

Incremental Housing in Urban Areas

Implementation of the process in Medium Rise Buildings



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1 Urban Shelter Design Development

The example of Barcelona

The need of housing is not only a problem for developing countries. Most of the cities in the world have been forced to deal with the issue during the last century when there were big migration processes and various wars. In Barcelona, for example, there was a first immigration wave in the 20s when many people, proceeding from the south of Spain, arrived to Catalonia within a decade. The new incomers didn't have a place to stay so in 1929 there were 6 000 families, around 1% of the population, living in informal settlements in the city. The government was forced to launch a first housing plan to relocate these people in low rise developments that were called "casas baratas", cheap houses. All those housing programs were stopped during the Spanish Civil War and the first years of dictatorship. The informal sector kept growing and, in the sixties, there were already 20 000 families living in slums (Barraques, la ciutat informal website, 2008) which represented around the 6,5 % of the total population¹. By that moment, the city had grown and the price of land had increased so the strategy of the municipality was to start building massive housing projects. These "polígons

¹ Calculated by the author based on INE data

d'habitatge” were large developments of generally 10 to 15 storey buildings located in the outskirts of the city. (Ferrer Aixalà, 2006)



Figure 1: Slums in Barcelona seafront in the fifties
Source: Museu d'Història de Barcelona



Figure 2: Cases Barates Eduardo Aunós (1929)
Source: Museu d'Història de Barcelona



Figure 3: Polígons d'habitatge (1958)
Source: Museu d'Història de Barcelona

These housing strategies have influenced the development of the city a lot and many social problems have appeared. The relocation sites were completely isolated from the rest of the city so the people in the area could hardly ever mix with other people creating a lot of ghettos and security problems. Today, these areas are mainly inhabited by international immigrants and some people are still afraid to go there.

There were also big problems related to construction. To optimize the cost per unit and build faster, they developed a new light weight concrete that was based on aluminous cement. This concrete, exposed to the Mediterranean Sea humidity, reacted by losing resistance and porosity. This pathology wasn't discovered until 1990 when a building collapsed in "Turó de la Peira", one of the polygons developed in the sixties (COAC, 2004). After the big tragedy, many blocks were forced to be demolished and huge amount of money was invested to improve the structure of the remaining buildings. Nowadays, twenty years later, there are still some buildings that haven't been reinforced (Ortega, 2012).

The need for incremental housing

From this experience, we could conclude that when designing social housing it is important to look not only to the immediate costs but to think also about the long term ones that are often more difficult to solve. There has always been the discussion whether it is better to build more units in a lower quality or to build less but with higher standards. To try to give a solution in the seventies the incremental tendency was developed. The principle, which is based on the historical way of building houses, is that the developer shouldn't give already finished units but should provide only a minimum cell. This cell usually consists of a sanitary unit and a room for shelter. The users can extend, then, their unit through the time according to their needs and savings. The process has proved to be very successful especially in rural environments (Greene and Rojas, 2008) but has hardly been adapted to urban contexts where it is also important to deal with the issue of density.

Two of the first experiences of organized incremental housing were developed in Peru in the 70s. The country was experiencing a process of internal migration into the urban areas and was forced to produce large amount of housing, especially in the capital. In this context, Villa El Salvador was developed. This large scale project consisted of surveyed plots that were grouped in 400 x 400 m neighbourhoods, each of them with a reserved space for community facilities in the centre. The terrain was originally a desert located in the outskirts of Lima. The entire project was self-help built. The community was organized in order to create the different houses and services. The social experience of Villa el Salvador was really successful, the self-help incremental process helped the community to develop. Nowadays, Villa el Salvador is the second largest city in Peru and has low criminality rates. (Chavez, 2009) However, the expansion of the area wasn't planned and the incremental process was developed without technical assistance. The problem now is that most of the units have grown up to two or three storeys high without a proper structure able to stand in the case of an earthquake.

In the same decade, PREVI project was developed in Lima. This international competition's main concept was to develop a high density neighbourhood with low rise buildings that could host 1500 families. The proposals should take into account flexibility, modulation, and the incremental development of the units.

Each proposal had to host 4-6 people on the first stage and be able to extend until 8-10 on the second one. At the end, the jury decided to build a prototype of the 26 proposals presented to the competition, building an overall of 467 units. The heterogeneity of the neighborhood, created by both the incremental and the different typologies, has turned to be very successful and, 30 years later, the neighborhood is consolidated. Most of the houses have been upgraded and different uses have appeared. Some units have been converted into schools or kindergartens and some have developed into all kind of businesses (García Huidobro et al, 2010). In this case, the original unit was one storey high and the extensions consisted in adding one or two floors. The extensions were planned from the beginning and, therefore, the structures are still safe. The small scale of the project, the planning of the extensions, and the technical assistance have been crucial to the success of the experience.



Figure 4: Villa el Salvador
Source: ELEMENTAL website



Figure 5: Previ Project
Source: ELEMENTAL website

2 Factors Shaping Urban Shelter Design

The incremental process: advantages and requirements

As we have seen in the previous examples, incremental housing has a lot of advantages. The main one is that it can reach much more people than conventional methods due to the lower initial cost. In Chile they decided to include incremental process in their national housing plan and they were able to develop 120 000 units per year whereas they could only reach 37 000 households / year through conventional methods (Muñoz, 2006). The incremental process is also a more natural process to build and it is, in fact, the one that has been applied historically when houses expanded as families grew or the income increased. This process has

proved to be very successful, also, in improving the capacity to generate savings of the households that, motivated by the house improvements, learn how to administrate their money. Finally, the self-help process helps a lot to stimulate the communities while at the same time that process reduces construction expenses. The construction work is a good opportunity for people to get to know each other, take responsibilities and learn about conflict management. The communities learn how to organize themselves during the construction and, after the process, they can perform alone in order to ensure safety and maintenance of the neighbourhood. In addition to all of this, the incremental process gives the user the possibility to develop and allows the mixture of people and uses. In order to develop a good incremental process, technical assistance is always required. The experiences of the NGOs PRODEL in Nicaragua or FDLG in Guatemala are good examples of assisted self-help housing (Liu, 2012). By assisted self-help housing I mean a process where individual households receive technical advice during the construction process. However, this is a very personalized process that requires small groups to succeed.

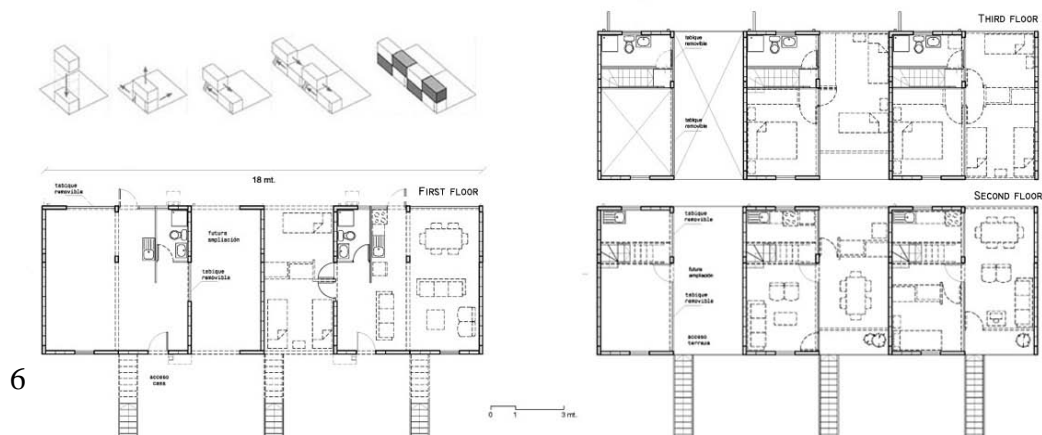
Incremental experiences have turned out to be very successful in the case of single-family houses where there is, usually, a space in the plot where the building can extend or, at least, it is possible to build an extra floor. However, this solution is no longer valid for most urban areas where the land value keeps increasing and there is a need for density in order to optimize services. The possibility of developing incremental housing in multi-storey buildings seems to be an adequate alternative to mitigate the need of housing that could be applied not only in developing countries. There are few projects that have already tried to develop this approach. I will try to summarize some of the alternatives I have noticed.

Examples of incremental housing in Medium Rise Buildings

The first step to reach an incremental solution for multifamily buildings is to sell empty units and let the user set their own standard. This is the strategy that private developers, like PHINMA in Manila, are developing. In Sofia Bellevue project, for example, the user can choose between three different sizes of units 25, 36 or 40 m² (PHINMA Properties, 2012). The units, initially, only provide a bathroom and the installation for a kitchen. Then, the user can choose between different

interior layouts that the company provides or they can propose a new design that should be approved by the organization. This solution allows different kind of people to mix in the area as there is a range of sizes and standards to choose from. Although the standard of the unit can be increased, the dimension of it is already set. Therefore, the only possibility to increment the house is by purchasing another unit which can be difficult to manage.

In 2001, ELEMENTAL group, led by Alejandro Aravena, did a first attempt to work with incremental housing in a three storey building with Quinta Monroy on site relocation project. In this project, which was developed in the context of Chile Barrio process, they built 93 units that were originally 36 m² and could double their extension by self-help building. The architects noticed that in usual condominiums, units can only extend horizontally in the ground floor and vertically on the top one. From this idea, they tried to develop a block with only ground and top floor. This way they can overlap two units, a single one on the first floor and a duplex on the second one. Their strategy is to leave a covered gap between units that could be filled by the user. To achieve it, they work with prefabricated concrete modules that host the services and frame the future extensions as we can observe in figure 1. These prefabricated components contribute to reduce the construction costs and, at the same time make the process faster. For the self-help part, they organized the community in four different groups of about 20 households. This reduced size was optimum to create a social tissue able to coordinate the construction process and take care of the maintenance of the area afterwards. The project has proved to be very successful. Five years after the construction almost every unit had improved and there was a raise in the value of the units. The construction cost of the unit was 7 500 \$, and 5 years later all units were valued over 20 000 \$ (ELEMENTAL, 2010).





*Figure 6: Quinta Monroy Relocation Project – ELEMENTAL S.A
Source: ELEMENTAL website*

ELEMENTAL group has continued to work with the same incremental idea and they have developed many similar projects since then. The aim of this profit organization that works in association with COPEC, Chile's Oil Company, and Universidad Pontificia de Chile is to develop projects with public interest and social impact. In all their projects they try to get the community involved so they organize workshops to help people personalize their units and their future extensions. To facilitate the process, they work with local builders and governments. Although most of their projects are only three storey buildings, in 2009 they developed an eight storey building. In Paraisopolis, located in Sao Paulo, they overlap four duplex, or triplex in some cases, units. In each floor there is a gap left prepared to take the extensions as shown on figure 2. The project hosts 120 units which are initially 44,6 m² and can extend until 63,9 m². The three floor ones may grow until 83,7 m². All the circulations are done through external corridors and stairs that converge in a public plaza on the second floor. The project doesn't contain any elevator. On the ground floor, there is a reserved space for shops. The design criteria included separating the bathroom from the living room, give each room a private balcony and leave a separate space for the cleaning devices following the Brazilian habit (Horta, 2009). Although the project hasn't been built yet it is a really good example of how incremental housing can be developed in medium rise buildings on a larger scale.



Figure 2: Paraisopolis, Sao Paulo – ELEMENTAL S.A
 Source: *Arquitectura e Urbanismo 186*

In Venezuela, where there is an estimated lack of 3 million dwellings, Juan Barroeta developed a system for multifamily incremental housing. It is based on a bolted steel structure system that had been previously used in educational and office buildings. This system can be very advantageous for the incremental process. The bolted joints give structural flexibility to the system allowing the fast and easy addition of components. However, the process must be always supervised by a professional. The standardized production makes it economic and quick. In addition, the material is produced in Venezuela and can be recycled. The proposed system is based on $3,6 \times 3,6$ m modular system and can be applied in up to four storey developments. The distance between pillars axis is 3,775 m in order to achieve four internal modules of 90 cm. That way all the beams have the same dimension and all the internal partitions can also be standardized. The extension of the units is always done outwards. It is essential that the community is organized in order to coordinate the incremental process. All the wet areas are concentrated and enclosed by masonry walls. The units are originally, 50 or 60 m² and can extend up to 80 m² when they have added 6 modules as we can see in figure 3. In the first floor, it is possible to include a balcony. All the components

are produced in industrial metal workshops. The construction process is, therefore, really short in comparison to traditional processes. However, steel requires a lot of maintenance and it is expensive to protect it against fire (Hernández, 2007). This system is a very good example of how prefabrication can help solving the urgent need for housing and has clear economic advantages. However, the participation of the people in both the design and construction process is reduced. The systematization process can lead to more impersonal houses by providing the same kind of rooms to different kind of users. The prototypes of dwellings that have been developed for the moment can only host two dwellings per floor which represents an elevated cost of vertical communications. The system could be easily improved by adding some community spaces.

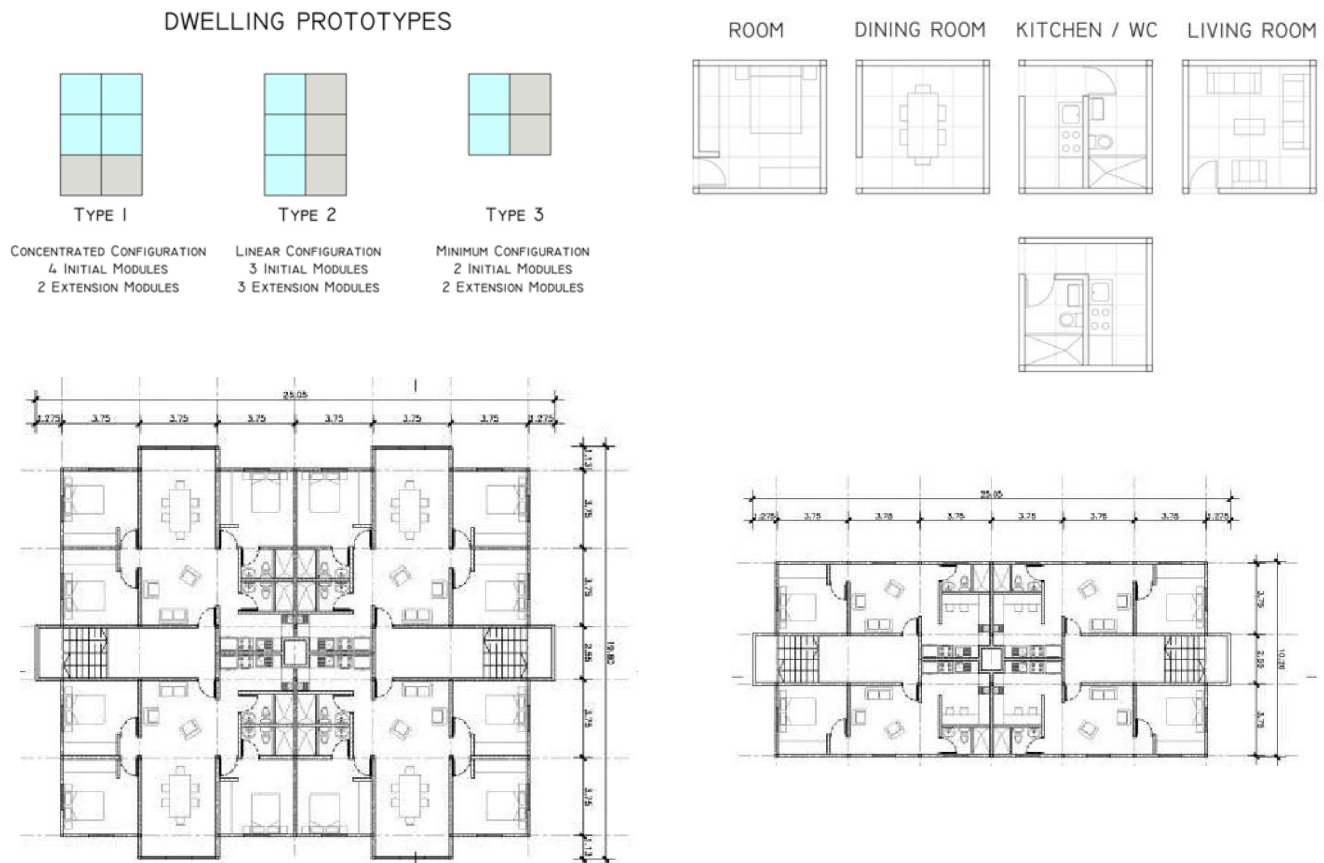


Figure 3: Incremental Dwelling prototypes developed by Juan Barroeta
Source: Beverly Hernández, 2007

3 The Role of Architects

As we have discussed in the previous chapters, it is time to change our approach to housing and stop considering houses as finished objects but as something that can keep evolving. Architects are, therefore, forced to reinvent their profession. Some could think that in the incremental approach architects lose their importance as most of the design tasks are done by the users. However, as we have seen in the previous examples, incremental housing, especially when it is applied in multi-storey buildings, must be planned in advanced and requires technical assistance during the whole process.

In my opinion, architects should take not only part in the design process but be present as well in the construction, the maintenance and the incremental phase. We have also seen before that the most successful projects are the ones where the community is well organized and gets involved in the construction. It is very important that architects keep close contact with the users. They should lead the participative process and work with the community to make their designs. In order to fit the different kind of users, they should provide different alternative designs for the units. Architects should also monitor the construction process and could even contribute training the community with construction skills. After the construction, the architect continues acting as a consultant to discuss with the users about their possibilities to extend their units. The experience of micro credits with technical assistance that, for example PRODEL has developed in Nicaragua, has proved to be very successful and could easily be applied in this context. When users receive a loan to extend their unit, they are forced to consult with an architect about the extensions they are planning to build (Delgado, 2009). Architects can give design and construction advice and also help preparing the budget. I think it should be compulsory for each household to have an appointment with an architect before they start extending their unit.

Incremental housing involves many different sectors of our society from governments to private developers, banks, user cooperatives and building companies. Architects are often in a privileged position and can get in contact with all these different sectors. Therefore, I believe that architects should be the link between all these different agents involved in the incremental process. They

could, for example, facilitate the contact between user cooperatives and local building companies that could supply the materials needed.

As we have mentioned in the previous chapter, the incremental approach in medium rise developments is almost unexplored. Therefore, it is time for architects to start investigating the possibilities that it can offer. It is important to research on prefabricated and modular components that could reduce the costs and facilitate the construction for the users. It is also important that architects contribute on the research of new construction materials and the application of local materials in social housing projects.

4 Design of Sustainable Shelter and Neighbourhoods

To summarize, when building in urban areas there are many factors that should be taken into account. First of all, it is crucial to consider the location of the project and its connections with the rest of the city. Density should be considered as the value of land keeps increasing and it is important to optimize the street services and facilities. It is important to work also on the social tissue. Most of conventional massive relocation projects have turned into problematic areas because all their inhabitants have the same background and there isn't a mix with the rest of the society. In order to improve it, social projects should plan a mixture of uses and users. The involvement of the community in the construction process has proved to be very successful in order to consolidate communities and reduce the costs; however, it must be always done with technical assistance. Therefore, incremental housing seems to be an adequate solution for this kind of developments as it allows people to improve their units according to their needs and economic situation at the same time that reduces the initial economical invest. It has proved to be very successful to deliver units with only a sanitary block (kitchen and WC) and an empty room. Users can, then, design the rest of their house and, eventually, make some extensions. As a following, I have listed some of the different expansion alternatives that I think can be applied in medium rise developments.

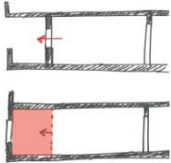
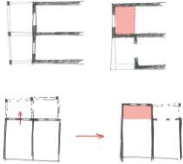
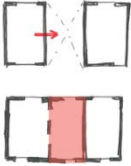
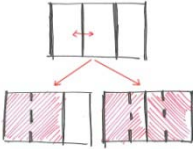
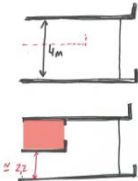
Growing system		Advantages	Disadvantages
Extension over balcony		<ul style="list-style-type: none"> - Safe structure - Easy to expand - Street width remains the same 	<ul style="list-style-type: none"> - Reduced extension space - Larger initial invest: the slabs and the structure have to be done in the first stage
Extension over prepared structure (beams and pillars)		<ul style="list-style-type: none"> - Lower initial invest - Safe initial invest - Extension space can be larger 	<ul style="list-style-type: none"> - Requires technical assistance - Street width can vary
Filling empty spaces		<ul style="list-style-type: none"> - All the structure is done in the first stage - Easy to expand 	<ul style="list-style-type: none"> - Many empty space in the first stage
Joint units		<ul style="list-style-type: none"> - Safe structure - Easy to expand - Profitable from the first stage - Can be applied in ordinary buildings 	<ul style="list-style-type: none"> - Difficult to purchase two units - Need for half units - Management problem
Vertical expansion: Mezzanines		<ul style="list-style-type: none"> - Safe structure - Easy to expand and manage 	<ul style="list-style-type: none"> - Higher invest in vertical communications - Mezzanines height - Can lead to ventilation problems

Table 1: Expansion alternatives for units in Medium Rise Buildings. Anna Arias (2012)

All of the different growing methods listed on the table can be used in Medium Rise Buildings. From my point of view, the first three solutions are the ones that can fit users the best. In this case, the extended spaces don't have any height limitation and can be completely designed by each user without any pre-existence, as it would happen with the joint units where there would also be a big problem of management. However, the two last alternatives are also perfectly valid and can be the most interesting ones for developers. These two solutions have the highest initial profit as all the area is used from the first stage.

To conclude, in order to develop a successful incremental process the extensions should be planned from the beginning. Any of the alternatives growing

methods listed in table 1 can work. It is very important that the community is involved in the process from the beginning and that they receive technical assistance during the whole process. The responsibility of the success relies in many different actors; therefore, it is very important that everyone plays their role. Local governments should act as developers and manage the projects. However, private developers can also get involved in the process. Architects should act as designers and advisors keeping always close contact with the users. The social aspect should be lead by NGOs that could help selecting the users, organizing the self-helped construction process and assisting the community after it. It's also important that universities and other institutions get involved and try to explore new and more effective solutions and technologies. The main actors are, however, the users who, through this incremental approach, would participate in all the stages of obtaining their own shelter.

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