

# Living in a Flexible Space

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**Abstract.** How long does a space or an object have to last? If in the past an object or a building manufacturing was designed to last as much as possible, nowadays it is designed to have a life related to the time in which it will be used. Flexibility is what characterizes a space, it's the ability to be variable and adaptable to changes in the lives of users or in relation to the use which these will make over time. The evolution of the labour market, the difficulty of inserting within it and the need to push more and more frequent move today in the trial of living space models increasingly flexible: people, especially young people, are forced to move on territory outlining a new condition to which the flexible nomadic dwellings offer an adequate response, ensuring high functional performance in confined spaces.

## 1. Introduction

The concept of living unit flexibility dates back to the early twentieth century: starting in fact from the twenties the great European masters of architecture questioned on methodologies and technical-type solutions to solve the problem of the housing construction applying project criteria careful to realize, in small spaces, high quality performances based on both the rational organization of space and the building-furnishings integration.

## 2. Minimal housing unit and the main developments in the twentieth century

The minimal housing issue was the central theme of the II Congress of Modern Architecture (CIAM) held in Frankfurt in 1929: aim of the conference was to invite to reflect on the issues of the minimum size of the dwelling and the formalization of project ideas that use rationality and economy criteria: the concept of *Existenzminimum* was introduced, the reduction of the housing's dimensional standards had to allow an increase in equipment and services.

Alexander Klein worked in a context of economic crisis in the defeated Germany after the First World War that led to review the dimensional standards of housing and streamlining its distribution characters, developing a range of compositional rules for controlling the correct distribution and its sizing, by comparing practical cases. In this way he worked out minimum standards in terms of quality and quantity to arrive to an objective and controllable method through three stages: the method of valuation of the floor plans based on the examination of the preliminary spaces in minimal housing, the reduction of the projects to the same scale and the graphical method aiming to investigate the performance of the paths, the surfaces free from the furniture and from the user space, the cast shadows [1]. Klein argued that the accommodation was not only to meet the cost-effectiveness and rationality, but it had to actively relate with the living conditions and the cultural needs of the time. Even Walter Gropius claimed the changes in family structure must be considered: the patriarchal family was



disappearing, the family had fewer parts and the woman acquired greater independence. The ability to read and grasp these changes would have enabled them to better respond to the changing needs of housing and of the families who inhabited them [2].

In Italy in the seventies the architect Cini Boeri recognized the changes taking place in the society and in the way of living. Next to the reflections on the size of each environment, the architect was convinced that the space of the house was to be managed as much as possible from those who occupied it, guaranteeing the maximum flexibility: the spaces not necessarily had to be shared, but they had to be adaptable to different situations, using distributional measures that would promote both individual and collective private life. Besides the technical aspects of the design of the house, Cini Boeri considered the person and his interpersonal relationships crucial, studying how these, in their change, reflected in the domestic environment [3].

At the end of the eighties the study HARO, L. Julienne and J. M. Mamdone, studied various internal organizational solutions, based primarily on the interior furniture and the flexibility of the dividers, for a house which was according to the existential situation of potential occupants. Three solutions were identified: the "type of freedom" suitable for a single, the "type of absence" designed for a single parent with a child, the "type of solitude" designed for an elder [4].

### 3. Technological solutions for the flexible accommodation

During these decades they were tested integration solutions between furniture and architecture to optimize the space of the house and make it as flexible as possible. Great importance took the "internal borders", non-load bearing building elements with the function of separating the environments and incorporate within them piece of furniture, thus eliminating elements that traditionally were placed along the walls subtracting space to the environment itself (figure 1). The wall units combined function of separation between environments with that of closed or open containers: everything from the closet to the modular furniture in which was placed the bed, the table, the kitchen, with rollover solutions, sliding and closing that allowed to hide them completely and use them in certain hours and moments of the day by placing them in the position of use. In the wall units could be placed internal and passage openings. Sometimes the solution could be of the type with double-sided or alternating overlooking solution. The use of these solutions often arose from the need for space flexibility over time together with cost-effectiveness of the intervention cost [5]. The flexibility of use could also be obtained with sliding panels which allowed to divide the open space or separated niches with special function within the environment. During the day the structure guaranteed one single living space, while at night the structure provided for the formation of bedrooms, even disengaged with each other for access to the toilet.

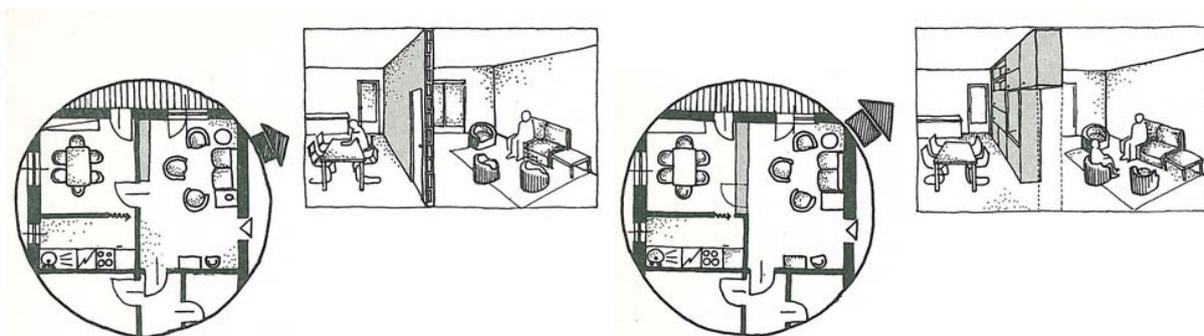


Figure 1. Example of internal border between living room and kitchen

In the history of architecture and design there are examples of great impact. Gerrit Thomas Rietveld built Schroeder house in Utrecht in 1924: the flexibility of the environment of the first floor is achieved by sliding the thin dividers on ceiling tracks, so the floor is divided into four separate rooms, one bedroom for the householder and three bedrooms for her sons, or one open room used for living room. Le Corbusier built the double house in Weissenhof quartier in Stuttgart in 1927: designed with the objective of achieving the maximum transformability of the interior space, the housing space during the day is unique and served by three large niches in which are located the fixed cupboards from which are extracted the beds for the night; in its night trim housing is transformed, through the use of sliding walls, into three bedrooms. Shigeru Ban built in 2000 in Japan the Naked House. This house consists of one unique large space of two-story high in which four personal rooms on casters can be moved freely. To reduce weight and optimize mobility, these rooms are not very large and hold a minimum of belongings and fittings. They can be moved accordingly to the needs of their use. Placed against the walls of the house, in front of the heating or air-conditioning units, warm air or a cooling breeze can flow into it. They can also be put side by side and create a larger room, when their sliding doors are removed. They can be taken outside, on the terrace, for the full use of the space inside. They can also work as a supplementary floor for the children to play on top [6].

Italian design offered some example of multifunctional furniture to transform the house during all the day. Total Furnishing designed by Joe Colombo in 1972 are monoblock elements, a system of independent equipment from the housing container capable of ensuring high flexibility of performance able to offer thus a dynamic space, in continuous transformation, according to the requirements. It's organized in four blocks: kitchen, cupboard, bathroom, bed and privacy: the cabinet acts as barrier between the kitchen and the environment bed and privacy, which summarizes in itself all the functions of living, sleeping, eating, reading. The sleeping area is achieved with two pull-out beds, as well as the table located under the TV unit is removable (figure 2). Abitacolo proposed by Bruno Munari in 1971, is intended as the environment adaptable to the young occupant's personality: thought with the idea to create a new area for the kids allows them to find a space for each object and activities, from books to toys, up to the space for sleeping: it is therefore both the bedroom, study, library and closet (figure 3).



Figure 2. J. Colombo Total Furnishing kitchen and bed & privacy. Figure 3. B.Munari Abitacolo

#### 4. Living flexible today: large-scale projects

Living sets always the linking of the person with its living space, a physical place which can respond over time to the continuing transformation of its demands. The life of adults, teens and children is now increasingly characterized by a growing independence and a continuous differentiation of everyday life. The transformation of the traditional family, the presence of workers and students for short or medium periods or immigrants with other cultures, the spread of teleworking and home office, the increased number of people who decide to live alone or single parents with children require a radical rethinking on how to conceive housing.

Though there are occasional examples in major world metropolis of housing experiments of flexible accommodation, in New York they have been tested in large-scale small cut dwellings where furnishing is assigned the specific task of organizing space at different times of the day. Example of notable impact on overall is My Micro NY by nArchitects. My Micro NY is the winning proposal of an initiative launched as part of former Mayor Bloomberg's administration's New Housing Marketplace Plan to accommodate the city's growing small household population.

The building provides 55 loft-like rental apartments, ranging in area from 25 to 35 sqm, and complemented by generous shared amenities, setting a new standard for micro-living. The project has been watched closely as a new housing prototype in NYC. The architects designed the exterior and interior spaces of Carmel Place as a repeatable and systemic new paradigm for housing in NYC and other cities with similar housing challenges. The aim was to provide a new social framework for small households that emphasize nested scales of community rather than individual residents. Each unit consists of a micro-kitchen, a bathroom with wardrobe and a room overlooking a balcony and fits through the furniture depending on your needs: study day, evening sitting room, bed at night (figure 4) [7].

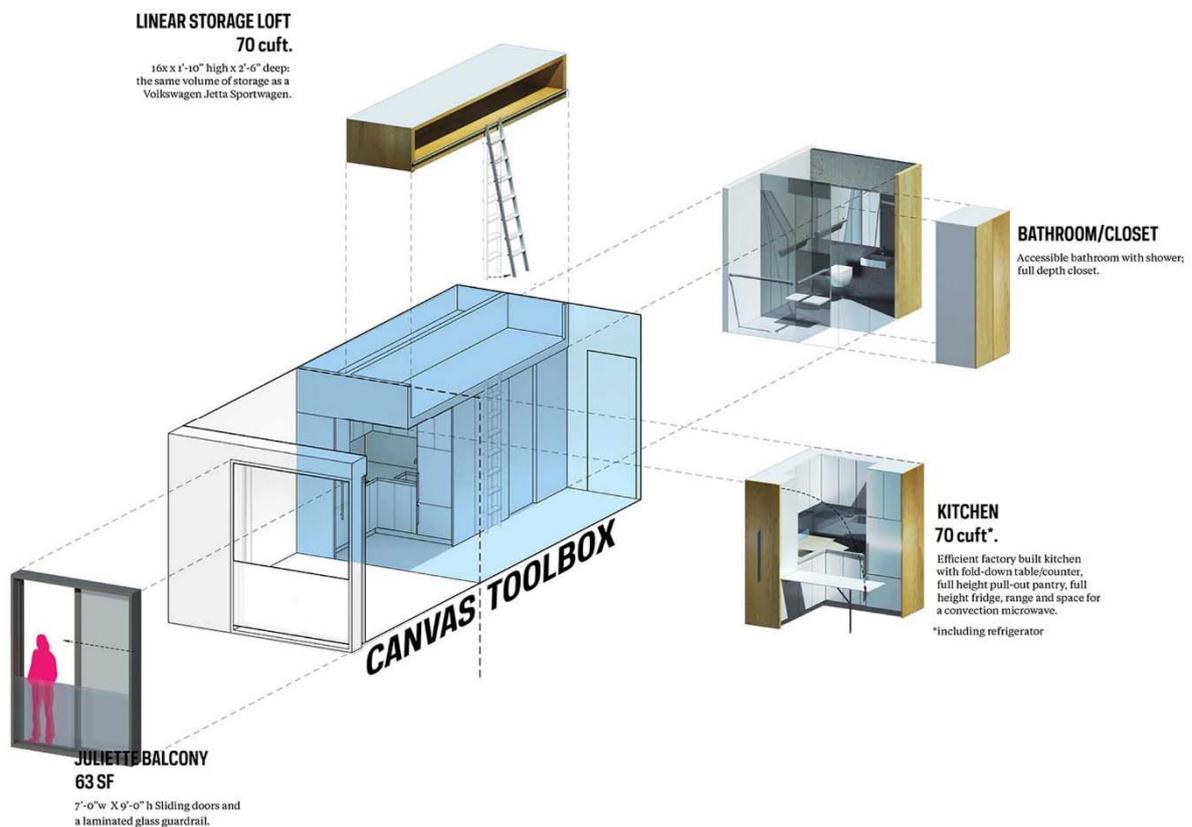


Figure 4. My Micro NY: components of housing unit (image courtesy nARCHITECTS)

The architects also worked to source flexible built-in furnishings that integrate storage located in the added height above the bathrooms, couch and bed into the layout of almost half of the units. Their design goals for the unit interiors were to achieve at the same time a sense of spaciousness, comfort and efficiency (figure 5).

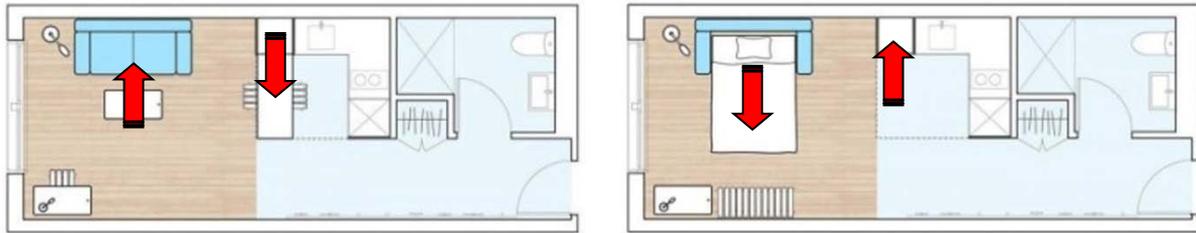


Figure 5. My Micro NY: the floor plans show how one of the units can be adapted from a living room (left) to a bedroom (right)

In Italy in Turin a similar experiment sees the conversion in the city centre of the old eighteenth-century Augustinian monastery in small dwellings, where the rationalist concept of *Existenzminimum* is applied in a contemporary way: qualitative increase of the implement and their performance follow to the reduction of dimension standards. The name of the project is QuadraTo by Building SpA, a firm which has refurbished a lot of old buildings in the city centre in the last years. The building consists of five floors, an attic, a basement and comprises a large inner courtyard. The operation, under construction, will demolish as many as possible of the ancient monastic cells to create rental apartments of varying size on the second, third and fourth floors: monotype, bi-type and tri-type are the result of a study of the functional and minimal housing cell to meet different customer needs. The concept of *Existenzminimum* has influenced the definition of the project of the space in the housing units, starting from the smallest. It develops the single person's need to live in a single environment through careful furnishing design. Kitchen, table, chairs, pantry, wardrobe, sofa, bed, desk, chair become the unit as a whole. In fact, the space is defined by the succession of the furnishings intended as hierarchical definition of functional requirements in a single environment. This was possible due to two main elements: the table, which slides on a rail placed along the wall, from the kitchen to the window, turning the kitchen space in the dining area, from living room to study, and the step that creates a second surface to walk, sit, beneath which are concealed the bed and storage units. The kitchen uses the table as a workbench and the table uses the platform as a seat (figures 6, 7, 8).

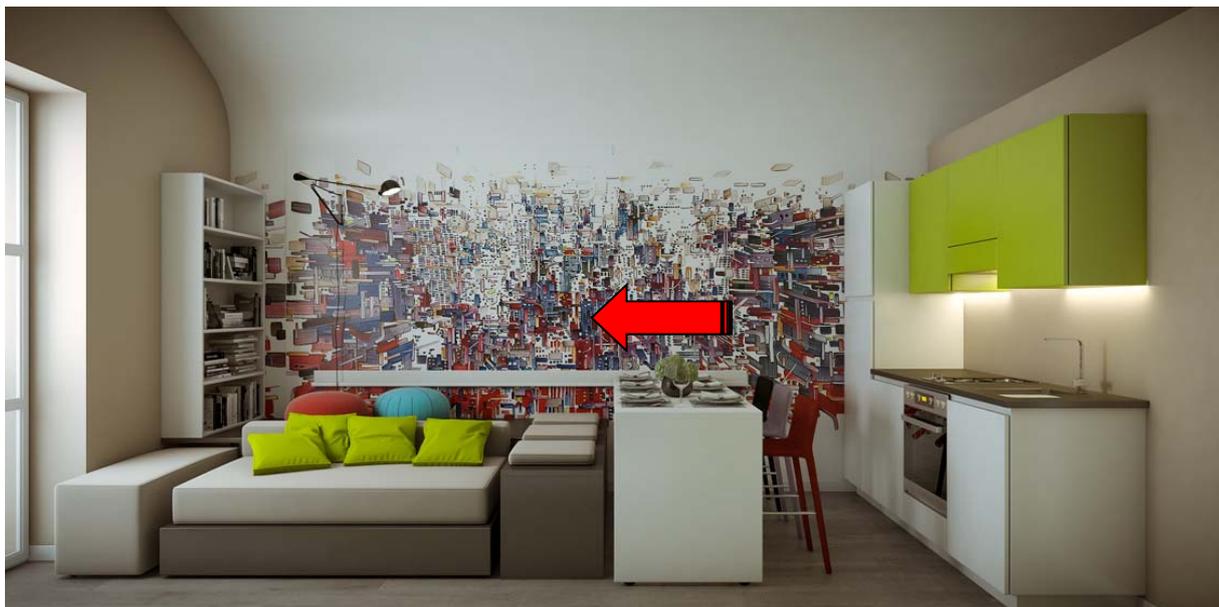


Figure 6. QuadraTo mono-type unit: lunch/dinner time (image courtesy Building SpA)



Figure 7. QuadraTo mono-type unit: working time (image courtesy Building SpA)

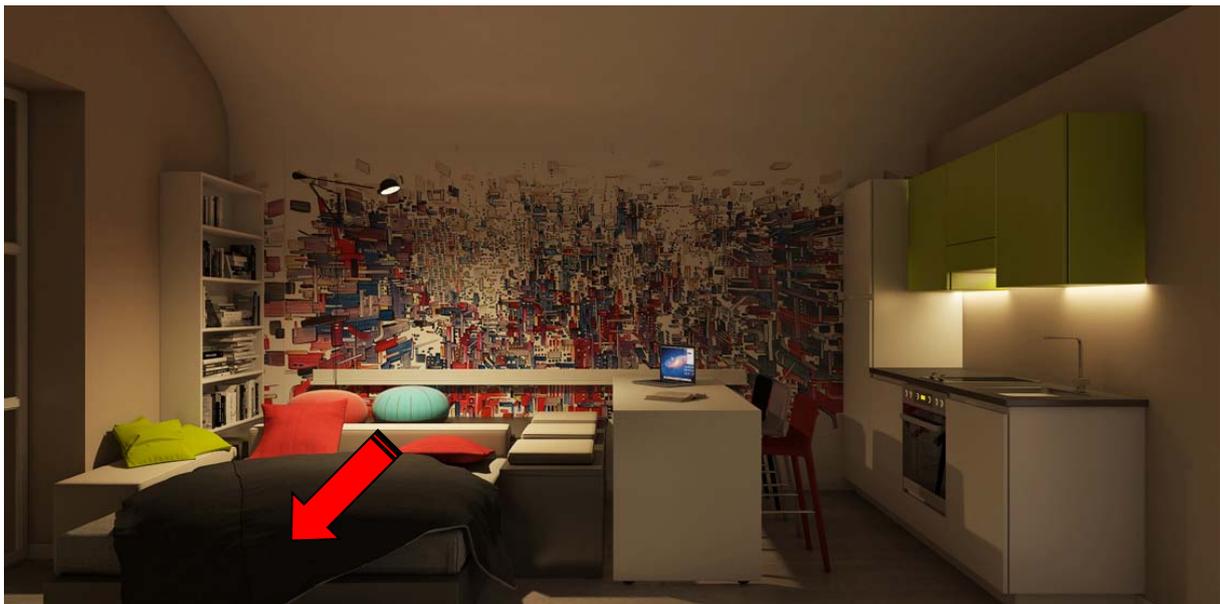


Figure 8. QuadraTo mono-type unit: night time (image courtesy Building SpA)

The same concept is present in bi-type and tri-type apartments with the addition of one or two bedrooms thus allowing a greater number of occupants (couples, the couple with child or two people, with no bond of kinship, who wish to share the apartment).

### 5. Living flexible today: research proposals

The intervention in Turin city centre was also an opportunity to experience in interior architecture Master courses and degree thesis furnishing systems, meaning hierarchical definition of functional requirements in a single environment, able to meet the need for high quality of living within a mesh of serial spaces typical of the original building. Starting from the constraints which Building SpA architects had to confront, proposals have been prepared thinking of a use by singles, students and off-site workers,

focusing on transforming the building of small cell in a comfortable space which suits different situations of the everyday life. In this chapter four proposals will be presented, two related to the flexible rental property and two related to the topic of the flexible owned property. For all these solutions, it started from the same point: maximum functionality and flexibility in minimal space for the occupant; the use of mechanical elements of furniture and the use of high quality patented products for the owned property solutions are of course free from economic constraints that instead are the basis of a correct commercial operation for the accommodation of income.

### 5.1. Project work 1

The purpose of the project is to give to those who live in this environment the idea of a free space that can be used in different situations and times of the day. The versatility of the space is given by the presence of tailored furnishing solutions, complements which can be converted in relation to the function that is taking place. The flexibility of space is obtained thanks to the presence of a system that longitudinally defines it, a solution that contains inside the different housing functions, allowing to change the appearance of the environment in the different hours of the day. The cabinet system hides inside the furniture modules, bed and wardrobe, columns kitchen and toilet. The kitchen block frontally placed, thanks to the rotating counter, acts as a living room furniture and study table. The modular sofa encloses ottoman which can be used as additional seating in social occasions (figures 9, 10).

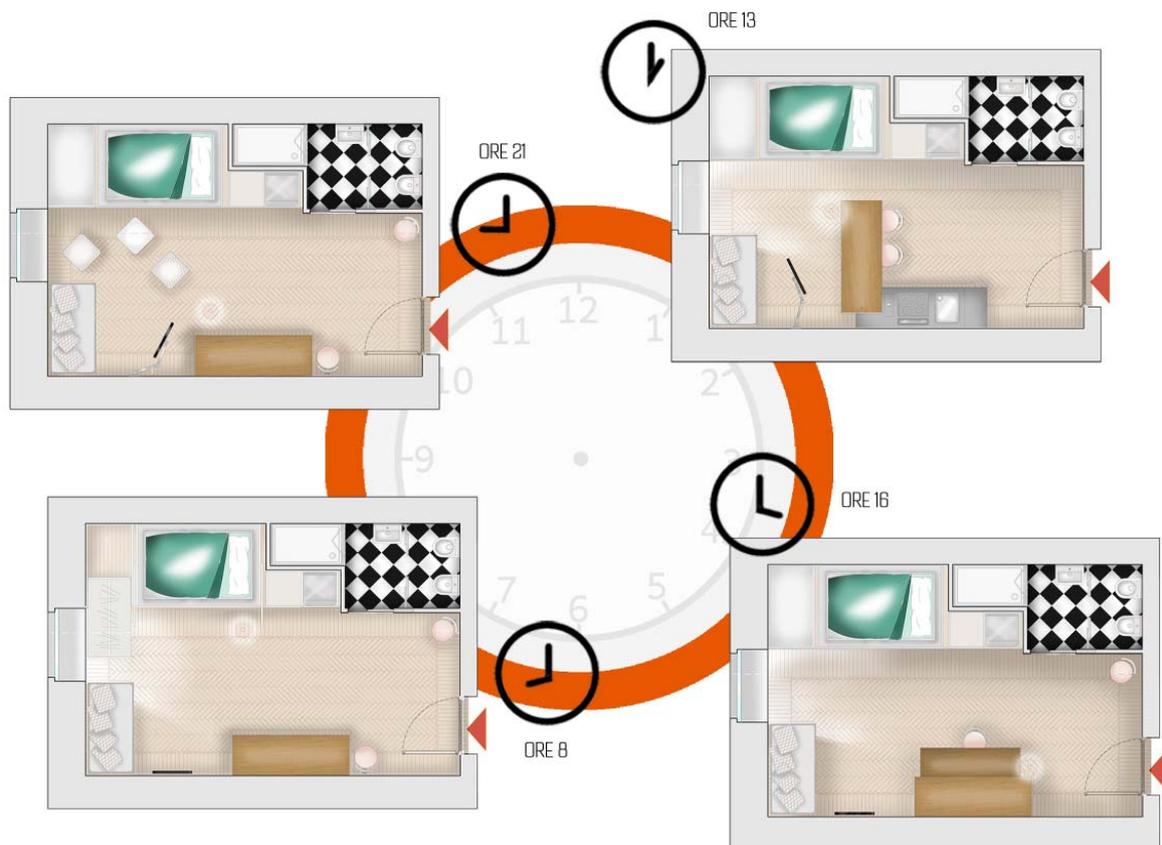


Figure 9. Rental property: floor plans in different time of the day (project work by D.Massetani-E.Piga-A.Tedeschi - Master in Interior, Exhibit & Retail Design Politecnico di Torino 2015-2016 edition, Atelier of Interiors, professors M.Vaudetti, G.Callegari, S.Canepa, C.De Giorgi, M.Varrata)



Figure 10 Rental property: interior views (project work by D.Massetani-E.Piga-A.Tedeschi - Master in Interior, Exhibit & Retail Design Politecnico di Torino 2015-2016 edition, Atelier of Interiors, professors M.Vaudetti, G.Callegari, S.Canepa, C.De Giorgi, M.Varrata)

### 5.2. Project work 2

The organization of the space is optimized by creating a platform that welcomes the angle of the study, the sofa and at the same time hides the bed when not in use. Within moments the sofa, pinned against the platform, slides and turns into bed. The container space of the accommodation is the wall, a modular system which can be declined in different sizes, to best meet the various needs: from the closed storage compartment to the shelf. The accommodation is equipped with six boxes which have the function of chairs for the table, hiding within themselves an additional storage capacity (figure 11).

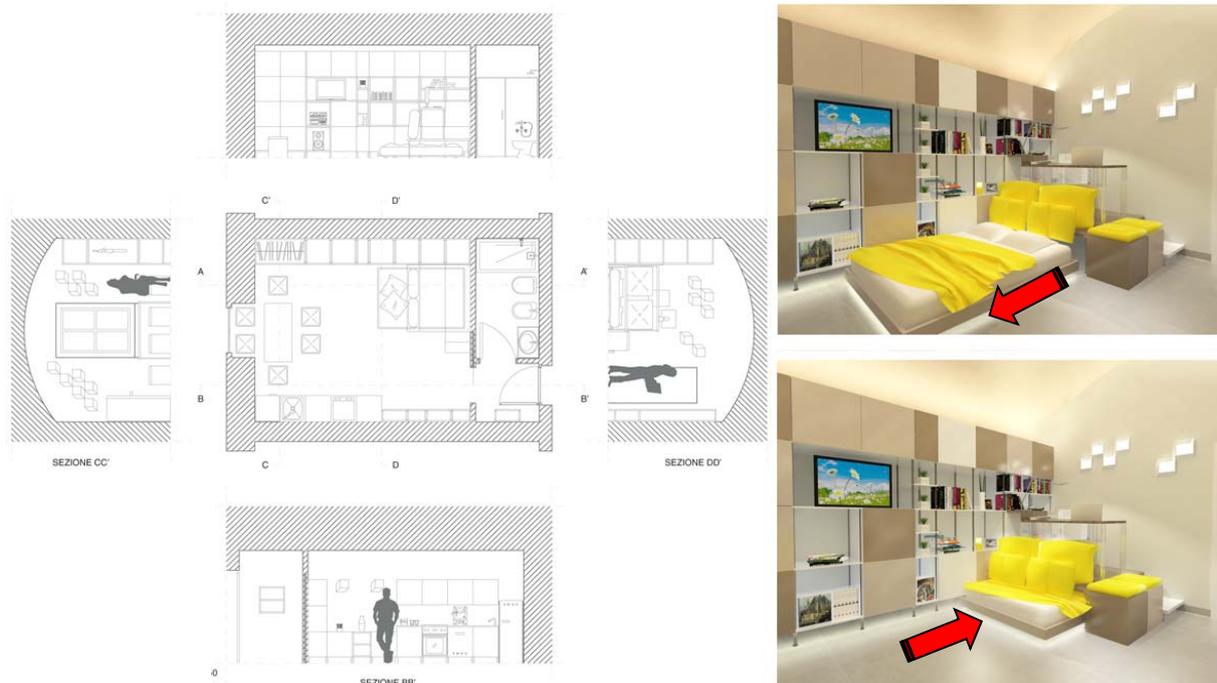


Figure 11. Rental property: floor plan, sections and interior views (project work by C.Allocco-M.Amione-E.Danelon - Master in Interior, Exhibit & Retail Design Politecnico di Torino 2015-2016 edition, Atelier of Interiors, professors M.Vaudetti, G.Callegari, S.Canepa, C.De Giorgi, M.Varrata)

### 5.3. Project work 3

A sliding storage element glides from one end of the room to the other, revealing and exchanging spaces between daytime and night time zones. As the moving volume pulls away from the wall, it reveals a dressing room space with built-in clothing storage. Fully extended, the space for a queen-sized fold-down bed is created. The sliding element is powered and cabled for a television along with additional storage and display space. A pivoting enclosure with custom speakers allows the television to rotate 180 degrees for viewing from the seating area, or the bed and dressing rooms. At the opposite end of the

room are spaces for a home office and library, the opposite wall is home to the kitchen equipped with a pull-out table for dining. The exchange of volume between night time and daytime increases the number of individual uses in the transforming apartment but also greatly expands the range of different spaces and experiences (figure 12).



Figure 12. Owned property: floor plans and sections (degree thesis by E.C.Giusto - MSc degree in Architecture Construction City December 2016 supervisor S. Canepa)

#### 5.4. Project work 4

The design solution features patented transformable furniture. The world leader in this field is the company Clei, founded in 1962, in a period when there was much debate on the flexible furnishing theme [8]. Elements chosen for this project are: Tango 270, Girò and Kitchen Box. Tango 270 is a system composed of a vertical double bed with tilting opening and an integrated fixed sofa cm.270 wide, with either fixed or sliding seats. The double bed, integrated in the structure of the unit, has a sliding mechanism for the opening and closing movements. Girò is a consolle integrated and joined to a store element with drawers and flapping door that transforms into a dining table. The element is composed with two bi-folding tops, a supporting leg with supporting panel and revolving mechanism. Kitchen Box is a transforming kitchenette composed of a fixed unit joined to a big equipped element revolving on wheel that is as well a closing panel to hide the kitchen when required. The revolving element with 90° opening can be either on right or left side facing it is equipped with pantry and is provided with an integrated tilting table that, once open, is aligned to the horizontal panel of the unit making the useful working surface double. Table can be opened and used even if the revolving element is closed. Kitchen box includes all appliances (figure 13).

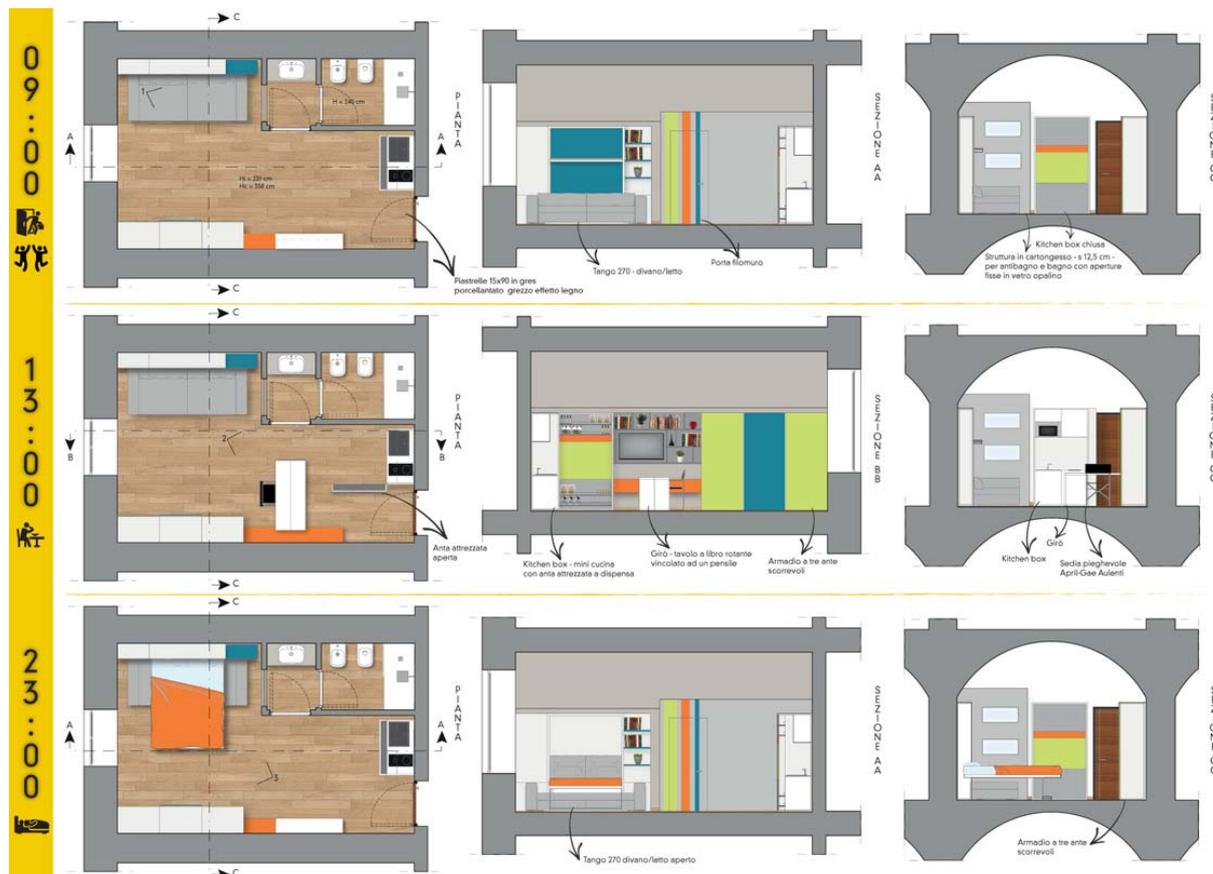


Figure 13. Owned property: floor plans and sections (degree thesis by E.C.Giusto - MSc degree in Architecture Construction City December 2016 supervisor S.Canepa)

## 6. Conclusions

Living the contemporary city implicates a comparison with ways of live in continuous evolution: who lives do it in forms and with different times, on its social and generational affiliation. To investigate on the domestic space, in a society in continuous evolution, it points out new tied up housing orders to the temporariness, to the flexibility, to the adaptability. The rational use of space and flexibility understood as adaptability of the space built to different needs over time, should be the basic criteria of a project that looks at the user's well-being in different times of the day. The idea of house changes upon a different and more intelligent design of the living features that make it what it is; the concept of the furnishing, based on a radical as well as innovative re-interpretation of the final use, has deeply changed the traditional repartition of house areas, making the classic time-connected divisions day and night totally old.

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