

ABSTRACT

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EXPERIMENT

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This thesis examines the implications and levels of choice for the user in the built environment. The living environment persists through change and adaptation and as society progresses, specializations continue to increase and man forfeits basic levels of choice. So often, choice has become dictated by the options that are available for purchase and specializations have created a system where people now rely on the services and goods of others. The built environment reflects this system and is creating a building stock that is less adept to changes of a building's function.

While this study does not aim to naively denounce this current system, it does investigate a process to reintroduce choice for the user and create sustainable architecture that promotes change. Through this exploration, the issues of affordability and the importance of economic diversity will be addressed. The means for tackling these issues is spatial flexibility of high-density housing.

CHOOSE HOUSING: AN AMERICAN HOUSING DESIGN EXPERIMENT

By

Jacob Hadley Zager

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of the requirements for the degree of
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Foreword

The focus of this thesis is studying the immediate and spontaneous relationship of the user and the built environment in the act of dwelling. As Ivan Illich notes,

*"Dwelling is an activity that lies beyond the reach of the architect not only because it is a popular art; not only because it goes on and on in waves that escape his control; not only because it is of a tender complexity outside of the horizon of mere biologists and system analysts; but above all because no two communities dwell alike. Habit and habitat say almost the same. Each vernacular architecture (to use the anthropologists' term) is as unique as vernacular speech. The art of living in its entirety – that is, the art of loving and dreaming, of suffering and dying – makes each lifestyle unique. And therefore, this art is much too complex to be taught by the methods of a Comenius or Pestalozzi, by a schoolmaster or by TV. It is an art which can only be picked up. Each one becomes a vernacular builder and a vernacular speaker by growing up, by moving from one initiation to the next in becoming either a man or a woman inhabitant. Therefore the Cartesian, three-dimensional, homogeneous space into which the architect builds, and the vernacular space which dwelling brings into existence, constitute different classes of space. Architects can do nothing but build."*¹

Discussion of this issue regarding the user's control upon the built environment, or lack thereof, can be perceived as casting the Architect in a negative light. This is not the intention. However, there are presumptions that will be made about the education and practice of Architecture in this thesis that may not flatter the Architect. To understand why I take some issue with the education of Architecture I recall my graduate education that included a seminar in Regionalism taught by the legendary Bill Bechhoefer, who once

¹ Ivan Illich, In the Mirror of the Past (New York, NY: Marion Boyars, 1992) 56.

said that in Architecture there are two beliefs. The first is the belief that Architects know better and go forth in teaching others what they know. The second is that Architects go forth in effort to learn from others and apply that learning to their architecture. If asked which way an auditorium of architects may lean in favor of an approach, the results may be an equal split of the opinions; for this is a scenario dealing with personality traits mixed with architectural beliefs. Obviously, given this thesis, I tend to favor the former position.

The other experience during my education was the role I played as a member of the LEAFHouse team in the designing and building of an 800 square foot, solar powered house. From 2006-2007 I was deeply involved with the University of Maryland's LEAFHouse project. To me this experience enlightened my thinking towards issues, like the one described earlier, that have been brewing ever since I began work for an architecture firm following my undergraduate education. Solace from the various conflicts I have with Architecture came by living on the construction site and finding solutions not only on paper but in the built form. In LEAFHouse, the cycle of design was full circle, and as both builders and architects, the team idealized designs on paper at our desk or cardboard on the construction site and then tested the designs on the home itself - allowing for design adjustments to be made based on the built form. The process was not efficient. It was incredibly messy and amazingly stressful, and I have come to believe that meaningful works are meant to be so. We fought amongst ourselves and celebrated

what we built. Divisional lines of different specializations that are commonplace in the building practice were erased in this project. We identified our strengths and somewhat organically moved towards the jobs that fit us best. But, there was not a single moment that we were not a team. All members involved joined LEAFHouse to help push this common goal of building a house that happened to be fully powered by the sun. For two years, students and faculty constructed a home of the early 21st Century in a manner that is rare today.

The end result was so meaningful that whatever is written or spoken about the process never seems to fully justify the experience. For the handful of professors and students that were entirely consumed by the process to the point that it was unmistakably the center focus of our lives, I think that what we experienced was maybe the closest any of us had encroached upon fully participating in the act of dwelling. This may be why the core of us did not want to leave the house at the end of project, and why each of us refers to the house as “my house.” It may also be why parting with the house to an organization that will give it good use and purpose, evokes a sense of loss that may never dissipate. This was the process that I idealize in this thesis and strive to resurrect in my career some day.

Dedication

To those that endeavor to serve others to the best of their abilities and our families and loved ones that inspire us to do so. For me, that would be Sarah and my family.

Acknowledgements

To go through this process and forget to mention the professors that were mentors is to not fully comprehend the rarity and weight of such an experience. Karl says, “You’re next project is your best project.” But, many, including Karl, would most likely admit that thesis remains to be a once-in-a-lifetime opportunity for Architects.

I want to thank Ralph and Karl for being my mentors through graduate school, not just thesis alone. These two counselors will officially end their academic teaching careers this semester, and I feel honored to have been one of the last to benefit from them. But, despite retirement, they will never cease to teach and in that comes great relief.

Table of Contents

Foreword	ii
Dedication	v
Acknowledgements	vi
Table of Contents	vii
List of Figures	viii
Introduction.....	1
Chapter 1: Flexibility and the Importance of Choice	3
Understanding the User	3
The Value of Good Typology.....	5
The Need for Good Housing that just so happens to be Affordable	8
A Perpetual Shift in Household Configurations	11
Chapter 2: Change Requires Time and Time requires Change; The Importance of Expansion and Contraction.....	20
Louis Sullivan's Half Truth.....	20
All Buildings Can Grow, But Can They Shrink?.....	23
Layers and Levels	28
Open Building Implementation	34
Chapter 3: Why High-Density Housing in the City?	36
Not relying on the Automobile	36
Living in the Center versus outside the Center.....	37
The Need for Good Housing that is Affordable (Part II).....	39
Precedents and Influences.....	40
Chapter 4: The Design	42
The Sites and Background Design Pedagogy.....	42
Baltimore, Maryland.....	43
Hyattsville, Maryland.....	44
Early February.....	48
Early March.....	56
Late April.....	64
Chapter 5: Conclusion	87
Original Intentions.....	87
God is, in fact, in the Details (Design Trip Wires).....	88
Lessons Learned	90
Bibliography.....	91

List of Figures

Figure 1:	Various Configurations for User.....	4
Figure 2:	Pavilion outside of Chiang Mai, Thailand.....	6
Figure 3:	Pavilion outside of Chiang Mai, Thailand.....	7
Figure 4:	Flex Space Diagram.....	10
Figure 5:	Image of Geuze's Base.....	12
Figure 6:	Studio Flexibility.....	14
Figure 7:	Traditional Flexibility.....	16
Figure 8:	Shift in Household Over Time.....	17
Figure 9:	"Pop-Top" Home, Takoma Park, Maryland.....	18
Figure 10:	"Pop-Top" Home, Adelphi, Maryland.....	19
Figure 11:	Typical New Building vs. Multi-Use Building.....	21
Figure 12:	Cottage grows to McMansion.....	24
Figure 13:	Demonstrating Expansion/Contraction.....	26
Figure 14:	Cottage to McMansion back to Cottage.....	27
Figure 15:	Layers/Levels of Building System.....	28
Figure 16:	Layers/Levels of <u>Typical</u> Built Environment System.....	31
Figure 17:	Layers/Levels of <u>Proposed</u> Built Environment System.....	33
Figure 18:	Theoretical Influences.....	40
Figure 19:	Precedent Examples.....	41
Figure 20:	Baltimore, Maryland.....	43
Figure 21:	Hyattsville, Maryland.....	44
Figure 22:	Unit Configuration Matrix.....	45
Figure 23:	Room Layouts of Modules.....	46
Figure 24:	Room Layouts of Modules, Part 2.....	47
Figure 25:	Baltimore, Maryland Site Plan.....	49
Figure 26:	Indirect Flexibility Diagram.....	50
Figure 27:	Indirect Flexible Diagram ...continued.....	51
Figure 28:	Direct Flexibility Diagram.....	52
Figure 29:	Direct Flexibility Plan B.....	53
Figure 30:	Direct Flexibility Plan C.....	54
Figure 31:	Space Function Analysis Matrix.....	55
Figure 32:	Preliminary Planning Grid for the Module.....	56
Figure 33:	Scheme 1 and Scheme 2.....	57
Figure 34:	Scheme 3 and Floor Plan Examples.....	58
Figure 35:	Direct Flexibility Diagram.....	59
Figure 36:	N-S Section Thru Courtyard.....	60
Figure 37:	Aerial Perspective.....	61
Figure 38:	Street Perspective.....	61
Figure 39:	Street Perspective.....	62
Figure 40:	Perspective of Courtyard.....	62
Figure 41:	Interior Perspective of the Corridor.....	63
Figure 42:	Interior Perspective of the Unit.....	63
Figure 43:	Planning Grid for the Module.....	64

Figure 44:	Plan Aggregations.....	65
Figure 45:	Section Aggregations.....	66
Figure 46:	Evolution of Owner/Renter relationship.....	67
Figure 47:	Flat Units (1/3) Floor Plans.....	68
Figure 48:	Two Story Units (2/3) Floor Plans.....	69
Figure 49:	Full Units (3/3) Triple Height Floor Plans.....	70
Figure 50:	New Site near JHU Campus.....	71
Figure 51:	Site Plan.....	72
Figure 52:	The Circulation Floor Plan.....	73
Figure 53:	The Non-Circulation Floor Plan.....	74
Figure 54:	Parking Garage Floor Plan.....	75
Figure 55:	N-S Section.....	76
Figure 56:	E-W Section.....	77
Figure 57:	Building Diagrams.....	78
Figure 58:	Module Infill Variety.....	79
Figure 59:	Street Perspective.....	80
Figure 60:	Courtyard Perspective.....	81
Figure 61:	Courtyard Perspective.....	82
Figure 62:	Courtyard Perspective.....	83
Figure 63:	Courtyard Perspective.....	84
Figure 64:	Rooftop Perspective.....	85
Figure 65:	Aerial Perspective.....	86

Introduction

"The constantly growing diversity of our housing needs (...) demands great flexibility in the use of the accommodation. (...) If the architect limits himself to treating the kitchen and the bathroom as constants, because of their plumbing, while partitioning the remaining living area with movable walls, I believe that by these means it is possible to satisfy every reasonable dwelling need."²

-Ludwig Mies van der Rohe

This thesis will look at the relationship between the user and the home to reinvigorate the act of dwelling that has been cut back in the creation of production housing. The focus of this relationship will revolve around choice and flexibility. As time has passed, choice has deteriorated for the user. For renters and homeowners, choice primarily exists within the various options offered by pre-configured and pre-designed apartment buildings and single family detached homes. In these circumstances neither the apartment building or the single family home provide internal flexibility that allows a diverse group of users to activate the home according to their idiosyncratic preferences. This is the case because to do so would be an inefficient and costly process given the system in place today with regard to architects, builders, and developers.

In this document, Chapter 1 will be the foundation for exploring this theory of incorporating flexible building design that provides a "blank canvas" for each and every new user. The building type is high density housing and to achieve this, the thesis will analyze the limitations of the typical unit type and study the enduring

²Karin Kirsch, The Weissenhofsiedlung: Experimental Housing Built for the Deutscher Werkbund, Stuttgart, 1927 (New York, NY:Rizzoli, 1989) 47.

change in family structure. For example, the young family of 2007 is quite different to the young family of 1957, and future family trends will continue to shift.

Chapter 2 of this document will go into greater depth of the design implications of flexibility and choice by distinguishing layers in the built environment and highlighting the more immediate layers involved in the act of dwelling. As a result of identifying these layers, new opportunities that do not exist for current building practices will arise and inform the design process.

Chapter 3 will justify the rationale for the site selection of this experiment in an urban context and not a sprawling landscape. The two sites for evaluation range in density and scale. The first site is Baltimore, MD, and the second site is Hyattsville, MD.

In Chapter 4 is the design process and as part of this design process, there are four scales that this thesis will work. They are as follows:

- Building Scale.
Here will be the building parti design appropriate to the site
- Unit Scale.
At this point is the design of the unit(s) organization and their flexibility for different configurations
- Room Scale.
At this scale is the study of the room layout within the various unit configurations
- Detail Scale.
Finally, this scale will investigate the construction technique to achieve unit flexibility

The final chapter is the conclusion to this year long process. Identifying the successes and weaknesses of the thesis will be included, as well as indicating the design issues that would receive more exploration if there were more time.

Chapter 1: Flexibility and the Importance of Choice

Understanding the User

“And this means, of course, that in two cultures, people may see sidewalks differently, that is, they may have different patterns in their minds – and, that they will, as a result, act differently on the sidewalks. For example, in New York, a sidewalk is mainly a place for walking, jostling, moving fast. And by comparison, in Jamaica, or India, a sidewalk is a place to sit, to talk, perhaps to play music, even to sleep.”³

-Christopher Alexander

There can be a wide range of interpretation between cultures in regard to something as common as a sidewalk. Given a home, imagine the far wider range of interpretation for spaces like living rooms or kitchens not just between two cultures, but between two neighbors. Given this smorgasbord of spatial organization, a flexible housing design that can create spaces unique for all different lifestyles is a viable solution to the inflexible organization of so much modern day housing. In the past, even without designing unit flexibility to accommodate change, users commonly made alterations to their homes. The reasons may be due to a stronger sense of ownership of the home in the past.

“Each generation, each occupant, changed what he found. That is why in restorations more than one ceiling is found, or why paneling hides earlier, often more beautiful, wall decorations, why conservatories are added, doors blocked up and others formed, balconies removed or added, mullioned windows replaced by sash windows, window bars removed, gables replaced by cornices. These iterations were not always done for functional purposes. They were done to keep up with the times or because notions about living changed, because one could not identify with what one took over or because it belonged to a different generation.”⁴

-N.J. Habraken

³ Christopher Alexander, The Timeless Way of Building (New York, NY: Oxford University Press, 1979) 72.

⁴ N.J. Habraken, Supports; an alternative to mass housing (New York, NY: Praeger Publishers, 1972) 14.

Through maintaining Habraken's observation, this thesis explores and maintains three issues throughout the design:

1. Enabling **all** users to have input into the design of their home;
2. Accommodating and creating good affordable housing;
3. Allowing for shifts in household configurations over time.

Understanding that the American people are a culturally and economically diverse people with fluctuating living trends, there is an opportunity to activate the user in the creation of good housing. Flexible housing design can cater to the user's specific needs and given America's short turnover rate in homeownership, a given home can occupy many families over time. Therefore, creating a framework that enables spatial changes over time is a great asset for all dwellers. But, there must first be a standard from which deviations can take place. This standard will be expressed through typology.

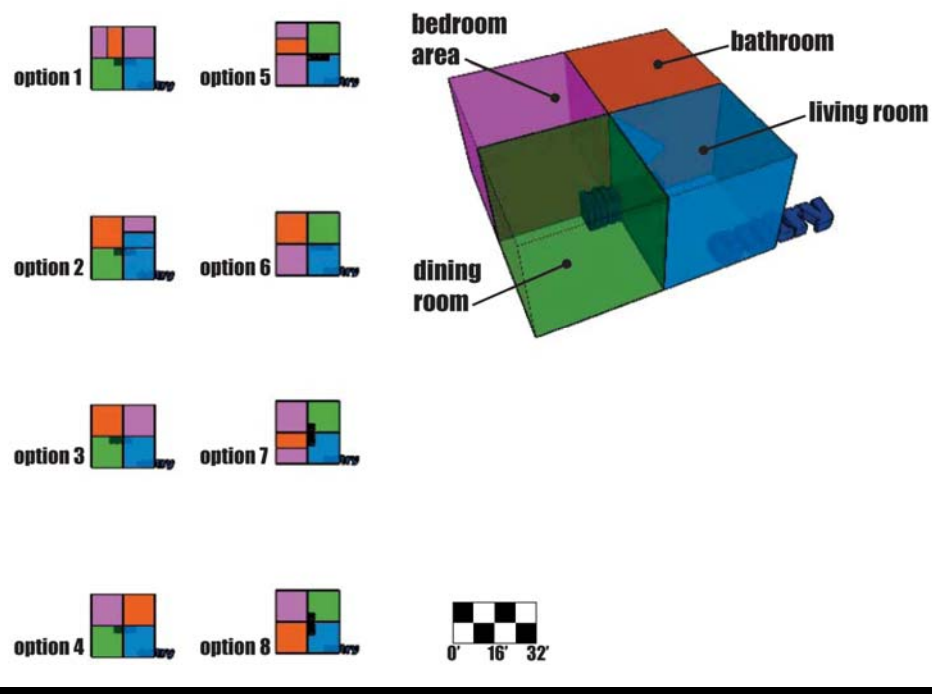


Figure 1 Various Configurations for User [Author]
This idea allows for different users of the same unit to choose a different layout from multiple options. The parameters of the module have not been studied at this point. This is purely a diagram offering a basic intention of this thesis.

The Value of Good Typology

*"The vernacular design process is one of models and adjustments or variations, and there is more individual variability and differentiation than in primitive buildings; it is the individual specimens that are modified, not the type. When a tradesman builds a farmhouse for a peasant, they both know the type in question, the form or model, and even the materials."*⁵

-Amos Rapoport

Today, the relationship between the user and the builder has transformed into a consumer and producer interaction. The relationship that Rapoport describes above has disappeared. As society has progressed along with fast-developing technology, the rise of specialized businesses, industries, and politics have disrupted the relationship that Rapoport describe. Specialization in society has adversely affected that partnership to the point that homebuilding industries have evolved into specializations themselves. The common man does not know the intricacies of building or maintaining a home like fixing a leaking faucet; nor has the time to do so. As a result, the user purchases homes as goods and hires the services of a plumber. The user has now become a consumer in the process.

*"In the 'developed' world, for example, both expertise and control of the building process have been taken away from ordinary citizens. Most people have been reduced to consumers, buying or renting products over which they have little control. In these places, developers for whom the bottom line is profit, and planners, who work within systems of bureaucracy, control the shape of cities and houses, and prevent the 'from the ground up' kinds of processes that might lead to more human results (Davis 1999)."*⁶

-Howard Davis

⁵ Amos Rapoport, House Form and Culture (Upper Saddle River, NJ: Prentice-Hall, 1969) 4.

⁶ Howard Davis. "Architectural Education and Vernacular Building." *Vernacular Architecture in the Twenty-First Century*. Ed. Lindsay Asquith and Marcel Vellinga. (London: Taylor and Francis, 2006) 232.

Rapoport's scenario is more of a snapshot of "primitive" building processes in a time when specializations were few and the majority of people, builders and all, understood without question the housing type, the subsequent building materials, and the form. Through this understanding the builder and the peasant could make variations upon the type to encapsulate the idiosyncrasies of the user. See Figure 2 and 3.



Figure 2 Pavilion outside of Chiang Mai, Thailand.

[Author]

The typology of this pavilion and the other pavilion in Figure 3 are consistent. The construction method and the majority of materials are also consistent. Yet, the scale of this pavilion is larger. The overhang is a continuation of the roof form, whereas in Figure 3 the overhang possesses an angle change. Variation between types can occur and be fairly drastic as well. By following and maintaining a strong typology, a wide range of diversity as a result of personal choice can occur. Through this example, this thesis will employ a strong type that can be deviated to accommodate an immediate degree of choice for the user.



Figure 3 Pavilion outside of Chiang Mai, Thailand.

[Author]

The key issue of these two figures is that there can be a great deal of variation on the type that can still reflect the individual without having to change the fundamental basic type all together. The user can have a great deal of input into this process by making changes upon the type.

In much of the American housing stock, the user is unable to give input during the design and/or building process. The only opportunity for choice is following the completion of the house, which can only occur if the user can afford the services of an architect and a builder. The simple truth is that once architects and builders become involved, the cost of personalizing the dwelling is increased. Through the design strategy, this thesis will provide an opportunity for those that may not be able to afford the costs of professionals to execute the user's intention – prohibiting the act of dwelling.

The Need for Good Housing that just so happens to be Affordable

“Good housing is good housing that is affordable.”⁷

-Karl DuPuy

Affordability is a major housing problem, particularly in the current mortgage crisis. Cost is an issue that prevents many Americans from attaining good housing. But, there is a fundamental problem when creating housing that is literally cheaper and of poorer quality as a response to those that cannot afford good housing. For this reason, affordable housing stands on a slippery slope. It can manifest into an architecture that throws out holistic design principles which make “good” housing. The demand for affordable housing cannot be remedied if the quality and the program of the housing stock are banal and uninteresting. Buildings that engage residents and businesses can foster a sense of belonging and pride in the building and the community.

“If housing designers recognize that the difficulty of keeping housing costs affordable has more to do with household income than housing costs, perhaps they can better plan communities to allow for more income-generating opportunities. By allowing more creative and flexible live/work situations, house-holds can have appropriate space for entrepreneurial activities that can boost their incomes.”⁸

-Michael Pyatok

Instead of thinking of affordable housing as an architectural problem this thesis addresses the issue as a programmatic opportunity. Pyatok notes that “even if innovations in methods or materials could lower production costs as much as 10 percent, it may represent only a 5 percent reduction in sales prices. And just a half

⁷ Karl DuPuy. Personal Interview. 17 February 2008.

⁸ Adrienne Schmitz, et al., Affordable Housing: Designing an American Asset (Washington D.C.: ULI-the Urban Land Institute, and the National Building Museum, 2005) 31.

percent jump in the mortgage interest rate would wipe out that savings.”⁹ As a result, it is clear that square footage of the home plays a key role in determining the affordability of housing. The smaller the owned/rented square footage then the smaller the mortgage or rental payment will be. Given this truth, affordable housing relies on efficient use of space and materials, and can often lead to higher spatial efficiency and higher quality housing than most market-rate housing.

Through this exploration of flexibility in this thesis, owners are given the opportunity to own more square footage than they occupy. See Figure 4. Leftover spaces, known as “flex spaces,” cultivate possibilities for the owner to increase his/her income. Flex spaces can act as additional rooms for renters or as an office/shop that can support entrepreneurial enterprises, reinforcing Pyatok’s notion of creating income-generating opportunities.

In this diagram, the owner can produce a variety of configurations which include flex spaces as income opportunities depending on the owner’s family size or the amount of space the owner chooses to occupy. The only constant of the four scenarios in the diagram is that all flex spaces must have egress access independent of the owner’s unit; all flex spaces must have their own front door just like the owner’s unit.

⁹ Adrienne Schmitz, et al., Affordable Housing: Designing an American Asset (Washington D.C.: ULI-the Urban Land Institute, and the National Building Museum, 2005) 31.

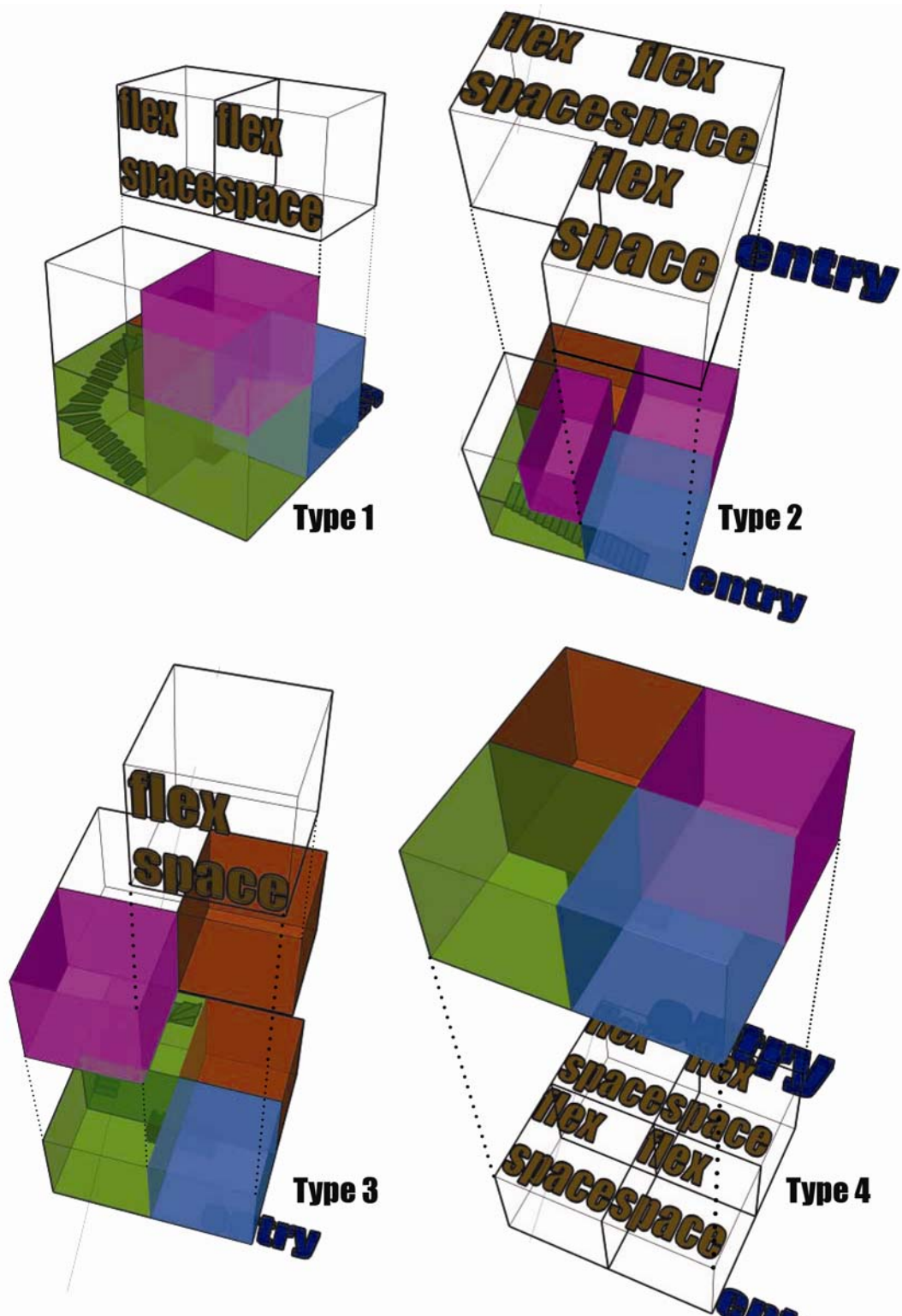


Figure 4 Flex Space Diagram

[Author]

An owner living efficiently can utilize leftover spaces for other uses to increase the owner's income. The individual blocks are 12' x 12' (144 sf)

A Perpetual Shift in Household Configurations

*"In this century the houses of America and Europe have been altered utterly. When servants disappeared from them, kitchens suddenly grew, and servant's rooms became superfluous and were rented out... 'Family rooms' expanded around the television. In the 1960's women joined the work force, transforming both the workplace and the home. With shifting economic opportunities and stresses, families fragmented so much that the conventional nuclear family has become a rarity, and the design of housing is still catching up with that ."*¹⁰

-Stewart Brand

This subchapter focuses on the changing dynamic of the American family and the need for the home to respond to this change without prohibitive construction costs. This thesis examines the role of the home in serving an economically and compositionally diverse group of people. Through efficient space planning, the intention of this study is to encourage the user to minimize his/her occupied square footage and give the opportunity for mixed-use within the building. If done properly, the potential for high-density housing to sustain a rich variety of functions leading to self-sustaining practices is great. The theory of creating flex spaces that can generate income is assuming that enhancing the economic diversity and creating mix-use is adding to the value of the building/community. A flex space that becomes a daycare facility can entrust a tight-knit community. All the while, the different uses can add to the owner's income level. Yet, this idea is not new. In fact, in Maryland, Montgomery County's Housing Opportunities Commission refers to this pattern as Accessory Apartments. By permitting more homeowners of single family detached houses to designate their basements as rental units will increase their income, and can inadvertently add to the richness of their community. For example, Sarah Sayler, a former architecture graduate student at the University of Maryland, rents a

¹⁰ Stewart Brand, How Buildings Learn: What happens after they're built (New York, NY: Penguin Books, 1995) 3.

basement in Takoma Park, Maryland. As a result, she has become a baby-sitter for her landlord's neighbor and drives another neighbor's four-year old son to school in the mornings. In this example, Sarah's landlord unknowingly increased the value of her community by opening her basement for rent to a grad student.

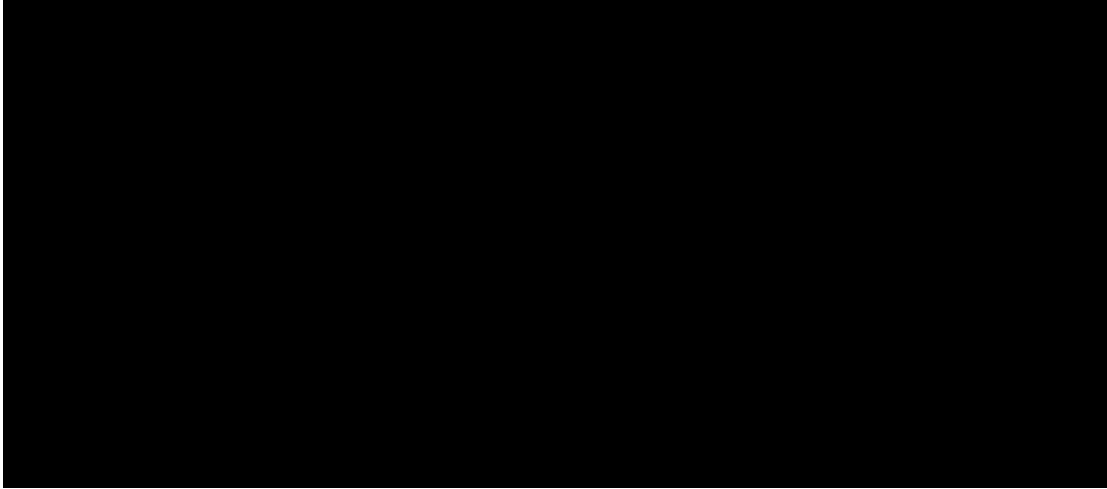


Figure 5 Image of Geuze's Base

This image is taken of a unit at Borneo Sporenburg in Amsterdam. In this picture of what seems to be a dinning room with an adjacent living room, notice the television on the floor. In this unit, the design does not account for a location for the television because Geuze's contemporary dweller does not need a wall niche designated for a TV stand. The floor is a fine place for the television.

Similar to the growing diversity of households and encouraging a variety of typologies to which respond to this changing dynamic, people's **needs** are also becoming more diverse and specialized. Adrian Gueze notes that over the past half-century there has been shift in the social needs of the common citizen. Geuze says,

"...the contemporary...desires just a base. A unit from which he organizes his life and from where he jumps into the world, works, travels and gather social contacts..."¹¹

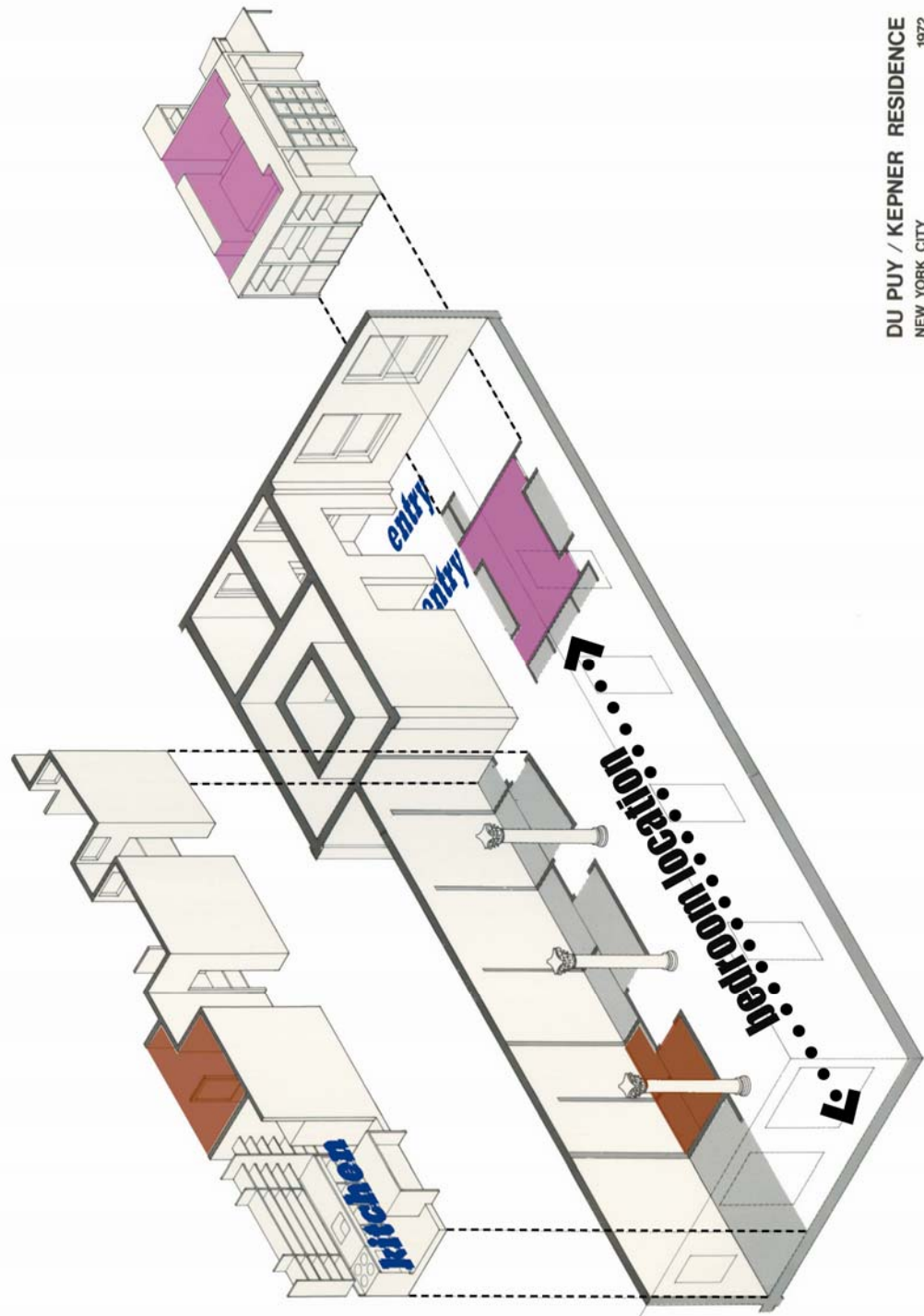
¹¹ Adrian Geuze, "Introduction," West 8, ed. Luca Molinari (Milan: Skira Architecture Library, 2000) 27.

As he suggests, even referring to home as “home” is no longer applicable for all people. Geuze redefines the traditional home as a base. Whereas a traditional home may provide rooms for all possible activities, a base is more efficient with less space, which allows for the resident to prioritize and choose the function of rooms that respond to their lifestyle. For example, Sarah never hosted a dinner party; therefore, a complete dining room was not needed. But, she did need an area for a desk and an area to watch television, so those activities took priority compared to having a dining room. While this study embraces spatial efficiency, it **does not** support the belief that the home must provide well-proportioned, generous areas for all functions imaginable, nor should the design be prescriptive regarding the location of rooms. However, the unit may hint or suggest areas that may be best suited for specific functions like sleeping or playing foosball.

Built niches for a television set or for a washer and dryer falls back into a dictated spatial organization not created by the user. By not dictating the location of specific functions, it frees the dweller to think and choose their own living configuration furthering the personalization of the unit and reinvigorating art of dwelling. Results like placing the television on the floor, as seen in Figure 5, are precisely indicative of the level of choice and freedom that this thesis beckons.

“...what we need are flexible types that make it possible to react to changing life circumstances by simple means.”¹²
-Christian Schittich, editor of *In Detail High Density Housing*

¹² Christian Schittich, ed. *In Detail: High-Density Housing: Concepts, Planning, Construction* (Basel, Switzerland: Birkhauser, 2004) 9.



DU PUY / KEPNER RESIDENCE
NEW YORK CITY
1972

Figure 6 Studio Flexibility

[Karl DuPuy, altered in Photoshop by Author]

Rotate image clock-wise to horizontal.

While this exploded axonometric drawing reveals columns with Classical Corinthian capitals, the organization and overall design is much less formal with the privacy of the bedroom open to the public living room and kitchen. By treating the bedroom as a component not defined by full-height walls, the bedroom can move along the length of the apartment because no walls stand in its way. The bedroom has become more of an object that carves negative space into public space.

On the other hand, Studio Flexibility will not satisfy all users because, again, all users are not the same. While this concept embraces a studio/loft character, some prefer a different approach that is reminiscent of a standard composition with floor to ceiling walls. See Figure 7. Chapter 2 of this thesis delves into studies and analysis of building organization structures that aim to greatly simplify alterations to the unit over time and inherently, the simpler the process the less expensive the construction becomes. To achieve this economical and more efficient adaptable design, the necessary service pipes need to be separated from the structure of the unit. And a separation of the structure from the finish, like raised floors and dropped ceilings, allows for small conduit and chases to respond to particularities of the dweller. If services are integrated into the building structure or “snaked” into partitions, then altering the unit’s layout comes at a much higher cost due to added difficulty in construction and labor involved in rerouting the services/infrastructure in accommodating a new design.

Regardless of preference for either Studio or Traditional Flexibility, the intention of maximizing a minimal amount of space in order to develop flex spaces still carries throughout the thesis. Minimal occupation is bound to all three of the major issues for this exploration stated in the beginning of Chapter 1. Through the notion of using only what is needed, the opportunity for more flex spaces allows more situations for the owner to give another user a home and for creating positive scenarios as did Sarah Sayler’s landlord. Then later on, the flex spaces can be reclaimed by the owner if an increase in family size occurs like the birth of a new child or an elderly parent who needs to be close to the family. Through this concept the units can expand and contract through time, accommodating the fluctuating needs of the owner and various social trends through time while maintaining a high density and efficient use of space. See Figure 8.



Figure 7 Traditional Flexibility

[Karl DuPuy, altered in Photoshop by Author]

This plan looks at the flipside of a loft or studio apartment. By building out the walls to create halls, this design approach is categorized as more formal. In this situation, partitions enclose all the rooms to define their space, leaving little open-ended ambiguity. Yet, even though the rooms are enclosed, there is still opportunity for change. The northern most bedroom could be relinquished and converted into a library, for example. Or the wall that separates that bedroom from what could be a study room could be removed to make a new and larger living room. When the needs of the owner change, there is still a great deal of flexibility available because the service pipes required to operate the kitchen and bathroom are located strictly in their appropriate zones and do not run through any other partitions or other areas of the building. So walls that define other rooms are merely for definition of the unit. Yet, change does not come without some effort and money to remove and rebuild any partition.

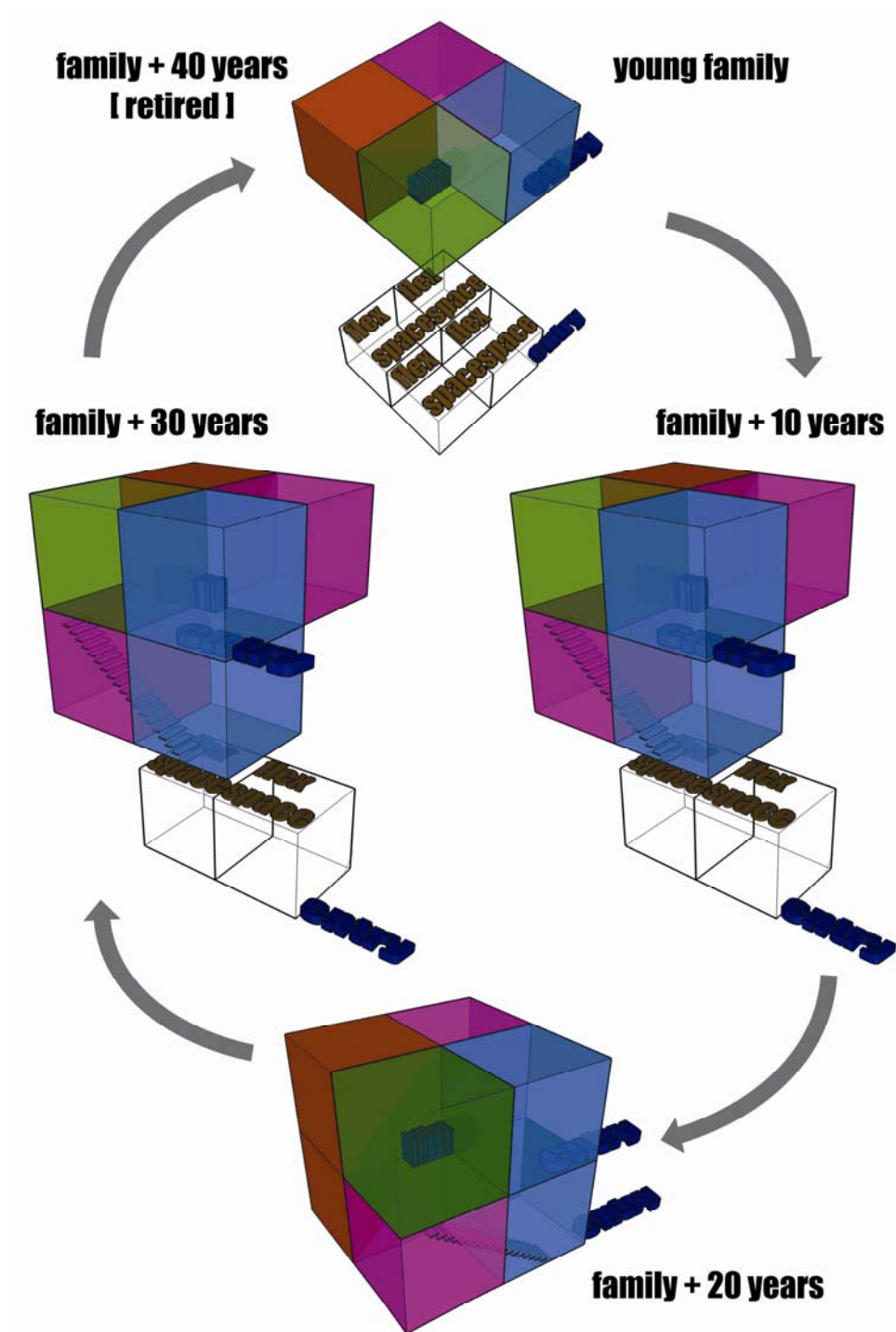


Figure 8 Shift in Household Over Time [Author]

The young family only needs a small amount of space, even with a young child (young family). As the family grows and children become older (family +10 years) the family can occupy more of its owned space and still maintain 288 sf of flex space for single person to rent or for a shop. As the family size peaks (family +20 years) the owner can occupy all of the owned space. As children get older and begin to leave the home, the family size shrinks (family +30 years) and can make leftover space available for rent again. As the children leave the home for good and the parents are alone (family +40 years/retired) the family only needs the amount of space that they started with.

Throughout American subdivisions from the post WWII era, there is a construction trend in the 1 ½ story, single family detached home that is becoming more frequent. Known as, “Pop-Top” houses, this trend removes the roof and the ½ story attic space from the first floor brick walls and adds a second, sometimes third, floor. See Figure 9.



Figure 9 “Pop-Top” Home, Takoma Park, Maryland

[Author]

Given building setback regulations, more homes are building upwards adding another floor because the home does not accommodate the family size or the family’s preference for more space. This thesis allows for this growth or for the initial desire of more space and can accommodate the user from the very beginning of the building process. It also aims to lower the costs involved with this construction.

Occasionally in “Pop-Top” houses, the owner does not even hire the services of an architect, but of only a builder. And in some situations, if the homeowner happens to be a builder, the construction work and design idea is carried through without any outside consultation or contracting. The need for additional space in these homes could be attributed to an increase in family size or the simple desire for

more space. Given these potential circumstances, the user may opt out of hiring an architect because of the extra fees, the added time for design, and because often enough the user believes that he/she knows best. The “Pop-Top” method is a viable solution for maximizing square footage by building towards the sky when building setbacks and lot regulations prevent the homeowner from increasing the building footprint. Consequently, more neighborhoods are witnessing a growing diversity of building densities. But, what happens to the enlarged homes when the reason for needing extra space is removed? The new extra square footage is often times not used and wasted space and does not add to the income of the owner. Yet, the extra square footage is still serviced by heat and air conditioning, raising energy costs to un-used parts of the home.



Figure 10 “Pop-Top” Home, Adelphi, Maryland

[Author]

The homes in Figures 9 and 10 have undertaken extensive remodeling and addition work to their homes for the purpose of increasing the size. It is impractical in the building industry to go through the construction process to decrease the size of the home, as Figure 8 alludes to. Common thinking is if you have too much space, then simply do not use it. But, as E.F. Schumacher points out in *Small is Beautiful*, having too much is never a problem for western civilization. There is no reason for the size of the home to mimic the size of the family through time, as seen in Figure 8. In fact, there are no real incentives to encourage this flexibility for single family detached homes given the significant costs for demolition and the waste of materials. Through the notion of flex space, see Figure 4, this thesis attempts to tackle this inflexible trend.¹³

¹³ E.F. Schumacher, Small is Beautiful: Economics as if People Mattered (New York, NY: Harper and Row, 1973)

Chapter 2: Change requires Time and Time requires Change; The Importance of Expansion and Contraction

Louis Sullivan's Half Truth

*"Sullivan's form-follows-function misled a century of architects into believing that they could really anticipate function [future]. Churchill's ringing and –then-they-shape-us truncated the fuller cycle of reality. First we shape our buildings, then they shape us, then we shape them again-ad infinitum. Function **reforms** form, perpetually."¹⁴*

-Stewart Brand

Retrospectively looking back at the trends that shape the current housing industry, the impacts that have guided decision making are many. The tenet houses of the late 19th Century and early 20th Century in major American cities situated on their 25' x 100' lots reflected the common attitude that housing was not part of architecture, consequently leading to atrocious living standards for so many. Yet, the tenet houses did respond to a great need for shelter, providing some explanation as to why so many people tolerated the abysmal standards. Given the state of conditions, many metropolises in the United States were ripe for a steadfast, straightforward improvement. Just like the transformation of the tenement houses, the automobile; the television; the progression of technology in regards to the increase of mass production; cultural and economic movements thwarting the nuclear family structure; and asbestos taking a turn from being a revolutionary product to a revolted and dangerous application (which Professor Ralph Bennett knows all too well) demonstrate the unpredictability of life. The automobile spurred the garage which has led to many new design attitudes for methods of incorporation

¹⁴ Stewart Brand, How Buildings Learn; What happens after they're built (New York, NY: Penguin Books, 1995) 3.

(or exemption); the television led to the invention of the “family room” that has now become solidified to the kitchen; increased specialization has allowed goods to be bought and sold by unprecedented amounts, which limits self-sufficiency; and the Woman’s Rights Movement invigorated a break from traditional family structures. All of these highlighted landmarks are merely a few of a resounding trend of changeability. Just as these listed trends, buildings themselves also grow and respond to the dynamic shifts of region/climate, technology, socio-economics, culture, and fashion.

*“All buildings are predictions
All predictions are wrong.”¹⁵
-Stewart Brand*

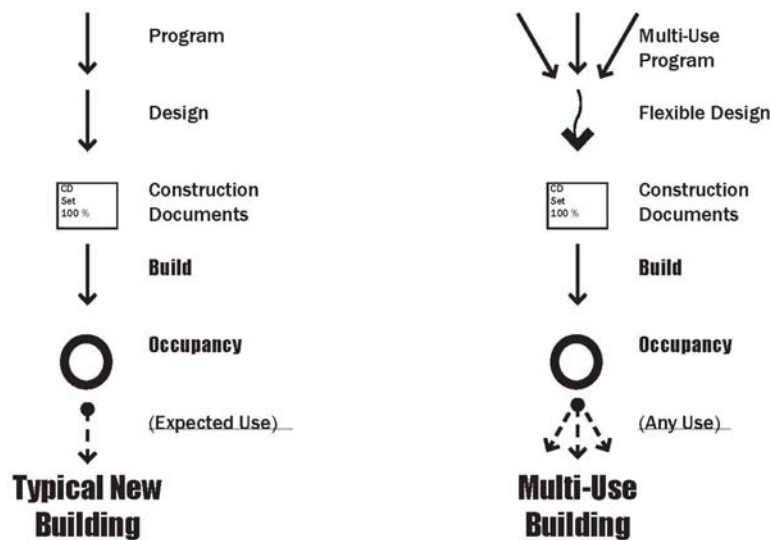


Figure 11 Typical New Building vs. Multi-Use Building

[Author]

A building that can accept different uses throughout time and accept renovations rather easily is sustainable. By minimizing the demolition of existing infrastructure for unknown, future changes, a building ready for many uses can easily adjust and maintain its reason for being over time. Not to mention, such a building also creates a deeper sense of ownership.

¹⁵ Stewart Brand, How Buildings Learn: What happens after they're built (New York, NY: Penguin Books, 1995) 178.

In his book, *How Buildings Learn*, Stewart Brand maintains that Louis Sullivan's famous adage of "form follows function" insinuates that the function of a building does not change (refer to the prior quote at beginning of subchapter). While Brand finds serious problem with the phrase and condemns it as false, another could infer that the phrase is broad enough to incorporate an adaptable design and construction process which mimics the function of a building perpetually. Brand's inferred reading of permanence from "form follows function" is subjective. There is no reason that "form follows function" cannot be included into this adaptable practice that Brand calls for. Naturally, this thesis does not believe that Sullivan originally called for adaptable building design. But regardless of the context, "form follows function" can be stretched to encompass an adaptable and ever-changing design practice.

In accepting the truth that buildings change functions over time just as nature does, this thesis will strive for a standardized design that could serve as housing as well as office space for commercial and institutional functions. Architect William McDonough, known for an ecological emphasis in his architecture, beliefs in the multi-use of products and the built environment that operate on a cradle-to-cradle system and not cradle-to-grave as so much of our world operates.¹⁶ Therefore, if a building can accommodate different functions over time, the likelihood of that building avoiding demolition enhances. A building that can only accommodate one function would be forced to undergo major reconstruction or destruction for a new use, and such a process would consume and waste much more building materials and other natural resources compared to a building that has been designed for many uses.

¹⁶ William McDonough and Michael Braungart. Cradle to Cradle: Remaking the Way We Make Things (New York, NY: North Point Press, 2002)

All Buildings Can Grow, But Can They Shrink?

“...the living environment can persist only through change and adaptation.”¹⁷
-N.J. Habraken

Change does not necessitate consuming more. In this thesis, “building growth” is not only indicative of additional square footage; it also represents any change that occurs to the building. In this sense, the word “growth” is interchangeable with “change.” A building may “grow” into a new use, but the new use may actually use less of the original square footage. As Figure 12 shows, the small cottage adds on space and structure until the original cottage is encompassed by a new façade and new structure on nearly all sides.

Expansion makes sense when a family wants more space and so the cottage becomes a “McMansion.” But, the reverse of this transformation is not only uncommon, it is impractical. Reasons for the “McMansion” or the houses in Figures 9 and 10 to contract in size and revert to the original structure are evident when the family no longer requires the extra square footage. But, given the labor and often complexity of demolition, tearing down an addition because it is not as extensively used as it was once before is not enough incentive to counter the costs and work of demolition. Instead, the addition(s) will stay even when the family has no more use for it. The logical choice would be to move and sell the home, hopefully for a higher value than what was originally paid for. But, regardless of money, the new owner of a now enlarged home might find their new home to be too big for the new family, but for which they will have to pay extra to cover the higher value of the newly modified home.

¹⁷ N.J. Habraken, and Jonathan Teicher, ed. The Structure of the Ordinary (Cambridge, MA: The MIT Press, 2000) 6.

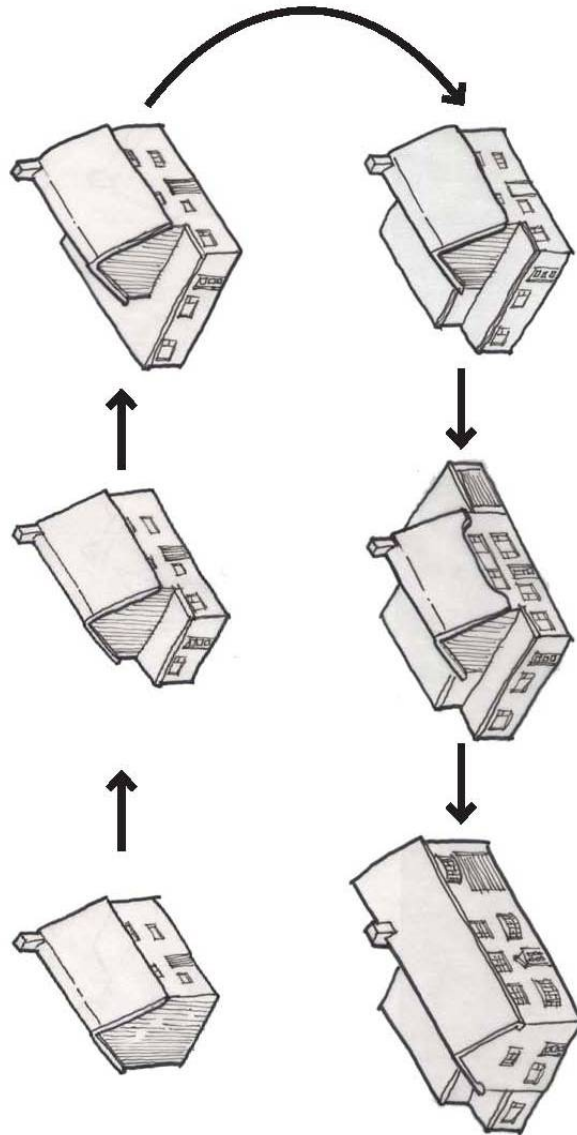


Figure 12 Cottage grows to McMansion

[Author]

Rotate Clockwise.

The cottage as a starter home grows into a McMansion as a young family grows and needs more space. But what about when the family shrinks and does not need as much space?

And what about a new young family that wants a starter home for themselves, but the original cottage is now a McMansion? Do they demolish the addition to get the original cottage back? Of course not, the logical thing to do is to build their own cottage home from scratch. Add the materials for the new cottage home to the materials that went into making the McMansion and now two families have consumed more materials and spent more money. While this may be a good for the GDP, it has consumed more materials than if there was a rational way for the first cottage home to grow into the McMansion, but then contract into the cottage. The design process in Chapter 4 attempts to provide a rational solution for this perpetual change as a means to accommodate: (1) The act of dwelling and; (2) A more sustainable building practice

Hypothetically, if this pattern of growth were to occur universally to all the single family detached houses it would vanquish the smaller square footages of starter homes built 30 years ago. Any new family wanting their own starter cottage, for example, will have to impractically demolish the additions previously made to get the cottage back to its original size. But, of course, there will never be such a scenario where the only homes available to Americans exist at a minimum of 5,000 sq. ft while many families might only really need 1500 sq. ft. Yet, what does take shape is a skewed and growing perception of what constitutes as “enough.”

The square footage of homes built even 20 years ago has increased dramatically in 2008, and builders are still advertising huge new homes for sale. All the while, affordable housing has become a concern not only for the low-income, but for the middle-class as well for people like teachers, fire fighters, police officers, and college graduates in various other fields. Many people’s standards for “enough” are much higher than what they were before and now fewer people can afford what they expect. This is in part due to an economic system that relies upon consumption of resources. This pattern of growth has become the norm that has now engrossed Americans abating the indulgence and wastefulness of increased consumption. We continue to have more “junk” in our houses.

“What is ‘enough’? Who can tell us? Certainly not the economist who pursues “economic growth” as the highest of all values, and therefore has no concept of ‘enough.’ There are poor societies which have too little; but where is the rich society that says; ‘Halt! We have enough’?”

There is none.”¹⁸

-E.F. Schumacher

¹⁸ E.F. Schumacher, Small is Beautiful: Economics as if People Mattered (New York, NY: Harper and Row, 1973) 25.

Like nature, people expand and contract in their physical size, but also in regard to their possessions. Americans might have more “junk” than other societies, but this thesis believes all people understand the notion of “too much.” Such a comprehension is demonstrated in the basic premise of yard sales and flea markets. See Figure 13.

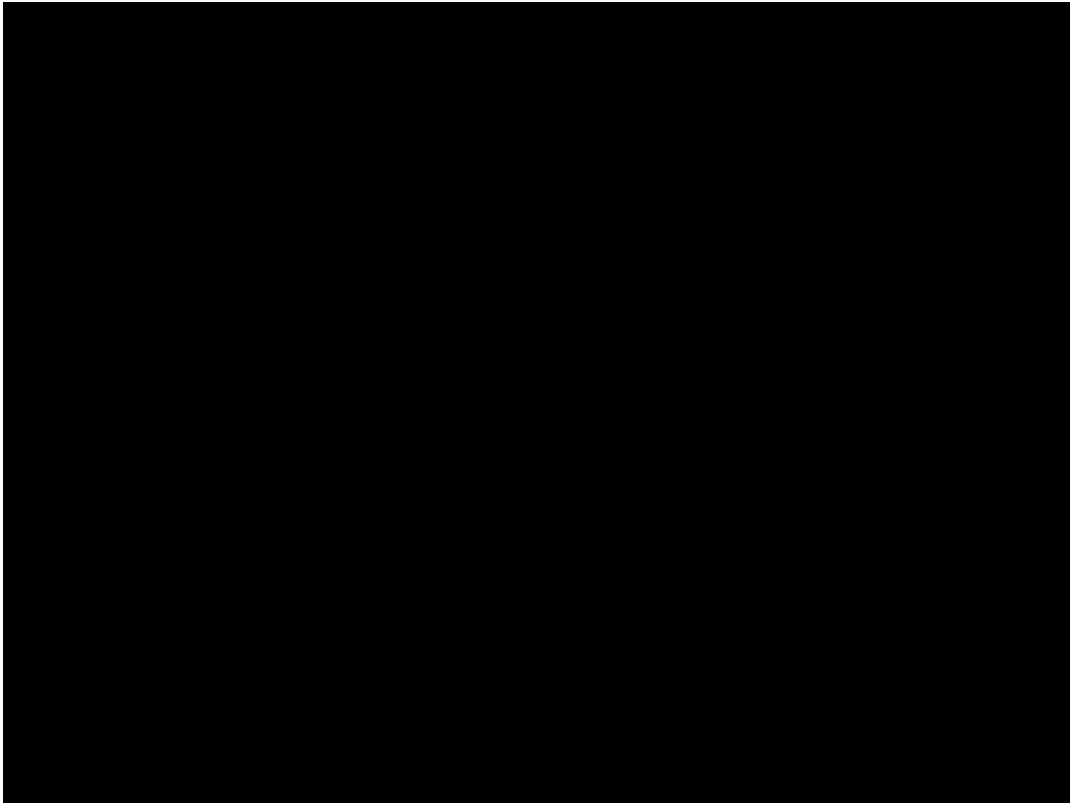


Figure 13 **Demonstrating Expansion/Contraction** [<http://www.flickr.com/photos/eraut/558053224/>]

What is required is a means to better enable the natural expansion/contraction of people in the built form. While change is perpetual, it does not warrant contraction in our current system of designing and building. This thesis will demonstrate a relatively efficient and cost-effective systemization that encourages the contracting (and expanding) stage of change to prevail with relative

ease. See Figure 14. Affordability is also an issue deeply entrenched in this full-circle pattern of change. A vital part of this thesis is to create incentive and cost-effective means for all **buildings to grow** and **shrink**. To be better equipped to address this design challenge, one must identify the layers and levels involved in the built environment.

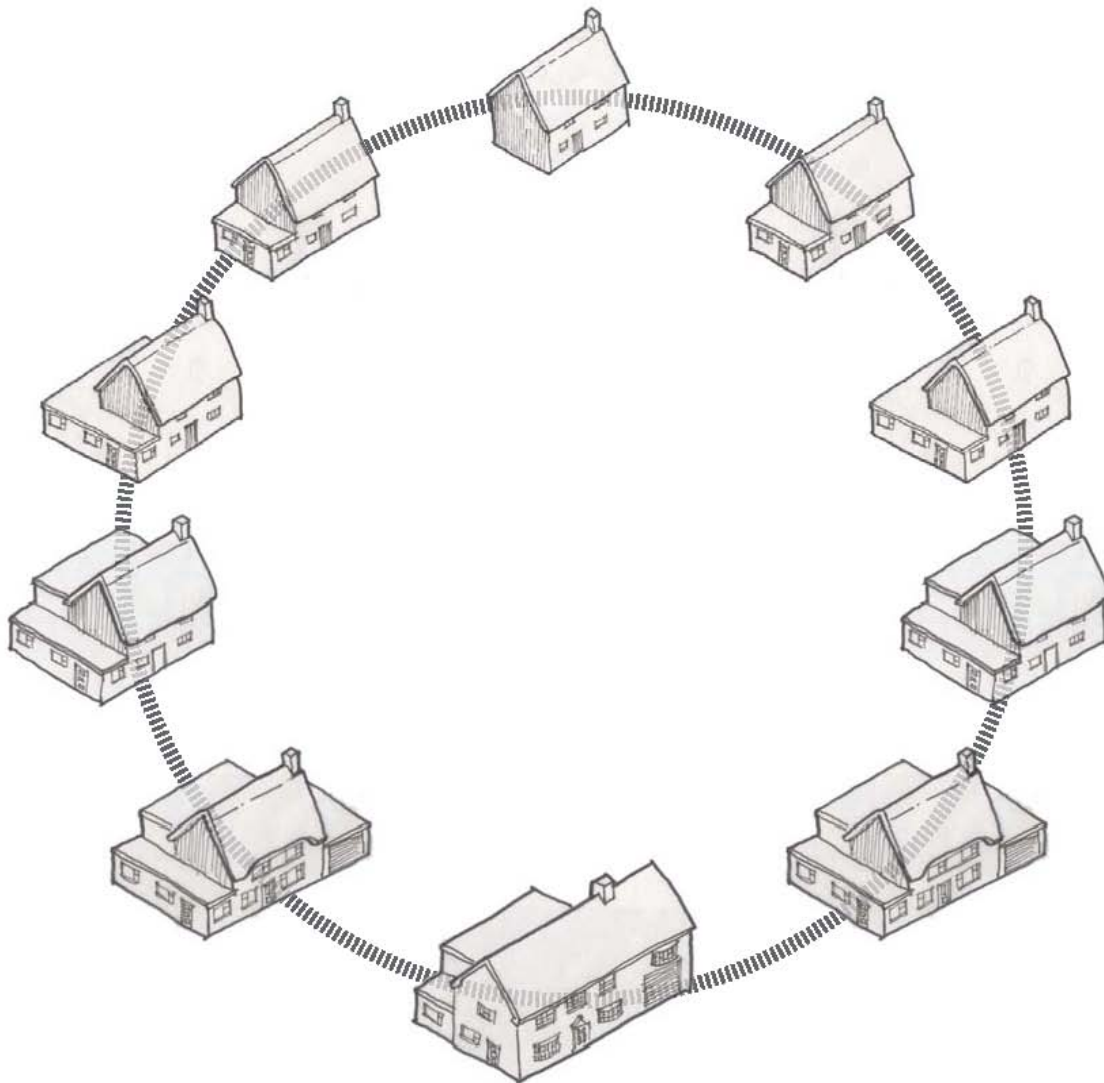


Figure 14 Cottage to McMansion back to Cottage (Expansion/Contraction) [Author]
In this diagram is a means for enabling an act of dwelling time and time again and using less materials than building from scratch a starter home for every new family so that everyone may partake in the act of dwelling. In fact, this system even promotes using a pre-fab system of perpetual re-use that can be constantly go through a re-sale process, giving incentive to contract when space is no longer needed.

Layers and Levels

"We maximize that which we control."

-Author

For clarity, this thesis will use "layers" and "levels" interchangeably, for they are the same meaning in this context. Also, this subchapter will go into understanding the physical layers of the building form to diagnose why, in current design and building practice, the process of contraction is not logical and how the introduction of a new level in the built environment's enclosure hierarchy (Figures 15 and 16) can facilitate a process of perpetual change. To begin will be a break down the layers of the building system. See Figure 15.

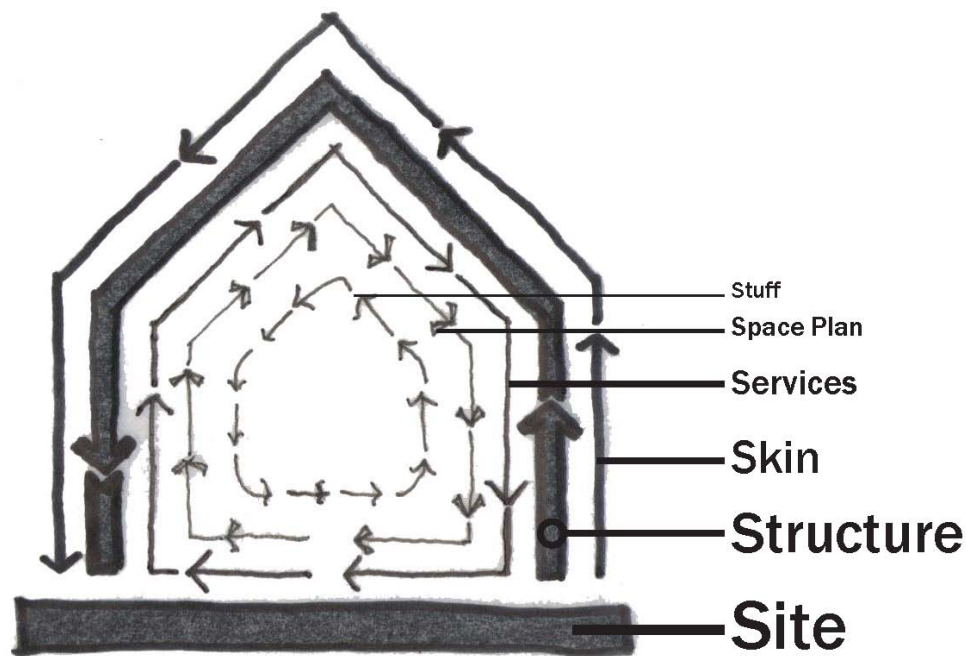


Figure 15 Layers/Levels of Building System

[Author]

The intention of this diagram is to demonstrate that though a building system can be broken down in 6 parts, control over each of these parts varies greatly between different building types and a wide-range of different owner/occupant scenarios. Based on Brand's "six S's" the figure breaks down the building system into a hierarchical organization that starts from the bottom.

As Figure 15 shows, the building system can be simplified into 6 “S’s.” Literally, from the ground up, one “S” impacts the next. The Site being the most basic, it will be graded and dug for footings and foundations of the building. Much like a tree’s roots, a building must be connected to the ground. Even if the building is elevated off the ground on piloti or something as basic as a wheel chassis, there is no denying gravity and the ground still has a relationship with the building that dictates the way the building is subsequently designed. Again, as Figure 15 shows, the Site, Structure, Skin, Services, Space Plan and Stuff all are interrelated, but some more than others. For instance, the Space Planning does not have as intimate of a relationship with the Site as it does have with the Structure. In typical designing practice, the structure often does dictate the dimensions of rooms by the placement of load bearing walls. To achieve the goal of spatial flexibility, there needs to be rules for the building system. They are as follows:

- Structure must be at a minimum to maximize choice of the dweller
- Skin shall be a part of the choice for the user, which will reflect the individual units and reveal the building as a living organism
- Services must be separated from all other levels and located within “pockets” for easy access and maintenance

With these rules, a balance must be found. No matter how minimal the Structure level is, it will limit the degree of choice for the occupant. Space Planning and Stuff will have to accommodate the levels before it and work around those levels. Complete freedoms of choice, with things like dimension of the unit, are impossible to achieve because the Structure must exist. The Structure level could be different dimensions for different units, but, the problem with doing so is that now there is a level of customization that ripples all the down the building system into the

Structure layer. The intention of this thesis is to provide a “blank canvas” for all users, current and unknown future users, to choose their living situation. If the Structure were to create varied dimensioned units, but at one point in time all the users wanted the dimensions of Unit AA, for example, then only one user would get that choice. By this thinking, the Structure and the building need to provide a consistent dimension and all users need to be given the same “blank canvas” for a more efficient and impacting degree of choice.

The location of the bathroom and the kitchen, the two spaces that need access to the Service level also fall into the same issue of choice. If the location of these service oriented spaces were to be up the choice of the user, then designing a means of flexibility would be creating a great deal of wasted space in order to provide such choice. The plumbing stacks are not like bending straws that can be turned and moved in any fashion. More importantly, this thesis is not about designing such a flexibility; it is about taking conventional methods construction and re-organizing them to achieve as high a level of freedom as possible. Therefore, by “locking” the placing the spaces that are dependent on the Service layer into a designated zone, the rest of the unit can be open for choice and wasted space like chases can be mineralized.

The final obstacle of consideration is the level of prescriptive floor plan design. Refer to the very early scenario of two architectural beliefs in Bill Bechhoefer’s Regionalism course described in the Foreword of this thesis. Do Architects know best in designing the way in which people dwell? Or should there be complete freedom of the user to identify where the bedroom and living room are located (remember that the thesis has already identified the need of “locking” the Service-dependent spaces into a zone.) As the thesis moves forward into the design (Chapter 4) this issue will be further addressed.

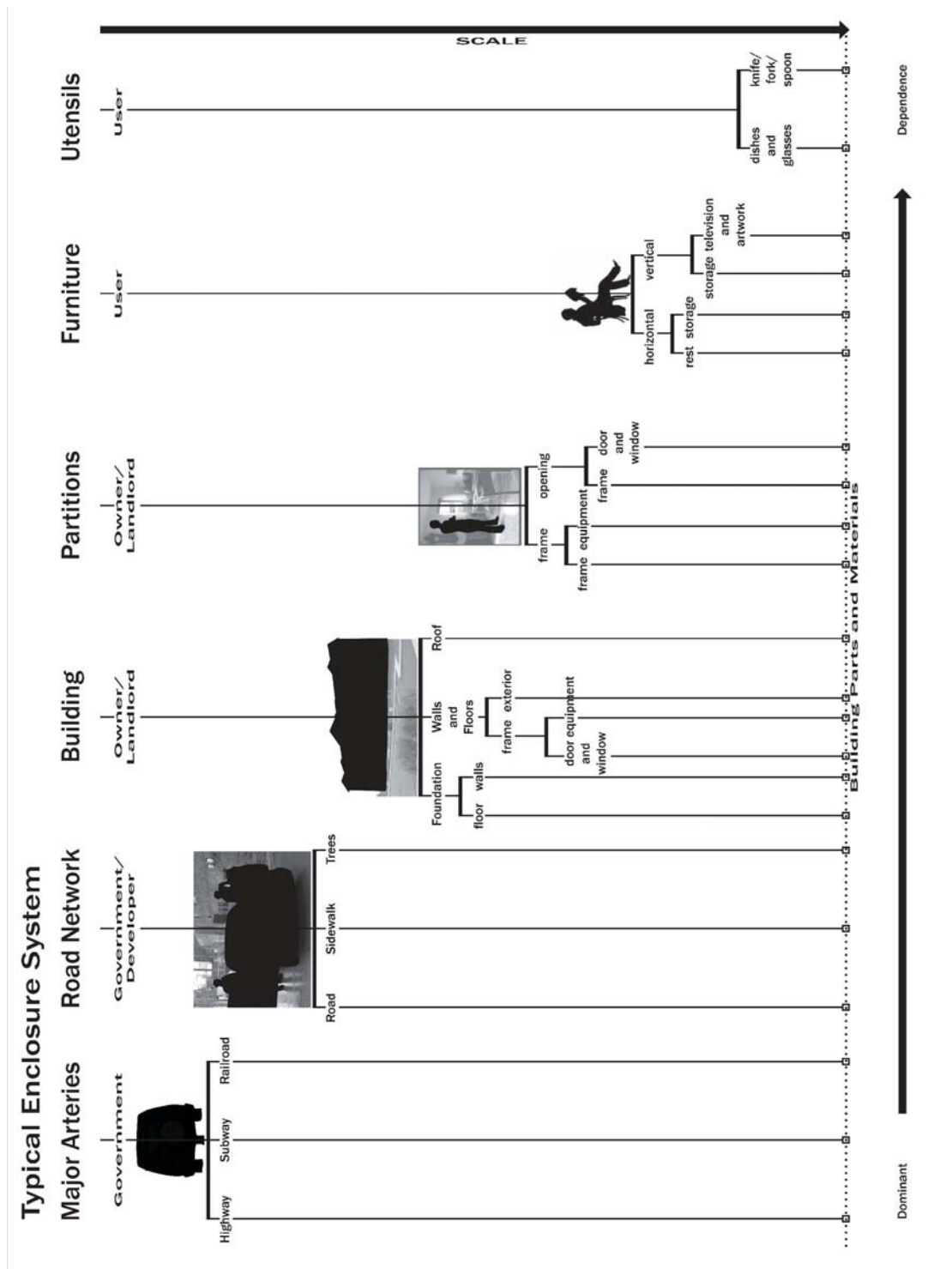


Figure 16 Layers/Levels of Typical Built Environment System

[Author]

Rotate Clockwise

Levels on the left dominate levels to the right. And the scale of the level is largest at the top and smallest at the bottom.

Zooming back out, Figures 15 and 16 demonstrate a broader system than just the Building System. It demonstrates a hierarchy of the enclosure system that exists in the built environment. Figure 15 demonstrates the typical enclosure system and the agents that control each enclosure level. For example, the Road Network is controlled by the Government or in the case of a suburban development the developer dictates the location of the roads. Moving further along the horizontal (left to right) the Building level dominates the Partition level. Through this specific example, the diagram reveals its organization. Moving left to right, the level on the left dominates the level on the right, and the level on the right is dependent upon the level on the left. Therefore, the Partition level cannot force the Building level to change.

In Figure 15, notice the only levels that are controlled by the user: the Furniture and Utensil layer (similar to the “Stuff” layer in Brand’s six “S’s.”) Now, refer to Figure 16 and notice the levels that this thesis aims to bring back into the user’s control. To achieve this, the Partition level in the Typical Enclosure System has been replaced by the Infill level in the Proposed Enclosure System. It may not be apparent at first, but this switch puts a great deal of power back into the user’s hands. By treating the Building level and the Infill level as equals, it creates a balanced relationship between the agent that controls the Building level and the User that controls the Infill level.

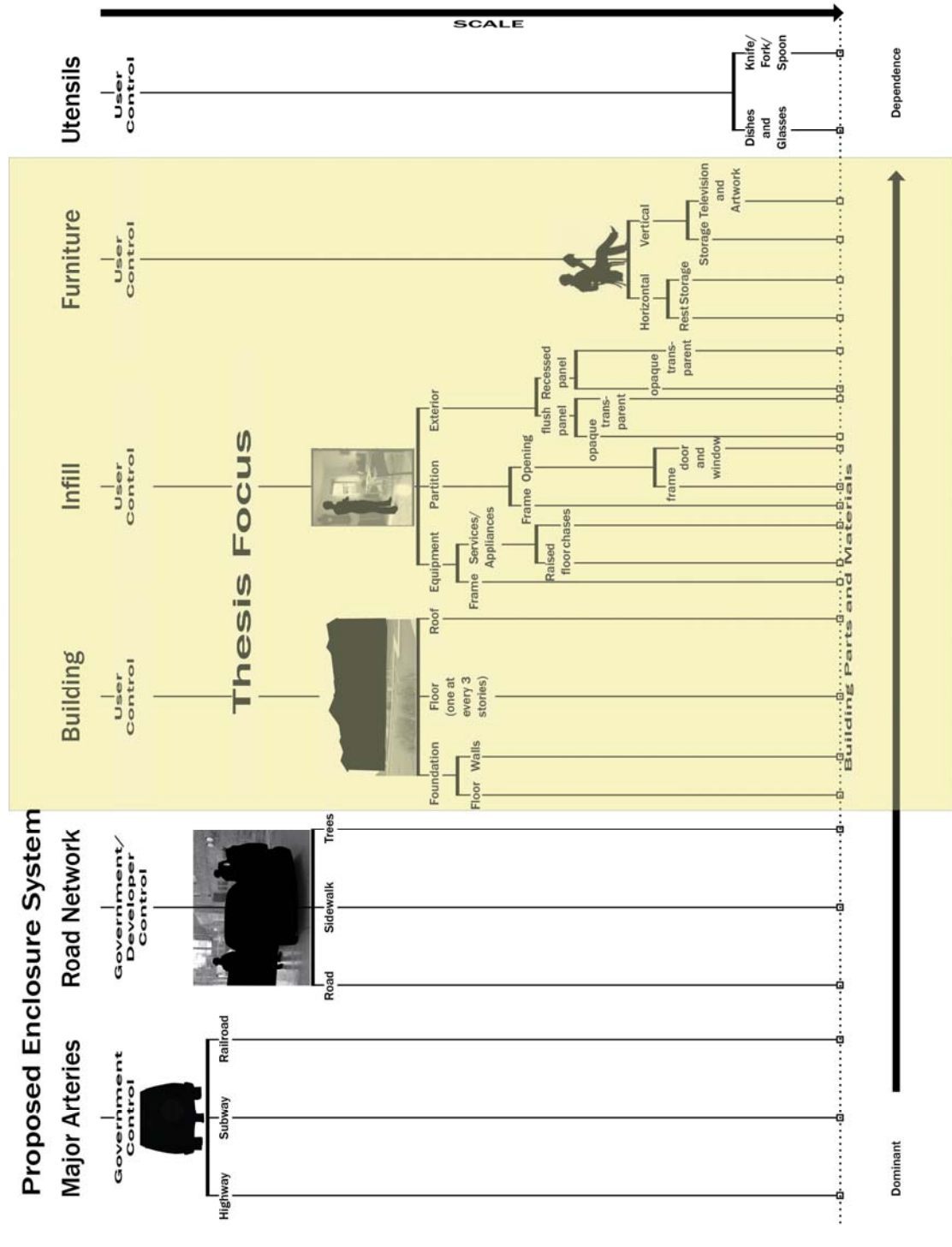


Figure 17 Layers/Levels of Proposed Built Environment System [Author]
 Rotate Clockwise.

By putting the Infill layer and the Building layer on the same vertical point, it brings an equal scale of importance between the two layers. Yet, the Building level still dominates the Infill level, because it must do so to achieve efficient and sensible design strategies for the built environment.

Open Building Implementation

In 1997 under the umbrella of the International Council for Building Research Studies and Documentation (CIB), a task group was formed, known as the CIB Task Group 26: Open Building Implementation. In the publication of a workshop conducted by the CIB TG 26 in Washington, DC, from November 3-5, 1997, TG 26 acknowledged a growing difficulty that confronts key participants in the designing and constructing of buildings. The task force identified major causes for these growing challenges that prevent current practitioners of the building industry in easily addressing the needs of the clients and the users of the building industry. Four of TG 26's identified causes that act as obstacles are:

1. the inability of users to control and utilize their space;
2. an increased complexity of technical controls and systems that range from the heating and cooling core to the façade and envelope of the building;
3. a higher turn-over rate of building use;
4. an increased number of participants in building design and construction, each with diverse values and criteria for evaluation.¹⁹

This thesis agrees that the listed four causes prohibit the designing of a simpler, more user-friendly housing structure that can also accommodate other building typologies that will truly activate various types of users. The core goal of this thesis and Open Building Implementation is simplifying modern building technologies to reactivate the dweller and create an extremely flexible higher-density housing that can adapt to various inhabitants throughout time.

¹⁹ Stephen Kendall, ed. CIB TG 26 Open Building Implementation: CIB Proceedings Publication 221. (CIB, 1998) 7.

Clearly this idea is not as efficient in some typologies as others. Using this proposal in a single family detached house in suburban America, where mixed-income and mixed-use is not always welcome, does not receive all the benefits that such a design system could provide. Throughout this thesis, the notion of community and affordability have been major underlying themes and the best opportunity for these themes to spring forth would be to situate this design idea in an Urban context where there is a much higher likelihood for existing economic diversity and an existing building stock geared towards tight-knit community. To better rationalize this belief, Chapter 3 will provide some insight.

Chapter 3: Why High-Density Housing in the City?

Not relying on the Automobile

"...the enormous deficiencies of one-dimensional living [living in a single family house outside of the city] have to be compensated at the expense of individual time and money in a manner that is questionable, both ecologically and economically."²⁰

-Klaus-Dieter Weib

Without digging a hole into the never ending, great debate between suburbia and cities, there are advantages and disadvantages for both scenarios. Yet, there are undeniable advantages for living in the city that pertain to a cheaper cost of living than living in the suburbs. Still, the choice of living in the city versus the suburbs is a decision that many young American families confront, especially when the planning of children factors into the mix.

Many people that are raised in the suburbs cite privacy, security, cleanliness, open space, peace, and nature as evidence that suburbia is preferable. Obviously, this must be true because outside of the architecture and planning fields, a great number of Americans fully believe in the value and integrity of their suburbs. But, an unmistakable truth of the suburbs is that the automobile is a necessity for living. In the few lower-lying suburbs to the city that have some connection to mass-transportation, which usually is the bus system, travel tends to be slow and infrequent, adding time and stress to people that cannot afford the cost of a car.

²⁰ Klaus-Dieter Weib. "From Isolation in the Peripherie to the Highrise of Homes in the City." In Detail: High Density Housing: Concepts, Planning, Construction. Ed. Christian Schittich. (Basel, Switzerland: Birkhauser, 2004) 16.

Consequently, those same people that could greatly benefit from living close to transit are forced into a time consuming, stressful mode of transportation as part of their lifestyle. Specifically for this reason, this thesis is sited in an urban environment where all people of all economic backgrounds can benefit from more direct access to better mass-transportation, shops, banks, and grocery stores. Not to mention, the ecological reasons for independency from the car are part of this thesis' goals.

The automobile reigns supreme in American culture and has become a common fixture of possessions for nearly all Americans. Yet, for those that spend +30% of their annual income for rent, the extra costs for the car are very difficult, if not impossible, to afford. In this thesis, the car is outside of the income range for people that would utilize the flex spaces as their homes. This is another major reason this exploration is located within the city.

Living in the Center versus outside the Center

"To keep [the] affluent and educated clientele in the city, we need flexible completion options, patios or yards, separate entrances and the latest in technology are listed as important design criteria."²¹

-Eberhard Wurst

Despite these advantages of the city, people still flock towards the suburbs for its advantages. Single family detached houses can provide windows for every room inside the home, a strong connection to the landscape immediately at the doorstep, and sense of ownership heightened by required care for yards, flower

²¹ Eberhard Wurst. "Inside and Outside – The Search for Special Qualities in Contemporary Housing." In Detail: High Density Housing: Concepts, Planning, Construction. Ed. Christian Schittich. (Basel, Switzerland: Birkhauser, 2004) 28.

beds, and trees that do not exist in condominium ownership. This investigation aims to integrate these low-density advantages into the high-density housing design.

High-density housing in the city closely correlates to the three major design issues from Chapter 1. By accounting for the desire to enable the user, accommodate affordability, and allowing for shifts in family configuration through time, a high-density building is more economically and ecologically viable for integrating these three goals with great efficiency. By creating an agile infrastructure for the building(s), construction costs for changing a unit's square footage can be minimized through mobile partitions. Flexibility is a result of this technique and so creating affordable units that can expand and contract according to the owner's square footage needs is more viable in higher density housing within in the city than single family detached houses in suburbia. All the while, high-density housing offers other tactile strengths when compared to the suburban single family home:

- Better protection from intruders given the physical proximity of neighbors.
- Decreased property costs due to cost-sharing between numerous units
- Good views
- Stronger opportunity for good relationships with neighbors
- Central location in the city with immediate access to better public transportation, school, work, stores, and banks
- Improved building systems with the cost being divided by all units of the building

The Need for Good Housing that is Affordable (Part II)

"Architects are the guardian of public health, safety, and welfare."

-Unknown

The assembly of spatially efficient, affordable units for the many who cannot afford the service of architects and the opportunity for good housing is a critical part of this thesis. The role of architects is to guard public welfare, but, the reality is that architects cannot consistently work for small profit margins. Thus, their cost for service is only applicable to people with a certain minimum level of income. Yes, many architects like the firm Pyatok Associates and Bennett Frank McCarthy do work with non-profit agencies for low income projects. But, again, the profit margin for projects like these is often small enough that architecture firms cannot always solely focus their work on public service projects for low income residents.

Architecture has to follow money to survive. Precisely for this reason, this thesis does maintain a higher regard for the issue of affordability when compared to the need to address sprawl by providing suburban living in the sky. In this design exercise, to not consider the great many that are unable to receive the good fortune of architectural service as great importance is to deny architect's duty as guardians of public welfare. Flexibility and choice is a means to many ends in this exploration and one of the ends is affordability. As discussed before, the issue of affordability in this thesis is better served by concentrating housing in the city and not the suburbs.

Precedents and Influences

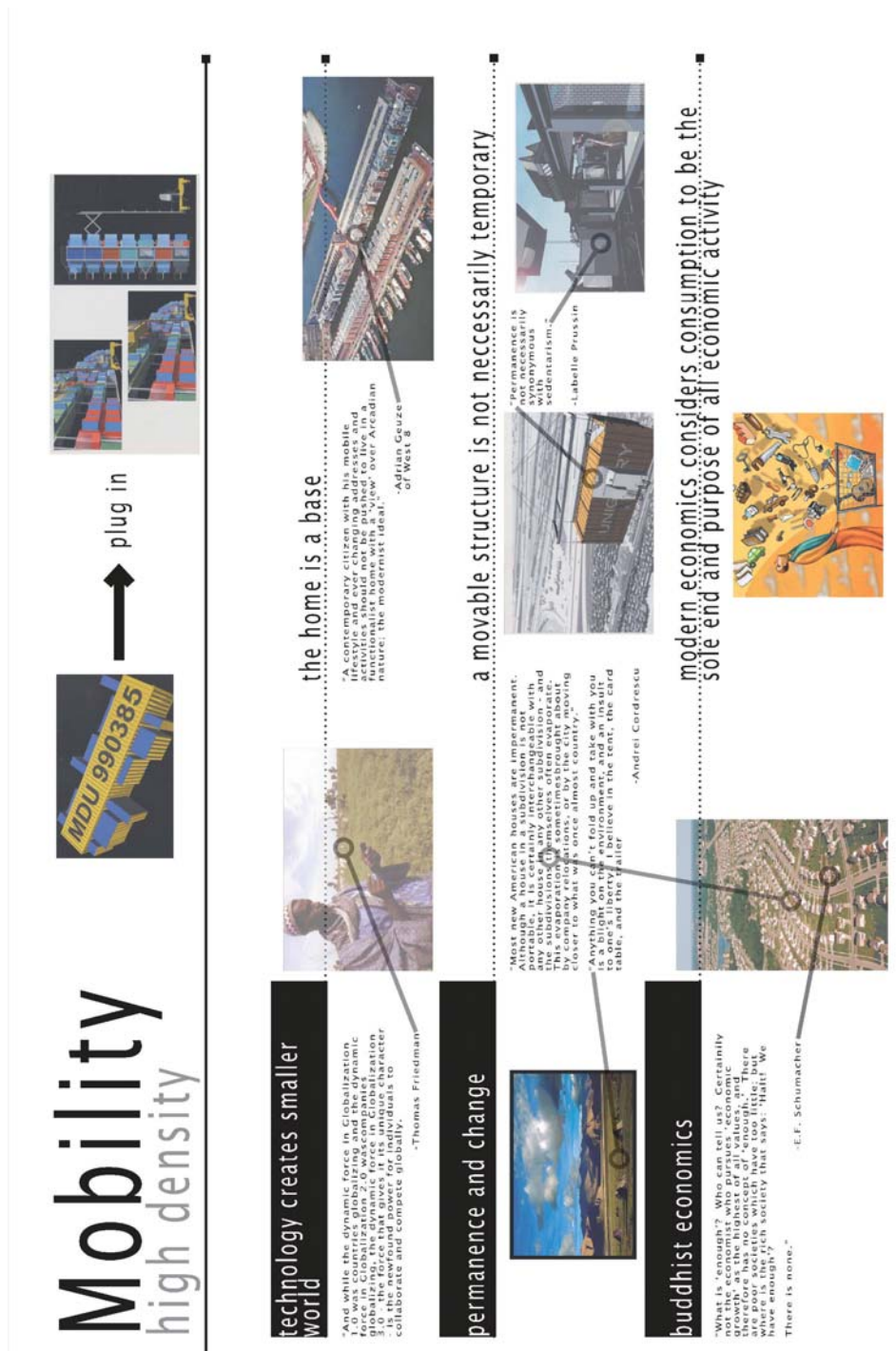


Figure 18 Theoretical Influences

[Author]

The common theme of these topics is self-sufficiency, the importance of minimal consumption, and community. All images derived from research compiled in the Regionalism Seminar taught by Bill Bechhoefer. The final paper for that class was "The Regionalism of Mobility." The values in that topic inspired this thesis.

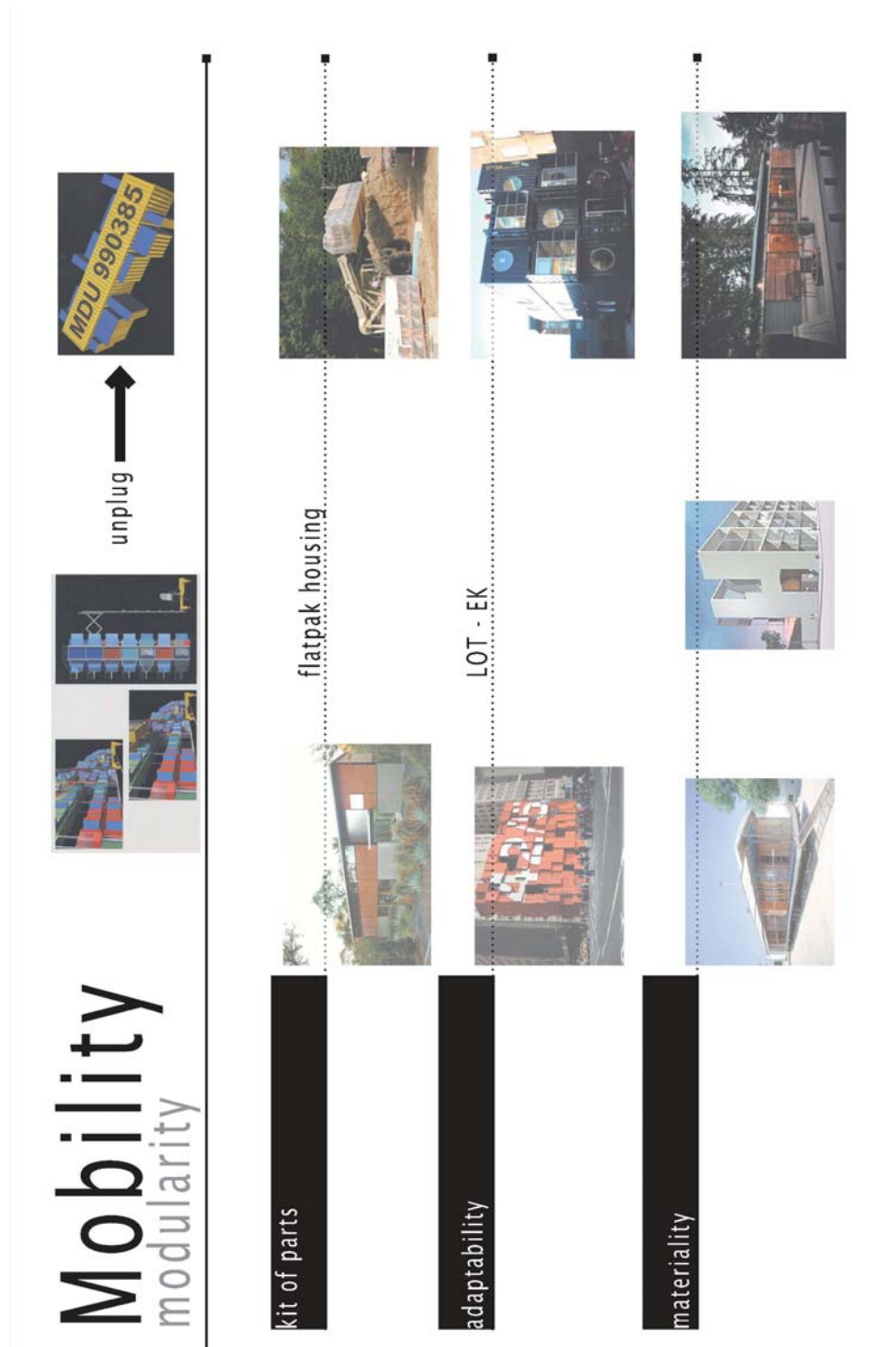


Figure 19 Precedent Examples

[Author]

As the precedents show, the early thinking of the design was to create a pre-fabricated module that could simultaneously be independent and interwoven based on the whim of the user. Instead, as the design process evolved, the module became an infrastructure that encouraged infill design and construction more immediately reflect the choices of the user.

Chapter 4: The Design

The Sites and Background Design Pedagogy

There are two sites of different scales. One is in Hyattsville, Maryland on the edge of a major redevelopment area. Hyattsville has been bombarded by used car shops that create parking lots facing Route 1. Route 1 is a major artery of Hyattsville connecting the city to Washington D.C. and to Baltimore, Maryland. A 3 -4 story building would be an appropriate scale given Hyattsville's character.

Through its recent and ongoing re-development, Hyattsville is aiming to create an Arts District. Given the nature of the Arts, its foundation stands on new ideas and taking chances. Thus, this site seems to be a good situation to create a new housing type given that housing tends to be an area of the building industry that people feel more comfortable with the familiar and less so with the contrary.

*"...people seem to be at their most conservative when it comes to housing and since clients tend to choose the path of least resistance, and lower risk, innovations are extremely slow to gain acceptance in the housing sector. While futuristic design and the latest technologies are embraced wholeheartedly in other areas, for automobiles and computers, for example, and also for building tasks such as railway stations, museums or fashion boutiques, housing ideas and tastes lean towards proven and traditional values."*²²

-Christian Schittich

The second site is Baltimore, Maryland. At this site, scale is considerably larger than Hyattsville. In this city, a mid-rise building of 12-24 stories, depending on the structural capacity of the building's system, will aim to house many more people.

²² Christian Schittich, ed. In Detail: High-Density Housing: Concepts, Planning, Construction (Basel, Switzerland: Birkhauser, 2004) 9.

Baltimore, Maryland



high density

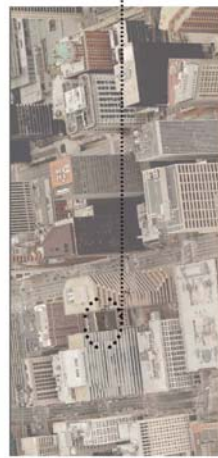


Figure 20 Baltimore, Maryland

[Author]

This site is in the heart of Baltimore's financial district at the corner of Light Street and East Baltimore Street. The initial reasoning for such a location was to show the ability of the module to create a community anywhere. This value became less important as the process evolved and the site was soon let go for a site further North on Charles Street, approximately 5 blocks South of John Hopkins University Campus.

Hyattsville, Maryland

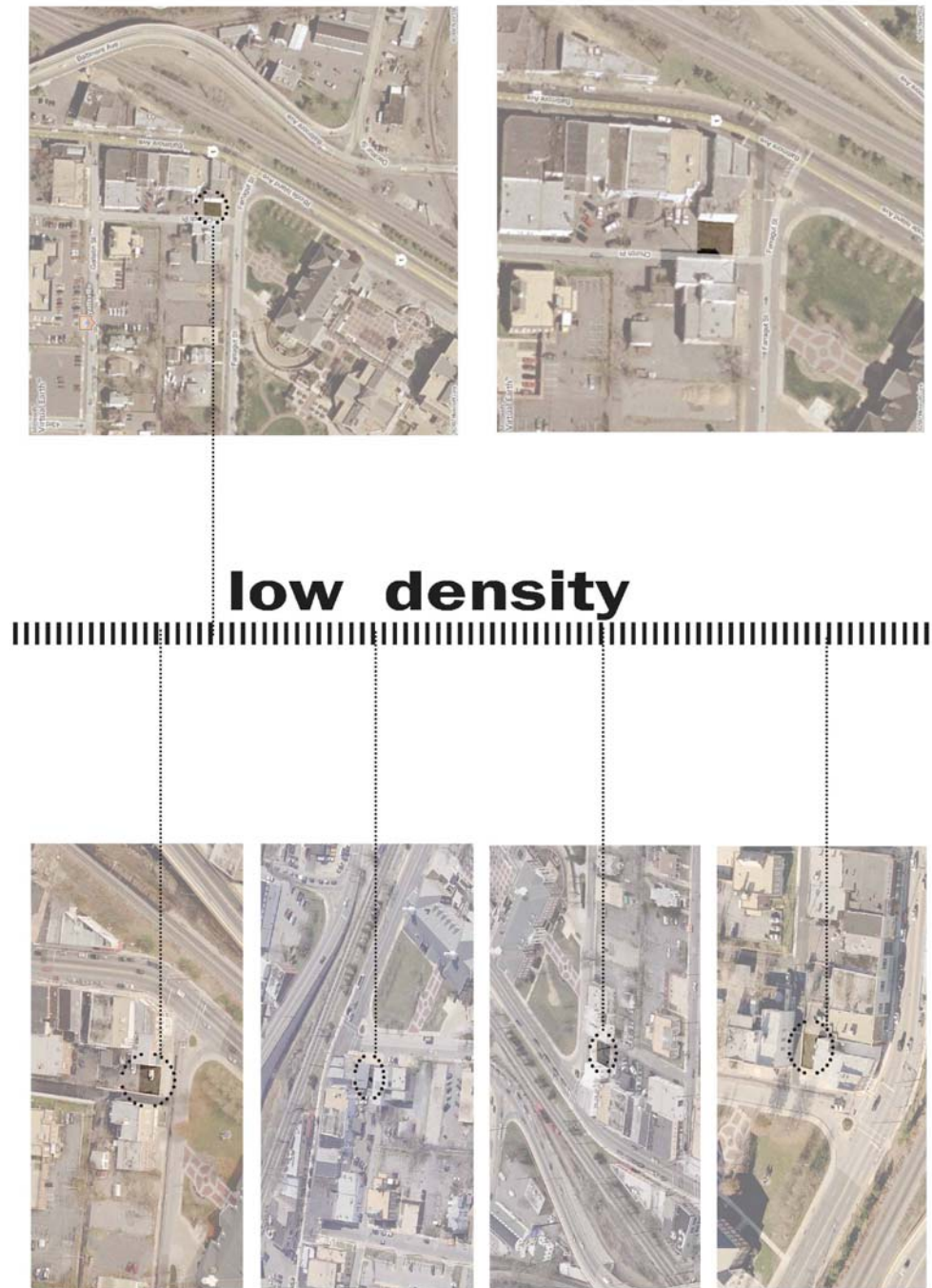


Figure 21 Hyattsville, Maryland

[Author]

This site is one block off of the Route 1 corridor on Farragut Street. With a similar outcome as the previous site, the testing of the module on different densities was less important. It was not towards the end of the project that this was realized as a mistake. If there were additional time, placing this module in this location to test its applicability would be the next step of the project.

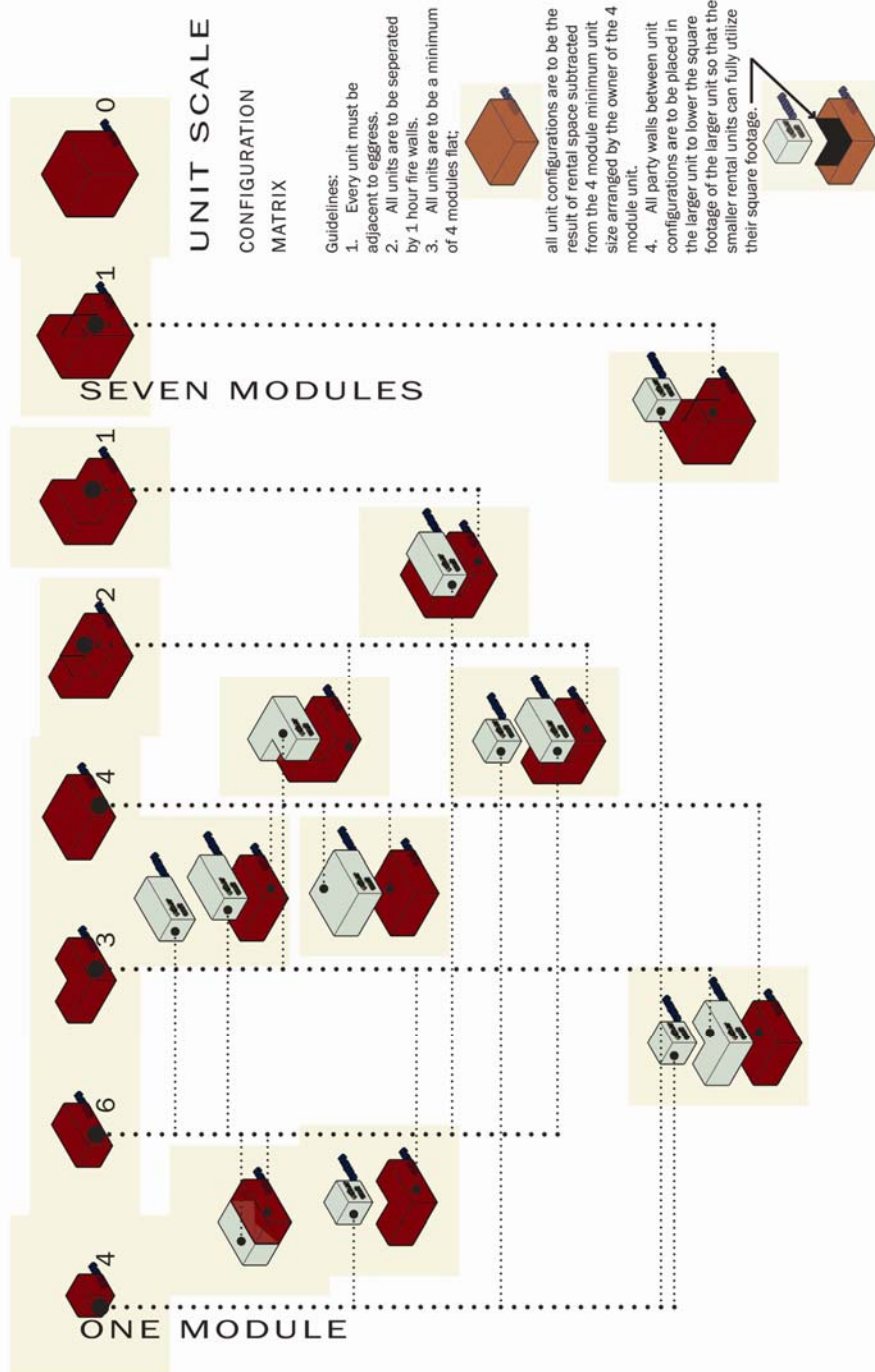


Figure 22 Unit Configuration Matrix

[Author]

At this point in the design process, the module was thought of as a 12'x12' room that could be acquired if the user needs more space. The original intention was a pre-fabricated, structural unit that could be easily added and removed.

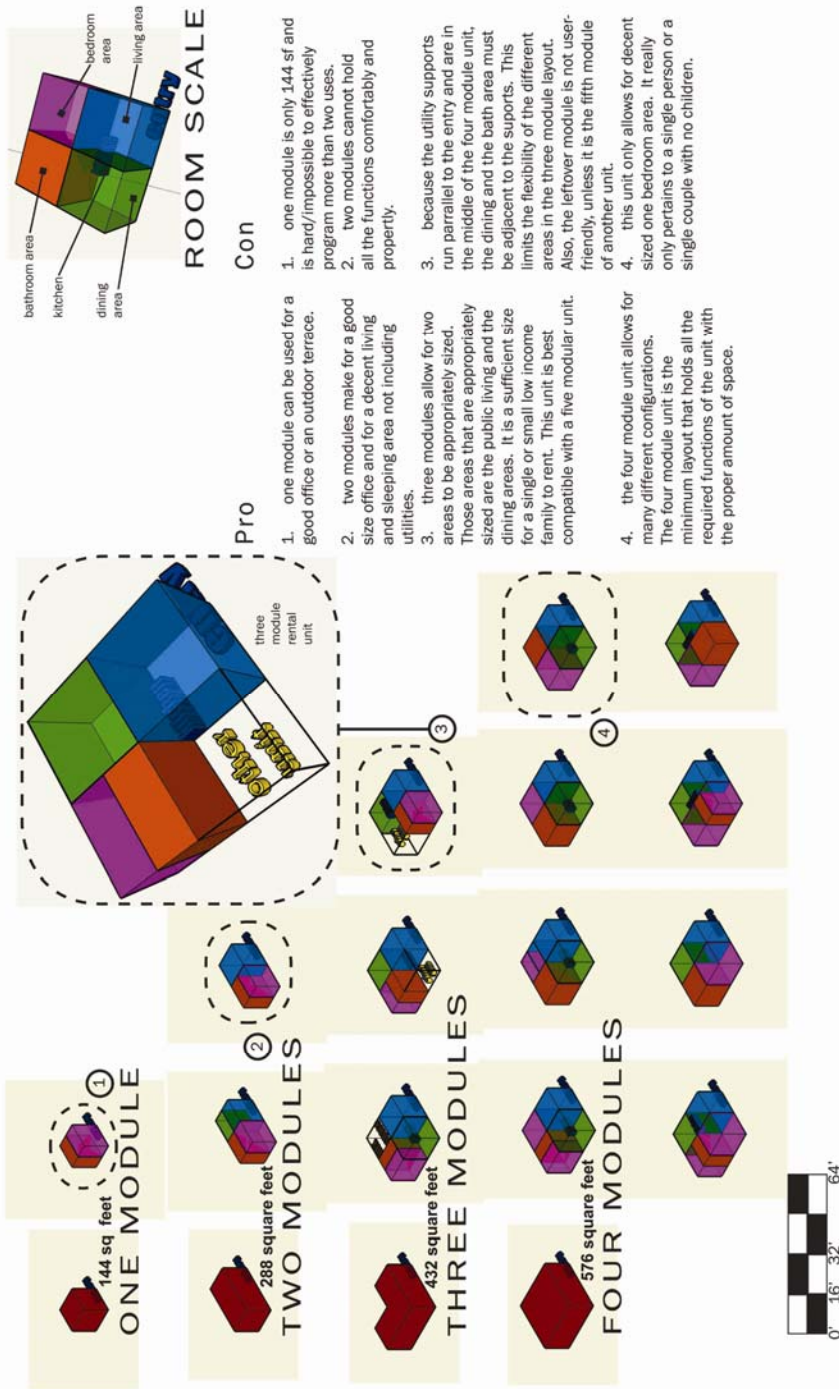


Figure 23 Room Layouts of Modules

[Author]

At this point, the “module” of space that was to be spatially flexible was thought of at a smaller scale where the module was a 12’x12’ room that could be added to fulfill personalization and directly respond to the user’s income. For example, unlike a single family detached house where the user may by more than want they truly need, this system would encourage a minimalist consumption of modules.

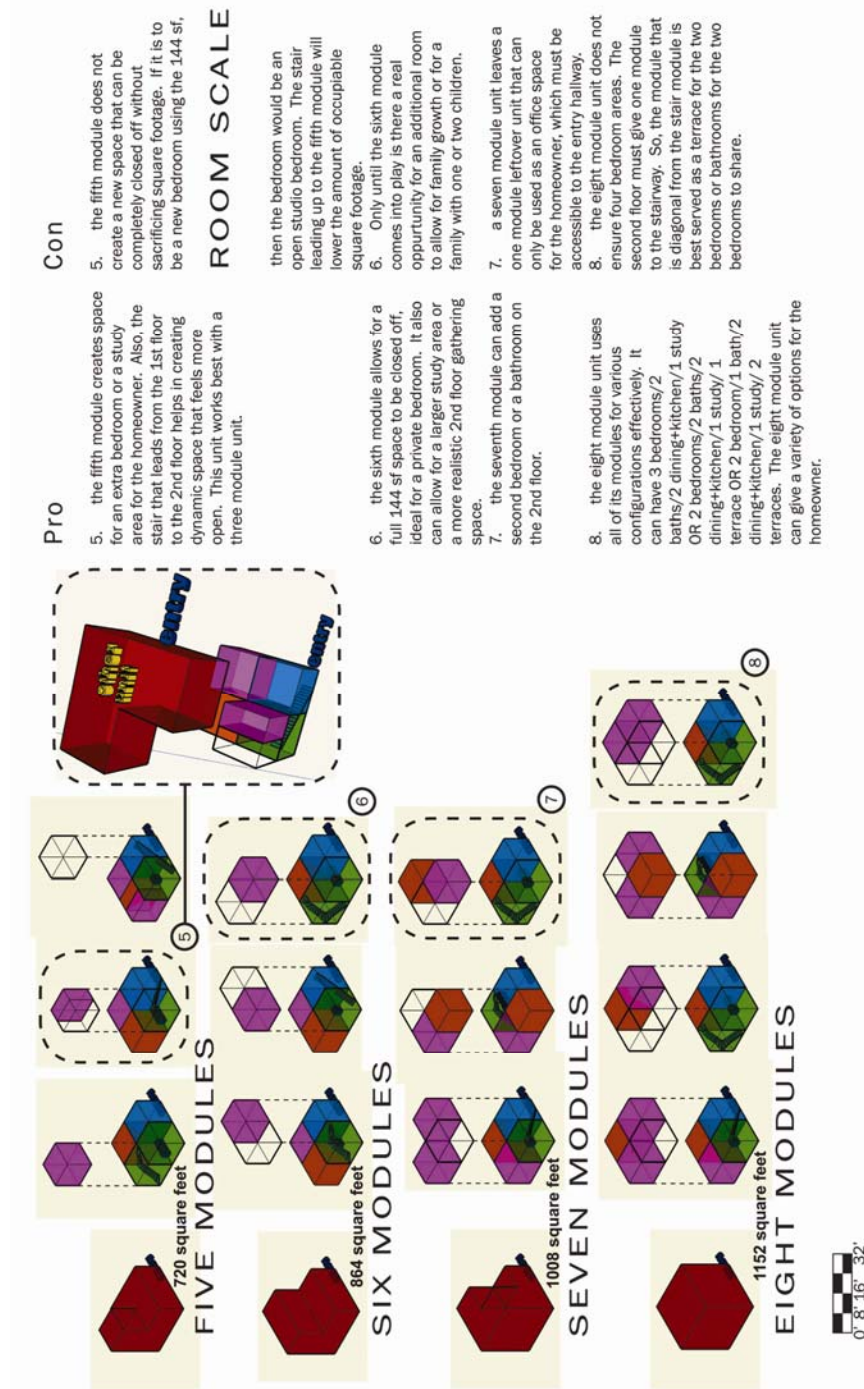


Figure 24 Room Layouts of Modules, Part 2

This is the same purpose as in Figure 23, but with more additional modules.

[Author]

Early February

Immediately, at this point, creating the module's organization and dimensions and its subsequent aggregations was of greater importance than testing it on the site. Therefore, the intention of testing the module on a low-density, urban site was abandoned. The site in Baltimore, however, was kept and continued to be explored.

The module remains a cube during this time. Here, there are two concepts of infill systems. The first is more dependent on the module's concrete structure. The second is independent of the concrete structure and relies on its own columns and walls to support and 2nd or 3rd story spaces. The second, more independent options is sometimes referred to as the "jungle" scheme given its multi-story, self supported image. The former option is much more traditional with infill floor frames to create spaces on the 2nd and 3rd stories. The intention for this scheme, however, was to be based on incremental floor infill. So if a family wanted more utilized square footage later in life, they could slowly infill the entire 2nd floor. But, until then, they could be left with a double height space wherever they desired.

BALTIMORE, MARYLAND



Figure 25 Baltimore, Maryland Site Plan

[Author]

This is the original Baltimore site on the corner of Light Street and East Baltimore Street. It was later abandoned for a site more fitting of the structural height limit of the module's system, which is roughly 10 stories (a mid-rise building..)

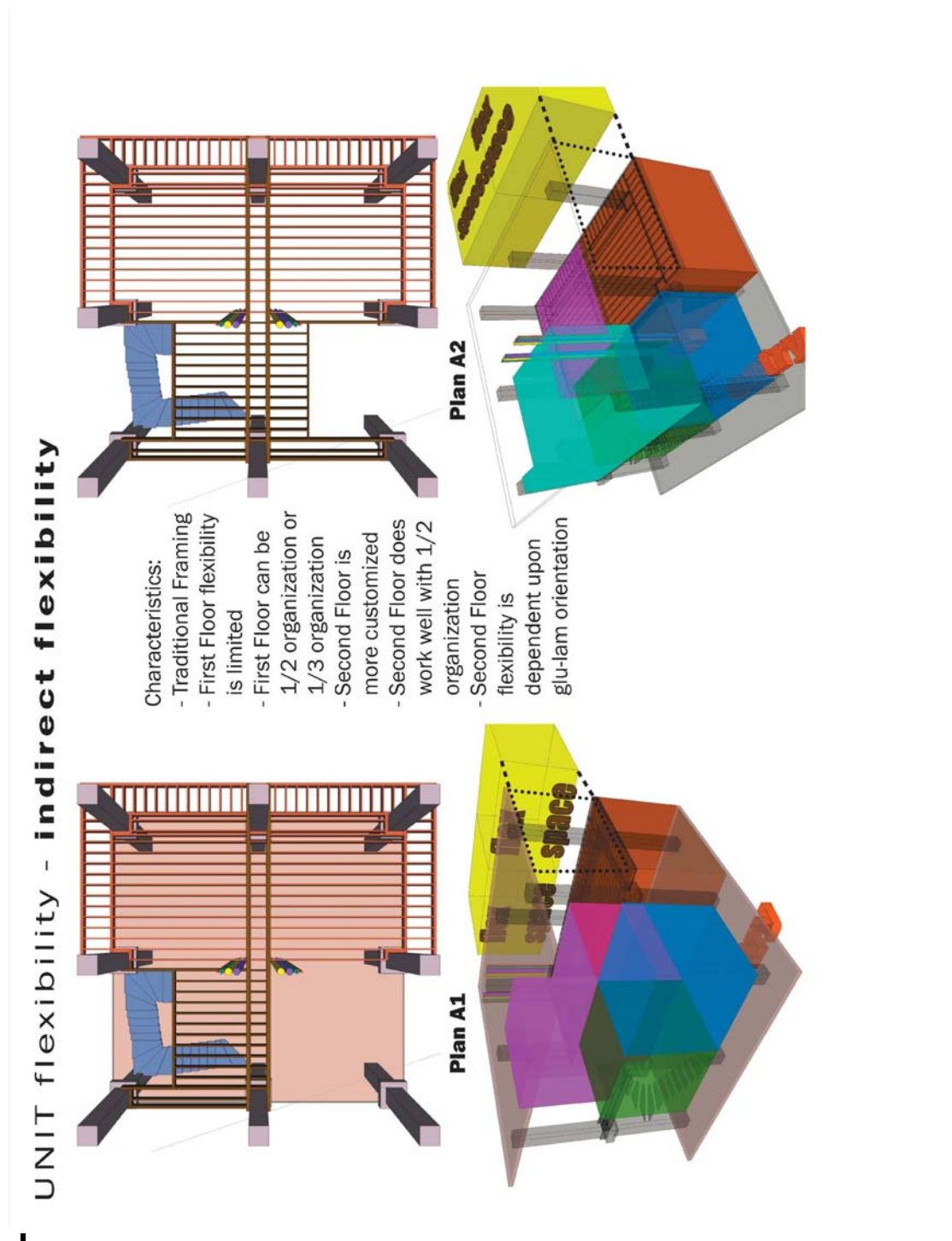


Figure 26 Indirect Flexibility Diagram (now Traditional Flexibility in Figure 7) [Author]
 In this and the following Figure 27 is the early design of the incremental infill of the module. At this point, the module was still a cube of space and as one can see, creating zones for stairs or other functions of space was random and had the potential for creating poorly designed layouts if the decisions are entirely left to the user. At this point, it was evident that the role of the Architect is to help create positive living standards and the fact is that Architects are trained designers and the general public is not. So, in this manner, the Architect does know best. There needs to be a some prescriptive design.

UNIT flexibility - indirect flexibility

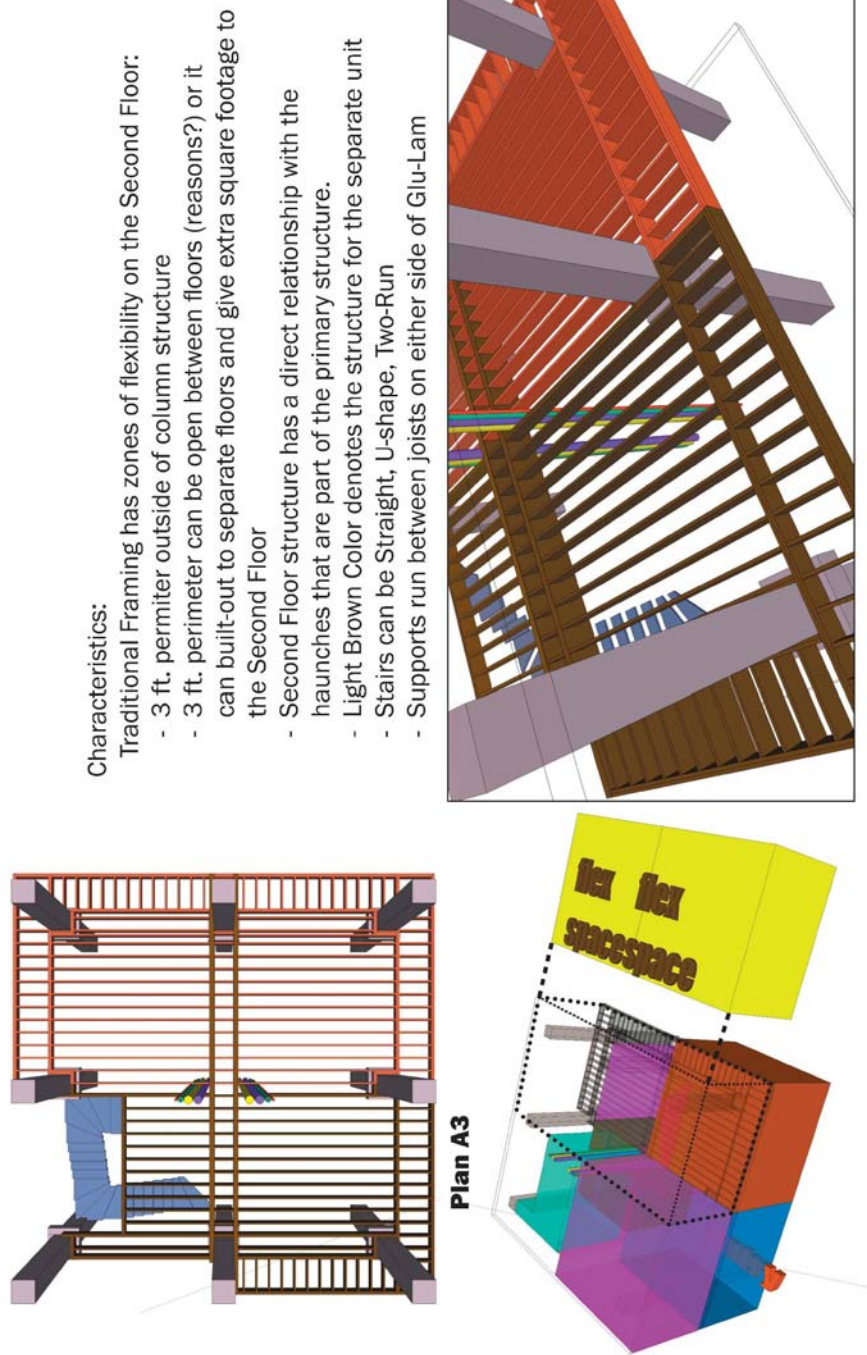


Figure 27 Indirect Flexible Diagram ...continued

[Author]

The detail perspective shows the floor framing composed of joists tying into bandboards that are bolted to the concrete columns. The columns are 3'x3' thick due to their independence of beams. The intent was that horizontal structure should be minimal to provide as much freedom of infill as possible for the user. The end result was overly thick columns and too little clarity on the Architect's part that would optimize good design.

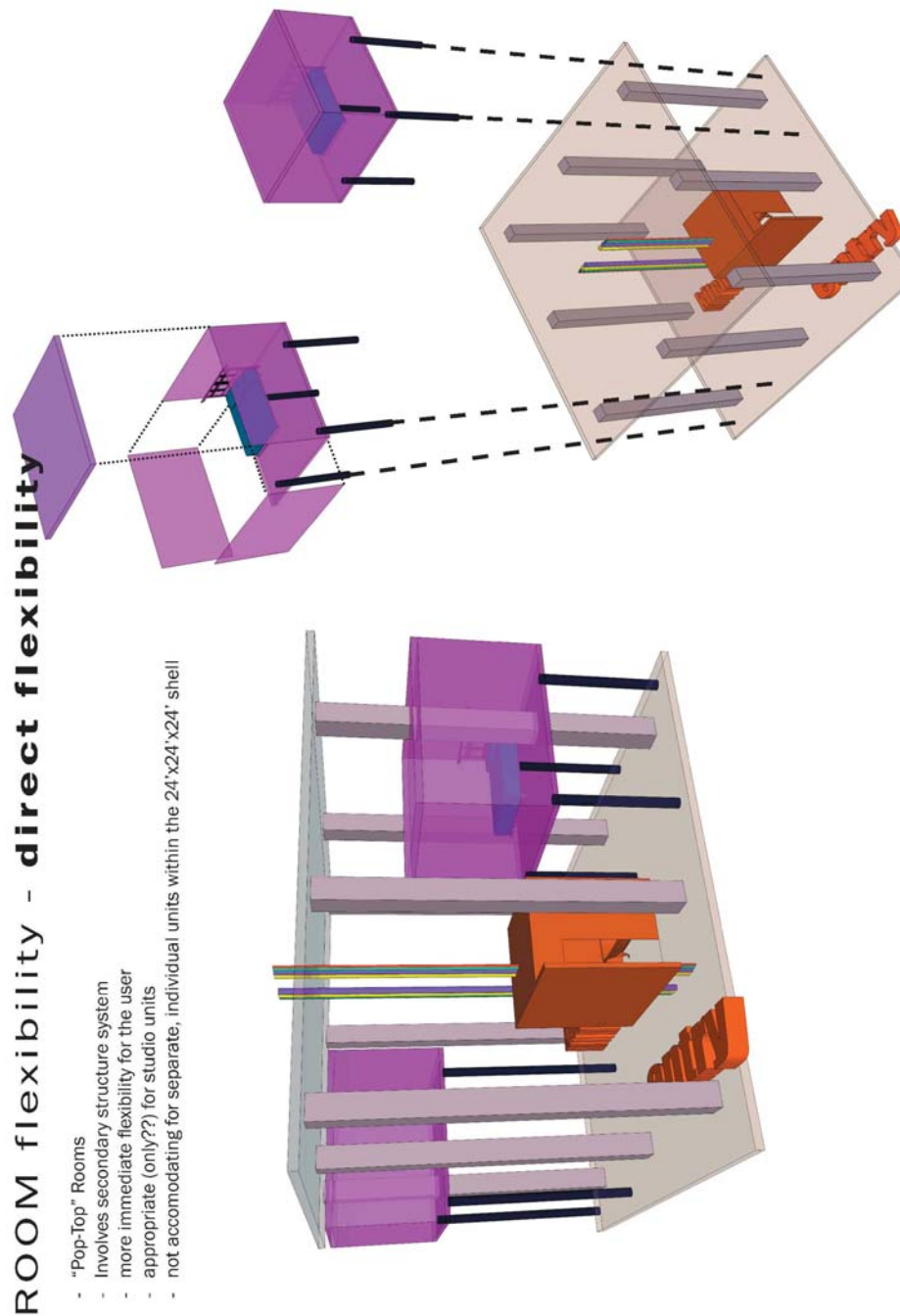


Figure 28 Direct Flexibility Diagram (now Studio Flexibility in Figure 6)

[Author]

The difference between this concept and the Indirect Flexibility is that in this scheme, the horizontal structure would be self-supported by columns and walls that are only infill and not reliant upon the module's structure. This idea is rather wasteful of space given that it can be design with truly no constraints. The same problem occurs here as it does in the Indirect Flexibility. There is no level of prescriptive design on the part of the Architect, allowing for poor design to occur and putting the user at some risk. At this point it was realized that there needs to be a better balance between prescriptive design and choice for the user. It cannot be one-sided toward the user.

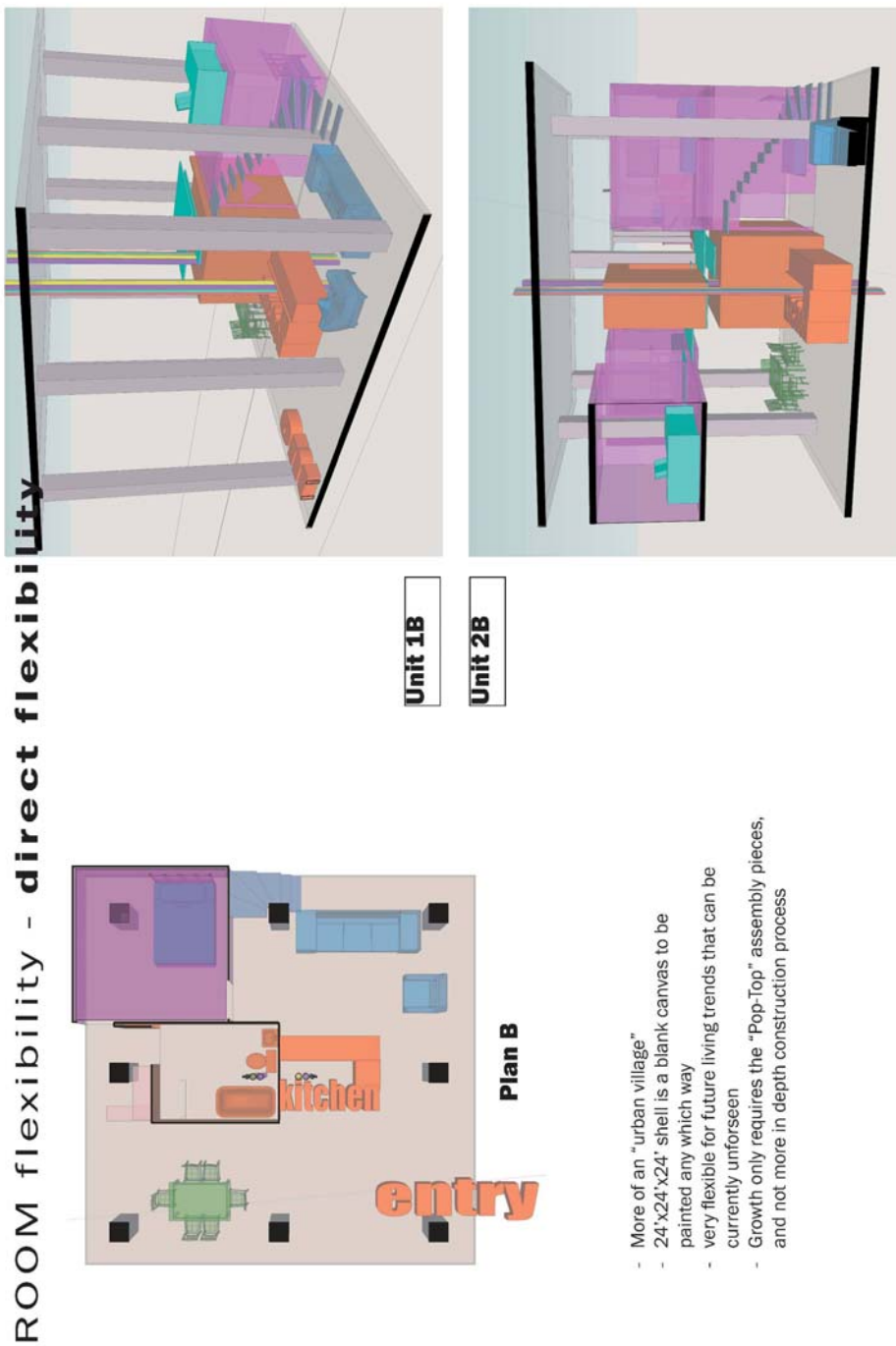


Figure 29 Direct Flexibility Plan B

[Author]

*Please note, the colored round columns that run through the space in these series of diagrams are the plumbing and HVAC stacks for the unit.

Compare the difference between Plan B and Plan C in Figure 30.

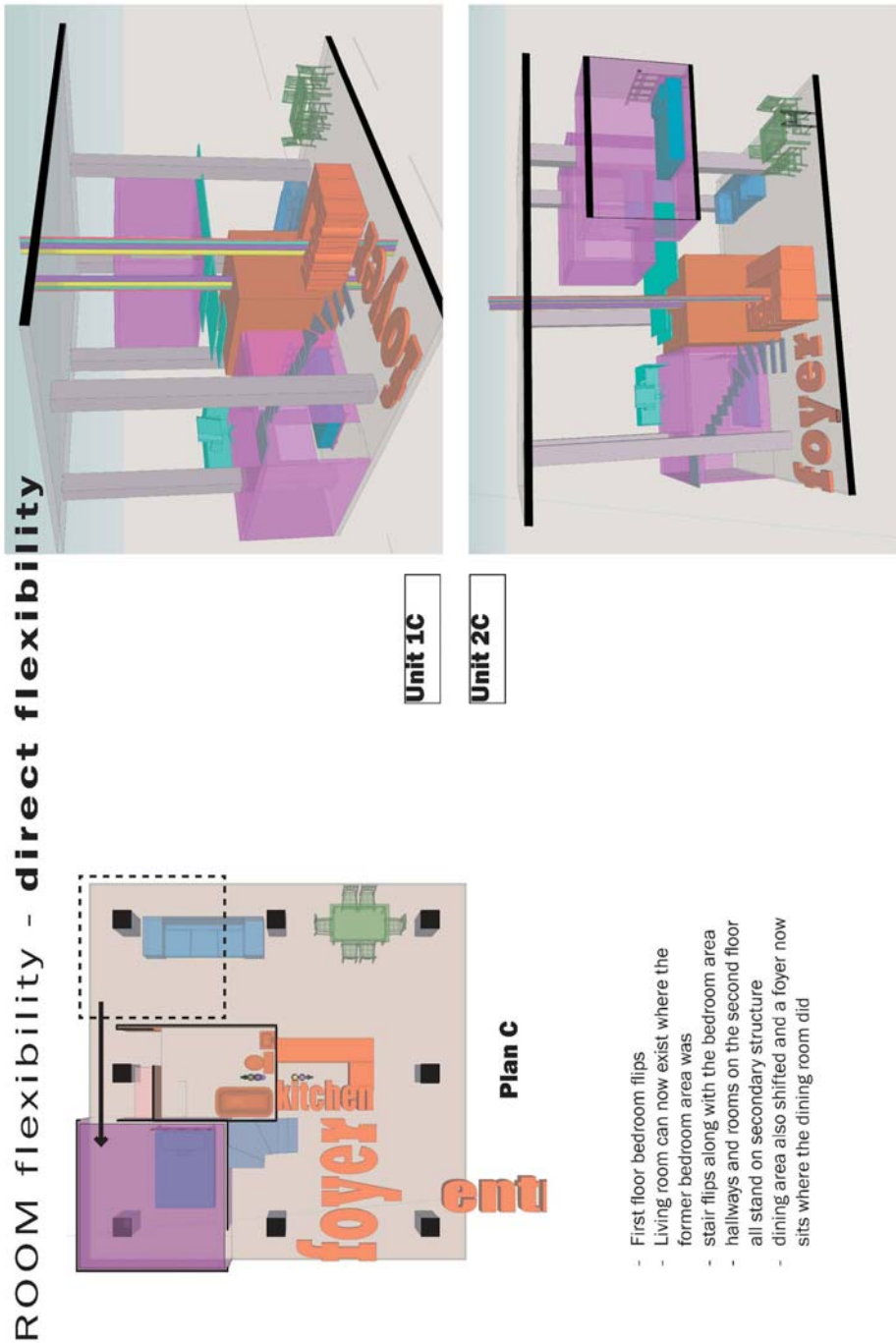


Figure 30 Direct Flexibility Plan C

[Author]

This diagram and the diagram in Figure 29 call back to the earlier diagrams of different unit layouts. The intention of Direct Flexibility is that it can provide the user to much more easily and quickly move a bedroom from one side of the module to the next because the infill structure is not bound by the module's structure as is the case in Indirect Flexibility (and hence the naming system)

Space Function Analysis Matrix - special purpose room

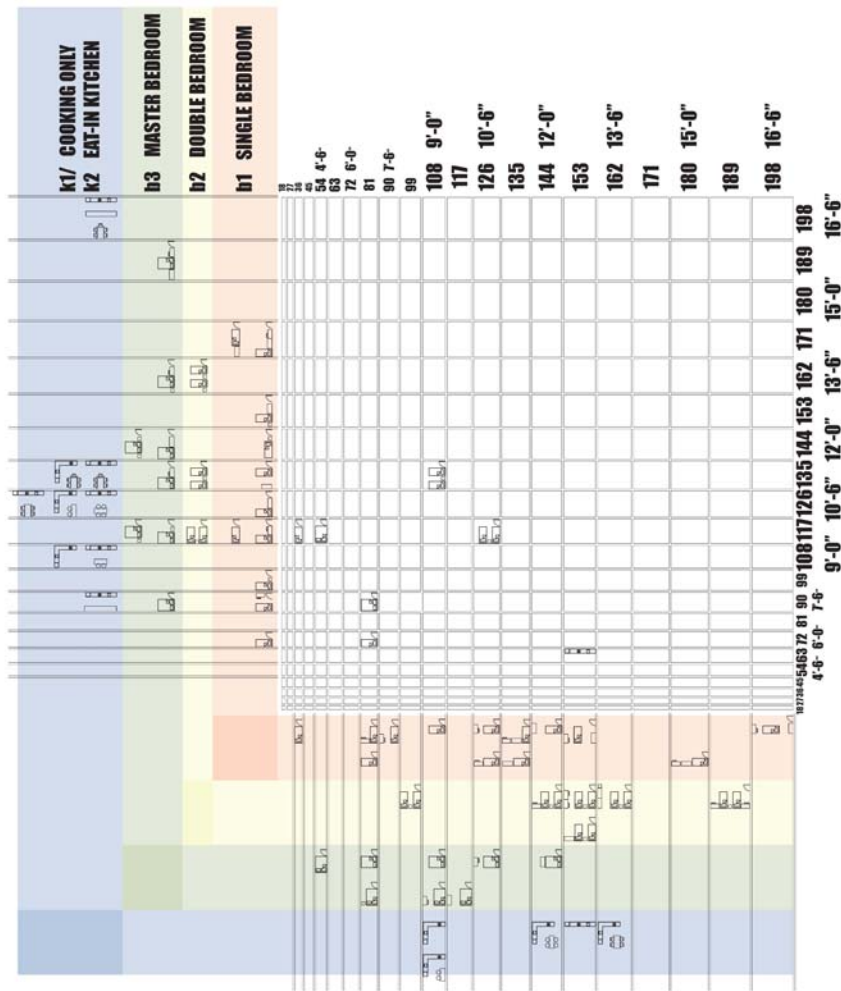


Figure 31 Space Function Analysis Matrix [Author]
 After the meeting with the committee in regards to the Indirect Flexibility and Direct Flexibility, it was clear that there needs to be much more clarity in the system. Thus, the Space Function Analysis was devised to help determine good dimensions for the new and improved module. This exercise is completed for the bedroom and kitchen layout. Other exercises were completed for the living room and for the bathroom. The intention of this is to find the minimal dimension for specific, code-enforced movements of egress and of comfort. By finding the minimal dimension for various layouts, there is greater comprehension for a universal dimension satisfying a number of layout configurations.

Early March

Immediately, at this point, creating the module's organization and dimensions and its subsequent aggregations was of greater importance than testing it on the site. Therefore, the intention of testing the module on a low-density, urban site was abandoned. However, the site at the corner of Light Street and East Baltimore Street in Baltimore was kept and continued to be explored.

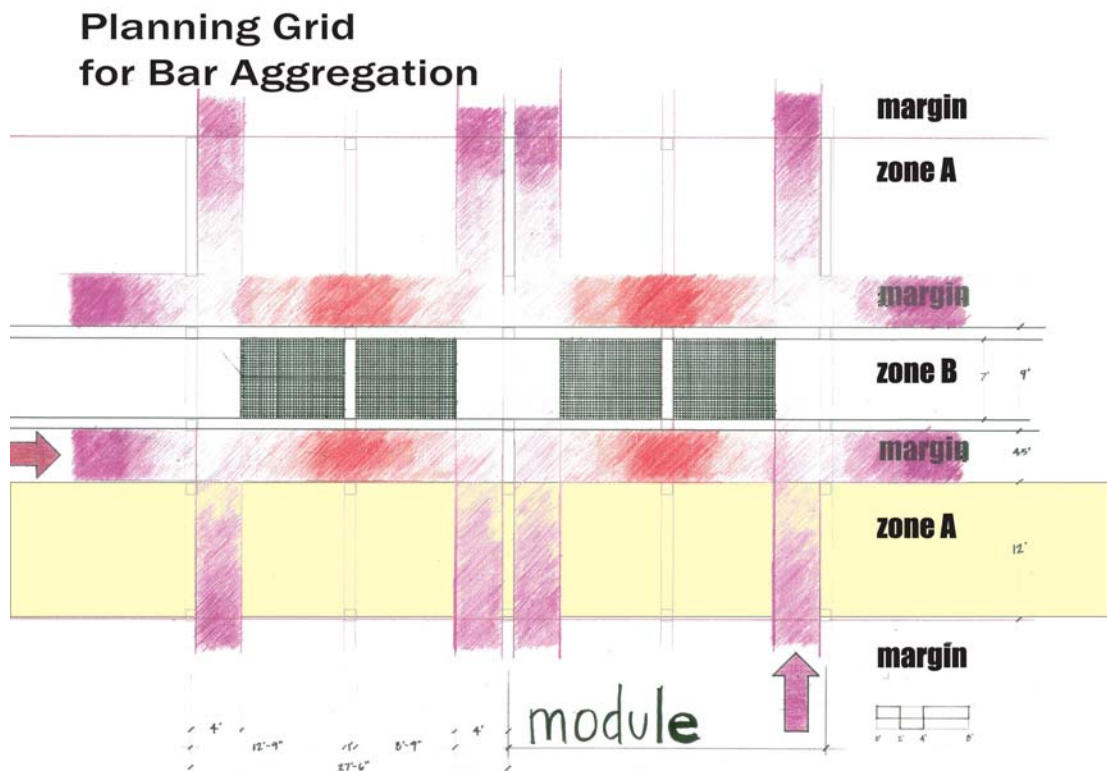


Figure 32 Preliminary Planning Grid for the Module

[Author]

The Planning Grid is the realization of many studies and process drawings completed to find a good layout and organization for the module. Please refer to Figure 33 and the section perspective to help understand the planning of this module. The idea is to design the module to be 3 stories tall. The middle level (as indicated by yellow in this plan) is to be the corridor that will give access to all three levels: the upper floor, the adjacent middle floor, and the lower floor. The margin between Zone A and Zone B, immediately adjacent to the corridor is the stair zone. Here, there is access to the upper and lower floors. The stairs do not occupy the entire width of the module, so that one can still get independent access to the middle floor. The purple zones are merely suggestions for the circulation in the unit. The red zones are also suggestions for circulation, but could also be swallowed up by a room if one wishes to make a room bigger. Zone B is area for the kitchen and bathroom locations.

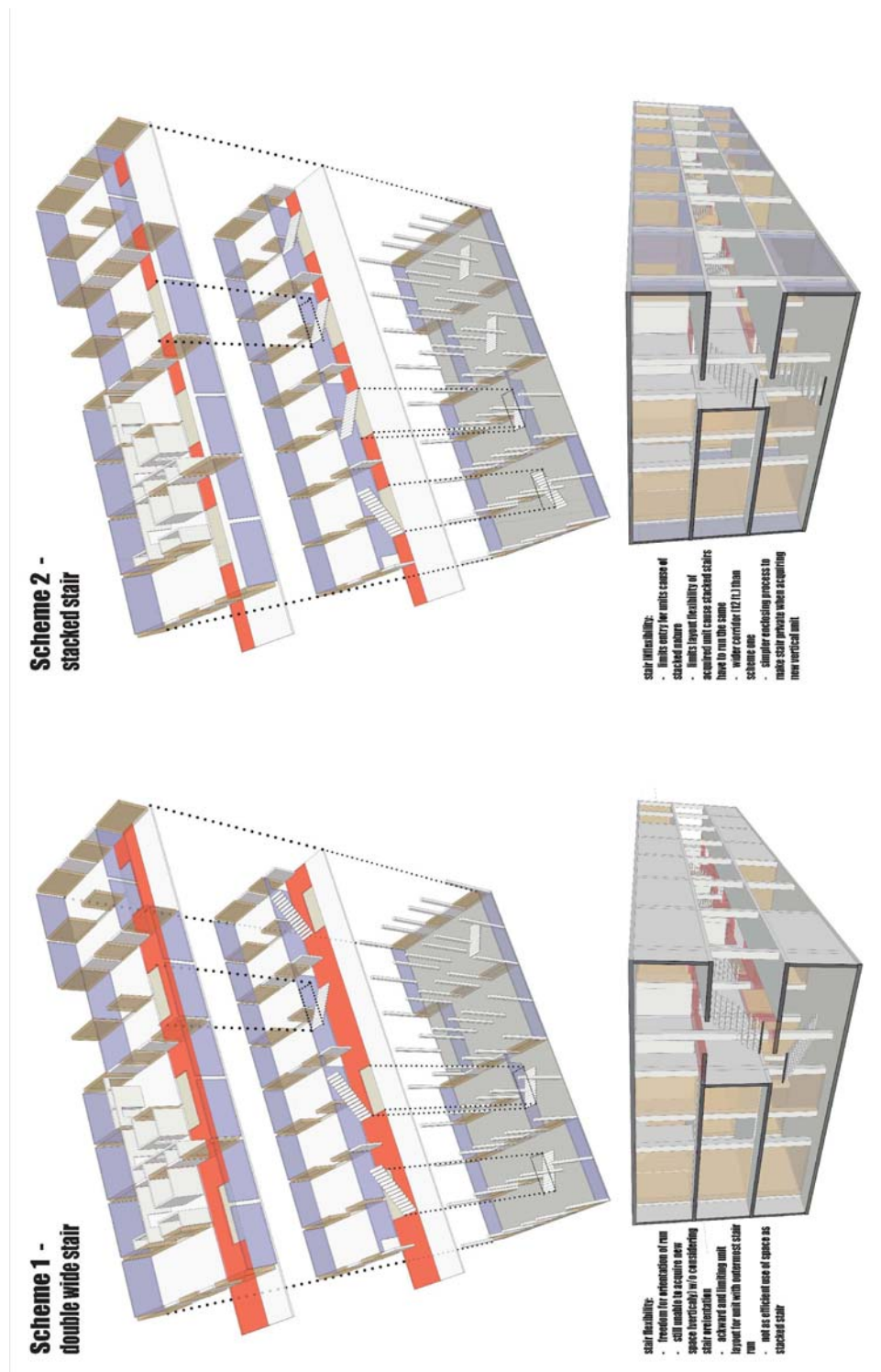


Figure 33 Scheme 1 and Scheme 2

[Author]

Refer to the description in Figure 32 to better understand the module. The exploded axons for the two schemes separate the different floor levels. The lower floor shows the columnar grid for the module. Notice the undulating façade in some of the floor levels. The intention was to allow for the zone to be enclosed unit space or outdoor balcony space for the unit. Finally, the only difference between the two schemes is that in Scheme 1 the stairs are not a straight run, which takes away width from the corridor.

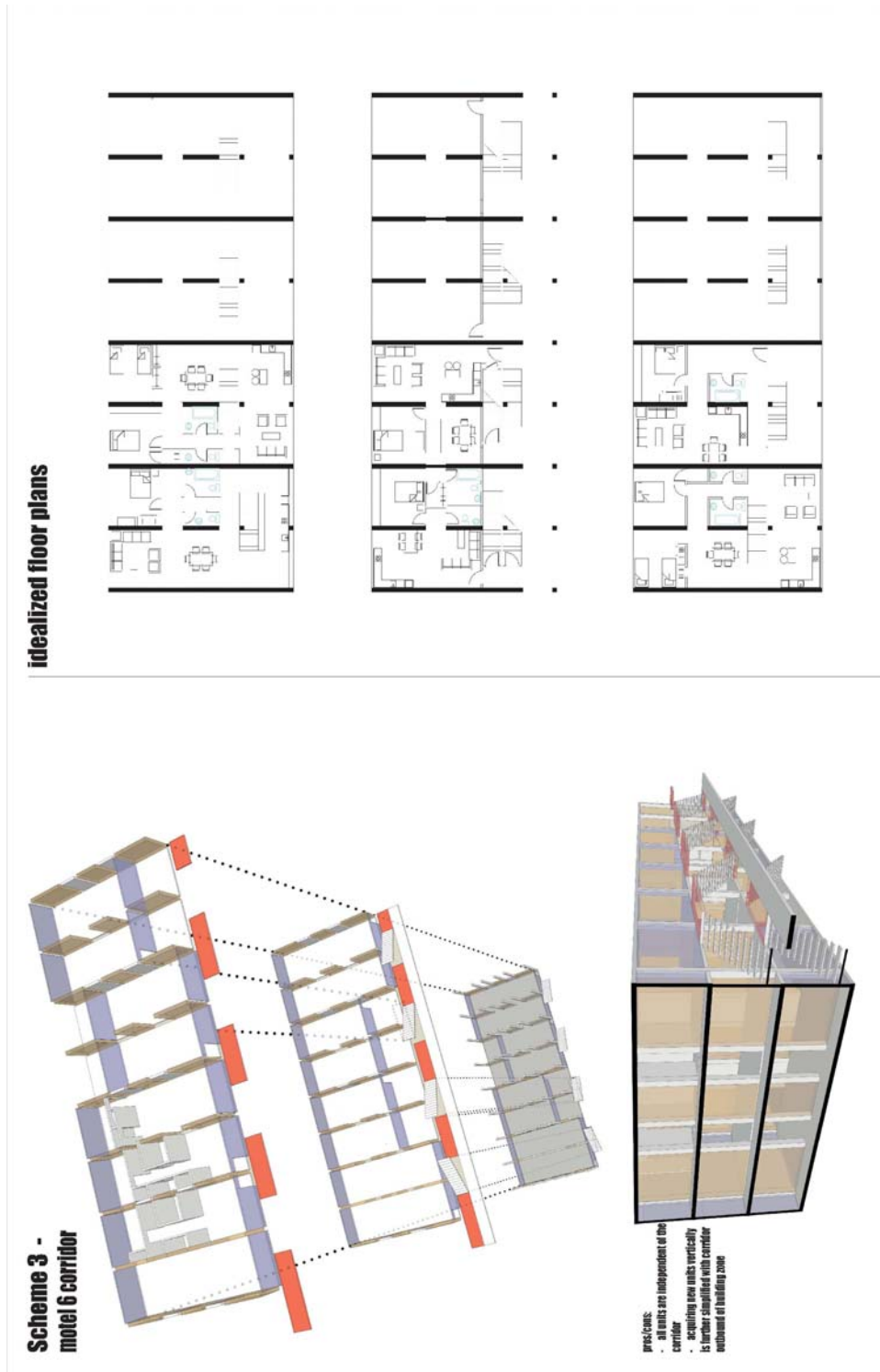


Figure 34 Scheme 3 and Floor Plan Examples

[Author]

The third scheme was to simply show the possibility that the corridor could move outboard of the module, given for all three floor levels to be the same dimensions and not make a small square footage for the middle floor as in Scheme 1 and 2. This page was mostly included to show the early floor plans for this system in the design process.

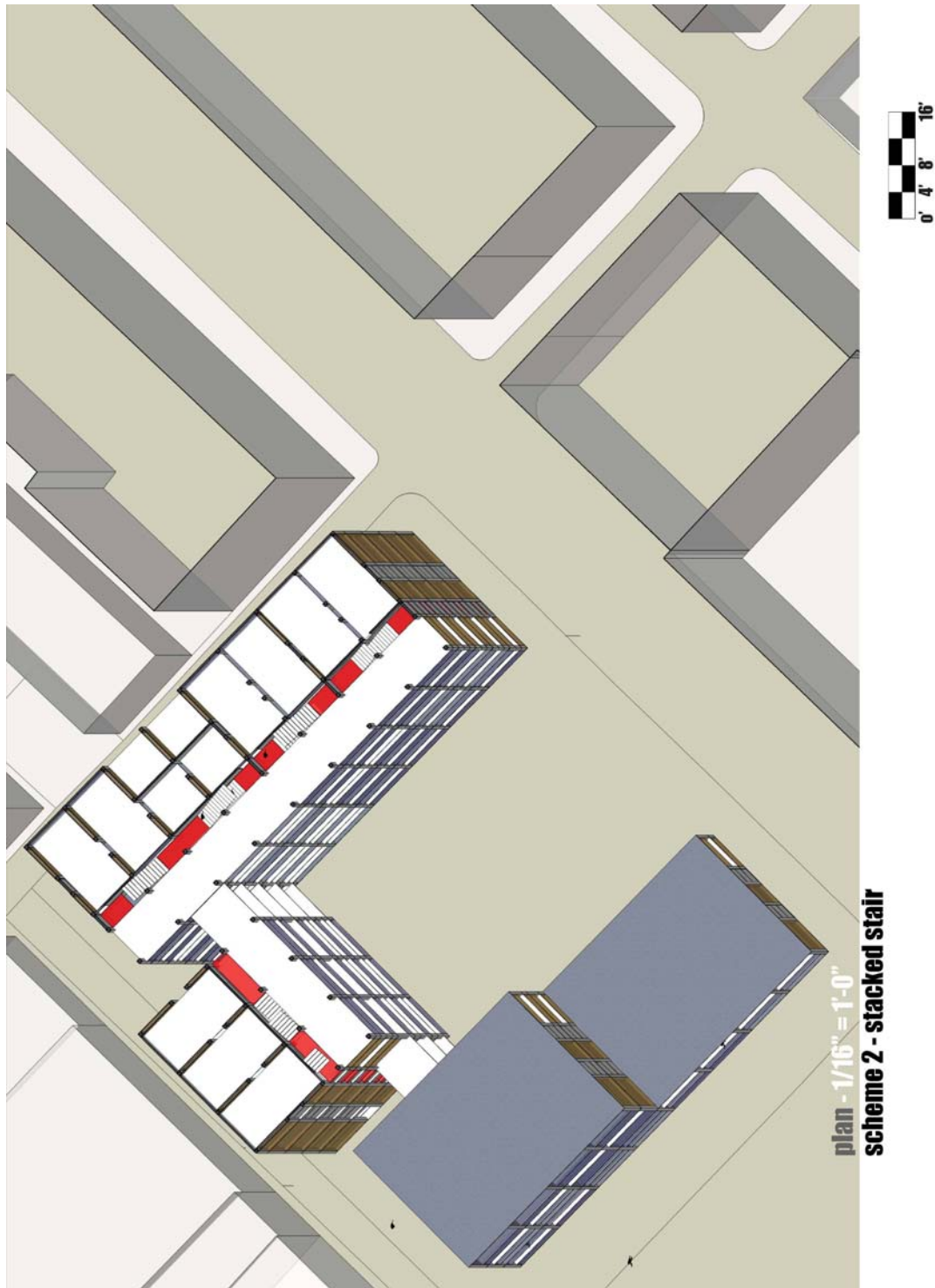


Figure 35 Direct Flexibility Diagram (now Studio Flexibility in Figure 6) [Author]
 Notice the U-Shape building creating a courtyard at the center. This was an early parti, but the courtyard provided a good typology for the goals of this thesis. Regardless, at a later design meeting with the committee, the focus was to take the theory behind the Schemes in Figures 32, 33, and 34 and apply them to the site. It was at this point that this site was beginning to reveal its inappropriateness for this study. The following week the thesis class met with structural engineers. (con't in Figure 36)

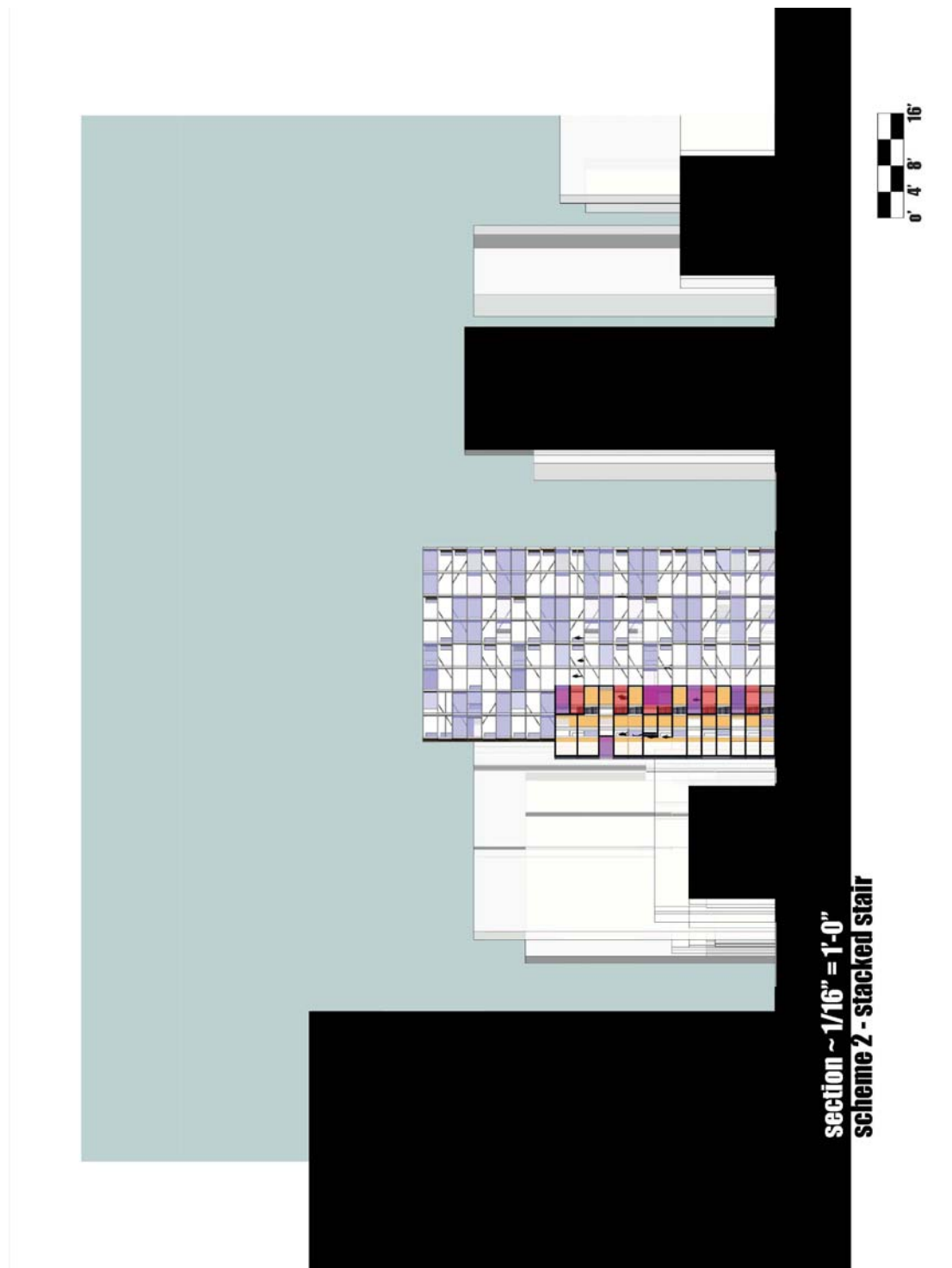


Figure 36 N-S Section Thru Courtyard [Author]
 (...cont't from Figure 35) The structural engineer then identified the height limitation of the module. In these series of images of the revised module, the concrete columns were 1'x1' thick. Despite the small tributary area of the columnar grid, the thickness of the columns limited the building's height to roughly 10 stories. Investigations were made as to increase the column width in order for the building to increase its height. But, increased width of the columns proved detrimental to the living space of the module.



Figure 37 Aerial Perspective
Looking into the courtyard and onto Light St.

[Author]



Figure 38 Street Perspective
From the NW corner of East Baltimore St. and Light St. looking South onto Light St.

[Author]

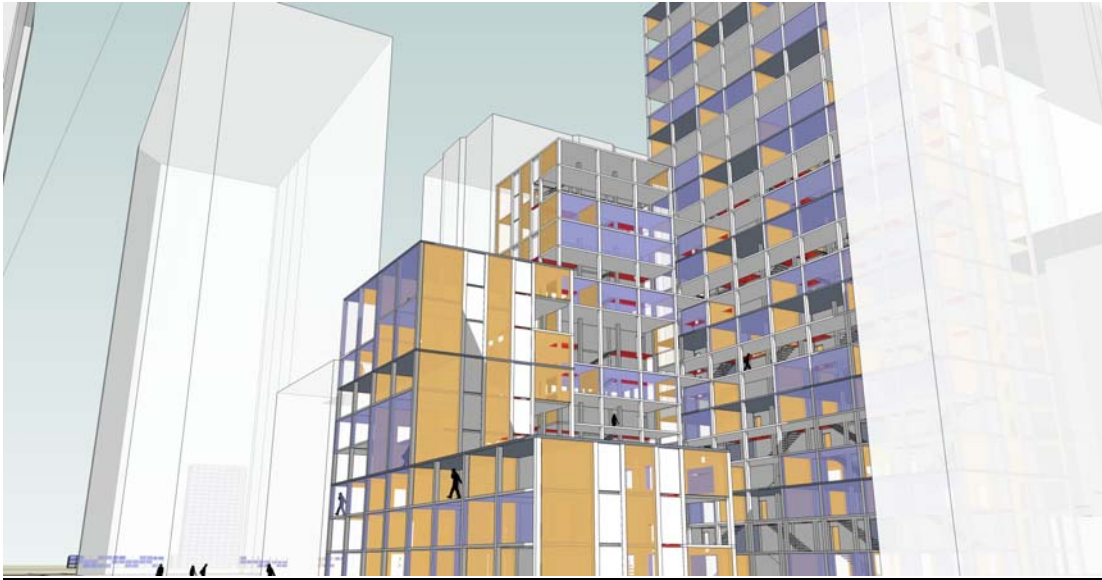


Figure 39 Street Perspective
On Light Street looking North

[Author]



Figure 40 Perspective of Courtyard
Perspective from the 10th floor.

[Author]



Figure 41 Interior Perspective of the Corridor

[Author]

Note the red zone in this perspective is indicating the infill of the stair zone. The silhouette closest in the perspective is accessing the middle floor unit. Note the stairs above her lead to the upper floor and the landing that she is standing on also leads to the lower floor of the module.



Figure 42 Interior Perspective of the Unit

[Author]

As seen in Figure 41, the stairs can be open to the corridor. Or, as in Figure 42, the stairs can be open to the unit if the unit occupies more than one floor within the module. Note the stairs on the right of the perspective. The beige walls in between the columns are also infill.

Late April

Planning Grid for Bar Aggregation

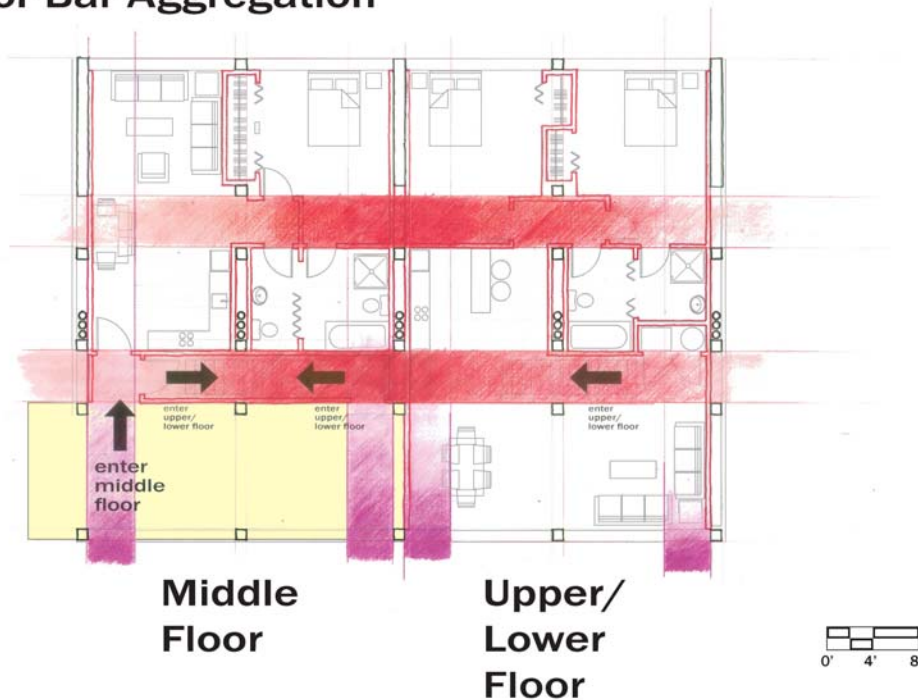


Figure 43 Planning Grid for the Module

[Author]

As shown in Figure 32, the planning grid and overall module design from early March remained intact through the end of the semester. This diagram shows the way the middle floor interacts with the upper/lower floor. The zone directly above/below the corridor is utilized space for that floor. The same idea is communicated in an earlier sectional perspective diagram in Figure 33. Note that the purple zone accesses the middle floor and the red zone adjacent to the corridor leads to the units above/below. Once inside the apartment, the second margin serves as the short hallways giving access to the bedrooms, bathrooms, living room, and kitchens.

Plans

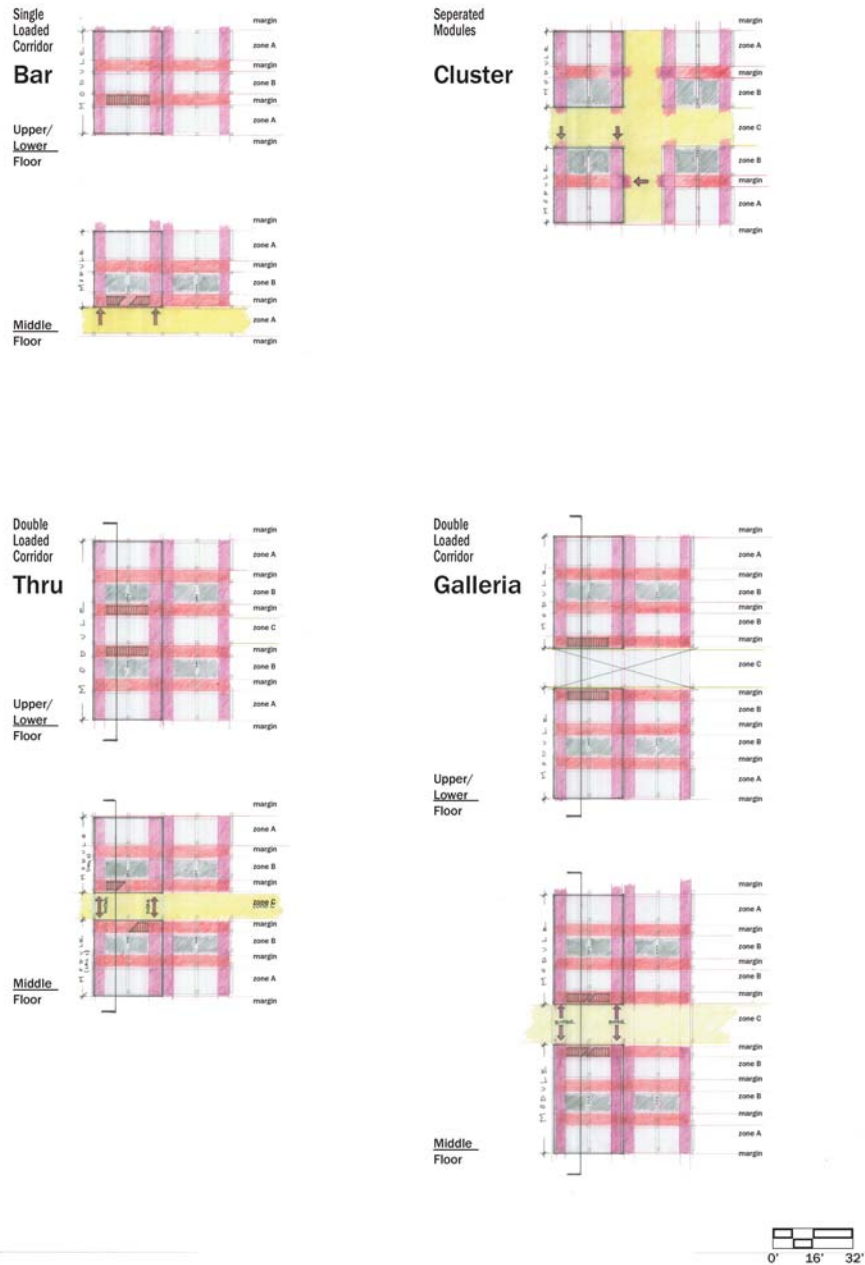


Figure 44 Plan Aggregations

[Author]

Throughout the process of creating the planning grid for the BAR aggregation, there were clues about other systems that could be created that maintain a similar organization as the BAR aggregation. The other three systems: CLUSTER, THRU, and GALLERIA, use the same zones with the same dimensions. The only major difference is the different repetition of zones. The CLUSTER aggregation has 2 exposures for each module. The THRU aggregation moves the corridor from the BAR scheme into the middle of the unit. The GALLERIA is similar in plan to the THRU but not in section. Please refer to Figure 45 to see the sections of the aggregations.

Section Aggregations

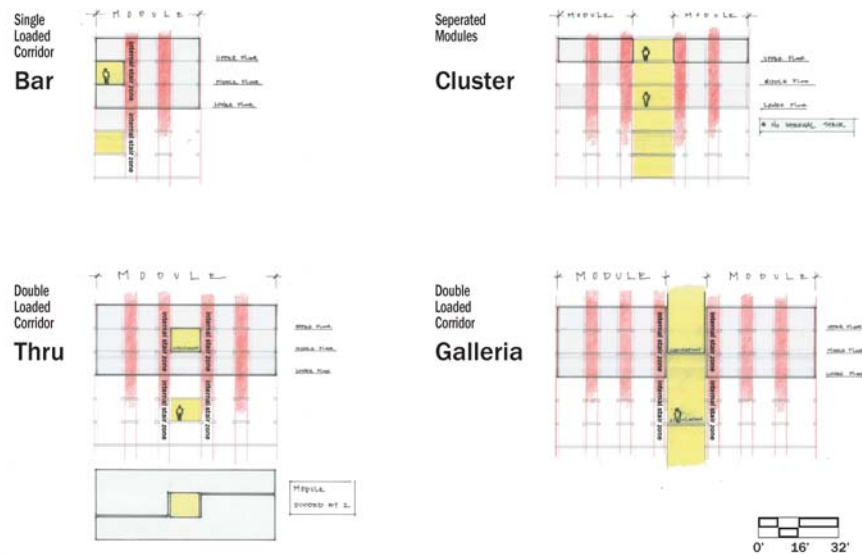


Figure 45 Section Aggregations

[Author]

The BAR scheme is the chosen scheme for exploration in this thesis.

The CLUSTER creates units that are identical to one another. They have the same square footage and zoning as the middle floor of the BAR aggregation, and each floor has a corridor so that there is no internal stair circulation. Clearly, with this move, the module as is understood in the BAR aggregation does not exist in the CLUSTER. This system may be best suited for a typical residential condominium or apartment building.

The THRU scheme is very similar to the BAR. It simply takes the BAR aggregation and mirrors it to create a longer module with the corridor running through the middle. A second diagram demonstrates an interesting design scenario for the THRU scheme.

Very similar to this, in section, is the GALLERIA. The major difference between the GALLERIA and the THRU scheme is that the corridor is a 3 story tall space at each middle floor, which attempts to create an atrium space or an enclosed street for the units.

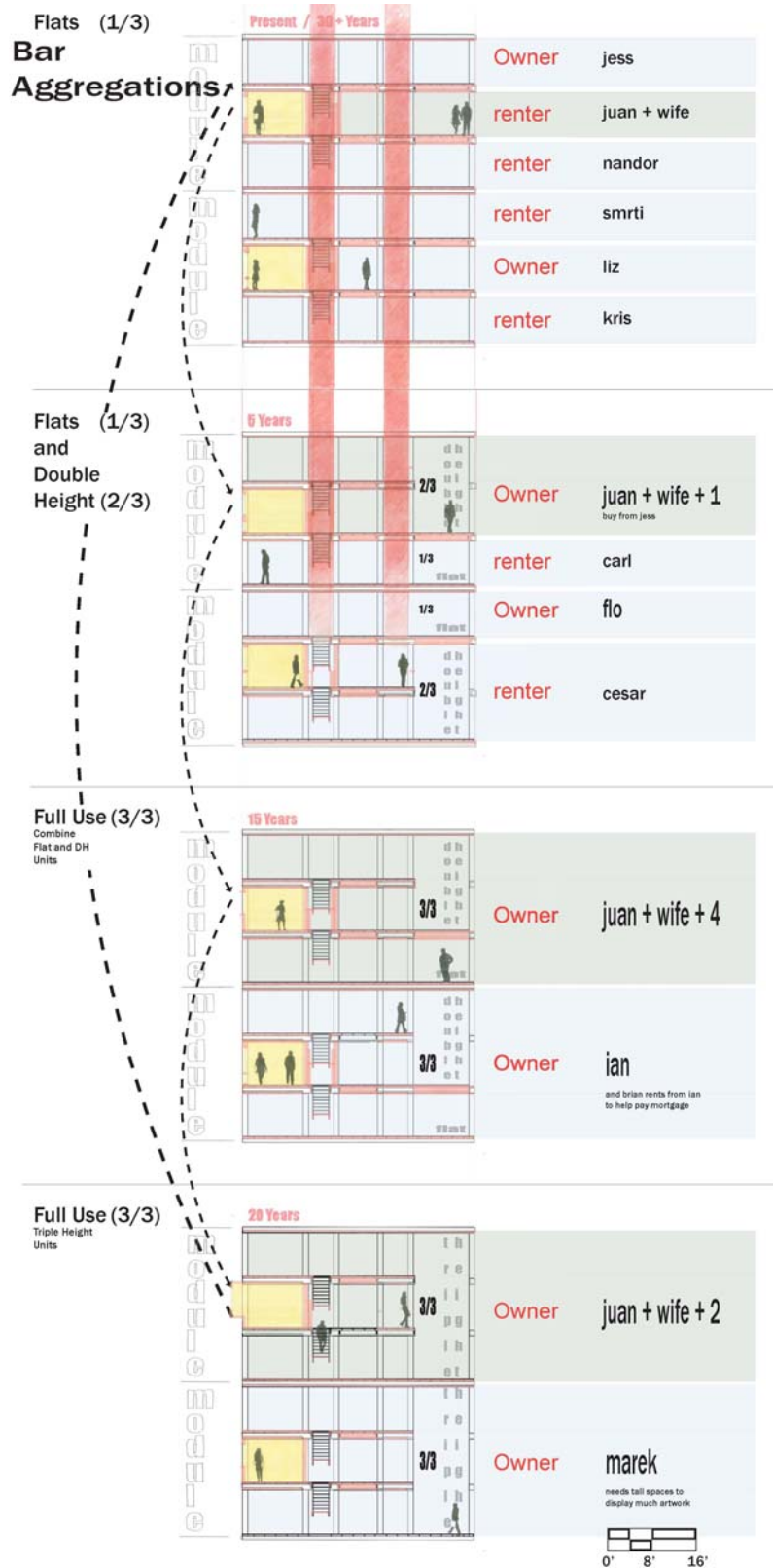


Figure 46 Evolution of Owner/Renter relationship [Author]
Track Juan's family's expansion and contraction. Note the similarity of situations at Present/30+years.

Flat Units (1/3)

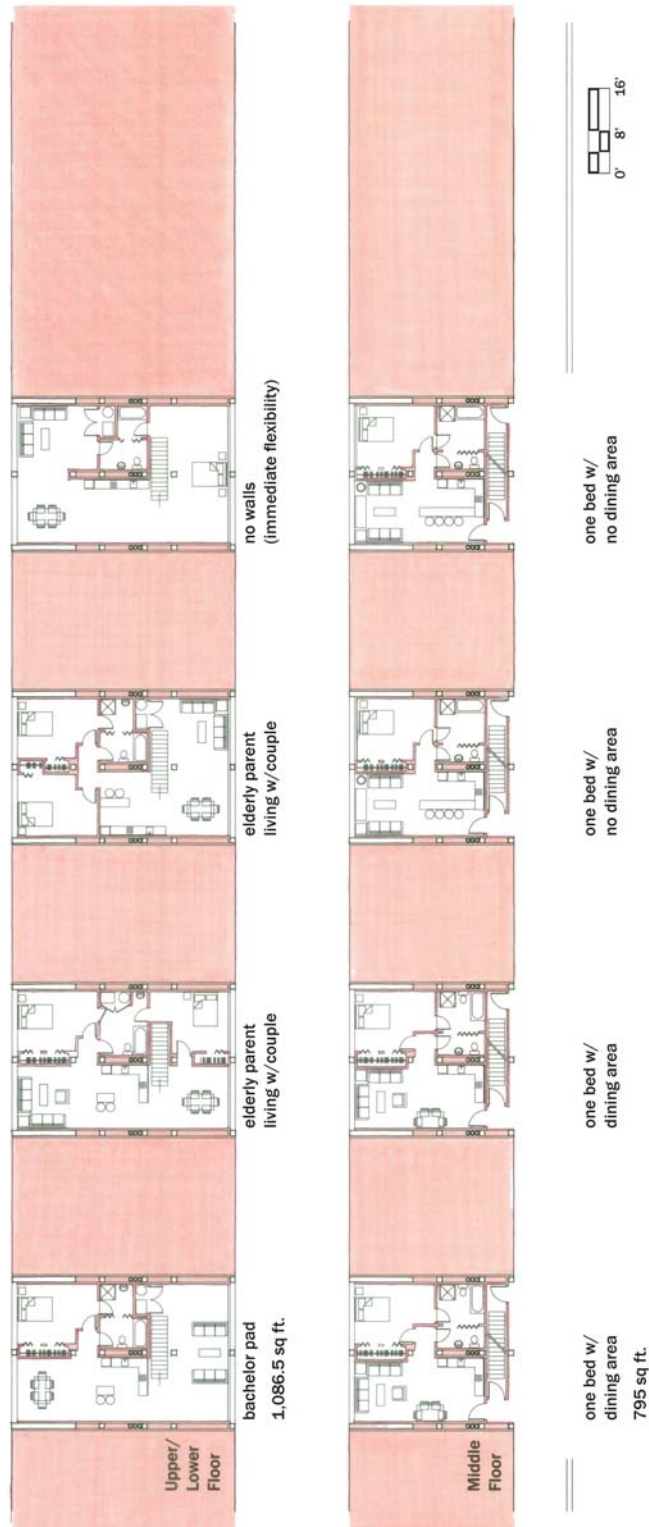


Figure 47 Flat Units (1/3) Floor Plans

[Author]

Here, each floor is occupied by separate individuals. Just like the diagram at **Present/30 + years** in Figure 46.

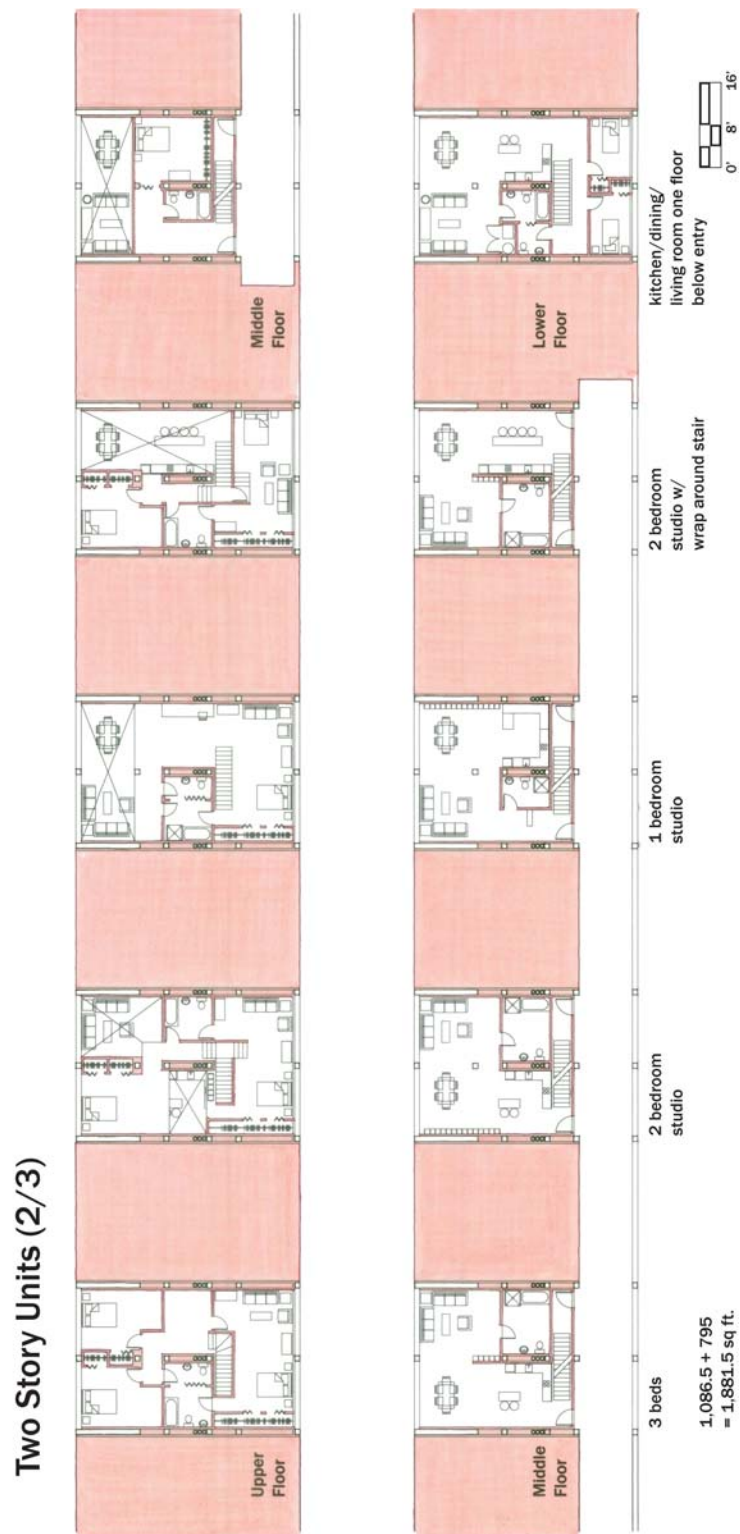


Figure 48 Two Story Units (2/3) Floor Plans

[Author]

Here, the user occupies an upper/lower floor and a middle floor, creating a two story unit. There is the possibility for double height spaces, as demonstrated in the plan. Refer to the diagram at **5 years** in Figure 46.

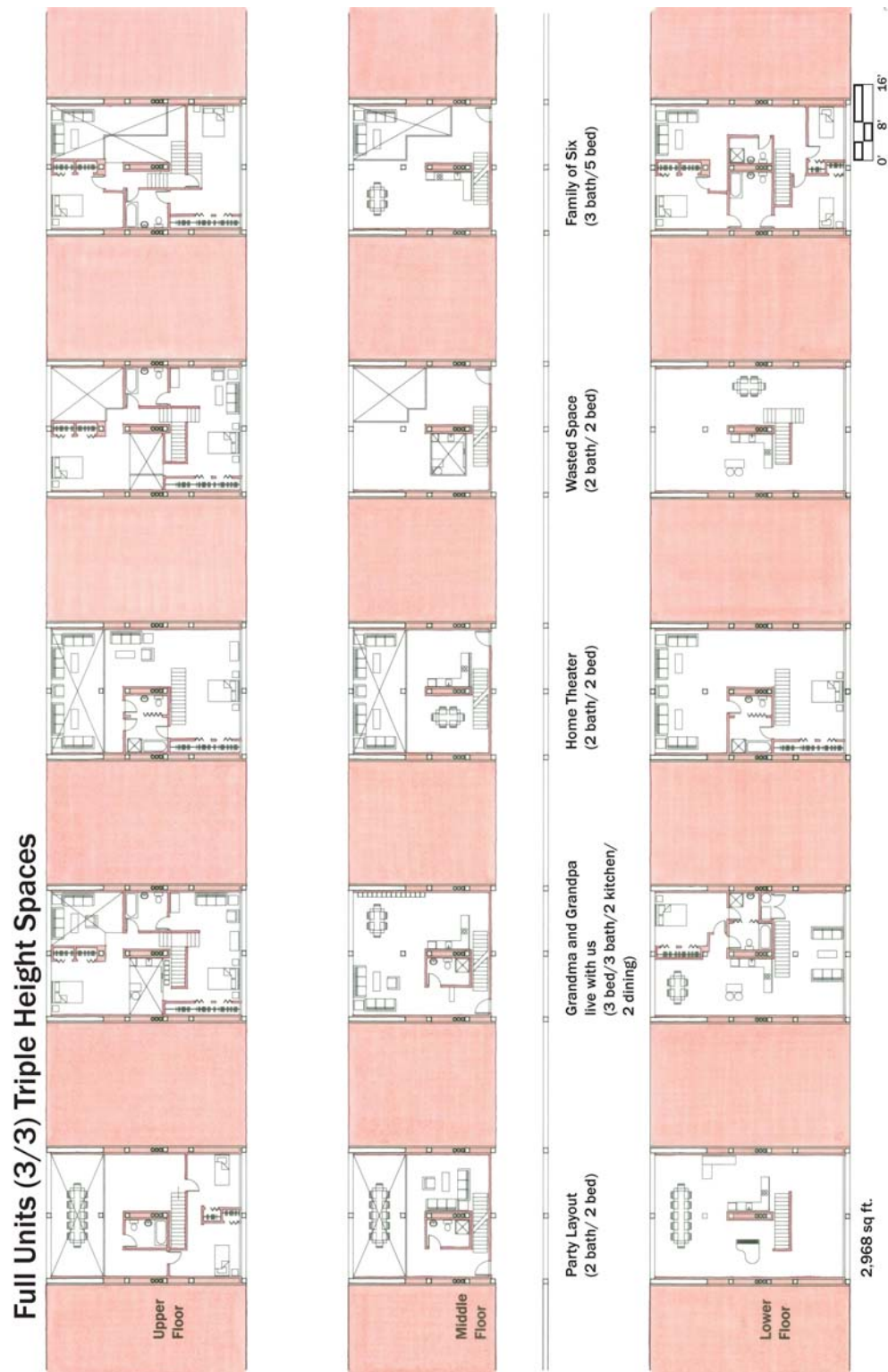


Figure 49 Full Units (3/3) Triple Height Floor Plans

[Author]

Here, the user occupies all three floors and chooses to create a triple height space. An alternative to creating triple height spaces, but while occupying all three floors, is to combine a two story unit (2/3) floor plan with a flat unit (1/3) floor plan. Refer to the diagram at **15 years** and **20 years** in Figure 46

Baltimore, Maryland

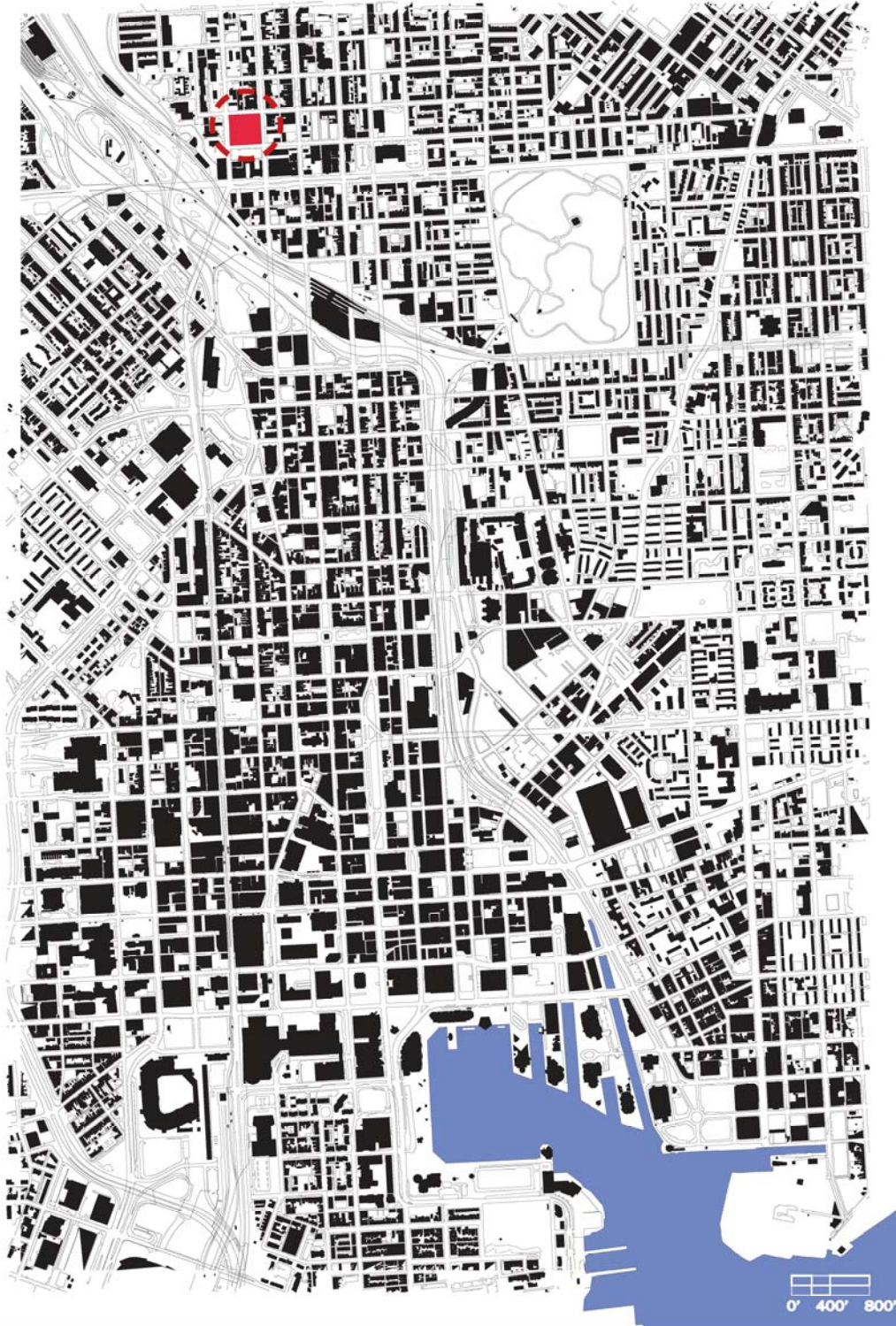


Figure 50 New Site near JHU Campus

[Author]

The new site is more appropriate for a mid-rise building. The testing ground is a perimeter block bounded by Maryland Ave., N. Howard St., W. 21st St., and W. 20th St. The site is filled in red.

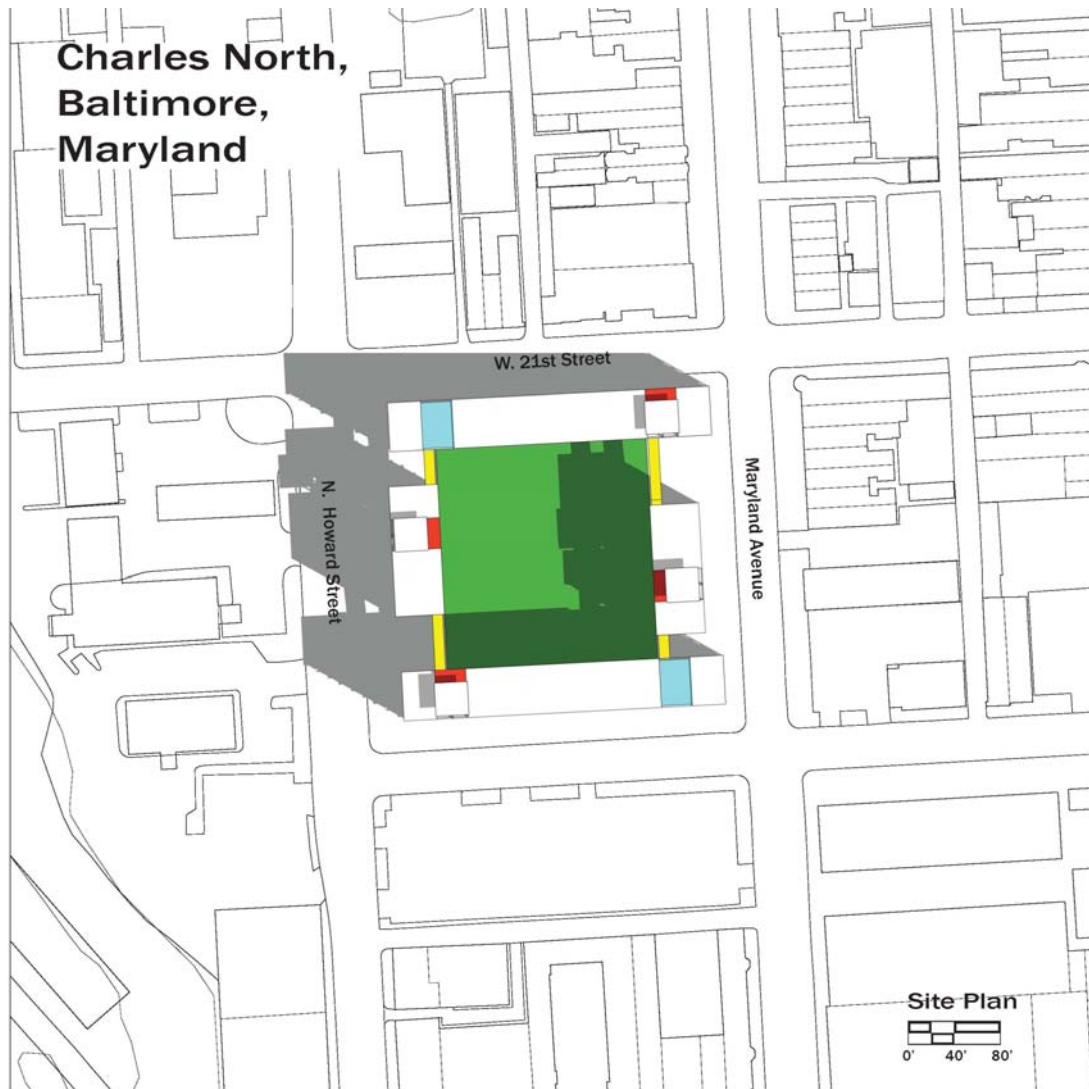


Figure 51 Site Plan

[Author]

The color scheme here uses a similar palette to the Planning Grid Figures. But here, the only color that carries through is the yellow which represents the corridor. In this courtyard plan, the decision to pull the corners apart was done to give as much exposure to the units as possible. It also creates a separate address for each building, given a sense of intimate identity to the place, while still interacting as a community. The blue areas are common areas for meetings or recreation. The red area signifies the module that is the fire stair.

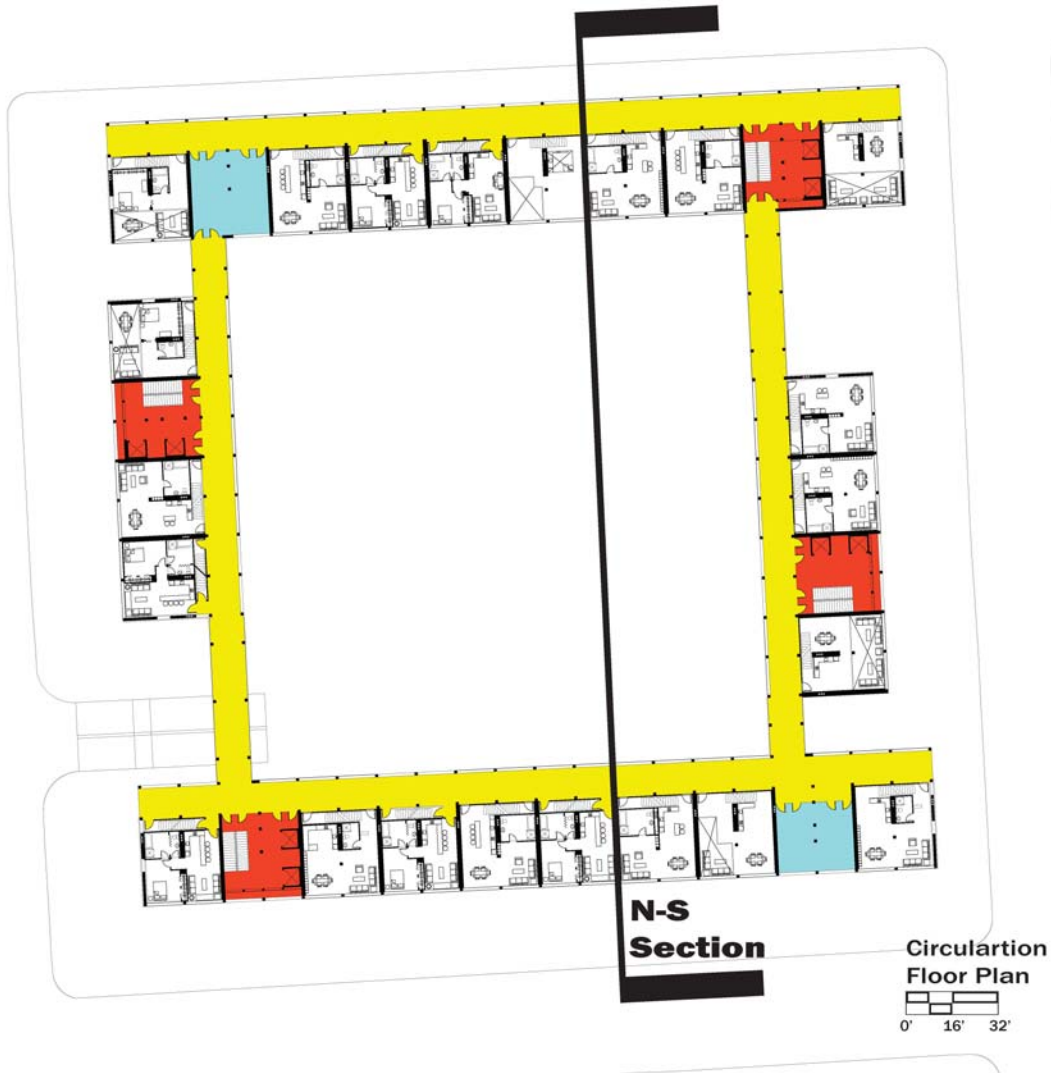


Figure 52 The Circulation Floor Plan

[Author]

The color palette described in Figure 51 remains. Parking is underneath the courtyard. The entry to the garage is on the West side of the building along N. Howard St. The North Bar Building's corridor does not face the courtyard, instead, it faces the street. The reason for this is because if the corridor faced the courtyard, the middle floors on the North Bar would never get Southern solar exposure. The importance of such light is great enough that the North Bar deviates from the other Bar Building's relationship to the courtyard. The key note is that all unit floors must receive some direct Solar gain, be it Morning or Evening light.



Figure 53 The Non-Circulation Floor Plan

The color palette described in Figure 51 and 52 remains for this plan.

[Author]

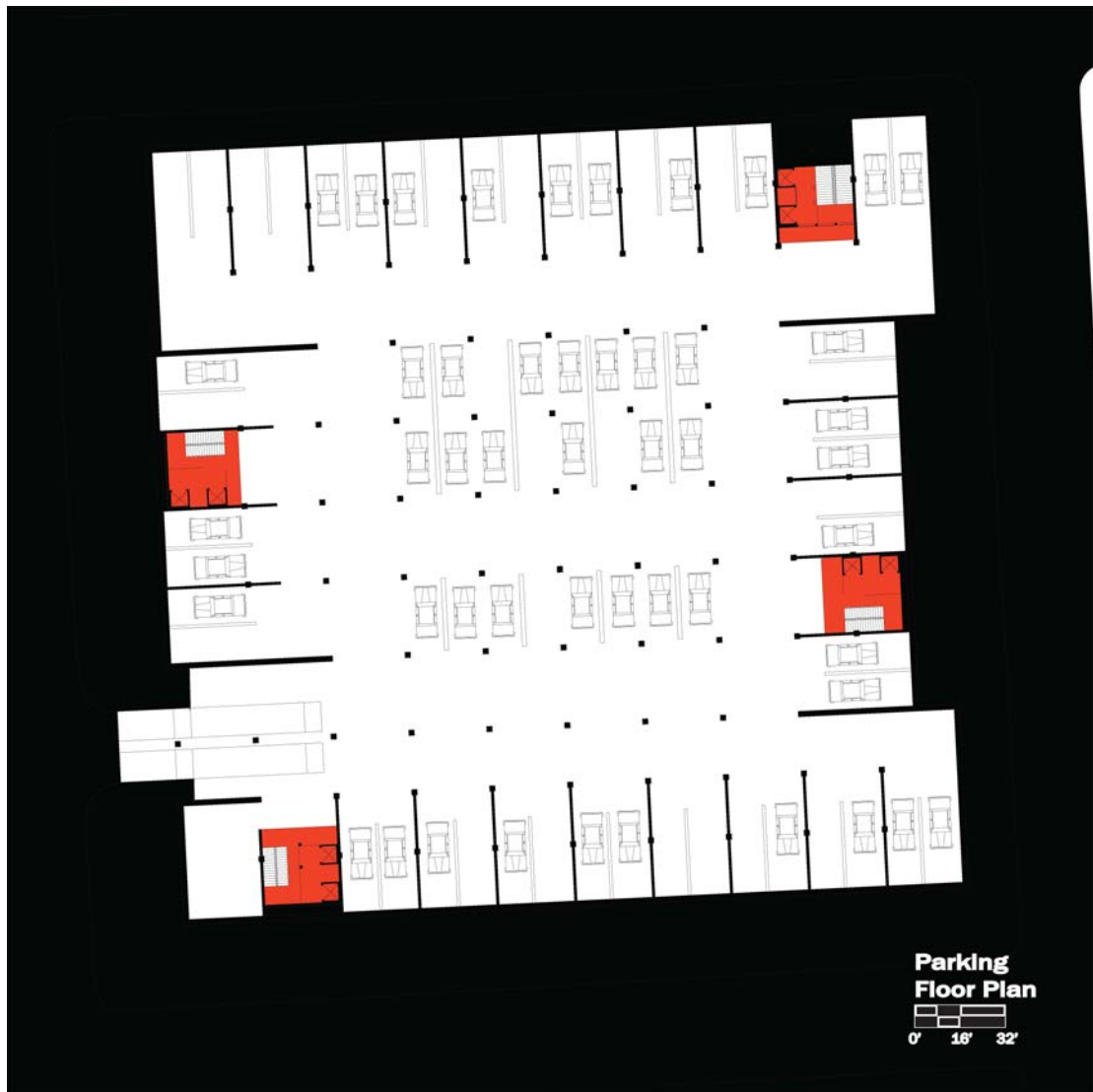


Figure 54 Parking Garage Floor Plan [Author]
 Within each module's overall length and width, up to 4 cars can park in 2 rows, 2 cars deep. If a user wishes to forgo the reliance of the car, then the parking space can be used for storage. There is an intention of having secure grates separating the parking areas between modules.

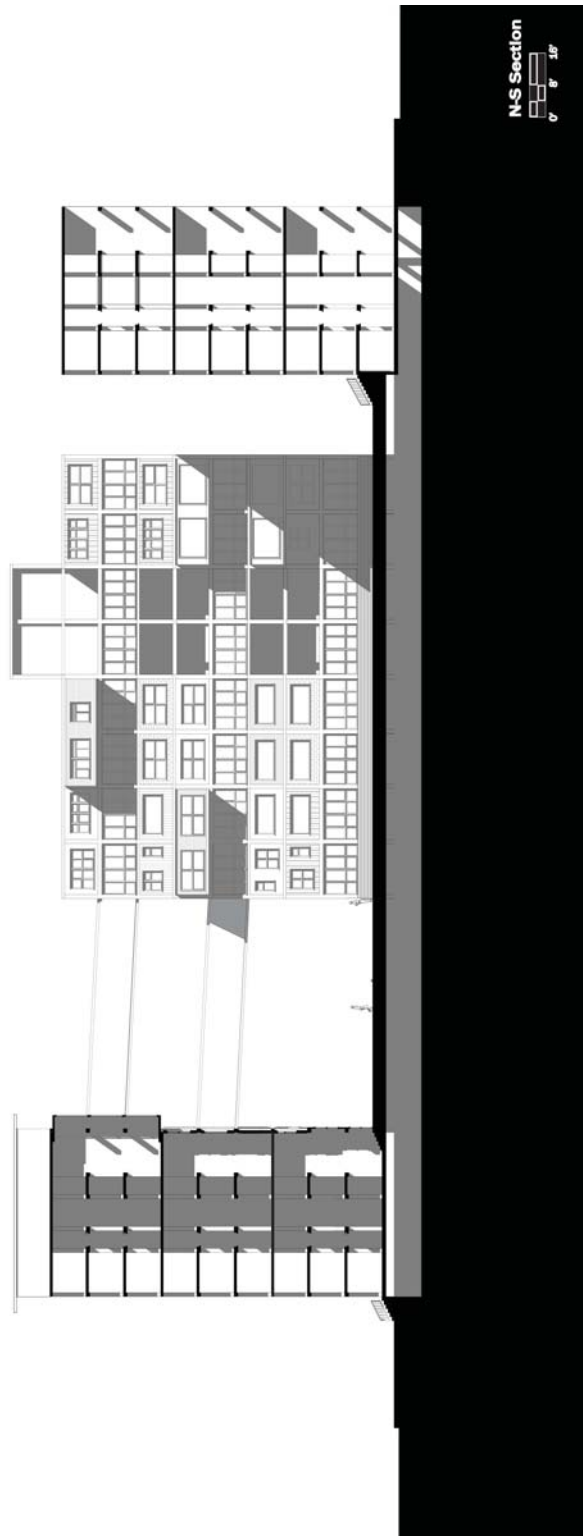


Figure 55 N-S Section
Here is the North-South Section cut through the building

[Author]

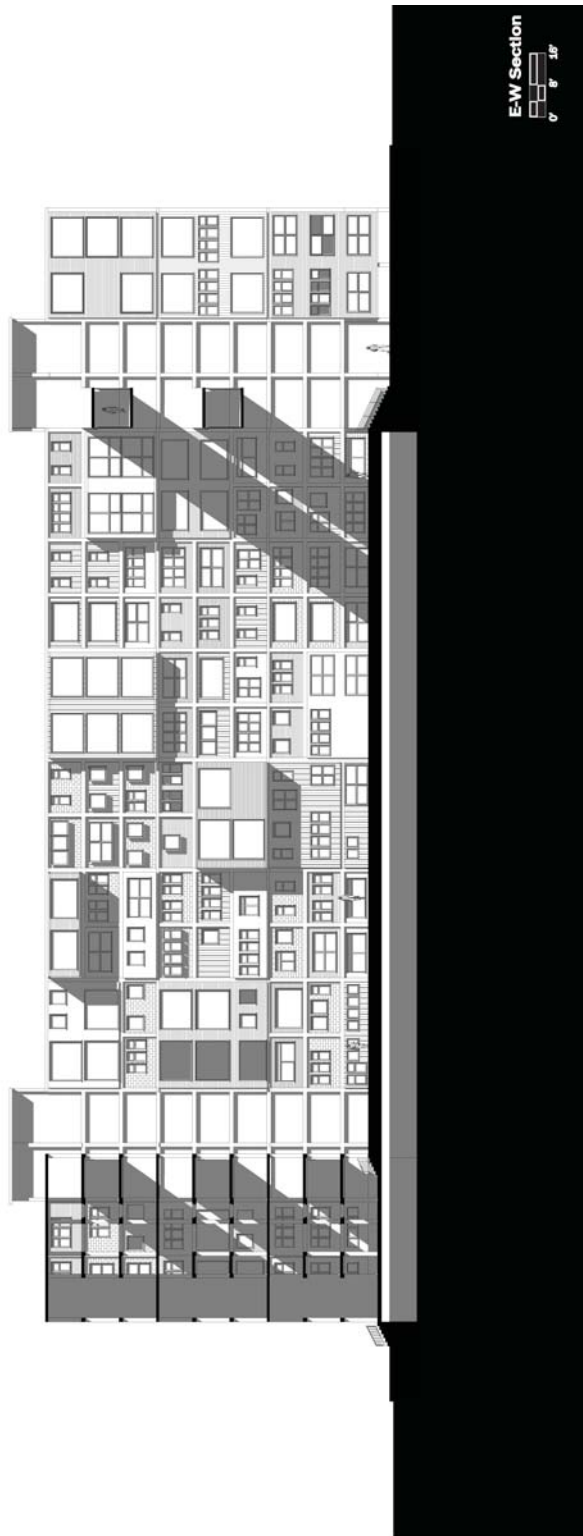


Figure 56 E-W Section
Here is the East-West Section cut through the building

[Author]

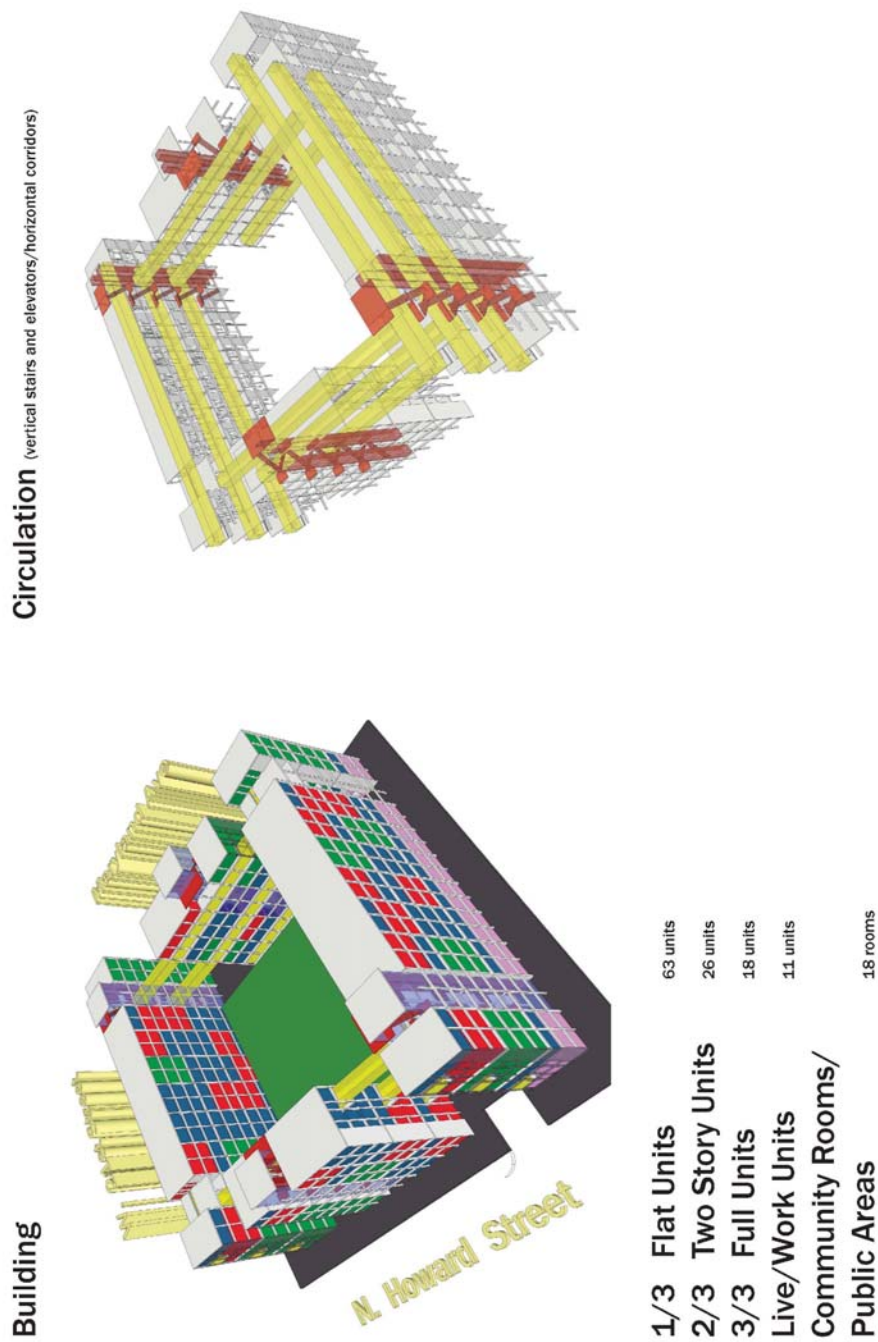


Figure 57 Building Diagrams

[Author]

The Building diagram shows the diversity of module infill throughout the building. The Circulation diagram shows the corridors and the fire stairs.

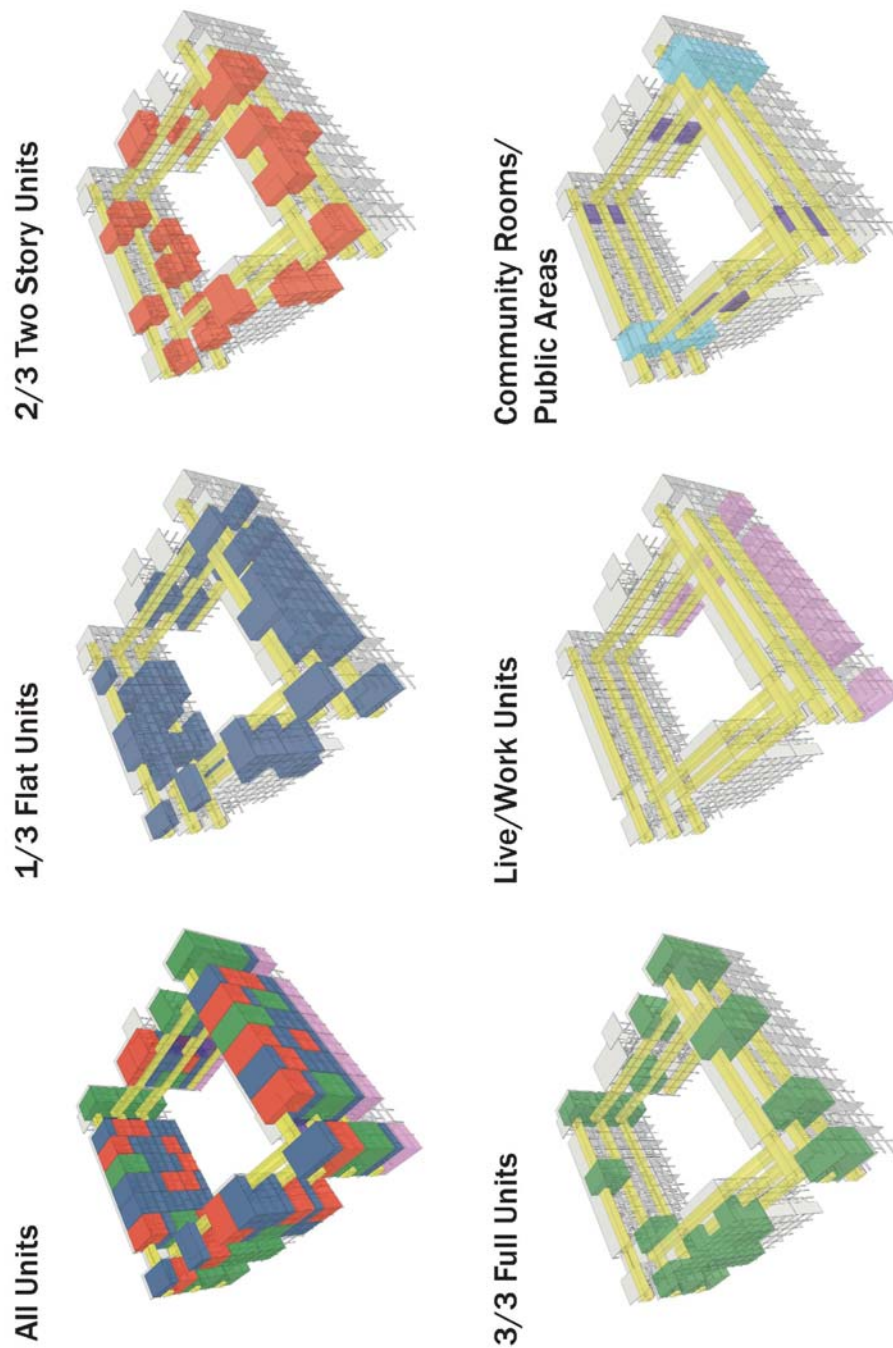


Figure 58 Module Infill Variety

[Author]

Note that the majority of infill types is the Flat (1/3) units. This is the intention of the thesis. The issue of providing suburban living in the sky could result in the entire building being composed of Full (3/3) Units, and that would be a failure in the agenda of affordability of this thesis. Diversity is important.

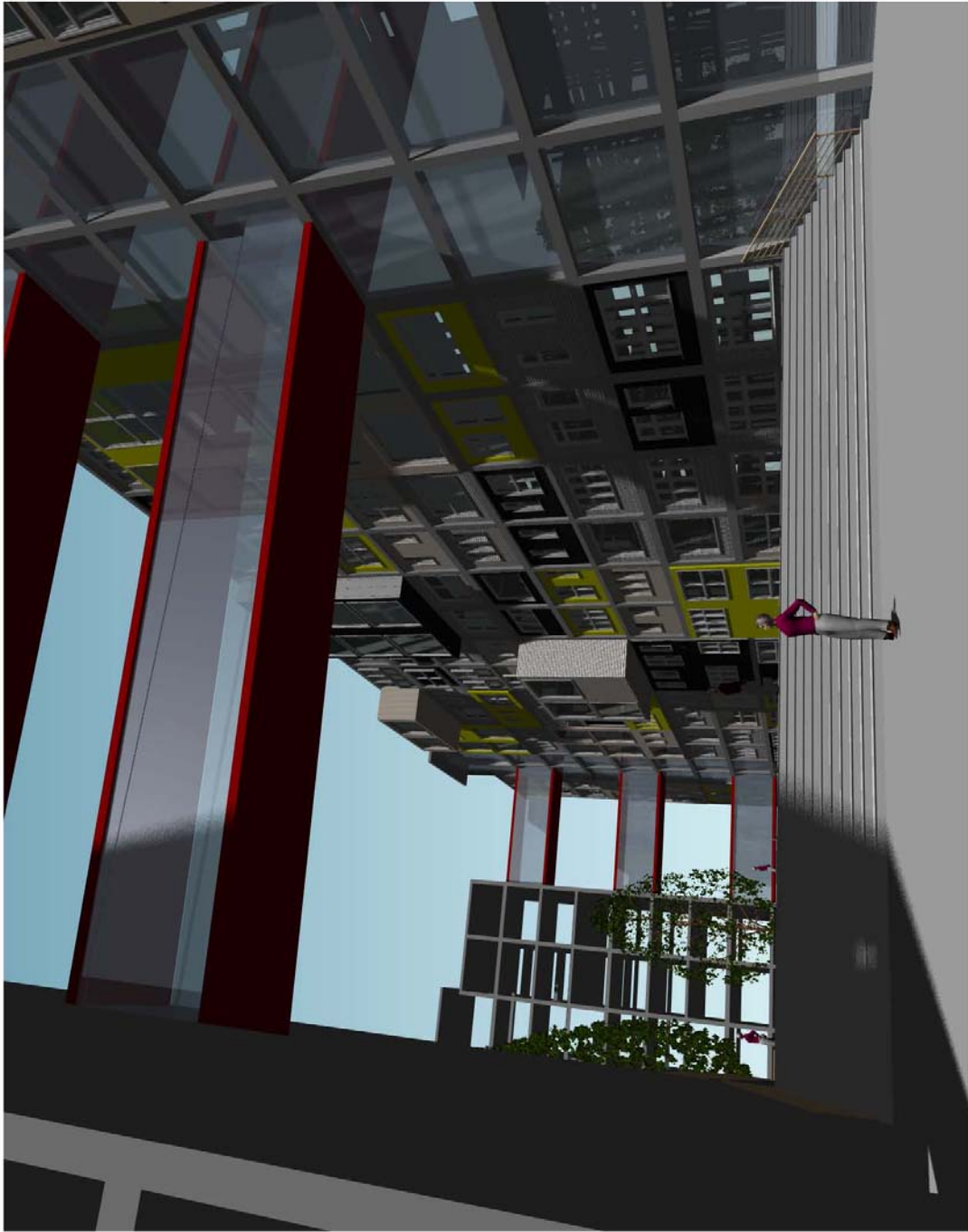


Figure 59 Street Perspective
From Maryland Ave, looking onto the step that lead into the courtyard.

[Author]

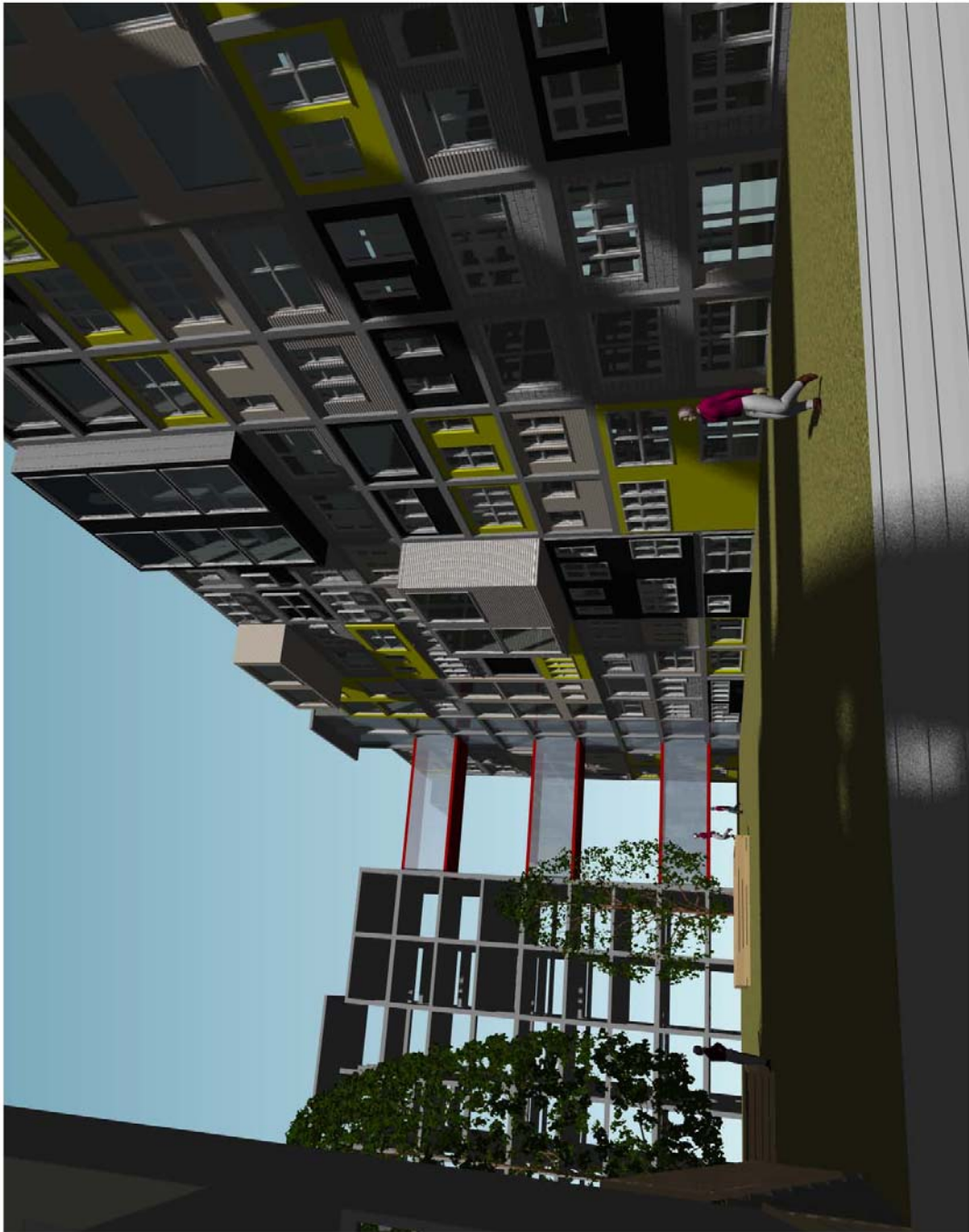


Figure 60 Courtyard Perspective

[Author]

From the steps off of Maryland Ave. Note the Bar building directly in front is not occupied but the infrastructure is up. The intention is to show this building as a living organism that grows and infills over time.



Figure 61 Courtyard Perspective [Author]
 From the steps that lead to the live/work units. Looking at the North Bar building's interior elevation.



Figure 62 Courtyard Perspective
From the South Bar Building looking at the North-East corner.

[Author]



Figure 63 Courtyard Perspective
From the 5th floor bridge between the North Bar and West Bar Buildings.

[Author]



Figure 64 Rooftop Perspective
View from the South Bar Building rooftop.

[Author]

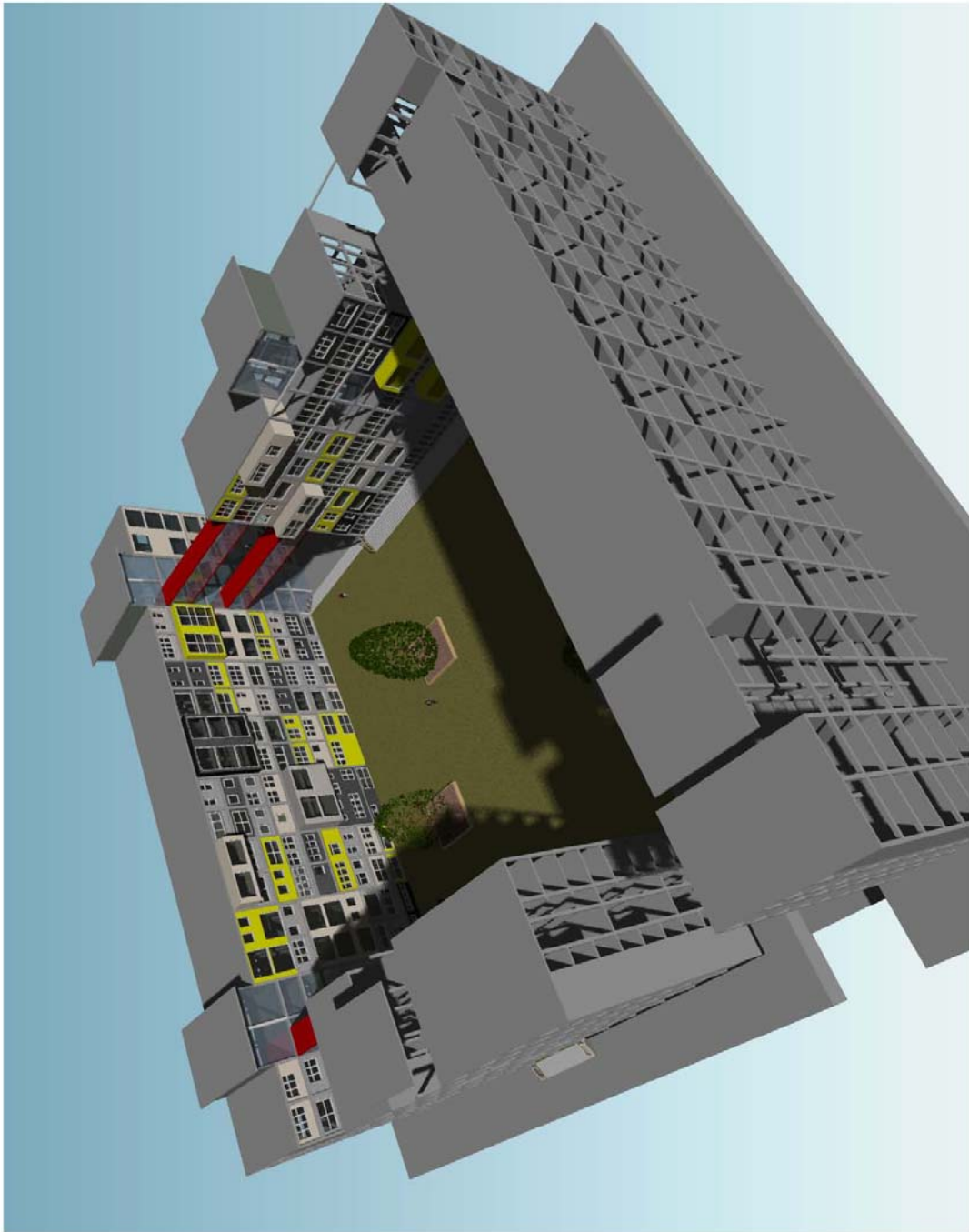


Figure 65 Aerial Perspective

[Author]

Chapter 5: Conclusion

Original Intentions

The rate of consumption is an issue that is at the forefront of sustainability and has dramatically deep implications throughout the built environment. This thesis deals with the America's over-consumption tendencies and pinpoints opportunities to reduce the rate. Jane Jacobs, Christopher Alexander, William McDonough, and various other planners and designers have focused their careers on this issue. The way in which societies redevelop cities by wiping out large swathes for rebuilding compared to piecemeal growth correlates to the rate of consumption. It may be obvious, but this thesis has a strong bias for the latter mode of growth. Slow is healthy.

By designing a system that can accommodate the fluctuation of a family's needs over time, it can sustain communities and lower the rate of consumption that would otherwise go unchecked when a family needs more space and, therefore, buys a new and larger home. By creating a spatially flexible system, a given family has the opportunity to stay in one place when their need for space expands and then contracts later in life.

The module can also be infill for a narrow lot, or be aggregated to compose a larger building. Originally, demonstrating this design ability at various scales in different sites was the intention. Yet, the planning for the module dominated too much. The original plan, as stated in the Introduction of this thesis, was to study at 4 distinct scales: building, unit, room, and detail. Instead, the unit layout and planning

system consumed most of the process. In the midst of the semester, it did not seem as important to design the building as a complete and comprehensible element tied into an urban fabric. At some point, the value of the architecture, itself, seemed not necessary. The planning seemed more important. This mistake revealed itself near the very end of the project and results in a rather incomplete attempt to create perspectives and elevations of the building, which manifested into a courtyard scheme.

God Is, in fact, in the Details (Design Trip Wires)

For nearly 1 ½ months, the focus of the thesis was creating the spatially flexible module. The intention, which is evident in so many of the diagrams, but especially in Figures 22 through 30, was to maintain a cube that was square in plan and square in section as the module. Being attached to the square plan was inhibiting progress for various design issues like the structural implications that would better reveal the module's spatial flexibility.

The big design decision with the organization was to quit designing various floor plans within the cube and trying to resolve many different issues all at once. Issues such as access, faces of exposure, HVAC and plumbing stacks accessible to all areas of the module, and how the modules would be interwoven in different aggregations created complications preventing progress.

After the 2nd meeting the inefficiency of the process was so much that design stopped and research pickup again to find a new plan of attack. Then, it was Habraken's *Variations*, that provided the resolution. The cube was now dead and the systematic design of support structures led the design of the module. The

module now stretched in the direction of access, becoming longer and incorporating “margins” that could truly be the peak areas of spatial flexibility. The other big decision was to “lock” the bathroom and kitchen areas into a zone that would isolate the HVAC and plumbing supports, increasing overall efficiency of the unit and building organization. If this phase were to have happen earlier, then there would have been more opportunity for addressing the building and detail scales that could have created a more realized building in Baltimore, MD.

The meeting place for the site and the building occurs at the ground plane. If more time could be granted, this would be the immediate focus. The ground plane is often times considered the most important aspect of the built environment cause people are on average 6 feet tall and our means for interaction is vertically limited. There are two options for this thesis in regards to the ground floor. The first is to do nothing different than simply having the module meet the sidewalk. Yet, this relationship is not very accommodating for defensibility, as Oscar Newman would point out, because there is not semi-public buffer space. Thus, if the module meets the sidewalk, business or community rooms would be appropriate to occupy the ground floor. That is why in Figure 58 the live/work units are on the ground floor for the East and South Bar Buildings. The other option is to create a buffer space of at least 3 feet in the vertical direction to help separate the privacy of the unit from the publicity of the street. The North and East Building Bars do so with 6-step stoops leading into the bottom floor of the module. By elevating the module 3 – 4 feet, the garage below is revealed just a little on the sidewalk. The dynamic relationship of this rich variety at the ground floor could strengthen the options for the built environment.

Lessons Learned

This experience really provided lessons in managing the pace and process of the project. To be able to spend the majority of time designing and trying to resolve a single piece within the greater whole can trap the Architect into a linear design process. It also can breed emotional attachment to the idea which skews objectivity. All in all, designing one thing in similar scale can be a “black whole” of designing. Moving back and forth between scales and designing in different mediums is a value that was stressed during the undergraduate years. But, when the entire pace of a project is solely dependent on the student, as is the case for thesis students, this trap hides itself. One of the lessons learned is the importance of a good outline for phased completion.

The importance of realizing a clear design and its relationship to its site context did not seem to be as important as the strength of the module’s planning. The ideas of detail and of the building’s relationship to the city were not demonstrated for some time. At the formal review with the guest critics, Julie Ju-Youn Kim from the University of Detroit Mercy stressed the value of a theoretical idea being tested in context because its relationship to the built environment and its relationship to people is the only way to understand the idea. In the foreword of this document, there is a description of the University of Maryland’s LEAFHouse project and the importance of the Architect to be on the construction site was greatly stressed because it is the belief of this thesis that not until the building is built does the Architect and user ever truly understand the building. This value was lost in the midst of this exploration otherwise there would have been much more emphasis on the realization of the building. We live in the built environment and that is the only way in which we understand our ideas and intentions.

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