Repairing the suburban metropolis: Introducing varied housing typologies into the suburban city model

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REPAIRING THE SUBURBAN METROPOLIS:
INTRODUCING VARIED HOUSING
TYPOLOGIES INTO THE
SUBURBAN CITY
MODEL

by

Randy L Barnes

Bachelor of Science
University of Nevada, Las Vegas
1995

A thesis submitted in partial fulfillment
of the requirements for the degree of

Master of Architecture

College of Architecture
University of Nevada Las Vegas
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Reparing the Suburban Metropolis: Introducing Varied Housing Typologies Into The Suburban City Model

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ABSTRACT

Repairing the Suburban Metropolis:
introducing Varied Housing
Typologies Into the
Suburban City
Model

by

Randy Barnes

Mr. Richard Beckman, Examination Committee Chair
Professor of Architecture
University of Nevada, Las Vegas

Suburban cities are renowned for containing a limited range of housing
typologies, specifically the single family house and the apartment. This thesis
examines the varied groups whose needs are not served by the housing types
offered in the suburban model as well as the role that typical suburban housing
has had in shaping the suburban city model. Included are design solutions for
introducing varied housing typologies into an existing suburban city, schematic plans for implementing mass transit, a reorganization plan for zoning layouts and a financial analysis for implementing specific housing modifications.
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Most importantly, all that I have done is for the benefit and future of my daughter Rayana. May she know greater success and happiness than I.
INTRODUCTION

This thesis is a critical examination of the history and current condition of housing typology within the suburban city planning model. It discusses current criticisms; presents established ideas concerning the model; and offers methods and examples for modifying chosen samples within a suburban city, for the purpose of providing a wide spectrum of housing types to serve the needs of a varied and dynamic population.

Evolution of the Suburbs

Since just before the 1900's, and possibly earlier than that, the suburban model has grown to be the dominant city planning model used in the United States today. Following the advent of the train as a daily mode of transportation, wealthy Americans, and soon after, the middle class, discovered the possibility of living outside the city without entirely giving up the benefits of city life. The train gave those who could afford it a means to live in the open countryside while traveling daily to the city, where employment opportunities and cultural facilities tended to concentrate. Cities at that time were generally cramped and polluted.
due to the rapid growth of industrialized society. The ability to live away from those conditions was widely considered desirable. "Suburbs turned American cities inside out... For most of history, being well-to-do had carried the privilege of living near a city's center... By the 1890's being well-to-do offered the reverse privilege - a chance to commute to the city center from some district farther out than most...." ¹

Just as Henry Ford had made the automobile accessible to the mass public, mail order houses, developers of land tracts, the suburban trolley and the automobile made living away from the city accessible as well. The use of the automobile increased drastically between the periods of 1910 and 1930. The number of automobiles in the United States numbered roughly two hundred thousand in 1910 to nearly twenty-three million in 1930. This surge in automobile usage had effectively put the trolley out of business. ²

**Government Involvement**

In 1933 the federal government formed the Federal Housing Authority which provided mortgage insurance and greatly increased the availability of loans for housing. Soon after World War II, the Veterans Administration assisted in easing the qualifications required for veterans attempting to purchase a house. This resulted in a great boom within the single family housing industry and the consequent explosion in suburban development. 1946 saw a large surge
in level of housing construction, mostly to accommodate soldiers returning from World War II. This housing boom continued for the next forty years. 

Since that time the federal government has subsidized three agencies which support home mortgages. The Federal National Mortgage Association purchases low rate mortgages from lenders at times when interest rates are rising, in order to reduce the risk of lenders. It specializes in FHA and VA insured loans. The Government National Mortgage Association guarantees mortgages and mortgage payments to lenders. The Federal Home Loan Mortgage Corporation also purchases low rate mortgages but it specializes in conventional loans as opposed to FHA and VA backed loans. Each of these agencies supports lenders in an effort to make home loans available to borrowers.

Assisting in the rapid growth of the suburban model was again, the federal government via their support of expanding transportation infrastructure. However the majority of this funding was aimed at the automobile through roads and interstate highways. 1956 brought the construction of a 42,500 mile interstate highway system, directed by the Federal Highway Act and financed by the nation's taxes. These highways sped the decentralization of urban cities and the growth of suburbs. This growth of suburbs demanded an expanded infrastructure to support it, even those residing in urban areas who would never benefit from it. Once such large amounts of funds had been expended on highways and roads many cities found it difficult to support public transit.
Urban Abandonment

The 1960's and 1980's brought two other dramatic changes in the nature of cities, the migration of the city's urban elements and their employees to the suburbs, described by Robert Cervero as second and third waves of suburbanization. The first wave had consisted of middle and upper income residents moving to the cities' outskirts, this wave continued throughout the 1900's. The second wave lasted through the three decades following World War II as commercial and industrial activities followed. The third wave consists of the workers supporting the elements of the second wave. Today workers don't travel from the suburbs to work each day, the suburbs have become the destination and they include all of the ills which accompany a city, most prominently traffic congestion.

The American Dream

Central to development of the suburban model and the single family detached house is the "American Dream", that idealized vision of each family with their own house on their own plot of land. Early in American history this plot of land was seen as a small farm, but one can look around suburbia today and see how that plot has shrunk as the house has expanded. "Dream houses got
out of control economically, environmentally and socially because they carried unacknowledged costs; they required large amounts of energy consumption; they demanded a great deal of unpaid female labor; they were often unavailable to minorities; and eventually they overwhelmed the institutions that had traditionally financed them." 7

The Current Condition

Today the suburban city model is unarguably the dominant model used in the United States, if not the world. However this model is largely responsible for producing a society with little social interaction, congestion which is at least as bad as that of industrialized cities and difficult access to urban elements. It is a model which consumes a disperportionate amount of its citizens' financial resources in housing and transportation alone.

Within this thesis chapter one will discuss the characteristics and criticisms of the contemporary suburban model. It also compares those criticisms to a selected sample within the Western United States. Chapter two presents the history of the single family house and compares these thoughts on the modern single family house as well as comparing these thoughts to the selected sample. Chapters three and four discuss multi-family buildings and non-residential buildings in the same manner as chapter two. Chapter five provides a schematic plan for re-orienting the urban elements of the city, i.e. office space, retail,
schools etc. Chapters six, seven and eight discuss methods of modifying the building typologies discussed in chapters two, three and four. Chapter nine then discuss financial feasibility and methods for implementing the modifications discussed in chapters five through eight.
ENDNOTES


2Ibid., 18.

3Wentling, James, Designing a Place Called Home (New York: Chapman & Hall, 1995), 23.

4Ibid.

5Hayden, Dolores, Redesigning the American Dream (New York: WW Norton & Co., 1984), 47.

6Cervero, Robert, America’s Suburban Centers (Boston: Unwin Hyman, 1989), 4.
CHAPTER 1

THE SUBURBAN MODEL

Physical Properties

The suburban model is typified by a homogeneously dispersed field of urban elements (figure 1), a condition referred to as a dispersed metropolis. Movement throughout the city is via a modified grid of arterial streets, normally based on a one mile interval, from 75 to 100 feet in width and often bordered by sidewalks 4 feet (figure 2). Arterials are usually joined by two or more perpendicularly oriented connector streets of 55 to 70 feet in width, which many times continue for several miles, forming a secondary system of arterial streets. Finally the connector streets are intersected by various collector streets which complete the movement system within the overlying grid. Collector streets typically vary from 35 to 50 feet in width, again with 4 foot sidewalks. In most of the suburban models collector streets serve as access to residences, and are faced by the garage doors of single family houses or the parking spaces for apartments.
Figure 1 Dispersed Metropolis

Figure 2 View of a typical Suburban Arterial Street
This gridiron pattern is a result of the speed and ease of its layout and the level of planning flexibility which it provides. The pattern is somewhat of a paradox, it implies an unending expandability while at the same time reinforcing a sense of street life and form. Commonly, collector streets serving residences are curved in various directions or end in cul-de-sacs, in an attempt to create a reduction in visual length. While curved streets can create a sense of smallness in the face of wide sprawl "...the curving cul-de-sacs of suburbia often create sameness from forced variation." 

In most cases throughout the suburban city model its urban facilities are found facing arterial streets as well as connector streets. On occasion one will find urban elements on collector streets, most commonly in industrial parks or office parks which are fairly evenly dispersed throughout the city. Quite often the suburban model contains one condensed corridor of commercial and public facilities. Where it occurs, this corridor is usually considered the downtown area and contains the larger civic buildings as well as high rise office buildings.

Problems with the Suburban Model

San Francisco urban planner Peter Calthorpe has identified the following five problems with the suburban model when compared to higher density planning:

1. It devours vast amounts of rural land.
2. It squanders energy.
3. It wastes people's time.
4. It is homogenous and intolerant of diversity.
5. It fails to provide public spaces for personal contact.

In addition to Calthorpe's criticism of the suburban model, a study done by the Real Estate Research Corporation in 1992 drew the conclusion that high density planning is less expensive than suburban. The study listed the following results (the exact specifications of high density planning were not discussed):

1. The cost of roads, utilities and other infrastructure is 50% less in high density planning.
2. Half as much land is required for high density cities.
3. Air pollution is half as much in high density cities.
4. Energy consumption is lower in high density cities.
5. Fewer traffic accidents occur in high density cities.

The contemporary suburban city has been further criticized by several architects and urban planners including Sim Van der Ryn who expressed the following concerns about the suburban pattern:

"It is a pattern that began with the large scale development in the years following World War II of single-family housing on large tracts of raw land, and since has extended to the creation of an entire auto-centered way of life, whose key physical elements include 'the strip,' the shopping center, the workplace, and entertainment, all woven together along a horizontal grid. The newer suburban pattern is different from [the older] urban pattern in the sense that it is a suburban city and includes all the functions of a city arrayed on an auto-linked grid."

Zoning and Accessibility

The suburban model is typically divided into zones of uses.
Simplified, these zones are: institutional, residential, office, commercial and industrial. "The two elements of the suburban pattern that cause the greatest problem are the extreme separation of uses and the vast distances between things." 7 People tend to equate stress with lack of time to accomplish tasks, however it is usually the inconvenient distances between destinations which devour precious time. 8 This distancing of destinations tends to alienate several groups of residents including children, elderly and homemakers (although today nearly 70% of all two parent households contain two wage earners). 9 Simply put, it alienates those without an automobile at their disposal.

"Our cities and communities are zoned black and white, private or public, my space or nobody's space. The auto destroys the joys of urban streets, the shopping center destroys neighborhood stores, and depersonalization of public space grows... private space is strained by the physical needs to provide for many activities which were once shared, and is further burdened by needs to create some identity in a surrounding sea of monotony." 10

The lack of accessibility as a result of single use zoning has been noted as a contributing cause of several social woes including youth violence and vandalism. Due to a lack of public spaces and activities and the ability to reach them juveniles often experience group isolation and boredom. Television and video games soon lose their luster as entertainers, often replaced by juvenile vandalism and violence. Early degeneration of the elderly is another woe of suburbanism. The elderly, who face the same lack of meeting spaces and means of transportation, often find themselves unable to venture into public spaces. Access to public spaces can be especially difficult for elderly women. In a recent
study Helena Lopez found that over fifty percent of elderly widows do not visit public spaces, eighty-two percent could not provide a means of transportation for themselves or others and forty-five percent had no method of transportation on which to rely. In addition suburban cities can be attributed to feminine isolation and stress. Homemakers lack accessible destinations for their children and consequently must spend time driving them. "Michele Rosaldo, a cultural anthropologist, argued that women's status is lowest in societies where women are most separated from public life." Due to the configuration of suburban house tracts and the houses built upon them, homemakers experience low levels of social interaction. Often, throughout history women have not shared as equal of an amount of the American dream as men. In the recent past white, males enjoyed the benefit of owning their suburban dream houses while the majority of their spouses suffered a life of unpaid labor as housewives and family caretakers. Typically women have been expected to serve as homemaker, even when they hold a full time job.

"Employed women often find themselves with two jobs: one at home, one at work. Pulled between unpaid work and paid work, women race from office or factory to home and back again. they know they have no time for themselves. They have to spend an inordinate amount of time simply struggling to get husbands or children to do a little more housework instead of leaving it all for Mom." As geographer Bonnie Lloyd points out, much of a female homemaker's work is supposedly status producing for her family, however this glorification of her household usually comes at the expense of her own personal status, an activity which leads to damaging personal conflict.
In addition to social woes, the practice of single use zoning can be attributed to many citizens' financial difficulties. Local governments often zone cities in a manner which keeps land values in certain areas higher than others. This sort of social gerrymandering limits housing for certain groups and keeps poorer residents in unwanted areas while reserving choice land for the wealthy.

**Transportation**

In the suburban model, access to necessary destinations such as one's workplace, shopping and school can be extremely difficult without an automobile. Though many suburban cities have public buses, and a very few do contain rail lines, the automobile remains the predominant form of transportation. "People everywhere are attracted to cars ... because they offer better transport services than does any other mode." Furthermore buses cannot be supported without subsidies if they lack a sufficient ridership. Two generations of Americans have aged in suburban cities where most individuals with adequate financial means own an automobile and consider buses second class transportation. Mass transit is almost unused in the suburban model due to low employment densities and large amounts of free parking. Describing the problems of car oriented cities, Peter Calthorpe states that:

"The corporate chain stores are remote, rarely invest in the community, and are highly fossil-fuel dependent: for auto access only. Twenty-four percent of the trips of the average family are for shopping, education, and recreational activities, and 15 percent are for services (bank, post office,
etc.) and personal business (dry cleaners, doctor, etc.).

Once one accepts the fact that automobile ownership is nearly mandatory, then the realization of the associated financial cost is quite disturbing. The average individual spends $6,360 per year, (based on a $15,000 vehicle financed over five years at 9% interest, fuel consumption of 60 gallons per month at $1.30 per gallon, maintenance costs of $500 per year, and insurance payments of $100 per month). This figure is per vehicle, most households support at least two and many times three.

The average suburban city dweller will spend 33 minutes traveling 11 miles, one way, to work each day, not including subsequent trips to lunch, stores and their children's school. An individual travelling in heavier daily traffic or greater distances would experience longer trip times. In 30 minutes the average human can walk 1.2 miles, bicycle 5.3 miles, travel by rail 7.8 miles (with frequent stops) or travel by rail 12.7 miles (with few stops). In the United States 86.5% of all daily commutes are by automobile, only 13.4% of these involve carpooling. 5.3% of daily commutes are by public transportation and 5.2% by other means. only 3% of the United States workforce does not travel to their workplace.

The unpopularity of the busing system is not undeserved. In a test of the efficiency of the Las Vegas bus system I found it more difficult than using an individual automobile. I attempted to travel from the central business area to a destination four miles to the east at 5:15 P.M. Including time spent waiting for a
bus this trip took 18 minutes. Consequently, while in San Francisco, California I took of a similar location, distance and time, this trip took 7 minutes. I found that the greater efficiency of the San Francisco bus system is due to several reasons:

1. The city is more compact. Roughly eight miles in width compared to the twenty to thirty miles of typical suburban models.
2. The greater density of the city allows for a greater number of patrons to be served along a given linear distance.
3. Finding parking space for an automobile is difficult and expensive. Because of this fact it is usually easier to use the bus system.
4. There is a much larger number of bus routes per square mile.

Even in the height of rush hour traffic the streets of San Francisco were less crowded with private automobiles than in Las Vegas, Phoenix or Los Angeles. The configuration of San Francisco is quite different. Sidewalks are commonly 12 to 20 feet in width even where the major streets grow to the moderate size of 40 feet, and those sidewalks are busy with human activity. Several factors contribute to this active street life. First, as discussed earlier, San Francisco has a well developed public transit system, and consequently automobile ownership is not a necessity. Second the sidewalks lead to accessible destinations such as shops, workplaces and public gathering spaces. Workplaces and shops are scattered throughout residential areas giving the city's inhabitants walkable destinations and opportunities for human interaction. San Francisco doesn't contain the openness of the suburban model, the density of the city is roughly 4,000 people per square mile compared to Las Vegas, Nevada which contains 2,700 people per square mile. San Francisco does however provide a wide...
choice of transportation modes, a well used and accessible series of public spaces and a comfortable mix of uses.

Although this thesis does not seek to contrast San Francisco and the suburban model, nor does it suggest modifying the suburban model to mimic San Francisco, it does use San Francisco as an alternative urban model.
ENDNOTES


3 Ibid., 4.

4 Ibid.

5 Ibid.

6 Van der Ryn, Sim and Peter Calthorpe, *Sustainable Communities*, (San Francisco: Sierra Club Books, 1986), 35.


10 Van der Ryn, Sim and Peter Calthorpe, *Sustainable Communities*, (San Francisco: Sierra Club Books, 1986), xiii.


12 Ibid., 50.

13 Ibid., 49.

14 Ibid., 50.

15 Ibid., 50.

16 Wentling, James, *Designing a Place Called Home*, (New York: Chapman & Hall, 1995), 35.


CHAPTER 2

SINGLE FAMILY HOUSES

The Dominance of the Single Family House

The most common housing type in the suburban city model is the single family house. In Las Vegas fifty-eight percent of all residences are single family houses. Of these houses: 13.4% contain one person households; 39.9% 2 persons; 20.1% 3 persons; 14.6% 4 persons; and 12% 5 or more persons. In 1995 75% of the total valuation of all new housing units was expended on single family houses. "The dominance of detached houses in our total housing stock was, and continues to be, unique in the modern world." 4

Evolution of the Suburban Single Family House

Early single family houses were pre-cut mail order houses (figure 3). These woodhouses were commonly 900 square feet and came without garages. At that time, lenders commonly required 20% or more down and for the land...
to be debt and lien free.
Families often purchased land first then borrowed money for the mail order garage, which they lived in until it was paid for. The mail order house was purchased only after the payment of the garage was complete. These mail order houses came in traditional, Americanized styles such as the Cape Cod, Four Square, Saltbox, or diluted classical and Federal styles, eventually referred to as bungalows. (figures 4, 5, 6 and 7) Mail order houses were traditional in configuration, small, efficient and popular. In its best year Alladin sold 3,600 houses.

Figure 3 Mail Order House (From The Comfortable House)

Figure 4 Cape Cod House (From The Comfortable House)

Figure 5 Four Square house (From The Comfortable House)
The suburban single family house reached a critical development point at Livittown in 1947 when Levitt & Sons broke ground for a development of 2,000 rental units. Levitt had taken advantage of the Federal Housing Authority's insured mortgage program which protected lenders from default. Levitt's notion was to create masses of cheap housing at very high rates of speed, and to sell residential land at low prices while holding the commercial land until the population rose. The commercial land was then sold at a high price. Levitt's practiced earned quite a high level of retained earnings. In an effort to cut building costs Levitt created several methods of efficiency: he bypassed union leadership and hired workers as subcontractors. The houses were built in modules of 4 feet by 8 feet in order to take advantage of sheetrock and plywood panel sizes and he used dimensional lumber sizes in an effort to reduce waste. Loads of precut or partly assembled materials were delivered directly to the site.
by rail, and he purchased hardware, appliances and pre-manufactured casework
directly from the manufacturer. In 1948 Levitt & Sons produced 150 houses per
week. "The speed of production was unprecedented. Contemporary
commentators compared the process to an automobile assembly in reverse." 6
When Levittown was complete Levitt had built 17,500 units and a quasi-city.
"Levittown had seven village greens with shops and services, nine swimming
pools and a community meeting hall, all provided by the builder." 7

When Levitt began his houses were simple Cape Cods of roughly 900
square feet, each house resting on 6000 square feet of land. At the end of this
project Levitt had introduced the ranch style, typically 1,100 square feet, figures
which appear small when compared to today's average single family house of
1,780 square feet. 8

Configuration and Siting

Most suburban cities in the U.S. have strict physical dimensions for siting
single family houses. The standards in Las Vegas are a 20 foot setback from the
street, 15 feet from the back property line and 5 feet from each side property
line. Corner lots require 10 to 15 feet from the street to the side of the house.
Typical suburban lots range from 50 feet by 80 feet, to 100 feet by 150 feet. The
latter size typically applies to custom or older houses, and the former is rapidly
shrinking as developers find that consumers, who may have dreamed of large
lots, will accept nearly any lot size offered as long as it rivals the status quo.

If we look at the configuration of a mail order house from the 1920's (figure 8) one can see how these houses were oriented to the street. Front porches were commonly provided at that time and tended to command a sizable portion of the facade while the front of the contemporary suburban house is dominated by the garage (figure 9).

However the popularity of dedicating the majority of the facade to the automobile cannot wholly be blamed for this change. Where the people of the early 1900's were a "front porch generation" modern Americans are a "living room generation". We receive the majority of our current event information from television and discuss it in the workplace. This is as opposed to the 1900's generation who received their information through radio and local community networks and discussed it on front porches, over fences and inside parlors. Some sociologists argue that local community networks are being replaced with virtual networks.

Figure 8 Plan of a mail order house (From The Comfortable House)
"According to subculture theory, such consequences [replacing the local community with non-place specific social worlds] results from the continued development of communications technology, which has enabled subcultures to form networks unfettered by physical proximity. Technology itself may contribute to a sense of isolation. As a result, it disrupts the traditional organizations based on proximity of residence."  

However this replacement of local community can also be attributed to the suburban model and its housing configuration.

Figure 9 A contemporary suburban house.
Housing Uses

Permitted uses within the suburban city model are almost completely restricted to single use types, specifically for residential zones, which can be used for little more than housing. Very restricted business functions are allowed, i.e. a transcriptionist or other limited services, provided that the house is not used to warehouse, and that customers or employees will not be arriving at the house. Entrepreneurs are required to find space outside of their home, located in commercial zones. Typically this results in leased office buildings at much higher costs.

San Francisco

San Francisco, California is a city which contains entirely different methods of street layout, land use planning, housing and building typology than that of the suburban city model. Lots in San Francisco are typically 25 feet in width and 120 feet in depth and many houses have front and side yards ranging from zero to 5 feet (figure 10). The common house is that of a box configuration, consisting of a base of 9 feet, a box of 12 to 35 feet and a roof of 6 feet (figure 11). The versatility of this model is in its flexibility and ease of adapting to changing uses. This typology quite commonly houses 1 to 3 families or mixtures of families and businesses. San Francisco has a much more liberal mixed use
zoning policy than the suburban city model. This policy results in a city which encourages density, diversity, walkability and streets used for public interaction. The houses are typically sized to use as much of the lot as possible, often the units are three stories in height, as opposed to the typical one or two story suburban model.

![Figure 10 Plan of a Victorian house (From Built For Change)](image1)

![Figure 11 Section of a Victorian house (From Built For Change)](image2)

The Automobile in the Suburban Model

Single family houses in the suburban model are designed to house the automobile. In fact most houses provide enough space for six automobiles; two in the garage, two in the driveway adjacent to the garage and two on the street. "You may have heard the saying that the average homeowner pays more to house his or her automobile than to house his or her children." 10 The average
size of a single car garage is roughly 200 square feet, where the average secondary bedroom is only 120 square feet. The garage has evolved from a carriage house at the rear of the house in pre-war (World War II) times to an integral portion of the house, consuming a majority of the front facade. However, architects today are promoting several alternative methods of addressing the issue of automobile housing including: parking courts; the return of alleys with rear accessed garages; and tandem garages (figure 12).

Figure 12 Plan of a house with a tandem garage (From Designing A Place Called Home)

The Cost of Housing

The median cost of a single family house in Las Vegas, Nevada is $135,000 with a probable monthly mortgage of $1,020 (based on 7.5% interest with 5% down, 10.5% tax, and insurance costs of 3.5%). The median yearly income of home owners in Las Vegas is $50,745. A nationwide survey in 1990
showed that nearly 40% of all households had an income of only 50% of that of
the area median. In Las Vegas the yearly household median income of all
residents is $36,710 resulting in a net monthly median income of $2,294
(based on 25% total deductions), meaning that 40% of its residents have a
monthly income of less than $1,147. Subtract the monthly mortgage of $1,020
and $530 for the automobile, and the wealthiest of these 40% would be left with
$-404 per month to live on. Based on these figures the American dream is
clearly beyond the reach of many.

Historically the suburban model is designed to house the nuclear family
with a medium income, in a single family house. Since the end of World War II
the Federal government, builders and lending institutions have concentrated
enormous amounts of capital for single family housing, despite demographic
shifts to smaller and varied types of households. As a result many households
considered as atypical face great difficulty finding housing which meets their
needs. In addition to lending practices the Federal governments offers
homeowners tax incentives in the form of deductible interest payments. From a
political standpoint this tax structure makes sense due to the fact that
homeowners tend to be more stable residents, due to the fact that they have
purchased an investment in the community, and thus more reliable voters than
renters. It is not surprising that our lawmakers design tax laws to favor those who
have the greatest potential to re-elect them.
The Need for Alternative Housing Typologies

Many social critics, architects and social advocates are calling for the development of a range of housing types for alternate user groups.

"Social structure has been changing rapidly,... the number of households composed of unattached individuals of one or both sexes has increased dramatically, as has the number of single parent households. Combined with a vast increase in the number of women in the workforce, a lower birth rate, and housing costs that have risen far more rapidly than real income, this is having a dramatic effect on housing patterns in the suburbs and elsewhere. Single parents band together to share childrearing, and singles find that they must share housing and use facilities cooperatively. All of these trends point to opportunities to redesign the suburban block patterns toward greater density of use and more adaptable housing forms." 16

Yet other critics define a multitude of user groups which require housing typologies beyond what the suburban model provides. Single people, male and female alike find difficulty in obtaining housing which offers the flexibility and complexity which they crave. The elderly often experience distress in striving to maintain larger households on fixed incomes. Single parents probably face some of the greatest difficulty in the absence of a support system including infant care, day care, after school care and public transportation for older children to be able to move about independently. All of this is in addition to the necessity for close proximity to shopping and other daily tasks. Life for the single parent is probably the most difficult in a city designed for a full time housewife. 17 Clearly there is a need and a market, in the suburban city model for introducing alternate housing typologies. The old and unilateral methods of designing housing require a fresh
perspective which can meet the needs of the diverse levels of the users of our cities.
ENDNOTES


2. Ibid.

3. Ibid., 52.


7. Ibid., 32.


16 Van der Ryn, Sim and Peter Calthorpe, Sustainable Communities (San Francisco: Sierra Club Books, 1986), 40.

CHAPTER 3

MULTI-UNIT BUILDINGS

Demographics

The second most plentiful building type in the suburban city model is the multi-residence apartment or condominium. This thesis makes no differentiation between apartments and condominiums since both typologies are nearly identical, the only difference being that apartments are typically rented while condominiums are owned. I will refer to multi-residence buildings as apartments and their inhabitants as renters. Statistics which are given in reference to renters include mobile homes, duplexes and others. In Las Vegas 42% of all households live in apartments. Of these 28.7% contain 1 person, 41.3% 2 persons, 14.1% 3 persons, 11.1% 4 person and 4.8% 5 or more persons. ¹

The Cost of Renting

If one considers the prevalent mindset of the American dream and the
ideal of owning one's own home, it becomes easy to believe that many residents of apartments would prefer owning their own home, even without the tax breaks homeowners receive on interest payments and property taxes. Most apartment residents are unable to acquire a house due to either inability to save the necessary down payment, or the inability to qualify for mortgage financing. It is also a common perception that buying a house will require a higher monthly payout, however the perceived higher monthly cost may be a false perception.

The average rent for a 900 square foot apartment in Las Vegas is $610. By comparison the monthly mortgage payment on a 1,100 square foot house would be $472.98. (Formula 3.1).

(3.1) 1. Median home price: $135,000.
2. Average square foot: 1,780.
3. $135,000/1,780 = $75.84 per square foot.
4. 900 x 75.84 = $68,258.43.
5. Down payment of 5% = $3,412.92.
6. $68,258.43 - $3,412.92 = $64,845.51.
7. Monthly payment @ 30 years, 7.5% = $453.41.
8. Tax deduction @ 33% deductibility = $1,565.14.
9. $1,565.14/12 = $130.43.
10. Monthly payment minus tax savings of the first 5 years, averaged: $453.41 - $130.43 = $322.98.
11. With average property tax and mortgage insurance of $150 per month: $322.98 + $150 = $472.98.

Once one has purchased a home, automobile insurance can be combined with the home insurer resulting in a savings of $20 per month (based on a 20% savings for homeowners on a yearly policy of $1,200). With all of these factors considered, the monthly cost of owning an 1,100 square foot house is $147 less per month than renting a 900 square foot apartment. As mentioned in the

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previous chapter the suburban city model, tax laws and fiscal zoning practices are structured to favor home owners over renters.

Users

Typical users of apartments tend to be retirees on fixed incomes, single parents, and young people both singles and couples. Some inhabitants may be those who own their units and use them as seasonal homes, but as discussed earlier most choose apartments due to lower initial cost and the inability to qualify for mortgages. In Las Vegas the average vacancy rate is 3.1%. Although Las Vegas is one of the fastest growing cities in the United States, such a low vacancy rate indicates a greater need for an affordable range of housing.

Configuration

Apartments in the suburban city model are commonly built in blocks of six to fifteen residences which are replicated and randomly placed around the site. As an example, (figure 13) the Aviara apartment complex is made of 23 blocks, each block is two stories in height and contains 8 residences. Each unit is bordered by parking on one side (which is then surrounded by a small, private street) and open lawn on the other three. The complex contains three primary
Figure 13 The Aviara apartment complex
common spaces: the interconnected open lawns, the two clubhouses and the two swimming pools. In a survey of this site the most commonly traveled path was from the street, to the parking spaces and then to the units. The second most traveled path was from each unit to the common mailbox area where residents found scant opportunities for interaction. The third most traveled path was from each unit to the swimming pool. (This survey was performed during the month of August, it is assumed that travel to the swimming pool will decrease considerably in the colder months.) Fourth was from the units to the clubhouses, more often the inner clubhouse. The least used space was that of the common lawn areas. Residents occasionally used the lawn areas for walking pets or travelling to the swimming pool. On rare instances I noticed children playing in them, but for the most part these spaces are unused.

Each of the apartment units are exposed on at least two sides, end units have three exposed sides. Each unit also has a small balcony or porch on one side. Much like the lawns, these balconies go unused. This lack of use can be attributed to several reasons:

1. They are small and tend to feel uncomfortable.
2. They are isolated, there is no path of travel across or through them.
3. One half of them open onto parking spaces creating an undesirable view, the other half open onto the lawns, but with little activity to observe.
4. The units lack sufficient storage space so many balconies are used for storage, even though this is forbidden by the rules of the complex. Ironically the balconies which face the lawns are most commonly used for storage.
One apparent problem facing this complex is accessibility. The complex is bordered by an arterial street to the north, a connector street to the west, a private street to the south and an automotive shop to the east. However the complex is nearly entirely surrounded by a six foot high concrete block and ornamented steel wall. Despite the units' close proximity to an arterial street lined with several stores and a strip mall, it is oriented inwards, focusing on the swimming pools and parking spaces. The units are separated from the street by the block wall and circulation in and out of the complex is via electronically regulated security gates which favor the automobile over pedestrians.

**Defensible Space in Suburbia**

This "gated community" is a prime example of the wall-dominated version of defensible space which is finding prominence in America. In an effort to reduce crime and unwanted elements these protective walls and regulated gates attempt to create a sense of security for the inhabitants of the complex. Recently many architectural theoreticians have argued that gated communities such as this create an architecture of fear rather than one of safety. These theoreticians contend that walls not only create a message of "keep out", but also messages such as "you're not wanted" and "you're not trusted." These themes may cause potential criminal elements to feel more inclined to enter the complex. From a physical standpoint the complex is not impenetrable and once a criminal has
entered, the walls provide an ample visual barrier between the units and viewers from the street, such as police, concerned residents or passers by.

Suburban apartment complexes do provide some opportunities for several user groups and functions due to their small size and close proximity to one another: Single parents, elderly on fixed incomes, young couples bachelors and bacheloretts, etc, as discussed earlier in this chapter, the greatest percentage of apartment residents are singles, alone or as roommates. The common orientation of apartments to streets makes them good candidates for alternate uses such as ground floor shops or offices, and their dense nature makes them good nominees for collective and co-operative housing.
ENDNOTES

1 1996 Las Vegas Perspective (University of Nevada Las Vegas), 8.

2 Ibid., 8.

3 Ibid.
CHAPTER 4

NON-RESIDENTIAL BUILDINGS

Description and History of the Strip Mall

The most common retail typology in the suburban model is the strip mall. Las Vegas contains over 100 such malls each comprising at least 100,000 square feet. The strip mall is typically a one story, "L" shaped building, or series of buildings housing several shops, etc. and "anchored" by a supermarket or other store offering a wide base of marketable goods. The supermarket is usually the largest store. It brings in large numbers of customers, of which the smaller shops then derive their customer base. Strip malls are often found at intersections of arterial streets due to their need for high visibility, easy automobile access and free advertising. In describing the evolution of strip malls Calthorpe and Van der Ryn state:

"The first malls sprang up around the new suburbs and were designed as a convenient central alternative to city shopping areas, which typically were congested, and difficult to park in. The malls quickly achieved success, eliminating long trips to the city, providing adequate parking and bringing together a wide enough selection of goods and services..."
Orientation

Strip malls are completely oriented towards the automobile. They use large signs, bright lights and high visibility as marketing tools. These malls are usually fronted by a sea of parking spaces. Enough parking space is provided for a 100% customer saturation rate of each store simultaneously, thus each customer has a designated parking space at each store resulting in a great surplus of parking at any given time. In discussing this parking issue Robert Cervero states that strip malls "...have in the range of 60-70% excess [parking] capacity." ³ The rear of the mall typically serves as an alley, used for the unloading of cargo from trucks.

Uses

Due to zoning regulations strip malls are used strictly for businesses, mostly stores, sometimes services and rarely as office space. However Calthorpe and Van der Ryn have suggested that strip mall uses can be expanded into a town center. "Our strategy is to turn the mall into precisely that: a town center. The commercial heart is there; what is lacking is housing improvement and a greater variety of activities to provide sufficient diversity." ⁴ Calthorpe and Van der Ryn go on to promote the opportunities for redesign due to the strip's low density and the typically high turnover of businesses. They
discuss several strategies for modifying the strip mall. The first encompasses access to shopping from the residence. This is accomplished by concentrating housing in blocks adjacent to strip malls and altering the alley of the strip mall into a front facade accessed by foot or bicycle. Thus reducing the need for large parking lots and allowing the reclamation of that space. A second method is a re-structuring of the single use strip mall into a mixed use center.\textsuperscript{5}

Since its creation, the strip mall has functioned as a single use facility. However the changing demands and demographics of American society require that such wasted use must be exploited to a fuller potential. This building type probably presents the most exciting possibilities for re-examination and re-design.
ENDNOTES

1. 1996 Las Vegas Perspective (University of Nevada Las Vegas), 68.

2. Van der Ryn, Sim and Peter Calthorpe, Sustainable Communities (San Francisco: Sierra Club Books, 1986),


4. Van der Ryn, Sim and Peter Calthorpe, Sustainable Communities (San Francisco: Sierra Club Books, 1986), 44.

5. Ibid., 43.
CHAPTER 5

MODIFYING THE SUBURBAN CITY MODEL

Goals of Modification

The content of this thesis is primarily the introduction of varied housing typologies into an existing suburban city. However during the course of examination it became evident that simply adding different housing types would not, on its own, be entirely feasible nor solve the ills of suburbia. My initial concerns were those of parking and access to urban facilities. In addition the use of the automobile as the dominant transportation method drastically affects the street and sidewalk character of a city. It is therefore my conclusion that the suburban city requires re-organizing as well as alternate methods of transportation. While this thesis does not propose a return to traditional core cities, nor the homogenous density of cities such as San Francisco and New York, it does propose that the suburban model can be modified in order to provide the following:

1. Public destination spaces which will foster human interaction.
2. Easily accessible urban facilities with a mix of uses.
3. Efficient public transportation with the automobile as an option rather than a necessity.
4. A wide variety of housing typology, density, affordability and location.

Other critics have expressed similar goals. In *Designing a Place Called Home*, James Wentling lists these six goals:

1. Mixed income and mixed density housing.
2. Pedestrian oriented streets and circulation systems.
3. Higher density housing with quality open space.
5. Integration of residential and commercial uses to reduce dependency on the automobile.
6. Environmentally responsible planning and design. ¹

In their book *Sustainable Cities*, Peter Calthorpe and Sim Van der Ryn propose eight basic principles for modifying suburban cities:

1. Utilizing residential densities greater than the suburban standard of six to ten dwellings per acre.
2. Locating everyday shopping and services so that people can meet their daily needs with greater convenience and less stress.
3. Building a local employment base within the community.
4. Devising information efficient and energy efficient building strategies.
5. Creating design that encourages the emergence of networks of local people to carry social responsibilities.
6. Providing local energy and food production within the community.
7. Recycling water and wastes.
8. Integrating community design with a transportation system that provides balances options. ²

Calthorpe and Van der Ryn go on to suggest modifications for the workplace and the suburban block. "The design of our workplace in the city will undergo radical transformations. Once the segregation of work and home is broken and the freeway link reduced, the form and criteria of the workplace will become part of
the neighborhood again." ³ "A first strategy is aimed at de-emphasizing the
ing the importance of the street. In the typical suburban block, much of the total land
area is wasted. Streets that serve only local traffic are usually oversized. The
use of narrower... streets also encourages the use of walking and bicycling
within the neighborhood." ⁴

City Organization

Due to the fact that urban planning was not the primary goal of this thesis,
I have developed only a schematic plan for reorganizing the city. The city
chosen for this exercise is that of Las Vegas, Nevada. The current population of
the metropolitan Las Vegas area is roughly 850,000. As a goal I selected a
target expansion to a population of five million and attempted to create a city
plan for that number without expanding the current boundaries of the city. The
city was divided into forty cores, each core roughly three miles in diameter and
containing 125,000 people (figure 14).

This method of modification is one sometimes referred to as a satellite
metropolis (figure 15) or polynucleated urban realm. (figure 16), ⁵ It is the
gathering of many of the city's urban facilities into strong cores and dispersed at
intervals. Each core would contain the urban facilities and services necessary
for daily activity, i.e. workplace, schools, shops, parks, etc. The cores are
typically dense at their center, slowly giving way to lower densities away from the
Figure 14 Schematic plan for the city of Las Vegas
center in a somewhat concentric manner. In this way a selection of housing typologies and variety of densities are offered. Mixed uses are allowed throughout the first two concentric areas surrounding the core except for the very outer rings which would be suburban, as we know it (figure 17). The actual results of re-organizing the city would not produce such sharp edges as shown in this diagram, however it is shown in this manner for clarity.

The size and configuration of each core was derived by dividing the population of the city by the current square footage of each building type (table 1). Deciding on the exact population for each housing group type was a somewhat difficult process since one cannot know what percentage of people wish to live in which area without extensive polling. Since such information was not the primary goal of this thesis, these percentages were assumed and are
Figure 17 Sample Core

REGIONS (from center)
1. PUBLIC & 30 DU/ACRE
2. 20 DU/ACRE
3. 15 DU/ACRE
4. 5 DU/ACRE
shown in table 1.

Table 1. Square Footage Required for a Three Mile Diameter Core with a population of 125,000 Persons.

<table>
<thead>
<tr>
<th>Category</th>
<th>% of Persons</th>
<th>Population</th>
<th>Square Footage</th>
<th>% of Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>N/A</td>
<td>N/A</td>
<td>7,500,000</td>
<td>3.81%</td>
</tr>
<tr>
<td>30 du/acre</td>
<td>12%</td>
<td>15,000</td>
<td>8,370,000</td>
<td>4.25%</td>
</tr>
<tr>
<td>20 du/acre</td>
<td>17%</td>
<td>21,250</td>
<td>17,786,250</td>
<td>9.03%</td>
</tr>
<tr>
<td>15 du/acre</td>
<td>48%</td>
<td>60,000</td>
<td>66,960,000</td>
<td>34.00%</td>
</tr>
<tr>
<td>5 du/acre</td>
<td>23%</td>
<td>28,750</td>
<td>96,312,500</td>
<td>48.90%</td>
</tr>
<tr>
<td>Totals</td>
<td>100%</td>
<td>125,000</td>
<td>196,928,750</td>
<td>99.98%</td>
</tr>
</tbody>
</table>

In this thesis I have chosen one core to develop (figure 17). In it most corners and several edges of the one mile grid are given over to commercial space. After modification most of these urban facilities have been gathered into the center in order to provide common, accessible destinations. Some urban facilities remain along street edges, in order to provide urban facilities within a walkable distance of housing units located away from the core. These facilities are presented in greater detail within chapter 7.

In this sample, as with most suburban models, the collector streets join to connector streets, which connect to arterial streets. Arterial and connector streets are straight and follow the grid, but collector streets are often curvilinear (figure 18). Although curvilinear streets provide a sense of protection, they tend
Figure 18 Existing street system in sample core

to prohibit accessibility. Many of the curved streets and cul-de-sacs in this sample are modified to create through streets which ultimately lead towards the core area (figure 17).
"Cul-de-sacs tend to form isolated pockets of houses... they do not work together to form a cohesive larger neighborhood. On cul-de-sac streets, a household is more likely to focus primarily on their immediate group of neighbors and have no reason to circulate to the next cul-de-sac. Through streets on the other hand, have continuity and connect to one another in a more comprehensive fabric, allowing more opportunities for social interaction." 

Once accessible street orientation is established, secondary public transit such as busses and shuttles becomes more efficient and greater mobility is provided.

**Transportation**

The cores are linked by two methods of public transit, a high speed rail (figure 19) and a slower surface rail (figure 20). I have proposed to use the existing freeway system as a route for the high speed rail as this would result in the least amount of disturbance to existing buildings. In other places, where freeways do not exist, the best manner would be to install underground rail systems (figure 21). Underground rails are probably the most expensive method but certainly not the only one available to city planners. The high speed rail system links 16 of the 40 cores, however each core is linked to at least three others by surface rail systems following existing streets on the one mile grid. Busses, or other smaller mass transit vehicles, fill in the remainder of each core's area, and run at 1/8 mile intervals on the street grid. In this fashion, citizens will have the option of using several methods of transportation, including the automobile.
Figure 19 High speed rail

Figure 20 Surface rail

Figure 21 Underground rail
Increasing Density

The rational for increasing density in the suburban model may be questioned as to its benefits but as discussed in the PhD dissertation of Majd, Al-Humoud titled *External Space Enclosure Affords Neighborhood Level Social Interaction*, "Increasing density tends to be associated with weak social bonds ... due to cognitive overload. However, Fischer and Haggerty suggest that density provides people with more choices for social contact." 6 Al-Humoud goes on to say that, "A neighborhood with houses close together and windows offering easy natural surveillance of the street, affords easy interactions. A neighborhood of spread single family homes does not afford interactions." 7 Jane Jacobs, in her book *The Death and Life of Great American Cities* spoke of the ability of dense cities to promote diversity, create a safe sidewalk life and support public facilities. Jacobs was also adamant that density alone would not be sufficient. She believed in a combination of density, (usually 10 to 20 dwelling units per acre) numerous streets, parks in lively spaces and a mix of residential and non-residential spaces.

In addition to its social benefits, density is necessary for the survival of public transit. In Las Vegas, where density is low, public transit consists only of busses, typically running on one mile intervals. Dense cities such as San Francisco contain light rail and trolleys in addition to busses and its busses run on 1/8 to 1/4 mile intervals, with much greater frequency.
Once the city's configuration and zoning plan have been changed to allow the type of development discussed in this chapter the likelihood of this plan evolving is high. Of course major organization within public entities is required to implement public transit systems as well as changes in the perspective of those who plan our cities. This thesis agrees with the thoughts of Jane Jacobs, those being that people want to interact and if included in a cohesive neighborhood fabric they will rely upon each other and in turn be reliable.
ENDNOTES

1Wentling, James, *Designing a Place Called Home* (New York: Chapman & Hall, 1995), 53.


8Wentling, James, *Designing a Place Called Home* (New York: Chapman & Hall, 1995), 65.
CHAPTER 6

MODIFYING SINGLE FAMILY HOUSES

Increasing Density and Diversity

In suburban cities, housing tends to low and long with large lots, but "Large lots do not help define a neighborhood. When individual houses are too far apart they cease to relate to one another." 1 Calthorpe and Van der Ryn argue in favor of adding units by owners who wish additional income or need housing for children and relatives. Modification of this type occurs frequently, although illegally, as homeowners renovate garages, basements and attics into occupiable rooms. 2

As noted in chapter 5, nearly 50% of all land area within each core will remain single family homes at 5 dwelling units per acre after modification. 34% of all land area will be converted into a density of 15 dwelling units per acre. I have developed several examples which convert existing single family homes into two or three units each.

Each of the houses in this sample (figure 17) contains an estimated
average of 4,250 square feet of unoccupied space (based on a total lot size of 6,500 square feet minus 1,750 square feet of house space), whether in the form of front, rear or side yards (figure 22). This thesis proposes using this space to create additional units in this unoccupied space. The uses of these additional units can house a variety of purposes, including:

1. Guest houses for those with frequent visitors.
2. Rental units for empty nesters of those requiring extra income.
3. Secondary units for elderly relatives or grown children who cannot afford their own houses.
4. Units which can be built and sold for a profit.

Figure 22 Single family house site before modification
In the case of each modified single family house a majority of the front yard is used to create living space while a portion is reserved for exterior privacy zones (figure 23). "Exterior [privacy] zones, including porches, decks, overhangs, decks, gates, etc. ... extend [the private home] to people outside the residential unit." ^ Exterior privacy zones also create defensible space which residents can inhabit while passively participating in neighborhood activities. Such passive participation creates, as Jane Jacobs argues in her book *The Death and Life of Great American Cities*, eyes on the street, those whom she refers to as the proprietors of the street. It is commonly thought that our generation is not a front porch generation, as were those before us. Largely due to the manner in which we receive and transmit information and communicate with one another. However one can only speculate whether or not front porches in our generation will or will not be used. It is the belief of this thesis that with the right environment, such as houses closer together with exterior privacy zones in visual contact with one another, wider sidewalks with pedestrian activity and streets less dominated by the automobile, front porches will be used and will create those eyes on the street so lauded by Jane Jacobs.

The next important element of modifying these units is the provision of flexibility. Housing types such as the San Francisco Victorian have proven to be not only economical in their use of space, but flexible as well. One may find their three stories used for dwelling, office or retail. Donald MacDonald has argued for houses with greater flexibility to provide for future changes of users.
Figure 23 Single family house site after modification

and uses. "People's homes should not be permanent and final. They should be flexible, they should be changeable..." The examples shown in figure 24 are based loosely on the Victorian box due to their efficient means for utilizing narrow lots. A 65 foot lot, when divided results in three lots of just over 21 feet
Figure 24 Single family house site showing floor plans

or two lots of 32.5 feet.

The specific site chosen for this exercise is six single family houses within the 15 dwelling units per acre region (figure 22) it can be found as site A in figure 14. Since the actual density rings will not be so precise as shown in figure

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17 four of the six existing units will be modified into three units each and two of the six existing units will be modified into two units each. All single family houses in the sample core are detached and rest on a minimum lot size of 65 feet in width by 100 feet in depth. Due to the difficulty of accurately surveying each of these units the units shown in this exercise or not those which actually exist in the site. Instead six typical units were taken from developer's newspaper advertisements and presented as existing houses. These examples are quite similar to what actually exists on the site.

Methods of Change

Three methods are presented in the modification. The first is the utilization of the large rear yard to add two units (figure 25). In this manner one side yard becomes a driveway for all three units. The existing two car garage becomes a portion of the existing unit's dwelling space and that garage is moved to the side to make use of the new driveway. Although the front yard is still very large a front porch is added to create a defensible zone much more pleasant than the previous.

Due to the narrow space, I have utilized the rational of the Victorian box in order to create the plan of the two new units. Each unit shares a common wall which creates the long portion of the house. The Victorian uses a stepped plan in order to allow light to pierce each room. These units poses the same stepped
plan, but also extends this idea into the buildings’ overall form. Each step suggests a new layer, these layers create a multitude of boundaries which then articulate themselves into a physical dialog between structure and skin, exterior and interior.

This method of adding units is by far the least obtrusive and possibly the least expensive, however the two added units do not communicate directly with the street. This situation may be pleasant or unpleasant depending on one’s perspective but the result is a new semi-public street with a quaint and comfortable relationship between it and the dwellings. This method is best for those who wish to build additional units for relatives, rent or for sale.

Method two is one of substantial intrusion (figure 26). In these cases the interior partitions are modified from very little to quite a bit in order to add one or two units. In each case the structural walls of the existing unit are maintained, though in some cases portions of stud walls are changed to post and beam in order to obtain openings. Each new unit is at least two stories and narrow and in each case the dwellings are brought much closer to the sidewalk in order to improve the relationship between the dwelling and the street.

The idea of such intrusion required a plan and form which reflected the violence of such an act, without creating a feeling of chaos. The plan of the new unit, and addition to the existing, are made up of piercing forms, wedges forcing their way. Yet because the idea of home is one of stability, the resulting form had to be one which felt sound and safe, thus the almost crystalline appearance of
the additions.

This method of modification seems most suitable for those who do not wish to own such a large home and can add additional units for rent or for sale as well as someone who buys a house, adds two and sells for a profit.

The third method is that of complete annialation. The existing unit is completely demolished and three units built in its place (figure 27). This method allows the most freedom for designing dwellings suitable to the changed city. The design of these units results from an attempt to explore the idea of contemporary home ownership. In the United States our system of government allows one to flow freely from state to state and houses have lost some of their meaning as icons of rooting oneself in a community. Houses tend to be viewed as investments rather than shelter and their owners as temporary occupants. The result was a form which reflected a loose connection between elements. The entire building appears to be separating yet evokes enough of a sense of connection to quell the fear of structural failure.

Although this may be the easiest modification method for changing the face of a neighborhood, it is simply not feasible to demolish every house, thus this example is only shown once on the site. This method of modification might be best suited to one wishing to speculate on the land value of a neighborhood.
Figure 25 Modification method 1
Figure 26 Modification method 2
Figure 27 Modification method 3

Each of these methods produces units which average roughly 1,500 square feet. A modest size in terms of modern suburban city houses but comfortable for residents of this semi-urban area. In this region the use of dwellings for retail and office space is allowed. One might consider this dangerous to the fabric of a residential area but the neighborhoods of a city, and in this case its individual cores, will evolve as the neighborhood sees fit. Some areas may become very residential while others become more commercial. The
most important aspect is to allow such change and not restrict it. Figure 28 indicates how such a neighborhood might appear after the suggested modifications.

One objective of this project is to modify the city in such a way that the daily use of the automobile becomes an option. However, even if daily commuting is possible without the automobile, some space will need to be provided for the following reasons:

1. Inhabitants should retain the freedom of choice between automobile and public transit
2. The automobile will make many types of trips more convenient, i.e. grocery shopping, carrying packages, etc.
3. Inhabitants will require automobiles for recreational and business trips away from the city.

For these reasons each housing unit is provided with at least one, and up to three parking spaces through a combination of off and on street parking.

Garages are provided in most of these units, however never with doors of more than one car width.
ENDNOTES

1Wentling, James, *Designing a Place Called Home* (New York: Chapman & Hall, 1995), 68.


CHAPTER 7

MODIFYING MULTI-UNIT BUILDINGS

Multi-unit buildings such as apartments are good candidates for creating diverse housing types. The example for modification in this thesis is the apartment complex presented in chapter three, the (figures 29 and 30) it can be found as site B in figure 14. It is located within the area which is scheduled for expansion to 20 dwelling units per acre. This exercise will target three user groups not provided for in the suburban model city: entrepreneurs, single parents and elderly.

A first step in modifying this complex is to increase access. I have removed the walls surrounding the complex to allow the edge buildings to access the sidewalk. A street is added at 1/8 mile from the top allowing the street system to continue through. Three additional entrances are provided in order to allow traffic flow at multiple points, as opposed to the two gated entrances which the complex currently holds.

Parking is currently perpendicular to the buildings and includes at least one covered parking space per unit, but parallel parking creates a less ominous barrier between livable space and street. The parking requirements for
Figure 29 Aviara apartment complex
this area are that of one space per unit, not including street parking. It is assumed that the user groups targeted in this example could live quite comfortably with one automobile due to their situations and the proximity to public transit. While a site of completely parallel parking may create a more comfortable zone between sidewalk and street it is not feasible due to the number of spaces required. Therefore perpendicular parking is maintained however it is changed somewhat to improve its visual impact. To begin covered parking is removed. Covered parking is a common amenity in apartment complexes however it is usually, and is in this case, provided via simple steel post and beam with roof deck and placed directly in front of the unit. These
structures are rarely integrated into the building design and tend to create a negative impact on the view to and from the units. Removal of these structures will improve the complex's streetscape and the transition of living space to street as well as increasing the ability to survey the street.

Secondly some landscaping at the edge of the sidewalk eases the transition between car and people space, as well as replacing the shade previously provided by the canopies. In addition it creates a clearer line of vision between units and the street.

Data on Existing Units

The units themselves are one and two bedroom units averaging about 950 square feet (figure 31). Although space planning is fairly well done, entry into the units leaves something to be desired. In addition to the apartment buildings this complex contains two offices and a clubhouse, shown as buildings A, B and C on figure 29. These buildings offer several amenities to the residents including a fitness center, a media room (wide screen television with theater-like seating) and a large kitchen. On the weekends (prime time use according to the management) I observed that the kitchen was used only on Sunday mornings, when the complex offered free pastries. The media room was half full on Saturday and Sunday, for roughly two to six hours when professional and collegiate sports were broadcast; and the fitness center was one third to one half
Figure 31 Aviara unit plans
Figure 32 Aviara complex after modification
full throughout each day. Due to the lack of patronage, the use of two buildings are changed. Building A remains the complex's office while building B becomes a daycare center and building C becomes leasable space.

**Entrepreneurial Units**

The first user group addressed in this exercise is what I have termed entrepreneurial. These are individuals or families who have their home sited directly above their workplace. These units can be found in the North half of buildings two and three, building four and to some extent in building one (figure 29). Buildings two and three have been modified using the existing buildings of the complex. The ground floor has been changed to retail or office space and space added such that it communicates directly with the sidewalk. The spaces are somewhat generic so that users may create whatever space is necessary to conduct their business. What was the second floor apartment is now the first floor of living space. Entrance into it comes directly from the commercial space below on some units and through separate stairways on others (figure 33). This first floor of living space includes most of those spaces considered semi-private, kitchens, living rooms, dining rooms, etc.. The third floor of the building is completely new construction and creates the second floor of living spaces. It
Figure 33 Plan of building 2
contains those spaces considered most private, bedrooms, study, etc. (figure 34). These units are somewhat large, averaging over 2,000 square feet.

The conversion of a purely residential building to one of retail and office as well required a series of forms which would articulate the overlapping and mingling of uses which this building would provide. The result is a group of expressive shapes not only overlapping spaces in relation to their use, but also stretching from unit to unit in a seemingly chaotic but actually cohesive manner. Figure 35 shows a rendering of how the street perspective of buildings one and two might feel to one passing by or patronizing the street level stores.

Building four is similar to buildings two and three except that this building is completely new. The arrangement of space is much the same although these units are slightly smaller at an average of 1,500 square feet (figures 36 and 37). The site was the primary denominator of this building, creating a form which is long and narrow. The plan of each unit is repetitive resulting in an expression of this near repetitiveness on the exterior. The only unit which is substantially different is the Northern-most unit. Consequently this end unit departs from the rest of the building both in its form and orientation.

Building one is similar to the entrepreneurial units discussed above, however this new building does not provide direct access between commercial and residential space. It is not designed specifically so that operators of businesses on the ground floor can live above, although that is possible, but so that residential space located on the second, third and fourth floors can be
obtained by those wishing to live in such a condition (figure 38). The units above are small, roughly 600 square feet each. They are meant for smaller households with fewer means such as single parents or bachelors, however these can function well for a variety of user groups not requiring large amounts of space (figure 39).

The individual units have only one exterior side each. Since there exist three separate spaces requiring access to natural light, two of those, the living room and one bedroom, are placed adjacent to the exterior wall. The second bedroom is located in the loft above the kitchen/dining area, thus allowing it access to light as well as an overview of the living room. The building itself is initially a reaction to the curving drive to the South. Its two uses suggested two distinct, yet slightly separate, curving forms which narrow as the drive meets the arterial street to the North.
Figure 34 Plan of building 2 unit
Figure 36 Plan of building 4
Figure 37 Plan of building 4 unit

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Figure 38 Plan of building 1
Figure 39 Plan of building 1 unit
Single Parent Units

The second user group targeted is that of single parents. As discussed earlier single parent households account for a large enough population to deserve consideration. In this exercise buildings five six and seven compile a group of buildings meant for single parent households (figure 29). These particular buildings were chosen for their proximity to the adjacent lawn and to the existing clubhouse, building B.

Figures 40 and 41 show the modifications made to the first and second stories. Each unit is expanded slightly such that it becomes a four bedroom unit with a shared kitchen and living/dining area. The entire unit comprises roughly 1,300 square feet. The added third story (figures 42 and 43) is similar in function however it adds a fair amount of common porch space and direct access to the lawn from each unit. These unit are comfortably small at 1,100 square feet each. A size which is meant to create a reasonable cost of rent to accommodate the typically struggling single parent.

Since the focal area of these buildings was the lawn, it became necessary for the added third story units to orient themselves towards this area as opposed to the existing units below which orient in opposite directions. A system was devised which would allow all of the new units access to the West side while providing entrance from both. This resulted in a plan which appears to be
straining towards the West side as each units endeavors to obtain a view. The overall form became almost a metaphor of parenthood as the East units produce a form suggesting some peculiar organism while the West units appear to be protected by it.

In addition to the use of the lawn for the single parent households the clubhouse is turned into a daycare center. In this manner single parents have not only reasonably priced and sized housing, the ability to share duties with other single parents, easy access to public transit and retail facilities, they also gain immediate access to daycare.
Figure 40 Plan of building 6 lower
Figure 41 Plan of building 6 lower unit
Figure 42 Plan of building 6 upper
Figure 43 Plan of building 6 upper unit
The last target user group is that of the elderly. It is common in our society to create entire buildings and even complexes which house the elderly. The failing of such buildings or complexes is that they tend to isolate the elderly from the rest of society. In this exercise building eight is reserved for the elderly. Many of the units are modified similar to those in figure 40 except that instead of adding two bedrooms I have added two entrances. In this manner two widows, widowers or other single elderly people can have the privacy of their own bed and bathroom, while sharing a common kitchen and dining/living room area. Two elevators are added to this building to ease vertical movement. After modification these units are not much different than the types of dwellings provided for the rest of society, however the important aspect is to allow elderly people the same access to public facilities and public life.

The remainder if the site is shown developed in figure 44. Only a few buildings have been developed in detail in order to display how existing buildings might be modified and new buildings constructed in order to provide housing types for groups of users currently unattended in the suburban model city.
Figure 44 Site Plan and Enlarged Model of Apartment complex after modification
CHAPTER 8

MODIFYING NON RESIDENTIAL BUILDINGS

As discussed in chapter four, non residential buildings provide an opportunity for conversion into a complex with a multitude of mixed uses. The type of non-residential building selected for modification in this exercise is the strip mall (figure 45). As a model for modifying this strip mall I have studied the mixed use building. It is an old and tried building typology, which is now rarely seen in the suburban model, although it is beginning to gain some recognition in revitalization uses. Mixed use buildings offer opportunities for the mingling of stores, restaurants, libraries, services, child care, office space and residential units. Although this typology was common in earlier American cities and Europe, the contemporary suburban city almost never contains such buildings. By arranging in close proximity, various commercial functions and residential space, mixed use buildings offer nearby destinations during lunch, shopping after work and other conveniences unknown in the suburban city model. In addition, upper floor residences offer an alternate housing type for those who wish to be close to the activity of a mixed use complex.
As mentioned in chapter four Calthorpe and Van der Ryn suggest that strip malls, due to their configuration and location, offer an excellent opportunity for modification into mixed use buildings. Strip malls are exclusively commercial, whereas mixed use buildings usually have commercial functions on their ground level combined with office space and residences above. By adding levels above existing strip malls and using surface parking space for infill one can easily modify a strip mall to serve as a mixed use complex. The site within the core for this exercise can be found in figure 14. It is the densest region of the core and very close to the high speed rail line.

One common aspect of the strip mall is its homogenous nature. This
homogeneity creates a certain flexibility, which permits a large variety of commercial activities to adapt and re-adapt to the space. It is quite common for businesses to change frequently and if one business fails it is relatively easy for that business to move out and another to move in. Although the suburban model has been criticized for its overall homogenous nature, this flexibility of building use is one of the more positive aspects. In this exercise, that homogeneity is maintained. Figure 46 shows the plan of the existing site. Figure 54 illustrates the modifications made to the original plan of the strip mall, additions are shown in a heavier line weight. The majority of its front facade in untouched except for the large blank wall at the supermarket. Previously this area contained a bank, photo lab, customer service and several other stores within the store. I have removed these spaces and changed that area into more retail space facing the sidewalk. In addition to this the back of the strip mall, previously only a loading zone is converted into more retail space and the loading area into a street. Space along the rear street's sidewalk is still reserved so that trucks may unload. Since most large deliveries occur in off peak hours the disturbance to sidewalk activity should be minimal.

The overall plan for this site is to change one story of retail to two stories of retail/office and three stories of mostly residential. Figure 48 shows a sectional diagram of the relationship between spaces.

In this exercise parking has been condensed into a central structure and parallel, on street spaces. The parking structure (building 1, figure 49) is
Figure 46 Site plan of strip mall.
Figure 47 Strip mall floor plan after modification
surrounded by commercial space on its first and second floors to limit its visual impact (figure 50). Due to the fact that this area is dense and in close proximity to major public transit nodes, parking requirements are set at 1/2 per housing unit and one per 1,000 square feet of commercial space.

Figure 48 Sectional diagram of mixed use complex

Co-Operative Units

Two user groups are targeted in this exercise, co-operative or co-housing households and bachelors. Co-operative and collective apartments were quite common in the Eastern United States in the nineteenth century. The Ansonia in New York, 1904 (figure 51) was described as an apartment hotel which offered services including food preparation, house cleaning, laundry.
Figure 49 Site plan of mixed use complex
service, dining rooms and automobile service. It also offered units which ranged from bachelor rooms to full family apartments. Although this particular building catered to the upper class it can be used as a model for collective or cooperative units. Such units could share or be provided amenities such as dining, cleaning, child care, entertainment space or satellite office space.

Figure 52 shows an example of co-housing in Stockholm, by John Ericsson. This particular building includes common dining, stores and child care facilities, as well as one and two bedroom apartments.

The co-operative housing building in this exercise is shown as building 2 in figure 49. It is a three story building containing 21 two and three bedroom households, averaging 1,000 square feet each (figure 53). Each unit has one family or living room for household gathering (figure 54), but such activities as dining and recreation occur in common areas, however each unit is provided
Figure 51 Ansonia building, New York 1904 (From American Architect and Building News, 1907)

with a small kitchenette. In addition the building provides a media room (television, movies, internet access, etc.) a library and a satellite office area with fax machines, copiers, computers and other shared items necessary for
Figure 52 Stockholm co-housing building (From New Households New Housing)

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Figure 53 Plan of co-operative building
Figure 54 Plan of co-operative unit
conducting business from the building (figure 53).

This co-operative building contains a considerate amount of shared space, not only interior space but exterior as well. It was decided that the building should provide two distinct edges where decks occurred. One is straight while the other concave. One provides a direct perspective and the other a panoramic one. The curved edge faces the mixed use complex and allows the viewer to catch a range of vistas. The act of co-housing is a highly cohesive and interdependent way of life. In an effort to capture this essence the building is solid in form, yet its supporting structure exposes itself and extends beyond the skin.

This particular building may be used in several ways. Residents may pool themselves as a workforce to provide cooking, maintenance, security, etc. Or they might act as a co-operative organization where dues or rent is used to purchase this labor. Amenities might go as far as providing housekeeping and laundry services. A shrewd co-operative organization might go as far as pooling dues for investment to ensure the longevity of the building and its inhabitants. Regardless of the means of operation this building type offers the choice of a living style atypical of the suburban model city.
Bachelor Flats

The second user group targeted in this exercise is that of bachelors and bacheloretts. These are people with no spouse or children, usually quite young who tend to spend less time at home than other households. The building can be found as building three in figure 49 and is one which I have termed bachelor flats. Bachelor flats is by no means a newly coined name. This housing type was popular during the late nineteenth century in the larger cities of the Eastern United States. At that time bachelors (I will use the term to encompass both sexes) were faced with the choices of hotels, which were expensive, and boarding houses, which lacked privacy. The building shown in this exercise (figure 55) is based on those of the nineteenth century bachelor flat.

The bachelor flat included in this thesis is a three story building made of 110 units. Each unit includes a bedroom, bathroom, living room and a very small kitchenette (figures 56 and 57). The smaller one-person units are 400 square feet while the larger two person units reach 600 square feet. These units faced the same problem of exterior exposure as building 1 in chapter 7, consequently a similar solution is presented. Each unit places the actual bedroom area in a loft over the restroom and kitchenette.

In addition to these units the building provides two dining rooms, a library, gym, media room, recreation room and laundry service. The operation of this building might vary, much like the co-operative building discussed above, such
that the dining rooms are at complete cost to the residents, or included as part of
the rent. And again the other facilities included in the building might operate in
several of various similar manners.

The concept of a building constructed for bachelors presents the image of
a dynamic environment, the building demanded a dynamic form to contribute to
this environment. Since circulation is such a strong element in this building I
began by extending those lines to the surface. Next I concentrated on the
contra-ventional nature of the building's eventual inhabitants and allowed their
variety to create a sense of order which would be subliminal rather than intuitive.

The remainder of the site is shown developed in figures 48 and 58,
however the two buildings described above are the only which are completely
designed. The accompanying buildings are suggested infill assembled in such a
manner as might complete the site. Figure 59 are illustrates how the site might
look from the street.
Figure 55 Plan of bachelor flats
CHAPTER 9

FINANCE AND FEASIBILITY

Methods of Change

Re-ordering the suburban model will of course require extensive reworking of zoning ordinances. Certainly large scale government involvement would be necessary to implement such projects as transit corridors and shuttle routes. Typically projects such as these would require funding through avenues such as bonds, and might ultimately become a voter issue. However such a project is certainly not impossible. If modifying strip malls and apartment buildings can be proven profitable the market may ultimately demand such improvements.

Modifying private residences poses quite an ominous task. Peer pressure can become a method of change, but its results are somewhat uncertain. Eminent domain can be used as a last resort, however such strong measures tend to destroy the grass roots effort that a movement such as this would require. It is possible that once zoning regulations are loosened, market demand
would force the necessary changes. Another possibility is a corporate or community coalition which could attempt to purchase properties of owners who are unwilling to change or entire neighborhoods for re-development.

Financial Analysis

In order for such a project as I have proposed to be considered it must first be proven that such an undertaking is financially feasible. For that reason I have conducted three financial analyses: The first is that of adding two units to a single family house. The second, modifying one of the apartment complex buildings proposed in chapter seven. The last is the construction of one of the buildings proposed for the strip mall as discussed in chapter eight. Estimates of construction cost and rental rates are not based upon the actual designs illustrated in the previous chapters but on regional averages based on the square footages of the buildings shown here. Post 1986 depreciation rules apply.

Addition to a Single Family Home

For this exercise I have chosen the home shown in figure 25 in which two units are added using the rear yard. The cost of construction is based upon a $50 per square foot cost. It is assumed that each unit will be rented at a price of
$0.65 per square foot, per month and that the original homeowner holds the mortgages. The total square feet of building is 2,400. Tables 2 through 6 illustrate the financial analysis.

Table 2. Calculation Data for an Addition to a Single Family Home.

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Table 3 Before Tax Cash Flows for an Addition to a Single Family Home

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Table 4 After Tax Cash Flows for an Addition to a Single Family Home

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<td>$19,433</td>
<td>$20,016</td>
</tr>
<tr>
<td><strong>DEPRECIATION</strong></td>
<td>$4,182</td>
<td>$4,364</td>
<td>$4,364</td>
<td>$4,364</td>
<td>$4,364</td>
</tr>
<tr>
<td><strong>INTEREST</strong></td>
<td>$7,980</td>
<td>$7,896</td>
<td>$7,805</td>
<td>$7,708</td>
<td>$7,605</td>
</tr>
<tr>
<td><strong>TAXABLE INCOME</strong></td>
<td>$5,622</td>
<td>$6,058</td>
<td>$6,698</td>
<td>$7,361</td>
<td>$8,047</td>
</tr>
<tr>
<td><strong>LOSS CARRIED FORWARD</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>NET CARRY FORWARD</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>NET TAXABLE INCOME</strong></td>
<td>$5,622</td>
<td>$6,058</td>
<td>$6,698</td>
<td>$7,361</td>
<td>$8,047</td>
</tr>
<tr>
<td><strong>TAX DUE</strong></td>
<td>$1,574</td>
<td>$1,696</td>
<td>$1,876</td>
<td>$2,061</td>
<td>$2,253</td>
</tr>
<tr>
<td><strong>BEFORE TAX CASH FLOW</strong></td>
<td>$8,597</td>
<td>$9,131</td>
<td>$9,680</td>
<td>$10,246</td>
<td>$10,829</td>
</tr>
<tr>
<td><strong>LESS TAX DUE</strong></td>
<td>$1,574</td>
<td>$1,696</td>
<td>$1,876</td>
<td>$2,061</td>
<td>$2,253</td>
</tr>
<tr>
<td><strong>AFTER-TAX CASH FLOW</strong></td>
<td>$7,023</td>
<td>$7,434</td>
<td>$7,805</td>
<td>$8,185</td>
<td>$8,576</td>
</tr>
<tr>
<td><strong>ACCUM DEPRECIATION</strong></td>
<td>$4,182</td>
<td>$8,545</td>
<td>$12,909</td>
<td>$17,273</td>
<td>$21,636</td>
</tr>
<tr>
<td><strong>BOOK VALUE</strong></td>
<td>$115,818</td>
<td>$111,455</td>
<td>$107,091</td>
<td>$102,727</td>
<td>$98,364</td>
</tr>
<tr>
<td><strong>RESALE PRICE</strong></td>
<td>$123,600</td>
<td>$127,308</td>
<td>$131,127</td>
<td>$135,061</td>
<td>$139,113</td>
</tr>
<tr>
<td><strong>LESS SELLING EXPENSE</strong></td>
<td>$6,180</td>
<td>$6,365</td>
<td>$6,556</td>
<td>$6,753</td>
<td>$6,956</td>
</tr>
<tr>
<td><strong>LESS MORT BALANCE</strong></td>
<td>$112,793</td>
<td>$111,502</td>
<td>$110,120</td>
<td>$108,642</td>
<td>$107,060</td>
</tr>
<tr>
<td><strong>LESS RECAP DEP</strong></td>
<td>$1,045</td>
<td>$2,136</td>
<td>$3,227</td>
<td>$4,318</td>
<td>$5,409</td>
</tr>
<tr>
<td><strong>LESS CAPITAL GAIN</strong></td>
<td>($516)</td>
<td>$189</td>
<td>$914</td>
<td>$1,662</td>
<td>$2,431</td>
</tr>
<tr>
<td><strong>RECAPTURE OF LOSS</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>AFTER-TAX SALE</strong></td>
<td>$4,097</td>
<td>$7,116</td>
<td>$10,309</td>
<td>$13,687</td>
<td>$17,257</td>
</tr>
</tbody>
</table>
### Table 5: Amortization of Loan for an Addition to a Single Family Home

<table>
<thead>
<tr>
<th>YEAR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEGINNING BALANCE</td>
<td>$114,000</td>
<td>$112,793</td>
<td>$111,502</td>
<td>$110,120</td>
<td>$108,642</td>
</tr>
<tr>
<td>PLUS INTEREST</td>
<td>$7,980</td>
<td>$7,896</td>
<td>$7,805</td>
<td>$7,708</td>
<td>$7,605</td>
</tr>
<tr>
<td>LESS PAYMENT</td>
<td>$9,187</td>
<td>$9,187</td>
<td>$9,187</td>
<td>$9,187</td>
<td>$9,187</td>
</tr>
<tr>
<td>ENDING BALANCE</td>
<td>$112,793</td>
<td>$111,502</td>
<td>$110,120</td>
<td>$108,642</td>
<td>$107,060</td>
</tr>
</tbody>
</table>

### Table 6: Valuation of an Addition to a Single Family Home

<table>
<thead>
<tr>
<th>DISCOUNT RATE 6%</th>
<th>YEAR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASH FLOW</td>
<td>$11,120</td>
<td>$14,550</td>
<td>$18,114</td>
<td>$21,872</td>
<td>$25,833</td>
<td></td>
</tr>
<tr>
<td>PRESENT VALUE</td>
<td>$10,491</td>
<td>$19,575</td>
<td>$28,481</td>
<td>$37,119</td>
<td>$45,582</td>
<td></td>
</tr>
<tr>
<td>IRR</td>
<td>85%</td>
<td>124%</td>
<td>128%</td>
<td>127%</td>
<td>125%</td>
<td></td>
</tr>
<tr>
<td>NET PRESENT VALUE</td>
<td>$4,491</td>
<td>$13,575</td>
<td>$22,451</td>
<td>$31,119</td>
<td>$39,582</td>
<td></td>
</tr>
</tbody>
</table>
Additions to an Apartment Complex

In this exercise I have taken building six (figure 32) of the apartment complex in chapter 7. The cost of modification to the lower units is assumed to be $55 per square foot and that total square footage is 1,632. The cost of adding the third story units is assumed to be $70 per square foot and that square footage is 6,215. Rents for the units are assumed to be $0.65 per square foot per month. Tables 7 through 11 illustrate the financial analysis.
Table 7 Calculation Data for Additions to an Apartment Complex

<table>
<thead>
<tr>
<th>PROJET COST:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND</td>
<td>$0</td>
</tr>
<tr>
<td>BUILDING</td>
<td>$524,810</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$524,810</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROJECT FINANCING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAN AMOUNT</td>
<td>$498,570</td>
</tr>
<tr>
<td>INTEREST RATE</td>
<td>8.00%</td>
</tr>
<tr>
<td>AMORTIZATION PERIOD</td>
<td>30</td>
</tr>
<tr>
<td>INITIAL EQUITY INVESTMENT</td>
<td>$26,241</td>
</tr>
<tr>
<td>HOLDING PERIOD: FIVE YEARS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPERATING DATA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS RENT - ONE YEAR</td>
<td>$61,207</td>
</tr>
<tr>
<td>VACANCY RATE</td>
<td></td>
</tr>
<tr>
<td>YEAR ONE</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR TWO</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR THREE</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR FOUR</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR FIVE</td>
<td>3.00%</td>
</tr>
<tr>
<td>OPERATING EXPENSE - YEAR ONE</td>
<td>$0</td>
</tr>
<tr>
<td>EXPENSE RATIO</td>
<td>7.50%</td>
</tr>
</tbody>
</table>

| GROWTH RATES                  |       |
| GROSS RENT                     | 3.00%  |
| OPERATING EXPENSE              | 3.00%  |

| RESALE ASSUMPTIONS            |       |
| GROWTH RATE IN RESALE PRICE   | 3.00%  |
| RESALE EXPENSE RATE           | 5.00%  |

| DEPRECIATION METHOD: RESIDENTIAL |       |
| INVESTOR'S MARGINAL TAX RATE    | 28.00% |
| INVESTOR'S EXCESS CAPITAL GAINS TAX RATE | 20.00% |
Table 8 Before Tax Cash Flows for Additions to an Apartment Complex

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS RENT</td>
<td>$61,207</td>
<td>$63,043</td>
<td>$64,934</td>
<td>$66,882</td>
<td>$68,889</td>
</tr>
<tr>
<td>VACANCY</td>
<td>$1,836</td>
<td>$1,891</td>
<td>$1,948</td>
<td>$2,006</td>
<td>$2,067</td>
</tr>
<tr>
<td>NET RENT</td>
<td>$59,370</td>
<td>$61,152</td>
<td>$62,986</td>
<td>$64,876</td>
<td>$66,822</td>
</tr>
<tr>
<td>OPERATING EXPENSES</td>
<td>$4,590</td>
<td>$4,728</td>
<td>$4,870</td>
<td>$5,016</td>
<td>$5,167</td>
</tr>
<tr>
<td>NET OPERATING INCOME</td>
<td>$54,780</td>
<td>$56,423</td>
<td>$58,116</td>
<td>$59,859</td>
<td>$61,655</td>
</tr>
<tr>
<td>MORTGAGE PAYMENT</td>
<td>$44,287</td>
<td>$44,287</td>
<td>$44,287</td>
<td>$44,287</td>
<td>$44,287</td>
</tr>
<tr>
<td>BEFORE TAX CASH FLOW</td>
<td>$10,493</td>
<td>$12,137</td>
<td>$13,829</td>
<td>$15,573</td>
<td>$17,369</td>
</tr>
<tr>
<td>DEBT COVERAGE</td>
<td>1.24</td>
<td>1.27</td>
<td>1.31</td>
<td>1.35</td>
<td>1.39</td>
</tr>
<tr>
<td>BREAK-EVEN OCCUPANCY</td>
<td>79.86%</td>
<td>77.75%</td>
<td>75.70%</td>
<td>73.72%</td>
<td>71.79%</td>
</tr>
<tr>
<td>OPERATING EXPENSE</td>
<td>7.50%</td>
<td>7.50%</td>
<td>7.50%</td>
<td>7.50%</td>
<td>7.50%</td>
</tr>
</tbody>
</table>
Table 9 After Tax Cash Flows for Additions to an Apartment Complex

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
<th>YEAR 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NET OPERATING INCOME</td>
<td>$54,780</td>
<td>$56,423</td>
<td>$58,116</td>
<td>$59,859</td>
<td>$61,655</td>
</tr>
<tr>
<td>DEPRECIATION</td>
<td>$18,289</td>
<td>$19,084</td>
<td>$19,084</td>
<td>$19,084</td>
<td>$19,084</td>
</tr>
<tr>
<td>INTEREST</td>
<td>$39,886</td>
<td>$39,533</td>
<td>$39,153</td>
<td>$38,743</td>
<td>$38,299</td>
</tr>
<tr>
<td>TAXABLE INCOME</td>
<td>($3,394)</td>
<td>($2,194)</td>
<td>($121)</td>
<td>$2,033</td>
<td>$4,272</td>
</tr>
<tr>
<td>LOSS CARRIED FORWARD</td>
<td>$3,394</td>
<td>$2,194</td>
<td>$121</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>NET CARRY FORWARD</td>
<td>$3,394</td>
<td>$5,589</td>
<td>$5,710</td>
<td>$3,677</td>
<td>$0</td>
</tr>
<tr>
<td>NET TAXABLE INCOME</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$595</td>
</tr>
<tr>
<td>TAX DUE</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$167</td>
</tr>
<tr>
<td>BEFORE TAX CASH FLOW</td>
<td>$10,493</td>
<td>$12,137</td>
<td>$13,829</td>
<td>$15,573</td>
<td>$17,369</td>
</tr>
<tr>
<td>LESS TAX DUE</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$167</td>
</tr>
<tr>
<td>AFTER-TAX CASH FLOW</td>
<td>$10,493</td>
<td>$12,137</td>
<td>$13,829</td>
<td>$15,573</td>
<td>$17,202</td>
</tr>
<tr>
<td>ACCUMULATED DEP</td>
<td>$18,289</td>
<td>$37,373</td>
<td>$56,457</td>
<td>$75,541</td>
<td>$94,625</td>
</tr>
<tr>
<td>BOOK VALUE</td>
<td>$506,521</td>
<td>$487,437</td>
<td>$468,353</td>
<td>$449,269</td>
<td>$430,185</td>
</tr>
<tr>
<td>RESALE PRICE</td>
<td>$540,554</td>
<td>$556,771</td>
<td>$573,474</td>
<td>$590,678</td>
<td>$608,399</td>
</tr>
<tr>
<td>LESS SELLING EXPENSE</td>
<td>$27,028</td>
<td>$27,839</td>
<td>$28,674</td>
<td>$29,534</td>
<td>$30,420</td>
</tr>
<tr>
<td>LESS MORTGAGE BALANCE</td>
<td>$494,168</td>
<td>$489,415</td>
<td>$484,282</td>
<td>$478,738</td>
<td>$472,750</td>
</tr>
<tr>
<td>LESS RECAP DEP</td>
<td>$4,572</td>
<td>$9,343</td>
<td>$14,114</td>
<td>$18,885</td>
<td>$23,656</td>
</tr>
<tr>
<td>LESS CAPITAL GAIN TAX</td>
<td>($2,257)</td>
<td>$824</td>
<td>$3,998</td>
<td>$7,267</td>
<td>$10,634</td>
</tr>
<tr>
<td>RECAP OF LOSS</td>
<td>$950</td>
<td>$1,565</td>
<td>$1,599</td>
<td>$1,030</td>
<td>$0</td>
</tr>
<tr>
<td>AFTER-TAX PROCEEDS</td>
<td>$17,993</td>
<td>$30,914</td>
<td>$44,005</td>
<td>$57,284</td>
<td>$70,939</td>
</tr>
</tbody>
</table>

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Table 10 Amortization of Loan for Additions to an Apartment Complex

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BEGINNING BALANCE</th>
<th>PLUS INTEREST</th>
<th>LESS PAYMENT</th>
<th>ENDING BALANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$498,570</td>
<td>$39,886</td>
<td>$44,287</td>
<td>$494,168</td>
</tr>
<tr>
<td>2</td>
<td>$494,168</td>
<td>$39,533</td>
<td>$44,287</td>
<td>$489,415</td>
</tr>
<tr>
<td>3</td>
<td>$489,415</td>
<td>$39,153</td>
<td>$44,287</td>
<td>$484,282</td>
</tr>
<tr>
<td>4</td>
<td>$484,282</td>
<td>$38,743</td>
<td>$44,287</td>
<td>$478,738</td>
</tr>
<tr>
<td>5</td>
<td>$478,738</td>
<td>$38,299</td>
<td>$44,287</td>
<td>$472,750</td>
</tr>
</tbody>
</table>

Table 11 Valuation of Additions to an Apartment Complex

<table>
<thead>
<tr>
<th>DISCOUNT RATE 8%</th>
<th>YEAR</th>
<th>CASH FLOW</th>
<th>PRESENT VALUE</th>
<th>IRR</th>
<th>NET PRESENT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>$28,486</td>
<td>$26,376</td>
<td>8.6%</td>
<td>$136</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>$43,051</td>
<td>$46,625</td>
<td>49.6%</td>
<td>$20,385</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>$57,834</td>
<td>$66,032</td>
<td>57.8%</td>
<td>$39,742</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$72,857</td>
<td>$84,651</td>
<td>58.9%</td>
<td>$58,411</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>$88,141</td>
<td>$102,533</td>
<td>58.4%</td>
<td>$76,292</td>
</tr>
</tbody>
</table>
Strip Mall Expansion

The building selected for this exercise is building 3 in figure 49, the bachelor flats. Cost of construction is assumed to be $79 per square foot and includes both the bachelor flats and one floor of retail space below. Rental rates for the bachelor flats are set at $0.65 for dwellings and $2.00 for retail space. Total square footage is 115,048. Tables 12 through 16 illustrate the financial analysis.
Table 12 Calculation Data for a Strip Mall Expansion

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT COST:</strong></td>
<td></td>
</tr>
<tr>
<td>LAND</td>
<td>$0</td>
</tr>
<tr>
<td>BUILDING</td>
<td>$9,111,802</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$9,111,802</td>
</tr>
<tr>
<td><strong>PROJECT FINANCING</strong></td>
<td></td>
</tr>
<tr>
<td>LOAN AMOUNT</td>
<td>$8,565,094</td>
</tr>
<tr>
<td>INTEREST RATE</td>
<td>10.00%</td>
</tr>
<tr>
<td>AMORTIZATION PERIOD</td>
<td>30</td>
</tr>
<tr>
<td>INITIAL EQUITY INVESTMENT</td>
<td>$546,708</td>
</tr>
<tr>
<td>HOLDING PERIOD: FIVE YEARS</td>
<td></td>
</tr>
<tr>
<td><strong>OPERATING DATA</strong></td>
<td></td>
</tr>
<tr>
<td>GROSS RENT - ONE YEAR</td>
<td>$1,300,833</td>
</tr>
<tr>
<td>VACANCY RATE</td>
<td></td>
</tr>
<tr>
<td>YEAR ONE</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR TWO</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR THREE</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR FOUR</td>
<td>3.00%</td>
</tr>
<tr>
<td>YEAR FIVE</td>
<td>3.00%</td>
</tr>
<tr>
<td>OPERATING EXPENSE - YEAR ONE</td>
<td>$0</td>
</tr>
<tr>
<td>EXPENSE RATIO</td>
<td>15.00%</td>
</tr>
<tr>
<td><strong>GROWTH RATES</strong></td>
<td></td>
</tr>
<tr>
<td>GROSS RENT</td>
<td>3.00%</td>
</tr>
<tr>
<td>OPERATING EXPENSE</td>
<td>3.00%</td>
</tr>
<tr>
<td><strong>RESALE ASSUMPTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>GROWTH RATE IN RESALE PRICE</td>
<td>3.00%</td>
</tr>
<tr>
<td>RESALE EXPENSE RATE</td>
<td>5.00%</td>
</tr>
<tr>
<td><strong>DEPRECIATION METHOD:</strong></td>
<td>RESIDENTIAL</td>
</tr>
<tr>
<td>INVESTOR'S MARGINAL TAX RATE</td>
<td>28.00%</td>
</tr>
<tr>
<td>INVESTOR'S EXCESS CAPITAL GAINS TAX RATE</td>
<td>20.00%</td>
</tr>
</tbody>
</table>
Table 13 Before Tax Cash Flows for a Strip Mall Expansion, Dollar Amounts in Thousands

<table>
<thead>
<tr>
<th>YEAR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS RENT</td>
<td>$1,300</td>
<td>$1,339</td>
<td>$1,380</td>
<td>$1,421</td>
<td>$1,464</td>
</tr>
<tr>
<td>VACANCY</td>
<td>$39</td>
<td>$40</td>
<td>$41</td>
<td>$42</td>
<td>$43</td>
</tr>
<tr>
<td>NET RENT</td>
<td>$1,261</td>
<td>$1,299</td>
<td>$1,338</td>
<td>$1,378</td>
<td>$1,420</td>
</tr>
<tr>
<td>OPERATING EXP</td>
<td>$195</td>
<td>$200</td>
<td>$207</td>
<td>$213</td>
<td>$219</td>
</tr>
<tr>
<td>NET OP INCOME</td>
<td>$1,066</td>
<td>$1,098</td>
<td>$1,131</td>
<td>$1,165</td>
<td>$1,200</td>
</tr>
<tr>
<td>MORTGAGE PAY</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
</tr>
<tr>
<td>BEFORE TAX CASH</td>
<td>$158</td>
<td>$190</td>
<td>$223</td>
<td>$257</td>
<td>$291</td>
</tr>
<tr>
<td>DEBT COVERAGE</td>
<td>1.17</td>
<td>1.21</td>
<td>1.25</td>
<td>1.28</td>
<td>1.32</td>
</tr>
<tr>
<td>BREAK-EVEN OCC</td>
<td>84.85%</td>
<td>82.81%</td>
<td>80.84%</td>
<td>78.92%</td>
<td>77.06%</td>
</tr>
<tr>
<td>OPERATING EXP</td>
<td>15.00%</td>
<td>15.00%</td>
<td>15.00%</td>
<td>15.00%</td>
<td>15.00%</td>
</tr>
</tbody>
</table>
Table 14 After Tax Cash Flows for a Strip Mall Expansion, in Thousands

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NET OP INCOME</strong></td>
<td>$1,066</td>
<td>$1,098</td>
<td>$1,131</td>
<td>$1,165</td>
<td>$1,200</td>
</tr>
<tr>
<td><strong>DEPRECIATION</strong></td>
<td>$317</td>
<td>$331</td>
<td>$331</td>
<td>$331</td>
<td>$331</td>
</tr>
<tr>
<td><strong>INTEREST</strong></td>
<td>$856</td>
<td>$851</td>
<td>$845</td>
<td>$839</td>
<td>$832</td>
</tr>
<tr>
<td><strong>TAXABLE INCOME</strong></td>
<td>($107)</td>
<td>($83)</td>
<td>($45)</td>
<td>($5)</td>
<td>$36</td>
</tr>
<tr>
<td><strong>LOSS FORWARD</strong></td>
<td>$107</td>
<td>$83</td>
<td>$45</td>
<td>$5</td>
<td>$0</td>
</tr>
<tr>
<td><strong>NET FORWARD</strong></td>
<td>$107</td>
<td>$191</td>
<td>$236</td>
<td>$241</td>
<td>$204</td>
</tr>
<tr>
<td><strong>NET TAX INCOME</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TAX DUE</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>BEFORE TAX CASH</strong></td>
<td>$158</td>
<td>$190</td>
<td>$223</td>
<td>$257</td>
<td>$291</td>
</tr>
<tr>
<td><strong>LESS TAX DUE</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>AFTER-TAX CASH</strong></td>
<td>$158</td>
<td>$190</td>
<td>$223</td>
<td>$257</td>
<td>$291</td>
</tr>
<tr>
<td><strong>ACCUM DEP</strong></td>
<td>$317</td>
<td>$648</td>
<td>$980</td>
<td>$1,311</td>
<td>$1,642</td>
</tr>
<tr>
<td><strong>BOOK VALUE</strong></td>
<td>$8,794</td>
<td>$8,462</td>
<td>$8,131</td>
<td>$7,800</td>
<td>$7,468</td>
</tr>
<tr>
<td><strong>RESALE PRICE</strong></td>
<td>$9,385</td>
<td>$9,666</td>
<td>$9,956</td>
<td>$10,255</td>
<td>$10,563</td>
</tr>
<tr>
<td><strong>LESS SELLING EXP</strong></td>
<td>$469</td>
<td>$483</td>
<td>$497</td>
<td>$512</td>
<td>$528</td>
</tr>
<tr>
<td><strong>LESS MORT BAL</strong></td>
<td>$8,513</td>
<td>$8,455</td>
<td>$8,392</td>
<td>$8,323</td>
<td>$8,247</td>
</tr>
<tr>
<td><strong>LESS RECAPT DEP</strong></td>
<td>$79</td>
<td>$162</td>
<td>$245</td>
<td>$327</td>
<td>$410</td>
</tr>
<tr>
<td><strong>LESS CAP GAIN TAX</strong></td>
<td>($39)</td>
<td>$14</td>
<td>$69</td>
<td>$126</td>
<td>$184</td>
</tr>
<tr>
<td><strong>RECAP OF LOSS</strong></td>
<td>$30</td>
<td>$53</td>
<td>$66</td>
<td>$67</td>
<td>$57</td>
</tr>
<tr>
<td><strong>AFTER-TAX SALE</strong></td>
<td>$392</td>
<td>$604</td>
<td>$817</td>
<td>$1,032</td>
<td>$1,249</td>
</tr>
</tbody>
</table>
Table 15 Amortization of Loan for a Strip Mall Expansion, in Thousands

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEG BAL</td>
<td>$8,565</td>
<td>$8,513</td>
<td>$8,455</td>
<td>$8,392</td>
<td>$8,323</td>
</tr>
<tr>
<td>PLUS INTEREST</td>
<td>$856</td>
<td>$851</td>
<td>$845</td>
<td>$839</td>
<td>$832</td>
</tr>
<tr>
<td>LESS PAYMENT</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
<td>$908</td>
</tr>
<tr>
<td>ENDING BAL</td>
<td>$8,513</td>
<td>$8,455</td>
<td>$8,392</td>
<td>$8,323</td>
<td>$8,247</td>
</tr>
</tbody>
</table>

Table 16 Valuation of a Strip Mall Expansion, Dollar Amounts in Thousands

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCOUNT RATE 8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASH FLOW</td>
<td>$550</td>
<td>$794</td>
<td>$1,040</td>
<td>$1,289</td>
<td>$1,541</td>
</tr>
<tr>
<td>PRESENT VALUE</td>
<td>$510</td>
<td>$827</td>
<td>$1,135</td>
<td>$1,434</td>
<td>$1,724</td>
</tr>
<tr>
<td>IRR</td>
<td>0.8%</td>
<td>35.9%</td>
<td>44.4%</td>
<td>46.6%</td>
<td>46.9%</td>
</tr>
<tr>
<td>NET PRESENT VALUE</td>
<td>($36)</td>
<td>$281</td>
<td>$589</td>
<td>$887</td>
<td>$1,177</td>
</tr>
</tbody>
</table>
CONCLUSION

The changes proposed in this thesis are of a profound magnitude. After living most of my life in suburban cities, it is my sincerest hope that such a plan will one day be implemented. I do feel that the social climate for such changes is ripening as fossil fuels run low, road rage becomes common and cities around the world begin to sprawl endlessly.

One aspect of our changing world which frightens me, in its relation to cities, is the rapid advancement of technology. The time may soon come when we can carry out nearly every aspect of our live without leaving our home. It is even possible that virtual interaction could take the place of real interaction. As a race we must be careful how we develop our lives and our physical environment. The virtual threat could damage human interaction far more than suburban sprawl has.

Upon completing this document the reader will note that there are many points alluded to which have only been slightly addressed, or not discussed at all. It is my intention to continue the ideas begun here in a complete work which will encompass in greater detail, city planning, transit stations, buildings at the center of cores, etc. By the grace of God I hope to complete this work.
BIBLIOGRAPHY


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Thesis Title:
Repairing the Suburban Metropolis: Introducing Varied Housing Typologies Into the Suburban Model

Thesis Examination Committee:
Chairman, Mr. Richard Beckman, Master of Architecture, Urban Planning
Committee Member, Liza Hansen, Master of Architecture
Committee Member, Kevin Kemner, Master of Architecture
Graduate Faculty Representative, Dr. Terrence Clauretie, PhD
Economics