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MARCO LUCCHINI*, GASPAR JAEN I URBAN**

The house is the city: resilience in Barcelona apartments plans during '50-'60 modernism

Abstract:
The paper deals with the Modernist housing design in Barcelona during '50s and '60s. In this period, the architecture culturally committed was struggling against Francoist censorship and the wild real estate development. The urban landscape is characterized by the housing design that can be considered a critical interface between the houses ground plan layout and the arrange-ment of the urban tissue at the settlement scale.
The evolution of the Modernist housing design in Barcelona is the outcome of a dialectic be-tween long-lasting types as the H-model, a strong will to be modern expressed by architects as a reaction against the cultural lack of Francoism, the avant-garde heritage, namely the GATCPAC (Group of Catalan Architect and Technicians for the Promotion of Contemporary Architecture) and the research aimed to resume the traditional Barcelonese way of built-in which lays the city identity. By this point of view, we can argue that the concept of resilience in spite of its use as buzz word in the last 15 years is rooted in the history of the city: Barcelona it's an example due to the "resistance" carried on by the modernist architects that was the background for the Renaissance of the city since the Olimpic Games onward.

Keywords: Housing, Barcelona, Modernist, Catalan Architecture, H-type module

1. Introduction

The word Resilience, in the Italian as well as in the Spanish language, originally meant the property of materials to resist stress without breaking and, by extension, the ability to withstand adversity. Later it took on the meaning of resume an original state after an adverse event. From this point of view, since 2011, it has become a buzzword for all purposes including the disciplinary field of architectural design, where it refers, above all, to the issues of sustainability (Gardoni, 2019).
Resilience intended as "resistance" is linked to the concept of permanence, a well-known matter in architectural and urban design. The identity of European architecture is grounded precisely on the dialectic between "permanence and change" as the persistent elements represent the basis on which variations subject to contingencies are grafted (Gregotti, 1999, 102). This concept is deeply rooted in the concept of type, a theoretical instrument detected by the schools of Barcelona and Milan between the '70s and '90s.
From a morphological standpoint, the resilience can be addressed to the typological thinking and can relate to the ability of urban structures to withstand crises resuming an initial state. The latter will not be completely identical to the one before the crisis, but there will be transformations that lead to a change in the settlement or urban form. However, it should also be noted that the concept of the resilient city usually means "being able to face shocks and persistent structural changes in such a way that it keeps on delivering societal well-being without compromising that of future generations"[1].
Besides, resilience must be considered with certain prudence in the social sciences: if on the one hand, it means the ability to overcome stressful situations, on the other, it must be taken into account that in recent times the Pandemic Covid -19 caused grief and suffering, so the hypothetical resilience is not at all evident.
Throughout the history of the city, the house has always played an essential role in the urban identity (Monestiroli, 1999, 61) becoming a key factor, especially since the nineteenth century, in the complex relationships between building shape, settlement typology, and urban morphology. In these relationships, the residence has a critical role as a physical entity that arranges the space according to well-codified rules of grouping, then as a real place of living where people's experiences are condensed.
The comparative study of the plans of the houses at different scales "cuts out a portion of the space [...] and encloses it within a calculated and measurable figuration" (Vitta, 2008, 125), setting limits, which by building spatiality (the effect caused by space on things and about people), and articulating the space into units which order the relationships between people and things.
The relationships between space and body are made up in the plan, according to criteria typical both of the Euclidean geometry and Gestalt psychology, making distances, transparencies, paths, dynamic or stasis points perceivable.
This topic, valid for various urban situations, has been addressed by the authors in the context of modern architecture in Barcelona since the '40s. Dwellings and urban fabric, in Barcelona, are linked by a relationship that lies in the morphological correspondence between plots and buildings shape: the focus of the paper investigates the house as a constituent of the urban tissue,

* Marco Lucchini, Associate professor, Politecnico di Milano, Department of Architecture and Urban Studies, Faculty of Architecture, Urban Planning Construction Engineering, https://orcid.org/0000-0001-8051-3313, e-mail: marco.lucchini@polimi.it
** Gaspar Jaen I Urban, Associate professor. University of Alicante, SpainFaculty of Architecture Department of Graphic Expresion,Composition and Project, https://orcid.org/0000-0001-6957-1504, e-mail: gaspar.jaen@ua.es

the way by means it is contained in the urban blocks, contributing consequently to the urban form, and the arrangement of ground plan. This last affects indirectly the urban form: the shape of the building is linked to the one of the interior as this level life conveys an interplay between people's and architecture.

2. Method

The research work is grounded on the comparative analysis of literature and projects so that the output is narrative: the interpretation of the architectures and the contest where they have been built has been related with the theory of continuity and phenomenological approach rooted in the Ernesto Nathan Rogers oeuvre. Moreover the working method is grounded on historical research. The main problem is to bring out a past that is not present and not testable. The concept of type is an effective way to inquiry about history.

The type has been considered an "episteme" of architectural theory in the twentieth century (Avermaete, 2021) according to the studies carried on in the 1960s by a group of Italian Architects among which Saverio Muratori, Vittorio Gregotti, Aldo Rossi and Giulio Carlo Argan. They participated in a broad debate, originally promoted by the Ernesto Nathan Rogers[2], addressed to discuss and criticize the most uncompromising position of Modernism focusing the structure of the form both at the urban scale and the building one discovering "how the building and neighbourhoods can accommodate change throughout time" (Avermate, 2021, 73). As Giulio Carlo Argan argued, the type is the internal form structure that unites constructions that are based on similar shape, so that it can be considered as the abstraction of a series of buildings that puts together their common structural features (Argan, 1963).

More than twenty years later, Carlos Martì Aris, a Spanish architect grown in the cultural context of the Barcelona of the 1970s, fostered a renovated concept of type. Besides the concept of invariant, he argued the type is interwoven with the notion of transformation as the building block of the elementary structure of whatever architecture. In a famous book Carlos Martí Aris pointed out that the type was "an invariant, a form that replicates itself in multiple objects and that reproduces itself in different situations [...] by binding a series of phenomena beyond differences) aiming to identify the "formal constants" of "phenomena" tracing them back "to a common root" (Martí Aris, 1990, 84, 105).

The critical comparison of structural forms referred to Barcelona's historical and geographical context between the 1950s and the 1960s provides a set of rules concerning the arrangement of housing buildings, the design of their façade, and the relationship between architecture construction and shape.

Even the social factors have been taken into account: the dictatorships influence and the spreading of the architectural knowledge by means of magazines, exhibitions, conferences although were contrasting elements boosted the development of architectural design, precisely for their opposition. The research method maintains a continuous confrontation between the architecture and the milieu where architects and people lived, designed and dwelled.

3. Characters of modernity in Barcelona

In Europe, the milestones of Modernist trajectory are well-known: if in 1920's and 1930's one can recognized some largely shared features as the faith in the progress and the rationalization of the mass housing design or the architectural lexicon addressed by the artistic avant-gardes after the WW2 a more critical and varied approach is driven both by a generational conflicts between the old and the new guard and by the different socio-economic conditions of the European countries.

In this frame the Italian architect Ernesto Nathan Rogers pursues a great effort to make the architectural design closer to history and context forerunning in such a way the critical regionalism theory stated by Kenneth Frampton in the early 1980s. (Frampton, 1983). Through the mediation of Gio Ponti and the Italian magazines Domus he founds a counterpart in a group of modernist architects operating in Barcelona among which Oriol Bohigas, Federico Correa Ruiz and in some ways José Antonio Coderch.

In Spain and especially in Catalonia the Modernist[3] architecture is struggling against the Francisco Franco's fascist dictatorship. After the years of the Second Republic (1931-1939) and the great hopes of GATCPAC[4] (Grup d'Arquitectes i Tècnics Catalans per al Progrés de l'Arquitectura Contemporània 1929 -1936) in which residential architecture took on avant-garde positions by proposing typological innovations to the urban and building scale - as the famous Casa Bloc (J.L .Sert 1932-36), Plan Macià, (1935) and Casa Lopez in calle Muntaner (J.L. Sert, JT Clavé, JB Subirana 1929-1931) – in Kenneth Frampton's term "the pre-war Spanish wing of CIAM" (Frampton, 1992, 316) - the political hegemony of Francisco Franco leads to a retrograde, monumental architecture openly hostile to the avant-gardes. The Modernism in Barcelona is defeated but not destroyed: after the Civil War it takes place again in a renovated way, as an intersection between past and present; it copes with the stratification of dramatic historical events, withstanding against a suffocating dictatorship and looking for different attitudes towards the project and professional practice.

After the end of WW2[5] the victory of allied forces has led Franco to loosen his grasp as he is considered a potential ally against the Soviet Union, receiving a loan from the USA for the reconstruction. Although nothing really changes for Spanish people, it is easier crossing the borders. In the V National Assembly of Architects held between May 10th and 18th 1949 in Barcelona, Palma de Mallorca and Valencia, the well-known Italian architect Gio Ponti has been invited to attend the meeting; he meets Josè Antonio Coderch, with which sets a long-lasting friendship, exchanging ideas and opinions about architecture and their professional activity starting the so called "Mirada Italiana" (literally "a look on Italy").

But what "Mirada Italiana" is? An architectural and cultural exchange between Barcelona and Milan that lasts over three decades, taking the form of a mutual fascination between the architectonic culture of both cities. The output is a flourish of great works of architecture involving explicit and implicit professional relations between architects and personal friendship.
The connection is not only "one way" but "back and forth" because Milan influences Barcelona, and vice versa so that we can speak of mutual correspondences. As concerns Barcelona, many modern architects gather around an innovative cultural trend aimed to bring back the architecture industry to a rational, functional and modern design, rejecting the rhetoric line and the classic lexicon of the official Francoist architecture. This action is promoted by a group of modernist architects which fosters the resuming of GATCPAC heritage.
In the most general sense, they tried to blend the Catalan Modernism's background and the Barcelona building traditions with the modern conception of architecture. For instance, one of the main design topics was housing. The floor plans pursue some typical and traditional features as the H-type plan or the "double body" combining them with updated languages, making architecture the representation of its construction. The typological and technical choices give consistency to the architectural entity, combining it with the narrative intention and making the form meaningful.
For what concern the urban development the decades from '1950 to '1960 saw the inability both of local and central government to handle the transformation process of the city. Despite a large number of urban plans (Barcelona Country Plan 1953, First National Housing Plan 1954, Subsidized Housing Act 1957, Stabilisation Plan 1959, The Preliminary Metropolitan Area Plan 1968 in turn divided into County Plan and Metropolitan Area Plan) the city development was in the hand of speculators. Those plans failed due to the contradictory managing of the urban planning affect by the diverging policies of the local and central government.
Indeed, the urban growth of Barcelona in the 1950s and 1970s - known as *porciolismo* from the name of the mayor José María de Porcioles (a notary by profession) in office from 1957 to 1973 – is supported by the more aggressive real estate development, boosted by fast economic growth, due also to the entry of american capital. If on the one hand there is a modernization of the infrastructures, on the other we are witnessing the irresponsible destruction of urban areas and valuable architecture, the obvious high remunerative property development, the severe lack of public structures, urbanization works, and urban services, as well as the lack of clarity and transparency in urban planning processes. Modern architecture cannot intervene on the urban structure in a progressive way, for example designing social housing districts, as happened in Milan. So, modernity expressed itself within limits left by clients and by developers that ask for good quality houses addressed to the real estate market or affordable housing for the working classes.

Many architects join modernism through manifold pathways. Among the main we can recall Oriol Bohigas (1925), the most prominent protagonist of the cultural debate, able to manage professional work, university professor since 1977, and committed to a constant intellectual and political thought expressed in numerous writings. Antoni Moragas Gallissà (1913-1985) who expresses his interest in historical knowledge and social issues through architecture (Montaner, 1997, 33). Beside one cannot forget the erudite Josep Maria Sostres (1915-1984) and his use of history as project material, while on a different level José Antonio Coderch (1913-1984) approaches modern architecture by means of a "process of acute introspection" (Arnesto, Diaz, 2008, 19) making for an architectural oeuvre that is supposed to be correct and objective.
There are two further cornerstones of the new architecture of Barcelona that must be considered: relations with the international community and efforts to implement what is now called „dissemination", through publications in journals and groupings of architects.
After 1949, Spain reopened its physical borders with France and the other democratic countries that won the war against nazi-fascists a few years before so that even the intellectual frontiers fall.
In fact, a fruitful interaction is developed between architects, with the mentioned V National Assembly of Architects' symbolical carried on between May 10th and 18th, 1949 in Barcelona, Valencia and Palma De Mallorca. The contacts between Antoni Moragas, Bruno Zevi and Alvar Aalto, José Antoni Coderch and Gio Ponti, Oriol Bohigas and Ernesto Nathan Rogers foster the openness and mutual exchange of Catalan architecture towards the city of Milan, Great Britain, and Scandinavia. An evidence can be found in references in architecture such as the famous analogies between the fishermen's house[6] at the Barceloneta by Coderch (1953) and the Borsalino house by Ignazio Gardella (1952) or in lesser-known examples such as the Monitor building the Federico Correa (1969-1970) on diagonal that recalls the BBPR's[7] towers as Torre Velasca in Milan. These and many other buildings were presented in a vast literature through which we can understand how deeply this exchange affects the architecture (Lucchini, Jaen i Urban, 2016, 147-66, Lucchini, Jaen i Urban, 2018, 9-24).
As regards the promotion of new modern architecture, is highly remarkable the role played by Grup R[8]. It has been active since 1951 and 1961 as association of architects addressed to consider the functionalism overcome, while rejecting conservative languages such as classicism. They therefore support a culture of "resistance", aimed at combining rationalist expressiveness with the enhancement of the languages and building types of the Catalan tradition (Rodriguez, Torres, Català-Roca 1994). Grup R, manage to be an "engine of modernity"[9], setting up four exhibitions (in 1952, 1954, 1956 and 1958 respectively) lasting two weeks each, which in the mediocre cultural environment of Francoist Barcelona, became the key to promoting modern architecture and design. These exhibitions also allowed architects to

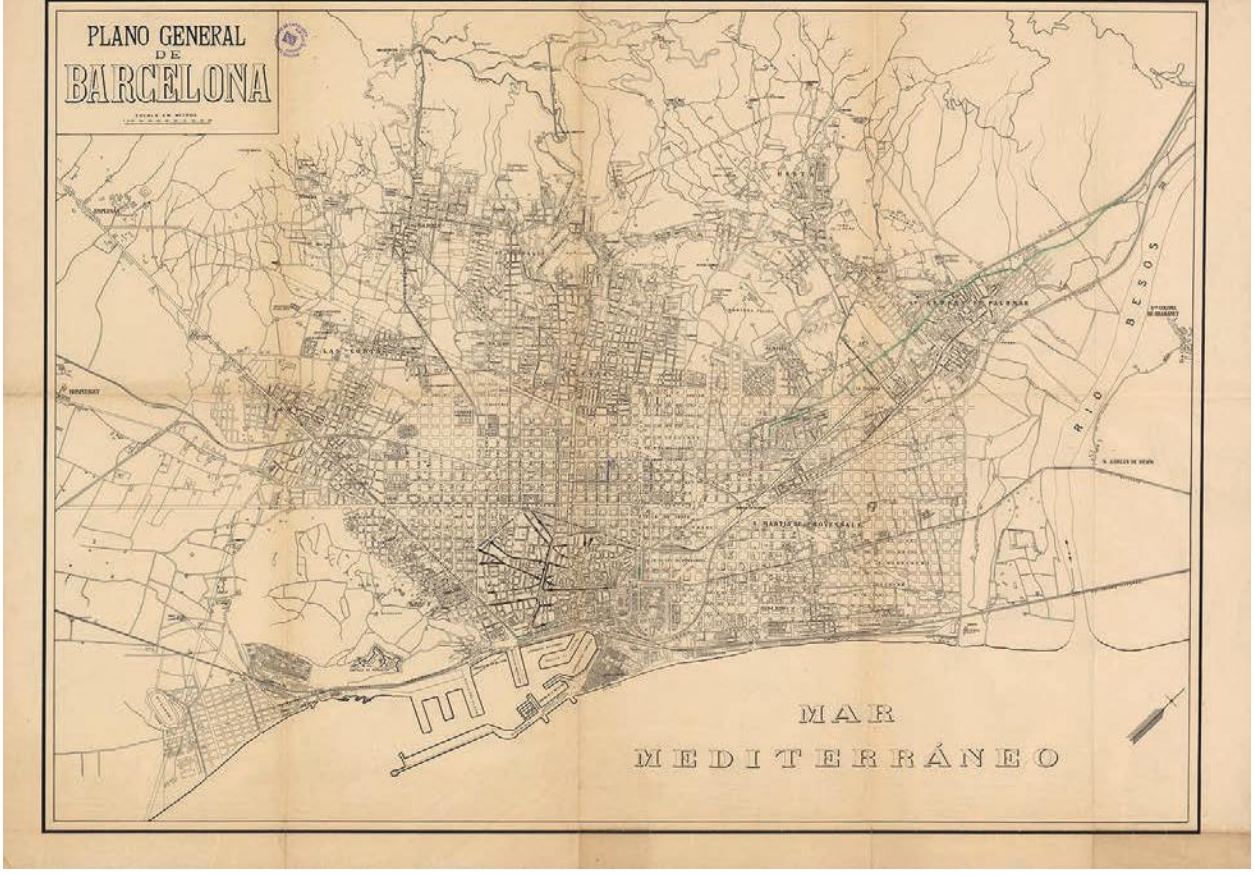


Fig.1. Urban Plan of Barcelona, 1935. Some blocks of the Ensanche are stille under construction. Source: Digital Institut Cartogràfic i Geològic de Catalunya https://cartotecadigital.icgc.cat

establish contacts with artists, writers and intellectuals, and the world of business and industry. Not everyone joins Grup R.: Coderch, after a first membership, leaves it, managing in any case to become a mythical figure of architecture thanks to a rigorous professional practice of the highest quality. He belongs to the small group of European architects that are allowed to publish in all modern magazines, and he has participated in the meetings of the Team X group since 1959.

Many other architects don't join the group formally, albeit they are involved in the recovery of modern architecture, such as Francisco Barba Corsini, Francesc Mitjans - in practice, one of the most influential architects of that period or Antoni Perpinyà. They are frequently sharing the cultural and professional experiences like the problem of affordable housing in Barcelona, the contest for new building of Board of Architects of Barcelona or Escorial district. However, none seem to have felt contrary or alien to the spirit of "normalization" and modernity that animated the R Group.

4. The housing design

The housing design is the place where the epiphany of the Barcelonese Modernism arises. This is partly caused by the enormous settlement pressure on the city: between 1950s and 1960s Barcelona, and the metropolitan area received 200,000 immigrants (Solà-Morales, 2008, 470) consequent to industrial development. The real estate speculation continued to densify the Ensanche[10] (Fig. 1) and to absorb the surrounding areas, transforming the overall urban form into a mosaic of large parts roughly put together by the Pla Comarcal (1953), then by the Pla d'Urgencia (1957).

The topic of the house as the founding element of the city, considered by a modern architecture point of view, can be investigated through a type-morphological reading. At the city scale, the urban fabric of Barcelona is strongly characterized by the Plan Cerdà grid layout that has set the measures and the shapes of the urban space, according to a rational principle of a "egalitarian isotropy of the limitless grid" (Solà Morales, 2008, 286).

The main features of Cerda's Plan are so famous (Busquets, 2005, 132) that here they will only be hinted: above all the street block system (in Spanish *manzanes*) sized at 113.3 by 113.3 meters with 20-meter-wide streets, and some large roads with a section of 50 meters that set up the main relations at urban scale.

The housing allotment is strongly affected by the wild exploitation of land values and favored the conformation of very profound plots. As known, at the beginning Cerdà has planned to build only two sides of the block but going on with the urban design, he fosters the building of four sides. The identity of the Cerdà block is given also by the chamfered corner cut off at 45°; it was considered an outstanding innovation in the urban shape for the better visibility and the quality of open space that seems to „flow" among the corners of the blocks (Solà Morales, 1975).

The relationship between the interior and the exterior of the block is different from that of the perimeter blocks of other European cities since the building edge is not just a limit that can be crossed through thresholds but a built interval of great thickness. The very deep and tall building edges, (the average buildings height increases from 5 storeys in 1860 to eight or more in 1975) later extended even inside the courtyards, produced

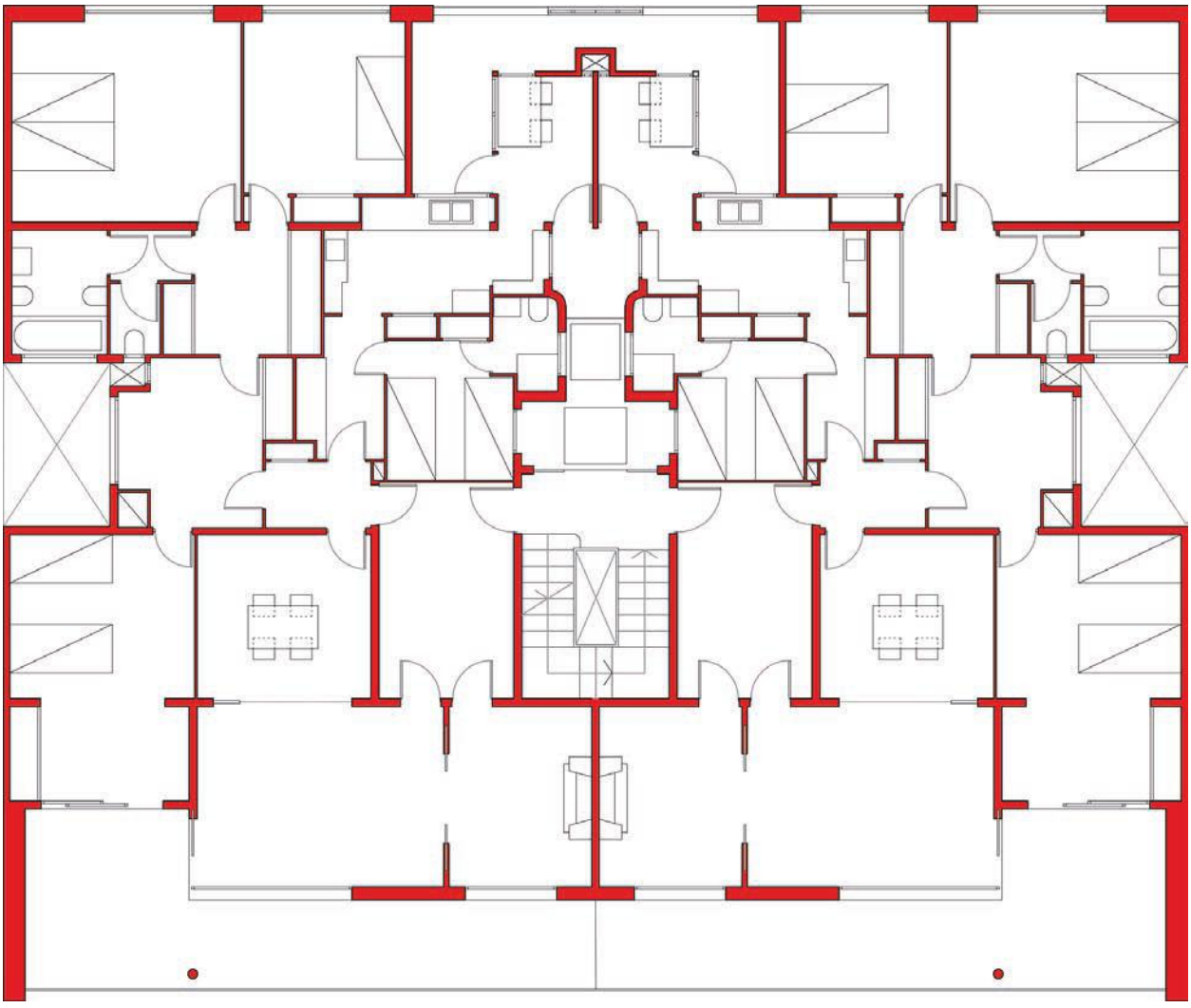


Fig. 2. Francesc Mitjans, Oller house, carrer d'Amigó 76 (1941-1944). Redraw by the author.

a considerable urban density that does not stop increasing until the ,70s.
It is estimated that only between 1940 and 1953 the average density of the population in the Ensanche increased from 977 inhabitants per block to more than 3,000, as well as that in 1958 the average volume built per block was already 300,000 m^2, when the volume initially planned by Cerdà was 67,000 m^3 (Gabancho 1990, 128, 190). Among the various ways of organizing the plans of the residential buildings built on the *manzanes*, two of them turn out to be highly significant. They are H-type and the square grid layout type. Both are related to the great flexibility of the Ensanche: but neither is a peculiarity of Cerdà's urban fabric nor is it an exclusive product of modernity: there are typological antecedents, and the same types are present in several Spanish cities. Nevertheless, they fit very well both to Cerdà tissue and other kinds of urban fabric in Barcelona for the adaptability to very different settlement situations related to the housing design. In this regard, it is helpful to observe how much of the modern residential buildings are located on the borders of the Ensanche or outside it in the expansion areas of the Jaussely (partially developed) and Comarcal master plans, which nevertheless maintained the deep plot (and profitable) of the Cerdà plan.

5. The square grid layout

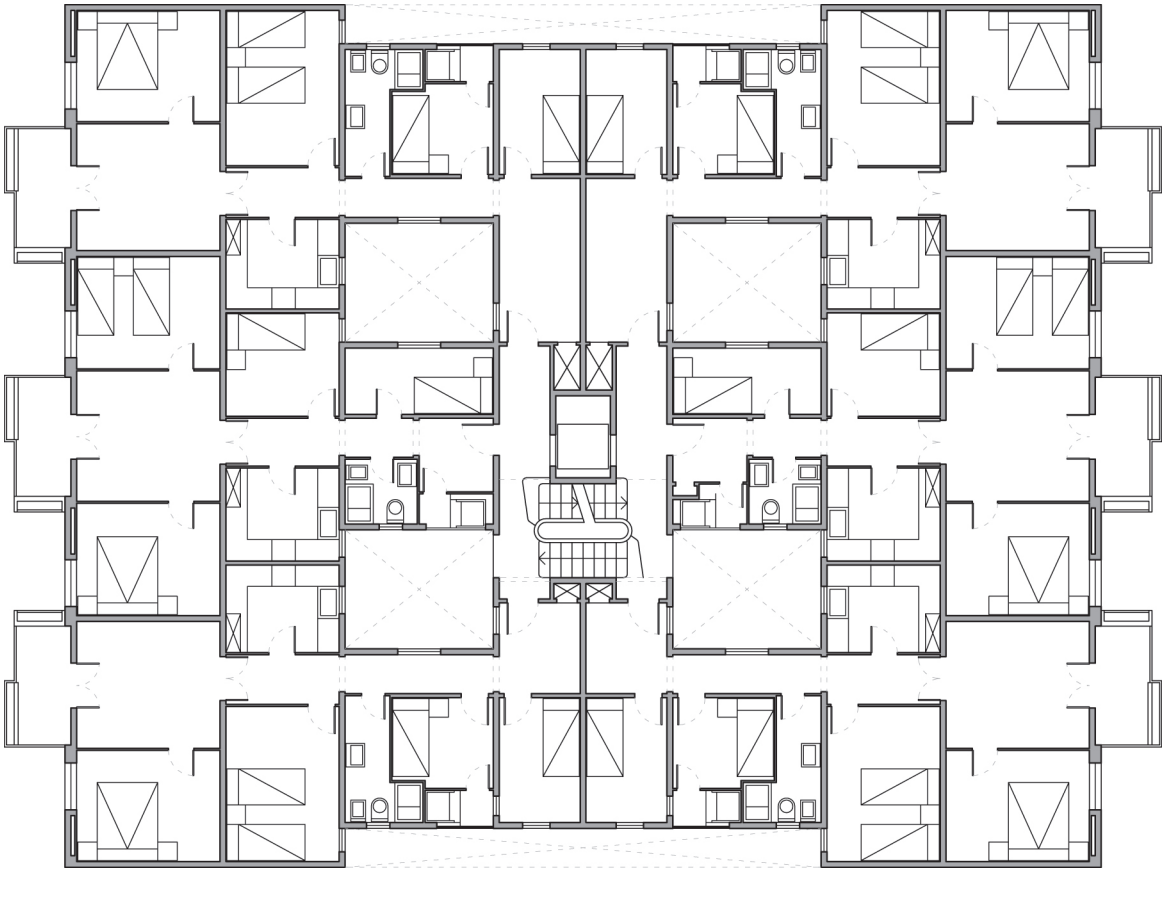
The square grid layout is a regular square pattern, usually recurring in tower buildings or in a plan whose proportion between length and thickness is approximately 1:1. The rooms are distributed homogeneously, and the interior spaces follow the regular rules set by the load-bearing walls.
The house designed in 1931 by Germà Rodríguez i Arias (among the founders of GATCPAC) in via Augusta 61, known for the façade striking rationalist language, can be considered a typological antecedent (Fig. 2). The layout arrangement is a hybrid between square-grid plans and an H-plan. This name is derived, as we'll see in the following paragraph, by the resemblance among the way to group together the rooms and the shape of capital H. If, on the other hand, we look at the surface of the rooms, apart from the living spaces, they roughly have similar dimensions and proportions, so that the ground plan can be classified among the square grid layouts.
The house is placed in a 92 mt x 84 mt perimeter block, and the typical plan is shaped according to a parallelogram framework. What makes it similar to an H is the living room placement parallel to the façade, while the bedrooms are aligned aggregated towards the two

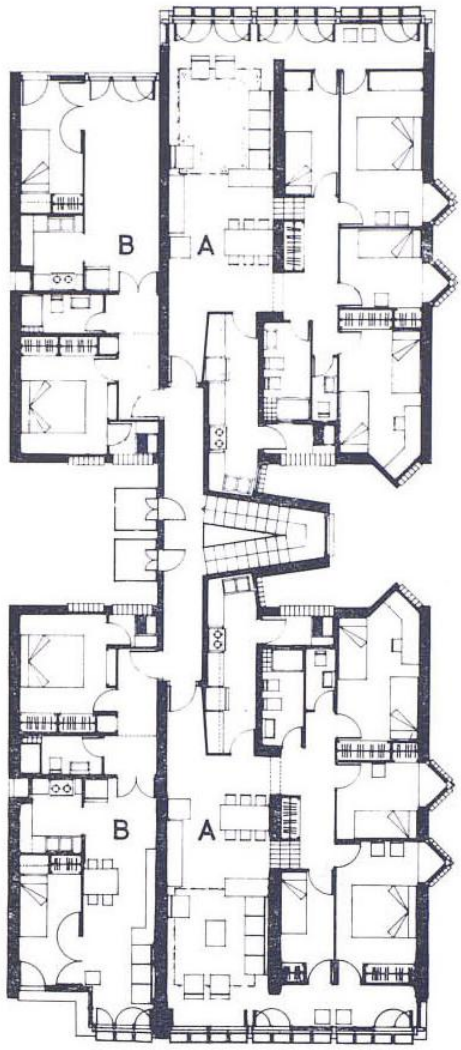
blind side-wall, and some facility spaces are densified, such as the kitchens and the interior rooms ventilated only by the shafts (Armesto, Mariona, 2006).
The square grid layout is evident in the Oller house plan in carrer d'Amigó 76 (1941-1944), by Francesc Mitjans; however, the strength of the rooms - living rooms and bedrooms -aligned parallel to the two façades tends to prevail, so this building could also be considered a hybrid. A paradigmatic example of square grid layout are the houses designed by Antoni de Moragas i Gallissà, especially those in carrer Gomis 32 (1953-1954), carrer Sant Antoni Maria Claret (1956-1957), and the Casas de los Toros (1960-1962) in Gran Via de les Corts Catalanes.
The layout arrangement is based on the repetition of an approximately square module with two or four apartments accessed by the staircase. The building thickness (26.7 meters in carrer Sant Antoni Maria Claret) is remarkable. Some rooms are unavoidably placed in the innermost core of the house and the light is provided by a lightwell as happens in Carrer Gomis House. The space arrangement is strip pattern shaped according to the perimetral walls so that the layout looks like an offset of "rings". The housing block in calle Amigò (1941-1943) designed by the same architect, takes advantage of the relevant thickness placing the living room in the middle of the plan. That would seem pretty strange, but Mitjans divides the living in two parts: the fireplace characterizes the inner one, and it's connected with a larger sector as width as the loggia overlooking calle Amigò (Monteys, 2006, 60).
Moragas often designs the houses with the help of this typological module: it is so flexible to allow composing the façades with different languages. In the Carrer Gomis there is an apparent reference to the catalan building tradition. On the contrary, in Santa Maria Claret house (Fig. 3) the elevation is the outcome of superimposition between a grid, which in turns is the projection of the partitioning walls, and a brickwork wall slightly backward marked by the windows. The grid pattern is a tool to control both the layout arrangement and the façade composition, making the expression exactly as it is entirely in accord with mathematical rules that lie under the grid. The building is located on a road axis that delimits the fabric of the Ensanche towards the northeast and forms the southern edge of the Horta-Guinardò district near the hospital of La Santa Cruz y de San Pablo. So, we can argue there is a settlement rule premised on a module and perfectly incorporated into the perimeter block of a neighborhood where there is the transition between the Ensanche pattern and the denser and more disordered fabric of the barrio el Camp de l'Arpa del Clot.

6. The H-type

A second planimetric type much more widespread than the previous one, so as to become an "eternal present" in which a powerful resilience is recognized, is

Fig. 3. Antoni. Moragas, F. Ribas de Salas, Housing Block in carrer S. Maria Claret (1956-58). Re-draw by the author.





← Fig. 4. Emili Donato Folch house in Calle Rosselló (1964-1966). Redraw by the author.

↑ Fig. 5. Emili Donato Folch house in Avenida Vallarca (1964-1966). Photo by the author.

the H-shaped one which takes on this name since it is shaped in a similar way to a H steel profile, where the web is the stair volume and the flanges the dwellings. This kind of plan has a central symmetry with a relevant thickness spanning from 15 to 27 meters.

The H-shaped plan is recognizable in buildings of different scale and urban meaning ranging from standalone buildings to perimeter block ones located in the Ensanche or the outermost neighborhoods.

The scheme responds to the practical need to effectively occupy the rather large lots in the urban fabric of Spanish cities, especially in Barcelona, since it allows to place toilets and stairwells in the not very bright central parts of the building, ensuring the contribution of air and light through shafts.

The popularity of the H-shaped plan is due to its easy repeatability and adaptability. Emili Donato Folch design the plan of two buildings reiterating the H module: one time in the narrow but deep house in Calle Rosselló (1964-1966), and two times in Avenida Hospital Militar (today Vallarca) (1965) (Fig. 04; Fig. 05). The first is a virtuosity of planimetric arrangment since the disproportion between the length of the façade (14 meters) and the depth (33 meters) forces the designer to work with narrow and long rooms separated by the load-bearing walls. By observing the plan, one can see how direct passageway start from the central staircase towards the façade imposing a linear movement which distribute the rooms. The façade formed by a sequence of windows and doors is remarkable for its compositional effectiveness, making it a light structure that is not bound to the masonry but separated by the loggia corridor that connects the living room to the bedroom (Fig. 05).

The second building (1961) is located in the more peripheral Gracia district and lies in the perimeter block of a long and narrow block, therefore with the usual constraint of two façades parallel to the street and two blind sides connecting it to the adjacent buildings.

In this case, the architect alters the usual central symmetry in H-shaped plans, giving more weight to the houses aligned with the street. All the apartments are arranged with pathways parallel to the façade while the size of the space is regulated by the structural bay which, contrary to the construction tradition, is a post-lintel system.

The apartments about 15 meters deep, take advantage of these strips to separate the living area from the sleeping one, while the spaces towards the inside of the block, located beyond the patio, look like a narrow band. (Fig. 06). The striking innovation is the kitchen located in the trapezoidal bow window; the worktop stretches to the edges wall; thus, the whole cooking space faces outwards. In the project drawings published in number 62 of the magazine *Cuadernos* in 1965, the kitchen is shown as an open space in the larger apartment. It is one of the cores of the house: it allows who is cooking

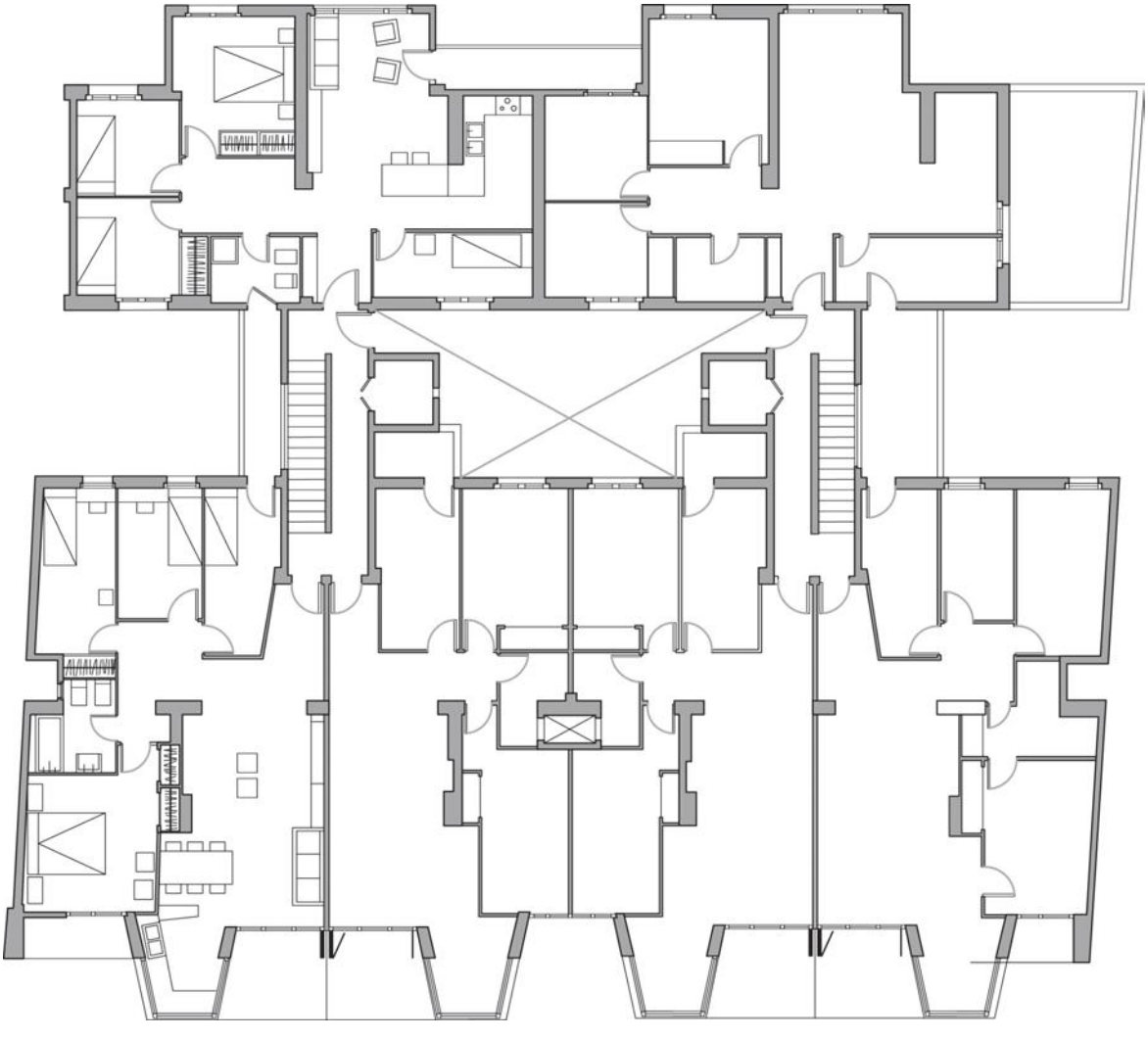
to stay in visual touch with the living room environment, while it works as a limit between inside and outside. This continuity is reinforced by the peninsula dining table stuck to the partition that separates the living area from the master bedroom. (Fig. 07)

Among the single H-shaped plans, the Vivienda ISM at Barceloneta District by José Antoni Coderch de Sentmenat is probably one of the most famous both for the architect's fame and his ability to introduce significant variations concerning the standard layout. The latter is modified by deforming the orthogonal walls and introducing inclined partitions. While Coderch was carrying on the project between 1951 and 1952, it turned the orthogonal walls into oblique, involving both the central core of the building around which staircase and services are clustered and the boundary between exterior and interior (Armesto, 1996, 31-54). The skin of the building is peeled off in two layers: the outermost is characterized by the famous Lambì shutter (the slats can rotate but cannot be open), outlining the semi-open space, placed between the three bedrooms and the shutters themselves. The innermost one overlaps two sections of the load-bearing masonry, and the central bedroom breaks it. Coderch, thanks to the inclined geometries, decreased the importance of the bedrooms' orthogonal partitions, which thus get a spatial role similar to the one of the furniture. (Fig. 08) The Barceloneta house is, therefore, a hybrid between a house arranged by rooms and an open space without partitions. A fluidity is obtained in the circulation inside the apartments so that the relationships between the areas are more dynamic than in the house with orthogonal walls: the living spaces are not split into rooms that works as interluded enclosures but in a more organic flow so that the relationships between spaces from "closed and rigid" become "open and fluid" (Cornoldi, 1988, 56).

Several architects multiplying the H-shaped module get much larger buildings where, however, the very principle of modularity allows to find coherence with different forms of the urban fabric.

The genealogy of the H-shaped is not to be sought only in Barcelona: Secundino De Zuazo Ugalde in the Casa de las Flores in Madrid (1930-1932) designs an innovative double-body residential building that radically criticized the closed blocks, deep and poorly ventilated, proposed by Carlos Maria De Castro for the Madrid

Fig. 6. Emili Donato Folch house in Calle Rosselló (1965). Redraw by the author.



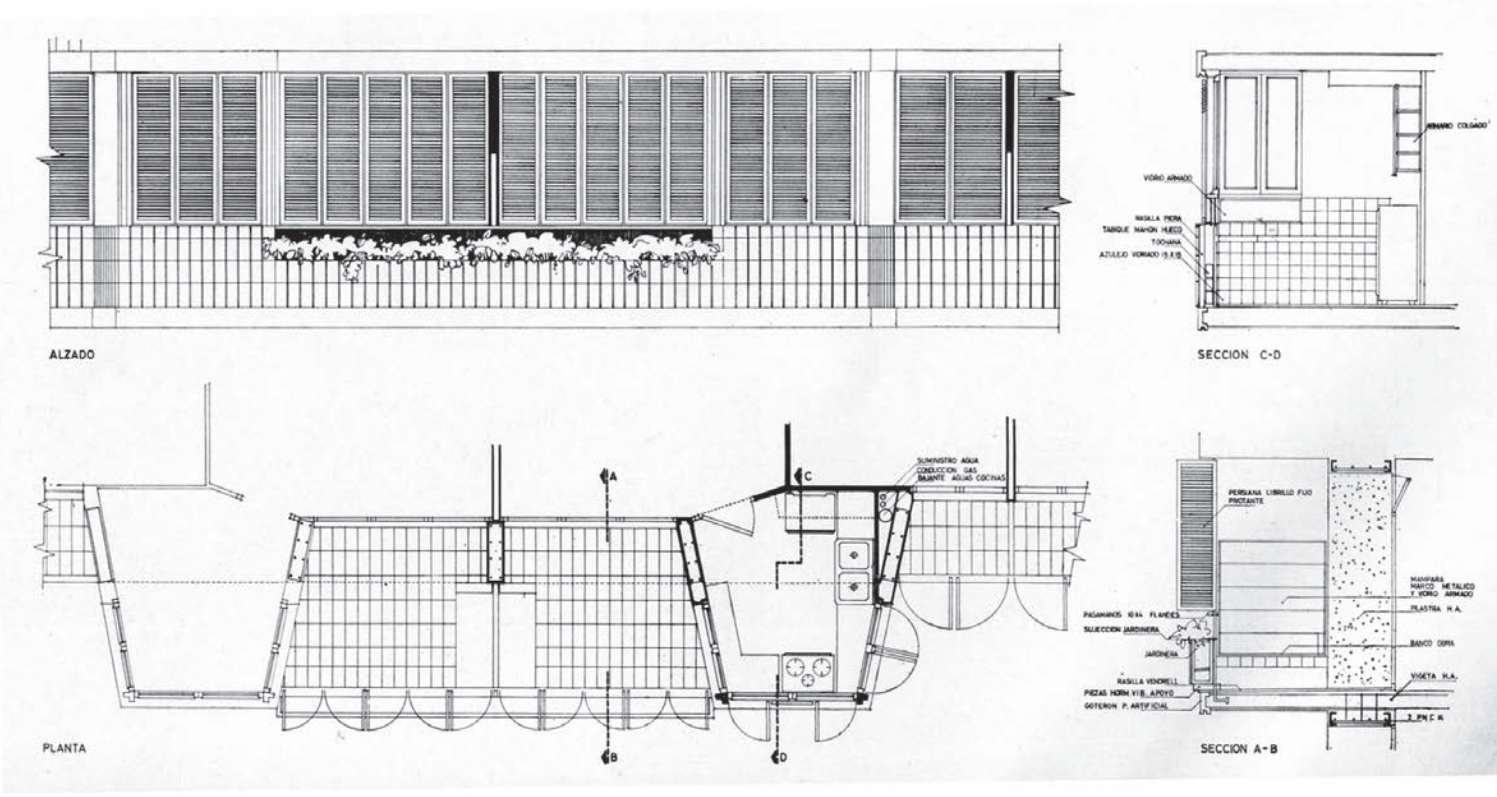


Fig. 7. Emili Donato Folch house in Avenida Vallarca: detail of the Kitchen. Cuadernos de Ar-quitectura, 62, 1965, p. 19.

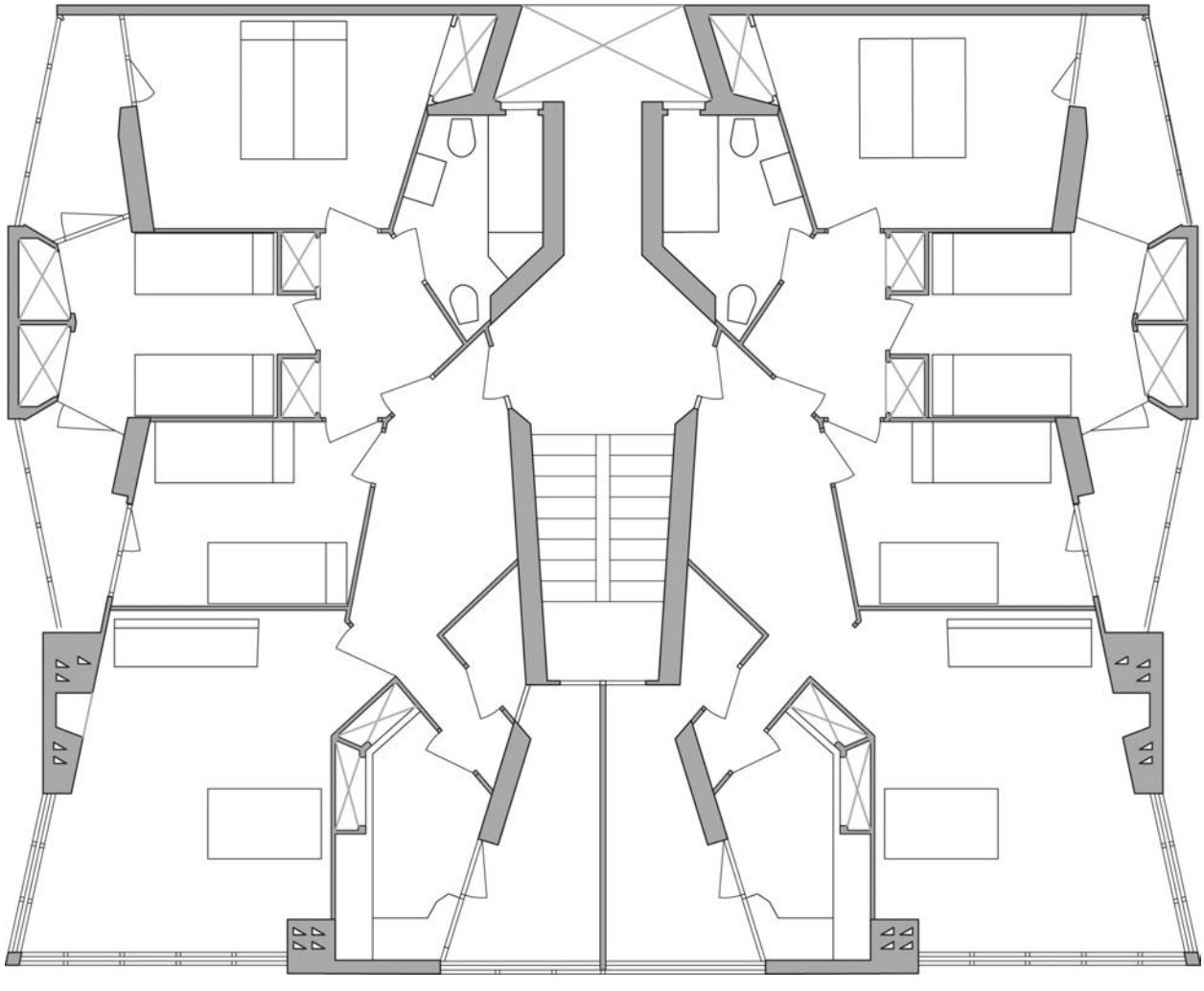


Fig. 8. Josè Antoni Coderch. ISM building (1953). Typical plan. Redraw by the author.

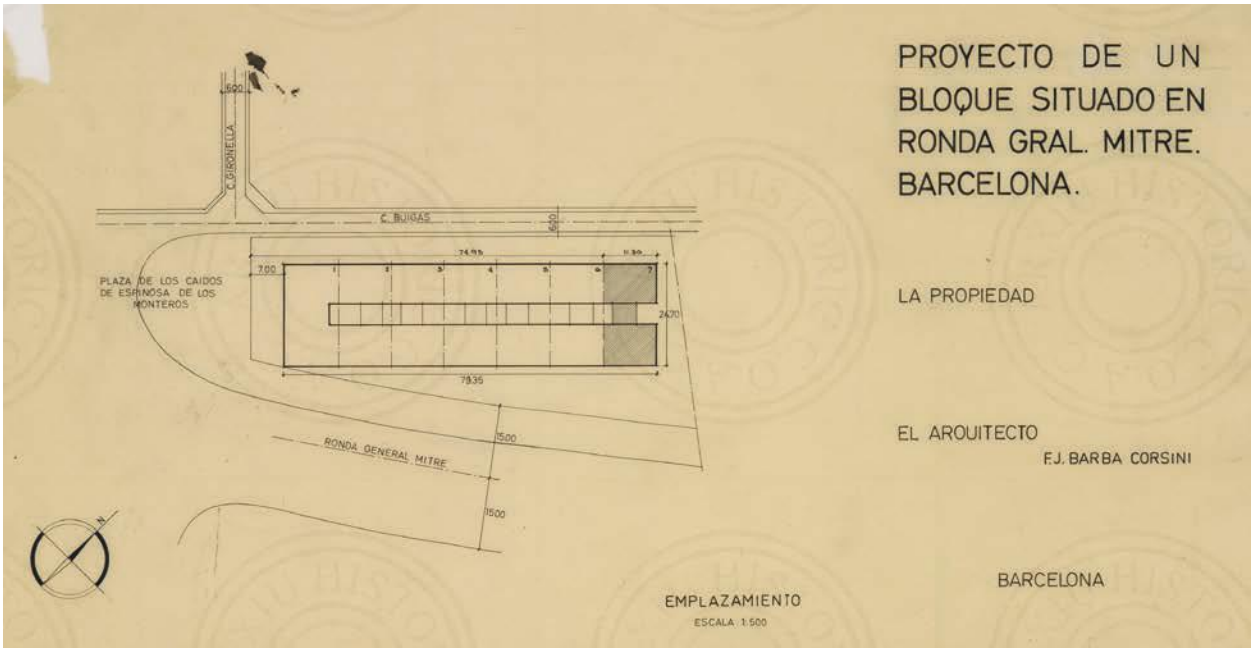


Fig. 9. Francisco Barba Corsini, Mitre housing block (1959-1964). Settlement plan. Archivo Histórico COAC, Barcelona. Fondo 6.1.1.1 - Fons arquitectes. Sub fondo. Barba Corsini, Francisco Javier H113l/1/8/7

Ensanche. The innovation consists of 'emptying' the building volume, turning it into a building that "fades" the thickness into a repeatable living module system. These last are made with a corresponding central core, as we have seen, by the staircase and by two side wings in which the apartments are located: "the result foreshadows the future and the consacrated H block" (Centellas, Jordá, Landrove, 2009, 201).

It should also be noted that the H-shaped plan is probably the evolution of the plans drawn by the "maestros de obras" (foremen) who designed the houses addressed to the bourgeoisie in the Cerdà Ensanche, which foresee a central block with the stairwells and the aggregations of living environments on the sides. It can thus be deduced that the resilient elements of the H-shaped module correspond to a part of the arrangement of space which, thanks to the repeatable matrix of the Cerdà plan, allows a correspondence between large and small parts. In this way the small scale of the domestic space is contained into the wider scale of urban space following a principle of continuity (García, Rovira, 2017, 32).

7. The double body

Thanks to its modular flexibility, the H-type becomes the basic unit for many double-body buildings, consisting of two parallel blocks close to each other, connected by stairwells and separated by patios. Typical examples are the Mitre housing block by Francisco J. Barba Corsini (1959-1964), the Mediterráneo building by Antoni Bonet Castellana (1966-1967), the housing block in Avenida Meridiana (1959-65) and in Calle Pallars (1955-1966) designed by MBM studio.

The Mitre is located in a district of Barcelona, at the time in the outskirt, southward of Sarria-Sants. It is a "double block with two parallel bodies" (Monteys, Fuentes, 1998, 19) (Fig. 09).

The planimetric conformation does not come from the simple juxtaposition of two slab buildings but from the sum of six H-shaped modules to which a headboard is added, which defines the façade towards the starting point of Avenida General Mitre: Barba Corsini specified that the building was made up of "six houses" (Monteys, Fuentes 1998, 12).

The conception of domestic space is one of El Mitre's most exciting design elements and renders the building noteworthy. The H-shaped module is formed by two units per side, each with a gross floor area of 123.5 square meters. These can accommodate a single dwelling, or they can be divided into two sub-modules or further subdivided into three units by placing a 46 square meter square-shaped unit on the module's centerline. (Fig. 10)

The El Mitre apartments are small, flexible, and versatile. Following the 1953 law, the minimal apartment floor areas required Barba Corsini to mix functions. While the position of the master bedroom on the exterior facade remains invariable, like that of the bathrooms and kitchens, the space on the interior façade between the kitchen and the entrance varies so that it can be the dining room or the bedroom hosting from one to three people. It can be a standard bedroom or host niches for beds and other furniture, thus obtaining minimal space. The entrance is overlapped on the sleeping area creating a "pass-through" bedroom where a foldable wall separates the sleeping niche from the circulation space. The movable wall also appears in the master bedroom; in some cases, the wall between the bedroom and living room can slide to blend these two spaces creating a heightened perception of space. (Fig. 11)

Right in the Ensanche Antoni Bonet Castellana built the Mediterráneo building (1964-68) in Carrer Consell de Cent, targeting the housing for a medium-high market. As in the Mitre, the four H-shaped modules define just as many autonomous residential units. The 28 meters

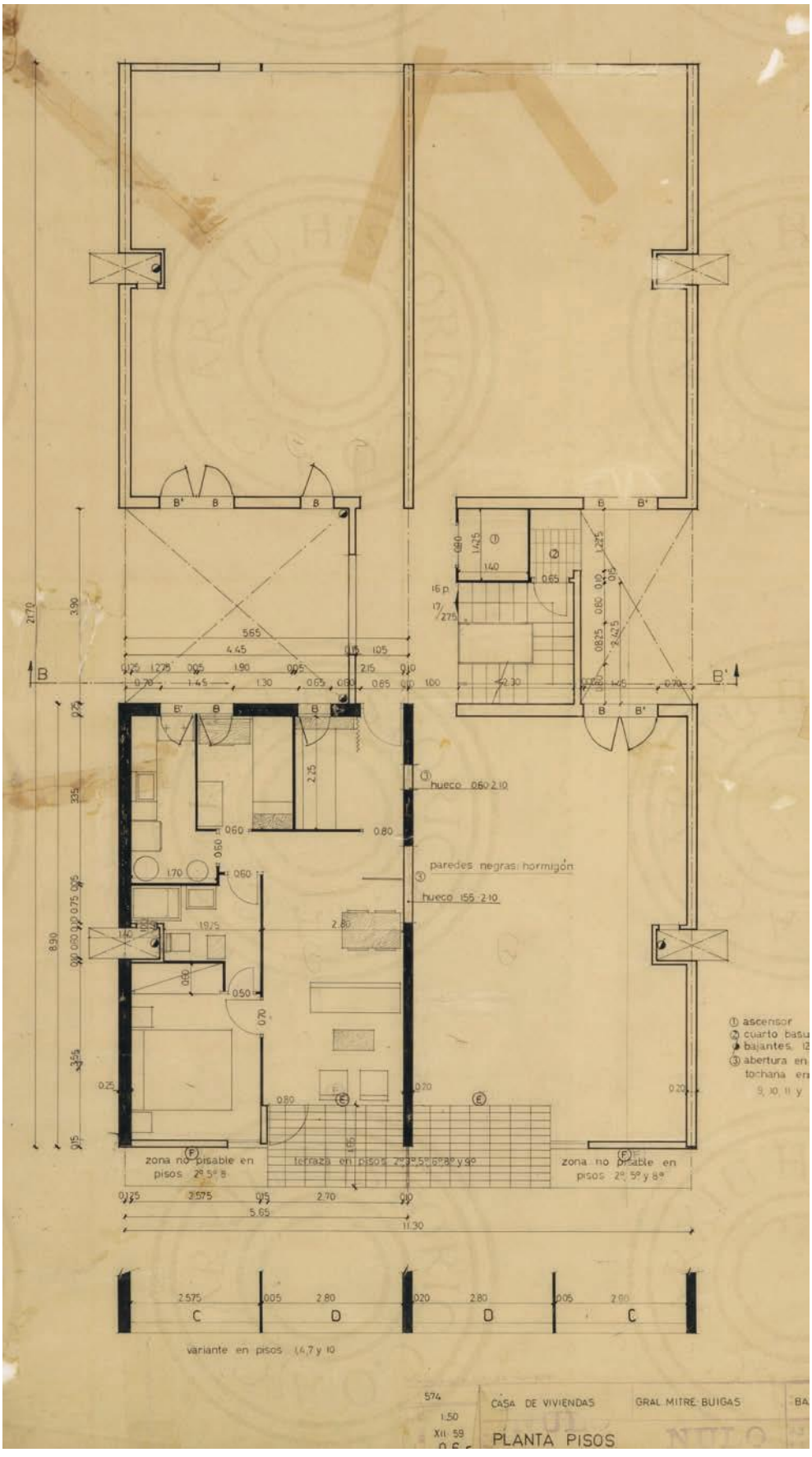


Fig. 10. Francisco Barba Corsini, Mitre housing block. H shaped plan. Archivo Histórico COAC, Barcelona. Fondo 6.1.1.1 - Fons arquitectes. Sub fondo. Barba Corsini, Francisco Javier H113l/1/8/34

Fig. 11. Antoni Bonet Castellana, Mediterráneo (1966-1967). Settlement plan. Redraw by the author.

deep of each module host four apartments of 146 s.m. each. The space arrangement provides a doubling strip of services with the bathrooms, both on the centerline of each of the two wings of the H-shaped module and towards the patios, where the kitchen, second bathroom, and service rooms are.

In the Mediterranean accommodations, the living room is vast and placed in an almost central position. Compared to the Mitre, there is a clear separation between the living and sleeping areas, and a more rigid delimitation between serving and served spaces is much more evident. The Mediterranean assumes an urban significance consistent with the settlement system of closed-block blocks and "represents an effort to enhance Plan Cerdà". The double body closes one of the sides of the block, and the depth pushed to 28 meters allows effective control of the deep plant typical of the Ensanche blocks. (Fig. 12) The most significant part is the corner: in place of the usual *chaflan* Bonet Castellana offsets the alignment of the heads of the parallel buildings to obtain, on the intersection between Carrer Consell de Cent and Carrer Comte Borrel, two shifted façades placed on different visual planes, thus getting alternative formal characteristics to the oblique façade of the Ensanche (Álvarez, Roig, 1996). (Fig. 12)

The Pallars residential block designed by MBM studio (Bohigas, Martorell, Mackay) is one of the most iconic examples of housing designed according to the H-shaped plan and the double body arrangement. Originally the project planned to build all the four sides of the block located in Poblenou, a brownfield area, thus taking up the settlement principles of Plan Cerdà. Practically, only one side was built, ending the corners by two oblique facades matching the *chaflan* and the related idea of space.

The fame of this house is due to the Català-Roca pictures that show the building shortly after the construction as a striking outcome of the so-called Barcelona School. This last is a group of architects which joined the investigation carried on by Oriol Bohigas that promoted the Italian "new realism" addressing the architectural language to bricks and mortar, supporting a regional identity rooted in the historical Catalan architecture. The H-shaped module is arranged placing the web (corresponding to the staircase) is perpendicular to the street facade (and not parallel as in building Mitre or Mediterraneo) so that the space between the two "wings" becomes a slit that gives rhythm to the façade with the help of the slightly everted edges of the exposed brick masonry.

Each of the H-shaped modules is connected to the adjacent ones through a shaft - around which kitchens and toilets are clustered. As has been pointed out, this is a reinterpretation of the Cerdà block and at the same time a criticism of the size of those blocks (Pierini, 2008, p. 60). (Fig. 13)

The housing complex was designed for the working class and is supposed to be affordable. So, the typical

Fig. 12. Antoni Bonet Castellana, Mediterráneo (1966-1967). View of the building with the Cerdà chaflan Photo by author.

accommodation, just 60 square meters, is an exercise in distributive skills since in such a small area, the designers get two or three minimal bedrooms with an essential supply of furnishings. Even in this case, the kitchen is innovative: it's a corner kitchen practical in terms of the distance between the sink and hob sticked to a cupboard which makes up a center-point for the apartments able to separate spaces and address towards the bedroom.

The Avenida Meridiana housing block by MBM is a double body consisting of three modules, this time with the web parallel to the main façade (the stairs is two-quarter landing) a relevant depth of the building. Each module houses four apartments arranged in a strip: immediately after the entrance, there is the clustering of the toilet and the pass-through kitchen that leads to the center of the house.

This building seems huge even if his size (60 x 25 meter approx.) is the same of many other housing blocks but the proportions make it appear bigger than what really it is. That suits perfectly with the urban context as Avenida Meridiana is a four lanes road planned as is known by Plan Cerdà and now it is connected with the motorways. The area around MBM's building is characterized by other dwelling blocks with the same typology and the next one is by Antoni Moragas. Both are a sort of "dam"[11] against the chaotic urban tissue between the Avenida and the Sagrera rail yard. The housing blocks were planned in the frame of an intensive development area clearly visible in the 1958 urban map (Fig. 14), while the aforementioned urban tissue facing calle Sagrera was likely let free to grow without rules.

8. The "case" Bofill

The first building designed by Ricardo Bofill i Levi in carrer Johann Sebastian Bach, n. 28 (1960-1962) shows an unusual way to arrange the floor layout with the H-type model.

In this building, the core formed by the staircase, the patio and the bedrooms has been rotated of 35° in the northeast direction.

The nine-storey high building is a prestigious residence, with a flight of stairs and two elevators serving two flats per floor, while on the top there is an attic.

The apartment layout is worked out, dividing clearly day and night area, placing the first towards the Calle Bach, and the second around the patio.

Fig. 13. MBM studio, Pallars residential block (1955-1966). Settlement plan. Redraw by the author.

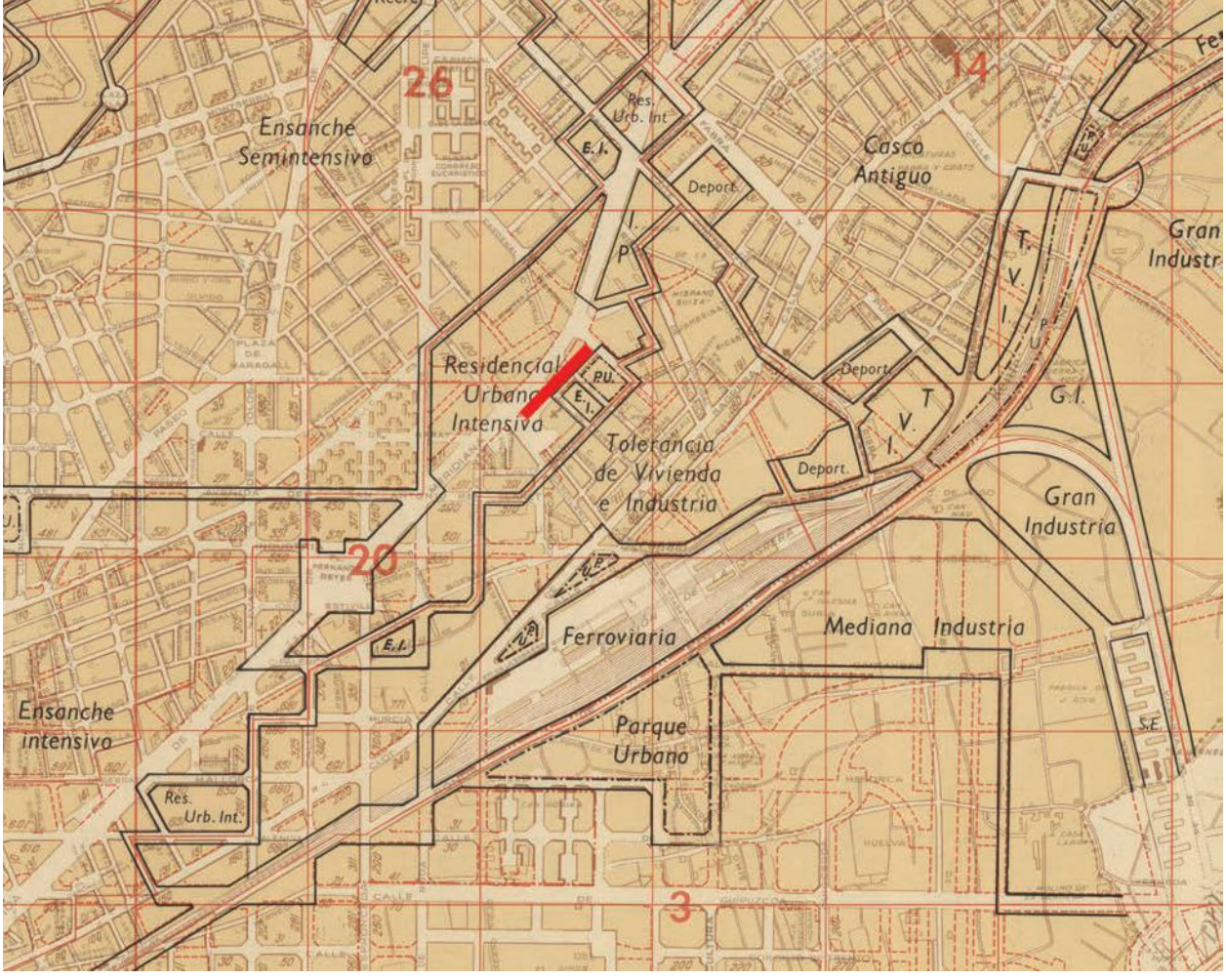


Fig. 14. Barcelona development plan 1958. The area where both MBM's building and Moragas' one are planned is red hatched. http://cartotecadigital.icc.cat (RM.26333)

In the ground plan Bofill carefully sets the spaces served by very clear pathways: the edge-walls, the partitions, and the furniture as well set the layout into closely defined parts. The fine-tuning attention becomes known through the drawings where the floor pattern is drawn with accuracy, as Coderch had done in the ISM Vivienda so that it is a pattern that contributes to the geometry of the arrangement.

The living is organized, in turn, into three areas: dining room, recessed loggia and conversation space, all linked together by open and dynamic relationships. The bedrooms are lined up in a passageway with built-in wardrobes. (Fig. 15)

The façade towards the patio has an atypical, serrated edge: the walls have been inclined by 30 degrees so that the small loggias can have a good amount of light despite the narrowness of the courtyard and in the meantime channel the view to avoid visual interference with the rooms on the opposite side. Bofill in this façade is looking at Coderch's ISM house and at the housing block "la maquinista" resuming the way to interlock inside and outside space.

The penthouse floor occupied by a single apartment that directly accesses the garden roof has fewer partitions. In the large living room, the architect takes advantage of the "perimeter strategy" by placing sitting spaces along the walls, including the serrated ones of the patio, getting fluid and dynamic spatiality. The portioning fades away, suggesting an "open door" use of the apartment (Monteys, 2006, 59). Although Bofill's house seems to be pretty traditional has an outbreaking character due to the geometric fracture powered by the staircase and night area rotation. Rather than responding to a standard planimetric type, this house, like the other works by Bofill of this period, express a will to shape architecture going beyond the boundary of the School of Barcelona to which this building belongs (Bohigas,1968).

9. Conclusions

There are many other types of residential ground plans designed in Barcelona during' 50-'60. For instance, Federico Correa's Atalaya building (1966-1970), where it is easy to recognize an echo of the BBPR Milanese towers; other buildings take up the corridor type layout and a relatively narrow cross-section (on average 11 m) as the houses of the Escorial housing complex (1952-1962) built by various architects belonging to the R Group including Bohigas and Mitjans. In the '70s, some architects follow completely different and sometimes unusual layouts for the city's history: an interesting case is the Fullà house by Clotet and Paricio with double-height bayonet-mounted apartments.

However, what gives the plans of the houses a Barcelona identity, that as we have seen has been recognized and promoted as a school by Oriol Bohigas is the combination of the wide section of the building (the so-called deep plan) and the H-types, the grid, the double

body, combined with the language, characterized by exposed bricks, exposed concrete for the bases, louvers and slat façades or bow-windows.
Investigating all types of layout is impossible in this paper, but the aim of the work concerns the comparative study of the formal features of ground plans at different scales: if we take into account the tectonic and linguistic aspects, we will have the necessary elements to formulate a critical judgment on the historical period under consideration.
But how the ground plan does fit with the resilience? As we have seen, resilience partly coincides with the permanent characteristics of architecture, which are certainly not only linguistic ones but also changeable, but those relating to space and its relationship with the practical use of the inhabitants.
In Barcelona, resilience is one of the characteristics that allow modernity to survive the dictatorship.
Modern architecture, and Modernism, means a much broader phenomenon than the famous architectures referred to in the '20- '30s, has to struggle in a city ruled by real estate speculation. The urban planning of the Franco period alternates the absolute immobility of the '40s, with a frenetic real estate activity in the following decades, with a lack of any serious cultural program of reconstruction of the urban fabric but, rather, endorsing the denial of public space as a social place and supporting all informal and abusive construction. The building of *polygonos* for social housing provides just built-up volumes, located somewhat randomly in the extreme periphery, without designing an urban place, and with rather disappointing figurative results and severe infrastructural deficiencies. In this situation, also known as *desarrollismo*, cultured architecture cannot do anything but work for the middle-upper bourgeois client, at the same time questioning the segregative and speculative urbanism, especially since the '60s and '70s. This critique will be the basis for the city's subsequent democratic project, which will take not coincidentally the public space redesign as a driving topic. (Borja, 2010, 77).
It is an intellectual criticism made not only by architects but by a plurality of other subjects, including lawyers, journalists, writers, associations, trade unions. In the city's transformations following the Olympics Game in 1992 which marked the beginning of the "Barcelona model", taken as an example and exported to Europe. Among the different ways to cope with the urban design this is "an empirical model that does not begin with great technocratic plans, based on fragmentary operations as well small and medium-sized projects that strategically help to make up the city a live lesson on the process of continuous planning" Montaner, 1990,19.
Empiricism is a working method related taken up, in particular by the Milan School which had developed it following the Ernesto N. Rogers teachings.

Fig. 15. Ricardo Bofill i levi. Carrer Bach 28 Housing block. Redraw by the author.

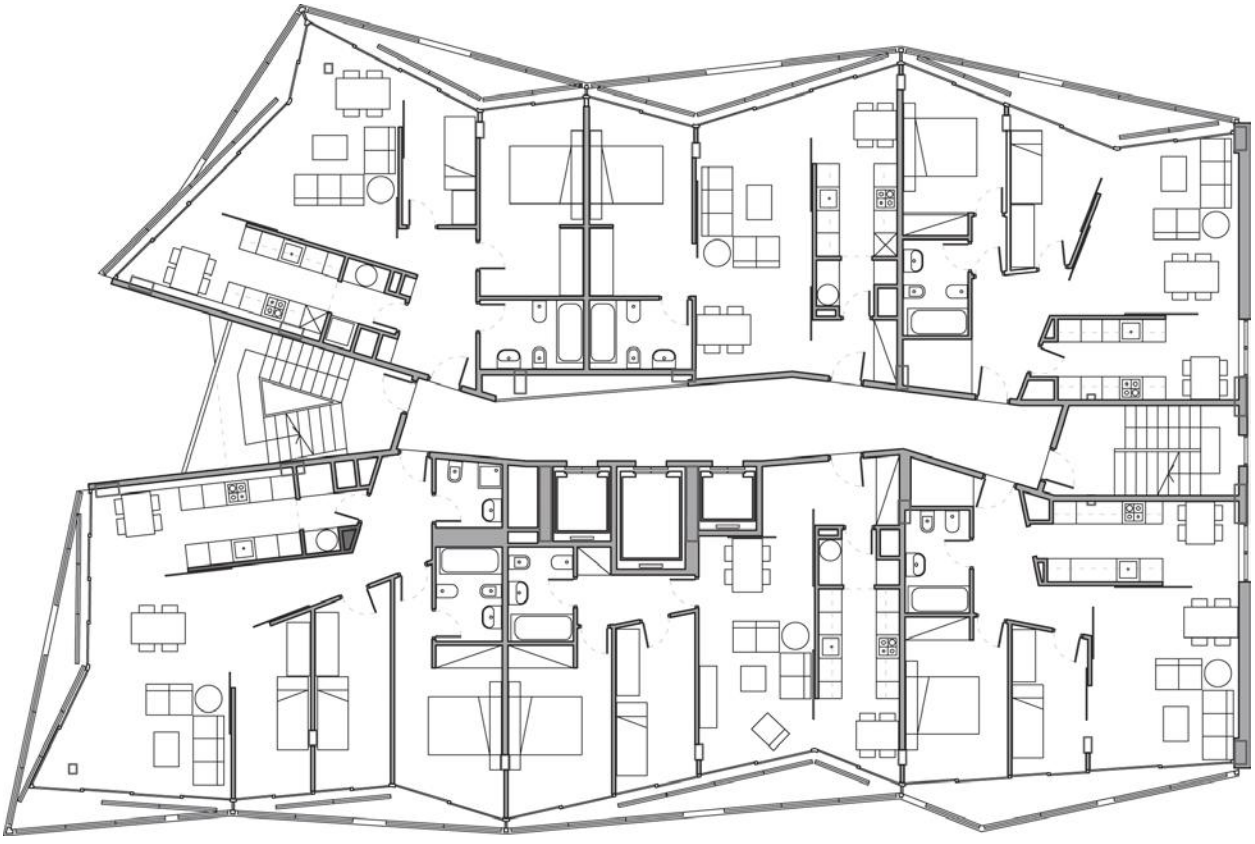


Fig. 16. OAB (Carlos Ferrater), Vertix Housing, Barcelona 2003-2007, Redraw by the author

The residential projects of the '50s and '60s are a component of this overall process: from a typological point of view, they remain and characterize architectures built in the contemporary world: the H shaped plan is still popular among Barcelona architects as shown by the Vertix Building designed by Carlos Ferrater[12] (Fig. 16) in 2009.

This continuous rewriting of what has already been done is, after all, one of the most consistent themes of architecture that makes it not a collection of fashionable objects but an actual testimony of human life.

We are talking about houses or places of living where architecture intersects and interacts with the lives of the inhabitants, thus making space "domestic". The term "home" refers to the synthesis between the space shaped by architecture and the emotional and personal dimension of living: "the house is the house in which we were conceived and in which we conceive, in which we remember loved ones and in which our hope of survival is placed. But it is also the place of our conscious emotions and of our unconscious, in which […] to set one's life and one's dreams" (Raboni, 2005, 53).

ENDNOTES

[1] Alberti, V., Alonso Raposo, M., Attardo C. et al., The future of Cities, http://dx.doi.org/10.2760/375209, Publication Office of the European Union. https://urban.jrc.ec.europa.eu/thefutureofcities/the-resilien-city# the-chapter. Last access May 2021)

[2] Ernesto Nathan Rogers (1909-1969) was an Italian architect and director of *Casabella* magazine. He influenced Italian Modernist Architecture by addressing architectural design to a closer attitude to the environment, including the human being. That was not so far from the pre-war modernist age and its ethical concerns, but its rigid trust in technology and progress was rejected. E. N. Rogers attained a phenomenological approach gathered from the interchange between the philosopher Enzo Paci (1911-1976). Rogers and Paci shared the same view of culture since both trusted the need for a continuity between tradition and modern.

[3] As it is well known in Barcelona one should not confuse Modernism or Modern Movement with Modernisme.

[4] In the international context GATEPAC is more common as the C of Catalans is replaced by the E of Españoles.

[5] Spain didn't join the WW2. Three years of Civil War 1936-1939 left the country seriously wounded with many cities damaged and a death trail that went far beyond those killed in battle. In 1938 Barcelona was the capital of the land controlled by Republican government. With the city's fall on January the 26th, the Republicans lost most of their forces and the most significant part of the war industry. In 1939 after the final defeat of the Republican Army, Francisco Franco became officially the head of the Spanish government ruling the country with a dictatorship. Democracy was wiped out and a "political stabilization" made up of arrests, summary executions, torture followed. Besides, the borders were sealed up, and the whole country was forced to a long period of autarchy.

The radical innovations pursued by the GATPAC had been erased as many of its members were considered dangerous and too close to socialist and communist ideas. Some prominent architects like Josep Lluìs Sert, co-founder of the GATPAC and Le Corbusier's friend as well as Antoni Bonet Castellana, run away in South America. Most of GATPAC archives was destroyed, and the publication of A.C. magazines suddenly stopped

[6] This house is also known as ISM house that stands for "Instituto Social de La Marina".

[7] BBPR is the acronymous of Banfi, Belgiojoso, Peressutti e Rogers, one of the outstanding architectural office in Milan Modernism. Ernesto Nathan Rogers was the theoretical leader. They started to work together in 1932 managing to give a remarkable contribute to Italian rationalism being involved in MIAR (Movimento Italiano per l'Architettura) and in the magazine Casabella. After WW2 they went on without Banfi dramatically killed in Gusen Nazi Concentration camp. They designed a lot of master works as Restoration and refurbishment of the Sforzesco Castle, Milan (1956), Velasca Tower Milan (1959), Hispano-Olivetti building in Ronda de la Universidad, Barcelona (1964), Office building (Chase Manhattan Bank) in Piazza Meda, Milan (1969).

[8] Some of the Grup R members are: Balcells, Bassó, Bohigas, Coderch, Gili, Giráldez, Martorell, Monguió, Moragas, Pratmarsó, Ribas, Sostres, Valls y Vayreda.
[9] *Motor de Modernidad* was the title of an exhibition about Grup R hold at MACBA in Barcelona from February 5th and June 4th 2014.
[10] The Ensanche or Eixample (in Catalan) is the expansion of old Barcelona still confined in the walls, designed by Ildefonso Cerdà and imposed to the city by the Royal Decree of May 31th 1860. The urban plan consists in a pattern of square blocks known as "manzanas". The block corners are chamfered at 45° to improve the circulation flow, but the tangible outcome was an original urban space shaped by the cross of the road and the juxtaposition of the chamfered buildings.
The most important feature of the plan lies in the theoretical background explained by Cerdà in the book General Theory of Urbanization published in 1867. The cornerstones of Cerdà's thought are: hygienism and the improvement of people life quality; circulation, as the roads are compared to the human circulatory system due to their essential role in making the city works; the plan concerns the whole Barcelona territory extending over the municipality.
[11] The idea of the "dam" against the urban disorder was evoked by Italian historian Manfredo Tafuri about the huge social housing building Corviale at Rome with the outstanding size of 1 km length and 200 meters wide (Tafuri, 1981).
[12] Viviendas Vertix https://ferrater.com/es/project/viviendas-vertix/ last access may 2021

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