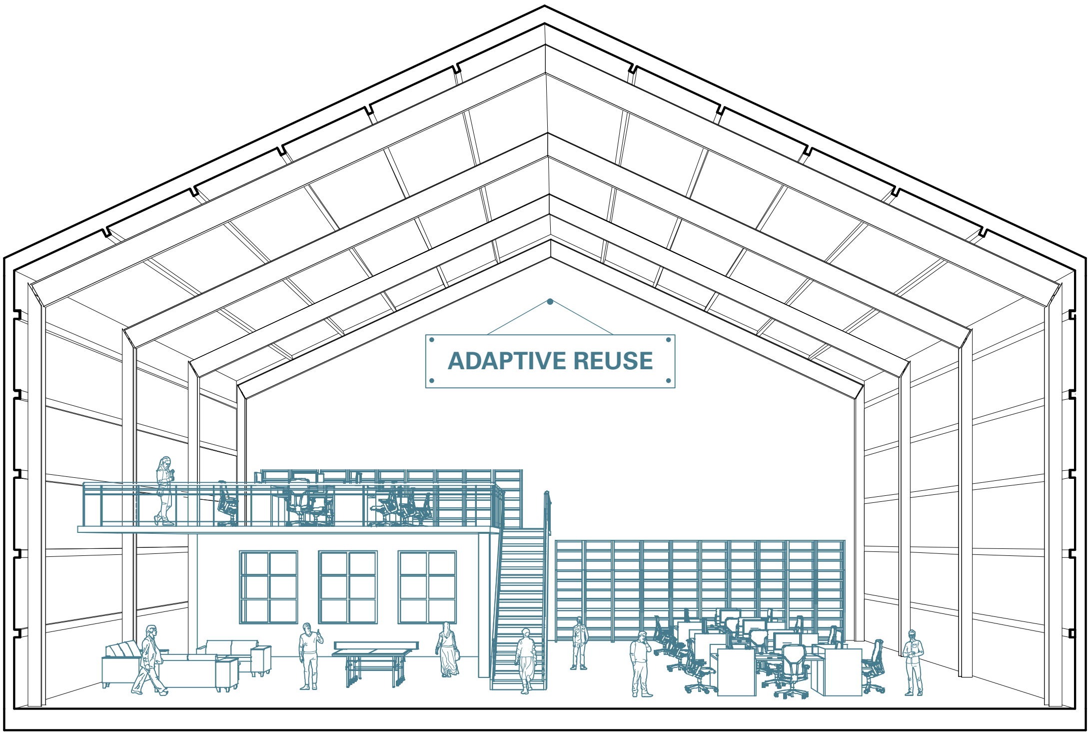

The potential of forgotten space

A method for the assessment of spatial qualities
in adaptive reuse projects.

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Master Thesis / Politecnico di Torino
MSc Architecture Construction City

A.A 2018 - 2019

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Acknowledgements

I would like to deeply thank those people who have helped me throughout this process. To my tutor, Professor Isabella Lami, for her patience, enthusiasm, and support from the beginning of the investigation. To my co-tutors, Lucia Baima and Matteo Robiglio, who with their support and ideas allowed me to better understand the problems that were sought to be addressed during this thesis. To Toolbox Coworking, for allowing me to carry out the fieldwork in its facilities to understand and analyze the adaptive reuse process.

I want to especially thank my family, who from the distance was an unconditional support during this time. The motivation and energy they gave me were essential to move forward and complete these studies. Special thanks also to my girlfriend Maria Camila for all the help, understanding, patience and encouragement she gave me during this time and that were fundamental to be able to complete this work. In the same way, thanks to my friend Alejandro, who with his ideas helped me to think of a different way of addressing the problems that arose during this thesis.

For all these people, a sincere thanks for everything they did to help me in the development of this thesis.

Abstract

Adaptive reuse is a process that currently is part of the discussion about sustainable urban development in contemporary cities. Research has shown how conducting this type of process represents not only a series of social, economic and environmental benefits that attract the interest of developers, urban planners, and administrative bodies, but also represents an alternative vision and way of thinking to tackle the growth and development of cities making efficient use of available resources. This study aims to determine from architecture the conditions that must be considered to successfully carry out an adaptive reuse project. More specifically, this thesis seeks to answer: How do the spatial qualities of an existing building influence in the successful development of an adaptive reuse process?

To answer this question, an experimental method was proposed for the qualitative and quantitative analysis of the adaptability and flexibility of the space in existing buildings, in order to understand to what extent these could be transformed and adapted to new requirements. In this way, it was intended to be consolidated as a possible tool to support the decision-making of stakeholders in this type of projects.

This method was applied in six different adaptive reuse case studies in Italy and, as a result, it could be understood that besides to social and economic factors, the spatial qualities of the building, infrastructure or site to be reused also represent a fundamental factor to consider in the success of the adaptive reuse project.

However, this method has some limitations in the form and scope of the analysis of the spatial qualities for which future research and development would be required so that it can contribute to the discussion of sustainable urban development in contemporary cities.

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1.0 Introduction

Contemporary cities currently face an important challenge. As the population grows, also increase the need for more urban spaces of quality in which people can live and work. To meet this need, new structures would have to be developed as more people are concentrated in the urban areas. However, many of these areas have already reached the limit of expansion in their territory, or conversely, it is decided to contain urban sprawl for reducing the excessive consumption of resources and energy that entails extending the city limits, as well as the pollution generated in the transport of people that have to travel longer distances between home, workplaces and public facilities than in a compact city.

Given this situation, the alternatives to address this challenge would be: using the areas still available in the city for much higher and more compact new developments that allow densification of the city, removing existing urban constructions to make way for new developments, or reusing existing structures that are not used or underused for adapting them to people's needs. It is precisely in this last alternative that the concept of adaptive reuse is framed, a form of sustainable urban development in which the use of resources and the pollution generated are considerably reduced with respect to new constructions, but that could also satisfy the need of people to have more urban spaces of quality while preserving the existing urban landscape.

In addition, the benefits of adaptive reuse at an economic, social and environmental level can make this type of process considered of interest for urban planners, developers and administrative bodies, who are looking for alternatives to efficiently face the growth of contemporary cities. Therefore, it is considered fundamental to understand the necessary conditions to promote the development of adaptive reuse processes in the urban context. However, these conditions can be complex to determine and depend on the point of view under which they are analyzed, either from economics, politics, sociology, urban planning, among others. Therefore, with the purpose of defining an analysis perspective, this study will focus on understanding these conditions from the field of architecture. Where it will be sought to analyze the spatial qualities of existing buildings that could foster adaptive reuse processes.

In the same way, analyzing these spatial qualities will allow discovering the transformation potential of existing buildings in the city under the terms of adaptive reuse, helping in the decision making of the interested parties in this type of projects. For achieving this, this study will propose an experimental analytical method for assessing spatial qualities, both quantitatively and qualitatively, so that at the end of the process it is possible to compare and select existing buildings to adapt and reuse them depending on the potential of the space to be transformed.

1.1 Scope and methodology

This study focuses on understanding the potential space transformation of existing buildings for adapting them to satisfy people's changing needs under the concept of adaptive reuse. In this way, it will be necessary to first define the concept of adaptive reuse and its characteristics to determine the scope of the transformation process. Moreover, for understanding this process, several projects of adaptive reuse will also be analyzed in deep focusing on its architectural characteristics qualities. Likewise, to determine the spatial qualities for being analyzed it will be necessary to reflect on the concepts of urbanity and urban qualities, terms that must also be defined and will establish the basis of the method.

The method to be proposed will constitute an experimental approach for analyzing determined spatial qualities in existing unused or underused buildings, regardless of their typology, previous usage or size. These qualities will be analyzed through a series of steps in which both quantitatively and qualitatively will be measured the potential for space transformation. For this, mathematical procedures and diagrams representing this potential will be used.

This method derives from the research conducted during this study, in which it were considered not only the theory of adaptive reuse, the case studies and the concept of urban qualities, but also were considered precedent experiences in the analysis of spatial qualities in buildings. It will be explained in detail step by step for later being applied in the aforementioned case studies.

Finally, it must be considered that this proposal does not constitute or pretend to be a definitive form for analyze and understand spatial qualities in adaptive reuse projects, but represents a proposal that could support the development of this type of process more objectively. However, future research is needed for analyzing the conditions that promote adaptive reuse that were not considered in this study but that equally influence the successful completion of this process.

Chapter one

Adaptive reuse

2.1 CONCEPTUAL CONSIDERATIONS ON ADAPTIVE REUSE

Adaptive reuse has been a much-debated concept in recent years in the field of architecture and urban planning.[1] The growing environmental awareness of society to address the effects of climate change is generating a new way of understanding development and progress in the cities. In this way, concepts such as use and waste have assumed an important role in contemporary urban life, where not only is thought in consuming goods for then discard them when they do not meet people's needs but how that the goods that people are consuming could be recycled and reused over time.

However, it is necessary to clarify that in the urban context goods are not only referred to the common items used in daily life, such as vehicles, food or clothes, but also to the entire *built environment* [2] that constitutes the urban landscape. In this sense, the different components of urban built environment, such as buildings, public space, and transportation infrastructure, although generally projected for long term usage, must be considered as consumable goods that, when will not meet people's needs, also could be demolished or abandoned in the urban space.

Under these considerations is framed the concept of adaptive reuse in contemporary times. A concept that although has been addressed from different approaches, maintain the same idea of sustainability in the urban development. Therefore, three current concepts of adaptive reuse are going to be analyzed and compared in order to choose the definition that best suits the purposes of this study.

Firstly, according to the Australian Department of Environment and Heritage,[3] adaptive reuse is defined as 'a process that changes a disused or ineffective item into a new item that can be used for a different purpose.' (p.14) This definition is considered a too general approach to the term because it does not define the limits in which it is framed. The word *item* force thinking in the reuse of practically whatever physical element without distinction. On top of that, it does not seem to consider the implication of the word *adaptive* in the definition, what leads thinking that in this case adaptive reuse is intended in the same terms of a simple reuse process but with a usage variation.

Secondly, according to Freschi and Maas[1] adaptive reuse, in city planning and architecture, 'applies to the use of a building (often partially reconstructed) for a new function that differs from the purpose for which the building was originally erected.' (p.13) In this case, conversely to the prior statement, the definition is highly precise in its scope, but it is framed in just one part of the built environment components, the building. And as it was explained before, all the urban constructions are susceptible to disuse and abandonment, generating an opportunity for subsequent reuse. Moreover, this definition does not explain in which terms the building adaptation to the new use is intended, what constitutes a difficulty to understand how to conduct the process.

Finally, Robiglio states when proposing the definition for adaptive reuse in architecture:

1. Freschi E, Maas M. Conceptual reflections on Adaptive Reuse. In: Freschi E, Maas M. (eds.) *Adaptive Reuse: Aspects of Creativity in South Asian Cultural History.* Wiesbaden: DMG; 2017. p. 11-24.

2. Built Environment, as explain by Tom J. Bartuska in *The Built Environment: A Collaborative Inquiry into Design and Planning (New Yersey, 2017),* is 'everything humanly created, modified, or constructed, humanly made, arranged, or maintained.' (p.5)

3. DEH. *Adaptive Reuse: Preserving our past, building our future.* Canberra: DEH; 2004.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

> 'Adaptive reuse is the process of reusing an existing site, building, or infrastructure that has lost the function it was designed for, by adapting it to new requirements and uses with minimal yet transformative means.' [4] (p.173)

This last statement clearly defines the scope proposed in the concept. By considering site, building, and infrastructures as subjects of reuse, Robiglio is considering the entire components of the built environment, a position that is assumed as consistent with the sustainable urban development approach.

On the other hand, and unlike the precedents definitions, is proposed the way for conducting the adaptive reuse process when are mentioned the minimal transformative means as the paramount condition. And although it is not explained how these minimal transformative means are intended, all these characteristics aforementioned propose Robiglio's definition as the most suitable for the purposes of this study.

5. United Nations. *The Sustainable Development Agenda.* Available from: https://www.un.org/sustainabledevelopment/development-agenda/ (Accessed 31st July 2019).

6. United Nations. *Goal11: Make cities inclusive, safe, resilient and sustainable.* Available from: https://www.un.org/sustainabledevelopment/cities/ (Accessed 31st July 2019).

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

Adaptive reuse and sustainable urban development

Sustainable urban development has been considered these decades as a crucial factor in the urban agenda throughout the cities in the world. So much so, that it has been included in the *Goals for Sustainable Development* [5] proposed by the United Nations in 2015 and projected until 2030.

Precisely the goal *Sustainable Cities and Communities,* [6] highlights the importance of improving urban planning and policies for promoting the sustainable growth of the cities in order to face climate change. Thereby, this goal proposes a greater awareness in the way of dealing with resources within the city, which mean reflecting on the urban built environment aforementioned.

Thus, particularly talking about buildings in the city, Baum [7] claims that they must 'be regarded not merely as a material and economic resource, but also as an important component that makes the city itself into a source of new developments and new lifestyles.' (p.10) This statement leads thinking that buildings have a connotation that could go beyond the simple process of use and reuse for promoting sustainable development, these are tightly related to people's lives and the way they interact with the built environment.

Furthermore, the building plays an important role in the definition of urban identity. Its architecture besides demonstrating the original use it was designed for, also determines its significance for a specific community. Likewise, buildings as products of society's needs over time, are proof of the identity of a determined location.[7]

In this way, Baum states that 'if the existing buildings are appropriately converted, they can remain as an active part of the urban structure and as a node in the network of relationships, interlacing and movement in the urban space.' [7] (p.10) Which constitute an entirely new approach under the sustainable urban development concept, where urban built environment comprises not only merely static structures which fulfill a specific function but also active structures that support and create relationships between people and urban space.

This active feature encourages awareness in the value of the current urban built environment in the future development and growth of the cities. In summary, sustainable urban development does not bound the city's growth to the implementation of new and more efficient construction technologies that will allow reducing the resources consumption and the carbon footprint of new constructions, but it also encourages considering the existing ones for future developments that besides constituting an improvement in the resource use efficiency, fosters the preservation and strengthening of the identity formed in time. Architect Carl Elefante proposes that 'The greenest building is the one that is already built'.[8] (p.26) Under the exposed considerations and increasing the scope of this idea it could be proposed that *the greenest city is the one that bases its growth and development in the use of the existing urban built environment.*

8. Elefante C. The Greenest Building Is... One That Is Already Built. *Forum Journal*. 2007;21(4): 26-38.

Adaptive reuse and other RE-use processes

As it was explained before, adaptive reuse is a process that goes beyond the simple act of reusing existing urban constructions. It requires a process of adaptation, a term which Douglas[9] define as 'any work to a building over and above maintenance to change its capacity, function or performance.' (p.1) However, this definition is very extensive and could lead to confusion of adaptive reuse with another type of *re-use processes*. Some of them could be in some way analogous to the definition while others could represent a totally opposite position. That is why it is going to be used some terms from the extensive adaptive reuse's glossary provided by Wong,[10] in order to clarify the possible similarities and differences between them:

9. Douglas J. *Building Adaptation.* Second edition. Abingdon: Spon Press; 2011. p.1,589,590.

10. Wong L. *Adaptive Reuse: Extending the lives of buildings.* Basel: Birckhäuser; 2017.

Reconstruction- 'Defined as the act or process of reproducing by new construction the exact form and detail of a vanished building, structure, or object, or a part thereof, as it appeared at a specific period of time.'[11]

Refurbishment- 'Means adapting it to meet current standards, too, whether because of change in users' demands or new technical regulations.'[11]

11. Giebeler G. *Telling Time, The History and Theory of Preservation in America.* New Yersey: Jhon Wiley & Sons; 2006. p. 5.

Rehabilitation- 'Defined as the act or process of making possible a compatible use for a property through repair, alteration, and additions while preserving those portions or features which convey its historical cultural or architectural values.'[12]

12. Weeks K, Grimmer A. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Building.* Washington: US Dept of the interior; 1995. p. 26.

Remodeling- 'This is a North American term analogous to adaptation. It essentially means to make new or restore to former or other state or use.'[9]

Renovation- 'Upgrading and repairing an old building to an acceptable condition, which may include works of conversion'[9]

Restoration- 'Defined as the act or process of accurately recovering the form and details of a property and its setting as it appeared at a particular period of time by means of the removal of later work or by the replacement of missing earlier work.'[11]

Retrofitting- 'The redesign and reconstruction of an existing facility or subsystem to incorporate new technology, to meet new requirements or to otherwise provide performance not foreseen in the original design.' [9]

9. Douglas J. *Building Adaptation.* Second edition. Abingdon: Spon Press; 2011. p.1,589,590.

All of these processes shares the prefix *'re'*, which according to Robiglio[4] evokes 'the idea of returning to the existing city to fix its failures'.(p.191) However, although in general terms these demonstrate an intention to recover or transform the original idea proposed about an existing site, building or infrastructure, the means of transformation completely differ from one to other.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

This is how, for instance, while remodeling and adaptive reuse suppose a process of transformation for adapting the existing structure to a determined use, the former demands much more resources and energy, moreover implies a major alteration on the building's image and, consequently, in the identity formed through time. And as it was explained before, adaptive reuse suppose a minimal transformation of the existing conditions for not altering the three particular characteristics of this reuse process '-identity, autonomy, and memory-'.[4] (p.191)

In conclusion, 'with respect with other reuses, the adaptive is inherently more conservative, but does not have the ideal of completeness... neither substitute the old with the new nor restore the old to its integrity.' [4] (p.193,194)

Benefits of adaptive reuse processes

As it was mentioned before, adaptive reuse represents an opportunity and a means to prompt sustainable urban development. However, it is necessary to highlight the particular benefits that this kind of process could bring to the urban context that could result in an interesting and attractive strategy for city planners, developers and administrative bodies. For this purpose, these benefits are going to be divided into three general categories: *environmental, social and economic*.[3]

3. DEH. *Adaptive Reuse: Preserving our past, building our future.* Canberra: DEH; 2004.

13. Tucker S, Ambrose M. *Embodied energy of dwellings.* In: CSIRO ESD Success Applications Conference.Sydney: N.S.W; 1997.

1. Freschi E, Maas M. Conceptual reflections on Adaptive Reuse. In: Freschi E, Maas M. (eds.) *Adaptive Reuse: Aspects of Creativity in South Asian Cultural History.* Wiesbaden: DMG; 2017. p. 11-24.

Environmental- Adaptive reuse proposes an approach to city development based on ambient awareness, this is achieved firstly by the reduced use of material resources being implemented, representing important waste and energy saving in their manufacturing, transportation, and installation, also known as '*building's embodied energy'*,[13] which finally results in less ambient pollution. In this sense, 'by reusing buildings, their embodied energy is retained, making the project much more environmentally sustainable than entirely new construction.' [3] (p.4) And secondly, by preventing urban sprawl, containing the growth of the urban fabric and the necessity of developing new infrastructure to provide the basic urban services. In this way, it is also conserved the city skyline which forms part of the collective memory.[1] Therefore, these conditions characterize adaptive reuse as a process that is committed to the preservation and with the efficient use of resources for protecting the environment. The use of the existing urban constructions for satisfying the people's changing needs is its main concern.

14. Elsinger A. The Social Value of Transformation. In: Baum M, Christiaanse K. (eds.)*City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 67-72.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

15. Bone-Winkel S, Matheis H. The Economic Aspects of Real-Estate Development. In: Baum M, Christiaanse K. (eds.)*City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 82-88.

Social- For knowing the social benefits of adaptive reuse, it is necessary to first understand that the urban built environment stock comprises not only the physical components already described but also 'the networks and specific traditions that exist in a city, its people and the spatial figures inscribed by their everyday pathways in the city.'[14] (p.67) Thereby, the social value of adaptive reuse lies in its capacity of integration to the city's everyday life.[14]

In the same way, this process plays an important role in the preservation and strengthening of the identity and collective memory[4] of determined locations in the city. As products of a past society, the existing buildings, sites, and infrastructures represents a story of how people used to live these spaces and what they represented for them, a story that in most of the cases has been preserved until these days. Nevertheless, these could also represent an opportunity to propose new and innovative forms of development. Accordingly, in adaptive reuse 'social benefits are concrete, specific and local. Their extent emerges in the phase of assimilation and usage of what has been transformed'.[14] (p.67) What leads thinking that its social value is not only related to the final usage of the reuse project but also is tightly linked with the process of transformation and the degree of participation and engagement that the local community has had in its realization.

Economic- From the ones already described, economic benefits seem to be the most evident and attractive for this kind of processes. Existing urban construction suppose an advantage when compared to new construction projects in terms of cost and competitiveness given that these are usually sold at a price below restoration costs. Likewise, as less investment is required for existing constructions, low rents could be offered for the interested in this kind of properties.[15] Furthermore, given that the main structure is already built, the transformation project could suppose a staged process in which spaces are adapted as more resources become available.[4] This will allow harnessing the existing urban constructions for promoting new business ideas that could have the possibility of growing over time progressively as the needs arise. A condition that represents an investment opportunity particularly for entrepreneurs looking for a platform to start their business ideas. Nevertheless, it must always be considered that the transformation costs must not jeopardize the feasibility of the entire project.

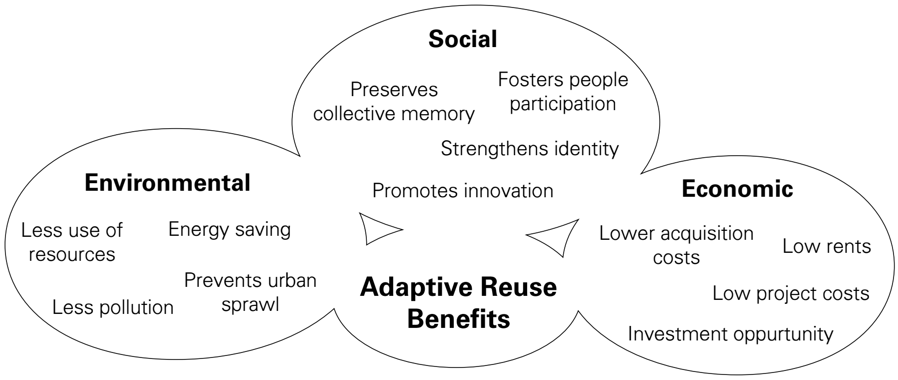


Figure 1. Benefits of adaptive reuse

2.2 A BRIEF STORY ON ADAPTIVE REUSE ORIGINS

10. Wong L. *Adaptive Reuse: Extending the lives of buildings.* Basel: Birckhäuser; 2017.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

16. Christiaanse K. Traces of the City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 14-24.

Talking about adaptive reuse origins, Wong claims that this process 'has existed since time immemorial.' [10] (p.6) According to her, the first signs of adaptive reuse date back to the reuse of caves as domicile, where the first human beings found the way to satisfy their necessity of shelter from the harsh environmental conditions. However, for purposes of this study, its origins are going to be explained in the context of the XX century, where it is considered that the 'canonic tale of adaptive reuse begins'. [4] (p.173)

It is considered that the emergence of adaptive reuse processes during the XX century was tightly related to the definition of the *loft* concept. According to Christiaanse[16]:

> 'The current concept of the loft originated in New York in the 1950s, when artists started to settle in disused industrial buildings and created studio and living spaces in them. With the increasing concentration of lofts in Lower Manhattan, networks functions emerged- such as exhibitions halls, galleries, event spaces and artists' cafés- and the streets started to be galvanized with actions and performances. The free lifestyle inside the loft came out into the open to conquer and emancipate the public space as well.' (p.14)

In this way, it is demonstrated how derelict industrial buildings were considered as an opportunity for new developments and for satisfying the needs of space for new uses and activities in an already overdeveloped urban context as was New York City.

Figure 2. Lower Manhattan skyline, New York City, 1955[17]

17. Fox photos. *The Manhattan skyline in New York city, 1955.* Getty Images. Available from: https://www.gettyimages.it/detail/foto/the-big-apple-fotografie-stock/JB4031-001. (Accessed 2nd August 2019).

The loft concept thus emerges in a context of strong resistance to change and to new ways of living in the city, given that, 'since the 1950s, suburbia had so dominated popular images of the American home that it was almost impossible to imagine how anyone could conceive the desire to move downtown into a former sweatshop or printing plant.' [18 (p.58)]

Thereby, loft living faced an important challenge to attract people and convince them to re-inhabit the city when they were increasingly migrating to the outskirts fleeing from the frenetic that urban life represented. However, this perception of loft living was drastically changed when in 1953, New York artist Robert Rauschenberg returning from a trip to Europe and North Africa, practically penniless, decided to live in a loft with no heat or running water, but for which would pay ten dollars per month for the rent for this space located in the Lower Manhattan.[18]

A quantity considered quite low for its location in the city downtown, where, according to the *1943 New York City Market Analysis*,[19] the average apartment rent in the same area (Battery Park) was roughly 30 dollar per month, and for the 1950s it is estimated that this value increased to 60 dollars per month.[20]

This particular space also became his workplace, a studio shared with the also artist Cy Twombly, where he began making the first range of paintings and sculptures pieces that would boost his work as an artist.[21] Like him, other artists of the time were searching for this type of space, since they 'were ready to trade substandard living and working conditions for raw but large, free, bright, cheap space, associated with the strong identity of places of production.' [4 (p.173,174)]

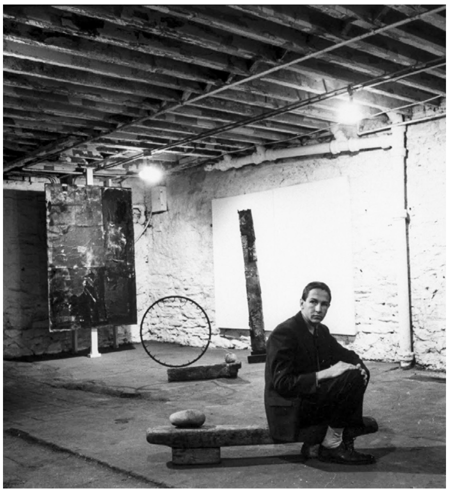


Figure 3. Robert Rauschenberg in his Fulton Street Studio in 1953.[22]

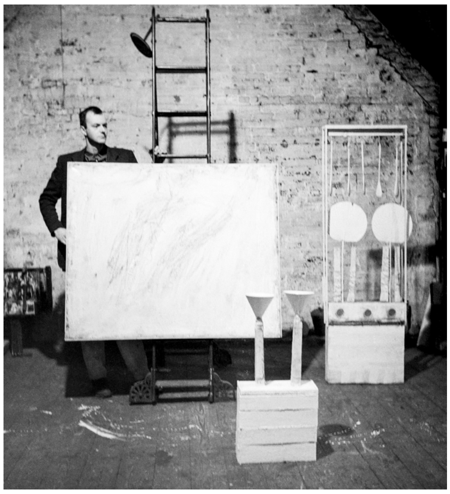


Figure 4. Cy Twombly with his artwork in the Fulton Street Studio in 1954.[23]

In this way, Robert Rauschenberg could be considered as one of the pioneers of the adaptive reuse during the XX century, a process that apparently has found in the fine arts an unexpected ally allowing new developments, new activities, and new lifestyles, even in the most consolidated urban contexts.

As Christiaanse explains based on Andy Warhol ideas, 'the combination of art, film and music production with an event space in a single building connected a network of venues and stimulated club and pop culture, as well as related activities such as recording studios.' [16 (p.14)]

18. Zukin S. *Loft Living: Culture and Capital in Urban Change.* Baltimore: Johns Hopkins University Press; 1982.

19. New York City Market Analysis. *1943 Profile of the Battery Park, Manhattan area.* New York: New York Times et al.; 1943.

20. Miller J. *Change is the Constant in a Century of New York City Real Estate.* Available from: https://www.millersamuel.com/files/2012/10/DE100yearsNYC.pdf (Accessed 2nd August 2019).

21. Smith R. *Rauschenberg, Before Fame Struck.* The New York Times (internet). 2014 (Cited 2nd August 2019). Available from: https://www.nytimes.com/2014/05/09/arts/design/rauschenberg-before-fame-struck.html

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

22. Grant A. *Dead End Artist.* Available from: https://artsandculture.google.com/asset/dead-end-artist/ (Accessed 2nd August 2019).

23. Robert Rauschenberg Foundation. *Untitled (Cy with his artwork, Rauschenberg's Fulton Street Studio.* Available from: https://www.rauschenberg foundation. org/art/artwork/ (Accessed 2nd August 2019).

16. Christiaanse K. Traces of the City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 14-24.

Aside from this, and referring here to the economic benefits aforementioned, derelict industrial structures began to arouse some interest in the real estate developers which found this kind of spaces as an investment opportunity considering the transformation possibilities that could be undergone, from productive to residential spaces, and the relatively low costs that these could represent.

19. Zukin S. *Loft Living: Culture and Capital in Urban Change.* Baltimore: Johns Hopkins University Press; 1982.

That is why Zukin proposes the term *Artistic Mode of Production* [19] for describing this phenomenon, in which art was now part of a marketing strategy for new urban developments, where not only was intended to increase the prices of some locations but also to respond to the demand of authenticity in a society of constant change and progress.[4]

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

During the previous years that the perception that the society had regarding the derelict infrastructures in the city was changing, Robert Moses was already carrying out his vision of progress that such a great metropolis like New York City should follow. Said vision, that included the development of various parks, pools, expressways, bridges, public housing projects, among others, considered the construction of new constructions as the key to facing the rapid growth of the city and its inhabitants just before the 1950s, period from which the city's population declined almost in one million as a consequence of the post-war period.[24]

24. Jackson K. Robert Moses and the Rise of New York: The Power Broker in Perspective. In: Ballon H, Jackson K. (eds.) *Robert Moses and the Modern City: The Transformation of New York.* New York: W. W. Norton & Company; 2008. p. 67-71.

However, since the urban fabric of the city before the mid-century was already quite consolidated, and the space for new construction was needed, Robert Moses opted for demolishing the existing aged or abandoned infrastructure to make way for the new development.[4]

Nevertheless, Jane Jacobs strongly opposed to this vision established by Moses, thus becoming in a sort of safeguard for the existing constructions threatened to be destroyed for the progress.[4] In fact, in *The Death and Life of Great American Cities*,[25] Jacobs argues the need for aged buildings in the city:

25. Jacobs J. *The Death and Life of Great American Cities.* New York: Vintage Books; 1992.

> 'Cities need a mingling of old buildings to cultivate primary diversity mixtures, as well as secondary diversity. In particular, they need old buildings to incubate new primary diversity.' (p.195)
>
> 'The economic value of new buildings is replaceable in cities. It is replaceable by the spending of more construction money. But the economic value of old buildings is irreplaceable at will. It is created by time. This economic requisite for diversity is a requisite that vital city neighborhoods can only inherit, and then sustain over the years.' (p.199)

These ideas support Jacobs' vision of the city and reaffirm her position by suggesting that 'old ideas can sometimes use new buildings. New ideas must use old buildings'. [25(p.188)] A position that considers, as the sustainable urban development guidelines, the use of the existing resources for promoting the development and progress of the city. In this way, Jacobs's ideas of the value of the existing buildings in the city constitute the basis for reflecting on adaptive reuse processes and on the promotion of new ideas for urban development.

16. Christiaanse K. Traces of the City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 14-24.

Adaptive reuse was not just a phenomenon confined to the United States during the mid-XX century, but it rapidly extended to different parts throughout the world where the need for new developments using efficiently the urban resources was a constant.[16] Thereby, the interest in adaptive reuse processes has grown in such a way that it has been included in the current urban agenda to foster sustainable development.

However, although adaptive reuse could represent an opportunity from an economic point of view in which it is possible to acquire low-cost properties to transform them into business opportunities, its success is not always represented in terms of the yield and profit, but also in the new qualities that it could offer to the society in the urban context. That is why, 'in many cities, cultural entrepreneurs are developing projects that are not directly aimed at maximizing returns in the short term, but rather on achieving high-quality conditions with mixed programmes such as culture, housing and work, which enables sites to develop into valuable centres.' [16 (p.24)]

These projects correspond not only with the idea of having better places in the city where people can live and work, but also are the result of the current economic dynamics in which the concept of production based on the extraction, the use and waste of resources without control is evolving towards a production system based on the reuse, the reduction of resources dependency and the efficient use of these, some of the characteristics of the denominated *circular economy*.[26] In this sense, this type of economy requires a different mindset regarding urban development in order to value the potential in the variety of the urban built environment networks that currently represent an inactive resource, abandoned or underused, but that could be turned into an active part of the urban economy.

26. European Investment Bank. *The EIB Circular Economy Guide: supporting the circular transition.* Luxembourg: EIB; 2018.

In conclusion, the origins of adaptive reuse during the mid-XX century were motivated firstly, by a new social perception promoted from art, in which industrial spaces were considered as the most affordable and with the best qualities for both living and working purposes, 'an existing space (that could be) repurposed for new uses with minimal effort and low-cost tactics'.[4 (p.176)] And secondly, by the contraposition of two different visions of city progress, in which demolition and preservation of the existing constructions were facing each other to define which one was the best way of development in a consolidated urban context. All this supported by the economic interest from real estate developers and investors, who greatly influence whether such a kind of process could succeed or not, having the capability of 'turning their temporary market inefficiency into new economic value'. [4 (p.176)] and contributing to the promotion of the circular economy in the city.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

2.3 Industrial space as an opportunity for reuse

Adaptive reuse proposes considering any type of existing unused place in the urban context (sites, buildings or infrastructures) as a potential space for the development of new functions and activities. However, the minimal transformation process implicit in the characteristic 'adaptable' leads thinking that although this kind of process is intended for all type of existing structures, there are some of them probably more suitable for meeting its purposes, as are industrial buildings.[4]

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

Since the Industrial Revolution, the theory and the practice of architecture have significantly changed. Whilst in the late eighteenth-century architecture was mainly concerned with the design of military, ecclesiastical and public buildings symbolizing the western reigning powers, by the early nineteenth-century the concern was the design of the spaces that would hold the growing production and transformation of goods, characteristic processes from the industrial era.[27]

27. Aitchison M. Industrial Architecture Past and Present. In: Aitchison M (ed.) *The Architecture of Industry: Changing Paradigms in Industrial Building and Planning.* Abingdon: Routledge; 2016. p. 1-8.

This relationship between architecture and industry demonstrated to be highly productive since it settled the basis for new and innovative solutions to technical or functional problems in the industrial operation realm.[27] In this way, 'building for industry was an industrial activity in itself, with standards forms defined by the available technologies -steel, iron, concrete, wood- offering maximum freedom from internal constraint (and possibly fire resistance).' [4 (p.194)]

Industrial spaces thus were characterized for its efficiency, either in its constructive process as in its functional organization, and for its safety, an essential characteristic for ensuring the proper development of the production processes. However, for a better understanding of the industrial space, it is necessary to analyze the type of buildings produced in the city under this approach, which are classified mainly in two types: multi-story frames and big sheds[4]:

> 'The frames were used as warehouses and for small manufacturing; the goal was to multiply space for light production by multiplying the natural ground in artificial vertical platforms. The sheds were used for wrapping space around heavy production. Both were generic, potentially infinite spaces with no distribution. The internal layout was defined later by the variable disposition of machines, the chains transmitting power, the organization of the assembly line, and the given forms of bigger engines and machines.' [4 (p.194,195)]

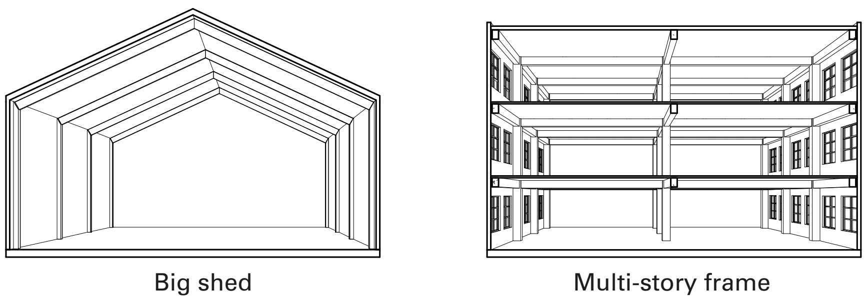


Figure 5. Two types of industrial spaces.[4]

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

In general, the specific form of these buildings was the result of the contraposition between the inner spatial freedom, needed to establish the different production lines; and the constraints of the context, in which were considered the influence of the building's layout and size in the urban fabric and the relatedness that could be given with the surrounding buildings and infrastructure.[4]

Both types of buildings, which were later highly standardized, have their previous initiators: 'the multi-story factory can be traced back to the first industrial mills, the big shed is a by-product of railway construction.' [4 (p.195)] But despite being designed for different purposes, these buildings share the same logic of simplicity and freedom in the interior, in which space could be easily adapted to a variety of uses and meet different needs.

28. Bury T. *Liverpool Crown Street station looking east in 1831.* Available from: http://www.disused-stations.org.uk/l/liverpool_crown_street/ (Accessed 5th August 2019).

29. IIC. *Cromford Mills, the conservation of 'Building 17'.* Available from: https://www.iiconservation.org/node/4601 (Accessed 5th August 2019).

Figure 6. Crown Street railway station, the world's first intercity passenger station, built in Liverpool in 1830.[28]

Figure 7. Cromford Mill , the world's first water-powered cotton spinning mill, built in Derbyshire in 1771.[29]

These buildings were also a representation of the society of the time, a society in which the migration from rural to urban areas and near the production sites was constant for searching better living conditions. Hence, the big shed and the multi-story buildings became a symbol of economic growth and stable live conditions for the communities around them. However, when the economic dynamics changed and the production sites moved, the workforce also was bound to move for integrating to new production lines.

This displacement brought with it the abandonment of many of the existing industrial buildings and the infrastructures linked to them. Transforming productive and thriving zones into derelict and declining areas, but would later represent a potential reuse opportunity.[4]

A condition demonstrated by Robiglio when he states that: 'the disappearance of productive uses meant the disappearance of productive distribution. Buildings were returned to their original genericity. They had become voids. When production leaves, the loft is what is left.' [4 (p.197)] Accordingly, many of these buildings remain unused and available in the city and constitute a latent opportunity for adaptive reuse processes in the urban context.

2.4 Adaptive reuse and architecture

So far in this study, it has been possible to establish a relationship between adaptive reuse and social, economic and environmental factors. In the same way, this process has been described from a historical perspective in relation to the conditions that allowed it to be currently considered as a form of sustainable development in the city. However, given that adaptive reuse is more related to a social and economic process that is developed in an existing urban construction than with an architectural project itself, it is considered necessary to establish the role that architecture could have in adaptive reuse processes.

The relationship between adaptive reuse and architecture is not clearly defined, the spontaneity and informality allowed for this type of reuse lead thinking that there is no need for architecture or an architect to carry out the project.[4] However, is precisely in this indeterminacy in which architecture can serve as support to allow new and creative ideas to be developed in the most flexible way possible. For this purpose, architecture must be able to provide the appropriate solutions that allow facing people's changing needs through time.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

In the same way, this relationship requires a particular understanding of the use of materials and the different forms of construction that follow the proposed objectives of versatility and flexibility in space. An idea that does not represent a new vision of architecture given that 'the goal of simplifying construction and turning it into an assembly process of prefabricated elements has been a constant goal of architecture since industrialization proved the power of scientific production and the limits of craftsmanship...' [4 (p.208)]

The Fun Palace, a project by Cedric Price from 1961, is a radical example that represents this purpose of having a highly flexible space that could be adapted to different usage requirements, but that at the same time could provide the technical systems needed for the operation of the building. Although the Fun Palace was never built, this project constituted a reference for the design of structures that allow the arrangement of different uses under the same space, such as in exhibition halls or in airports halls.[4]

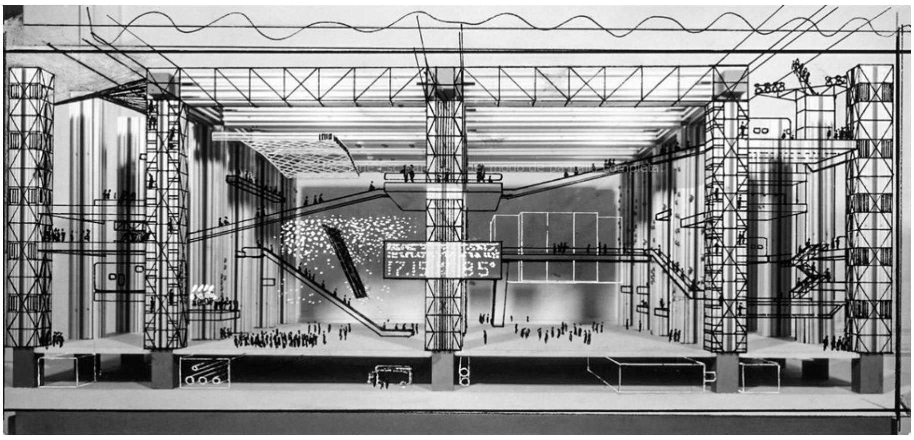


Figure 8. The Fun Palace by Cedric Price, 1961.[30]

30. Glynn R. *Fun Palace, Cedric Price.* Available from: http://www.interactivearchitecture.org/fun-palace-cedric-price.html (Accessed 5th August 2019).

Therefore, it could be inferred that the relation between adaptive reuse and architecture lies in the different solutions and strategies that through architecture allow adapting the spaces to the temporary and permanent character of this type of process; temporary given that it presupposes the idea of satisfying constantly changing needs through the versatility and flexibility of space, and permanent given that the basis on which all these changes occur is always an existing urban construction with determined qualities which are expected to be preserved over time.

However, this distinction between temporary and permanent is not always understood in the same way, and it could happen that there is not necessarily an established limit between the scope of both terms. This condition is demonstrated by Robiglio when he states that 'adaptive reuse further weakens the borders of temporarity and permanence. Its evolutive incrementalism sees the *production of locality* as a possibly unending sequence of temporary stages, a permanent placemaking activity progressively giving form to space.' [4 (p.211)]

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

Thereby, it is considered that the main concern of adaptive reuse is focused on discovering and harnessing the potential of the contained space, the temporary layer of the urban constructions that allows change and represents an opportunity for a reuse process in which through architecture it is possible to adapt the dynamics and needs of the contemporary society to existing spaces in the urban context. However, these 'new societal forms require architects to imagine new spatial distributive configurations, open and free layouts that redistribute positions, grant accessibility, maintain flexibility, reverse hierarchies, and blur distinctions.' [4 (p.213)]

2.5 Summary

Adaptive reuse does not present an unequivocal definition, the different approaches to the concept studied in this chapter differ in the way the reuse process is intended. Moreover, there is no complete clarity in the way in which the adaptive characteristic of this type of process should be understood. Robiglio proposed that this characteristic is related to minimal intervention with significant value that allows adapting the spaces to the changing needs.[4] However, the limits of this minimal intervention are not established and lead thinking in a lot of transformation possibilities in which the unique determined and constant is the existing urban constructions. A condition that is considered an interesting and sustainable form of urban development that evolves according to the social and economic dynamics of the contemporary city.

Nevertheless, there some ideas that these approaches have in common regarding adaptive reuse, and they are the interest to preserve and give value to those places in the city that at some time represented a response to the needs of a society but that because of various changes in various factors are currently underused or in a state of abandonment and deterioration; and the need for platforms that allow fostering the creation of new ideas but at the same time represent the tradition and identity of a known place, of one rooted in the collective memory of the people.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

And particularly it is this characteristic of dealing with preservation and innovation what differentiated adaptive reuse from other reuse processes.[4] Thereby, it is considered confined somewhere in between, where the interplay among these oppositions allow the emergence of new and creative forms of urban development.

On the other hand, given the historic context in which adaptive reuse was developed during the mid-XX century, it could be thought that this process is related mainly with the reuse of industrial buildings due to their spatial and structural characteristics. But although the industrial space is suited and could ease the development of this type of process, the scope for reuse must be extended and generalized to any existing urban space that could have the potential for change and adaptability for new requirements, regardless of its building typology. Potential that could be supported with the implementation of architectural solutions that enables the flexibility and the freedom for new spatial configurations.[4]

Accordingly, adaptive reuse represents not just an interesting opportunity for fostering sustainable urban development given the multiple benefits it offers, but also an opportunity to provide new urban qualities to the cities that improve the quality of life, and where people are committed and participate in recovering the forgotten urban spaces for transform them into better places where they can live and work.

Chapter one notes

1. Freschi E, Maas M. Conceptual reflections on Adaptive Reuse. In: Freschi E, Maas M. (eds.) *Adaptive Reuse: Aspects of Creativity in South Asian Cultural History.* Wiesbaden: DMG; 2017. p. 11-24.

2. Built Environment, as explain by Tom J. Bartuska in *The Built Environment: A Collaborative Inquiry into Design and Planning (New Yersey, 2017),* is 'everything humanly created, modified, or constructed, humanly made, arranged, or maintained.' (p.5)

3. DEH. *Adaptive Reuse: Preserving our past, building our future.* Canberra: DEH; 2004.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

5. United Nations. *The Sustainable Development Agenda.* Available from: https://www.un.org/sustainable development/development-agenda/(Accessed 31st July 2019).

6. United Nations. *Goal11: Make cities inclusive, safe, resilient and sustainable.* Available from: https://www.un.org/sustainable development/cities/ (Accessed 31st July 2019).

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.)*City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

8. Elefante C. The Greenest Building Is...One That Is Already Built. *Forum Journal*. 2007;21(4): 26-38.

9. Douglas J. *Building Adaptation.* Second edition. Abingdon: Spon Press; 2011. p.1,589,590.

10. Wong L. *Adaptive Reuse: Extending the lives of buildings.* Basel: Birckhäuser; 2017.

11. Giebeler G. *Telling Time, The History and Theory of Preservation in America.* New Yersey: Jhon Wiley & Sons; 2006. p. 5.

12. Weeks K, Grimmer A. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Building.* Washington: US Dept of the interior; 1995. p. 26.

13. Tucker S, Ambrose M. *Embodied energy of dwellings.* In: CSIRO ESD Success Applications Conference.Sydney: N.S.W; 1997.

14. Elsinger A. The Social Value of Transformation. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 67-72.

15. Bone-Winkel S, Matheis H. The Economic Aspects of Real-Estate Development. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 82-88.

16. Christiaanse K. Traces of the City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 14-24.

17. Fox photos. *The Manhattan skyline in New York city, 1955.* Getty Images. Available from: https://www.gettyimages.it/detail/foto/the-big-apple-fotografie-stock/JB4031-001. (Accessed 2nd August 2019).

18. Zukin S. *Loft Living: Culture and Capital in Urban Change.* Baltimore: Johns Hopkins University Press; 1982.

19. New York City Market Analysis. *1943 Profile of the Battery Park, Manhattan area.* New York: New York Times et al.; 1943.

20. Miller J. *Change is the Constant in a Century of New York City Real Estate.* Available from: https://www.millersamuel.com/files/2012/10/DE100yearsNYC.pdf (Accessed 2nd August 2019).

21. Smith R. *Rauschenberg, Before Fame Struck.* The New York Times (internet). 2014 (Cited 2nd August 2019). Available from: https://www.nytimes.com/2014/05/09/arts/design/rauschenberg-before-fame-struck.html

22. Grant A. *Dead End Artist.* Available from: https://artsandculture.google.com/asset/dead-end-artist/ (Accessed 2nd August 2019).

23. Robert Rauschenberg Foundation. *Untitled (Cy with his artwork, Rauschenberg's Fulton Street Studio.* Available from: https://www.rauschenberg foundation. org/art/artwork/ (Accessed 2nd August 2019).

24. Jackson K. Robert Moses and the Rise of New York: The Power Broker in Perspective. In: Ballon H, Jackson K. (eds.) *Robert Moses and the Modern City: The Transformation of New York.* New York: W. W. Norton & Company; 2008. p. 67-71.

25. Jacobs J. *The Death and Life of Great American Cities.* New York: Vintage Books; 1992.

26. European Investment Bank. *The EIB Circular Economy Guide: supporting the circular transition.* Luxembourg: EIB; 2018.

27. Aitchison M. Industrial Architecture Past and Present. In: Aitchison M (ed.) *The Architecture of Industry: Changing Paradigms in Industrial Building and Planning.* Abingdon: Routledge; 2016. p. 1-8.

28. Bury T. *Liverpool Crown Street station looking east in 1831.* Available from: http://www.disused-stations.org.uk/l/liverpool_crown_street/ (Accessed 5th August 2019).

29. IIC. *Cromford Mills, the conservation of 'Building 17'.* Available from: https://www.iiconservation.org/node/4601 (Accessed 5th August 2019).

30. Glynn R. *Fun Palace, Cedric Price.* Available from: http://www.interactivearchitecture.org/fun-palace-cedric-price.html (Accessed 5th August 2019).

Chapter two

Adaptive reuse case studies

3.1 Six projects of adaptive reuse in Italy

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development*. Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

31. Tesei A. *L'Italia che cade a pezzi*. La Stampa (internet). 2019 (Cited 25th August 2019). Available from: https://www.lastampa.it/tuttogreen/2019/06/16/news/l-italia-che-cade-a-pezzi-1.36541540

32. Lami I. M. *Abandoned Buildings in Contemporary Cities: Smart Conditions for Actions*. Cham, Switzerland: Springer Nature; *Forthcoming.*

Adaptive reuse projects are spread practically throughout the world, but despite the internationality of this kind of urban process, all these projects are linked with the particular economic, social and political conditions of the specific countries in which they are located.[7] However, although all these projects vary in the scale, the reuse process and its protagonists, they all share the same interest in using the abandoned or underused urban constructions as a platform for promoting new and creative ideas to incorporate these places back into the city.
Therefore, for understanding the adaptive reuse process under the same economic, political and social factors, this study will analyze different projects of adaptive reuse in Italy. A country in which currently there are hundreds of thousands of abandoned buildings.[31] Buildings that represent an opportunity for a potential transformation process.

These projects were selected according to determined criteria: 'spatial distribution, origin of the initiative, management and governance model and the current state of progress of the initiative.' [32] Accordingly, six cases of adaptive reuse were selected from different regions: 'two in the North (Toolbox in Turin and Factory Grisù in Ferrara), two in the Centre (Officine Zero in Rome and CAOS in Terni), and two in the South (Farm Cultural Park in Favara and Ex Fadda in San Vito dei Normanni).' [32] All these projects were developed in different types of buildings and on various scales and each one represents a unique experience of an adaptive reuse process.

For the purposes of this study, all these projects will be reconstructed digitally and analyzed under the same parameters for later being able to understand and compare them according to their different characteristics. In this way, these case studies will also help in understanding not just the characteristics of the adaptive reuse process but also the necessary conditions to conduct it.

Figure 9. Location of adaptive reuse projects in Italy.

FARM CULTURAL PARK- FARM XL
FAVARA, SICILY

3.2 Recovering the derelict historic center

Farm Cultural Park

Cortile Bentivegna

Favara, Sicily

ITALY

www.farmcultural-park.com/

Farm Cultural Park is an urban redevelopment project. Redevelopment in the first place of a prestigious historic center, but also the redevelopment of an entire territory from a social and economic point of view. The aim of the project is to recover the entire historic center of Favara, so as to become, after the Valley of the Temples, the second tourist attraction of the province of Agrigento and one of the top ten cultural attractions of all Sicily. The project's idea is to offer on the one hand the architectural authenticity of a Sicilian historic center, and on the other hand, the internationality and contemporaneity of what is housed within these buildings.[33]

A little less than 10 km from Agrigento, Favara is a town of about 30 thousand inhabitants with a historic center already inhabited in prehistoric times, where generations of Greeks, Arabs, Normans, and Spaniards met and mixed. A center that, however, literally fell to pieces until a few years ago. And precisely following the collapse of a building, where three people died in 2010, the redemption action of the notary Bartoli and the lawyer Saieva, former art collectors, long wanted to do something to stop the abandonment and the marginality of their city.[34]

Farm Cultural Park is a reference point for artists and an art site for everyone. There are seven courtyards distributed in the city's center but connected one to another. Seven white courtyards that make up the cultural park, in which you can find art galleries, photography exhibitions, music events, variety of food, among others.[35]

This is a project that could represent another type of economy: a model of development in which it's imagined a renaissance entrusted to the specificity of the territory, to its intertwining of nature and history, to the richness of flavors and traditions. All illuminated by the light of contemporary art, at the center of FARM's functional program (gallery, but also a place of artistic production, residence for young artists, space for workshops and didactics), but above all at the base of an aesthetic enhancement able to show in a new way the ruins, as part of a complex and stratified landscape, open to interpretation and transformation.[34]

Farm Cultural Park is truly a workshop for social innovation: a space in which a community of citizens and creatives elaborates problems and intervention strategies, trying to maximize resources, to reuse, regenerate, reinterpret, revitalize and cultivate.[34]

For this study, the building complex will initially be analyzed together, but the Farm XL building will be used for the architectural analysis, given that is considered as one of the most representative of the project and of which there was sufficient information for its analysis.

33. Visit Agrigento. *Farm Cultural Park.* Available from: https://web.archive.org/web/20130113021940/http://www.visitagrigento.it/da-vedere/musei/item/116-farm-cultural-park-favara-ag.html (Accessed 21st June 2019).

34. Palumbo M. *Farm Cultural Park.* Domus. 2016 (Cited 21st June 2019). Available from: https://www.domusweb.it/it/architettura/2016/07/20/farm_cultural_park_favara.html

35. Visit Sicily. *Farm Cultural Park di Favara.* Available from: http://www.visitsicily.info/en/farm-cultural-park-di-favara/ (Accessed 21st June 2019).

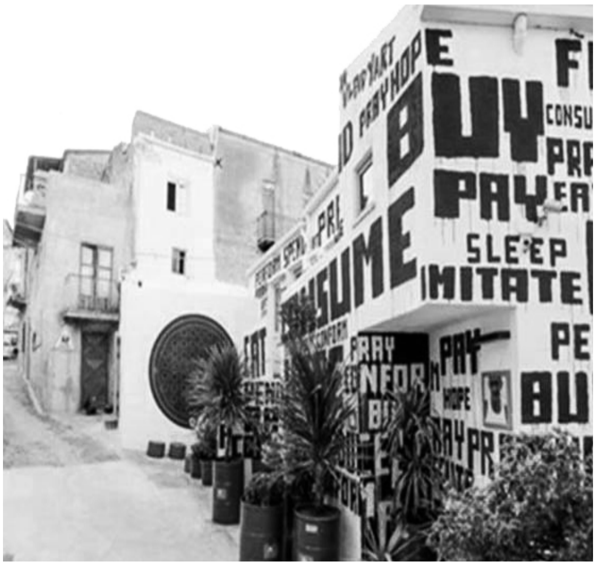


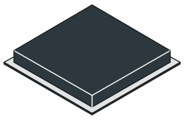
Figure 10. Farm Cultural Park exterior view.[36]

Figure 11. Farm Cultural Park interior view.[37]

Location

Urban connections

Size

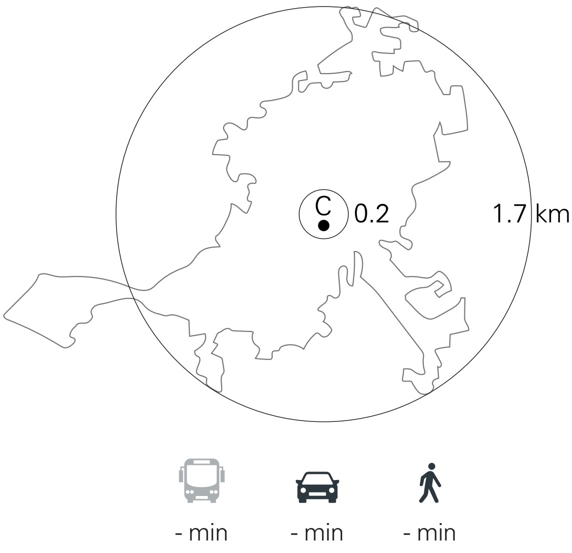


Ground floor area 2.707 m²

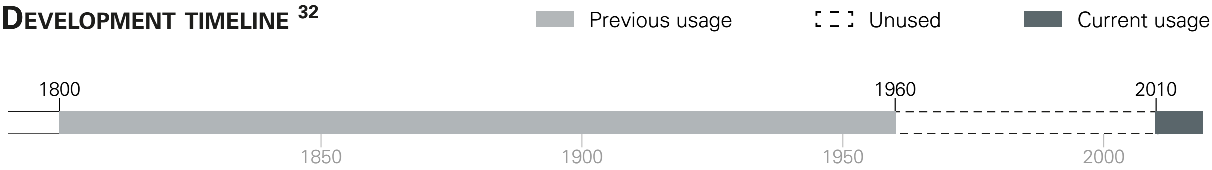
Total area 3.439 m²

Occupancy 78%

Distance to center



Development timeline [32]



Previous usage: Mainly residential

Current usage: Cultural center

1800 Boom in the sulfur industry: 20,000 inhabitants in the historic center of Favara.

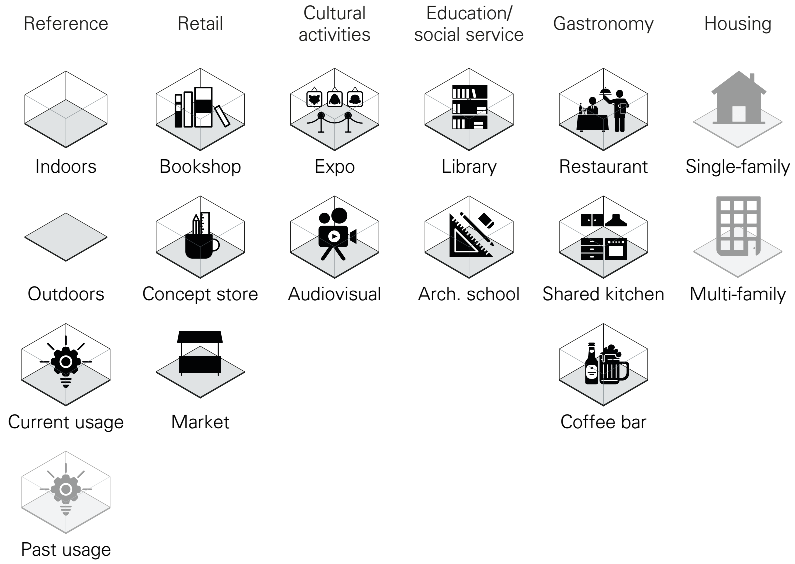
1960 Depopulation and degradation of structures: the historic center with seven courtyards becomes a ghetto-district subject to crime and social hardship.

2010 Farm Cultural Park opens with the XL building: exhibition space and art shop, but also a related cultural and artistic events programme. From that moment Farm Cultural Park started growing.

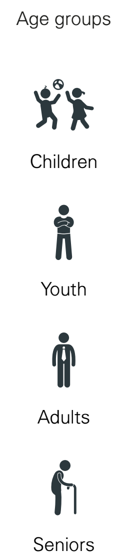
2014 The Municipality of Favara, issued an eviction order for illegal occupation of public land, condemning Farm Cultural Park to pay a fine.

2018 After eight years of development in Favara, it was launched 'Società per azioni buone' with the aim of enlarging and replicating the experience of Farm Cultural Park.

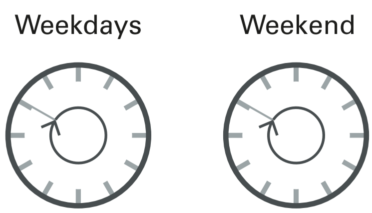
Program [38]



Users



Daily life [38]



	Weekdays	Weekend
	12h/d	12h/d
~~Mon.~~	10:00-22:00	10:00-22:00

Annual visitors [38]

90.000 visitors/year

Form of intervention

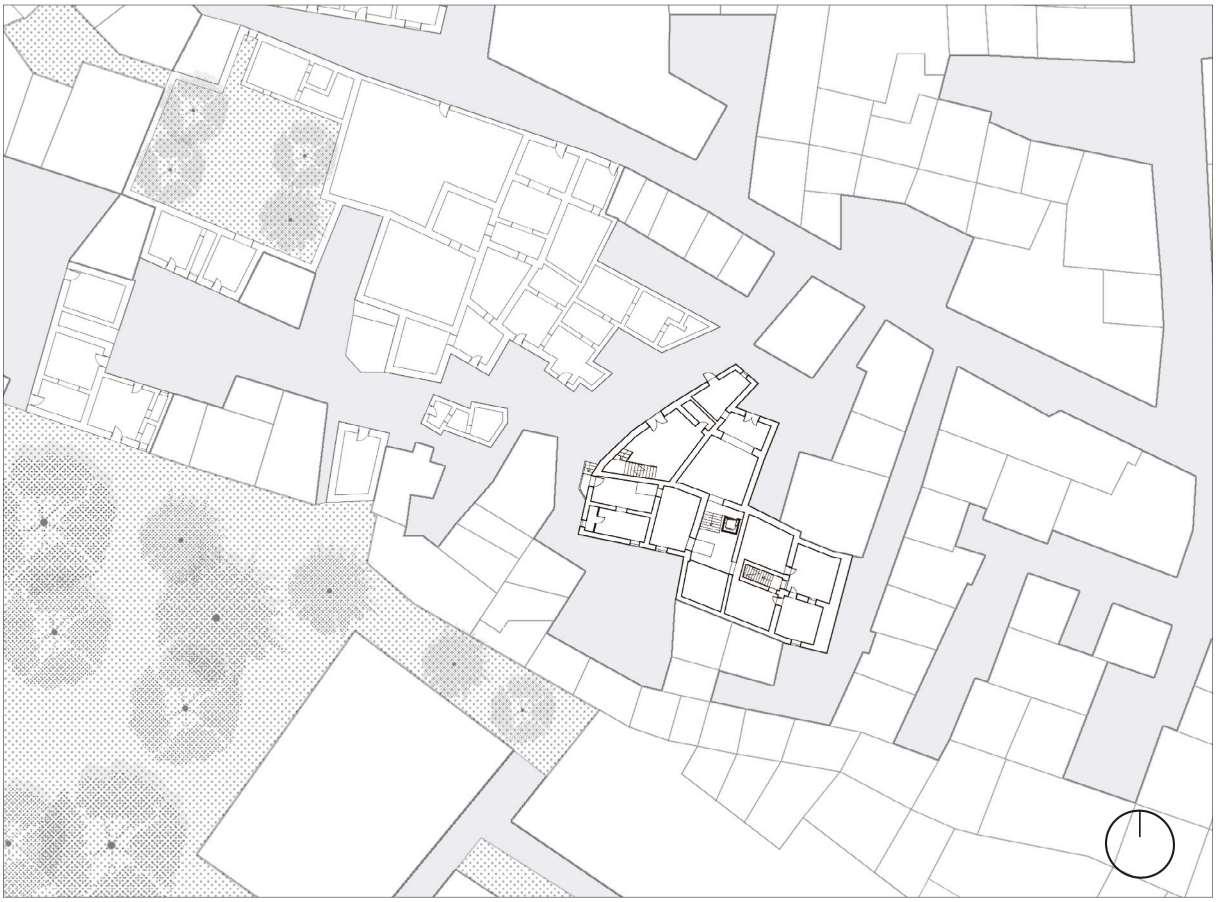
Stakeholders [32]

Property owner
Private

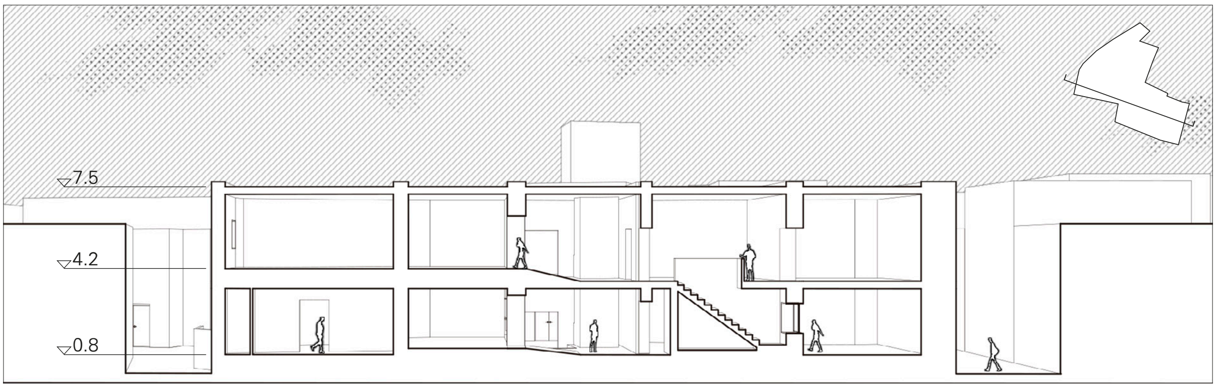
Devolopment
Private

Type of intervention

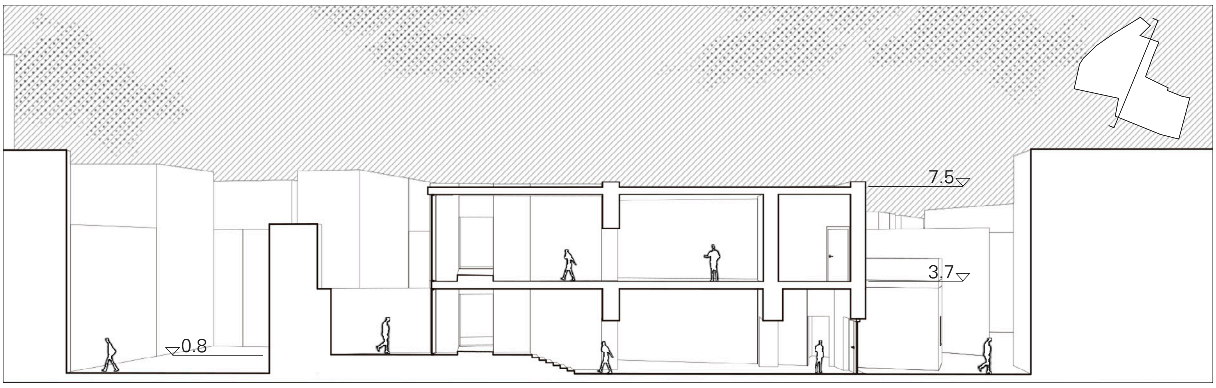
Permanent



Farm XL- Ground floor area: 463 m^2 **Ground floor** ESC 1/750

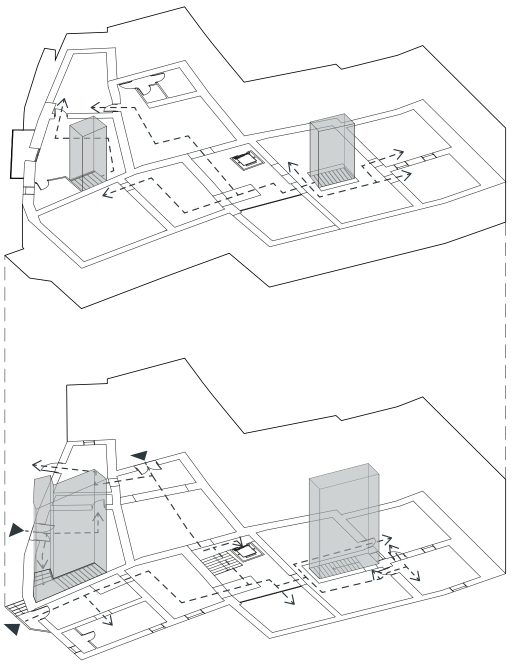


Section a



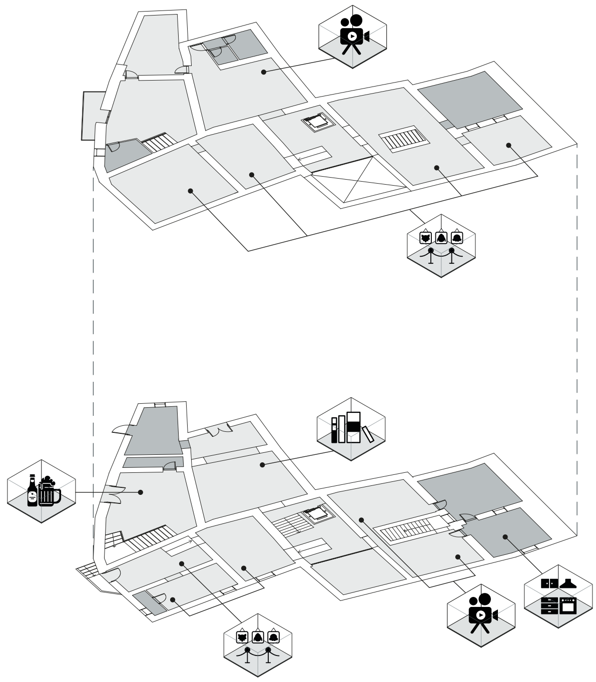
Section b

Circulation



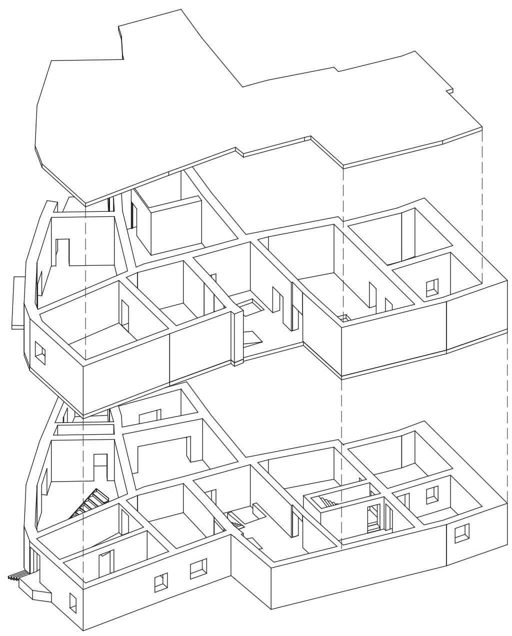
▲ Pedestrian access   - - -> Major circulation   Vertical circulation

Program distribution

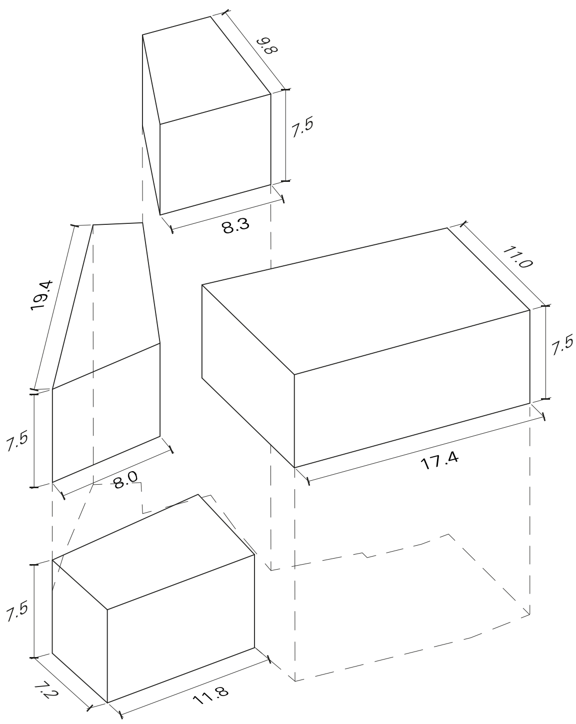


Private space   Common space

Structure

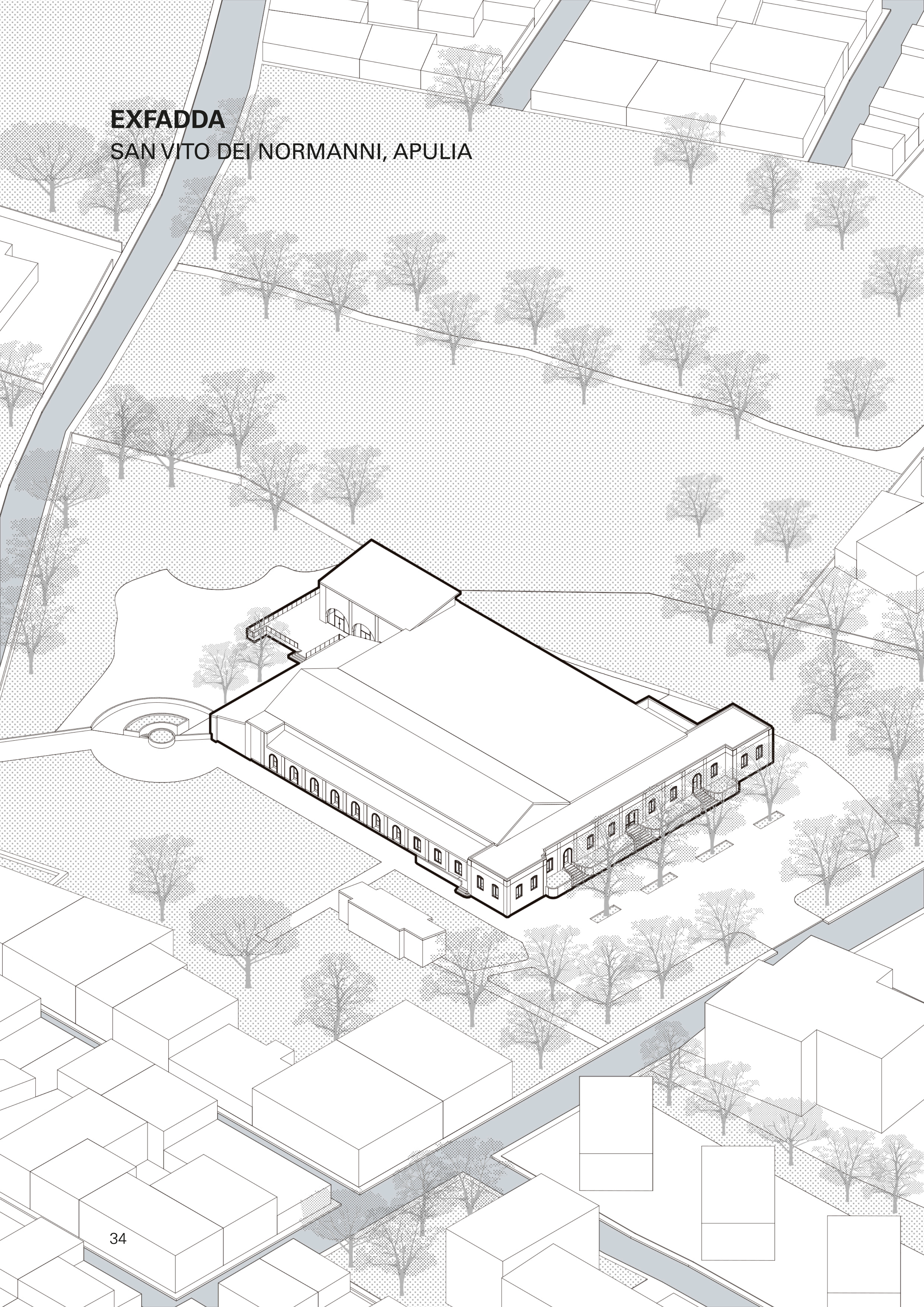


Geometric composition



EXFADDA

SAN VITO DEI NORMANNI, APULIA



3.3 Participative construction of culture

ExFadda

Via Brindisi 126

San Vito dei Normanni, Apulia

ITALY

www.exfadda.it/

ExFadda is an urban laboratory born from the recovery of an old abandoned wine factory in San Vito dei Normanni, refurbished through a participatory self-construction process. The place (4,000 square meters and one hectare of garden) now holds around 30 organizations, mainly youth, active in the fields of music, art, sport, crafts, welfare, among others. Through the sharing of resources (space, relationships, skills, money) ExFadda seeks to encourage the activation of young people who have an idea to carry out or want to learn by collaborating on initiatives that are already active.[39]

ExFadda was born within the Bollenti Spiriti e Laboratori Urbani program, an infrastructure operation through which the Puglia's Region has financed some common interventions of recovery of abandoned buildings to make spaces entrusted to young people. In San Vito dei Normanni, a wine factory owned by one of the most powerful noble families of Southern Italy, the Dentici di Frassa, had been waiting since the 1960s to raise a new re- destination project.[40]

Starting from the belief that everything that diverges from custom produces positive effects and that anti-planning can be an effective management tool, the structure has been made really usable. A self-construction site was created in which groups of architects, designers and artisans guided groups of young people who wanted to develop their project here or citizens who simply wanted to be of help to their territory. The basic idea is that ExFadda is not a space where there are users or customers, but a place where everyone can feel entitled to enter and modify his structure.[40]

From these premises, between 2013-2014, ExFadda has assumed the identity of a community incubator, a space in which the people who work there are not taught how to make a business plane, but are helped to develop the project that they have in mind, yet with the awareness of being able to realize it in a dual direction: generating a social impact and making it a source of income, passing from an associative imprint to a more professionalizing one.[40]

ExFadda is a 'low threshold' space, accessible, easy to reach, pleasant and useful to cross, open to different forms of use, at different times of the day. From the very beginning, the focus was on making the spaces usable by others. Having something to do gives people a reason to go to a place and come back. More activities are in progress, more people have the opportunity to participate.[41]

39. La Scuola di Bollenti Spiriti. *ExFadda.* Available from: http://www.lascuoladibollentispiriti.it/project-work/exfadda (Accessed 21st June 2019).

40. Archinà A. *ExFadda: innovazione culturale formato comunità.* Il Giornale delle Fondazioni (internet). 2015 (Cited 21st June 2019). Available from: http://www.ilgiornaledellefondazioni.com/content/exfadda-innovazione-culturale-formato-comunit%C3%A0

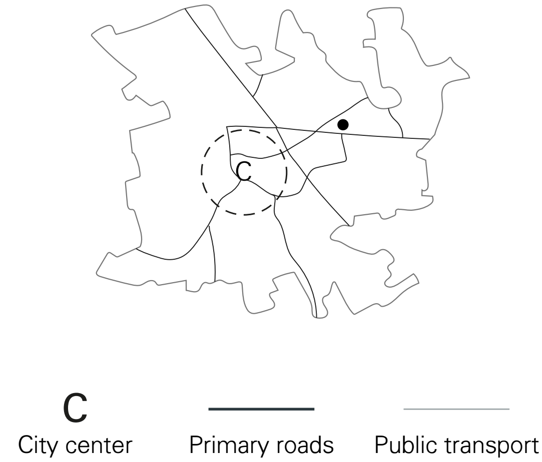
41. Agenda Urbana. *Laboratorio Urbano Exfadda.* Available from: https://community.agendaurbana.it/sites/community.ifel.it/files/attachments/Laboratorio%20Urbano%20ExFadda.pdf (Accessed 21st June 2019).

Figure 12. ExFadda exterior view.[42]

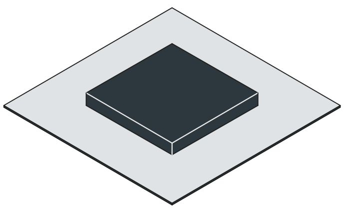
Figure 13. ExFadda interior view.[43]

Location

Urban connections

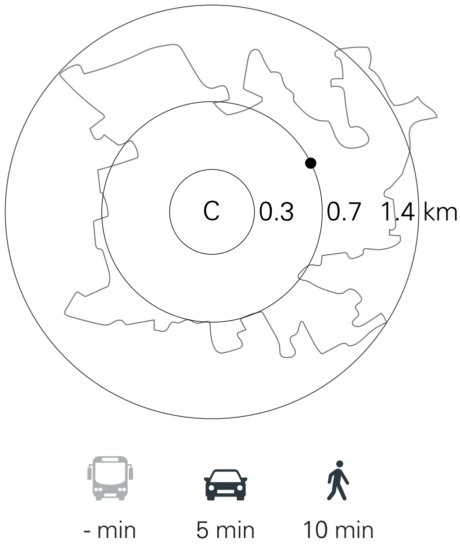


Size



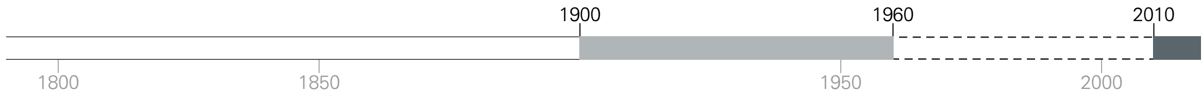
Ground floor area	3.295 m^2
Total area	12.700 m^2
Occupancy	26%

Distance to center



Development timeline [32]

Previous usage | Unused | Current usage



Previous usage: Wine factory

Current usage: Cultural center, social innovation laboratory

1900 Early 1900s, construction of the factory commissioned by the Dentice di Frasso family.

1960 End of the '50s: Donated by the Dentice di Frasso family to the Municipality of San Vito dei Normanni with the bound of using it for social and public aims.

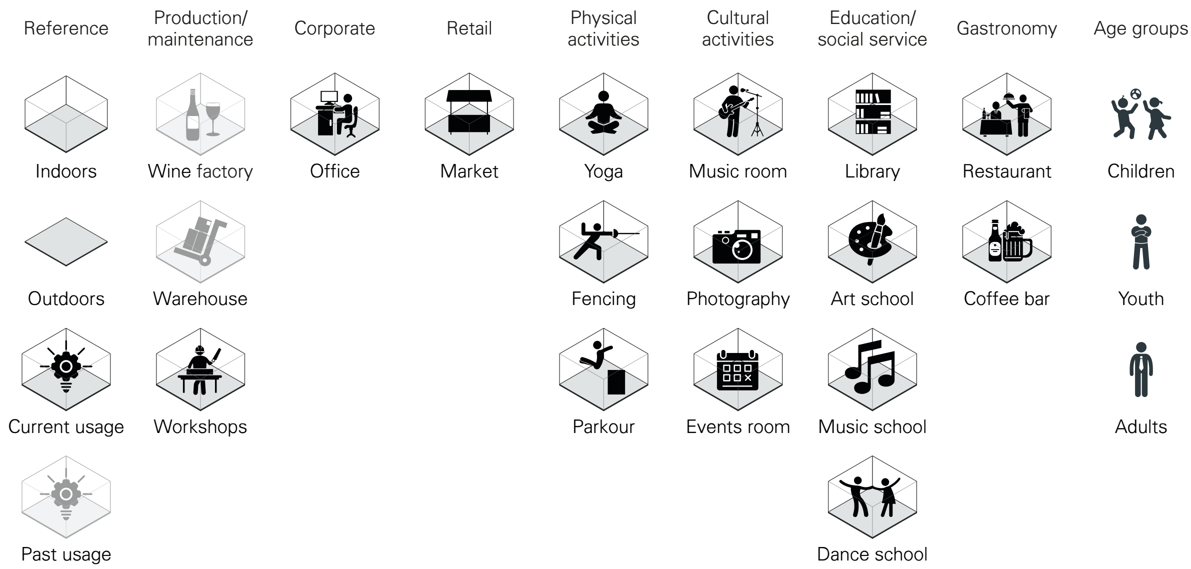
2008 The Municipality restored the building with an investment of 350.000 euros.

2010 Opened the Ex Fadda Cafè in the former guard house.

2012 Ex Fadda self-construction laboratories were organized in order to reactivate and restore all the spaces with the participation of local population. Ex Fadda began to host associations and initiatives led by local people: music and dance schools, photo collective.

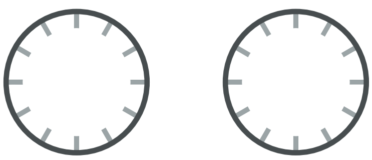
Program [44]

Users



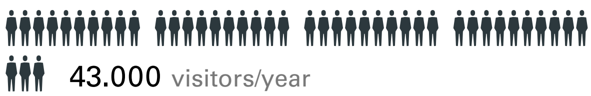
Daily life [45]

Weekdays | Weekend



24h/d 00:00-24:00 | 24h/d 00:00-24:00

Annual visitors [45]



43.000 visitors/year

Form of intervention

Minimal | Medium | Intensive

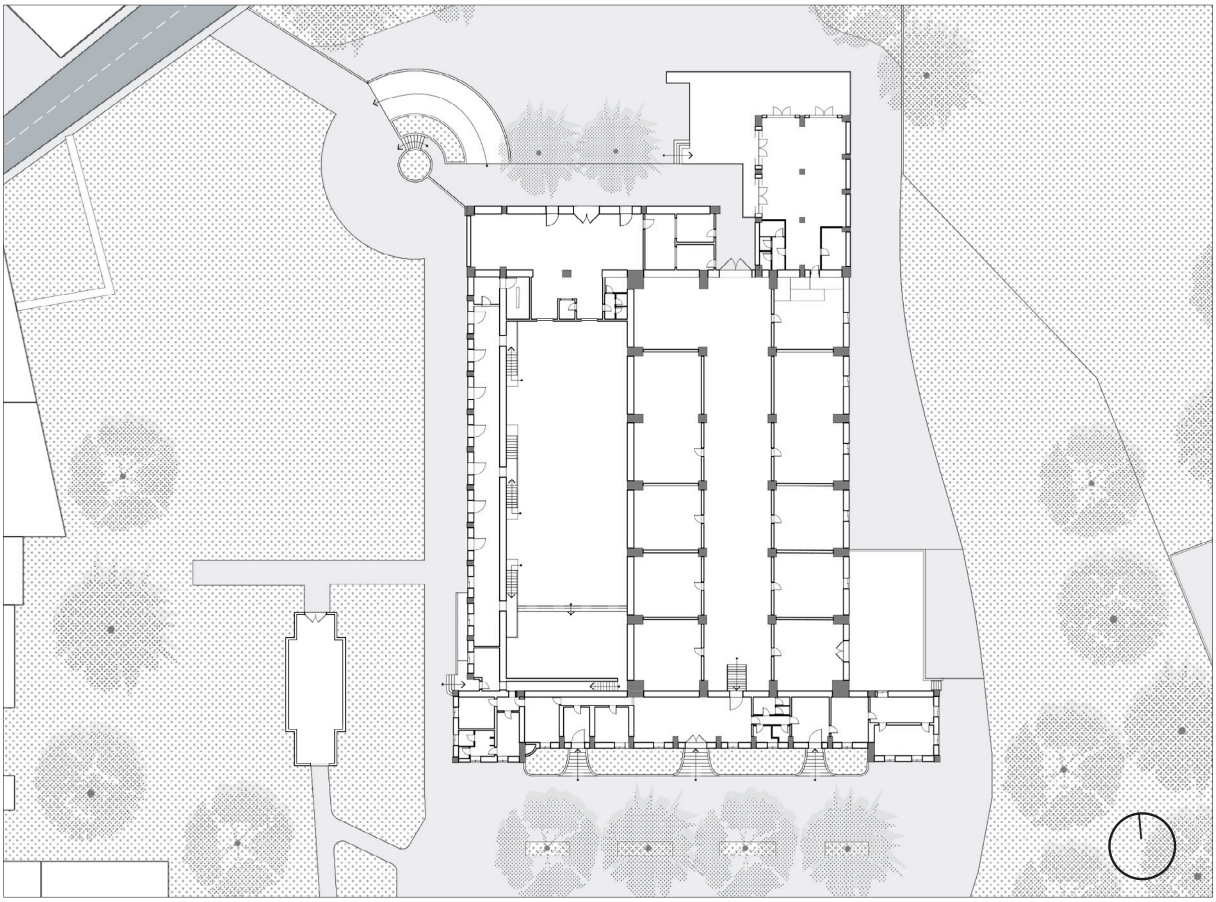
Stakeholders [32]

Property owner
Public

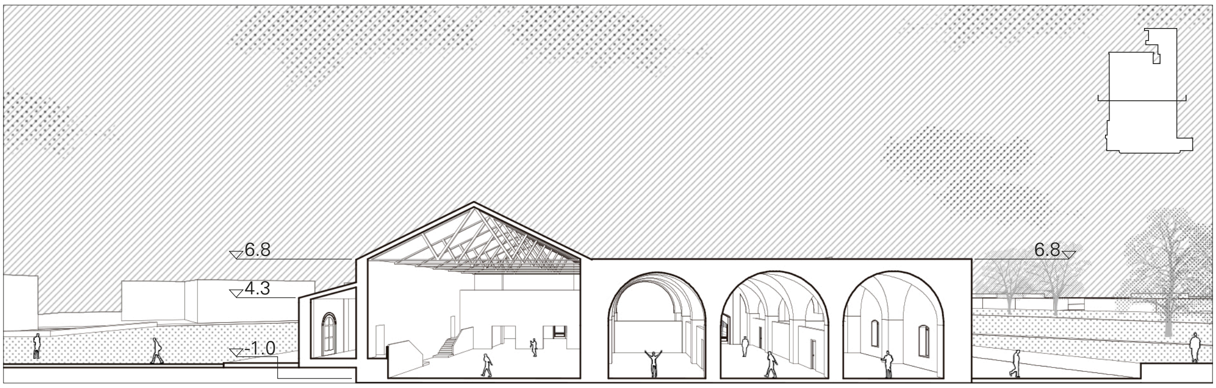
Devolopment
Public

Type of intervention

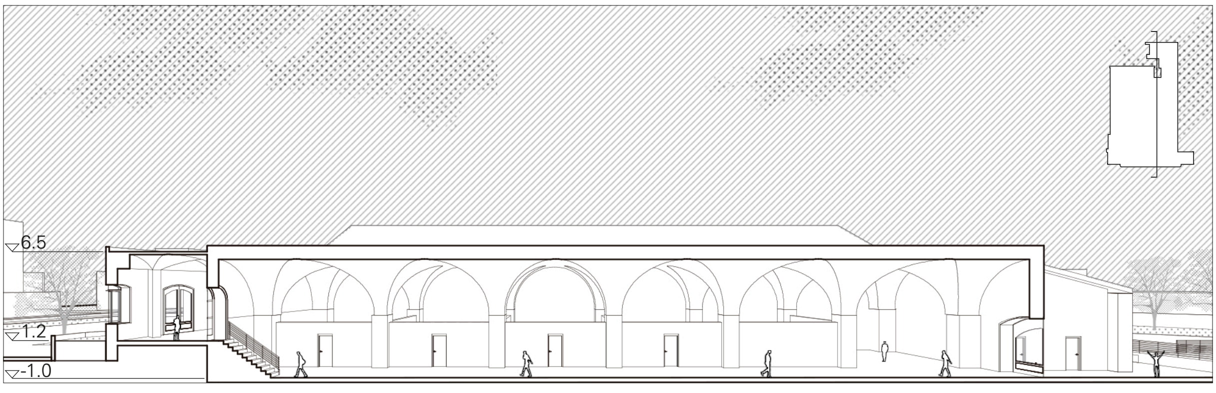
Permanent



GROUND FLOOR ESC 1/750

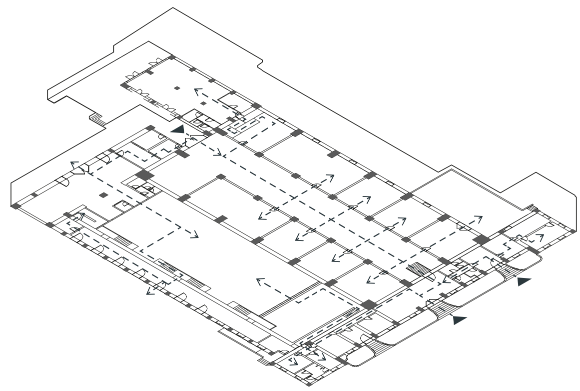


SECTION A



SECTION B

Circulation

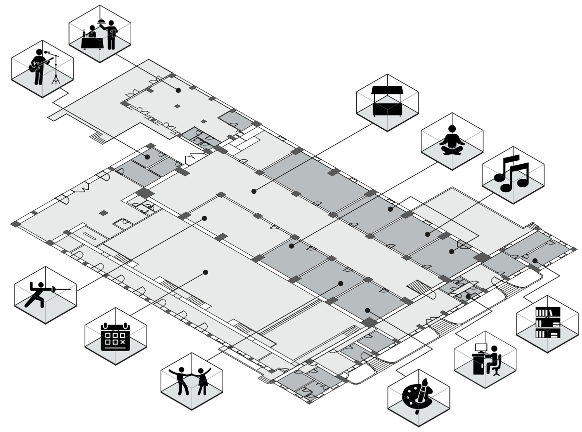


▲ Pedestrian access

---> Major circulation

Vertical circulation

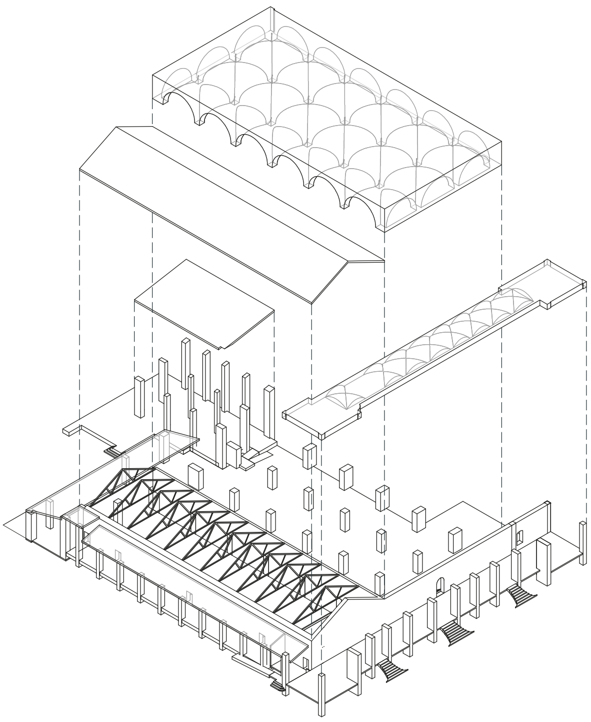
Program distribution



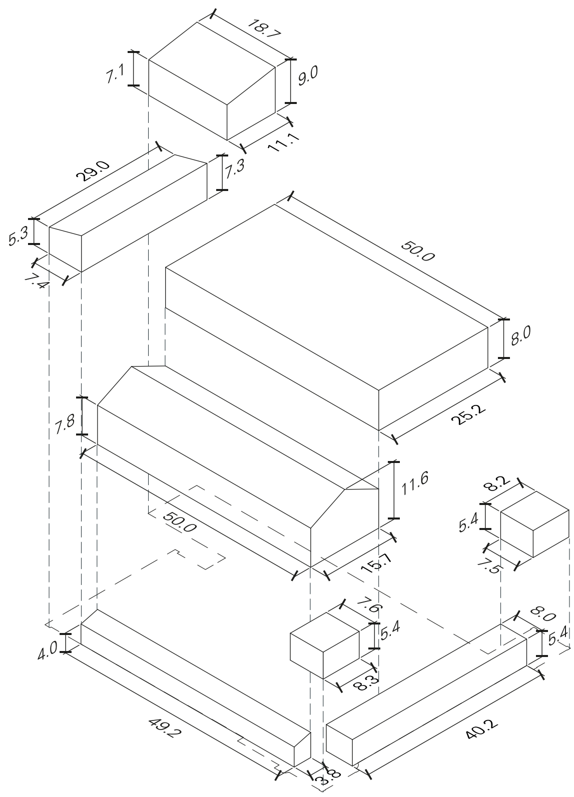
Private space

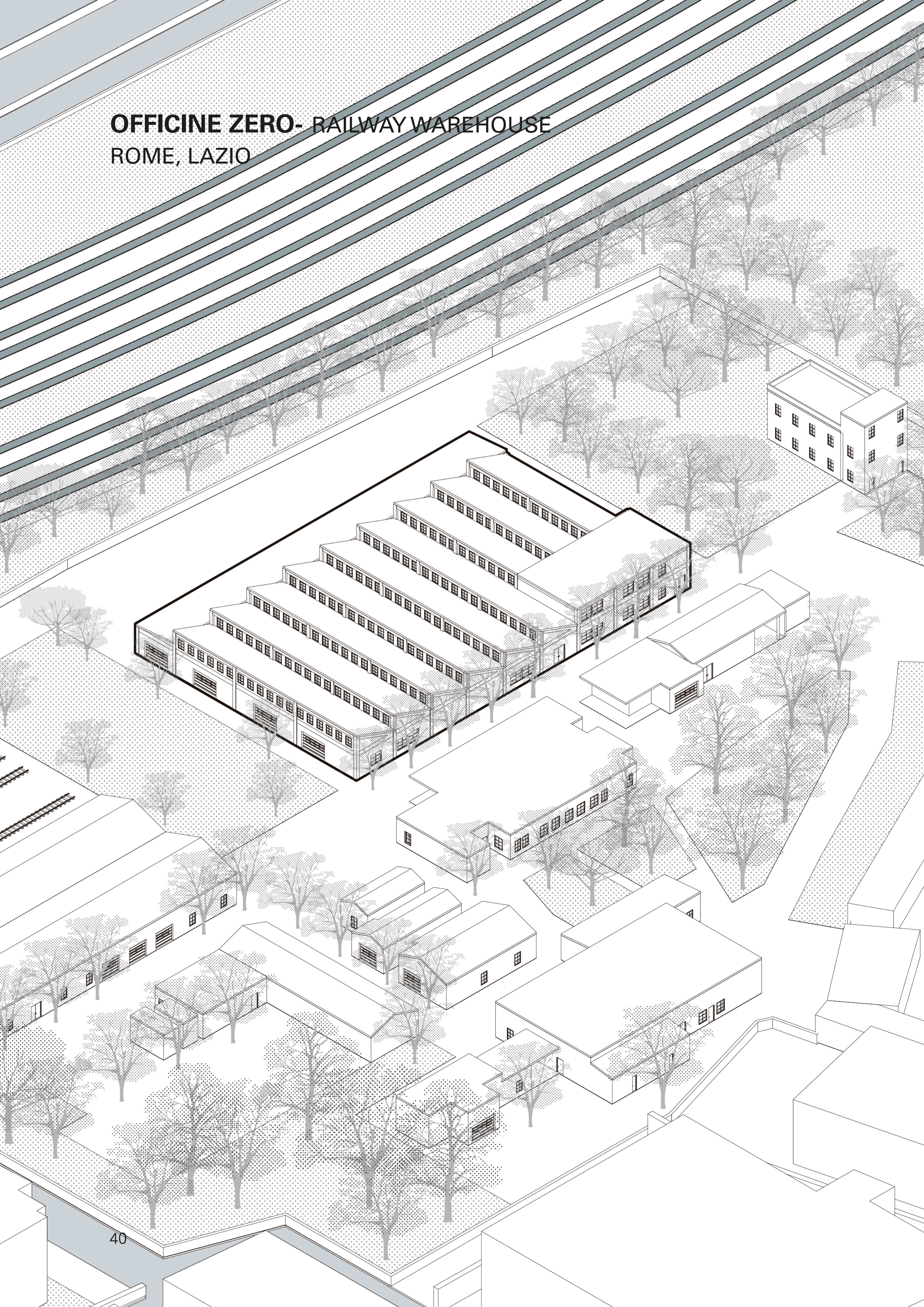
Common space

Structure



Geometric composition





OFFICINE ZERO- RAILWAY WAREHOUSE
ROME, LAZIO

3.4 Collaborative renewal of an ex-industrial area

Officine Zero

Via Umberto Partini 20

Rome, Lazio

ITALY

www.ozofficinezero.org/

Oz- Officine Zero is an urban regeneration project that has become a multi-factory over the years: artisan laboratories, carpenters, design studios, coworking, outdoor cinema, exhibition space, and concerts; all sharing the same place. Born from an old industrial area dedicated to the railway sector, It is a productive space with a strong human dimension capable of engaging an active change, which aims to modify the face of the city and the way of acting in the context of work.[46]

It was born in 2012 after the illegal occupation of a private area, by old workers belonging to the former RSI- Rail Service of Italy, for the maintenance of night trains. All this happened when Trenitalia, the main train operator in Italy, had progressively dismantled night trains by shifting most of its investments to high-speed ones, bringing later RSI to declare bankruptcy. However, another signature had taken over the ownership of the area, Barletta Srl, with the intention of converting the surface into a logistics hub, but the initiative failed before works started. Finally, the movable and immovable property of the area was transferred to a bankruptcy agency in charge of selling the assets to repay the liabilities.[47]

The project's area, built in the 1920s, is historically linked to the city's working history. Today it is considered a rather lively suburb, above all because of the social life that develops around the main square of Santa Maria Consolatrice. However, the local committees complain of a certain deterioration and lack of public services as well as adequate infrastructure works. [48]

The area consists of 22 buildings of various sizes and materials that reach a total of 10.000 square meters of covered area (the main shed of about 2.000 square meters), devoid of particular historical and cultural value. It has wide open spaces, over 20.000 sqm, occupied by asphalt, green and trees, with connection to the tracks. All buildings are in poor condition, with untested facilities, but are equipped with basic urbanizations.[48]

The main activity of Oz-Offcine Zero consists in offering work spaces in a collaborative context to self-employed workers, associations and cooperatives, but this activity is flanked by others that are no less important, increasing the production and social value of Officine Zero. These activities are divided into: teaching and training, production and services. In the near future, OZ wants to affirm itself as a space for experimentation and implementation of new technologies both in the energy and IT fields. Furthermore, part of its area will be developed into sports projects by exploiting the presence of an old multi-purpose camp and renovating and transforming the former locker room area into a gym.[48]

For this study, the building complex will initially be analyzed together, but the Railway Warehouse building will be used for the architectural analysis, given that is considered as one of the most representative of the project and of which there was sufficient information for its analysis.

46. Gennaro A. *Roma, dal fallimento RSI alla cessione dell'area. I lavoratori delle 'Officine zero' a rischio sgombero.* Il Fatto Quotidiano (internet). 2018 (Cited 21st June 2019). Available from: https://www.ilfattoquotidiano.it/2018/07/08/roma-dal-fallimento-rsi-alla-cessione-dellarea-i-lavoratori-delle-officine-zero-a-rischio-sgombero-si-faccia-chiarezza/4458855/

47. Veli S. *Officine Zero sotto attacco.* Il Manifesto (internet). 2018 (Cited 21st June 2019). Available from: https://ilmanifesto.it/officine-zero-sotto-attacco/

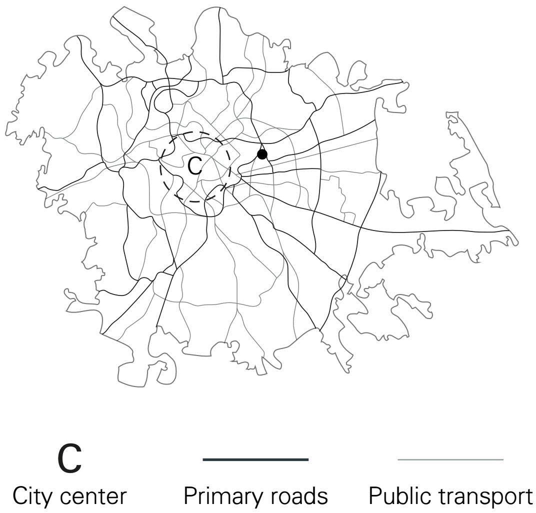
48. Officine Zero. *Dossier september 2017*. Rome; 2017.

Figure 14. Officine Zero exterior view.[49]

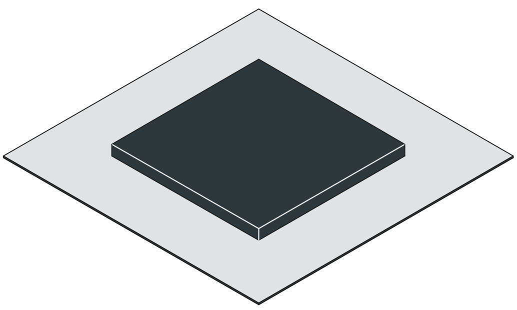
Figure 15. Officine Zero interior view.[49]

Location

Urban connections

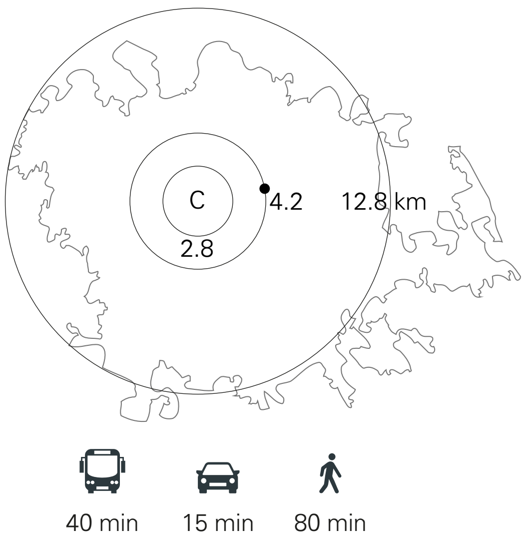


Size

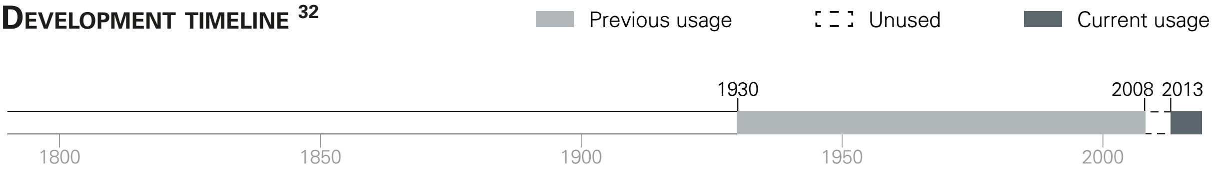


Ground floor area	9.579 m²
Total area	29.000 m²
Occupancy	33%

Distance to center



Development timeline [32]



Previous usage: Trains maintenance

Current usage: Multifactory with shared work spaces

1930 The owner of the area was Wagons Lits S.P.A.: night trains set up.

2000 The property passed to the Investment Fund Colony Capital, Rail Services International Italy S.P.A: trains maintenance.

2008 The property passed to Barletta Group: trains maintenance.

2011 The activities were interrupted and was activated a lay off fund for the workers.

2012 The factory was declared in liquidation and entrusted to Costa Sistemi Ferroviari S.P.A.

2013 Officine Zero officially opened. The model was that of the southern american 'Fabricas Recuperadas': reactivate the factory with a different production.

2018 The Municipality of Rome officially declared the spaces of the former RSI, Officine Zero, under eviction.

Program [48]

Users

Daily life [50]

Weekdays | Weekend

12h/d
10:00-22:00

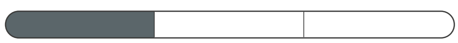
12h/d
~~Sun.~~ 10:00-22:00

Annual visitors [50]

10.000

18.000 visitors/year

Form of intervention



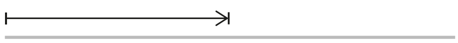
Minimal | Medium | Intensive

Stakeholders [32]

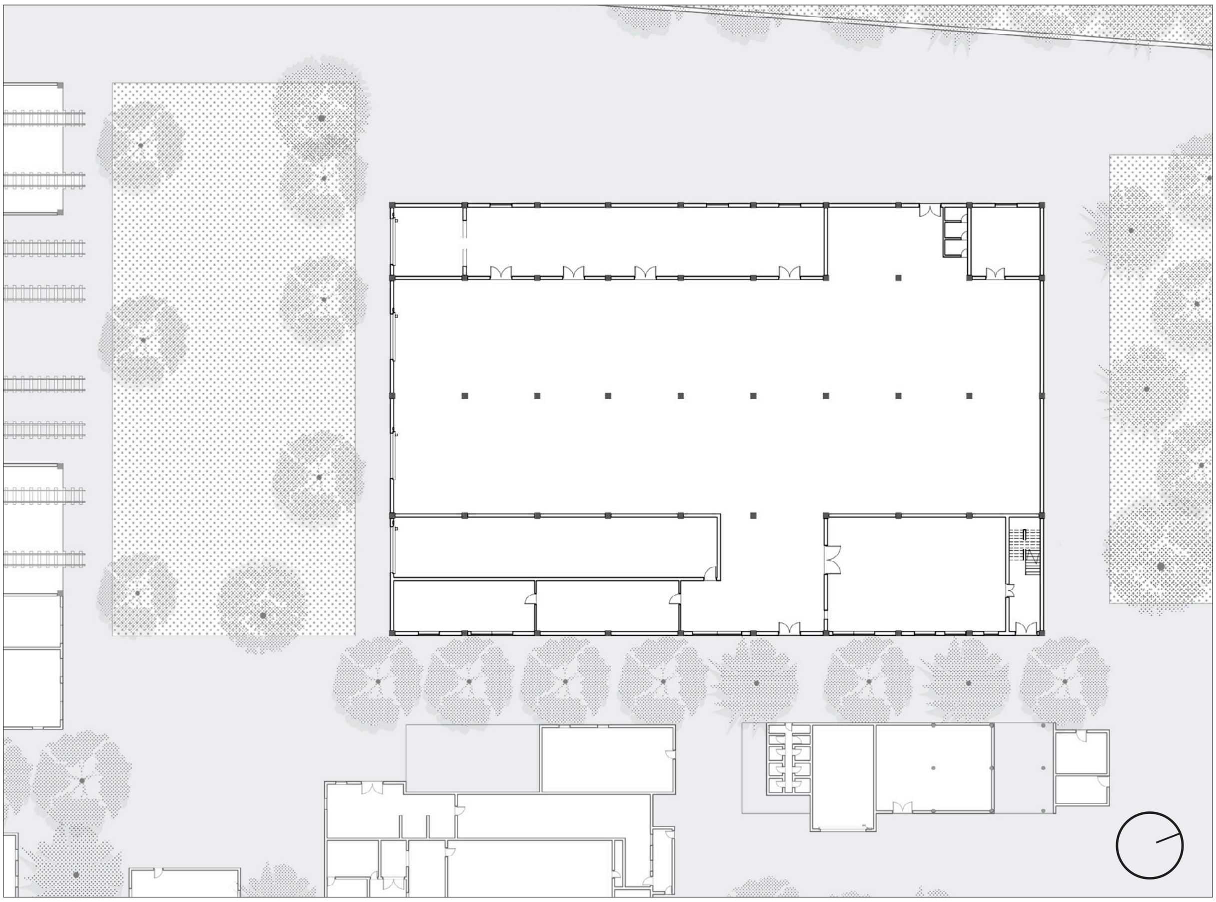
Property owner
Public

Devolopment
Private

Type of intervention

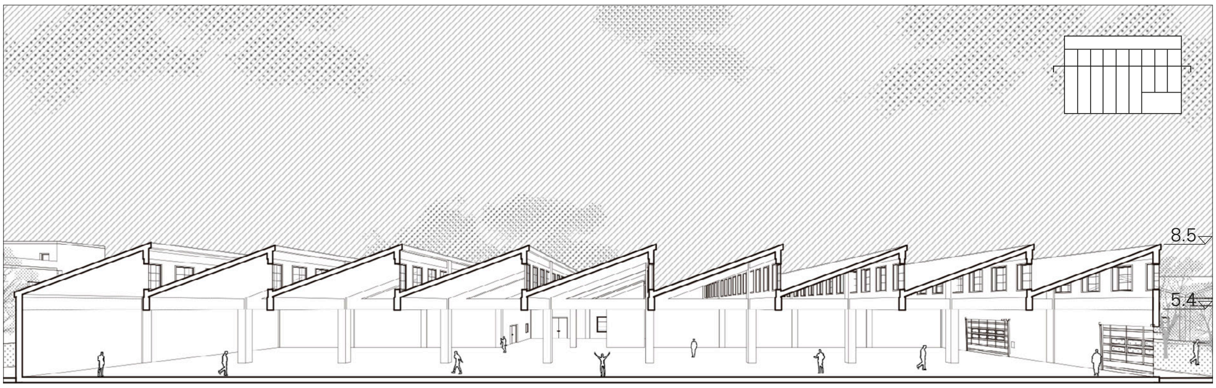


Temporal

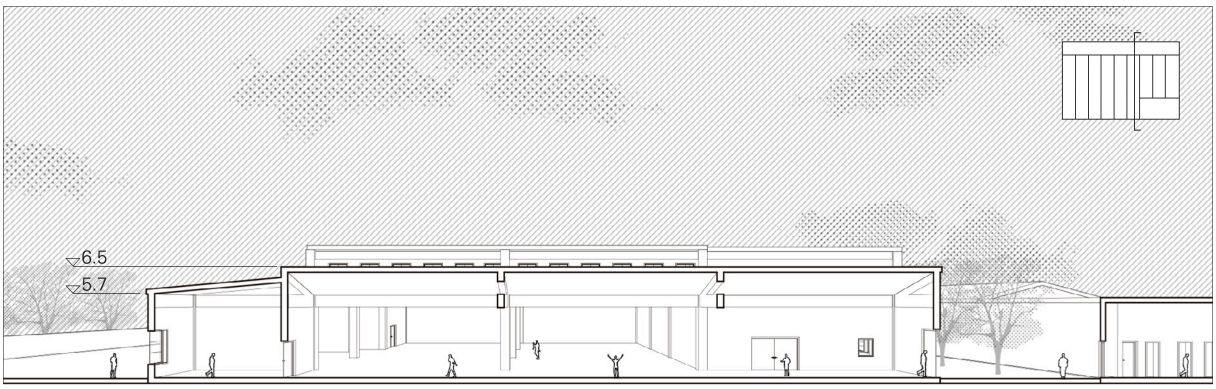


Railway Warehouse- Ground floor area: 3.450 m^2

GROUND FLOOR ESC 1/750

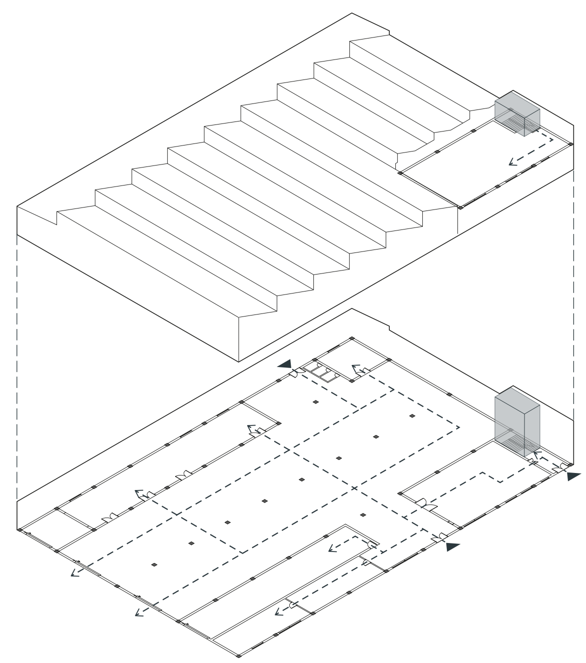


SECTION A

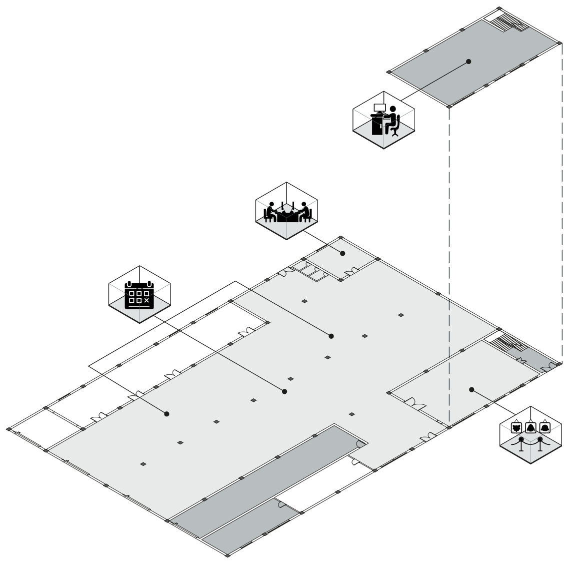


SECTION B

Circulation



Program distribution



Pedestrian access

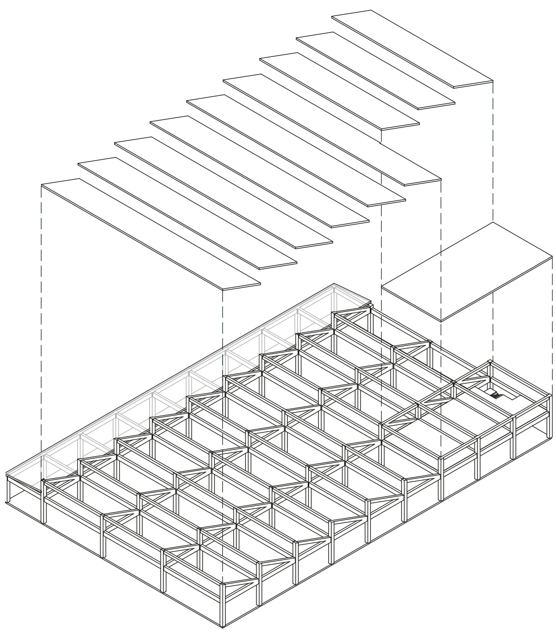
Major circulation

Vertical circulation

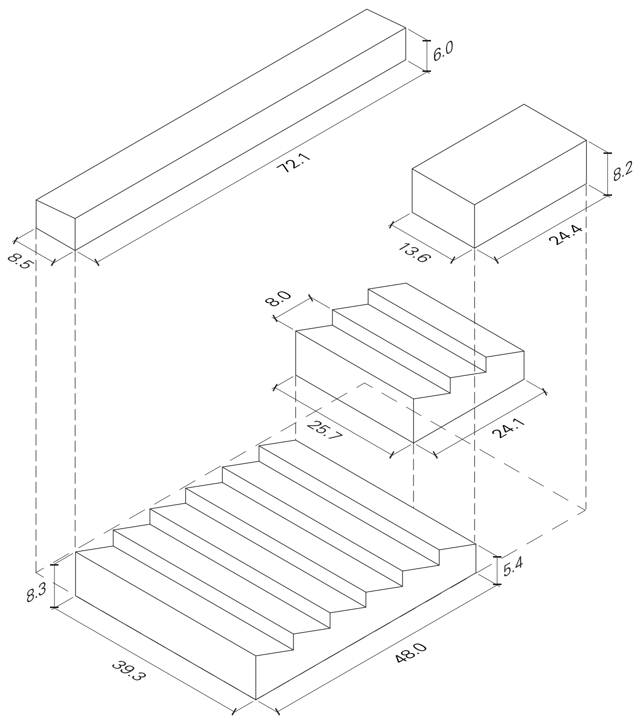
Private space

Common space

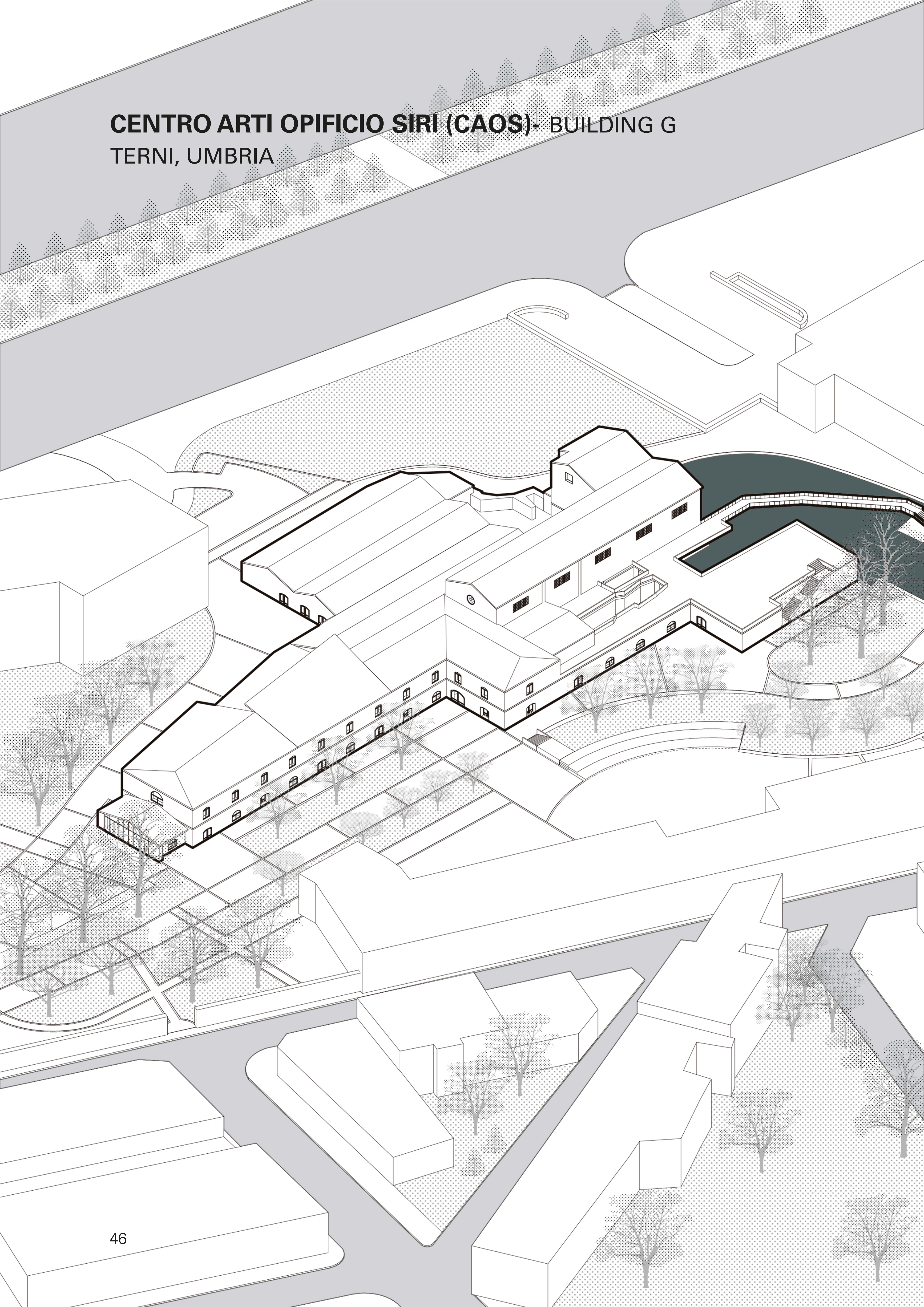
Structure



Geometric composition



CENTRO ARTI OPIFICIO SIRI (CAOS)- BUILDING G
TERNI, UMBRIA



3.5 City's cultural catalyst

CAOS

Viale Luigi Campofregoso 98

Terni, Umbria

ITALY

www.caos.museum/

CAOS, *Centro Arti Opificio Siri*, is a cultural center dedicated to the enjoyment of the arts and creative production. Owned by the Municipality of Terni, born from the conversion of the former SIRI chemical factory, it is currently managed by a temporary association of companies, which deals with managing planning and services. The CAOS has in its DNA 5600 square meters dedicated to culture, experimentation, and innovation, to be lived 24 hours, animated between 4 subjects and 23 heads, 46 arms always in motion to promote countless ideas and artistic languages.[51]

In 1793, the place hosted an industrial settlement, specifically a pontifical ironworks, the largest Umbrian factory at the time of national unification with an extension of 12,000 square meters and a workforce of about 200 units. In 1905 the Ironworks closed and from 1910 the plant is destined to metal and mechanical processing mainly for war purposes. In 1925, on the initiative of Luigi Casale, SIRI was born, the Italian Industrial Research Company, active in the production of synthetic ammonia and chemical products and in the study and exploitation of new industrial processes in the field of chemistry, physics, and mechanics. Since 1945 there has been a gradual decline in production and workers, to reach final closure in 1983.[51]

Finally, thanks to a recovery and redevelopment campaign held by Terni's Municipality, hosts since 2009 the CAOS. Together with the preservation of the access road and with the central widening of the original settlement system, all the existing buildings have been recovered for cultural and leisure services, while the housing function has been restored on the first floor of the perimeter body.[52]

The CAOS consists of a plurality of spaces, to which corresponds a panorama of activities that includes the realization of temporary exhibitions, events and research activities and promotion of new talents with residences, laboratories, and international projects. The CAOS wants to be an actuator center, a multi-place dedicated to research and that acts as a cultural catalyst for the city and as a driving force for projects linked to the contemporary; while maintaining a careful eye towards tradition.[51]

The CAOS is a fundamental step in the process of redefining the city of Terni under the sign of the contemporary: the recovery of the spaces of the former Siri marks an important and emblematic scan of the economic, architectural and urban changes that are transforming city's profile, no longer solely devoted to industrial production, but constantly evolving.[51]

For this study, the building complex will initially be analyzed together, but the Building G will be used for the architectural analysis, given that is considered as one of the most representative of the project and of which there was sufficient information for its analysis.

51. CAOS. *Chi Siamo.* Available from: http://www.caos.museum/chi-siamo/ (Accessed 20th June 2019).

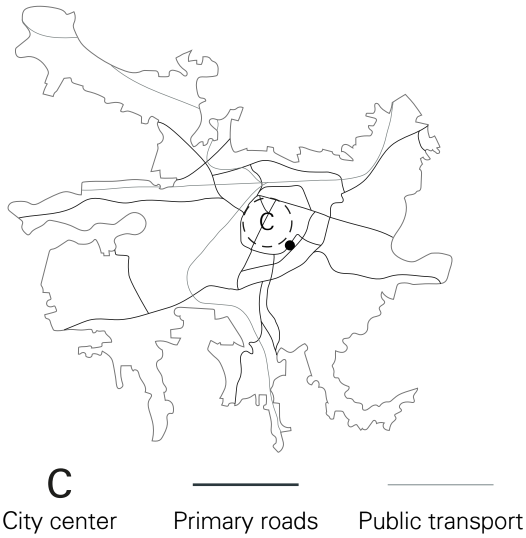
52. CAOS. *Come era.* Available from: http://www.caos.museum/chi-siamo/come-era/ (Accessed 20th June 2019).

Figure 16. CAOS exterior view.[53]

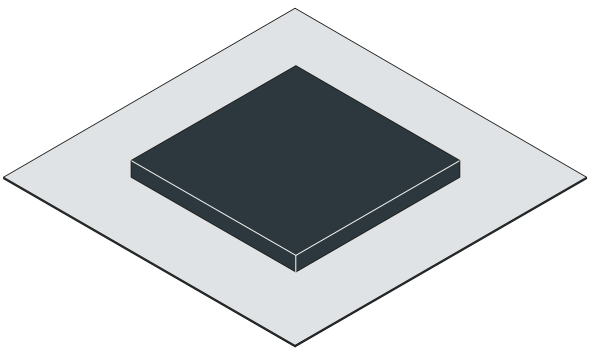
Figure 17. CAOS interior view.[54]

Location

Urban connections



Size

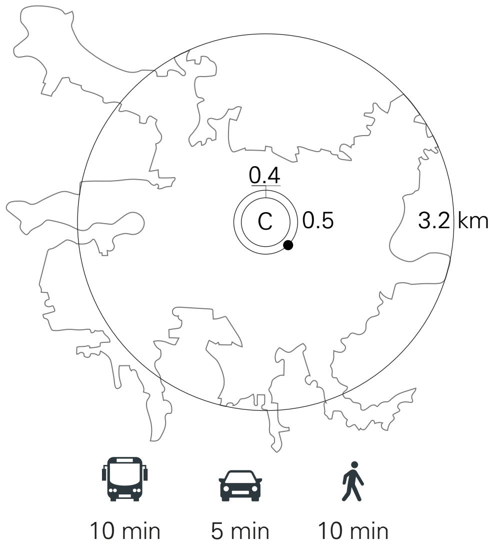


Ground floor area 14.010 m²

Total area 44.000 m²

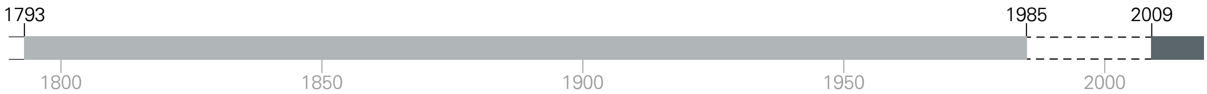
Occupancy 32%

Distance to center



Development timeline [32]

Previous usage · Unused · Current usage



Previous usage: Smithy (1793), chemical industry (1925)

Current usage: Cultural center

1793 Construction of the Pontifical State factory.

1925 The factory becomes chemical industry of the Italian Society for Industrial Research (SIRI).

1985 Closing of the company.

1997 Acquisition of the main historical buildings by the Municipality of Terni.

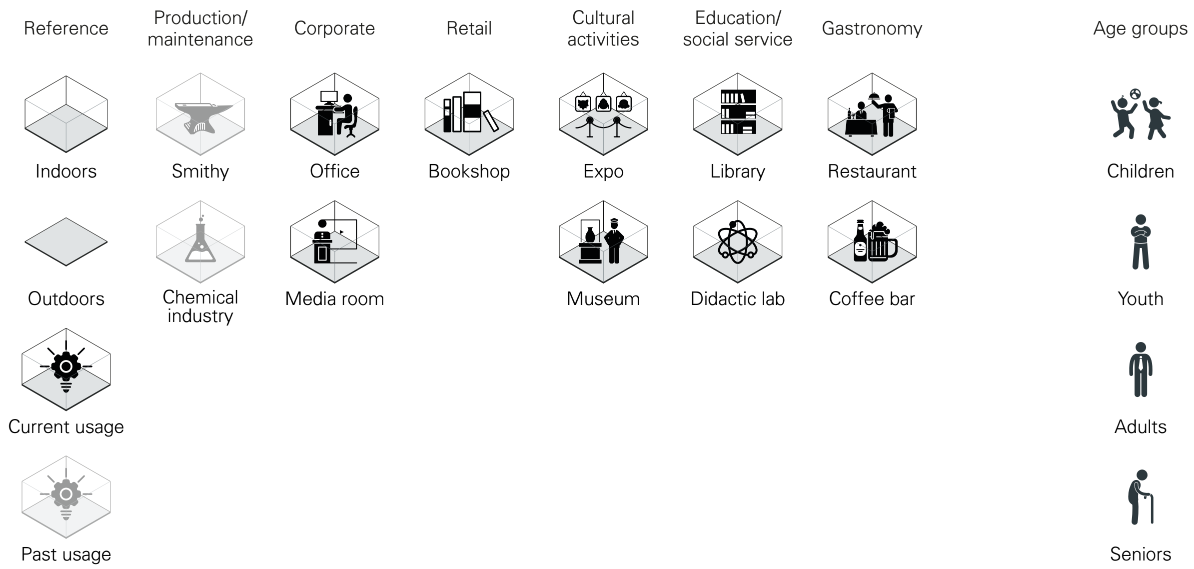
2003 Redevelopment of the entire area with Coop Centro Italia.

2009 Centro Arti Opificio Siri opens.

2014 New call of the Municipality for the management of CAOS.

Program [52]

Users



Daily life [55]

Weekdays

5h/d

~~Mon.~~ 10:00-13:00
17:00-19:00

Weekend

5h/d

10:00-13:00
17:00-19:00

Annual visitors [55]

20.000 visitors/year

Form of intervention

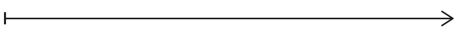
Minimal · **Medium** · Intensive

Stakeholders [32]

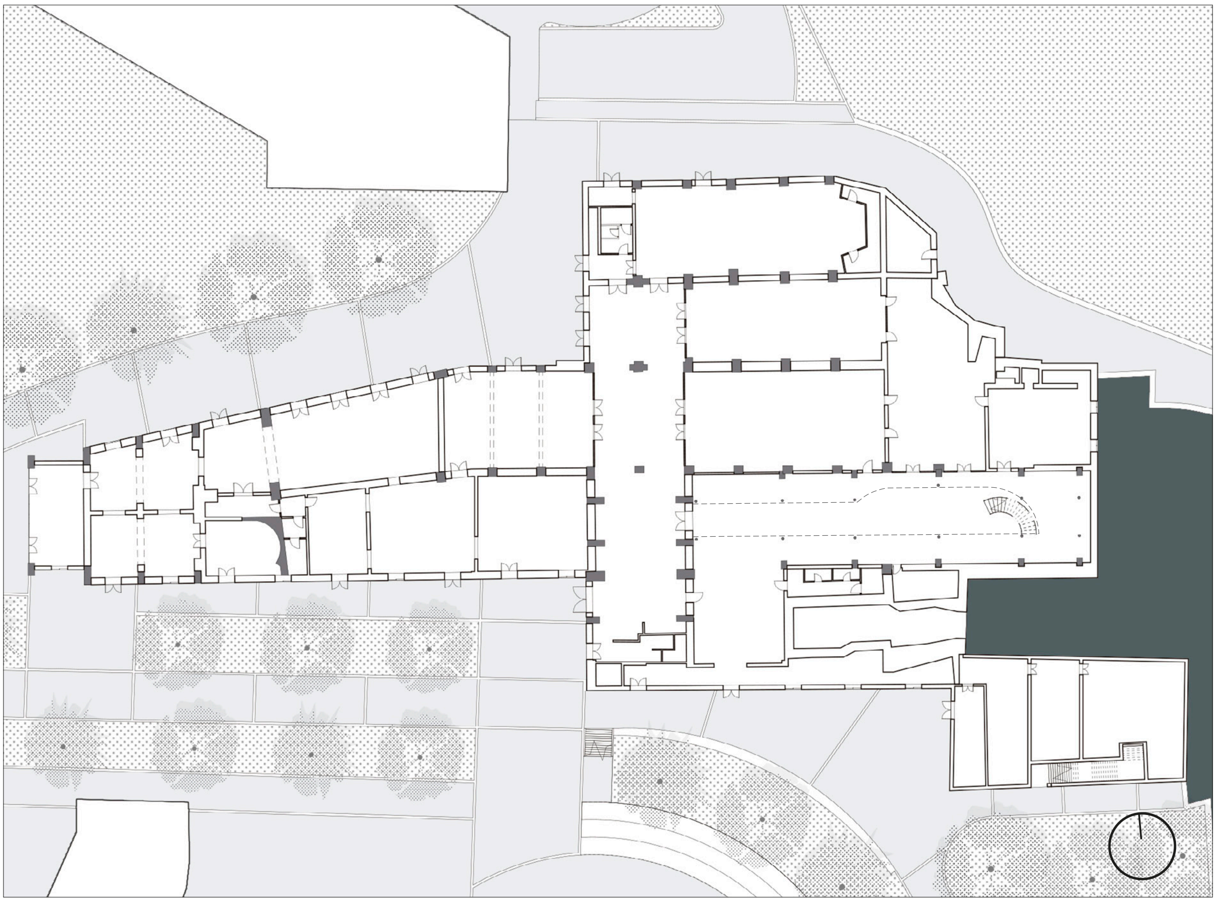
Property owner
Public

Devolopment
Public

Type of intervention

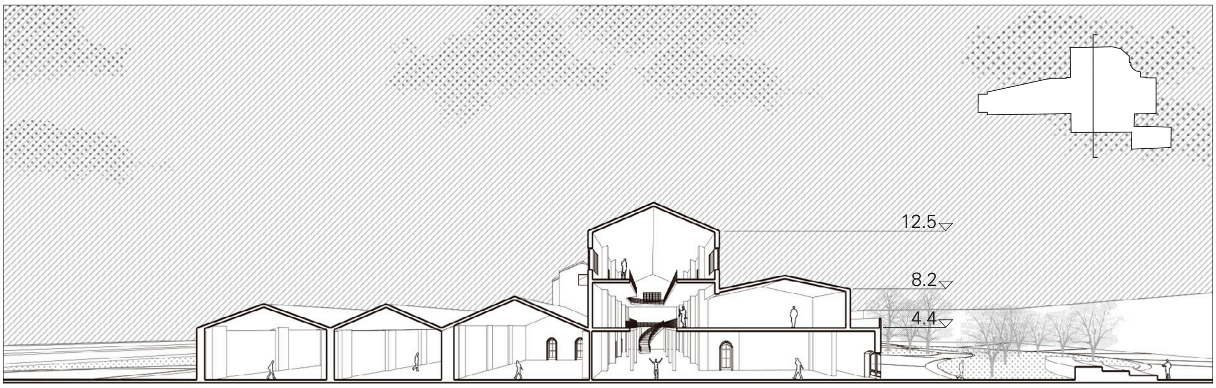


Permanent



Building G- Ground floor area: 7.156 m^2

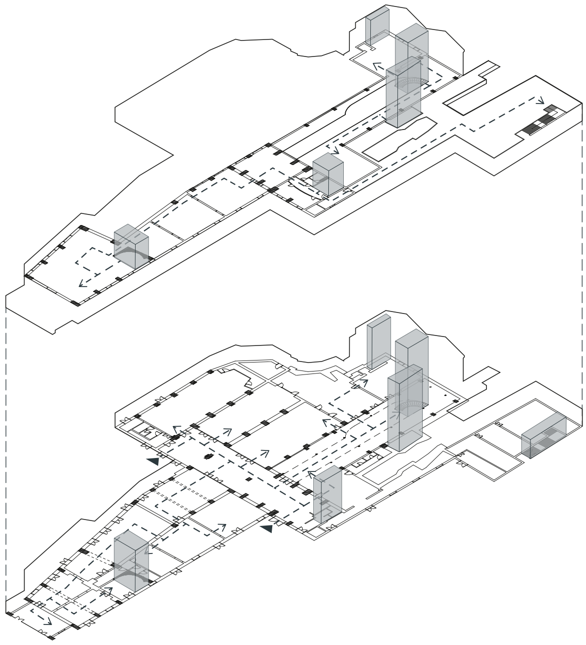
Ground floor ESC 1/1000



Section A

Section B

Circulation

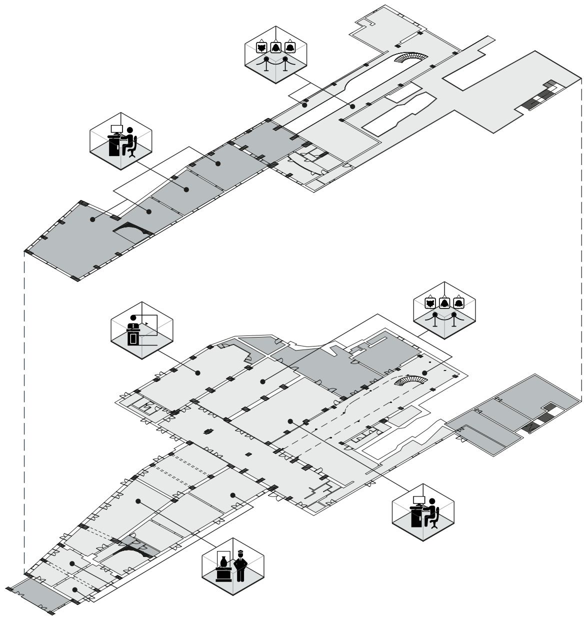


▲ Pedestrian access

- - -> Major circulation

Vertical circulation

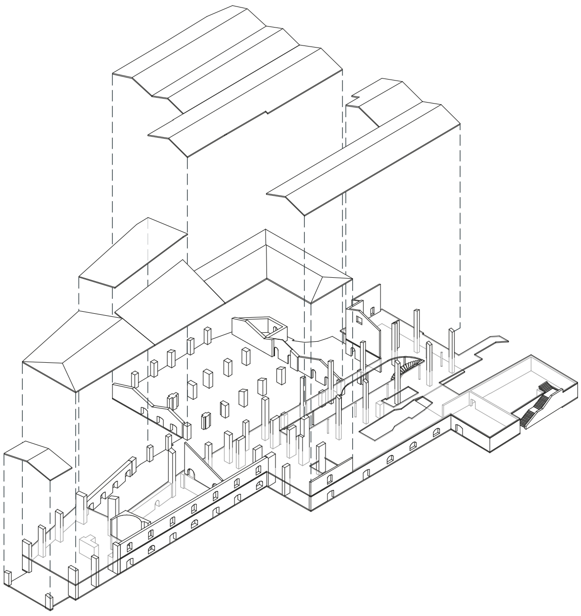
Program distribution



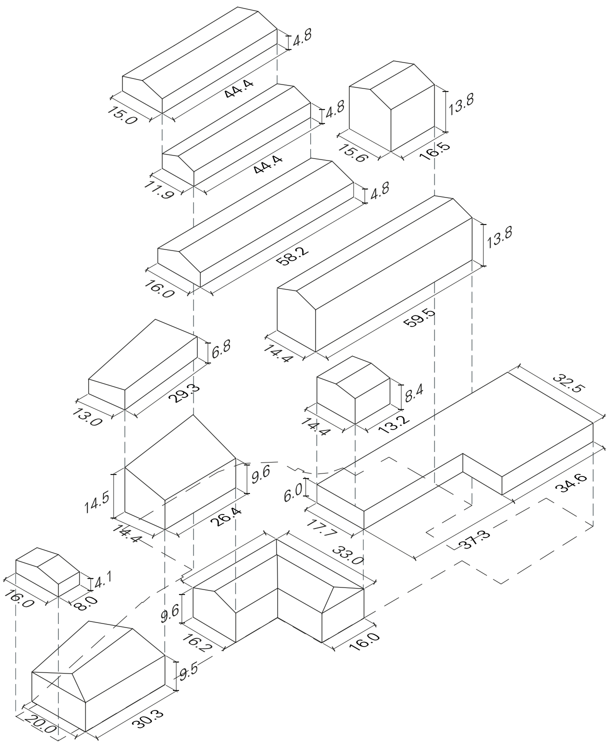
Private space

Common space

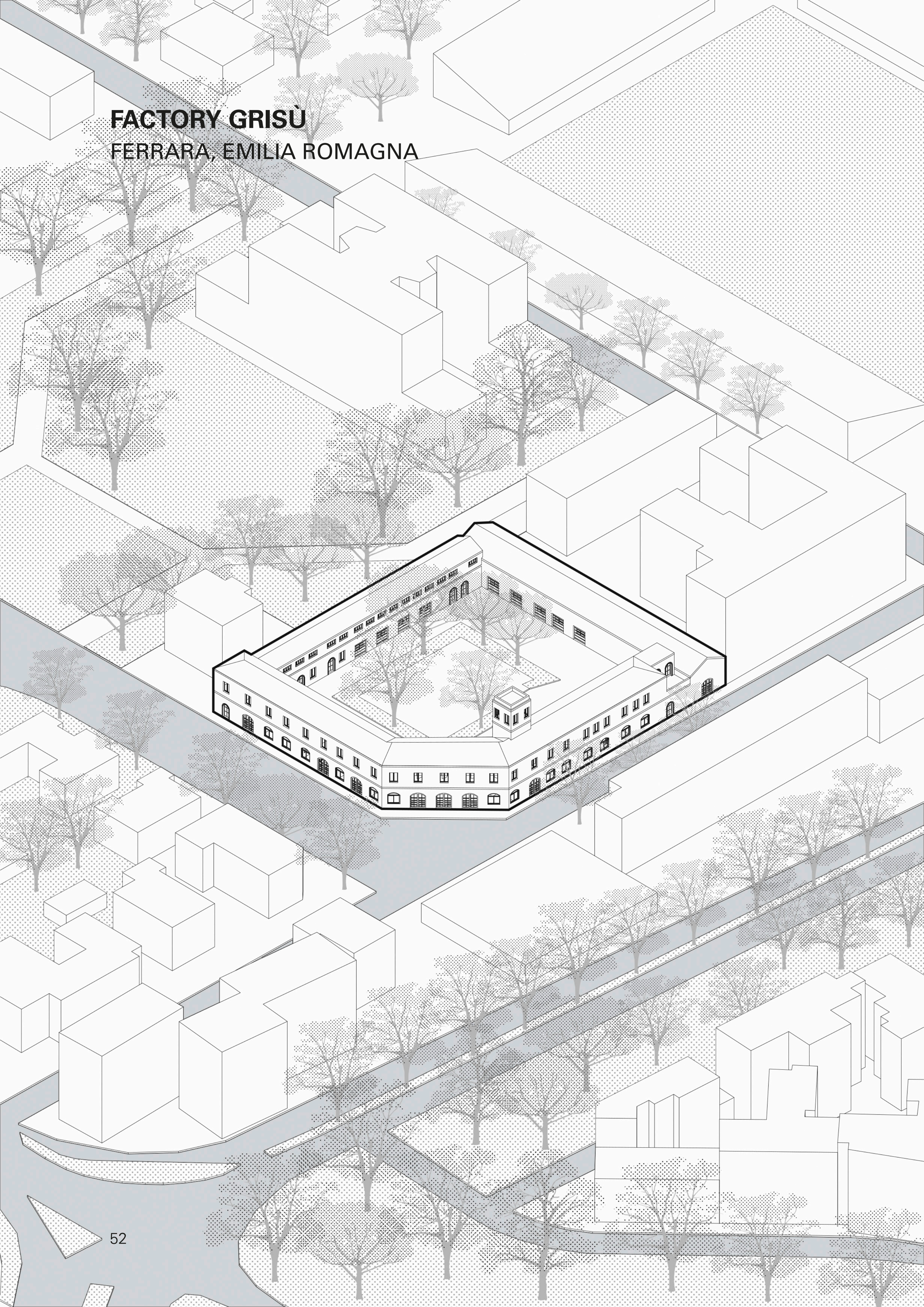
Structure



Geometric composition



FACTORY GRISÙ
FERRARA, EMILIA ROMAGNA



3.6 Creative hub at a former barrack

Factory Grisù

Via Mario Poledrelli 21

Ferrara,
Emilia Romagna

ITALY

www.factorygrisu.it/

Factory Grisù is an initiative that brings together companies from the cultural-creative sector, local authorities and associations in an urban regeneration project characterized by a balance of investments between public and private. It is located at the former Fire Station of Ferrara, in the garden district, an area that connects the railway station with the historic center.[56]

The barracks of the civic fire brigade was built on the original project of engineer Luigi Barbantini and inserted in a redesigned street layout and building spaces. It was inaugurated on October 28, 1930, the eighth anniversary of the march on Rome, and finally abandoned in 2004.[57]

Almost 10 years of inactivity and then the rebirth, in 2012, when the Province of Ferrara decided to hand over the keys of the building to the non-profit group Grisù which promised to recover the space and fill it with innovative business activities. In fact, it was seeking a place for all those who use art and culture as a raw material. A place that connects with other colleagues working in the same field to influence each other and exchange ideas. In February 2016, the Factory Grisù Consortium was established in Ferrara, with the aim of participating in the tender called by the Municipality for the management of a creative factory, to be built at the former barracks of Ferrara's Fire Station.[58]

Currently, the Factory Grisù Consortium includes 14 creative cultural firms ranging from design to architectural design, from online communication to 3D printing, from electronic engineering to the provision of online services. It provides spaces of various sizes and possibilities of use. Some of these are destined for temporary uses, others are assigned to creative cultural firms until 2025. Established companies must join the consortium, thus acquiring the free use of the allocated space, but at the same time assuming the economic burden of restructuring and setting up its own space. Discounts are available for youth companies. The candidacies of new companies must be presented at the appropriate calls. Spaces for temporary use have a cost, but the consortium reserves the right to make them available free of charge for non-profit cultural initiatives of non-profit organizations, should these become part of the Creative Factory project, making a significant contribution.[57]

However, in addition to being the place where dozens of people work every day, Factory Grisù is also a stage for theater, music, conferences, and workshops, a point of reference for projects of cultural associations, a covered market, a meeting place to share experiences and develop new work projects.[57]

In brief, Factory Grisù main objective is creating a hub of companies and other subjects of the cultural and creative business sector capable of generating economy of scale as well as supply chain opportunities to face a complex market characterized by a high level of fragmentation. Focusing especially on young companies.[59]

56. Emilia Romagna talenti e innovazione. *Consorzio Factory Grisù.* Available from: https://emiliaromagnatalentieinnovazione.aster.it/spazi-giovani/consorzio-factory-grisu (Accessed 19th June 2019).

57. Factory Grisù. *Spazi disponibili.* Available from: https://www.factorygrisu.it/spazio (Accessed 19th June 2019).

58. Stinco G. *Spazio Grisù, a Ferrara nasce la prima factory creativa dell'Emilia Romagna.* Il Fatto Quotidiano (internet). 2013 (Cited 19th June 2019). Available from: https://www.ilfattoquotidiano.it/2013/04/08/spazio-grisu-a-ferrara-nasce-prima-factory-creativa-dellemilia-romagna/554951/.

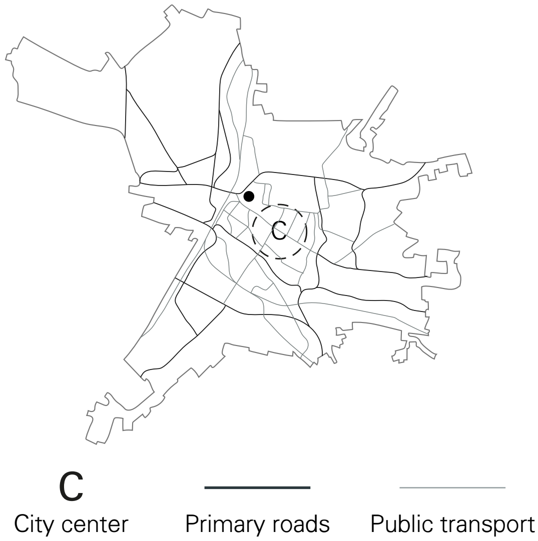
59. Smau. *Factory Grisù: Progetto di rigenerazione urbana.* Available from: https://www.smau.it/company/exhibitor/detail/factory-grisu/ (Accessed 19th June 2019).

Figure 18. Factory Grisù exterior view.[60]

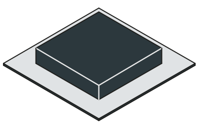
Figure 19. Factory Grisù interior view.[61]

Location

Urban connections



Size

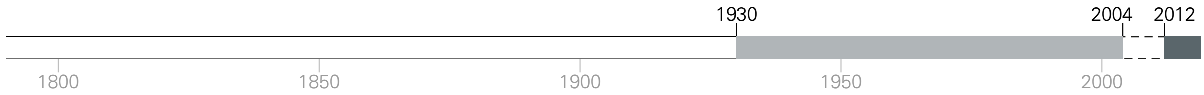


Ground floor area	1.565 m²
Total area	3.611 m²
Occupancy	43%

Distance to center

Development timeline [32]

Previous usage | Unused | Current usage



Previous usage: Fire station

Current usage: Creative and business center

1930 Inauguration of the fire station.

1943 The province of Ferrara becomes its owner.

2004 Firefighters were transferred to a new barracks and the building is abandoned, becoming warehouse of Ferrara Province.

2012 The Grisù Association requested the use of the structure to the Province with the Spazio Grisù project.

2013 Association gave the spaces to the first 13 companies and associations selected.

2016 The Municipality of Ferrara launched a procedure of public evidence for the management of the property and the renewal of the Spazio Grisù project.

Program [58]

Reference: Indoors, Outdoors, Current usage, Past usage

Corporate: Office, Meeting room, Events room

Cultural activities: Outdoor events, Street art

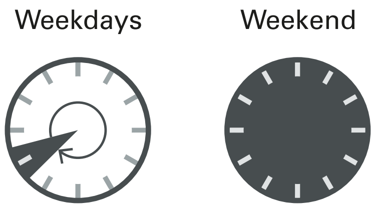
Education/social service: Firefighters

Gastronomy: Restaurant, Coffee bar

Users

Age groups: Youth, Adults

Daily life [58]



Weekdays: 11h/d, 8:30-19:30

Weekend: 0h/d

Annual visitors [58]

10.000

11.000 visitors/year

Form of intervention

Minimal | Medium | Intensive

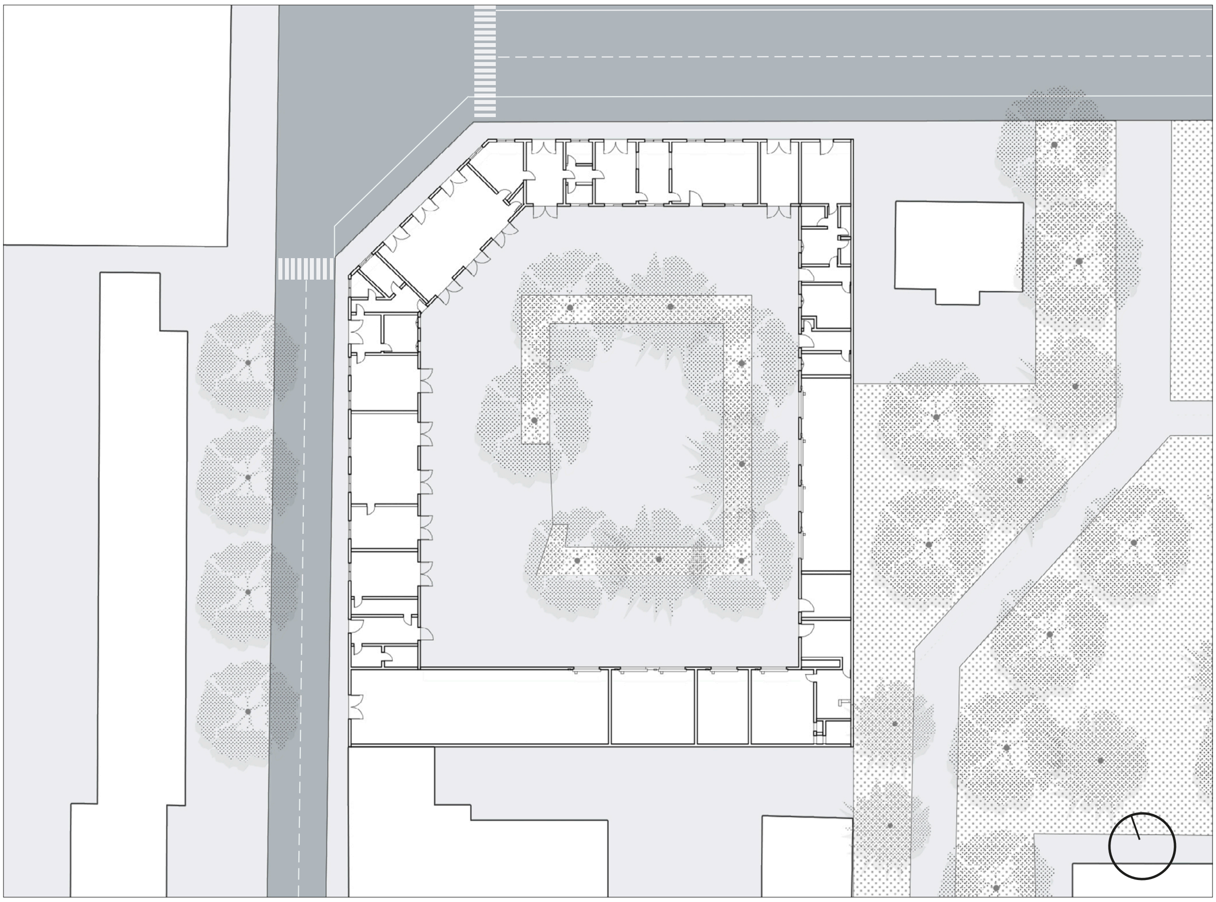
Stakeholders [32]

Property owner: Public

Devolopment: Private

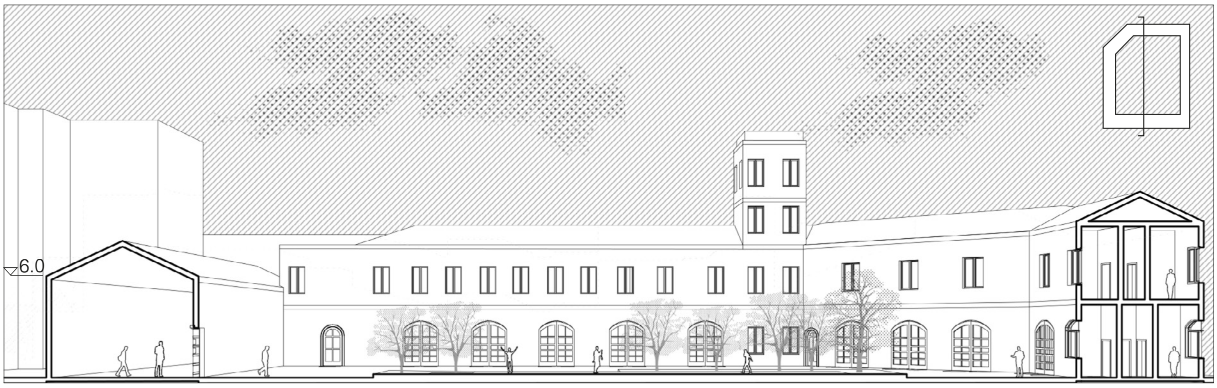
Type of intervention

Leased usage



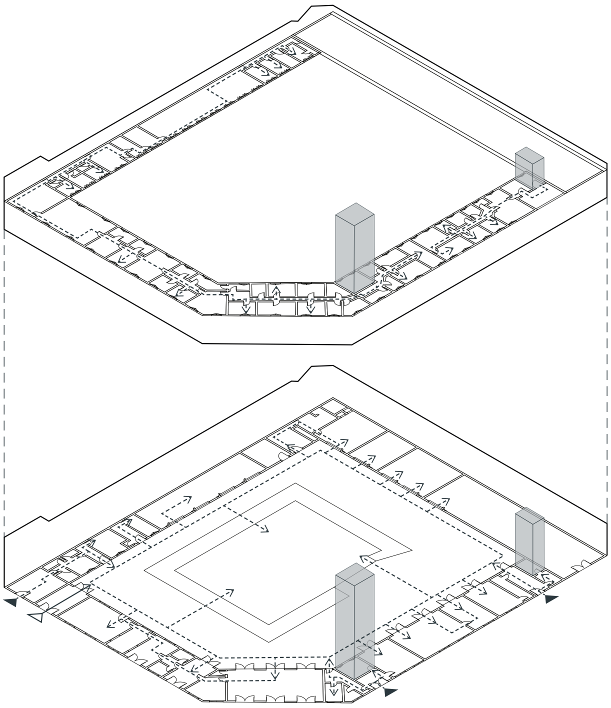
Ground floor ESC 1/750

Section A

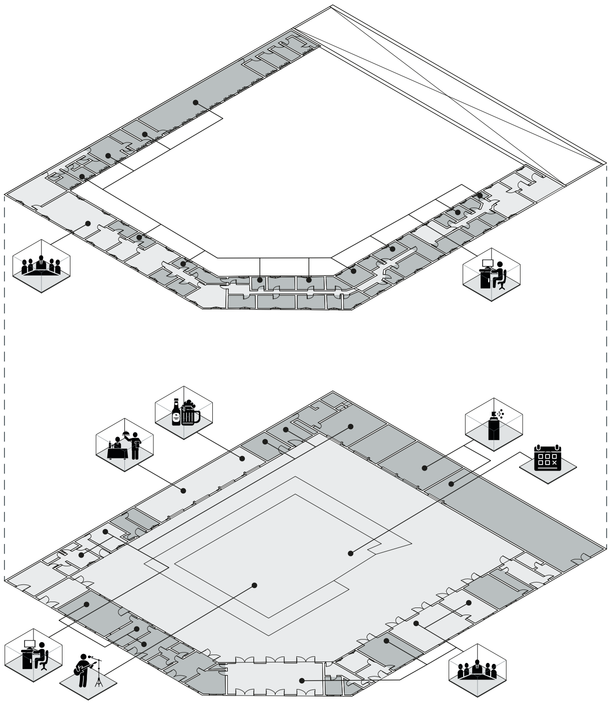


Section B

Circulation



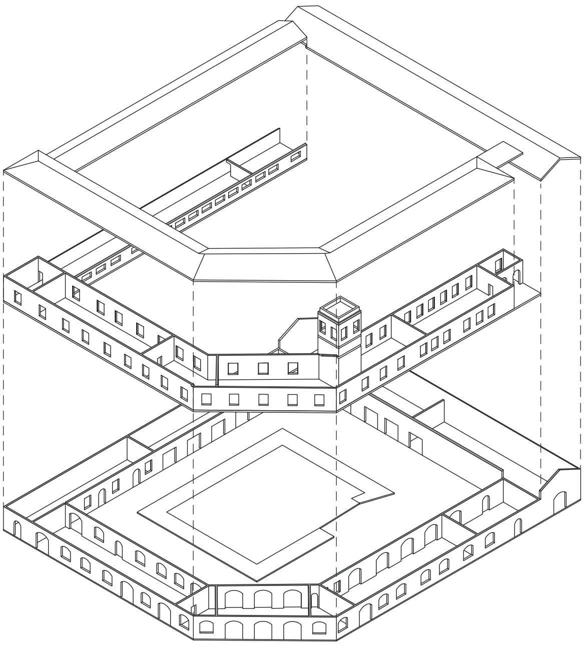
Program distribution



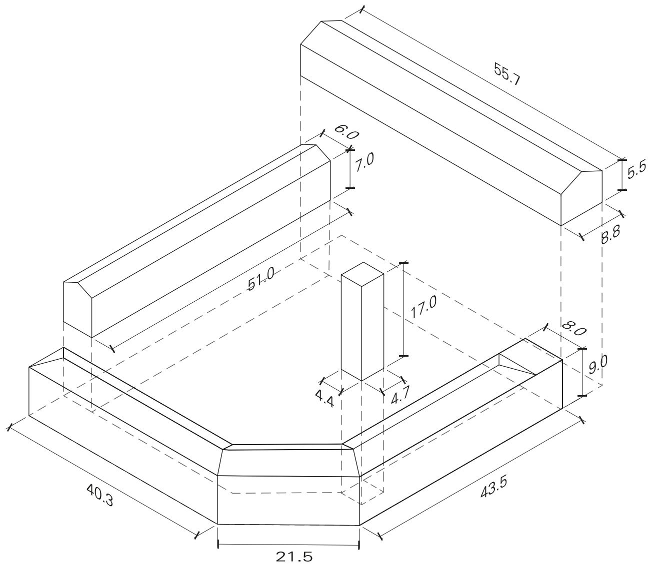
Pedestrian access
Vehicle access
Major circulation
Vertical circulation

Private space
Common space

Structure

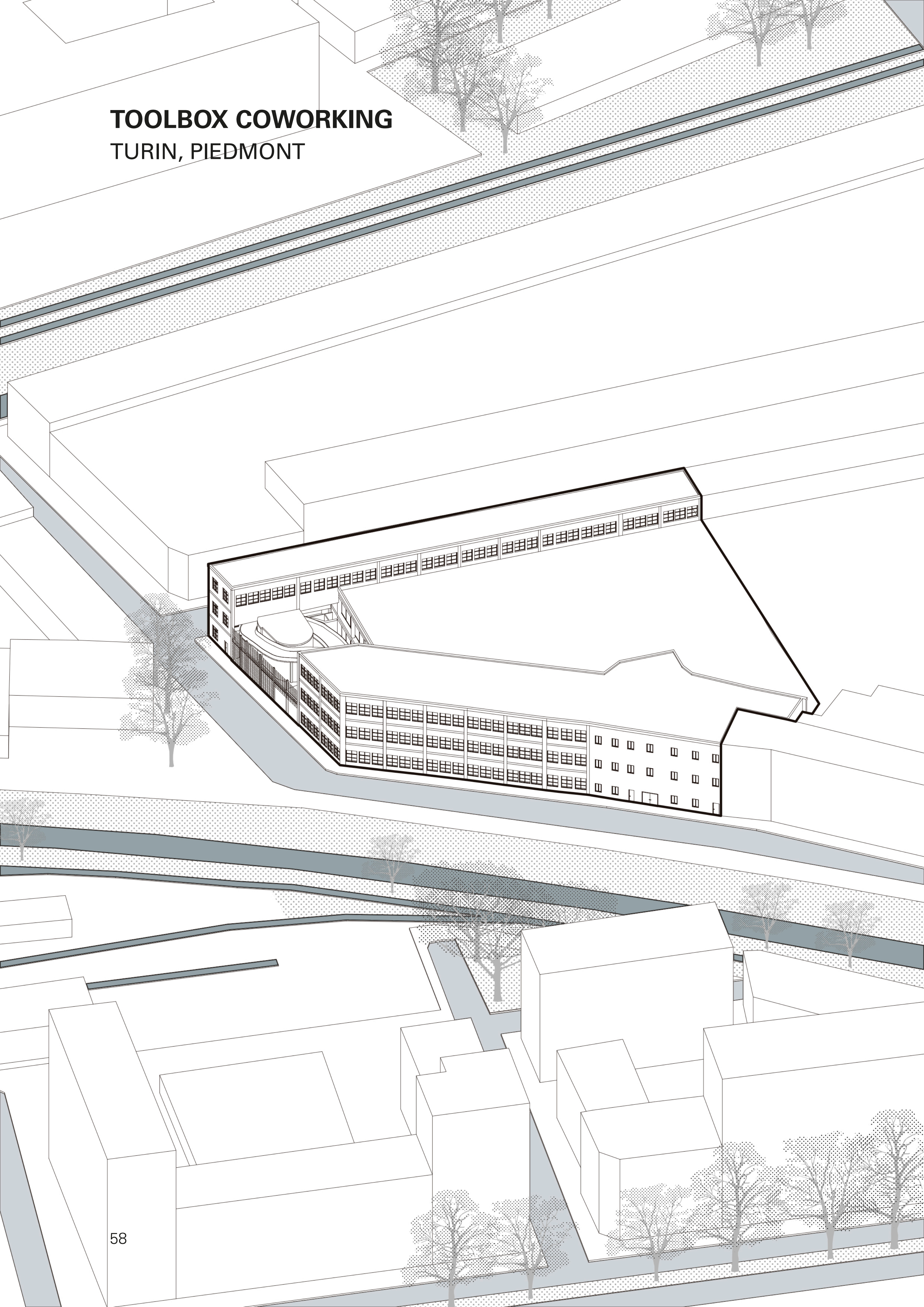


Geometric composition



TOOLBOX COWORKING

TURIN, PIEDMONT



3.7 Co-generating new ideas

Toolbox Coworking

Via Agostino da Montefeltro 2

Turin, Piedmont

ITALY

www.toolboxoffice.it/

Created from a former foundry built at the beginning of the 20th century, Toolbox Coworking is a creative space dedicated to work: 8000 square meters, plus 150 different activities, over 450 members, experienced every day by freelancers, start-ups and companies, all under one roof, all with the same collaborative and entrepreneurial mindset. A space dedicated to innovation, which promotes collaboration and an interdisciplinary approach.[62]

The industrial area where Toolbox Coworking now stands, called the "OSI Area", is located about 1,500 meters from the city's central railway station, in a triangle land of 51,000 square meters. In an area that today we would call the outskirts of which many businesses of the time had established their productive activities. It was mostly industries related to metallurgy, which probably were part of the FIAT industry, but there were also establishments related to different sectors, including a couple of companies that produced precision equipment and even a dairy industry.[63]

In 2007, just before the closure of I.D.S., the former Ghia area, the former O.S.I. and half of the area belonging to the foundry is acquired by an investment fund that plans an intensive real estate intervention. The historic buildings of the foundry with a usable area of approx. 10,000 square meters, however, remain independent of the ownership of the fund. Their subsequent development will be linked to the implementation of the Toolbox Coworking project. On Thursday 8 April 2010 the former Carlo Garrone Foundry, then transformed into Trafilati SpA and finally into a clothing company, re-opened its doors for the fourth time in ninety years and officially became Toolbox Coworking. To reach this goal it had taken about 12 months of work for the redevelopment of the environments, but above all an intense reflection and a deepening of the aspects and values that underpinned the very experience of coworking.[63]

Coworking is basically a bottom-up phenomenon, a bottom-up organizational model, between freelancers and entrepreneurs who decide to share spaces, ideas, and skills by creating a working community while maintaining different activities and businesses. The vitality of a coworking space, therefore, depends on the community that is established within it and it is for this reason that since the opening, all Toolbox initiatives were designed with the aim of creating one. The main themes on which it was decided to base the entire community building activity were those related to digital innovation, the sharing economy, networking, freelancing, and entrepreneurship. The aim was to attract people with a high professional diversity around Toolbox, but homogeneous in interests, through the organization of various types of events and media communication.[63]

In summary, it is clear that with the arriving of the sharing economy, the concept of production places is changing and the Toolbox coworking project in Turin is an example of innovation and quality in workspaces.[64]

62. Toolbox Coworking. *Toolbox: Persone e lavoro da sempre.* Available from: https://www.toolboxoffice.it/soluzioni-e-prezzi/ (Accessed 19th June 2019).

63. Balestra A, Ferrero M. Area OSI OVEST-NORD: Toolbox Coworking. In: Armano E, et al.(eds.) *Postfordismo e trasformazione urbana: Casi di recupero dei vuoti industriali e indicazioni per le politiche nel territorio torinese.* Turin: IRES; 2016. p. 241-266.

64. De Grandi C. *Nuove idee di lavoro e condivisione: il coworking Toolbox di Torino.* Art Wave. 2013 (Cited 19th June 2019). Available from: https://www.artwave.it/architettura/designinterior/nuove-idee-di-lavoro-e-condivisione-il-coworking-toolbox-di-torino/

Figure 20. Toolbox exterior view.[65]

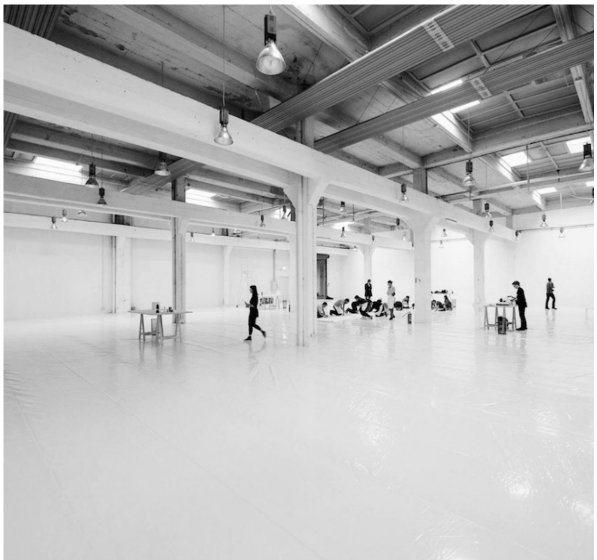
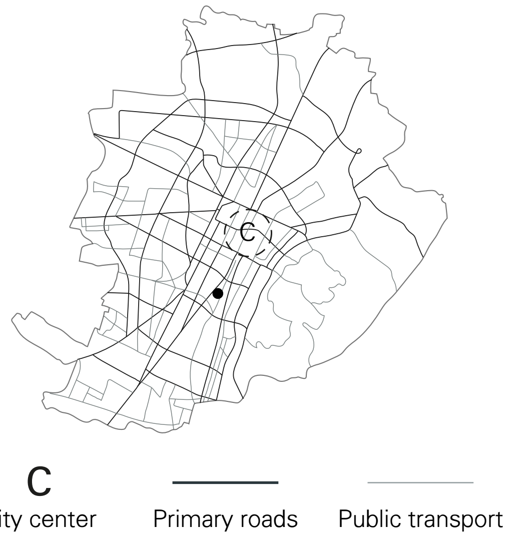


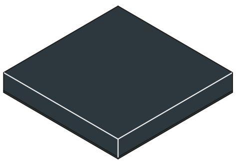
Figure 21. Toolbox interior view.[66]

Location

Urban connections

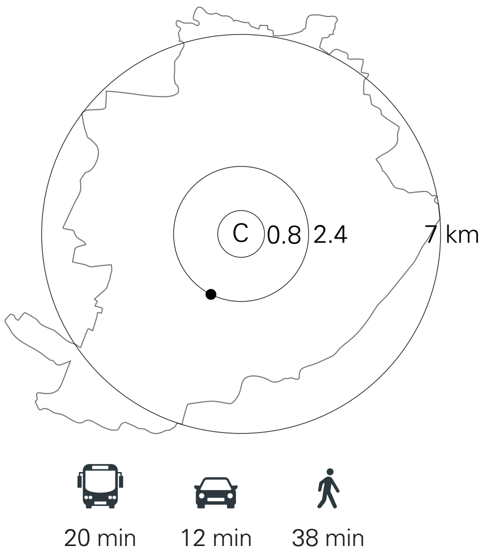


Size



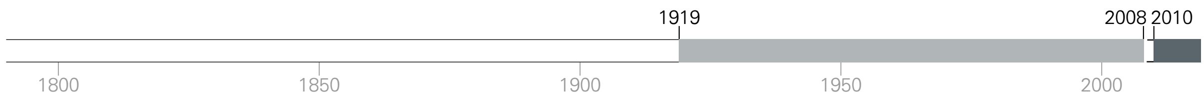
Ground floor area	5.872 m^2
Total area	5.872 m^2
Occupancy	100%

Distance to center



Development timeline [32]

Previous usage · Unused · Current usage



Previous usage: Foundry (1919), clothing industry (1978)

Current usage: Creative hub for work

1919 The Foundry Garrone was designed by arch. Porcheddu.

1960 Opened Officina Stampaggi Industriali (OSI).

1968 Closed the Foundry Garrone.

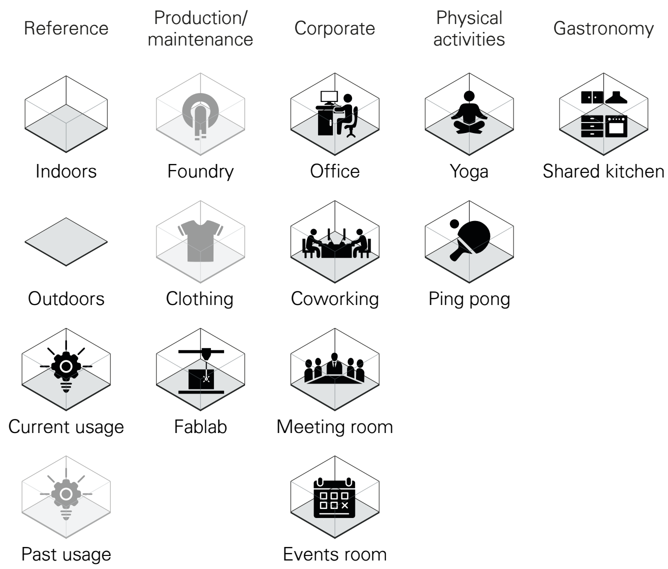
1978 Opened G.B. Sportelli in the buildings of the Foundry.

2010 Closed Officina Stampaggi Industriali (OSI).

2008 Closed G.B. Sportelli in Turin, the ownership passed to Montefeltro SRL, of the same Milanese group.

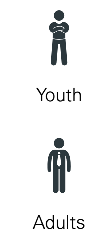
2010 Opened Toolbox (1.500 square meters).

Program [63]



Users

Age groups



Daily life [63]

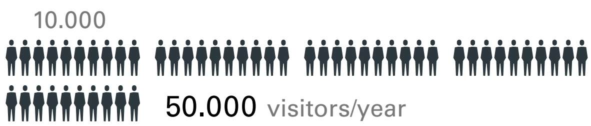
Weekdays

Weekend

12h/d
8:00-20:00

0h/d

Annual visitors [67]



50.000 visitors/year

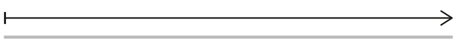
Form of intervention

Stakeholders [32]

Property owner
Private

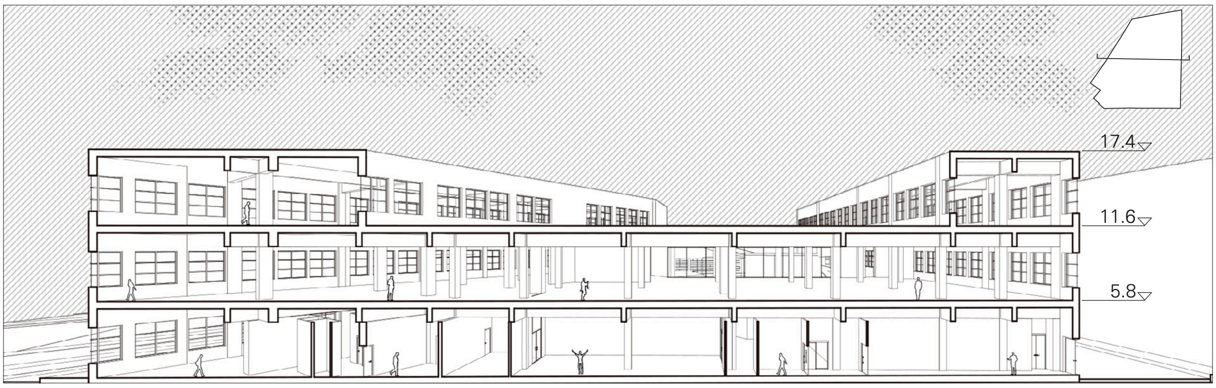
Devolopment
Private

Type of intervention

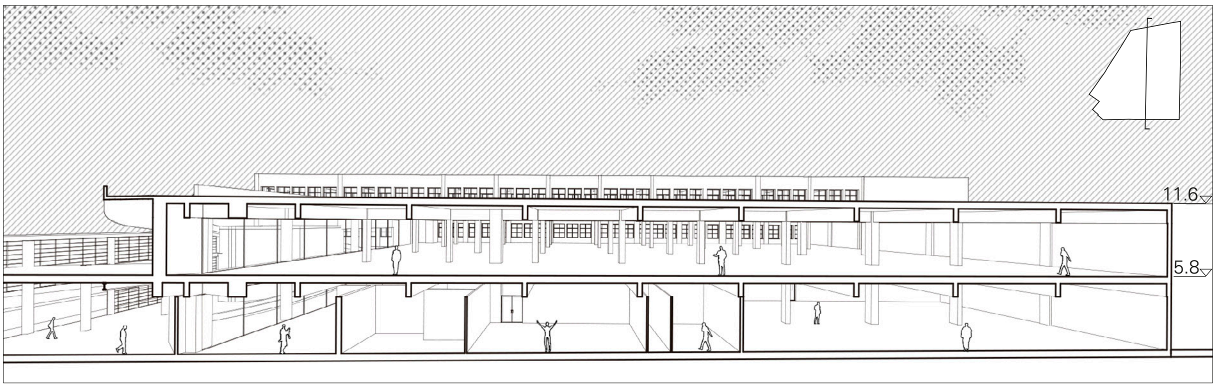


Permanent

Ground floor ESC 1/750



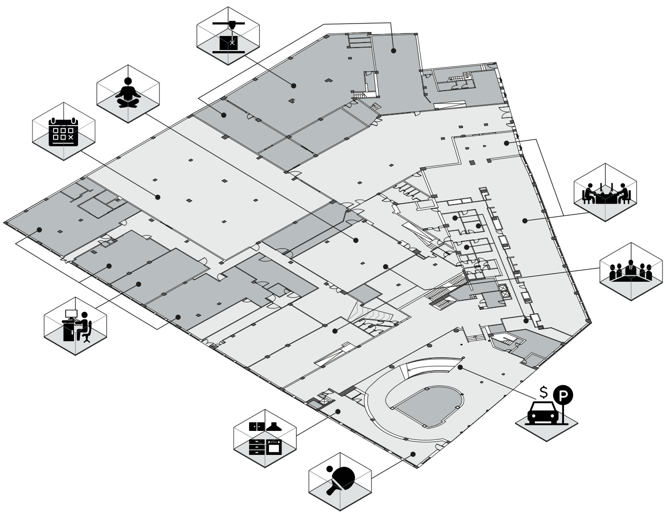
Section A



Section B

Circulation

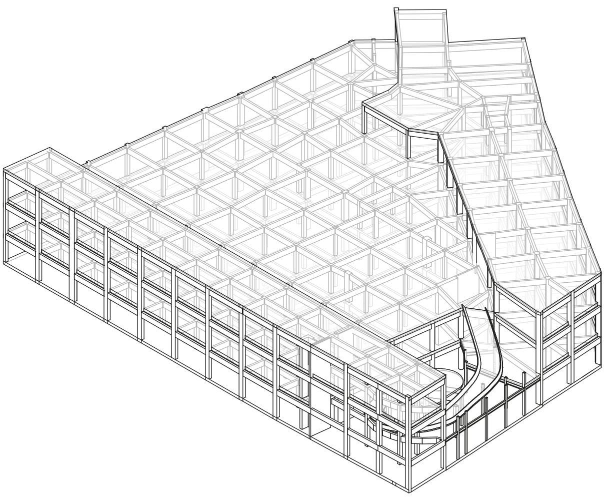
Program distribution



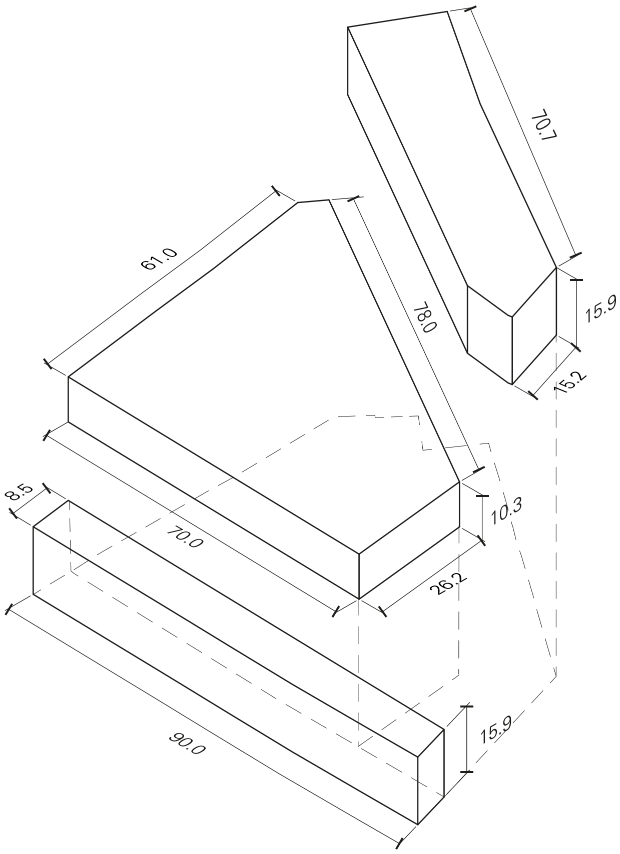
Pedestrian access | Vehicle access | Major circulation | Vertical circulation

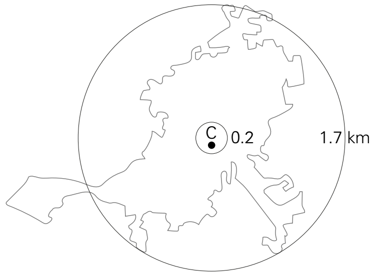
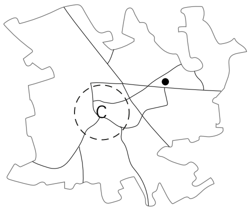
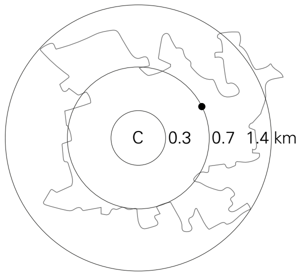
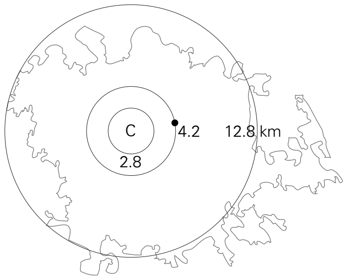
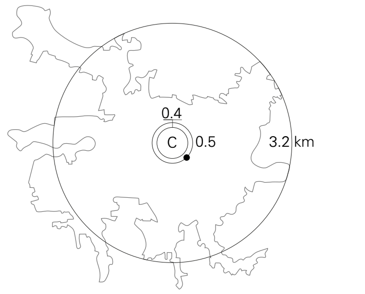
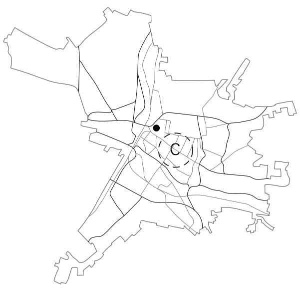
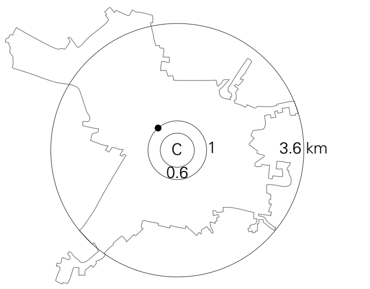
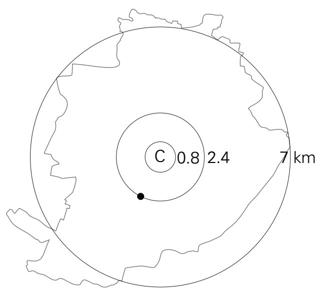
Private space | Common space

Structure



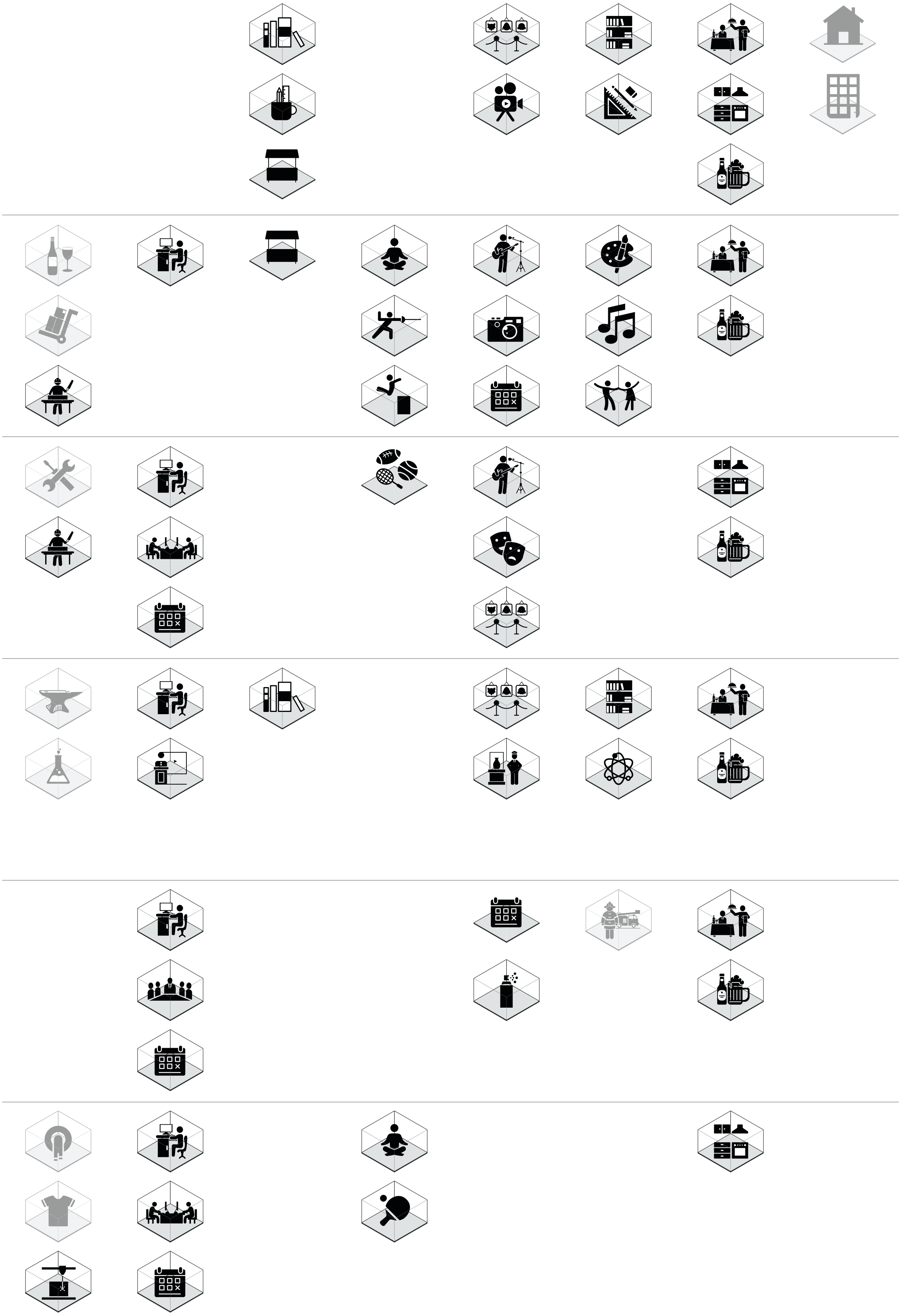
Geometric composition



Project	**Urban connections**	**Distance to center**
FARM CULTURAL PARK FAVARA, SICILY		
EX FADDA SAN VITO DEI NORMANNI, APULIA		
OFFICINE ZERO ROME, LAZIO		
CAOS TERNI, UMBRIA		
FACTORY GRISÙ FERRARA, EMILIA ROMAGNA		
TOOLBOX COWORKING TURIN, PIEDMONT		

Program

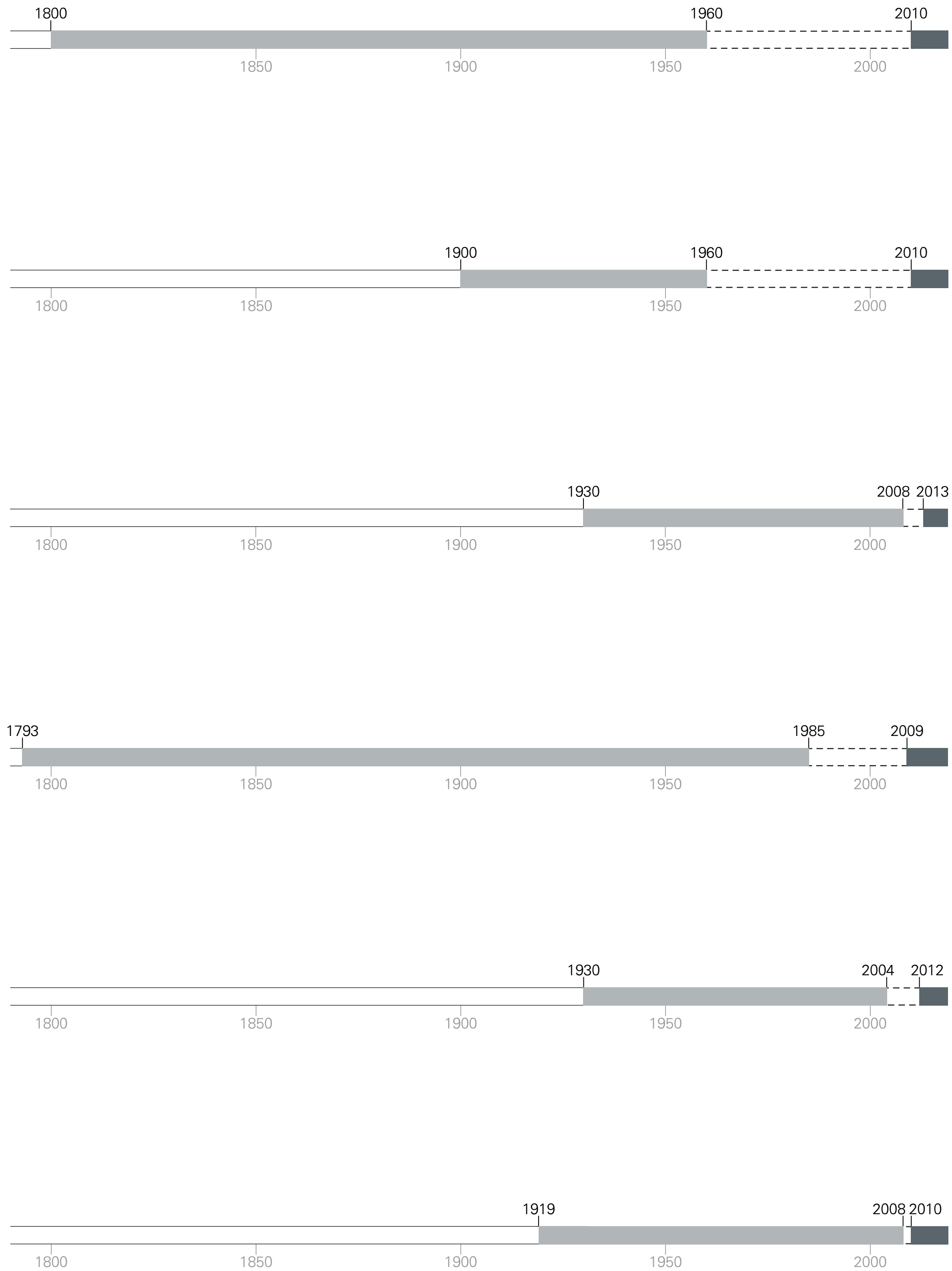
Production/ maintenance | Corporate | Retail | Physical activities | Cultural activities | Education/ social service | Gastronomy | Housing

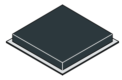
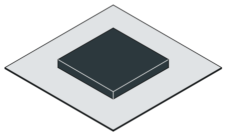
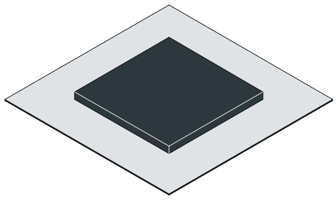
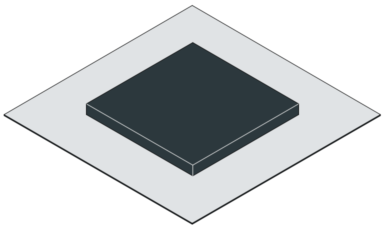
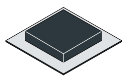
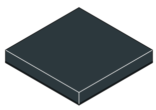


Project	Daily life: Weekdays	Daily life: Weekend	Annual visitors
FARM CULTURAL PARK FAVARA, SICILY	12h/d ~~Mon.~~ 10:00-22:00	12h/d 10:00-22:00	10.000 90.000 visitors/year
EX FADDA SAN VITO DEI NORMANNI, APULIA	24h/d 00:00-24:00	24h/d 00:00-24:00	10.000 43.000 visitors/year
OFFICINE ZERO ROME, LAZIO	12h/d 10:00-22:00	12h/d ~~Sun.~~ 10:00-22:00	10.000 18.000 visitors/year
CAOS TERNI, UMBRIA	5h/d ~~Mon.~~ 10:00-13:00 17:00-19:00	5h/d 10:00-13:00 17:00-19:00	10.000 20.000 visitors/year
FACTORY GRISÙ FERRARA, EMILIA ROMAGNA	11h/d 8:30-19:30	0h/d	10.000 11.000 visitors/year
TOOLBOX COWORKING TURIN, PIEDMONT	12h/d 8:00-20:00	0h/d	10.000 50.000 visitors/year

Development timeline

Previous usage Unused Current usage



Project	**Size** GFA- Ground floor area TA- Total area	**Stakeholders**
FARM CULTURAL PARK FAVARA, SICILY	 GFA 2.707 m^2 TA 3.439 m^2	Property owner Private Devolopment Private
EX FADDA SAN VITO DEI NORMANNI, APULIA	 GFA 3.295 m^2 TA 12.700 m^2	Property owner Public Devolopment Public
OFFICINE ZERO ROME, LAZIO	 GFA 9.579 m^2 TA 29.000 m^2	Property owner Public Devolopment Private
CAOS TERNI, UMBRIA	 GFA 14.010 m^2 TA 44.000 m^2	Property owner Public Devolopment Public
FACTORY GRISÙ FERRARA, EMILIA ROMAGNA	 GFA 1.565 m^2 TA 3.611 m^2	Property owner Public Devolopment Private
TOOLBOX COWORKING TURIN, PIEDMONT	 GFA 5.872 m^2 TA 5.872 m^2	Property owner Private Devolopment Private

Users	Form of intervention	Type of intervention
Children, Youth, Adults, Seniors	Minimal, Medium, Intensive	Permanent
Children, Youth, Adults	Minimal, Medium, Intensive	Permanent
Youth, Adults	Minimal, Medium, Intensive	Temporal
Children, Youth, Adults, Seniors	Minimal, Medium, Intensive	Permanent
Youth, Adults	Minimal, Medium, Intensive	Leased usage
Youth, Adults	Minimal, Medium, Intensive	Permanent

3.8 Analysis of cases

These projects represent just a part of all the cases of adaptive reuse that could be found in Italy. However, they are very useful for understanding the characteristics of this process. They all have different characteristics, the size of the project, the original and new uses that were assigned (related mainly to cultural, educational and corporate uses), the project timeline, the daily usage and even the relation with the urban context.

Nevertheless, after having analyzed all of the cases, some similarities may also be established in all these reuse experiences. For instance, they all are the product of an alternative vision of urban development in which not just the new constructions are symbols of the growth and progress of the contemporary city, but also the reuse of the existing urban constructions represents a form of development, one that is certainly more concerned with the sustainability and the efficient use of the urban resources. Another characteristic that these projects have in common is that they were all transformed from mono-functional complexes, which became obsolete when the needs changed; to mixed-use complexes, where the diversity of activities and relationships that could be established constitute the added value of these types of projects and will allow them to adapt to new needs in the future.

On the other hand, the fact that not all adaptive reuse projects analyzed had an industrial past usage demonstrates that this type of process is not specifically related to a single type of building, but basically depends on social and economic factors that promote the reuse project and on the spatial qualities that each urban construction has for being adapted to new uses and requirements. [68]

When reflecting on social factors, it is necessary to consider that the commitment and participation of the developers, operators, users and visitors of each project are fundamental to the success of an adaptive reuse process. They decide the new requirements and establish how the spaces must adapt to meet their needs. The developers, who are in charge of initiating and promoting the project, could be individuals or groups of people from the private sector who want to develop a venture with or without profit, or public sector institutions that are looking for alternatives to improve quality of life in the city. In the best case, there is an alliance between the public and private sectors to strengthen the project. The example of Factory Grisù is an example of this alliance, where it is demonstrated how due to the concessions of the public administration of Ferrara, owner of the property, entrepreneurship and local economy can be promoted, thus benefiting both sectors.

Users and visitors are those who give it life and help maintain the project over time, through them it is possible to evaluate the reuse experience and thereby understand the social benefits of the project. Similarly, if the experience is significant enough, certain projects may help build and strengthen the collective memory of citizens. In this case, Farm Cultural Park represents an example of a project that has not only attracted the interest of thousands of people locally and internationally, but at the same time has been decisive in strengthening

68. Baum M. It's all about places, people and having a vision. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 355-365.

the identity of the historic center of Favara that once was in a high degree of deterioration and abandonment.

Reflecting on the economic factors, the cases analyzed present a variety of conditions regarding the financing of the project. Some of these received economic support from the public sector and the type of proposed uses varies from the cultural sector, as in the case of ExFadda and CAOS, to the corporate and entrepreneurship sector, as in the case of Factory Grisú. Others are the result of initiatives and economic support from private companies that opted for ventures from the cultural sector, such as Farm Cultural Park, the corporate sector, such as Toolbox coworking, and even a mixture between both sectors, as in the case of Officine Zero.

Many of these projects have been able to achieve the financial stability of their operations, such as in Toolbox, Factory Grisù and Farm Cultural Park; while the others are still in process or are in difficulties to be economically sustainable. Sustainability that does not depend specifically on the type of new uses that have been proposed but on the type of administration and promotion that has been given to the project.

Finally reflecting on the spatial and architectural qualities, it could understood that at the urban level, the projects are generally located in places not far from the city center and have relatively good connections with the city's road system. At the architectural level, the projects have great differences in circulation, geometry, structure and even in the organization of space. These differences are partly because not all the buildings analyzed belong to the same typology. Some are industrial, with wide and open spaces where the structural system also allows a free organization of activities, as in the case of Toolbox and Officine Zero. Others, despite being buildings built for industry, have a very rigid arrangement of spaces and a structural system that does not allow major changes and transformations, as in the case of CAOS and Exfadda. In the same way, there is also the case of an institutional building like Factory Grisù, in which the spaces, circulation and structure were designed to respond specifically or the requirements of certain use in the past, and for which now It represents a greater effort to be adapted to new uses. And finally there is the type of residential building that was never intended to be otherwise, and in which it becomes almost impossible to physically transform the space.

However, despite all these limitations, all these projects achieved creatively and through a greater or lesser intervention of the existing buildings that the spaces were adapted to meet the proposed objectives. Besides, each project and the proposed new uses are the result of a conscious analysis of the particular conditions of the places where they are located, as well as the needs and interests of its inhabitants. Therefore, regarding adaptive reuse projects, economic, social and architectural factors are fundamental to the success of these types of processes.

Chapter two notes

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.)*City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

31. Tesei A. *L'Italia che cade a pezzi.* La Stampa (internet). 2019 (Cited 25th August 2019). Available from: https://www.lastampa.it/tuttogreen/2019/06/16/news/l-italia-che-cade-a-pezzi-1.36541540

32. Lami I. M. *Abandoned Buildings in Contemporary Cities: Smart Conditions for Actions.* Cham, Switzerland: Springer Nature; *Forthcoming.*

33. Visit Agrigento. *Farm Cultural Park.* Available from: https://web.archive.org/web/20130113021940/http://www.visitagrigento.it/da-vedere/musei/item/116-farm-cultural-park-favara-ag.html (Accessed 21st June 2019).

34. Palumbo M. *Farm Cultural Park.* Domus. 2016 (Cited 21st June 2019). Available from: https://www.domusweb.it/it/architettura/2016/07/20/farm_cultural_park_favara.html

35. Visit Sicily. *Farm Cultural Park di Favara.* Available from: http://www.visitsicily.info/en/farm-cultural-park-di-favara/ (Accessed 21st June 2019).

36. Marrazzo D. *A Favara una realtà unica tra arte e riqualificazione*. Available from: https://www.ilsole24ore.com/art/burocrazia-e-permessi-rischiano-bloccare-farm-cultural-park-favara-AEPE5NAC (Accessed 5th August 2019).

37. Guarneri G. *Scuola di architettura per bambini*. Available from: https://www.domusweb.it/it/architettura/2016/07/20/farm_cultural_park_favara.html (Accessed 5th August 2019).

38. Farm Cultural Park. *Place*. Available from: https://www.farmculturalpark.com/place.html (Accessed 5th August 2019).

39. La Scuola di Bollenti Spiriti. *ExFadda.* Available from: http://www.lascuoladibollentispiriti.it/project-work/exfadda (Accessed 21st June 2019).

40. Archinà A. *ExFadda: innovazione culturale formato comunità.* Il Giornale delle Fondazioni (internet). 2015 (Cited 21st June 2019). Available from: http://www.ilgiornaledellefondazioni.com/content/exfadda-innovazione-culturale-formato-comunit%C3%A0

41. Agenda Urbana. *Laboratorio Urbano Exfadda.* Available from: https://community.agendaurbana.it/sites/community.ifel.it/files/attachments/Laboratorio%20Urbano%20ExFadda.pdf (Accessed 21st June 2019).

42. Senza collone news. *Exfadda*. Available from: https://www.senzacolonnenews.it/cronaca/item/da-grande-saro-un-teatro-dallex-fadda-uno-dei-progetti-selezionati-dal-bando-nazionale-culturability.html (Accessed 5th August 2019).

43. ExFadda. *Antigua*. Available from: http://www.exfadda.it/antigua/ (Accessed 5th August 2019).

44. ExFadda. *Exfadda: Laboratorio urbano*. Available from:http://www.exfadda.it/ (Accessed 5th August 2019).

45. ExFadda. *Annual events*. Available from: https://www.facebook.com/pg/exfadda/events/?ref=page_internal (Accessed 5th August 2019).

46. Gennaro A. *Roma, dal fallimento RSI alla cessione dell'area. I lavoratori delle 'Officine zero' a rischio sgombero.* Il Fatto Quotidiano (internet). 2018 (Cited 21st June 2019). Available from: https://www.ilfattoquotidiano.it/2018/07/08/roma-dal-fallimento-rsi-alla-cessione-dellarea-i-lavoratori-delle-officine-zero-a-rischio-sgombero-si-faccia-chiarezza/4458855/

47. Veli S. *Officine Zero sotto attacco.* Il Manifesto (internet). 2018 (Cited 21st June 2019). Available from: https://ilmanifesto.it/officine-zero-sotto-attacco/

48. Officine Zero. *Dossier september 2017*. Rome; 2017.

49. Santini G. *La sfida di Officine Zero: lavoro, rigenerazione e innovazione*. Available from: https://www.labsus.org/2017/02/la-sfida-di-officine-zero-lavoro-rigenerazione-e-innovazione/ (Accessed 5th August 2019).

50. Officine Zero. Annual events. Available from: https://www.facebook.com/pg/OzOfficineZero/events/?ref=page_internal (Accessed 5th August 2019).

51. CAOS. *Chi Siamo.* Available from: http://www.caos.museum/chi-siamo/ (Accessed 20th June 2019).

52. CAOS. *Come era.* Available from: http://www.caos.museum/chi-siamo/come-era/ (Accessed 20th June 2019).

53. La notizia quotidiana. *Caos terni*. Available from: https://www.lanotiziaquotidiana.it/umbria/2019/07/11/terni-va-deserta-lasta-per-la-gestione-del-caos-scatta-la-polemica/ (Accessed 5th August 2019).

54. Bella Umbria. *Caos, museo*. Available from: http://www.bellaumbria.net/it/musei-e-gallerie-arte/caos-terni/ (Accessed 5th August 2019).

55. Caos. *Annual events*. Available from: https://www.facebook.com/pg/CaosCentroArtiOpificioSiri/events/?ref=page_internal (Accessed 6th August 2019).

56. Emilia Romagna talenti e innovazione. *Consorzio Factory Grisù.* Available from: https://emiliaromagnatalentieinnovazione.aster.it/spazi-giovani/consorzio-factory-grisu (Accessed 19th June 2019).

57. Factory Grisù. *Spazi disponibili.* Available from: https://www.factorygrisu.it/spazio (Accessed 19th June 2019).

58. Stinco G. *Spazio Grisù, a Ferrara nasce la prima factory creativa dell'Emilia Romagna.* Il Fatto Quotidiano (internet). 2013 (Cited 19th June 2019). Available from: https://www.ilfattoquotidiano.it/2013/04/08/spazio-grisu-a-ferrara-nasce-prima-factory-creativa-dellemilia-romagna/554951/.

59. Smau. *Factory Grisù: Progetto di rigenerazione urbana.* Available from: https://www.smau.it/company/exhibitor/detail/factory-grisu/ (Accessed 19th June 2019).

60. Urban center ferrara. *Spazi per il quartiere*. Available from: http://www.urbancenterferrara.it/comunita/le_pratiche/spazi-per-il-quartiere/ (Accessed 5th August 2019).

61. Calanna G. Un laboratorio nella Factory Grisù. Available from: https://i1.wp.com/www.lestroverso.it/wp-content/uploads/2017/10/Un-laboratorio-nella-Factory-Grisu%CC%80.jpg?ssl=1 (Accessed 5th August 2019).

62. Toolbox Coworking. *Toolbox: Persone e lavoro da sempre.* Available from: https://www.toolboxoffice.it/soluzioni-e-prezzi/ (Accessed 19th June 2019).

63. Balestra A, Ferrero M. Area OSI OVEST-NORD: Toolbox Coworking. In: Armano E, et al.(eds.) *Postfordismo e trasformazione urbana: Casi di recupero dei vuoti industriali e indicazioni per le politiche nel territorio torinese.* Turin: IRES; 2016. p. 241-266.

64. De Grandi C. *Nuove idee di lavoro e condivisione: il coworking Toolbox di Torino.* Art Wave. 2013 (Cited 19th June 2019). Available from: https://www.artwave.it/architettura/designinterior/nuove-idee-di-lavoro-e-condivisione-il-coworking-toolbox-di-torino/

65. Eutropian. *The Toolbox building*. Available from: https://cooperativecity.org/2018/01/22/toolbox-torino/ (Accessed 5th August 2019).

66. Dreamers Torino. *'Hangar' Toolbox*. Available from: http://www.dreamerstorino.it/info-e-contatti/toolbox/ (Accessed 5th August 2019).

67. Balestra A. Toolbox manager. Personal communication. 13th September 2019.

68. Baum M. It's all about places, people and having a vision. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 355-365.

Chapter three

Urban qualities

4.1 Urban qualities: the basis for adaptive reuse

Adaptive reuse has become an increasingly interesting topic in the current debate on the future urban development of the cities, so much that the endeavors are now directed in defining what are the necessary conditions to promote this type of processes.[7] However, to understand these conditions, it is necessary to first know the meaning of *urban qualities* and *urbanity* in the current context, terms which are considered the basis for adaptive reuse processes. That is why both terms will be analyzed based on current studies in order to define the necessary conditions for adaptive reuse and select the ones that will be of interest for the purposes of this study.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development*. Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

Urban qualities is not a simple term with an unequivocal definition, instead, is a complex concept that requires a multidisciplinary approach to better understand it. In fact, according to Schmitt et al.,[69] urban quality is as a multi-dimensional concept which its definition is formed from three different fields: urban planning, urban sociology and spatial economics.

69. Schmitt G, et al. Urbane Qualität aus Sicht der Ergebnisse des NFP 65. In: Wehrli-Schindler B. *Urbane Qualität für Stadt und Umland: Ein Wegweiser zur Stärkung einer nachhaltigen Raumentwicklung.* Zurich: Scheidegger & Spiess AG; 2015. p. 24-26.

According to them, urban planning ‘uses the concept as a benchmark, which can be primarily achieved through a coordinated interplay of infrastructure, buildings and open spaces’,[69 (p.24)] which evidence the interpretation of the physical components in the urban context under the figure of an interrelated network. On the other hand, urban sociology ‘analyzes urban qualities based on, among other things, activities and characteristics (e.g. length of stay, lifestyle) of different social groups in urban space, their perception of space and their participation in urban processes’,[69 (p.24)] which means an effort for understanding the different behavior patterns of people in their interaction with the physical components of the city. Finally, for spatial economics urban quality is intended in terms of ‘monetary evaluations of urban locations and their location characteristics in the foreground of quality discourses’,[69 (p.24)] which shows that defining the quality of urban space, also includes an assessment in monetary terms of it. Therefore, it could be inferred that the urban qualities are *basically the complex network of interactions and dynamics between urban space, people and economic capital*.

In the same way, Angélil et al.,[70] propose that ‘urbanity can be described as a state in which a wide variety of spatial, social and economic relationships take place. It is not a one-dimensional, but a complex property that can not be easily disassembled and reassembled.’ [(p.43)] A definition that demonstrates the close relationship that these terms have with each other, to such an extent that it is considered that the notion of urbanity results by the superposition of the urban qualities.[70]

70. Angélil M, et al. Urbane Qualitäten. In: Kretz S, Kueng L. (eds.) *Urbane Qualitäten: Ein Handbuch am Beispiel der Metropolitanregion Zürich.* Zurich: Edition Hochparterre, ETH Zurich; 2016. p. 42-73.

Urban areas have undergone significant changes during the last decades and, consequently, the notion of urbanity and urban qualities have also evolved.[70] As it was described before, these are terms that do not have an unequivocal definition due to the changing character of the spatial, social and economic conditions in the urban context. Nevertheless, despite the indeterminacy of the concepts, it is considered that some urban qualities could help to better understand

70. Angélil M, et al. Urbane Qualitäten. In: Kretz S, Kueng L. (eds.) *Urbane Qualitäten: Ein Handbuch am Beispiel der Metropolitanregion Zürich.* Zurich: Edition Hochparterre, ETH Zurich; 2016. p. 42-73.

and to track the essence of urbanity, and these are: centrality, diversity, interaction, accessibility, adaptability, and appropriation.[70]

These qualities 'bring together different socio-spatial and urban-planning aspects. They are neither directly influenceable nor clearly measurable, but they form an analytical grid with which urbanity can be captured and depicted.' [53 (p.43)] These are described as follows:

Urban qualities that define urbanity

Centrality- is a fundamental characteristic of every form of urbanity: the more people need and visit a place in their everyday lives, the more central this place is.

Diversity- means that different usages, user groups, social milieus and spatial characteristics are present in one space.

Interaction- means that different people interact and influence each other productively.

Accessibility- is the ability to visit a place at different times and stay in it.

Adaptability- means that a situation can be adapted as flexibly as possible to changing requirements for different user groups and uses.

Appropriation- means that different users and social milieus can actively claim a situation through their practices and relate it to their specific needs.

Figure 22. Urban qualities that define urbanity [70]

According to Angélil et al.,[70] these urban qualities do not follow a hierarchical structure that would lead to consider urbanity as the sum of a series of individual components that must be analyzed in a specific order, but instead, they should be understood as an interdependent structure that forms an analytical framework for defining an integral vision of urbanity. Finally, they also propose some possible urban strategies that could contribute to the promotion of each urban quality,[70] but for the purposes of this study it will be required just the definition and the characteristics above described.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

On the other hand, according to Baum,[7] the increasing need for urban qualities in cities has led planners, developers and administrative institutions wondering about how could this need be met. Therefore, proposes some questions that could help to address this problem, such as: 'which locations in the city have urban qualities and are able to allow new, unexpected networks to arise? What sort of conditions are needed to achieve this? Who are the people involved? And what effects do these locations have on their immediate surroundings and on the city they are situated in?' [7 (p.8)] Questions that lead thinking that there is a clear interest in understanding the notion of urbanity through the interaction between urban qualities.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

According to Baum,[7] over the last years, maintaining and converting derelict buildings dating from the industrial era has been considered as an opportunity to satisfy the desire for urbanity, identity and identification. Describing the characteristics of these buildings, she asserts:

> 'Through their architecture, history and identity, these locations are replete with meaning and have stability...At the same time, however, these locations also show a certain degree of openness to new elements that makes them viable for the future.' [7 (p.8)]

In brief, Baum describes all these characteristics as *dynamic-stable structures*, qualities that are considered to make the locations interesting and simultaneously promote citizen participation.[7]

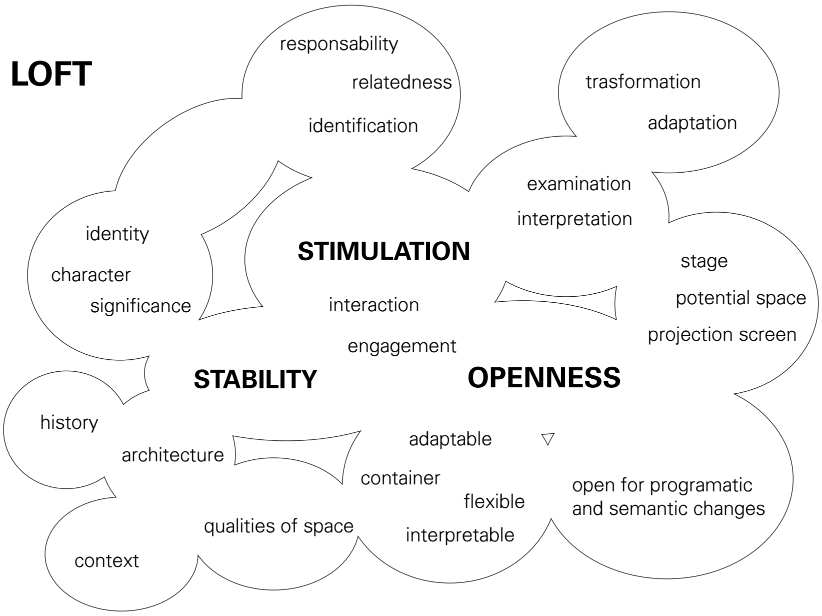


Figure 23. Loft: dynamic-stable structures [7 (p.9)]

Many people are attracted to these qualities, especially those who are willing to promote new ways of life, activities and trends, who find in these places the ideal place to start experiments that could become the basis of new creative urban development processes.[7] The word *Loft* could be understood as 'a term that sums up these urban qualities. In this sense, it is used to describe adaptable, flexible, and at the same time powerful spaces with identity in which people can live and work'.[7 (p.9)] A concept not limited only to buildings from the industrial era, but also to any building and open space that has the same quality of stability and openness already described.[7]

Both approaches, the one proposed by Angélil et al. and the other by Baum, define the urban qualities that are necessary to form a notion of urbanity in the contemporary city. Likewise, these approaches share some particular qualities within which stand out: the adaptability and flexibility with which spaces must respond to the changing needs of people; and the engagement and the sense of appropriation that spaces must generate in people to strengthen its identity. However, for the purposes of this study, it is considered that the term Loft, as described above, defines better the necessary qualities for promoting adaptive reuse processes in the urban context. Not just because of the wide variety of components analyzed regarding spatial, social and economic relationships, but also because it is defined under the characteristics of the adaptive reuse approach already explained in the first chapter. In this way, the urban qualities for adaptive reuse processes will be represented as follows:

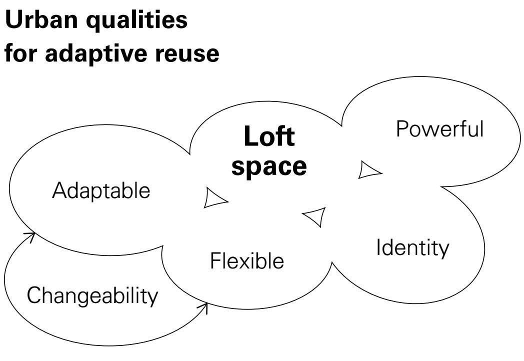


Figure 24. Urban qualities for adaptive reuse.[7]

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

Space and power

To understand the relationship between power and space, it must be referenced Foucault's[71] reflections, in which a tight linkage between these terms can be observed when he claims that 'space is fundamental in any form of communal life; space is fundamental in any exercise of power.' (p.252) According to Foucault, architecture, as a discipline mainly concerned with the comprehension and projection of space, has also an effect in the way in which social relationships are given in a determinate location.[71] As an example, in *Discipline and Punish: The Birth of the Prison,* he analyzes the social implications related to disciplinary spaces, such as hospitals, asylums, prisons, schools, military barracks, and factories.[72] For understanding this relation, and for the purposes of this study, it is taking in consideration two of the disciplinary spaces mentioned: the factory and the prison, the latter described in the context of a *panopticon.*[73]

For factories, and especially those appeared at the end of the eighteenth century, the main concern was specifying the surveillance and make them functional.[72] This means that these spaces were designed to be as logical as possible and disposed in the order that production line required. At the same time, for controlling all the production process it was necessary a complete visual supervision of all the workspace in order to 'observe the worker's presence and application, and the quality of his work; to compare workers with one another, to classify them according to its stages or elementary operations.' [72] (p.145) and above all to discipline them for fulfilling efficiency standards.

On the other hand, the panoptic space proposes a special emphasis on *visibility* as its main power instrument. And this can be given thanks to the arrangement of the spatial unities that makes possible seeing

71. Foucault M. Space, Knowledge, and Power. In: Rabinow P. (ed.) *The Foucault Reader.* New York: Pantheon Books; 1984. p. 239-256.

72. Foucault M. *Discipline and Punish: The Birth of the Prison.* New York: Vintage Books; 1995.

73. The Panopticon, as described by Jeremy Bentham in *Proposal for a New and Less Expensive mode of Employing and Reforming Convicts (London,1787),* is basically a type of building arranged in a circular shape that allows the inmates, occupying the circumference, to be observed by an inspector, located in the center of the space.

72. Foucault M. *Discipline and Punish: The Birth of the Prison*. New York: Vintage Books; 1995.

74. Foucault M. The Confession of the Flesh. In: Gordon C. (ed.) *Power/ Knowledge: selected interviews & other writings 1972-1977*. New York: Pantheon Books; 1980. p. 194-228.

constantly and recognizing immediately.[72] In this case, the sensation of being observed all the time allows a certain control between inmates' relations. In fact, Foucault proposes *The Panopticon* as a kind of laboratory of power, an ideal place to experiment on men's behavior in relation to the space they inhabit.[72]

These examples are a clear demonstration of the capacity of some qualities of space in a determined location, to directly influence the way in which people relate to each other and to the surrounding. However, for better identifying these qualities it is considered necessary first to understand the term *dispositif*, in English *apparatus*, which also belongs to Foucault's reflection about the relationship between space, knowledge, and power.

Although he never proposes a complete definition of the term, the characteristics that describe *dispositif* can be noted in an interview held in 1977,[74] in which, when asked about the meaning or methodological function of this term, he replied:

> 'What I'm trying to pick out with this term is, firstly, a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions - in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements.' [74 (p.194)]
> ...'I said that the apparatus is essentially of a strategic nature, which means assuming that it is a matter of a certain manipulation of relations of forces, either developing them in a particular direction, blocking them, stabilising them, utilising them, etc. The apparatus is thus always inscribed in a play of power, but it is also always linked to certain coordinates of knowledge which issue from it but, to an equal degree, condition it.' [74 (p.196)]

From his statements, it can be briefly inferred several features that help to understand the term *apparatus*:

- Apparatus is a complex and heterogeneous term that includes either physical and virtual components under the same understanding: discourses, institutions, architectural forms, laws, etc. All these seem to be in constant relation to each other.
- What is important to consider about apparatus' components, is not their single meaning as isolated terms but the meaning of the network relations that could be established between them.
- Apparatus has naturally a strategic function for creating, controlling, and manipulating social relations, that allows it to be defined as an instrument of power.

On the other hand, another more complex vision could be established between the apparatus and its relation to society, and with special interest nowadays that technology is reaching all ambits of human life.

75. Agamben G. *What is an apparatus?*. Standford, California: Stanford University Press; 2009.

That is why it is considered interesting Agamben's [75] position when he proposes that an apparatus shall be called:

> '...literally anything that has in some way the capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviors, opinions, or discourses of living beings. Not only, therefore, prisons, madhouses, the panopticon, schools, confession, factories, disciplines, juridical measures, and so forth (whose connection with power is in a certain sense evident), but also the pen, writing, literature, philosophy, agriculture, cigarettes, navigation, computers, cellular telephones and,why not, language itself, which is perhaps the most ancient of apparatuses.' [75 (p.14)]

Agamben's definition of an apparatus seems to be even more extensive than the one given by Foucault. However, they share some characteristics that are useful for understanding the space-power relation, and subsequently, for understanding the importance of urban qualities in cities' urban planning.

Both approaches define the apparatus into complex and heterogeneous terms, in which are include physical and virtual components, likewise, both intend an apparatus as an instrument of power that allows creating, controlling, and orienting social relationships. Nevertheless, what it is considered determinant in Agamben's position is that apparatus is not just restricted to prison, schools, hospitals, factories, and other disciplinary spaces described by Foucault, but it is open to any type of space that could be endowed with power faculties.

Therefore, as a synthesis, it could be said that space and power are two terms that can be found in a constant interplay in the construction of the city and society. And this interplay can be given due to the intermediation of the apparatuses as instruments of power.

In the same way, as it could be noticed in the explanation of urban qualities above described, these are also complexly defined features that are concerned with the interaction between urban space and social relationships. Furthermore, urban qualities also seek to be proposed as an instrument for the social construction of the city, but unlike apparatuses, with no apparent connotations of power in its aspirations. Accordingly, and for this study purposes, it is proposed that the term *urban qualities* can be considered inside the *apparatus* definition, previously described by Foucault and later by Agamben. Thereby, urban qualities are not just certain conditions that prompt citizen engagement and influence the form of networks, value-creation chains and attractiveness of particular locations,[7] but like apparatuses, a real instrument that can create, mold and orient the social relationships in the urban space.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development*. Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

Space and identity

Identity can be a difficult term to address because of the multiple ways there are to define it, its meaning will depend on the approach from which it is seen, whether from culture, psychology, politics,

76. Collins Dictionary (Internet). Glasgow: Harper Collins Publishers; c2019. *Identity*; (cited 2019 Aug 23rd); (about 1 screen). Available from: https://www.collinsdictionary.com/dictionary/english/identity.

77. Lynch K. *A Theory of Good City Form.* Cambridge, Massachusetts: The MIT Press; 1981.

78. Lynch K. *The Image of the City.* Cambridge, Massachusetts: The MIT Press; 1990.

79. Ching F. *Architecture: form, space and order.* Third Edition. New Jersey: John Wiley & Sons; 2007.

religion, among others. In general terms, it could be described as the characteristics that distinguish and differentiate one person or a place from another. [76] However, for understanding the relationship between space and identity it is considered necessary to reflect on the ideas proposed by Kevin Lynch.

Lynch [77] defines identity as 'the extent to which a person can recognize or recall a place as being distinct from other places- as having a vivid, or unique, or at least a particular, character of its own.' (p.131) According to him, people can experience the sensation of being in a special place according to certain qualities; in the same way, they can value the presence of these qualities and regret its absence in a determined place. Because of their characteristics, these special places are accessible to all the five senses and engage people's perception.[77] This happens because 'the direct enjoyment of vivid perception is further enlarged because sensible, identifiable places are convenient pegs on which to hang personal memories, feelings, and values. Place identity is closely linked to personal identity.' [77 (p.132)]

This description of identity demonstrates the strong relationship that people could have to a determined place based on its particular qualities. On top of that, Lynch states that this relation, in which memories, feelings and values are supported, is subsequently translated into mental images that people can have of a determined place, a characteristic that he defines as *imageability*.[78] A term which is described as:

> 'The quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, color, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment' [78 (p.9)]

Although this definition is related to the characteristics of a physical object, it is considered that not only are the attributes of the space container that can evoke a strong image in people; but are also the characteristics of the space contained that can generate strong connections between people and a determined place. Therefore, the scale, the proportion, the form, the light or even the views that space provides,[79] are also characteristics of the place that can evoke a strong image in the person who lives it. Then, the meaning of the place must be considered both in its physical and spatial component.

Since mental images represent the connections that people can have with a particular place based on their particular experience, it is probable that these images will not have the same meaning or the same characteristics throughout. Lynch explains this condition when he claims that 'imageability does not necessarily connote something fixed, limited, precise, unified, regularly ordered, although it may sometimes have these qualities.' [78 (p.10)] Therefore, it is considered that what is important in this characteristic of imageability is not the specific type of image that people could form and its meaning, but that the just the fact of having a mental image from a place depicts a certain identity relation between a person and a particular place.

Space changeability

Adaptability and flexibility are qualities of space that describes its ability to change through time for satisfying different needs. This quality of space is associated with the long-term vision of the built environment, a condition that must be considered not only for the existing buildings and open spaces that people use in the urban everyday life or the new ones that are being planned today,[7] but also for the existing urban constructions that has lost the function it was designed for but that can still change and be adapted to new requirements.[4]

In general terms, it is considered that, although these qualities represent together the capacity for change the space and adjust it to different needs, adaptability is concerned with the different uses that could be given to space, i.e. change by use; while flexibility is related to the capacity of physical transformation of space, i.e. change by physical transformation.[80] In this way, the characteristics of both qualities could be distinguished and analyzed independently to define the potential change that a determined space could have.

On the other hand, for addressing the analysis of these qualities, Schneider and Till[81] propose a simple method of division: Soft and Hard. Where '*Soft* refers to tactics which allow a certain indeterminacy, whereas *Hard* refers to elements that more specifically determine the way that the design may be used.' (p.7) However, this does not mean that adaptability and flexibility must be classified specifically in soft and hard qualities of space, respectively, but represents a division for understanding the way, either determined or undetermined, that space could be adapted according to the changing user necessities.[81] In this sense, 'soft use allows the user to adapt the plan according to their needs, the designer effectively working in the background. With hard use, the designer works in the foreground, determining how spaces can be used over time.'[81] (p.7) Nevertheless, although adaptability and flexibility are not associate specifically to the categories of this division, Jeremy and Till propose that these qualities could have some affinity degree with a certain category when they state that:

> 'Hard use is often allied with the rhetoric of flexibility: sliding doors, moving walls, and fold-down furniture come to the fore as a set of mechanisms that frame the user as an operator of architectural equipment. Soft use, on the other hand, passes control over the user, allowing them to appropriate the space as they see fit.'[81] (p.7)

Finally, it is considered that this capacity for space change must be taken into account in the current urban debate for its implications in the cities, given that if 'a building ceases to be versatile, its capacity for life is also called into question'.[82] (p.12) A situation that would go against the sustainable urban development approach and its vision of sustainable cities. Therefore, space changeability is considered as a fundamental quality not only for promoting adaptive reuse processes but also for guiding the future development of the urban areas.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

82. Müller G. *Neues Leben für alte Bauten-über den Continuo in der Architektur.* Stuttgart: Koch; 1977.

4.2 The need for an analytical method

All the urban qualities described above and their relationship with the urban space require a form of analysis and its definition under the adaptive reuse approach, an analytical method for being able to understand its characteristics and support the decision making along the process. These qualities must be contemplated both to initiate the said process as to its follow-up, given that an adaptive reuse project could have a beginning but not necessarily an end because people's needs are constantly changing and the urban space must be able to adapt as many times as it required. Therefore, it is considered that is not enough with just describing theoretically the necessary conditions for adaptive reuse, but it is also fundamental to be able to assess them, either qualitatively or quantitatively, and compare them between different projects. In this way, adaptive reuse would represent not only a theoric concept for promoting the sustainable urban development in the contemporary city, but also as an urban process that can be analyzed in a structured way and that could support the decisions in the city transformation.

However, trying to think of a method to assess the urban built environment under the adaptive reuse approach is not an easy task. It represents a real challenge for understanding how urban qualities influence the process for adaptive reuse and support the decisions for the project's stakeholders. Accordingly, this study will try to propose an analytical method to assess urban qualities in existing urban constructions that has lost its initial function and that is in a condition of abandonment or is underused. Nevertheless, it will be focused specifically on analyzing the space changeability in existing buildings that could be considered for adaptive reuse processes.

From the urban qualities, space changeability (adaptability and flexibility) was chosen for being considered the one that is more related to architectural characteristics and its concerns about space and form, which are of particular interest in this study. In the same way, from the urban constructions, buildings were chosen for being considered the most common, numerous and representative component of the urban context and where is clearly differentiated the physical container from the contained space. This scope represents a part of the necessary urban qualities and just a part of the urban built environment, but this proposal intends to be just the beginning of an alternative way to analyze adaptive reuse projects.

This method will be useful not only for understanding the current spatial conditions of these buildings but also for defining the potential that space could have for change and be adapted to the user's needs through time, both qualitatively and quantitatively. Accordingly, this proposal of an alternative analytical method will be named as the Space Changeability Potential method (SCP). Its particular characteristics, as well as the procedure for the analysis, will be described in detail in the next chapter. However, preliminary it is necessary to understand that this method is structured from the following concepts:

SCP method

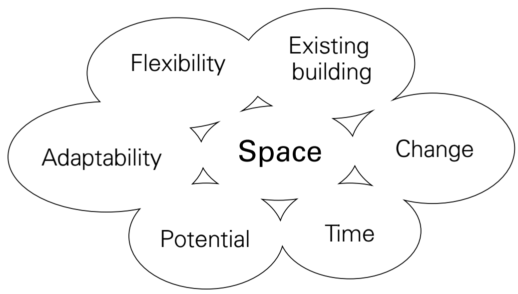


Figure 25. SPC method structure

4.3 Summary

70. Angélil M, et al. Urbane Qualitäten. In: Kretz S, Kueng L. (eds.) *Urbane Qualitäten: Ein Handbuch am Beispiel der Metropolitanregion Zürich.* Zurich: Edition Hochparterre, ETH Zurich; 2016. p. 42-73.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

Urban qualities is a complex and a multidimensional concept that concerns the relationship between spatial, social and economic factors in the urban context, an interaction in constant change. These factors must not be considered individually but as an interdependent structure that allows forming an integral vision of urbanity in the contemporary city.[70]

On the other hand, the Loft concept proposed by Baum is considered as the one that better defines the necessary conditions for adaptive reuse processes. Thereby, adaptability, flexibility, identity and power, are the proposed urban qualities for meeting this need.[7] This characteristics also consider the future vision of the cities based on the sustainable urban development approach and the efficient use of urban resources given that ‘if a building or space is open and adaptable for new requirements and future usages, while at the same time being powerful and meaningful, it may be capable of long-term survival.’ [7 (p.11)]

Nevertheless, these urban qualities should not be only described theoretically but also should be analyzed and possibly measured for being considered also as tools that could support the adaptive reuse processes. In this sense, the SCP method is proposed as an attempt to establish a new form for analysis in adaptive reuse projects, likewise, it will represent a possible tool for generating quantitative and qualitative information that could help in the decision-making of this kind of projects.

Chapter three notes

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.)*City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 8-13.

69. Schmitt G, et al. Urbane Qualität aus Sicht der Ergebnisse des NFP 65. In: Wehrli-Schindler B. *Urbane Qualität für Stadt und Umland: Ein Wegweiser zur Stärkung einer nachhaltigen Raumentwicklung.* Zurich: Scheidegger & Spiess AG; 2015. p. 24-26.

70. Angélil M, et al. Urbane Qualitäten. In: Kretz S, Kueng L. (eds.) *Urbane Qualitäten: Ein Handbuch am Beispiel der Metropolitanregion Zürich.* Zurich: Edition Hochparterre, ETH Zurich; 2016. p. 42-73.

71. Foucault M. Space, Knowledge, and Power. In: Rabinow P. (ed.)*The Foucault Reader.* New York: Pantheon Books; 1984. p. 239-256.

72. Foucault M. *Discipline and Punish: The Birth of the Prison.* New York: Vintage Books; 1995.

73. The Panopticon, as described by Jeremy Bentham in *Proposal for a New and Less Expensive mode of Employing and Reforming Convicts (London,1787),* is basically a type of building arranged in a circular shape that allows the inmates, occupying the circumference, to be observed by an inspector, located in the center of the space.

74. Foucault M. The Confession of the Flesh. In: Gordon C. (ed.)*Power/ Knowledge: selected interviews & other writings 1972-1977.* New York: Pantheon Books; 1980. p. 194-228.

75. Agamben G. *What is an apparatus?*. Standford, California: Stanford University Press; 2009.

76. Collins Dictionary (Internet). Glasgow: Harper Collins Publishers; c2019. *Identity*; (cited 2019 Aug 23rd); (about 1 screen). Available from: https://www.collinsdictionary.com/dictionary/english/identity

77. Lynch K. *A Theory of Good City Form.* Cambridge, Massachusetts: The MIT Press; 1981.

78. Lynch K. *The Image of the City.* Cambridge, Massachusetts: The MIT Press; 1990.

79. Ching F. *Architecture: form, space and order.* Third Edition. New Jersey: John Wiley & Sons; 2007.

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

82. Müller G. *Neues Leben für alte Bauten- über den Continuo in der Architektur.* Stuttgart: Koch; 1977.

Chapter four

The SCP method

5.1 QUALITATIVE AND QUANTITATIVE METHOD

The Space Changeability Potential (SCP) is proposed as a method for assessing certain spatial qualities of an existing building under the adaptive reuse approach. Therefore, and as it was explained in the previous chapter, this method will be concerned fundamentally in analyzing and measuring the adaptability and flexibility of the space in a building, some of the qualities that promote the successful development of adaptive reuse processes. In the same way, both qualities will become tools for assessing, qualitatively and quantitatively, the potential change of space, either in the way it could be used (adaptability) as in the way it could be physically transformed (flexibility). In the same way, and unlike the classification proposed by Jeremy and Till,[81] adaptability will be considered specifically like a *soft tool* since it does not consider altering physically the space, and flexibility in a *hard tool* since it represents the exact opposite of this condition.

This method could support the decisions of those interested in these types of projects, allowing to compare the spatial conditions of the existing buildings of interest as well as their transformation potential. Nevertheless, it should be understood that the results obtained at the end of the process may vary and should be taken as a reference value instead of an absolute one. This happens because the method is subject to the conditions imposed by the interested parties and the limitations of the particular regulations of each project location.

Both adaptability and flexibility are going to be clearly defined and differentiated from each other, considered as independent components of the method without a particular hierarchy. However, for having the same analysis reference, both will be developed using as a basis a sample building created to ease the analysis procedure and to better understand the method due to its particular spatial conditions.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

Building location

Turin, Piedmont

ITALY

Type of building

Non-specified

Spaces use

Non-assigned

Except for kitchen, restroom and technical room

Ground floor area

110.25 m^2

Access

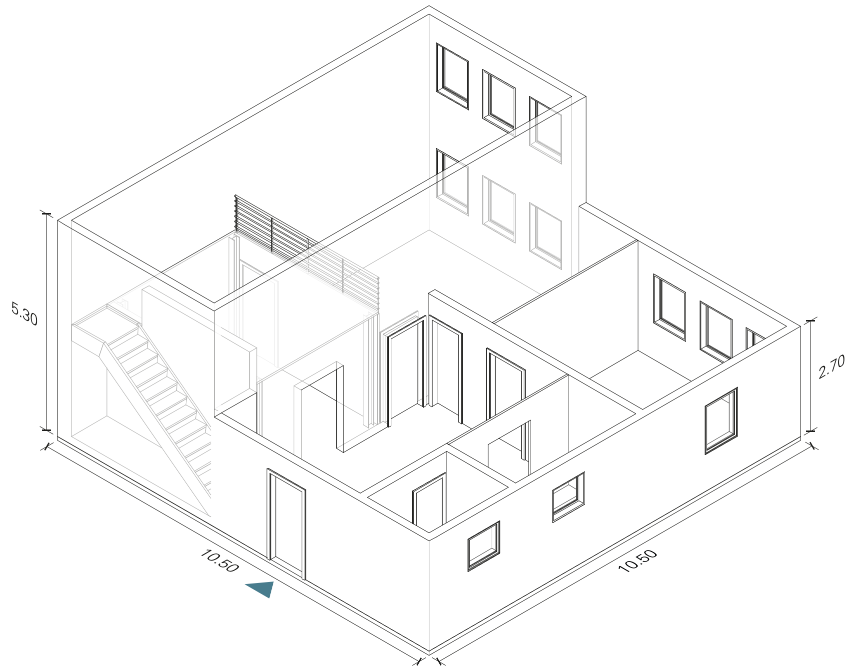


Figure 26. Axonometry of the sample building

5.2 Adaptability- Soft tool

Thinking about adaptability in architecture means, in general terms, considering the influence of the time in the building and the way in which it is used. Since, despite the image of stability than an edifice conveys, it is subject to the dynamics of people as users of the space and their constantly changing needs. In fact, Steven Groák [80] proposes that 'buildings have to be understood in terms of several different timescales over which they change',(p.15) from which is important to highlight the one called as *social utility,* referring specifically to the several uses that people can give to a particular space. In this sense, Groák defines adaptability of space as 'capable of different social uses',[80] (p.15) which lead thinking in the different ways that a given spatial organization can array different functions or uses in a determined moment.

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

Groák's statement is also considered in the arguments exposed by Schneider and Till [81] in *Flexible Housing*. In their study, they also emphasize the fact that adaptability is tightly linked to the changing social conditions of a determined location. Thereby, they state:

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

> 'Adaptability is achieved through designing rooms or units so that they can be used in a variety of ways, primarily through the way that rooms are organized, the circulation patterns and the designation of rooms. Adaptability thus covers 'polyvalency', the term employed in particular by Dutch architects and theorists to describe spaces that can be used in a variety of ways, generally without making physical changes.' [81] (p.5)

However, to better understand this explanation it is necessary to clarify the term 'polyvalence' aforementioned. For this purpose, it is considered the description offered by Herman Herztberger,[83] a Dutch architect who introduced the term into the architecture field when he proposed an alternative to functionalism and its search for 'efficiency', paradoxically represented in too specific and dysfunctional solutions that segregated uses in space instead of allowing their integration. Hence, talking about polyvalence Herztberger states:

83. Herztberger H. *Lessons for students in architecture.* Rotterdam: 010 Publishers; 1991.

> 'The only constructive approach to a situation that is subject to change is a form that starts out from changefulness as a permanent - that is, essentially a static - given factor: a form which is polyvalent. In other words, a form that can be put to different uses without having to undergo changes itself, so that a minimal flexibility can still produce a optimal solution.' [83] (p.147)

Therefore, adaptability here is understood in terms of polyvalence, accordingly, a polyvalent space is the one that could have different uses without making architectural or structural changes. Similarly, a polyvalent building will be the one that allows the exchange of different uses between the spaces without transforming the existing architecture and structure.

On the other hand, Bernard Leupen,[84] who has studied in depth the polyvalence applied in the dwelling, states that this concept could deal

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

with the changeability and unpredictability of space, since in the past while architects were trying to define the measurable aspects of living and transform them into design, they neglected the non-measurable aspects of living and limited the possibility for tackling the unpredictable changes in space usage.[84]

According to Leupen the term polyvalent 'has been known for years in the context of the multi-purpose hall or salle polyvalente, the building found in every French village or provincial town which is used for weddings and parties and for musical, theatrical and film performances.'[84 (p.24)] Which demonstrate that the idea that space could be used for different purposes according to people's needs existed even before that Herztberger's concept of polyvalence was proposed.

Leupen also points out that polyvalence establishes different requirements on the spatial organization depending on the type of building: housing, commercial or industrial building, as an example.[84] However, for the purposes of this study, the building polyvalence is going to be assumed in terms of the capability of arranging different functional configurations between available spaces, regardless the specific requirements of the building typology. This idea corresponds to the objective of defining adaptability in terms of adaptive reuse, in which, under the SCP method, the interest consists in reusing any type of existing building that has lost the function it was designed for, considering here the building as a space container regardless of its typology.

For a better understanding of the meaning of the building as a space container, it is necessary to refer to the terms *frame* and *generic space* proposed by Leupen.[85] According to him, the frame is the permanent aspect of the building that defines the space in which change can occur. In other words, 'the frame represents the specific. It thereby encompasses those elements that determine the building for a long time.'[(p.26)] On the other hand, 'the open space defined by the frame signifies the generic, the unspecified; it is generic space.'[(p.26)]

85. Leupen B. *Frame and Generic Space: a study into the changeable dwelling proceeding from the permanent.* Rotterdam: 010 Publishers; 2006.

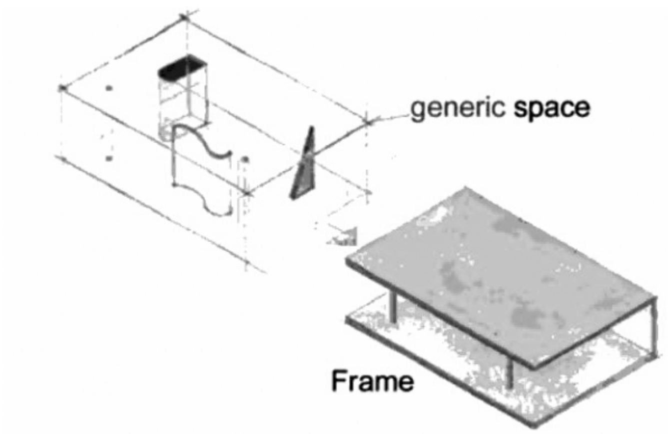


Figure 27. Principle of frame and generic space.[85 (p.26)]

In this sense, it is proposed for this method that adaptability will be concerned mainly with the preservation of the generic space of a building, considering the inalterability of both the permanents and the temporary building elements. This position corresponds to the idea that, as a soft tool for adaptive reuse processes, it is possible to adapt different uses in the space without investing major resources its transformation.

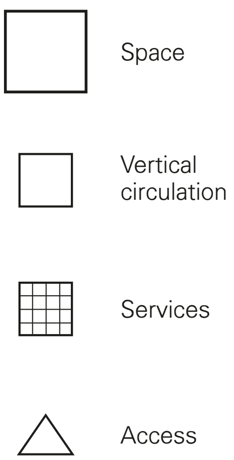
In conclusion, adaptability as a soft strategy in the proposed method is understood in terms of polyvalence, the capacity of adapting different uses without altering the existing generic space. Likewise, the degree of adaptability in a building will be determined by the possible functional arrangements it permits with no space alteration.

Adaptability analysis method

Analyzing the adaptability of space requires understanding, firstly, the spatial organization of the building in question, and secondly, the different ways in which given uses interact with these spaces. That is why for the purposes of this study, the analysis method of this quality will be based initially on the study conducted by Bernard Leupen on polyvalence in dwelling.[84] In brief, Leupen begins by establishing the basic activities that can be found in a dwelling: '**S**leeping, **G**et Together, **E**ating, **C**ooking, **B**athing and **W**orking.'(p.25) To later determine to what extent these functions could be located in different ways in the dwelling spaces. For achieving this, the spatial organization of a determined housing is depicted in a topological diagram, a type of graphic proposed by Hanson,[86] in which basically the different spaces of the dwelling and their connections are evidenced as simple pure forms: shapes and lines, respectively.

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

86. Hanson J. *Decoding Homes and Houses.* Cambridge: Cambridge University Press; 1998.



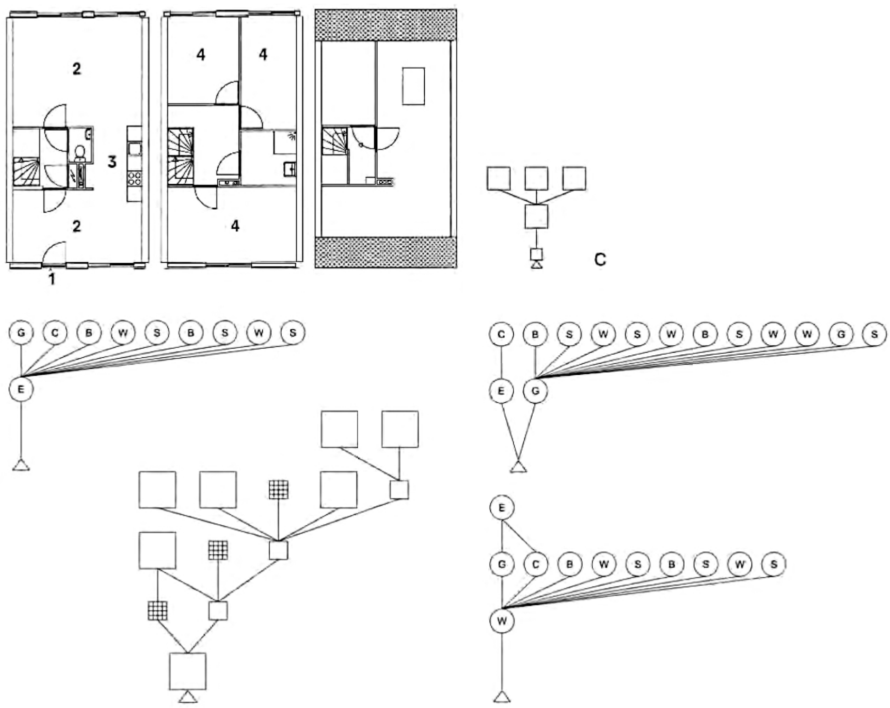


Figure 28. MVRDV, Ypenburg single-familiy dwelling [84] (p.27)

Next, Leupen proposes different functional arrangements based on the spatial scheme but also considering the particular conditions imposed

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

on certain functions, also called as rules of arrangement '(e.g. the activity Get Together is accessible only via the activity Sleeping)'.[84] (p.26) Finally, the results of his research evidenced how certain spatial configurations allow a major quantity of functional arrangements than others and, as a result, a greater degree of polyvalence.

The analysis conducted by Leupen on polyvalence in dwelling establishes the fundamental principles of the method proposed in this study, which will not be aimed at any particular type of building but will be based purely on the space-use relationship. Furthermore, and with the purpose of providing a basis on which these qualities can be compared within the case studies, it will be sought to establish a measure of the degree of adaptability that a building may have. The method consists of the following steps:

Step One- Spatial organization diagram

The first step, based on Leupen's study, will be the diagram of the different spaces that are in the building and the physical connections between them, physical in the sense that in any way either with a door, sliding door, window door or opening, it is possible to move from one space to another. Thus, all the spaces will be represented as perfect squares whose size will be determined, initially, by making them as large as the internal limits of each space allow it, for then reducing them by a quarter of its size. On these final squares and by simple straight lines, the physical connections existing between the spaces will be represented.

That is why, unlike the topological diagram proposed by Hanson, in this diagram is represented the proportion and the position of each space in the building. In this sense, the diagram must be done for each level of the building, from one structural floor to another. Therefore, starting from the floor plan of the sample building above described, the process will be the following:

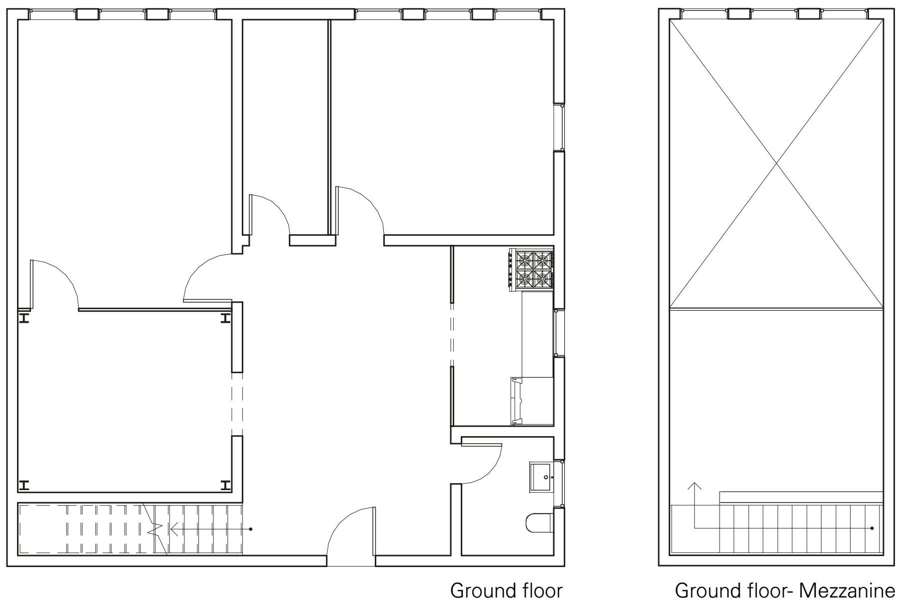


Figure 29. Plan of the sample building.

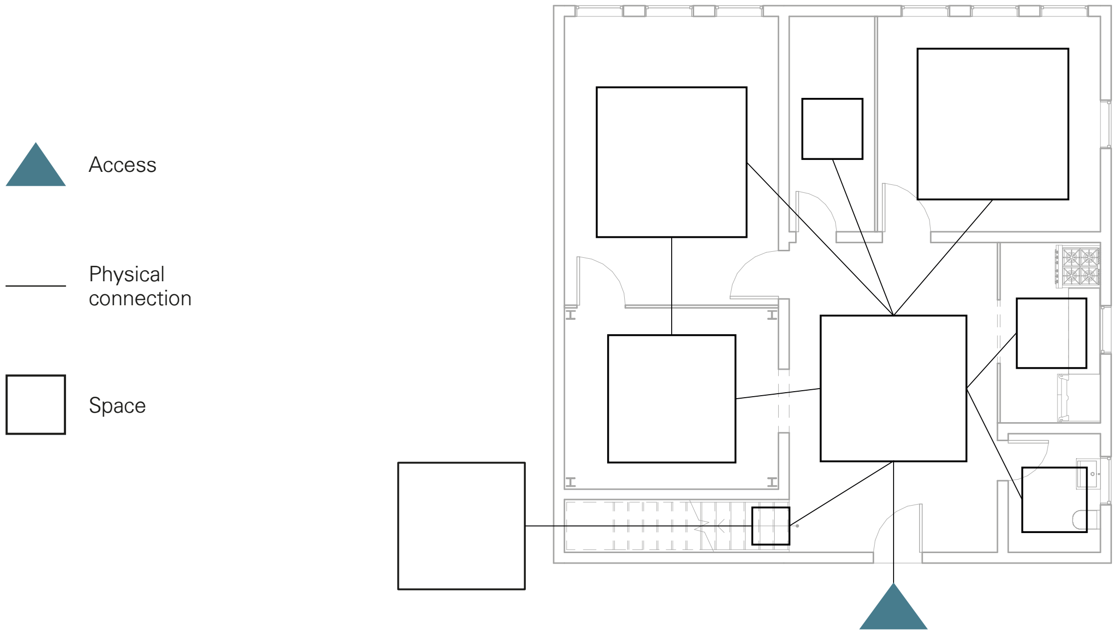


Figure 30. Step One- Spatial organization diagram.

Step Two- Restricted spaces diagram

The following step will be identifying which spaces are suitable for the adaptability analysis. In this diagram, it will be identified the different spaces that, due to certain characteristics, are considered to restrict the possibilities of arranging various uses within. Therefore, it is proposed the classification of the different spaces in the building as follows:

Circulation spaces- Are the spaces that, in general, are restricted due to its main function of connecting and allowing the movement between different spaces in the building, both horizontally, like corridors, foyers and galleries; and vertically, like stairs, ramps, and lifts. Normally if the size permits, these spaces are used also as common spaces, where people can meet and interact even if it was not intended for a particular use. In this diagram, although in the same category, vertical circulation spaces will have a sign for differentiating from horizontal circulation spaces.

Service spaces- These are restricted and necessary spaces that support the people's activities in the building. In this category, service spaces include mainly the kitchen, bathroom and the laundry. These spaces are fixed due to the existing constraints, such as technical systems and equipment, that moving them to another place in the building will require a major operation, a conversion.[84] And as explained before, in this method adaptability is not intended to transform the existing conditions of space.

Technical spaces- Commonly known as technical rooms. These are spaces restricted due to the fundamental functions that currently play in the operation and maintenance of the building. In these are hosted the equipment of the mechanical, electrical and plumbing systems of the building.[87] The access to these spaces normally is restricted to

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

87. Janis R, Tao W. *Mechanical and Electrical Systems in Buildings.* 6th Edition. New York: Pearson; 2018.

authorized personnel, a characteristic that differentiated them from the other described spaces. However, like service space, the technical one supports the people's activities in the building, and its displacement would signify a major transformation operation.

Uninhabitable spaces- In some cases, it could happen that some spaces in an existing building present particular conditions that hinder the possibility to host any kind of use and prevent them from being habitable, for instance, a space in an advanced condition of physical deterioration and abandonment that does not allow the development of any kind of activity and that could supposed a risk for the people's safety. If these spaces are present, they will be restricted for being considered uninhabitable. Therefore the procedure in the method will be excluding them from the spatial organization diagram without using any representation or indicative symbol.

Available spaces- Finally, the available spaces in the building will be those that do not present any from the aforementioned restrictions and it is possible to assign them a use. These spaces will be numbered, consecutively from left to right and from top to bottom, in order to have along the process a specific reference of its position in the building. In the event that the building has more than one level, the numbering will include all its spaces starting at the lower level until reaching the last level. These will represent the spaces of the building in which the degree of adaptability will subsequently be measured according to the method.

In this step, the spatial organization diagram from the first step will be used as a basis and the different type of spaces will be identified with distinctive patterns, as follows:

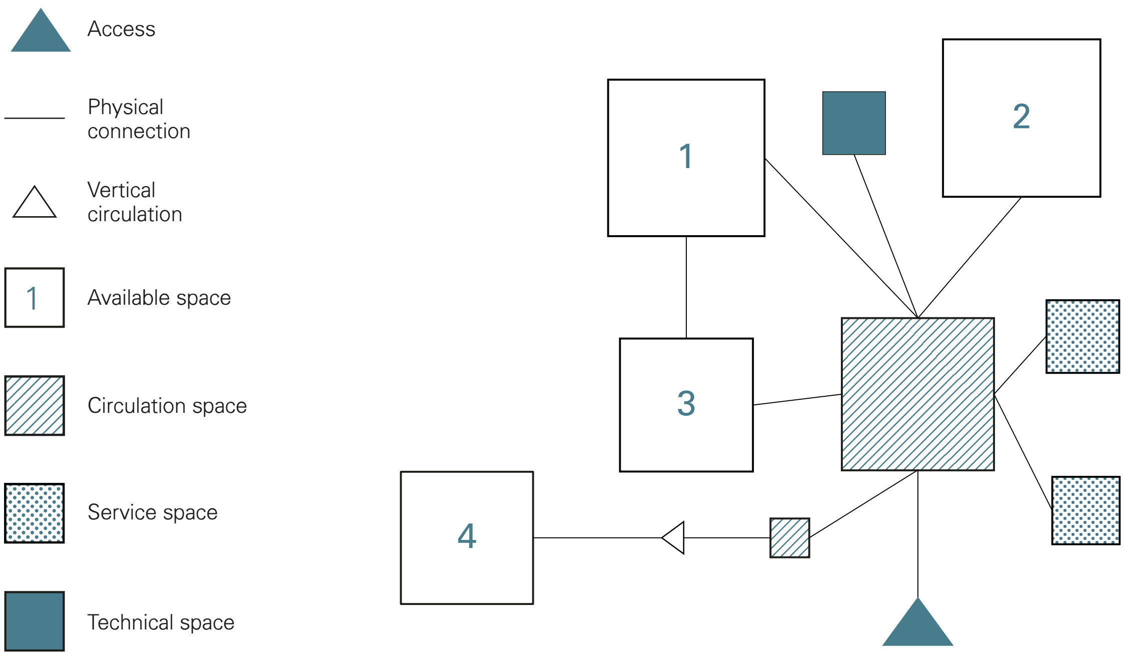


Figure 31. Step Two- Restricted spaces diagram.

Step Three- Incompatibility chart

This step will begin by determining the quantity and the type of uses that the available spaces will host for the adaptability analysis.[88] As a general rule, for calculation purposes, all the spaces must host just one use at the time. However, the uses could appear repeated between the spaces, creating the possible scenario in which the same use could be hosted by all the available spaces at the same time. This idea corresponds to the intention of analyzing the potential of adaptability in the usage that a building could have. The different selected functions [89] for measuring building's adaptability will be ordered alphabetically.

Subsequently, and considering that certainly not all the uses are suitable for all type of existing spaces, it is proposed to map the different situations in which a use could not be hosted by a space in an incompatibility chart; a type of graph based on the incompatible combination chart of the Strategic Choice Approach (SCA).[90] In this case, the incompatibility chart presents simply two components: use and space, and takes into account a system of letters (uses) and numbers (available spaces). Furthermore, since the incompatibilities between space and use could be so varied, it is proposed to classify them in the following categories:

Physical incompatibility- Is referred to the capability that space has to contain a particular use. In other words, if the form and the size of the space, considering surface and height, is suitable for hosting determined use. It could happen that, based on the promotor needs or the normative of the place, the minimal space requirements do not allow a specific use, or on the contrary, that the space is excessively large for the use and the number of people expected, or even that the form of the space is not suitable for determined use. Therefore, if the space available does not meet the minimum or maximum surface and height requirements for a determined use or the form is not appropriate, then it would present a physical incompatibility.

Technical incompatibility- Refers to the different technical systems that a space could have for supporting the development of certain activities. Mechanical, electrical, plumbing and even network systems (excluding HVAC system) must be considered for knowing whether a function is suitable for a particular space. For instance, if a computer lab is pretended to be assigned to a specific area in the building and this does not have a suitable network system, then this space could hardly allow the normal development of the activities without having a major intervention in the building components. Thus, this will imply a technical incompatibility for that specific use.

Ambiental incompatibility- It is referred to the ambient conditions, such as natural illumination, ventilation, humidity, and even temperature, which are factors that influence the comfort of a determined space and its use. As an example, a library requires good levels of natural illumination for ensuring the comfort of the readers, in this sense, a space with no natural illumination is incompatible and could not host this kind of use. However, these comfort conditions are not fixed and

88. This study will not concern the way in which the different functions have been selected since it could open an entirely new research scope analyzing the market demand for certain types of activities, as well as several economic issues based on project investment, yield and profit that go beyond the study purposes.

89. It is going to be assumed that the selected functions are: office, meeting room and media room. These do not represent particular criteria of selection, are used just for describing the method.

90. Friend J, Allen H. *Planning Under Pressure: The Strategic Choice Approach.* Third Edition. Amsterdam (etc.: Elsevier; 2005. According to the authors, the SCA is a problem structuring method that allows uncertainty management and commitment to support decision-making in complex problems.

could vary depending on the requirements of each use. Finally, it is necessary to clarify that comfort is a factor that could be regulated with climatization systems (HVAC), which constitute a technical system of the building. However, for differentiating Technical with Ambiental factors, it will be assumed that the climatization systems are considered in the Ambiental incompatibilities.

It must be considered that these incompatibilities are not absolute and depend on the criteria and needs of the person conducting the evaluation. Thus, the results of this step may vary.

Finally, once having identified the different incompatibilities,[91] what follows is their mapping in the incompatibility chart. The letters of the different uses must be located in their incompatible spaces and specifically in the types of incompatibilities presented. In this way, the same use could present several incompatibilities at the same time. The final chart will result as follows:

91. It is going to be assumed that for the sample building the incompatibilities are:

Physical- Meeting room (B) is incompatible with space 1 due to its size is quite big for a meeting room for 4 people.

Technical- Media room (A) and Office (C) are incompatible with spaces 2 and 4 because they do not have a suitable electrical system.

Ambiental- Office (C) is not compatible with space 3 due to its lack of natural illumination.

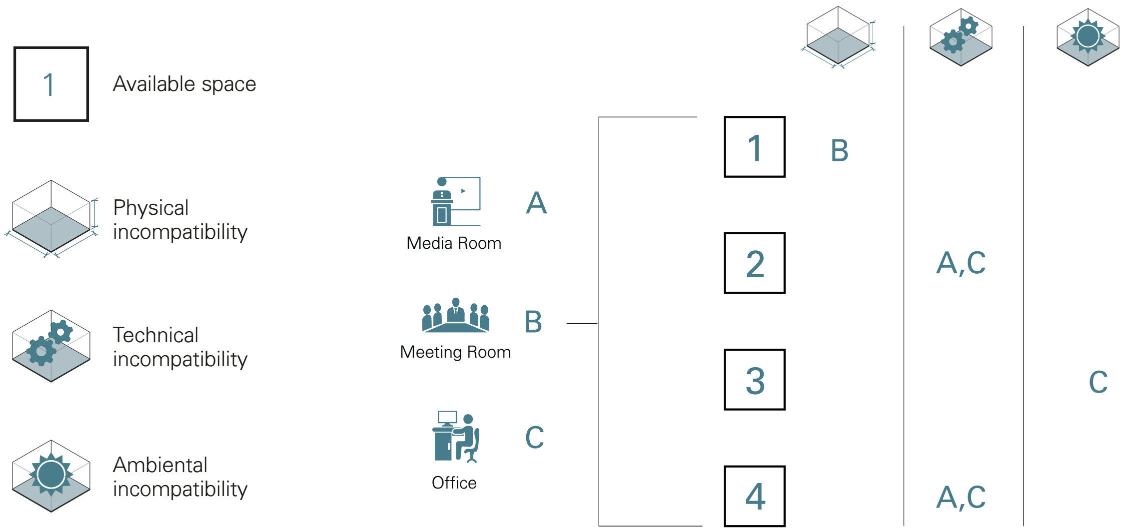


Figure 32. Step Three- Incompatibility chart.

Step Four- Usage priority diagram

After knowing which spaces and uses are incompatible between them, in this step, it is necessary to organize them according to the selected uses and the number of spaces compatible with them. Moreover, given that probably not all the uses are equally important for the promotor or the investor of the project, it is proposed to assign a degree of priority for each use that would reflect its level of importance for the stakeholders. The usage priority could be according to economic, social or even environmental benefits aforementioned.

Thereby, for each use is going to be assigned a priority value that goes from 1 to 3, expressed in Roman numerals, being 1 a low priority use and 3 a high priority use. These values are useful for differentiating their importance to the stakeholders. However, if all the uses are equally important, a value of 1 will be assigned for each use. Therefore, in this step the type of use, its compatible spaces, as well as its priority value, are represented as follows:

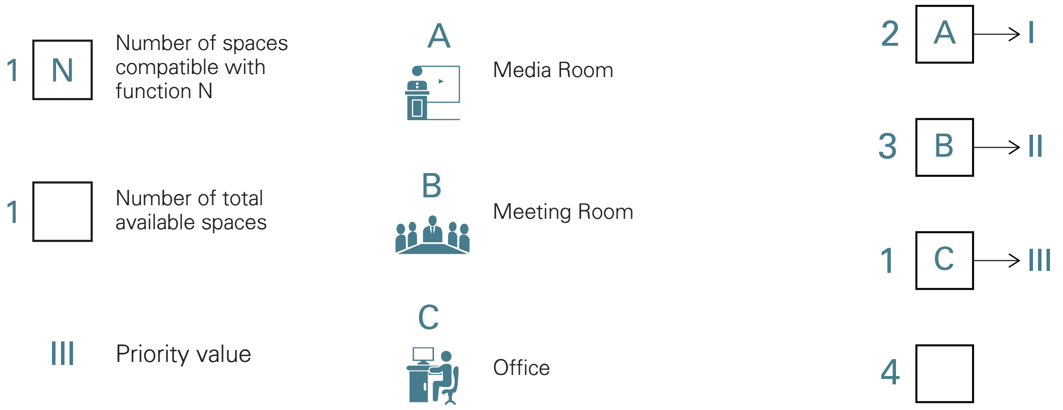


Figure 33. Step Four- Usage priority diagram.

Step Five- Adaptability calculation

This final step is represented by a simple mathematical formula that will express in terms of percentage the degree of adaptability of a determined building. Overall, this represents the percentage of the average number of spaces compatible with each use with respect to the total number of available spaces. This formula is composed as follows:

$$A = \frac{C}{M}$$

Where:

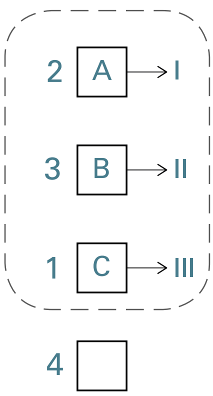
A= Degree of Adaptability.

C= Weighted average of the number of spaces compatible with each use.

M= Total number of available spaces.

To calculate the degree of adaptability, the diagram in step four will be used where the priority of use was defined, in which all the data necessary to calculate the value C and M is concentrated.

Calculating C value

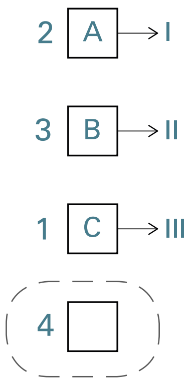


For C value, it must be considered the concept of weighted average, in which to each component it has been assigned a "weight", or an importance value. This value corresponds to the level of priority which has been already identified for each use. Therefore, C is calculated as follows:

$$\mathbf{C}= \frac{(2 \times 1) + (3 \times 2) + (1 \times 3)}{(1 + 2 + 3)}$$

$$\mathbf{C}= \frac{11}{6} \qquad \mathbf{C}= 1{,}83 \qquad \mathbf{C}= 2$$

Identifying M value



Next, the M value is clearly recognizable for being positioned always at the end of the diagram. This value is the unique value that remains constant throughout the process since its identification in step two. Thereby, regarding M value:

$$\mathbf{M}= 4$$

Adaptability value

$$A= \frac{C}{M} \qquad A= \frac{2}{4}$$

$$A= 0{,}50 \times 100$$

$$\mathbf{A}= 50\%$$

Finally, after calculating C and identifying M value, it is necessary to calculate the ratio between them. As a result, it will generate a decimal number that subsequently must be expressed in percentage multiplying it by 100.

This final value indicates that, from a determined number of available spaces (M), the current average of spaces compatibles with the chosen uses (C) represents 50% of the total spaces. In this way, a degree of adaptability of 100% will be achieved when all the available spaces are compatible with all the chosen uses.

Adapability tool outcomes- Functional arrangements

Aside from the degree of adaptability calculation, it is possible to know and represent the possible functional arrangements allowed in the building. These arrangements should be considered as the potential changes that space could have over time under the concept of adaptability. In the same way, it is possible to know that spaces in the building could allow an overlap of uses and activities, which could be developed simultaneously or at different times. Thereby, the development of the adaptive reuse process in a given building could be planned in the long term, understanding from the beginning how the chosen uses could be adapted to the different available spaces without altering them physically.

However, it must be considered that the order, duration and final amount of functional arrangements to consider will always depend on the needs of the interested parties, which define from the beginning the scope of the analysis to develop. For representing this outcome, the restricted spaces diagram from the second step will be used but just keeping the available spaces, the circulation spaces and their physical connections.

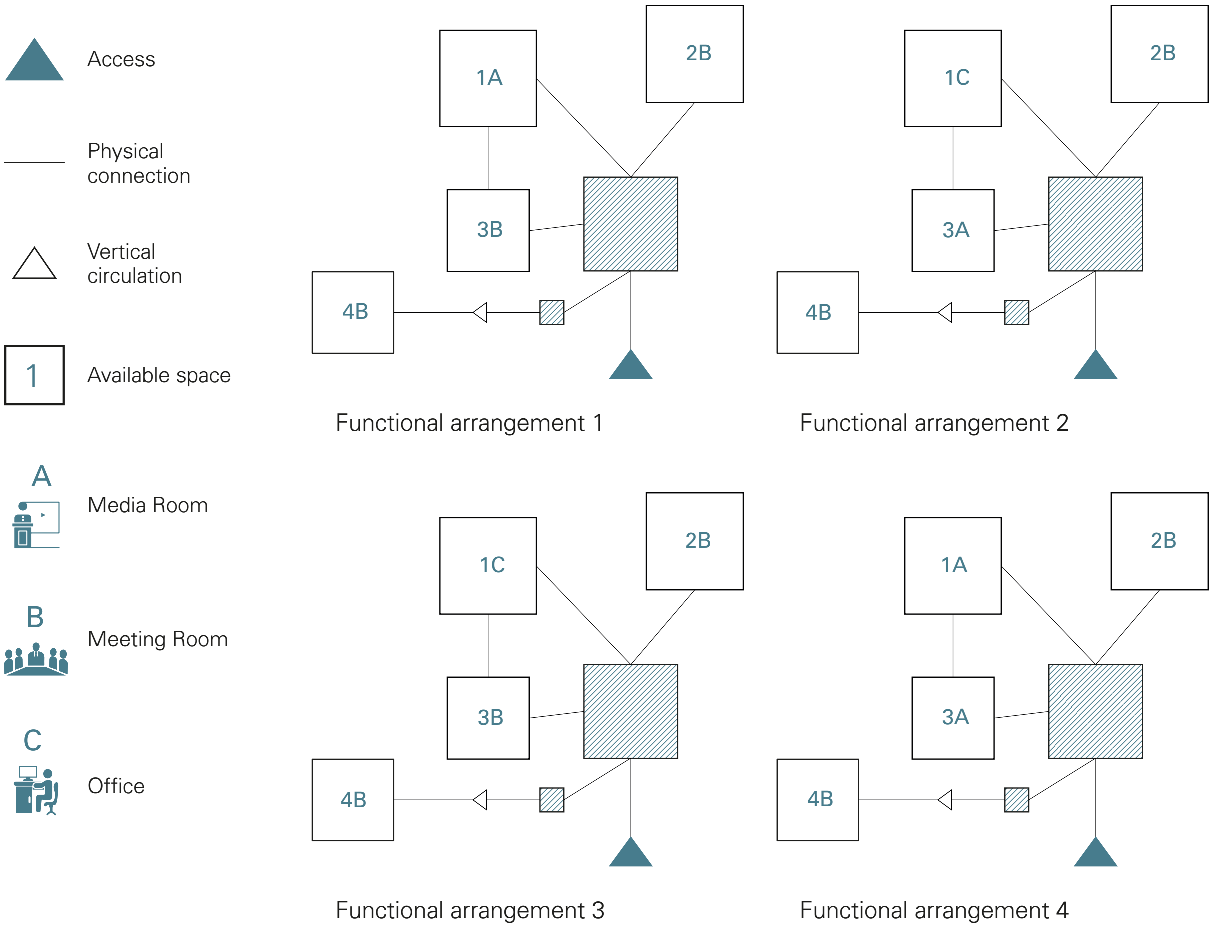


Figure 34. Possible functional arrangements.

5.3 Flexibility- Hard tool

Reflecting on flexibility in architecture will require a different approach than the one used for adaptability. Given that these two terms could be confused an intended in the same way; in this study, they will be conceptually clarified and differentiated in their analysis method.

While adaptability proposed, as described before, an approach to the different ways in which spaces can be used based on polyvalence, where no physical change to the building components was intended. Flexibility proposes, unlike this first posture, that spaces can be used in a variety of forms by altering its physical components for adjusting them to the changing user needs.[80] In the same way, Schneider and Till[81] state:

> 'Flexibility... is achieved by altering the physical fabric of the building: by joining together rooms or units, by extending them, or through sliding or folding walls and furniture. Flexibility thus applies to both internal and external changes, and to both temporary changes (through the ability to slide a wall or door) and permanent changes (through moving an internal partition or external wall).' (p.5)

Hence, once having clear the difference between these two qualities, it is necessary to reflect on a particular aspect about flexibility approach; the one regarding the way in which building spaces are designed to respond to a defined program. It is normally thought that a building should be designed based on the specific requirements of the uses that are going to be assigned.

However, this means that following this idea a building it just an unalterable structure that just can operate in the unique way in which it was projected, a position that is considered non compatible with the actual social needs. Nowadays everything turns around dynamism, people needs are in constant change and demand new spaces that can satisfy them.

That is why, under the flexibility approach in architecture, a building must be able to physically adapt its spaces to current and future functional requirements. This could be achieved by the implementation of the suitable construction technologies that are increasingly evolving to offer a vast amount of solutions for the distribution and creation of spaces in the building without hindering its future transformation. This idea is supported by Herztberger[83] when he states that:

> 'Flexibility signifies- since there is no single solution that is preferable to all others- the absolute denial of a fixed, clearcut standpoint. The flexible plan starts out from the certainty that the correct solution does not exist, because the problem requiring solution is in a permament state of flux, i.e. it is always temporary.' (p.146)

Therefore, flexibility's approach requires a different mindset regarding the relation between use and space. This quality, unlike adaptability,

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

83. Herztberger H. *Lessons for students in architecture.* Rotterdam: 010 Publishers; 1991.

involves more technical and technological aspects in the space definition, such as lightweight partitions, sliding or folding doors or even raised floors or ceilings that could ease the distribution of the technical system in the different functional arrangements.

Nevertheless, as well as adaptability, flexibility must be defined under the adaptive reuse approach and it is important to define the extent of the different physical transformations of space. As it was already explained in part one, adaptive reuse supposes minimal intervention for adapting the new uses to the existing building. But given that the minimal intervention is not defined precisely and that could be confused with only conservation processes, typical of heritage buildings, it is proposed to define the minimal intervention analyzing the layers of the building described by Leupen.[85]

According to him, every building consists of an assemblage of different layers which at the same time contain a collection of architectural elements that function as a whole. These layers are classified in: structure, skin, services, scenery, and access.[85]

The **structure** (columns, beams, load-bearing walls, trusses and structural floors) transmits loads from the building to the ground. The **skin** (cladding for facade, base and roof) meets the function of separating the inner spaces from the outside and constitutes the image of the building to the exterior. The **services** (pipes and cables, appliances and special amenities) regulate the operation and maintenance of the building. The **scenery** (internal cladding, internal doors and walls, finish of floors, walls and ceilings) orders and bounds the inner space of the buildings. Finally, the **access** (stairs, corridors, lifts, galleries) takes care of the accessibility to the different spaces in the building.[85]

85. Leupen B. *Frame and Generic Space: a study into the changeable dwelling proceeding from the permanent.* Rotterdam: 010 Publishers; 2006.

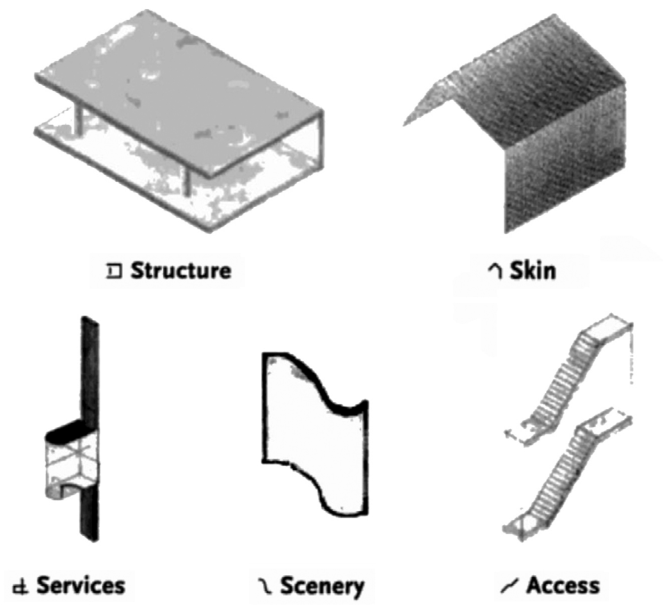


Figure 35. The five layers of the building.[85]

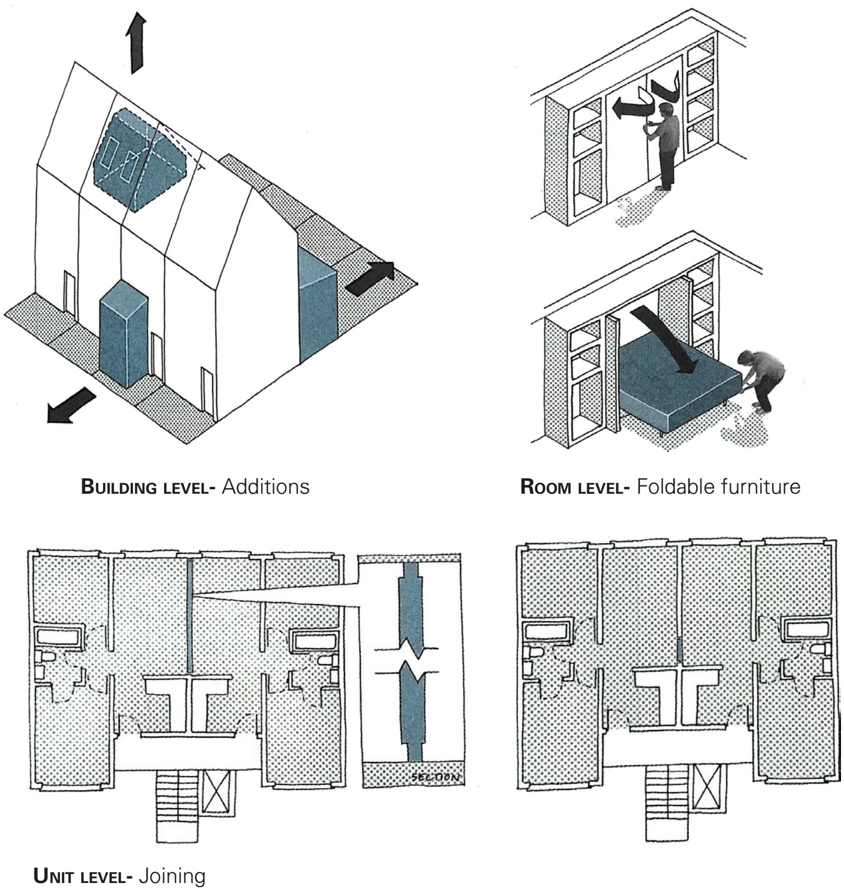
According to the previous description and knowing that the intervention in the structure or in the skin of the building will require a major intervention and resources consumption, a scenario non-compatible with the purposes of adaptive reuse processes. It is proposed that the minimal intervention in the building is bounded to the scenery layer, considering that it is related to the non-structural elements of the building; the access layer, as it represents the means for connecting the inner spaces; and the services layer, given that it supports the operation of the building and its activities.

In conclusion, flexibility as a hard tool in the proposed method is understood as the capacity of adapting different uses by the intervention on the scenery, access and the services, which represent some of the layers of the building.

Flexibility analysis method

For defining the analysis method for flexibility, this study will be based initially in the *Manual of Flexibility*,[81] (p.179) a guide proposed by Schneider and Till in which it is explained how one might design for flexible housing.[92]

In this manual, they propose a variety of strategies for either designing flexible housing (pre-occupation) or to make existing housing spaces flexible (post-occupation). Furthermore, these strategies are also classified in the different levels in which an intervention could take place, such as the building level, the unit level, and the room level. An example of this classification would be:



Building level- Additions

Room level- Foldable furniture

Unit level- Joining

Figure 36. Strategies for flexible housing.[81]

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

92. Although this research focus does not concern about the specifical way to address flexibility in a particular function, the ideas exposed help supporting the method analysis.

However, although this manual offers a great variety of strategies for addressing space flexibility, does not propose a quantitative way in which they can be measured, and given that this study considers both quantitative and qualitative values of the different components analyzed, a method of calculation must be established.

Therefore, it is proposed that for measuring the flexibility of a determined space, regardless the assigned use, it must be considered the two general ways in which this could be transformed under the adaptive reuse approach, which are by the addition and subtraction of architectural elements in the three layers of the building described above: scenery, services and access. These operations could be represented by either vertical elements, like internal partitions or claddings; or horizontal elements, such as finish of floors, ceilings or mezzanines. However, what it is important to consider is that any of these operations must consider exclusively non-structural elements which will not compromise the integrity of the entire building. Thereby, building's flexibility could be calculated with the following steps:

Step One- Building layout diagram

The first step for measuring flexibility will be determining the layouts of the building's levels. As in adaptability, this graphic method must be done for each level of the building, thus the analyzed space is bound from one structural floor to another. Thereby, this diagram represents the inner space of each level of the building in which the transformative operations will be assessed, but where the skin and exterior structural elements are out of consideration.

It is necessary to clarify that under this method, the area of the building is not synonymous of greater or lesser flexibility, but are the conditions of space and the potential of its transformation that determines this value. Thus, starting from the floor plan of the sample building above described, the process will be the following:

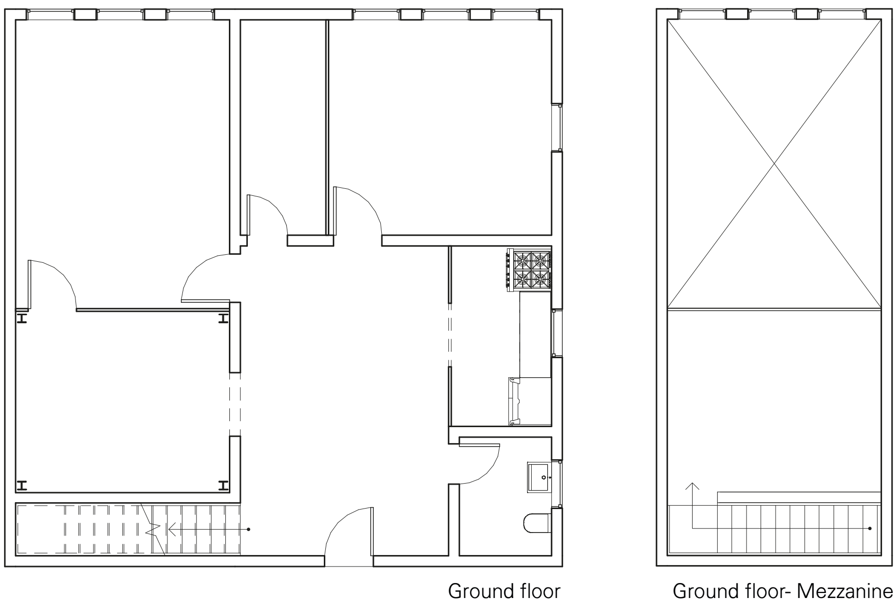


Figure 29. Plan of the sample building.

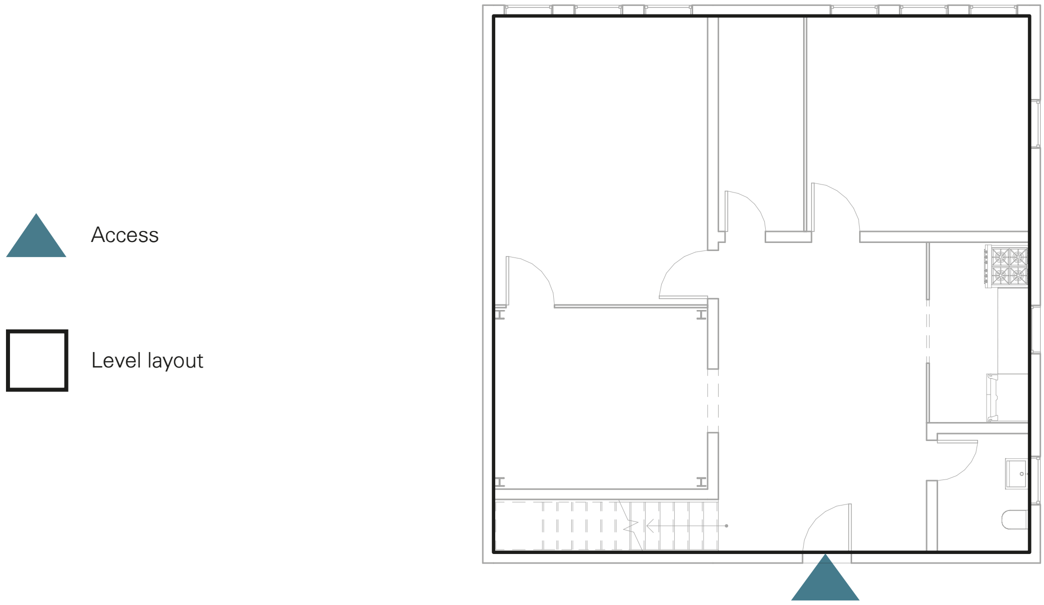
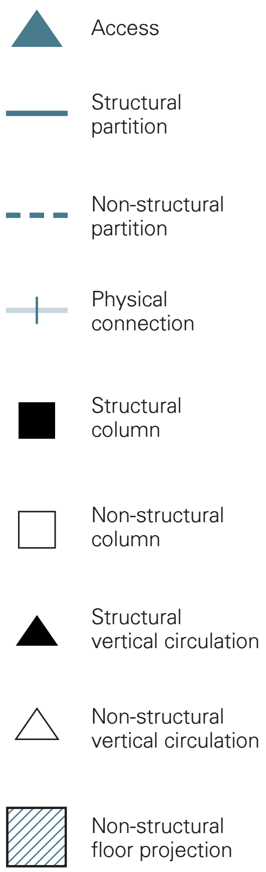


Figure 37. Step One- Building layout diagram.

Step Two- Subtraction value (S)

In the second step of the process, the concern is identifying the internal architectural elements that could be subtracted from the space. Therefore, all the architectural elements inside the layout will be classified in structural and non-structural elements, likewise, the physical connections between spaces must be evidenced with a symbol in the inner partitions. In this way, the diagram will represent in a graphic way, not just the position of these elements but also its characteristics and function in the space. In the case of having intermediate non-structural floors in between the space from one structural floor to another, its area must be projected in the diagram with a specific pattern. This diagram will be represented as follows:



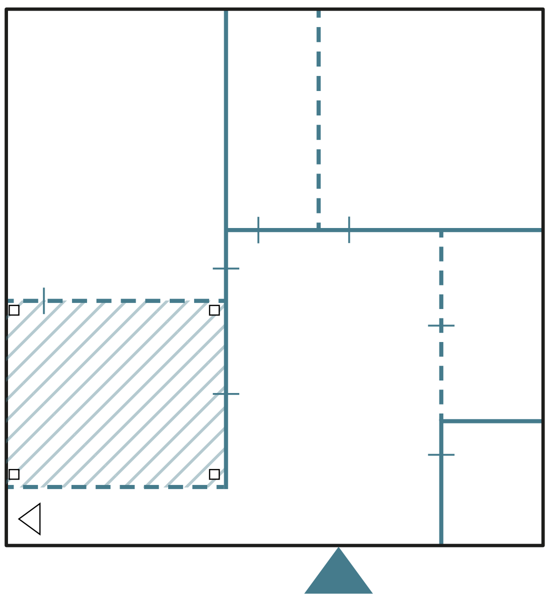


Figure 38. Step Two- Subtraction diagram.

Subsequently, for all architectural elements, classified in structural and non-structural, must be assigned the area they occupy in the level layout. In the case of having more than one level, these areas must consider all the architectural elements in the building. Finally, the Subtraction Value (S) will be calculated by the ratio between the area of the non-structural elements and the area of all the elements identified. This will represent the portion of the architectural elements that could be removed from space. This will be developed as follows:

Summary of areas

3,84 m^2 | 1,38 m^2 | 4,25 m^2 | 0,09 m^2 | 14,08 m^2

Structural elements (P)

$P=3{,}84\ m^2$

Non-structural elements (N)

$N=19{,}80\ m^2$

Total architectural elements (T)

$T=P+N \qquad T=23{,}64\ m^2$

Subtraction Value (S)

$$S=\frac{N}{T} \qquad S=\frac{19{,}80\ m^2}{23{,}64\ m^2} \qquad \mathbf{S=}\ 0{,}84$$

Step Three- Addition value (D)

The following step will be analyzing the space remaining for the possible addition of architectural elements. Therefore, in this part of the process, all the non-structural elements identified in step two must be eliminated from the diagram, leaving just the elements that cannot be removed from space. In general terms, the space available for new additions will be the total area of the layout but subtracting the area of the structural elements.

However, as the method considers the space in all its dimensions, it must be analyzed if its height could allow an extension of the surface by the addition of an intermediate non-structural floor. For adding this element, the height of the space must have a minimum value determined by the local law to have an additional surface. Moreover, the area of this intermediate floor must occupy until a maximum portion of the space in which it is located, a value also defined by the local regulations. In the diagram, the area that meets that minimum height requirement for adding surface will be represented with a specific pattern. Therefore, knowing that the sample building is located in the city of Turin, in Italy; and according to to city building regulations,[93] this process will begin by analyzing the height in the sample building section for later making the addition diagram as follows:

93. Città di Torino. *Regolamento Edilizio: Adeguato al Regolamento Tipo Regione Piemonte approvato con D.C.R.* n. 247-45856. Turin; 2017. p.53.

94. In Turin 'the height between the finished floor of the mezzanine and the lowest point of the finished ceiling must not be less than 2,00 meters and the height between the floor of the room and the lowest point of the mezzanine structure must not be less than 2,20 meters.' See note 77. Therefore, if the structure of the mezzanine has a thickness of 0,20 meters, the minimum height for this surface extension will be 4,40 meters from the floor until the ceiling of the room.

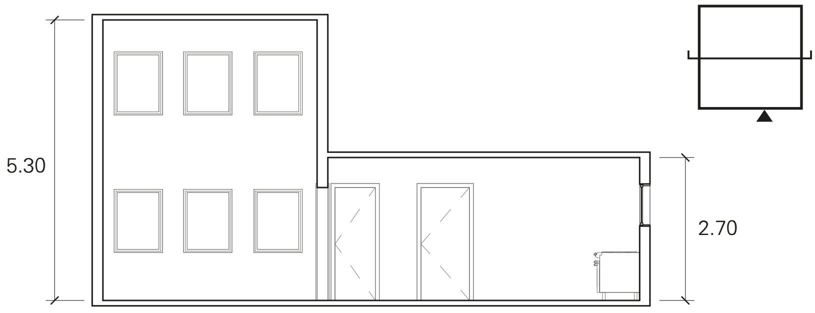


Figure 39. Section of sample building.[94]

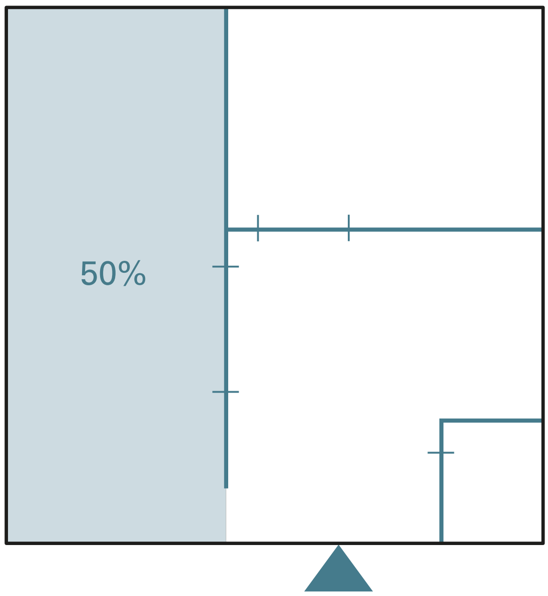


Figure 40. Step Three- Addition diagram.

Access

Structural partition

Physical connection

Zone with minimum height to extend surface

50% Percentage[95] allowed for surface extension

95. In Turin 'the net surface of the mezzanine, even if distributed over several levels, cannot exceed 1/2 of the net area of the space in which it is obtained.' See note 77.

Subsequently, it must be determined the area of the zone with minimum height to extend the surface, as well as the area of the level layout. In the case of having more than one level, the layout areas must be summed. Finally, the Addition Value (D) will be calculated by the ratio between the current area available, represented by the extendable surface allowed, the area of the level layout and the area of the existing structural elements; and the maximum possible area available for adding elements, in which is considered the area of the level layout and the maximum surface extension, considering the scenario in which the entire level has the minimum height for adding an intermediate floor. This will be developed as follows:

Summary of areas

Structural elements (P)

3,84 m^2

$P=3,84\ m^2$

Zone with minimum height to extend surface

50% Percentage allowed for surface extension

Extendable surface (E)

50%

41 m^2

$$E = 41 \times 50\%$$

$$E = 20{,}5\ m^2$$

Area of the level layout (B)

$$B = 103\ m^2$$

Current available area (G)

$$G = B + E - P$$

$$G = 119{,}66\ m^2$$

Maximum available area (K)

$$K = B + 50\%$$

$$K = 154{,}50\ m^2$$

Addition Value (D)

$$D = \frac{G}{K} \qquad D = \frac{119{,}66\ m^2}{154{,}50\ m^2} \qquad \mathbf{D =}\ 0{,}77$$

Step Four- Operation priority diagram

After the calculation of the addition and the subtraction values and before the flexibility calculation, in this step is necessary to identify the priority degree for each operation. As well as in adaptability, it is probable that for the promotor or the investor these operations are not equally important according to the economic, environmental or social benefits mentioned in the first chapter. For instance, considering the economic benefits, it could happen that the subtraction operations in the building are more expensive than the addition operations; or conversely, that adding elements could be more expensive than removing them. This situation can cause one operation to be more beneficial than the other, so it will be necessary to differentiate them with a higher or lower priority value.

Therefore, for each operation will be assigned a priority value that goes from 1 to 3, expressed in Roman numerals, being 1 a low priority operation and 3 a high priority operation. These values will represent its importance to the interested parties. However, if all the operations are equally important, a value of 1 will be assigned for each one. Thus, in this diagram, the type of operation with its previously calculated values, as well as its degree of priority, are represented as follows:

D Value of addition operations

S Value of subtraction operations

III Priority value

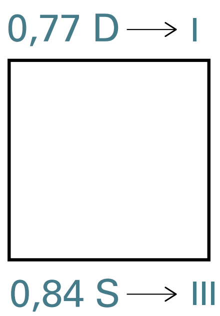


Figure 41. Step Four- Operation priority diagram.

Step Five- Flexibility calculation

This final step is represented by a simple mathematical formula that will express in terms of percentage the degree of flexibility of a determined building. This value is calculated by considering the possible addition and subtraction operations that could be done in the building, operations already calculated in the previous steps. In addition, it will indicate the degree of physical transformation of the space that could be done to adapt it to the new requirements. This formula is composed as follows:

$$F = \frac{D \times R_D + S \times R_S}{R_D + R_S}$$

Where:

F= Degree of Flexibility.

D= Value of addition operations.

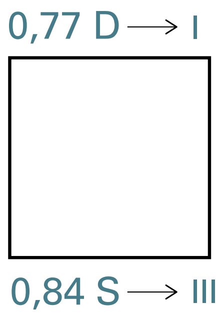
S= Value of subtraction operations.[96]

R= Priority value.

96. If the building does not has any type of architectural elements inside the layout, then the S value will not be considered in the flexibility calculation. This will mean that F= D.

It will be used the last of the diagrams described in step four when defining the operation priority, in which are concentrated all the necessary data for calculating the degree of flexibility.

Flexibility value



As in adaptability, for calculating the flexibility value must be considered the concept of weighted average, in which to each component it has been assigned an importance value. This value corresponds to the level of priority which has been already identified for each operation. Finally, the final obtained value must be expressed in percentage. Therefore, flexibility value is calculated as follows:

$$F = \frac{(0{,}77 \times 1) + (0{,}84 \times 3)}{(1 + 3)} \qquad F = \frac{3{,}29}{4}$$

$$F = 0{,}82 \times 100 \qquad \mathbf{F} = 82\%$$

This final value indicates that, from a maximum determined possible subtraction and addition operations (T and K, respectively), the current average of these operations (DS) represents 82% of that maximum. In this way, a degree of flexibility of 100% will be achieved if space already lack architectural elements, or if present, they all could be removed (T=N); and if the height of space is enough according to local law for increasing the current surface until reach the maximum extension of the level layout surface (G=K).

Flexibility tool outcomes- Physical arrangements

Aside from the degree of flexibility calculation, it is possible to know and represent some of the possible physical arrangements allowed in space. These will be limited to the conservation of the structural elements of the building and to the maximum extent of the surface allowed by law in the spaces where the height meets the minimum required. These possible physical dispositions do not represent a proposal for the design of the project nor do they intend to replace the work of the designer to conceive the spaces that best adapt to each need. There are simply four possibilities that could be developed based on the limitations already established. For representing this outcome, the subtraction diagram from the second step will be used considering the proposed representation for each architectural element.

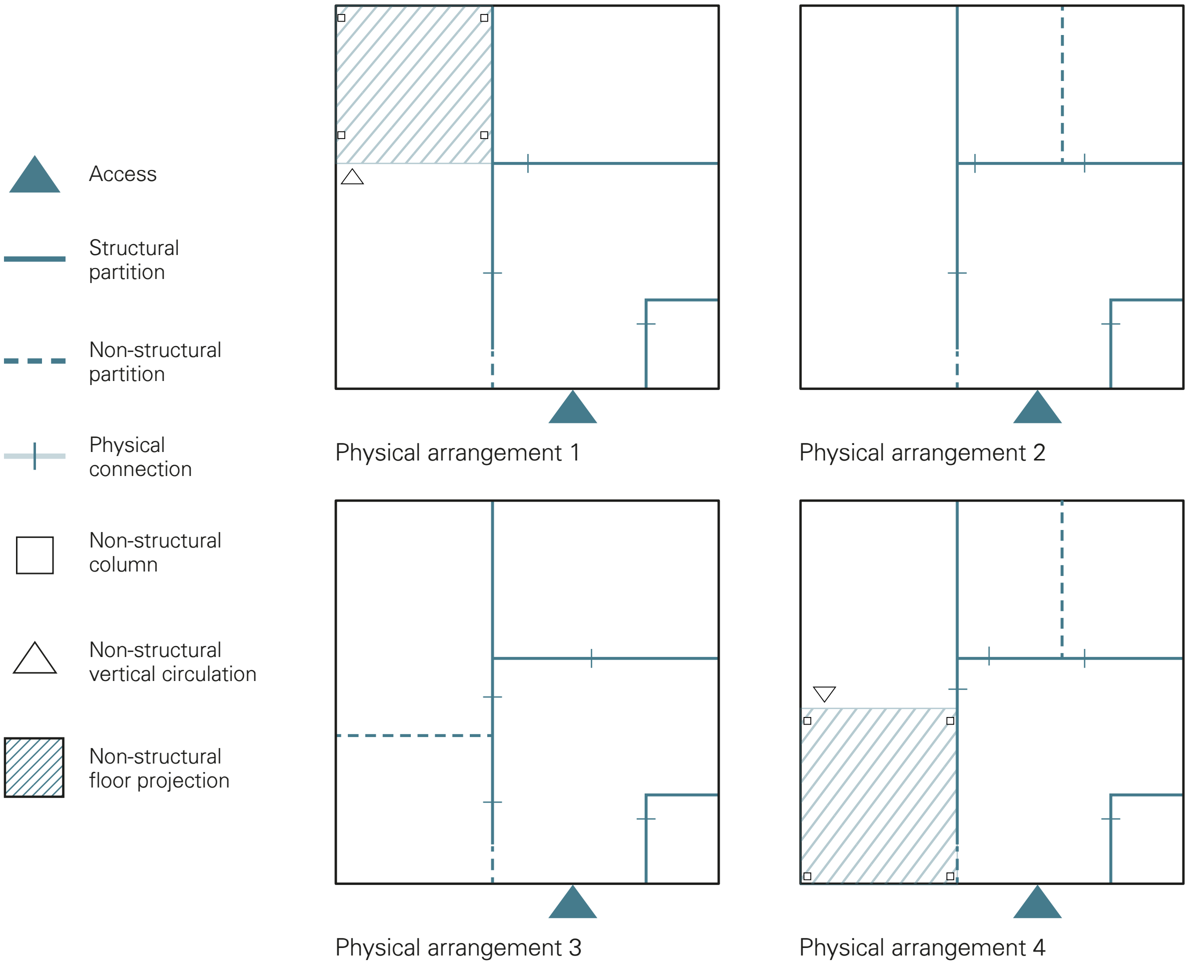


Figure 42. Possible physical arrangements.

5.4 Summary

As it was explained at the beginning of this chapter, it is considered that the space in an existing building, following the adaptive reuse approach, could change considering both its usage and the disposition of the physical elements that comprise it. Therefore, in this method

adaptability and flexibility are not just considered as characteristics for describing the space, but also as possible tools that allow representing and measure the potential for change.
This method aims to support the decision-making for adaptive reuse processes, allowing to asses and compare different buildings according to their spatial qualities, both qualitatively and quantitatively. It also allows understanding the way in which the possible interventions in the building could be done, considered as temporal given that they will not alter the structure or the skin of the building, its permanent elements. Thereby, all the interventions that could happen in the short or the long term are essentially temporary that will be adjusted as the needs change through time.

On the other hand, although the value for adaptability and flexibility must be assessed independently, it is considered that they could complement each other. For instance, if after the evaluation process the building got a low value of adaptability but a high value of flexibility, this would mean that through physical interventions in the space, uses that were previously incompatible with existing spaces could be adapted. Conversely, if the building got a high value of flexibility but a low value of flexibility, this would mean that without physically intervening the space, the selected uses can be adapted to the existing spaces. However, If both values were considerably low it would be best not to consider the building for adaptive reuse processes because there would be no way to adapt the uses to space, even considering the physical transformations, without affecting its structural integrity.

Chapter four notes

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

83. Herztberger H. *Lessons for students in architecture.* Rotterdam: 010 Publishers; 1991.

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

85. Leupen B. *Frame and Generic Space: a study into the changeable dwelling proceeding from the permanent.* Rotterdam: 010 Publishers; 2006.

86. Hanson J. *Decoding Homes and Houses.* Cambridge: Cambridge University Press; 1998.

87. Janis R, Tao W. *Mechanical and Electrical Systems in Buildings*. 6th Edition. New York: Pearson; 2018.

90. Friend J, Allen H. *Planning Under Pressure: The Strategic Choice Approach.* Third Edition. Amsterdam (etc.: Elsevier; 2005. According to the authors, the SCA is a problem structuring method that allows uncertainty management and commitment to support decision-making in complex problems.

93. Città di Torino. *Regolamento Edilizio: Adeguato al Regolamento Tipo Regione Piemonte approvato con D.C.R.* n. 247-45856. Turin; 2017. p.53.

CHAPTER FIVE

SCP METHOD APPLICATION

6.1 The case studies under the SCP method

After having explained all the procedure for applying the SCP method using a sample building. It is necessary to test it with existing buildings that could present different and more complex characteristics. As it was mentioned, this method aims not only to be useful for analyzing buildings in their singularity, but also for being able to compare them and understand why probably some buildings are more suitable than others for being reused based on their spatial qualities.

Therefore, in this study all the six case studies of adaptive reuse previously described are going to be analyzed and compare under the SCP method for understanding their spatial qualities. For practical reasons, in the projects that are represented by a complex of buildings (Farm Cultural Park, CAOS and Officine Zero) were chosen the ones that were considered as more representative or from which there was available sufficient information for the analysis. In this way, all of them will have the same unit of analysis, the single building.

However, although the method proposes to assess a building one at a time, this does not mean that it excludes projects comprised of multiple buildings. On the contrary, this method is designed to consciously analyze a base unit in order to better decompose and understand more complex projects with multiple units.

For this exercise a scenario will be assumed in which it is intended to carry out an adaptive reuse project considering the current conditions of each building, even if they have already been transformed to be reused. This is because it is considered that the analysis of the spatial qualities of the building must be carried out not only at the beginning of the adaptive reuse project but also during its development.

Therefore, all these six buildings will be analyzed considering their current usage, which was described in chapter two, and the regulations of their specific location. In this way, this exercise could represent an opportunity to assess the potential for spatial change of each building. Furthermore, given that all the final values are expressed in percentage considering the maximum possibilities for both adaptability and flexibility, they all could be compared in the same terms regardless of their particular size. Finally, it is important to mention that in the case of the adaptability analysis, technical incompatibilities were not considered due to the lack of information in the projects presented. Accordingly, the six buildings will be developed step by step under the SCP method as follows:

6.2 Farm Cultural Park- Farm XL Adaptability

Step One- Spatial organization diagram

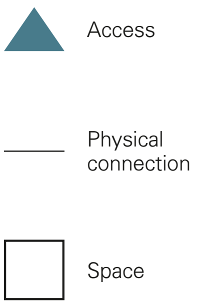
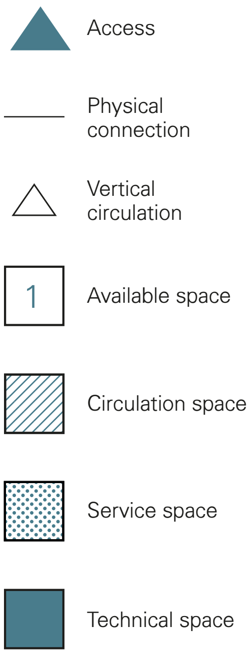


Figure 43. Farm XL- Spatial organization diagram.

Step Two- Restricted spaces diagram



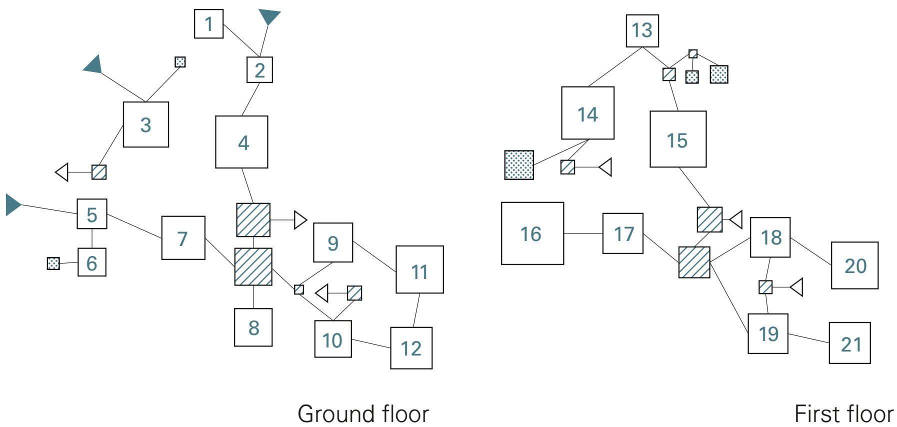


Figure 44. Farm XL- Restricted spaces diagram.

Step Three - Incompatiblity chart

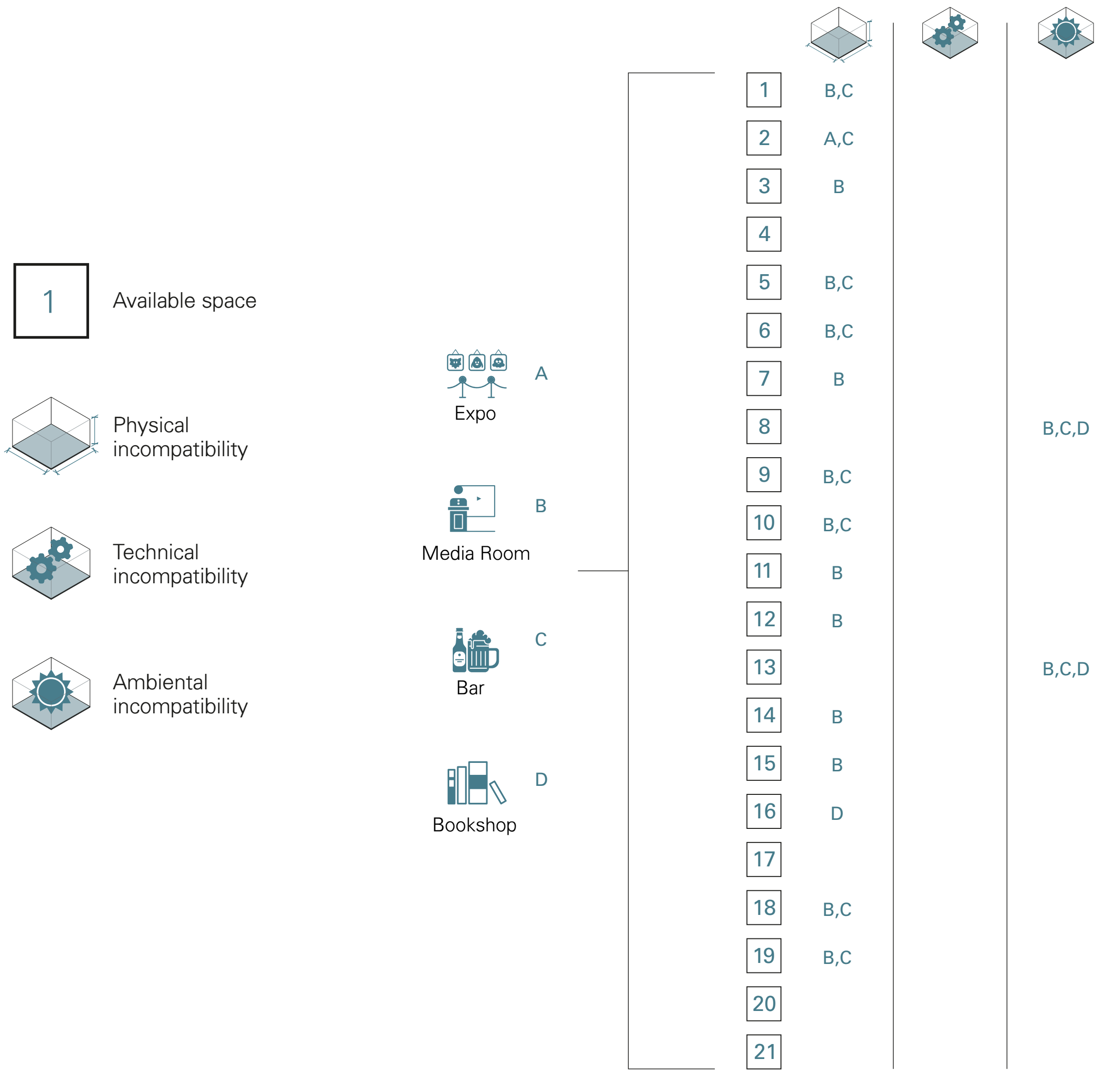


Figure 45. Farm XL- Incompatibility chart.

Step Four- Usage priority

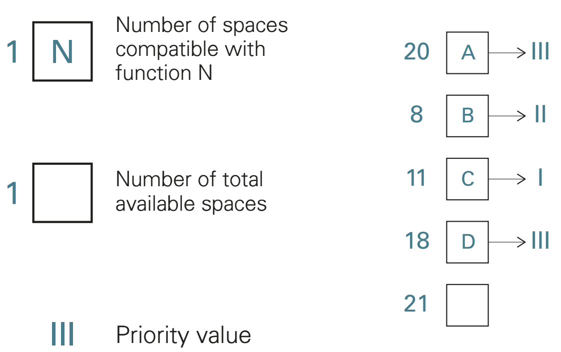


Figure 46. Farm XL- Usage priority.

Step Five- Adaptability calculation

$$C = \frac{(20 \times 3) + (8 \times 2) + (11 \times 1) + (18 \times 3)}{(3 + 2 + 1 + 3)}$$

$$C = \frac{141}{9} \qquad C = 15{,}67 \qquad C = 16$$

$$M = 21$$

$$A = \frac{C}{M} \qquad A = \frac{16}{21} \qquad A = 0{,}76 \times 100$$

$$\boxed{\mathbf{A} = 76\%}$$

Farm Cultural Park- Farm XL
Flexibility

Step One- Building layout diagram

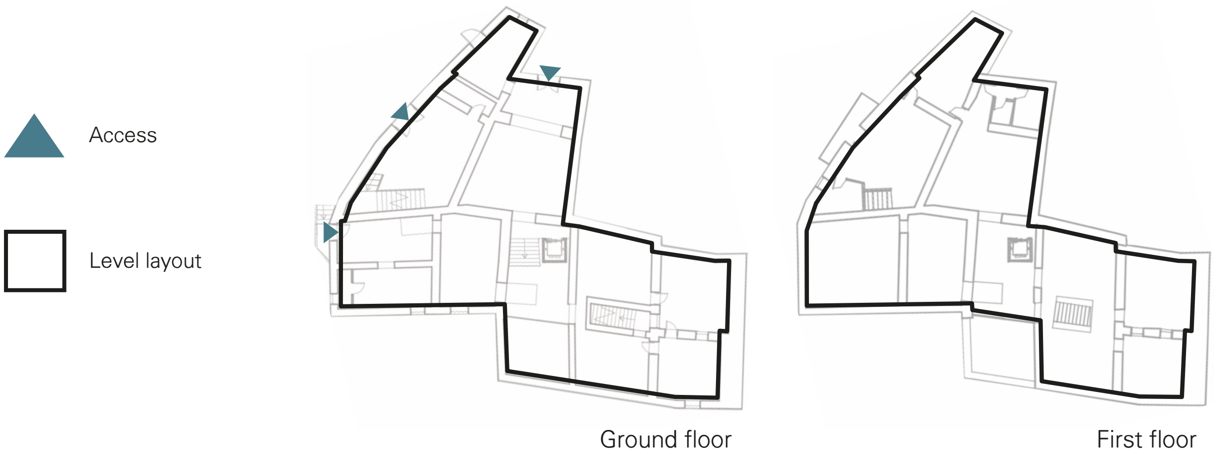


Figure 47. Farm XL- Building layout diagram.

Step Two- Subtraction value (S)

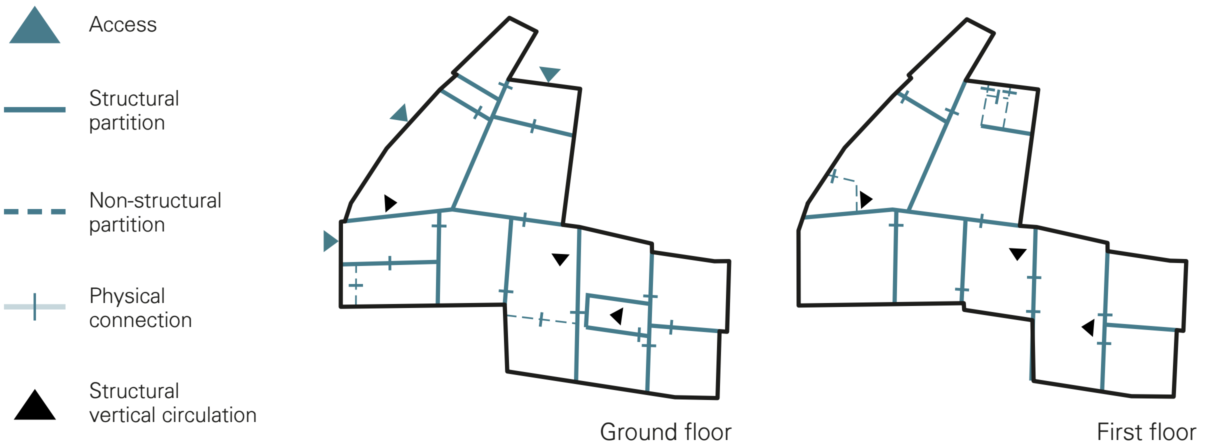


Figure 48. Farm XL- Subtraction diagram.

Summary of areas

92,5 m^2 34,5 m^2

Structural elements (P)

P=127 m^2

4,20 m^2

Non-structural elements (N)

N=4,20 m^2

Total architectural elements (T)

T=P+N T=131,2 m^2

Subtraction Value (S)

$$S=\frac{N}{T}$$

$$S=\frac{4{,}20\ m^2}{131{,}2\ m^2}$$

S= 0,03

Step Three- Addition value (D)

Access

Structural partition

Physical connection

Structural vertical circulation

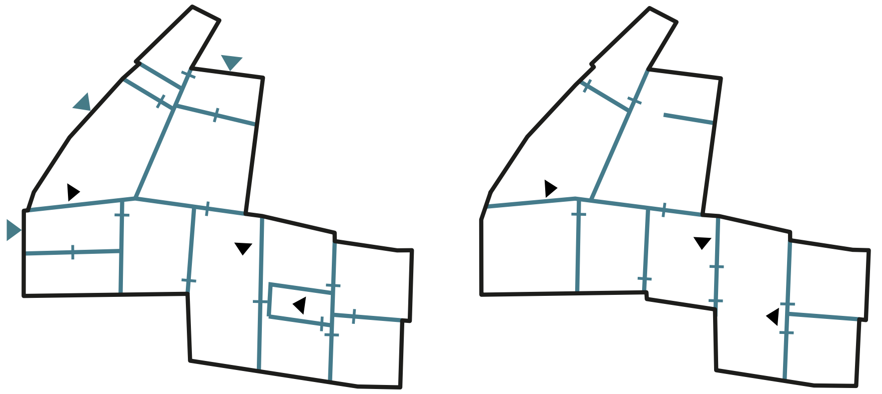


Figure 49. Farm XL- Addition diagram.

Summary of areas

92,5 m^2 — 34,5 m^2

Structural elements (P)

$P = 127\ m^2$

Extendable surface[97] (E)

$E = 0$

Area of the levels layout (B)

$B = 745\ m^2$

Current available area (G)

$G = B + E - P$

$G = 618\ m^2$

Maximum available area (K)

$K = B + 50\%$

$K = 1.117{,}5\ m^2$

Addition Value (D)

$$D = \frac{G}{K}$$

$$D = \frac{618\ m^2}{1.117{,}5\ m^2}$$

D= 0,55

97. Comune di Agrigento. *Regolamento Edilizio Comunale*. Agrigento; 2011. p.68. According to local regulations, the height of the space to build a mezzanine must be a minimum of 5,40 m.

Step Four- Operation priority

D — Value of addition operations

S — Value of subtraction operations

III — Priority value

Figure 50. Farm XL- Operation priority.

Step Five- Flexibility calculation

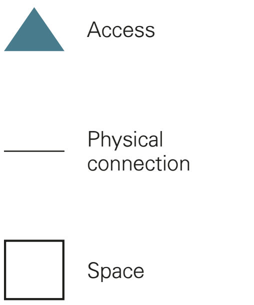
$$F = \frac{(0{,}55 \times 1) + (0{,}03 \times 1)}{(1 + 1)}$$

$$F = \frac{0{,}58}{2} \qquad F = 0{,}29 \times 100$$

$\boxed{\textbf{F=}\ 29\%}$

6.3 Exfadda
Adaptability

Step One- Spatial organization diagram



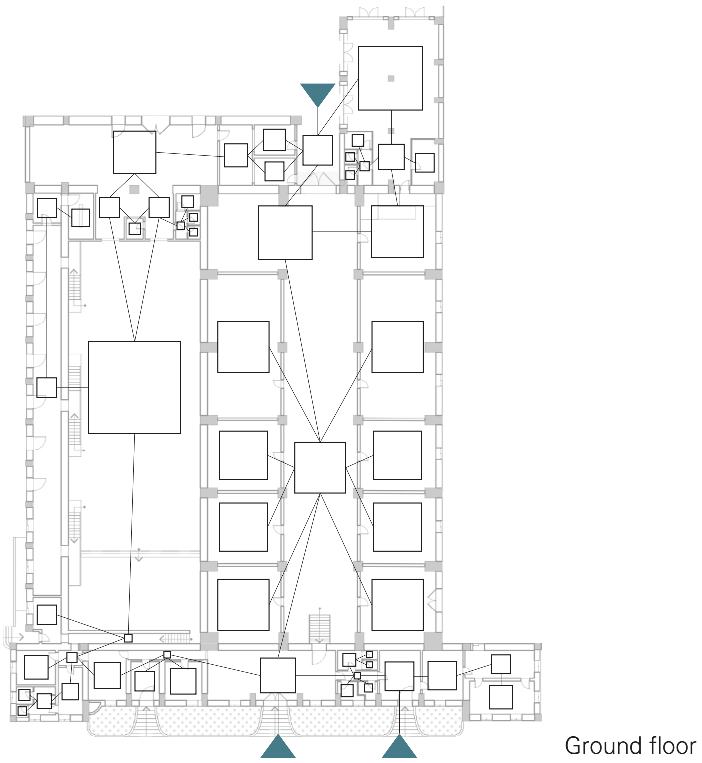
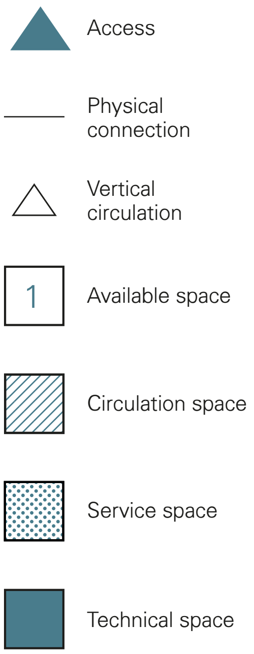


Figure 51. Exfadda- Spatial organization diagram.

Step Two- Restricted spaces diagram



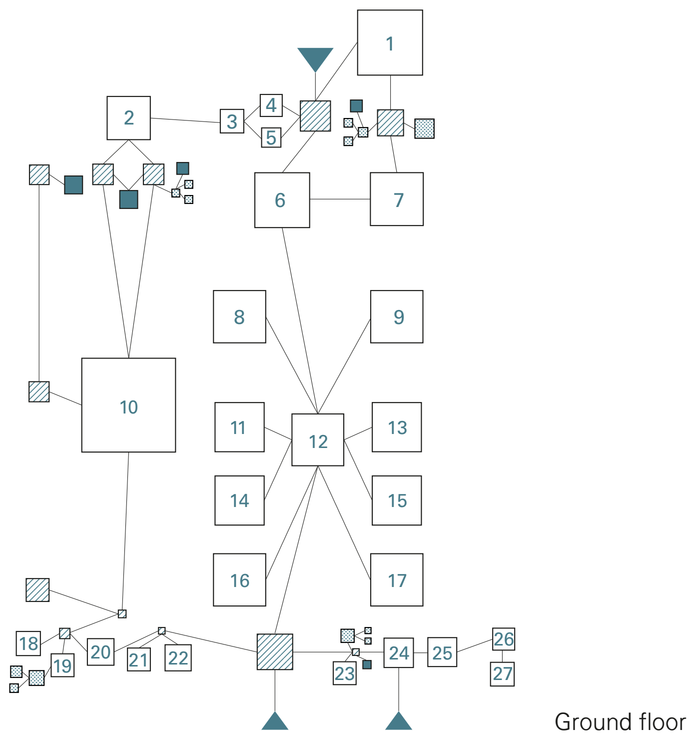
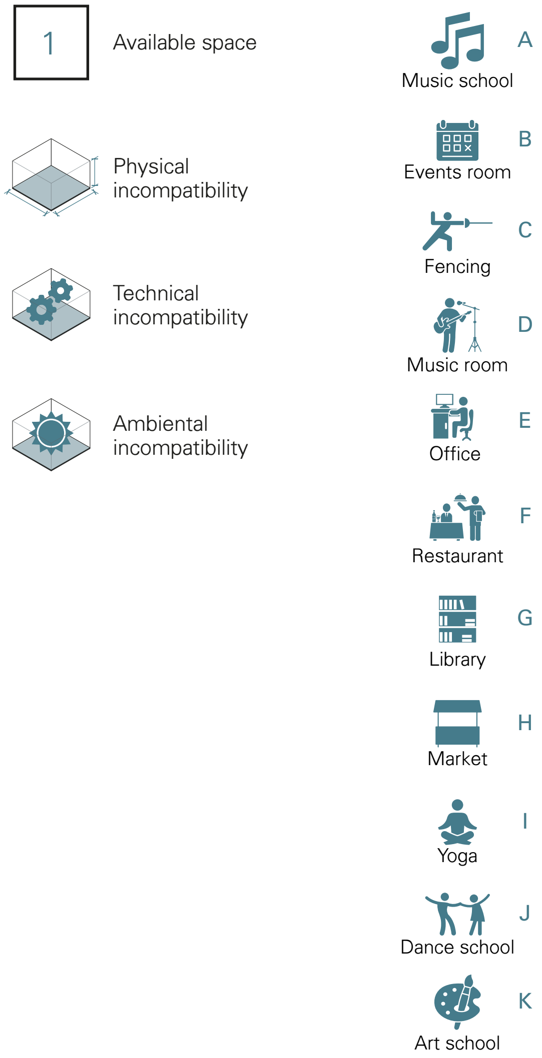


Figure 52. Exfadda- Restricted spaces diagram.

Step Three - Incompatiblity chart



1	B,H		D
2	A,B,D		E,F,J
3	A,B,C,F, G,H,J		E,F
4	A,B,C,F, G,H,J		E,F
5	A,B,C,F, G,H,J		E,F
6	E,F,J,K		A,D,F
7	B,H		
8	D,H,J,K		F
9	D,H,J,K		F
10	A,C,D,E,F,G,I,J,K		
11	B,F,H		F
12	F,J,K		F
13	B,F,H		F
14	B,F,H		F
15	B,F,H		F
16	B,F,H		F
17	B,F,H		F
18	A,B,C,D,F,H,I,J,K		D
19	A,B,C,D,F,H,I,J,K		D
20	A,B,C,D,F,H,I,J,K		D
21	A,B,C,F,H,I,J,K		
22	A,B,C,F,H,I,J,K		
23	A,B,C,D,F,H,I,J,K		
24	A,B,C,D,F,H,J,K		
25	A,B,C,D,F,H,J,K		
26	A,B,C,D,F,H,J,K		
27	A,B,C,D,F,H,J,K		

Figure 53. Exfadda- Incompatibility chart.

1 N Number of spaces compatible with function N

1 Number of total available spaces

III Priority value

Step Four- Usage priority

11	A	→ III
5	B	→ I
13	C	→ II
13	D	→ III
21	E	→ I
2	F	→ I
23	G	→ II
4	H	→ II
20	I	→ I
10	J	→ II
12	K	→ III
27		

Step Five- Adaptability calculation

$$C= \frac{(11 \times 3) + (5 \times 1) + (13 \times 2) + (13 \times 3) + (21 \times 1) + (2 \times 1) + (23 \times 2) + (4 \times 2) + (20 \times 1) + (10 \times 2) + (12 \times 3)}{(3 + 1 + 2 + 3 + 1 + 1 + 2 + 2 + 1 + 2 + 3)}$$

$$C= \frac{256}{21} \qquad C= 12{,}19 \qquad C= 12$$

$$M= 27$$

$$A= \frac{C}{M} \qquad A= \frac{12}{27} \qquad A= 0{,}44 \times 100$$

$$\boxed{\mathbf{A}= 44\%}$$

Figure 54. Exfadda- Usage priority.

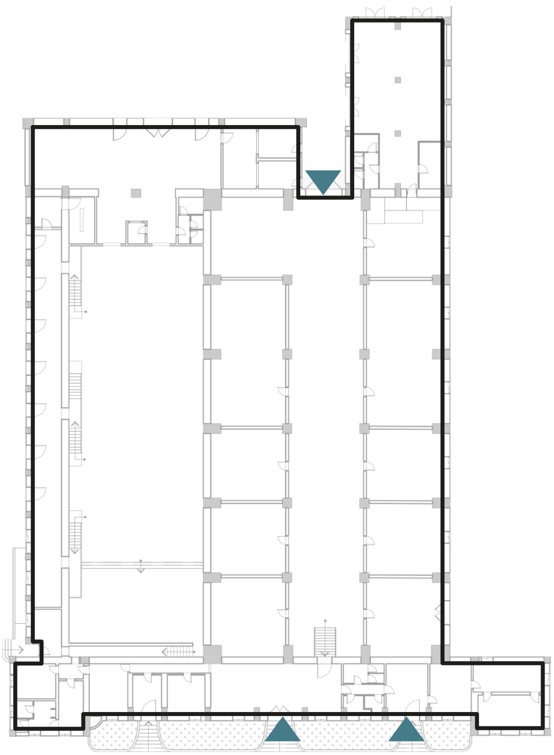
Exfadda

Flexibility

Step One- Building layout diagram

Access

Level layout



Ground floor

Figure 55. Exfadda- Building layout diagram.

Step Two- Subtraction value (S)

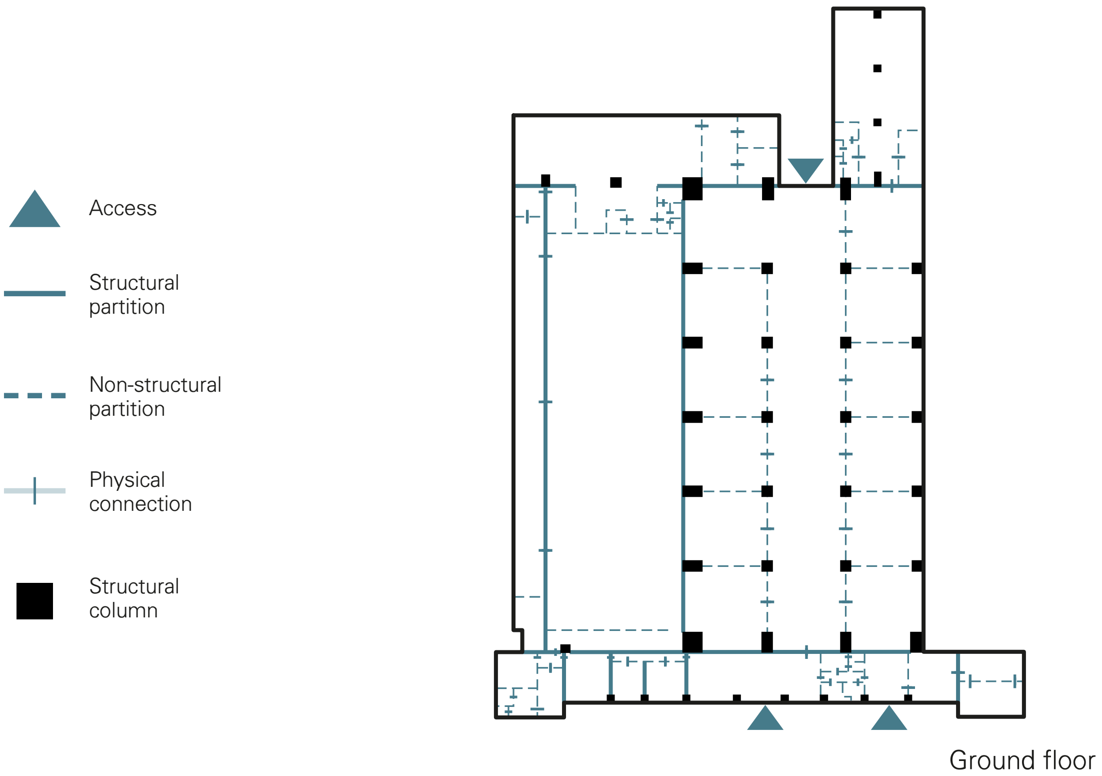


Figure 56. Exfadda- Subtraction diagram

Summary of areas

32,62 m^2 51,42 m^2

39,31 m^2

Structural elements (P)

P= 84,04 m^2

Non-structural elements (N)

N= 39,31 m^2

Total architectural elements (T)

T= P+N T=123,35 m^2

Subtraction Value (S)

$$S= \frac{N}{T}$$

$$S= \frac{39{,}31\ m^2}{123{,}35\ m^2}$$

S= 0,32

Step Three- Addition value (D)

Access

Structural partition

Physical connection

Structural column

Zone with minimum height to extend surface

50% Percentage[98] allowed for surface extension

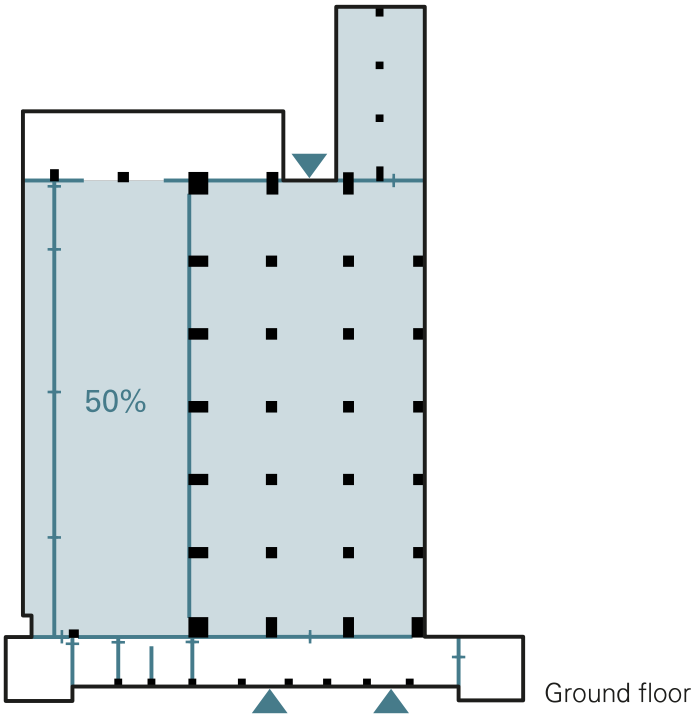


Figure 57. Exfadda- Subtraction diagram

98. Città di San Vito dei Normanni. *Regolamento Edilizio Allegato al P.R.G.* San Vito dei Normanni; 2017. p.68. According to local regulations, the height of the space to build a mezzanine must be a minimum of 4,5 m.

Summary of areas

32,62 m²   51,42 m²

Structural elements (P)

$P = 84{,}04 \text{ m}^2$

Extendable surface (E)

50% 2.118 m²

$E = 1.059 \text{ m}^2$

Area of the levels layout (B)

$B = 2.604 \text{ m}^2$

Current available area (G)

$G = B + E - P$

$G = 3.578{,}9 \text{ m}^2$

Maximum available area (K)

$K = B + 50\%$

$K = 3.906 \text{ m}^2$

Addition Value (D)

$$D = \frac{G}{K}$$

$$D = \frac{3.578{,}9 \text{ m}^2}{3.906 \text{ m}^2}$$

D= 0,92

Step Four- Operation priority

D Value of addition operations

S Value of subtraction operations

III Priority value

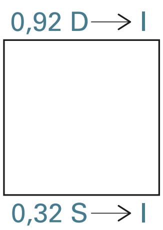


Figure 58. ExFadda- Operation priority.

Step Five- Flexibility calculation

$$F = \frac{(0{,}92 \times 1) + (0{,}32 \times 1)}{(1 + 1)}$$

$$F = \frac{1{,}23}{2} \qquad F = 0{,}62 \times 100$$

$$\boxed{F = 62\%}$$

6.4 Officine zero- Railway warehouse Adaptability

Step One- Spatial organization diagram

Figure 59. Railway Warehouse- Spatial organization diagram.

Step Two- Restricted spaces diagram

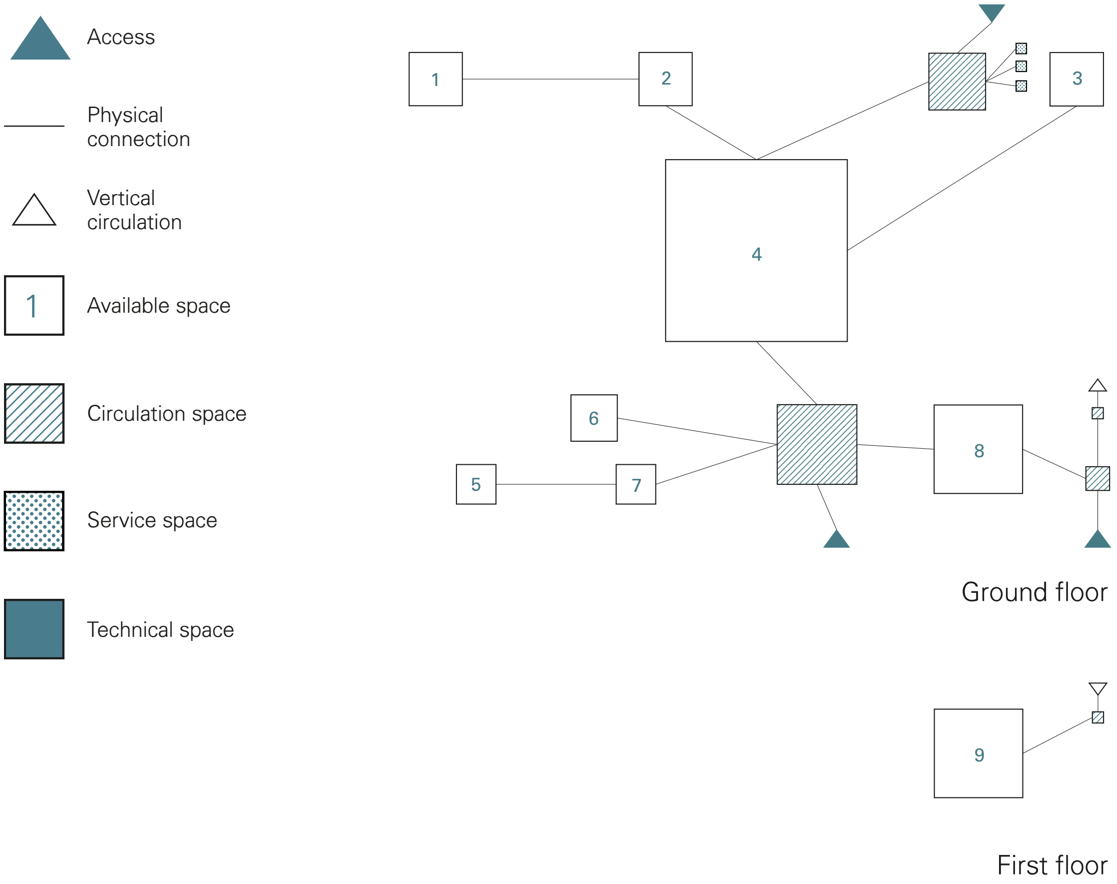


Figure 60. Railway Warehouse- Restricted spaces diagram.

Step Three- Incompatibility chart

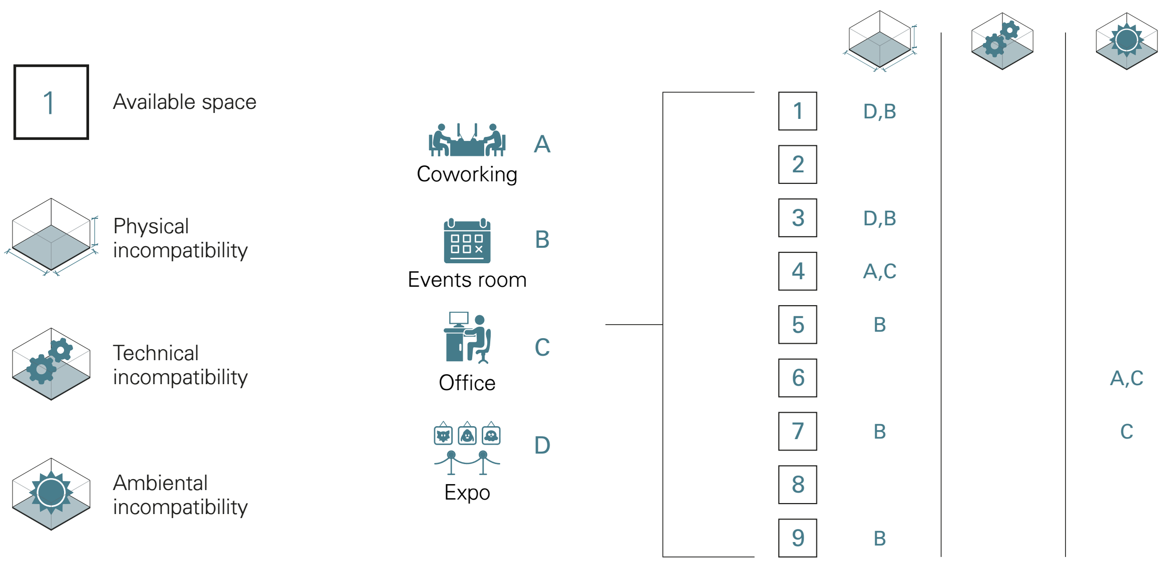


Figure 61. Railway Warehouse- Incompatibility chart.

1 N Number of spaces compatible with function N

1 Number of total available spaces

III Priority value

Step Four- Usage priority

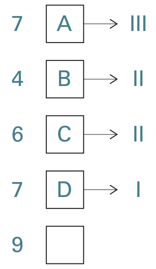


Figure 62. Railway Warehouse- Usage priority.

Step Five- Adaptability calculation

$$C= \frac{(7 \times 3) + (4 \times 2) + (6 \times 2) + (7 \times 1)}{(3 + 2 + 2 + 1)}$$

$$C= \frac{48}{8} \qquad C= 6$$

$$M= 9$$

$$A= \frac{C}{M} \qquad A= \frac{6}{9} \qquad A= 0{,}66 \times 100$$

$$\boxed{\textbf{A}= 66\%}$$

Officine zero- Railway warehouse

Flexibility

Step One- Building layout diagram

Access

Level layout

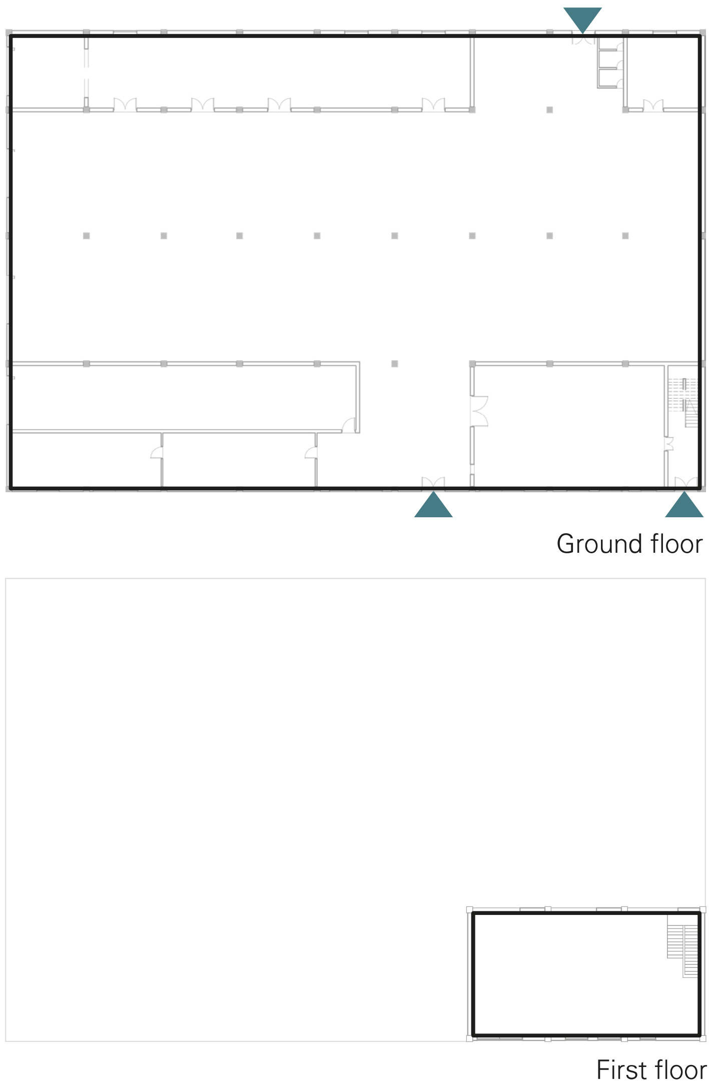


Figure 63. Railway Warehouse- Building layout diagram.

Step Two- Subtraction value (S)

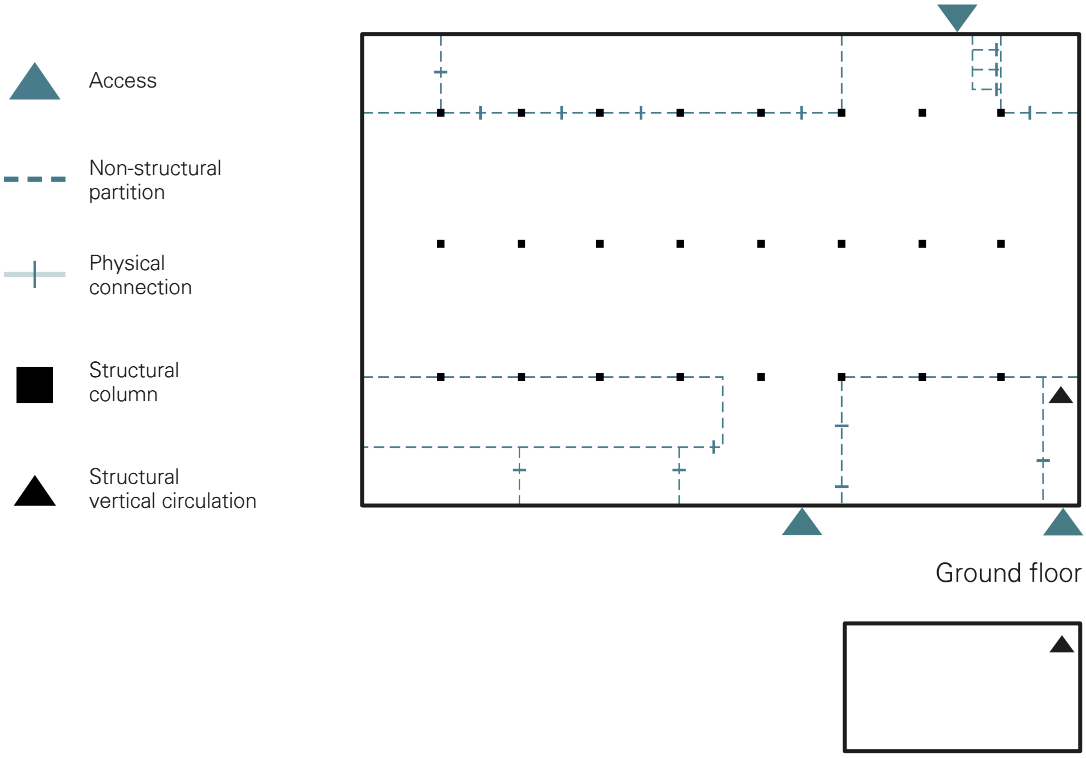


Figure 64. Railway Warehouse- Subtraction diagram.

Summary of areas

Structural elements (P)		Non-structural elements (N)
▲ 23,28 m²	■ 9,38 m²	– – – 82,32 m²

Structural elements (P)

P=32,66 m²

Non-structural elements (N)

N=82,32 m²

Total architectural elements (T)

T=P+N T= 114,98 m²

Subtraction Value (S)

$$S= \frac{N}{T}$$

$$S= \frac{82,32 \text{ m}^2}{114,98 \text{ m}^2}$$

S= 0,72

Step Three- Addition value (D)

Access

Structural column

Structural vertical circulation

Zone with minimum height to extend surface

50% Percentage[99] allowed for surface extension

99. Città di Roma. *Regolamento Edilizio General del Comune di Roma*. Rome; 1943. p.11.
According to local regulations, the height of the space to build a mezzanine must be a minimum of 5,40 m.

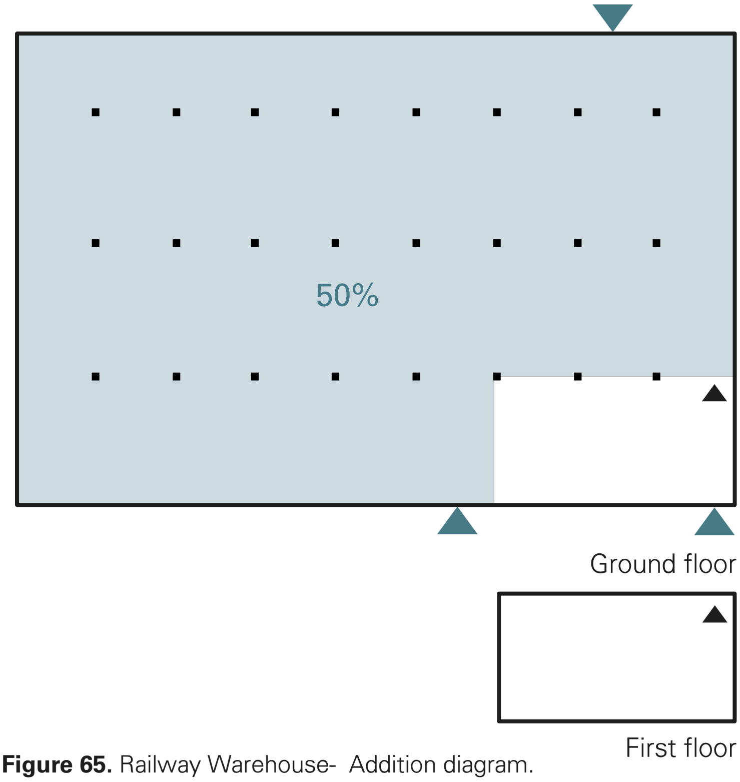


Figure 65. Railway Warehouse- Addition diagram.

Summary of areas

23,28 m²   9,38 m²

Structural elements (P)

$P=32{,}66\ m^2$

Extendable surface (E)

50% — 3.000 m²

$E=1.500\ m^2$

Area of the levels layout (B)

$B=3.920\ m^2$

Current available area (G)

$G=B+E-P$

$G=5.387{,}34\ m^2$

Maximum available area (K)

$K=B+50\%$

$K=5.880\ m^2$

Addition Value (D)

$$D=\frac{G}{K}$$

$$D=\frac{5.387{,}34\ m^2}{5.880\ m^2}$$

D= 0,92

Step Four- Operation priority

D Value of addition operations

S Value of subtraction operations

III Priority value

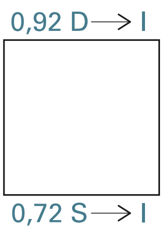


Figure 66. Railway Warehouse- Operation priority.

Step Five- Flexibility calculation

$$F=\frac{(0{,}92 \times 1)+(0{,}72 \times 1)}{(1+1)}$$

$$F=\frac{1{,}64}{2} \qquad F=0{,}82 \times 100$$

$$\boxed{\textbf{F=}\ 82\%}$$

6.5 CAOS- BUILDING G ADAPTABILITY

Step One- Spatial organization diagram

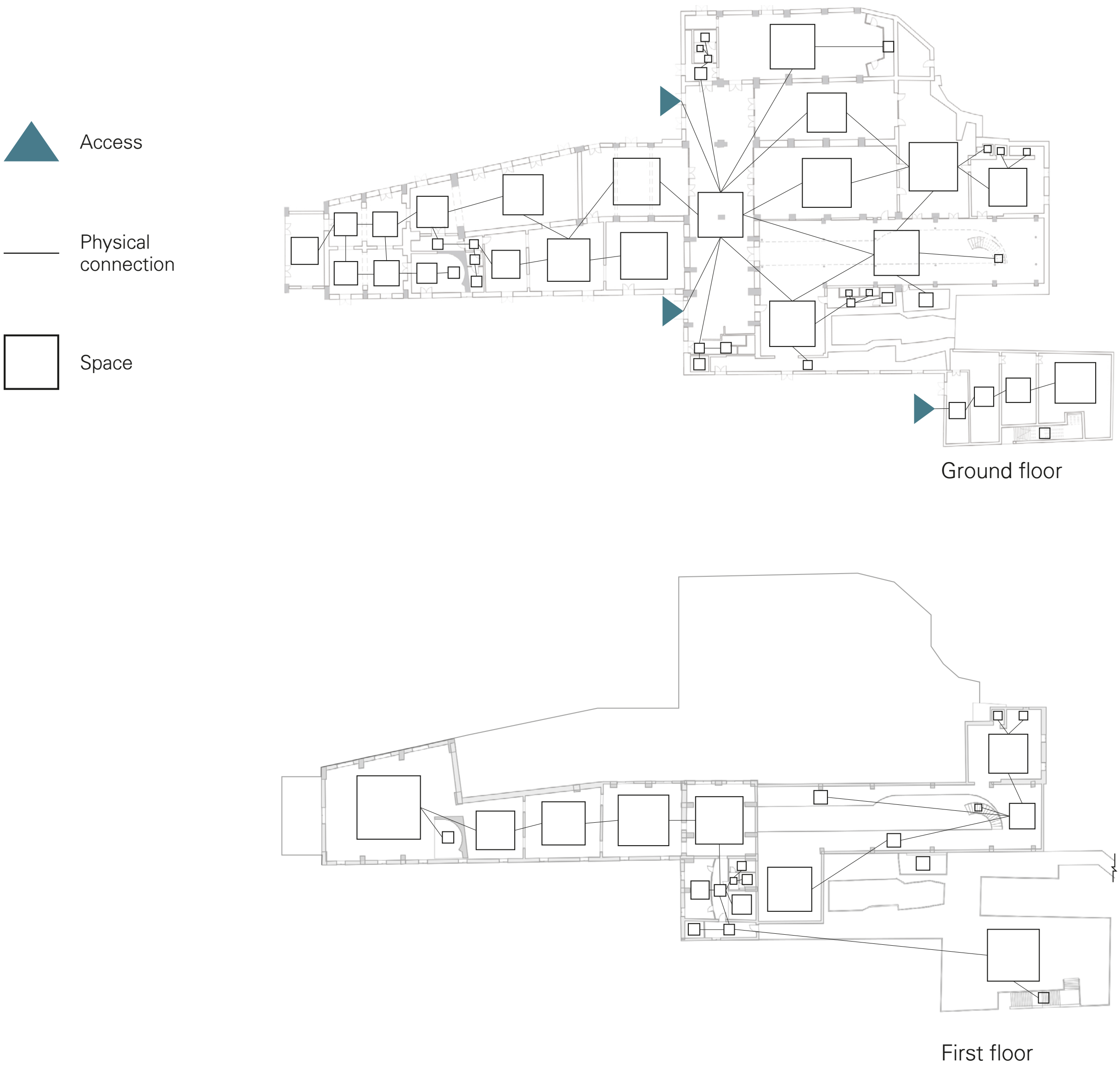


Figure 67. Building G- Spatial organization diagram.

Step Two- Restricted spaces diagram

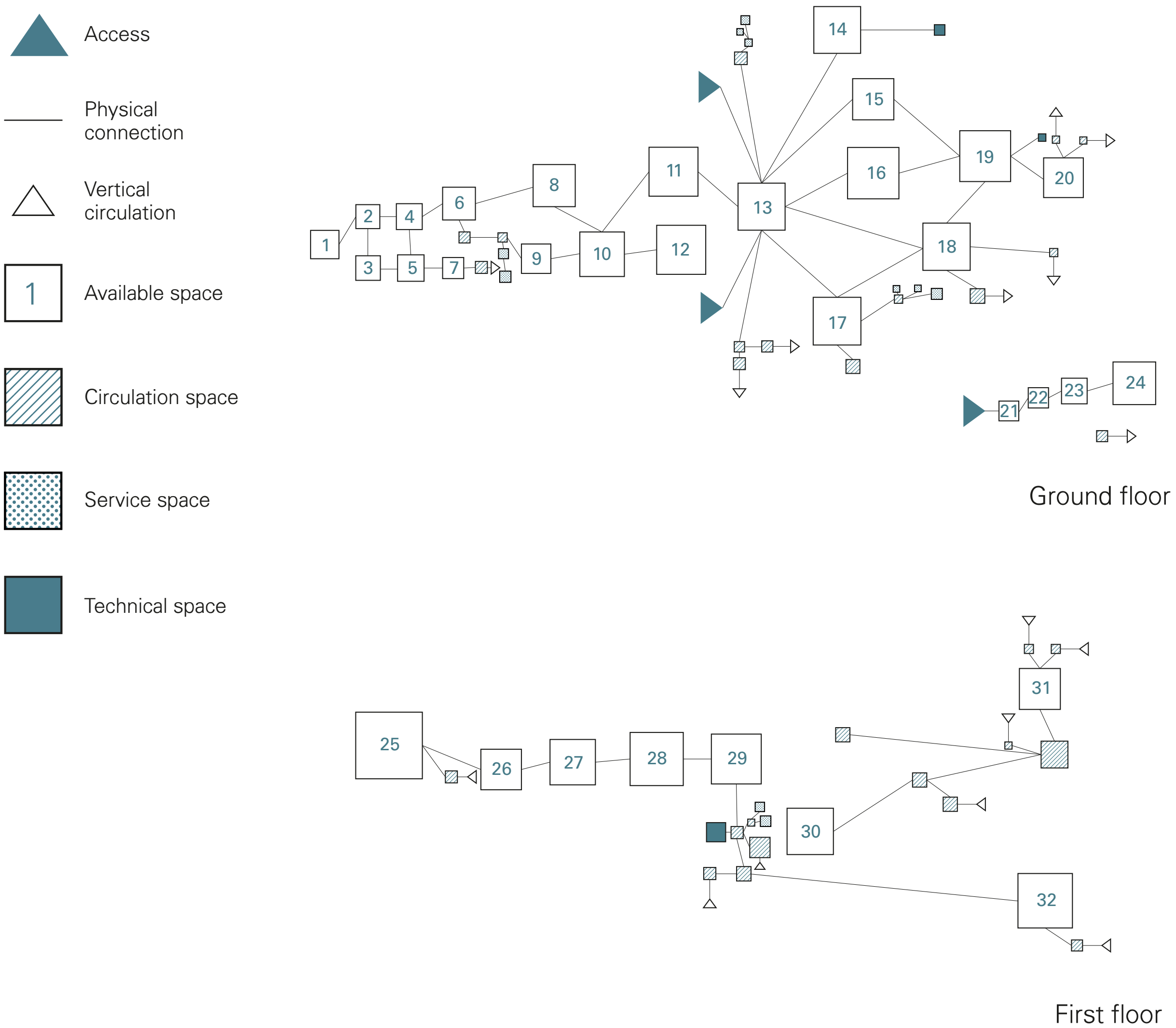


Figure 68. Building G- Restricted spaces diagram.

Step Three - Incompatiblity chart

1 Available space

Physical incompatibility

Technical incompatibility

Ambiental incompatibility

Office A

Media Room B

Museum C

Expo D

1	B,C,D		
2	A,B		
3	A,B		
4	A,B		
5	A,B		
6	B		
7	A,B,D		D
8	B		
9			D
10			
11			
12			
13	A,B		
14	B,C,D		D
15	A		
16	A		
17	A		
18	A,B		
19	A,B,C,D		
20	A,B,C,D		D
21	A		
22	A,B		
23	B		
24	A,B,C,D		
25	B		
26	B		
27			
28			C
29			C
30	B		C
31	B		
32	B		

Figure 69. Building G- Incompatibility chart.

Step Four- Usage priority

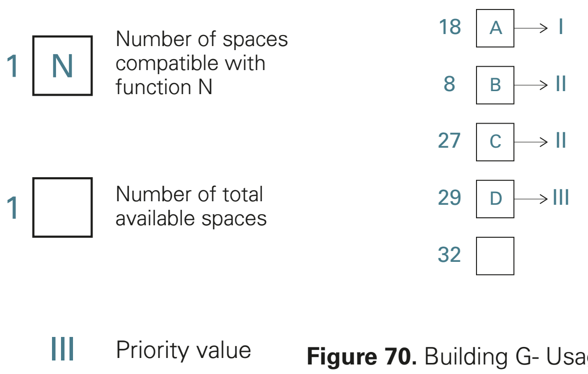


Figure 70. Building G- Usage priority.

Step Five- Adaptability calculation

$$C= \frac{(18 \times 1) + (8 \times 2) + (27 \times 2) + (29 \times 3)}{(1 + 2 + 2 + 3)}$$

$$C= \frac{175}{8} \qquad C= 21{,}87 \qquad C= 22$$

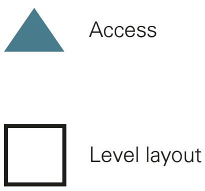
$$M= 32$$

$$A= \frac{C}{M} \qquad A= \frac{22}{32} \qquad A= 0{,}69 \times 100$$

$$\boxed{\mathbf{A}= 69\%}$$

CAOS- BUILDING G FLEXIBILITY

Step One- Building layout diagram



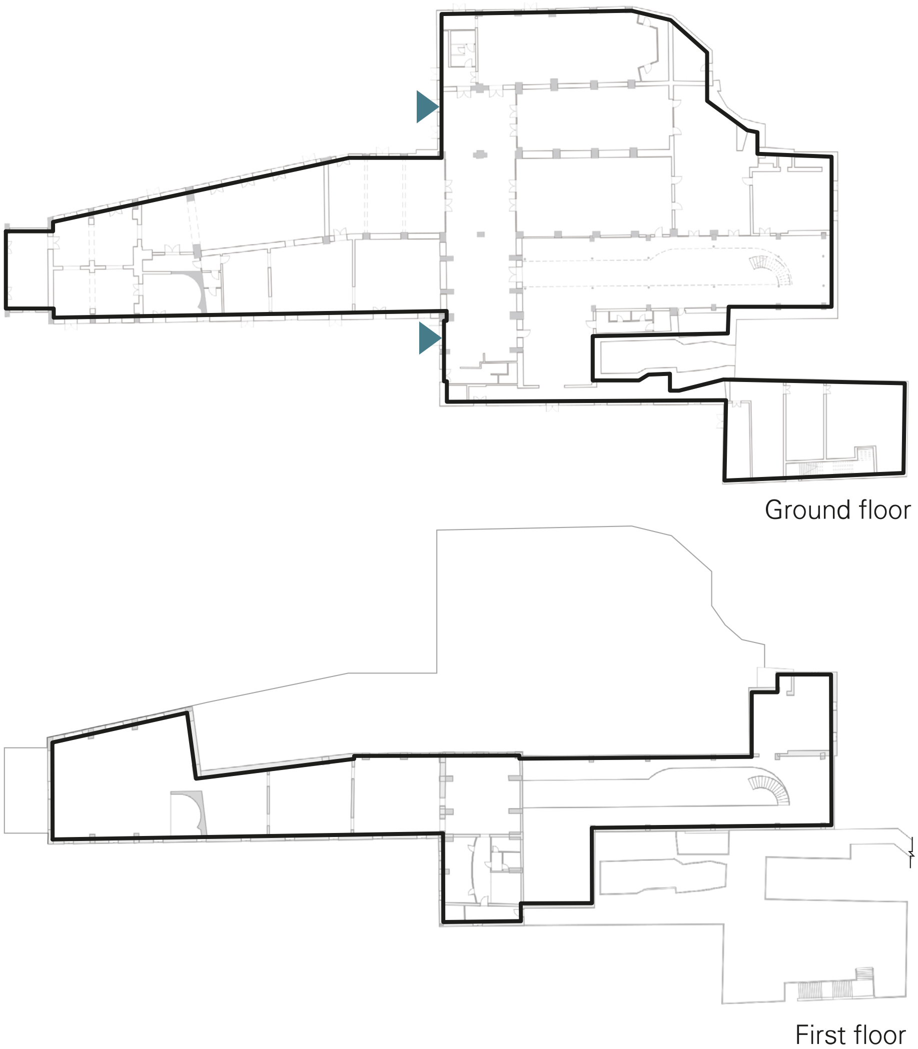


Figure 71. Building G- Building layout diagram.

Step Two- Subtraction value (S)

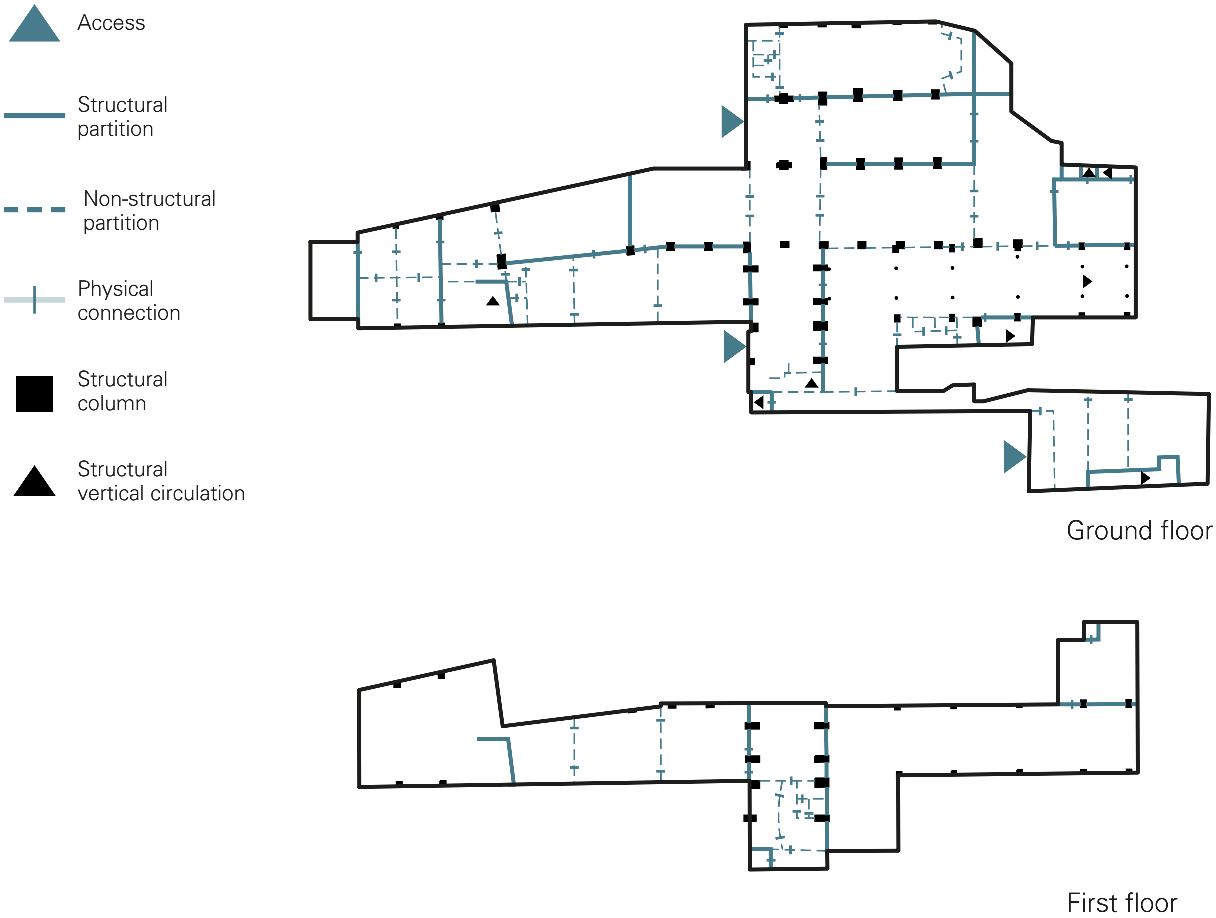


Figure 72. Building G- Subtraction diagram.

Summary of areas

332,80 m²	130,80 m²	34,56 m²	543,30 m²

Structural elements (P)

P=498,16 m²

Non-structural elements (N)

N=543,30 m²

Total architectural elements (T)

T=P+N   T= 1.041,46 m²

Subtraction Value (S)

$$S=\frac{N}{T}$$

$$S=\frac{543{,}30\ m^2}{1.041{,}46\ m^2}$$

S= 0,52

Step Three- Addition value (D)

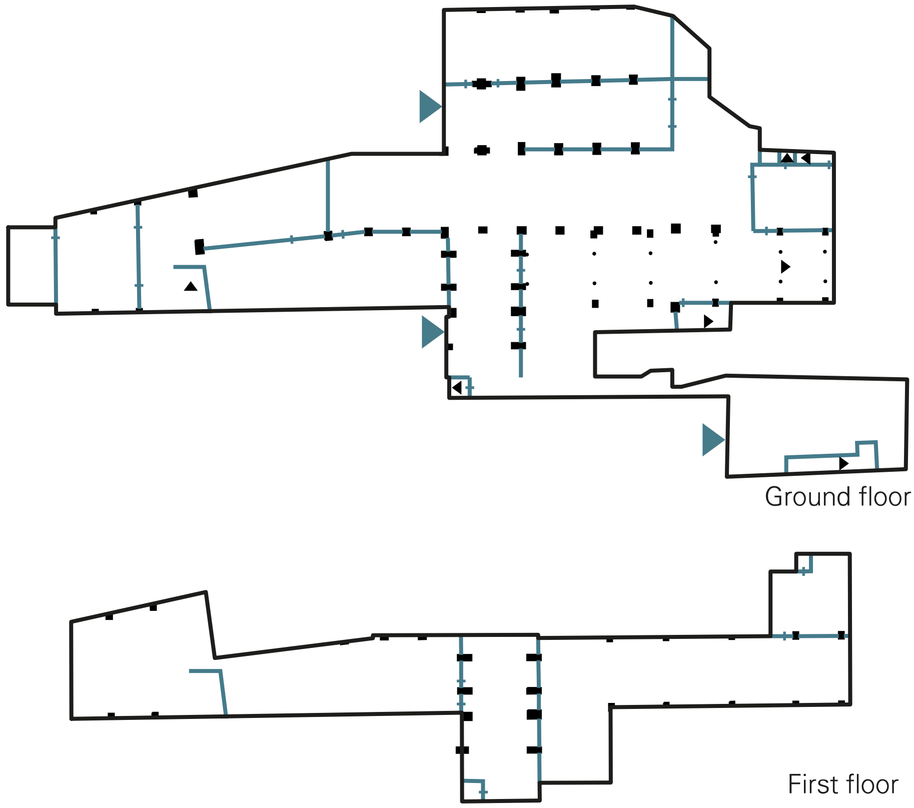
Access

Structural partition

Physical connection

Structural column

Structural vertical circulation



100. Comune di Terni. *Regolamento Edilizio.* Terni; 2015. p.26. According to local regulations, the height of the space to build a mezzanine must be a minimum of 4,50 m.

Figure 73. Building G- Addition diagram.

Summary of areas

Structural partition: 332,80 m²

Structural vertical circulation: 130,80 m²

Structural column: 34,56 m²

Structural elements (P)

$P = 498{,}16\ m^2$

Extendable surface [100] (E)

$E = 0$

Area of the levels layout (B)

$B = 9.599\ m^2$

Current available area (G)

$G = B + E - P$

$G = 9.100{,}84\ m^2$

Maximum available area (K)

$K = B + 50\%$

$K = 14.398{,}5\ m^2$

Addition Value (D)

$$D = \frac{G}{K}$$

$$D = \frac{9.100{,}84\ m^2}{14.398{,}5\ m^2}$$

D= 0,63

Step Four- Operation priority

D — Value of addition operations

S — Value of subtraction operations

III — Priority value

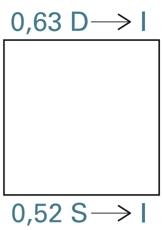


Figure 74. Building G- Operation priority.

Step Five- Flexibility calculation

$$F = \frac{(0{,}63 \times 1) + (0{,}52 \times 1)}{(1 + 1)}$$

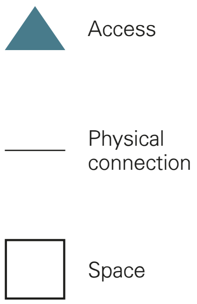
$$F = \frac{1{,}15}{2} \qquad F = 0{,}58 \times 100$$

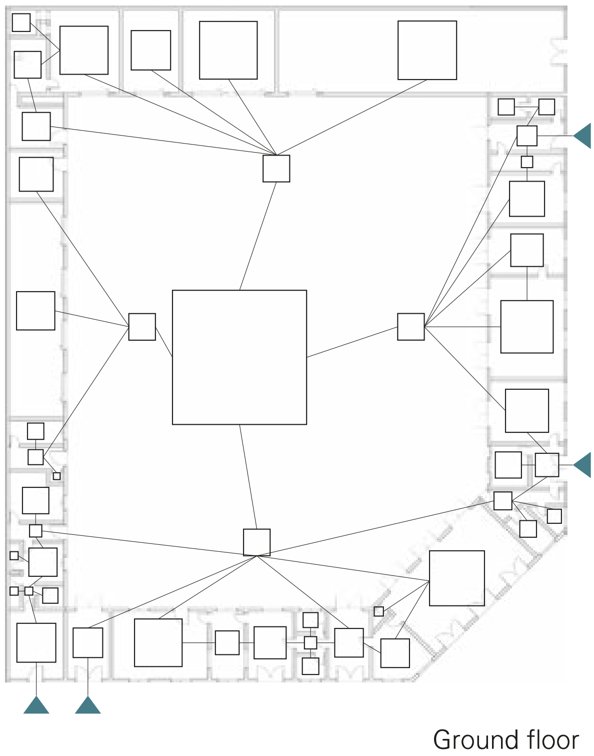
$$\boxed{\mathbf{F=}\ 58\%}$$

6.6 Factory Grisù

Adaptability

Step One- Spatial organization diagram





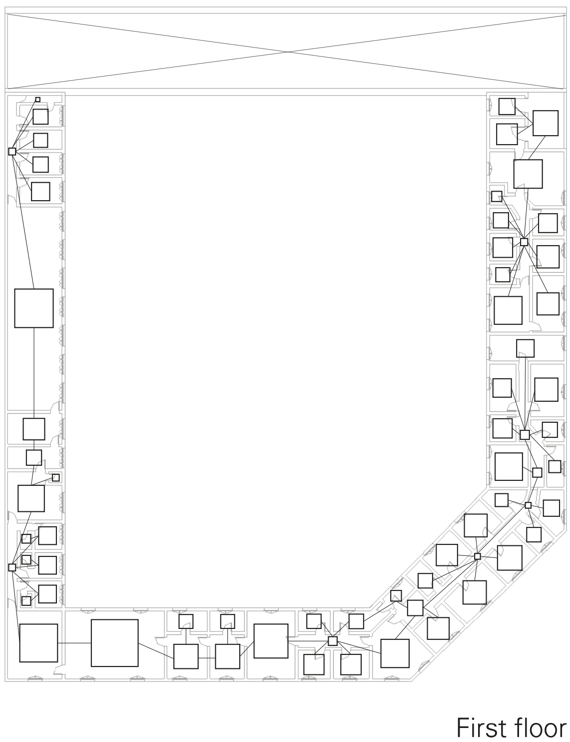


Figure 75. Factory Grisù- Building layout diagram.

Step Two- Restricted spaces diagram

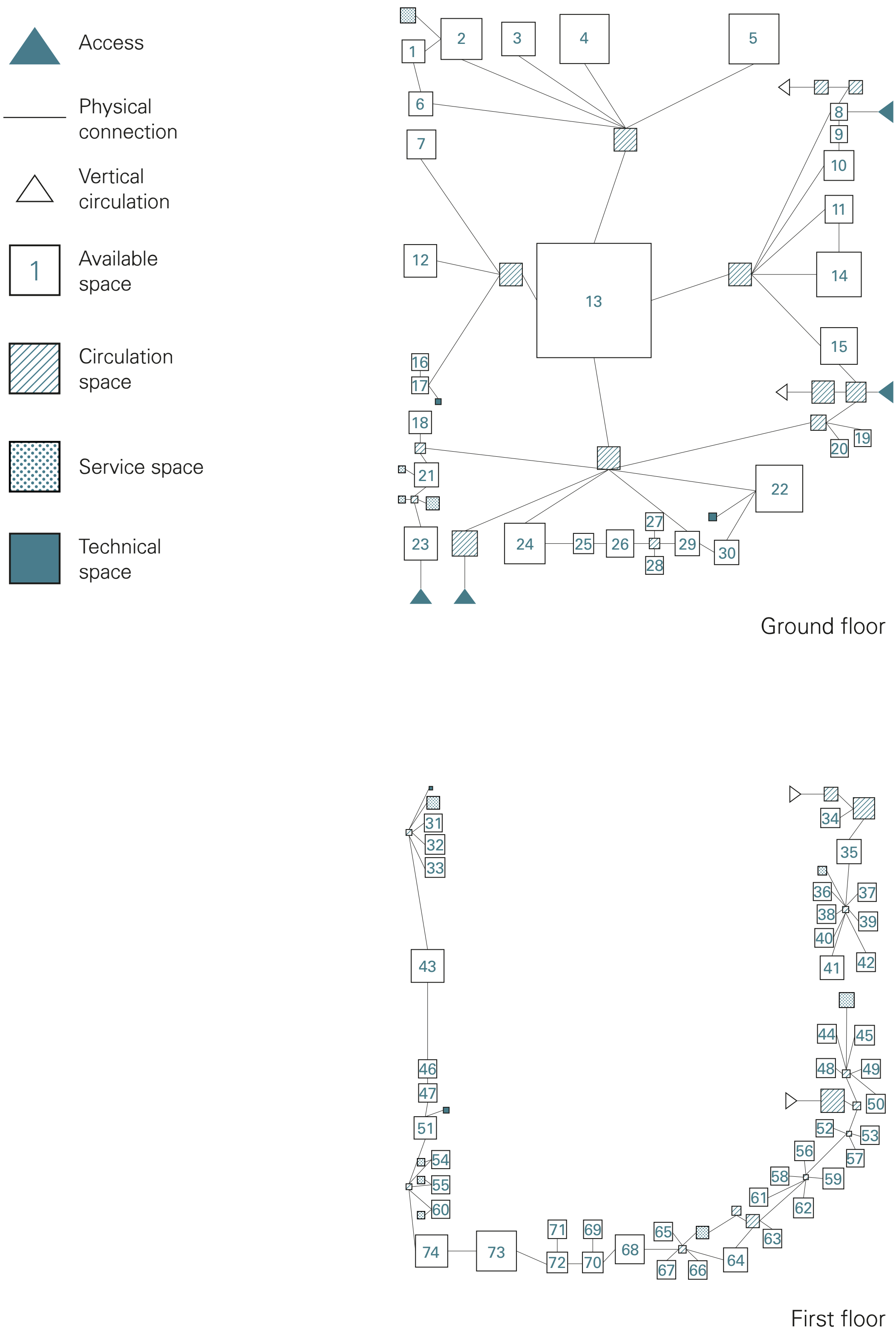


Figure 76. Factory Grisù- Restricted spaces diagram.

Step Three- Incompatibility chart

1 Available space

Physical incompatibility

Technical incompatibility

Ambiental incompatibility

A Events room

B Meeting room

C Coffee bar

D Restaurant

E Office

Available space	Physical incompatibility	Technical incompatibility	Ambiental incompatibility
1	A,B,C,D		D
2	A,C,D		
3	A,C,D		
4	A,C		
5	B,E		
6	A,C,D		
7	A,C,D		
8	A,B,C,D,E		
9	A,B,C,D,E		
10	A,C,D		
11	A,C,D		
12			
13			C,D,E
14	B,C		
15	A,C,D		
16	A,B,C,D,E		
17	A,B,C,D,E		
18	A,C,D		
19	A,C,D		
20	A,C,D		
21	A,B,C,D		
22	B		
23	A,C,D		
24	B,D		
25	A,C,D		
26	A,C,D		
27	A,C,D,E		
28	A,B,C,D,E		
29	A,B,C,D		
30	A,B,C,D		
31	A,B,C,D		
32	A,B,C,D		
33	A,B,C,D		
34	A,B,C,D		E
35	A,C,D		
36	A,B,C,D		
37	A,B,D		

Figure 77-A. Factory Grisù- Incompatibility chart

1 Available space

Physical incompatibility

Technical incompatibility

Ambiental incompatibility

Events room A

Meeting room B

Coffee bar C

Restaurant D

Office E

Available space	Physical incompatibility	Technical incompatibility	Ambiental incompatibility
38	A ,C,D		
39	A,C,D		
40	A,B,C,D		
41	A,C,D		
42	A,C,D		
43	B		
44	A,C,D		
45	A,C,D		
46	A,C,D		
47	A,B,C,D		
48	A,C,D		
49	A,C,D		
50	A,B,C,D		
51	A,C,D		
52	A,B,C,D		
53	A,C,D		
54	A,C,		E
55	A,C,D		
56	A,C,D		
57	A,C,D		
58	A,C,D		
59	A,C,D		
60	A,C,D		
61	A,C,D		
62	A,C,D		
63	A,C,D		
64	A,C,D		
65	A,C,D		
66	A,C,D		
67	A,C,D		
68	A,C,D		
69	A,C,D		
70	A,C,D		
71	A,C,D		
72	A,C,D		
73	B,C,D		
74	A,B,C,D		

Figure 77-B. Factory Grisù- Incompatibility chart.

Step Four- Usage priority

1 N — Number of spaces compatible with function N

1 □ — Number of total available spaces

III — Priority value

8	A	→ II
47	B	→ III
5	C	→ I
6	D	→ I
64	E	→ III
74		

Figure 78. Factory Grisù- Usage priority.

Step Five- Adaptability calculation

$$C= \frac{(8 \times 2) + (47 \times 3) + (5 \times 1) + (6 \times 1) + (64 \times 3)}{(2 + 3 + 1 + 1 + 3)}$$

$$C= \frac{360}{10} \qquad C= 36$$

$$M= 74$$

$$A= \frac{C}{M} \qquad A= \frac{36}{74} \qquad A= 0{,}49 \times 100$$

$$\boxed{\mathbf{A}= 49\%}$$

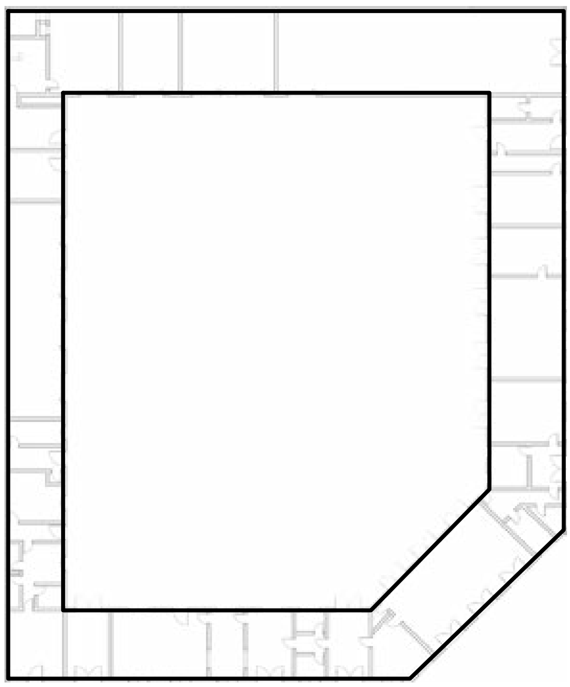
Factory Grisù

Flexibility

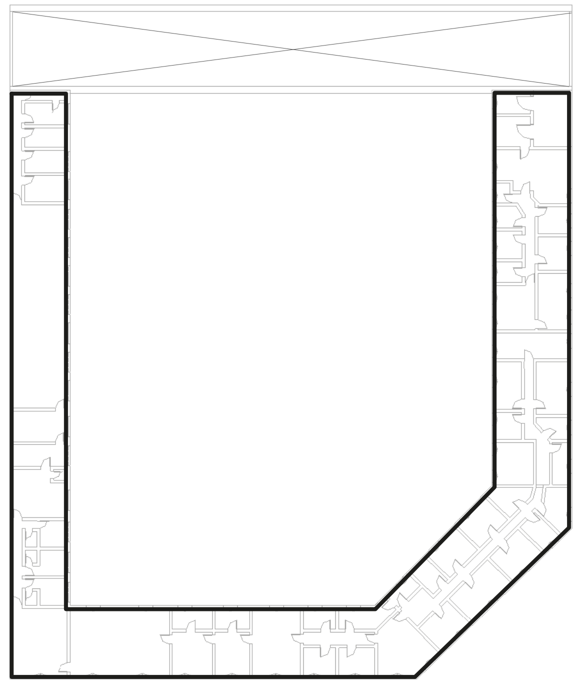
Step One- Building layout diagram

Access

Level layout



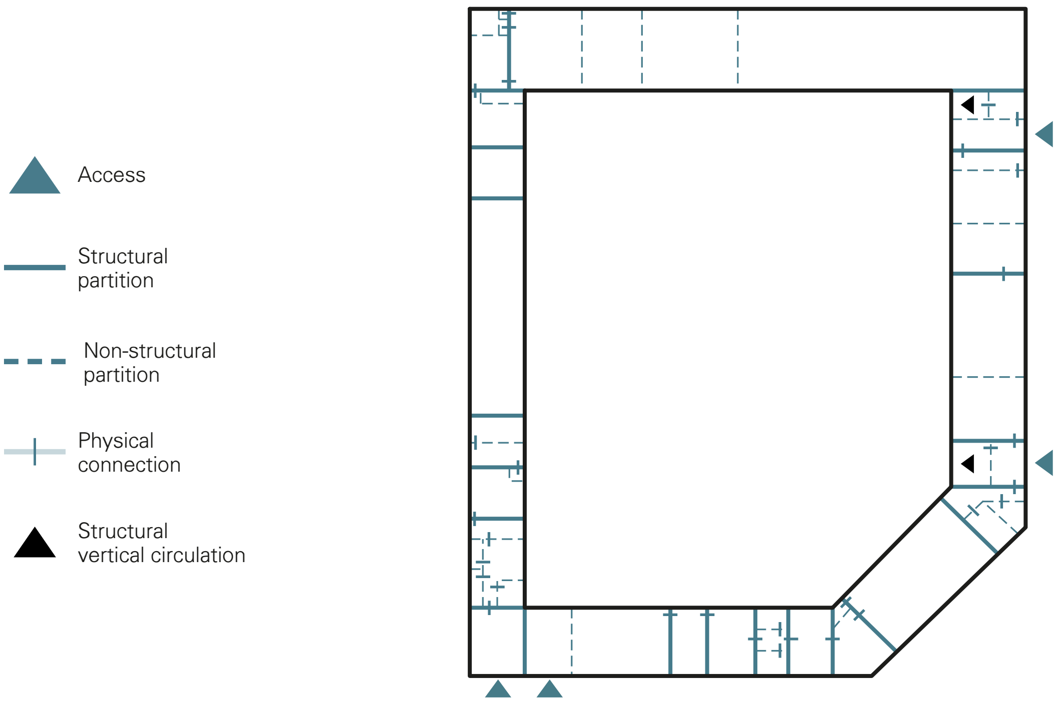
Ground floor



First floor

Figure 79. Factory Grisù- Building layout diagram

Step Two- Subtraction value (S)



Ground floor

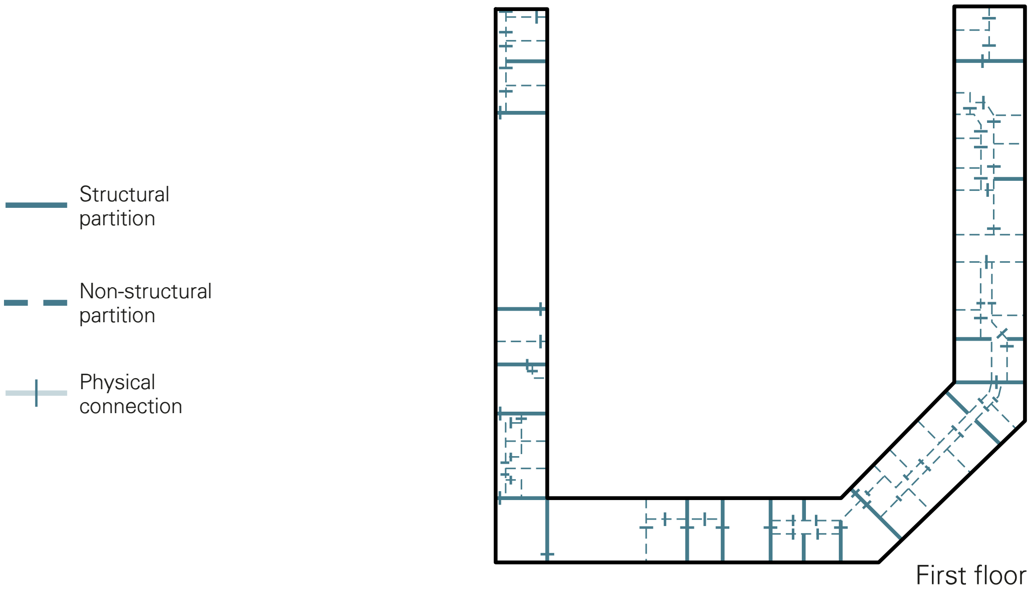


Figure 80. Factory Grisù- Subtraction diagram.

Summary of areas

68,70 m² 59,6 m² 114,77 m²

Structural elements (P)

P= 128,30 m²

Non-structural elements (N)

N= 114,77 m²

Total architectural elements (T)

T= P+N T= 243,07 m²

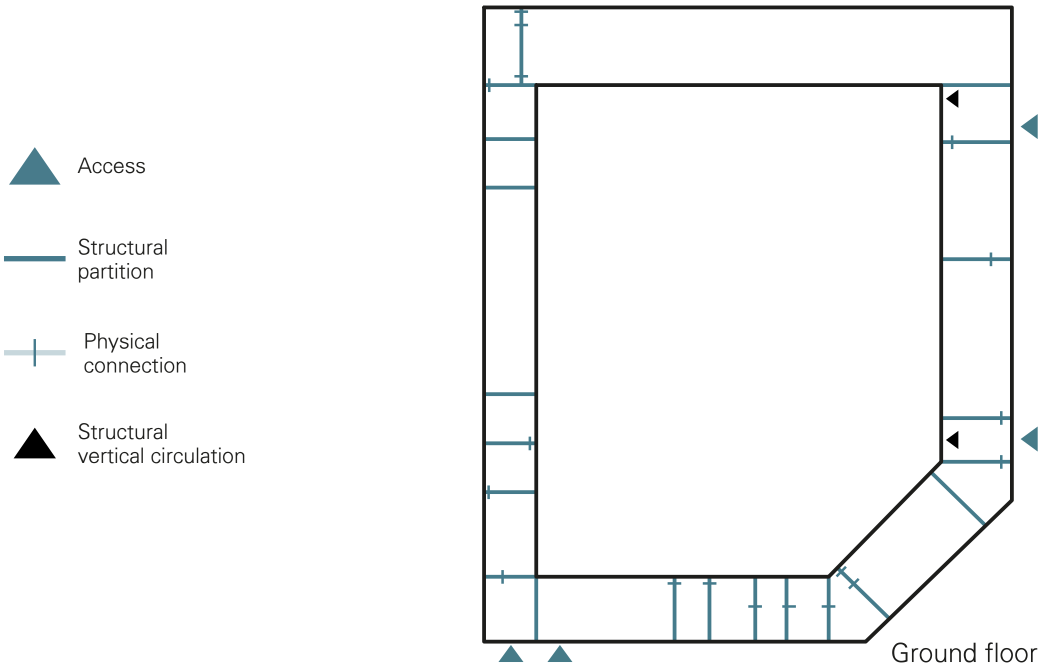
Subtraction Value (S)

$$S = \frac{N}{T}$$

$$S = \frac{114{,}77\ m^2}{243{,}07\ m^2}$$

S= 0,47

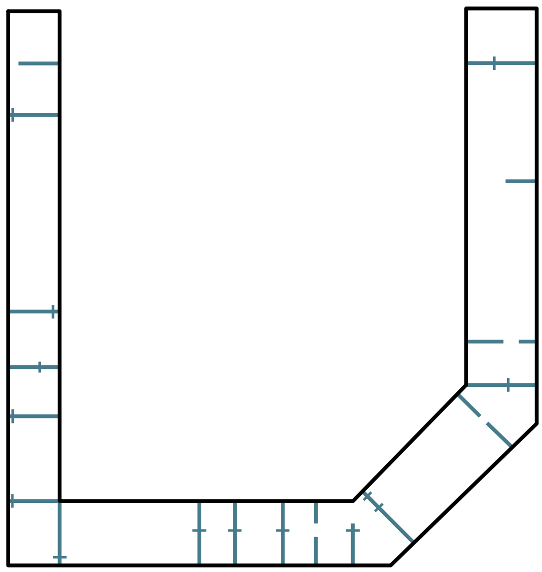
Step Three- Addition value (D)



Structural partition

Physical connection

101. Comune di Ferrara. *Regolamento Urbanistico Edilizio.* Ferrara; 2013. p.6. According to local regulations, the height of the space to build a mezzanine must be a minimum of 4,50 m.



First floor

Figure 81. Factory Grisù- Addition diagram.

Summary of areas

68,70 m² 59,6 m²

Structural elements (P)

P=128,30 m²

Extendable surface [101] (E)

E= 0

Area of the levels layout (B)

B=2.432 m²

Current available area (G)

G=B+E-P

G=2.303,7 m²

Maximum available area (K)

K=B+50%

K=3.648 m²

Addition Value (D)

$$D = \frac{G}{K}$$

$$D = \frac{2.303,7\ m^2}{3.648\ m^2}$$

D= 0,63

D Value of addition operations

S Value of subtraction operations

III Priority value

Step Four- Operation priority

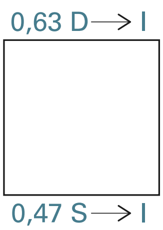


Figure 82. Factory Grisù- Operation priority.

Step Five- Flexibility calculation

$$F = \frac{(0,63 \times 1) + (0,47 \times 1)}{(1 + 1)}$$

$$F = \frac{1,10}{2} \qquad F = 0,55 \times 100$$

F= 55%

6.7 Toolbox coworking

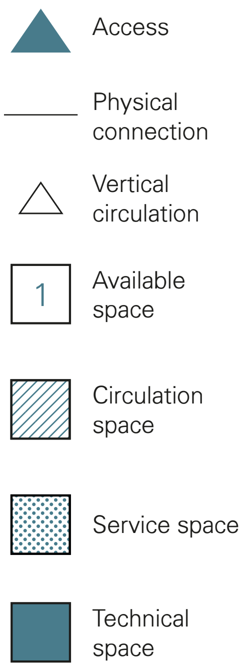
Adaptability

Step One- Spatial organization diagram

Figure 83. Toolbox- Spatial organization diagram.

Ground floor

Step Two- Restricted spaces diagram



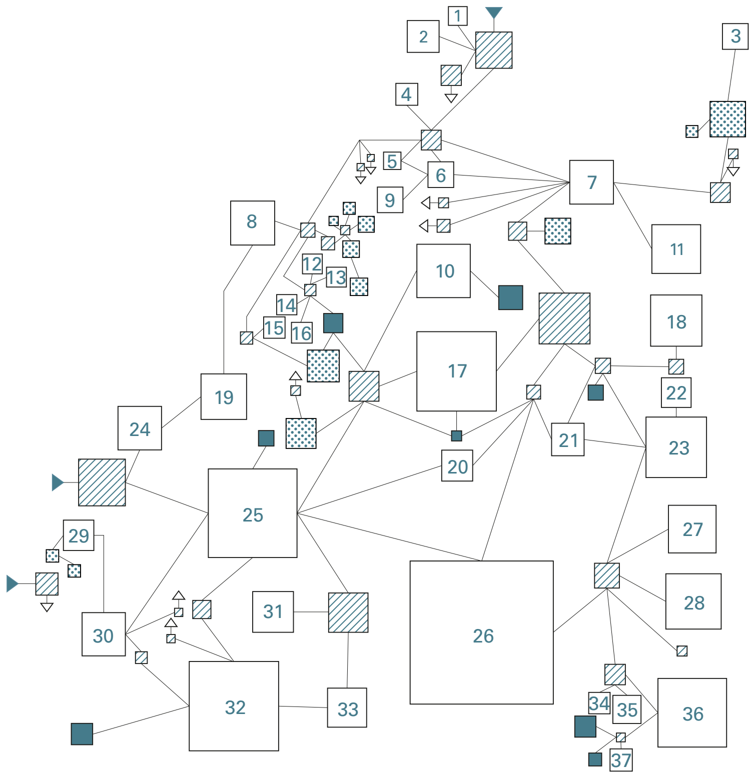


Figure 84. Toolbox- Restricted spaces diagram.

Ground floor

Step Three - Incompatiblity chart

1 Available space

Physical incompatibility

Technical incompatibility

Ambiental incompatibility

A Coworking

B Events room

C Meeting room

D Fablab

E Media room

F Office

Available space	Physical incompatibility	Technical incompatibility	Ambiental incompatibility
1	A,B,D,E		
2	A,B,D,E		
3	D,E		
4	A,B,D		
5	A,B,D,C		A,F
6	A,B,C,D,E		
7	C,E,D		
8	C,E		
9	B,D		
10			
11			
12	A,B,D,E		
13	A,B,D,E		
14	A,B,D,E		
15	A,B,D,E		
16	A,B,D,E		
17	C		
18			
19	C,D		
20	B,D		
21	C,D,E		A,F
22	A,D,E		
23	C		
24	B		
25	C,E		A,F
26	C,E		A,F
27	C		
28	C		
29	B,E		
30	C		
31	B,C		A,F
32	C		
33			A,F
34	A,B,D,E		
35	A,B,D,E		
36	B		
37	A,B,D,E		

Figure 85. Toolbox- Incompatibility chart.

Step Four- Usage priority

1 N Number of spaces compatible with function N

1 Number of total available spaces

III Priority value

18	A	III
18	B	II
22	C	II
17	D	I
18	E	II
31	F	III
37		

Figure 86. Toolbox- Usage priority.

Step Five- Adaptability calculation

$$C=\frac{(18\times 3)+(18\times 2)+(22\times 2)+(17\times 1)+(18\times 3)+(31\times 3)}{(3+2+2+1+2+3)}$$

$$C=\frac{280}{13} \qquad C= 21{,}54 \qquad C= 22$$

$$M= 37$$

$$A=\frac{C}{M} \qquad A=\frac{22}{38} \qquad A= 0{,}59\times 100$$

$$\boxed{\mathbf{A}= 59\%}$$

Toolbox coworking

Flexibility

Step One- Building layout diagram

Access

Level layout

Ground floor

Figure 87. Toolbox- Building layout diagram.

Step Two- Subtraction value (S)

Figure 88. Toolbox- Subtraction diagram.

Summary of areas

23,67 m^2	40,48 m^2	29,71 m^2	185,87 m^2	14,12 m^2

Structural elements (P)

$P = 93{,}86\ m^2$

Non-structural elements (N)

$N = 199{,}99\ m^2$

Total architectural elements (T)

$T = P + N \qquad T = 293{,}85\ m^2$

Subtraction Value (S)

$$S = \frac{N}{T}$$

$$S = \frac{199{,}99\ m^2}{293{,}85\ m^2}$$

S= 0,68

Step Three- Addition value (D)

Access

Structural partition

Physical connection

Area with minimum height to extend surface[93]

Structural column

Structural vertical circulation

50% Percentage[93] allowed for surface extension

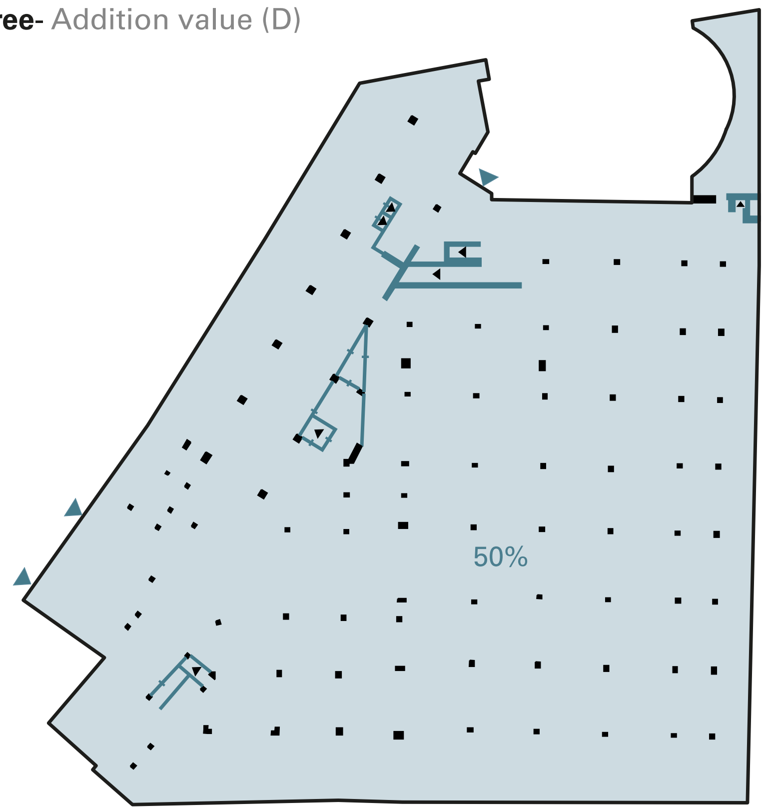


Figure 89. Toolbox- Addition diagram.

Ground floor

93. Città di Torino. *Regolamento Edilizio: Adeguato al Regolamento Tipo Regione Piemonte approvato con D.C.R.* n. 247-45856. Turin; 2017. p.53. According to local regulations, the height of the space to build a mezzanine must be a minimum of 4,40 m.

Summary of areas

23,67 m²   40,48 m²   29,71 m²

Structural elements (P)

$P = 93{,}86\ m^2$

Extendable surface (E)

50%   4.155,14 m²

$E = 2.077{,}5\ m^2$

Area of the levels layout (B)

$B = 4.249\ m^2$

Current available area (G)

$G = B + E - P$

$G = 6.232{,}7\ m^2$

Maximum available area (K)

$K = B + 50\%$

$K = 6.373{,}5\ m^2$

Addition Value (D)

$$D = \frac{G}{K}$$

$$D = \frac{6.232{,}7\ m^2}{6.373{,}5\ m^2}$$

D= 0,98

Step Four- Operation priority

D Value of addition operations

S Value of subtraction operations

III Priority value

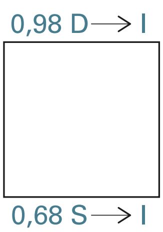


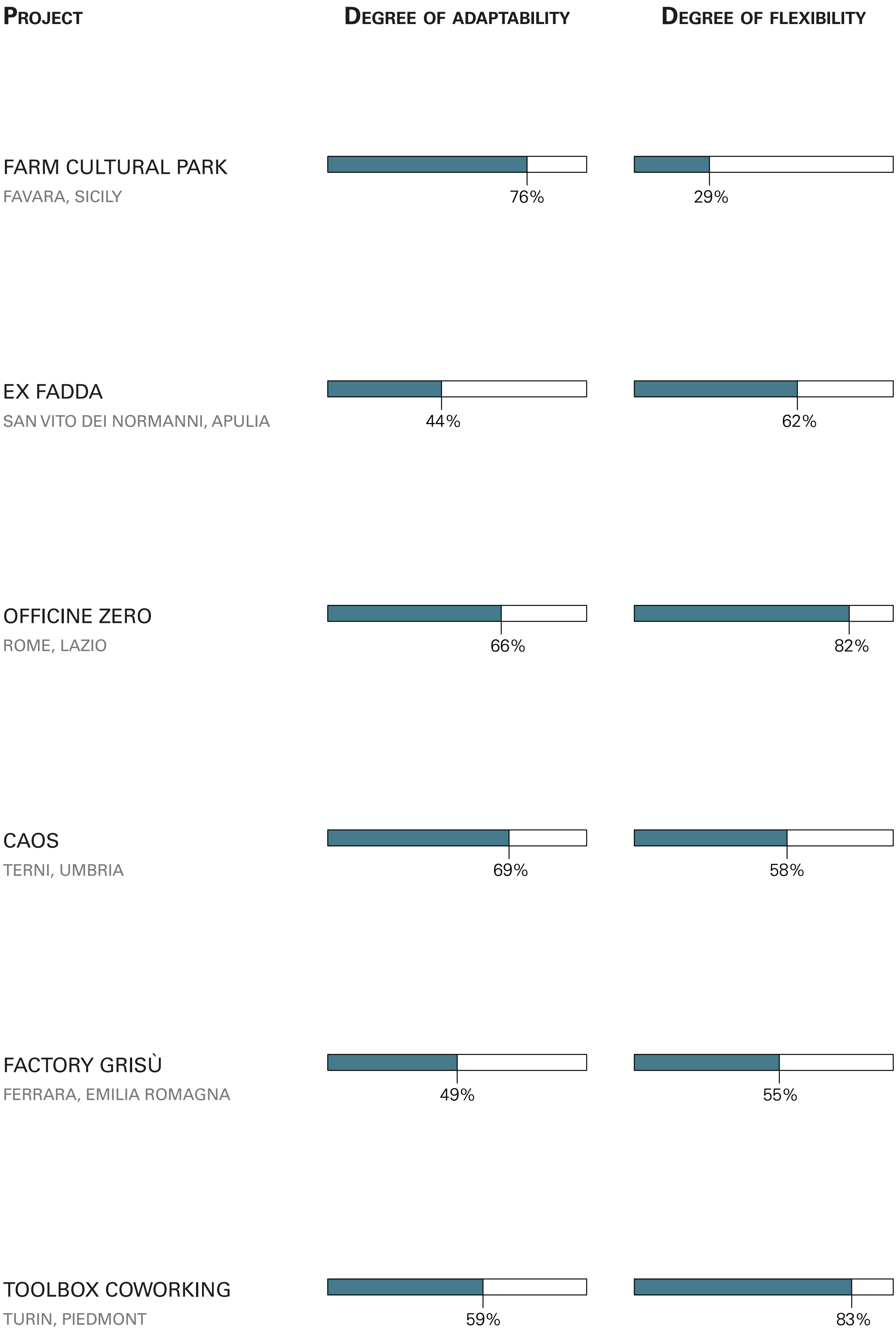
Figure 90. Toolbox- Operation priority.

Step Five- Flexibility calculation

$$F = \frac{(0{,}98 \times 1) + (0{,}68 \times 1)}{(1 + 1)}$$

$$F = \frac{1{,}66}{2} \qquad F = 0{,}83 \times 100$$

$$\boxed{\mathbf{F =}\ 83\%}$$


PROJECT
DEGREE OF ADAPTABILITY
DEGREE OF FLEXIBILITY
FARM CULTURAL PARK
FAVARA, SICILY
76%
29%
EX FADDA
SAN VITO DEI NORMANNI, APULIA
44%
62%
OFFICINE ZERO
ROME, LAZIO
66%
82%
CAOS
TERNI, UMBRIA
69%
58%
FACTORY GRISÙ
FERRARA, EMILIA ROMAGNA
49%
55%
TOOLBOX COWORKING
TURIN, PIEDMONT
59%
83%

6.8 Analysis of results

As explained above, SCP is proposed as an experimental method to analyze and measure certain spatial qualities, specifically adaptability and flexibility, in existing buildings that are presented as prospects for adaptive reuse projects. The objective of this analysis was to try to objectively measure the potential change of space, either in the way in which it could be used (adaptability) or in the way in which it could be physically transformed (flexibility).

However, after having carried out the application of the SCP method in the different cases studies proposed in this study it is important to understand what the results obtained mean and their possible usefulness. For this purpose, it is necessary to first understand these results separately following the concepts and characteristics of adaptability and flexibility, described in the fourth chapter of this study, to subsequently establish the relationship that may exist between them.

Starting with adaptability, the results obtained and expressed in percentages indicate the current average of spaces in the building in which a use could be adapted without altering the space with respect to the total number of spaces available in the building. Therefore, the adaptability value is a reflection of the requirements of each use that is intended to be incorporated into the existing building and its capacity to adapt them without making physical changes in the spaces. In this way, the results obtained do not correspond to any specific pattern nor do they evidence a trend to allow saying that a certain type of building is more adaptable than another. However, what it does allow is to know how adaptable the spaces of a given existing building are to be able to accommodate the new uses chosen and their requirements to carry out an adaptive reuse process. Besides, since the values are within the same reference scale, it is possible to compare which of the buildings has greater or lesser adaptability according to the imposed conditions and thus be able to choose the most suitable building.

On the other hand, concerning flexibility, the results indicate the current average of subtraction and addiction operations of architectural elements that can be performed in the building with respect to the maximum possibility of physical change. Therefore, the value of flexibility is a reflection of the space conditions of each existing building and its ability to transform physically and be adapted to new requirements but without affecting its structural integrity. In this way, the results obtained do not present a specific relationship with each of the uses that are intended to be incorporated, but it does represent how much space could physically change to adapt new uses. In this case, the values do represent a direct relationship with the typology of the building, since as expected from the beginning of the study, the existing industrial buildings (Officine Zero, Toolbox, Ex Fadda and CAOS) in general terms are those that present a greater possibility of physical change and therefore of flexibility to adapt new uses, compared for example to residential buildings (Farm Cultural Park) or institutional type (Factory Grisù) that in general have a lower degree of flexibility.

Also, as with adaptability, since the values are referenced under the same scale it is possible to compare the flexibility between buildings of different types or even of the same type and thus choose the most suitable building for the adaptive reuse process.

However, it is considered necessary to understand that because this study is proposing a new metric concerning the adaptability and flexibility of a given building, there is currently no reference value that allows establishing from what percentage is considered a degree of adaptability or high, medium or low flexibility. For this, it would be necessary to conduct a much broader study, including more studies of existing buildings that are currently in disuse or underused, allowing a much more extensive database to be established to determine a clearer frame of reference. However, at the moment it is possible to use this method to make the comparison between the spatial qualities of a series of buildings and choose the one that best suits the needs and requirements established by the stakeholders in the adaptive reuse project.

In addition, after the study conducted it is possible to say that both the adaptability and the flexibility of the space are qualities that must be analyzed together because one necessarily influences the other. The adaptability reflects on how the current spatial conditions of the building would allow accommodating certain uses with its already established requirements, and the flexibility reflects how these conditions can physically change to adapt to said need. Consequently, it is considered that a high value of flexibility can certainly influence a low value of adaptability obtained by increasing it to meet the new requirements. On the other hand, if a satisfactory adaptability value is initially obtained, it could be thought that the building in its current conditions allows new uses to be adapted without the need for physical interventions, and therefore reducing transformation costs considerably. And if in any case, both values were high enough it would mean that the conditions of that building are adequate to meet current needs but could also be adapted over time to meet new needs in the future.

All this study has been carried out to propose a more objective way to evaluate the space in an existing building and determine whether based on this criterion an adaptive reuse process could be developed successfully or not. However, it will certainly require more research and applications of the method so that it can truly become a support instrument for sustainable urban development.

CONCLUSIONS

7.1 Spatial qualities for adaptive reuse projects

This research aimed to propose an experimental method for the analysis of spatial qualities in existing buildings for considering adaptive reuse processes. More specifically, this study focused on defining a way to assess, qualitatively and quantitatively, the adaptability and flexibility of the space in existing buildings to be able to incorporate new uses and meet new requirements. This method was intended as a support for decision-making in this type of project based on a more objective analysis process. But within which the particular needs and personal judgments of interested parties are also taken into account.

The development of this evaluation allowed understanding how, in the case of adaptive reuse projects, not only social and economic factors are fundamental to the success of this type of process, but also the particular spatial qualities of each building influence the way in which these can respond and adapt successfully to new uses and needs. In this sense, reflecting particularly on the adaptability and flexibility of the space, it could be determined how adequate a building is to meet the requirements established in the reuse project. All these factors as a whole are determining to assess the feasibility of the adaptive reuse project.

To demonstrate this, the SCP method was applied in different adaptive reuse projects in Italy, which although they are cases of a transformation already carried out, represent a base sample to analyze the spatial qualities in existing buildings. The final results obtained through its application allow knowing the degree of adaptability that a building has to accommodate certain uses without physically altering the space, and also allow to know the degree of flexibility with which the same building could be physically transformed to adapt to new needs but preserving its structural integrity.

Although the value of adaptability is very variable and is influenced by the specific needs of each project and the value of flexibility represents the existing conditions of the space to be transformed, both qualities must be considered together as the potential of the space to change and be adjusted to new requirements. In this sense, the value of flexibility could influence to modify the value of adaptability once the transformation project has been carried out, or on the contrary, the value of adaptability could influence the type and degree of physical intervention that should be performed in the building.

The reference to establish when a value of adaptability or flexibility is low, medium or high could not be determined in this study, since for this purpose a much wider investigation should be carried out with the analysis of more case studies to form a solid basis to define a reference scale. However, the values obtained allow comparing the spatial qualities of a series of buildings to choose which one would best suit the purposes of the adaptive reuse project.

Aside from the difficulty to define a reference scale of the results obtained in the analysis. It is necessary to consider that the proposed method has other limitations in the analysis of spatial qualities in adaptive reuse projects, starting with the fact that only existing buildings were considered as the analysis unit when these projects are based on reusing all the components of the urban built environment that have lost the function they were designed for. Thus, unused infrastructures and sites should also be analyzed to assess the possibility to conduct an adaptive reuse process.

On the other hand, based on the definitions of adaptive reuse presented at the beginning of this study, it was established that the type of transformations that would be carried out would involve a minimal but transformative intervention of the space where a balance between preservation and innovation was sought. In this way and to limit the scope of the analysis, a position of not intervening in the skin or the existing structure of the building was assumed because they were considered as larger interventions that did not follow the adaptive condition of this type of process. The rest of the layers of the building were considered as a subject of intervention.

However, under real conditions, both the skin and the structure could suffer interventions to a greater or lesser extent to respond to the proposed needs and requirements. Therefore, to clarify the scope of the project transformation, a generalized discussion should be proposed on the type of elements that may or may not be intervened under the concept of adaptive reuse. Otherwise, there is a risk that the project acquires characteristics of a remodeling or restoration process.

Finally, it must be considered that to develop each of the steps in the analysis of adaptability and flexibility, sufficient planimetric information is required in which it can be understood the different architectural qualities of the building to be reused. A condition that could limit the application of the method, since many of the buildings that are currently in disuse in the city were built many years ago and the information about them is very limited. Accordingly, a first project would have to be carried out to reconstruct and complete the necessary information of the building, representing a greater duration and investment of resources in the project.

However, despite all these limitations, this method is proposed as an attempt to analyze from the architecture, the adaptive reuse process of existing structures in the urban context and understand the conditions to ensure the success of this type of projects. This has the aim of creating more urban qualities and more spaces where people can live and work, but considering the efficient use of the resources of the built environment for promoting sustainable urban development.

A clear understanding of the conditions for a successful adaptive reuse process of current urban structures would allow us to understand how new buildings, infrastructure and places to be developed in the future can be thought from the beginning to be adapted to the changing social, economic and environmental dynamics. For this, it should be considered that, on the one hand, the spaces should be able to respond to the possibility of hosting different uses over time without a specific functional assignment and, on the other hand, that the structural system and internal divisions should be as flexible as possible and open to future transformations without compromise the quality of the space.

7.2 Future research

Reflecting on adaptive reuse requires a conscious analysis of the characteristics, virtues, and limitations of this process from different disciplines. This thesis aimed for analyzing these conditions from the field of architecture, for which an experimental method was proposed to assess the flexibility and adaptability of the space to transform and adapt an existing building to new requirements and needs. This method is an attempt to motivate the analysis of adaptive reuse projects in a more structured way. However, it is recognized the limitations that may exist when applying this method in existing buildings, as well as it is understood that further development and research is still needed so that it can be considered as a tool that can help to promote the sustainable urban development. This study then becomes a provocation to reflect on the conditions that allow the success of an adaptive reuse project, which although they are considered to depend mostly on social and economic factors, it could be proposed from architecture an interesting discussion to better understand this phenomenon.

Adaptive reuse still has a broad spectrum of research, which is why future and innovative research is encouraged to explore new or better ways to analyze adaptive reuse in contemporary cities from architecture. In this way, the experimental method proposed in this thesis supposes a contribution to this exploration, a contribution that could be improved and developed more deeply to help in the collective construction of knowledge.

List of figures

Bibliography

1. Freschi E, Maas M. Conceptual reflections on Adaptive Reuse. In: Freschi E, Maas M. (eds.) *Adaptive Reuse: Aspects of Creativity in South Asian Cultural History.* Wiesbaden: DMG; 2017. p.11-24.

2. Built Environment, as explain by Tom J. Bartuska in *The Built Environment: A Collaborative Inquiry into Design and Planning* (New Yersey, 2017), is 'everything humanly created, modified, or constructed, humanly made, arranged, or maintained.' (p.5)

3. DEH. *Adaptive Reuse: Preserving our past, building our future.* Canberra: DEH; 2004.

4. Robiglio M. *Re-Usa: 20 american stories of adaptive reuse.* Berlin: Jovis verlag GmbH; 2017.

5. United Nations. *The Sustainable Development Agenda.* Available from:https://www.un.org/sustainabledevelopment/development-agenda/ (Accessed 31st July 2019).

6. United Nations. *Goal 11: Make cities inclusive, safe, resilient and sustainable.* Available from: https://www.un.org/sustainable development/cities/ (Accessed 31st July 2019).

7. Baum M. City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p.8-13.

8. Elefante C. *The Greenest Building Is...One That Is Already Built. Forum Journal*. 2007;21(4): 26-38.

9. Douglas J. *Building Adaptation.* Second edition. Abingdon: Spon Press; 2011. p.1,589,590.

10. Wong L. *Adaptive Reuse: Extending the lives of buildings.* Basel: Birckhäuser; 2017.

11. Giebeler G. *Telling Time, The History and Theory of Preservation in America.* New Yersey: Jhon Wiley & Sons; 2006. p.5.

12. Weeks K, Grimmer A. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Building.* Washington: US Dept of the interior; 1995. p.26.

13. Tucker S, Ambrose M. *Embodied energy of dwellings.* In: CSIRO ESD Success Applications Conference.Sydney: N.S.W; 1997.

14. Elsinger A. The Social Value of Transformation. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p.67-72.

15. Bone-Winkel S, Matheis H. The Economic Aspects of Real-Estate Development. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p.82-88.

16. Christiaanse K. Traces of the City as Loft. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p. 14-24.

17. Fox photos. *The Manhattan skyline in New York city, 1955.* Getty Images. Available from: https://www.gettyimages.it/detail/foto/the-big-apple-fotografie-stock/JB4031-001. (Accessed 2nd August 2019).

18. Zukin S. *Loft Living: Culture and Capital in Urban Change.* Baltimore: Johns Hopkins University Press; 1982.

19. New York City Market Analysis. *1943 Profile of the Battery Park, Manhattan area.* New York: New York Times et al.; 1943.

20. Miller J. *Change is the Constant in a Century of New York City Real Estate.* Available from: https://www.millersamuel.com/files/2012/10/DE100yearsNYC.pdf (Accessed 2nd August 2019).

21. Smith R. *Rauschenberg, Before Fame Struck.* The New York Times (internet). 2014 (Cited 2nd August 2019). Available from: https://www.nytimes.com/2014/05/09/arts/design/rauschenberg-before-fame-struck.html

22. Grant A. *Dead End Artist.* Available from: https://artsandculture.google.com/asset/dead-end-artist/ (Accessed 2nd August 2019).

23. Robert Rauschenberg Foundation. *Untitled (Cy with his artwork, Rauschenberg's Fulton Street Studio)*. Available from: https://www.rauschenberg foundation. org/art/artwork/ (Accessed 2nd August 2019).

24. Jackson K. Robert Moses and the Rise of New York: The Power Broker in Perspective. In: Ballon H, Jackson K. (eds.) *Robert Moses and the Modern City: The Transformation of New York.* New York: W. W. Norton & Company; 2008. p. 67-71.

25. Jacobs J. *The Death and Life of Great American Cities.* New York: Vintage Books; 1992.

26. European Investment Bank. *The EIB Circular Economy Guide: supporting the circular transition.* Luxembourg: EIB; 2018.

27. Aitchison M. Industrial Architecture Past and Present. In: Aitchison M (ed.)*The Architecture of Industry: Changing Paradigms in Industrial Building and Planning.* Abingdon: Routledge; 2016. p. 1-8.

28. Bury T. *Liverpool Crown Street station looking east in 1831.* Available from: http://www.disused-stations.org.uk/l/liverpool_crown_street/ (Accessed 5th August 2019).

29. IIC. *Cromford Mills, the conservation of 'Building 17'.* Available from: https://www.iiconservation.org/node/4601 (Accessed 5th August 2019).

30. Glynn R. *Fun Palace, Cedric Price.* Available from: http://www.interactivearchitecture.org/fun-palace-cedric-price.html (Accessed 5th August 2019).

31. Tesei A. *L'Italia che cade a pezzi.* La Stampa (internet). 2019 (Cited 25th August 2019). Available from: https://www.lastampa.it/tuttogreen/2019/06/16/news/l-italia-che-cade-a-pezzi-1.36541540

32. Lami I. M. *Abandoned Buildings in Contemporary Cities: Smart Conditions for Actions.* Cham, Switzerland: Springer Nature; *Forthcoming.*

33. Visit Agrigento. *Farm Cultural Park.* Available from: https://web.archive.org/web/20130113021940/http://www.visitagrigento.it/da-vedere/musei/item/116-farm-cultural-park-favara-ag.html (Accessed 21st June 2019).

34. Palumbo M. *Farm Cultural Park.* Domus. 2016 (Cited 21st June 2019). Available from: https://www.domusweb.it/it/architettura/2016/07/20/farm_cultural_park_favara.html

35. Visit Sicily. *Farm Cultural Park di Favara.* Available from: http://www.visitsicily.info/en/farm-cultural-park-di-favara/ (Accessed 21st June 2019).

36. Marrazzo D. *A Favara una realtà unica tra arte e riqualificazione.* Available from: https://www.ilsole24ore.com/art/burocrazia-e-permessi-rischiano-bloccare-farm-cultural-park-favara-AEPE5NAC (Accessed 5th August 2019).

37. Guarneri G. *Scuola di architettura per bambini.* Available from: https://www.domusweb.it/it/architettura/2016/07/20/farm_cultural_park_favara.html (Accessed 5th August 2019).

38. Farm Cultural Park. *Place.* Available from: https://www.farmculturalpark.com/place.html (Accessed 5th August 2019).

39. La Scuola di Bollenti Spiriti. *ExFadda.* Available from: http://www.lascuoladibollentispiriti.it/project-work/exfadda (Accessed 21st June 2019).

40. Archinà A. *ExFadda: innovazione culturale formato comunità.* Il Giornale delle Fondazioni (internet). 2015 (Cited 21st June 2019). Available from: http://www.ilgiornaledellefondazioni.com/content/exfadda-innovazione-culturale-formato-comunit%C3%A0

41. Agenda Urbana. *Laboratorio Urbano Exfadda.* Available from: https://community.agendaurbana.it/sites/community.ifel.it/files/attachments/Laboratorio%20Urbano%20ExFadda.pdf (Accessed 21st June 2019).

42. Senza collone news. *Exfadda.* Available from: https://www.senzacolonnenews.it/cronaca/item/da-grande-saro-un-teatro-dallex-fadda-uno-dei-progetti-selezionati-dal-bando-nazionale-culturability.html (Accessed 5th August 2019).

43. ExFadda. *Antigua.* Available from: http://www.exfadda.it/antigua/ (Accessed 5th August 2019).

44. ExFadda. *Exfadda: Laboratorio urbano.* Available from:http://www.exfadda.it/ (Accessed 5th August 2019).

45. ExFadda. *Annual events.* Available from: https://www.facebook.com/pg/exfadda/events/?ref=page_internal (Accessed 5th August 2019).

46. Gennaro A. *Roma, dal fallimento RSI alla cessione dell'area. I lavoratori delle 'Officine zero' a rischio sgombero.* Il Fatto Quotidiano (internet). 2018 (Cited 21st June 2019). Available from: https://www.ilfattoquotidiano.it/2018/07/08/roma-dal-fallimento-rsi-alla-cessione-dellarea-i-lavoratori-delle-officine-zero-a-rischio-sgombero-si-faccia-chiarezza/4458855/

47. Veli S. *Officine Zero sotto attacco.* Il Manifesto (internet). 2018 (Cited 21st June 2019). Available from: https://ilmanifesto.it/officine-zero-sotto-attacco/

48. Officine Zero. *Dossier september 2017.* Rome; 2017.

49. Santini G. *La sfida di Officine Zero: lavoro, rigenerazione e innovazione.* Available from: https://www.labsus.org/2017/02/la-sfida-di-officine-zero-lavoro-rigenerazione-e-innovazione/ (Accessed 5th August 2019).

50. Officine Zero. *Annual events.* Available from: https://www.facebook.com/pg/OzOfficineZero/events/?ref=page_internal (Accessed 5th August 2019).

51. CAOS. *Chi Siamo.* Available from: http://www.caos.museum/chi-siamo/ (Accessed 20th June 2019).

52. CAOS. *Come era*. Available from: http://www.caos.museum/chi-siamo/come-era/ (Accessed 20th June 2019).

53. La notizia quotidiana. *Caos terni*. Available from: https://www.lanotiziaquotidiana.it/umbria/2019/07/11/terni-va-deserta-lasta-per-la-gestione-del-caos-scatta-la-polemica/ (Accessed 5th August 2019).

54. Bella Umbria. *Caos, museo.* Available from: http://www.bellaumbria.net/it/musei-e-gallerie-arte/caos-terni/ (Accessed 5th August 2019).

55. Caos. *Annual events*. Available from: https://www.facebook.com/pg/CaosCentroArtiOpificioSiri/events/?ref=page_internal (Accessed 6th August 2019).

56. Emilia Romagna talenti e innovazione. *Consorzio Factory Grisù.* Available from: https://emiliaromagnatalentieinnovazione.aster.it/spazi-giovani/consorzio-factory-grisu (Accessed 19th June 2019).

57. Factory Grisù. *Spazi disponibili*. Available from: https://www.factorygrisu.it/spazio (Accessed 19th June 2019).

58. Stinco G. *Spazio Grisù, a Ferrara nasce la prima factory creativa dell'Emilia Romagna.* Il Fatto Quotidiano (internet). 2013 (Cited 19th June 2019). Available from: https://www.ilfattoquotidiano.it/2013/04/08/spazio-grisu-a-ferrara-nasce-prima-factory-creativa-dellemilia-romagna/554951/.

59. Smau. *Factory Grisù: Progetto di rigenerazione urbana.* Available from: https://www.smau.it/company/exhibitor/detail/factory-grisu/ (Accessed 19th June 2019).

60. Urban center ferrara. *Spazi per il quartiere.* Available from: http://www.urbancenterferrara.it/comunita/le_pratiche/spazi-per-il-quartiere/ (Accessed 5th August 2019).

61. Calanna G. *Un laboratorio nella Factory Grisù.* Available from: https://i1.wp.com/www.lestroverso.it/wp-content/uploads/2017/10/Un-laboratorio-nella-Factory-Grisu%CC%80.jpg?ssl=1 (Accessed 5th August 2019).

62. Toolbox Coworking. *Toolbox: Persone e lavoro da sempre.* Available from: https://www.toolboxoffice.it/soluzioni-e-prezzi/ (Accessed 19th June 2019).

63. Balestra A, Ferrero M. Area OSI OVEST-NORD: Toolbox Coworking. In: Armano E, et al.(eds.) *Postfordismo e trasformazione urbana: Casi di recupero dei vuoti industriali e indicazioni per le politiche nel territorio torinese.* Turin: IRES; 2016. p. 241-266.

64. De Grandi C. *Nuove idee di lavoro e condivisione: il coworking Toolbox di Torino.* Art Wave. 2013 (Cited 19th June 2019). Available from: https://www.artwave.it/architettura/designinterior/nuove-idee-di-lavoro-e-condivisione-il-coworking-toolbox-di-torino/

65. Eutropian. *The Toolbox building.* Available from: https://cooperativecity.org/2018/01/22/toolbox-torino/ (Accessed 5th August 2019).

66. Dreamers Torino. *'Hangar' Toolbox.* Available from: http://www.dreamerstorino.it/info-e-contatti/toolbox/ (Accessed 5th August 2019).

67. Balestra A. Toolbox manager. Personal communication. 13th September 2019.

68. Baum M. It's all about places, people and having a vision. In: Baum M, Christiaanse K. (eds.) *City as Loft: Adaptive Reuse as a Resource for Sustainable Urban Development.* Zurich: gta Verlag, ETH Zurich; 2012. p.355-365.

69. Schmitt G, et al. Urbane Qualität aus Sicht der Ergebnisse des NFP 65. In: Wehrli-Schindler B. *Urbane Qualität für Stadt und Umland: Ein Wegweiser zur Stärkung einer nachhaltigen Raumentwicklung.* Zurich: Scheidegger & Spiess AG; 2015. p. 24-26.

70. Angélil M, et al. Urbane Qualitäten. In: Kretz S, Kueng L. (eds.) *Urbane Qualitäten: Ein Handbuch am Beispiel der Metropolitanregion Zürich.* Zurich: Edition Hochparterre, ETH Zurich; 2016. p. 42-73.

71. Foucault M. Space, Knowledge, and Power. In: Rabinow P. (ed.) *The Foucault Reader.* New York: Pantheon Books; 1984. p. 239-256.

72. Foucault M. *Discipline and Punish: The Birth of the Prison.* New York: Vintage Books; 1995.

73. The Panopticon, as described by Jeremy Bentham in *Proposal for a New and Less Expensive mode of Employing and Reforming Convicts* (London,1787), is basically a type of building arranged in a circular shape that allows the inmates, occupying the circumference, to be observed by an inspector, located in the center of the space.

74. Foucault M. The Confession of the Flesh. In: Gordon C. (ed.) *Power/Knowledge: selected interviews & other writings 1972-1977.* New York: Pantheon Books; 1980. p. 194-228.

75. Agamben G. *What is an apparatus?*. Standford, California: Stanford University Press; 2009.

76. Collins Dictionary (Internet). Glasgow: Harper Collins Publishers; c2019. *Identity*; (cited 2019 Aug 23rd); (about 1 screen). Available from: https://www.collinsdictionary.com/dictionary/english/identity

77. Lynch K. *A Theory of Good City Form.* Cambridge, Massachusetts: The MIT Press; 1981.

78. Lynch K. *The Image of the City.* Cambridge, Massachusetts: The MIT Press; 1990.

79. Ching F. *Architecture: form, space and order.* Third Edition. New Jersey: John Wiley & Sons; 2007.

80. Groák S. *The idea of Building: thought and action in the design and production of buildings.* London: E & FN Spon; 1992.

81. Schneider T, Till J. *Flexible Housing.* Amsterdam (etc.: Elsevier; 2007.

82. Müller G. *Neues Leben für alte Bauten- über den Continuo in der Architektur.* Stuttgart: Koch; 1977.

83. Herztberger H. *Lessons for students in architecture.* Rotterdam: 010 Publishers; 1991.

84. Leupen B. *Polyvalence, a concept for the sustainable dwelling.* Nordic Journal of Architectural Research. 2006; 19(3): 23-31.

85. Leupen B. *Frame and Generic Space: a study into the changeable dwelling proceeding from the permanent.* Rotterdam: 010 Publishers; 2006.

86. Hanson J. *Decoding Homes and Houses.* Cambridge: Cambridge University Press; 1998.

87. Janis R, Tao W. *Mechanical and Electrical Systems in Buildings.* 6th Edition. New York: Pearson; 2018.

88. Explanatory comment.

89. Explanatory comment.

90. Friend J, Allen H. *Planning Under Pressure: The Strategic Choice Approach.* Third Edition. Amsterdam (etc.: Elsevier; 2005.

91. Explanatory comment.

92. Explanatory comment.

93. Città di Torino. *Regolamento Edilizio: Adeguato al Regolamento Tipo Regione Piemonte approvato con D.C.R. n. 247-45856.* Turin; 2017. p.53.

94. Explanatory comment.

95. Explanatory comment.

96. Explanatory comment.

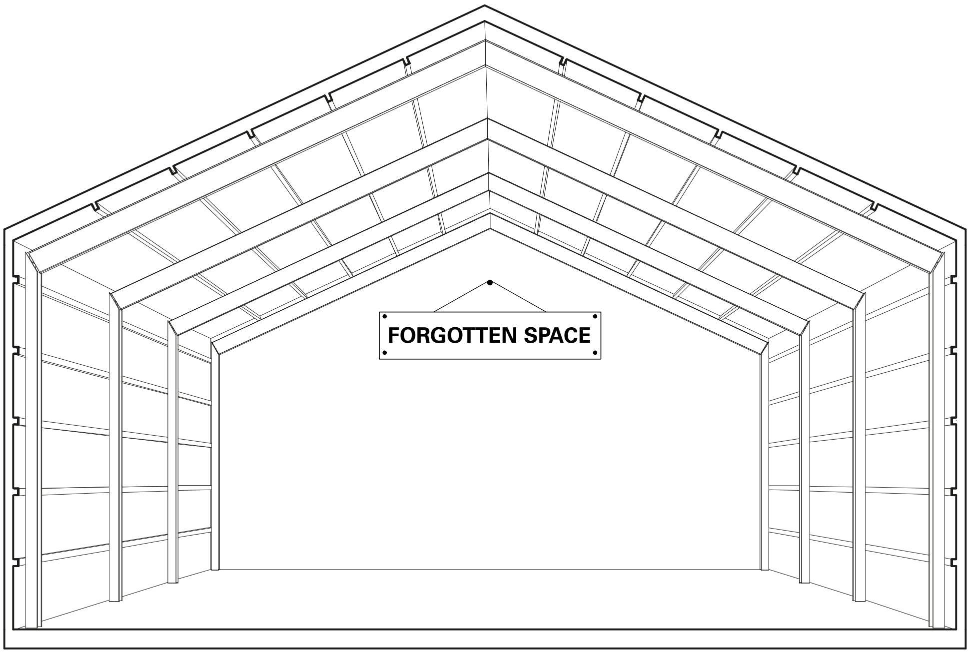
97. Comune di Agrigento. *Regolamento Edilizio Comunale*. Agrigento; 2011. p. 68.

98. Città di San Vito dei Normanni. *Regolamento Edilizio Allegato al P.R.G*. San Vito dei Normanni; 2017. p.68.

99. Città di Roma. *Regolamento Edilizio General del Comune di Roma*. Rome; 1943. p.11.

100. Comune di Terni. *Regolamento Edilizio.* Terni; 2015. p.26.

101. Comune di Ferrara. *Regolamento Urbanistico Edilizio*. Ferrara; 2013. p.6.



Adaptive reuse is a process that currently is part of the discussion about sustainable urban development in contemporary cities. This study aims to determine from architecture the conditions that must be considered to successfully carry out an adaptive reuse project. More specifically, this thesis seeks to answer: How do the spatial qualities of an existing building influence in the successful development of an adaptive reuse process?