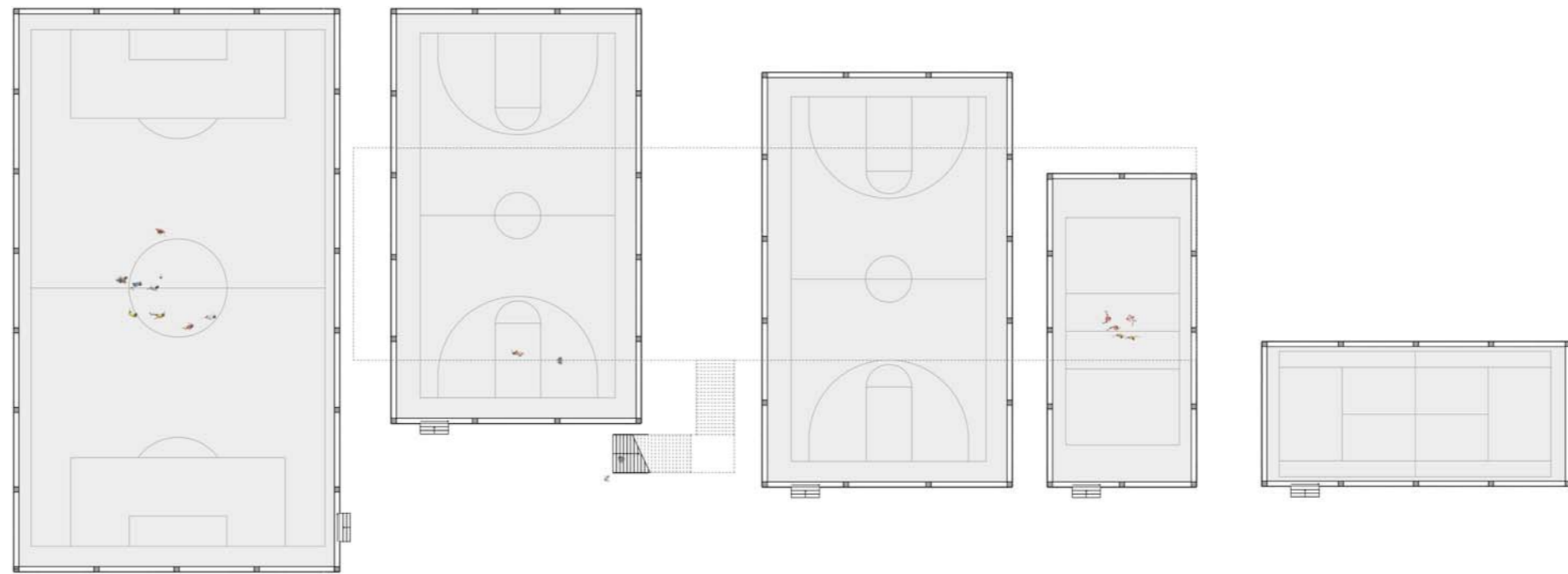


+12500  
scale 1:500

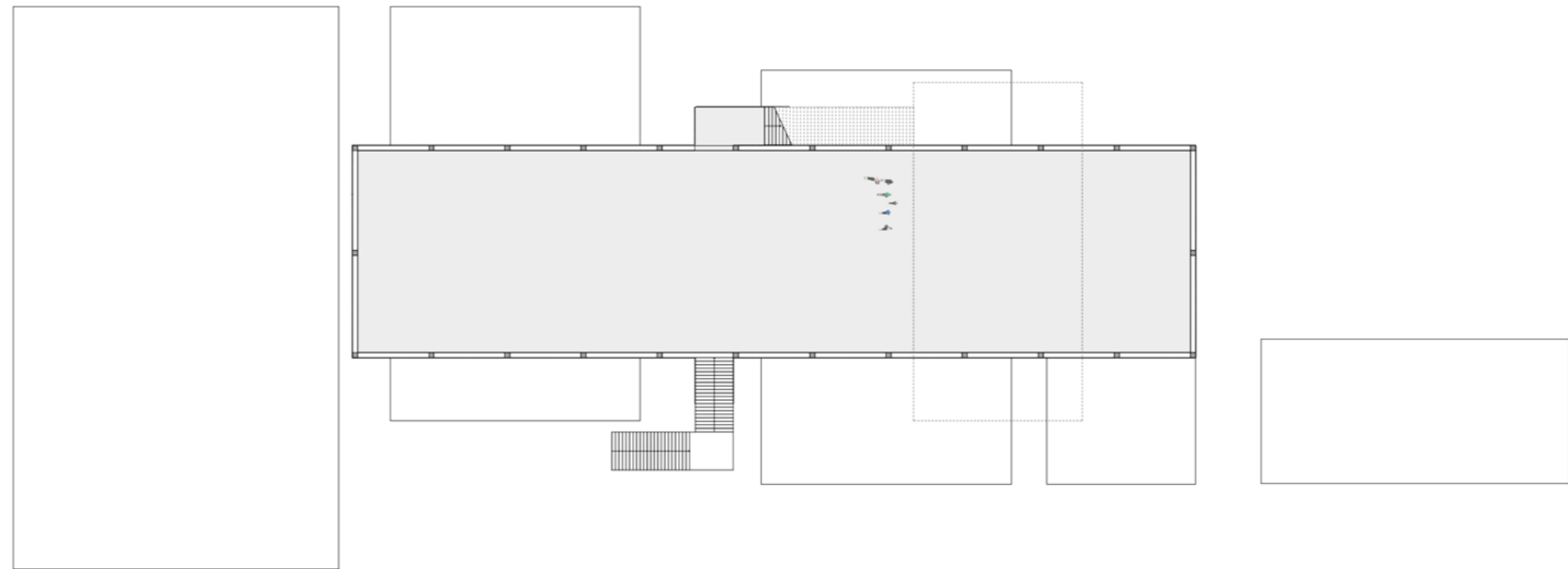




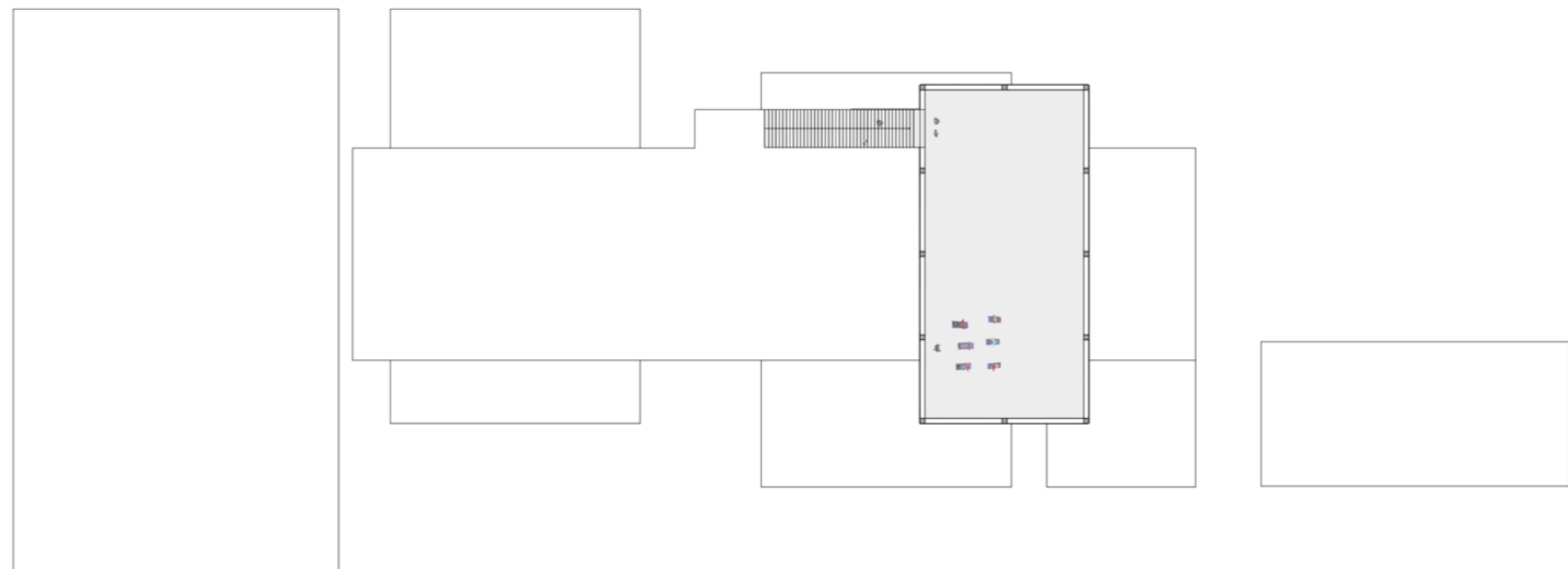




+0  
scale 1:500



+7400  
scale 1:500



+14800  
scale 1:500

## URBAN GYM

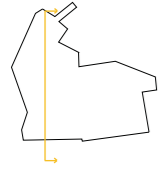
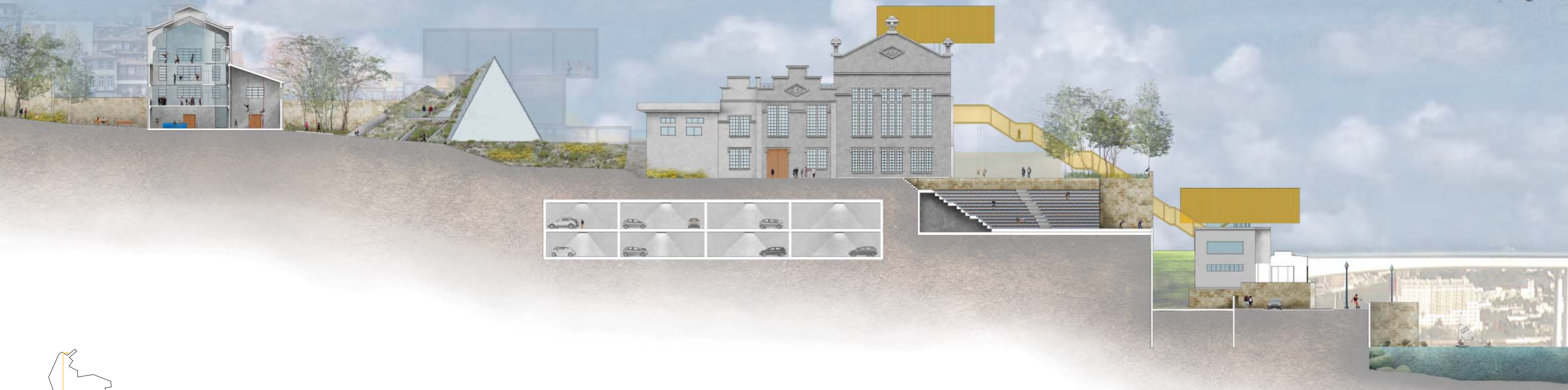
In the urban gym several ball sports can be played; soccer, basketball, tennis, and volleyball. The fields for these sports are located in sports cages on the ground floor. It is also possible to do fitness, and inhabitants of Campanhã can participate in group classes. The cages for these activities are placed on top of the cages for ball sports. The sport cages are constructed from vierendeel trusses and covered with anthracite grey aluminium lamellae.







# MIND ROUTE



<-- <--

52  
Model urban farm

<--  
53  
Urban gym

54  
Section body route  
scale 1:500

-->  
55  
Buildings included in  
the mind route





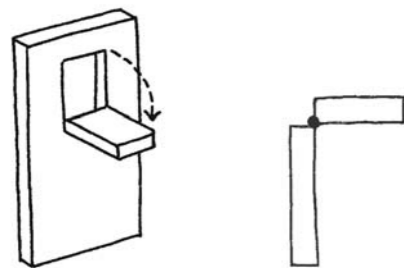
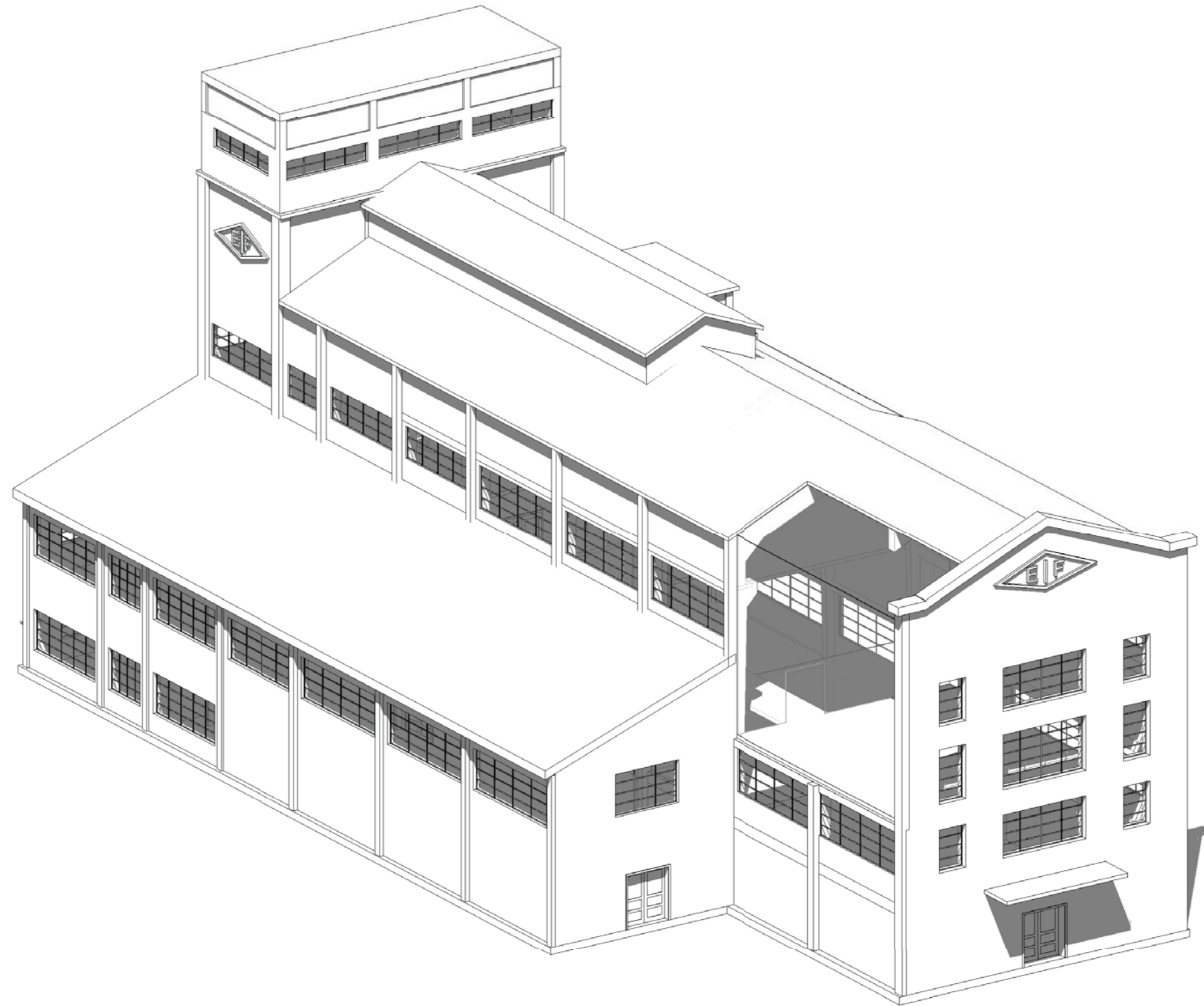


## PERFORMANCE CENTRE

The first building that belongs to the mind route is the performance centre. In this building, inhabitants of Campanhã can participate in drama classes, dance classes, and music classes. The openings, that were present for the electric ovens, are closed with glass to create extra floor space. A visual connection between the different floors is still available.

More floor spaces is created by making cuts in the walls, after which the surfaces of the façade are folded towards the inside of the building. The folded parts are used as a floor. The new facade openings that arise are closed with glass.

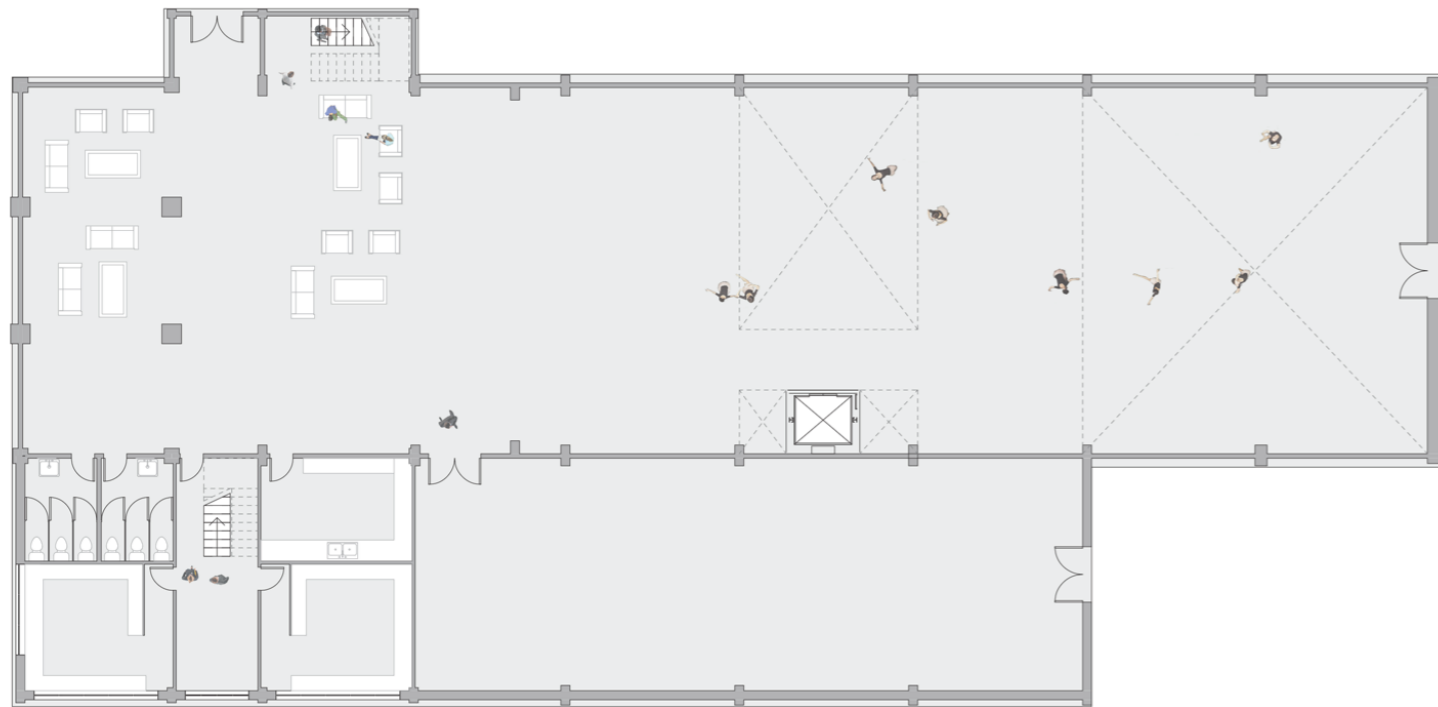
The folding principle is also visible in the detailing. The floor is placed on an L-profile, and the wall is folded around a hinge. On the other side, the floor is suspended on a tension cable. The roof of the performance arts centre is covered with a white and blue tile tableau.



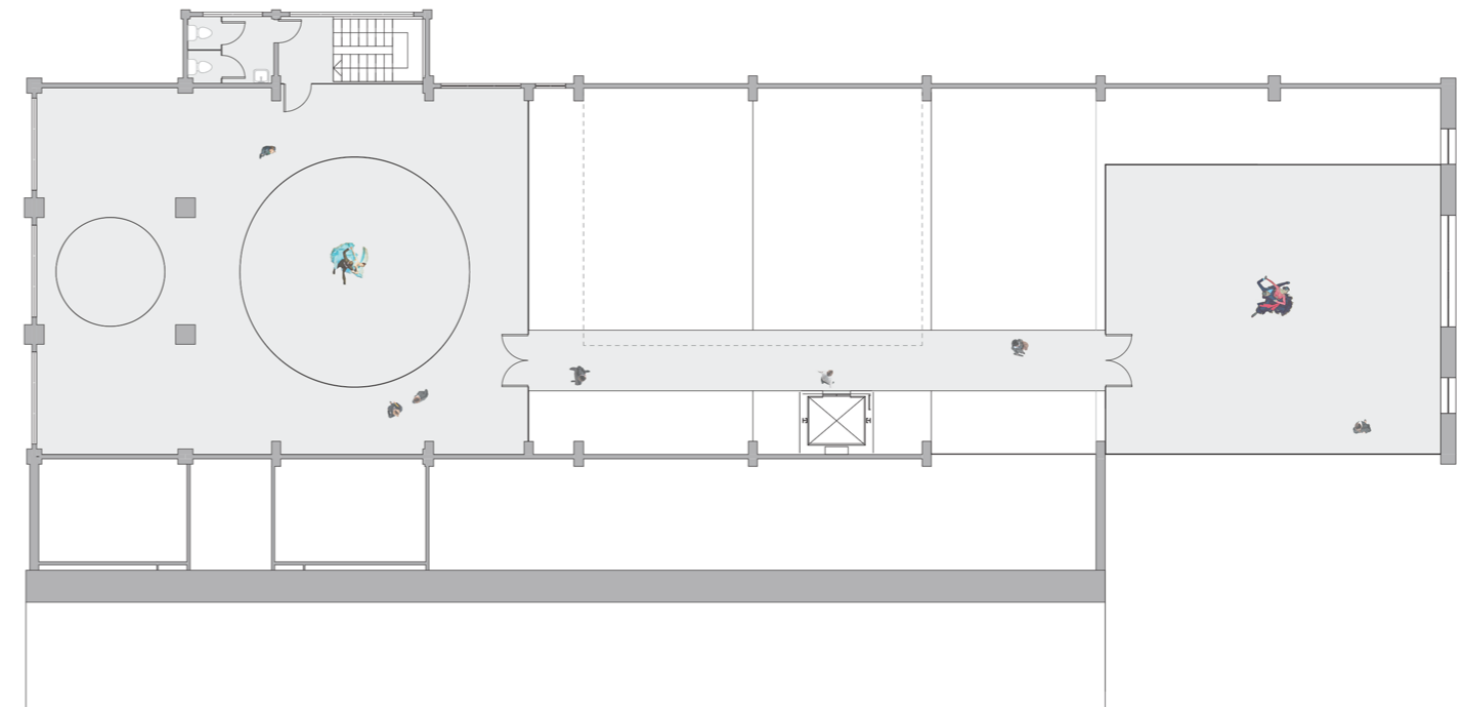
56  
Folding principle

57  
Performance centre





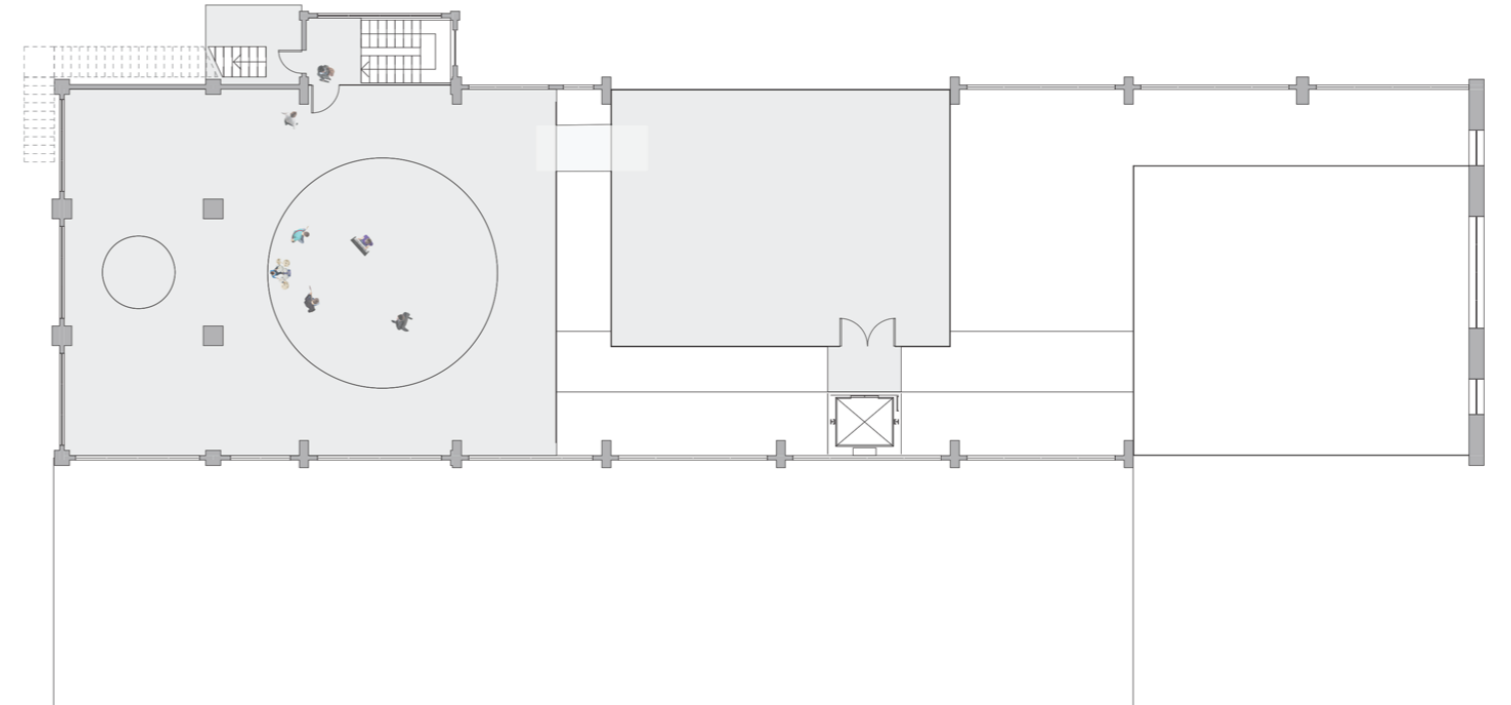
+0  
scale 1:250



+6750  
scale 1:250

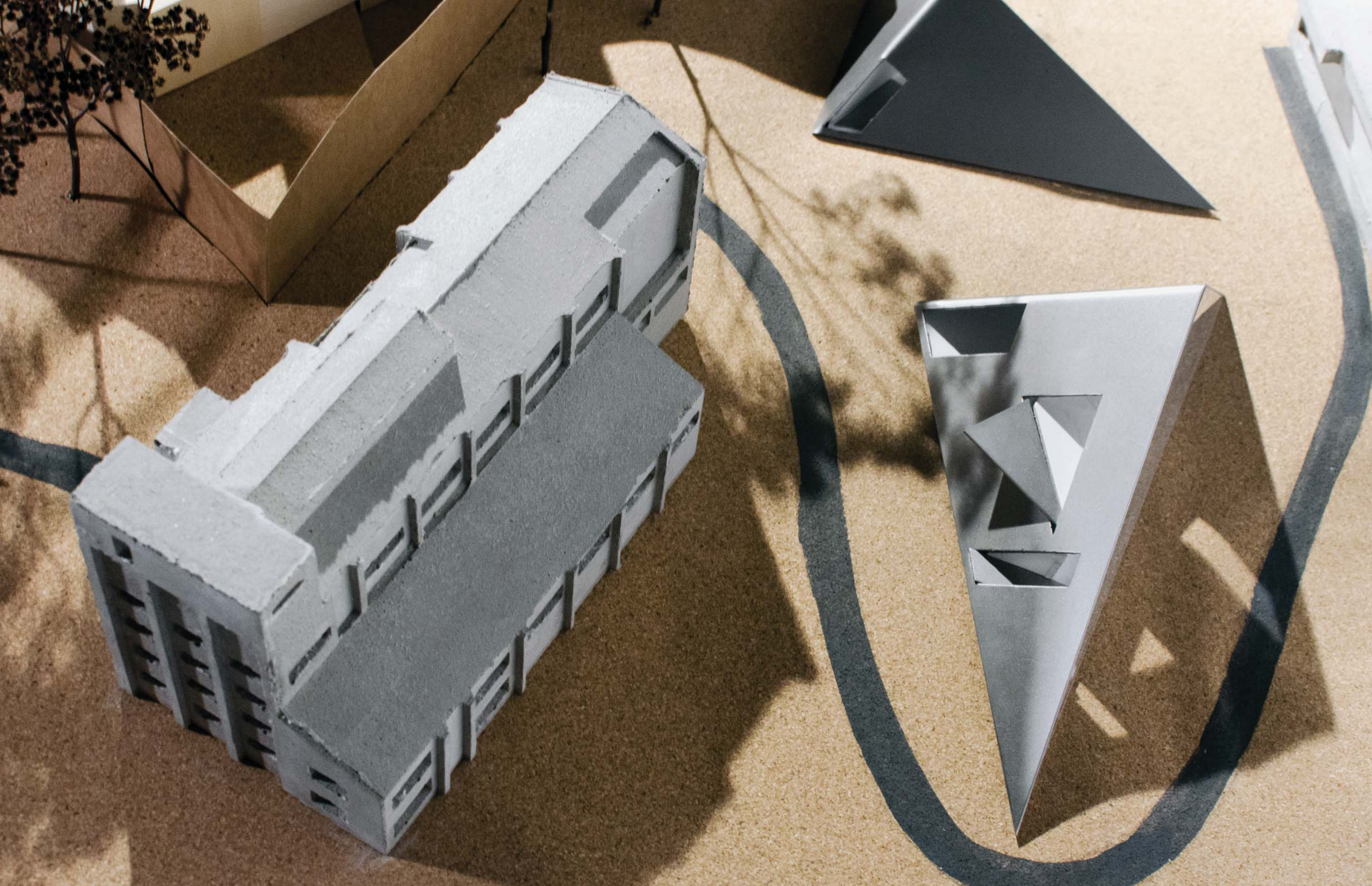


+3500  
scale 1:250

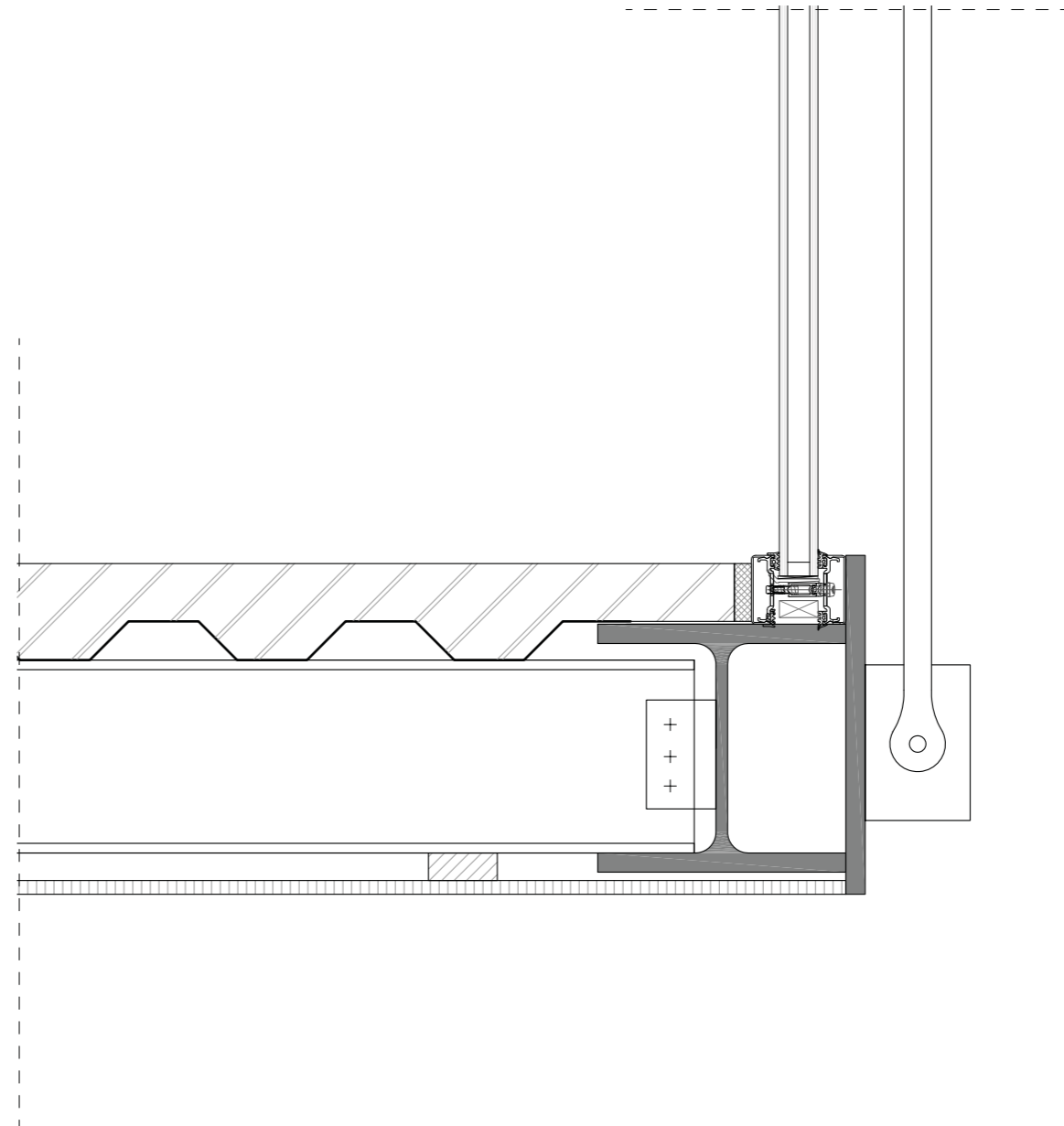
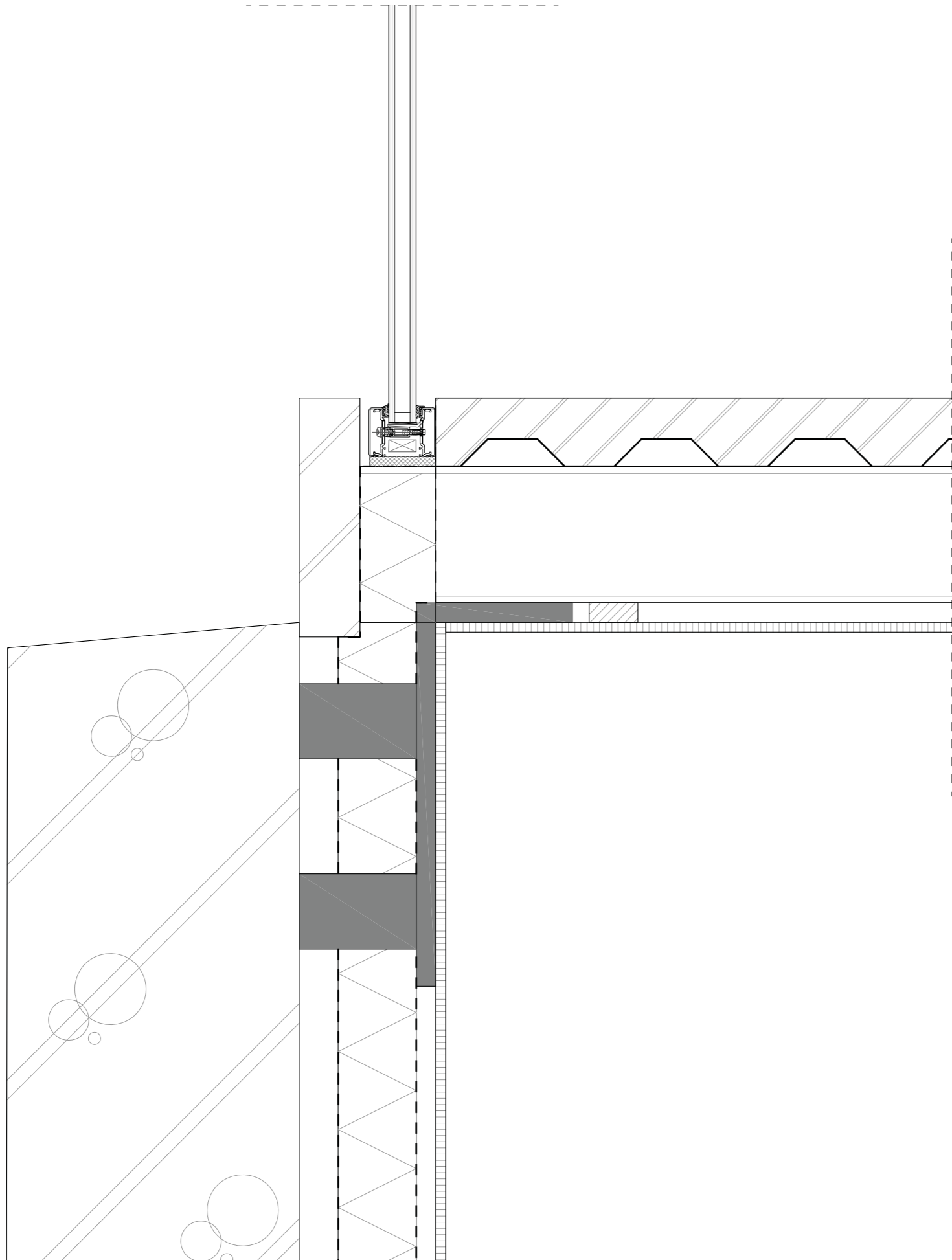


+9950  
scale 1:250





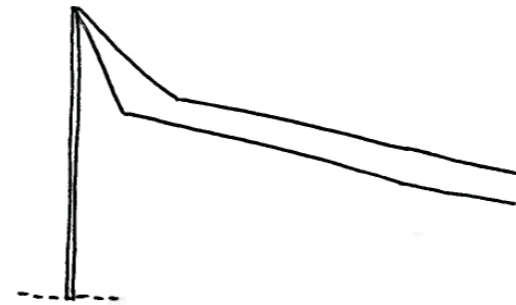
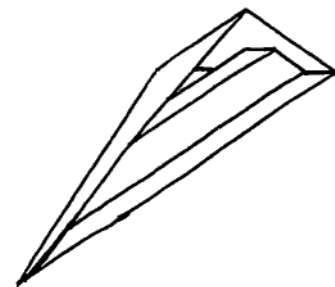
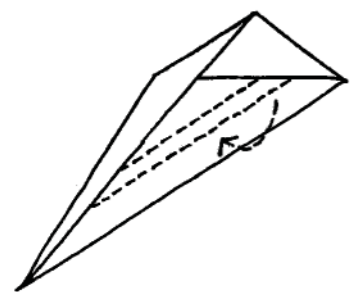
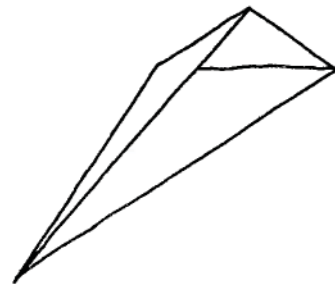
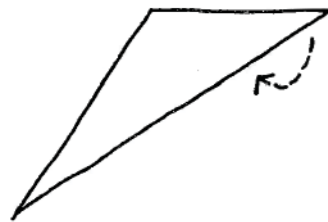
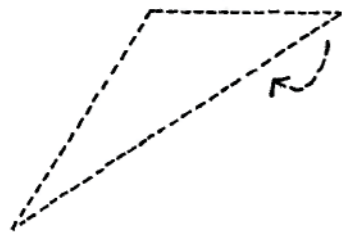




<--  
 58  
 Performance arts centre  
 and visual arts centre

59  
 Detail performance centre  
 scale 1:5





60  
Folding principle volume  
visual arts centre

61  
Folding principle windows  
visual arts centre

62  
Structural principle

-->  
63  
Model visual arts centre

The mind route continues to the visual arts centre. This is a new volume in the masterplan. A part of the earth is lifted to create a closed space which gives a secure environment to learn new skills. The same hierarchy that is used in the mind route - learn and open - show is visible in the floorplan of this building. The more closed spaces, at the back of the building, are used for classes, the more open spaces are used for workplaces. A place where people can interact in order to inspire each other. Parts of the façade are folded towards the inside or outside to create window openings.

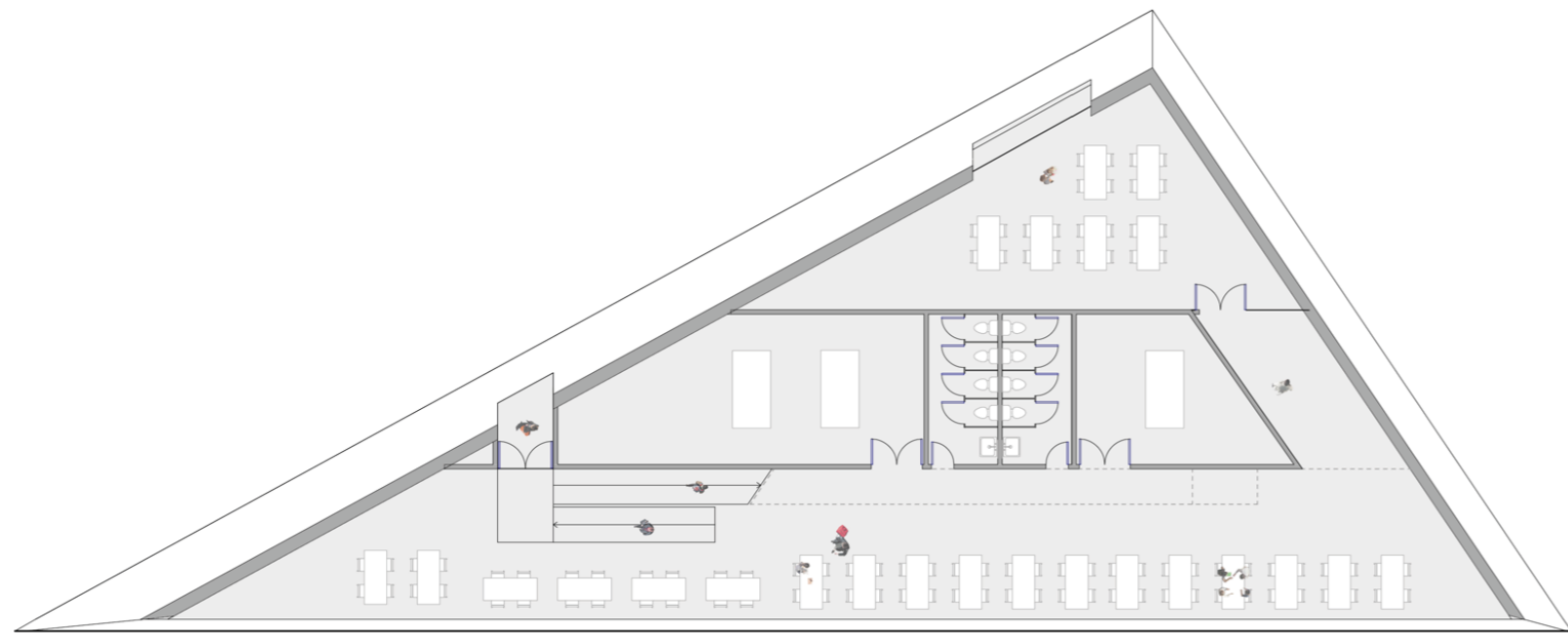
The roof of this building is supported by an arch. This arch is combined in the edge of the roof. This edge is thicker than the rest of the roof to create enough construction height. This edge also functions as a railing in case people set a foot on the roof. The edge of the roof is covered with a strip of tiles and the rest of the roof is covered with vegetation.

The mind route continues to the market, the amphitheatre, the exhibitions space that is combined with a swimming pool located on the water.

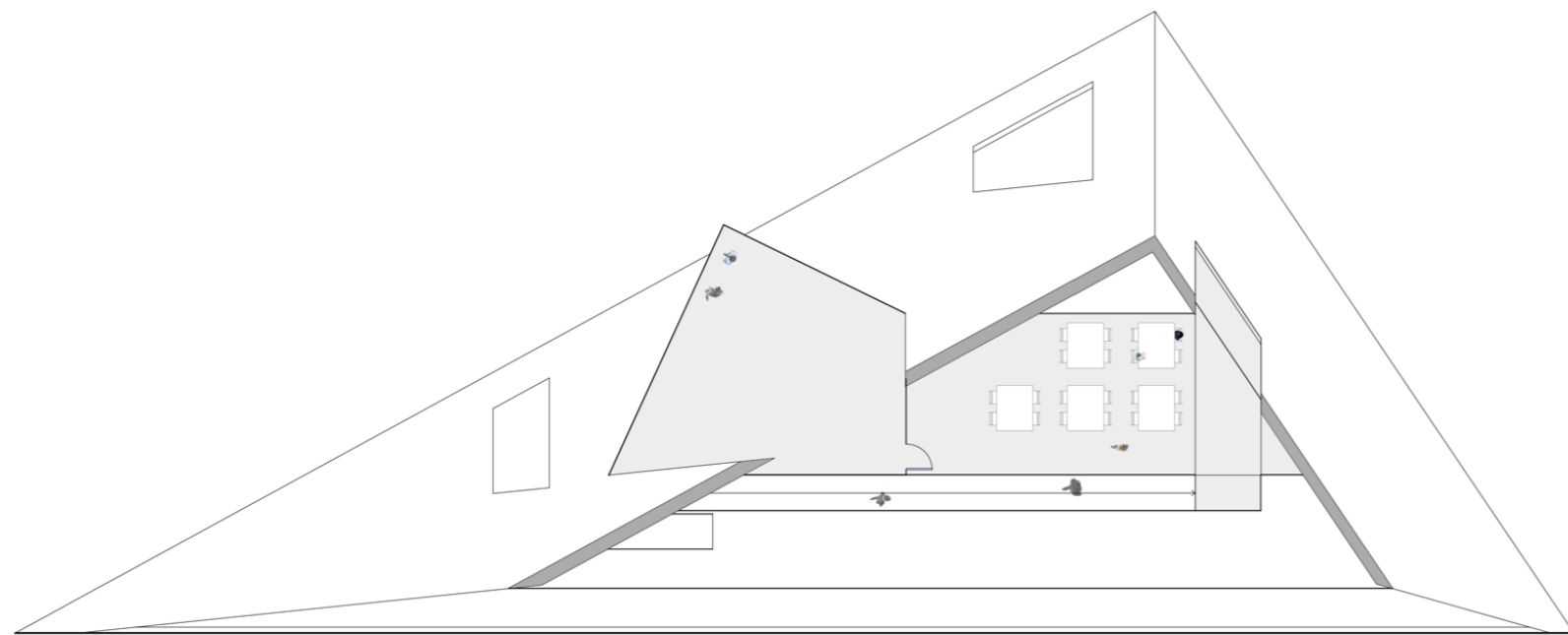








-1000  
scale 1:250



+3000  
scale 1:500

64  
Amphitheatre  
-->  
65  
Mind route









# MARKET



66  
Section market  
scale 1:500

-->  
67  
Market and visual  
arts centre

--> -->  
68  
Elevation Market

--> --> -->  
69  
Entrance body route





















The two routes come together in the market hall. The market is located in the former power station. Food that is produced in the urban farm is sold at the market. This central building also houses a restaurant. Art produced in the mind route is exhibited and sold in the gallery. The body route enters the building

on the first floor. The market with the food stands is located at the ground floor. The ceiling of the market has two voids. The restaurant is located on the first floor. People that are seated in the restaurant are able to see the people that are visiting the market and the other way around.

<--  
70  
Section market

71  
Voids in the ceiling

-->  
72  
Windows restaurant

--> --> -->  
73  
Market

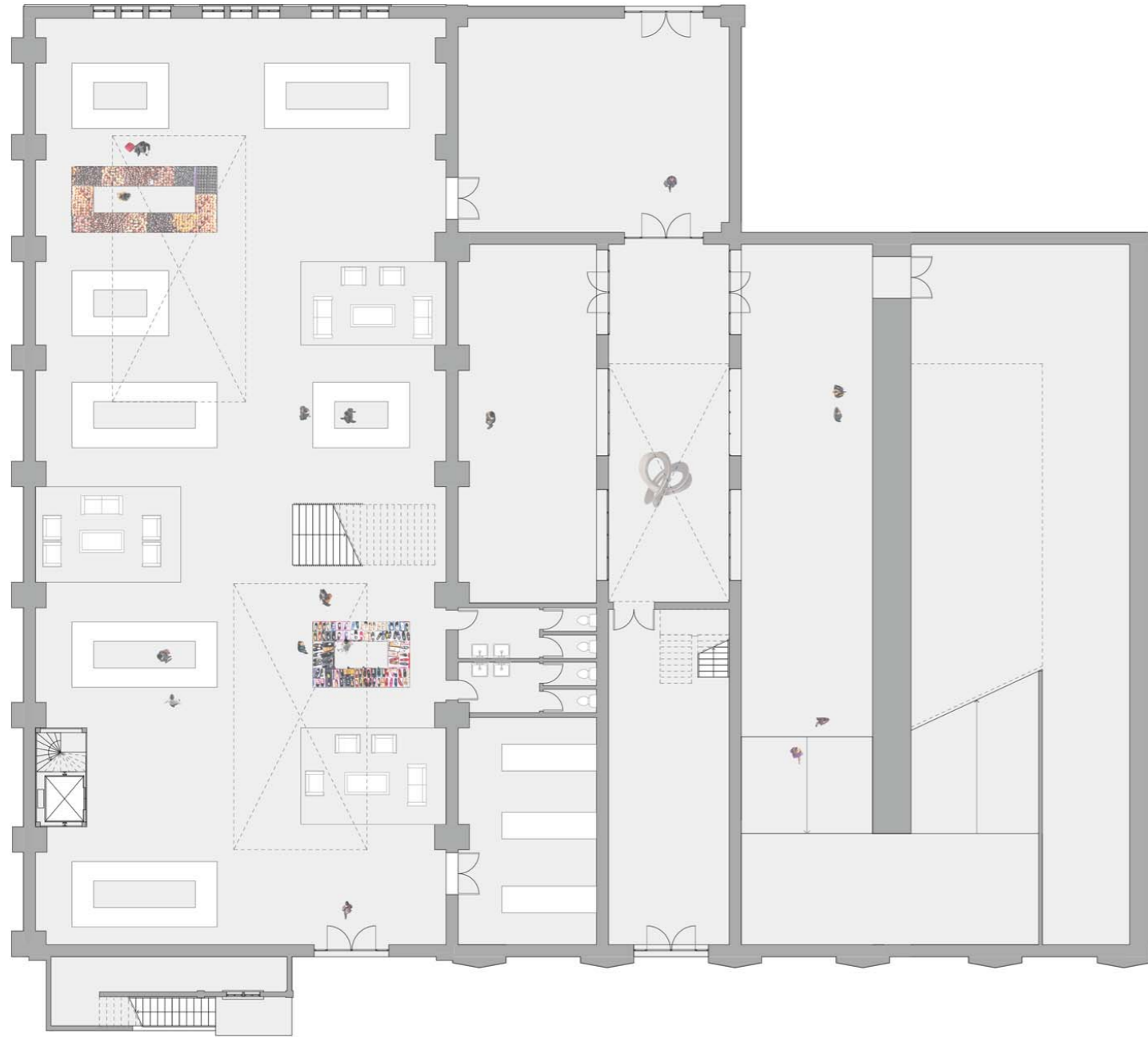
--> --> --> -->  
74  
Restaurant



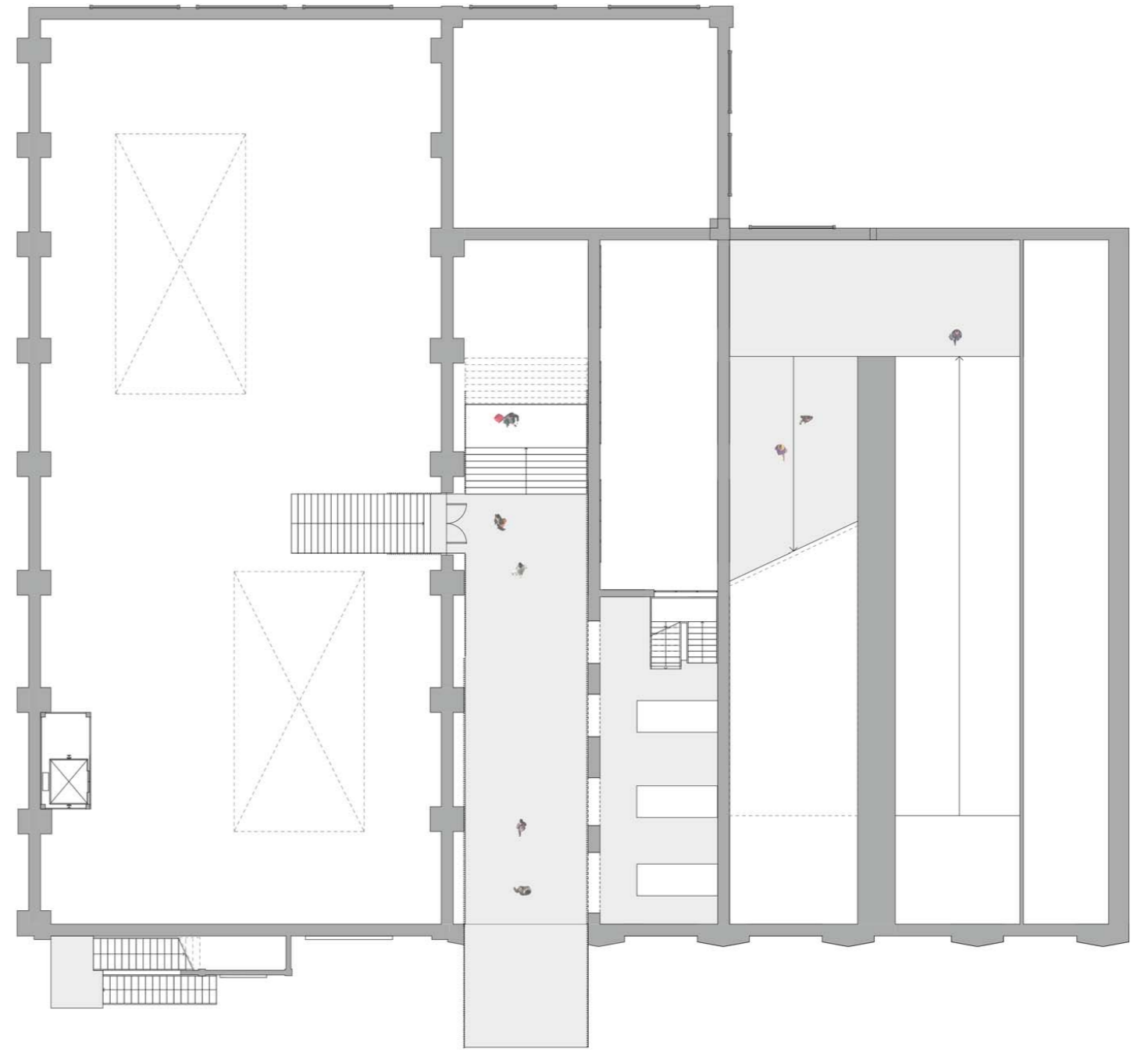








+0  
scale 1:250



+3600  
scale 1:250









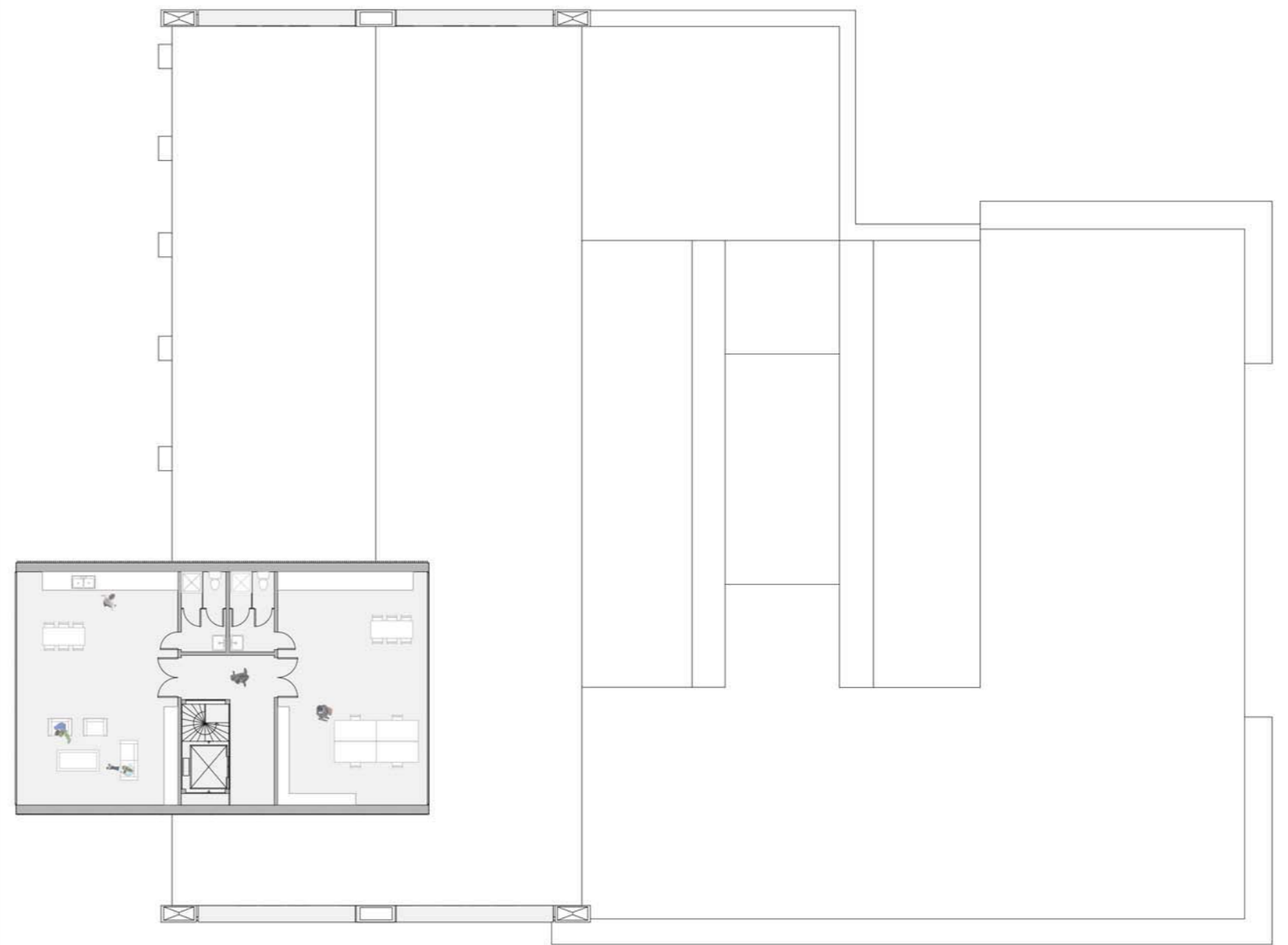






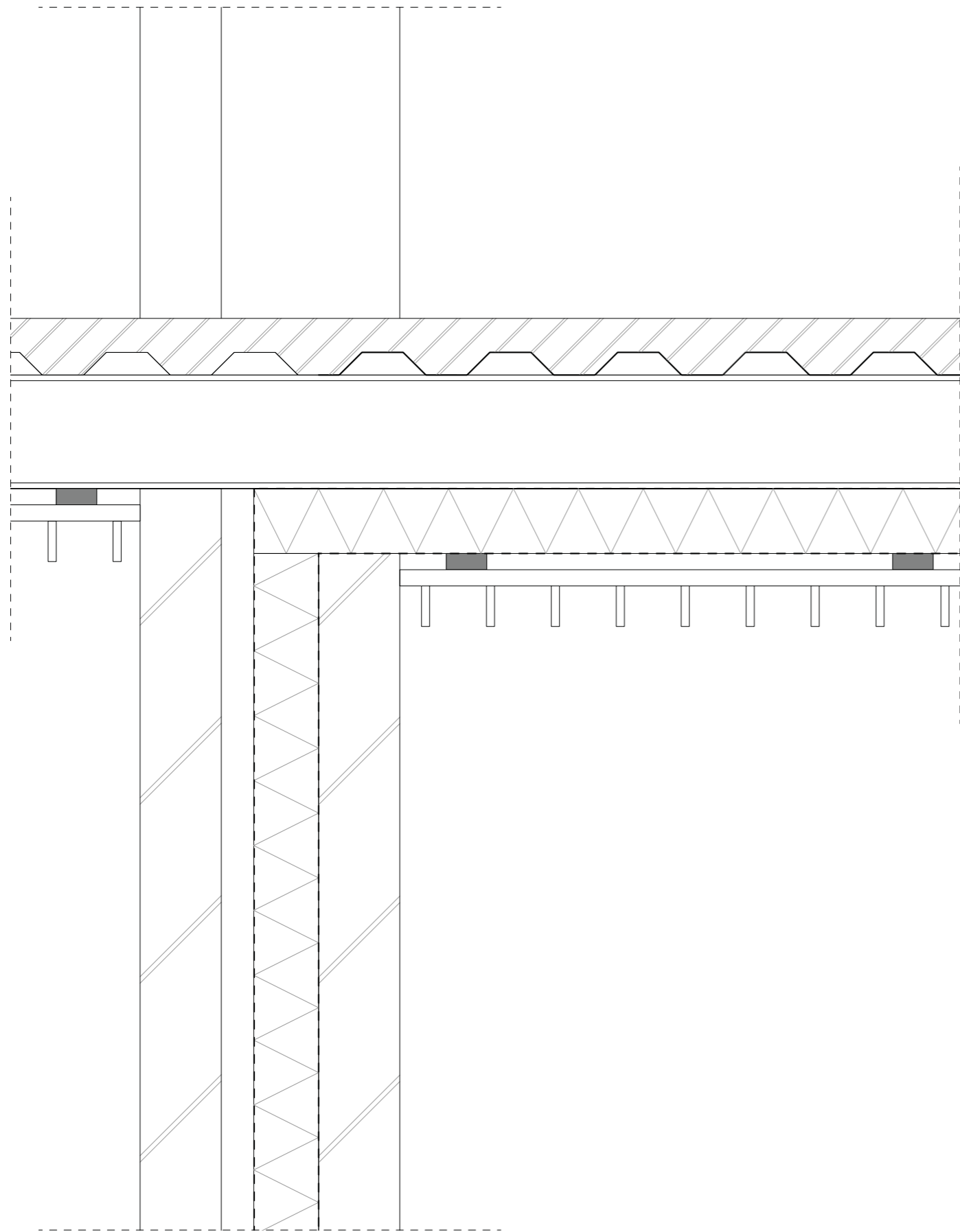


+5700  
scale 1:250

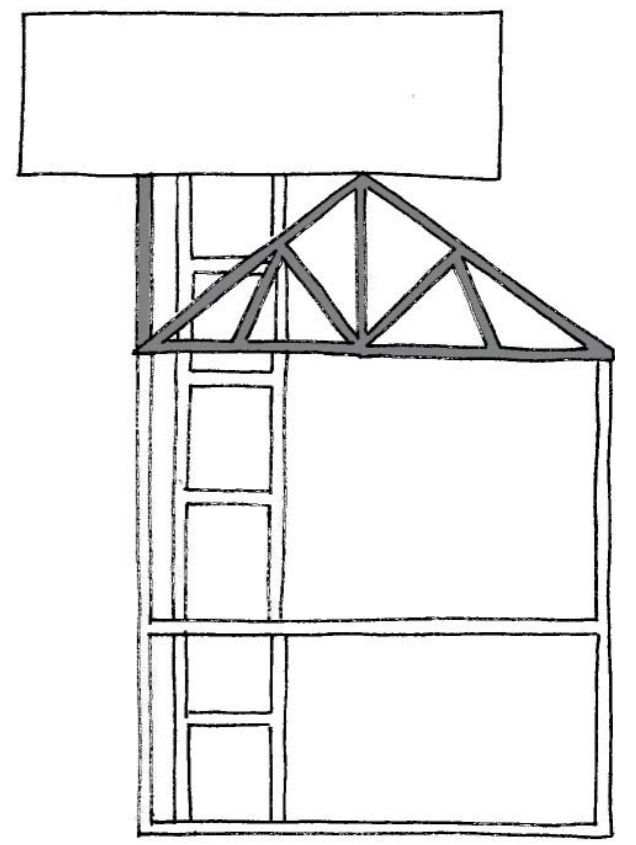


+22000  
scale 1:250





<-- <--  
 75  
 Entrance mind route  
  
 76  
 Detail bridge  
 body route  
 scale 1:5  
  
 77  
 Structural principle  
  
 -->  
 78  
 Ramp gallery  
 mind route



On top of the market is an extra volume. This volume contains the control room of the security. This volume is supported on one side by columns. On the other side, it is not desirable to support this volume with columns. These columns would cross the market and the restaurant. At this side the volume is supported by the trusses in the roof. It is desirable to keep the weight of the extra volume as low as possible. The volume is created by a timber frame structure and covered with yellow aluminium lamellae.





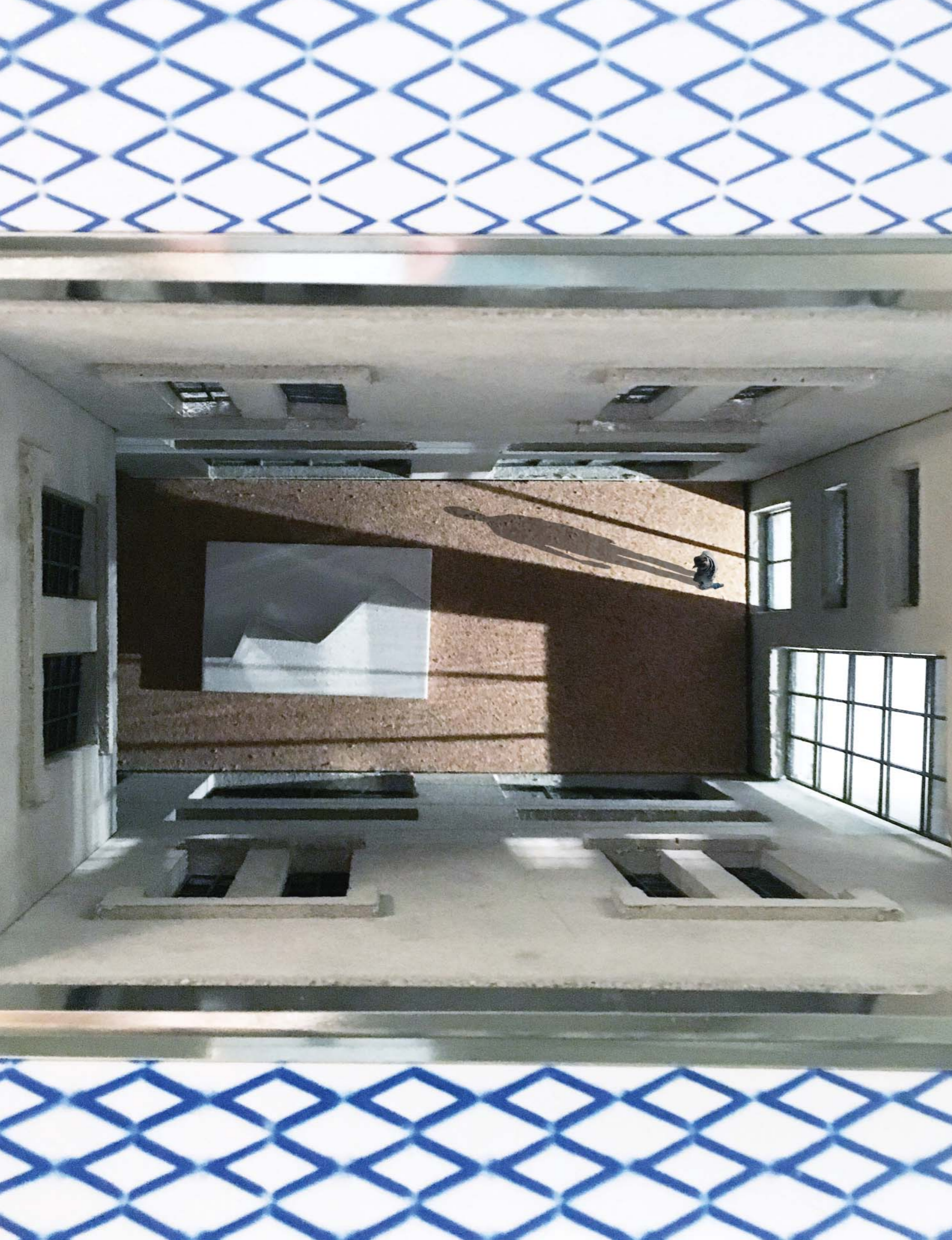


The mind route winds through this central building. The façade on the left side of the building is folded towards the outside. This creates a ramp, which can be used as an entrance to the gallery

79  
Court yard









# CONCLUSION

Porto has many districts with bad living conditions. Campanhã located in the east of Porto is one them. This district has a high crime rate and poor living conditions. This resulted in the following research question:

How can the Central Termica do Freixo be transformed into a Community Centre that contributes to a positive change in the living conditions and the daily functioning of the population of Campanhã?

Improving the living conditions in Campanhã will not provide a long lasting solution for the problems. Urban rehabilitation must come from the inhabitants of Campanhã. Residents of Campanhã have to develop themselves in order to create new opportunities and trigger urban rehabilitation.

The Central Termica do Freixo is transformed into a community centre which gives the inhabitants a possibility to develop themselves. This makes it possible to create new opportunities. The body route connects the urban farm with the urban gym, cook school, and the market. In this route, inhabitants of Campanhã can learn about a healthy lifestyle and they can

participate in to achieve such a lifestyle.

In the mind route, people can develop mentally through art education. Inhabitants improve their social skills, which they can use to create new opportunities.

During major events in the transformed Central Termica do Freixo, visitors from outside Porto are expected. These visitors can provide the critical mass that is necessary to support retail establishments, restaurants, and other facilities. The transformation of the Central Termica do Freixo results in other investments.

# REFLECTION

The proposed plan for the Central Termica do Freixo covers a large area. It is impossible to say with certainty that the investment into a community centre will trigger urban rehabilitation. This process depends on the community and the inhabitants of Campanhã themselves. As an architect it is possible to create facilities and spaces but inhabitants of Campanhã cannot be forced to develop themselves. The investment costs are high and the question that can be asked: is it possible to earn the money back over time? If not? Is it still worth to spend a large amount of money on this project.

I spent most of my time in the model workshop during this graduation project. Building models is an important method in my design process. These models are not only used to visualize the end result but it is also a method to design. In an early stage of a design process models are a quick method which matches the level of accuracy. When the level of detail increases, building models takes a lot more time. This was visible when I was building the sectional model scale one to fifty. I am very proud at the result, but the question can be asked: could a less time consuming method visualize the design in a similar way.



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