INTRODUCTION

This field research focused on Elemental and similar projects in Santiago, Chile. These projects are known worldwide for their successful incremental expansion design for multi-story housing. Particular interest was on the types of structural joints when families expanded their houses. More specifically, for the case of Elemental an interest was to determine if the design and material restrictions as proposed in the initial starter core were followed.

Structural joints are an essential aspect of safety in user built construction. When users build their own houses from scratch, they decide the type of structure and materials for incremental growth without many restrictions. On the contrary, when houses are designed and build predicting incremental growth its structural design guides the type of joints and materials. In the case of Elemental, houses where designed to double their area over time but with design and material restrictions. Overall, it seems that the choice of materials for incremental growth is usually limited by the starter structure and varies between wood and steel structure. All the projects visited had survived very well the earthquake that struck Santiago in 2010.

Surprisingly in most cases the intended incremental expansion of the Elemental house was not built incrementally by the families. Families managed to find subsidies from the government to pay for the expansion of the house before moving in.

Elemental Projects visited:

1. Elemental Renca, 2005
2. Elemental Lo Esepjo, 2005
3. Elemental Lo Barnechea, 2010

Other Incremental Housing Projects visited:

4. Los Torreones de la Reina
5. Los Sauces
6. Comunidad Andalucía
7. Casas Chubi
Elemental Renca

Arch. Elemental
Av. Brasil 6300, Santiago, Chile
Contact person: Mario Orellana phone +56 996348679
Elemental Renca
Arch. Elemental, 2007
Type: Incremental growth
Previous settlement: Informal settlement very close.
Unit size: 35 sqm + 32sqm (expansion) = 67sqm (final)
Materials: Clay bricks, wood and steel beam
Type of growth: ground floor house (ground expansion), second floor house (second and third floor expansion)

Elemental Renca was developed with “Un Techo para Chile” a local NGO that can be classified as an EGIS (Entidad Gestora de Inmobiliaria Social) which is in charged of bridging the housing needs of organized communities (Comité de Allegados and Comité de Campamento) and the government to facilitate housing subsidy.

The government proposed to build new housing very far from Renca where the organized community was living, the community argued that it would threaten their livelihoods and families to move so far and raised money to buy a garbage dumpsite space within Renca. This case originated a new public policy named “Subsidio de Localización” (Localization Subsidy). The site was excavated and a landfill was made adjacent to the houses for a park, which has been abandoned. The houses are organized as row houses leaving alleys that have become the key open space for the families.

Each house was designed to grow incrementally inside within a structural shell. In reality, the organized community managed to find additional subsidy from private funding to build the complete house from the beginning. Nonetheless, the back and front yards have been occupied with additions not designed or predicted by the architects. The houses located on the main road have built small shops in their front yard space. Some families have used light steel structure because they considerer it safe and fast to build, other have used wood. No additional floors can be built because the structure and the tilted roof makes it very expansive and dangerous.

When interviwing Mario Orellana, he said “We passed from an emergency (situation) to an investent”
Houses facades with additions
Expansions in backyards
Alleys, Expansions in frontyards
Mario Orellana's house (he has not changed the original house)

Steel beam and wooden floor

Wall structure: reinforced concrete and wood floor

Ground floor space

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Staircase made with wood

Ana Vargas Field Report, Santiago, Chile. December 2014
Khaty's house (small changes inside divisions)

Khaty’s family

Master bedroom with sliding door that opens into room

Staircase

Bathroom

Additional room below tilted roof
Elemental Lo Espejo  
Arch. Elemental, 2007  
Type: Incremental growth  
Previous settlement: Informal settlement very close.  
Unit size: 36.2sqm // Final House: 60.5sqm (GF) and 72.5sqm (duplex)  
Materials: Clay bricks, wood and steel beam  
Type of growth: ground floor house (ground expansion), second floor house (second and third floor expansion)

The families of Lo Espejo used to live in Don Ramón an informal settlement (campamento) in the same area. This project was pilot project to relocate 30 houses in a small lot. The houses are row houses. One on the ground floor, with possible expansion on the ground, but very limited natural light and ventilation. The other, a duplex apartment accessed by outside stair that could grow to one side. In reality, the houses were finished before the families moved in because they received additional government subsidy.

During the house visits it was evident that the ground floor houses have little access to natural light and ventilation. Some families made significant changes in their houses. For example, Johanna changed the location of the staircase inside her house to expand and open the kitchen into the social space.
Johanna’s House (Duplex House)

Johanna’s family

Bathroom expanded after moving staircase

Children’s room

Expanded and open kitchen
Yanira’s House (Ground floor house)

Kitchen and dinning table

Lack of natural light in main social space

Frontyard covered with light roof

Small patio for light and ventilation
Inside courtyard occupied with ground floor expansions

Campamento (previous settlement)

Staircase
Elemental Lo Barnechea
Arch. Elemental
Getsemani 238, Lo Barnechea, Santiago.
Contact: Alejandra phone +56985072732
Elemental Lo Barnachea,
Arch. Elemental, 2007
Type: Incremental growth inside structural shell
Previous settlement: Informal settlement in the same site.
Unit size: 44.5 sqm (core), 27.7sqm (expansion) = 69.2 sqm
Materials: Clay bricks, wood and steel beam
Type of growth: second and third floors inside internal shell.

Elemental Lo Barnechea was built in a small site next to a larger housing project to relocate families living in informal settlements in the area. Lo Barnechea is a wealthy neighborhood in the northern side of Santiago, many of the people living in the Elemental houses work as house staff in the neighborhood and can walk to work. The row houses were placed in groups around shared open courtyards.

Each house was designed to grow incrementally with a shell, but as the other Elemental projects visited, the houses were finished with government subsidy before the families moved in. Each house has three floors, one bathroom and three bedrooms. They have informally expanded into their backyards or/and front yards.

During the visit, one family was demolishing a balcony they had added because the builder had made it out of steel that was too thin and it was on risk of going down. Our guide explained that the house footings were very small and could not support heavy structural additions.
Steel Structure Expansion being demolished

Entrance to courtyard

Typical Street
Alejandra's House

Alejandra and husband

Dinning and living room

Staircase and Structure

Master bedroom (third floor)

Bathroom
Casas Chubi, Villa El Valle

Arch. Victor Gubbins, 2005
Av. Tobalaba con El Valle, Santiago, Chile. Subway stop: Grecia
Coordinates: -33.4799881769, -70.5581553258
Casas Chubi, Villa El Valle
Arch. Victor Gubbins, 2005
Type: Incremental housing, single units paired houses.
Previous settlement: Toma de Peñaloén
Unit Size: 32.18 sqm (core) + 48.56sqm (expansion) =76.52 sqm
Materials: Reinforced Concrete for structure, bricks for sidewalls, wood and drywall for walls, tin sheet for roofs.
Type of growth: enclosure and finishes

“Casas Chubi” typology was developed for 4 sites in Santiago in the Peñaloén District on the east and southern side of Santiago. The families were previously settled at “Toma de Peñaloén” an informal settlement in the same area. They used to live in wooden shacks without access to basic services. The four sites are called: El Valle, Las Higueras, Las Torres y los Microbuseros. The closest metro station is “Grecia” from line 4. They can be directly accessed by “micros” (Transantiago). Each site has at least one public space, either a plaza or a sports facility.

The design for incremental growth of this typology is based on a 3 by 3 meter modular plan. Each family received half a house of 32.18 sqm consisting of: kitchen, bathroom, common area and one room on the second floor with a staircase. The planned expansion can add 48.56 sqm for a total area of 76.52 sqm. The houses were designed to build within structural constraints that help control their incremental growth. A reinforced concrete load-bearing wall was built between each house. The second floor is made of wood beams supported by reinforced concrete columns and load-bearing walls. This strategy helps guide the self-construction phase because it limits the structural growth.
Initial House

Expanded House
Each family received government subsidy for the initial house. After two years, if they had saved money, the government offered a subsidy to the owners so that they could build their house expansion. According to the interviews, some families had already finished theirs because they needed the extra space; others did not have the required amount of money to apply for the subsidy and remained only with the initial house. When visiting the site one could observe very few houses remained untouched. Most houses enclosed their front yard and some even opened a little shop.

Notes form talking to the tenants:

1. Some families invested in moving the toilet to the back of house or to the second floor, because it was uncomfortable to have it so close to the entrance and social space.
2. The second floor addition is built with the same wood beams and floor and walls are built using drywall.
3. All the houses remained standing after the 2010 earthquake.

The name “Chubi” comes from this colorful candy because of the facade colors.
Use of front open space

Facade variations

Facade variations
Los Torreones de la Reina

Arch. Fernando Castillo Velasco, 1998
Address: Av. Las Perdices (behind La Reina Municipality). Subway stop: Egaña
Coordinates: 33°27'20.20"S 70°31'47.88"W
Los Torreones de la Reina
Arch. Fernando Castillo Velasco, 1998
Type: Incremental growth inside structural shell
Previous settlement: Municipality of La Reina
Unit size: 15.5 smq (core), 31sqm (expansion) = 46.5 sqm
Materials: Clay bricks, wood and steel beam
Type of growth: second floor inside internal shell.

Los Torreones de la Reina were designed by the Arch. Fernando Castillo Velasco, Chilean architect and Politian who was elected four times as Mayor of La Reina Municipality. They are located behind the Municipality’s building and were organized as a closed condominium organized in 8 groups (torreon) of 6 to 8 houses each, with a total of 71 housing units. Each group of houses is organized around a circular shared courtyard giving the shape of a cylindrical building.

Each housing unit was paired with its neighbor around the circular courtyard. The shell was built as the core unit, which consisted of one open space on the ground floor with kitchen and bathroom. The ceiling was built about 9 meters above to allow for two more floors within the same shell. The structural strategy was to leave a steel beam to support a wooden floor structure for the second and third floors. Most of the houses visited had already build their upper floors.

During the visit to this housing project, it was interesting to see how each family has taken over their garden space to accommodate their different needs. It seems that the real incremental growth has happen within this additional ground space, where one can find: extra rooms, swimming pools or garages.
Entrance to housing units, courtyard

Wooden staircase inside a house

Expansion on ground floor open space

Expansion on ground floor open space
Comunidad Andalucía

Arch. Fernando Castillo Velasco,
Address: Av. Lord Colchrane con Pedro Lagos, Santiago, Chile
Coordinates: 33°28'1.77"S 70°39'7.33"W
Villa Andalucía was designed as one enclosed urban block with 200 housing units, open spaces and shared facilities. The tenants relocated to this place and given a house with the potential to grow up to two or three floors within a shell. They also have a small patio in the back, which has been used for informal expansions. The structural design included a steel beam to build the second and third floors using a wood platform as floor.

The complex is organized within one enclosed urban block with three entrances. The houses have access only from inside the complex. The corners of the block are reserved for shops that can be accessed from the outside.

The special quality about this housing complex is that being enclosed it has a strong sense of community. They are well organized, they have a community library and they share and maintain the open spaces together. They even applied for government subsidy recently to improve their shared facilities and repair houses. During the visit, it was evident the difference between the private open space in the back of the houses which has been filled with irregular additions in contrast with the front open spaces which remained untouched and well kept.
Steel beam for floor additions

Wooden staircase

View of open back space

Compound view
Shared Community Spaces
Los Sauces

Arch. Francisco Vergara, Aldo Bravo, 1984
Address: Av, Vicuña Mackenna and Elisa Correa. Subway stop: Elisa Correa
Coordinates: 33°34'7.26"S 70°35'4.43"W
Los Sauces
Arch. Francisco Vergara, Aldo Bravo, 1984
Type: incremental growth front and backyards.
Previous settlement: unknown
Unit size: 66 sqm
Materials: Reinforced concrete, bricks and wood.
Type of growth: second and third floor inside internal shell.

Los Sauces is located next to Elisa Correa Metro Station (Line 4). There are 843 houses organized in 12 macro blocks with an open courtyard in the center. The houses are row houses with an entrance from the street and access to the common courtyard from the backside. The common space can also be accessed through the corners of the urban block, which allows neighbors to park their cars inside. Each courtyard has a sports field and shared garden, which was not well kept.

The houses are designed in half floors and the incremental growth is within the shell. Nonetheless, some families have built additions in their backyards. Sometimes this additions bring problems to the community because they bloc the sun from their neighbors.

Los Sauces is very far from the city center but in 2005 the Elisa Correa metro station made it easier to commute and it has brought a lot of commercial life to the area.
Small street between macro blocks

Small street between macro blocks

Facade variations according to incremental needs
Internal community space

Backyard informal expansions

Backyard informal expansions

Backyard informal expansions
Backyard informal expansions

Roof structure

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