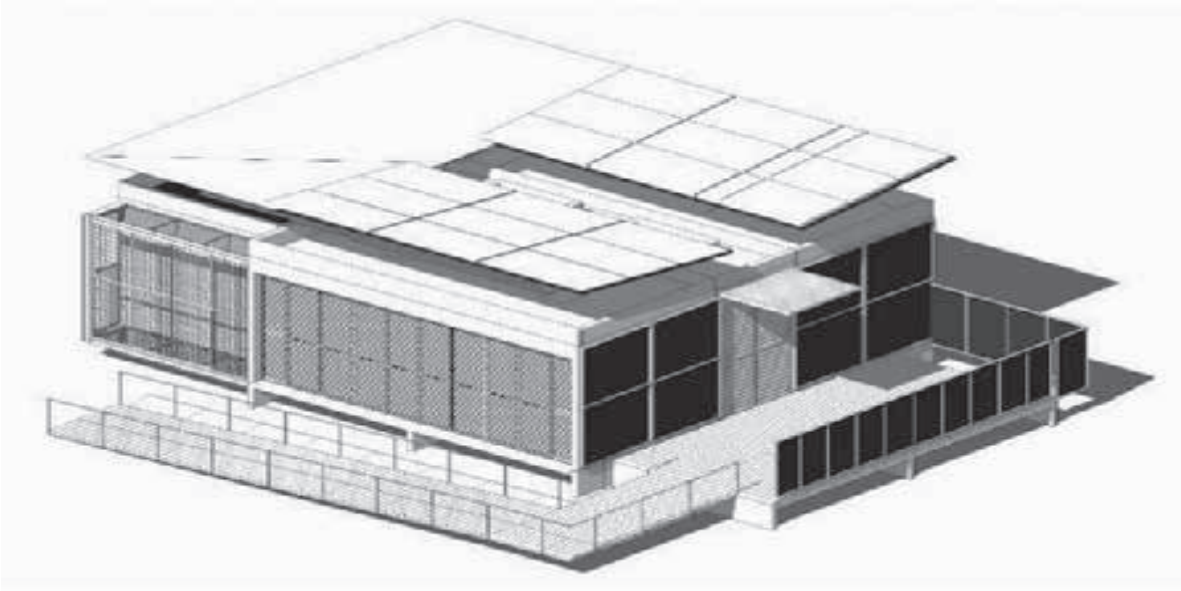
Chapter 1

Construction Design



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Urban Scale

The Mihouse urban project consists of common areas with buildings with four to five stories formed by groups of apartments. These buildings can be replicated depending on the place, the density requirements and the types of urban blocks (Figure 1.1 right).

Figure 1.1. Mihouse urban proposal

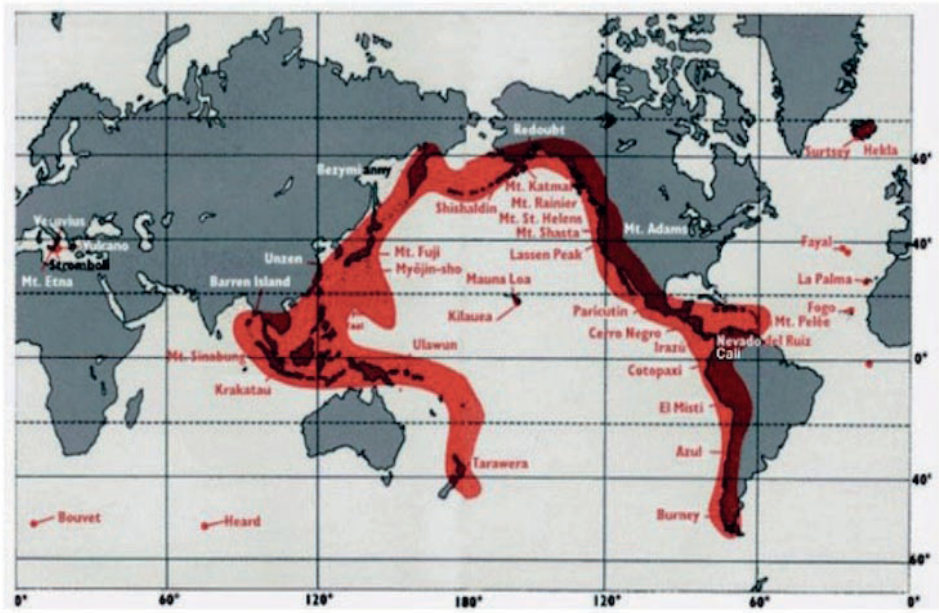
Note: (left) Mihouse urban proposal, (right) Mihouse urban proposal in the neighborhood.

Source: The Authors.

The whole residential condominium would be composed by 30 buildings surrounded by eight parks destined for different uses like landscape contemplation, parks for recreational activities, among others (Figure 1.1 left). Also, the whole urban compound would be surrounded by 4 blocks.

Prototype Scale

Figure 1.2. Prototype Scale



Note: Process of post-war reconstruction

Source: Villalobos et al.(2018)

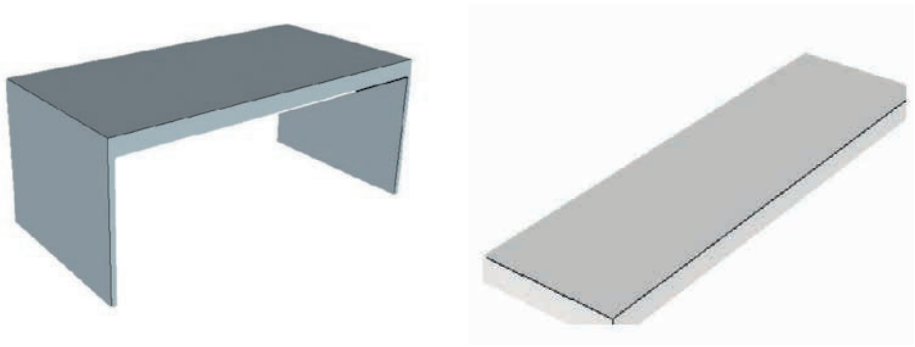
The project Mihouse constructive system is based on the prefabrication of prestressed concrete structural elements, recognized advantages in the construction of mass housing at reduced costs and widely used in many experiences in our country. On the other hand, the seismic condition of Cali, located in the western region of Colombia, which is part of the so called “Ring of Fire”, known worldwide for its high probability of major earthquakes, requires the construction of buildings with high resistance to such natural events and precisely with material that provide the proposed structural safety system required in these cases (Figure 1.2).

This criteria, paired with the high sustainability of the chosen materials and the principles of constructive and structural efficiency, has hallowed to propose the Mihouse project as a building that can be shaped primarily by two prefabricated structural modules in prestressed concrete. These concrete modules can be conveniently repeated and assembled together and they define the spatiality of the housing units and the number of floors required for the technical feasibility of the proposal.

For identification, we have given the name “Main Table” and “Central Table” at Figure 1.3.

Resting on a foundation of reinforced concrete plate, which must be designed according to the type of terrain that applies in each case, the main structure of the building is resolved as a stack of these basic structural modules, linked together by mechanical fasteners that provide and ensure its comprehensive action to support vertical loads and horizontal seismic forces. Along with a perfect assembly of the constituent parts, this new system excludes the need to dry joint, which is one of the most critical points in the traditional way as usually these structures are resolved.

Figure 1.3. Main Table and Central Table

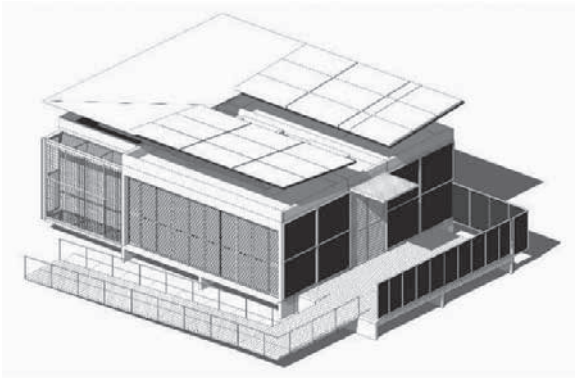


Main Table - Central Table

Source: The Authors.

The following Figure 1.4 shows the design of the prototype of the apartment located at the top floor of the building at the residential condominium, the process of assembly of this house would be first the junction of the modules shown in Figure 1.3 through high resistance mechanical anchors, then the installation of the ramp, steel orchard, Teak wood blinds, the green wall structure and the plastic wood deck, would be made forming the residence shown in the Figure 1.4.

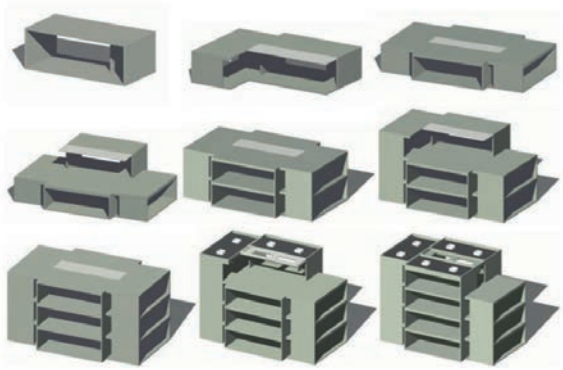
Figure 1.4. Mihouse Prototype design



Source: The Authors.

In addition to the residence prototype, the following sequence shows the assembly of the modules up to the completed building, and conceptually illustrates high construction efficiency of the proposal.

Figure 1.5. Assembly of the modules up to the completed building.



Source: The Authors.

Wall lengths resulting in each orthogonal direction of structural plant generate a high regularity in response to earthquake resistant assembly being confluent in perfect symmetry and the center of mass and rigidity, thereby providing high reliability in evaluation of earthquake resistant building in the light of the rules required by the Colombian Earthquake Resistant Building Regulations NSR-10, mandatory in our country (Figure 1.5).