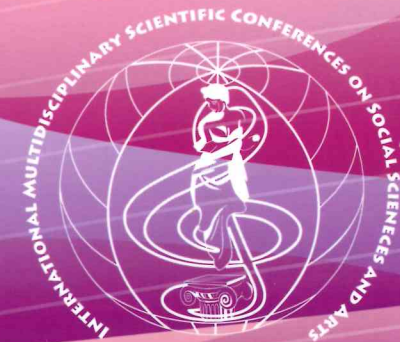


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## TECHNO-TYOLOGICAL EXPERIMENTATION IN MULTIFAMILY SOCIAL HOUSING.

### LESSONS FROM THE PAST AND DESIGN RESEARCH PERSPECTIVES

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#### ABSTRACT

In times of economic crisis a renovated demand for social housing emerges which relaunches the debate on high quality - low cost residential developments. In contemporary architecture the concept of high performance housing is often interpreted either in terms of energy and environmental efficiency - thus leaving to technical innovation in construction systems, components and materials a leading role in the design research – or in terms of aesthetical appearance enabling to provide the building with a strong identity.

This paper has the aim of discussing a proposed definition of housing quality as the simultaneous compliance to both environmental, technological and spatial requirements as well as incorporating a temporal perspective in terms of adaptability, flexibility, maintainability, and durability to follow changing demands over time and contrast the physical and functional obsolescence of buildings. Hence, high performance and global cost control, to be likewise considered over time as the sum of construction, operation and upgrading activities, relies in the ability of the project as a synthetic creative interpretation of both technological and typological issues and not univocally in the application of specific materials and products. This concept is illustrated through the identification and the analysis of significant social housing case studies of Modern Architecture, with special reference to multifamily homes, which disclose different lines of experimentation, albeit sporadically recognizable through history.

Accordingly, this work can contribute to highlight possible paths of design research and further perspectives for techno-typological experimentation where technological innovation allows for the development of typological answers in the flexible and efficient organization of the home spaces able to respond to inhabitants' changing needs.

**Keywords:** social housing, housing quality, housing typology, flexibility, technological innovation.

#### INTRODUCTION

The enduring economic crisis has harshened the demand for affordable housing thus relaunching the architectural debate both on processes and design [1]. Once again in history the issue of delivering high-quality low-cost dwellings is investigated through research and experimentations with the aim of responding to affordable housing demand, albeit showing different needs in comparison with the past.

The sustainability imperatives which characterise contemporary culture not only focus on the aim of reducing energy and resources consumption but have broadened the timeline control to a life cycle perspective. Moreover the evolutionary framework of our heterogeneous society features a diverse range of rapidly changing dwelling models corresponding to increasing new concepts of family groups.

Accordingly, a current definition of housing quality entails the simultaneous compliance to environmental, technological and spatial requirements as well as incorporating a temporal perspective in terms of adaptability, flexibility, maintainability, and durability to follow changing demands over time and to contrast the physical and functional obsolescence of buildings. Hence, high performance and total cost control, have to be considered over time as the sum of construction, operation and upgrading activities.

Although theoretically acquired and shared these principles have not yet led to the development of a new language, to a paradigm shift [2] neither in architectural design nor in the construction sector.

In contemporary architecture the goals of high performance and cost control are often addressed through the application of technical innovation in new construction systems, components and materials, sometimes of uncertain reliability over time, also providing an iconic aesthetical appearance [3]. Simultaneously, typological research has led to an increase of types also in order to cope with social change [4], especially investigating different possible interpretations of semi-public spaces and private open spaces to enrich the program and the fittings of multifamily residential buildings.

However, as significant modifications in architectural conception reflecting the *weltanschauung* of their time have been in the past the result of a synthetic creative interpretation of both technological and typological aspects [5], the expected change in the discipline approaches towards contemporary issues, might be the result of analogous experimentations.

This paper illustrates the concept of techno-typological experimentation as a possible means of developing a housing quality where technological innovation allows for the development of typological answers in the flexible and efficient organization of the home spaces able to respond to inhabitants' changing needs.

#### TECHNO-TYOLOGICAL EXPERIMENTATION: CASE STUDIES FROM THE PAST

The concept of techno-typological experimentation is illustrated through the identification and the analysis of significant social housing case studies of Modern Architecture, with special reference to multifamily homes, which disclose different lines of experimentation, mainly focusing on the housing unit. These projects are not only outstanding examples of significant paths of research to be developed also in contemporary social housing research, but also represent a design approach which combines new materials and technologies or new construction processes as sources of inspiration for innovative typologies.

Since 1909 Henri Sauvage e Charles Sarazin develop a design solution with the aim of enhancing health conditions of public housing in high density neighbourhoods [6].

The stepped terrace system, which they patented in 1912, exploits the potentials of structural concrete frames to design buildings which, albeit placed along narrow streets, could benefit from direct solar radiation, natural lighting and ventilation and a balcony for each apartment. The architects had hoped that the rentable space unused, on the exterior because of the terraces and on the interior because of the unfeasibility to open windows in the façades, could be balanced by the possibility of building higher constructions, waiving Paris Building Regulations. However, although the Municipality refused to alter height limitations, thus precluding the economical profitability of the typology, Sauvage introduced public facilities in the courtyard to solve the problem; the Apartment building 13 rue des Amiraux, Paris (1922-1927) [Fig. 1] accommodates a municipal swimming pool inside. The project traces two sometimes intertwining paths of following architectural research: the idea of providing a private open space to each low cost housing unit in order to enhance the relationship between inside and outside even in a multi-storey building and the introduction of public facilities for inhabitants. A similar proposal, the Immeuble Villa project, was presented by Le Corbusier in 1925.

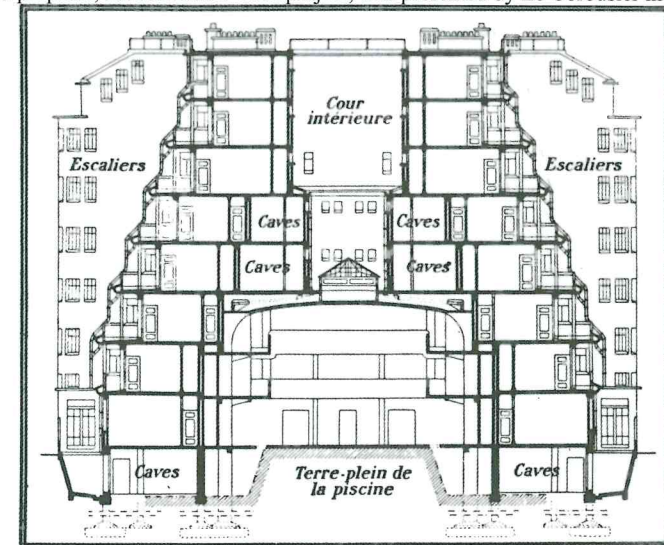


Figure 1 - Henri Sauvage, Charles Sarazin, Immeuble Rue des Amiraux, Parigi, 1922, Transversal Section. (Source: Loyer F., Guéné H., Henri Sauvage, les immeubles à gradins, IFA/Mardaga, Paris/Liège, France, 1987, p. 86).

The stepped terrace system, located in a flat urban environment, has had limited success in the following century. Mainly adopted for holiday homes in France in 60s and 70s, it has reached extreme peaks of morpho-typological exploration in the public housing design of Jean Renaudie, aimed at supplying each flat with a private suspended garden [7]. With this goal this typology has been recently rediscovered and reinterpreted in contemporary architecture as in the Mountain Dwelling building (BIG and JDS, Copenhagen, 2008), though in a completely different urban setting, but still offering a public use for the enclosed lower spaces of the building. In other proposals (such as

BIG, 8 House, Copenhagen, 2008 or Dattner, Grimshaw, Via Verde, New York, 2012) the stepped section accommodate semi-public vegetated paths allowing for the access to the apartments or to added facilities.

Between 1925 and 1943 Giovanni Broglio designs and builds one of the many examples of his personal research as chief architect of the Milan Public housing Institute around affordable residential architecture: the Regina Elena District for very low income families in Milan [8]. The adopted solution makes available private toilets and ancillary spaces even to the flats of the poorest families, also allowing a more regular organization of the spaces as a consequence of the reduction of aisles and corridors. This techno-typological invention is the result of the application of the emerging technology of reinforced concrete structural frame which replaced thick masonry loadbearing walls with infill enclosures. All the ancillary spaces (minimal kitchens and toilets) are located along the façades in the cavity within the double layer envelope of the building to create bow-windows which enrich the street elevations in combination with balconies and traditional windows. The layouts are thus arranged through the juxtaposition of rooms similar in dimension which have different functions (bedroom or dining/living-room) and can be grouped diversely to generate apartments of various size [Fig. 2].

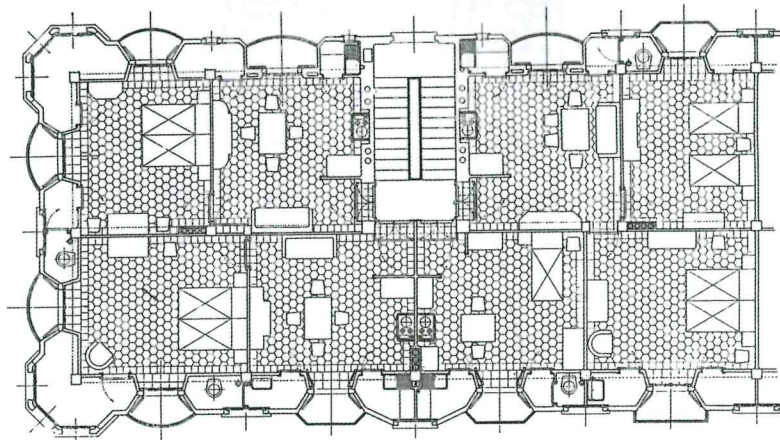


Figure 2 – Regina Elena very low income housing plan (Source: Broglio G., *L'Istituto per le case popolari di Milano e la sua opera tecnica dal 1909 al 1929*, Bertieri, Milano, Italia, 1929, p. XXXIV).

The Broglio idea, which he also reinterpreted in other residential developments in Milan, represents the synthesis of different concepts which can be recognized and have been a source of inspiration in architectural history. Firstly, the multifunctional inhabitable façade emerges, which can be traced back to the thick masonry loadbearing fortifications accommodating distribution and ancillary spaces of the medieval Scottish Castles [9], it can be as well analysed in the work of Louis Kahn, and also pinpointed in contemporary projects. The Plus study-cum-manifesto launched by Frédéric Druot, Lacaton & Vassal in 2004 [10], advances the addition of a glazed double façade to

transform dull Modernist French housing, supplying apartments with open and closed private spaces acting also as envelope buffer zones and recreating a new identity to the buildings and their surroundings.

Secondly, Broglio suggests the separation of ancillary spaces and the provision of rooms with indeterminate program to be subject to different uses and different partitions between flats over time.

Nevertheless, the experimentation of the Masters of Modernism on reinforced concrete structural frames, represents a wider and more fertile experience. The research path of open plan, traced by Mies van der Rohe and Le Corbusier at the Weissenhof Siedlung in Stuttgart in 1927, doesn't find many followers in social housing projects until long after the II World War; efficient Taylorism prevails introducing the zoning concept from city to housing.

Two following experiences display a likewise significant propounding power, both in France: along the Broglio line in terms of relationship between structure and building services, the structural system experimented in the 70s in Val-d'Yverres and, developing the 'plan livre' concept, the Nemausus building in Nîmes.

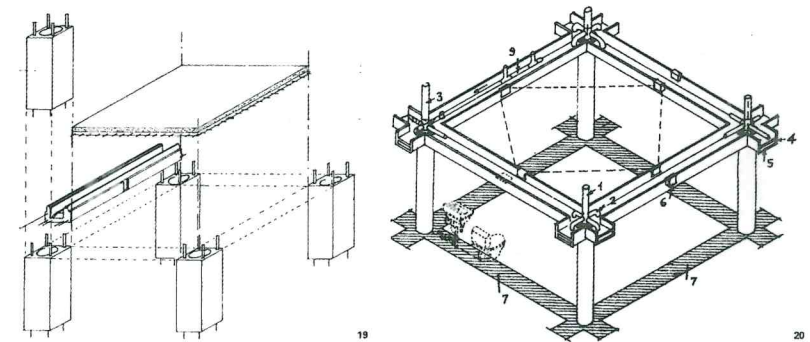


Figure 3 - Prefabricated C shaped reinforced concrete system for Les Marelles development (Source: Carini A. et alii, *Housing in Europa seconda parte 1960-1979*, Luigi Parma, Bologna, p. 327,1979).

In the Les Marelles project, a 100 apartments development, architects B. Kohn et G. Maurios adopt a prefabricated square grid reinforced concrete structural frame with C shaped pillars and beams [11]. The cross section of the elements is conceived in order to accommodate horizontal and vertical piping of the building systems [Fig. 3], thus allowing the highest flexibility of the internal spaces. The design also encompassed a perhaps too complex economic and social planning to involve into the process also the future inhabitants. Moreover the building systems fittings - disclosing a relationship with previous experimentations advanced in the late 50s in office and industrial buildings as in the work of Marco Zanuso [12] - were overabundant for inhabitants' requirements and the possible program changes over time, therefore introducing a cause of major cost. However, the project outlines a course of following studies about systems integration in buildings and flexibility of spaces, leading to different solutions of systems vertical distribution concentrated in cores, along spines or on the façades thus

reconnecting with the Broglio line previously described. Some of the results of this research in contemporary architecture were collected by Manuel Gausa in his 1998 book 'Housing: new alternatives, new systems' [13].

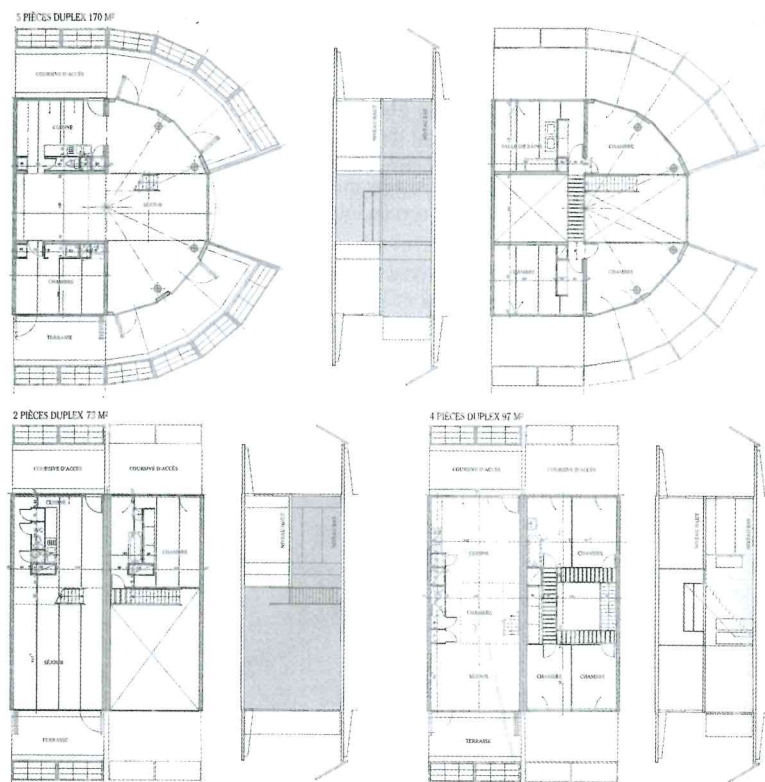


Figure 4 – Plans and sections of 3 apartments in the Nemausus project (Source: Tonka H. (direction de), Nouvel J., Ibos J.-M., *Nemausus. 114 Appartements Sociaux à Nîmes*, Les Editions du Demi-Cercle, Paris, France, 1986, p. 36).

In the two Nemausus twin buildings in Nîmes (1985-1987), Jean Nouvel faces the issues of social housing design with a solution aimed at responding to high quality demand in terms of quantity [14]. The extension of the apartments in fact is larger than the affordable housing standards and, to balance the resulting increase of construction cost, not only the finishes and the interior walls are reduced to minimum, but materials and components are those typical of industrial buildings using dry assembly reversible technologies [Fig. 4]. However, despite the construction cost control, the rent, following a bureaucratic calculation according to the flat area, was higher than expected, precluding further developments of the concept.

Nonetheless, the project stands out as typical example of a design approach dealing with the idea of customisation of the house involving inhabitants participation since start or over time, due to changes occurred in the family composition or wealth. An outstanding specimen of this research path are the studies developed by the Dutch group SAR with John Habraken, in the early 60s suggesting a separation in the physical infrastructure of buildings between support and infill. The proposal, developed in the book by Habraken 'Supports: An Alternative to Mass Housing', which was first published in 1961 [15], advocates an approach where the Government (at different levels) provided the infrastructure on top of and between which people could build their own housing. In contemporary architecture the same approach can be recognized in the incremental public housing projects by Alejandro Aravena in Chile where inhabitants are offered a minimum housing unit but provided with free space to enlarge their homes by self-construction in the following years.

**Conclusion:** The different projects analysed show specific yet suggestive interpretations of architectural themes regarding social housing: a building typology which can accommodate open uncovered spaces to enrich the programs of the apartments and at the same time allowing for the inclusion of semi-public facilities; the concept of a multifunctional inhabited façade to add open or closed spaces as well as to control the building energy performance, both in new construction as well as in retrofitting operations; the integration of building systems, structure and space layout both to enhance flexibility over time and to allow for the accessibility of the building systems piping; the idea of involving dwellers in the completion or in the quantitative/qualitative improvement of their homes. However, the common feature of these solutions is the synthesis of function and technology leading to an integrated thus more efficient design, the same attitude which should lead contemporary architecture in order to respond to life cycle thinking and sustainability issues. A possible answer might be in terms of hybridization, that is a positive indeterminacy of typology (interior space), technology (envelope) or process (dwellers' customization), thus conceiving the building as the result of hard elements, with higher durability and reliability and soft systems which can be transformed over time to suit changing demand as well as easily and efficiently replaced in case of functional or physical obsolescence.

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## TEMPLE COMPLEXES OF THE XIII-XIV C. NORTH CAUCASUS IN NATURAL AND LANDSCAPE CONTEXT

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### ABSTRACT

During the considered period there was a development of the principles of an arrangement of the Christian temple created earlier in a natural and landscape context: inaccessibility, creation of cult complexes, unity natural and artificial, placements of the temple in a point of the visual review of the concrete district, hierarchy of sacral objects of a complex, a temple arrangement in the center the patronymic of burials. Against formation of different types of religious contamination of outlook these principles were transformed and supplemented with the new. According to the developing radial and route system of moving the greatest development was received by the hierarchical principle. The second for the importance was the principle of construction of the cult complexes including ensemble from the Christian temple and several objects of paganism and the idolized landscape elements – trees, stones, mountains, caves. The ensembles becomes one of the leading characteristics of temple architecture of this period. The third basic principle - construction of the family temples by each patronymic family.

**Keywords:** medieval architecture, religious contamination, Christian temples.

### INTRODUCTION

The principles of a territorial and landscape arrangement of Christian temples, which have become traditional by 13th century, created in the previous periods: the inaccessibility defining concept of a way to the temple; creation of the cult complexes demanding carrying out ceremonial procession from object to object; unity natural and artificial; the principle of marking of space sacral object with a further idolization of object and the landscape; placement of the temple in a point of the visual review of the concrete district taking into account his subsequent divine "influence" on this territory; hierarchy of sacral objects of a complex according to a patronymic society organization; inclusion of the temple in system of defensive works of the settlement; a temple arrangement in the center the patronymic of burials – gain further development during the considered period and are supplemented with new.

### METODOLOGY AND INTERPRETATION

In the conditions of further strengthening of patronymic and formation of mountain societies according to system of moving the greatest development receives the hierarchical principle. Each mountain society represented the patriarchal tribal community connected by a certain territory of the dwelling. The principle of "the" territory was so important that names received the majority of mountain societies even