A HIGHRISE URBAN VILLAGE: Tectonic Mutation in a Design Studio

Jin-Ho Park

Abstract
This paper presents the design exploration of a studio conducted at the University of Hawaii at Manoa. The study began with the premise that high-rise housing in Honolulu is not a viable solution within such a unique natural and urban setting. Students have challenged the issue by testing and experimenting on a variety of distinct housing alternatives within the studio. The studio then introduced some pedagogical agenda of housing to students and required an analytical project that focused on the dwelling and its collective form to elucidate fundamentals of housing design. This study laid the groundwork of each student's design development throughout the project, upon completion a variety of different designs and solutions were proposed responded to distinct themes and problems. In this article, different types of housing prototypes and their distinctive clustering as a unique urban village as a whole are shown, and the final model of the studio as a collective form is presented. In conclusion, the pedagogical value of the design studio is discussed.

Keywords: Highrise Housing, Flexibility, Diversity, Individuality

1. INTRODUCTION
High-rise housing in Hawaii is in high demand, due to the scarcity of land in a high-density urban city and high property values on average in the U.S. High-rise housing is the means in which a large amount of people live and interact. Similar to other places, the overriding concern of the housing industry in Hawaii is mainly mass-production and marketing. Hence, housing designs have very limited quality in terms of construction and design due to the development process and the capital commodity. Developers many times rush the design process or have a limited number of set plans and layouts to be used, resulting in low quality housing. Hence, diversity and individuality are far lacking. In addition, the way of clustering in current high-rise projects seem to provide no sense of urban village, in interior as well as in exterior. Besides, user-initiated or participated open design directly associated with architect is non-existent. According to Ahrentzen (1999), for democratic choices to be possible among diverse people, housing diversity is a necessity.

Contemporary urban housing is heavily skewed towards minimal individual character in designs. Especially in Hawaii, the perceived dichotomy between built and natural landscapes is amplified by the island condition because of the oversized natural environments and limited buildable area. Under such conditions, the natural and the man-made are seen to be at a greater distance from one another and are understood through contrast. Tropical island development has sought to preserve the idea of islands as remote, pristine places of untouched nature, even as islands have become host to truly urban densities. Development has sought to promote and preserve the perception of this environmental myth through the use of low-rise buildings, caricatured native island styles and dispersed development.

This exploratory piece of research and pilot design study is intended to examine existing theoretical research and design precedents by revisiting their issues and suggesting a new high-rise housing alternative for contemporary housing in Honolulu.

2. STUDIO PROGRAM AND DESIGN PROCESS
Taking these flexibility and plug-in issues, this experimental studio project is interested in revitalizing an existing multistory residential building much further beyond the standard factory manufactured housing. Twelve students from a second year class collaborated throughout the design process for five weeks; the studio meets formally three times a week for
four hours each session. These hours were devoted normally to discussion with the studio instructor. The whole team of 12 students spent most of their hours of the day and night together, collaborating to build the final digital as well as physical design. Throughout the design process, students facilitated digital and physical methods as their communication tools. As a matter of fact, their ability to seamlessly integrate digital and tangible data in real time enhances both the design process and communication to each other.

Each student has a different housing program with their own language of style which shows their designs unity in diversity. We assumed that the current housing residents, as clients, participated in the design process to help different users develop the layout of housing units according to their own needs and preferences.

2.1. CASE STUDIES

One notable drawback of high-rise housing in Hawaii is the feeling of existing in a cookie cutter box. Repeated units throughout a high-rise would make anyone feel as if they were living in a cage. They share similar housing plans with repeated patterns of design. Movement throughout the space of these apartments is typically limited to back and forth rather than up and down. The challenge we are faced with in this project is in breaking these identical layouts and in creating an organic space of interest out of a static structural grid from an existing high-rise structure.

Much effort in housing design has been given to industrialize production. In retrospective, numerous architects and manufacturers have proposed a wide variety of housing alternatives through research and experimentation. The development of innovative housing solutions in contemporary architecture continues to generate interest in construction systems and technological methodologies for typological diversity and spatial flexibility. Plug-in and infill housing fully equipped with appliances have been discussed for the purpose of the inspiration throughout the project.

In the beginning of the design studio, a number of historical precedents are notably present. Although the giant, twelve-story high block is a typical apartment from the exterior, Le Corbusier’s Unite d’Habitation in Marseilles (1946-52) conveys a clever idea that makes it significant (LE CORBUSIER, 1984). Sheltering 1600 residents, the apartment is intended to alleviate a severe postwar housing shortage after the end of the Second World War. The project was conceived of as a vertical community, providing green space, internal streets and community services. Each unit block as an independent entity is inserted into the frame of the structure. Ramirez (2000) has tried to metaphorically refer the system to ‘bottles in a wine rack’. With a simple rectilinear ferroconcrete grid as its structure, the program of the building is yet elaborate with twenty-three different configurations. The pre-
cast individual apartment units are slotted in the grids, housing singles to families as large as ten. The project was known as ‘a self-contained vertical city, with modular housing units’. It is very first high-rise housing type of this kind with Le Corbusier’s utopian ideals of “vertical city”.

Swedish architect, E. Friberger experimented with a unique multi-layer low-rise housing design to address the problems of the mass housing industry and to enhance the efficiency of the building process of diversity, flexibility, and systems of construction (HOFFMANN, 1967). His thesis is concerned with the scarcity of buildable land through artificial stratification by providing a new type of housing with additional structure, containing vertical and horizontal circulations. After the structure is constructed, a number of units are added to each concrete platform.

Similar efforts are also found in James Wines’ project (SITE, 1982) and in Mark Mack’s housing design. In the 1980s, James Wines proposed a design focusing on a combination of issues including sustainability, landscape, and a variety of homes within a highrise boxy gridiron structure. His design proposal noticeably features an open structural frame filled with a mixture of various single-family houses. Although never built, this project intends to provide vertical green spaces and accommodate choices of each resident in highrise housing. Recently, Mark Mack designed a housing project in Fukuoka. Mack’s solution in the Nexus Fukuoka is unique (GHIRADO, 1994) in that he offers different unit designs depending on each resident’s preference. The façade design, colors in interior, and interior spatial designs of each unit are designed independently creating a unique living space for each resident. Mack proposed a design where “no two of the twenty-nine units are alike” and “no configuration is repeated”. Each unit consists of a double story apartment within a 6m. and 4.2m. structural grid.

Housing adaptability and flexibility are not new theme in the development of dwelling design. The aspiration toward housing adaptability and flexibility for the needs of different residents have been comprehensively developed in theory by N. J. Habraken (1972 [1961], 1976) and implemented throughout in practice. His idea of “support and infill” approach has been institutionalized and widely influential in contemporary housing practices Habraken’s theory attempts to examine the variables and fixed systems to facilitate the changing needs of individual users across their time period through various stages of the design as well as its implementation process.

Although each of above theoretical and practical examples challenges one approach over another, a common thread through these series of precedents is flexible design strategies with plug-in and infill housing techniques that allow for greater diversity and spatial flexibility in housing designs, thus eventually offering the possibility of individualization.
by the resident. As the first step of the design studio, each of key ideas of these precedents is discussed and then, is employed to shape the student's final design throughout the design studio as the fundamental strategic means.

2.2. DESIGN SCENARIO

We coined the term, "tectonic mutation," to explain the central theme of the design exploration. Here, tectonic mutation denotes any spatial recombination of various units within a given housing frame, thus resulting in a unique housing design away from a typical and normal type that is prevalent in a city of Honolulu. The notion promotes the process of producing multiple sets of standard units, and tectonically mutating them to the given frame and locale. The design should rely on a structurally rational construction and craft production (Frampton, 1995). The pedagogic implication of the theme is that while the basic structural frame of the existing housing component is maintained as an ordering principle of the construction, a variety of new and distinctive housing units are crafted and then inset into an existing structure. Accordingly, each housing unit specifies a unique design in a highrise urban village, as envisioned in Le Corbusier's Unite d'Habitation. In this case, no single housing unit is regarded as typical and standard. It is not a simple remodeling of the old; it is new construction that perhaps will bring a new design strategy for the remodeling housing industry.

To bring the highrise housing issue "tectonic mutation" into focus, a run-down residential high-rise building in Waikiki was chosen to be remodeled. The address, 2115 Ala Wai Boulevard in a densely populated neighborhood, overlooks the Ala Wai Canal to the northeast. It was built in the 1920s to drain the water from the swamps and rivers of the area. The walkway along the canal is perfect for jogging and relaxing. The region has a humid and rainy climate, at times with trade wind.

Currently the structure holds eighty housing units, two or three bedrooms in a twenty story high building. Our project will use the structural frame of this pre-existing building to develop the framework for tectonic mutation by gutting the already existing apartment building leaving only the structural frame. These out-of-the-box spaces provide new opportunities for enhanced units. By breaking the box, issues of space division come into play. The next task is to design different types of units and then, insert them into the structural frame as a collective form. During the preliminary design development, each student has dealt with each neighboring students. A lot of communication took place among students.

There are a total four residential bays on each floor. The existing ground and basement floor are left alone. New units are linked through existing vertical and horizontal circulation systems. Laundry and community spaces are provided for at the top and bottom of the building. Maintaining its structural frame, each designer is permitted a progressive freeing of the interior space. The first bay measures 40 x 40-foot and the remaining three all measure 30 x 50-foot. The height from floor to floor is 12-foot. Six bay areas are assigned to each designer as 'lots,' a similar effect as with suburban housing is achieved.

Each person's six bay area could be located on as many as six floors or as few as two. Although the configuration of the structural bays cannot be altered, the bays themselves can be subdivided or compiled. In addition, the exterior face of each bay

Fig 3. Left. Site map of the existing housing; Middle. A photo of the existing housing; Right. A photo showing the surrounding context
can be extruded up to a maximum of eight feet beyond the face of the building on three sides as cantilevered overhangs. The six bay areas that each designer was given should be thought of as one contiguous form to be manipulated as he or she sees fit. One might even consider it a community within a community. This scenario will become the future of architecture, where designers are sought to create structure around and on existing developments.

2.3. Unit Prototypes
While innovative housing designs have been continuously developed, it must be noted that the diversity in housing in terms of unit designs, their forms, arrangement is still much less than it could be. The current housing floor plans of the existing housing are monotonous and most of units were identical. Taking all units out but leaving the structural frame provides new possibilities and opportunities for design exploration.

Unit diversity is a pivotal element of this studio exploration. The studio challenges the issue creating each student a unique set of prototypes, including studio, loft, 1BR, 2BR, and 3BR. With the basic units, prototypes can be extended and elaborated depending on personal preferences and lifestyle of the clients, providing an appropriate level of intimacy or privacy. The unit sizes are no longer predetermined but accommodated by the needs of clients. After all, each unit has the right to express their unique identity. Besides, several prefabricated apartment units can plug-in or slide-out of the tower as a filecrawler in a filing cabinet. Within a large space frame, there are array of "spaces for individual life" (HOLL, 2002). In the overall design exploration, various schemes are employed to provide typological diversity and spatial flexibility (Figure 6).

Although the existing structure holds eighty...

Fig 4. Unit assignments to each student. Colors represent a domain of each designer.

Fig 5. Left. Structural frame of the existing housing; Center. Partial clustering studies where some housing units are plugged in; Right. Partial clustering studies with different color schemes.
housing units with two and three bedroom types, the new housing offers a multitude of 40 diverse housing units. Diversity is a key factor in this experimentation. The efficiency ratios between the existing tower and its student-designed renovation are calculated. The result turns out to be comparable. It is due to our decision to permit newly designed apartment units to have eight feet overhangs.

2.4. Clustering
The discussion of clustering in high-rise housing is extremely rare; no wonder high-rise housing takes on such a stacked, matrix form. The study of our residential unit plans inevitably leads us to give our attention to their groupings. Following Maki’s terminology, various prototypical units are developed as a generator of a ‘collective’ form of village (MAKI, 1964). Village is a notion defined by the organization of individual dwelling units into groups, enclosing and creating a community space (Figure 8). This definition can be amplified in the modern high-rise building. As most villages have their own characteristics of how they are formed and grouped, our high-rise building can also have a unique expression of its whole by way of clustering. By continuously rearranging various units, multiple possibilities in the way they are assembled are created (Figure 11). A hybrid assemblage of diverse units, with a communal vertical corridor creates our unique urban village. Apartment units are designed to have cross ventilation, in/out views, roof gardens and terraces evolving a new type of building matrix.

In the studio, the individual students communicated with each other as adjoining neighbors - horizontally, vertically, and diagonally to create a harmonious tower design with non-repetitive apartment units and green corridor spaces pulled-out and pushed-into the framework, while others remain on the plane.

2.5. Façade Treatment
Another neglected area in apartment design is façade treatment. Our facade designs are in sharp contrast with the typical rather boring high-rise towers where it is relatively impossible to identify one’s own apartment from the street. Perhaps, the repetitive and standardized building units are a vital requirement for the effective and economical adoption of mass housing production. However, it forms
repetitive and monotonous designs, producing unpopular and unpleasant residential units. Housing façades should be designed to avoid a monotonous or continuous facade, because it denies residents their own outer image. It is our intent in this design exploration that each architect determines his or her own facade character in the given structural frame, rather than employing standardized façades. Thus, our façade design no longer results in just a simple dividing line.

2.6. Vertical/Diagonal Spinal Green Corridor
The impact of residential housing on the sense of community is quite strong in Hawaii. This strong family bond is referred to as ‘Ohana; interaction between public and private spaces in the neighborhood is an important dimension. Contemporary urban life is more home centered and the public spaces within cities are being increasingly restricted, particularly in high-rise urban housing. In our project, an interior green corridor is provided to allow for the organization of our building’s community spaces, along with existing elevators. The common urban corridor provides a vertical/diagonal meandering space in our multistory structural frame that runs from the top to the bottom like a strong urban pedestrian street. The green corridor threads all units together as a whole with a sequential path linking open community and Hawaiian lanai spaces in each floor while keeping each unit’s privacy. The corridor acts as an internal spine of spatial homogeneity in the village. Through the corridor, social activities arise among the community allowing for the incorporation of light commercial opportunities. The corridor becomes a true social and spatial focus for all residents. This newly established corridor acts as a vertical/diagonal linkage, making the units integral parts of the whole, while creating fertile ground for gathering, sunbathing, and socializing in our islands tropical atmosphere.

2.7. Free Section
Typological studies of housing units focus mostly on their floor plans (TICE, 1993). Units are lined up
side by side, and then stacked high into the sky, creating the monotonous checker frame buildings that blanket the horizon in many urban settings. The inhabitants of such apartments live daily routines knowing in the back of their minds that they inhabit the same space as their neighbors. Instead of reproducing these typical building blocks that are continually being erected, perhaps a solution can be obtained by, splitting, staggering, contracting, expanding, interlocking, intersecting and breaking up the spaces. The notion of the free section is found in a number of works by early modernist architects such as Adolf Loos, R. M. Schindler, and some De Stijl architects.

3. FINAL DESIGN

Students finalized all initial design work in the computer. After fabricating these virtual models, a ¼ scale structural framework was constructed based off of the original building. Individuals then constructed their unit designs within this frame. Figure 12 illustrates the full 3-D scale model of the project. Although no real form restriction was placed on unit designs, a color-palette system was adopted to augment the models unity and identity. In the final stages of model fabrication, the bright colors clearly defined the distinct interior spaces, yet the exterior facade tones stayed limited to the neutral color of the foam core and the natural colors of the wood, glass and metal. This effect is intended to draw the observer into the interior spaces of the model, which might otherwise be overwhelmed by the busy exterior façade. Overall the color scheme results in an artistic palette of striking tones emanating from within like coals in a passing fire.

Albeit ambiguous when seen in its clustered form, the outlook of the final design becomes a true collective urban high-rise village. Each designer has his/her own fenestration design and lanai with flower boxes, expressing its identity in a collective whole. Its sectional view will give its three-dimensional dynamism, no longer stratified and static structural matrix. The final design shows not any more a functional box with functional rooms. It is a place for human beings, much more than just a sum of its parts. The design shows a unique integration with open air, light, nature, green path, and communal space that Hawaii’s environment can offer.

By the end of the semester, the students had generated a wide variety of spatial housing designs emanating from different units, assembling these units into play against the mundane designs of Honolulu housing. In the beginning of the studio, it was hard for students to predict how to design their
individual units in a given frame, and to conceive how such diverse housing units are to be grouped as a clustered village. However, the final design as a whole turns out to be surprisingly complex, yet appealing as a design solution.

Interesting enough, the final output of the design studio in its external look is similar to three other similar housing projects that need to be briefly discussed. The first being Moshe Safdi’s Habitat completed in 1967 in Montreal Canada, the second is artist and architect Friedensreich Hundertwasser’s housing design in Vienna, and the last is an apartment building without an architect in Hong Kong. Although each approached has a different point of departure, their final designs share similar ideas. The approach of Safdi’s Habitat is based on a much more conventional modular method (SAFDI, 1998). Using a rectangular modular to join housing units in an offset L shape, it produces a variety of dynamic external faces from every side of the street. A similar idea is methodically demonstrated in Park (2004). Unlike the Habitat, Hundertwasser’s approach is similar to that of the Arts and Crafts movement that counters almost the dehumanization of machine techniques devoid of the loving hand of the craftsman (RESTANY, 1998). Hundertwasser challenged the monotonous form of street apartment buildings, incorporated with landscape and colors thus, introducing richness and individuality into apartment buildings. In Hong Kong, the Kowloon Walled City, although demolished, is an interesting example of dynamic housing. It is a housing design without an architect, and with no preplan. The tenants change their housing units according to their needs. Basically, it is the most basic form of housing where the users transform their living form, a home.

CONCLUSION

The inquiry presented in this experimental housing design is to provide an examination of the intersection of innovative design philosophies and architectural pedagogy. One of the remarkable values of this experiment and learning experience was that the students had an opportunity to learn critical aspects and limits of existing housing designs, and to test new possibilities of diverse and flexible highrise housing. In essence, the design experimentation was heuristic and didactic as part of students’ learning process.
Looking back, this project has been appreciated by students on different and interrelated levels. During the design process, students have acquired new insights by experimenting with their design ideas. Besides, students have been able to think critically and to apply concepts and techniques learned during their design process in order to further understanding through research and design exploration. This will lead students to a better understanding of the impact of housing development as well as a determination of a more efficient housing development.

The final design was a result of the collective efforts of twelve students, who were at first skeptical about highrise housing. With the thematic enquiry given for the studio, they all worked intensively side-by-side in the same design studio. In addition that each individual project resulted in a highly original and a unique approach to critical analytical thinking, strategic planning, and design decision-making, their effort, inquisitiveness and open-mindedness were instrumental for developing the final design. One student commented that during the design process, they “learned how to communicate; not just communicate, but design through communication”. Due to the fact that each student gave the chosen part of the building an identity, the final design may look chaotic in an ordered structure. Nevertheless, students commented about the final output as “a new type of vertical sprawl”.

Several distinct patterns in the highrise dwelling model have been emerging with a variety of methodical approaches. This design exploration can also play a significant pedagogical role in promoting an ongoing discourse concerning the strategy of housing remodeling. These lessons could be applied as canonical solutions and pedagogical references to the development of new housing typologies, which can then be adapted for contemporary housing developments. In particular, as housing ages, their physical condition deteriorates and their designs and systems become outmoded. Rather than reconstructing the whole new housing, the strategy adopted in this experimental design studio may be employed into the remodeling process. The remodeling process helps to maintain the structural integrity of each unit, update homes, and adjust the size and layout to changing family needs.

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Author's Address:
Jin-Ho Park,
Korea University
Seoul, Korea
jinhopark@inha.ac.kr