

ZERO TYPE

MANUAL AGAINST TYPOLOGICAL STEREOTYPES

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PREFACE

This thesis explores the issue of typological flexibility for an application in the field of modern social housing.

The research work that accompanies this theme is inspired by the work done during the workshop “Final design studio, 2019/2020” with the professor Gennaro Postiglione named as “Affordable Housing Domesticity Reloaded”.¹

Here it will be introduced the key-themes that have supported the research of this thesis work in order to provide the literary background to which it refers.

During the lectures in the studio classroom, supported by a large amount of work done individually, we observed the up-to-date phenomenon of social challenges and of the urgent housing needs created by the profound socio-demographic transformations that have taken place in the West, over the last few decades.

Numerous interventions outside the studio were made by professors or architects interested in the subject and coming from different realities beyond Milan, have provided different study materials and different levels of interpretation on the theme. In addition, the class has been divided into macro themes in order to have a wider range of knowledge than the basic “affordable housing”.

In recent years, we are witnessing deep and wide changes in housing needs more diversified among social profiles and more changeable over time. The causes of these new needs are attributable to socio-economic and socio-demographic changes. The situation of the labour markets imposed more mobility, flexibility and as consequence precariousness. The long global recession and austerity policy, together with a centralization in urban centres with population growth, rising real estate values, low and decreasing housing affordability, have contributed significantly to socio-economic changes. Moreover, there is a deep transformation of traditional family forms: there are more singles, separated and divorced couples, single-parent and recomposed families, and the category of Living Apart Together people. There is also an increase of ageing of population: more persons and more years spent with dependency and disability families. Finally, not to mention, the changing migration patterns with abundant immigration and emigration flows to which they belong economic migration, refugees and asylum seekers.

The consequences are more visible in the research for new housing solutions. There is a preponderant mismatch between the features of existing housing stock and housing needs. Existing constructed heritage does not take into account affordability as minimum distancing, overcrowding of housing solutions and apartments. In addition, during this period when it becomes increasingly necessary to have a working space at home, the risk is of overlapping housing and working functions which makes it more difficult to reconcile them both in one place. In some cases there is a large amount of need to have more than one dwelling at the same time for particular work or family situation.

This has led to the emergence of different housing practices in search of policy support as co-habitation, work from home, liv-in family assistants, renting out part of one's dwelling, pied-à-terre for “family commuting” and so on.

It is therefore necessary to develop new housing solutions in terms of typology, shape, design, equipment, services, management forms, promoters and providers, and as the last the relation with policies.

During the studio all these complex issues have emerged and call for the intertwining of different competences that were declined in as many themes. Among these issues addressed our field of intervention, in a group of six people ² we deepened the theme

[1] - Final design studio 2019/2020, AH 2019 – “AFFORDABLE HOUSING DOMESTICTY RELOADED: Form, Uses, Spaces, Practices and Policy for Contemporary Dwelling”.

Professors: M. Bricocoli, G. Postiglione, S. Sabatinelli. In collaboration with the Research Team “ForDwell-DASTU Dipartimento d’Eccellenza”: G. Caramellino, S. Guidarini, F. Lepratto, S. Pierini, R. Rizzi; and with AIUC School scholars: B. Brollo, A. Carvalho, L. Consalez, E. Fontanella, F. Gotti, M. Jacomella, M. Natri, I. Paoletti; in cooperation with Double Degree programme TU Graz prof. A. Lichtbau.

[2] - Morena Amendolagine, Michela Stamin, Alice Cajelli, Gianluca Guju, Margherita Furia Bonanomi, Enrico Robin.

of typology within the macro theme of housing affordability and how this feature could intervene in the programming of social housing buildings. The “Typological” theme has been addressed by our group as a redefinition of the idea of traditional housing solution, apparently inadequate, in order to have an enlargement of the field of survey to detect new types of habitats that would better answer the needs and expectations of our time against the massive and stereotyped production generated following the Modern Architecture International Congresses³.

In that research it has been explored the notions of type and typology in its various facets, meanings and its heterogeneous interpretations, which aim is to find if today they have still a role in the architectural design. In this context, it is interesting to ask once again the two questions underlined in an issue of *Casabella* dating back to the 1985, which continues to be very current. “Is it still meaningful today to base a new disciplinary certainty on the notion of type? Is it possible today to inaugurate a new common design basis?”⁴

In this “liquid-modern society”⁵ the situations, in which men act change before their ways of acting, are able to consolidate themselves into habits and procedures, the need for a design open to changes is once again emerging.

“Transformation, as a dynamic and fluid concept, must be conceptualized as an absolute value, to guarantee the liveliness, exchange and liveability that are the basis of the very idea of city and architecture”⁶.

Nowadays everything is in constant changing. Bauman⁷ emphasizes that in the modern age everything was given as a solid construction, whereas in our day every aspect of life can be artificially reshaped. Nothing has sharp outlines, defined and fixed once and for all. This can only affect human relations, which have become precarious, as we do not want to feel trapped.

On the contrary, analysing the concept of typology over time, in antithesis to the previously stated concept, the type is primarily understood as “[...] the very idea of architecture; what is closest to its essence. And therefore what, despite every change, has always imposed itself “on sentiment and reason”, like the principle of architecture and the city.”⁸ This statement of Quatremere de Quincy seems to suggest that the typological question can be always actual, nevertheless the circumstances.

The research done during the studio, is proposed based on the theme of type, able to seek a conscious and reasoned answer to the questions previously reported by the magazine *Casabella*. Scenarios were presented based on the study of the type on a large scale, addressing the topic through a collection of materials concerning how the typology has been configured through the centuries and related interpretations from the point of view of architects, scholars and literati, trying to interpret the study they carried out and trying to give our definition through the analysis of some subsequent case studies proposed, bringing the notions back into a kind of monothematic encyclopaedia.

The attempt of that research was to shift the discourse based of the notion of type towards a renewed interest in typological spatiality and its architectural quality. In this sense, the case studies chosen were addressed and analysed from the point of view of their spatial quality.

We cannot therefore speak of type in an absolute, immanent and constant sense, but always with reference to a range, a phase, a spatial and temporal compartment. It can be said that it experiences a double temporality: a synchronicity to its concrete manifestation, in a given place, in a given time; a diachronic, as a sum of similar mutations, in the same place, aimed at modifying the type itself.

Dealing with the theme of typology today means being able to count on a significant theoretical background that can lead to a profound re-discussion of the idea of type, both in its conception of a classification system and as a formal project model.⁹

In today's architecture, the notion of type has turned out to be an autonomous concept from the past classifications, incorporating new aspects of design, based on different qualitative spatial characteristics. The stereotype of the archetype, as a basic model to be copied in a slavish way, is overturned, emphasizing the autonomy aspect of architecture. In this way the type becomes only the moment of reconnection with the classic tradition of the history of architecture, which set reference models.

In this panorama, the use of the typological tool, as understood in the past, appears to be tight to new morphological needs. The aim of the research was therefore to define different conceptions of type in order to try to understand their relationship with contemporary architecture.

Recalling the questions asked in the *Casabella* magazine, mentioned in the introduction of this book, we have to ask ourselves another question now: “Do we need to classify new types?”

With this question the research conducted for the examination of the laboratory is closed and the subject of this thesis is then opened. Looking back over the work carried out, it can be said that this thesis has its roots in a broader research, which starts from a situation of socio-economic change to culminate in the search for a new typology that responds to these needs. In this dynamic landscape, in continuous movement and transformation, it is fitting the introduction of the theme of this thesis, carried out in favour of the search for new housing solutions that have as a matrix the aspiration to a typological flexibility, therefore intrinsic to the very shape of the building.

[3] - *Congrès Internationaux d'Architecture Moderne* or CIAM.

[4] - *Casabella* 509-510, January-February 1985.

[5] - Z. Bauman, *Liquid Modernity*, 2000.

[6] - R. Moneo, *On Typology*, 1978.

[7] - Z. Bauman, *Liquid Modernity*, 2000.

[8] - Q. De Quincy, *Dictionnaire historique de architecture*, 1932, reported in Rossi, A., “*L'architettura della città*”, 1966.

[9] - as asserted by V. Gregotti, in “*I terreni della tipologia*”, *Casabella*, n 509-510, 1985, p. 4-7.

ZERO TYPE

ABSTRACT

This thesis is entitled “*Zero-type: a manual against typological stereotypes*”, and is structured in such a way as to become almost a manual of instructions for the design of residential buildings flexible typologically, through the identification of essential features.

The basic idea is to look for a “**zero**” type, primary, a model that can be followed in the design, that respects the needs of users and that is free from time references, against the stereotypes fixed and stationary, imposed in the past, related to the flexibility and the typology.

The research work that accompanies this thesis is based on the identification of solutions capable of responding to the new housing demands and needs that arise from the socio-economic changes, characterizing the last decades. In particular, we intend to investigate the issue of spatial flexibility from the typological point of view, drawing on the experience of historical nineteenth-century building in order to suggest solutions capable of being resilient over time.

Flexibility in residential construction must be considered as a programmatic, design and management principle, able to ensure the adaptability over time of the building product, also offering an indisputable and valuable quality of housing.

Throughout history, and especially in the nineteenth Century, it was developed in domestic architecture a design strategy characterized by spaces not functionally specialized and interconnected with each other that over time have proven to

have a great versatility of use, able to respond very well to the transformations that the housing demand has been expressing over the past hundred years.

The structure of this thesis includes three parts, two theoretical and one project. Each phase is important as it gives the total work an indispensable support for the success of the whole complex.

The first part explores the notion of flexibility and its different forms which are reflected in the multiplicity of strategies and solutions found in modern and contemporary buildings. A work of **classification** has led to the determination of models of behaviour subject to a comparative reading aimed at the search of the specific design strategies of each category. The four categories of flexibility are: **constructive, technological, functional and typological**.

Among the categories presented there is at the end the typological flexibility, found in a predominant way in the built residential heritage of the nineteenth century, as already introduced by LAN Architecture in the exhibition “*Hausmann’s modele de ville*” through research on Haussmanian Parisian buildings.

At this point the second part of this thesis is developed around the main theme, through the search for all the design characteristics present in nineteenth Century and modern case studies, deeply characterized by a marked and recognizable

typological flexibility.

Through the mapping of different case studies, with the support of literature, the highlighted analytical characters act as a pivotal element for the design.

The **volume** of the spaces is the true fulcrum of typological flexibility, as it allows each space to adapt to different needs, without having to undergo any structural change. Comparing the **modules** and the dimensions of each room and verifying their volume, it is possible to realize how important the design of over-dimensioning can be, both bidimensionally and in the third dimension.

The environments that make up the living spaces need a neutrality of form with respect to use, generating a polyvalence in the way of living the house: each room can take on different values and functions between day and night, or over the years. From the morphological and structural point of life, the **modularity** and the **distributive characters** work together in order to permit different aggregations of the residential nuclei, allowing spatial changes, combining or disrupting adjacent spaces, taking into account the position of the services which makes accommodation more or less flexible.

Finally, the **neutrality** of the facade and the uniformity of the design arrangements, have made the buildings of the nineteenth Century built heritage timeless, emphasizing once again the resilience that characterizes them. Designed with the intention of being detached from the functions inside the building, the prospects are suitable for any type of use.

The last part of the thesis is the putting into practice of all the theoretical part that acts as a manual for the realization of a typologically flexible project. The formulation of these guidelines finds its application in the project of a flexible social housing at the intersection of Viale Tunisia and Via Lecco, in Milan, in the Lazzaretto district. The project that we propose wants to try to give qualified answer to a demand for housing differentiated and articulated, compared to the atrophy of the offer present today on the real estate markets, which continues to reaffirm the functionalist paradigms of the Modern Movement in residential construction, seeking to recover the adaptive and resilient typology typical of nineteenth Century residential construction.

PART I

FLEXIBILITY

METHODOLOGY

In this section, it is intended to demonstrate that housing design focused on principles that generate flexibility is a central principle in the pursuit of quality housing and residential.

Through research and analysis we have tried to offer a wide range of information, methods and tools suitable and effective to understand how the theme of flexibility has been analyzed and studied within the projects under consideration.

“**Flexibility**” is a widely cited issue, but what is the situation, the current state of affairs, the point reached in the field of transmission and implementation of “flexibility” today? What are the methods and approaches to the issue; there are common lines of thought, divergences; are there any guidelines?

In a highly variegated panorama, the contributions in this regard are various and different, both as regards the meaning that this theme assumes, and for the level of depth reached or in the theoretical treatment of international literature and non-fiction or in design practice.

Starting from the assumption that there is a need to define this theme more specifically, in order to have clearer what its real meaning and value is, we intend to try to identify **four categories** in which to collect and evaluate the different characteristics that make accommodation flexible. This classification work was carried out to identify **exemplary**

models and outline procedural and design methods of general validity.

The theme, in fact, has undergone different interpretations and declinations. Furthermore, the vastness of the theme, its sub-categories and the problems with which it interacts, determines the inevitable difficulty of being conveyed in an exhaustive, complete and homogeneous manner.

Limiting the range of interest is necessary not only because of the breadth of the topic, but also on a practical level, to understand what the condition of Italy and the European Union is and whether hypotheses and proposals can be advanced.

By systematizing the data and information emerging from the essays and projects with the requisites of usability, livability, durability required of building organizations, we will come to understand if the principle of “flexibility” is really a paradigm of housing quality; that is, if it guarantees the quality at all levels that it implies.

FLEXIBILITY

Flexibility in architecture, and specifically in our range of interest (that of housing), nowadays requires a more complete knowledge and a more technical and precise decoding, so that, once the categories and classifications have been clarified, they can be defined exemplary models and outline procedural and design methods of general validity.

In this thesis we intend to demonstrate that housing design, centered on principles that generate flexibility, is a central principle in the pursuit of quality housing and residential.

It is necessary to offer, through research and analysis, a range of information, methods and tools suitable and effective to build a methodological and procedural practice. To this end, it is useful and interesting to try to understand in what ways and according to which approaches the theme of flexibility is treated.

The research work is therefore based on the need to investigate how the flexibility theme of residential housing is analyzed, understood and applied within the various projects.

*What is meant today by “flexibility” of accommodation?
What are the definitions in the different potential currents of thought?
How should it be interpreted and what are the design cases in which it is actually achieved?*

The survey would like to lead to understanding the degree of flexibility pursued in contemporary creations in the various countries, highlighting gaps and strengths, typological and technological choices that perform and used by architects.

Finally, we will try to outline some simple **guidelines** that we believe can be decisive for the purposes of a better implementation of what is believed to be one of the design principles capable of responding to the needs of quality, well-being, usability, safety, and privacy, expressed by today's users.

Flexibility, understood as a generating principle of living quality at all levels, must therefore be considered as the **programmatic, planning, construction and management** principle, capable of guaranteeing the durability of the building product over time: designing buildings with the aim of satisfying flexibility levels, means preventing or reducing from the beginning the obsolescence phenomena to which they are inevitably subject.

WHAT

In this thesis we intend to demonstrate that housing design focused on principles that generate flexibility is a central principle in the pursuit of quality housing and residential.

The **spatial quality** includes a series of factors that must characterize each level of the project and implementation in relation to the psycho-physical well-being of the users, the cost-effectiveness of management, the possibility of using the spaces, the ease and cost-effectiveness of maintenance and the inspectability of plans.¹

With reference to the UNI 10828/1999 standard, housing quality is defined as “*the set of properties and characteristics of the building or its parts that give them the ability to satisfy, through performance, expressed or implicit needs*”.

Building quality is normally divided into: environmental quality, technological quality, technical quality, operational quality, useful quality, and maintenance quality.

It is a concept that cannot be summarized unilaterally, but it requires a systemic interpretation between multiple objectives to be met through specific requirements, namely the translation of a need into factors capable of identifying the conditions for its fulfillment.

In the face of “*individual and collective, explicit and implicit*” needs, expressed by users, and the aforementioned classes of needs, it is necessary to know how to respond through typological requirements, of suitable technological and technical systems and subsystems.

It is intended to identify the characteristics that give a high degree of quality to the building organization, specifically for residential use, which should be understood as a system based on a set of interdependent relationships, appropriately understood and correctly developed.

If on the one hand in the design it is necessary to counteract the physical deterioration of the architectural object, equally a forecast of future uses and uses is required, both as regards the replacement of users, and in view of the potential change of use of the building.

In both of the aforementioned cases, the building will need to be prepared during the design phase using construction techniques and methods that allow the building to be reused through non-invasive and easy-to-implement modifications, paying close attention to **structural** and **typological** systems.

The principle of flexibility of the building product is inextricably intertwined with the **time factor**, at the various degrees that this factor implies: it intends to provide the keystone for total understanding and the intrinsic response to the challenges that exist in the life cycle of the architectural product.

“*Flexibility*” is not and must not remain a mere theoretical principle, but is aimed at its own design and concrete development in the architectural practice of residential buildings.

Therefore, first of all, it is necessary to verify the real correspondence between the flexibility declared by some international case studies and its actual presence within the project.

The next step will then be to understand what are the concrete benefits brought by “*flexible*” design to the livability level in such interventions.

[1] - G.D. Riva, M. Trabucchi, *I nuovi modelli abitativi e la qualità tipologica*, in Ginelli E. (a cura di), *L'intervento sul costruito. Problemi e orientamenti*, Dipartimento BEST, FRANCOANGELI Editore, 2001

TAXONOMY OF FLEXIBILITIES

The research of the case studies and their related analysis was guided by the ability they possess to keep together the elements of complexity, recalling Robert Venturi *"In architecture I am attracted by complexity and contradiction (...) I prefer the richness of meaning to its unique clarity"*¹.

Over the course of history, and especially in the modern era, a new concept of living has been shaped, which is realized through the design of more fluid spaces that guarantee a multipurpose use of space.

Different categories of flexibility are the result of precise design strategies, which generate multiple distribution possibilities depending on the required qualitative objective: **privacy, well-being, usability, security, contrast to decay and obsolescence**. In this regard, we have identified four categories in which to collect and evaluate the different characteristics that make accommodation flexible.

This **classification** work was carried out to identify exemplary models and outline procedural and design methods of general validity.

1. The first category takes into consideration the central idea of the Modern Movement, that is the free plan and the point-like structure, which have generated the concept of **constructive** flexibility, allowing an internal transformability to the accommodation without constraints, according to the new models of constructive flexibility.

2. The second category refers to **technological** flexibility, which is developed around the design of technological equipment such as furniture and / or technical infrastructures, generating instant and / or continuous transformability over time.

3. The third category refers to **functional** flexibility, and consists of a design that gives the space a high degree of internal modifiability without acting on the structure, but with the provision of neutral spaces that can accommodate more functions.

4. The last category we have identified is **typological** flexibility, the core theme of our thesis, which can be represented in different ways and with different design approaches, which arise from a clear break with the functionalist paradigm.

In this study, initial cards were made, explaining the projects, and aimed at understanding the case study through written parts, photos and drawings. In fact, the plan of each project has been redesigned and its relationship to the system to which it belongs.

Then, we carried out the flexibility analysis within the project. The analysis consists in identifying **how** flexibility has influenced the design.

From the breakdown of the building, the elements that constitute it are defined, which are related to each other, thus allowing to highlight the objective of flexibility.

These elements allow the space to be open to greater possibilities and therefore to be able to expand its degree of flexibility.

These elements have been summarized in:

1. Unit subdivision;
2. Modularity;
3. Structural scheme;
4. Black water pipes;
5. Vertical and horizontal circulation;
6. Finally, Light and ventilation.

[1] - R. Venturi, *Complessità e contraddizioni nell'Architettura*, Dedalo, Bari, 1980, p. 16

AFFORDANCE 1: CONSTRUCTION FLEXIBILITY

Constructive flexibility, understood as a generating principle of housing quality at all levels, must be considered as the programmatic, design, construction and management principle, capable of guaranteeing the durability of the building product over time, (in the specific case, for residential use).

Designing buildings with the goal of satisfying levels of flexibility means preventing or reducing the obsolescence phenomena to which they are inevitably subject from the outset.

At a first level (which is correlated to the physical-material degradation of the building body), the use of technological and typological choices, construction techniques and elements, semi-components to system-products¹ that allow **simplicity of modification**, ease of replacement or **interchangeability**, immediacy of inspection or maintenance, guarantee a reduction and postponement of the negative effects that naturally occur over time in each building.

If on the one hand it is necessary to counteract the **physical deterioration** of the architectural object, consequently significantly decreasing the management costs, at the same time it is necessary to foresee future uses and users, both as regards the replacement of users, and in a perspective of potential change of use of the building.

In the planning stage, it will therefore be necessary to prepare the building using construction techniques and methods that allow the building to be reused through non-invasive and easy-to-implement modifications, paying close attention to structural and typological systems.

In anticipation of satisfying the needs of a plurality of types of users that will follow and replace over time, already at the programmatic level, conventions will have to be outlined between the inhabitants and the administrations, producing at the level of requests to the designers, documents that require the presence of certain characteristics and potential of the space within the project.

At the meta-planning and design level, it will be necessary to produce buildings and housing that can be adapted to different needs, either in the construction phase, thus obtaining an initial flexibility, or in the management phase, thus guaranteeing degrees of flexibility from initial to instantaneous.

We want to demonstrate that constructions based on the principles of flexibility, allow greater control in the phase of possible decommissioning, at the end of the building's life: in this, the use of dry construction techniques combined with the use of prefabrication elements is fundamental, that allow the integrity of the parts during assembly and the possibility of reuse, significantly reducing waste of materials and scraps.

Contemporary architectural reflection will have to focus on concepts such as **flexibility, adaptability, transformability**; values in stark contrast with the concept of immutability to which architecture has mostly been associated, being understood as something immutable.

The permanence of the buildings, until today, has been the subject of the studies of many architects.

Architecture should adapt to its environment to ensure its survival over time. For this reason, it must be adaptable and flexible and possess a certain intrinsic capacity of transformability or modifiability, thus preventing it from being destroyed or becoming,

[1] - "A fronte di (...) un mercato sempre più ricco di prodotti, si è indagato il segmento specifico che propone prodotti evoluti o comunque sistemi in grado di semplificare le operazioni (...)." E. Ginelli, *L'intervento sul costruito. Problemi e orientamenti*, Capitolo: Selezione dei prodotti-sistema e test di verifica della scheda di prodotto; Dipartimento BEST, FRANCOANGELI Editore, 2001

like so many examples of the past, mere constructions suitable for hosting subsequent buildings.

Architecture must contain within itself the character of mutability, with the aim of ensuring its **durability** over time, as opposed to the numerous existing examples of structural and constructive obsolescence.

The first to experiment with new types of housing, preceding numerous architects in this sense, were the artists of the twentieth century, who gave rise to the two types of great success of the twentieth century:

1. “*the artist’s atelier*”, characterized by a large central volume of double-height work and large windows positioned to the north;
2. the “*loft*”, characterized by a deep and empty space to which the structure gives flexibility and freedom of occupation by the inhabitants.

Still, the loft and the artist’s atelier represent two important typological references in housing research.

The theme of flexibility has long been dear to architects and studied over time; as early as 1923 Le Corbusier was publishing *Vers une architecture*², which included principles of flexible and mass-produced housing, based on the Dom-ino system, which he developed in 1914.

The Dom-ino system proposed an open and free floor plan with ribbon windows that guaranteed infinite levels of flexibility in the layout of the interior spaces.

Over time, this developed into numerous projects, arranged in open and modifiable plans, around fixed nuclei of services.

This greater spatial uncertainty, it was thought, could allow greater changes in the use of housing.

During the project, the building system must be set on modularity, so the starting point is the “*static-structural flexibility*” project, thanks to which the pitch and the type and configuration of the supporting structure can be determined.

A higher degree of flexibility in terms of construction is offered by the use of **industrialized open-cycle processes**, achievable thanks to the characteristics of coupling and combinability of the industrialized elements-components.

A further step in pursuing degrees of constructive flexibility is the introduction of complex construction elements of use, which also perform the ability to use, containing within themselves some fixed furniture elements.

The construction flexibility, to be expressed in the design phase, is fulfilled by elements and components equipped with equipment, that is, designed to contain the plan infrastructure.

The factory elements can be equipped or fitted, in which the shielding of the systems and the points of use are inserted, in the workshop.

In the case of elements that can be equipped, they are prepared so that they can receive the different parts of the system necessary in the presence of different needs, and the location of points of use: this solution allows greater correspondence with the various needs and greater flexibility of use.

The equipped or fitted elements offer a number of advantages both in terms of design and execution of the works, as well as in terms of flexibility when using the accommodation.

Although the principle of flexibility requires a non-correspondence between structure and internal partition elements, during the design it is necessary to set the building system on modularity, so the starting point is the project of “*static-structural flexibility*” thanks at which the pitch and the type and configuration of the supporting structure

can be determined.

Three possible structural solutions are indicated for flexibility purposes:

1. *pillar structure*, placed according to a variable modular grid in relation to distribution modules;
2. *partitions*, with structural space coinciding with the size of the dwellings;
3. with “*thick walls*”, ie a sequence of transversal elements of appropriate size, with a step that allows the insertion of standard furniture and walls.

The design of the structural scheme, subsequently, must provide for the integration between the structure and the envelope, with a view to predisposing it to being suitable and capable of change, energy saving and low environmental impact; basic, at the level of design of the envelope, is the interrelation with private outdoor spaces.

The construction of the envelope must provide for construction methods by combining elements that can be assembled, based on dry technologies.

It should be added that the constructive and structural flexibility is interrelated with the provision of technical slots and equipped wardrobes that can guarantee inspection, integrability, modifiability, assembly and disassembly and pre-wiring systems, i.e. the preparation of plan infrastructures that provide for additions without demolition.

The flexibility of the internal space has always been linked to the direct technical solution that makes it possible, be it the classic sliding door or the most innovative home automation preparation.³

“*Home automation*”, in fact, “*discipline of integration of automation and control systems of all systems in general of residential buildings, to be effective it needs to respond in terms of performance to the design requirements and be accepted by the technological systems of the building, through a process of technological infrastructure, which allows an optimal installation of the foreseen devices and systems, with the possibility of future implementations.*”

These conditions are essential and indispensable in order to effectively support the planning of the building organism that aim at a spatial-functional flexibility of the environmental units, guaranteeing an open and instantly reconfigurable use of the home and common spaces, overcoming the typological schematism of zones or rooms with predetermined functions.”⁴

[2] - Le Corbusier, *Vers une architecture*, Paris : G. Crès & Cie, 1923

[3] - The neologism “*Domotica*” is actually the contraction of the term “*Domus*” and “*Informatics*”

[4] - M. Capolla, *Sistemi di precablaggio per gli edifici residenziali: principi irriducibili per l'infrastrutturazione tecnologica e predisposizione alla domotica*, in In E. Bosio, W. Sirtori (a cura). *Abitare. Il progetto della residenza sociale fra innovazione e tradizione*, 2010, Maggioli Editore, pg. 1520-1527

Songpa Micro - Housing

SsD Architects
Seul, Corea, 2015



1. Songpa Micro Housing, SsD Architects, Seoul, Corea, 2015 - External view.
2. Songpa Micro Housing, SsD Architects, Seoul, Corea, 2015 - External view building in the context.

1. Project explanation

The project of Songpa micro-housing units, by the Korean studio SsD Architecture, is located within the dense context of Seoul, Korea and stems from the reflection on the growth of the urbanization process and the natural propensity to optimize space, generating homes which prove to be temporary, as they are not suitable for hosting changes in the family and with little social value.

2. Flexibility as a tool

The designers propose a project of fourteen micro-housing units (Infill) inserted in a load-bearing structure of seven levels that tapers upwards (support), the system is finally covered by a metal casing that takes its own shape with respect to the support and at the infill, performing several functions depending on the context: at the ground floor level the steel bars of which it is made take on the function of parking for bicycles, on the elevation it allows the drainage of water, on the top perimeter floor the terrace and finally generates different levels of porosity with the outside in all its surface, modifying the internal privacy.

Songpa Micro-Housing offers a new type of residential building, demonstrating that “space” and “size” are distinct concepts.

Songpa Micro-Housing offers a new typology that extends the limits of the residential unit, to also include semi-public circulation, balconies, and visual extensions.

The fourteen blocks have different sizes, the smaller ones are on the second and sixth levels and do not exceed 11 m² (minimum area in Korea).

There are two configurations: a square and a rectangular, and are placed on the floor so that they can open towards each other and generate larger configurations, using the distribution space to the accommodation, which can become part of the units.

The flexibility of this project lies in creating a “free plan”, adaptable to any change.

Developed as flexible mixed-use housing, fourteen “residential blocks” allow residents to occupy a single unit or, if they were a couple or a group of friends, to recombine the blocks for larger configurations.

In addition, the units can be used as different galleries or workspaces.

This flexibility allows occupants to live in the building longer.

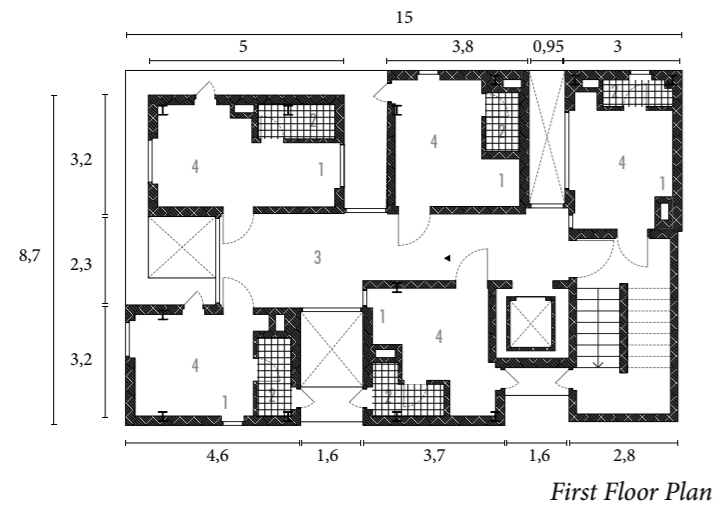
The units can all be opened simultaneously within the floor, expanding the functions to different functions that go beyond the residential one, such as the creation of an art gallery or coworking.

Furthermore, the cells being independent of the load-bearing structure, can position themselves by detaching themselves from it and from the envelope that surrounds the entire structure, generating interstitial spaces that allow residential units to project outwards, if they are used as balconies, or inwards by expanding the internal functions or by creating walkways and small bridges of connections.

This particular solution allows you to create a game between the housing units and the support, creating spatial redundancy that allows you to open the whole system to multiple possibilities.

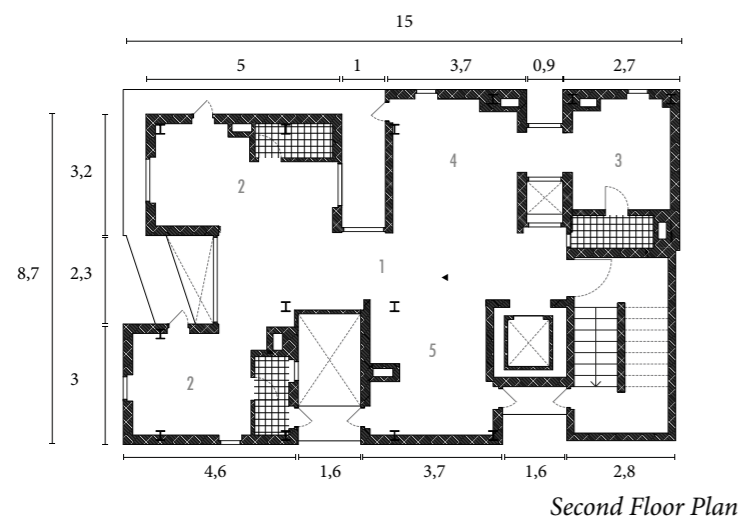
The internal spatiality between the rooms is kept open through holes between the floors, which allow the passage of light and sounds and to widen the depths of the space.

The Songpa system maintains its openness also on the ground floor where the designers, who for regulatory reasons had to entrust the function of a parking space to this space, allow the space to perform multiple functions: a parking space for four cars but open to others. possibility.



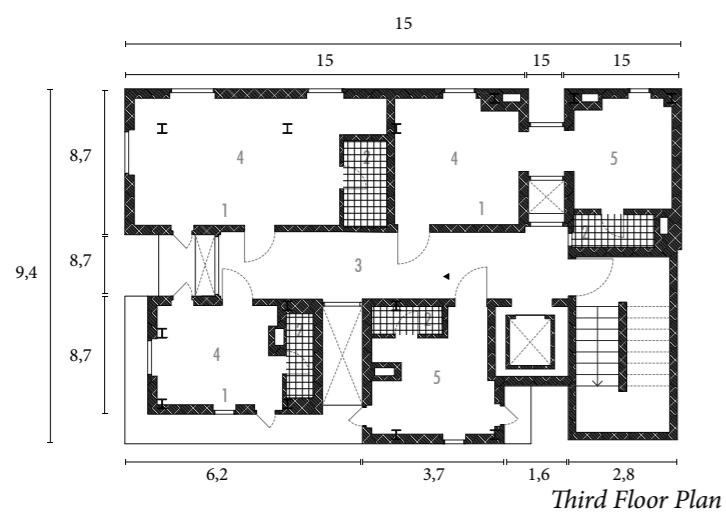
HOUSING

1. Kitchen
2. Toilette
3. Corridor
4. Bedroom



OFFICE

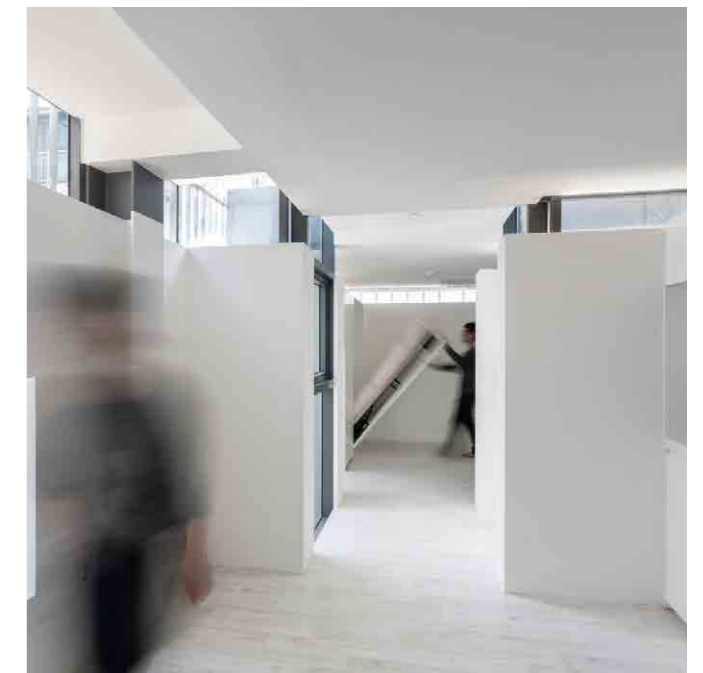
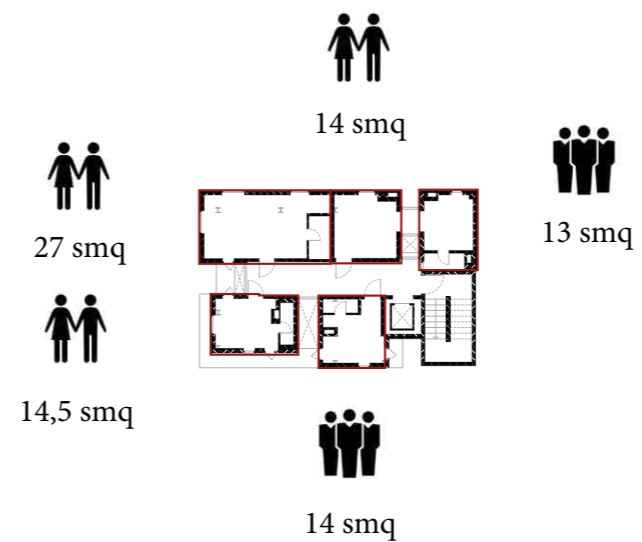
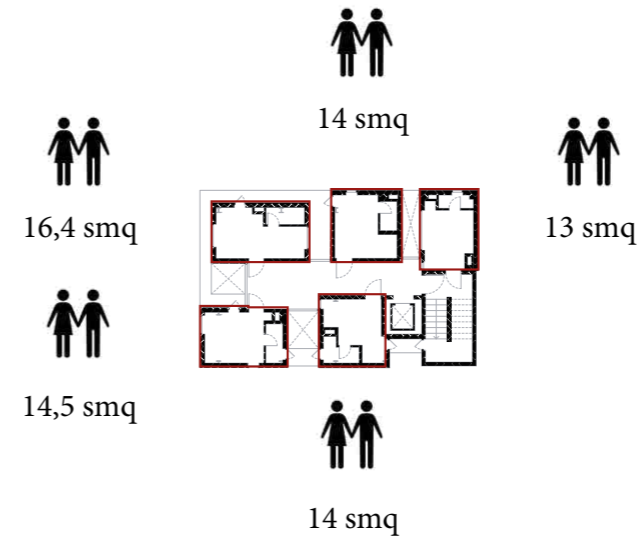
1. Corridor
2. Office
3. Meeting space
4. Co-working room
5. Waiting area



HOUSING AND OFFICES

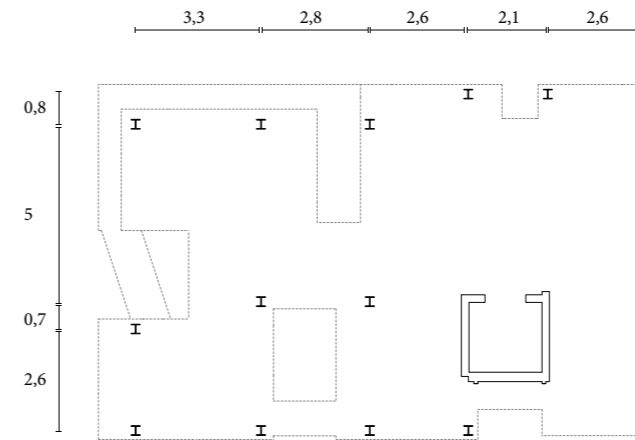
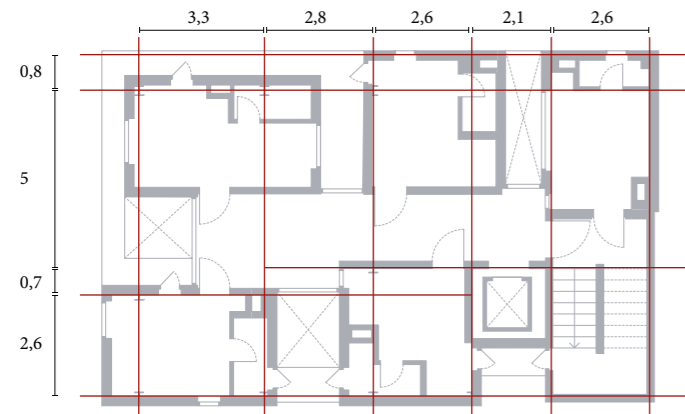
1. Kitchen
2. Toilette
3. Corridor
4. Bedroom
5. Office

Unit subdivision



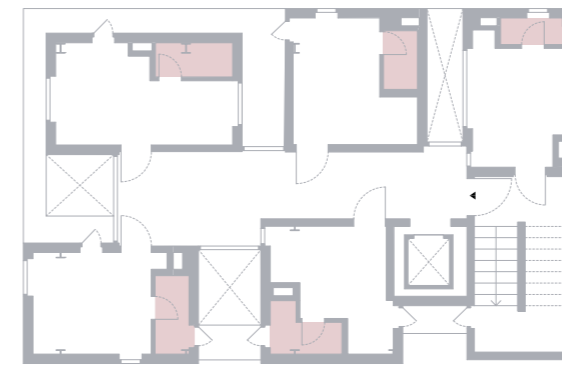
3. Songpa Micro Housing, SsD Architects, Seoul, Corea, 2015 - Inner view.

4. Songpa Micro Housing, SsD Architects, Seoul, Corea, 2015 - Inner view of the rooms.

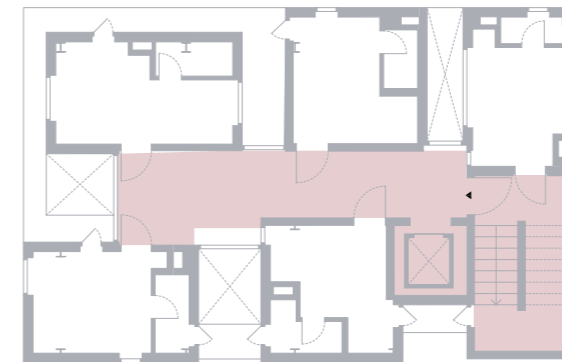


Structural scheme

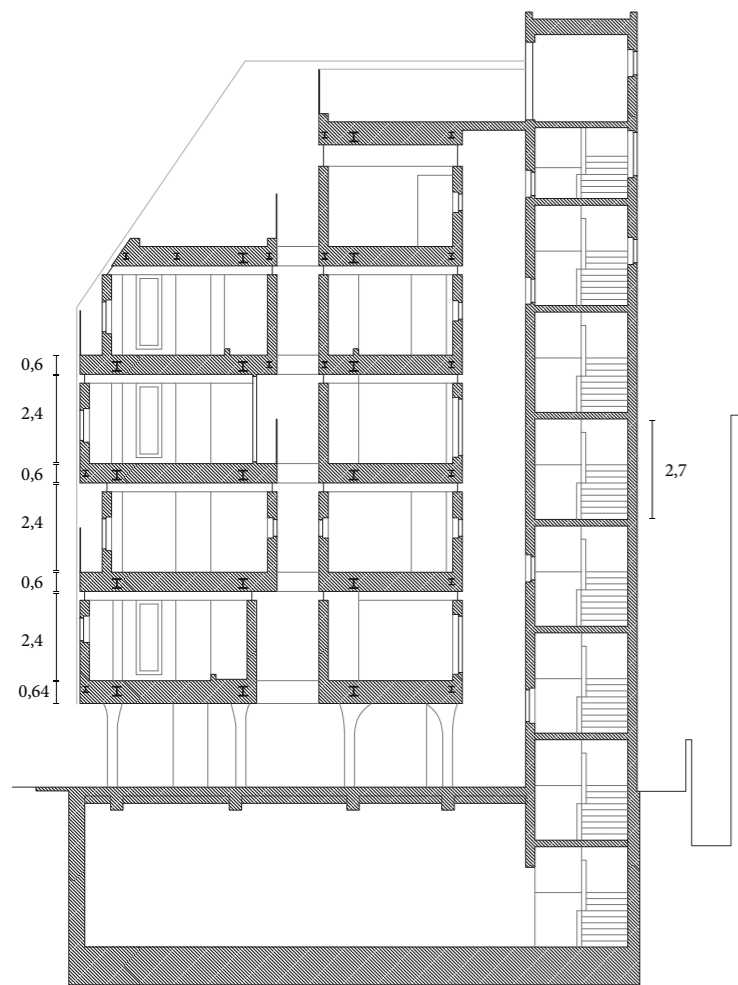
Modularity



Black water pipes



Vertical and horizontal circulation



Section



Light and ventilation

AFFORDANCE 2: TECHNOLOGICAL FLEXIBILITY

Technological flexibility indicates the real capacity of the spaces of a technological and technical system such as a building, to undergo changes over time, in its configuration and in the possibilities of use, ensuring the satisfaction of diversified needs.

For this to be possible, maximum usability must be guaranteed, which concerns the functional equipment such as furnishings, technical infrastructure and the relationship between spaces; **instant** and **continuous transformability** over time; multifunctionality generating a high value in the use of space, in a logic of resource optimization.

Over the course of history, and especially in the modern era, a new concept of living is created, which takes shape within the residences through the design of more **fluid spaces** that ensure better use of space.

In this regard, the concept of flexibility is outlined, which consists of a design that gives the space a high degree of internal modifiability without altering the overall volume, and therefore without acting on the structure.

The result is impersonal spaces that can accommodate multiple functions.

This type of design finds its highest expression in the use of the free plan, a theme introduced by Le Corbusier in the book “*Towards an Architecture*” of 1923, in which he expounded the “5 points of architecture”, or the characteristics that had to have buildings to cope with the new way of conceiving architecture and living it.

The use of the **free plan** is made possible, since its first uses, by the introduction of a load-bearing skeleton that eliminates the limitations imposed by the load-bearing walls, allowing the designer to divide the spaces as he wishes.

Le Corbusier uses flexibility through technical means within his projects, such as the Maison Domino (1914), a manifesto of his architecture, in which he intended to demonstrate the infinite possibilities of the free plan; finally, in other projects such as the Maison Loucheur (1929), in which he conceived a diversified use of the central space, which changed in the passage of daytime to nighttime hours. In fact, the accommodation, through movable furniture and the use of sliding walls, was able to transform the internal spatiality, assuming inhabitants within the accommodation with the same needs.

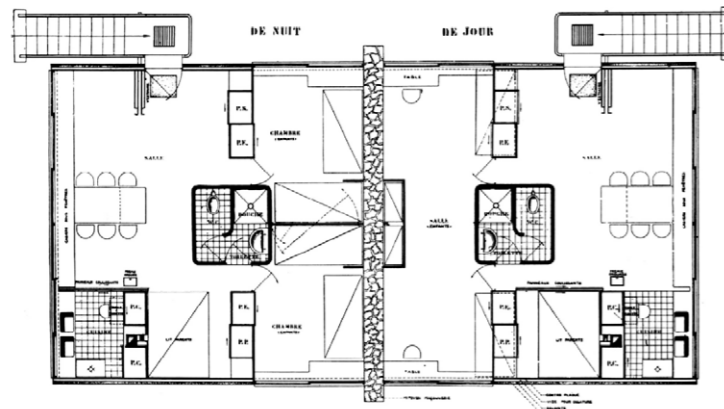
So, if on the one hand the flexibility was conceived through the mobile and foldable furniture, able to reconfigure the internal layout, on the other hand it was possible to achieve flexibility also through a certain “**neutrality**” of the space, which could make it easily adaptable to a different function.

Furthermore, the standardization of the individual user also made it possible to simplify the guiding reasoning of the residence, designed to be able to change only in a way and in a short-term view of the functions within it.¹

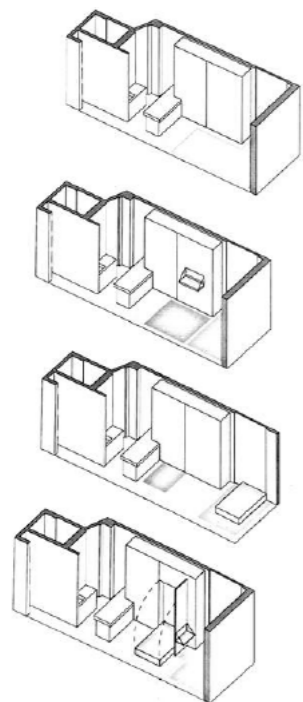
Flexibility through technical and technological means after World War II abandoned the use of sliding walls and folding furniture, to focus rather on the development of lightweight steel structures that modified the potential for change of the building, whose model was now the machine.

Although industrialization had profound effects during the nineteenth Century, its development and influence in the construction world came later.

The continuous evolution of the techniques (mainly linked to the industrialization of the prefabrication building process) combined with the growing need for houses, led to



5. Maison Loucheur, Le Corbusier, 1929 - Drawing typical floor plan.



amplify the interest in standardization in the production of them.

The relationship between flexibility and prefabrication systems is based on the principle that the components that make up the prefabricated living cell can potentially be assembled in various ways: we wanted to show how standard elements allow for infinite variation.

The “flexibility of the machine” was not aimed only at optimizing space, but also at experimenting with buildings that could make the most of new techniques and technologies; and therefore change according to needs.

In this period some studies on the house arose that wanted to overcome the research of modernism, as they were not limited to the creation of minimum accommodations at a subsidized price, to structures that could improve people’s daily lives. The intentions were aimed at freeing the buildings “from their traditional fixity”², up to the conception of a city in which the buildings could be mobile.

The idea of technological flexibility has been developed and refined by various architects to the present day, and frees the accommodation from its classic conformation that sees it as a “sum of environmental units” and instead makes it a continuous and multifunctional space.

Therefore, new relationships are defined between public and private environments within the same residence, which are increasingly amalgamated and integrated, and transformation techniques are sought that are able to diversify and multiply the nature that a space can assume. .

In defining and identifying these methods it is necessary to take into account the time frame in which these variations occur. They can, in fact, take place during a single day (morning, afternoon and evening) or a week, but they can also be seasonal changes, and ultimately involve much longer periods of time, linked to a change of user or destination. more lasting use of spaces.

The creation of environments without pre-established configurations, due to the absence of fixed partitions, allows to achieve high internal flexibility, and finds in the use of equipped walls and movable partitions one of the most effective and widespread methods of realization.

While in the traditional home the domestic equipment is arranged separately in rigidly delineated rooms, to which a particular and specific function is attributed, these flexible structures instead give the possibility to the remaining spaces to emerge as empty with a very high degree of spatial and functional modifiability. .

The Unfolding apartment, built in Manhattan in 2003 by the Michael K. Chen Architecture studio, can explain comprehensively and help you understand the idea behind the furnishing of the rooms.

It is a house-studio where flexibility is guaranteed by the presence of a piece of furniture, positioned on the long side of the apartment, which contains a bed, a bedside table, a wardrobe, a desk, a bookcase and a pantry.

All the components of this equipped range can be opened and closed according to the user’s needs during a whole day. The space in front of this functional pole can, depending on its use, turn out to be a large open space, a study with desk and bookcase, a bedroom or a living room, without having to resort to the larger surfaces of a traditional house and guaranteeing at the same time, a good level of privacy thanks to the presence of movable dividing elements between the different “environments”.

In other cases, however, flexibility manifests itself through the combination of rigid elements, which are made up of fixed technical cores, and a versatile residual space.

The technical cores can be placed in different areas of the space creating different configurations.

Among the experiments carried out in this area, the ABC formula is very significant:

Wardrobe-Bathroom-Kitchen designed by the ACTAR team, which allows you to generate different subtypes through the different positioning of three types of prefabricated and equipped walls, each of which contains a function essential for the functioning of the entire system. In this way, more or less open spaces can be obtained, which can be managed with the use of sliding walls.

The research, instead, of the designer Manuel Cerdá Pérez replaces the equipped walls by introducing three technical systems, such as functional boxes, technical nodes and autonomous cubes. These systems, which can have a specific function or be functional and be used by users in different ways according to need, are added and incorporated into the space to obtain diversified and interchangeable configurations.

In both cases, we find ourselves faced with “a neutral space which, through the right displacement of the technical elements, can reproduce any environment inside it”.

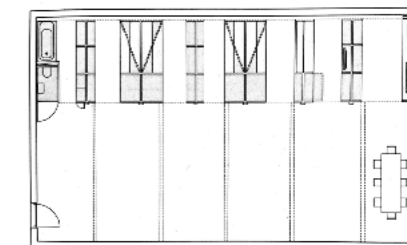
Parallel to the experimentation of these rigid and fixed elements, mobile equipped technical units were also designed that could give rise to infinite configurations of the space, allowing to optimize the efficiency of even very small surfaces and make them perfectly functional.

For example, in the Elastic Living Unit project by Angelo Roventa in 2001, the space is organized through modular elements equipped and arranged on a side strip of the house that can be moved thanks to a system of wheels and rails, which allow movement along one direction.

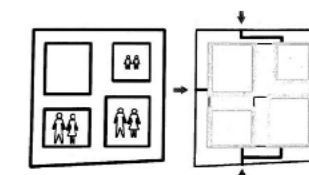
Returning to the diffusion, in modern times, of atypical families, forced, for various reasons, to live in the same place, despite the generational differences, we can then speak of a flexibility, no longer linked to a concrete variation of the configurations of the internal space, but, rather, generated by the design of spaces in advance and permanently circumscribed, which, however, thanks to their limitedly delineated characters, can adapt to any type of need.

In this way homes are created that make moments of community and family meeting possible, but which guarantee, in the same way, the individual members of the nucleus to have their own privacy.

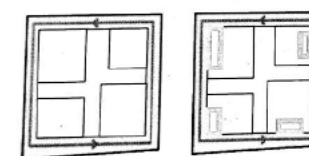
A clear example in which this concept is realized is the S House, 60 built by the SANAA studio in 1995. In this project the Japanese architects make the rooms completely independent with a perimeter corridor that connects them and to which they are directly connected, while concentrating the services, bathroom and kitchen, on an upper floor. This arrangement makes it possible for individuals to leave the house without having to invade and pass through the common area.



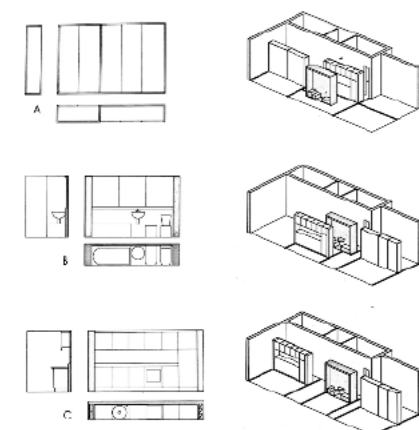
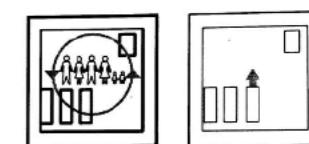
Ground floor: space and individual accesses



Ground floor: distribution path



First floor: collective space and service distribution



6. Michael K. Chen Architecture, Unfolding Apartment, 2003, Manhattan
7. Team ACTAR, Formula ABC, 1996

[1] - S. Corda, *La flessibilità nell'abitare contemporaneo: l'opera di Glenn Murcutt come manuale*, Cagliari 2010 p. 29

[2] - A. Forty, *Parole e edifici. Un vocabolario per l'architettura Moderna*, Bologna, Pendragon, 2004 (Words and Buildings. A vocabulary of Modern Architecture, 2000) p.150

8. Roventa, *Elastic Living*, 2001

9. SANAA, *S-House*, Giappone, 1995

Social housing in Carabanchel, 64 housing units

Aranguren + Gallegos

Madrid, Spain, 2003



10. Social Housing in Charabanchel, 64 housing units, Aranguren and Gallegos, Madrid, Spain, 2003 - East facade.

1. Project explanation

In Madrid in the neighborhood named Carabanchel, one of the several experimentations of social housing, Aranguren and Gallegos Arquitectos realized this project.

The concept is based on the typology of a courtyard, a cluster, derived from in line buildings that seem to slide one inside another: this is the result of four linear parallelepipeds with different dimensions.

The functional program provides an underground plaza for a garage, a mezzanine and other two floors aboveground, which host 67 dwellings.

Structurally, the building is composed by a frame system, for a better rationalization of the construction phases and for a free reorganization of the inner spaces.

The choice to have a skin made by concrete prefab panels industrially produced and standardized, allowed to reduce the time of realization and the related costs.

These panels in concrete overlook the inner Japanese garden and the windows are realized with the coupling of two different strips of 60 cm high, in a modular grid. In this way, every inner space can have differently matched windows, with single or double height.

The obscuring system is made of aluminium and every sliding piece can move both in horizontal and vertical way, according to the different typology of frame window.

The perception is that the inner space is protected by the facade, in which all the openings are located in the upper part, to guarantee the privacy.

The dwellings are organized around a central spine, in which are located all the services and the vertical and horizontal distribution. All the apartments provide for several housing units with different dimensions with two, three or four units according to the number of inhabitants.

Gli alloggi sono composti da cucina, spazio per il pranzo, soggiorno, due bagni, tre camere da letto. Queste ultime risultano di dimensioni ridotte, ma, grazie all'uso delle pareti a pannelli impacchettabili, possono essere utilizzate singolarmente, oppure unite in un unico ambiente.

2. Flexibility as a tool

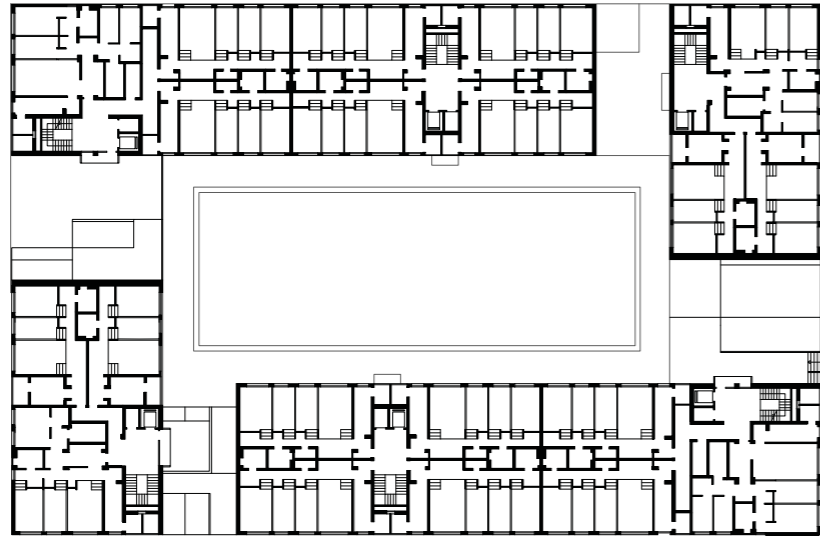
The basic project proposal is the possible housing flexibility during the day. Only the services are fixed and predetermined by the designers, while the rest of the accommodation and its environments can be changed thanks to the use of movable walls, so that the space can be transformed and adapted to the needs of day and night.

In addition to a good initial flexibility, pursued by guaranteeing typological variety, the accommodations are equipped with (instantaneous) flexibility of use with a constant surface with daily cycles of temporal variation. This arrangement allows users to have more space available during the day, increasing the housing quality of the accommodations whose dimensions derive from the minimum standards required by the relevant legislation for social housing.

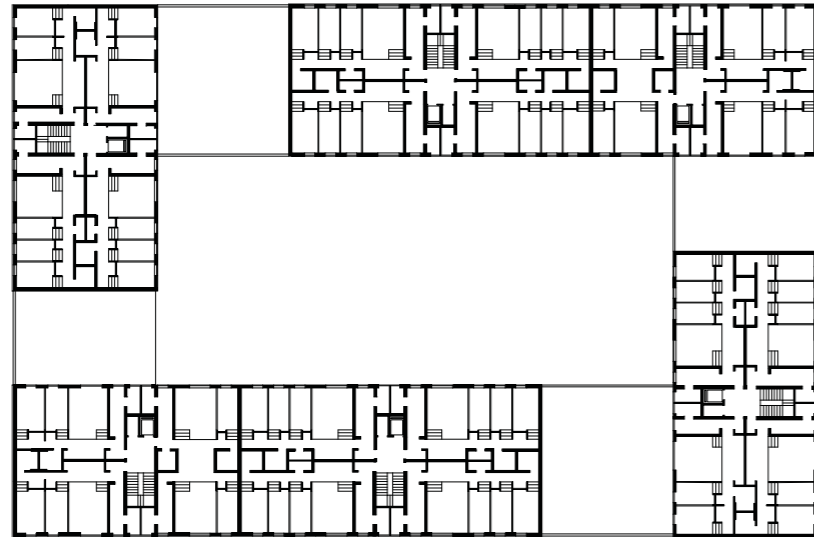
Furthermore, the system of mobile partitions

is a good solution to make a simple space saving: as we have seen, the urban density increases and this phenomenon forces us to live in ever smaller spaces. In too small apartments, student rooms or studios, mobile partitions can shape temporary sub-spaces such as an office, a reading corner, a bedroom, etc.

However, this solution remains limited in terms of use, as it allows a functional mix only in the short term.

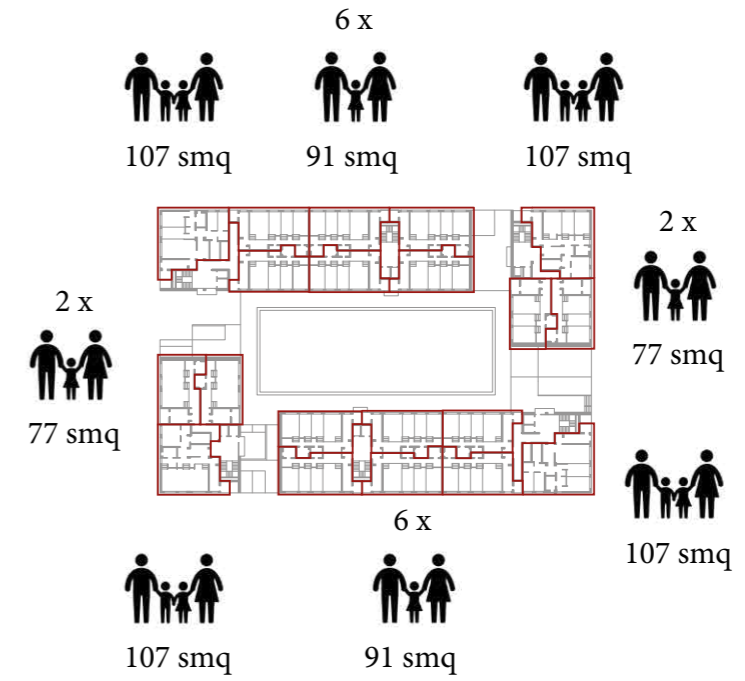


Groundfloor plan



First and second floors plan

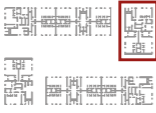
Unit subdivision



Night arrangement

Day arrangement

Groundfloor



First and second floors



Apartment for 3 dwellers
107 sqm

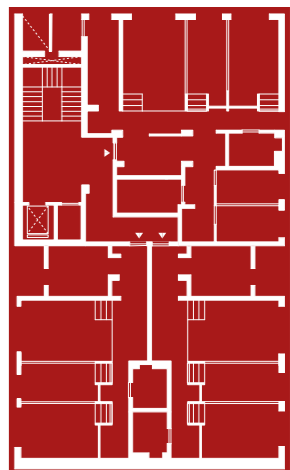
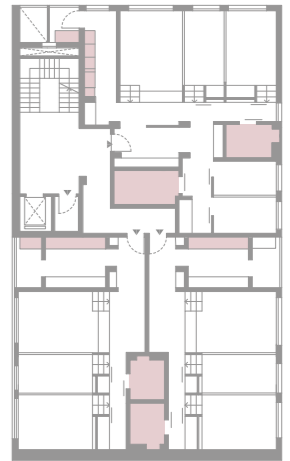
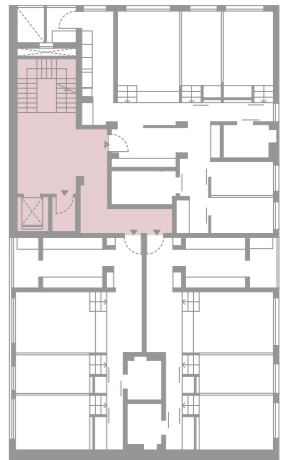
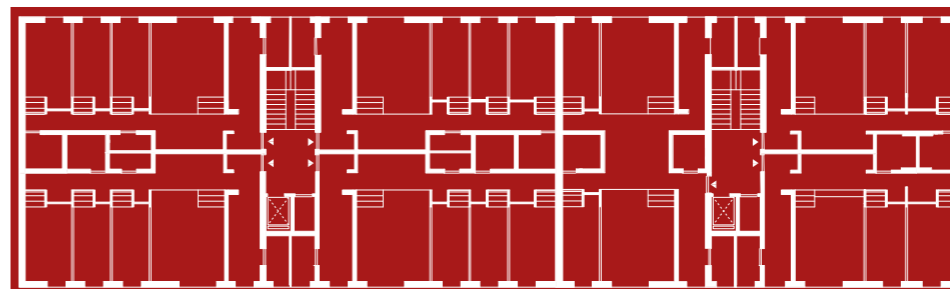
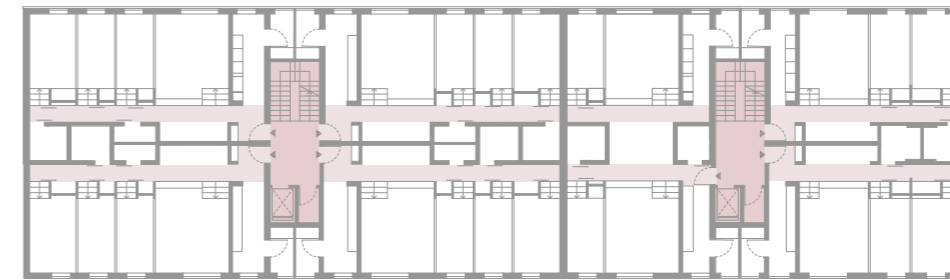
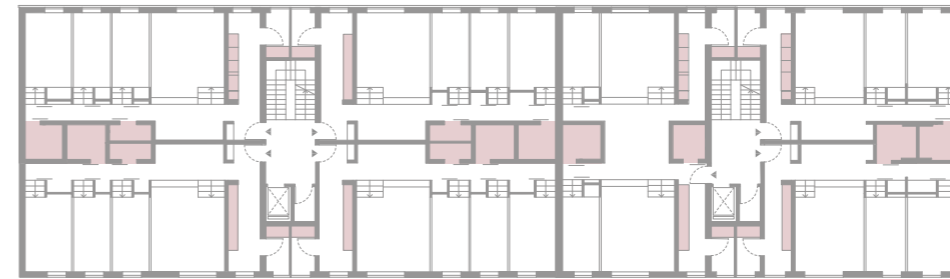
Apartment for 2 dwellers
74 sqm

Apartment for 4 dwellers
112 sqm

Apartment for 3 dwellers
87 sqm



- 11. Photo: View from the corridor
- 12. Photo: Portable doors in movement.
- 13. Photo: Portable walls opened.
- 14. Photo: View of the technological system.



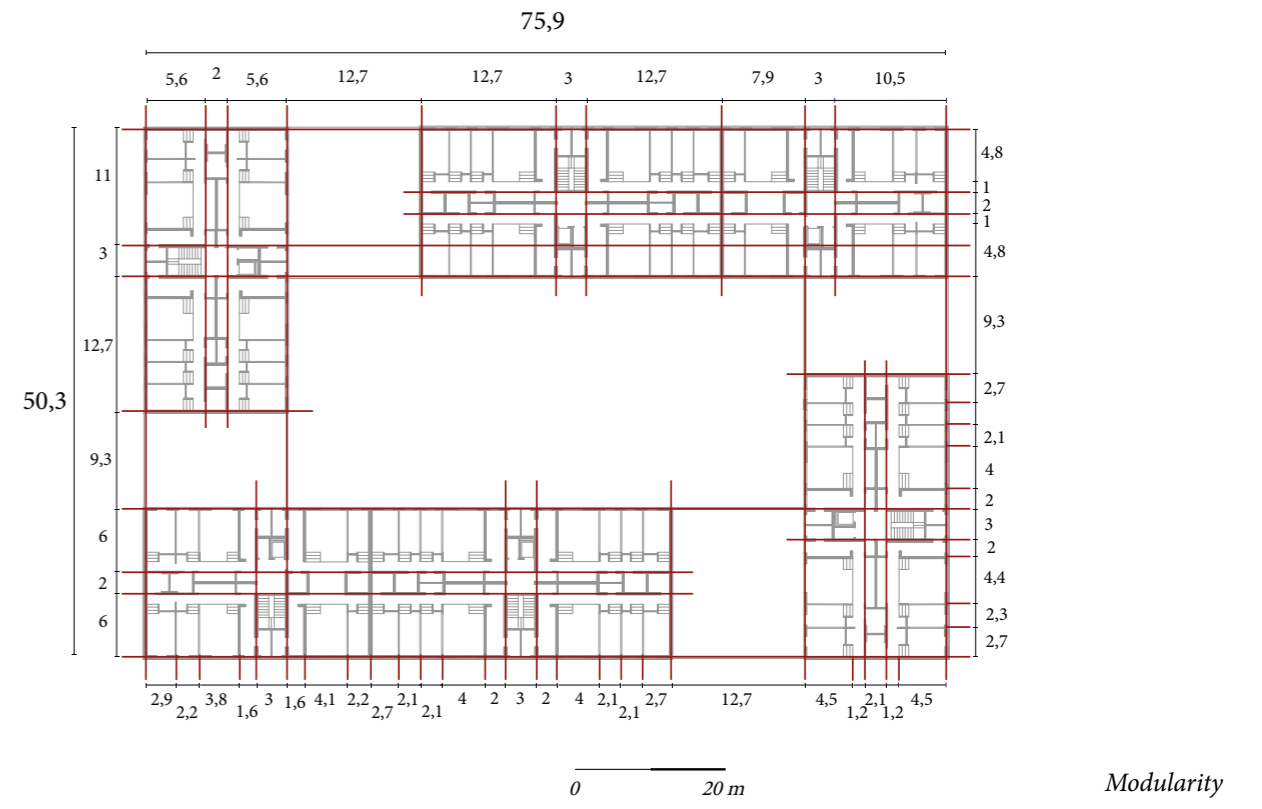
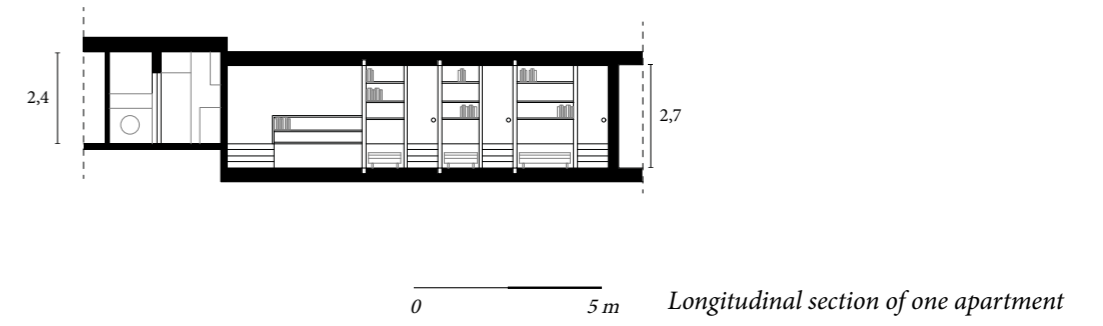
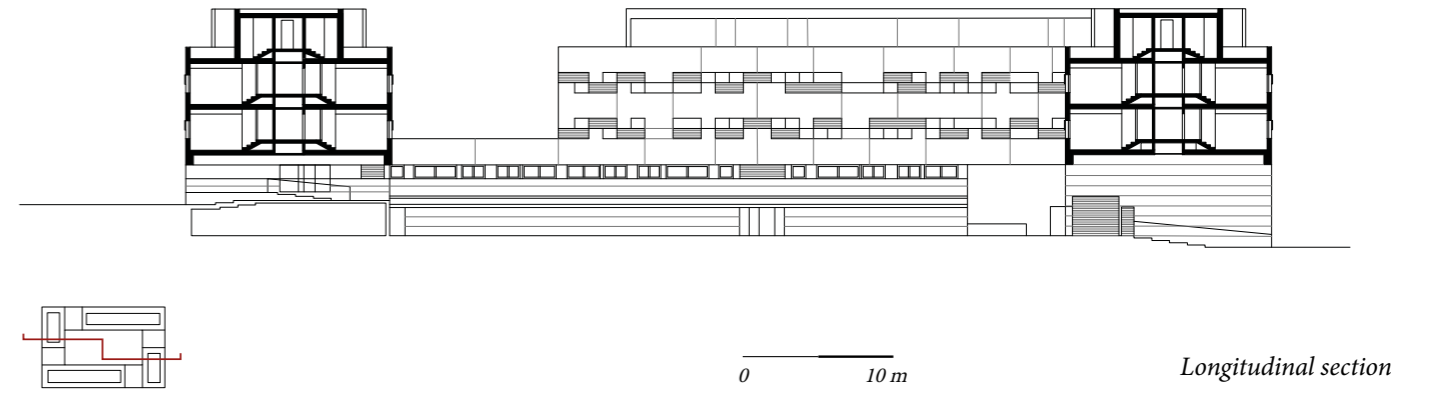
Black water pipes

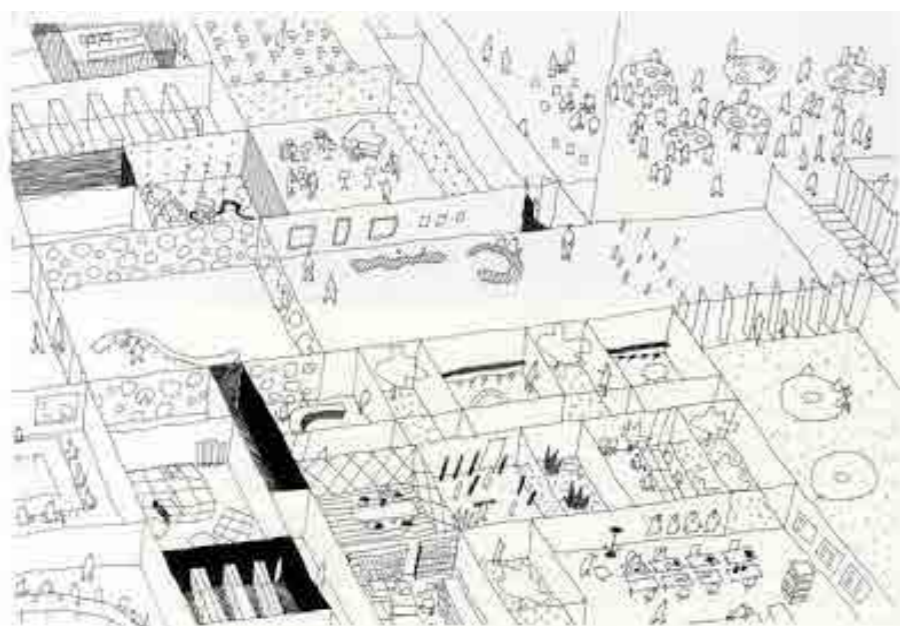
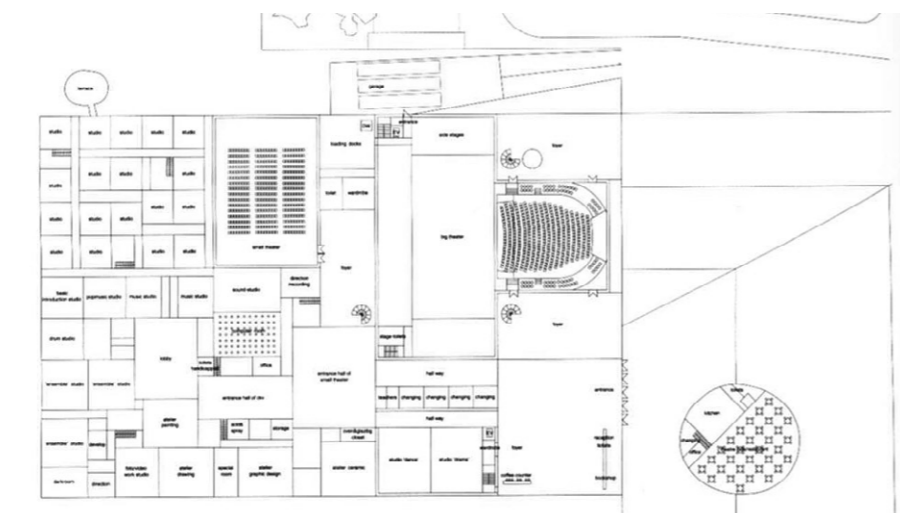
Connection and accesses

Light and ventilation



15. Photo: External view.
16. Photo: Inner view of the corner.





17. Traditional Japanese House, Kazuhiko and Kaoru Obayashi, 1850.
 18. Plan of the project Stadstheater, SANAA, Almere, Holland, 1998.
 19. Interior drawing of the project Stadstheater, SANAA, Almere Holland, 1998.

AFFORDANCE 3: FUNCTIONAL FLEXIBILITY

Functionalism, in architecture, is the principle that a building should be designed in order to function properly.¹ Flexible space literally implies a “**multi-functional**” space. The space has to be capable of accommodating various conditions, so flexible space has to be designed to fulfill requirements that depend on the functions that are supposed to be in the space.

Spatial flexibility cannot be discussed without considering the functional performance of a space. This means that even though every space has the potential of flexible use, if flexibility means that people can use a space for many purposes to the extent that the space can function appropriately, the word “appropriately” highlights the issue.

The suitable variety of functions for a specific space should be defined according to the space meaning and essence. In such a process, it can be considered that the multiple activities are compatible because they are derived from common essence and meaning.

Norberg-Schulz belief when he declares that the place opens a territory that gathers things that belong to each other (Norberg-Schulz, 1988) may implies such compatibility. It can also be considered that in this process, these multiple activities have mutual interaction. Therefore, while speaking of multifunctional space as the third principle of flexibility, the diversity and multiplicity of activities should be defined in such compatible and interactive characteristics. This will lead to a sense of liveliness and richness in space. It can be usually seen in multifunctional places that a range of marginal activities occur beside or around the main activity. The marginal activities can imply the small centers emerging around the center as the main activity.

Jane Jacobs believes that the multiple and diverse functions grow in response to giving service to an existing activity and in order to give service to the people that the main function attracts them.

She believes that diversity can be inefficient unless it is dependent to a main function. In such condition, it can produce liveliness (Jacobs, 1992).

In some other multifunctional spaces, the main activity is not defined. In such cases, the multifunctional space may be produced by the interaction of some equal functions.

A space is designed and is built to fulfill a certain request, and in order to perform properly, the space needs to be equipped with proper building systems such as lighting, acoustics, structural system, etc. Additionally, as Rem Koolhaas has emphasized the growing role of building systems in his article “Last Apples,” in S, M, L, XL¹, the coherent relationship between a **space** and **building systems** in contemporary architecture is getting closer. Flexibility can be achieved not only by the design of a space itself, but also by building systems that support it.²

In his book, “the Production of Space,” Henri Lefebvre attacked on the irony of Functionalism in terms of flexibility: “Functionalism stresses function to the point where, because each function has a specially assigned place within dominated space, the very possibility of multifunctionality is eliminated.”³ Herman Herzberger also warned the extreme application of programs into flexible design in the same article in which Herzberger criticized neutral solutions for spatial flexibility. Herzberger criticized that the direct application of functionalism into a space results in the fragmentation of the space rather than the integration of it and emphasized the “polyvalence of a space” as an archetypical form.

The uniform urban plan and the uniform floor-plan are based on the segregation of functions, and it is the blind obedience to the dictates of these functions that has resulted

in taking the distinctions between living and working, eating and sleeping etc. as the starting point for conceiving the space for different purposes in different ways, on the grounds that different activities make different specific demands on the spaces in which they are to take place ... Collective interpretation of individual living patterns must be abandoned. What we need is a diversity of space in which the different functions can be sublimated to become archetypal forms, which make individual interpretation of the communal living pattern possible by virtue of their ability to accommodate and absorb, and indeed to induce every desired function and alteration thereof.⁴

Aldo Rossi is another figure who appreciates the **adaptability** of traditional urban form by criticizing the modern architecture in the name of “naïve functionalism.”

Rossi proposed that traditional urban forms are more resilient, more flexible than the modern architectures that were designed by ingenuous empiricism and revealed that the naïve functionalism is not enough to express or explain the very complicated urban phenomena from urban structure to social lives.¹⁹ In the similar sense, Rossi took an interesting example while stating the permanence of a city.

According to Rossi⁵, permanences present two aspects: one is considered as propelling elements, and the other, as pathological elements.

Additionally, meanwhile most of historical housing types show some arrangement that can allow to obtain more functional flexibility.

For example the **traditional Japanese house** is organised as a series of interconnected spaces that can be joined or divided by means of sliding partition walls. As the most typical of these kind of house is proposed as example the one's designed by Kazuhiko and Kaoru Obayashi in Japan at the end of 1880. There is no hierarchy between the rooms. Every room has the same spatial quality and generates the different layout from time to time. In addition, there is no “circulation” system provided by corridors or buffering zones. The circulation is achieved in a different form according to the different room layout. The individual rooms are only separated by lightweight walls and can never really be fully isolated.

The flexibility that derives from this principle, is one of **indeterminacy**. The openness of the plan as well as the frame construction suggest that functional and social changes can be dealt with easily.

The actual flexibility and adaptability of the house is thereby completely dependent upon the active participation of the users: by pulling out futons from a storage cupboard, a room that was used as a dining room or sitting room can be transformed into a bedroom, the minimal approach to furnishings and the relative lack of other clutter, demands a discipline to achieve flexibility that may be beyond normal living patterns. Flexibility was also enabled through a modular approach to design. The size of the rooms is based on the standard measure of tatami mats, with rooms made up of a set of these mats (i.e. 6 or 8).

Kazuyo Sejima's work has the similar aspect: in Stadstheater project, the plan is a rectangle that is subdivided into smaller rectangles of different sizes. There is no obvious hierarchy between rooms, and the plan is almost reduced into some geometrical patterns in accordance with different use scenarios. Any number of combinations is possible in this plan: a rectangle can be a room at one time and a circulation space at another time.

The proposal⁶ by Kazuyo Sejima and Ryue Nishizawa formalizes this project through circulations and interior patios that visually illuminate and link different rooms. Through a hierarchy of the distribution of the different spaces of the program, which is outlined through the same rooms, each room has its own visual relationships with the rest of the building, and the circulations are articulated through them.

[1] - The Functionalism mentioned here has more essential meaning of architecture, “utilitas (utility),” that Vitruvius explained as one of the basic requirements of architecture.

[2] - Koolhaas, Rem. “Last Apples,” S,M,L,XL New York, NY: The Monacelli Press. Inc. 1995, 663-685.

[3] - H. Lefebvre, *The production of space*, Cambridge, MA: Blackwell, 1991. p. 369.

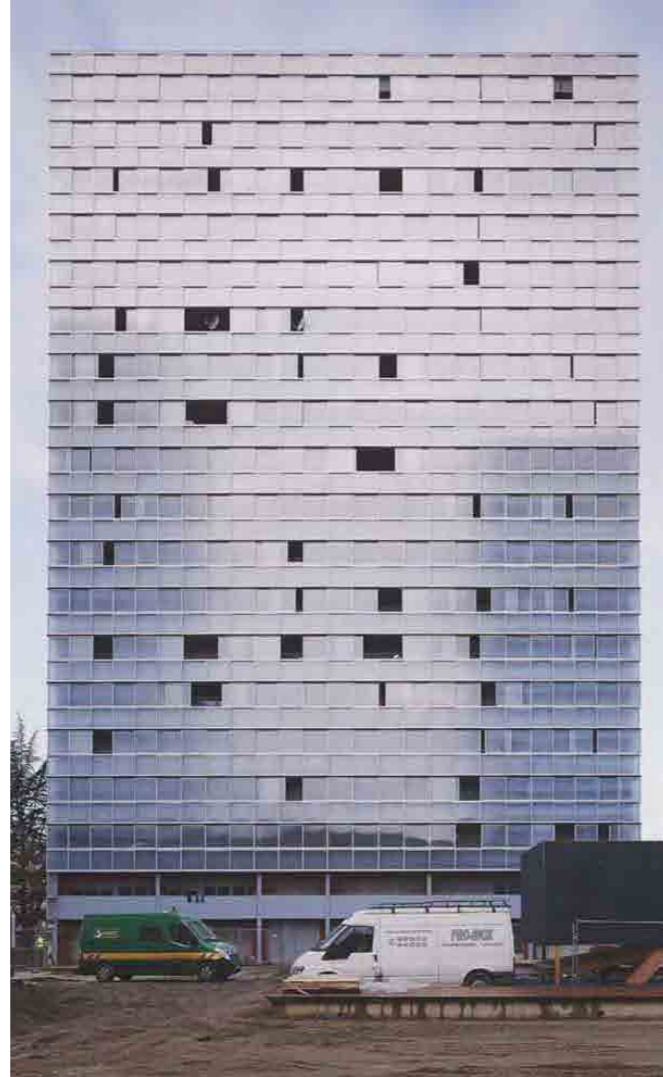
[4] - H. Hertzberger, *Lessons for students in architecture*, Rotterdam: Uitgeverij 010, 1991. p. 14716. Ibid., P. 134.

[5] - A. Rossi, *The Architecture of the City*, Cambridge, MA: The MIT Press, 1982. p. 46-48.

[6] - Kazuyo Sejima Ryue Nishizawa 1995-2000, El Croquis 99, p.188-196.

Urban Renovation Lormont

LAN Architecture
Genicart, France, 2015



20. Building before renovation.

21. Building after renovation.

1. Project explanation

The Génicart district, located near the centre of Lormont and adjacent to the town's main urban and interurban network, consists primarily of collective and social housing. Comprising 10% of the city's municipal territory, it accommodates roughly 10,500 people and 50% of Lormont's population.

This ambitious urban and social renovation project is organized around four different residences, located on the South sector of the district: Saint-Hilaire (387 units), Leroy (114 units), La Boétie (105 units) and Villon (104 units). The project has established a residentialisation programme. The term "residentialisation" originated in the 2000s and follows the first phase of rehabilitation of housing estates operated from the 80s.

In this programme, housing units are gradually distinguished from one another, and public space follows suit. Through the use of pathways and a more progressive hierarchy of public and private, the presence of unused collective space is reduced. The pitfall of residentialization lies in its premise. It is an impoverishment of shared spaces, a homogeneous privatization of ground against the very principle of large sets: the free plan. The risk is to strengthen the withdrawal, and return once again to the margins of neighborhoods.

The project area Génicart attempts to reconcile the redefinition and the free plan. Taking advantage of every opportunity offered by the need to intervene on the buildings, the project follows an overall strategy of making urban blocks more comprehensive through architecture, whilst keeping the landscape open. This is achieved through gradually transforming public and private spaces such as green areas, sports facilities and new pathways into an entirely pedestrian area.

Each residential group is reconfigured into a distinctive entity and follows the logic of the plot area. The renewal of the façades, which is initially designed to thermally insulate the building, opens up an opportunity for a dualistic approach to the rehabilitation. On one side, the rehabilitation has presented an opportunity to generate more space through creating additional rooms, loggias and balconies. On the other, it has defined a new architecture, visibly distinguishing each city block from one another.

2. Flexibility as a tool

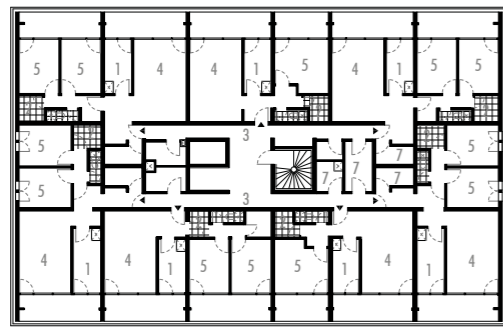
The central core with staircases and services is the main characterization of this kind of functional flexibility. Around this inner part are settled all the rooms in a precise module that allows a perfect systematization of spaces. In this way all the rooms appears to be equal in function, leaving the high possibility of a total transformation.

The hierarchy of all the rooms is done by the subdivision of the module, in order to create service spaces as well as kitchen and bathrooms.

The black water pipes are positioned around the core, so that in a future transformation it is possible to leave freedom at the other spaces.

The position of the windows is an important element that arise the characteristic of multi-functionality of a space. In this project it is visible how the sliding windows as bigger as the external wall, is the most undefined character that can be used for any function inside the room.

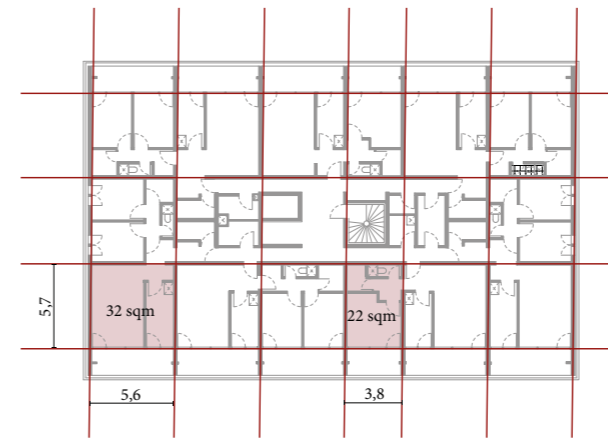
In the renovation of this buildings, Studio LAN added aone another layer to this facade: a double skin that enlarges the dimension of the balcony, protects the inner spaces by solar radiation, gives another "play" to the elevation and hides the room that face this loggia.



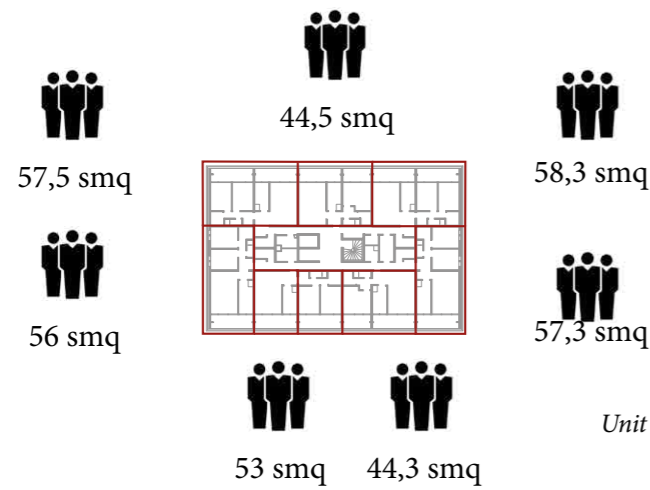
Type floor

HOUSING

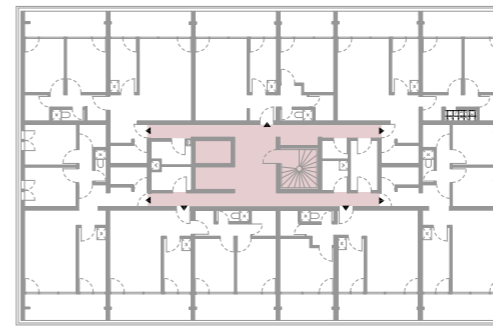
- 1. Kitchen
- 2. Toilets
- 3. Corridor
- 4. Living room
- 5. Bedroom
- 6. Loggia
- 6. Services



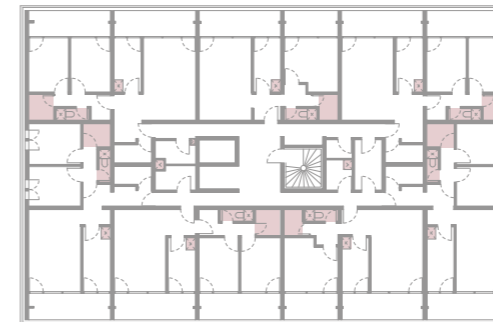
Modularity



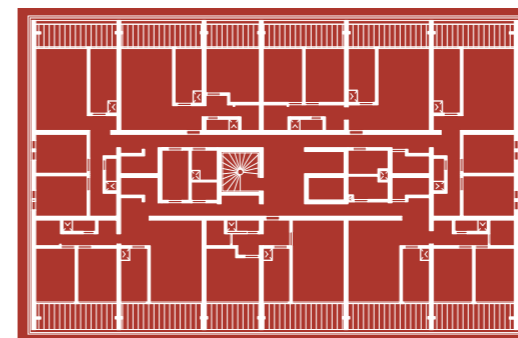
Unit subdivision



Black water pipes



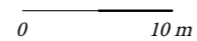
Connection and accesses

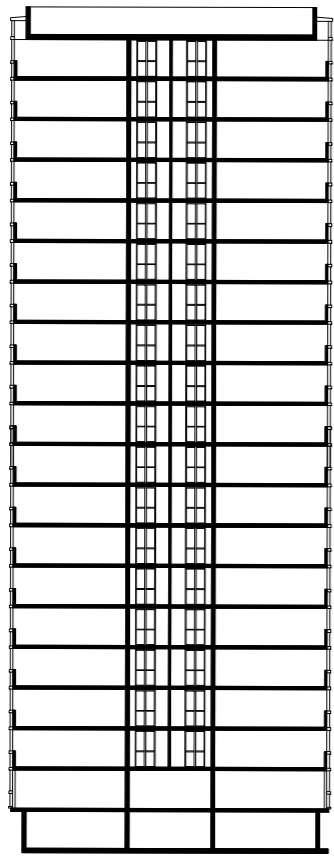


Light and ventilation

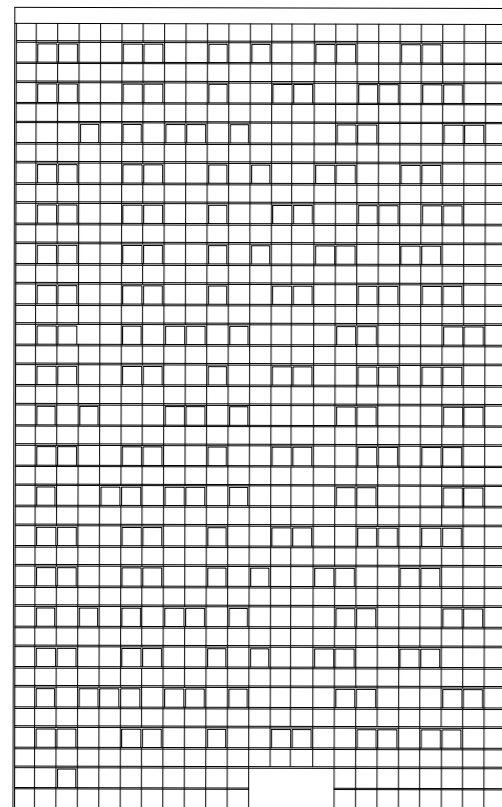


22. Photo: 15th Biennale of Venice, 2016. Physical model of Urban renovation of Lormont Genicart district.





Section



Elevation

- 23. Drawings provided by LAN Architecture: Inner section before and after renovation.
- 24. View of the facade of the double layer of skin of the facade.
- 25. View of the double layer of skin of the facade.

AFFORDANCE 4: TYPOLOGICAL FLEXIBILITY

As it was already mentioned in previous sub-chapters, this thesis steeped into the research of a different kind of flexibility than earlier cases, that could be referred to the **resilience** of the ancient building of the old Paris manners of designing perfected by Haussmann.

After having espoused the different types of flexibility that until now have been studied, the interpretation, through which this thesis work is going in deep, is related to the typological matter.

Referring to the research carried out during the workshop on how **typology** intervenes in the discourse of social housing and cited in the premise of this thesis, it can be stated that in architecture, typology usually refers to the special concepts and configurations of which a dwelling, a building or a city structure is formed. Besides being an architectural entity, a building can also be considered as a system or several nested systems, effected by its social and cultural context. Type and typology are significant concepts for the theoretical understanding of architecture and have affected the designing process during the time.

In today's architecture, the notion of **type** has turned out to be an autonomous concept from the past classifications, incorporating new aspects of design, based on different qualitative spatial characteristics. The stereotype of the archetype, as a basic model to be copied in a slavish way, is overturned, emphasizing the autonomy aspect of architecture. In this way the type becomes only the moment of reconnection with the classic tradition of the history of architecture, which set reference models.

In this panorama, the use of the typological tool, as understood in the past, appears to be tight to new morphological needs.

The typology understood as the essence of architecture together with flexibility as a design feature of transformability, are a tool for the search for new patterns.

The concept of typological flexibility can be designed taking into account a clear cut from a function-based design paradigm towards a different understanding of space as the real matrix of the transformation. This kind of flexibility is to indicate the maximization of the level of usability of the accommodation by the user, over time, as well as the maximization of the durability of the dwelling, in a contrast of the rigidity of an accommodation declared flexible but which actually appears to be limited in time.

Typological flexibility is first and foremost related to design process that all architects conduct from their own typological starting points and generally in a slightly different manner. In this sense, the flexibility is intended as the cornerstone of the quality of living as long as the programmatic principle able to guarantee the durability in time of the building, by reducing the obsolescence phenomena. This concept is totally linked with the factor of the time, which serves as the intrinsic answer of all the challenges that elapses during the life cycle of the building.

The flexibility is not resulted from interchangeability variability of a space, but from the change of the relationship between spaces. The architect has the task of design a series of spaces with an highly calculated use scenarios with an effectively organized program arrangement, and building systems capable of support each changeable spatial property.

This research intends to reassess the concept of flexibility linked only to modern buildings with the technological support. For this reason, this thesis is rooted into the study of LAN Architecture that made an Exposition about the flexibility embedded in

Hausmann's residential buildings.

Looking at the past, in traditional buildings, particularly in residential type, were used special tactics that a posteriori are revealed as the perfect answer to functional changes. In most cases, because of traditional structural systems, making changes in design organization was not easy and feasible. Accordingly, flexibility was achieved through creative tactics within structural limitations.

Traditional spaces have special abilities to be multifunctional and to be merged so providing larger space or divided into small spaces. The hierarchy of the spaces provides different scales such as minor, middle and major spaces that can be suitable for a diversity of uses and changes.

The model of the investment property of Hausmann in the old Paris, is particularly interesting in terms of its flexibility and reversibility. It is often subject to significant transformations over the time as apartment sizes are reduced, the number of co-owned lots increases, and some change in use. This exceptional adaptability turned the buildings constructed during the Hausman period into a reference point for investment that remains current, and into the archetype of Parisian habitat.

The constraints that framed the design of this type of building lie in part at the origin of this flexibility. In effect, at the sale of lots, which Hausmann usually attended at wise deeds he signed, the contracts included precise "charges, clauses and conditions": "The houses within each block must have the same floor heights and the same principal facade lines, facades in cut stone with balconies, cornices, and mouldings; the building height facing the courtyard may not exceed that of the facade facing the street". These rules, combined with the importance given to ornamentation, led architects to design the facades almost independently of the building plan, thereby adapting the content to the container.

From the historical buildings we can identify the modality and the elements for the realization of the typological flexibility, embedded in the following designing choices and point to work in order to obtain it.

First of all, a very effective design choice is undoubtedly the general oversizing of the space designed in all the elements that compose it, from the heights, to the circulation space, from the mechanical systems to the installation ones. We can certainly highlight how far this tool looks beyond the historical moment in which Hausmann designed the urban plan, taking into account the possible increase in demand for energy requirements in the future. In this way, the posterior adaptability of a building or accommodation increases. It is clear that a generous distance between floors can be used for differentiated functions over time, from residential to the service sector.

It should be borne in mind that in social housing the increasingly required containment of construction costs, however, does not allow an approach of this type aimed at overabundance.

However, it must be taken into account that the Hausmanian work is pioneering as regards design work no longer on the area, but on the volume.

The facade constitutes a truly **generic grid** behind which all the functions are affixed. It is applied indiscriminately to all buildings, regardless of their volumes.

All the buildings have heights that vary from one floor to the next: the ground floor is often between 4 and 5 meters, the mezzanine no more than 3 meters, the second and third floors average 3.6 meters, and the remaining floors are between 3.20 and 3.40 meters tall.

The neutrality of the facade, understood as the absence of symbols or shapes that indicate a specific use, not to be confused with standardization or absolute repetition, promotes the flexibility of use of a building. This variation allows certain floors to incorporate usages other than habitat. The most frequent transformation is into offices on the second to fifth floors, as the generosity of their volumes allows for the installation of the drop ceilings and false floors that such programs often demands.

A useful design principle for this is the modularity of the building blocks of the building envelope.

An **adaptable** building, capable of relating to variable uses and to constantly changing urban contexts, is a theme of primary importance for quality urban planning policies. The building is part of a context and should not be understood as an object detached from its surroundings.

Contextualism, i.e. the sensitivity to work of one's predecessors or contemporaries, not to be understood with the reproduction of the pre-existing buildings in series, is the ability that the context can have to emphasize some building typologies or features that are part of a heritage.

The contextual discourse is part of a flexibility perspective because, if on one hand innovation and typological experimentation is important, on the other it is necessary to guarantee user recognition.

An adaptable building, capable of relating to variable uses and to constantly changing urban contexts, is a theme of primary importance for quality urban planning policies. The building is part of a context and should not be understood as an object detached from its surroundings.

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The contextual discourse is part of a flexibility perspective because, if on one hand innovation and typological experimentation is important, on the other it is necessary to guarantee user recognition.

Despite the powerful aesthetic symbolism of architecture, a building cannot be considered "disposable" as happens with typical products from other sectors, such as fashion. Reasons closely related to the temporal, economic and material expenditure necessary for construction, impose the need to last over time. It is precisely this presence over time and intrinsic quality that invites us to establish a stable relationship and the ability to adapt to diversified needs in order to survive and not disappear.

The material and detail quality of a building is an essential requirement for obtaining the aforementioned timelessness and ensuring a "robust" identity. The attention to detail (typological, technical and technological), contrary to what is believed by currents of thought that consider it an obsolete and outdated practice, increases the value of the building and, if directed in this direction, increases the ability to transform.

47, Boulevard Malesherbes

Architect : Unknown
Paris, France, Around 1850



26. Photo: Boulevard Malesherbes, 1859.

27. Photo: Boulevard Malesherbes today.

1. Project explanation

This building belongs to the urban renovation settled by the Baron Georges Eugene Haussman under the guidance of Napoleone III around 1850. The pianification was focused not only on the urban patterns but also on the identification of some rules for the design of the buildings.

Boulevard Malesherbes is a fine example of a “Hausmannian” street.

The new apartments were self-contained, their facades or exteriors were considered to be part of the street and as such, they had to conform to a number of restrictions. This uniformity is a typical example of the Haussmannian style with some of its distinguishing features are as follows.

The building is made of stone, where plaster had been used in the past.

There are balconies on the second floor and on the 4th and 5th floors which extend along the whole length of the building.

The buildings go straight up from the ground to the 5th floor cornice, at which point the roof begin to slant inwards. This allows light to filter down to the lower floors. The inward slant meant that from the street all the buildings seem to have the same height.

Although the buildings at first appear to be very uniform, on closer inspection it can be seen that each architect would add small details to give his own personal stamp to the building.

The buildings often have small interior courtyards and this is where the pipes, the lift machinery, ventilation shafts and all the unsightly necessities were hidden.

2. Flexibility as a tool

The Haussmann building was designed primarily as a place of residence for the bourgeoisie, but it revealed itself to be an extraordinarily open architecture capable of incorporating other uses besides habitation.

The model of the investment property is particularly interesting in terms of its flexibility and reversibility. It is often subject to significant transformations over the time as apartment sizes are reduced, the number of co-owned lots increases, and some change in use.

There are common characteristics in all these architectures that lie at the base of this flexibility: a clear structure, a ground floor that is accessible from the street and which can extend to

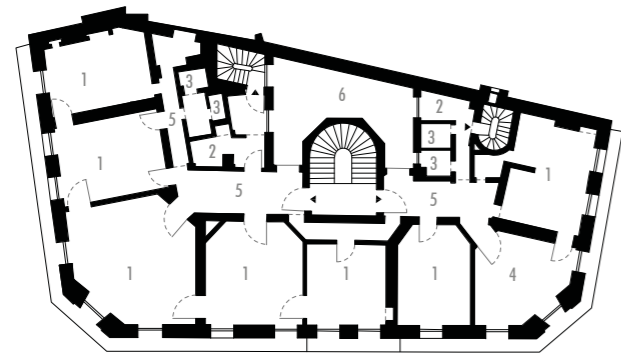
include the mezzanine, a wealth and variety of door and window openings to allow for the construction of all kinds of plans, variable heights in the floors, adequate thickness, and a high level of compactness.

We can say that the spatial and constructive generosity is the result of public health attitudes of the era. Everything is designed to facilitate ventilation: large and small courtyard, apartments that traverse the whole floor, high ceiling and heights, especially on the “piano nobile” floors, etc.

The facade constitutes a truly generic grid behind which all the functions are affixed. It is applied indiscriminately to all buildings, regardless of their volumes.

All the buildings have heights that vary from one floor to the next; this variation allows certain floors to incorporate usages other than habitat.

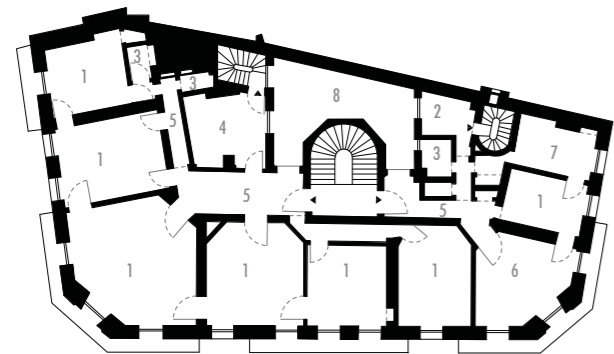
The transformation done for this building and often in all the others, is into offices on the second to fifth floors, as the generosity of their volumes allows for the installation of the drop ceilings and false floors that such programs often demands.



Second floor

OFFICES

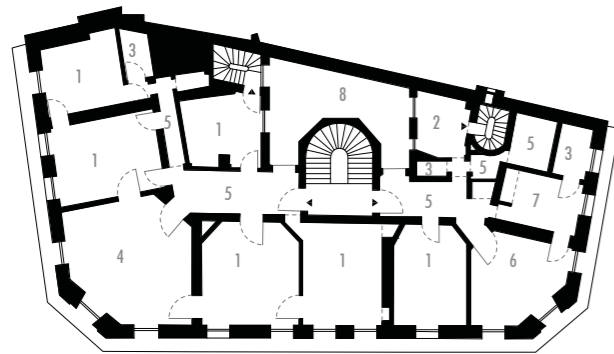
- 1. Office
- 2. Kitchen
- 3. Toilets
- 4. Meeting room
- 5. Corridor
- 6. Court



Third floor

OFFICES + HOUSING

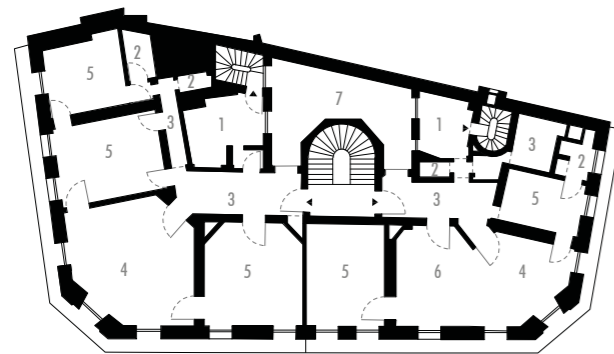
- 1. Office
- 2. Kitchen
- 3. Toilets
- 4. Meeting room
- 5. Corridor
- 6. Living room
- 7. Bedroom
- 8. Court



Fourth floor

OFFICES + HOUSING

- 1. Office
- 2. Kitchen
- 3. Toilets
- 4. Meeting room
- 5. Corridor
- 6. Living room
- 7. Bedroom
- 8. Court

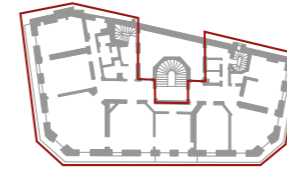


Fifth floor

HOUSING

- 1. Kitchen
- 2. Toilets
- 3. Corridor
- 4. Living room
- 5. Bedroom
- 6. Dining room
- 7. Court

Unit subdivision




255 smq

There is no fixed modularity between the rooms, but different dimensions characterizes the modules.

Every room has different dimensions

The width of the corridor becomes the central spine of the building with the main staircase.

The bigger rooms are dedicated to living rooms or meeting rooms, but the dimension of each room allows a flexibility of the function.

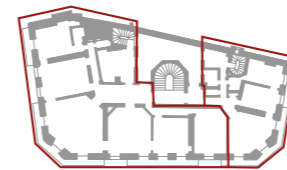
The windows are all the same in width (1,3 m), but the height is different according to the story and the hierarchy.


The distance between the windows is proportional and in many rooms there are two. The biggest is the room the biggest is the distance between the windows.

For what concerns the position of black water pipes, are relegated to marginal spaces, next to the staircases.

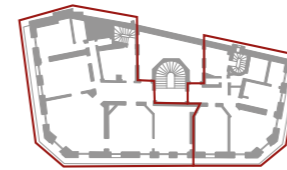
The circulation is settled in the central core of the building with a corridor that divides the entrances in two, so that, there is a good flexibility of spaces.



183 smq



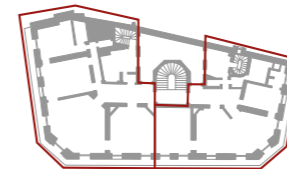

72 smq



160 smq



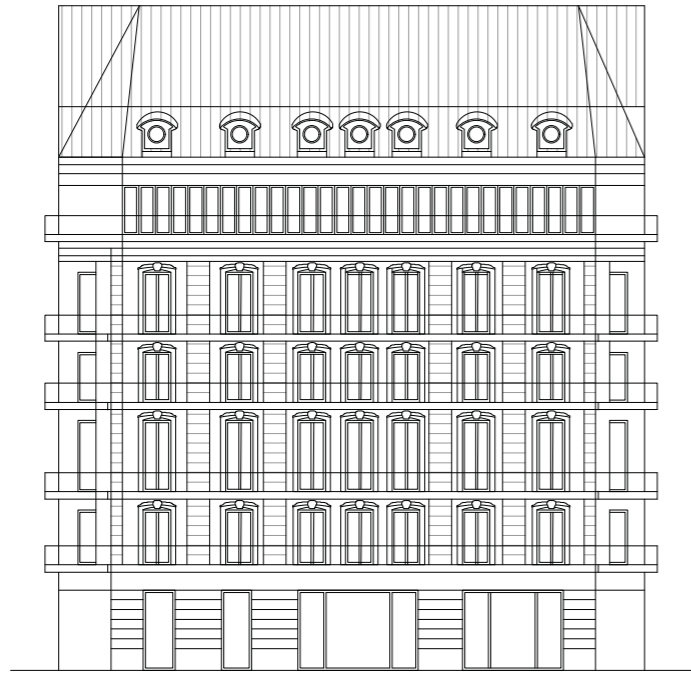

94 smq


138 smq

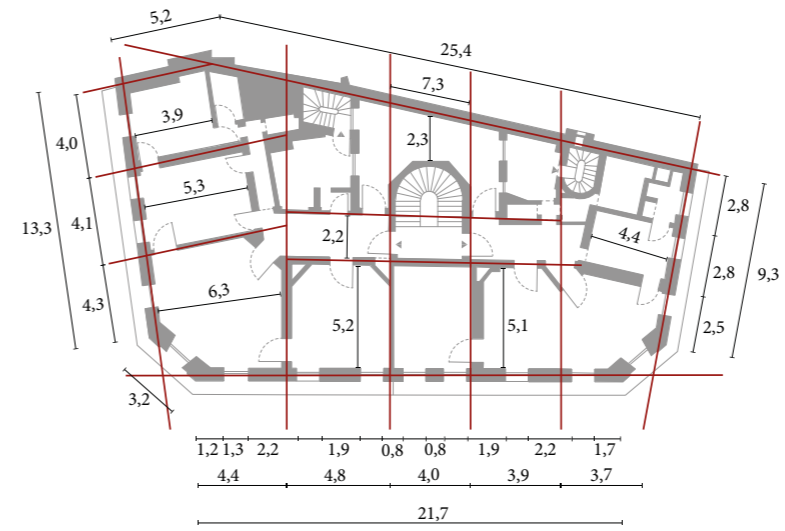
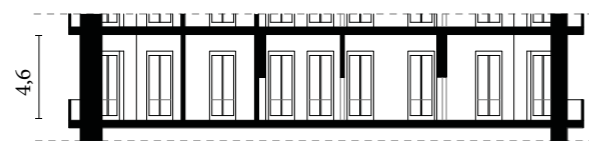



117 smq

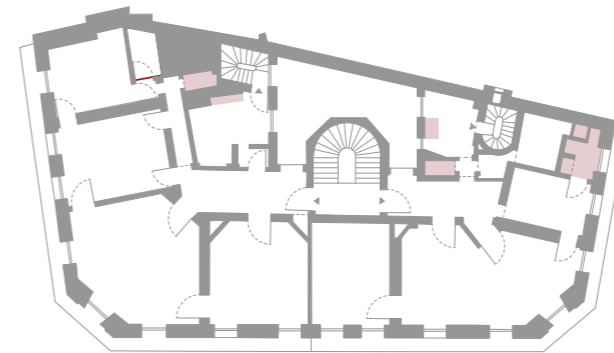
Elevation



Section of the fifth floor



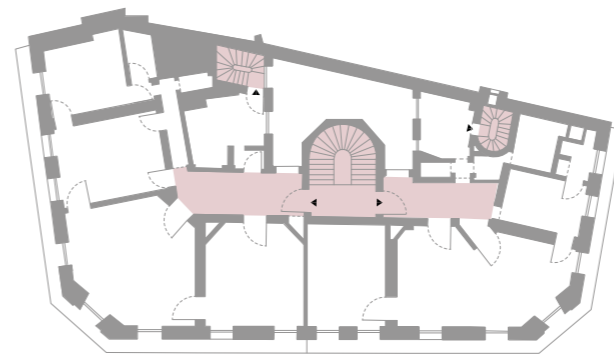
Modularity



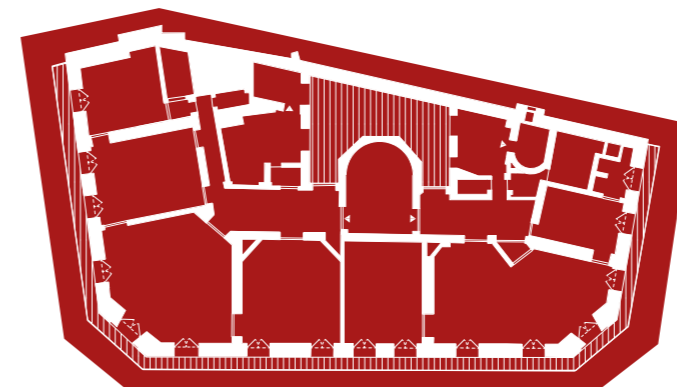
Black water pipes



28. Zoomed photo of the facade.



Connection and accesses



Light and ventilation

Paris XVII, 40 housing units

LAN Architecture
Paris, France, 2014



29. Photo: External view of lot 4.2 within the “Saussure” area.

1. Project explanation

The project pays homage to Paris, to the architecture of the 19th century, and to the Haussmann building. A perfect extrusion of the parcel, the project introduces, through its flexibility, the notion that by emptying an architecture of its program, a building generates potential that will accompany the evolutions in urban development and allow it to respond more readily to changes in use.

The design of the façade for Lot 4.2 uses a structural pattern similar to the office buildings (1.35 meters). It alternates one full module with two empty ones, which correspond to the window openings.

We consider these values as the great heritage of the Parisian building, and we have sought to translate them into an architecture that forms part of the city’s current logic, but which also offers solutions to current and future challenges.

2. Flexibility as a tool

Through its flexibility, the project introduces the notion that by emptying an architecture of its program, a building generates potential that will accompany the evolutions in urban development and allow it to respond more readily to changes in use.

The rue de Saussure building seeks to anticipate needs and changes by proposing a full reversibility between a residential and an office building.

At the same time, this sense of openness gives each residence a very particular quality.

The building was configured to have flexibility even its structural system, which is in fact composed of a loadbearing core which contains all the horizontal and vertical circulations, and trumeaus surrounding the windows which take the vertical load distribution from the façade.

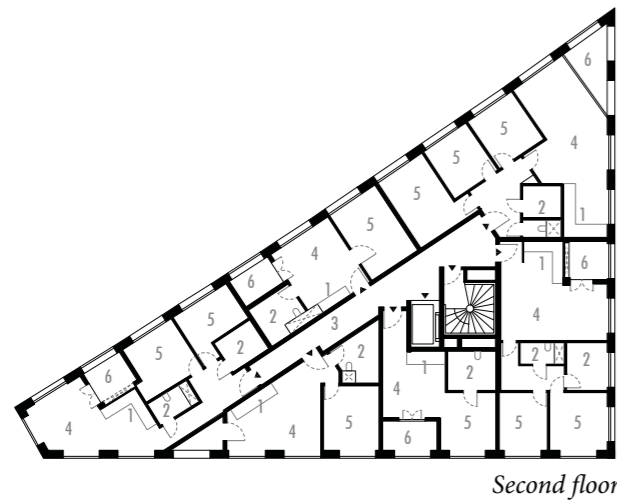
Brick walls separate the apartments, and the partitions that define the rooms can be removed to create space for offices.

A clear structure, a ground floor that looks out onto the street, a wealth of door and window openings that allow for the construction of all kinds of plans, variable heights between floors, an adequate thickness, and a high level of compactness.

The flexibility addresses the multiple uses to be observed in Haussmann buildings: housing, commerce, schools, banks, offices, etc.

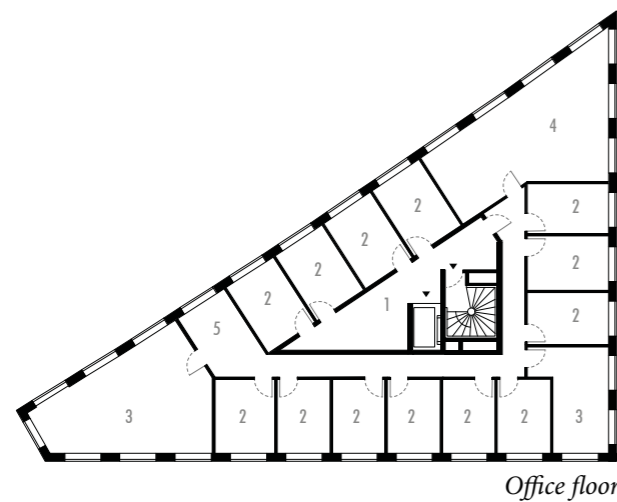
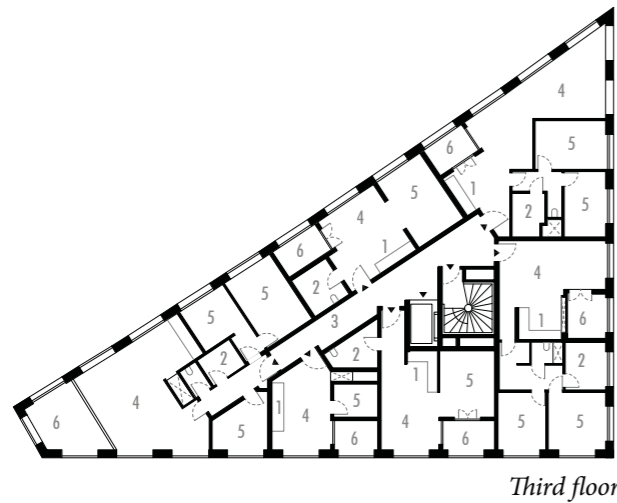
The rue de Saussure building seeks to anticipate needs and changes, in particular by proposing a full reversibility between a residential and an office building.

The configuration of the floors, the spatial proportions, the regularity of the door and window openings in the façade, as well as the structural system all facilitate the modification of the interior layouts.



HOUSING

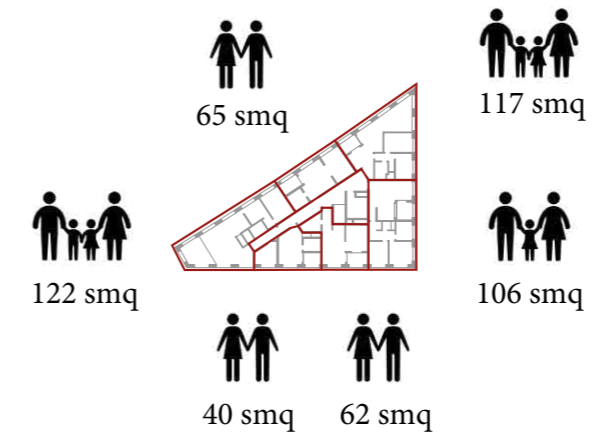
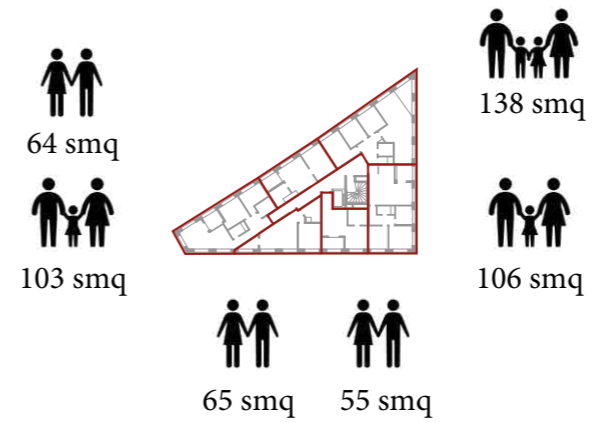
- 1. Kitchen
- 2. Toilette
- 3. Corridor
- 4. Living room
- 5. Bedroom
- 6. Loggia



OFFICES

- 1. Corridor
- 2. Office room
- 3. Meeting space
- 4. Co-working room
- 5. Waiting area

Unit subdivision

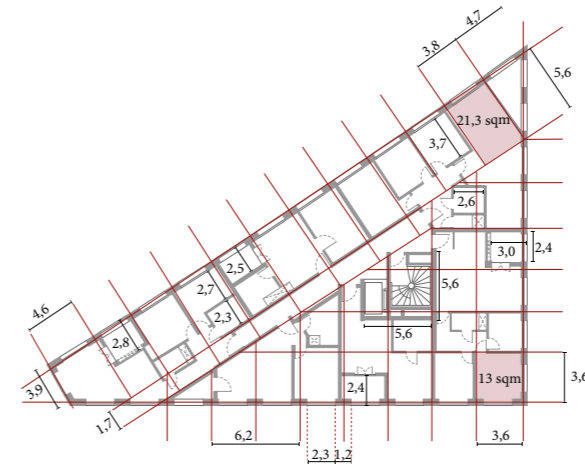


30. Photo: External view of the corner.
31. Photo: Inner view of the living room.





Longitudinal section



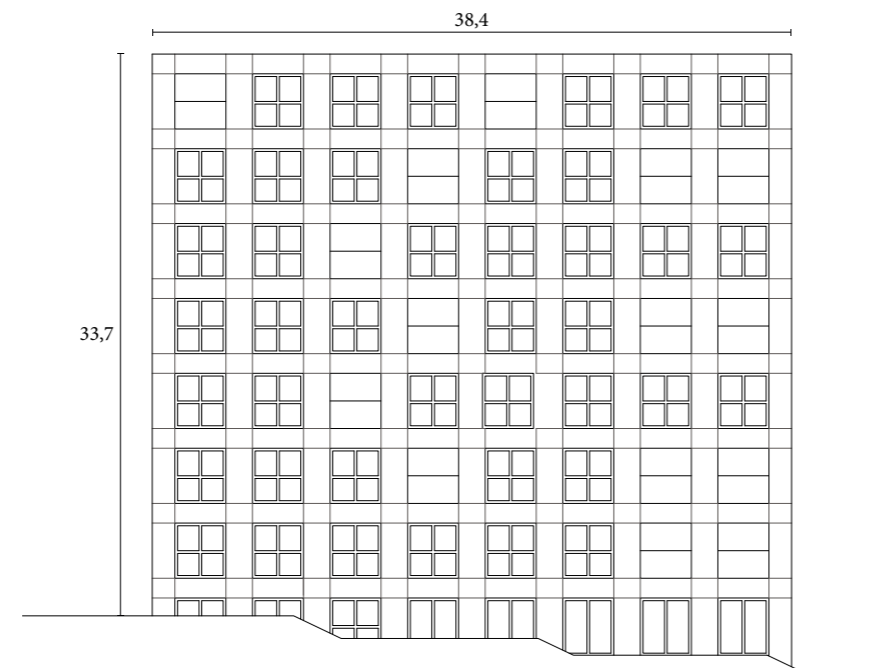
Modularity



Black water pipes



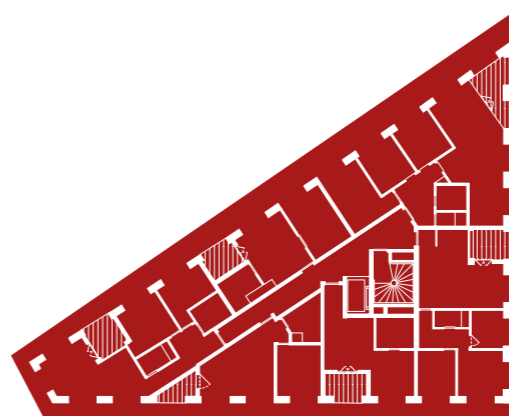
32. Photo: Inner view.
33. Photo: External view of a detail of the facade.



West elevation



Connection and accesses



Light and ventilation

111 Rooms

Maio Architects
Barcelona, Spain, 2016



34. Photo: External view of the facade.
35. Photo: Inner view of the living room.



1. Project explanation

The residential building designed by Maio in Barcelona is a system of 110 rooms that can be used at will.

Each apartment can potentially be enlarged or reduced by adding or subtracting rooms, in order to meet the future needs of its inhabitants.

The rooms have similar dimensions, eliminating any kind of spatial hierarchy and functional predetermination.

Each floor contains 20 rooms and is initially divided into four apartments with 5 rooms each.

2. Flexibility as a tool

The housing block is designed as a system of rooms that can be used as desired, the program is not determined.

Each apartment can be expanded or reduced adding or subtracting rooms.

Flexibility is simple as it only concerns opening or closing doors.

For the next coming years the floor plan is divided as a set of four apartments. Each one containing 5 rooms.

Rooms are connected among them, no corridor is needed.

The rooms are connected directly to each other and do not require distribution spaces.

A kitchenette is placed in the middle room acting as the center of the house.

The other rooms are going to be used as bedrooms and livingrooms.

The center of each apartment contains a core of services, while the other rooms can be used as bedrooms, living rooms ...

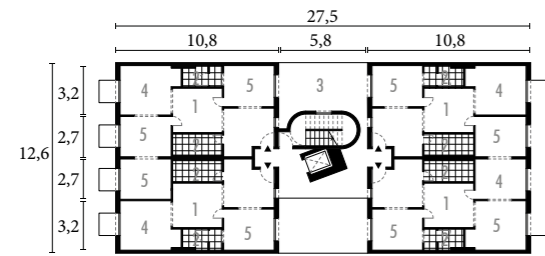
This flexibility is able also due to the position of the bathrooms, where all the installations are placed and work strategically as points for water, air conditioned and electricity supply.

The ground floor refers to the Eixample's traditional halls where veined marbles and large spaces define the place of reception and representation.

In this perspective, the themes of vertical connections, positioning of services, modularity of the supporting structure play a role of primary importance, in fact flexibility is due to the position of the bathrooms, where all the systems are positioned as supply points.

This theme of flexibility and adaptability also concerns the functional transformation from residence to tertiary and viceversa.

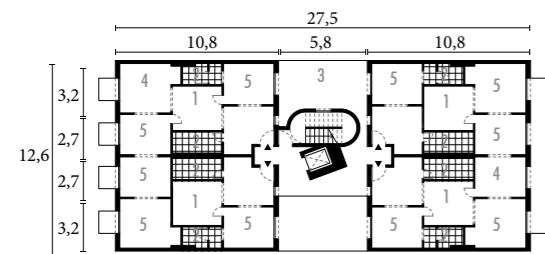
The facade is defined according to the height and composition of the adjacent buildings. It searches to consolidate the traditional style of the neighborhood where prevail opaque walls with vertical proportion openings, balconies with wooden shutters and lime stucco with decorative motifs.



Type floor 1

HOUSING

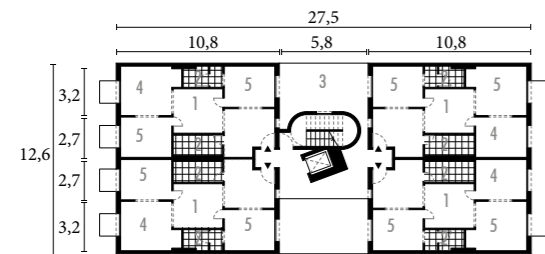
- 1. Kitchen
- 2. Toilette
- 3. Corridor
- 4. Living room
- 5.. Bedroom



Type floor 2

HOUSING

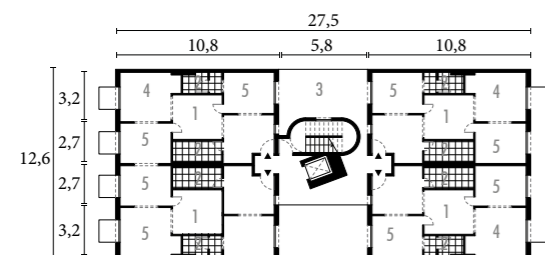
- 1. Kitchen
- 2. Toilette
- 3. Corridor
- 4. Living room
- 5.. Bedroom



Type floor 3

HOUSING

- 1. Kitchen
- 2. Toilette
- 3. Corridor
- 4. Living room
- 5.. Bedroom

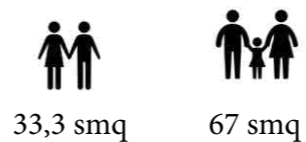
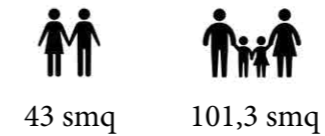
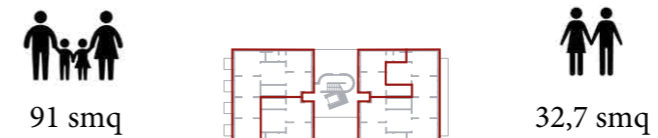
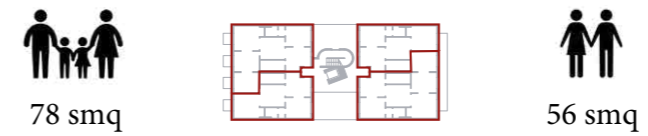


Type floor 4

HOUSING

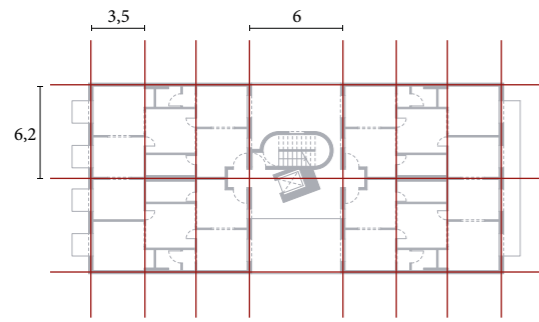
- 1. Kitchen
- 2. Toilette
- 3. Corridor
- 4. Living room
- 5.. Bedroom

Unit subdivision

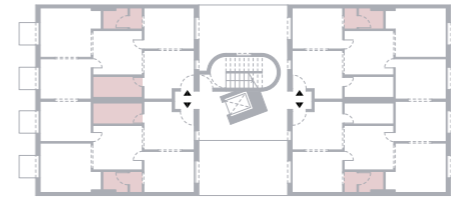


36. Photo: Four scenarios and uses of the rooms.

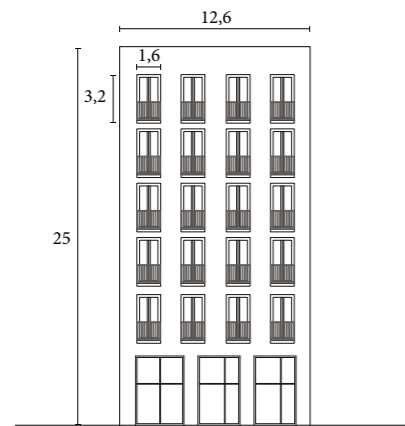




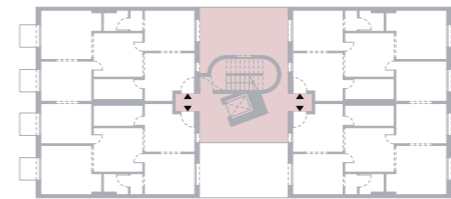
Modularity



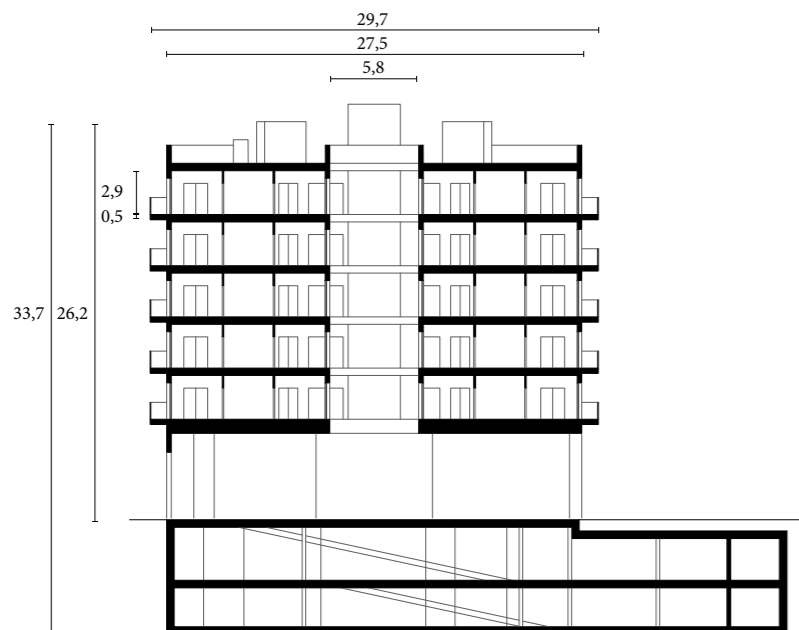
Black water pipes



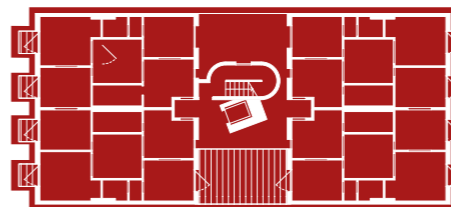
Elevation



Vertical and horizontal circulation



Section



Light and ventilation

PART II

TYOLOGICAL
FLEXIBILITY

METHODOLOGY

Typological flexibility refers to the idea of a building and its **spatial configuration**, which is epitomized as a design feature that enables unpredictable use of the building and space.

In architecture, the concept of typology normally refers to the classification of characteristics commonly found in buildings and urban places, according to their association with different categories.

Christopher Alexander coined the term "*pattern language*" in his homonymous book published in 1977. The pattern language, in his idea, is an organized and coherent set of **patterns** which describe a specific field of expertise.

All languages are made by a vocabulary, a syntax and a grammar and the pattern is a model.

By transporting this concept into the architectural field, particularly in this research work, the *vocabulary* could be the typology since it enclose all the characteristics (*grammar*) of an architectural object that are expressed through *syntax*, the composition namely.

According to Christopher Alexander's interpretation, we can call patterns the **architectural types**, those basic elements that are characterized by unequivocal elements that belong to the categories of typologies. According to the architect, they can be elemental or universal, as versatile ideals of design, either as found in experience or for use as component in practice. Patterns might be invented or found and studied, such as the

naturally occurring patterns of design that characterize human environments.

The field of intervention of the research carried out here holds together the theme of the typology, just explained and deepened previously in the book of the "final thesis study", with the concept of flexibility, presented in the previous chapter of this thesis.

The theme of typological flexibility starts from the search for possible "patterns" within the residential heritage of the past. As already studied by LAN Architecture and presented in the exhibition "*Hausmann's modele de ville*", this theme is introduced through analysis of the buildings of the Parisian residential heritage.

Because the spatial configuration of dwellings in modernism has usually been approached separately from the urban context, flexibility has generally been seen as a feature of singular dwellings and in the context of **transformability**. It has generally been used to refer to flexible architectural features in which the physical context of space can be transformed.

The typological approach in design refers simultaneously to the **spatial logic** of the buildings, the **configuration of passage spaces** to other spaces, and to the whole context of spaces within the architecture of building, as studied earlier in the context of type. In type and typology of building, everything affects everything simultaneously, as in systems in general. Besides being an architectural entity, a building can also be

considered as a system or several nested systems. The interface with urban context gives type depth and affects its social and cultural context.

Due to the flexibility of the type of the building, the influence of type on the urban context depends how integrally the spatial arrangements are linked to the interface between the building and the city structure. To take advantage of type, planning should always allow for the possibility of developing new types at the design phase, which could foster resilient development by enabling the building to react to social change

When buildings are understood through the concept of type and typological flexibility, and not through building type or house type, this also changes how we understand urban structure.

For this reason, to achieve the final objective of having as much material as possible covered by this theme, we have focused on a research that expands to other urban models that take up the Parisian one.

Due to the strong connection between the design of the city and that of the building, we then started from **three European urban plans**, and then deepen the theme on several case studies of the nineteenth Century. Following these cases we have added other modern case studies to compare the language. As mentioned above, the language of these models is composed of a syntax and a grammar. We then decomposed each of these buildings, looking for a common grammar, made of characteristic elements that could tell the syntax. The decomposition has led to the development of a series of elements that allow the building to be more or less flexible typologically. This important work of mapping has been fundamental in the realization of this manual, aimed at the search for a new flexibility already experimented unconsciously in the '800.

The interpretations proposed at the end of each of the two large groups of case studies offer our own interpretation on the subject, open to further research.

In this regard, Christopher Alexander inspired the classifications and evaluation of each feature highlighted, through the attribution of a “weight” marked with asterisks for possible competition to typological flexibility.

THREE URBANISTIC PLANS

The concept of type represents the real generating principle of every building. Talking about typological flexibility means to head towards the **morphology** of the building itself. This particular kind of flexibility, during the research that we have done, has been recognized very present in the historical residential heritage of the XIX Century, showing off a remarkable degree of **resilience** and **adaptability** across the time.

Taking a cue from the work done on Paris by the studio LAN on Haussmann's urban plan (1853), this thesis section aim to extend the research on two other urban European plans of the 19th-century: the plan Cerdà of Barcelona (1860) and the Beruto's plan of Milan (1884). Through this study, a targeted comparison is to be carried out to see if and how most of this historical heritage possessed an **“intrinsic intelligence inform”** (cfr. *“Haussmann modele's de ville”*) which has allowed him to survive the many social changes and many urban transformations that have taken place.

Designed primarily as a place of residence for the bourgeoisie, these historic buildings have proved to be the heritage of an extraordinarily resilient architecture, able to **adapt** to other uses besides the original one. The notion of resilience the capacity of to absorb changes while preserving the structure. In support of the theoretical research, some urban analysis want to return, in different scales, the morphology of the three cities and their urban plans. Each of these plans presented here is equipped with some graphic boards in three different

representative scales, starting from an urban, neighbourhood and block level.

In order to understand the characteristics of each urban plan, an example building was taken into account on which all the research takes place.

The first board at the urban level is drawn on a **1:100.000** scale. It wants to represent at the city level the main transport system, which was designed as early as the 1800s and still maintain their morphology today.

The next two urban boards, related to a portion of the city, are drawn on a **1:10.000** scale.

Through the use of black and white, the intention is to highlight some morphological aspects in order to compare them with the other examples. In particular, the first analysis wants to take up the Nolli plan of Rome made by Giambattista Nolli and concluded in 1748: the buildings colored in black focus all the built and compact parts of the city, bringing out the density of the urban system. As with contrast work, the next map depicts in black the voids of the city consisting of demolished streets, squares and areas.

Focusing on the portion of the neighbourhood, a **1:5.000** scale shadow analysis represents the different heights.

Finally, at the isolated scale two asymmetry in **1:1.000** representation scale. The block is composed of a continuous and systematic succession of buildings. These aggregate forms make it possible to detect the maximum of individual buildings and constitutes a device that works as a single body.

PLAN HAUSSMANN, PARIS, 1853

The first urban plan presented is the one for Paris, developed by Baron Haussmann under the auspices of Napoleon III. As already announced, this example is very important for the research carried out, because has been already addressed by the Parisian/Italian studio LAN Architecture, which conducted an in-depth research on the flexibility of housing in 19th-century Paris.

The Haussmann version of the investment property guaranteed the improvement of domestic sanitary conditions and compensated for the high density of the blocks. Its spatial and constructive generosity is the result of public health attitudes of that era. Everything is designed to facilitate ventilation and all the buildings are generous both in terms of space and materials.

The reversibility of the investment property along with the high degree of the block's flexibility, the coherence between the urban matrix and the infrastructure networks, as well as their initial oversizing, make Haussmann's city greatly capable of transforming itself and evolving in response to changes in the physical, social, and economic environment.

Napoleon III's expectations of beautifying, enlarging, sanitizing the city, combined with a series of strict rules and rules at all scales, from urban furniture to road tracking, create a single project aimed at spreading quality in all parts of the city. The state designs and controls the projects, the private individuals realize the residences.

From an urban point of view, new tracks were planned: Haussmann's network of boulevards and avenues is still the backbone of the Parisian urban fabric. He expanded the large boulevards and built or planned new axes of great breadth and the size of the squares could only be adequate to those of the boulevards. His dream, as the first sketch of the idea of the Métro, would have been to connect all the Parisian stations by rail, but he had to be content to improve the accessibility of the existing stations by connecting them through important road axes. In addition, the city was enriched with prestigious buildings and monuments, with the creation of several parks and forests and green urban areas.

Another point taken into account was the creation of a new water supply system in the capital and the disposal of black water and waste, along with the addition of drinking water.

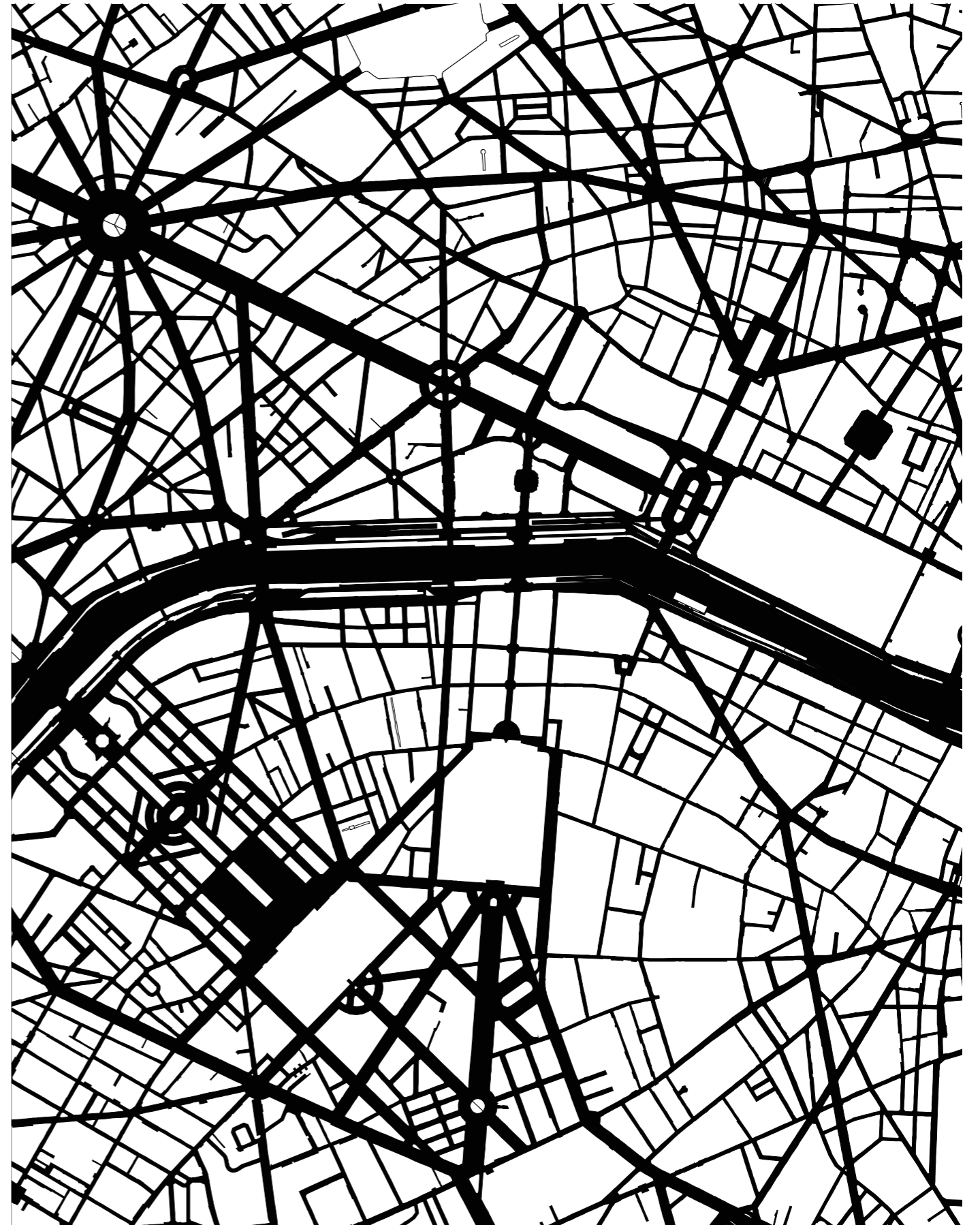
The Haussmann style is not content to chart roads and create urban infrastructure. It also intervenes on the aesthetic aspect of private properties.

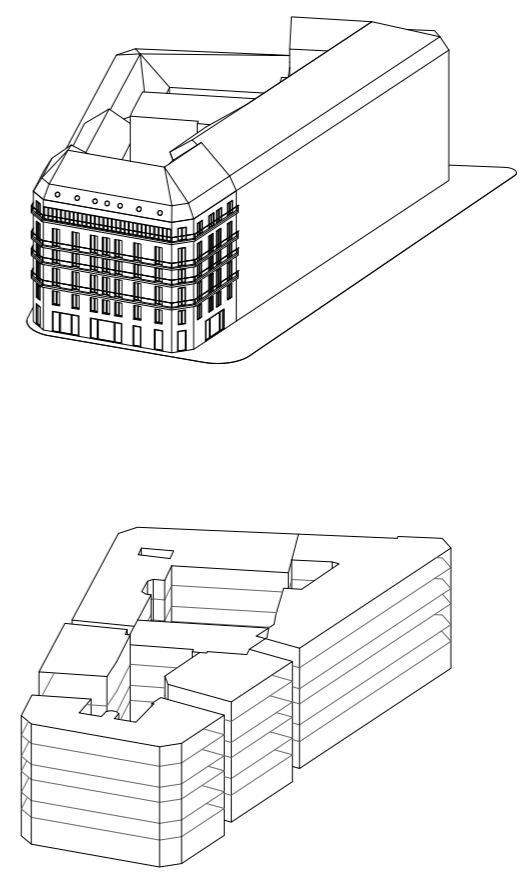
The front of the block on the road is conceived as a homogeneous architectural ensemble. The new property is not autonomous, but must help build a unitary urban landscape with the others built on the new track.

The regulation and servitude imposed by the public authorities favour the implementation of a type of construction that brings to an end the classical evolution of the Parisian property towards the characteristic facade of the Haussmannian capital: ground floor and mezzanine with re-entering walls; "noble" floor with one or two balconies; third and fourth floor in the same style, but from the frames of less affluent windows; fifth floor with continuous balconies, no decorations; roofs (which contain retaining 45-degree).

As an example of this urban planning, a building previously studied by LAN architecture and judged to be typologically flexible has been taken into account: it is located in 47, Boulevard De Malesherbes.







PLAN CERDA', BARCELONA, 1860

The city of Barcelona in the second half of the 19th century was characterized by the highest density of housing in all of Europe: the central government, in fact, looked with suspicion at the rise of the dynamic Catalan bourgeoisie and therefore ordered a ban on the expansion of the building outside the ancient walled enclosure and the borders of military jurisdiction. As a result, almost all of the population lived in the barrio of medieval origin, characterized by a small and fragmented roadway and a building fabric so compressed that it inevitably generated social and hygienic situations of great discomfort. This disastrous situation, which is actually common to all major European metropolises, prompted the reluctant central government of Madrid to ban in 1854 a plan for the reorganization of the building fabric and road infrastructure of the Catalan city.

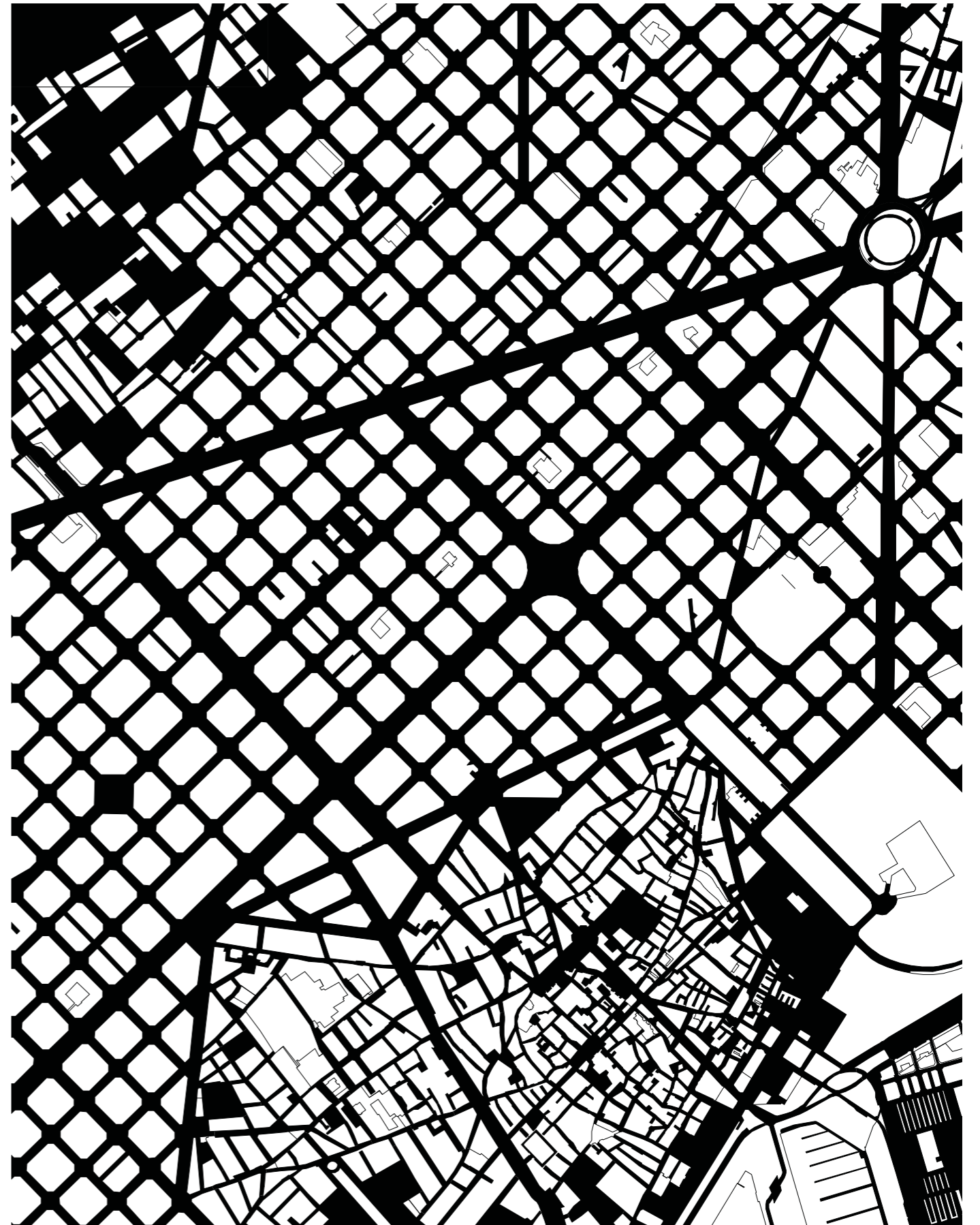
The Plan Cerdà was an 1860 urban reform and expansion plan for the city of Barcelona that followed an open and egalitarian checkerboard layout. The expansion foreseen by the plan was spread over an immense area free to be built and to be considered a strategic military zone. It proposed a continuous grid of manzana (block) of 113.3 meters, with roads of 20.30 and 60 meters with a maximum construction height of 16 meters. The novelty in the application of the checkerboard layout consisted in the fact that the manzana had the Chafaláns, that is the 45° rounded corners to have greater visibility at intersections.

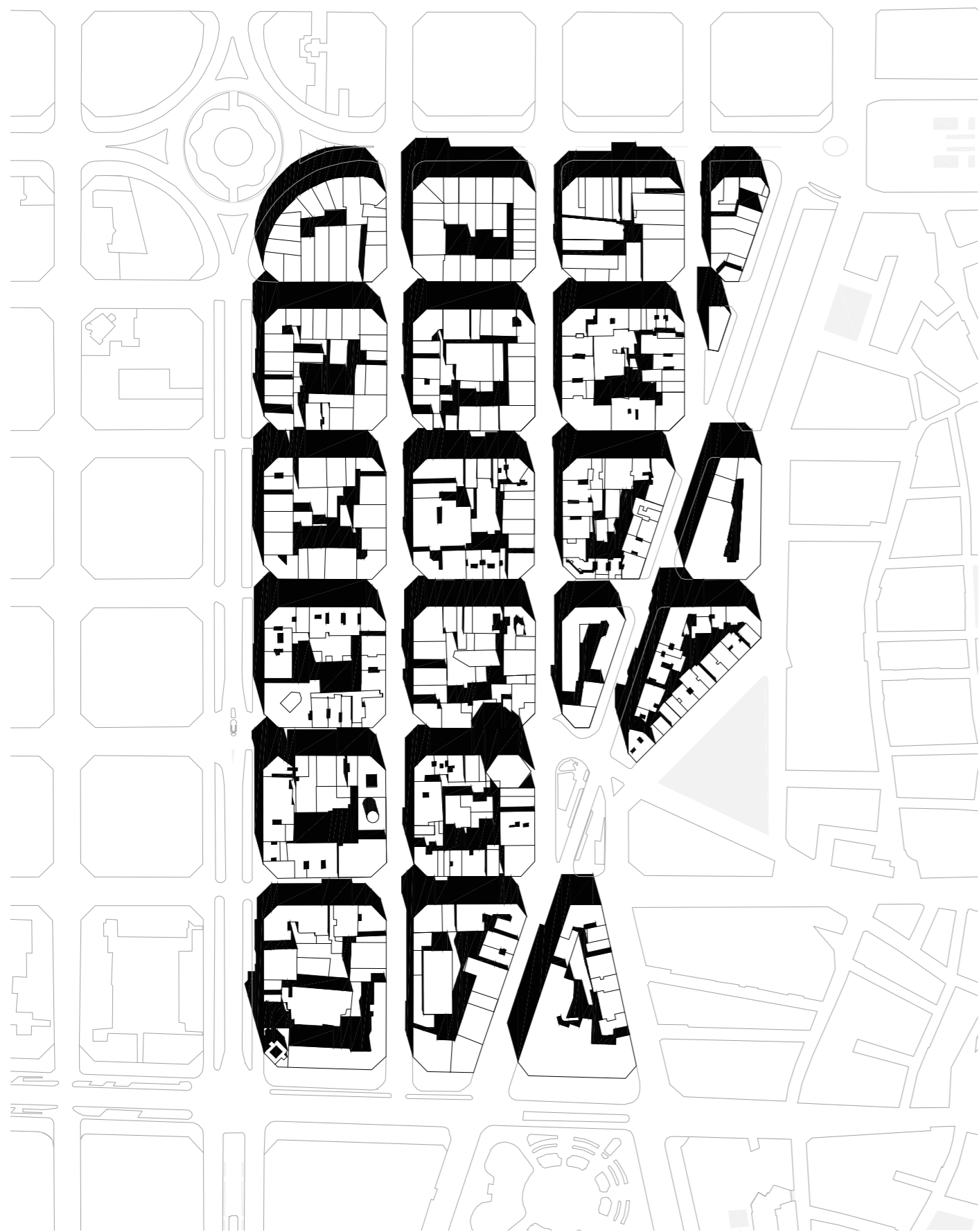
Cerdà is considered the father of urban planning: seeking an approach that is as objective as possible he considers the city as the result of the persevering and continuous work of several generations who over the centuries have adapted the urban landscape to their needs.

An extremely rigorous urban fabric is thus created, but enlivened by the coherent innervation of higher-ranking road axes. Cerdà did not consider the blocks as a simple urban residue of the road network, but came to give them a valuable architectural dignity. This was possible thanks to the introduction of a partition in lots where the building would occupy only 35% of the surface of the block, with the construction allowed only on two or at most three sides and the residual areas intended for other purposes. or equipped as a garden: Cerdà, in this way, foresaw, despite the monotony of the road grid, the generation of an extremely diversified building fabric, considering the extreme variety in plan of the blocks that would come to be built. This revision of the building typologies, however, was not successful, as it degraded in speculation: to increase the economic quality of the individual lots, in fact, no attention was paid to making the various building blocks on all four sides and to increasing the buildable surface and depth.

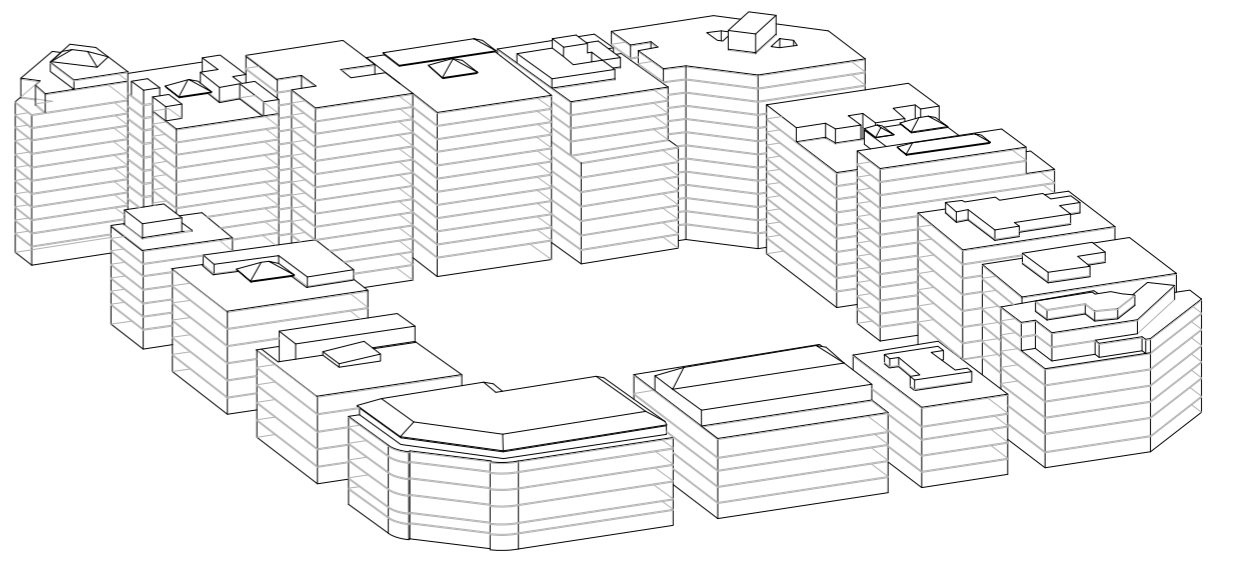
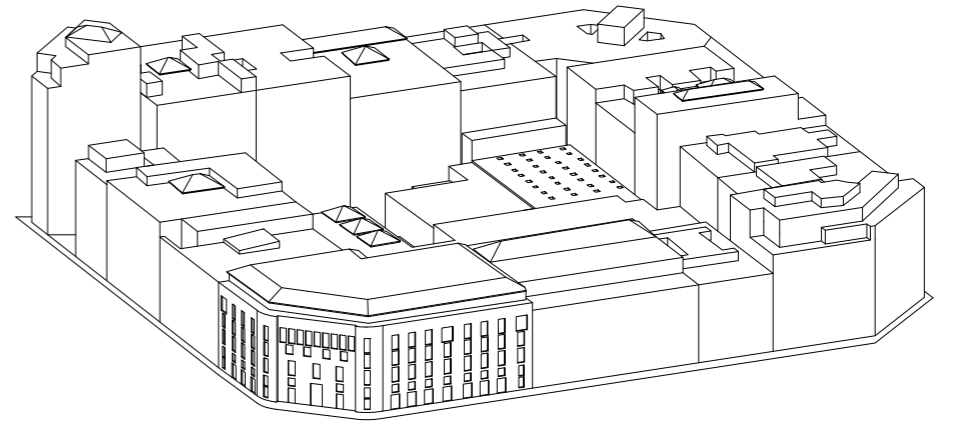
The Antoni Roger House (1888-1890), one of the first works of Enric Sagnier i Villavecchia, is a large building, deliberately representative, which is part of the set of houses that the upper middle class of Barcelona had built in the area below. right of the Eixample. As an early work, it suffers from an inconsistent use of elements of different stylistic origin, especially of classical and medieval origin, which is evident in the disproportionate Ionic-type columns and in the brutalism of the Greek crown of the crenelated crown. The emphasis on the corner façade is worth noting, where the main door opens onto a staircase with the same tone as a brilliant monumentalism, currently closed and in bad condition.







0 200 m



0 30 m

PIANO BERUTO, MILAN, 1884

Chosen for the importance that the city of Milan has within this thesis project and as an example of an urban plan in the European landscape, the Beruto's plan is the first local strategic plan of Milan made by the engineer Cesare Beruto for the first version in 1884.

This first urbanistic tool was proposed in a context of strong pressures and many disputes that arose between the city and a growing number of real estate investors and speculators interested in developing the areas of the historic Piazza d'Armi and the Sforzesco Castle. The objectives set for the design of the city of Milan, were designed in response to the growing demand for housing capable of absorbing new inhabitants, the progressive transformation of the outlying areas into industrial zones, and the constant need to make breaches in the ring of the Spanish fortifications (the so-called "bastions") that constituted a true barrier between the historical centre and the surrounding territory. Beruto proposed a series of interventions based on international models.

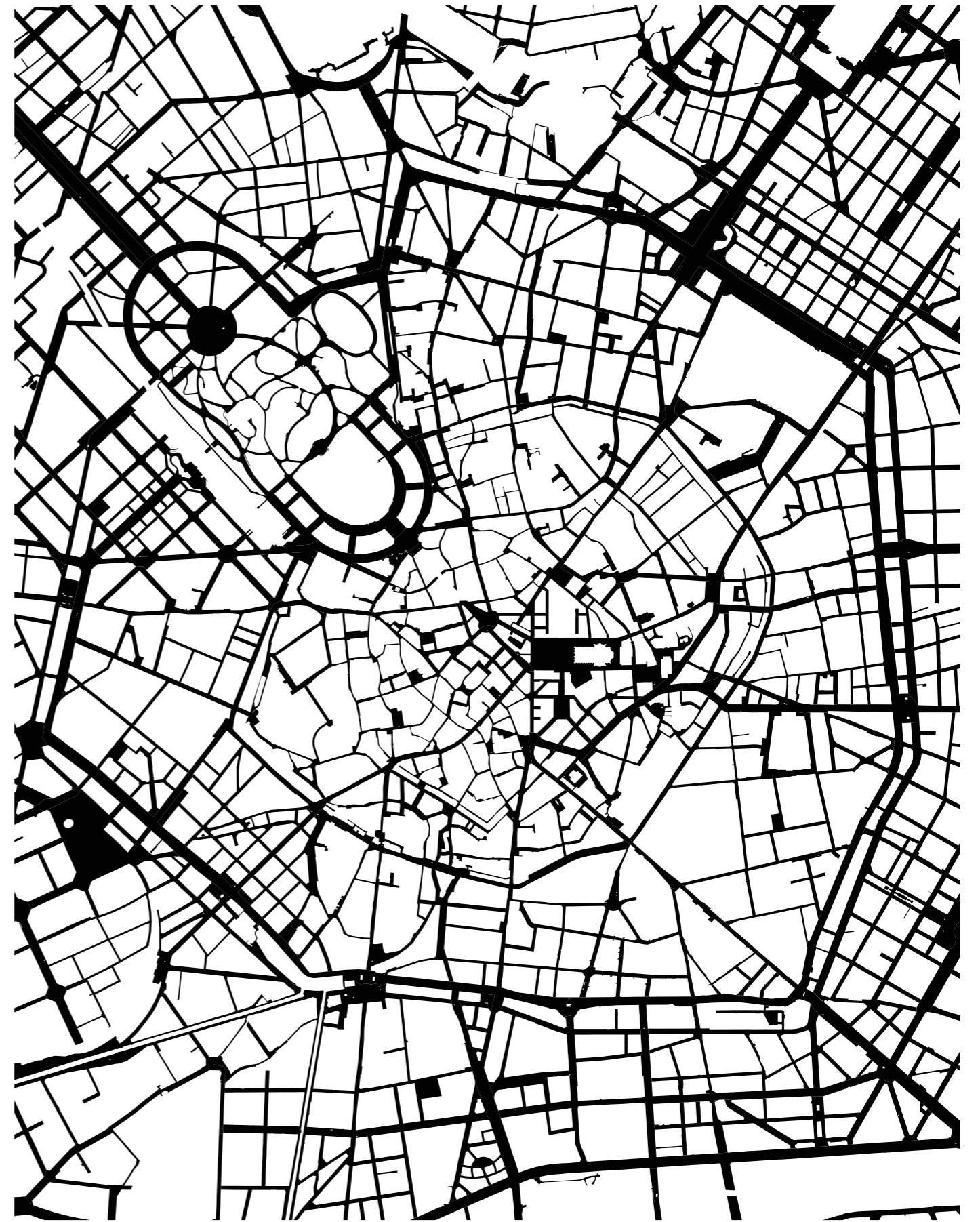
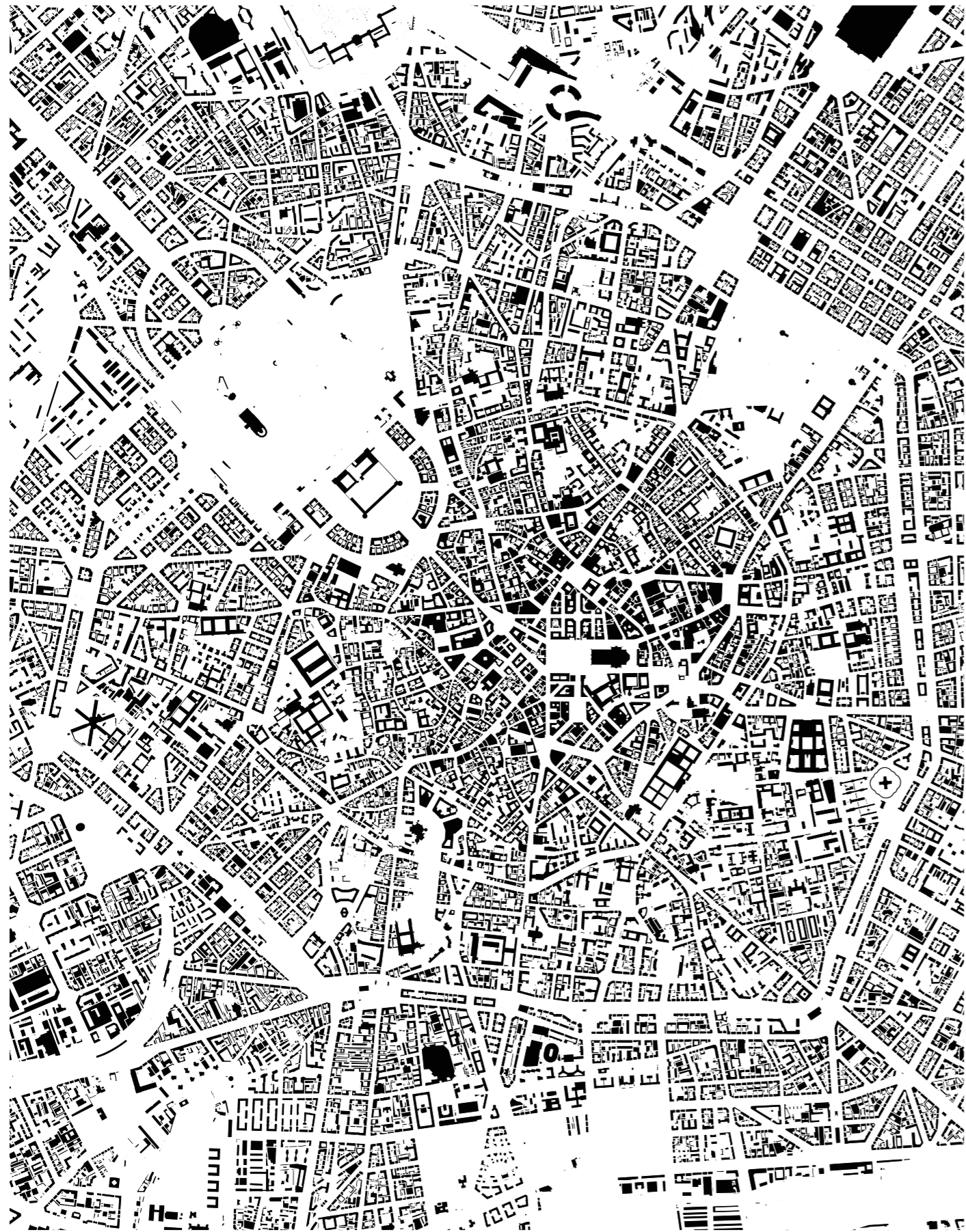
The widening ring was based on a radiocentric structure, centred on the radials that from the center extended to the surrounding territory; among the radials lay a regular mesh of blocks and streets whose organization was entrusted, in addition to the variations of the street caliber, also to those of the trees. In particular, the final version traced two tree-lined rings, one on the outer perimeter of the building and an innermost one connecting the main parks and avenues in a radial direction. The latter also formed connecting and passing areas between the built fabric and rural areas.

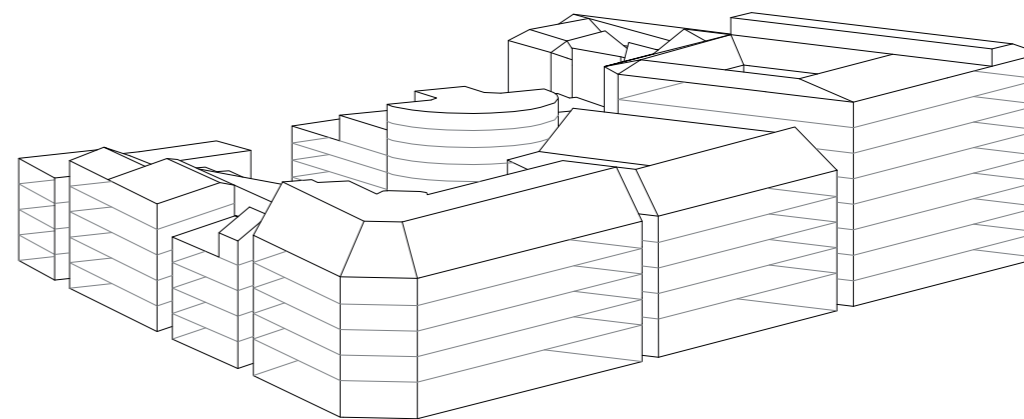
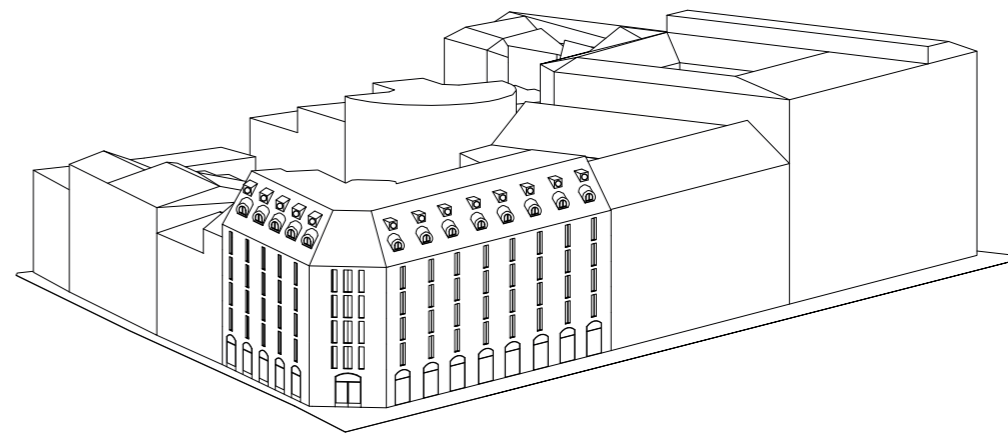
The system of public spaces, streets and squares, and of the green market therefore played an important role in the regulatory plan not only from the point of view of sanitation, but also from that of the urban form; It was in fact assigned above all the task of connoting urban spaces and paths, of defining hierarchies and points of interest. It is no coincidence that the system of tree-lined streets and boulevards is still one of the most important features of the Beruto plan.

For this urban plan, it was taken as an example building "Casa Broggi" in Via Dante, 5, in the center of Milan. The eclectic building of 1891 is located on the site of the ancient Church of St. Nazaro in Pietrasanta, demolished in 1888 during the gutting for the construction of Via Dante.

The first floor and mezzanine, reserved for the commercial side, are covered with a rustic bugged while the upper floors suffer from the Parisian architecture of the time, with large balconies and lesene. The top floor is decorated with mosaics and topped by an attic, typical of Haussmann's architecture, which was raised ignoring the rules that imposed a uniform height on the houses of the new street.







CHARACTERISTICS

TWO EPOCHES IN COMPARISON

Research on the flexibility of 19th and 21st century residential buildings finds its application in the study of the characteristics that make them so. Through the observation of some case studies, declared flexible by other studies previously conducted, we have extrapolated all those **characteristics** that have made buildings resilient over time and able to adapt to different needs.

In the previous chapter the elements forming a typologically flexible design were treated at urban level. In order to search in detail the flexible characters the next step was to select in the nineteenth-century residential building landscape of Paris, Barcelona and Milan, five case studies.

In particular, the literature we consulted allowed us to come into contact with hundreds of case studies with the characteristics we sought. From this list of buildings the selection of those to be presented was carried out by weighting all the possible flexible elements and their repetition over time that has led them to be an example of resilience to the present day.

Each of these cases has been analysed by researching the predefined characteristics starting from a redesign of prospectus plans and sections carried out by us. The detailed contact of all the buildings allowed the emergence of the design grammar.

Subsequently, we considered it appropriate to analyse also the

modern case studies of the last decades, judged typologically flexible. The selection phase of these buildings has been much longer and more precise, as in the modern landscape flexibility is understood in different ways and it is difficult to find it in the type and morphology of the building itself. By comparing in a eloquent way all the chosen cases with the nineteenth-century characteristics it was possible to decide the choice of the three modern case studies coming also from the three cities previously analysed. At the end of each of the two groups of cases study is presented a descriptive interpretative part that provides our personal observations on the cases.

We used a simple and direct graphic representation through the use of colours that could quickly explain the element analysed. Each facade, plan and section is analysed several times according to different points of view and characteristics in order to bring out all levels of interpretation belonging to each individual case study.

Referring to Christopher Alexander's theory of *pattern language*, this portion of the thesis looks for the syntax that articulates the grammar of the flexible cases considered.

ANALYSIS OF THE CHARACTERISTICS

Through the observation of some case studies chosen following well-established criteria explained below, are extrapolated all those features that have made these buildings resilient over time.

Elevation. Plan. Section. As a first operation, the basic representative elements of the architecture were taken into account: plan, section and elevation. These drawings allow to have a basis on which to then represent gradually all the elements reinterpreted.

Facade grid. Returning to the facade, two other characteristics are reported and represented with as many schemes. The first is that of the grid. The facade, free from any decorative level, basically consists of a generic grid behind which are affixed all functions. This compositional principle is highlighted through an extrapolation of the grid in which with a full red are highlighted the voids constituted by the windows.

Facade composition. The facade is then composed in its parts and graphically is represented with an explosion in which the individual portions are surrounded by a red line and are: *basamento, corpo and coronamento*. Each of these in turn is subdivided according to the number of plans of which it is formed. In addition to the lateral dimensions, there are coloured bars that gradually become lighter from bottom to top: the red ones correspond to the tripartition of the facade, while the blue ones correspond to the subsets of the floors.

Block. In order to pass on to the analyses on the plans, we introduce a scale of isolated analysis in which the voids of the hollows are highlighted in blue, representative of the porosity.

Structure. Fundamental in the design is the structure as it conditions the composition of the spaces. Its typology provides a clear element for the understanding of the project's potential in terms of flexibility. With the red color are then highlighted load-bearing walls or structural pillars.

Distribution. The arrangement of the doors and the consecutive internal circulation is of fundamental importance when it comes to flexibility. The doors are marked in blue and the internal distribution with a yellow dotted line.

Windows. The compositional rules for the facade are reflected in plan with the arrangement of the openings: in this blue scheme are highlighted the windows.

Plan composition. We wanted to give importance to the size of the rooms and their aggregation in the apartments. In particular, the three types of rooms are small S, medium M and large L, and the goal is to find out if they contribute definitively to the flexible design. Each type of room is assigned a colour: L pink, M light blue, S blue.

Room composition. Last pattern is a zoom in on the rooms. Depending on the spatial composition of the rooms and their dimensional cut it is necessary to understand the distribution of the windows. Then three rooms were extrapolated in plan, of the three different sizes, and the windows corresponding to each were flipped.

These analyses are the result of a careful study of all the fundamental elements of representation that can contribute to make a building resilient and flexible typologically. The different graphic representations have been chosen according to the connotative specificities of each character linked to different elements.

19TH CENTURY : CASE STUDIES

The choice of case studies was determined by the desire to continue the research initiated by the Italian / Parisian studio LAN Architecture, which conducted an in-depth investigation into the flexibility of residential construction in 19th century Paris.

Their study has shown how the historical residential heritage of the 19th century shows a remarkable degree of resilience and adaptability over time.

Our research is aimed at verifying whether and how most of this historical heritage possessed an “intrinsic intelligence in the form” (see “Haussmann model’s de ville”) which allowed it to survive the numerous social changes and the many urban transformations occurred.

Taking a cue from the work carried out by the LAN studio, we extended their investigation on the Haussmann plan in Paris (1853), comparing it with the other two great European urban plans of the 19th century: the Cerdà plan in Barcelona (1860) and the Beruto plan in Milan. (1884).

After a careful analysis of the urban fabric, we have selected, within the nineteenth-century historical heritage, both of Milan and Barcelona, buildings capable of responding to the characteristics considered by Studio LAN to be flexible, capable of giving food for thought to the designers today.

The research conducted on the case studies therefore starts from the desire to verify whether, after an extended period of time, the urban vision of large urban plans can be considered as an efficient system that has generated a dense and flexible city.

Well integrated case studies within the historical context were taken into consideration, belonging to blocks characterized by a high density.

Designed mainly as a place of residence for the bourgeoisie, the nineteenth-century historic buildings have proved to be the heritage of an extraordinarily resilient architecture, capable of being suitable for other uses in addition to the original one: hosting offices, shops, workshops, etc., thus resisting the social transformations and use of space.

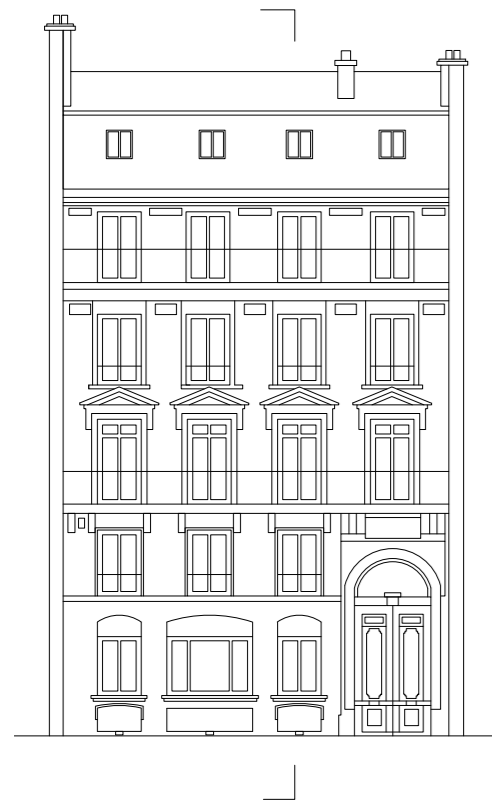
They are buildings able to anticipate changes and needs, offering reversible spaces.

Therefore, it identifies a great flexibility, made possible by the particular structural system, composed of the load-bearing elements of the facade; the neutrality of the spaces and their oversizing; from the facade, full of openings that make the quality of the interiors high.

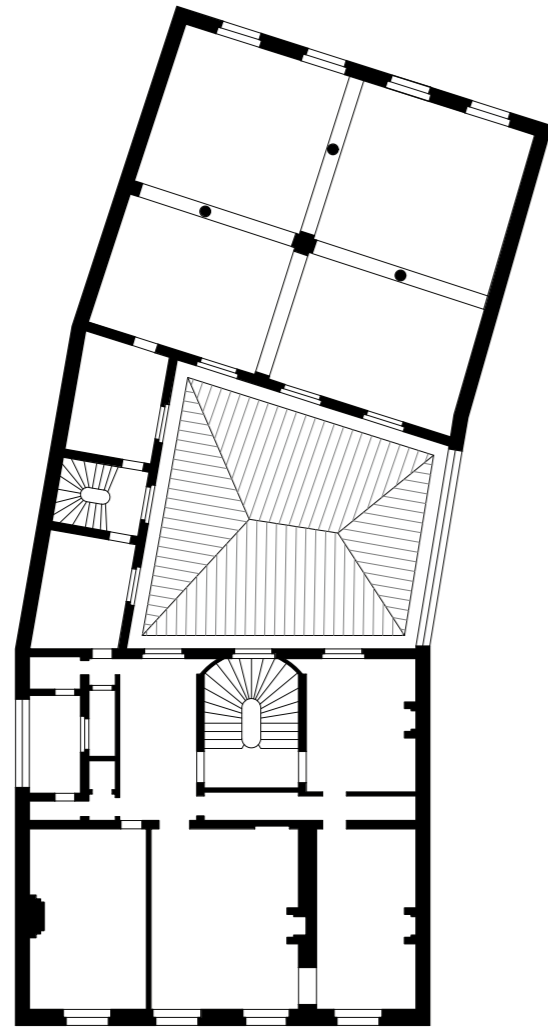
The volumetric dimension of the spaces of the nineteenth-century building thus becomes the true fulcrum of typical flexibility, as each living module has the chameleon-like ability to adapt to different needs, while remaining immobile.

11, Boulevard De Sebastopol

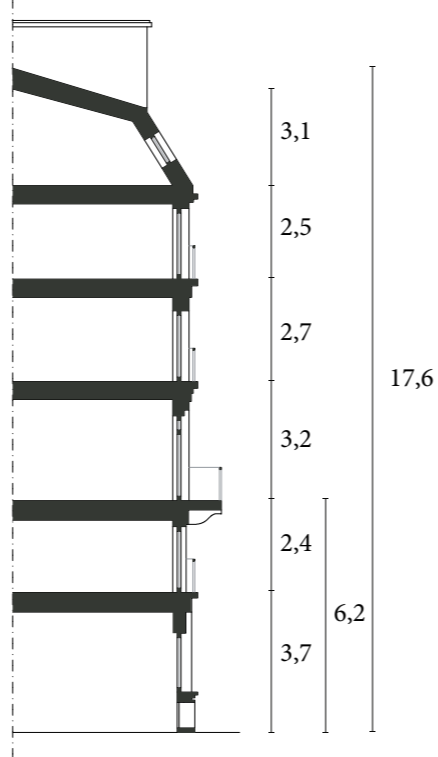
Architect : Blondel
Paris, France



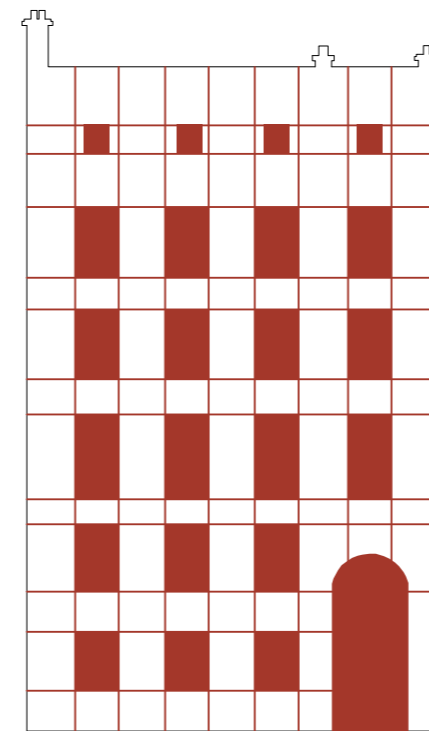
Elevation



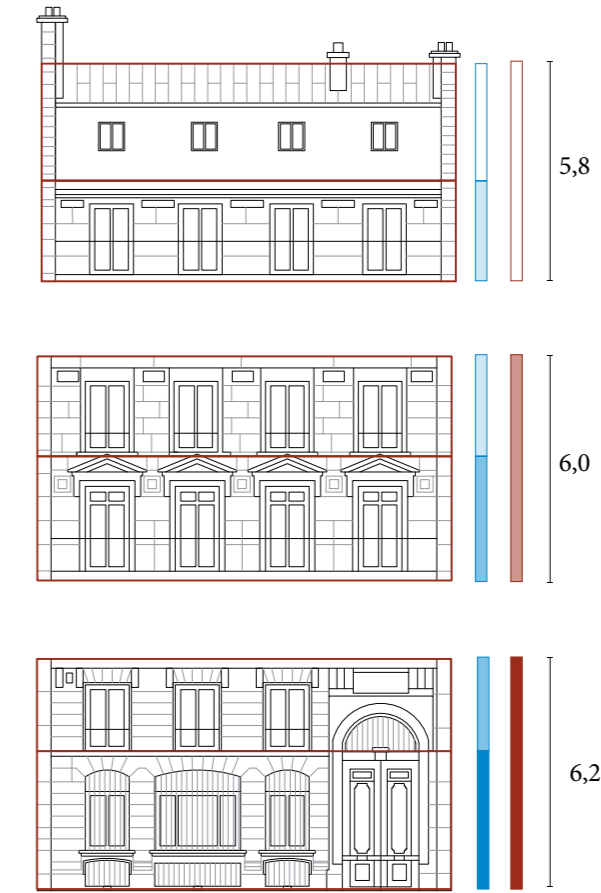
Plan



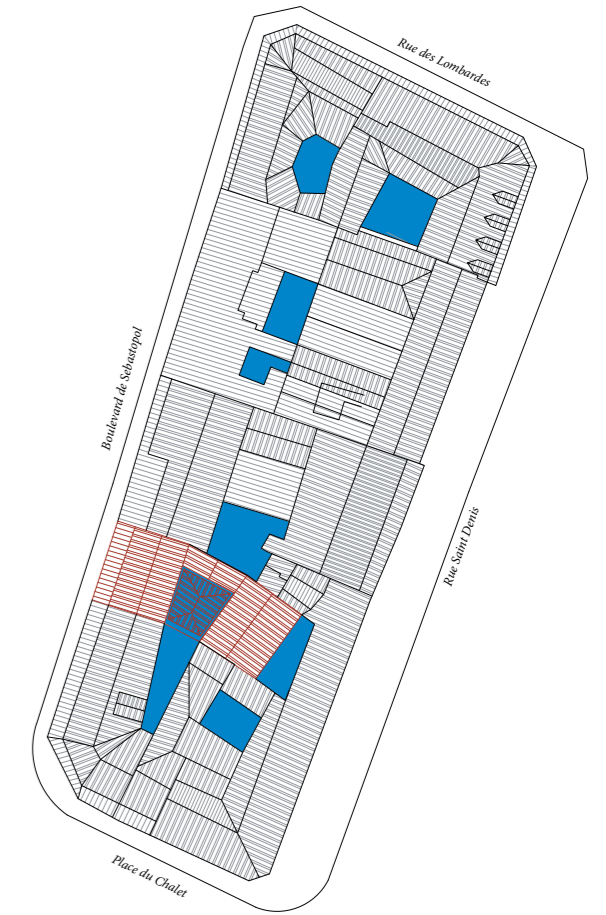
Height Differences



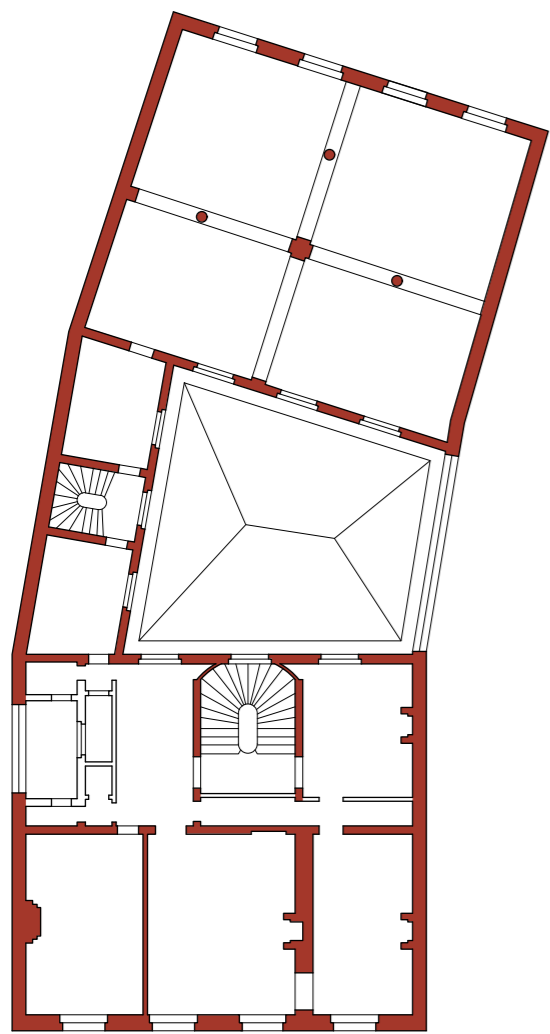
Facade Grid Regularity



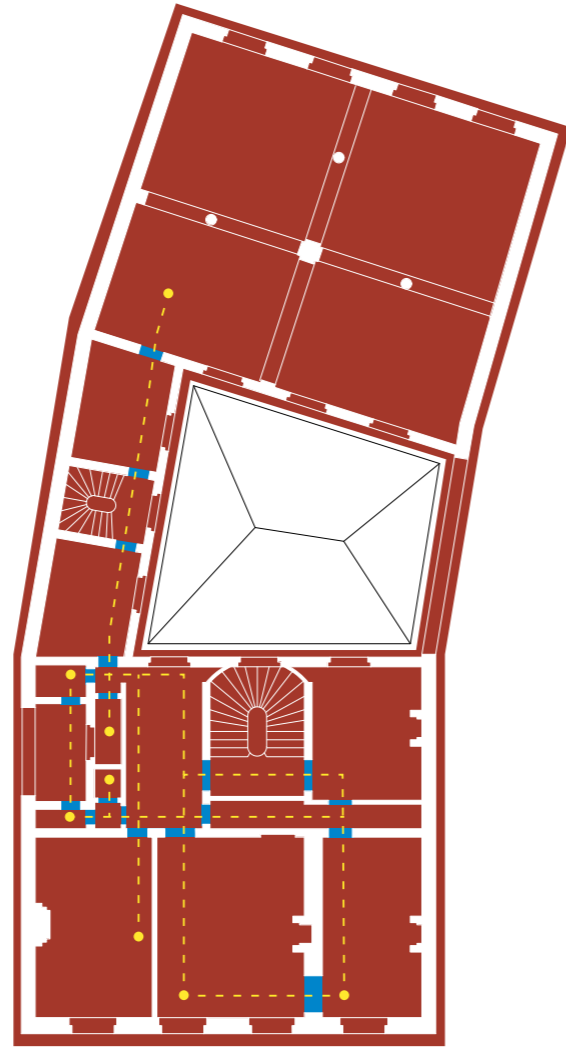
Facade Composition



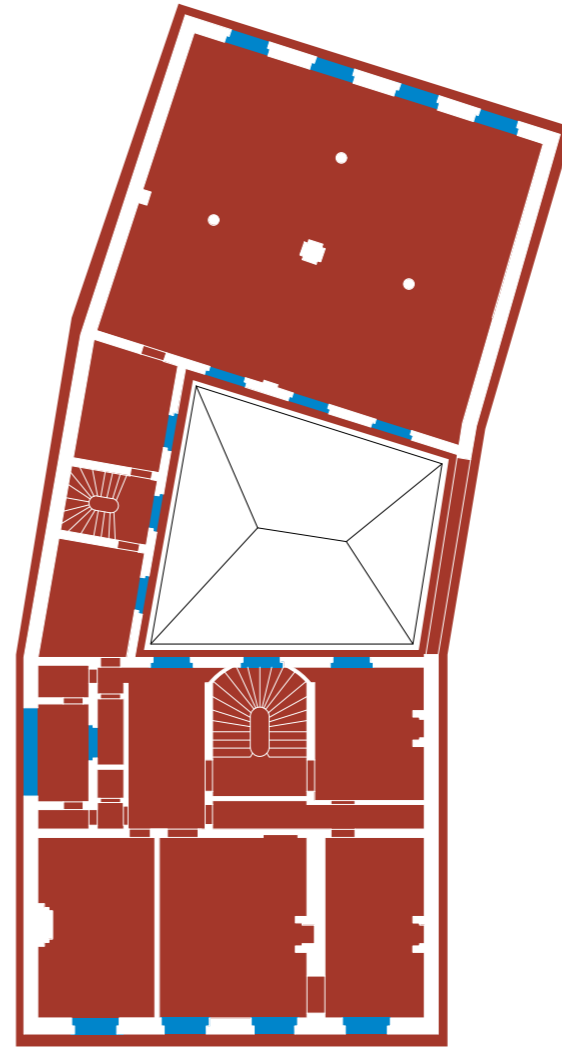
Block Vertical Porosity



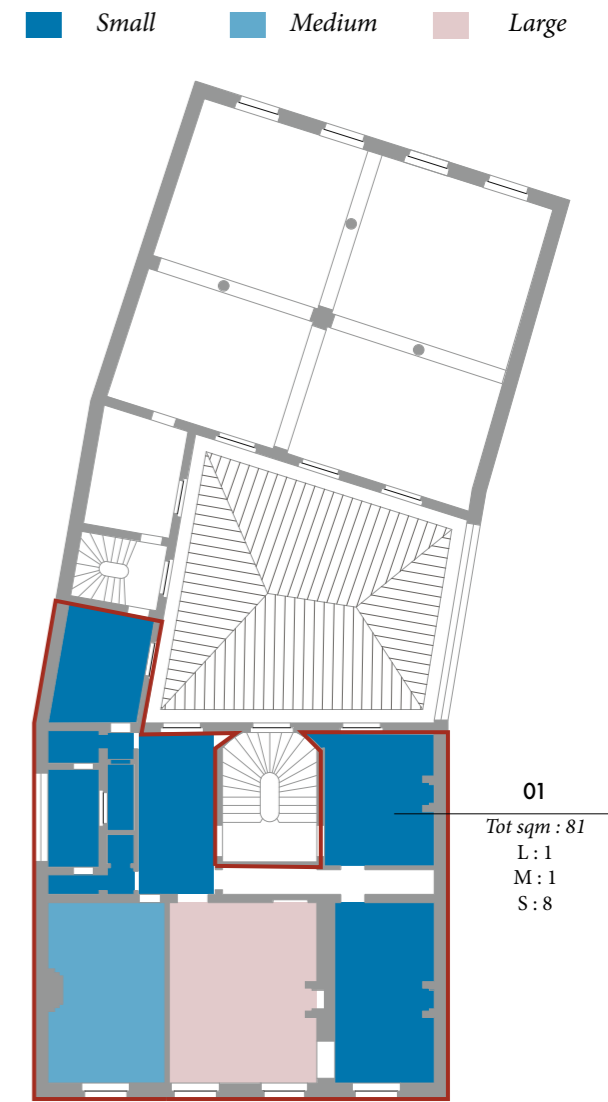
Structural Clarity



Circular Distribution

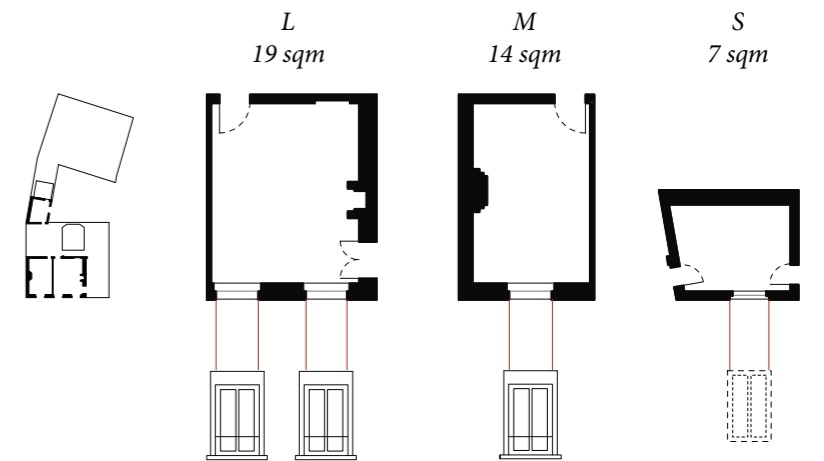


Windows Redundance



Plan Composition

01
Tot sqm : 81
L : 1
M : 1
S : 8



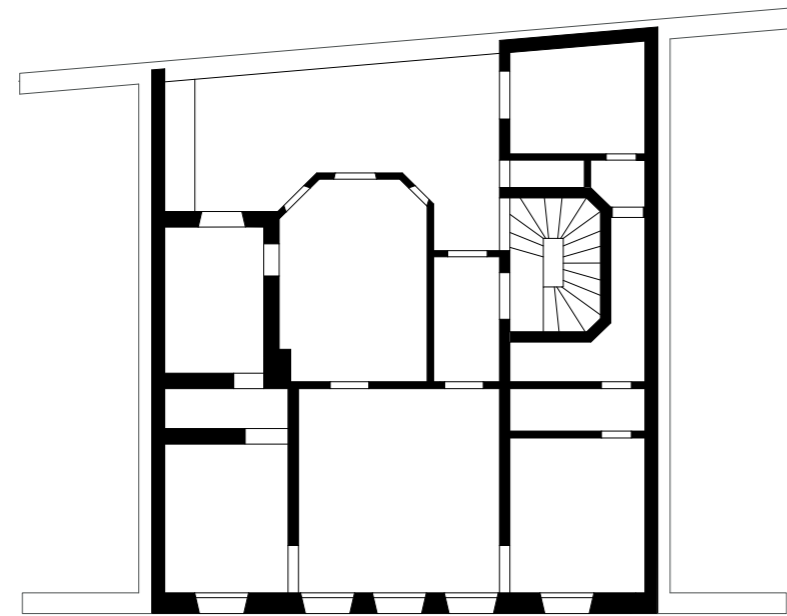
Rooms and Windows Hyerarchy

9, Rue Du Conservatoire

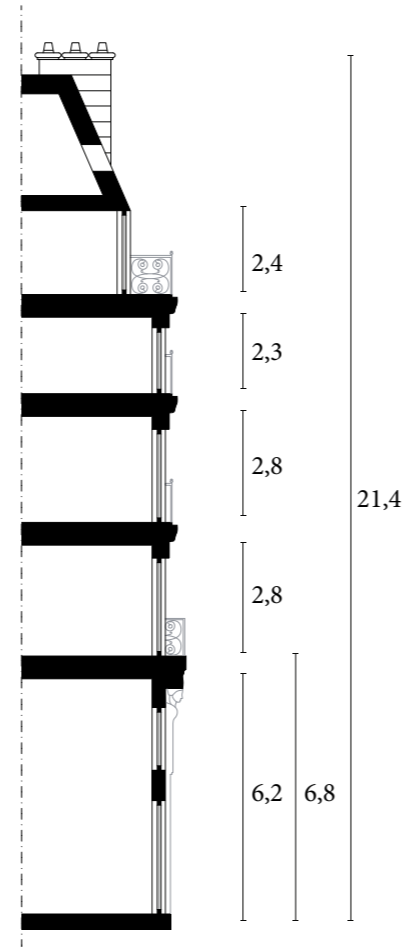
Architect : Amoudrou
Paris, France



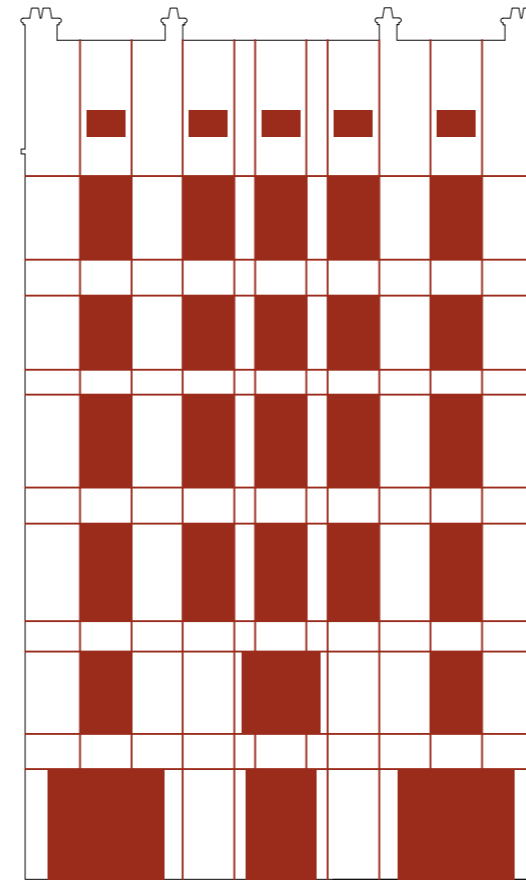
Elevation



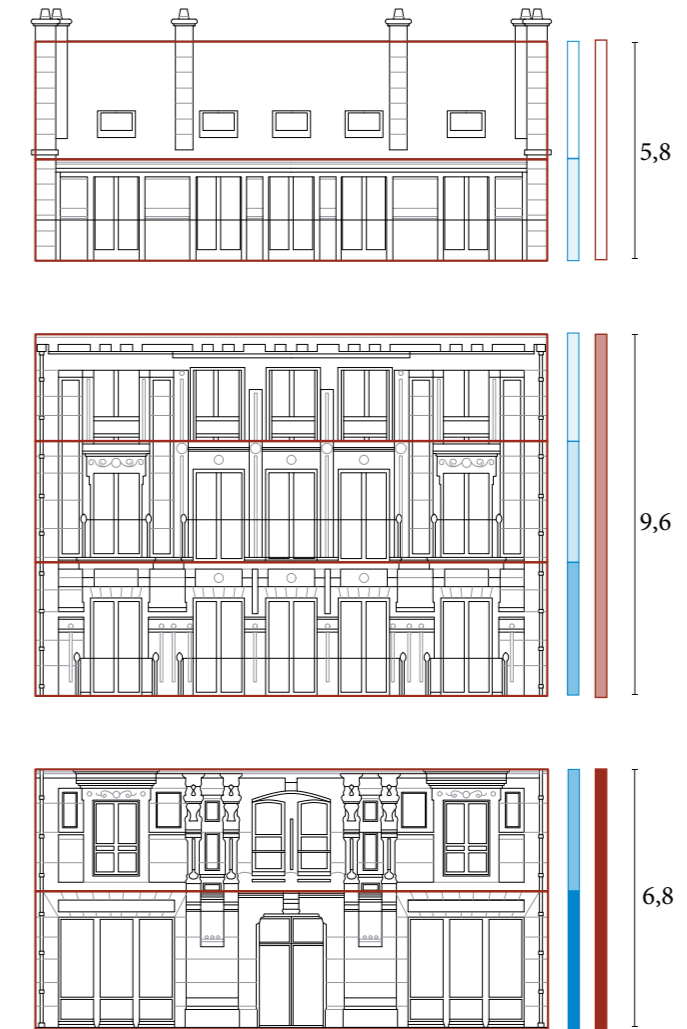
Plan



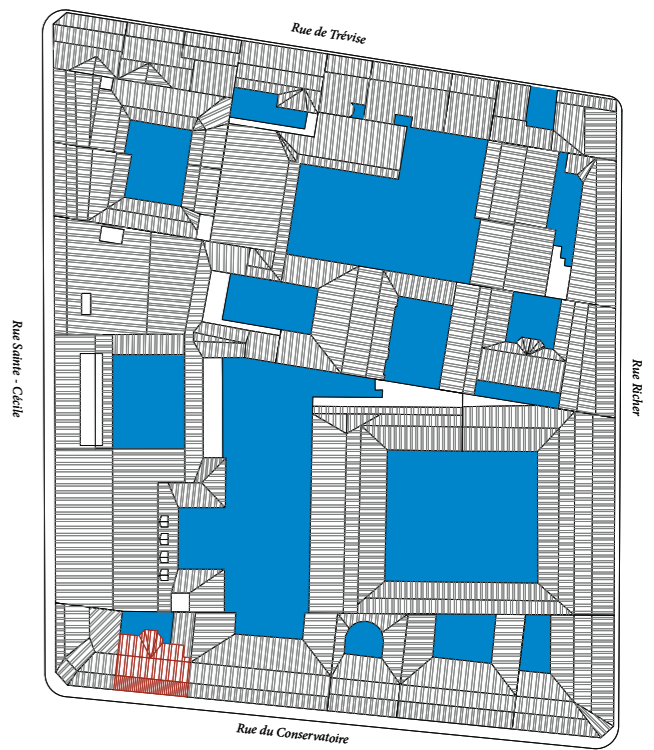
Height Differences



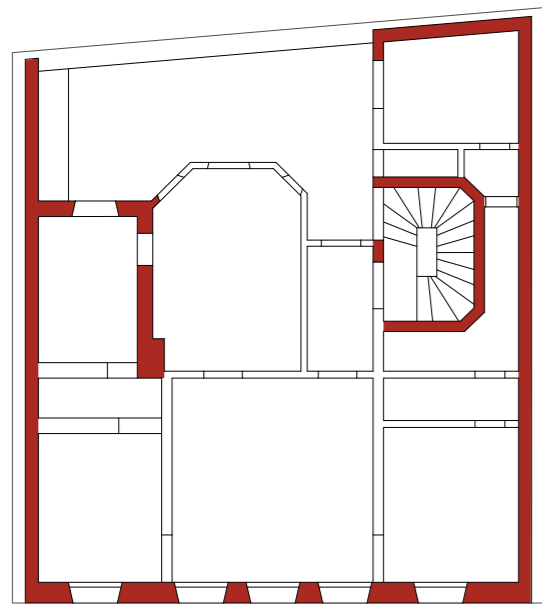
Facade Grid Regularity



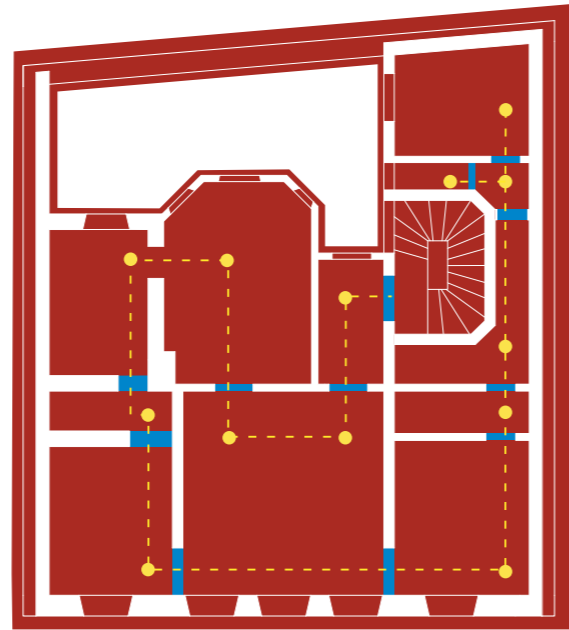
Facade Composition



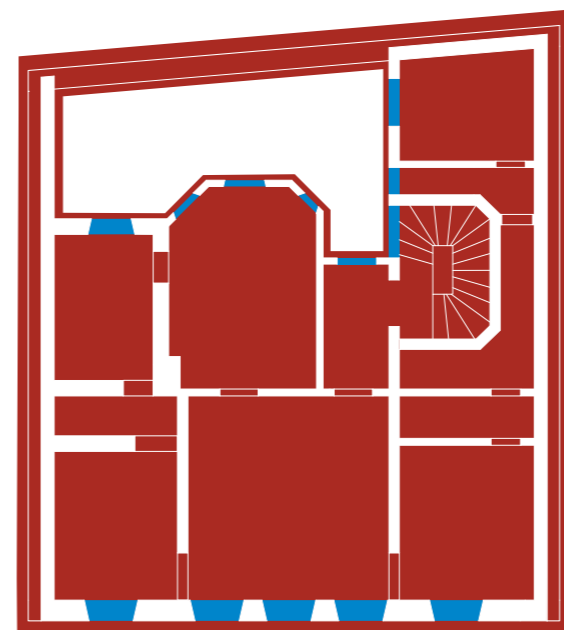
Block Vertical Porosity



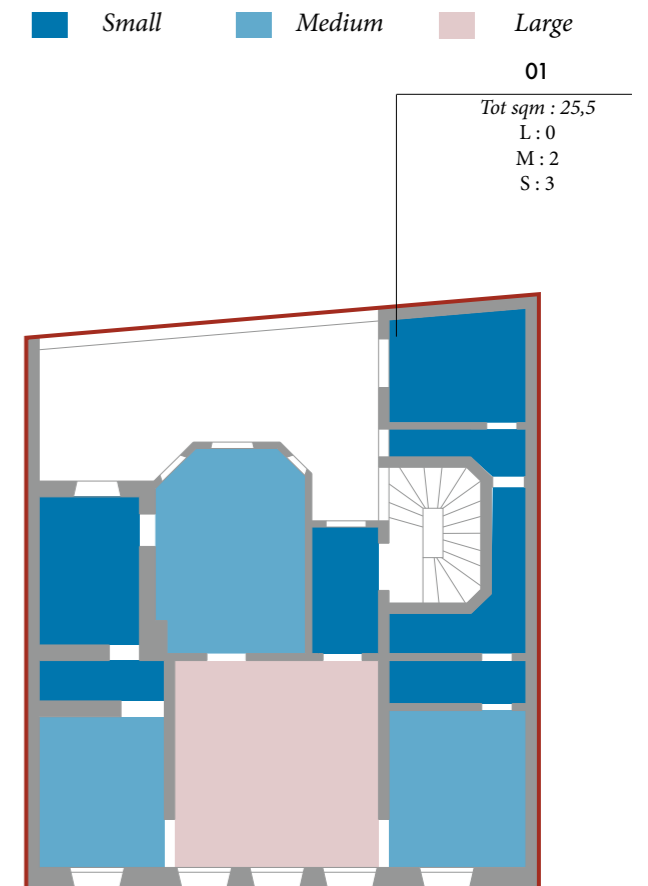
Structural Clarity



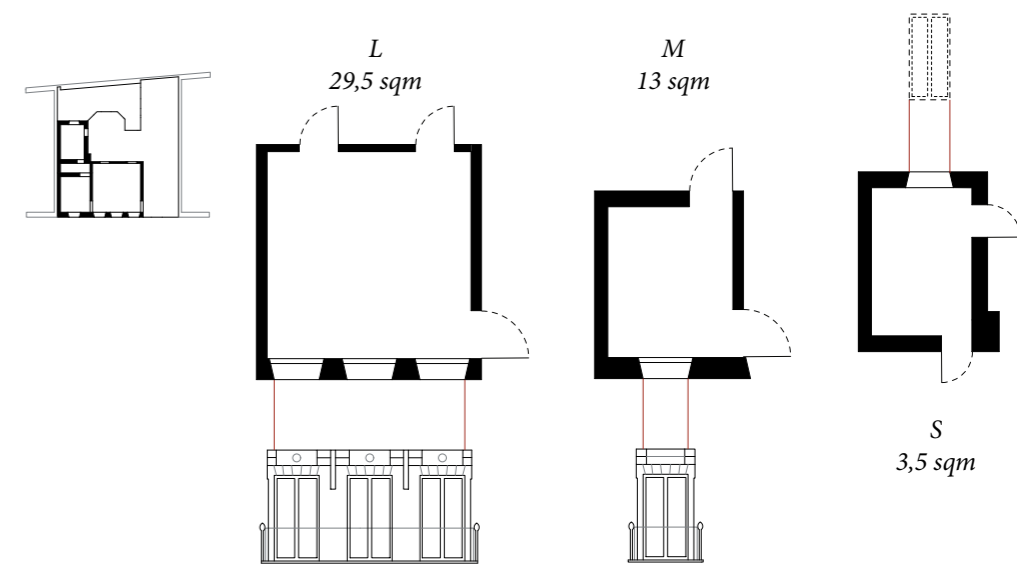
Circular Distribution



Windows Redundance



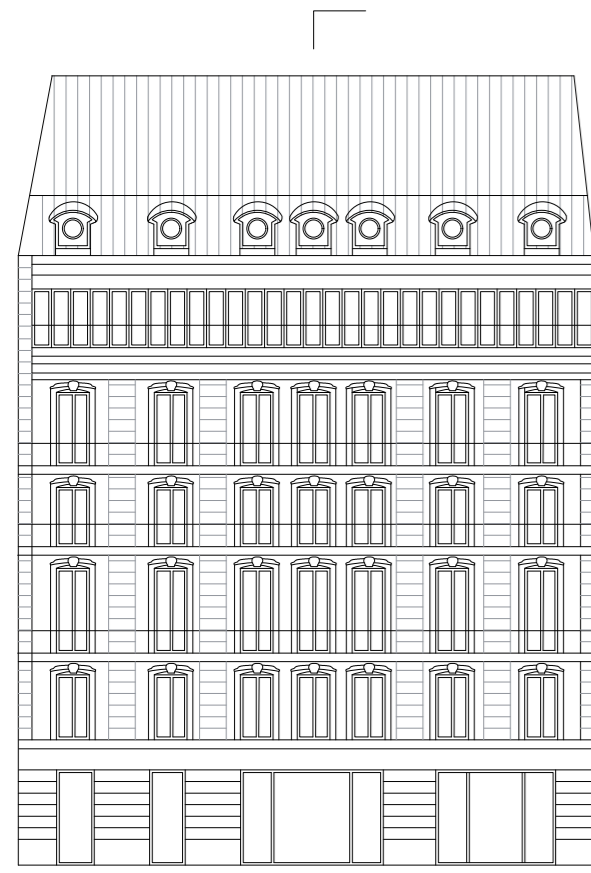
Plan Composition



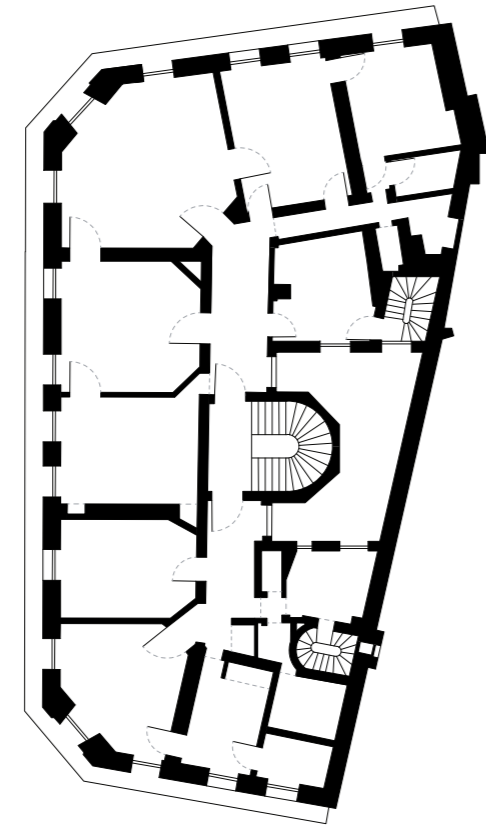
Rooms and Windows Hyerarchy

47, Boulevard De Malesherbes

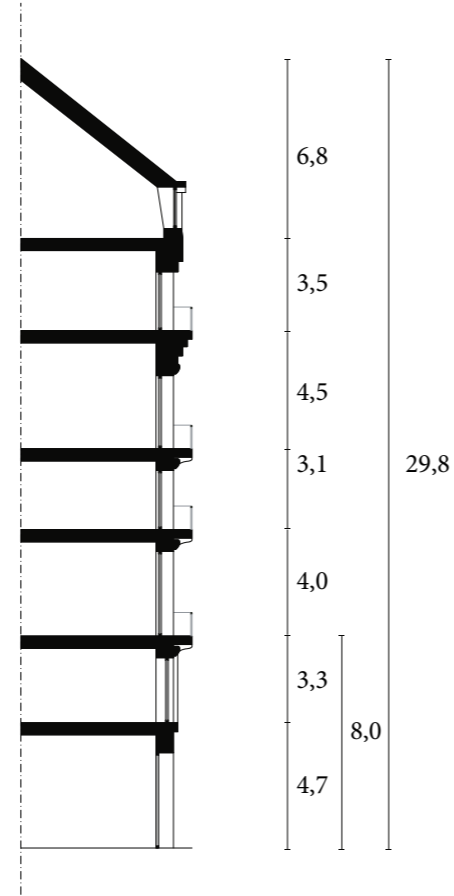
Architect : Unknown
Paris, France



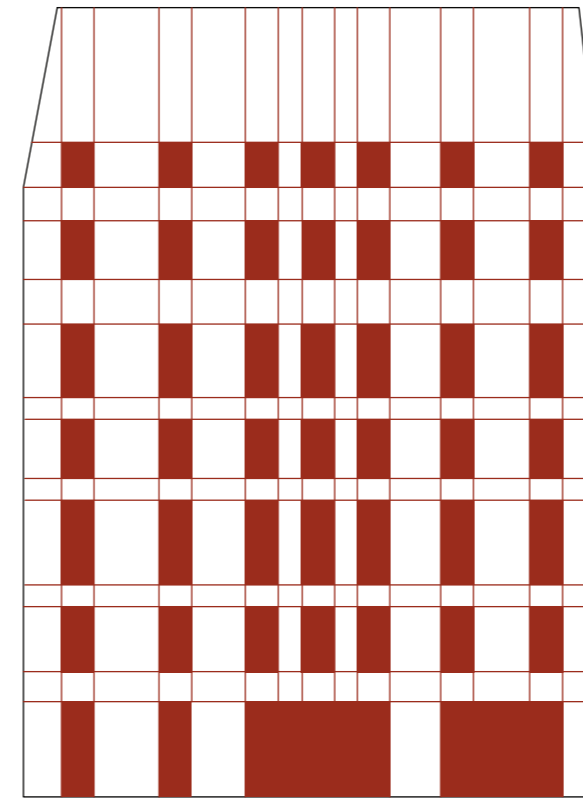
Elevation



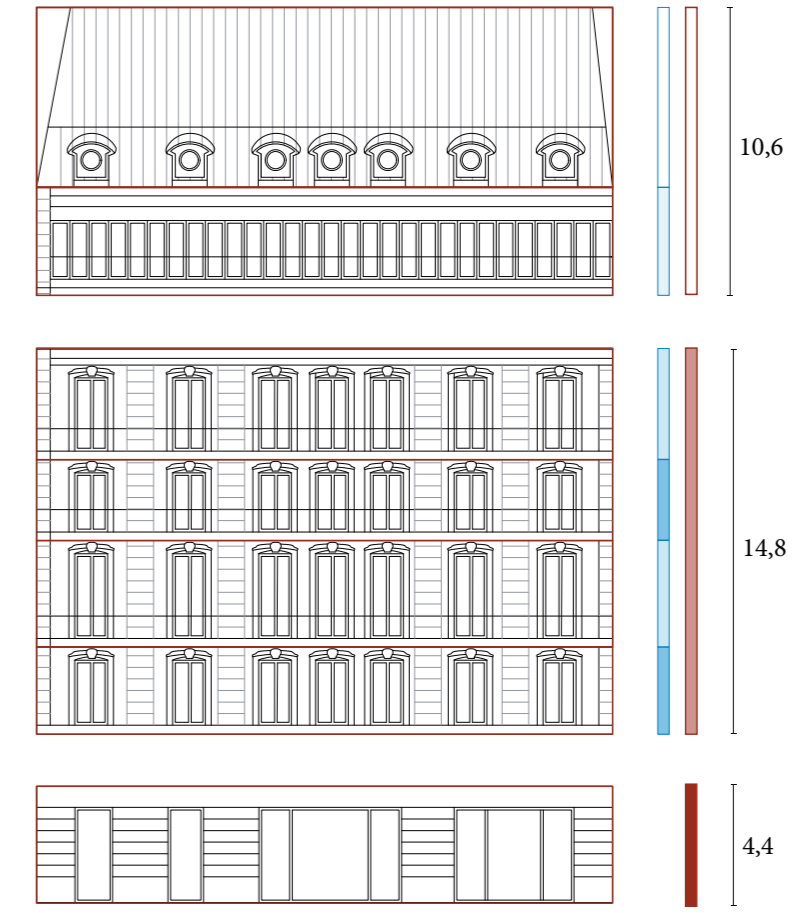
Plan



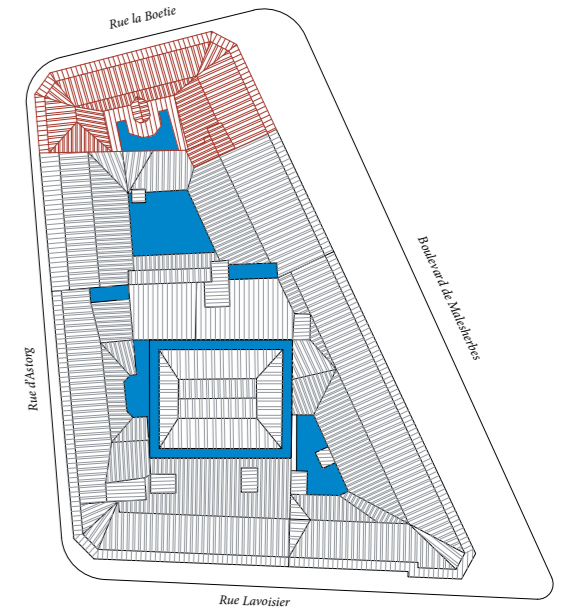
Height Differences



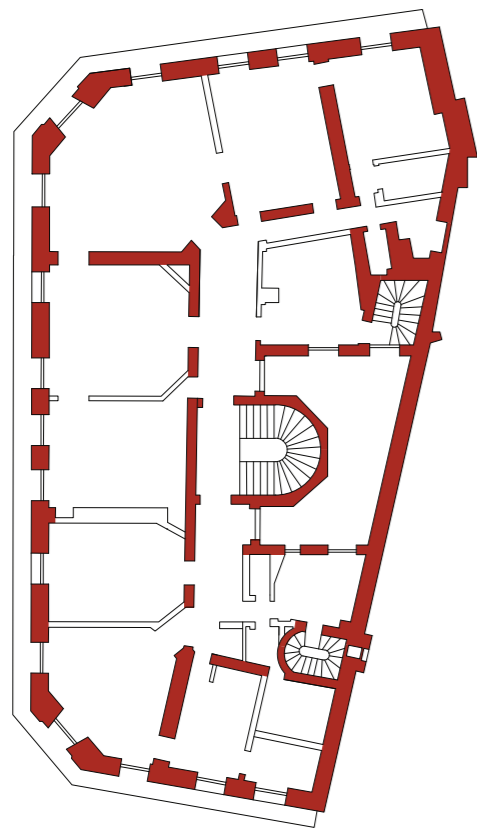
Facade Grid Regularity



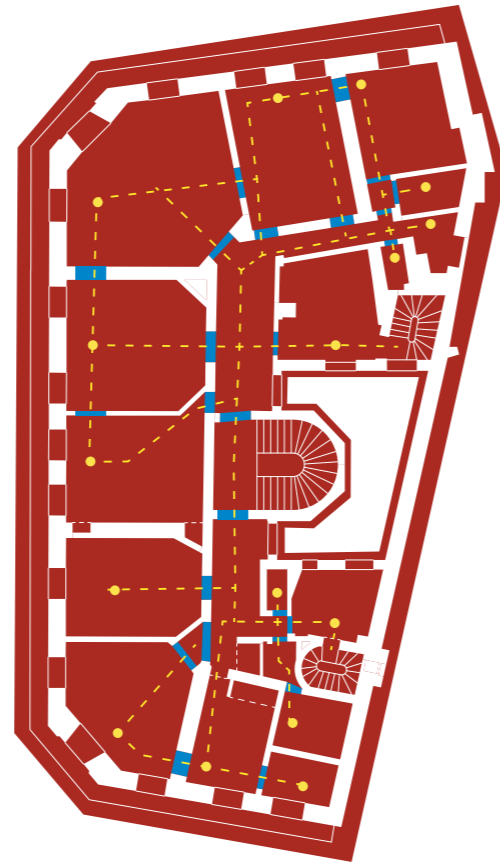
Facade Composition



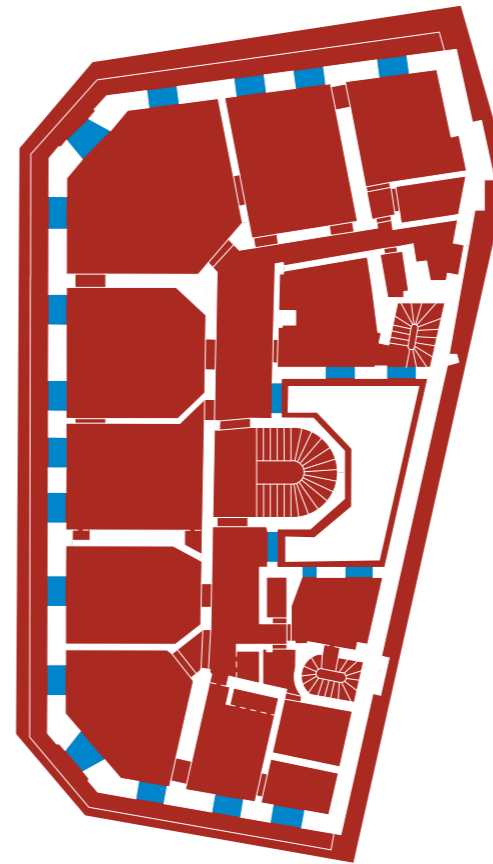
Block Vertical Porosity



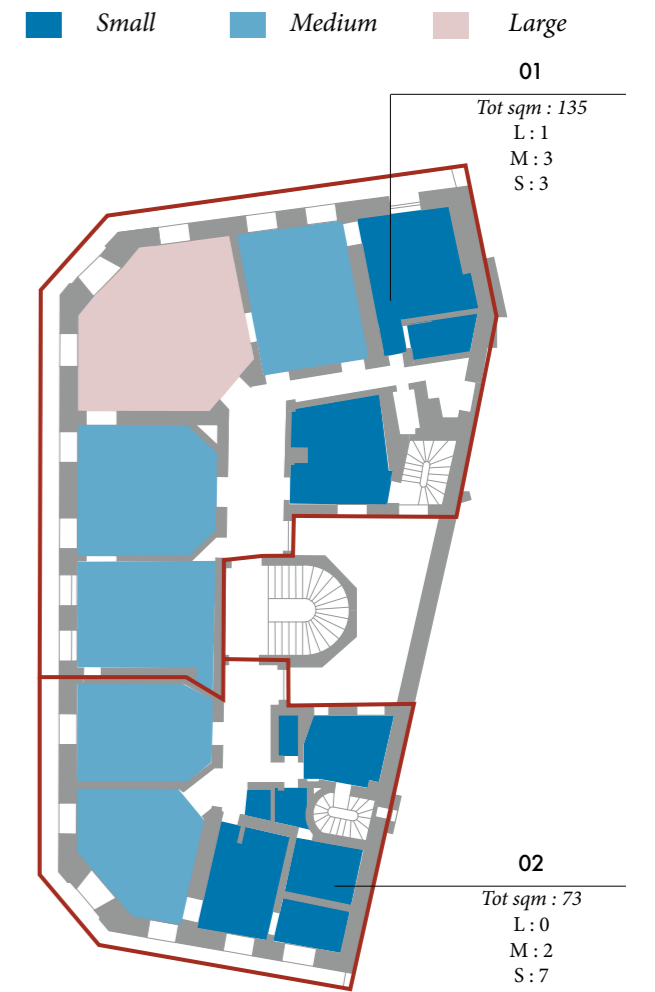
Structural Clarity



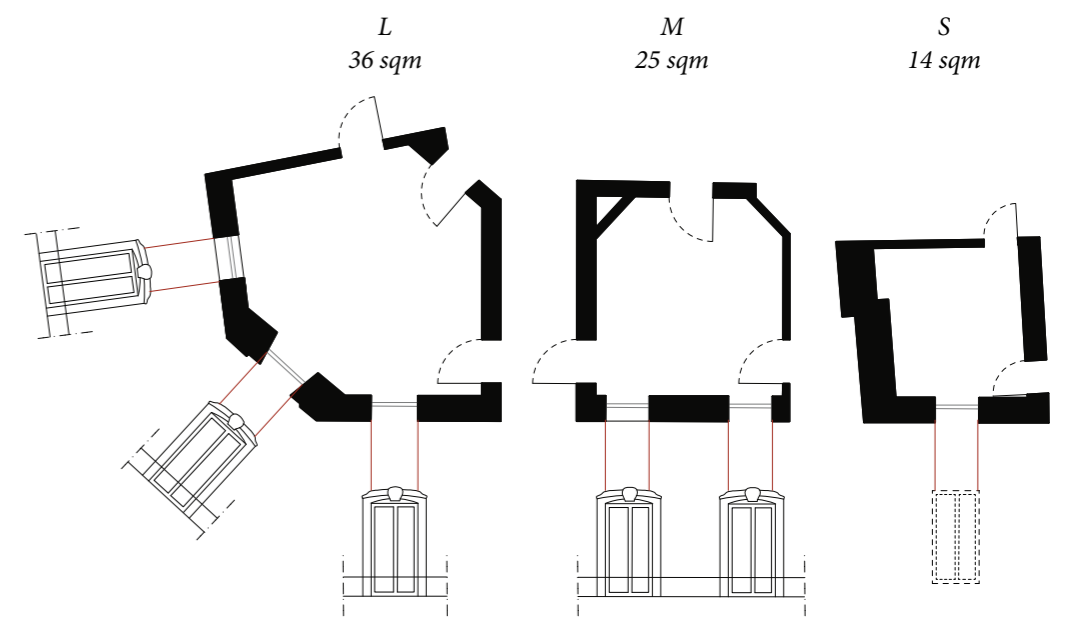
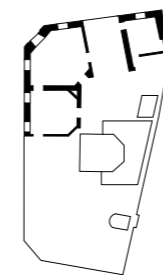
Circular Distribution



Windows Redundance



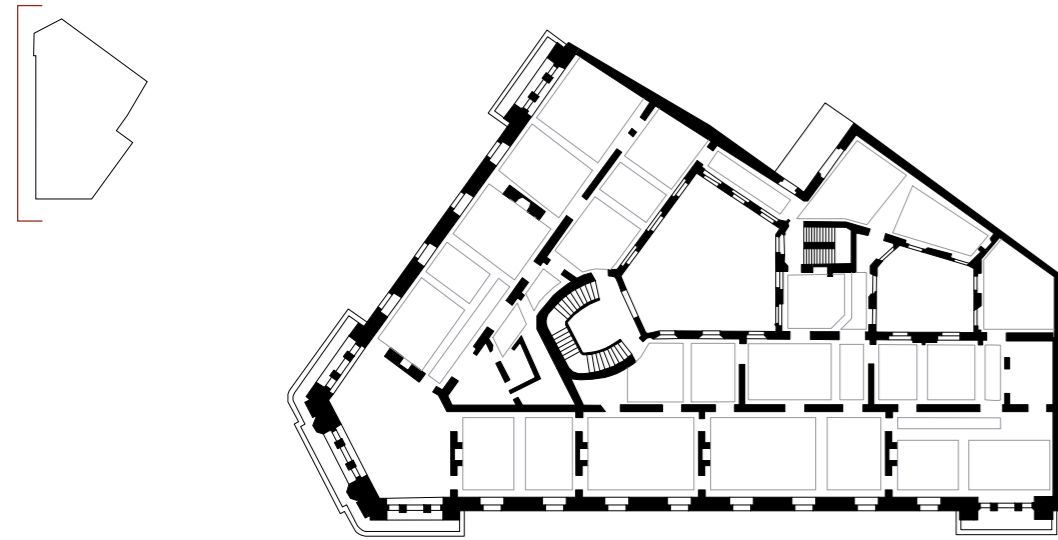
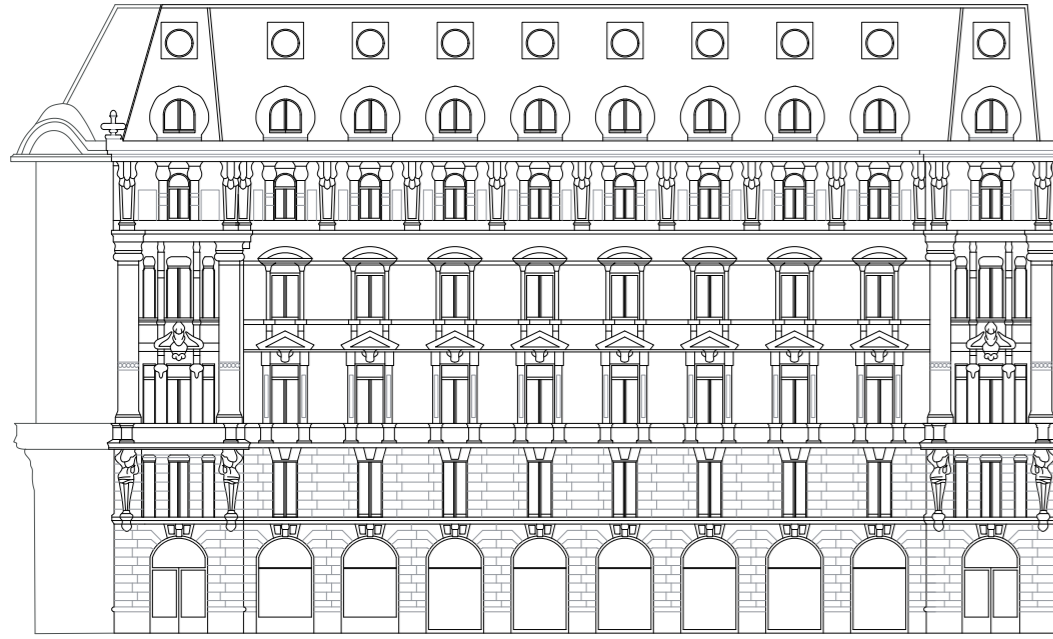
Plan Composition



Rooms and Windows Hyerarchy

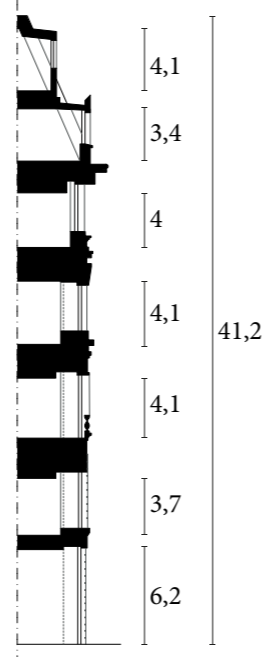
5, Via Dante

Architect : L. Broggi, G. Sommarago
Milan, Italy, 1891

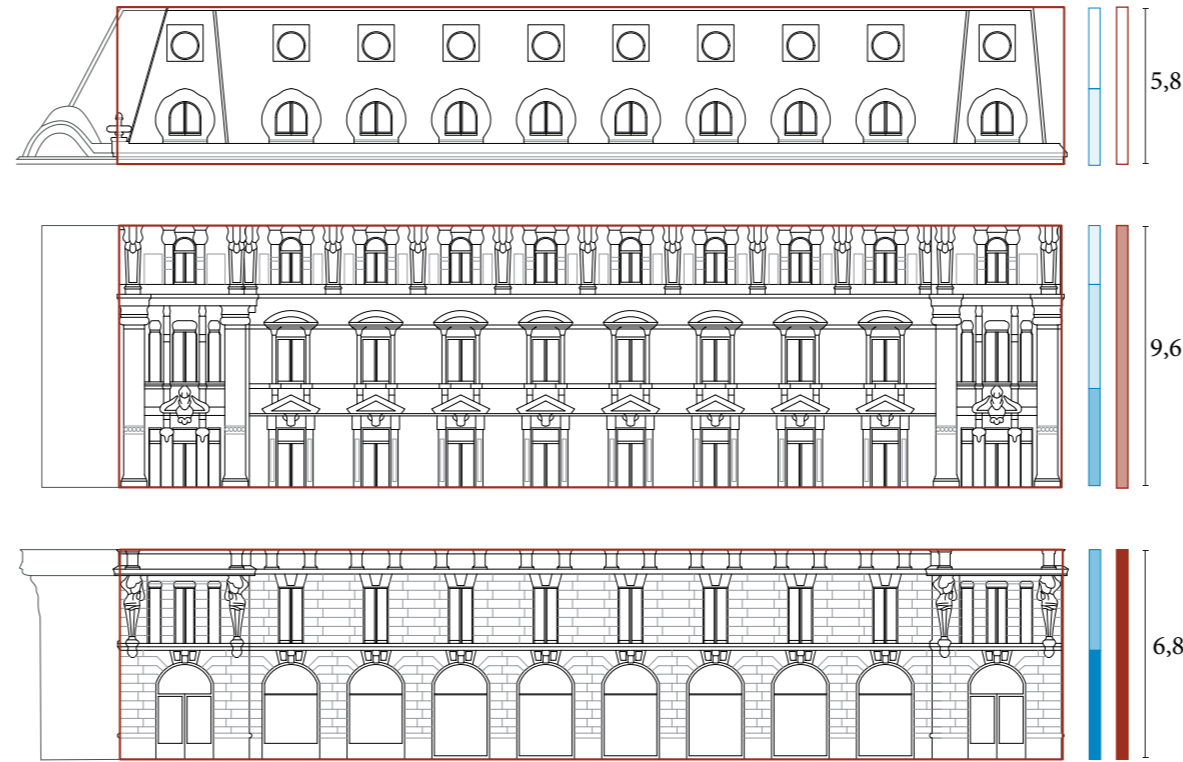


Elevation

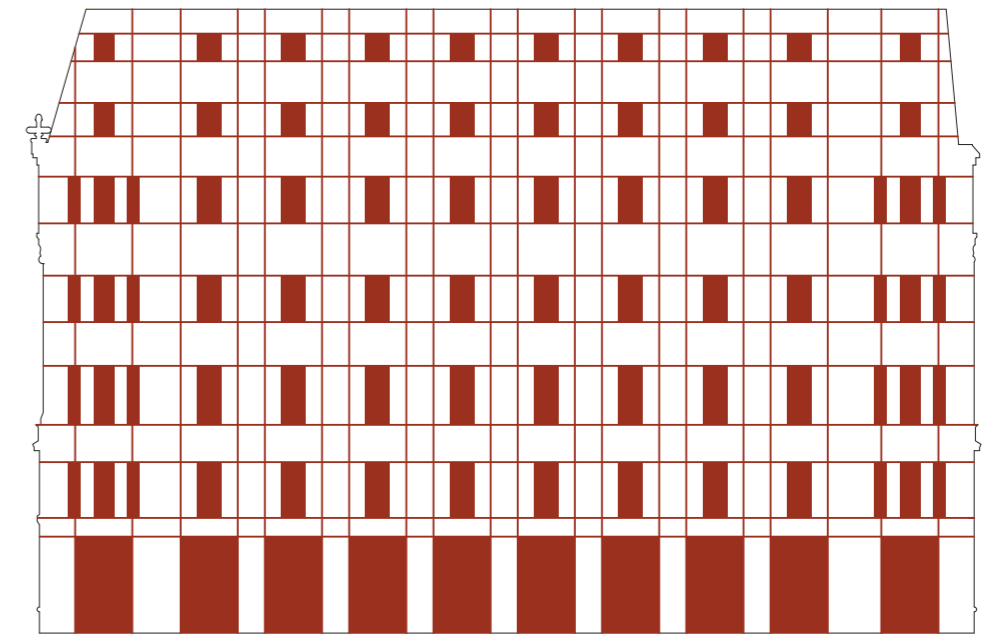
Plan



Height Differences



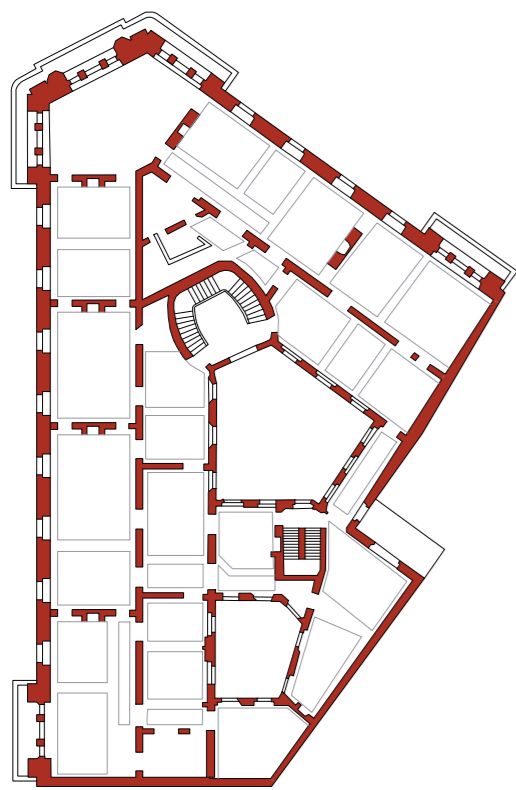
Facade Composition



Facade Grid Regularity



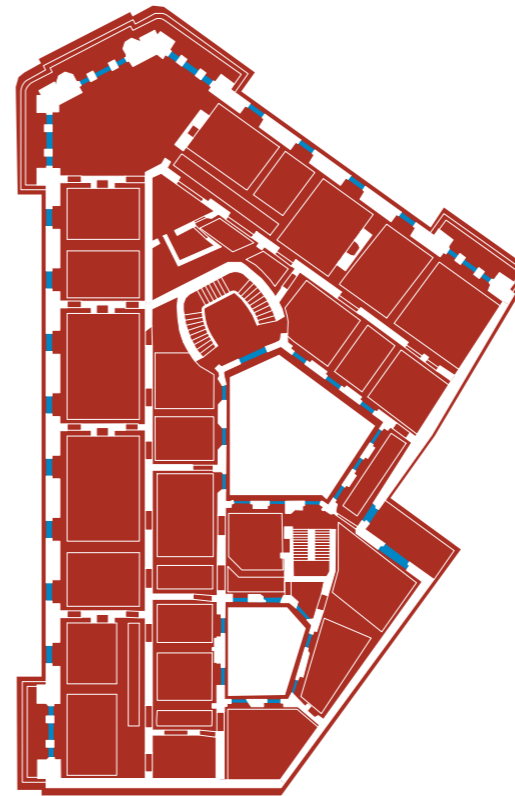
Block Vertical Porosity



Structural Clarity

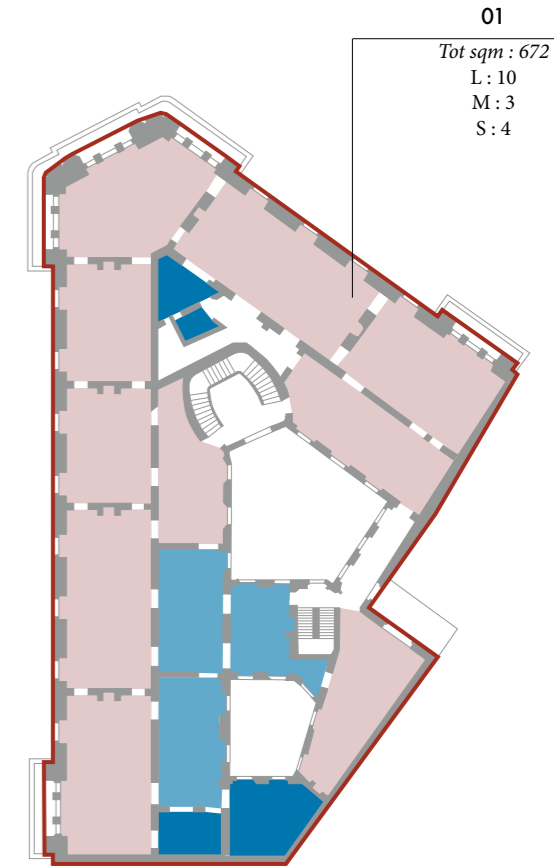


Circular Distribution



Windows Redundance

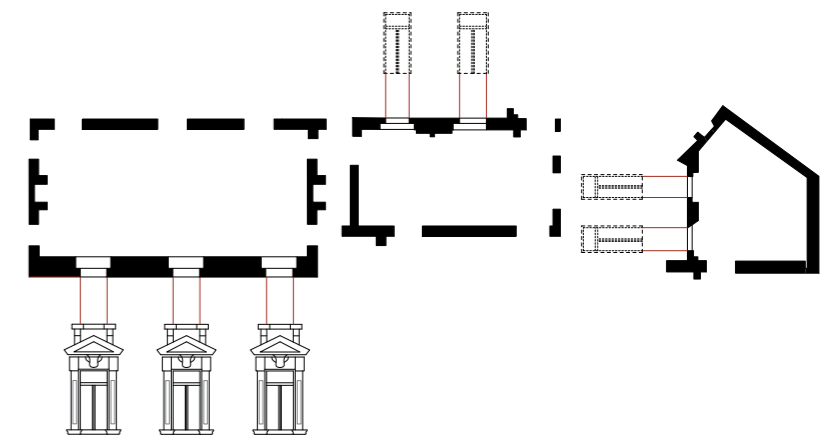
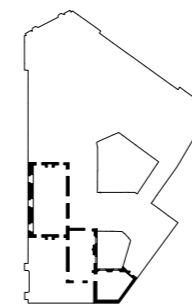
■ Small ■ Medium ■ Large



01
Tot sqm : 672
L : 10
M : 3
S : 4

Plan Composition

L 70 sqm
M 30 sqm
S 12 sqm



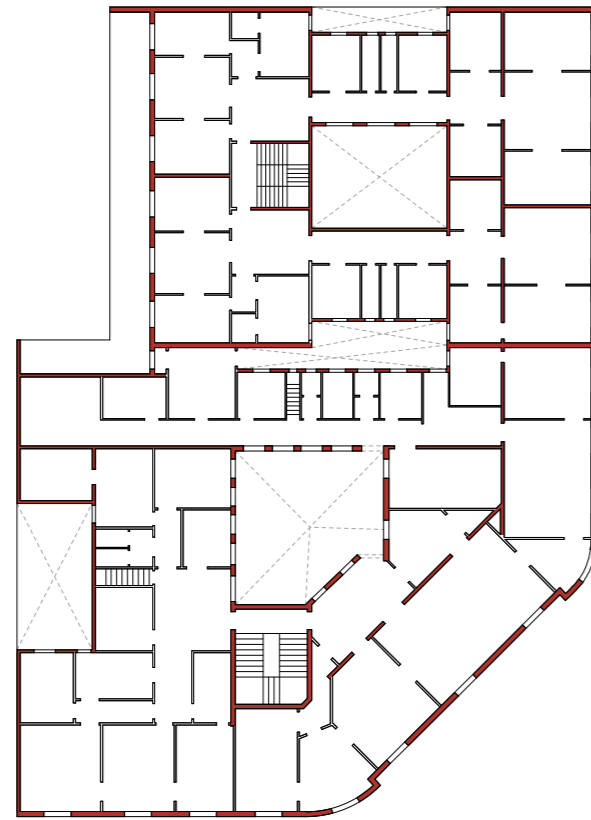
Rooms and Windows Hyerarchy

33, Casa d'Ausiàs Marc

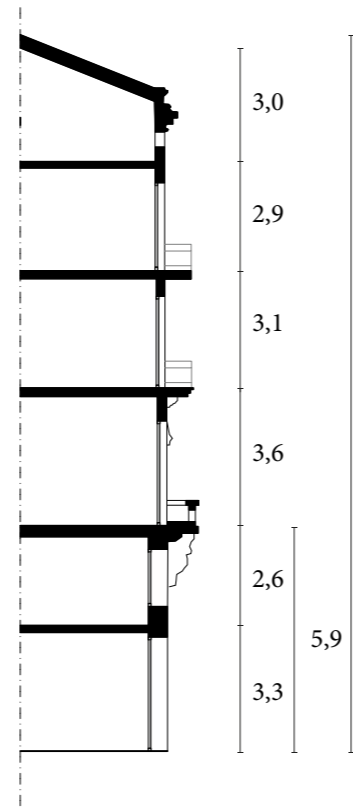
Architect : E. Sagnier i Villavecchia
Barcelona, Spain, 1888



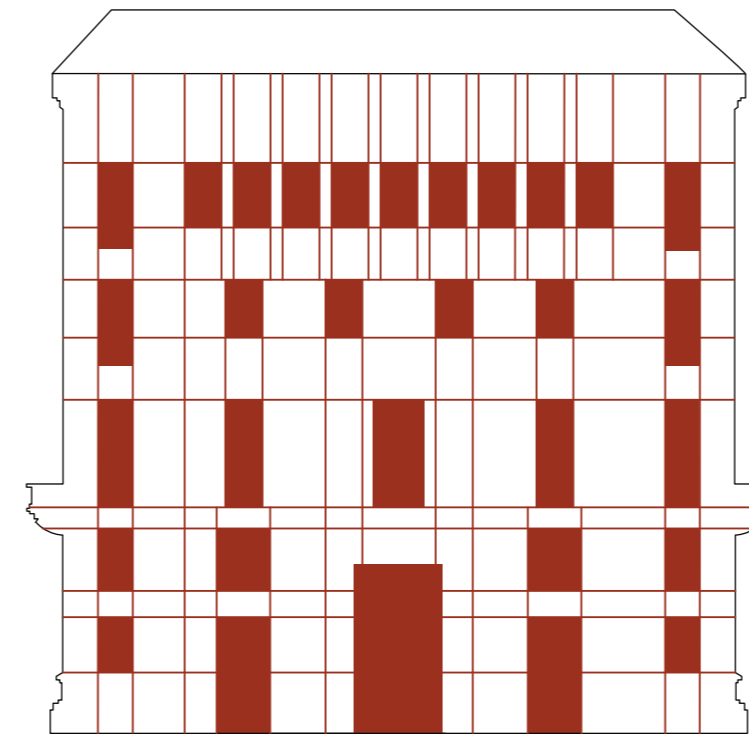
Elevation



Plan



Height Differences



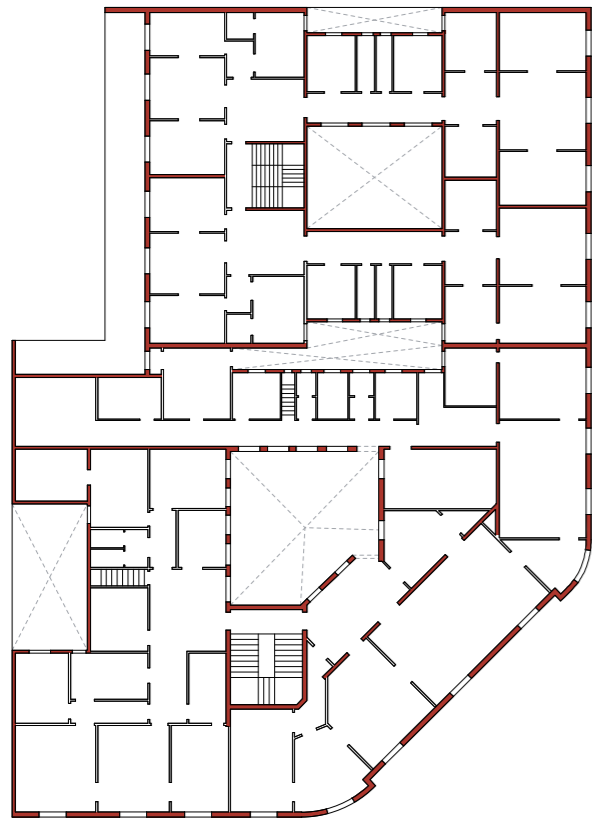
Facade Grid Regularity



Facade Composition



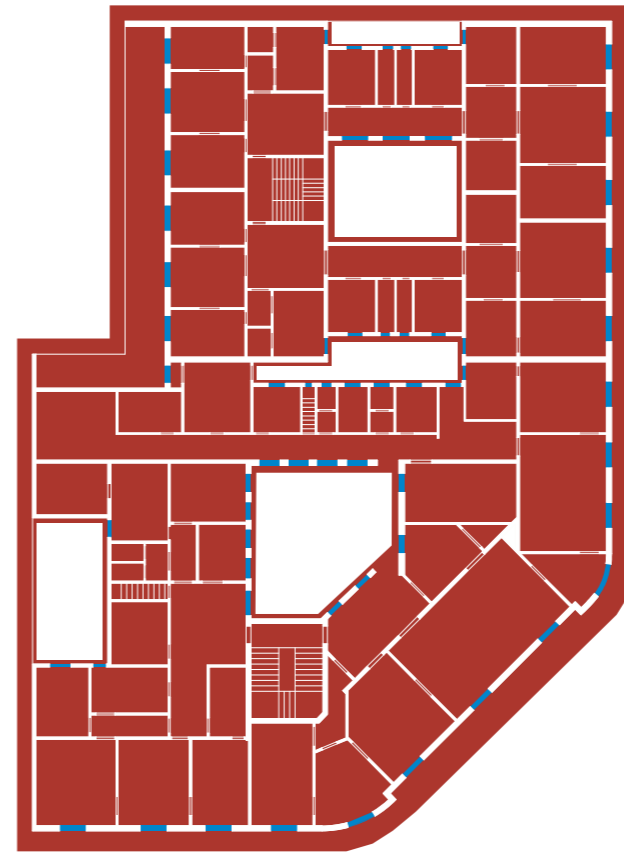
Block Vertical Porosity



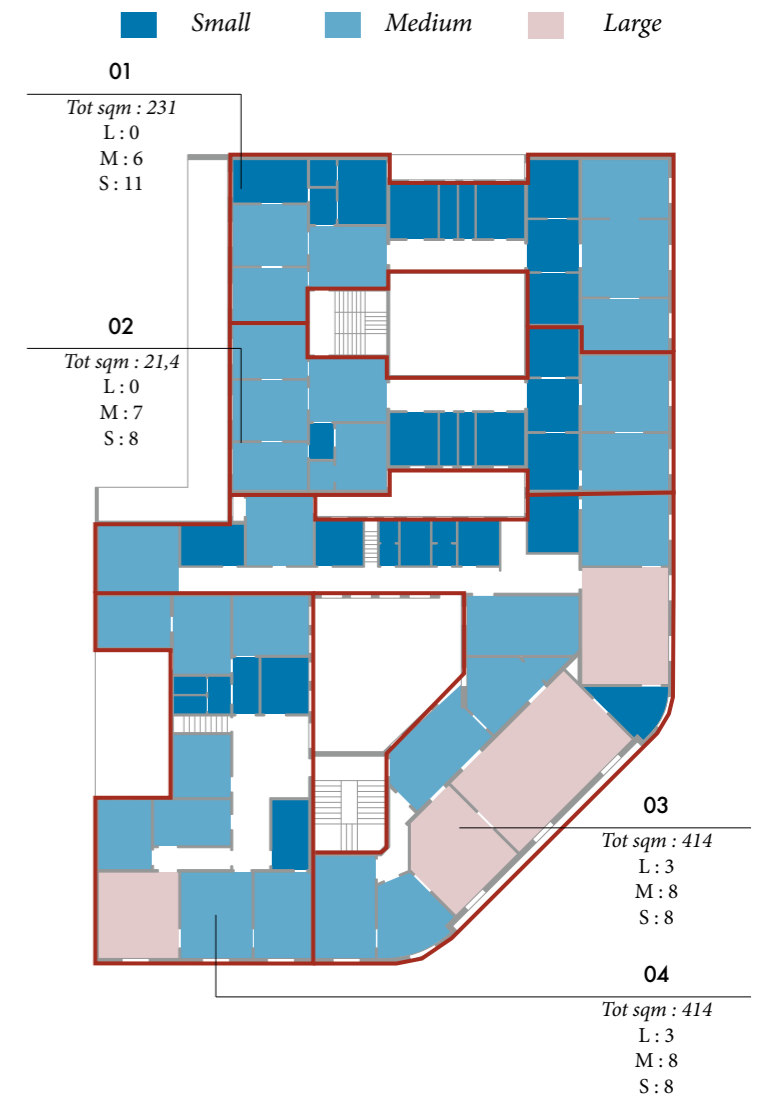
Structural Clarity



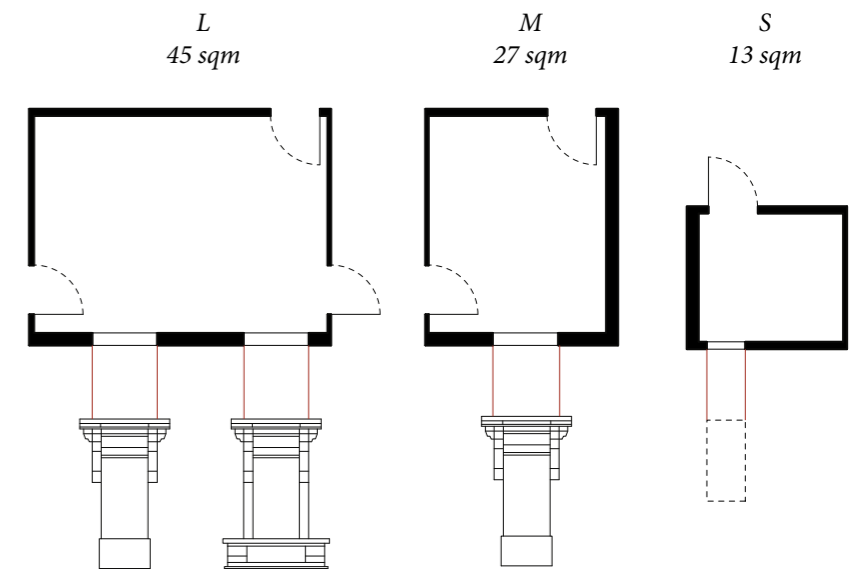
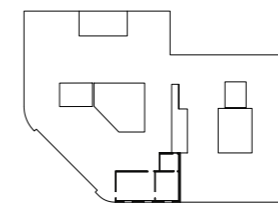
Circular Distribution



Windows Redundance



Plan Composition



Rooms and Windows Hyerarchy

INTERPRETATION

19th century buildings as an archetype of flexibility?

This thesis reveals the potential of the nineteenth-century urban model in its actuality as regards the problems and challenges of tomorrow.

The type-morphological analysis performed by the classification based on the size and endogenous characteristics of this heritage is comparable to the work of an entomologist or an archaeologist.

The corpus is captured by drawing and classifying in order to detect the rules and reveal the invariants that govern the shape of the buildings, while the dimensional and comparative analysis tries to restore their logic and efficiency.

This work, conducted on all scales - urban layouts, islets, buildings, down to the language or vocabulary of the composition of buildings - reveals the fractal logic that governs the production of the urban form of the 1800s.

The buildings considered by us have a number of invariants in common:

*Facade grid regularity ***

The facade of the nineteenth-century building arises from the design of a generic grid behind which the various functions are affixed. This compositional principle is applied to all buildings of the same historical period, in order to guarantee a strong identity.

Regardless of the function of the plan, the window openings are obtained inside the grid, in a systematic and consistent way.

From an urban point of view, the uniformity of the facade with the context highlights the basic element of the grid, which unites all the blocks as if it were a curtain wall.

This sort of contextualism is a feature that confers adaptability to the facade and therefore to the building itself within the urban fabric, an essential requirement for achieving timelessness. Attention to detail (typological, technical and technological), contrary to what is considered today as an obsolete and outdated practice, increases the value of the building by increasing its ability to transform.

*Height differences ***

The rules established in the nineteenth century in urban plans and regarding residential buildings, follow a design line that is as coherent as possible at the urban level, as well as respecting the hygiene rules imposed by the unsanitary conditions of the time.

All the buildings had to be designed according to pre-established inter-storey heights, different from floor to floor: the ground floor was often 4 or 5 meters high, the mezzanine no more than 3 meters, the second and third floors on average measured 3, 6 m and the other floors between 3.20 and 3.40 m.

This variation allows some floors to incorporate uses other than that of living: the ground floor and mezzanine are completely reconfigurable, on the upper floors the most frequent transformation is that into offices between the second and fifth floors, thanks to the generosity of their volumes; finally, the functional hyperstaticity allows different structural and spatial reconfigurations

The inter-floor variation, accompanied by a volumetric oversizing, highlights the farsightedness of the design rules imposed by the major exponents in the 19th century architectural landscape, with a view to transformability over time.

The ability of the structure to absorb changes in use over time is a significant factor of sustainability and an obvious form of resilience, as well as being a pioneering work regarding the attention placed on the volume of spaces rather than on the area..

*Facade composition **

The composition of the facade of the nineteenth-century building is independent of the internal functional structure, since it responds to design criteria related to the urban context.

This design principle that regulates the block, balances the architectural concept of the city and gives it harmony: the height of the building, between 12 and 20 meters, is proportional to the width of the road, and does not exceed six floors.

The neutrality of the facade, disconnected from the concept of absolute repetition but rather understood as the absence of elements or shapes that indicate a specific function, promotes a high flexibility of use of the building.

Analyzing the composition of the nineteenth-century façade, a similarity can be found with the classic motif. Although based on a generic grid, the façade is horizontally marked by the overlapping of three bands that reflect the compositional principle of the classical orders.

The orders are applied in the design of the architectural elevation creating a tripartition, which reflects the social stratification of the time:

- there is the “base”, consisting of the ground floor and the mezzanine, with recessed walls, intended to house commercial activities;
- “the column”: composed of a second noble floor with one or two balconies and apartments of greater value; and a third and fourth floors in the same style, but with less attention to detail. These floors were designed for the aristocracy, and feature higher ceilings and large balconies containing black wrought iron balustrades.
- finally, there is an “entablature”, consisting of a fifth floor with continuous balconies, without decorations and slate roofs, with the respective attics for the servants, inclined at 45 degrees. These last floors were intended to house the servants and warehouses.

*Structural clarity **

The construction system of the nineteenth-century building is simple and clear, given the need to build quickly using local resources. The structure of the building is made up of external load-bearing walls that support the slabs, reinforced by the staircase body. The structural redundancy makes the construction component clear and safe, allowing future spatial reconfigurations.

This potential for building reversibility, which goes hand in hand with the ability of the urban structure to absorb changes in use over space and time, is a significant factor in its resilience.

*Rooms hierarchy ****

In the nineteenth century, the house reflects the social level of the family that lives in it and the organization of the domestic space reflects the characteristics of the family system, the hierarchies within it, the values, and the type of sociality that takes place

there.

In plan, the nineteenth-century system is therefore simple, legible and oversized.

The generosity of the environments and of the construction is the result of the thought of the time, in which everything is designed to ensure a greater width of the spaces, with courtyards and courtyards that cross the apartments, ensuring greater flexibility and resilience of the spaces.

If we consider these qualities in relation to the criteria of comfort and “current performance”, abundance calls into question contemporary standards.

The contrast between a functionally determined plan within an ambiguous architecture generates a differentiation in the dimensions of the harmoniously distributed environments. Through a comparison between different nineteenth-century plans, three types of rooms were identified and mapped according to their size and characterized as S (Small), M (Medium), L (Large), in ascending order.

There is therefore a hierarchy of spaces, in which the premises used for social attendance are of great importance and constitute the largest part of the value of the entire house.

In fact, the largest room in the bourgeois house is undoubtedly the living room, the representative environment par excellence.

Compared to this room, the other rooms of the bourgeois house are modest.

It was only in the last decades of the nineteenth century that more attention was paid to the bathroom, which initially appeared as a great absentee, since people usually washed themselves in the bedroom. In fact, a compendium of civilian dwellings dating back to 1879 recommended “a toilet room with large washbasins and a bathroom next to that of the bed”.

*Circular distribution ****

Between the nineteenth and twentieth centuries the entire spatial layout of the accommodation was reconsidered, in response to a greater development of the sense of privacy.

The nineteenth-century plan becomes a sequential structure of rooms, in which the rooms are communicating and made up of two or three doors, which allow access to the rooms not to be one-way.

The functional structure of the corridor is eliminated, favoring the possibility of moving circularly within the rooms.

Thus, two different types of circulation inside the rooms are created: on the one hand, there is an internal circulation, which overlooks the smaller rooms, service or entrance; on the other side, there is an external circulation, located near the facade.

In fact, a system created by the presence of an enfilade is created: the doors of each room are aligned with each other along a single axis, allowing you to perceive the entire row of rooms with a single glance, creating a ceremonial of the passages, in which the enfilade has the function of a processional path.

The door thus becomes what determines the rhythmic structure of the spaces, guaranteeing and welcoming different levels of privacy.

*Windows redundancy ****

The compositional rules prepared for nineteenth-century buildings, combined with the importance given to ornament, led the architects to design the facades almost independently of the building plan, thus adapting the contents to the container.

Despite this, the arrangement of the windows and the compositional hierarchy of the rooms combine to generate design relationships in order to obtain typological flexibility. Depending on the spatial composition of the rooms and their intended use, the windows were distributed in such a way as to give more light to the most experienced environments during the day and less to the services. Usually the dining room and living room, symbols of the family reunion, were designed in large or corner rooms, in order to have multiple windows with different exposures. They were also equipped with mirrors, with the aim of reflecting the sun's rays, as well as making the rooms appear optically larger. The bedrooms, often of medium size, had a window, at most two, depending on the architectural impact of the facade. Finally, the small bathrooms were often designed in blind corners or facing the internal courtyard.

The generosity of the number of openings is one of the main characteristics of flexibility as, in addition to guaranteeing brightness and ventilation, it is a key element that holds the facade together with the functional component of the plan: a filter of ambiguity between the internal environment and the external perception of the building.

*Block vertical porosity **

The nineteenth-century urban plans ensured an improvement in the domestic health condition, offset by a high density of the urban fabric. The blocks are considered as aggregations of housing units, responding to the fundamental principle of the overall logic. As well as in the facade, even in the composition, each block works as a single entity, defined with a uniform architectural planning.

The spatial and constructive generosity of the blocks and individual buildings is the attitude of the time to meet the standards of public hygiene: everything is designed to facilitate ventilation. If we consider the qualities given by this generosity through our performance standards, we observe that the single nineteenth-century building, if considered alone, appears to have a low level of compactness and very fragile from a thermal point of view. At the same time, when considered in the isolated system, the fabric formed by the aggregation of buildings creates a high level of compactness, similar to that of today's buildings. This criterion becomes the leitmotif of performative optimization. At the same time, an important element that allowed this compactness linked to a depth of the buildings ranging from 7 to 13 meters allowing for double or triple exposure, is the presence of courtyards and shafts.

Each block is made up not only of constructed entities, but also of well-placed and distributed empty spaces. Their arrangement and size is linked to their specific use: a larger shaft is dedicated to residential courtyards or service spaces, small shafts are flues or ventilation channels that contribute to the proper ventilation of the residences. Many times the courtyards between the buildings are shared and used as social places, often connected to public services on the ground floors.

These rigid rules governing the design of buildings, imposed by Haussmann himself, demonstrate the conditions for the extraordinary flexibility of these architectures. Over time, these buildings have demonstrated their ability to adapt to major changes in lifestyle or function, thanks to their "intrinsic intelligence in form", which has allowed these architectures to survive changes, to evolve with the city and to make different functions live within them.

The nineteenth century building was born as a residence for the bourgeoisie, but it turned out to be an extraordinary architecture, capable of accommodating other functions other than housing: offices, commercial premises, ateliers.

A flexibility that finds reason for being in some invariants that characterize those architectures: a well-defined grid, a clear structure, a hierarchy of environments, a wealth of openings that allows the construction of inter-storeys of different heights, the enfilade of doors.

We have considered these values as the major legacy of the nineteenth-century building, translating them into an architecture that fits into the logic of the city and offers more solutions to current and future problems.

21TH CENTURY : CASE STUDIES

In such a varied landscape, the choice of modern case studies was determined by the judgment of third parties, such as judges, magazines or competitions, who considered these projects to be typologically flexible. These buildings were deemed capable of responding to the needs of quality, well-being, usability, safety and privacy.

For the identification of the case studies it was therefore chosen to refer to type criteria:

- Communicative: the project was published for the elements of “flexibility” it contains;
- Typological: only residential projects were considered;
- Chronological: buildings of recent date were examined;
- Geographical location of the intervention: interventions localized on the European territory were analyzed;
- Financing of the intervention: interventions carried out with public or mixed finance have been included, if not for a few exceptions.

“Flexibility” is not and must not remain a mere theoretical principle, but is aimed at its own design and concrete development in the architectural practice of residential buildings: therefore we considered it appropriate to verify the real correspondence between the flexibility declared by third parties and its actual presence within the project.

The buildings analyzed respond to some characteristics that we consider emblematic to guarantee flexibility and, therefore, greater spatial quality. In plan, they are located within historic and dense urban fabrics, belonging to the nineteenth-century urban plans.

These projects share the idea that by emptying architecture of its program, a building can generate a potential that will allow it to respond to changes in use, anticipating needs and changes, proposing full reversibility. Residential buildings are thus designed consisting of room systems that can be used as desired, without determining a schedule. The rooms are connected to each other, and do not require distribution spaces. This theme of flexibility and adaptability also concerns the functional transformation from residence to tertiary and vice versa.

Their flexibility in plan is also due to the position of the bathrooms, where all the facilities are strategically positioned and function as points for water, air conditioning and electricity supply.

From the point of view of the elevations, the façade is defined according to the height and composition of the adjacent buildings, trying to consolidate the traditional style of the neighborhood.

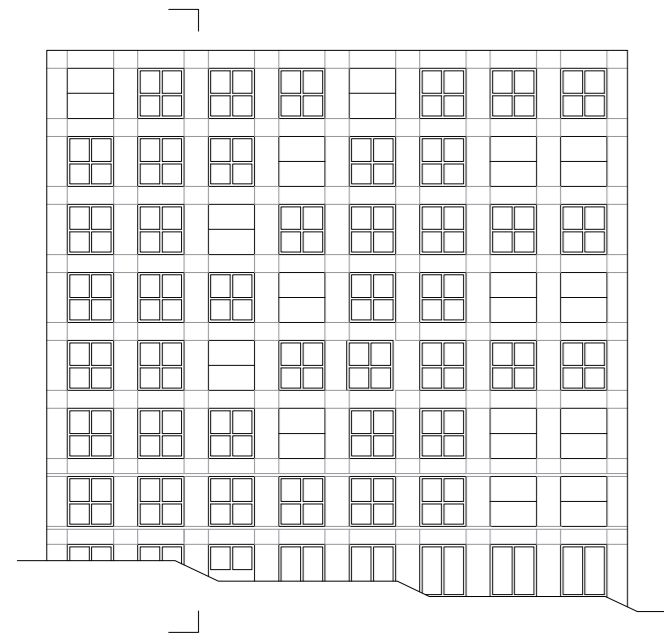
The buildings are characterized by large openings, capable of giving an abundance of natural light and greater spatial quality to the interiors.

These projects are characterized by the size and regularity of the door and window openings that create a general image of the building without specifically indicating its use.

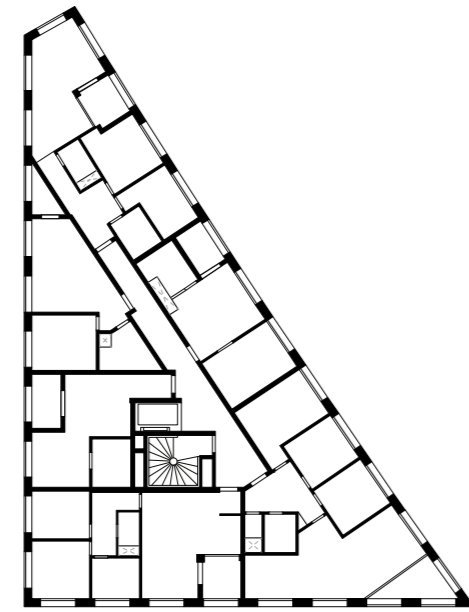
They have been configured to have flexibility also in their structural system, in which the modularity of the supporting structure plays a role of primary importance.

Paris XVII, 40 Housing units

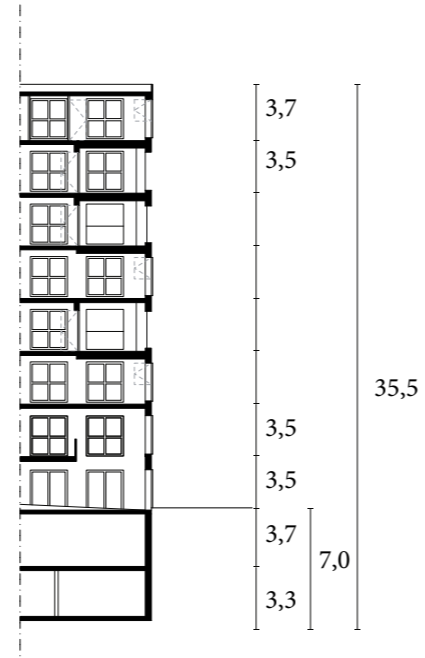
Architect : LAN Architecture
Paris, France, 2014



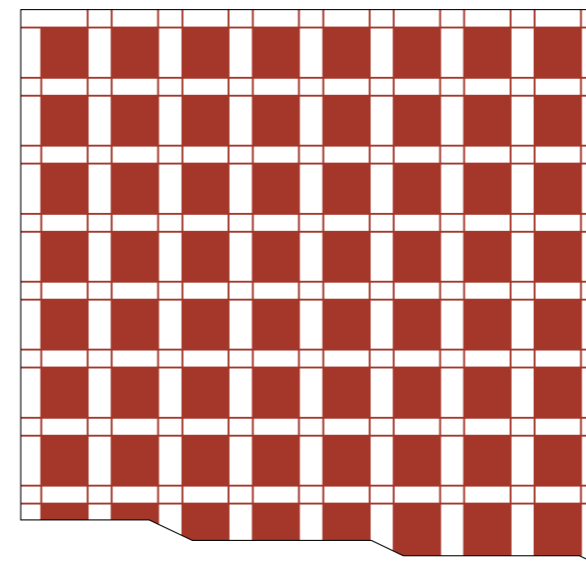
Elevation



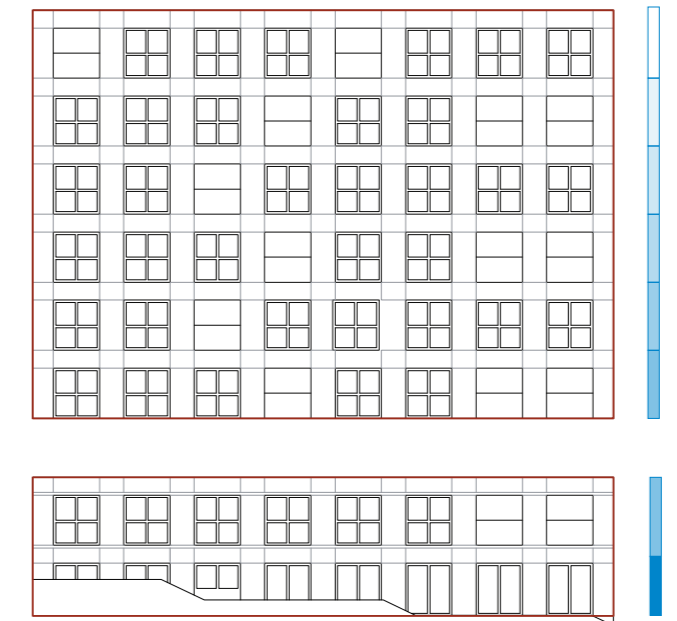
Plan



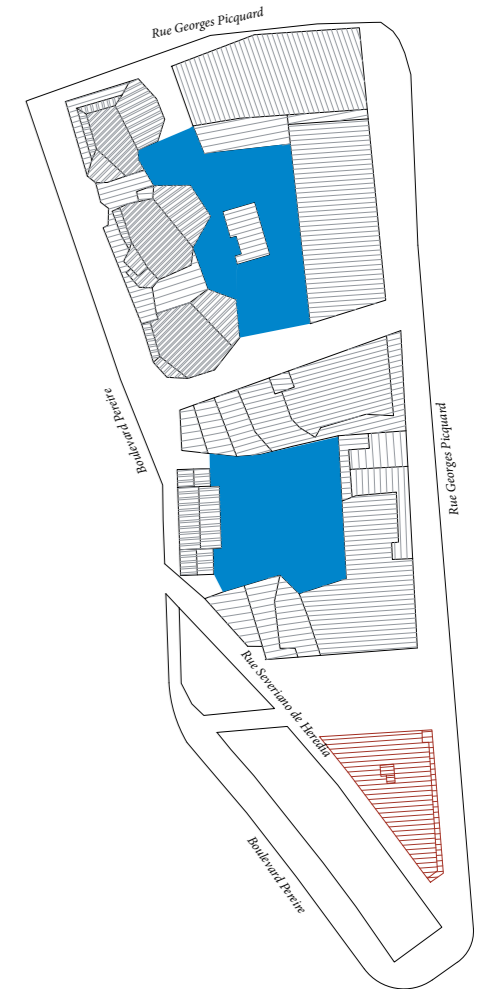
Height Differences



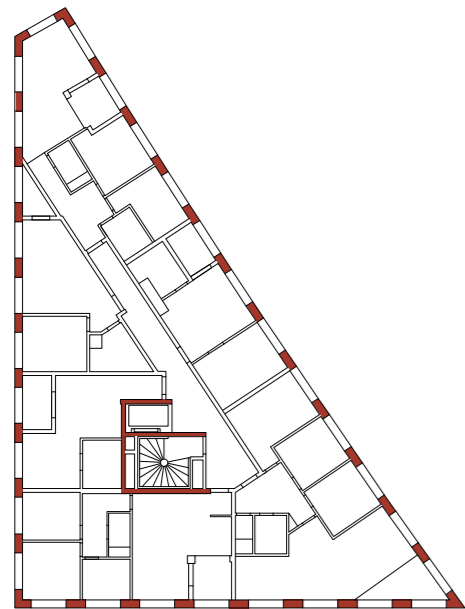
Facade Grid Regularity



Facade Composition



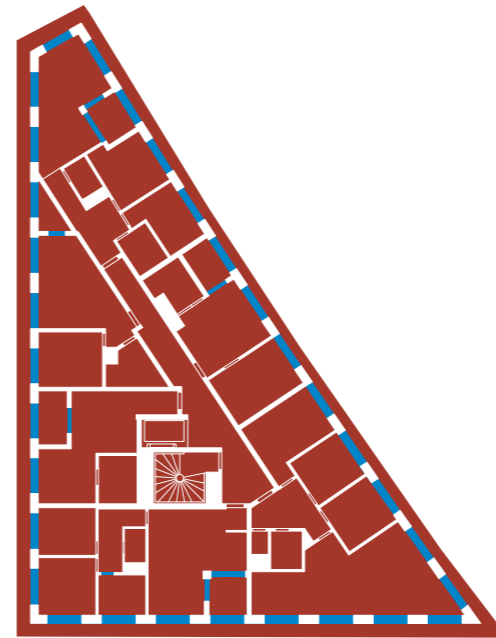
Block Vertical Porosity



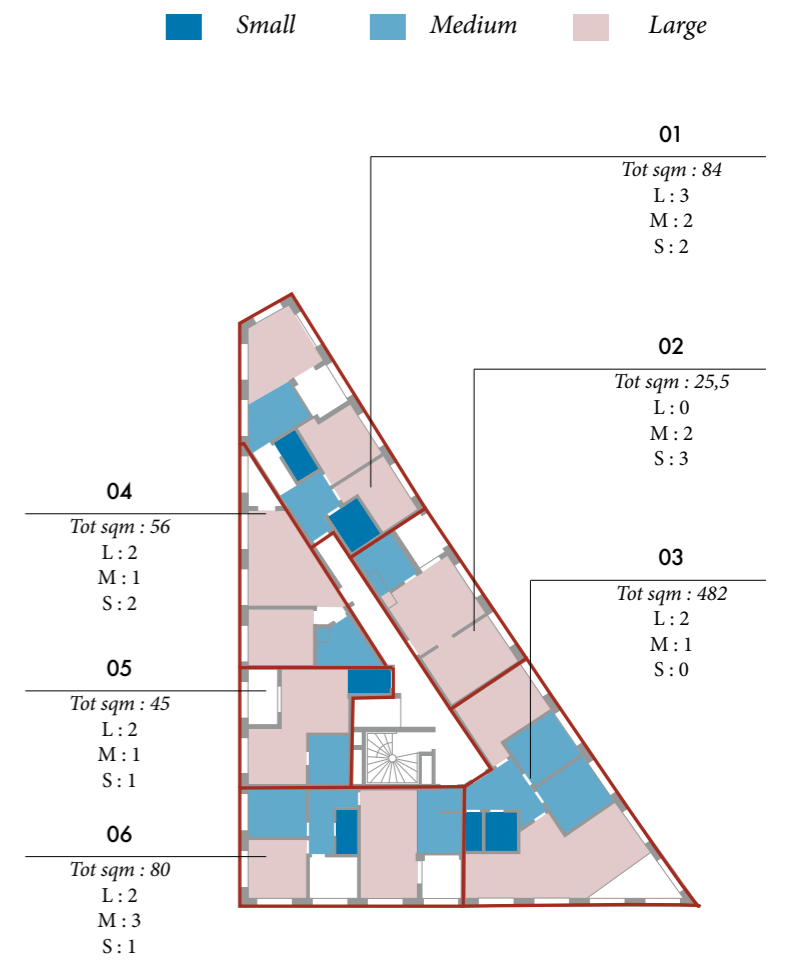
Structural Clarity



Circular Distribution

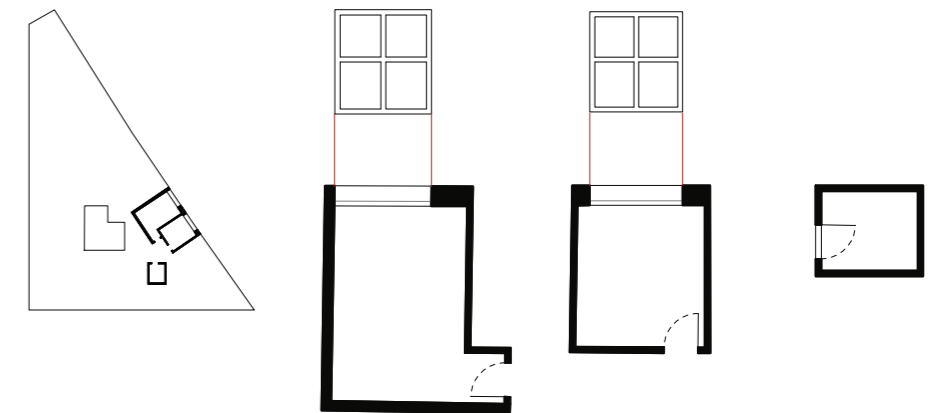


Windows Redundance



Plan Composition

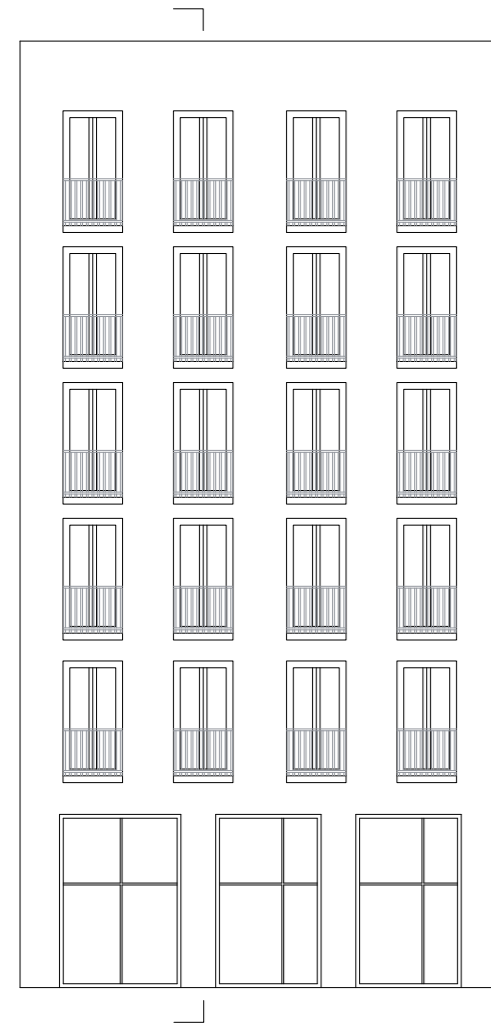
L 20 sqm
M 13 sqm
S 5 sqm



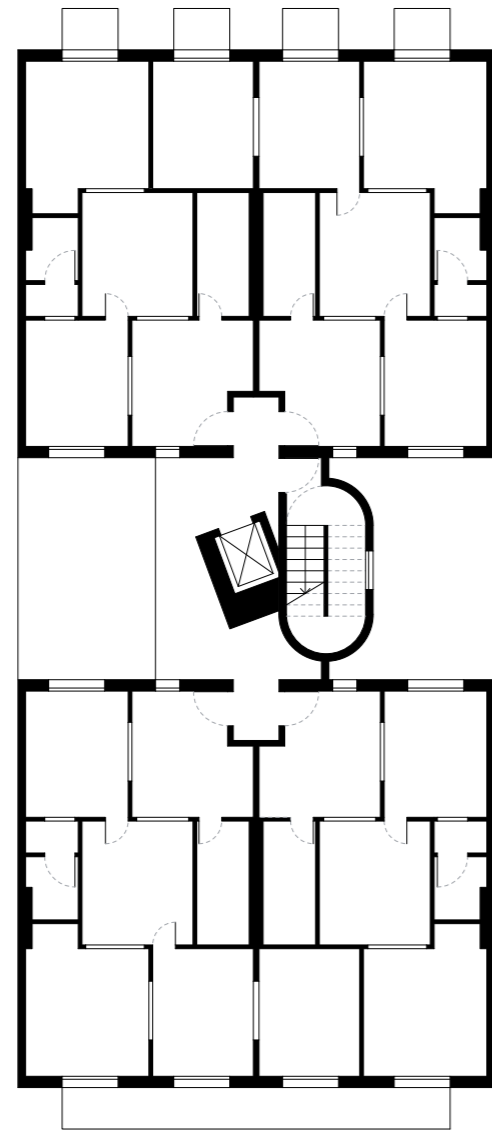
Rooms and Windows Hierarchy

111 Rooms

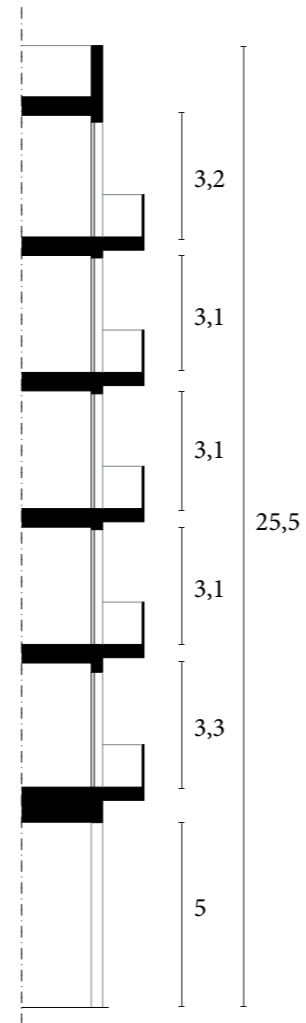
Architect : Maio Architects
Barcelona, Spain, 2016



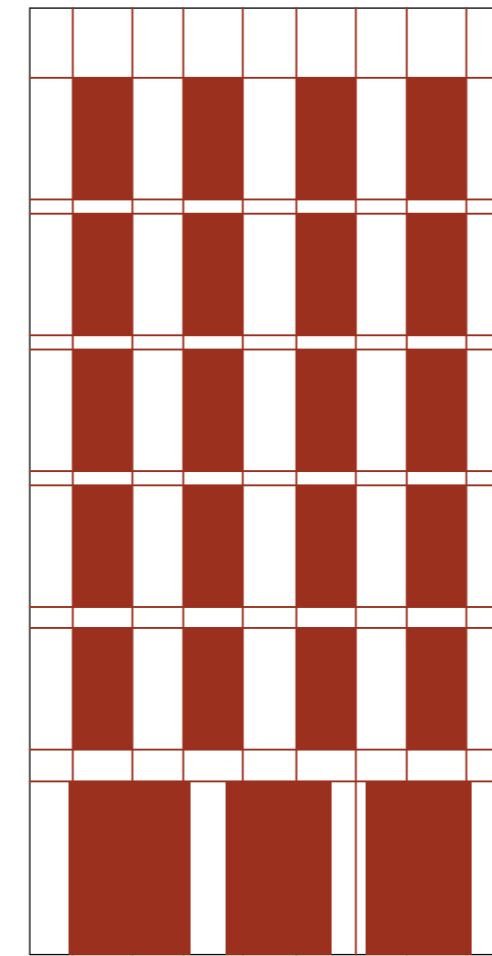
Elevation



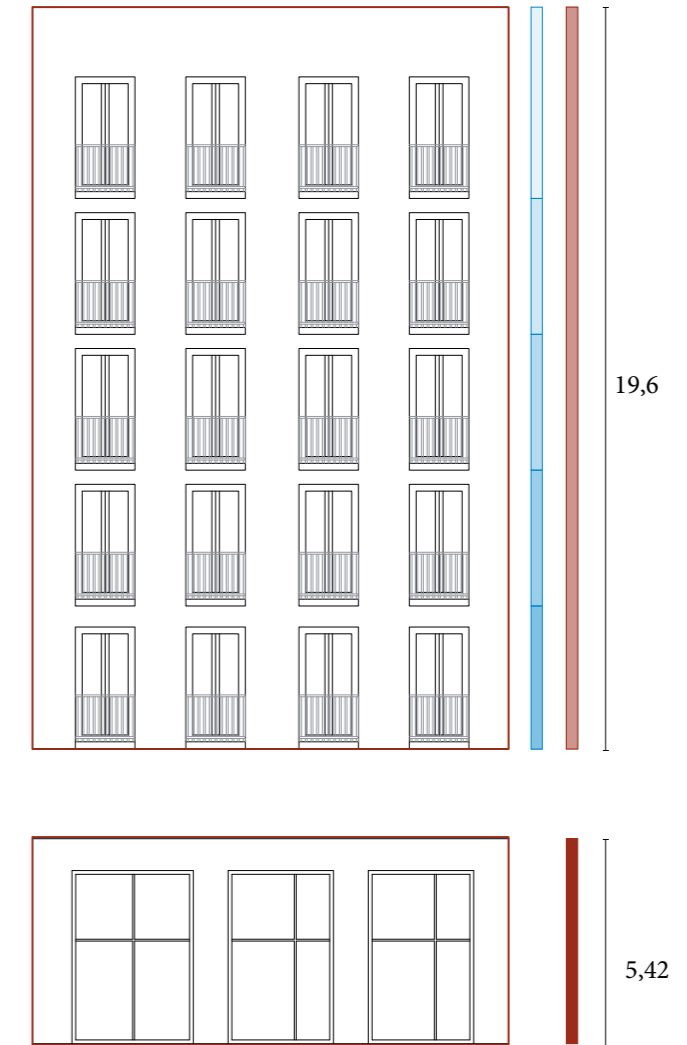
Plan



Height Differences



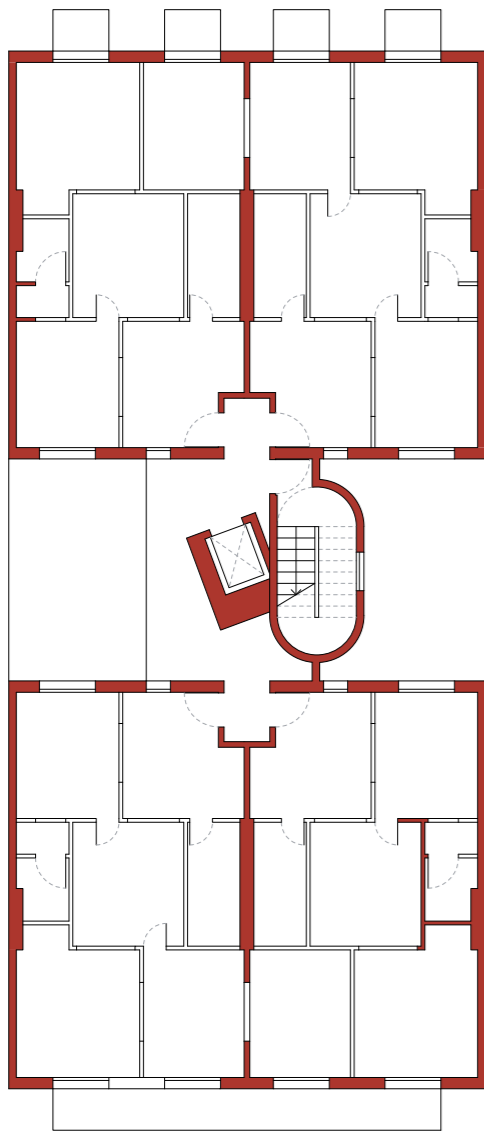
Facade Grid Regularity



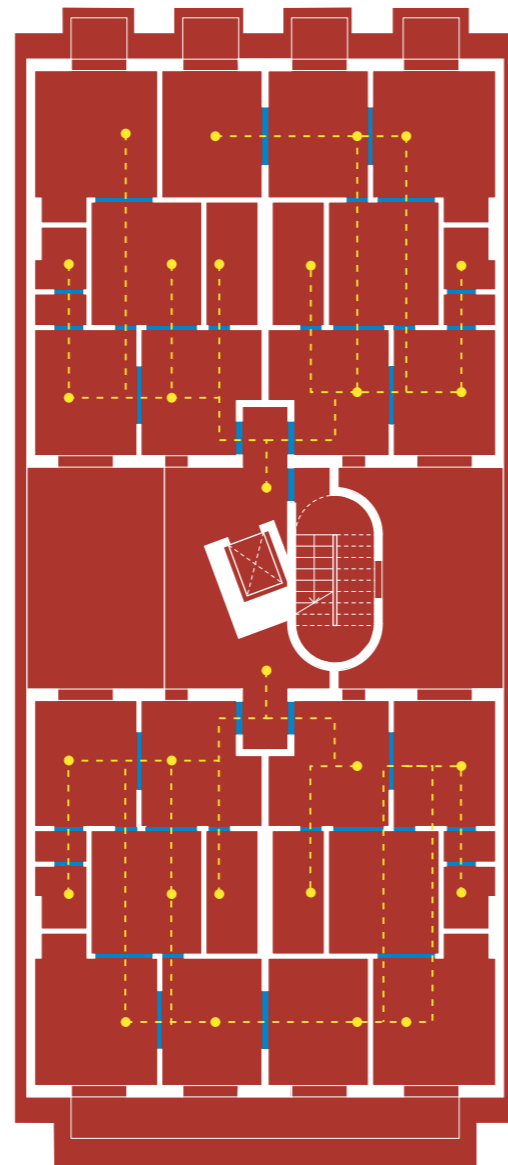
Facade Composition



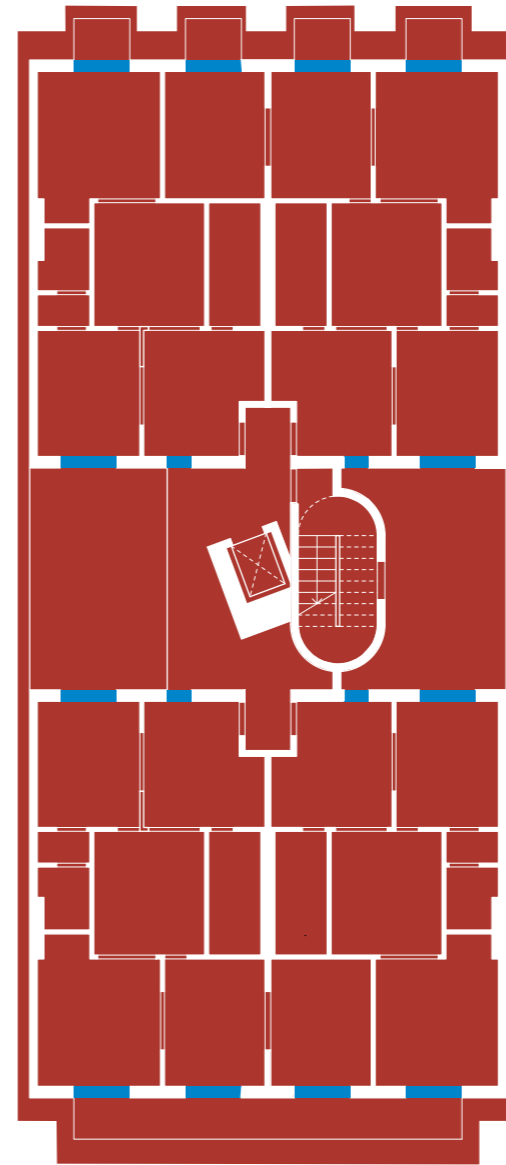
Block Vertical Porosity



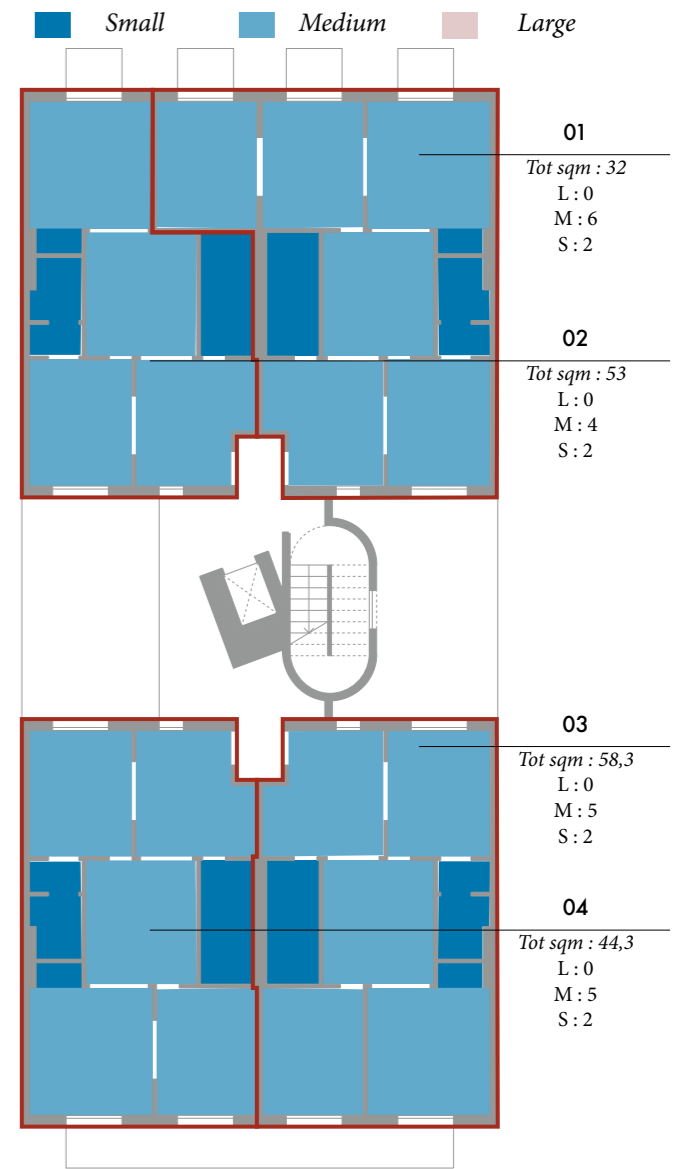
Structural Clarity



Circular Distribution

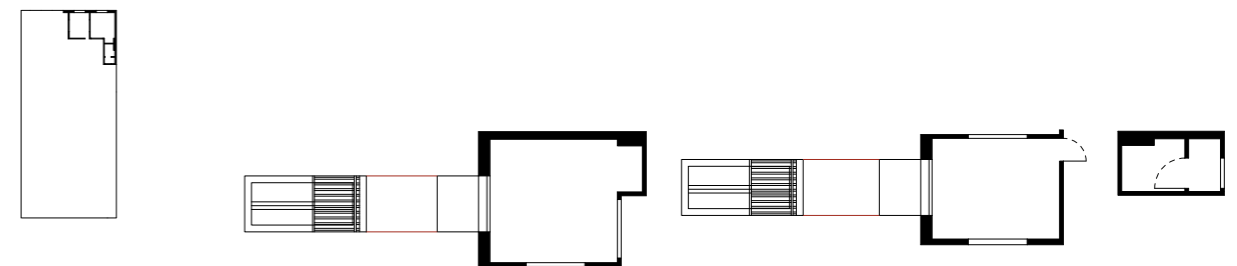


Windows Redundance



Plan Composition

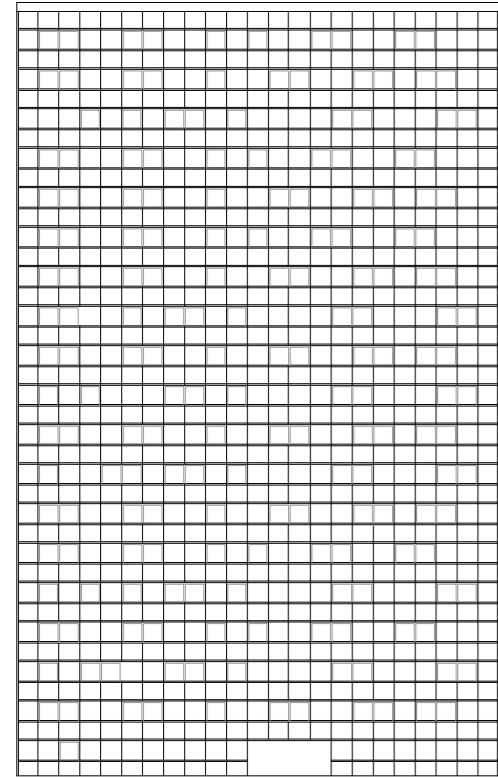
L 12 sqm M 9 sqm S 3.5 sqm



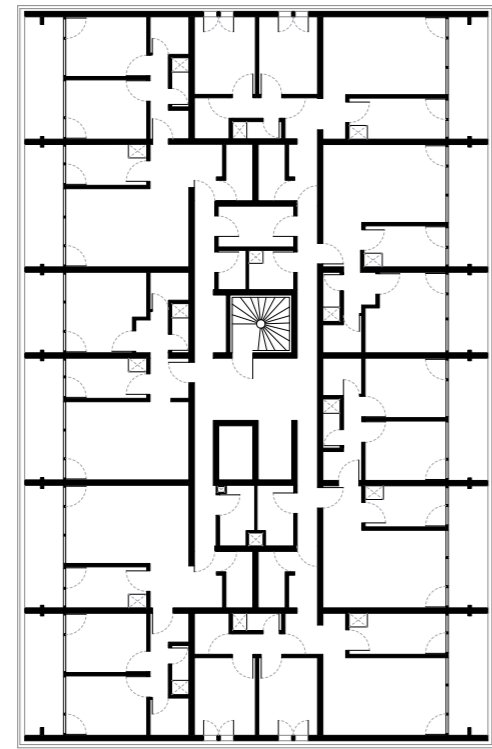
Rooms and Windows Hyerarchy

Urban Renovation Lormont

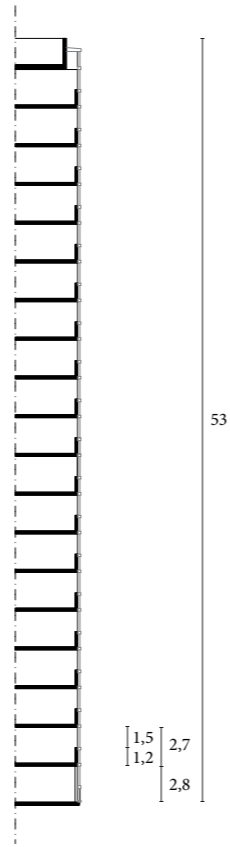
Architect : LAN Architecture
Genicart, France, 2015



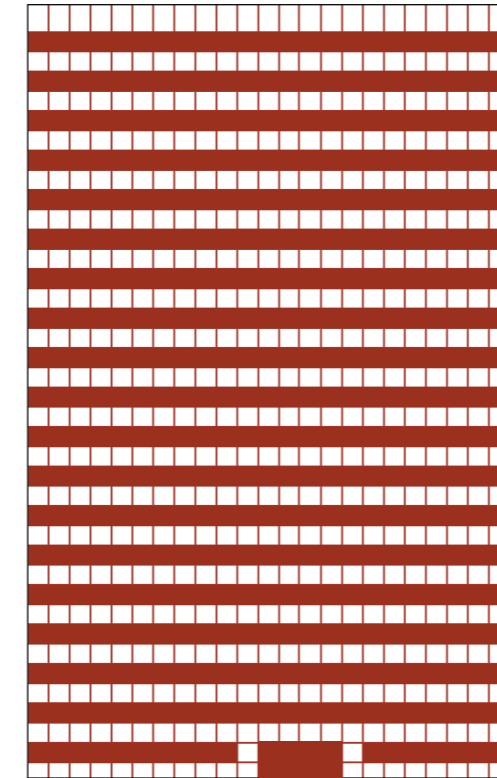
Elevation



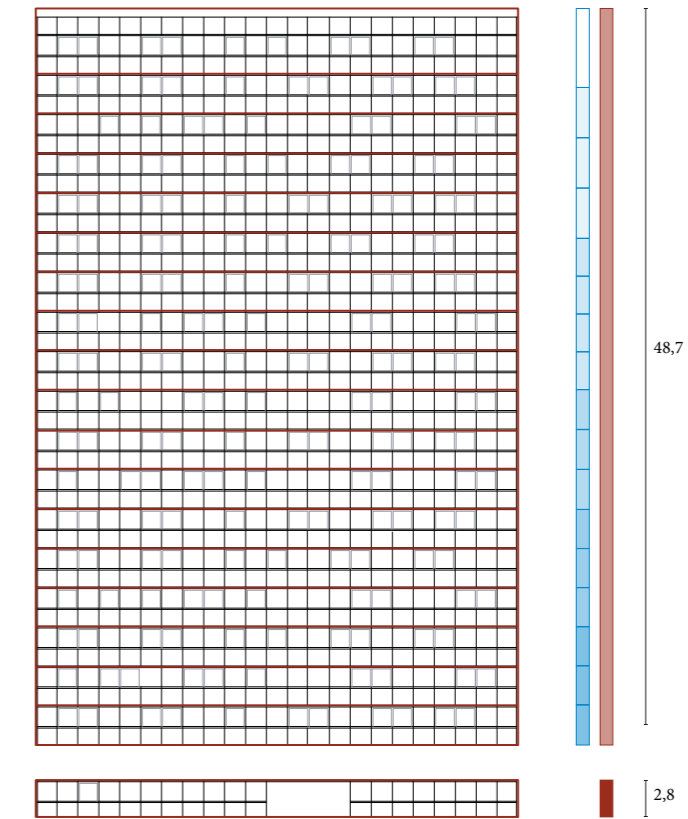
Plan



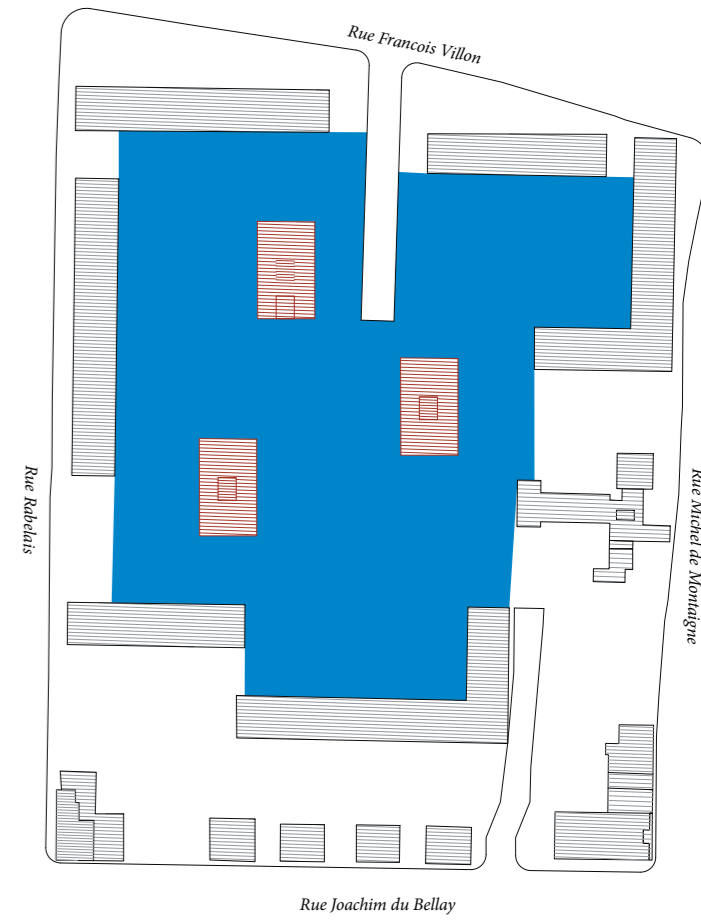
Height Differences



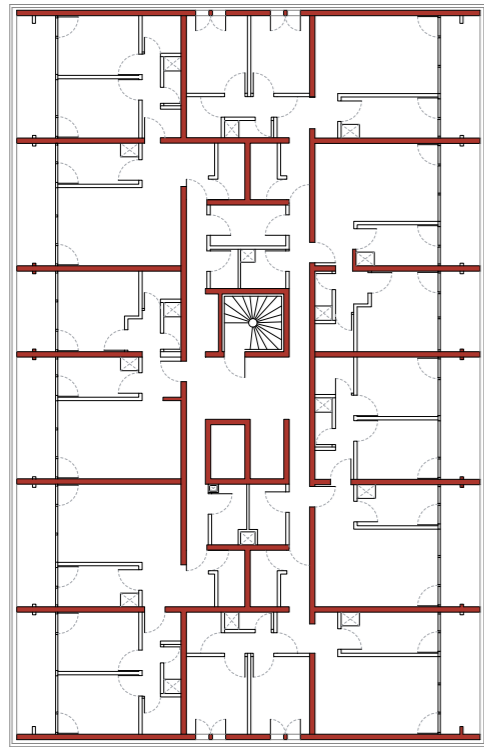
Facade Grid Regularity



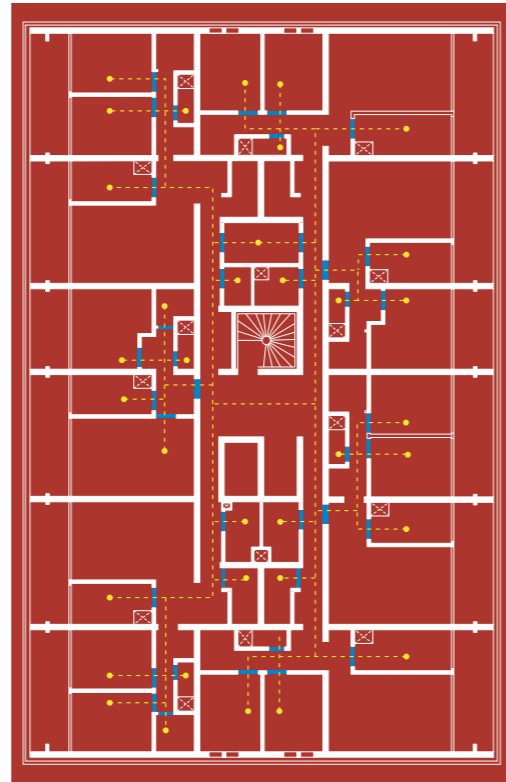
Facade Composition



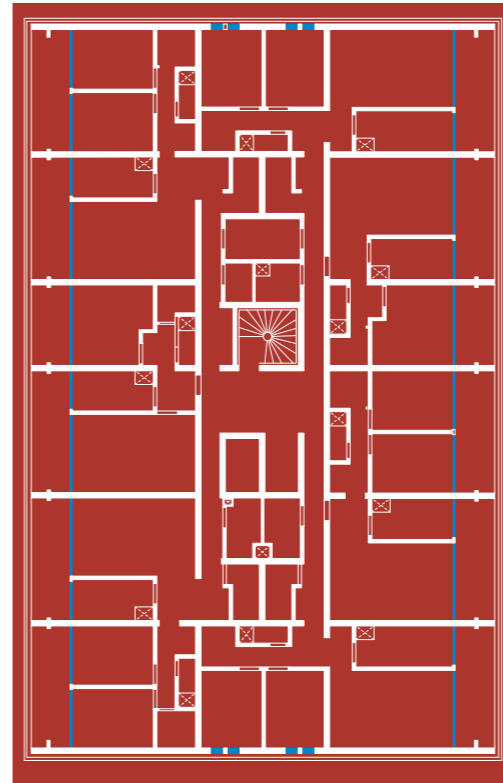
Block Vertical Porosity



Structural Clarity

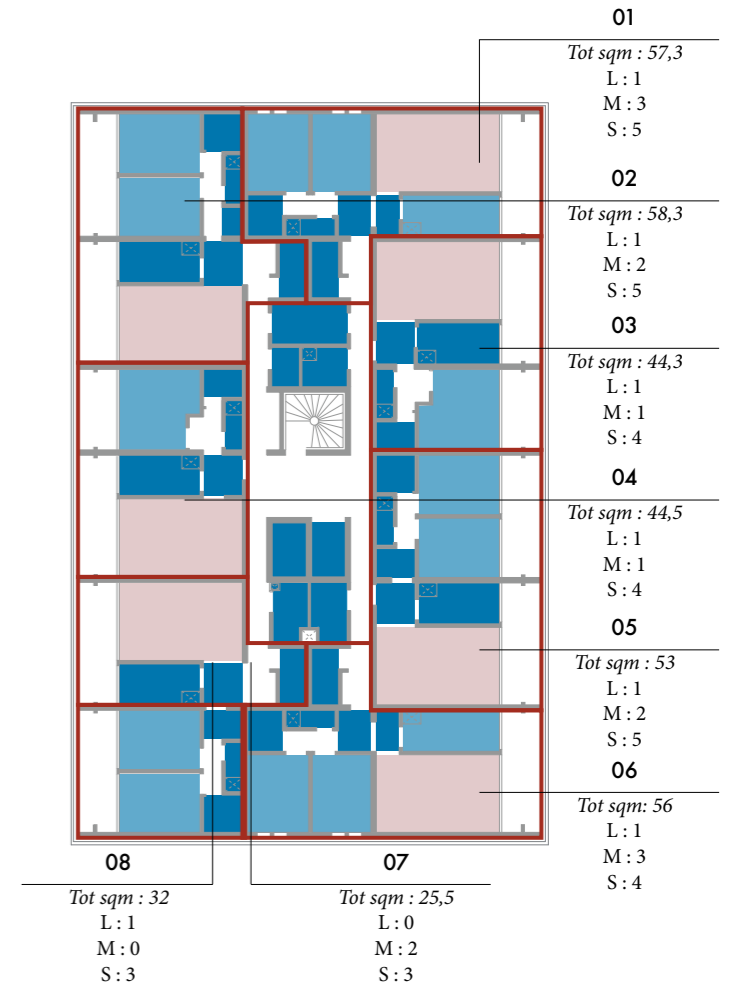


Circular Distribution



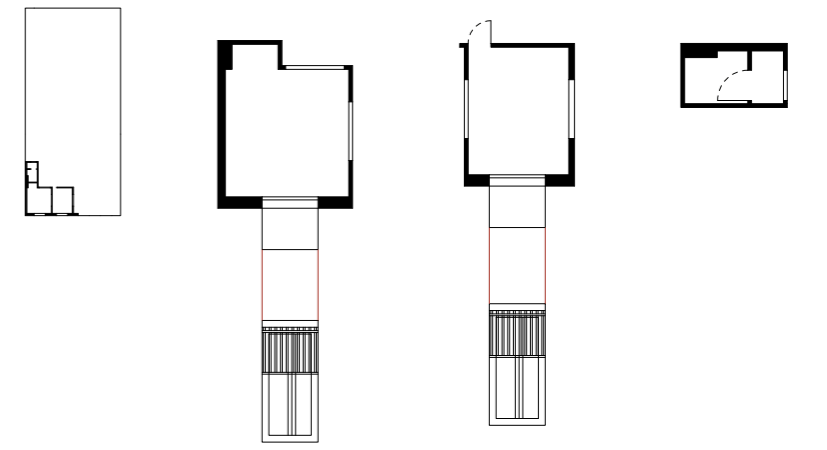
Windows Redundance

■ Small ■ Medium ■ Large



Plan Composition

L 19 sqm M 14 sqm S 7 sqm



Rooms and Windows Hyerarchy

INTERPRETATION

Do 21st century buildings meet the flexibility criteria?

With the aim of reporting to date the compositional analysis conducted on a certain number of nineteenth-century buildings, some projects defined by us as “best practices” regarding typological flexibility have been taken into consideration.

Comparing the characteristics highlighted as flexible in 19th-century residential buildings also in 21st-century buildings, the following variables were highlighted:

*Facade grid regularity ****

The modularity of the façade of the 21st century buildings under consideration defines a rational and minimalist relationship between the inside and the outside.

The regular and repetitive grid establishes criteria of proportion which in most projects underlines the close relationship with the composition and structure in the plan.

We are witnessing a simplification of the facades, designed on a rigorous structural grid.

Unlike the facades of the 1800s, anchored to the supporting structure flush with the outside, the so-called “free facade” theorized by Le Corbusier, allowed the design of larger windows that give more lighting to the interiors.

Furthermore, the compositional grid does not always meet the same criteria in all the case studies: different types of windows characterize the residential buildings of the last century, responding to needs both related to the context and to climatic requirements.

The repetitive sequence of full spaces with glazed parts is iconic of the 21st Century, as a feature of a search for maximum essentiality and functionality linked to the use of design and material systems in close relationship with industrial production.

A rational modularity of solids and voids is therefore created, in which particular attention is given to the sizing of the supporting structure, as it plays an important role in defining the general composition of the building.

In addition, the increasingly advanced technological research has allowed an oversizing of the windowed walls, allowing extraordinary interior lighting and a more direct contact with the outside.

*Height differences **

The contemporary case studies do not present a clear differentiation between the different residential floors, as the provisions of the building regulations do not provide guidelines on the design of the section, but rather establish the minimum of the inter-floor heights of a standard floor, to be respected to ensure habitability.

In particular, the cases subjected to analysis have a ground floor generally higher than the others, which remain unchanged for the entire section and respect the aforementioned limits.

Some case studies have been specifically designed to allow functional flexibility from

residence to offices, and therefore their inter-floor height is set a priori higher than the minimum, to ensure this transformation.

For this reason, this particular feature that provides for a strong differentiation between the floors of the same building is not considered of focal importance for the design of typologically flexible buildings.

On the contrary, following the cross-comparison with the buildings of the 19th Century, an adequate height of the inter-floor typologically gives more flexibility to the rooms from a volumetric point of view.

*Facade composition **

The composition of the facade follows lines completely in contrast to that of the buildings of the past. First of all, the classic tripartition consisting of base, body and crowning is abolished, in favor of a rationalization of the elements of the façade.

In particular, the basement remains almost unchanged in its function as a filter between the collective open space and the intimacy of the residential floors above: higher than the average of the inter-floor, it is usually used for common services or is left free with the presence of pilotis.

The second and last compositional band of the facade, that is the body, is compositionally the same for each floor, compact and linear.

The crowning, a characteristic element of the 19th century, gives way to flat roofs that are often usable and walkable, which are enriched with public functions and sometimes become garden roofs.

From the point of view of the elevation, the crowning becomes a higher string course that closes the building in its upper part, without any particular characteristics.

Finally, the refusal of the ornament that starts from the Modern Movement makes the elevation homogeneous and this entails a greater functional abstraction from the plan.

*Block vertical porosity **

The urban layout of the blocks of the last century is very different from that designed in the great nineteenth-century urban plans. Urban planning starting from the Modern Movement proposes a deconstruction of the compact block typical of the historic city, through the complete rupture of the built fabric.

The morphology of the contemporary city is the result of numerous changes in the regulations for urban design, compared to that of the past.

New housing needs related to the change in today's society and the increasingly present theme of the rehabilitation of abandoned areas, have led to an approach based on restoring the balance between anthropogenic and natural forces.

The block, therefore, acquires a diffuse porosity, as there are no longer closed courtyards, derived from the void left by the buildings, but it is the percentage of void that is greater than that of fullness. The buildings that are not part of the rehabilitation of areas in historic centers are more isolated and open, not directly overlooking the streets, but set back from the street, almost protected within the block.

The absence of a real continuous building curtain makes the buildings more autonomous, with windows on each front, therefore freer and brighter.

*Structural clarity ***

The compositional potential guaranteed by point-like and modular structures is certainly one of the characteristics that make a modern building flexible. The modularity guarantees structural safety and design freedom of composition both in plan and elevation.

In addition, the structurally free facade becomes an envelope that encloses and thermally insulates the building, becoming an independent element and vehicle of flexibility.

*Circular distribution ***

The architecture of the 21st century is conceived as an instrument capable of improving the human condition, through a rational and functional organization of spaces.

Thus was born a design that sees in architecture and urban planning the means to be able to act in favor of social progress, and aims to resolve the form to a sought-after essentiality, in which there is space only for an abstract, purified, adherent language. to the new technological civilization.

The plan is simple: the buildings denote a new type of interaction between inside and outside, making use of continuous walls that unify the space, in a continuous search for multidirectionality, which is realized in the design in the intersections of axes and in the connected interior spaces.

As in the nineteenth-century house, in the typologically flexible cases analyzed, the functional structure of the corridor is eliminated: there is a sequential structure of environments, in which the rooms are communicating and made up of one or two doors, which allow access to the rooms.

The space is no longer characterized by the presence of an enfilade, in which the doors of each environment are aligned with each other along a single axis, but a new spatiality and fluidity are sought, which favors the possibility of moving in a circulate between one room and another.

A different type of internal circulation is created, in which the rooms are connected to each other through the intersection of various axes. In some cases the movement is circular, while in others there is a linearity of the flow, with the creation of neutral spaces for access to the environments.

Flexibility, fluidity and interactivity become basic concepts placed at the foundation of any design program.

*Windows redundancy ****

The compositional rules prepared for modern buildings have led architects to design the facades almost independently of the function of the plan.

Despite this, the arrangement of the windows and the compositional hierarchy of the rooms combine to generate design relationships in order to obtain typological flexibility.

The windows functionally serve to guarantee light to the rooms and, unlike the nineteenth-century building, in which the windows were distributed in such a way as to give more light to the most experienced environments during the day, in the modern movement there is a regularity of the openings, of larger dimensions, and the same in all environments.

The only difference is in the service areas, where the windows are small in size.

The generosity of the number of openings is one of the main characteristics of flexibility as, in addition to guaranteeing brightness and ventilation, it is a key element that holds the facade together with the functional component of the plan: a filter of ambiguity between the internal environment and the external perception of the building.

*Rooms hierarchy ***

Unlike the buildings of the 19th century, in the 21st century we are witnessing a radical change in the role of the home, which is no longer just a “dormitory”, but also becomes a space for work, rest and recreation.

The changes in working hours have had a direct impact on families who, having more free time, can enjoy their home.

Social transformations have affected the environments: in the 90s, in fact, teleworking develops, which has brought about a great change within the home, which also becomes a workplace. The habitat must then be flexible enough to transform into an office during the day and return to being a home with the arrival of the evening.

In plan, the system is simple and legible.

The uses of the house are multiplying: a space is created dedicated to television, listening to music, practicing sports, working, etc.

Uses multiply as much as leisure activities, but the surface of the house remains the same.

Through a comparison between different plans, three types of rooms were identified and mapped according to their size and characterized as S (Small), M (Medium), L (Large), in ascending order.

Unlike the nineteenth-century house, characterized by a generosity of the rooms, today the demands change: families are no longer satisfied with just a living room, a kitchen and bedrooms, but it is now necessary to integrate leisure activities for free time and for the work.

There is therefore a different hierarchy of spaces: the rooms are smaller, and the difference in size between them is small. There is a majority of medium-sized rooms, capable of accommodating all functions, and guaranteeing greater flexibility and reversibility to the home.

The relationship between windows hierarchy of the rooms is much more simplified than in nineteenth-century buildings, as the French windows or ribbon windows are very large and the same for all the rooms, while the small rooms dedicated to services are for most of them blind, thanks to the building regulations, where they foresee this possibility of the building.

The buildings presented here belonging to the 21st Century do not follow the same design rules imparted in the urban plans of the nineteenth century and previously discussed in this chapter. At the same time, however, they transpose some characterizing elements in a different way and with stylistic reinterpretations.

While for nineteenth-century cases it is possible to verify whether over time they have been resilient and able to absorb in their shape and structure the various changes that have occurred, These modern cases still have a short life for a possible comparison on the temporal level.

This means that in order to verify their flexibility we can only use the analyses conducted here on the basis of the selected elements.

These buildings of the past decades have a clear rationalist reference in the composition of the facade and in the grid plan, a feature that has given greater ambiguity to the spaces.

Certain of a strong reminiscence in the field of flexibility, if one thinks precisely to the historical cases, the proposed buildings of this century become a melting pot of elements and characteristics that make each element adaptable.

Through the comparison between the historical cases and the modern ones it has been tried to generate a series of models or patterns able to supply rules and participations enclosed like in a manual. All the characterizing elements accompanied by descriptive adjectives, already provide a level of interpretation set by us, which you can also find through the schemes proposed here.

By drawing up these features it was possible to verify the importance of each of them and their interpretation, without which no building can be resilient and flexible.

PART III
PROJECT

STRATEGY

This thesis work aims to make concrete research on the interesting issue of tying flexibility. After having you in the previous chapters all the analysis on the case starting from flexibility to end up looking for case studies that are resilient, put into practice the theoretical part.

This last chapter aims to conclude all the knowledge gained, generating a design model placed in a real context. The idea behind this manual is that it is possible to retrieve all the steps that have been taken herein, using them as a guide to designing a typologically flexible building.

Through a guided series of steps, it will be possible to identify the characteristic elements of the project site, up to the more generic ones for any building.

Reconnecting in a peremptory way to the previous chapter, all the elements and their characteristics that have made case studies of the nineteenth century and modernity, icons of typology flexibility will be taken up.

Next, establish these characteristics and the weight to give to each of them in the design, it will be conducted through all the steps made for the design composition.

First, site choice is the first approach to flexible design. In particular, a series of project site analyses are proposed based on the recovery of the forms of the historic buildings of the district, verifying whether or not they are close to the previously studied cases of the 19th century. Subsequently,

urban analyses based on urban form reveal the composition of the strip of cities to which the project site belongs.

A series of design choices, made as if it were a manual, mark the entire sub-chapter concerning the project and define its designated design canons. This design standardization is accompanied by the mapping of the variable given by social challenges, changes that are constantly evolving, to which to report the project.

This very important part, leads to interface with the world of users, which becomes the focal point of a modern design and in step with the times.

After defining rules rigid enough to achieve typological flexibility, the “use” component of spaces intervenes, which is the actual verification of each element.

For this reason, all possible variables have been explored, adapting to each type of user, a different way of using the spaces.

In addition to this, there is a systematic description of a schedule consisting of all possible configurations of the apartments depending on the transformations that have taken place over time for users and use.

The final scheme is varied and flexible over time, suitable to adapt to multiple solutions.

MAPPING OF THE CHARACTERISTICS

The research for typological flexibility addressed so far has shown different interpretative facets resulting from the comparison of a number of ancient and modern case studies. In the previous chapter, this theme was addressed in watertight compartments by dividing the cases of the 1800 with those closest to the present day. Selective and targeted conclusions have been reached in this way.

In this chapter the main purpose is to draw general conclusions on the subject in search of real **fundamental elements** that can be repeated in a social housing project. Starting, therefore, from the previous analyses, the **eight case** studies were systematically and taxonomically mapped in chronological order in order to be able to observe the characteristics in a cross-section.

In this systematic phase of mapping, significant support is derived from the deepening of a particular theme offered by Christopher Alexander's literature in *"The pattern language"* (1977). In this book he explains the concept of pattern as *"represents our current best guess as to what arrangement of the physical environment will work to solve the problem presented"*. These solutions are "weighed" by adding a **qualitative asterisk** that in turn represents *"our degree of faith in these hypotheses"*. Following this interesting theme, some elements considered fundamental were highlighted, in a design way speaking, in order to achieve a nature flexibility, in the classification of each case study. Each of these elements has been flanked by an **adjective** that denotes its main characteristic that actually makes it flexible. Each of these characteristics, however, does not have the same "weight" for each case study. For this reason, asterisks have also been added here to represent the interpretation of the assessment of the impact they have on the issue of flexibility.

These features explore in different graphical returns all the compositional elements of the various projects, starting from the section, the facade and its composition, the block in which it is inserted, the plan and its composition. If in the previous chapter, the buildings had been evaluated divided into two macro groups depending on the historical origin, at this time a general evaluation is carried out on the subject starting from an asterisk up to three asterisks. It must be kept in mind that in any case, even the characteristics that have only one asterisk contribute, albeit to a small extent, to make these buildings **flexible**.

Starting from the section are highlighted the structures that govern the composition of the building, tripartite in *"basamento"* (basement), *"corpo"* (body) and *"coronamento"* (crowning element). What makes this element particularly interesting is precisely the non-homogeneous distribution of the heights of the various plans, offering a compositional variation even on the facade. This characteristic has been referred to as the **"height difference"** and the evaluation carried out is 1 in 3 asterisks (*/**), since in the past different stratification represented an equal division of social classes, today it is rare to find buildings that maintain this differentiation in section.

Then, moving on to the facade, the first element studied was the relationship between full and empty, looking for a basic structure, a grid, that held up this overlap. The name given to this feature is therefore that of **"facade grid regularity"**, which has been given three out of 3 asterisks (**/**) , since its importance within the design of a flexible building is remarkable. In the nineteenth and modern cases, in fact, the prerogative

is that of the harmony of the facade, as if it had been designed detached from the interior. Regularity therefore represents an element that marks both outside and then later inside, the composition of the building, making the spaces more usable over time. Comparing all cases this relationship between fullness and emptiness is different, since it responds to stylistic choices of different eras; nevertheless the above principle is the same.

Third element always referring to the facade is its composition (“**facade composition**”). Looking at the facade, it was divided into the “*basamento*”, “*corpo*” and “*coronamento*”, highlighting its identifying elements. Each strip has been given colored bands that describe its structure and precisely its composition. In this way it is possible graphically to observe the orders of which the facade is formed and compare them to each other. In 19th-Century buildings the tripartition is present, as opposed to modern ones whose compositional subdivision is binary. The “*coronamento*” gives way to a simple horizontal closure and without changes in heights. For this reason, the evaluation given to the “**facade composition**” is one asterisk out of three (*/**).

Subsequently, from elevation to the plan, as the first approach to the site of each case study, its behavior within the block was observed. This is because one of the features highlighted in the flexibility is the presence of shorts or internal behavior on the block. The given name is “**block vertical porosity**” and the evaluation carried out is one asterisk on three (*/**).

Going into detail in plan, the structure, and its subsequent clarity, make the composition of the spaces flexible as well. For this reason, this feature has been called “**structural clarity**” and the given evaluation is that of two out of three asterisks (**/**), because although having an evolution of the type of supporting structure, it is essential for the success of a flexible building.

Looking more closely at the plans and their arrangement of the rooms, fundamental is the distribution of the doors and the subsequent circulation between the rooms. This feature called “**circular distribution**” highlights all the paths and movements that can be made within the plan, so as to understand how valuable the arrangement of the doors is with respect to the location of the rooms and of course their function. The cases studied have different types of distribution, linear through a corridor, or passing between the rooms, but the common element is precisely the arrangement of doors and the number of them per room. This allows you to have more communication between areas, implying an ease of organization in a possible rearrangement of functions. The rating for this element is two out of three asterisks (**/**).

The same principle of facade grid regularity also uses the arrangement of the windows, which assumes the adjective redundancy (“**windows redundancy**”), as a predisposition of regular and abundant windows, allows the division of the rooms into smaller spaces, and gives a harmonicity in the facade. The evaluation is two out of three asterisks (*/**) as it is sufficiently of interest in terms of the flexibility and transformability of the environments.

Finally, but not least, “**plan composition**” is a very important element in the design of flexible buildings, in fact it has been evaluated with three asterisks (**/**). One of the elements that immediately catches the eye is the hierarchy of the rooms in each case study presented. Each room, however, does not have a particular function, but is arranged in such a way that it can be used in different ways. Each apartment has several cuts of rooms, which give wealth and housing quality.

After evaluating each element, you may have in mind all the features you need to take into account when designing a building that is typologically flexible by speaking.

This means that external elements or tools are not used that make a building more or less flexible, but it is the design and composition of the spaces itself, as well as the facade, that are the intrinsic characteristics to achieve the goal. Adjusting every single design element according to flexibility, makes the whole building as intrinsically resilient as possible in time and function.

11, Boulevard De Sebastopol
1860

9, Rue Du Conservatoire
1870

47, Boulevard De Malesherbes
1960

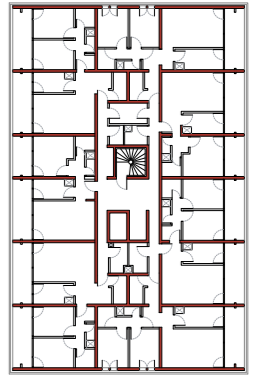
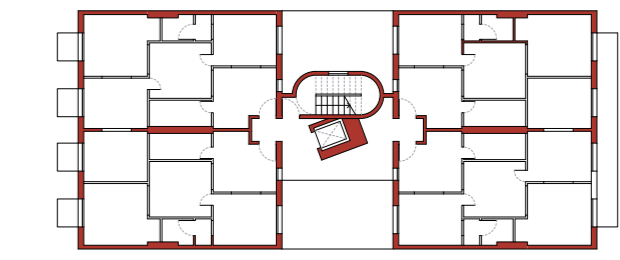
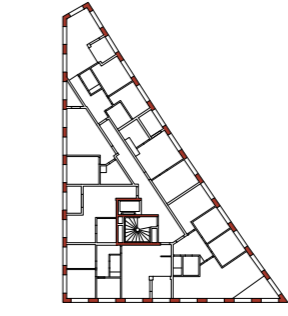
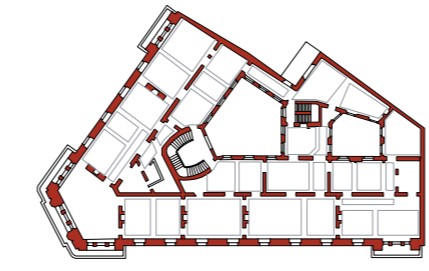
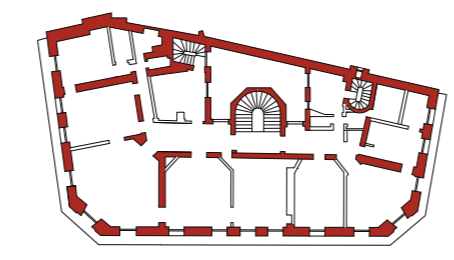
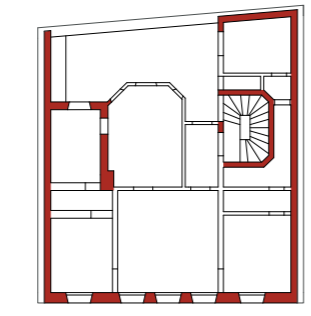
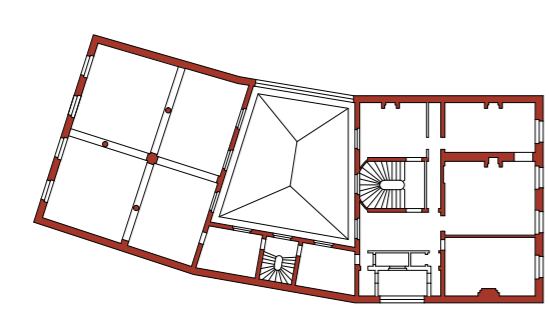
5, Via Dante
1891

33, Casa d'Ausiàs Marc
1888

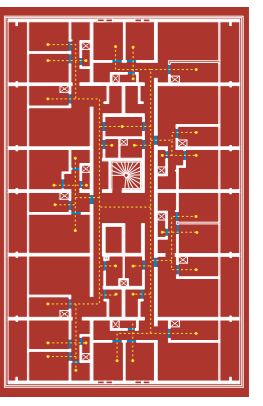
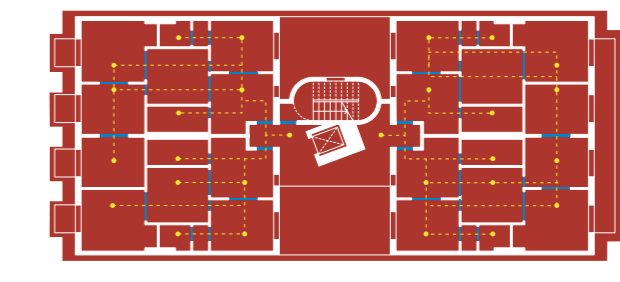
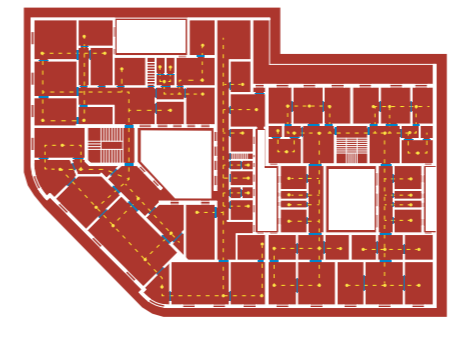
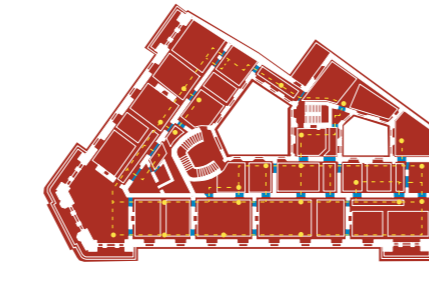
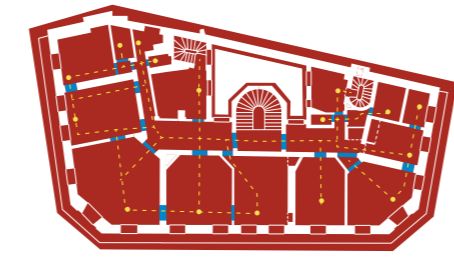
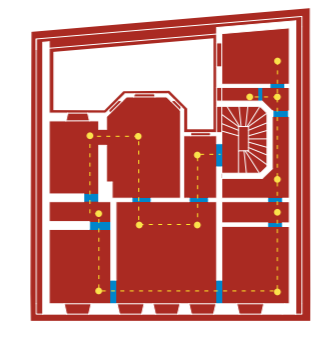
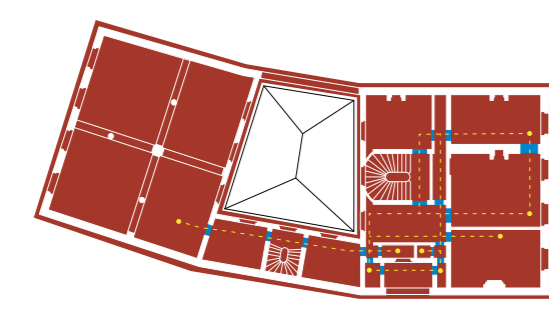
Paris XVII, 40 Housing units
2014

111 Rooms
2016

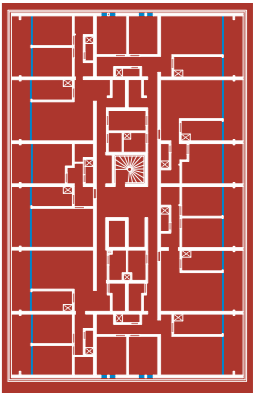
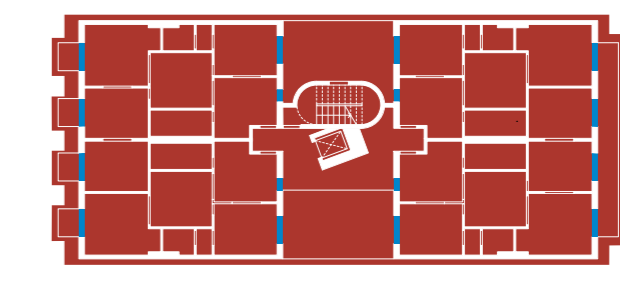
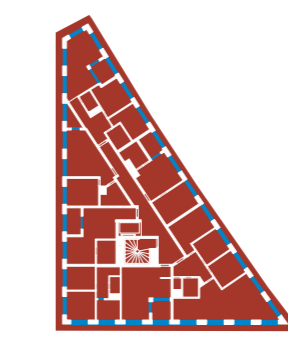
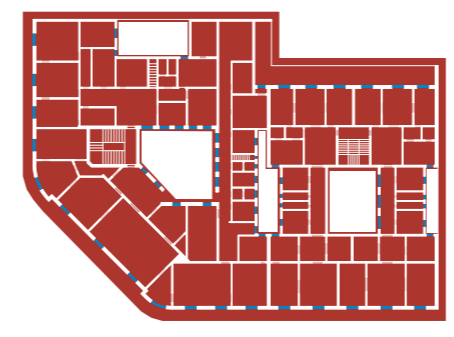
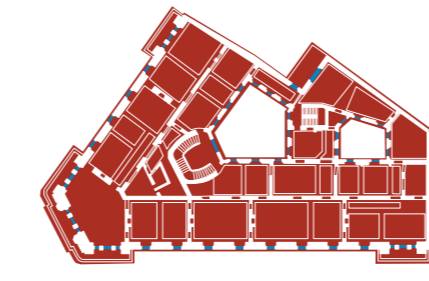
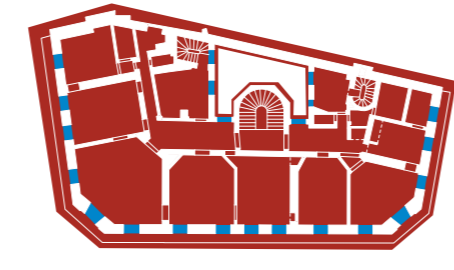
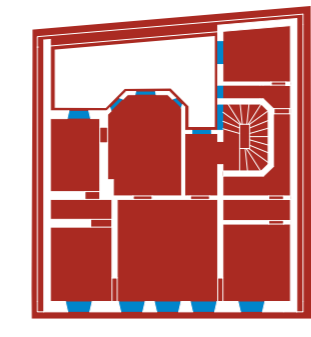
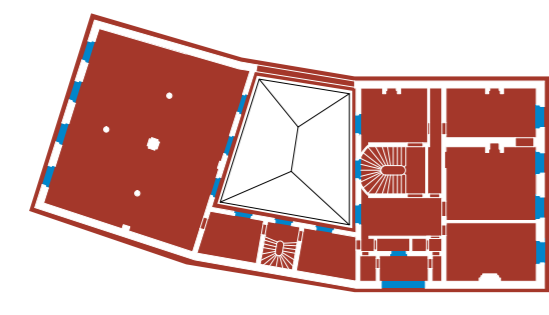
Urban Renovation Lormont
2015



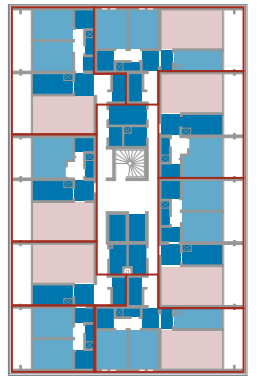
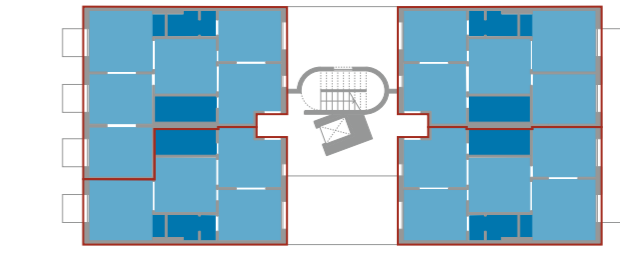
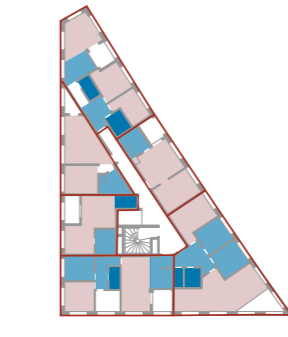
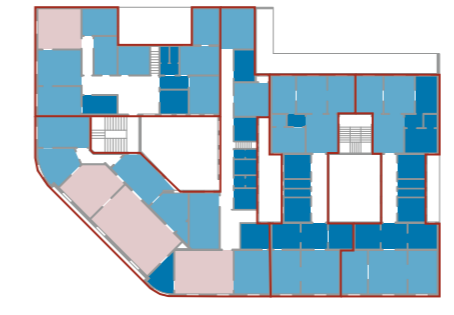
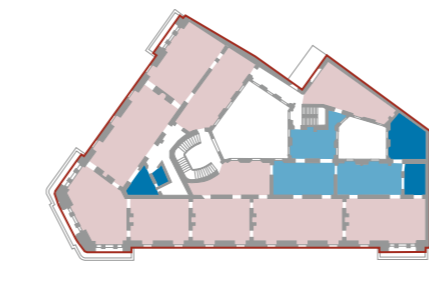
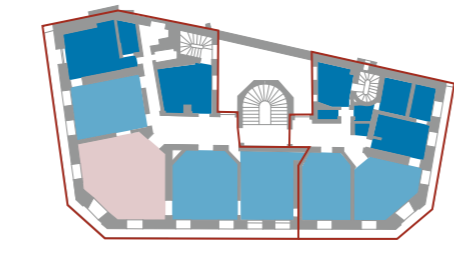
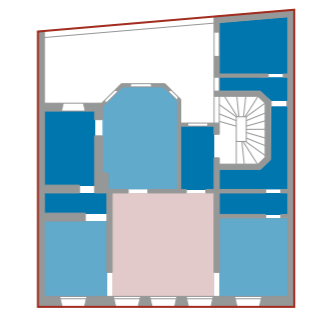
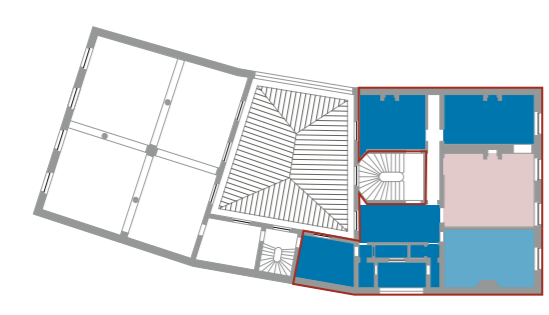
Structural Clarity **



Circular Distribution ***



Windows Redundance **



Plan Composition ***

THE SITE

The area of our study is located between Viale Tunisia and Via Lecco and is part of a rectangular urban block. The demolition of the building in via Lecco 9 (which took place in 2008-2009) left a void in the plug located in the south-east and south-west corner of the block, corresponding to the perimeter walls of the adjacent buildings and a courtyard.

The area is located near Porta Venezia, formerly Porta Orientale, in a point full of stratifications and historical traces, within the area of the Lazzaretto built around 1500 and opposite the church of San Carlo.

The area developed following the events of the Lazaretto: in the second half of the 1800s it was almost completely demolished and changed ownership, followed by the construction of several buildings and a subdivision, whose morphological layout was structured on orthogonal rectangular blocks.

The construction of the old Central Station and the railway viaduct located along the current Viale Tunisia, right in correspondence with the area, was added to this plan. It was later demolished in 1930-1933, following the construction of the current Central Station, while the public space overlooking the area, largo fra Polo Bellintani, was recently the subject of urban and pedestrianized furnishings. The church of San Carlo, located in the center of the old Lazzaretto, has also been restored and is about to be reopened for worship.

The demolished building in via Lecco 9 had been partially

damaged during the Second World War and for more than twenty years was characterized by a state of severe decay: dilapidated and disused, it became a destination for squatters and illegal immigrants.

For a short time it was occupied by a group of refugees; then evacuated, also following the requests of the residents who asked for the safety

The design of the area, therefore, must deal with the pre-existing structures and stratifications, propose a solution for the composition of the corner of the block and establish relations with the austere building curtain of Viale Tunisia.

The main goal of the project was to design a building complex for social housing, able on the one hand to integrate with the existing neighborhood and on the other to be characterized by its own identity, creating a new local centrality.

SITING

Why design Social Housing?

According to Pizzi¹, in contemporary architectural design, it is necessary to focus more and more on responding to the needs of a diversified user, paying more and more attention to the forms of “social living” and Social housing.

Today it represents a design challenge and an aspiration to change the used housing models.

The **Social Housing** project has greater potential than the role it has lived up to now: first of all it must not remain a building container, but must be able to prefigure a system of variable expectations over time; moreover, it must have an eye towards possible future scenarios in which the management aspects will increasingly have to direct changing aggregative models, without ever forgetting the urban level with which each building relates.

One of the biggest challenges for contemporary architecture is knowing how to respond to a demand for flexible and adaptive housing structures to different cultural, climatic and environmental conditions without renouncing to interpret the aspirations and hopes of users.

It is therefore necessary to define housing models that are adaptable to the changing needs of use by the nuclei of inhabitants and provide adequate answers to the expectations of a multifaceted social mix and to the transformations that each family nucleus, but also each category of users, necessarily place in the time frame of their existence.

Why the choice of the site?

The criteria with which the lots were selected are: of a geographical nature, that is, we have limited ourselves to areas within the Milanese territory; of typographic choice, as we have selected urban voids on which to reconstruct the building curtain; dimensional, as the intent was to make an area, albeit small in size, that is strategic from the point of view of potential to be used intensively; lots that are part of an urban fabric characterized by a high density.

Mainly four lots were selected: the area located in the Vanvitelli District, in Via Giovanni Pascoli, 10; project area belonging to the “*Vanvitelli Re Co.De! District! reshaping contemporary dwelling Thematic Design Studio*”; the area located in the Piola District, in Via Donatello; the area located in the Navigli District, in Via Ripa di Porta Ticinese; finally, the area located in the Lazzaretto District, in Via Lecco 9.

The project area located between Via Lecco and Viale Tunisia was selected as the object of study. The lot is deprived of a building restored after the bombing of the Second World War, but which in the last twenty years was abandoned in a state of absolute decay, until its total demolition in 2008-2009.

The urban context in which the lot is inserted is characterized by nineteenth-century buildings, from the 1930s-1950s.

The interests in this area compared to the others arose because, first of all, the lot is part of the Social Housing Program “*Ri-formare Milano 2016*”, which offered the possibility of working on all the areas and buildings in of decay and abandonment, with the aim of studying some of the issues outlined; subsequently due to its morphological characteristics: its surface of 414.47 square meters; its strategic position more than 10 meters away from the neighboring buildings; the possibility of building blind walls on the edge of pre-existing buildings; finally, the possibility of building a courtyard internally capable of allowing the building to enhance a double view.

[1] - E. Pizzi, *Nuovi paradigmi progettuali*, in *Arketipo*, N.76, Housing, p. 106-109



37. Photo: Via Vanvitelli.
38. Photo: Via Donatello.
39. Photo: Via Ripa di Porta Ticinese.
40. Photo: Via Lecco.

HYSTORICAL PATTERNS

Today in Porta Venezia very little remains of what was once the **Lazzaretto**, but its history echoes in the toponymy of the whole district.

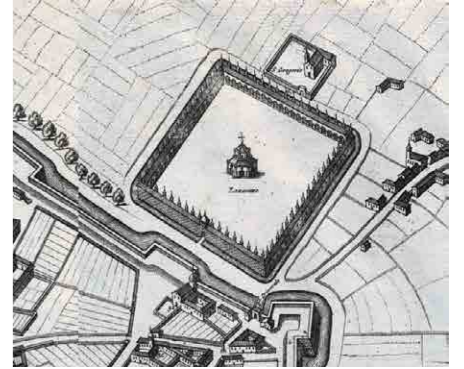
At the end of a serious plague that struck Milan in the years between 1484 and 1490 Lazzaro Cairati was commissioned to build the new hospital complex. The area outside the Eastern Gate, near San Gregorio, is considered suitable by the health commission due to the nearby presence of the Redefossi (Seveso) and many other canals and canals. The Lazzaretto was built from **1489 to 1509**. It was a large square enclosure with sides equal to about 375 meters, surrounded by a moat full of water, defined inside by 504 arches overlooked by the cells of the sick and with an octagonal church in the center open on each side, like a kiosk. Along the sides there were 288 chambers of 8 braccia by 8 braccia each (4.75 m); 280 rooms were intended for the sick and the other 8 (4 at the corners and 4 at the two entrances) were intended for services.

Father Felice Casati, on the other hand, was entrusted with the direction in 1630, the year of the terrible Manzoni plague, and his figure is also remembered in the Promessi Sposi. In the mid-1600s, the Lazaretto lost its function as a sanatorium and became a military warehouse and a field for vegetable gardens and pastures owned by the Ospedale Maggiore.

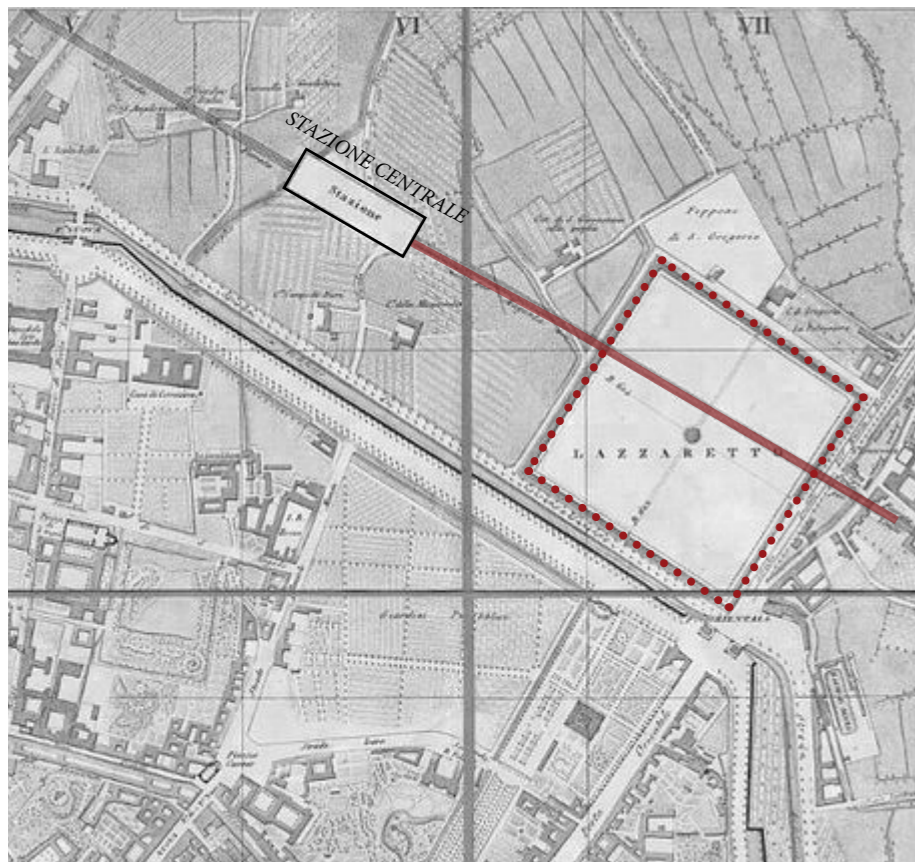
Of this large external structure, with its arcades, only the small terracotta portion remains which today houses the Russian Orthodox Church of St. Nicholas. The octagonal church of San Carlo, designed by Pellegrino Tibaldi and built in 1565, has survived intact, above an altar built in 1488 so that the functions could be seen by the sick at the Lazzaretto.

In 1861 it began its slow destiny of disposal, in fact a railway viaduct cut it in two. Between 1882 and 1890 it was definitively demolished, a short section remains in via S.Gregorio and the church with the walled portico.

After the demolition of the old Lazzaretto, the new buildings were built, then and of course the presence of the railway that cut the neighborhood into two parts (north and south) also conditioning the social life of the neighborhood, more “noble” towards Porta Venezia and more popular towards via San Gregorio and via Lazzaretto.



41. Medieval plan of Lazzaretto (1400).
42. Photo of Icilio Calzolari: Lazzaretto, 1880.
43. Photo: Lazzaretto and Basioni of Porta Venezia, from Corso Buenos Aires, 1878.
44. Photo: S. Carlo's Church, 2018.

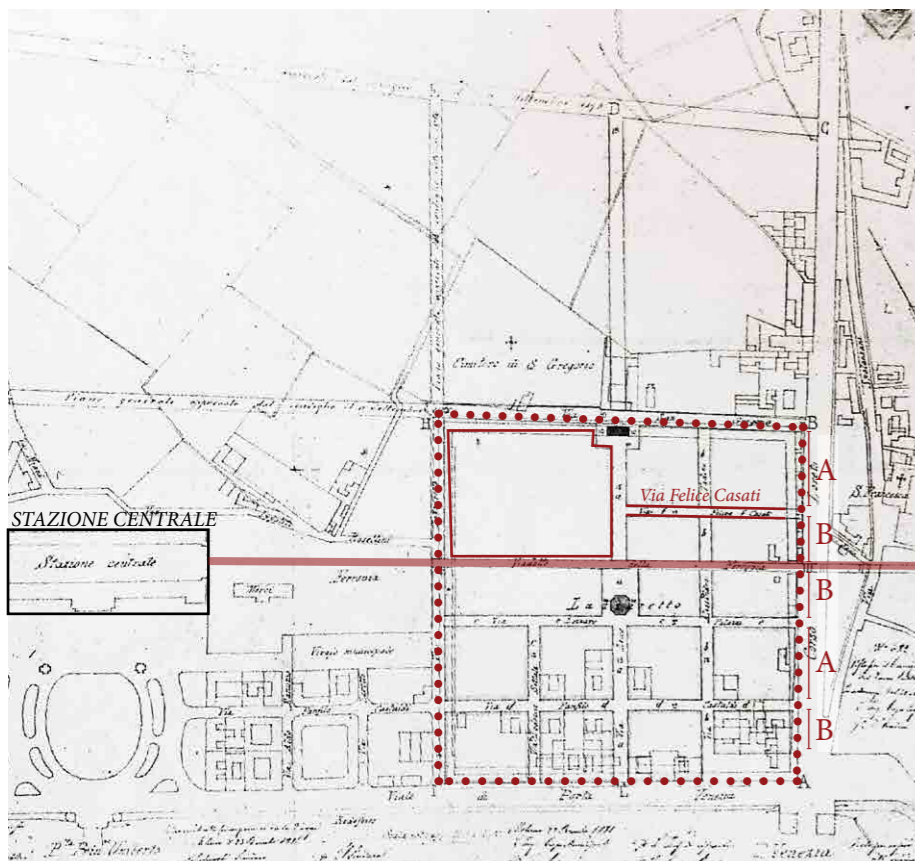


45. Map made by Giovanni Brenna, 1870.

There is a latent connection between the formation of the Central Station in Milan and the formation of the Lazzaretto district.

In this 1870 map, the Lazzaretto can be seen in its original conformation, as a health institution, crossed by a railway line from the Central Station.

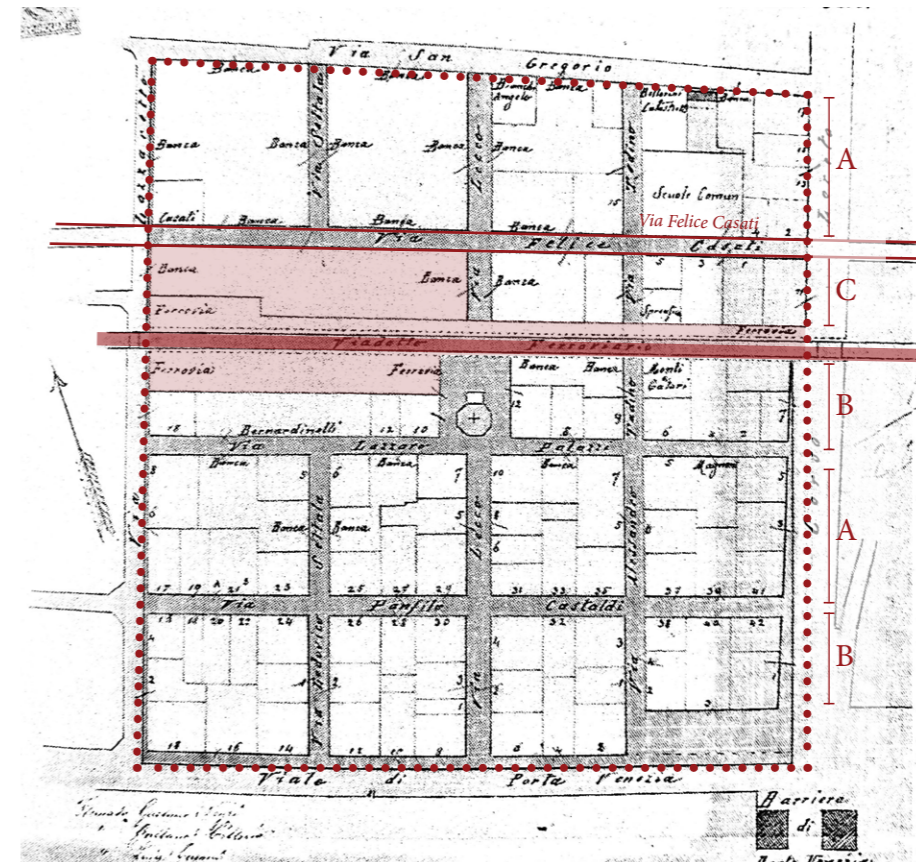
The old Central Station of Milan was inaugurated in 1864 by the King of Italy Vittorio Emanuele II. It was built to replace the old Porta Nuova and Porta Tosa head stations.



46. ASCM, Fondo Piano Regolatore, 1881

In this historical map of 1881 we observe the urban transformation of the Lazzaretto. The sanitary facility was demolished starting in 1880 and subsequently its urban form was adapted to meet the needs. The railway track passing through the district and supported by a viaduct, establishes the first guideline for planning, together with the main road that crosses the area longitudinally, today via Lecco.

There is a certain design harmony in the subdivision of the blocks, a legacy of a military base installed in the 1700s.



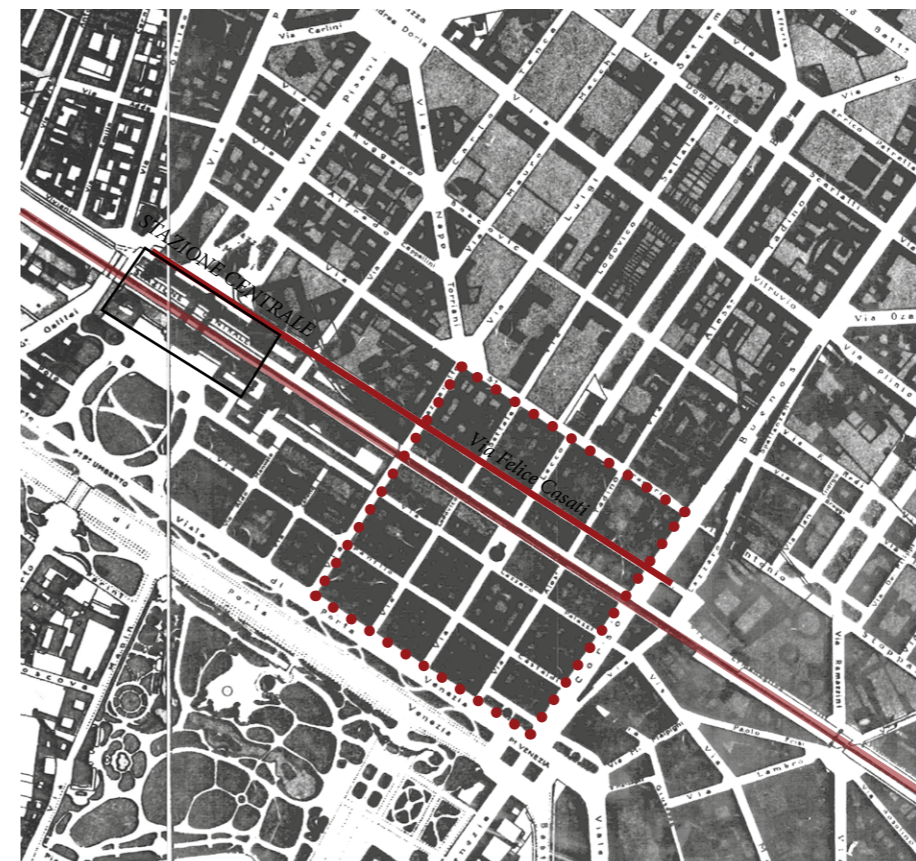
47. ASCM, Fondo Piano Regolatore, 1889

Via Felice Casati undergoes a change with respect to the previously designed system of the district.

This street was extended in order to generate a new subdivision of the blocks, also in the northern area, given the growth of the population.

Initially the block was composed of Blocks A and B, but later, with the displacement of Via Felice Casati, the spurious Block C was formed.

The railway viaduct built after 1864 was demolished in the second half of the nineteenth century to make way for new building lots that arose during the period of great expansion of the city. The blocks facing the viaduct were left free for the passage of the railway line.











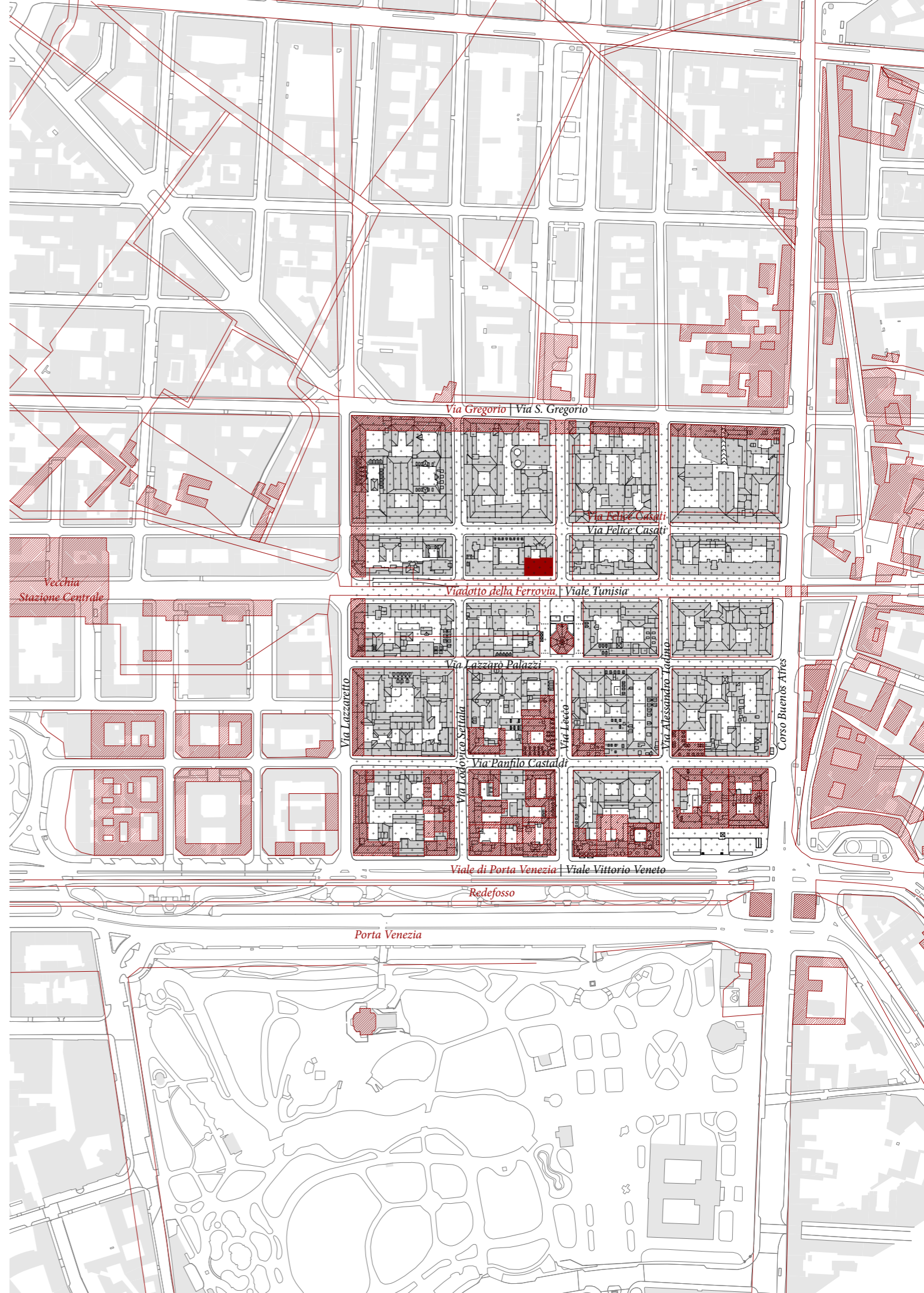
48. Piano Regolatore Pavia-Masera, 1910

Comparing the various maps, it is assumed that via Felice Casati has been moved 5 meters lower, so as to be able to continue towards the Central Station and exactly alongside the north side.

The depth of the central blocks facing via Felice Casati decreases, breaking the dimensional rhythm of the previous conformation.

The station was closed in 1931 following the entry into service of the current Milano Centrale station and was subsequently demolished.

-  Lazzaretto area
-  1884 | Block Limits
-  1884 | Context block limits
-  2020 | Block buildings
-  Project area
-  1884 | Historical buildings
-  1884 | Context historical buildings
-  2020 | Today buildings



METHODOLOGY

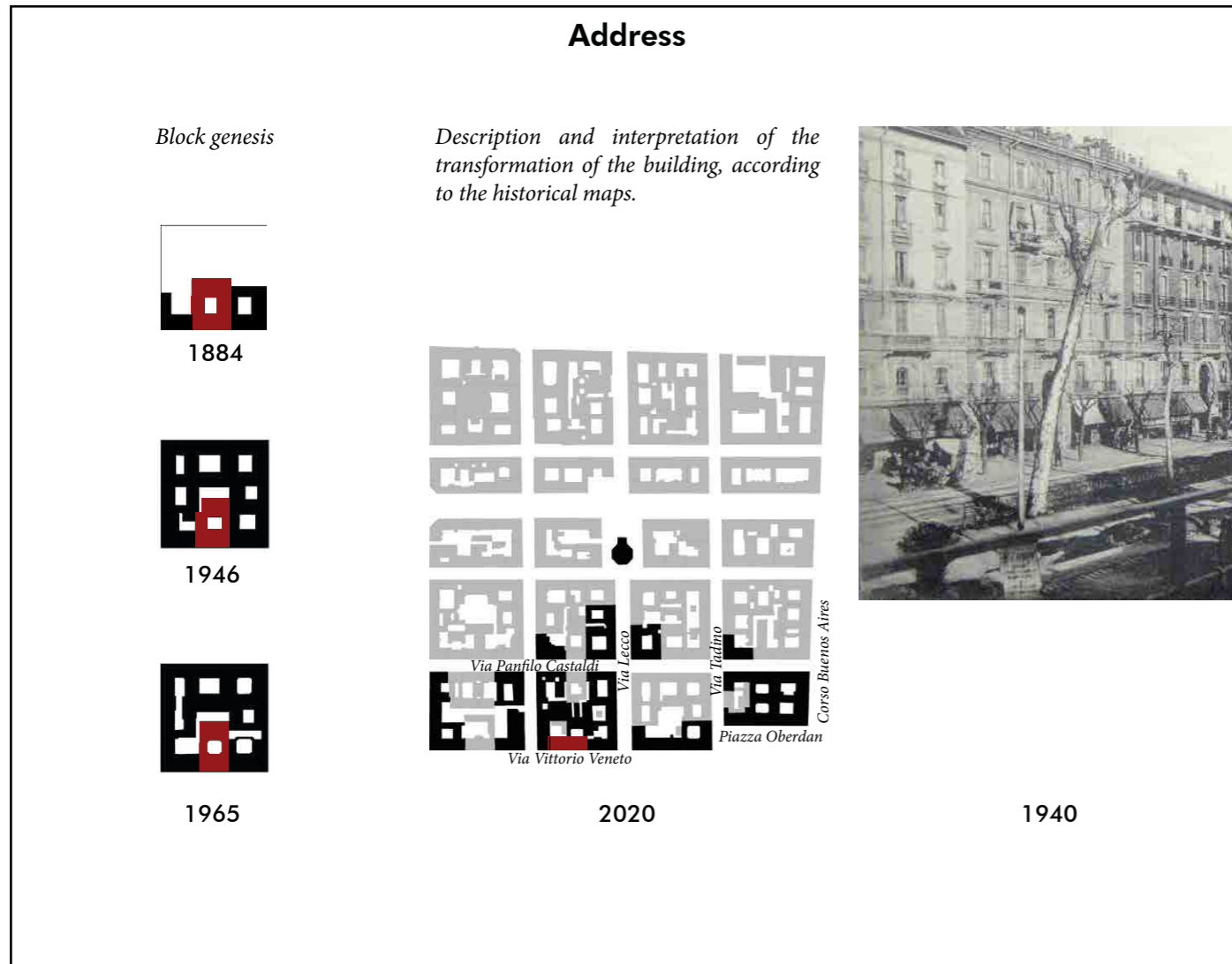
This page explains how to interpret the analysis sheets of the historic buildings in the Lazzaretto district. The purpose of this mapping is to understand the nineteenth-Century historical apparatus of which the neighborhood is equipped, analyzing its transformations.

The Lazzaretto district, being characterized by a very strong historical identity, is very interesting from an urban point of view, as its residential formation can be seen starting from the moment the health facility was demolished around 1880.

To explain the transformations of each block, the historical maps coinciding with the three urban plans of Milan were taken into consideration.

The historical plans taken into consideration are the following:

1. map of 1884 for the Beruto Plan (1884);
2. 1930 map for the Pavia Masera Plan (1912);
3. map of 1846 for the Albertini Plan (1934);
4. map of 1965, map of 1972;
5. finally, the map updated to 2020.

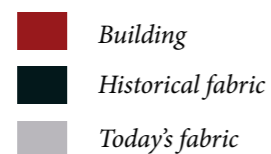


In this section there are historical maps that represent the historical evolution of the buildings and their isolated counterparts.

For each block, historical maps were chosen that represented the actual transformation over time.

Each block has a black building and the building taken into consideration is highlighted in red.

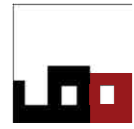
This 2020 map aims to highlight within the current fabric, the historic buildings still present in the area or transformed over time, locating the building considered in the interpretative sheet.



In this last section of the card, there are photographs depicting the building in 2020. Some cards also include historical images of the aforementioned building, showing the date of the shot.

8, Viale Vittorio Veneto

Historical formation of the block



1884

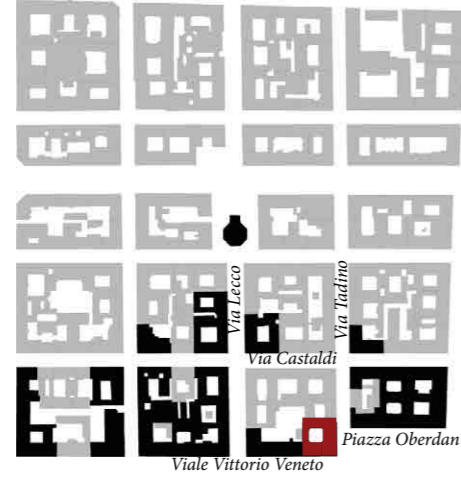


1946



1965

The residential building, built towards the end of the 1800s, is clearly visible in the photographs during the demolition of the Lazzaretto in 1882. In 1920 it was transformed into a cinema, renovated in 1950 and later in 1999. Today it is called Spazio Oberdan and has a function of cinema theater.



2020



1898



1882

4-6, Viale Vittorio Veneto

Historical formation of the block



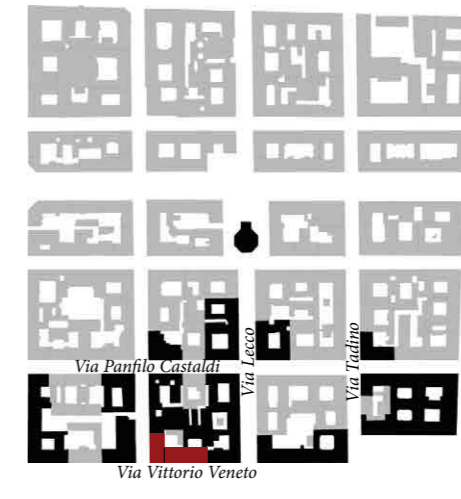
1884



1946



1965



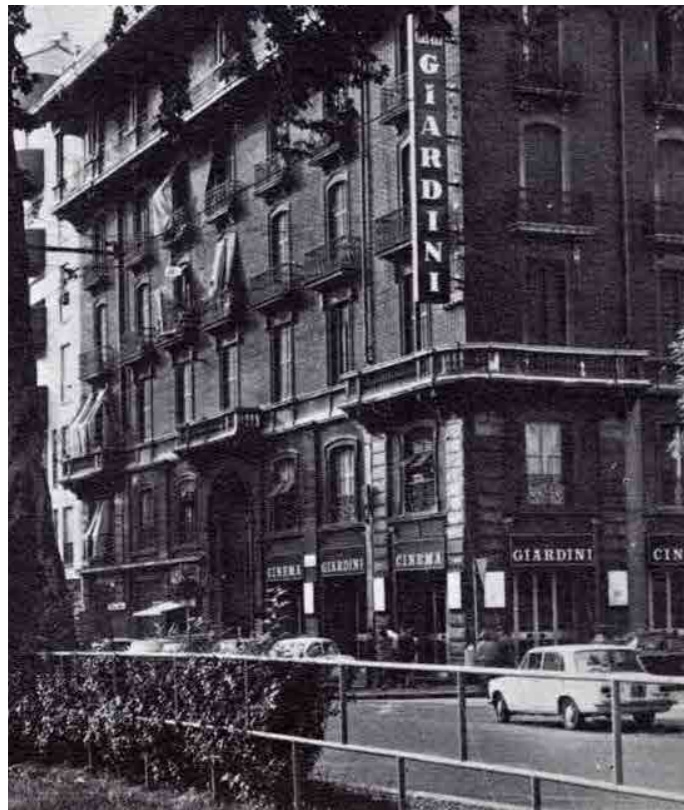
2020

The two residential buildings remain in their original shape until the end of the 1960s. They are subsequently rebuilt with a different system both in the ground connection and in the elevation.



1940

VIALE VITTORIO VENETO



1959



2019



n° 4



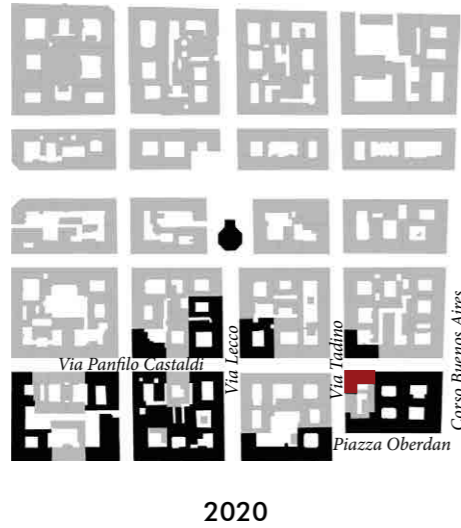
n° 6

38, Viale Panfilo Castaldi

Historical formation of the block

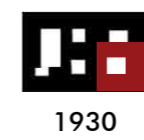


The residential building, already present in the maps of 1884. In 1930 its plan was enlarged.

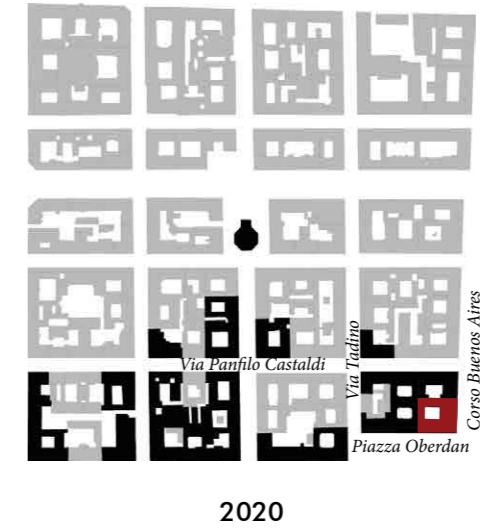


1, Corso Buenos Aires

Historical formation of the block



Palazzo Luraschi, built in 1881, was the first to break the servitude of the Resegone, the prohibition for the buildings located north of Porta Venezia to have more than three floors in order not to block the view of the Lombard Alps.



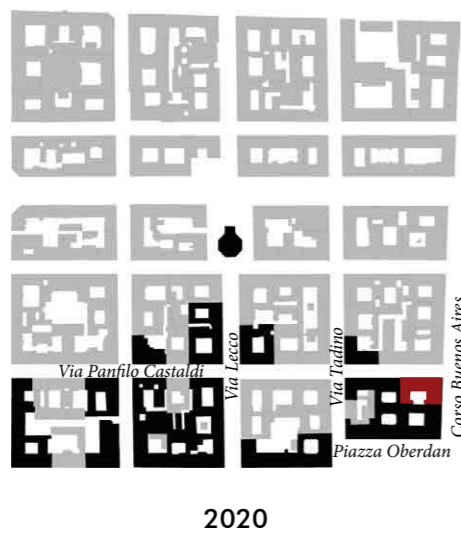
1882

42, Viale Panfilo Castaldi

Historical formation of the block



The residential building, already present in the maps of 1884. Its layout has remained unchanged over time.



3-5, Piazza Oberdan

Historical formation of the block



1884

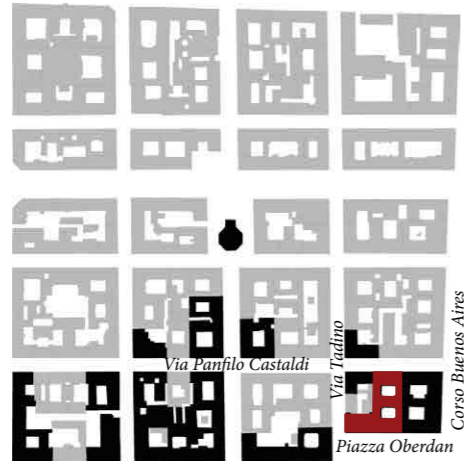


1930



1965

The residential buildings in Piazza Oberdan, built around 1884, remain in the same conformation today.



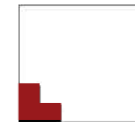
2020



1940

37, Via Panfilo Castaldi

Historical formation of the block



1884

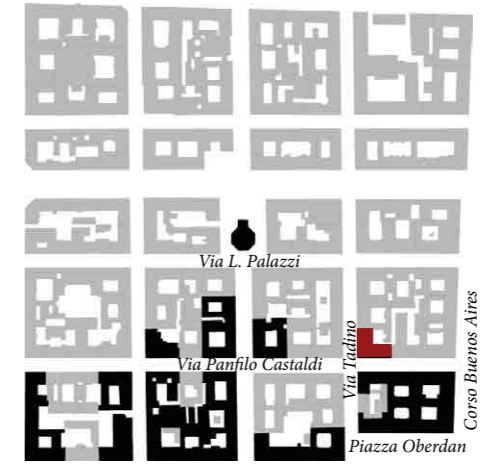


1930



1965

The residential building present in 1884, renovated in 1999.



2020



2020



2020

31, Via Panfilo Castaldi

Historical formation of the block



1884

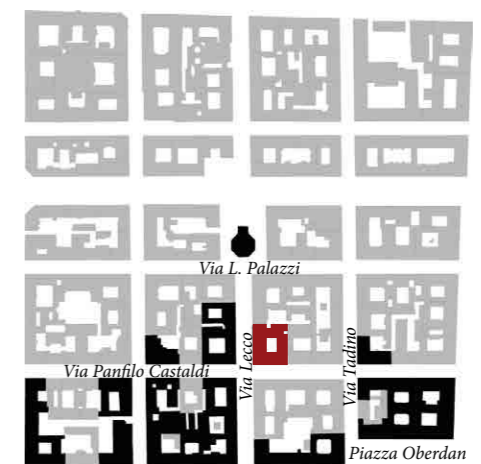


1930



1964

The residential building already present in 1884, has changed shape over time until it was then divided around 1960.

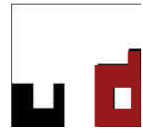


2020



29, Via Panfilo Castaldi

Historical formation of the block



1884

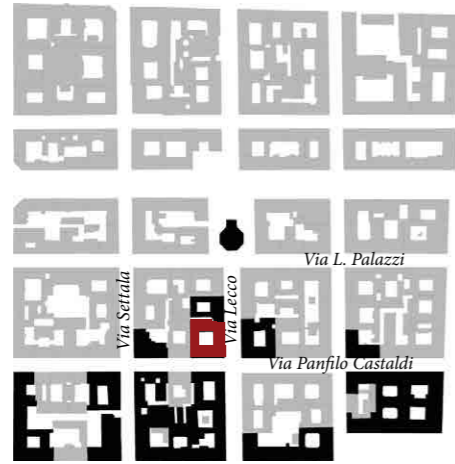


1964



1972

The residential building, already present in the maps of 1884. Its layout has remained unchanged over time.



2020



20, Via Panfilo Castaldi

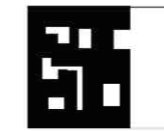
Historical formation of the block



1884



1930



1946

The residential building was built in 1830. Already in the maps of 1930 it appears to have been restored undergoing an enlargement and assuming a corner conformation. Today it houses the Hotel Brianza.



2020

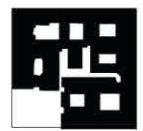


25, Via Panfilo Castaldi

Formazione storica dell'isolato



1884

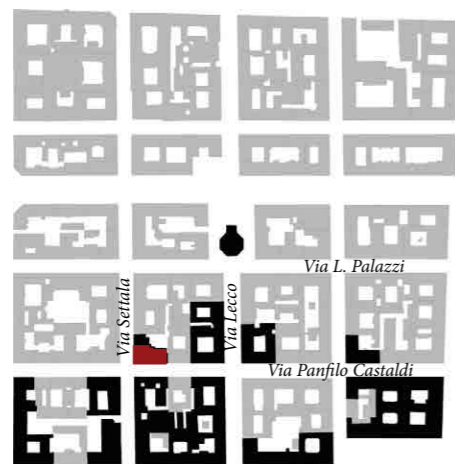


1964



1972

The residential building already present in 1884, remained so until the 1960s. After being demolished, it was rebuilt.



2020



24, Via Panfilo Castaldi

Formazione storica dell'isolato



1884



1946



1965

The residential building, already present in the maps of 1884, was demolished around the 1940s and rebuilt around the 1950s, as it can be seen today.



2020



1, Via Ludovico Settala

Historical formation of the block



1884

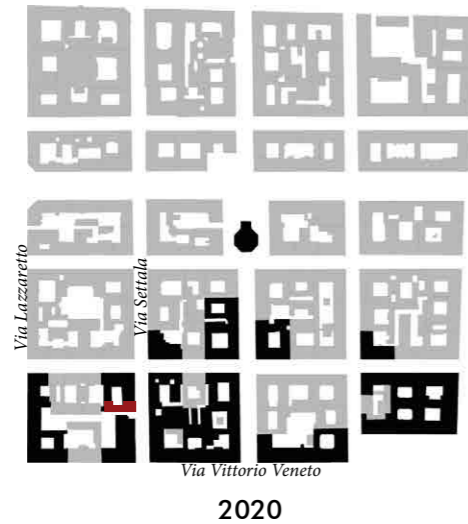


1946



1965

The residential building, already present in the maps of 1884, was demolished around the 1940s and rebuilt around the 1960s, as it can be seen today.



26, Via Panfilo Castaldi

Historical formation of the block



1884

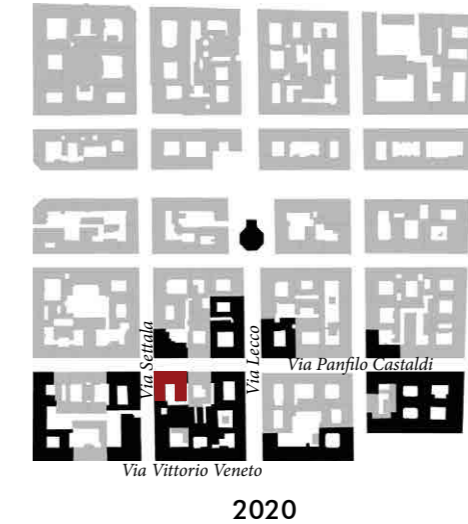


1946



1965

The residential building, already present in the maps of 1884. Its layout has remained unchanged over time.

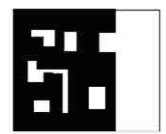


14, Viale Vittorio Veneto

Formazione storica dell'isolato



1884

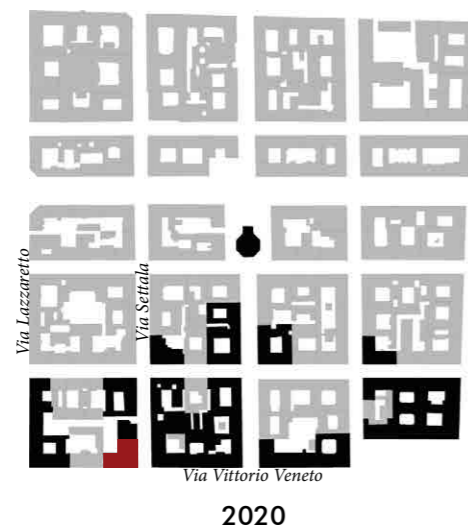


1946



1965

The residential building, already present in the maps of 1884, was demolished around the 1940s and rebuilt around the 1950s, as it can be seen today.

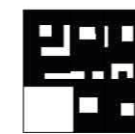


12, Via Vittorio Veneto

Formazione storica dell'isolato



1884

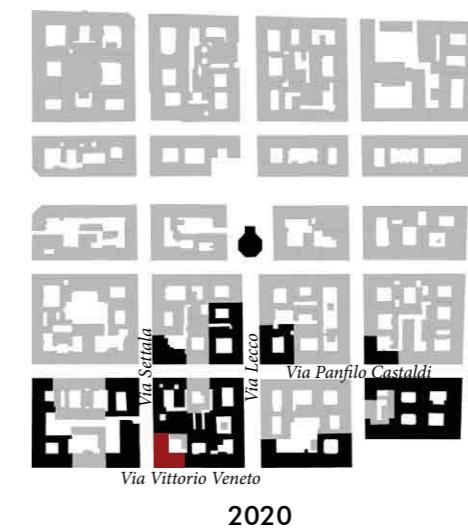


1946



1965

The residential building, already present in the maps of 1884, was demolished around the 40s and rebuilt around the 70s, as it can be seen today.



2, Via Ludovico Settala

Historical formation of the block



1884

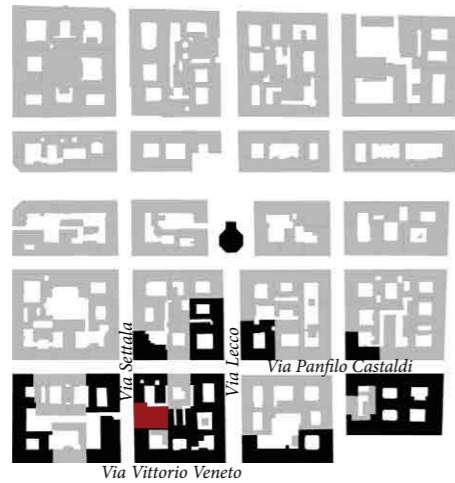


1946



1965

The residential building, already present in the maps of 1884 over time, has kept the facade and has undergone some extensions in the plan.



2020



2020



1931

1, Viale Lecco

Historical formation of the block



1884

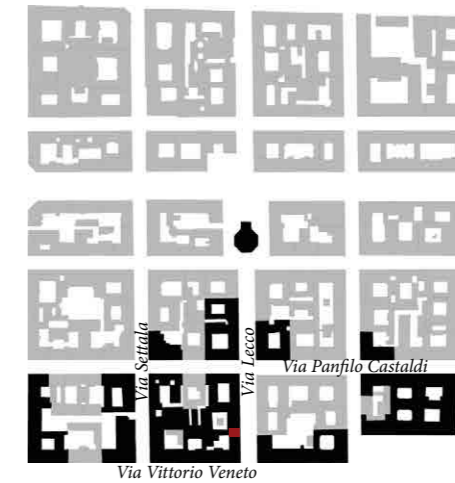


1930



1946

The residential building, already present in the maps of 1884, was demolished around the 1920s and rebuilt around the 1930s, as it can be seen today.



2020

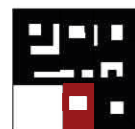


10, Viale Vittorio Veneto

Historical formation of the block



1884

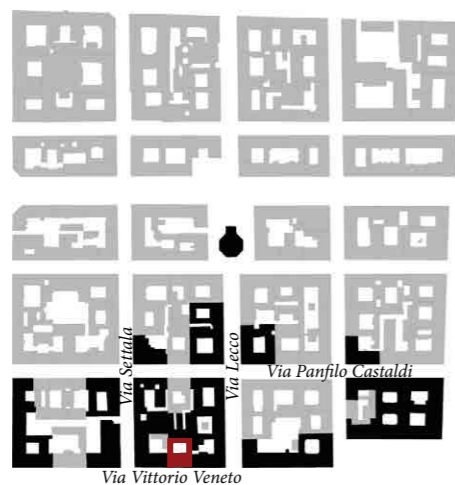


1946



1965

The residential building, already present in the maps of 1884. Its layout has remained unchanged over time, a transformation of its envelope on the street and inside the courtyard is assumed.



2020



12, Viale Vittorio Veneto

Historical formation of the block



1884

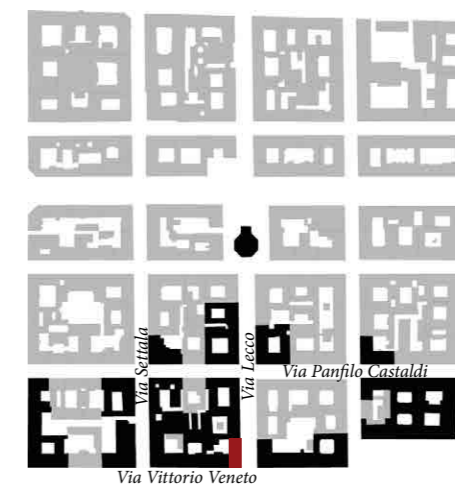


1946

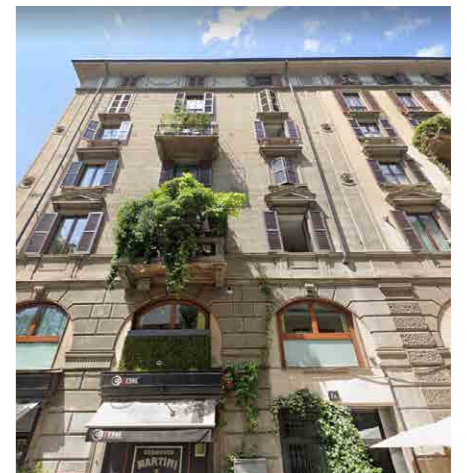


1965

The residential building, already present in the maps of 1884, was subjected to a division in the 1950s from the more recent building in Via Vittorio Veneto 8.



2020

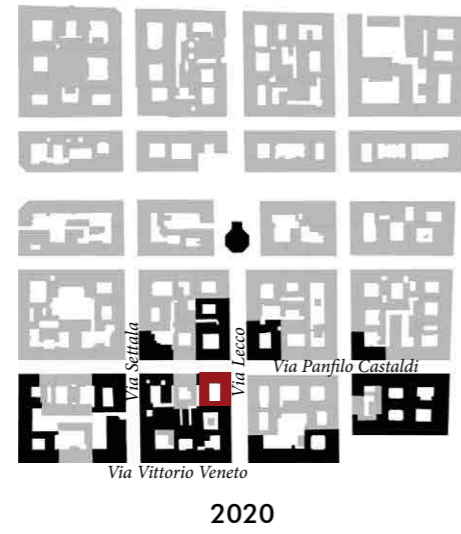


30, Via Panfilo Castaldi

Historical formation of the block



The residential building, already present in the maps of 1884, today remains in its original shape.



URBAN PATTERNS

Faced with the physical, social and ecological challenges posed by cities today, urban actors are exploring new concepts, new methodologies and new forms of organization. We are thus witnessing the emergence of a profusion of consultations, competitions and projects, which pave the way for an all-out, stimulating and fruitful experimentation.

Although all these experiences are based on almost always laudable intentions, they nevertheless find it difficult to radically break with the development of zoning or the accumulation of solitary objects and, consequently, struggle to provide fully convincing answers. The **criteria** of spatial organization remain very close to planning, despite the observation of the city, seen as a plan, pursuing the dream of an idealized city, out of reality.

This reality tells us that the problem is not the quality of each of the architectures, but rather the lack of an overview.

In the many new neighborhoods that have been built throughout Europe for twenty years, many interesting buildings follow one another and are placed side by side, without however being able to create their own identity or to integrate that of the places that welcome them.

What is in question today is not our ability to build and respond to quantitative injunctions of all kinds, but our genius to “make a city” and “make sense”.

The meaning of the city as a place of collective life is based on shared values.

While some of these values, including density, resilience, sobriety, connectivity or appropriation, seem to gain acceptance in current practice, other ideas sometimes seem to be omitted from urban reflections and experiments, such as the importance of form, texture and texture, endogenous character, local and awareness of an upstream heritage and a downstream responsibility.

Our observation focused on the **Milanese fabric**. Consisting mainly of condominiums, it is characterized by the great flexibility offered by this type, and by the strong programmatic and functional mix that derives from it: reconfigurable ground floors, free heights that facilitate the transformation of homes into offices, excesses of material and hyperstaticity that allow structural and spatial reconfigurations, technical reserves and gaps that absorb technological developments and the passage of new networks.

This potential for building reversibility, which goes hand in hand with the ability of the urban structure to absorb changes in use over space and time, represents a significant factor of sustainability and an obvious form of resilience.

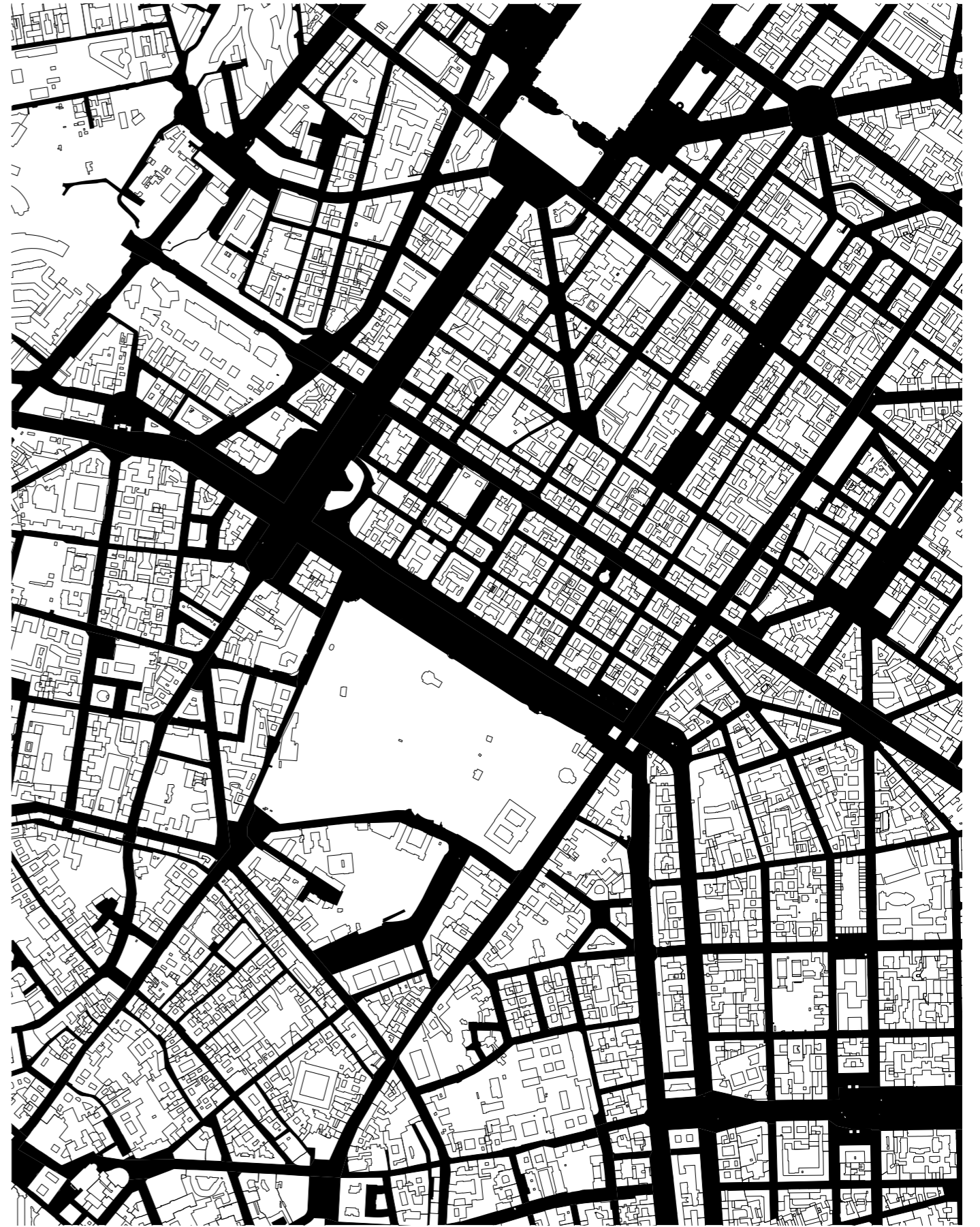
However, it is recognizable at all scales thanks to its signs, the generic elements of this vocabulary that give Milan its identity.

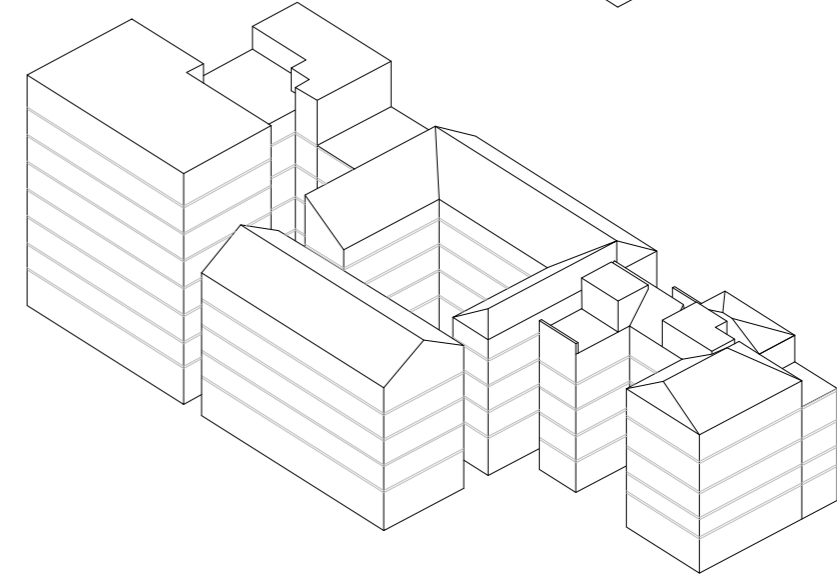
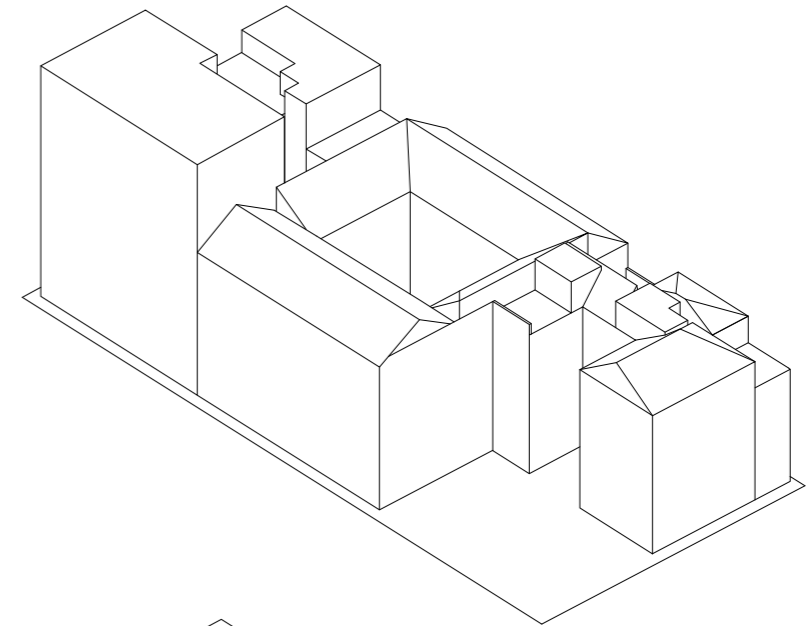
Our design research is therefore structured in different scales of urban analysis.

A **typo-morphological analysis** was conducted, in which the observed material is considered without a priori: extracted from its mode of production, both social and economic, it is deliberately disconnected from its historical and political contingencies. The corpus is thus learned through design and classification to detect the rules and reveal the invariants that govern its shape, while the dimensional and comparative analysis tries to restore its logic and efficiency.

This work, carried out at all scales (urban lots, blocks, buildings, down to the language or vocabulary of building composition) reveals the fractal logic that governs the construction of the urban form of Milan.







THE PROJECT

Zero-Type is a social housing project based on the search for a new typological flexibility, aimed at the resilience of the building.

Starting from an in-depth study conducted on the nineteenth-Century plans, and then reported in the projects of modernity, our research aims to provide adequate answers to the expectations of a multifaceted social mix and to the transformations that every family unit, but also every category of users, necessarily place in the time frame of their existence.

Starting from a proportionally sized **modular grid**, the project establishes an efficient “a priori” method for obtaining typological flexibility.

The grid offers, in fact, a dimensional and functional variety, able to fulfill and respond to all the transformations of use made by users.

Different ranges of apartments have been created and studied, composed of different room cuts, calibrated in such a way as to satisfy all the basic living functions.

For the design of the plans, a compositional criterion was studied that could be flexible, capable of responding to the need to create adaptive spaces to the changes in use of the user groups, providing answers to a highly differentiated social mix, to families in continuous change, to different categories of users and at the same time providing spaces that respond to today's needs and offer collective spaces or services

complementary to the private space of the accommodation.

Flexibility, transformability and **dynamism** of spaces are the three terms that can be considered the guidelines of our reflections.

And it was necessary, in order to provide an adequate response to the new needs of the inhabitants, a rethinking of both the functional, typological and distributive organization of the architectural spaces.

At the basis of our reflection is the theme of the private space of the home.

The house itself is an expression of social organization, its being the minimum housing unit in the urban organization reflects the interrelationships between the individual and the community, while its internal organization expresses the interpersonal relationships of the individual members of the family.

The architect, in the formal and distributive organization of the residence, must take into account both the functional needs, to which it must respond, and the deep links between the biological and psychological needs of the individuals and groups that use it.

METHODOLOGY

User manual

The methodology used consists of three main phases.

I PHASE

Initially, there are rules and limitations dictated by the project site under consideration to be taken into account.

In this preliminary phase of particular importance are: the size of the lot, its position within the block, the inclusion within the consolidated context, and finally, the ability to create alignments with existing buildings.

After this first analysis, there is the choice of the type of building. This choice is dictated by the context, in fact the types can be:

- O type,
- U type,
- C type,
- L type.

II PHASE

Subsequently, in the second phase, there is the choice of proportional criteria.

The formulation of the proportional criterion to be used is developed through the superimposition of two different project scales: on the one hand there is the study relating to the volume of the building to be designed, on the other there is the composition of the system.

III PHASE

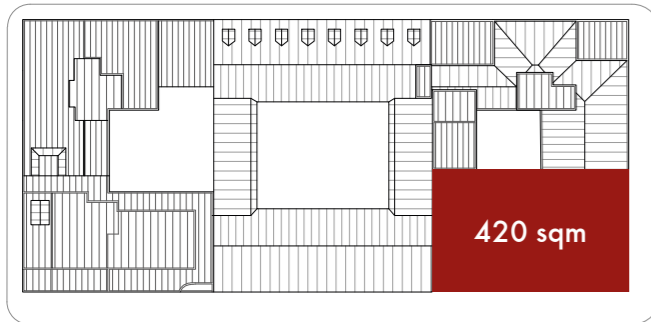
The third design phase concerns the choice of the type of home.

In this study, some types of different houses were identified:

- Central House, characterized by the presence of a room located in the center, which acts as a fulcrum around which the entire apartment develops.
- Corridor House, characterized by the presence of a distribution corridor located centrally with respect to the body of the building.
- Passing House, is based on the absence of a distribution system, such as corridor or vestibule, which favors circulation through the rooms themselves, but is characterized by the succession of pass-through rooms that give the possibility to arrange the functions in such a way as to guarantee neutrality to some spaces.
- Inner Loggia House, is based on the principle of three bands: two dimensionally equal and a smaller one, corresponding to the loggia, facing the internal side of the court. In this way, the loggia acts as a privacy filter placed inside the courtyard so that it can be shielded from the windows of the adjacent buildings.
- Outside Loggia House, characterized by the location of the band of minority rooms on the street front, in order to create a filter between the house and the city. The loggia on the street not only guarantees greater privacy to the apartments, but has a thermoregulatory function based on the seasons, as it can be closed in winter creating a greenhouse, and open in summer.

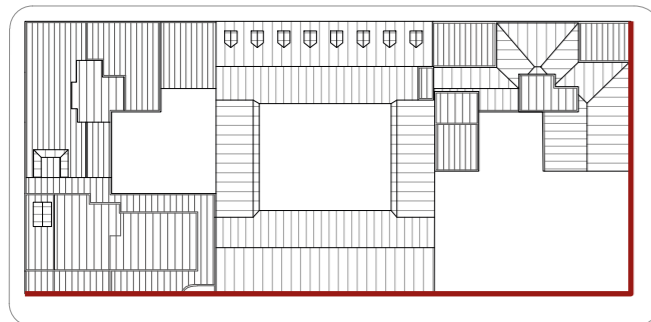
PHASE I

Rules and limitations



Presentation: Site area

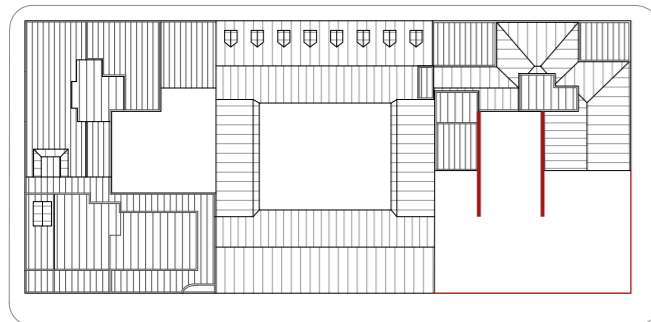
The project site is located between Via Lecco and Viale Tunisia, in an angular position on the block. The gross area is 420 sqm: to the north it has a completely blind side, and is bordered by a U-shaped building, overlooked by a small courtyard.



Rule I: Building "cortina"

The first guideline for the design in this area located at the corner between Via Lecco and Viale Tunisia, is that which provides for the continuation of the building "curtain".

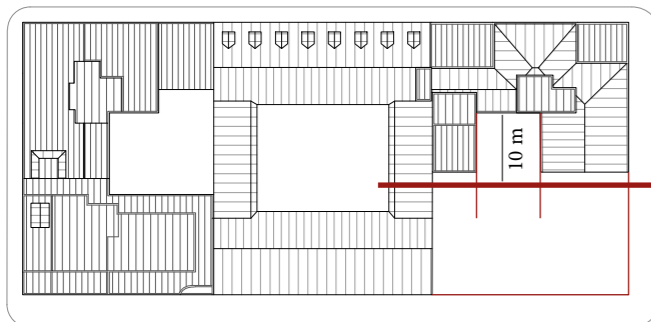
Restoring the corner means completing the block, the first step to rebuild an urban identity that recreates a continuous street front.



Rule II: Context alignment

The design of a new building in an already consolidated context must take into account the alignments with the surrounding pre-existence, in order to build stable and coherent links.

In particular, since the building is adjacent to the type C site, the alignments of the two arms of different depths are taken into account, in order to resume their alignments and create a design and compositional continuity with the existing one.



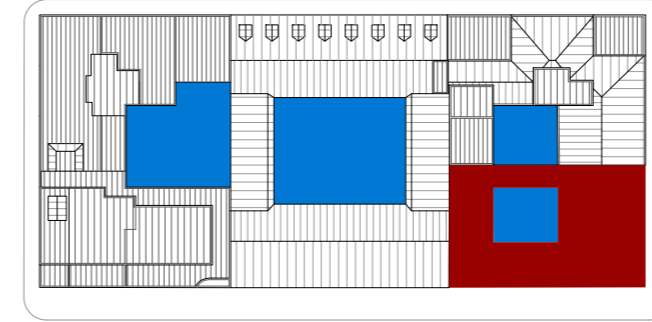
Rule III: Building regulation

According to article 86 *Distances and heights* of the 2020 Building Regulations for the city of Milan, it is mandatory to keep 10 meters away from the windowed sides of existing buildings.

As side A of the adjacent building is therefore windowed, the red line highlights the 10-meter limit to be taken into account for any built front.

PHASE I

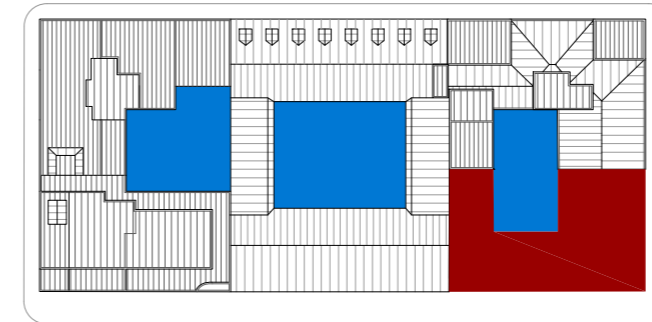
Building Typologies



Typology: O

This type of building, very common in the Lazzaretto district, is commonly called "a court" and is not very common in the 19th century buildings previously analyzed.

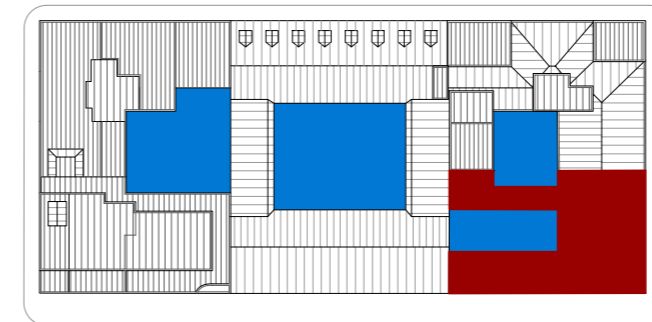
This typology presents some problems: it does not respect the minimum distance, according to the PGT2020 of the city of Milan, equal to 10 m from the windowed sides of the adjacent buildings; the irregular depth of the building generates numerous dark spaces, particularly in the corners; furthermore, the courtyard, separated from the existing one, is small and not very functional.



Typology: U

This building type consists of three open sides on the central courtyard that is created in correspondence with the existing one of the adjacent building.

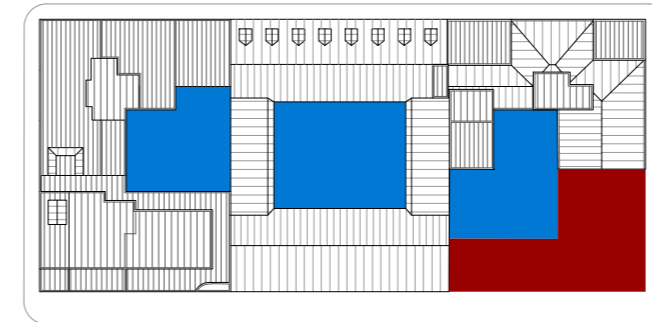
A problem that this type offers due to the design site so conformed is that the west wing has a very long, completely blind side, which does not guarantee a double view of any rooms located there.



Typology: C

Very similar to the previous one, the building typology called "C", is composed of three arms open on a courtyard, in this case positioned laterally. This option, designed to solve the problem of the distance of 10 m from the windowed side of the building in front, does not exempt itself from presenting other problems.

Especially on the north side, passing rooms would be configured, without distribution. Furthermore, also in this case there would be numerous dark spaces due to the very deep building.



Typology: L

The type called "L", thanks to its shape, is characterized by the composition of two sides perpendicular to each other, which allow you to grant more sides with windows and a very large courtyard in the middle of the area.

This typology tries to solve some of the problems previously exposed.

PHASE II

Proportional Criterion

After having examined all the possible types presented in the previous phase and defined the footprint of the built body, we move on to the search for the proportional criterion that can be the basis of the design.

The **proportion** in architecture is that set of dimensional relationships that link both the individual parts making up a building and their whole. These are geometric and arithmetic relationships, which can also be found in music, and modular relationships, that is, based on the iteration of a measure that allows the coordination of every other element of the construction.

For many centuries, proportion has been the basis of architectural design as these metric relationships express a balance of the components of the building and an overall harmony of the individual parts that characterize it. Proportion is not only a general rule that allows to guarantee a logical and coherent rational order, but implies a compositional balance that supports the project in its entirety. For this reason we can read the proportion both at a theoretical-quantitative level, as it concerns the magnitudes of the elements and the result of their connection, but also at a conceptual-qualitative level since it has to do with the grammatical and syntactic levels of the composition, thus involving the aspects most intrinsically linked to the linguistic contents of the building.

The historicity of the idea of proportion must be kept in mind. Throughout the history of architecture it is possible to see the alternation of different metric scales that interpret the dimensional relationships by expanding or contracting them according to the moment, mentality and taste, excluding the existence of invariant canons.

The theme of proportion appears in the studies of Pythagoras and, on his support, also of Plato, who dwell on the possibility of comparing the ratio between small whole numbers and combinations of musical harmonies, which in turn are the foundation of the natural harmony of existing.

Later we find it in all its problematic extension in *Book III of Vitruvius' De Architectura*. The Roman treatiser establishes a structural link between the notion of proportion (*proportio*) and that of symmetry (*concinntas*). Inspired by the Platonic and Pythagorean traditions, Vitruvius conceives symmetry as *commodatio*, that is to say as the commensurability of the parts and of the whole with respect to a numerical principle, a synthesis that is not mechanical-quantitative but extensively architectural, that is, capable of understanding the structural sphere and the semantic one in a unitary formal statement.

The contradiction between the invitation to greater subjectivity and the request for a more explicit and conscious attention to the three-dimensionality of architecture meant that an empirical orientation, a sort of enlightened pragmatism, prevailed for most of the nineteenth century as regards the proportional theme. based, as Eugène Viollet-Le-Duc argued, on critically retracing the genesis of known architectural works. With the advent of positivism there is a renewed interest in the proportional question in architecture, based no longer on transcendent visions of the theme but on scientific considerations.

In recent decades, especially due to the digital revolution, architecture seems to have moved further away from the problems associated with proportion. Precisely for this reason, after having conducted studies on flexible nineteenth-century residential buildings, the use of proportionality is particularly illuminating, as a generic rule that

can characterize architecture in its entirety, from its layout to its smallest detail.

The formulation of the proportional criterion used is developed through the superimposition of two different design scales: on the one hand there is the study relating to the volume of the building to be designed, on the other hand there is the composition of the plan.

After a first phase that takes into account the rules and limitations dictated by the context, then the dimensions of the side arms of the adjacent building are taken into consideration, in order to perfectly insert a new volume in a consolidated context.

(Image 1)

In addition, after evaluating the different building types possible in this area, the ground system of the future building is divided into three areas named with the letters A, B and C. (Image 2)

The relationship between these three environments is constant as regards the rules and limitations set, but at the same time varies in depth according to the type of building and the modules of the rooms prepared.

The first environment is defined with the letter A: it includes the corner between Via Lecco and Viale Tunisia and follows the alignments of the fronts of the block, to restore the building curtain. Room B is positioned between volume A and the opposite building from which the adjacent side is recovered. Finally, room C has the same depth as the north wing of the building in front and, depending on the type of building chosen, it can form a central courtyard system with it.

After having established this basic criterion that regulates the design of the built body according to the context and the type of building chosen, we then move on to the proportional principle concerning the composition of the plan.

Following the analyzes conducted on typologically flexible residential case studies, the importance of a hierarchical design between environments emerged, in order to offer a neutral but at the same time resilient functional program over time.

There are mainly three types of rooms with different sizes, but proportionally linked to each other.

The design principle formulated is based on an abstract proportional criterion, not linked to precise dimensions, so that it can be applied in any project. In particular, this principle is based on the division into equal parts so as to be able to take one or more parts of the whole for the sizing of the various types of rooms.

Returning to the concept of proportion, as a general rule that harmonizes a project in its entirety, the layout of the rooms is designed in such a way as to take into account the whole building and not just the individual housing module. Each room (A, B or C) is divided individually taking into account three fundamental criteria: the first is that of the *stratification* in the plan of different bands; the second is that of the *room hierarchy*; finally, the third is that of the *breaking of the regular grid* in favor of staggered rooms.

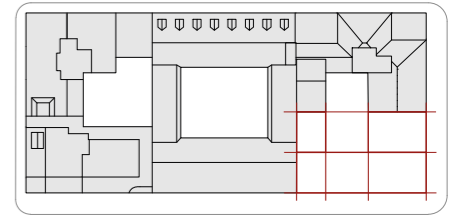
1. Stratification

Each volume in plan is longitudinally composed of two, three or four bands depending on the depth of the building. (Image 3).

This layerization leads to the definition of the housing model to be applied.

The housing model is a prototype that is referred to for the design of a residence with specific compositional characteristics.

Taking into consideration a generic module of an indefinite housing typology, the basic criterion for creating the bands is based on the subdivision into 2, 5 or 6 parts of the side, whatever its length, so as to be able to differentiate the rooms according to their dimension: if the bands are two and of equal size, there will be rooms of the same depth; if it is divided into several portions, however, it is possible to differentiate the depth of the rooms by taking one or two parts of the fraction.



context analysis e
creation of alignments

1.



subdivision of the body of
factory in three possible areas

2.



creation of the bands
depending on the building

3.

1. Alignment analysis.
2. Subdivision of the volume into three areas.
3. Creation of the bands.

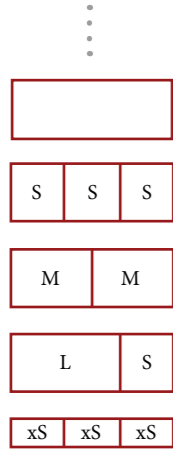
$$S = 1/3$$

$$M = 1/2$$

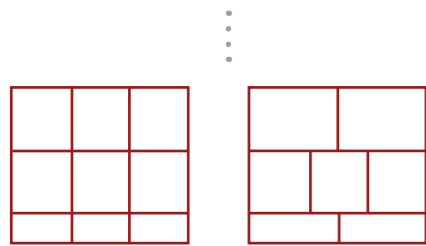
$$L = 2/3$$

$$xS = 1/2 S$$

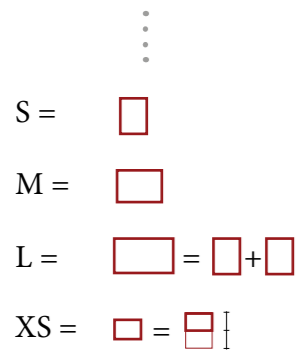
4. creation of xS, S, M, L



5. aggregation and creation of different types of rooms



6. break of the regular grid



7. dimensions of xS, S, M, L

4. Creation of xS, S, M, L.
5. Aggregation and creation of the different types of rooms.
6. Break of the regular grid.
7. Dimensions of xS, S, M, L.

2. Room hierarchy

As discussed in the flexible case study analyzes, layering helps to create a proportion of environments following one of the two dimensions of a room, while the hierarchy becomes one of the most important elements of a resilient design. In order to define a hierarchical variation, each band must be divided within it, always following a proportional criterion that we will explain later.

Taking into consideration a housing module (Image 4), divide the volume into three different room sizes: the smallest is the small (S), then there is the medium (M) and finally the large (L), considering the possibility of also having submultiples of each of them.

In general, each S takes 1/3 of the total, each M 1/2 and each L 2/3.

By dividing the side of the module into two or three parts, each strip can be characterized by the different types of rooms.

The upper band could be divided into 3 parts, thus generating three S or an L and an S, and the lower band into 2 parts, so as to have two M. In some cases, the smaller band, divided into 3 parts, sized like half of S, it is called xS. (Image 5)

3. Break of the regular grid

The third feature set a priori in the design is that of the regular grid break typical of the Modern Movement, which provides for a precise and clear geometry of all the environments. Consequently, according to the rules of the previous two points, by dividing the rooms proportionally, the bands of rooms are moved horizontally between them. This feature, very present in the buildings of the past, allows a circular distribution, able to connect the rooms between them and make their relationship always different. (Immagine 6)

These principles, described in this way, do not work on dimensions but on the proportions between the parts, so as to be always adaptable and in a certain way flexible in any project and context. Although this criterion is not based on precise dimensions, it takes into account the Building Regulations of the Municipality of Milan in force, which establish the minimum sizes for each housing function.

In addition, the subdivision into three different types of rooms (S, M, L), although it presents itself as a functional identification, contains within itself three dimensional ranges which in a way correspond to the minimum sizes provided by the Building Regulations.

According to the latter, the building minimums for the different functions are as follows: Bathroom 3.5 square meters; 7 sqm kitchen; Lounge 14 sqm; Double bedroom 12 sqm; Single bedroom 8 sqm; Studio 7 sqm.

This therefore becomes an additional element that helps in the choice of proportional division, as it establishes minimum limits under which it is not possible to design.

Consequently, if the Building Regulations dictate that the bathroom must have the short side not less than 2.1 m, in the design of the S room, the side of the module to be divided proportionally can only be divided by a factor that makes the part of the total (taken into account to form the rooms S) higher than that minimum.

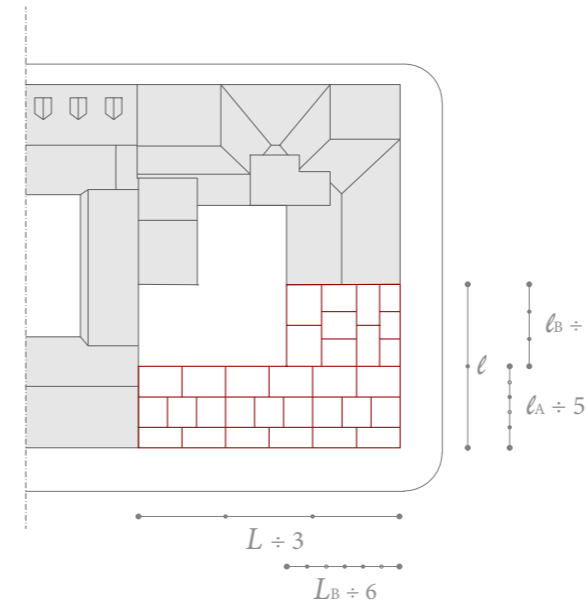
Example: if the side of the module is 7.2 m and you have to divide it to generate S rooms, if it is divided by the factor 4, the side of the S would be 1.8 m, less than 2.1 m, so you have to divide it by 3, in this way would be 2.4 m, and therefore greater than the minimum for the small side of the bathroom (according to the Building Regulations of the Municipality of Milan).

Once the room S is established, the rooms M come accordingly: this means that the division factor of the room M is equal to that of the room S-1. Ex. If the division factor of the room S is 3, that of the M is 3-1 = 2.

The large room (L) is the sum of two S rooms, while the extra small room (xS) is half of the S. (Image 7)

Consequently, here we report the three ranges within which the rooms S, M, L and xS should be designed: L [20 -16 m²]; M [15 - 11 m²]; S [8 - 10 m²]; xS [7 - 2.5 sq m].

PHASE III Housing Models Central House



Grid Plan

The concept of the Central House is based on the presence of a room positioned in the center, which acts as a fulcrum around which the whole apartment develops.

The central nucleus, marked with the pink color, is a central element, which allows a circular distribution and can be aggregated with the adjacent modules, so as to be able to enlarge rooms, generating large rooms (XL). (Image 1)

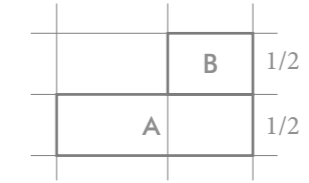
The proportions between block A and block B are the same, therefore the short side of block A (l_A) and of the block B (l_B) are exactly half of the front on Via Lecco (l). (Image 1)

The compositional grid is made up of three main longitudinal bands, proportional to each other, within which three types of rooms are developed: large, medium and small.

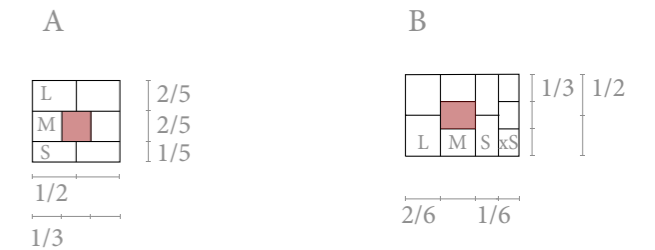
1. Block A

In particular, l_A has been divided into 5 parts, so as to have the upper and intermediate horizontal band equal to 2/5 each and the lower band, the smaller one, is equal to 1/5. (Image 2)

The horizontal side L, on the other hand, was divided into 3 parts to form three residential units. Later, L was further



1. A and B proportion



2. A concept housing units

3. B concept housing units

divided into 9 parts, in order to configure the Small (S) rooms. Finally, the Medium (M) rooms were designed by dividing the housing unit into two equal parts.

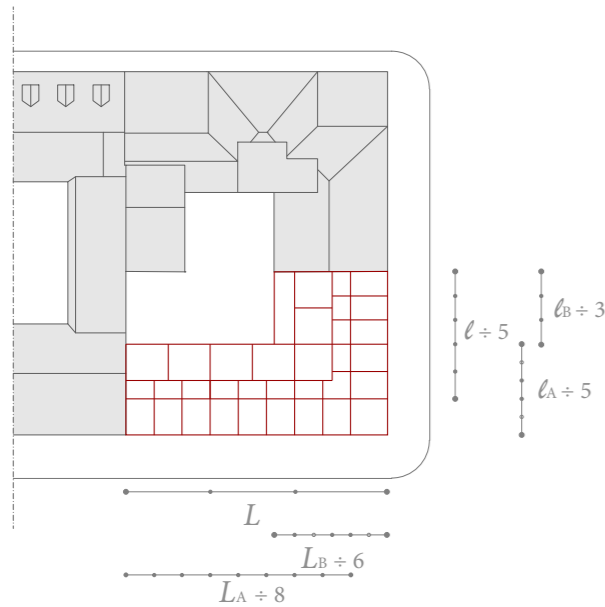
2. Block B

Block B was treated with the same compositional principle as block A, but, given the size of the side adjacent to the building in front of 11.6 m, it was possible to recover a fourth band for a loggia.

L_B has been divided into 6 parts, in order to generate different room sizes: the large (L) and medium (M) rooms are 2/6; instead the small (S) and extra-small (xS) rooms are 1/6 each.

Finally, l_B has been divided as follows: into three parts, to generate the stanzas M and xS; and in two parts, to generate the rooms L and S. (Image 3)

PHASE III
Housing Models
Corridor House



Grid Plan

The concept of the Corridor House is based on the presence of a distribution corridor located in the central part of the building.

By treating the corridor as an element proportionally attributable to the chosen compositional criterion, it not only has a purely functional value as a passing system, but acquires greater strength by being convertible into smaller rooms.

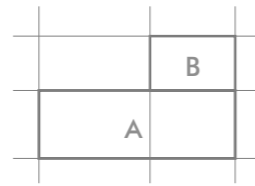
The proportions between block A and block B are not equal, as the size of the side of A (l_A) on Via Lecco is greater than that of B (l_B). (Image 1)

The compositional grid is made up of two main longitudinal bands, of proportional size to each other, intermediate by a smaller horizontal band, which acts as a link.

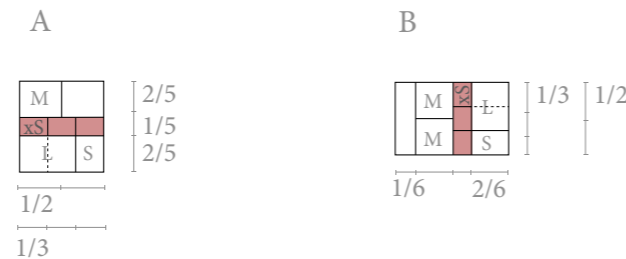
For the subdivision of the rooms, initially the small rooms (S) of both blocks (block A and block B) were sized, in such a way as to obtain the same dimensions. This led to the creation of a square corner room, as a cross between the modules of the two blocks.

1. Block A

In particular, l_A has been divided into 5 parts, in order to have



1. A and B proportion



2. A concept housing units

the upper and lower horizontal band equal to 2/5, while the intermediate band, the smaller one, is equal to 1/5. (Image 2)

Turning to the long horizontal side, L has been divided into 3 parts to form three residential units. Subsequently, without considering the corner room, L_A was further divided into 8 parts, in order to configure the Small (S) rooms. Finally, the Medium (M) rooms were designed by dividing the housing unit into two equal parts.

2. Block B

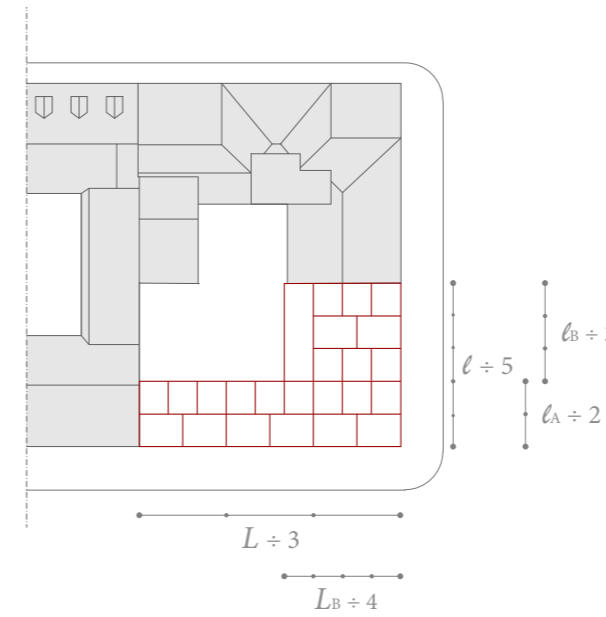
Block B was treated with the same compositional principle as block A, but, given the size of the side adjacent to the building in front of 11.6 m, it was possible to recover a fourth band for a loggia.

L_B it was divided into 6 parts, in order to generate different room sizes: the large (L), medium (M) and small (S) rooms are 2/6; instead extrasmall (xS) are 1/6.

Finally, l_B has been divided as follows: into three parts, to generate the stanzas L, S and xS; and in two parts, to generate the rooms M. (Image 3)

3. B concept housing units

PHASE III
Housing Models
Passing House



Grid Plan

The concept of the Passing House is based on the absence of a distribution system, such as corridor or vestibule, favoring circulation through the rooms themselves.

The distribution of the doors and the design of the functionally conceived rooms gives the possibility of arranging the functions in such a way as to grant neutrality to some spaces.

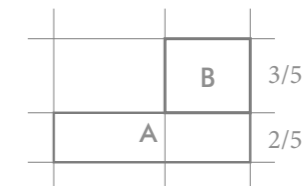
The proportions between block A and block B are not the same, but the size of the side of A (l_A) on Via Lecco is equal to 2/5, while that of the side of B (l_B) is equal to 3/5. (Image 1)

The compositional grid is formed: in block A by two main horizontal bands, of proportional size to each other; instead the body B is composed of three horizontal bands.

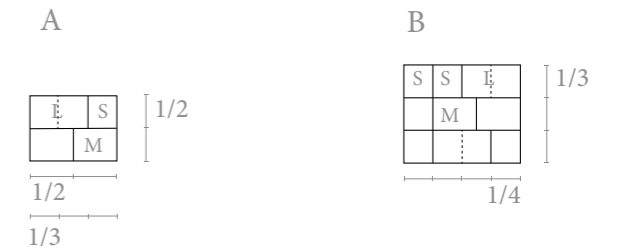
1. Block A

Starting from the long horizontal side, L has been divided into 3 parts to form three residential units. Later, L was further divided into 9 parts, in order to configure the Small (S) rooms. Finally, the Medium (M) rooms were designed by dividing the housing unit into two equal parts.

In particular, l_A has been divided into two parts, and each room is equal to 1/2 of the total. (Image 2)



1. A and B proportion



2. A concept housing units

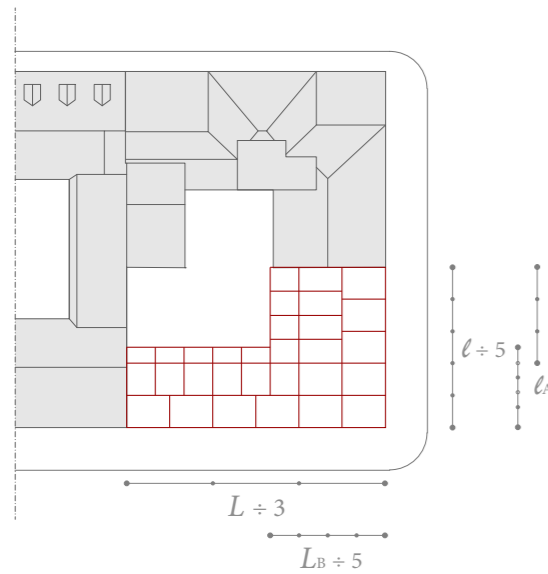
2. Block B
Block B was treated with the same compositional principle as block A, but, given the size of the side adjacent to the building in front of 11.6 m, it was possible to recover a fourth band for a loggia.

L_B has been divided into 4 equal parts, so that each part corresponds dimensionally to the small room (S) of block A.

Finally, l_B has been divided into three parts, and each room is equal to 1/3 of the total. (Image 3)

3. B concept housing units

PHASE III
Housing Models
Inner Loggia House



Grid Plan

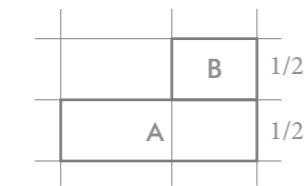
The concept of the Inner loggia House is based on the principle of two equal bands and a smaller one, corresponding to the loggia, facing the internal side of the court. In this way, the loggia becomes the privacy filter placed inside the courtyard so that it can be shielded from the windows of the adjacent buildings.

The proportions between block A and block B are equal, as the side l has been divided into 5 parts of equal size, as the two blocks have a length equal to half of the side facing via Lecco. (Image 1)

The compositional grid is made up of two main longitudinal bands, of proportional size to each other, and of a smaller horizontal band, which acts as a link.

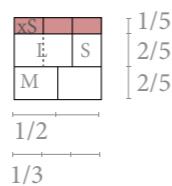
1. Block A

In particular, l_A has been divided into 5 parts, in order to have the lower horizontal bands equal to $2/5$, while the upper band (xS), the smaller one, is equal to $1/5$, or half of S. This detail is important as this band makes sure that half of side l corresponds to the depth of module A. (Image 2)

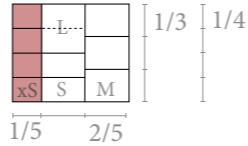


1. A and B proportion

A



B



2. A concept housing units

3. B concept housing units

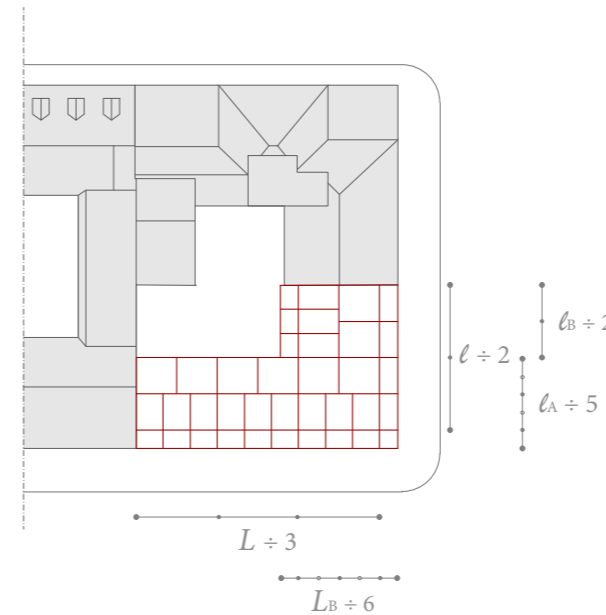
Turning to the long horizontal side, L has been divided into 3 parts to form three residential units. Later, L was further divided into 9 parts, in order to configure the Small (S) rooms. Finally, the Medium (M) rooms were designed by dividing the housing unit into two equal parts.

2. Block B

Block B was treated with the same compositional principle as block A, the horizontal length L_B has been divided into 5 parts, in order to generate different room sizes: the large (L), medium (M) and small (S) rooms are $2/5$; instead extrasmall (xS) are $1/5$.

Finally, l_B was divided as follows: into three parts, to generate the rooms M; and in four parts, to generate the rooms L, S and xS. (Image 3)

PHASE III
Housing Models
Outside Loggia House



Grid Plan

The concept of the Outside loggia House is exactly the opposite of the previous one, as it arranges the strip of rooms xS facing the street, in order to create a filter between house and city.

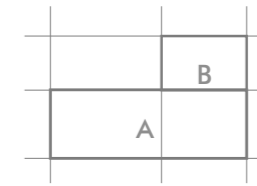
The loggia on the street not only provides greater privacy to the apartments, it has a thermoregulatory function according to the seasons, as it can be closed in the winter creating a greenhouse, and open in the summer.

The proportions between block A and block B are not equal, as the side of body B (l_B) it is smaller in size. Excluding, however, the band of the loggia on Viale Tunisia, it has been shown that the sides of block A (l_A) and block B (l_B) are the same. (Image 1)

The compositional grid is made up of two main longitudinal bands, of proportional size to each other, and a smaller horizontal band, which acts as a filter on the road.

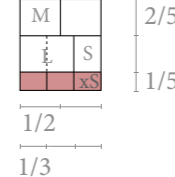
1. Block A

In particular, l_A has been divided into 5 parts, in order to have the lower horizontal band (xS) equal to $1/5$, while the upper band (S, M) equal to $2/5$ each. (Image 2)

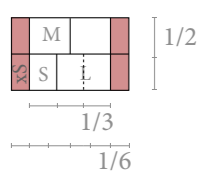


1. A and B proportion

A



B



2. A concept housing units

3. B concept housing units

Moving on to the long horizontal side, L was divided into 3 parts to form three residential units, excluding the band of the loggia on Via Lecco from the subdivision. Subsequently, the L side was further divided into 9 parts, in order to configure the Small (S) rooms. Finally, the Medium (M) rooms were designed by dividing the housing unit into two equal parts.

2. Blocco B

Block B was treated with the same compositional principle as block A, the horizontal length L_B it has been divided into 6 parts, in order to generate different room sizes: the large (L), medium (M) and small (S) rooms are $2/6$; instead extrasmall (xS) are $1/6$.

Finally, l_B has been divided into two parts, to generate the rooms M, L, S and xS. (Image 3)

PLAN GRID

The composition of the plan follows a well-defined procedural criteria, starting with the development of a general plan gridable to sustain all the design process.

In the previous chapter, it was faced the design method in order to define a modular grid sized proportionally. This allows to establish an “a priori” efficient method to achieve typological flexibility.

This **grid**, thus proposed, offers a dimensional and functional variety, able to fulfill and to answer to all the usage trasformations made by the users.

As is well well known from the diagrams, the main ranges belonging to the four cuts of different rooms have been calibrated in such a way that all the basic housing functions are satisfied.

In the first scheme (image 1), as already explained in the previous chapter, the grid is made by different room in size such as small, S, medium, M, and extra small, XS, half of S.

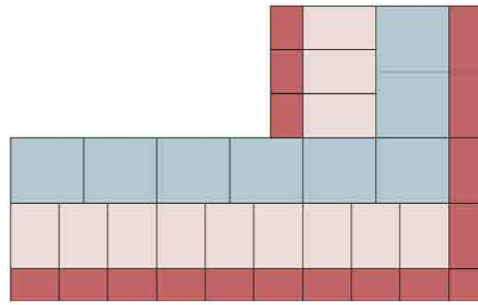
Turning to the second scheme (image 2), inside two M rooms, it was placed the lift core, composed by architectural staircases and an elevator, a hinge around all the rooms are developed.

As a compositional criteria, two S rooms can be grouped becoming a large one (L), the double sqm compared to the starting matrix. (image 3)

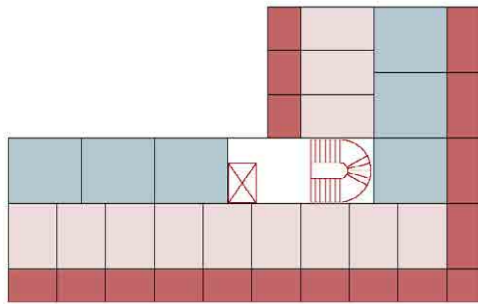
Another one compositional principle, provide a rearrangement of the rooms in order to create an efficient distributional system between the rooms. In particular, the extra small rooms, normally disposed on the perimeter of the building, are moved forward to the bordering room, becoming an active space for the apartment.

Each floor of the building is treated in a different way, in order to provide multiple situations, with a variety of dispositions of XS, S and L. In this way, it is possible to verify the effectie flexibility of each floor plan.

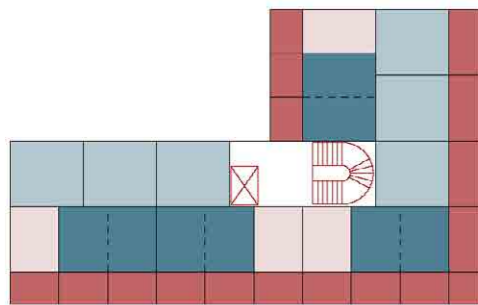
1.



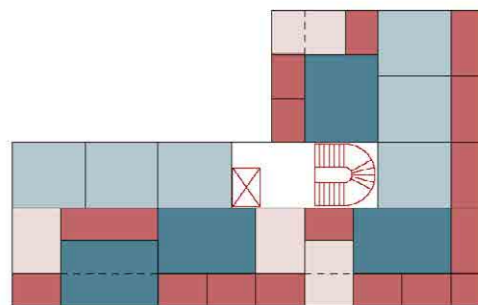
2.



3.



4.



- LARGE
20 > 16 sqm
- MEDIUM
15 > 11 sqm
- SMALL
10 > 8 sqm
- EXTRA SMALL
7 > 2 sqm

1. Room differentiation.
2. Placing of the lift core.
3. Rooms composition.
4. Rearrangement of the rooms composition.

Architectonical Layout

FACADE COMPOSITION

The Via Lecco lot is part of the new development area located in the former Lazzaretto area, at the meeting point of the two large busy roads: Viale Tunisia and Via Lecco.

The building plays a key role in recreating the building curtain, highly inserted in the context, and which allows the creation of an internal condominium green space.

The project pays homage to nineteenth-Century architecture, as it seeks to preserve the “*intrinsic intelligence of this form*”¹, which allowed the buildings constructed during the Haussmann period to survive many changes and grow with the city, providing multiple, often very different uses of the same building.

The characteristics underlying this flexibility are: a clear structure, a ground floor accessible from the street and which can extend to include the mezzanine, a wealth and variety of door and window openings to allow for the realization of all types of plans, variable heights of the floors, adequate thicknesses and a high level of compactness.

The body on the street, with five floors in addition to the ground floor, is connected to the eaves of the surrounding buildings, through a large terrace created in a singular and spectacular sloping roof covered in zinc that becomes the figurative matrix of the entire intervention.

On the ground floor, the pedestrian entrance is identified by an elegant paved arcade path, which incorporates the flooring of the Church of San Carlo al Lazzaretto, which leads into the atrium, while the private driveway is located on the right edge of the lot.

The façade design analyzes and uses the structural model of the buildings in the context. Alternate a solid module with voids, which correspond to the openings of the loggias. The height between the floors is 3.2 meters, responding to the standard height required for residential buildings (2.8 meters).

The commercial ground floor has a different treatment, which highlights its urban character.

The ornament borrows various elements from the nineteenth-century style, in particular the proportion of solids and voids.

The volume is a perfect extrusion of the particle that reconstructs the urban void and fully exploits all the spatial possibilities of the plot.

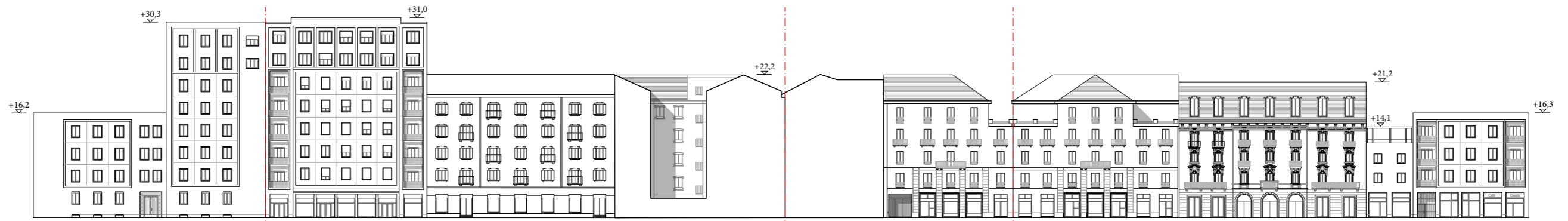
The large openings give each residence a very particular quality: the apartments are in fact very bright and spacious.

The loggias are the extension of the internal living space towards the outside, and also have a thermal and acoustic function, introducing a new layer in the building that helps ventilate the house during the summer months, and creates a filter with the street.

The study of the facade, through the sizing and regularity of the door and window openings, creates a general image of the building without specifically denoting its use.

[1] - B. Jallon, U. Napolitano, *Paris Haussmann: modèle de ville/A model's relevance*, Park books, 2017

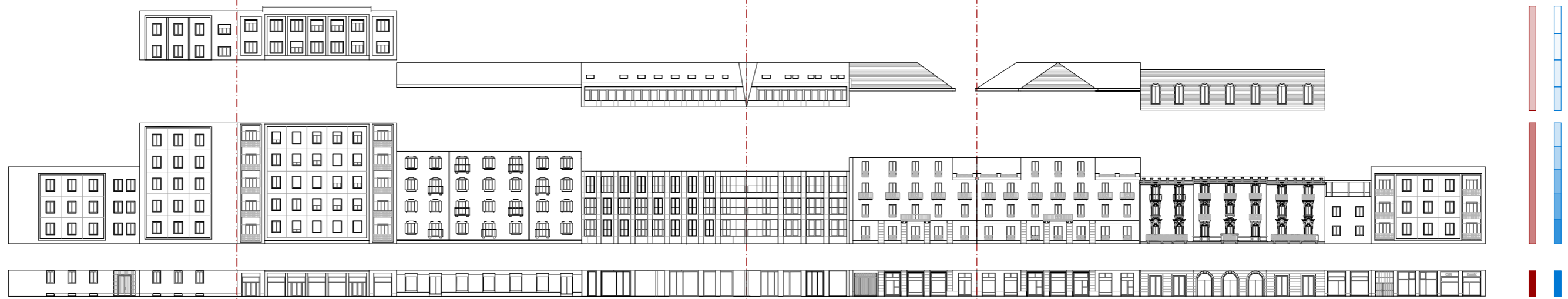
Block elevations



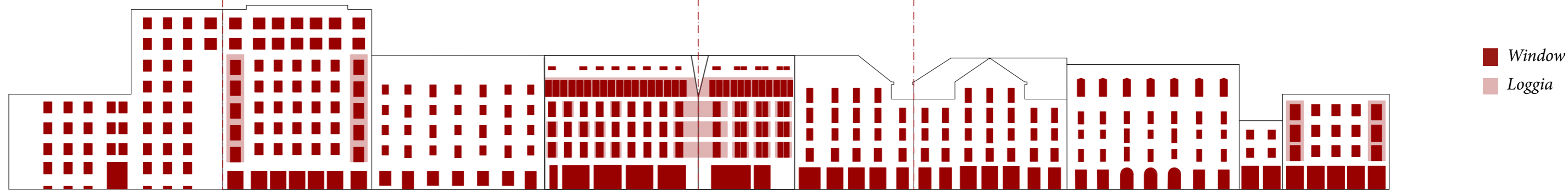
Block elevation | the project



Block facades composition



Block grid regularity



Via Ludovico Settala

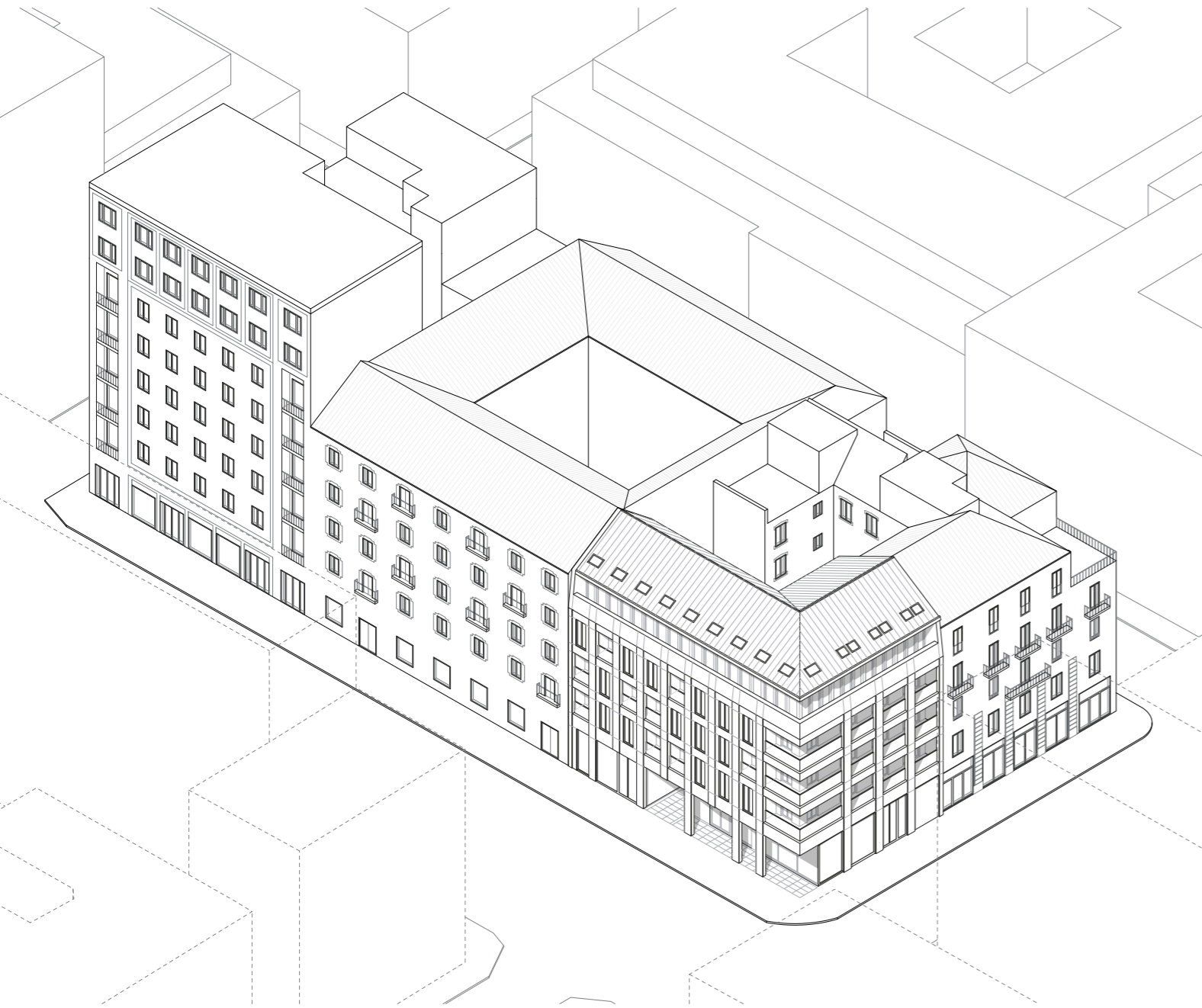
Viale Tunisia

Via Lecco

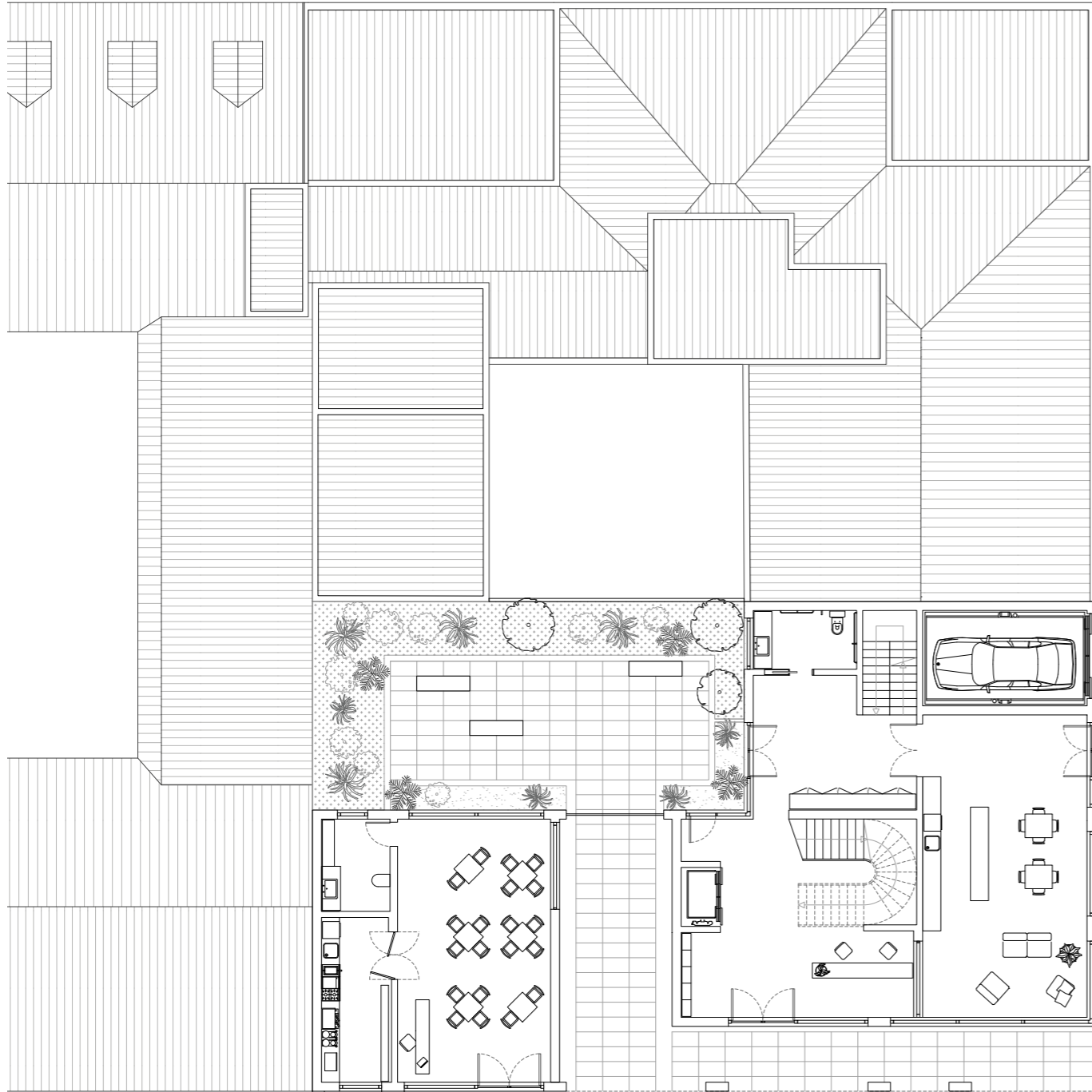
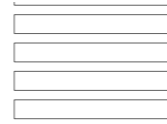
Via Felice Casati



Axonometry



Ground floor plan



Zero-Type is a social housing project based on the search for a new typological flexibility, aimed at building resilience.

The design process used makes it possible to define a **modular grid** proportionally sized, which offers a dimensional and functional variety, capable of fulfilling and responding to all the transformations of use made by users.

The project offers functional and thematic variety.

The building is made up of two blocks, centrally cut by an intimate passage: on one side, in close contact with the street, there is a public space, intended for refreshment functions; on the other side there is a private space of the residence, equipped with a conference area.

Furthermore, the type of building recreates the building curtain and places the importance on the creation of an internal courtyard, typical of Milanese history, which acts as a support to the house, as it is relegated to the entry of light and air into the rooms. The courtyard falls into the category of intermediate places between the intimate dimension of private living and the more properly public one of the street and the city, a theme at the center of the debates of the last century.

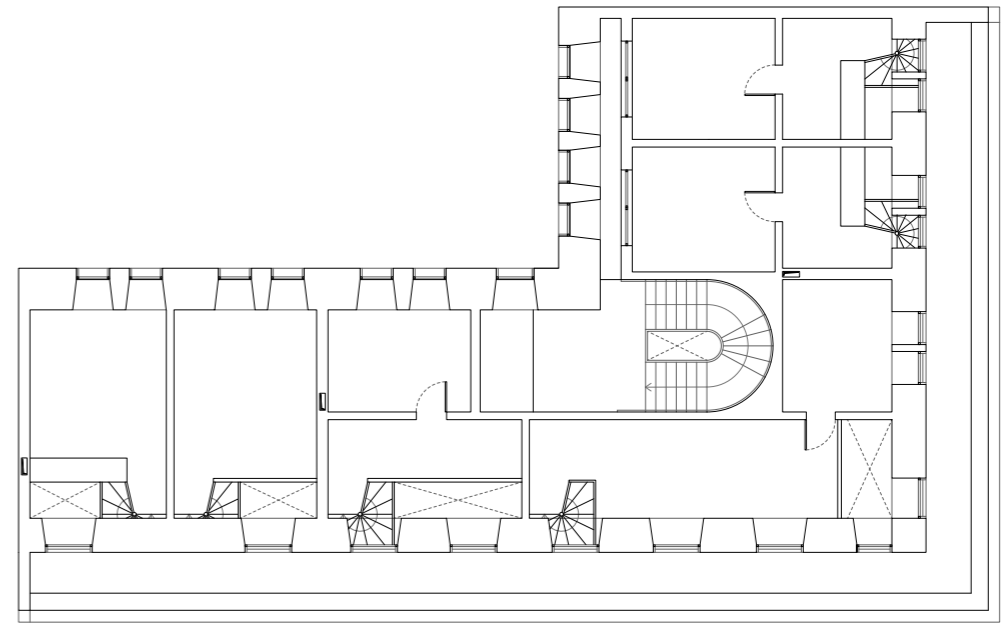
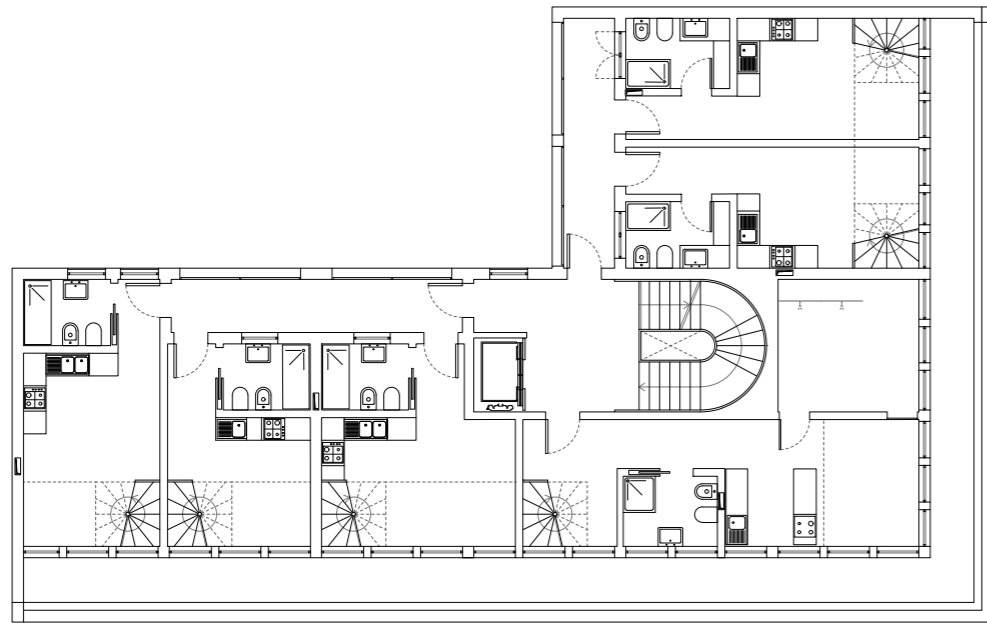


Typical floor plan





Duplex plans



The building also offers a variety of apartment types. Starting from the study of the composition of the nineteenth-century buildings, in which the top two floors are treated differently, both in plan and in the facade, the project creates a diversification in the types of internal apartments.

In fact, spatial flexibility was also envisaged in its verticality, with the possibility, through a lift system provided through the insertion of an internal staircase, to create duplex apartments, developed on two floors.

1. Plan of the fourth floor.
2. Plan of the fifth floor.



Constructive Layout

ZOOM IN

The structure of the building is composed of a regular and point-like mesh, made up of steel beams and pillars. This allows for extreme flexibility of indoor environments.

The study of the street façade takes up the **alignments** of the context. It is punctuated by horizontal openings and vertical French windows, while the body of the top floors, set back, has only windows.

The refinement of the construction details of the windows, often with opening systems designed ad hoc for the project, testify to the tireless attitude to research and study of the Milanese road.

The positioning of corner windows at the junction between the two volumes is singular, breaking the continuity of the corner between the facades.

The cladding of the fronts is in stone slabs, a material that highlights the geometric safety of the volume and the less abstract of the facades and also creates continuity on the sides facing the internal courtyard, arranged at the rear of the building.

The materials favor a certain sobriety: prefabricated panels for the façade in red stone, bronze lacquered aluminum for the windows, glass for both the windows and the railings.

The atrium is an articulated and bright space in direct relationship with the green of the open courtyard behind.

The ground floor is set back from the facade, and pierced by large windows; the entrance hall is a large transparent space, preceded by a portico, and visually connects the internal courtyard of the building.

The lift system is located in the entrance area, consisting of a large central wooden staircase.

The study of the external flooring makes the building integrated with the context: on the ground floor the pedestrian entrance is identified by an elegant paved arcade path, which takes up the flooring of the Church of San Carlo al Lazzaretto, which leads into the atrium, while the private driveway entrance is located on the right edge of the lot.

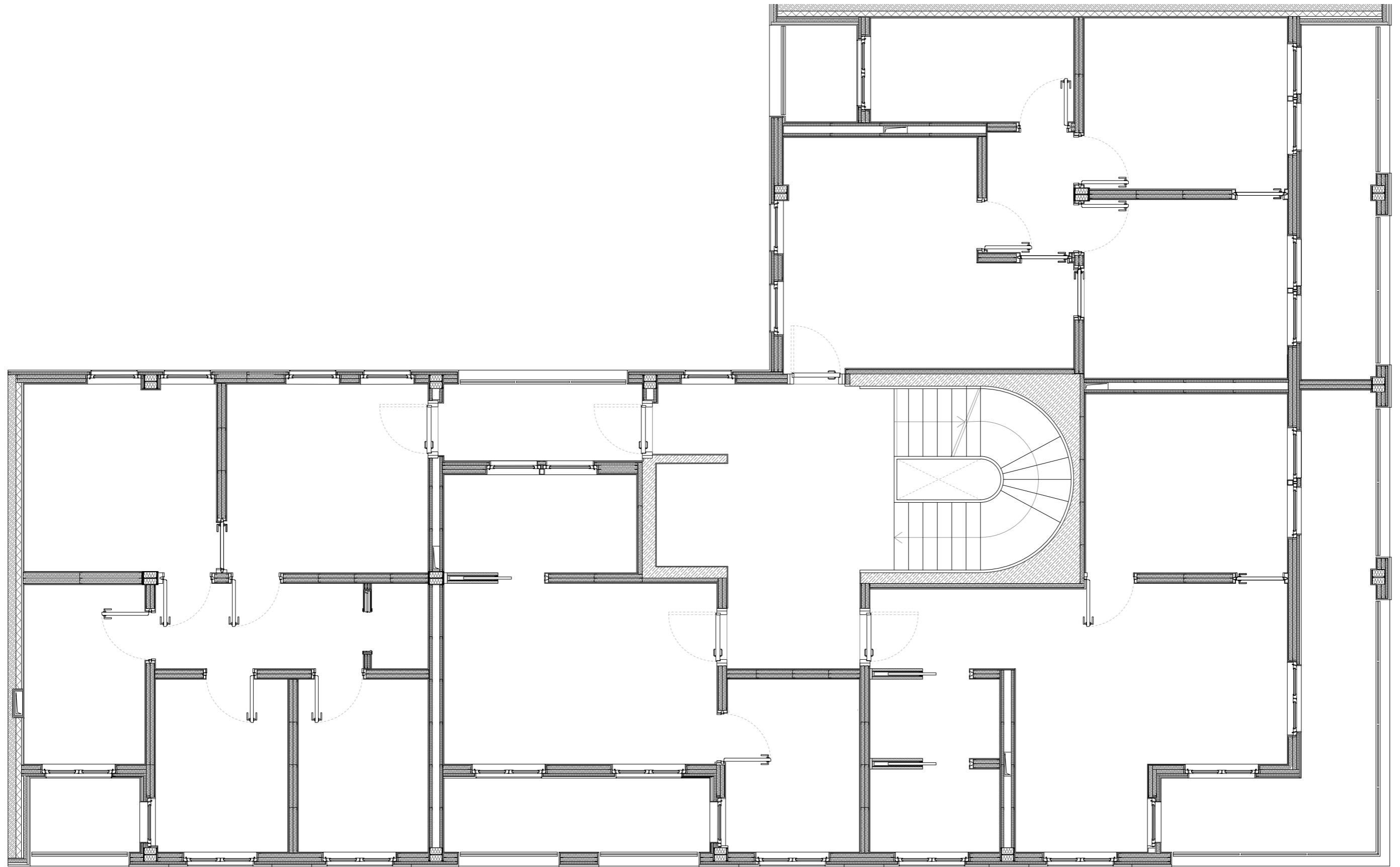
The roof takes up the Parisian tradition, made of zinc plates, shaped to cover, lower and laterally, the space of the attics.

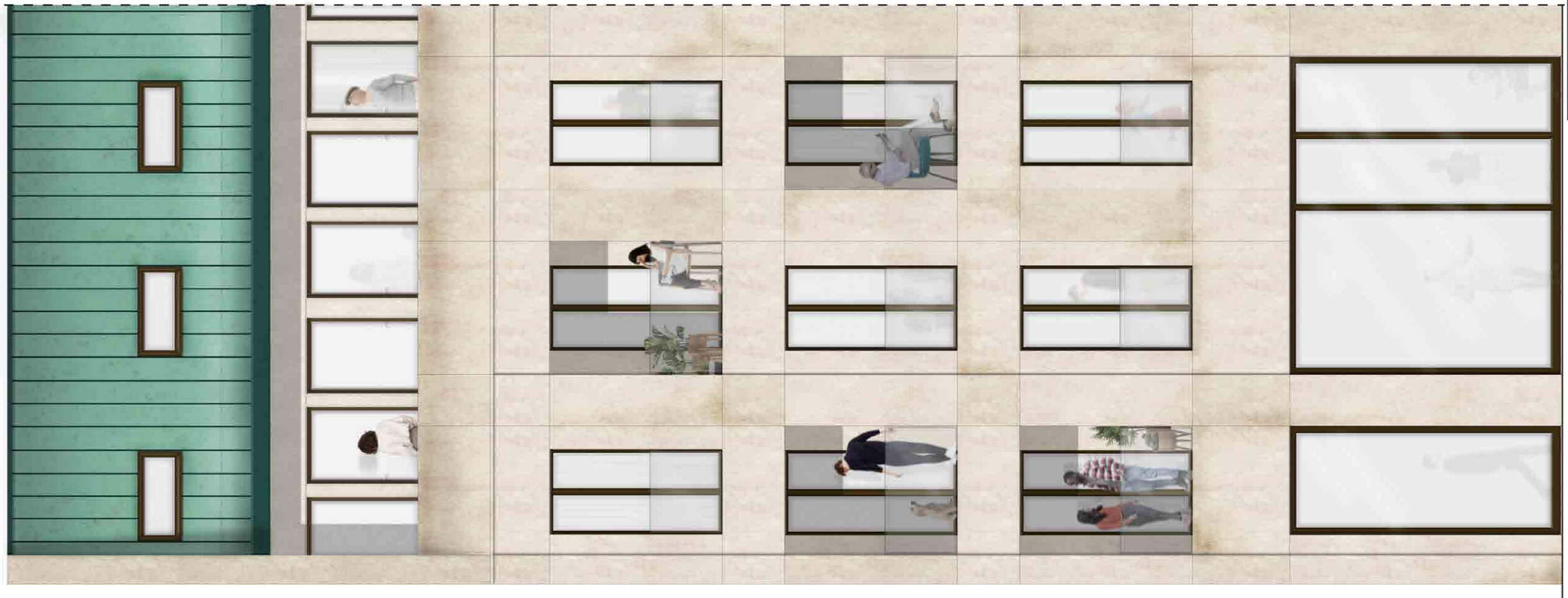
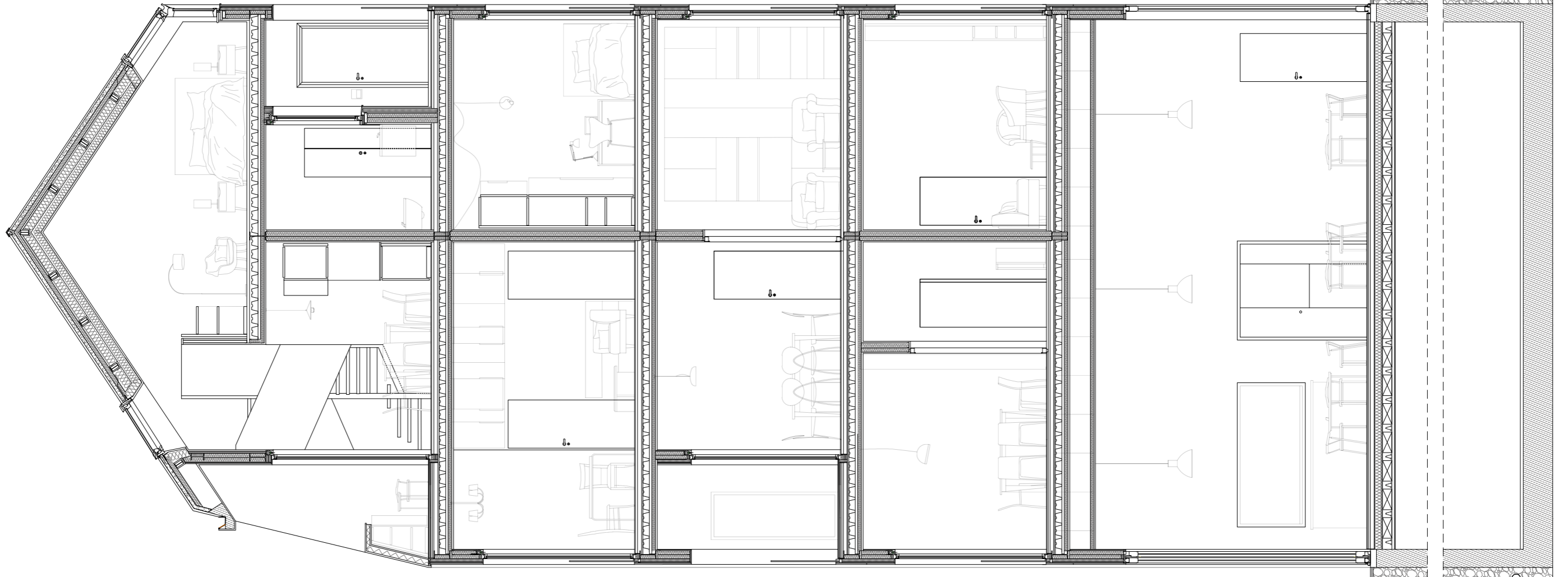
The attics, with these new roofs, change the use space of the top floors of the building, becoming a romantic but healthy place.

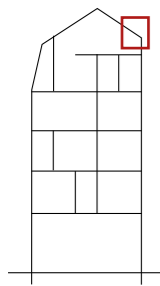
The zinc roofs also have the particularity of changing the chromatic tone, with the change of the meteorological time and this because, under the oxidation layer, there remains a surface that reflects the light.

The windows of the attic floor, carved into the roof, extend up to the ceiling with skylights, obtaining continuity between the vertical and inclined part.

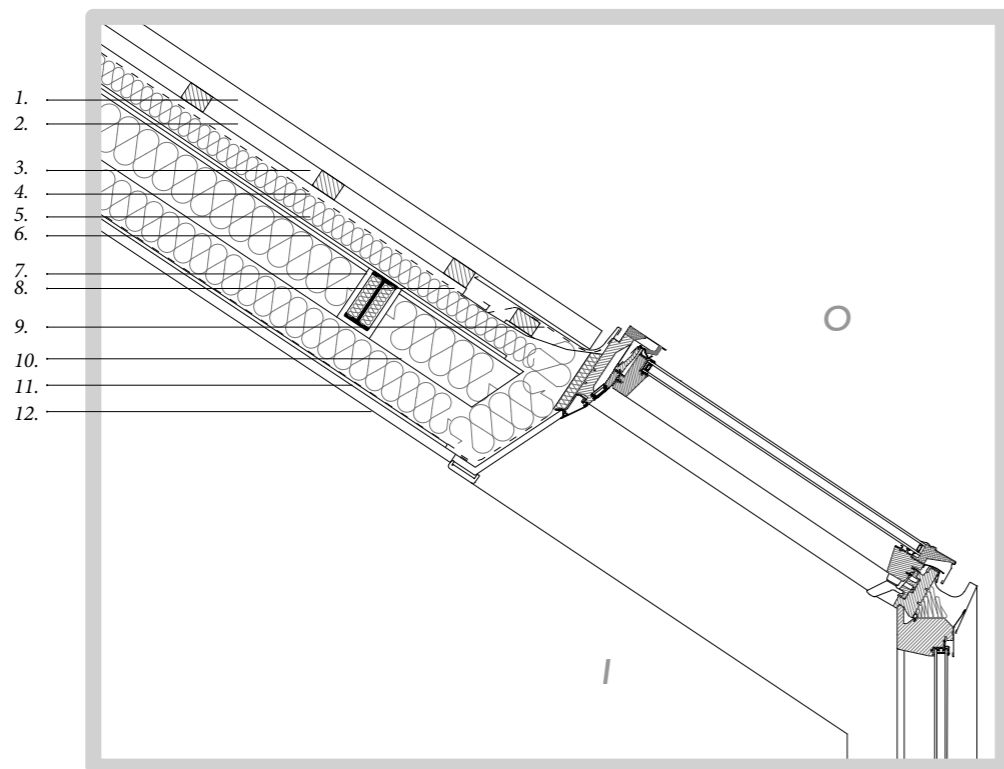
Structure of the typical floor plan







Detail n. **01**

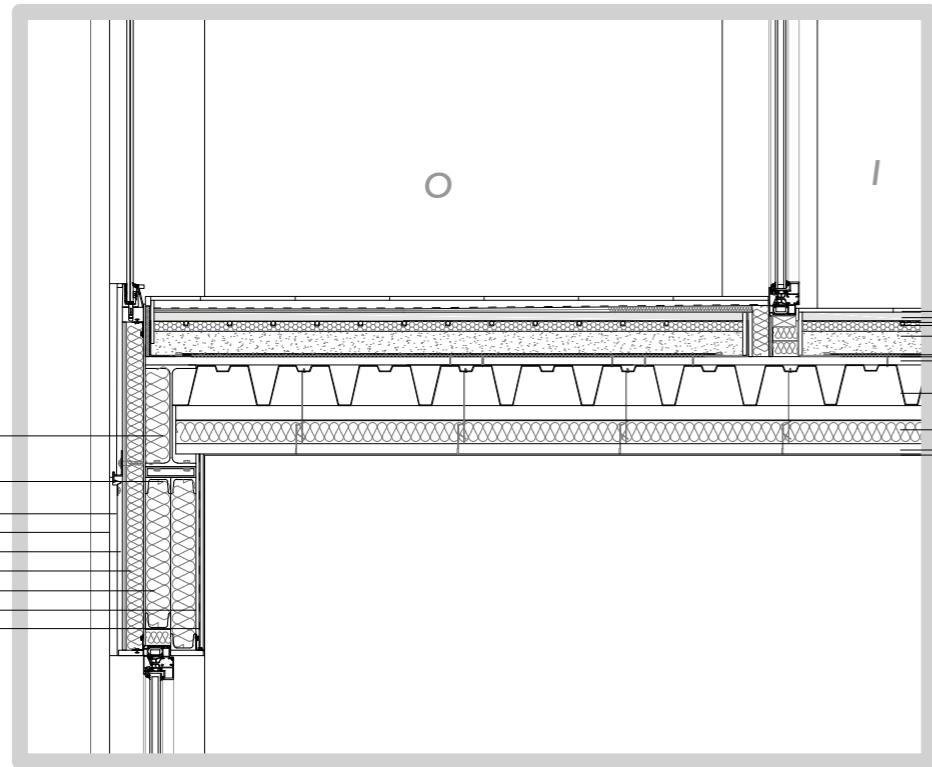
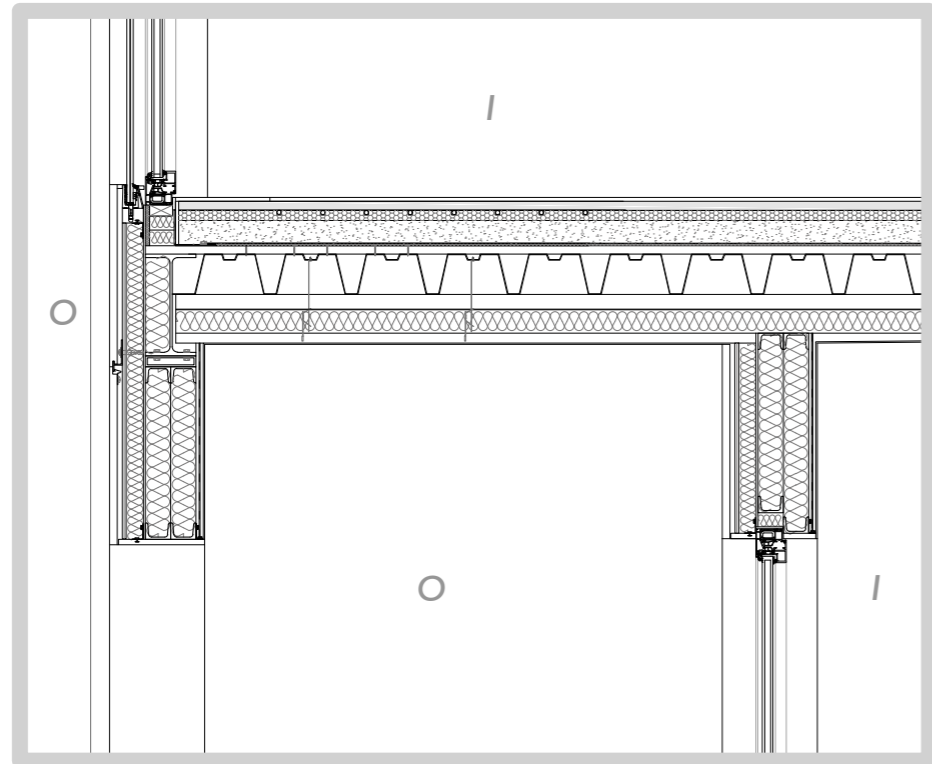
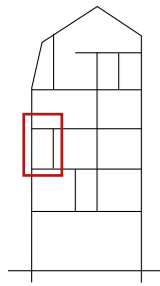


- | | | |
|-----|--------------------------------------|-------------------|
| 1. | Roof - Prefalz covering system | <i>th. 6 cm</i> |
| 2. | Ventilated roof, emptiness | <i>th. 8 cm</i> |
| 3. | Support joists | <i>th. 8 cm</i> |
| 4. | XDP vapor permeable layer | |
| 5. | Rock wool insulation | <i>th. 7 cm</i> |
| 6. | Pincipal beam IPE 300 | |
| 7. | Secondary beam IPE 140 | |
| 8. | Water drainage gutter | |
| 9. | Roof supporting profile | |
| 10. | Double layer of rock wool insulation | <i>th. 26 cm</i> |
| 11. | XDP vapor permeable layer | |
| 12. | Plasterboard sheet | <i>th 1,25 cm</i> |

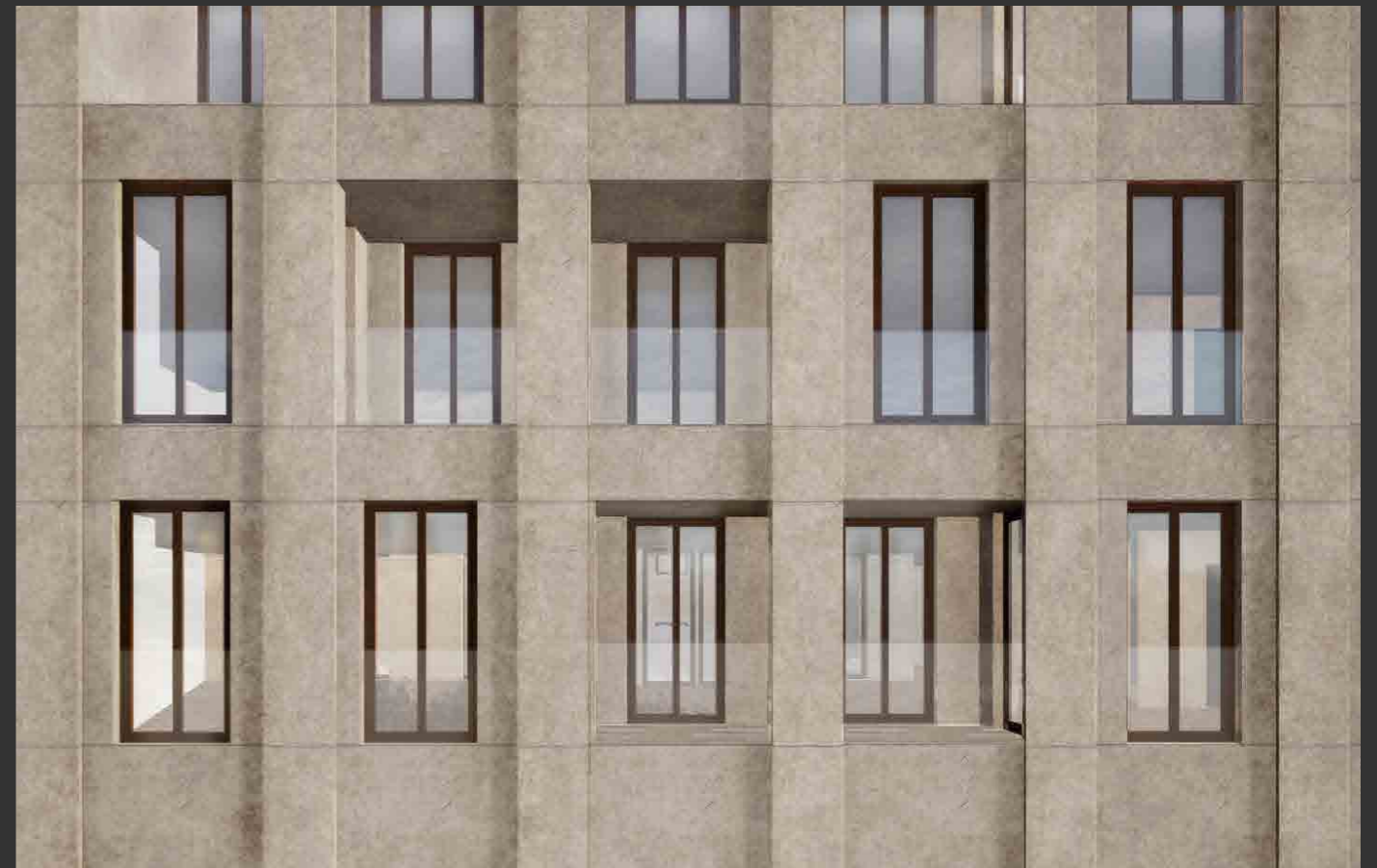


1. View of the detail of the roof.

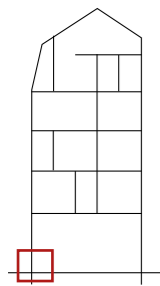
Detail n. **02**



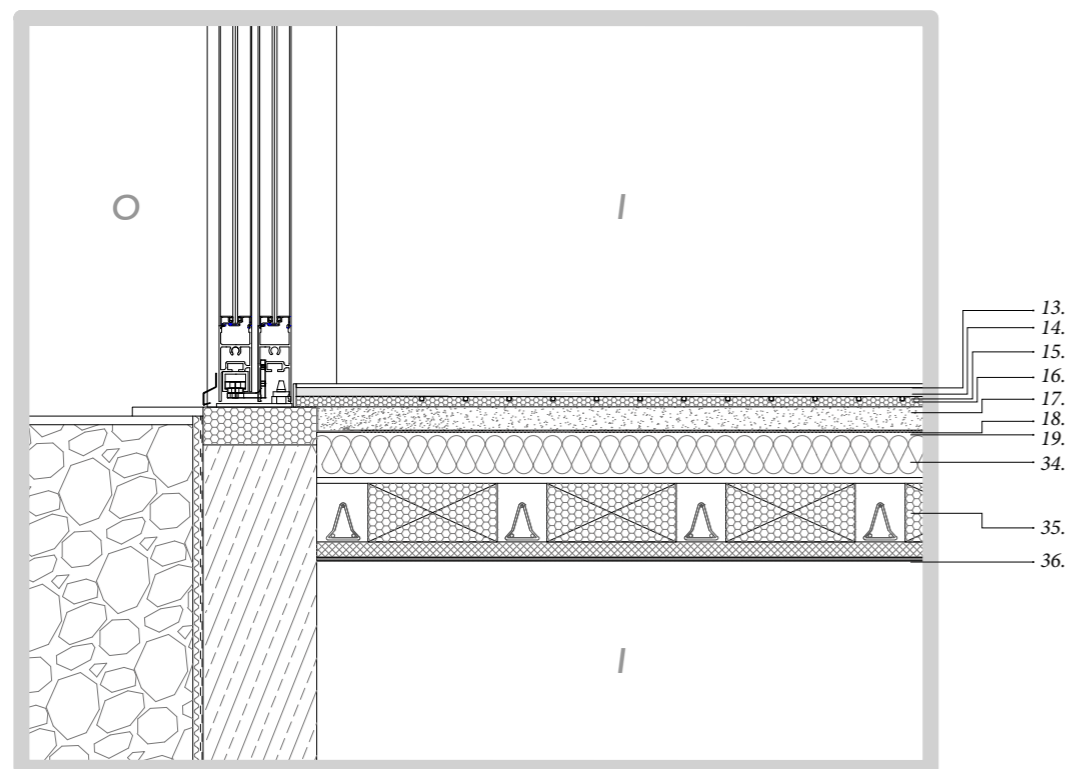
- 25.
- 26.
- 27.
- 28.
- 29.
- 30.
- 31.
- 32.
- 33.
- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.



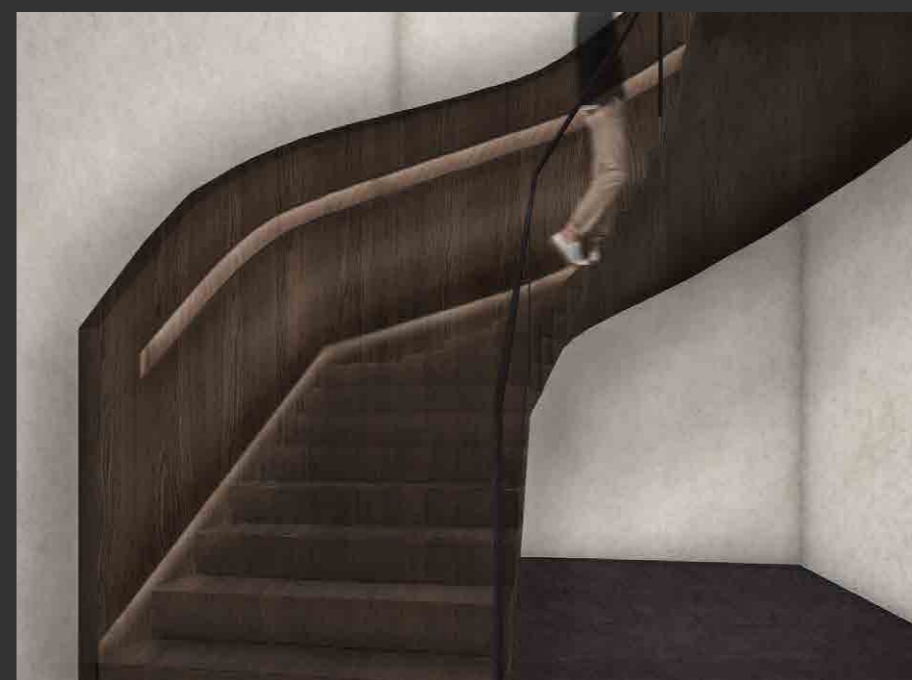
1. View of the detail of the facade.



Detail n. **03**



- | | | |
|-----|---|----------------------|
| 13. | Flooring: Parquet | th. 1 cm |
| 14. | Gypsum-fiber layer | th. 2,3 cm |
| 15. | Double layer of load sharing in galvanized steel | th. 0,2 cm |
| 16. | Pre-shaped insulating panel in expanded polystyrene | th. 2,8 cm |
| 17. | Bed base with granular inert in perlite | th. 6 cm |
| 18. | Waterproof case layer | |
| 19. | Corrugated cardboard layer | th. 4,5 mm |
| 20. | OSB panel | th. 2,2 cm |
| 21. | Fretted sheet | th. 2 mm |
| 22. | Rock wool panel insulation | th. 12 cm |
| 23. | Plasterboard sheet | th 1,25 cm |
| 24. | Finish | th 0,5 cm |
| 25. | Steel beam IPE 270 | |
| 26. | Steel profile type C 65 | |
| 27. | Ventilated facade, emptiness | th. 1 cm |
| 28. | Stone slabs, Pietra di Trani | th 3 cm |
| 29. | Ateel pillar HEA 280 | |
| 30. | Pre-shaped insulating panel in expanded polystyrene | th 5 cm |
| 31. | Double layer of insulation | th. 15 cm |
| 32. | Plasterboard sheet | th 1,25 cm |
| 33. | Finish | th 0,5 cm |
| 34. | Insulation layer of lana di roccia | th 12 cm |
| 35. | Structures in predalles slabs with lightened concrete casting | th 15 cm
th 24 cm |
| 36. | Plasterboard panels | th 2 cm |



1. View of the detail of the facade and material of the ground floor.
2. View of the detail of the interior stair.

Life inside the Building

ABACUS

To better understand the possibility that offer this kind of plan, based on the hierarchy principle, it is proposed an abacus that give a wide panoramic of compositions that could take place.

Taking into account a typical floor plan, the apartments have been subdivided in four colours according to their dimensions (**S, M, L, XL**). Of each have been highlighted the total square meters (which are equal for the same apartment in each floor) and than the subdivision into inner sqm of the living space and those of the loggia, which vary each floor according to the variation of the apartment composition.

The **typologies** of the apartments are four for the three central floors and six duplex for the fourth floor. This last one is composed by smaller apartments with double height and it is named following the previous nomenclature.

After this introductive part, the abacus occurs. A page is dedicated to each apartment and it is possible to find all the feasible options that can take place on the various floors, depending on the composition of the rooms of different sizes.

Furthermore, each plan is characterized by an identifying code, thus composed:

- The *first* letter in bold indicates the tipology linked to the size (S, M, L, XL).
- The *second* letter reveals the consequential letter of that particular apartment. (A, B, C, D). It should be noted that this letter is given starting from the north-eastern apartment in the plan and going on clockwise.
- The *third* element of the nomenclature is a number which manifests the number of option for that particular type of apartment. (1, 2, 3, 4, 5).
- The *last* letter, after a dot, suggests the variation of the option. (a, b, c, d).
- In duplex apartments, however, there is no number and no option, but the higher floor is marked with an asterisk.

For instance, starting from the north-eastern apartment, it is big 72,5 sqm, therefore it belongs to the large size range, so that the first letter is an L. Then, it is identified as the first L in absolute, so the second letter is an A. In addition, it is at the first floor and maybe we are looking at the third option, that is the “c” one.

The code for this apartment is:

LA3.c

In addition, each floor plan is characterized by letters indicating the function that each room has in that specific option, accompanied by a gray footprint of the services (kitchen and bathroom).




These letters are explained as follows:

- B** bathroom
- K** kitchen
- R** room (both bedroom and living or diningroom)

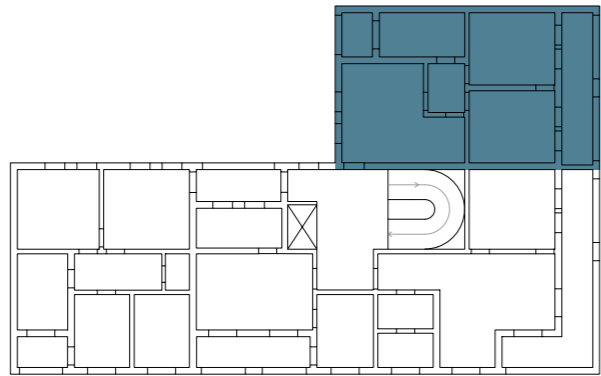
The succession of plans also represents the variation that exists between each of them, both functionally and compositionally. For this reason, the additions of walls have been highlighted for the transformation and/or subdivision of the rooms: small changes that can twist the composition of the plan.

The wall that is added in the next option is dashed; if instead we are in the option where the wall is added, then it will be highlighted in gray.

Apartment size range

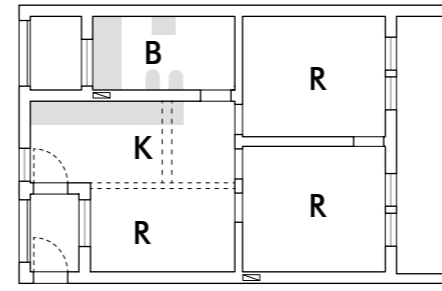
-  SMALL
40 > 30 sqm
-  MEDIUM
55 > 41 sqm
-  LARGE
70 > 56 sqm
-  EXTRA LARGE
81 > 71 sqm

APARTMENT LA

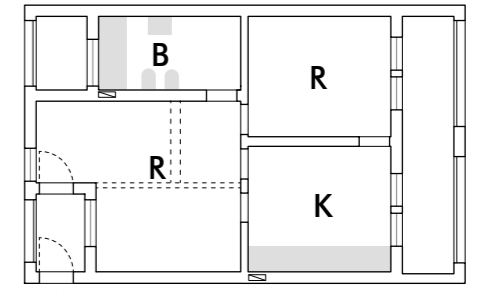


LARGE
70 > 56 sqm

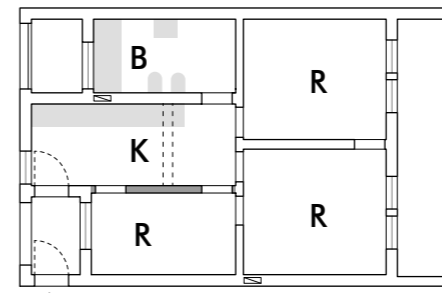
Apartment LA2 = 3R 1B 1K = 57 sqm + loggia 13,5 sqm



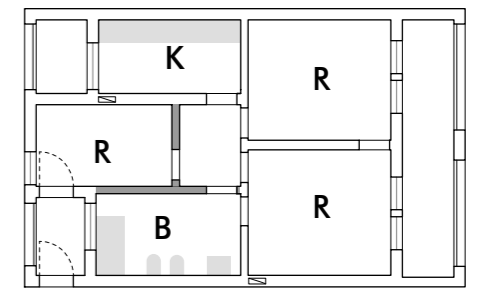
LA2.a



LA2.b



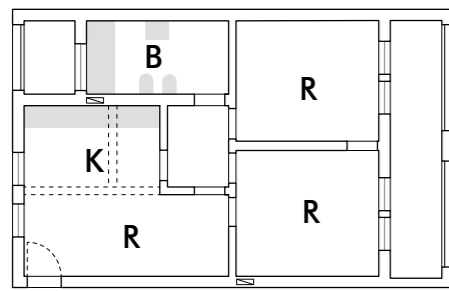
LA2.c



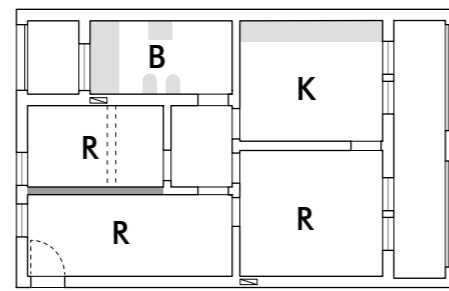
LA2.d

Apartment LA1 = 3R 1B 1K = 60 sqm + loggia 12,5 sqm

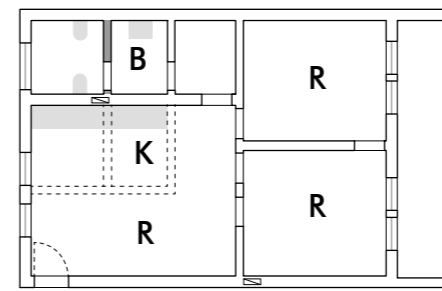
Apartment LA3 = 3R 1B 1K = 60 sqm + loggia 12,5 sqm



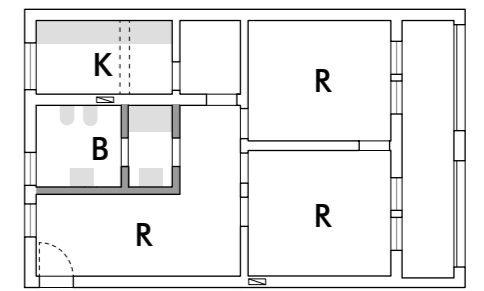
LA1.a



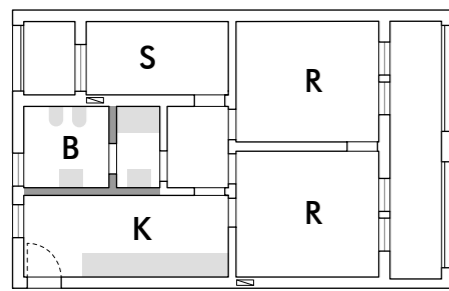
LA1.b



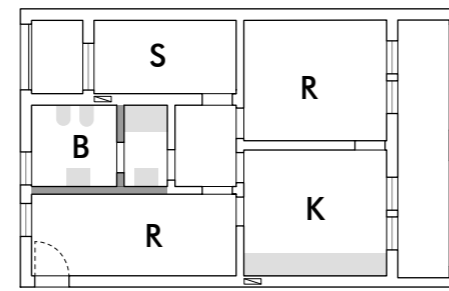
LA3.a



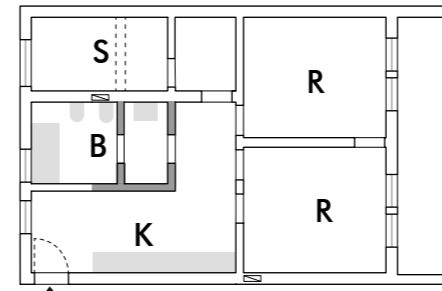
LA3.b



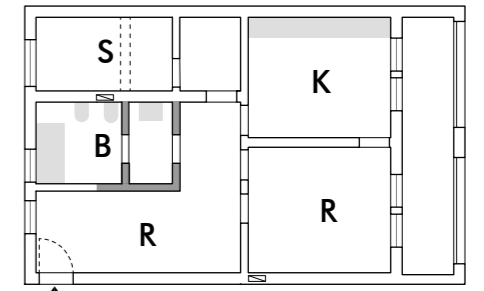
LA1.c



LA1.d

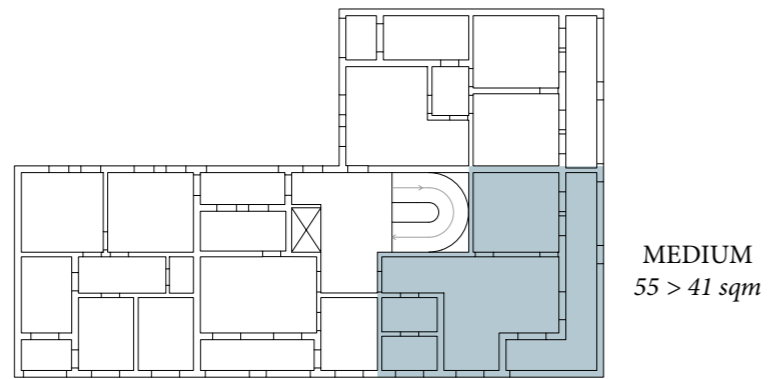


LA3.c

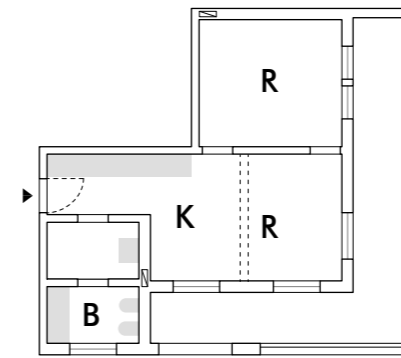


LA3.d

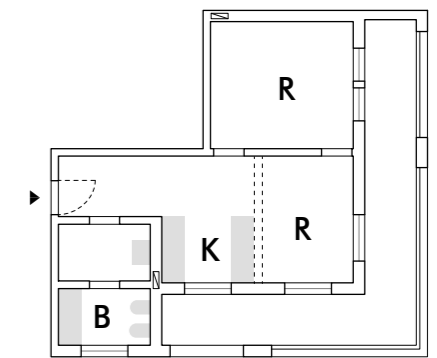
APARTMENT MB



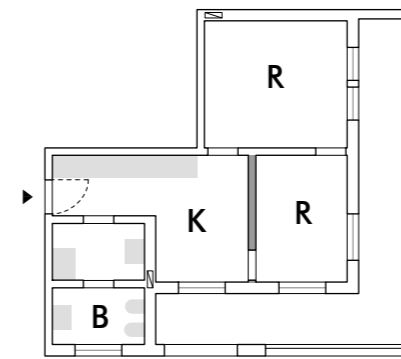
Apartment **MB2** = 2R 1B 1K = 44 sqm + loggia 19 sqm



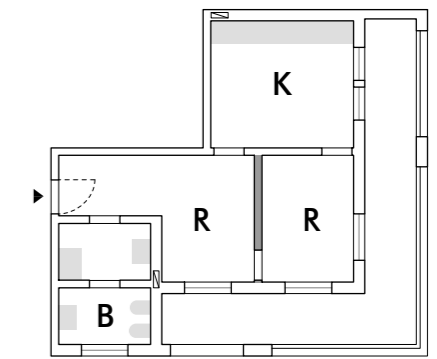
MB2.a



MB2.b



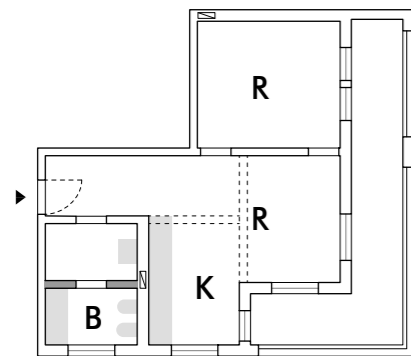
MB2.c



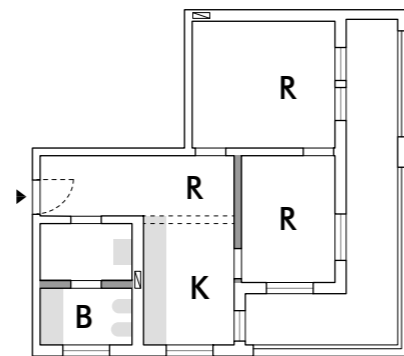
MB2.d

Apartment **MB1** = 2R 1B 1K = 48 sqm + loggia 15 sqm

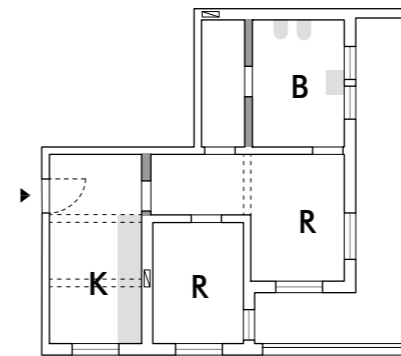
Apartment **MB3** = 2R 1B 1K = 48 sqm + loggia 15 sqm



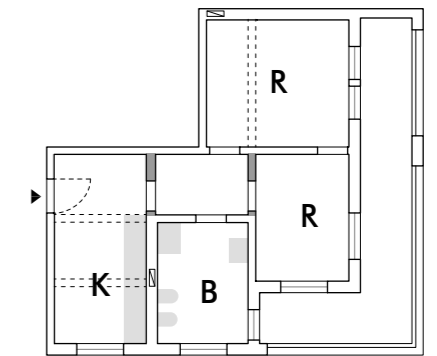
MB1.a



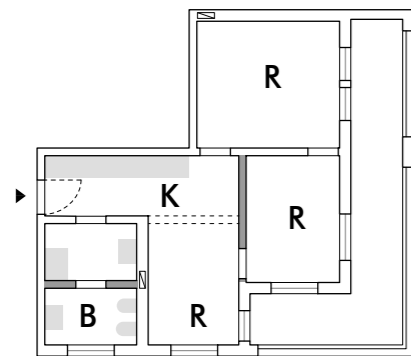
MB1.b



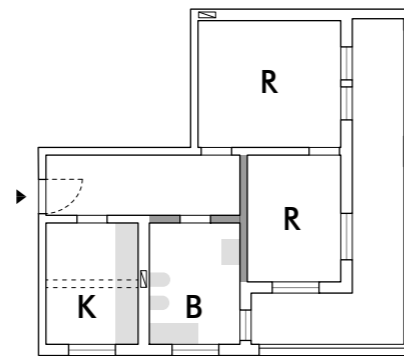
MB3.a



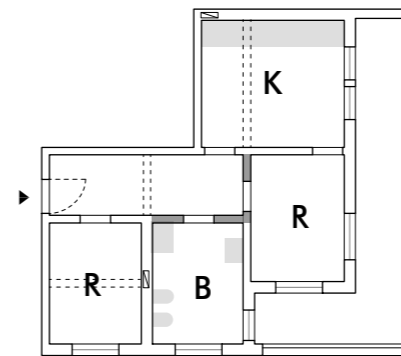
MB3.b



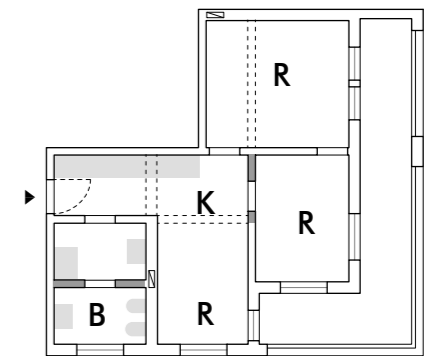
MB1.c



MB1.d

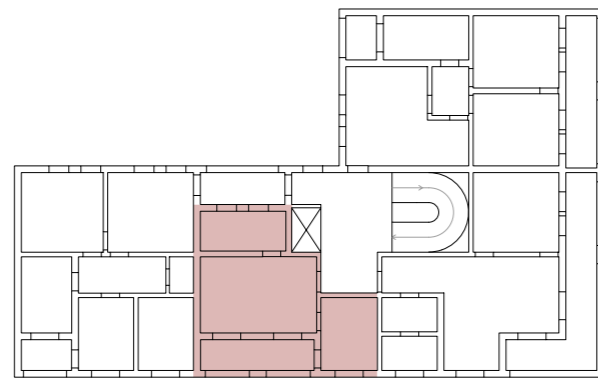


MB3.c



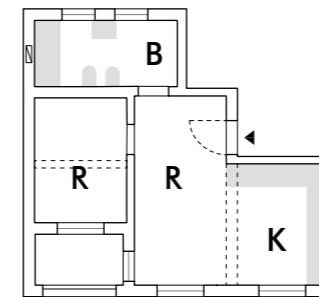
MB3.d

APARTMENT SC

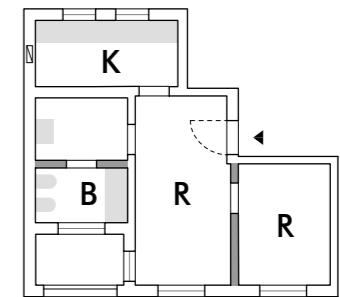


SMALL
40 > 30 sqm

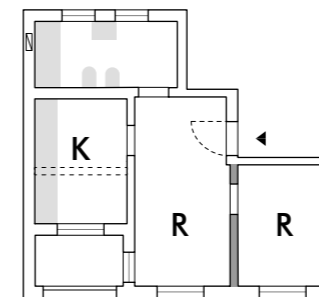
Apartment **SC2** = 2R 1B 1K = 37 sqm + loggia 3 sqm



SC2.a

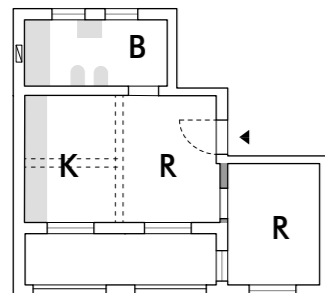


SC2.b

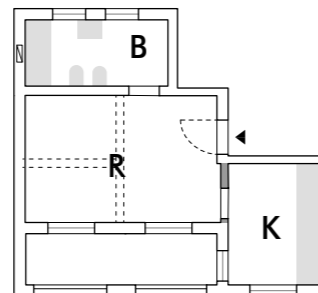


SC2.c

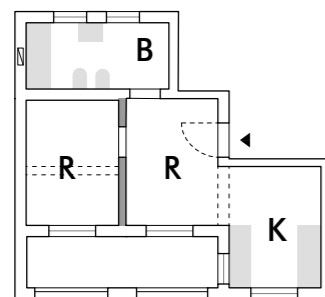
Apartment **SC1** = 2R 1B 1K = 33 sqm + loggia 7 sqm



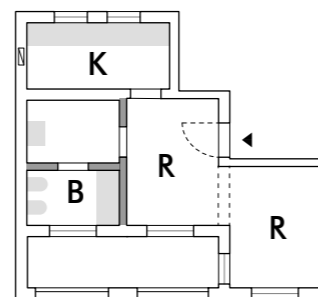
SC1.a



SC1.b

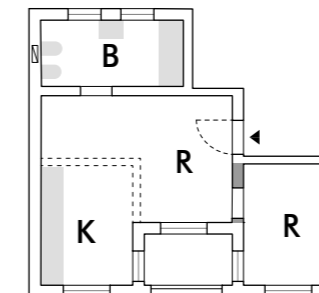


SC1.c

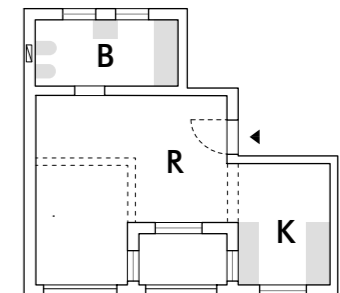


SC1.d

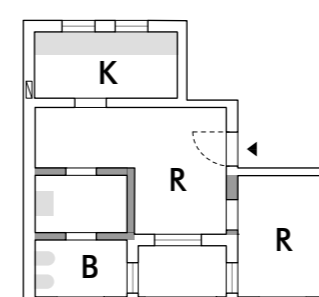
Apartment **SC3** = 2R 1B 1K = 37 sqm + loggia 3 sqm



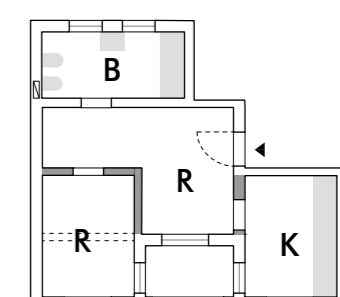
SC3.a



SC3.b



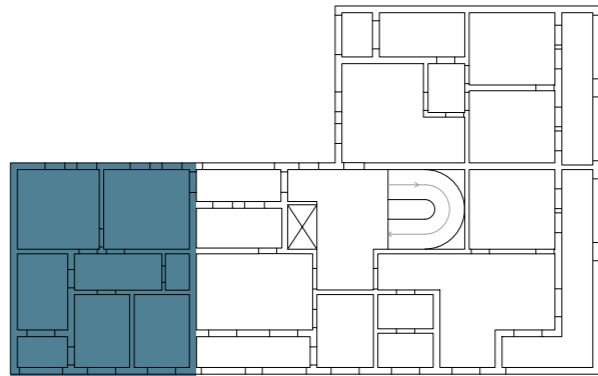
SC3.c



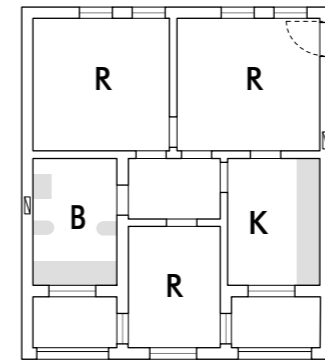
SC3.d

APARTMENT LD

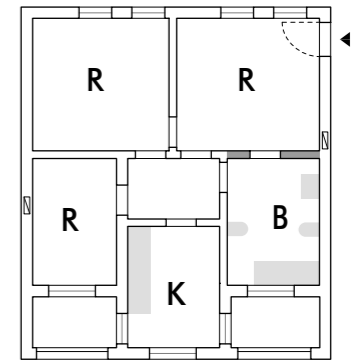
LARGE
70 > 56 sqm



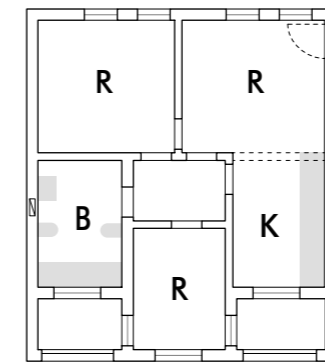
Apartment LD2 = 3R 1B 1K = 59 sqm + loggia 6 sqm



LD2.a

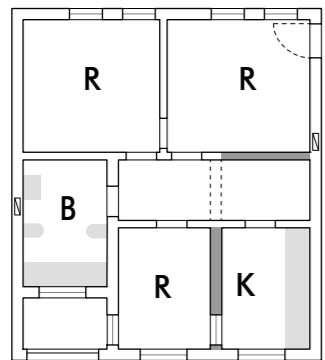


LD2.b

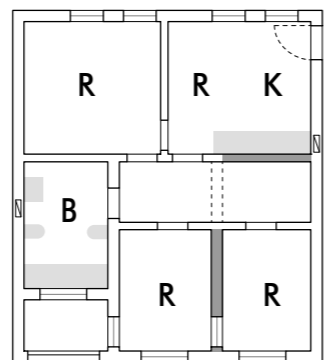


LD2.c

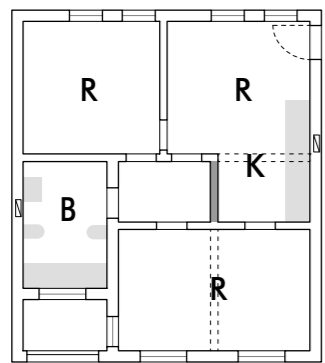
Apartment LD1 = 3R 1B 1K = 62 sqm + loggia 3 sqm



LD1.a

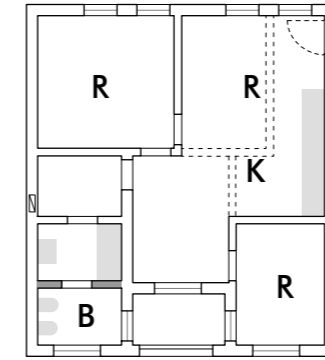


LD1.b

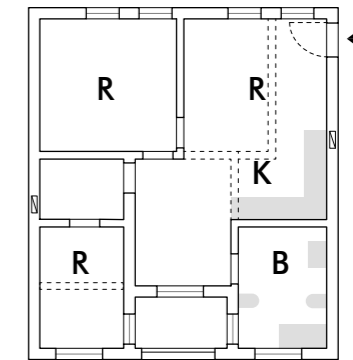


LD1.c

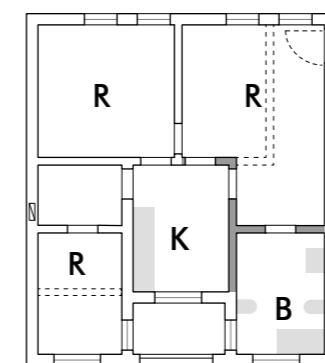
Apartment LD3 = 3R 1B 1K = 62 sqm + loggia 3 sqm



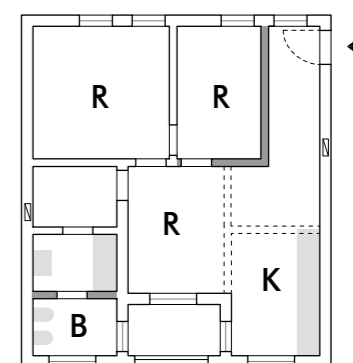
LD3.a



LD3.b

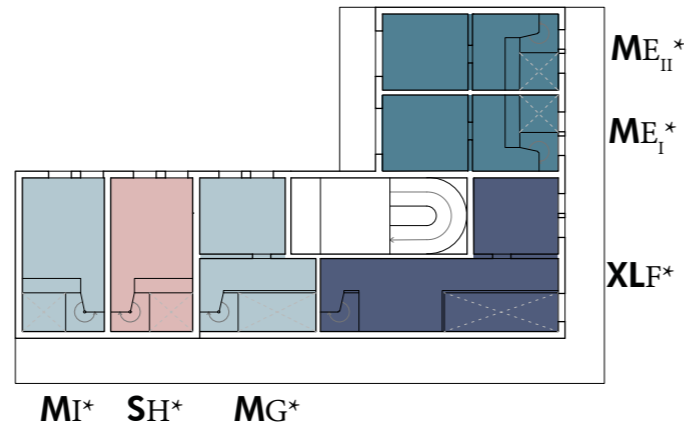
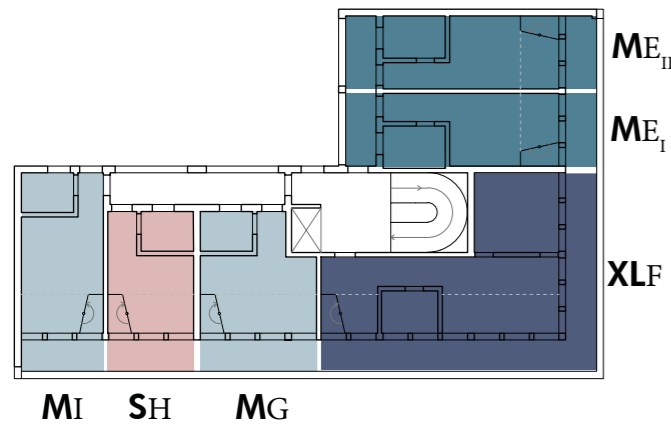


LD3.c



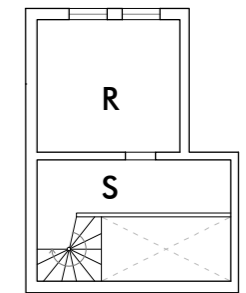
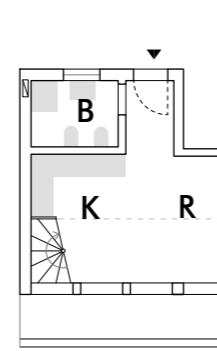
LD3.d

DUPLEX



Duplex **ME** = 2R 1B 1K 1S = 47 sqm + loggia 9 sqm

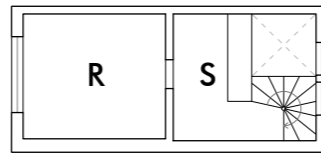
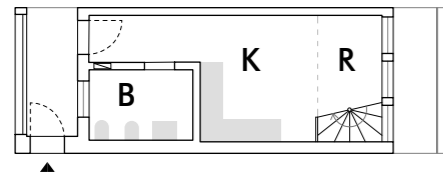
Duplex **MG** = 2R 1B 1K 1S = 47 sqm + loggia 7 sqm



MG

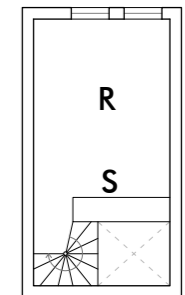
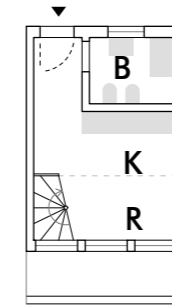
MG*

Duplex **SH** = 2R 1B 1K 1S = 40 sqm + loggia 5 sqm



ME1

ME1*

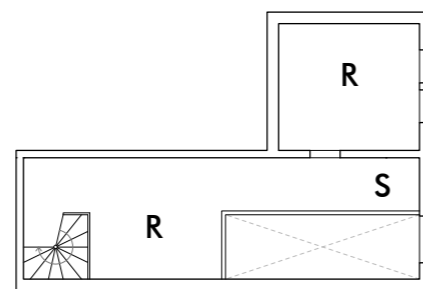
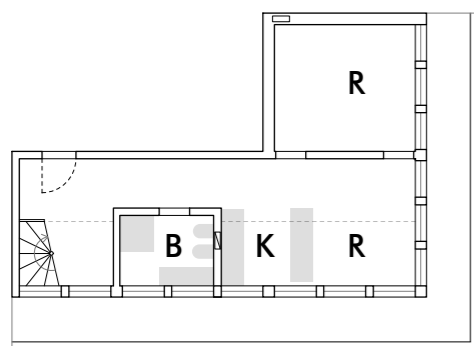


SH

SH*

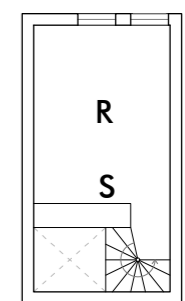
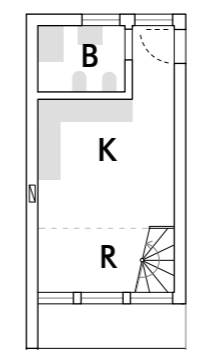
Duplex **XLF** = 4R 1B 1K 1S = 81 sqm + loggia 23 sqm

Duplex **MI** = 2R 1B 1K 1S = 45 sqm + loggia 5 sqm



XLF

XLF*



MI

MI*

ROOM AND USES

The mapping of the practices offers a clear perspective of what is the demand and what are the needs to provide.

Everything in this project is based on the idea of the **differentiation in size** of rooms, to offer the variety of usage of the same space in multiple manners.

The whole identification process of the right size for each type of room, starts from the restrictions imposed by the **PGT 2020** of the municipality of Milan, in order to offer the minimum indispensable for every functional use. Therefore, each room does not have a specific target from a functional and fruition point of view, but on the contrary, it provides a residential solution to the widest range of it.

Each housing unit is characterized by the aggregation of small, medium, large and extra small rooms, in which there is a big flexibility for what concerns the usages. In fact, the wet nucleus are located in strategic places, in order to provide dumping waste in a lot of different position. For this reason, there was placed one cavedium more than the number of apartments.

The rules imposed in the PGT are the following:

- A single person needs minimum **28 sqm.**
- A couple needs minimum **38 sqm.**
- Three people need minimum **14 sqm** each (in total 42 sqm).
- Four people need minimum **14 sqm** each (in total 56 sqm).

Moreover, there are limitations also in the minimum dimensions of the rooms with a specific function:

- Bathroom **3,5 sqm**
- Kitchen **5 sqm**
- Studyroom **7 sqm**
- A single bedroom **8 sqm**
- A double bedroom **11 sqm**
- Livingroom **14 sqm**

It is important to underline that in the planning process these minimums have been carefully taken into account, for a matter of housing quality of the environments. The dimensional hierarchy has therefore made it possible to offer more combinations, respecting the minimum aggregations, the square meters necessary for good living and the addition of extra comfort.

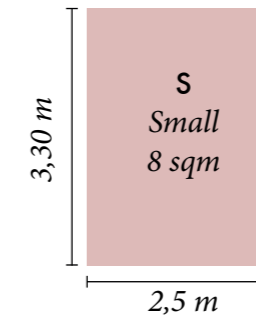
Taking into account all these considerations, the following pages present the totality of the functional variables possible within the rooms differing in size.

The Small room, S is 8 sqm, and its dimensions are 3,30 m per 2,5 m. In this dimension is possible to place a single bedroom with a bed and a wardrobe; a big bathroom with a lot of different configuration (it is also possible to put an antebathroom); a living kitchen with a table and a study room or a small office.

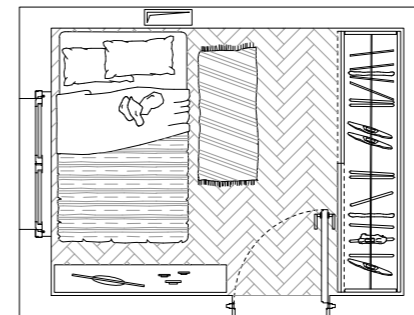
The room Medium, M is 14 sqm large 3,5 and wide 3,60 m. If a small room is a 1/3 of the total length of an apartment, the medium one is 2/3, (its length is one small and a half). It is bigger enough to have a big couple bedroom with a wardrobe and a desk; a livingroom; a double bedroom with two different beds or a bunk bed; a study room with a desk and a small livingroom; and a kitchen.

The room large, L is 17 sqm and it is exactly the double of the smaller one. The functions that occur in this typology of room are multiple. It is possible to have a kitchen and a livingroom together; a bedroom with two or three separate beds also divided by a library; a couple bedroom with a baby cot; a livingroom and in the end a professional studio, i.e. a place in which during the day it is possible to do a day care or a phsicology study room that during the evening becomes a normal livingroom.

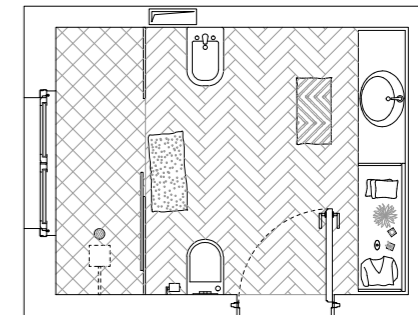
The mapping of the functions allows us to become aware of the potential that the whole plan has, as well as the individual cells. It is important to explore these possibilities so that it is possible to check whether each individual option is actually valid.



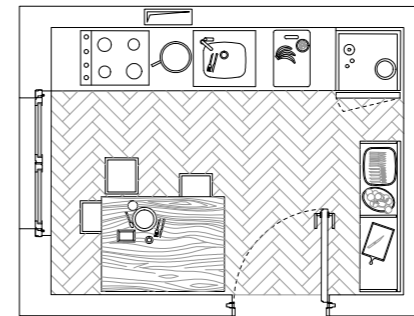
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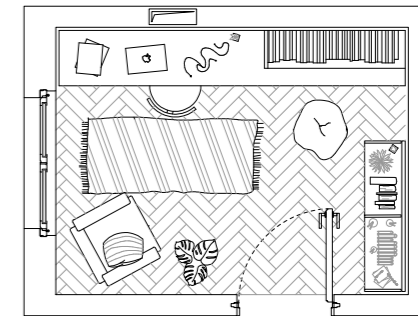
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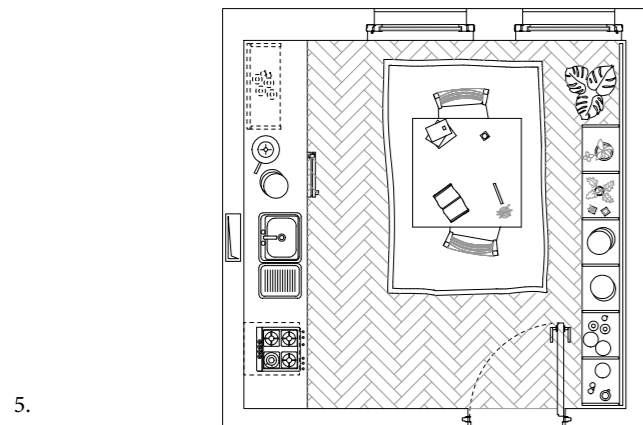
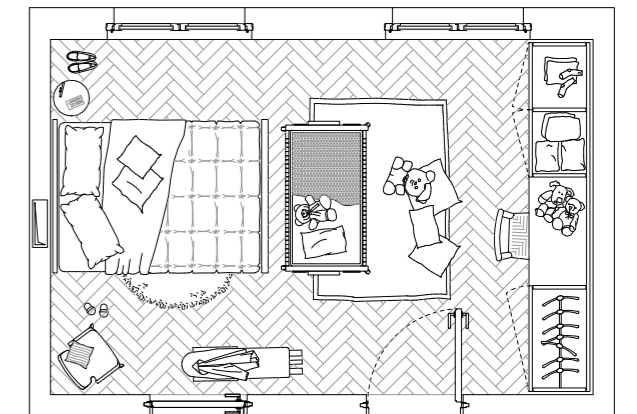
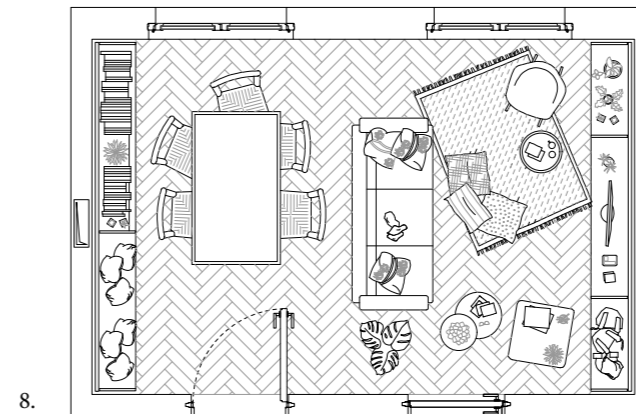
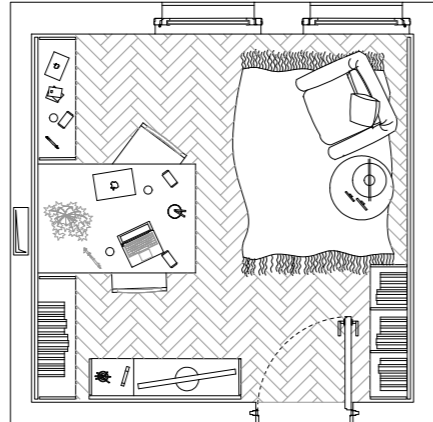
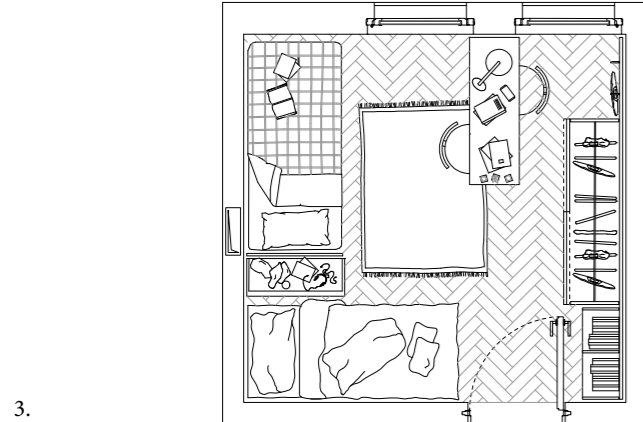
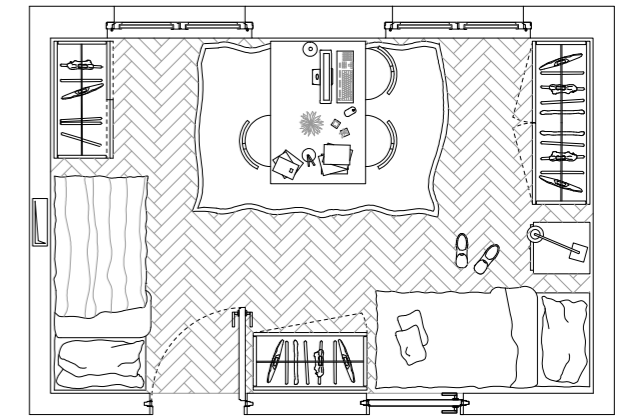
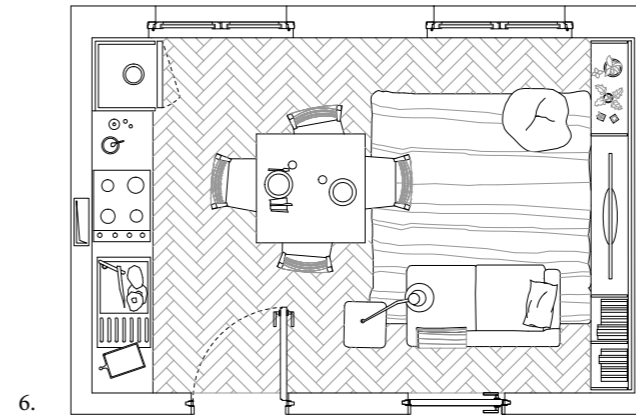
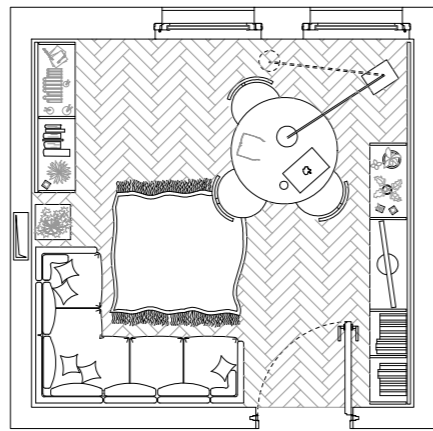
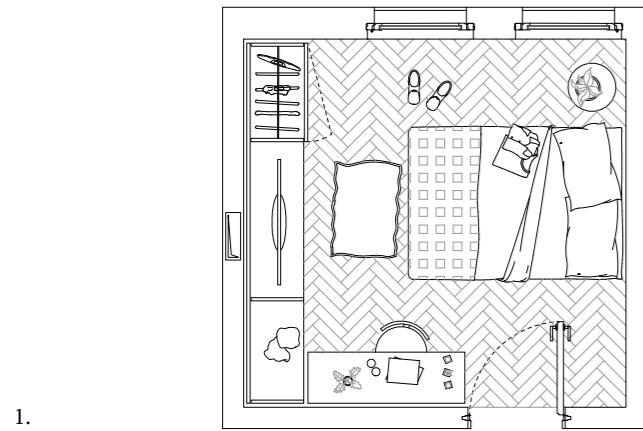
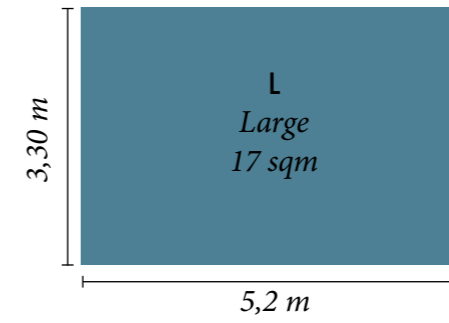
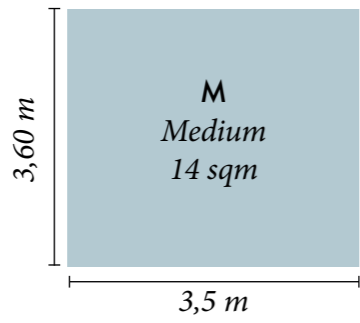
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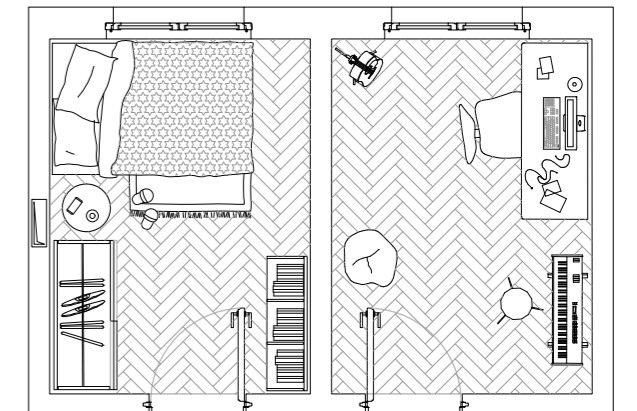
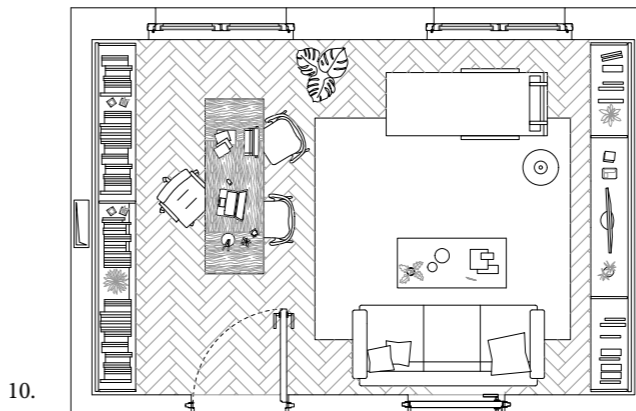
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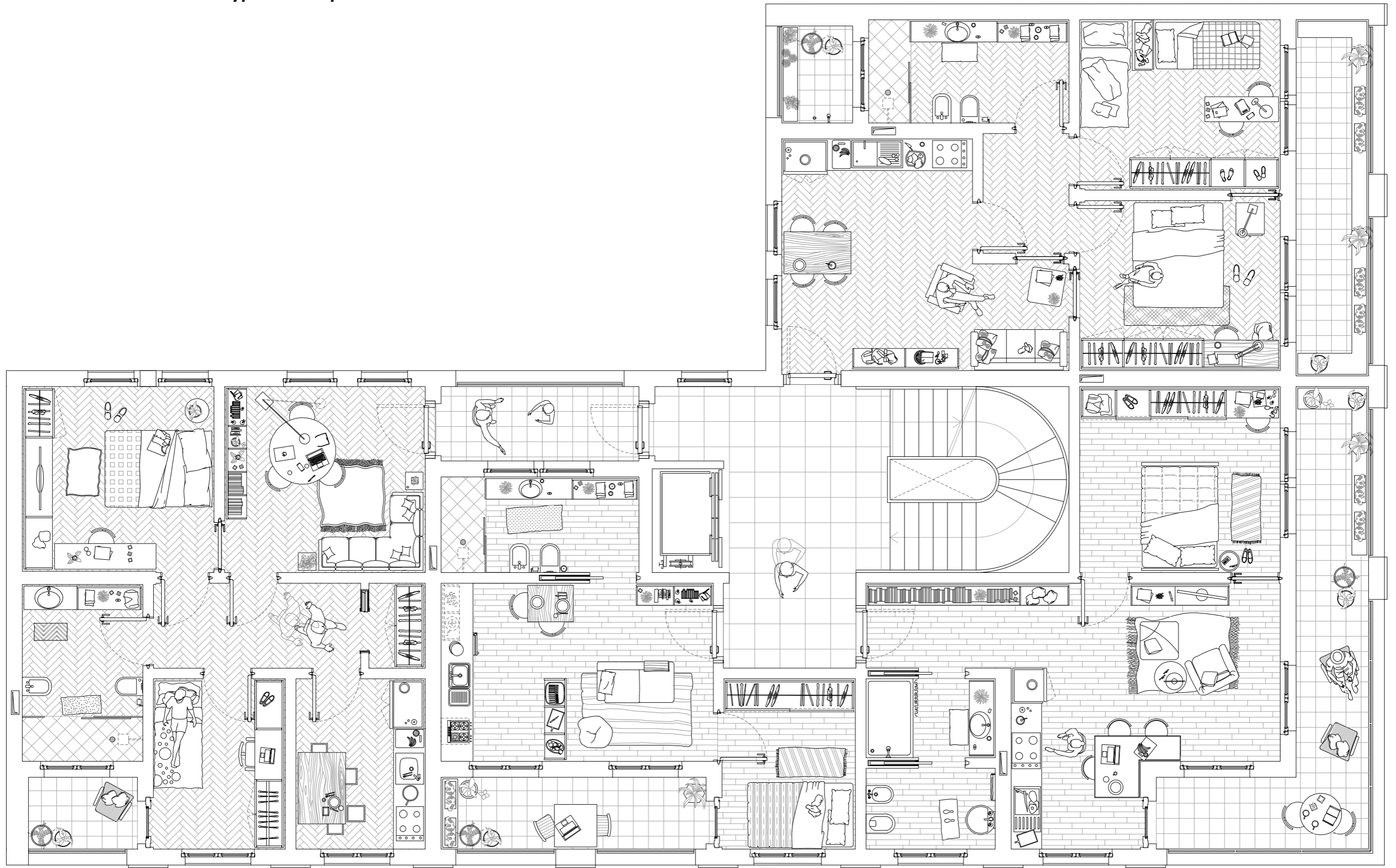
- 1. Couple bedroom.
- 2. Bathroom.
- 3. Kitchen.
- 4. Study room.



- 1. Couple bedroom.
- 2. Living room.
- 3. Double bedroom.
- 4. Study room.
- 5. Kitchen.
- 6. Kitchen + Living room.
- 7. Double bedroom.
- 8. Living room.
- 9. Couple bedroom + plus.
- 10. Study room.
- 11. Study room + bedroom.



Typical floor plan



MAPPING PRACTICES

The first volume of this thesis work shows the research about the actual living practices as consequence of the sociological and economical changes of the new century and at the same time, a necessity of a new housing policies. In order to understand deeply the phenomenon and have a wide view of the reality of these practices, in this paragraph are introduced different kind of people in different living situations.

The mapping produced a real panoramic of what is the living situation today and how different the housing realities are, confirmed what was emerging in the literature: there still are traditional families, but there are also people from different generations and not blood related who lives together. Important is also to notice that in the social housing panorama, the demand of a dwelling is so diversified that it is fundamental to achieve a flexibility during the lifetime of a family and the passage of an apartment from one dweller to another.

To better understand the necessities of the different ways of living, all the typologies of dwellers were classified in a groups do to the similarity of their conditions. The cases reported are taken from a research made in Politecnico of Milan from the international class of Thematic Design Studio in 2018; the bachelor students were guided by the professors Massimo Bricocoli, Rodrigo Pemjean Munoz and Gennaro Postiglione. The studio was called “**Re.Co.De 2018**” and the final purpose was to convert a traditional Milanese apartment building in shared living apartments; the users were chosen by the un-conventional families mapped during the studio, with the aim of studying the relationship between these people and their household. The housing typologies defined are the following:

- *Single adult*: composed by people living alone. This category includes people who for personal reason or external forces are living alone, they can be students, workers or retired people.
- *Adult plus one*: composed by two person who lives together as a temporary or long-term solution and often blood-related or connected by familiar relationship, for example a single mother with her child, or a grandmother and her grandson, or an old person with a caregiver;
- *Adult(s) and adult(s)*: made by two single adult person who decided to live together as a permanent decision, not blood related-and with an independent life;
- *Couple*: composed by a couple without children;
- *Couple with a plus*: composed by a couple without children who decided to host another person (family related or not) as a long-term solution, or temporary;
- *Family of three or four people*: composed by the traditional family situation with a couple and their sons;
- *Family plus adult*: made by an adult that decides to live with their parents all his/her life.

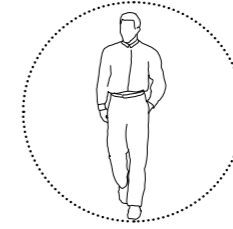
This mapping wants only to understand the different type of living that nowadays we have to take into consideration for the new project, because all the houses designed years ago for the typical traditional family are not suitable for them anymore.

The social and familiar changes require new kind of apartments, characterized by a layout that can be adaptable for any changes in life due to work, studies, familiar and economic reasons. Starting from the following questions “What profiles of inhabitants can be accomodated? What are their conditions and needs? How to provide them with appropriate adn affordable hosuing solutions? How to transform existing structures in order to respond to unmet need?”.

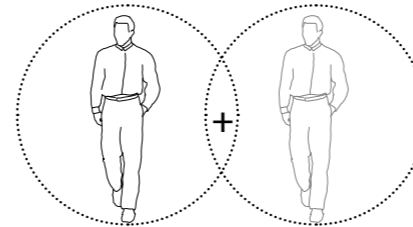
For this reason, we need to give an answer to these questions, proposing a project of new homes for different profiles. In this way we have designed three big group of apartments, according to the dimensions of each, to better answer to the differenciation of living demand.

Type of dwellers

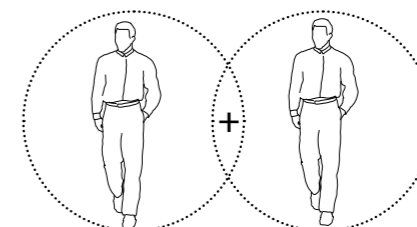
Single adult



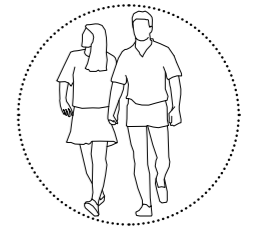
Adult + a plus



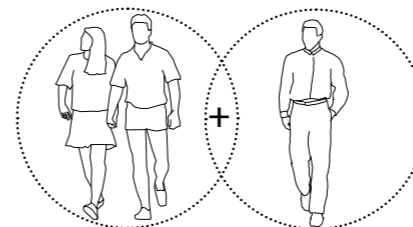
Adult(s) + Adult(s)



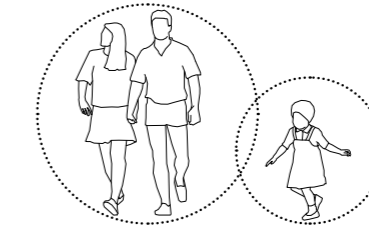
Couple



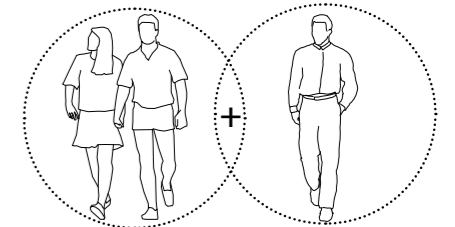
Couple + a plus



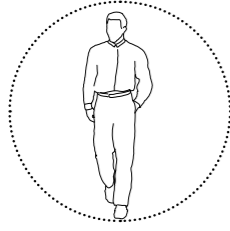
Traditional family



Family + a plus



Single adult

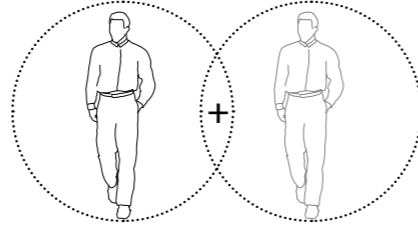


The category includes people who for personal reason or external forces are living alone; they can be students, workers or retired people.

Students don't always have a high budget for their own home, but a small, well-designed apartment can provide them with great accommodation for studying and hosting friends.

Workers may have apartments that are too small for host their sons or they may have apartments that are not suitable in terms of their habits. The retired people on the contrary, are obliged to live in their life house which is generally too big for they needs.

Single adult + a plus



This category consists in single adult people living together.

They may be blood related, siblings, mother and adult son or grandmother and nephew; but they can also be strangers.

Some of this people, are forced to have guest, like the elderly: obligate by the family or by their physical condition, they need the assistant of a caregiver who lives with them. It can also include conditions like a grandmother living with her nephew: reasons may be different but the choice of living with a member of the family help the members to support and take company of each other.

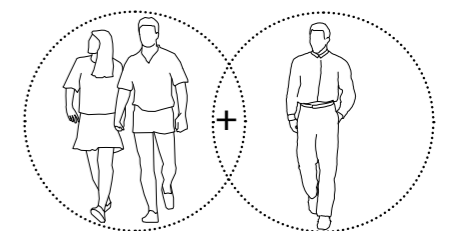
Couple



The category includes couples in a relationship without children.

They share the same room and all the spaces can be calibrated according to their needs. They can live in small apartments if they don't spend a lot of time indoors, or they can share bigger apartment if they needs more space.

Couple + a plus

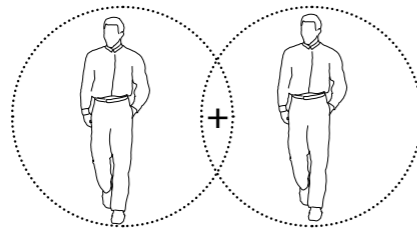


The category contains a couple without children that host another person in their households.

We may find grandparents who host their little nephew or a caregiver, but also couples who host a friend of a family member. In the most cases the presence of an adult can be solved given them a personal room.

The solution is generally temporary, when the adult will be able to find an accommodation for himself or find a convenient solution of living the co habitation can be over.

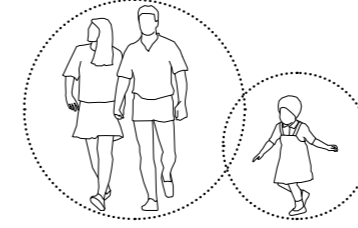
Adult(s) + Adult(s)



The category contains single independent adults that decide to live together. In most of the case they are not blood-related, but they can be blood-related as well, like brothers and sister or parent and adult son.

The difference with the category Adults with a plus is that in this case the members of the households have an independent life one to another; moreover, they are living together as a common and definitive decision, while in the other case members may not have an independent life from one another and they may be forced to live together.

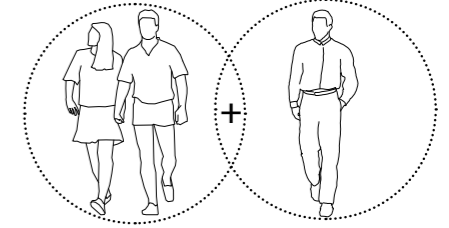
Traditional family



The category includes households composed by parents with children.

The needs to be met for this type of tenants are very simple, as it is the traditional family. Large and accommodating rooms for three or four people, with varying levels of privacy. In particular, the living and dining area must be able to accommodate all family members at the same time and the children's rooms must also have study spaces that allow them to study comfortably.

Family + a plus



This typology is composed by families who are hosting single adults.

In this case we can have multiple and different situations: a family who is hosting young workers, students or elderly. The adults may be blood related or not, in this case the person can be a friend or a stranger who is living in the house for a specific period and for a specific reason. The adult can be also a student, in exchange with some programme related to the biological children of the family, or a student that requires a room to stay. The family who are hosting these people can be composed by a married (or not) couple with children or a single parent with children.

APARTMENT FLEXIBILITY

Zero-Type is a social housing project based on the search for a new typological flexibility, aimed at building resilience.

Starting from a proportionally sized modular grid, the project used an efficient “a priori” method to achieve typological flexibility.

The grid offers, in fact, a dimensional and functional variety, able to fulfill and respond to all the transformations of use made by users.

Different ranges of apartments have been created and studied, composed of different room cuts, calibrated in such a way as to satisfy all the basic living functions.

Particularly emblematic was the choice of positioning the vertical connections: the core of the lift is located inside the two rooms M, and is composed of a large architectural staircase and an elevator.

For the design of the plans, a compositional criterion has been studied that can be flexible, capable of responding to the different needs of the inhabitants and a hypothetical reorganization of the rooms in order to create an efficient distribution system between the rooms.

Each floor of the building is treated in a different way, in order to provide multiple situations, with different arrangements of XS, S and L. In this way it is possible to verify the effectiveness and flexibility of each floor plan.

The building also offers a variety of apartment types. In fact, starting from the study of the composition of the nineteenth-century buildings, in which the last two floors were treated differently, both in plan and in the facade, the project creates a diversification in the typology of the internal apartments.

In fact, the top two floors are made up of duplex apartments, where flexibility is also found in verticality, as internal stairs have been provided, capable of connecting the two floors of the house.

Flexibility, transformability and dynamism of spaces are the three terms that can be considered the guidelines of our reflections.

In order to provide an adequate response to the new needs of the inhabitants, it was necessary to rethink both the functional, typological and distributive organization of the spaces.

At the base of our reflection was the theme of the private space of the house.

The house itself is an expression of social organization, its being a minimal housing unit in the urban organization reflects the interrelationships between the individual and the community, while its internal organization expresses the interpersonal relationships of the individual members of the family.

The architect, in the formal and distributive organization of the residence, must take into account both the functional needs, to which it must respond, and the deep links between the biological and psychological needs of the individuals and groups that use it.

Each apartment is able to respond to changes in the weather.

Time has been studied both from a daily point of view and from a long-term point of view, foreseeing changes in the family unit, or in the needs of users.

Typological transformation Apartment A

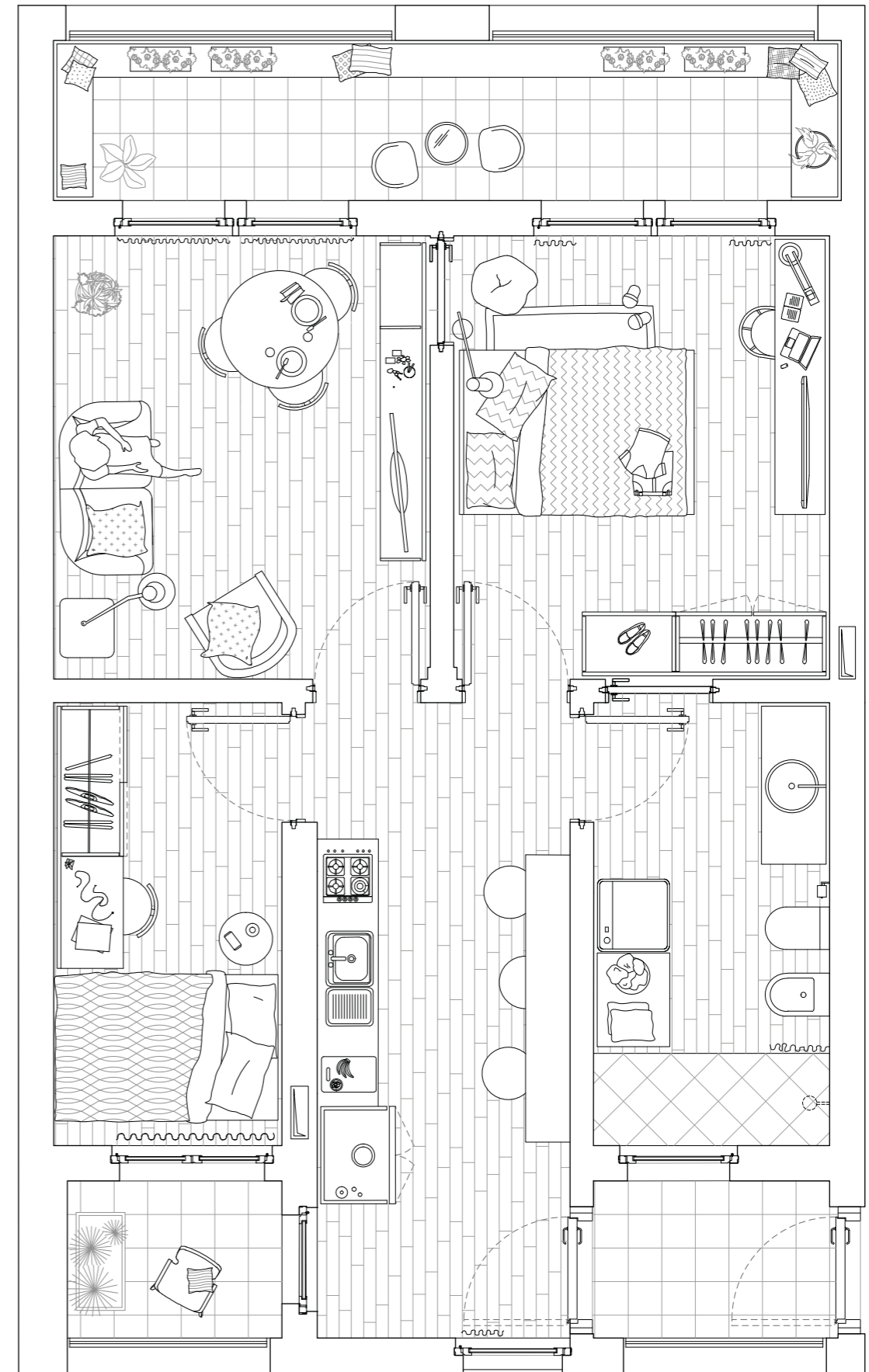
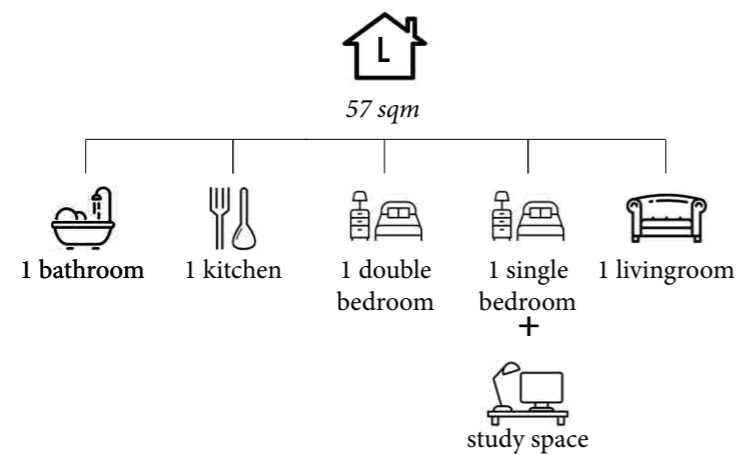
Family + a plus

Antonella , Antonio , Guglielmo
Pensioner , Pensioner , Accountant
83 years old , 84 years old , 40 years old



Antonio and Antonella have been married for thirty years. After living in the suburbs, they decided to move to the center of Milan in a small house, but with a large terrace.

They have a son, Guglielmo. Guglielmo is an accountant, and after a failed marriage he moved to his parents' house. Guglielmo works outside, and comes home only to sleep. He only needs a desk for when he has to work at night. Parents, being elderly, do not need large spaces: a living area reduced to the essentials, but spacious bedrooms.



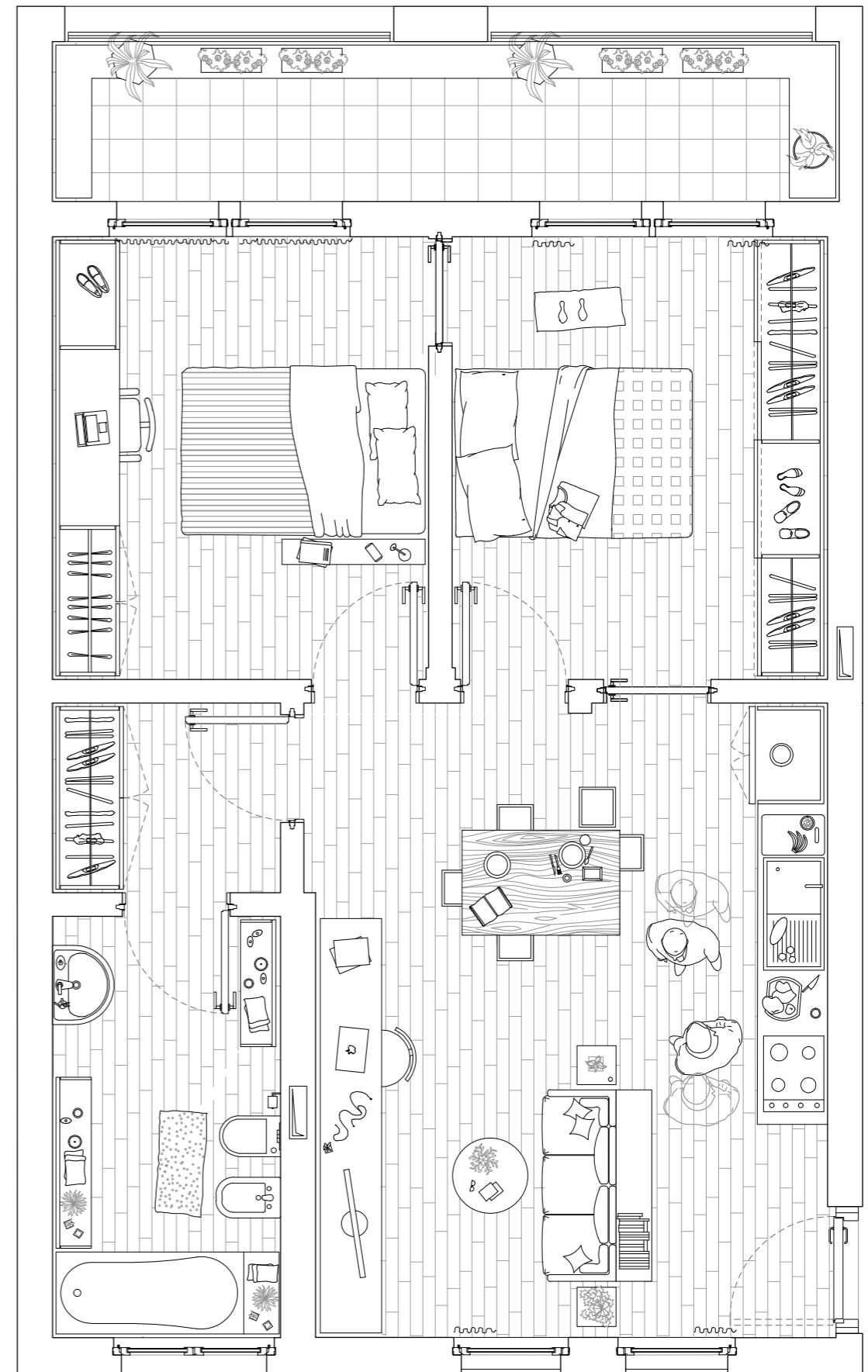
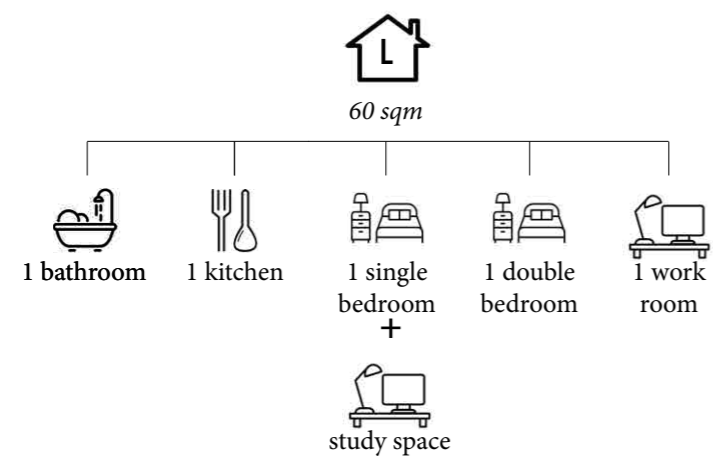
Apartment A

Couple + a plus

Marina , Giuseppe , Jennifer
Teacher , Architect , Erasmus Student
 31 years old , 33 years old , 21 years old



Marina and Giuseppe have been engaged since high school. She is a teacher in an elementary school, he is an architect. Having both reduced the stipends, they decided to share the rent with another person. Thus, Jennifer, a young Spanish student, came to Italy for an Erasmus exchange. Having separate lives, they don't need common spaces. The kitchen is reduced to the essentials, as all the tenants spend little time indoors and often dine out. Only Giuseppe has his own studio, as he often works in smart working from home.



Apartment A

Traditional Family

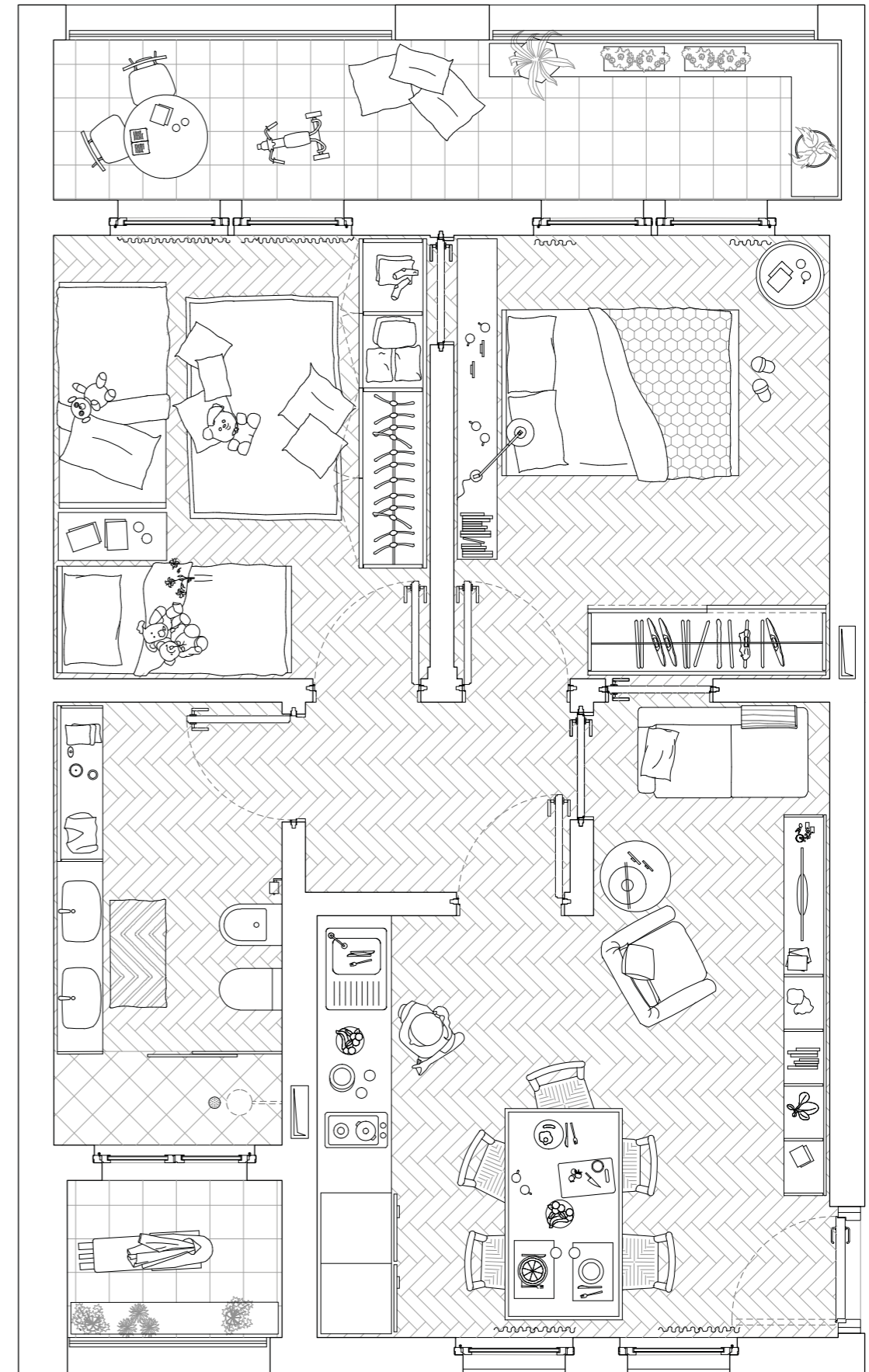
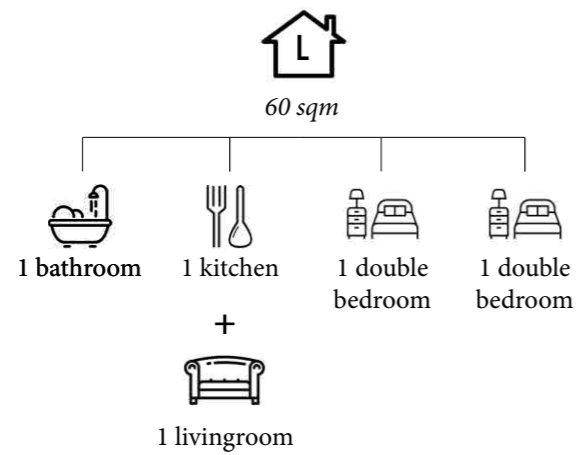
Paolo , Cristina , Alessandro , Federica
Doctor , Housewife , two children
43 years old , 35 years old , 3-5 years old



Paolo and Cristina have two separate lives. He is a doctor, and spends little time at home because he has very busy shifts. She is a housewife and loves spending time with their children, Alessandro and Federica.

Being still children, they need large common areas to play, and a large table to color. They love being outdoors, on a small table to be able to do their homework.

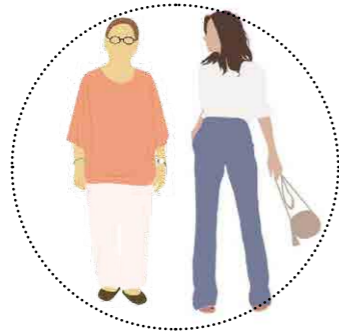
Cristina is very afraid that they will get hurt, so she decided to minimize dangerous spaces, hence the kitchen stove.



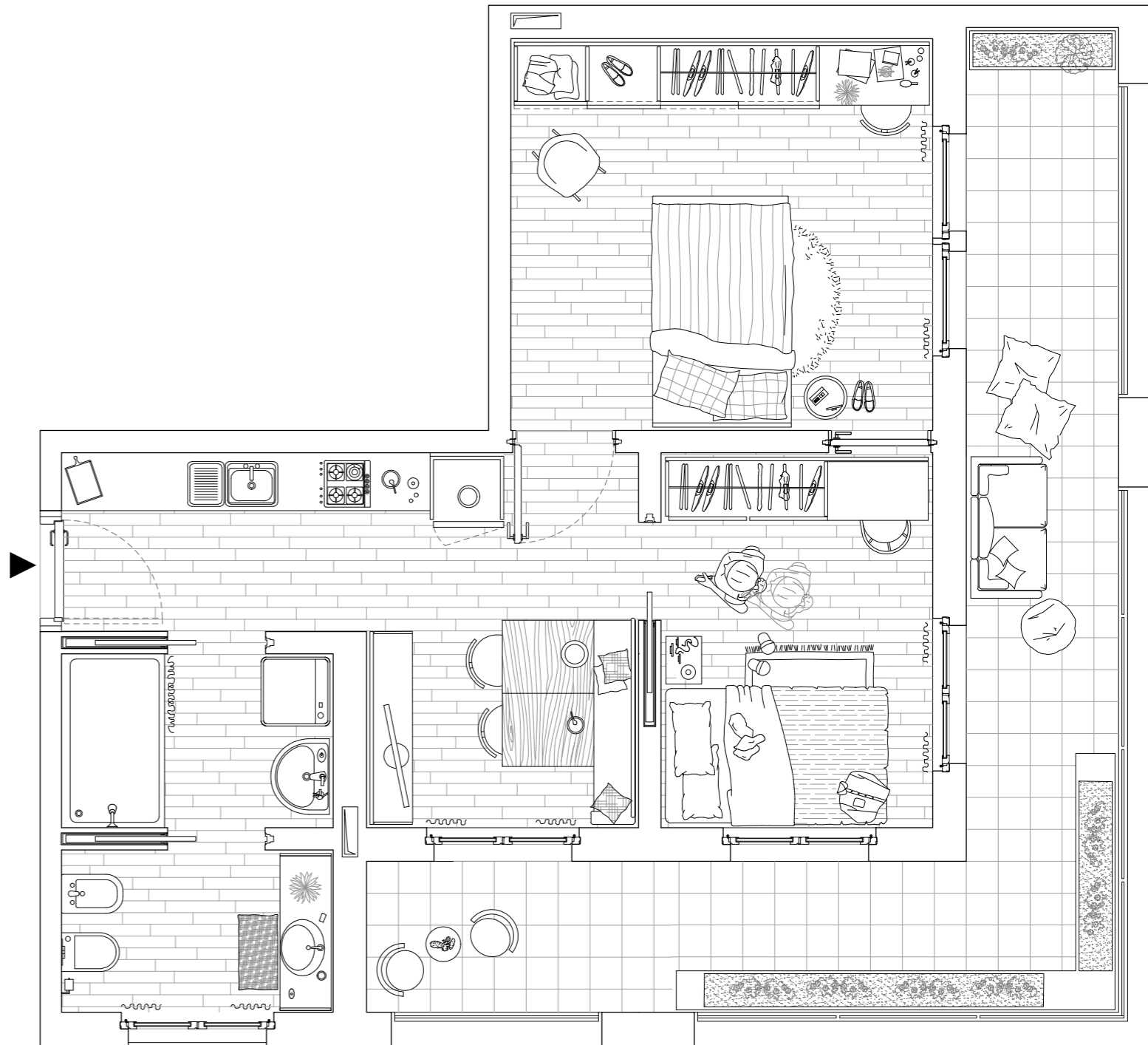
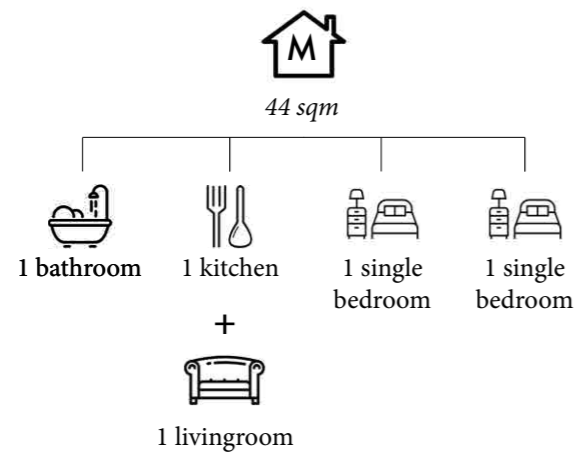
Apartment B

Adult + a plus

Franca , Silvia
Pensioner , Merchant
70 years old , 35 years old



Franca has been living in Milan for many years, and after a long divorce from her ex-husband, she decided to move into a house with a large terrace and a large bedroom, where she loves lounging and watching soap operas. She is never alone, because she hosts her niece Silvia. Silvia is a merchant and is often in Milan for work. Unlike her grandmother, Silvia doesn't spend much time at home, but when she comes back late in the evening she loves to sit at the table and tell her grandmother all the events of the day.



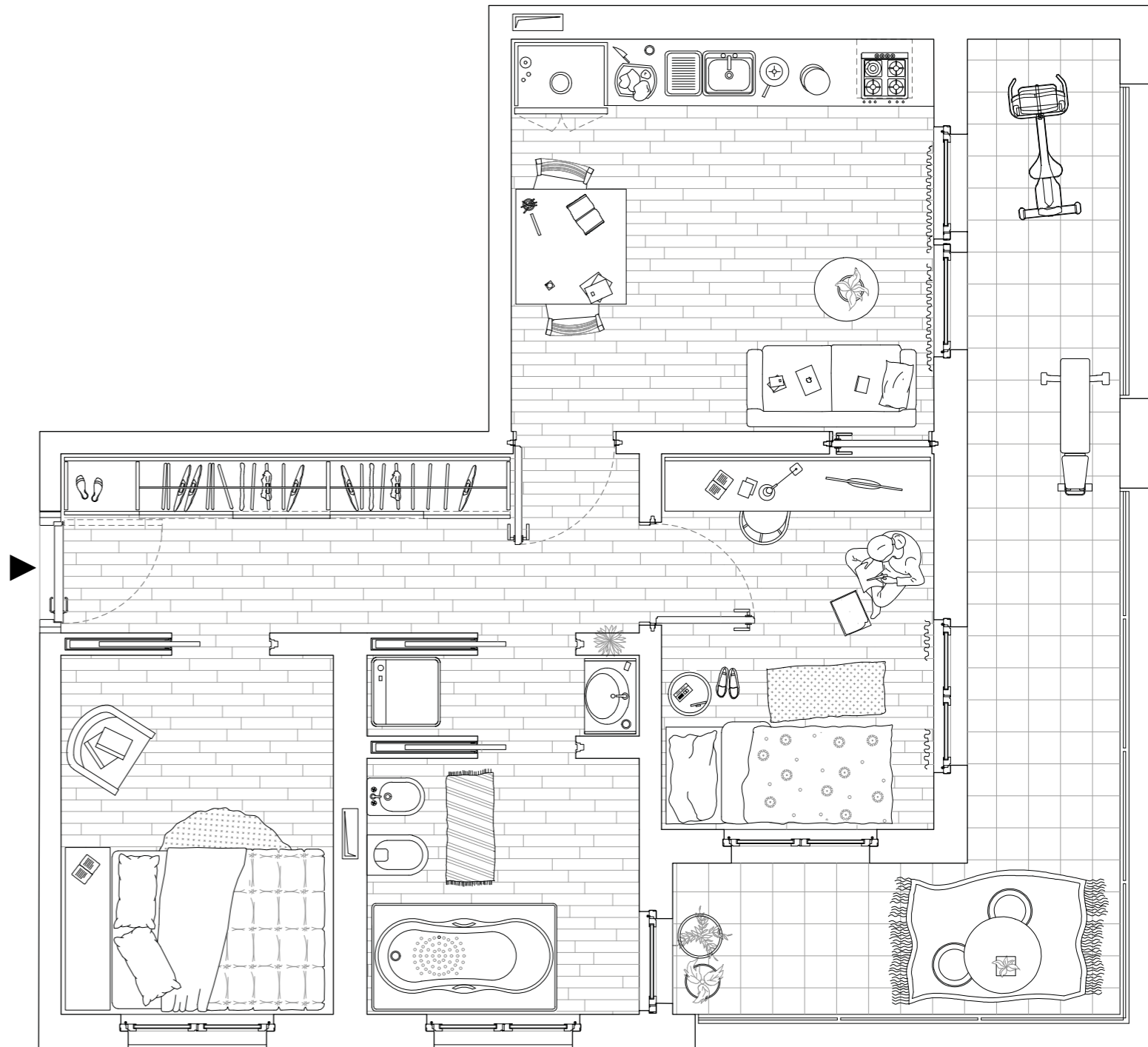
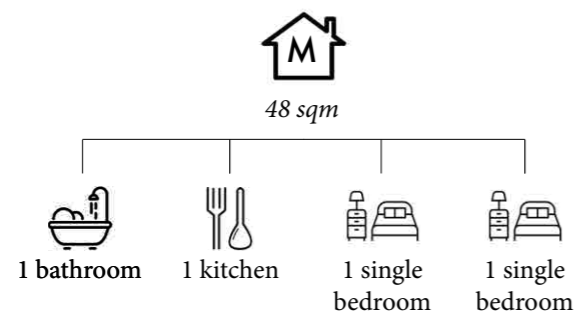
Apartment B

Adult + a plus

Caterina , Marta
Secretary , Personal trainer
50 years old , 27 years old



Caterina had her child Marta at the young age of 23. She had to change his whole life for her: she quickly found a job as a secretary and moved to a new home, suited to their needs. They don't need large spaces: they don't need a common area, and they need a basic kitchen, as they don't have much time to cook. Marta works in a gym, and at home she wanted to have a space to carry out her exercises in the open air, and a table to welcome her friends.



Apartment B

Single Adult

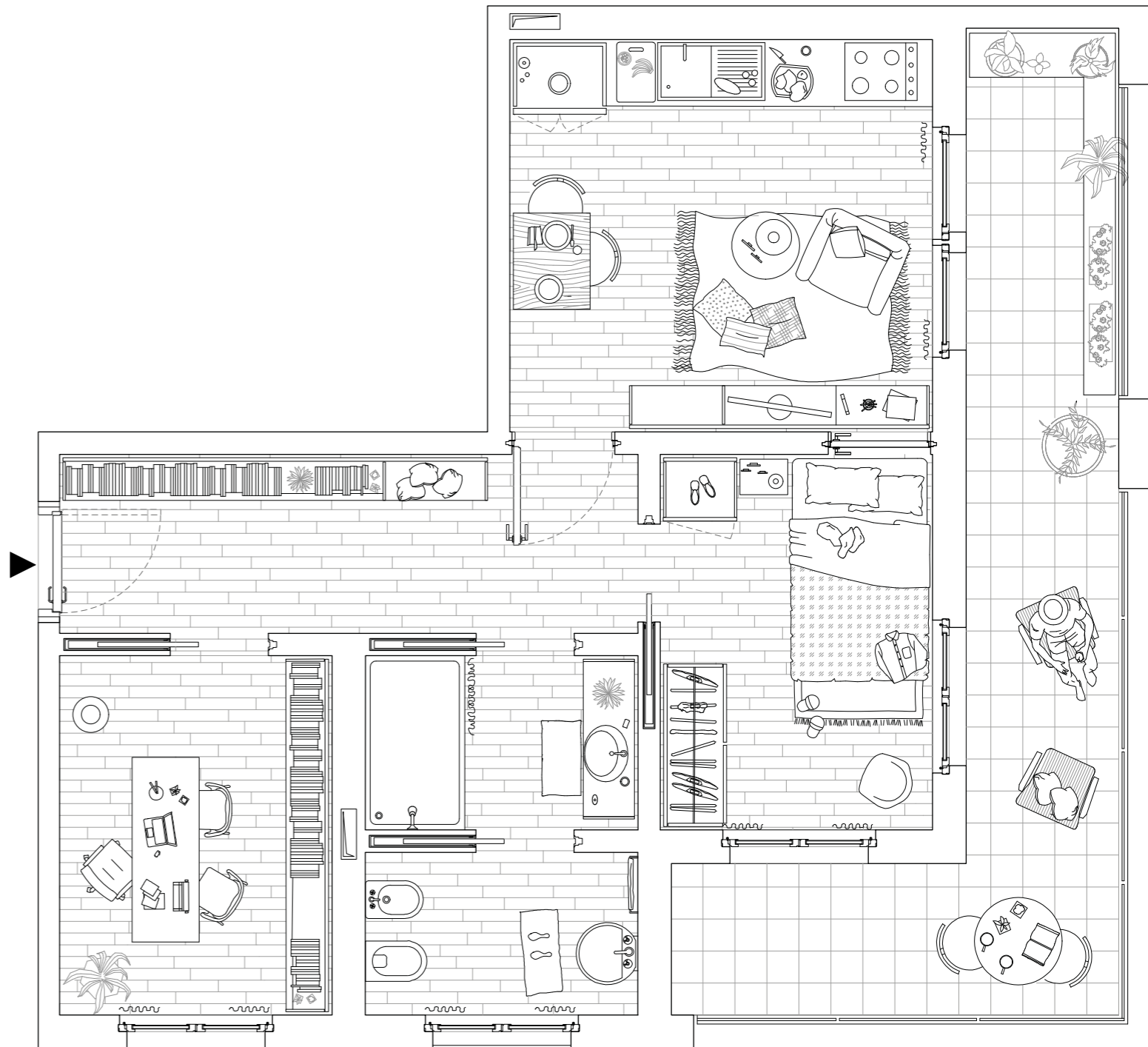
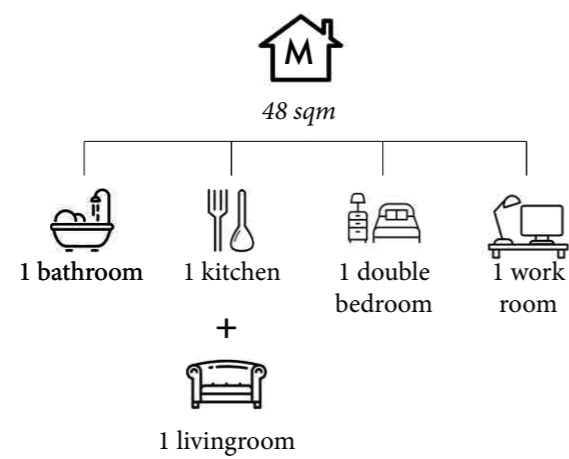
Goffredo
Lawyer
45 years old



Goffredo is a young lawyer who has decided to transform his house into his studio. The home for him is also a working environment, and for this reason he has decided to dedicate a room to welcome his customers.

His house is divided into two parts: an area dedicated to work, near the main entrance; and a private area, near the large terrace.

In his free time, Goffredo likes to welcome friends in his large living room, to be able to spend time together and enjoy dinner or a good movie.



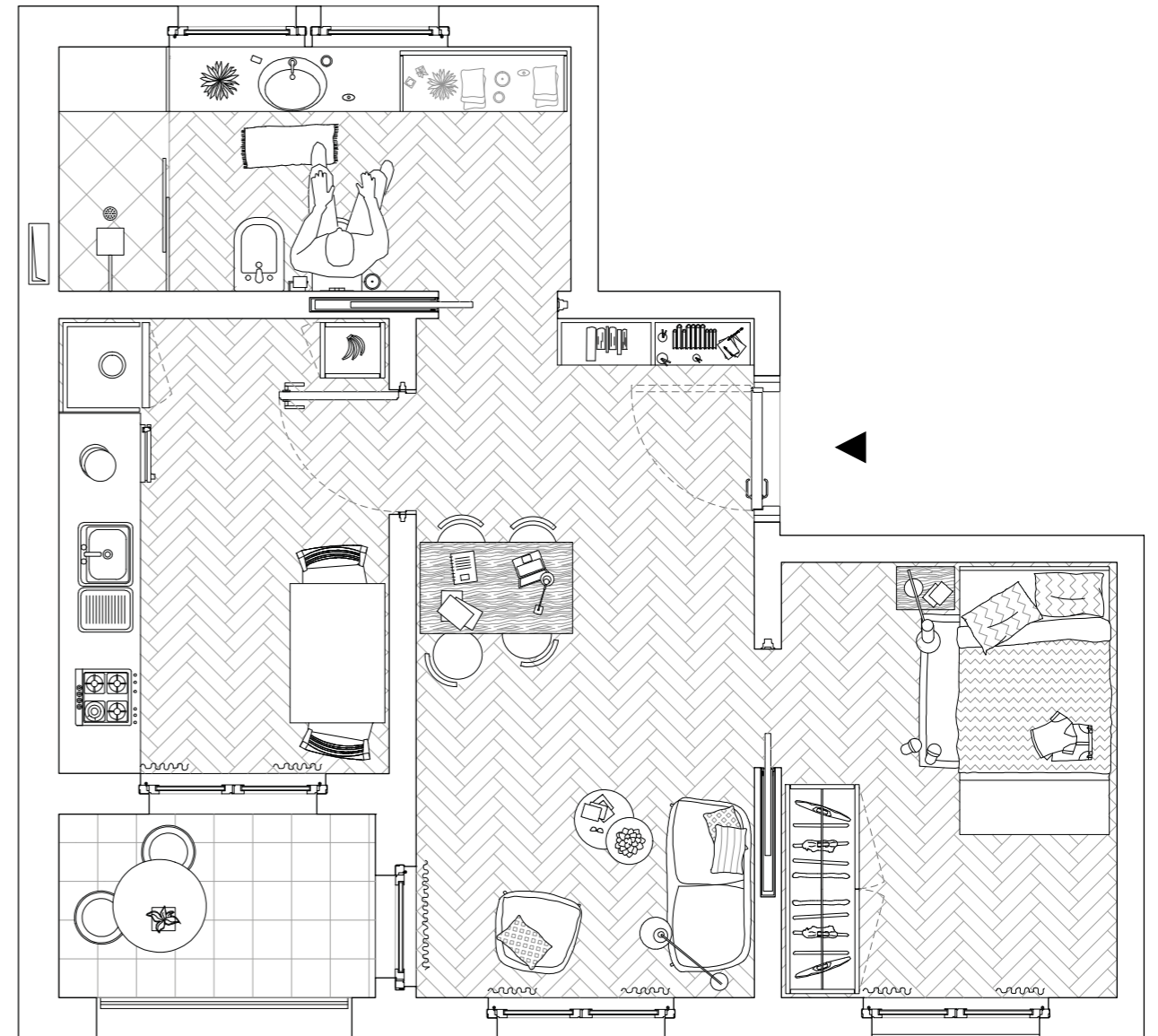
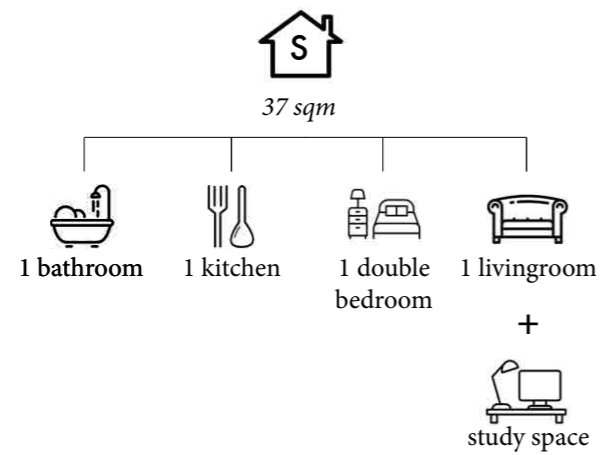
Apartment C

Single Adult

Martino
Student
23 years old



Martino moved to Milan to study. After living with other roommates, he decided to move alone into a house that suited his needs. He often invites his college colleagues to study, and they stay until the evening to be able to spend time together on the sofa or eat together. Martino was born in Puglia, and often receives food from his parents, which he loves to cook and let his guests taste.



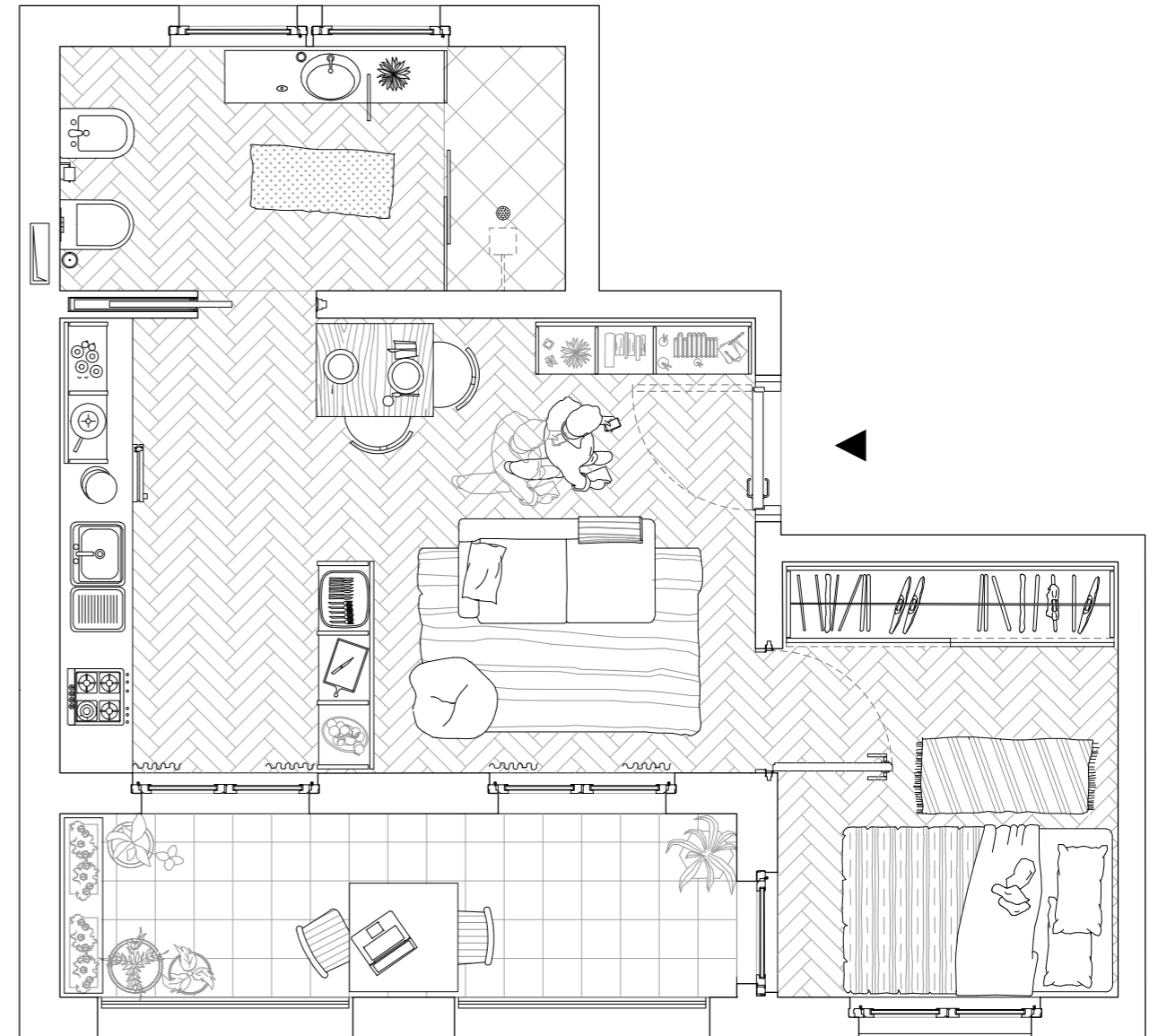
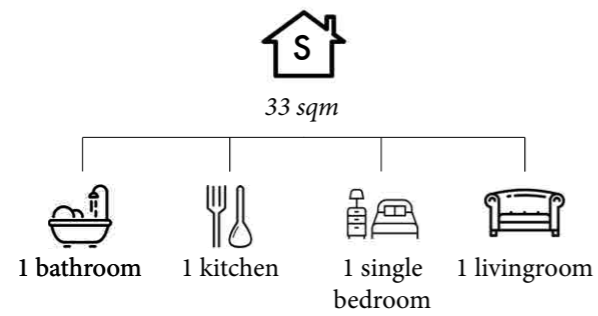
Apartment C

Single Adult

Rafael
Employee
40 years old



Rafael works in a Milanese company that deals with foreign exchanges. He recently moved to Milan, and in his home he had only one desire: a large wardrobe capable of holding all his clothes. He doesn't spend much time at home, but his girlfriend Claudia often comes to visit him. Claudia lives in another city and when she comes to Milan she loves being on the sofa with Rafael and enjoying the view over the city.



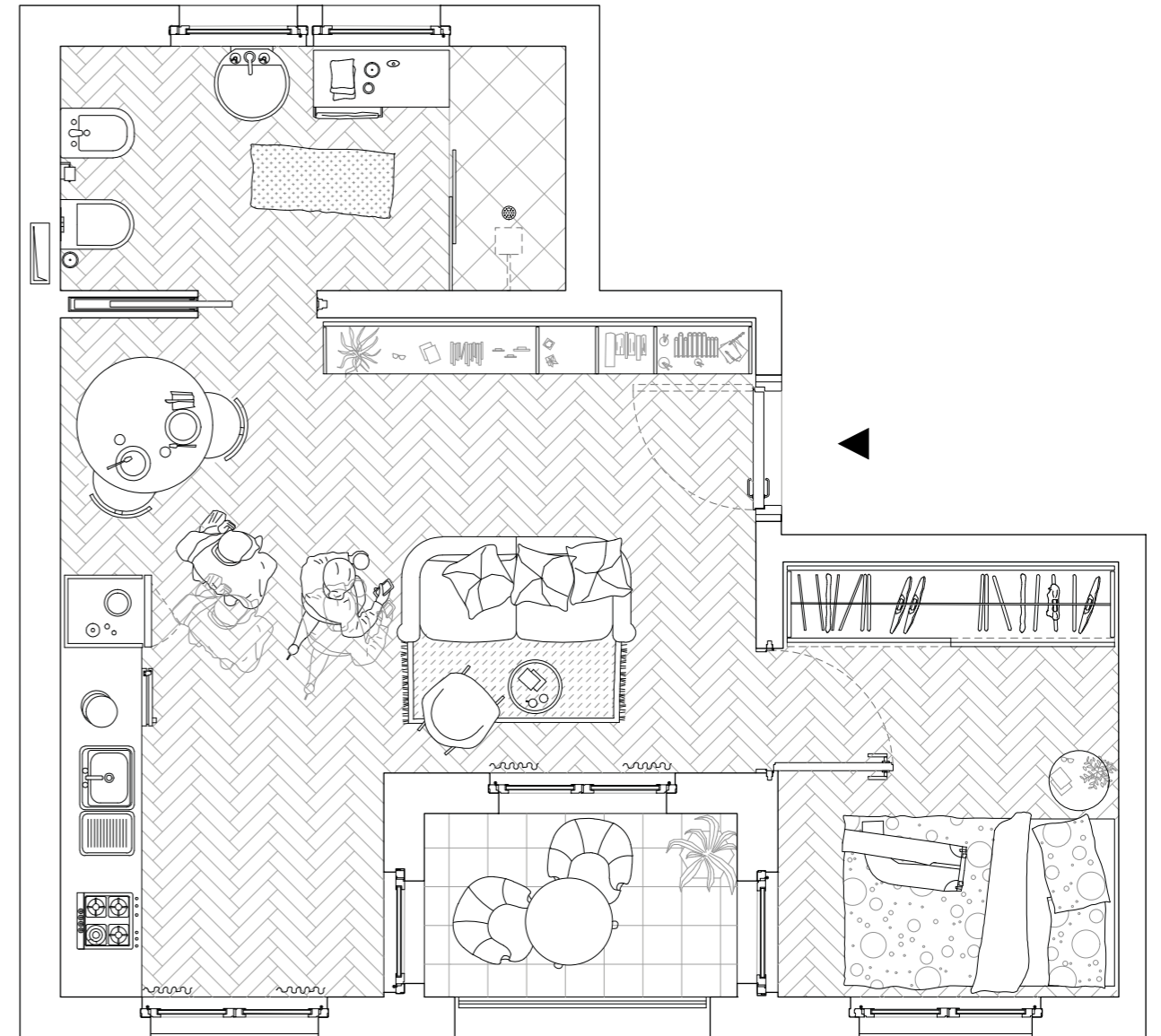
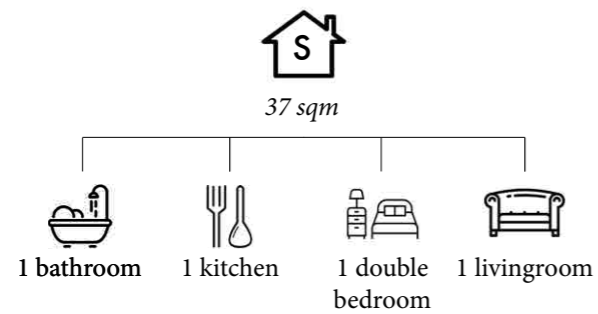
Apartment C

Couple

Miranda , Federico
Hairdresser , Accountant
53 years old , 51 years old



Miranda and Federico are a couple who are expecting their first child. In fact, Miranda is a hairdresser, and has spent a lot of time at home since she got pregnant. Federico is an accountant who works out of town, and often does not return home as he has to stay out of business for work. They wanted a small house, with a small outdoor space to enjoy the outdoors, and a small living room to welcome friends or family.



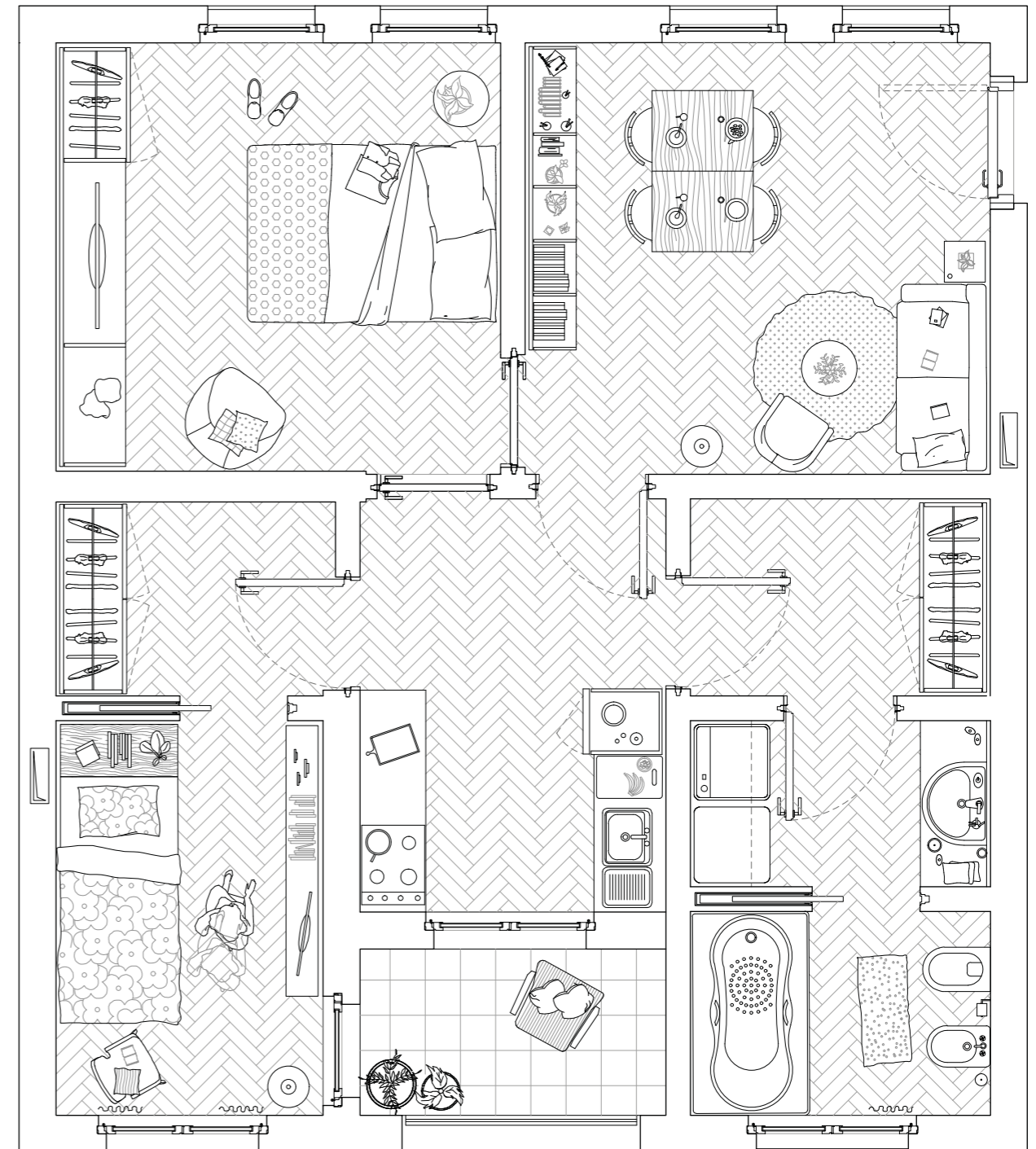
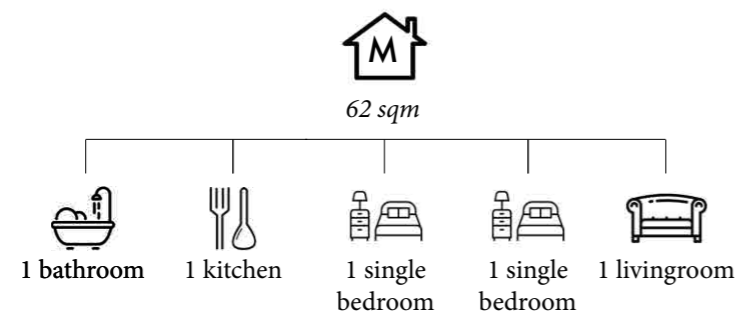
Apartment D

Adults + a plus

Maria Augusta , Anna
Pensioner , Caregiver
87 years old , 25 years old



Maria Augusta is an elderly lady who was married to Joseph. After her husband died, she moved to a new home. Having children who live outside the city, she needed help and good company. She decided to host Anna, a young foreign girl who came to Italy looking for a new job. Anna likes to talk and make other people feel good. They need a home suitable for an elderly lady who can help Maria Augusta to walk safely.



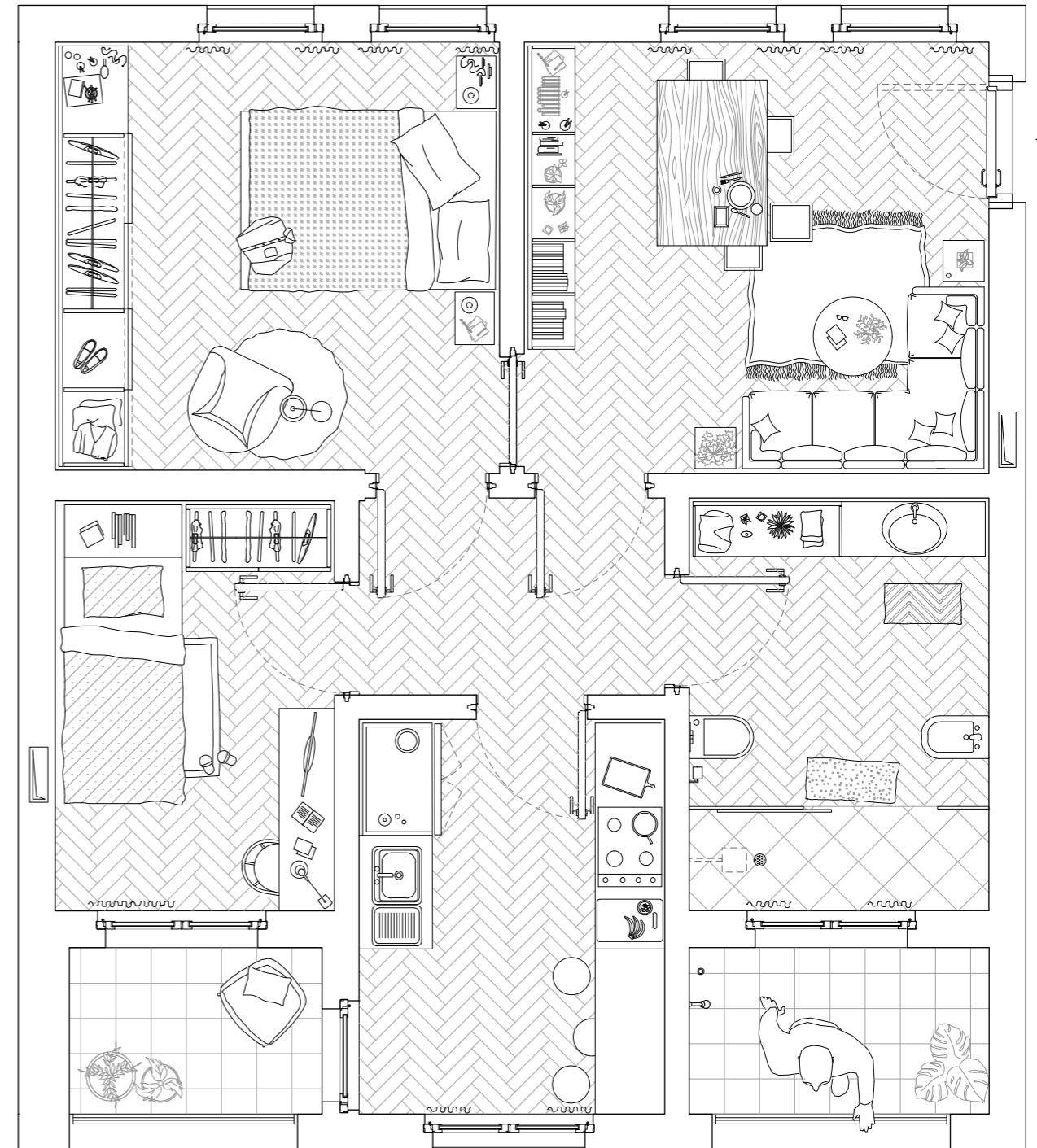
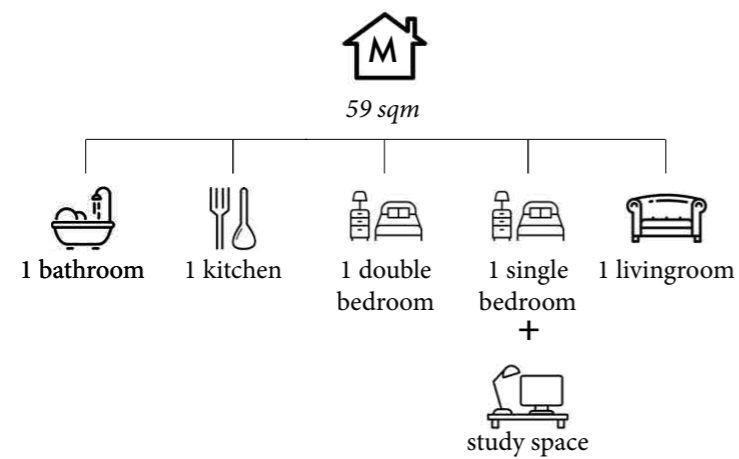
Apartment D

Traditional Family

Giorgio , Claudia , Alex
Banker , Journalist , Student
 37 years old , 36 years old , 15 years old



Giorgio and Claudia have a son, Alex. Giorgio works in a bank and spends most of his time at work. Claudia is a journalist and writes for an important Milan newspaper. When not working, they enjoy spending their free time with Alex, who is in high school for science. They need a big house, with a common space to be able to be together. They want a large sofa so they can be next to their son in the evening. Not working at home, they don't need study space, except Alex who needs a workstation to do his homework.



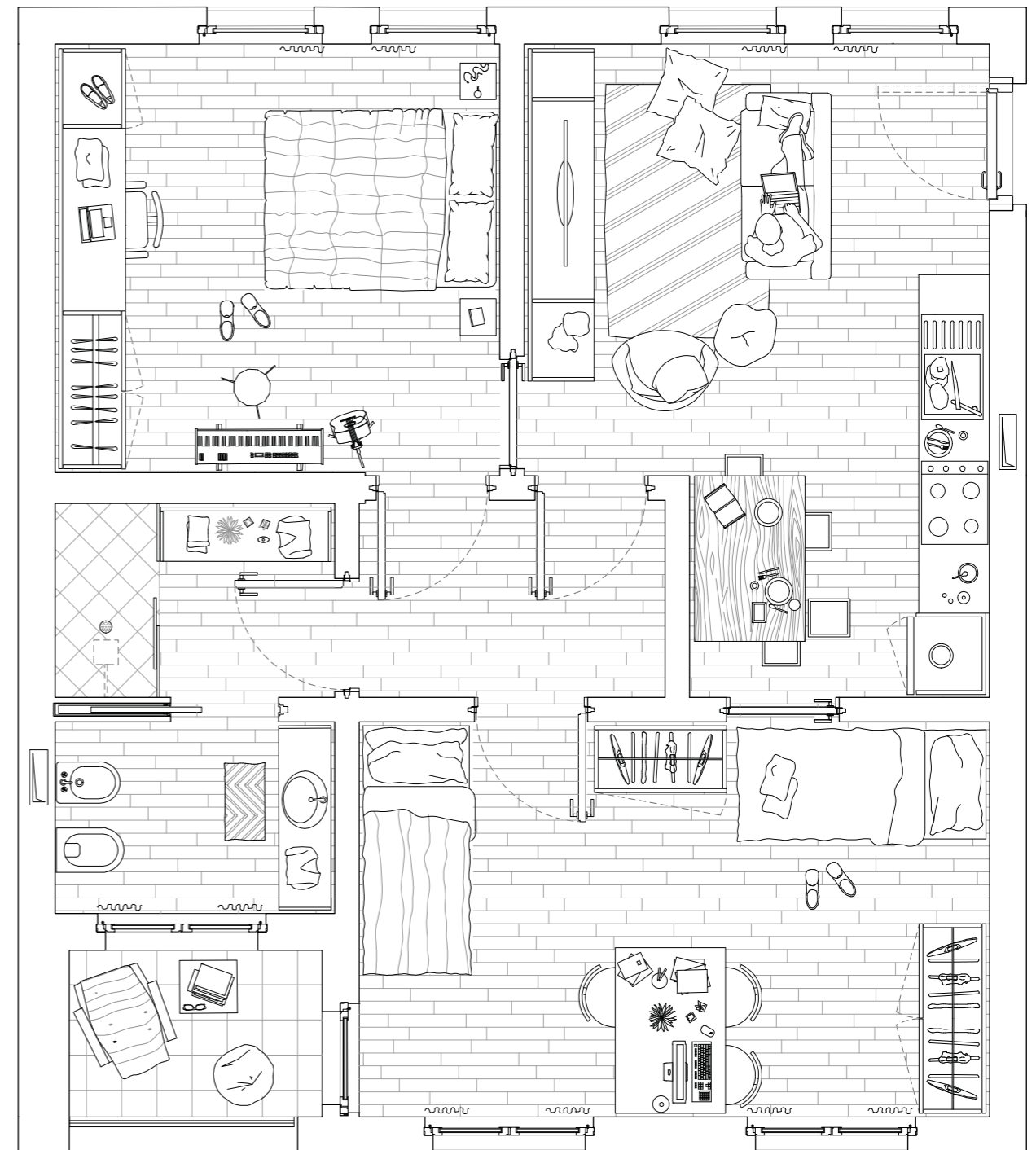
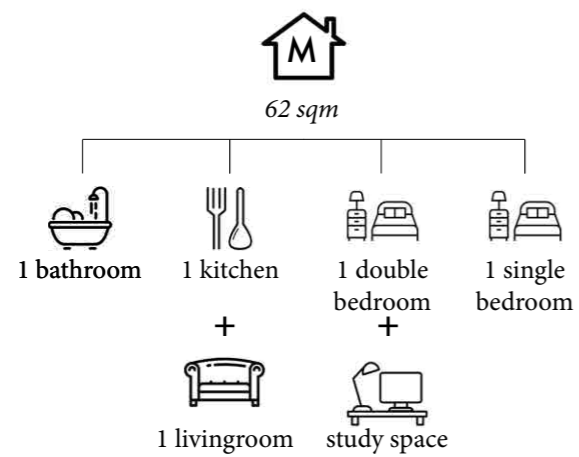
Apartment D

Adults + Adult(s)

Francesco , Maurizio , Edoardo
 Bartender , Student , Student
 24 years old , 25 years old , 25 years old



Maurizio and Edoardo met at the university. They are both off-site and by attending the same faculty they are passionate about the same hobbies, and so they met Francesco, a young bartender. They are very sunny people: they love being in the company of friends in the living room, playing on the playstation or watching movies. Maurizio loves to cook, and so in the evening they often meet around the big table to taste new foods. They have decided to stay in Milan for other years, until they return to their respective cities.

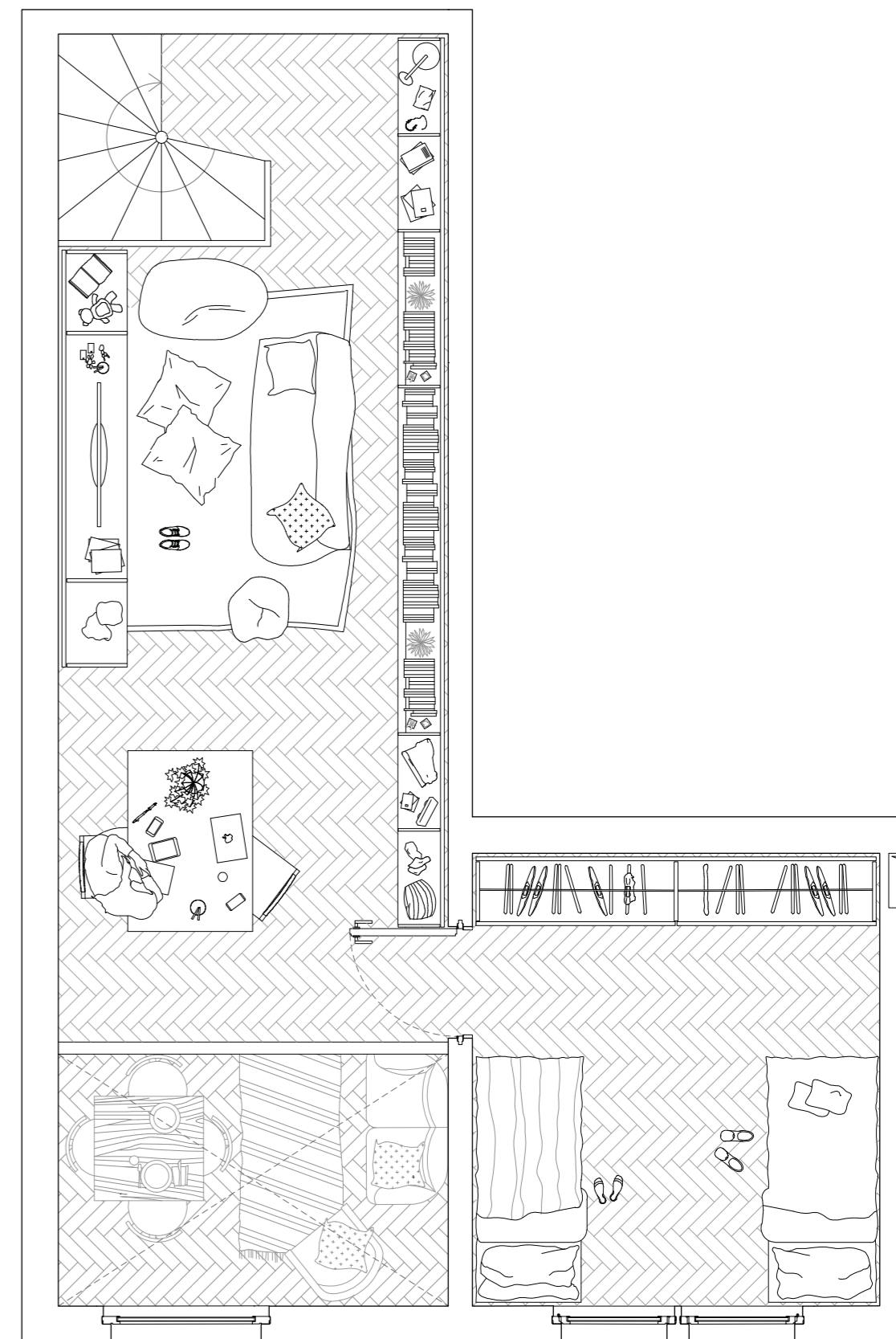
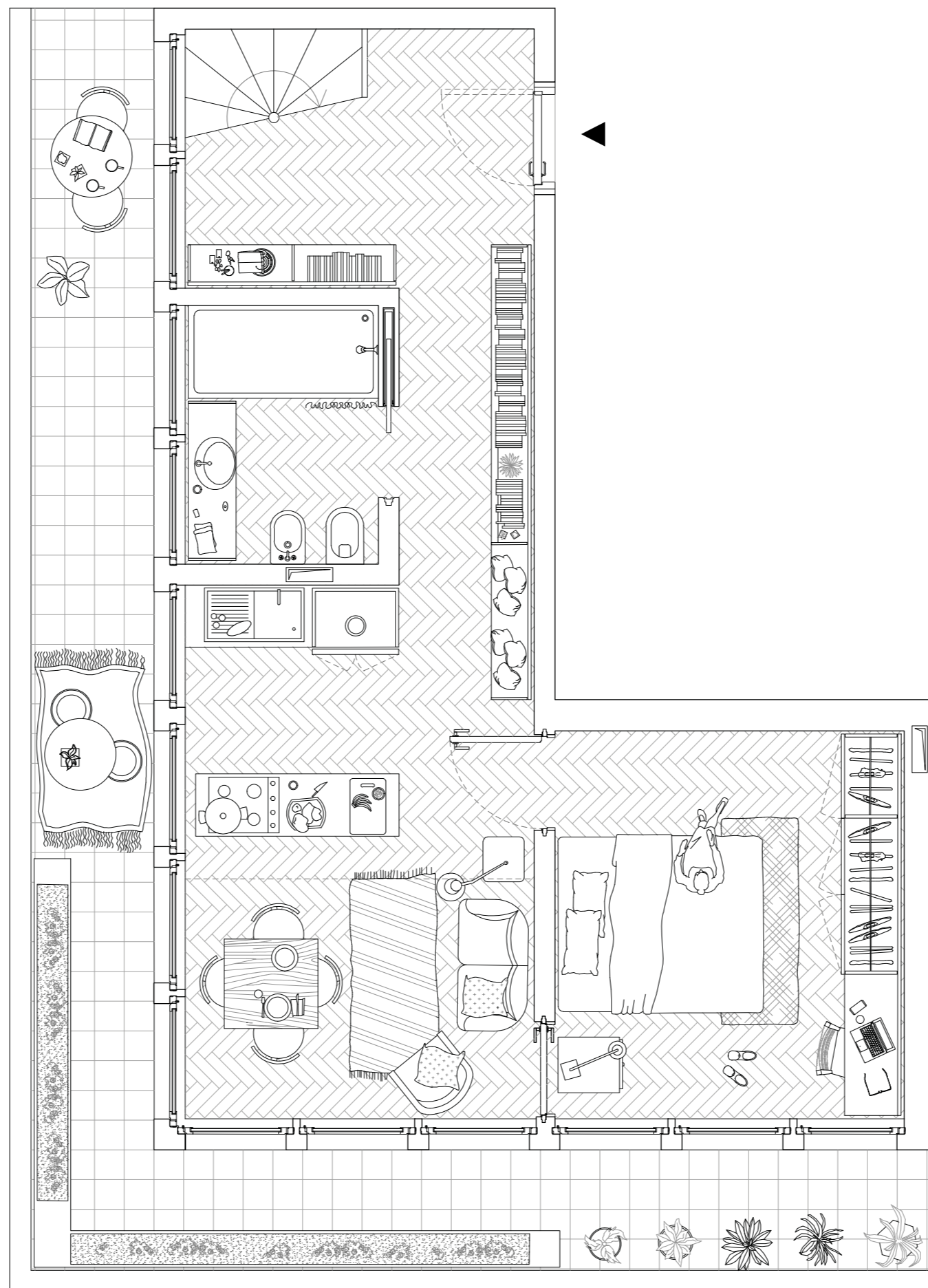
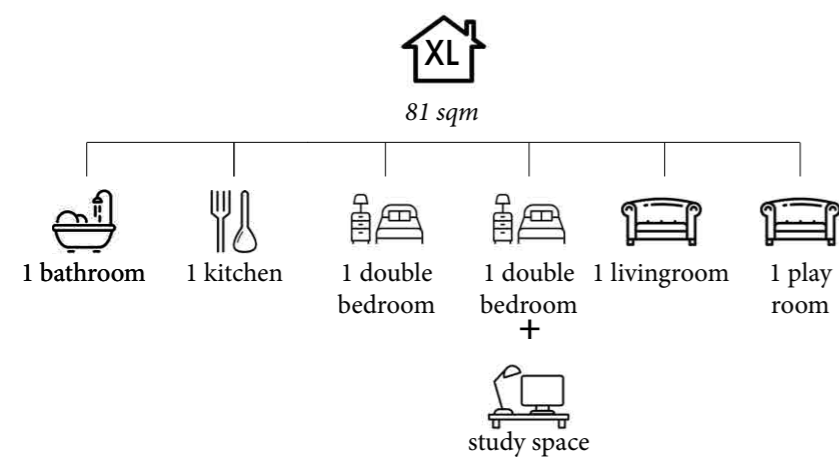


Apartment Duplex

Alberto , Consuelo , Luce , Letizia
Real estate agent , Interpreter , Students
45 years old , 49 years old , 11-13 years old



Alberto and Consuelo have two daughters, Luce and Letizia. They wanted a large duplex to give their daughters more privacy. In fact, Luce and Letizia are passionate about films and wanted to have a large space to be able to spend time together. Alberto and Consuelo don't spend much time at home because of their jobs. Consuelo dreamed of having a kitchen with a large central island in order to cook her husband's and daughters' favorite foods.



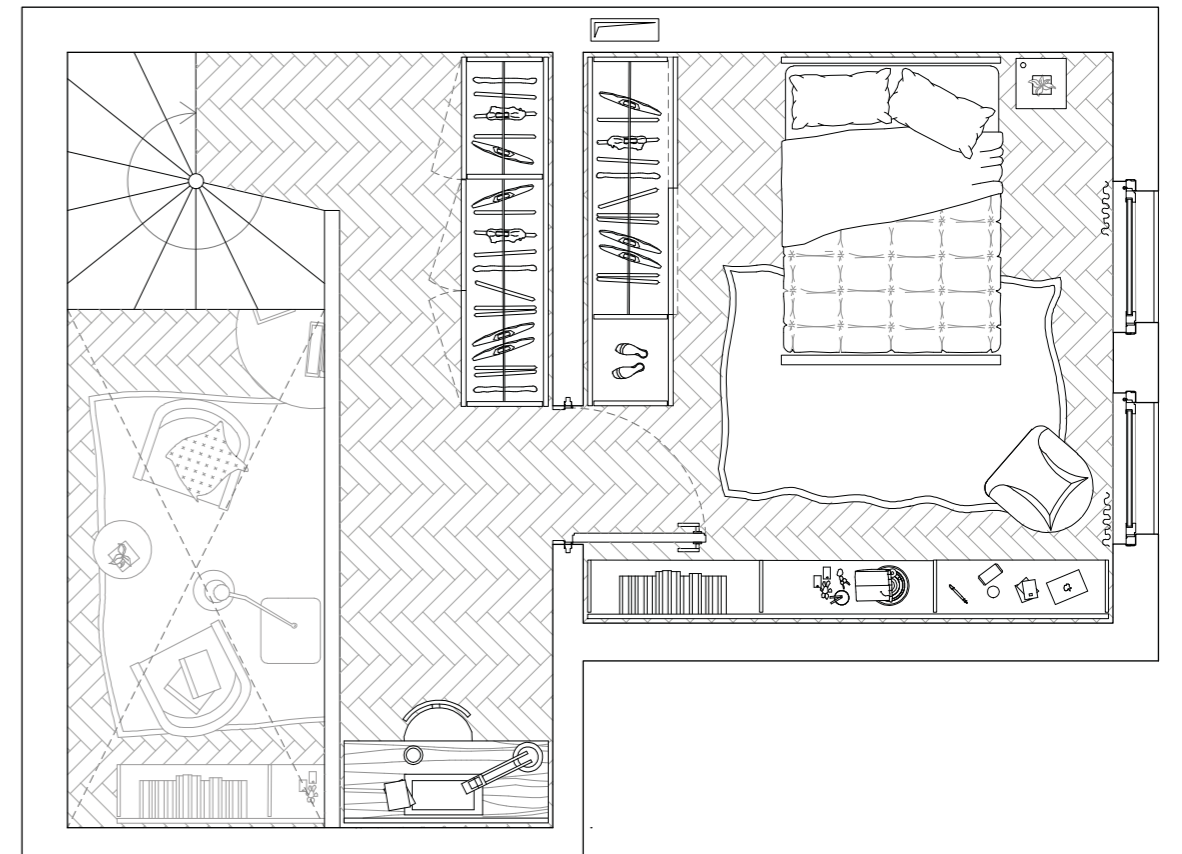
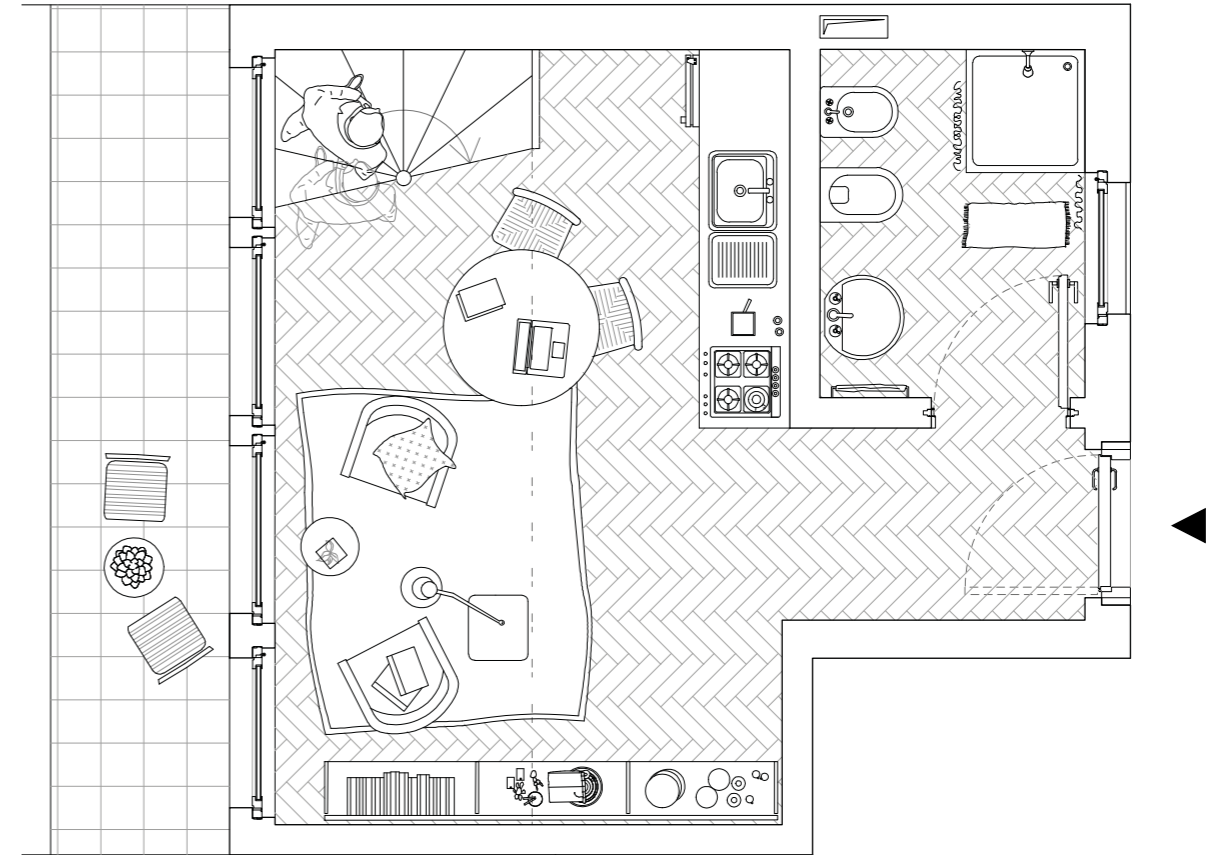
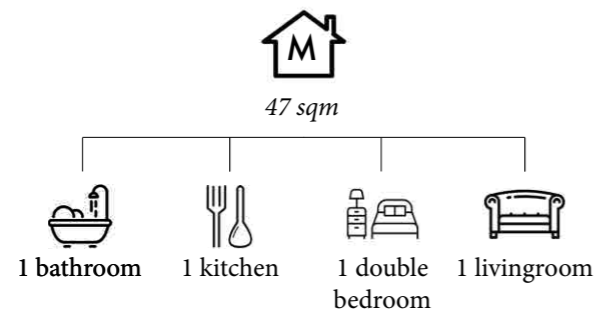
Couple

Apartment Duplex

Filippo , Valentina
Manager , Unemployed
27 years old , 28 years old



Filippo and Valentina are a young couple who moved to Milan due to his work. Filippo works as a manager, and is often out of town for work. Valentina moved in order to be close to her boyfriend, and is currently looking for a job. This leads her to spend a lot of time in her new two-story home. They love the privacy of the house, divided into two areas: on the first floor there is the living area; while upstairs there is the sleeping area with a private space to work.



Couple

Apartment and uses Apartment A

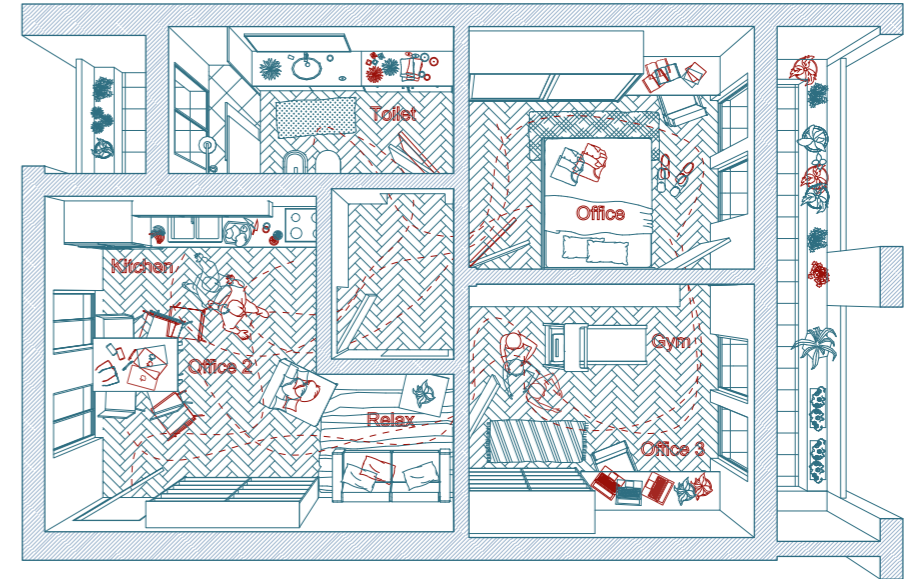
Alessandro , 30 years old
Chiara , 27 years old



Chiara and Alessandro moved in this apartment of 60 sqm made by an open space with a big Kitchen and Livingroom, one bedroom and a study room.

During the day this environment change in function, according to the usages.

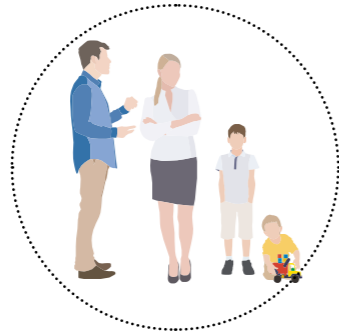
- Fixed furniture
- Daily movement
- Circulation



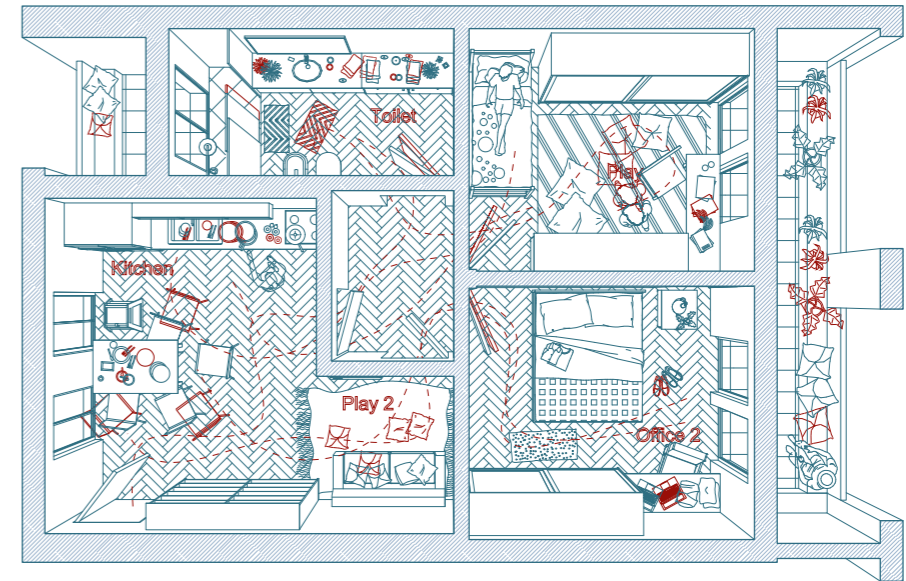
TODAY

Family

Alessandro , 34 years old
Chiara , 30 years old
Giorgio , 4 years old
Raffaele , 2 years old



After four years the family increases: a rearrangement of the apartment is needed. The parents move the master bedroom in the old study room, and the other one become a double bedroom, with the space for the children to play.



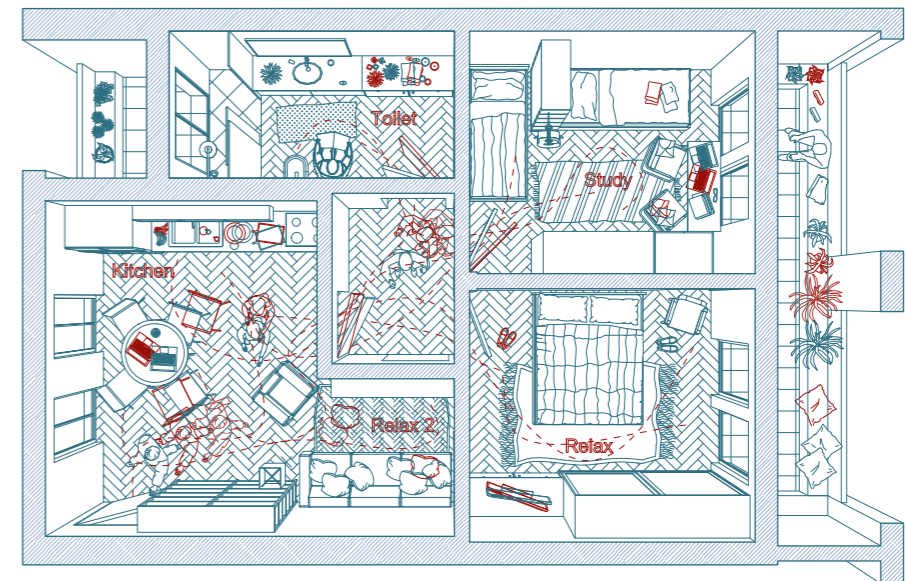
4 YEARS LATER

Family 2.0

Alessandro , 50 years old
Chiara , 46 years old
Giorgio , 20 years old
Raffaele , 18 years old



After twenty years the needs are different, and the changes are more and more. The boys, older, need more space to study or work, so that the furniture and the movements into the house change.



20 YEARS LATER

Apartment B

Pietro , 40 years old



Pietro, is a university professor. Recently transferred to Milan for a fixed-term research contract with the Politecnico, he decides to live in a modest two-room apartment for a period of 3 years. Working a lot from home, he needs a space for the smart working.

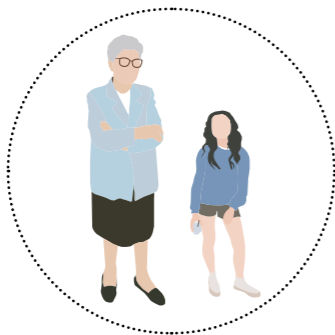
Rosina , 42 years old
Emilia , 20 years old



Rosina and Emilia are a family made by a mother and a daughter.




They take the place of the old dweller in this apartment, and they decided to rearrange the space for a better living. They decide to divide the old living room to have a small room for Emilia.

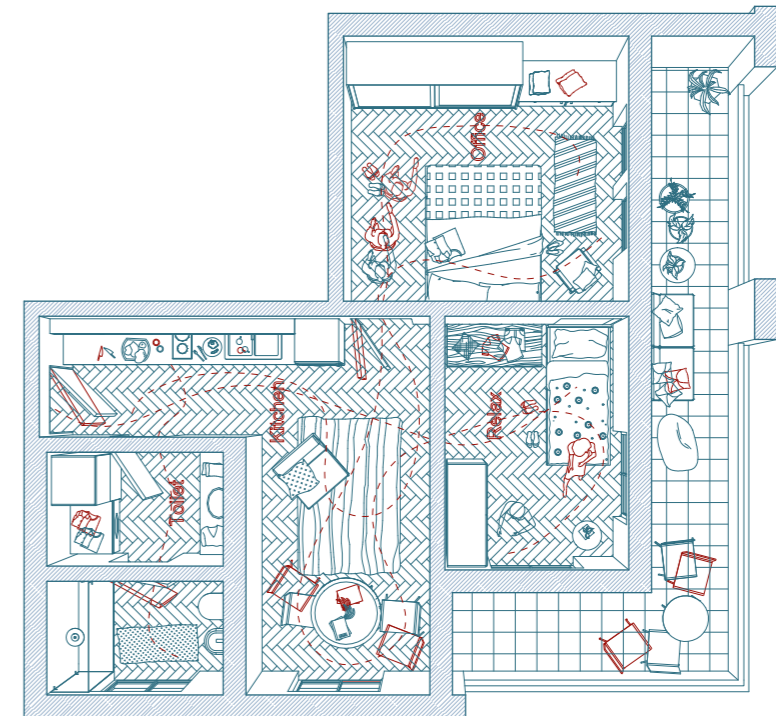
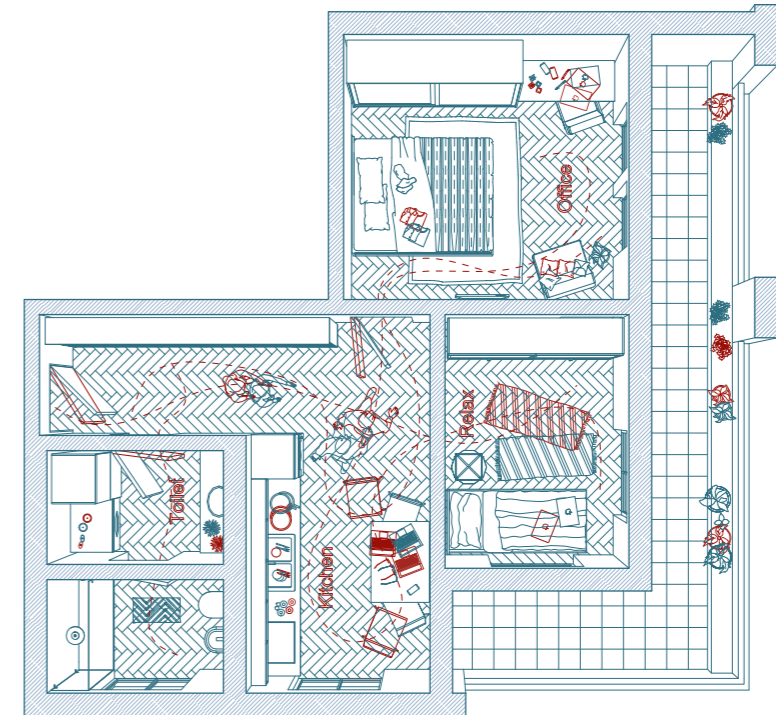
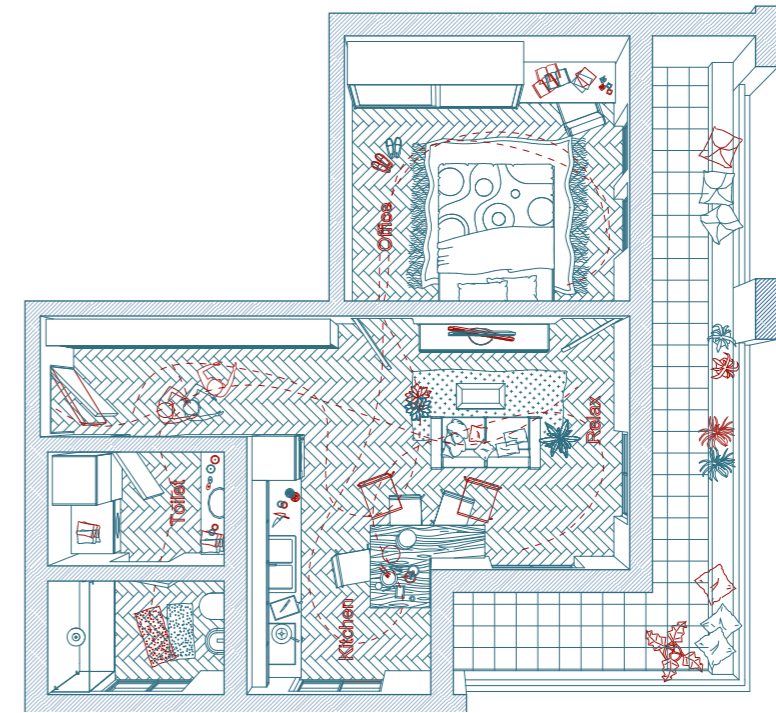
Rosina , 62 years old
Giusy , 13 years old



After thirty years Rosina's daughter is living in Paris for work and her granddaughter, Giusy, decides to live with her, to attend the last year of first grade high school, before the university.

After all these years, Rosina decided to renovate her apartment moving the kitchen near the entrance hall, in order to have more space for the livingroom.

-  Fixed furniture
-  Daily movement
-  Circulation



TODAY

4 YEARS LATER

20 YEARS LATER

Single worker

Change of ownership

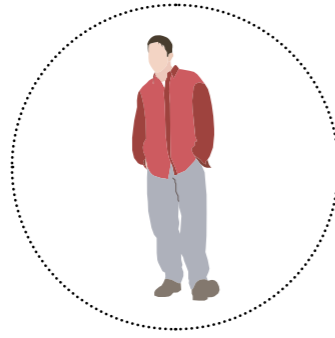
Mother + daughter

Grandmother + granddaughter

Apartment C

Single student

Giuseppe , 23 years old



Giuseppe, a 23 years old student, after years of living in a student house, decides to live alone, in order to have more privacy.

With a single bedroom and a big open space of kitchen and living room, is able to study and to host friends.

Couple

Giuseppe , 28 years old
Carla , 27 years old

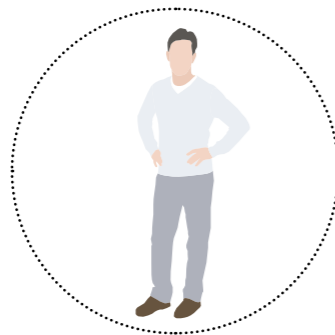


After four years, Giuseppe decides to accommodate his girlfriend Carla with him.




For this reason he renovates the apartment, moving the kitchen in the single room and transforming the living room with a sofa bed, in a temporary solution.

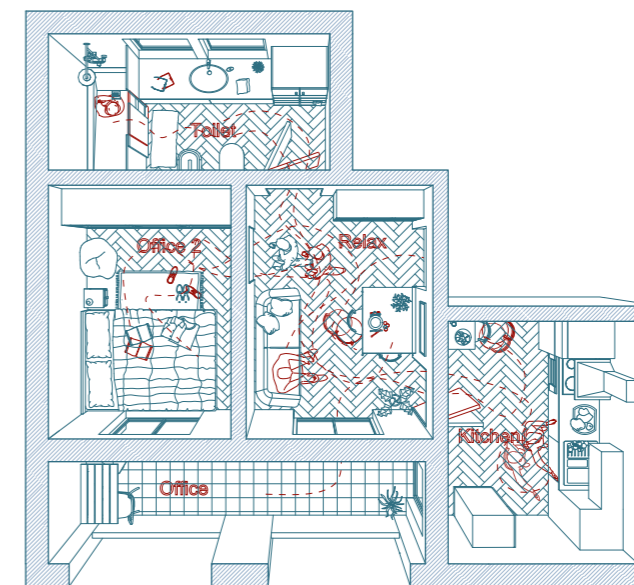
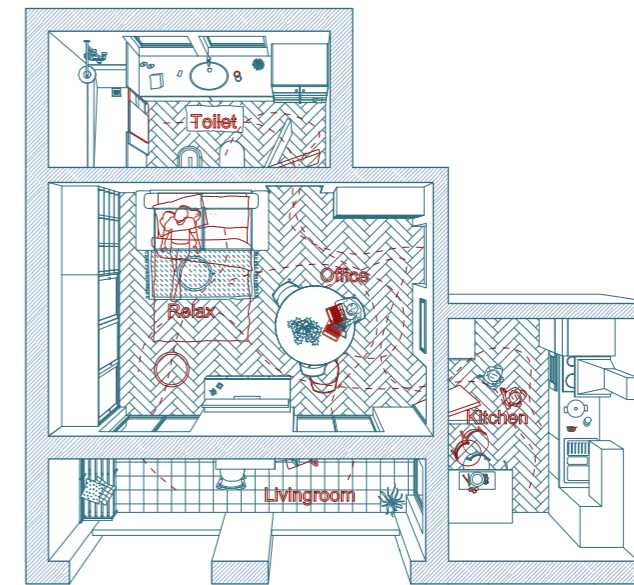
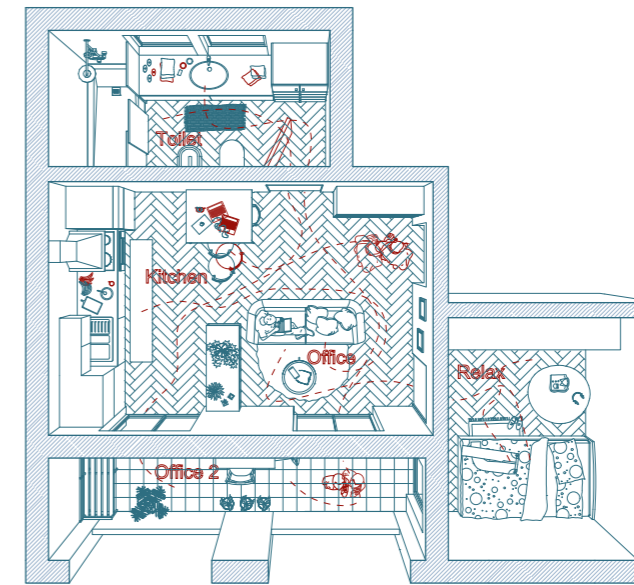
Adult worker

Giuseppe , 48 years old



Giuseppe and Carla moved 10 years ago in France, but he still needs an accommodation for temporary solution, when he has to give medical seminars in Milan.

-  Fixed furniture
-  Daily movement
-  Circulation



TODAY

4 YEARS LATER

20 YEARS LATER

Family

Apartment D

Nicolò , 48 years old
Giorgia , 45 years old



Nicolò and Giorgia have been married for 15 years. She is a doctor and he is an artist.

He loves to play piano, and he has a painting studio, because he is professor of artistic disciplines. On the contrary, she works all day outdoor.

Family + erasmus

Nicolò , 52 years old
Giorgia , 49 years old
Milo , 24 years old



Nicolò and Giorgia cannot have sons, so they decided to accomodate other people in their house. Today there is Milo, a greek student in erasmus in Milan. They arranged a room in the old Nicolò's painting room for their guest.

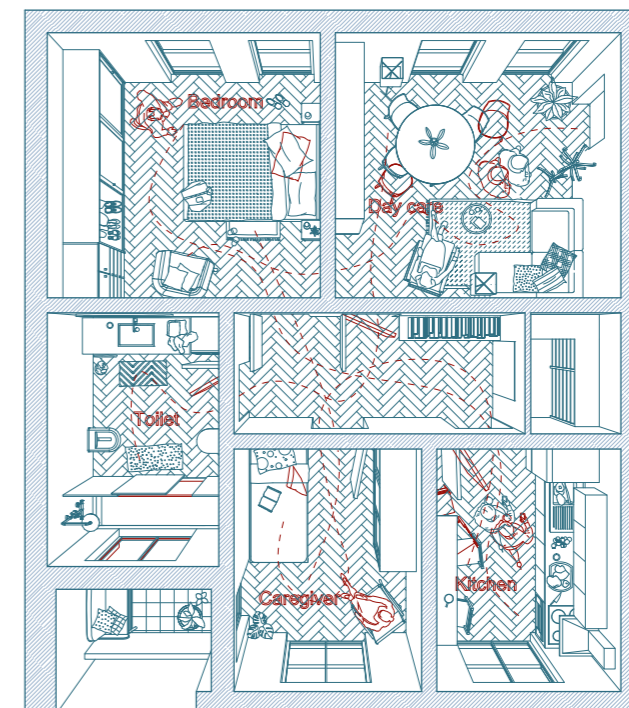
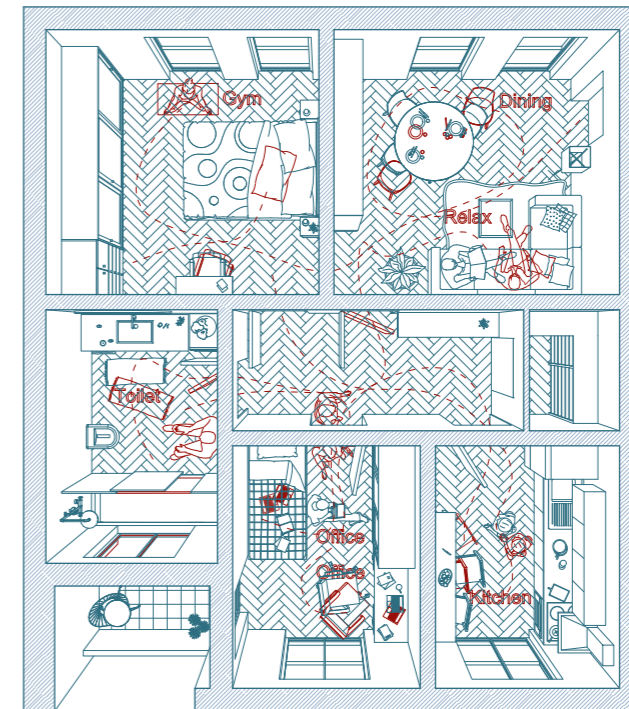
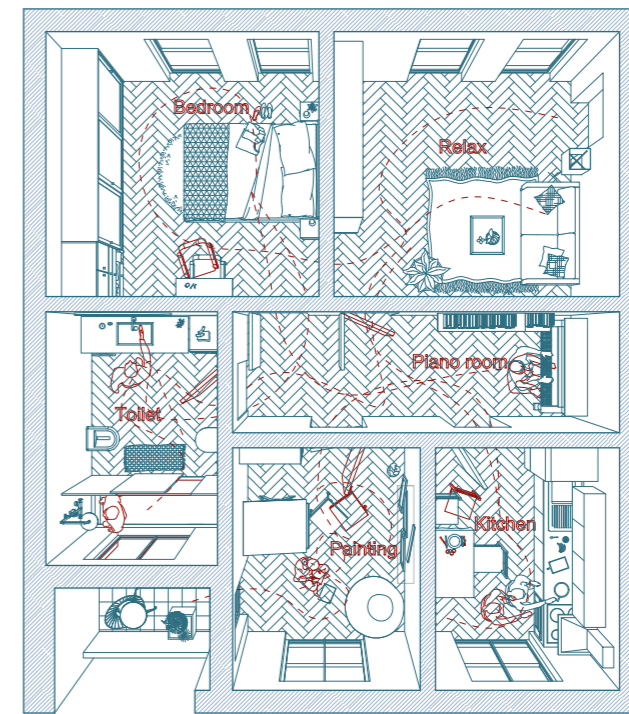
Retired people + caregiver

Nicolò , 72 years old
Giorgia , 69 years old
Carmen , 38 years old



After twenty years, Nicolò and Giorgia, retired people, need care. For this reason they rearrange the guest room for the caregiver, Carmen. In this way she can have her own room and privacy, and help them everyday.

- Fixed furniture
- Daily movement
- Circulation



TODAY

4 YEARS LATER

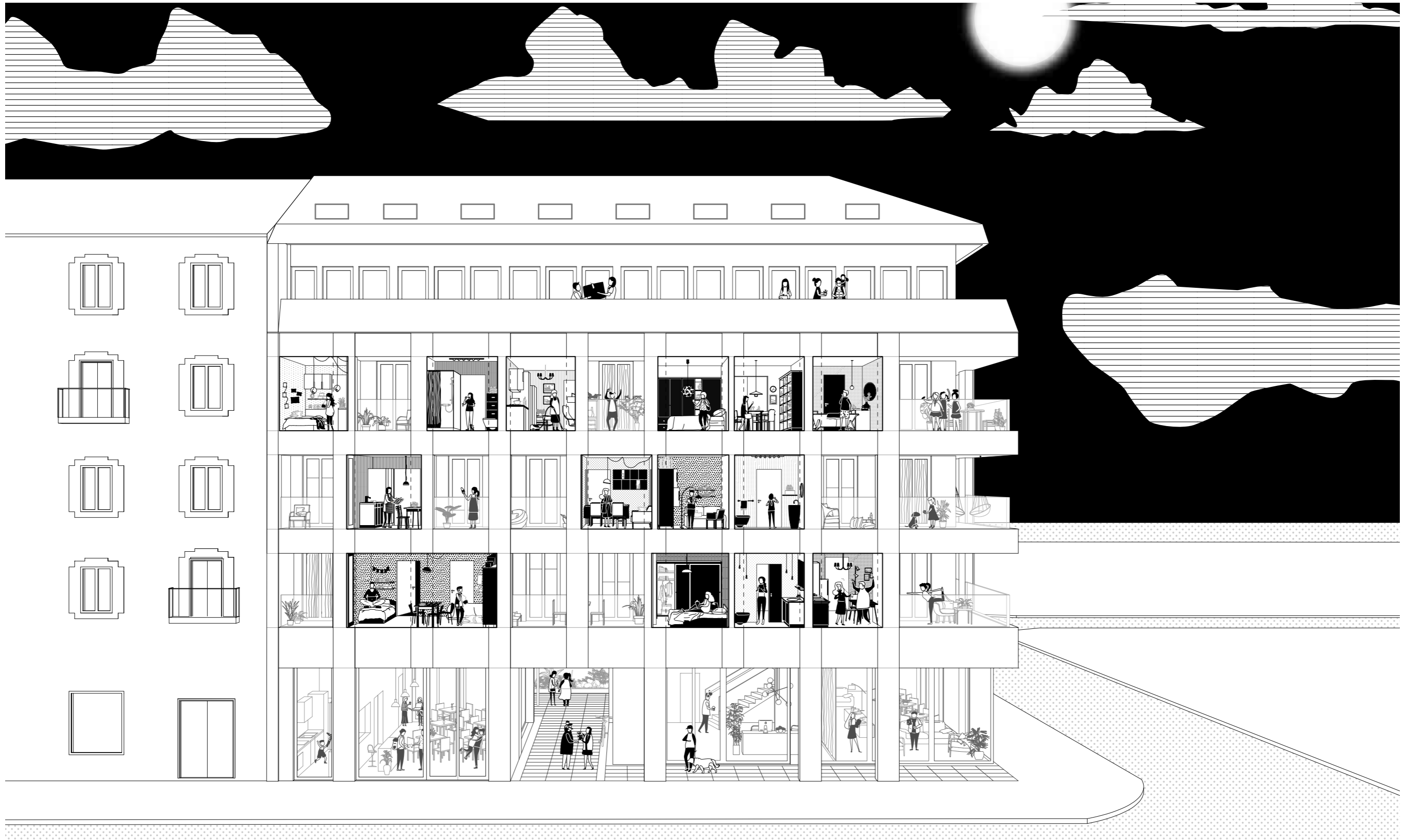
20 YEARS LATER

Section A - A'



Section B - B'





CONCLUSIONS

This thesis “Type zero: a manual against typological stereotypes” wants, without pretending to make considerations of absolute value, to outline some guidelines of general validity, which can be considered by future designers as the direction towards which all the actors in the building process have to follow.

The intention was to try to create an instruction manual for the design of typically flexible residential buildings, through the identification of essential characteristics. The research work is based on the identification of solutions capable of responding to the new housing demands and needs deriving from the socio-economic changes of the last decades.

The idea was to create an open research, which analyzes the theme of spatial typological flexibility, and does not end with our study, but can be further analyzed in the future. The idea was to look for a “zero” type, a model that can be followed in the design, that respects the needs of users and that is free from time references, against the fixed and stationary stereotypes, imposed in the past, relating to flexibility and typology. Flexibility in residential construction must be considered as a programmatic, planning and management principle, able to guarantee the adaptability of the building product over time, also offering an indisputable and precious quality of living.

Typological flexibility is therefore predominantly found in the residential heritage built in the nineteenth century. Through the study of nineteenth-century case studies, the research aims to demonstrate how these buildings have developed a design strategy in domestic architecture characterized by spaces that are not functionally specialized and interconnected with each other, which over time have proven to have a great versatility of use, able to respond very well to the transformations that the housing demand has expressed in the last hundred years.

Our research aims to act as a cornerstone for the design of new residential buildings, since, through the mapping of various case studies, with the support of literature, the analytical characteristics that are the fulcrum of typological flexibility have been identified.

The flexible social housing project located at the intersection of Viale Tunisia and Via Lecco is the implementation of the whole theoretical part that serves as a manual for the realization of a typologically flexible project.

The project we propose seeks to give a qualified response to a differentiated and articulated demand for housing, compared to the atrophy of the offer present today on the real estate markets, which continues to reaffirm the functionalist paradigms of the Modern Movement in residential construction, trying to recover the adaptable and resilient typology typical of nineteenth-century residential construction..

RESOURCES

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