2013

A Sustainable Urban Village for the "Six Corners" & "Old Hill" Neighborhoods of Springfield, Massachusetts

Patricia O'flaherty

University of Massachusetts Amherst

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A SUSTAINABLE URBAN VILLAGE FOR THE “SIX CORNERS” & “OLD HILL” NEIGHBORHOODS OF SPRINGFIELD, MASSACHUSETTS

A Thesis Presented

by

PATRICIA O’FLAHERTY

Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of

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May 2013

Architecture and Design Program
Department of Art, Architecture, and Art History
A SUSTAINABLE URBAN VILLAGE FOR THE “SIX CORNERS” & “OLD HILL” NEIGHBORHOODS OF SPRINGFIELD, MASSACHUSETTS

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William T. Oedel
Chair, Department of Art, Architecture, and Art History
DEDICATION

This thesis is dedicated to the people of Springfield, Massachusetts.
ACKNOWLEDGMENTS

I would like to thank my professors, Kathleen Lugosch, Steve Schreiber, Ray Mann, Kerry Dietz, Max Page, and Skender Luarasi, who with their enormous patience and understanding enabled me to fulfill a lifelong dream of completing this degree.

I would be remiss if I did not also mention Professor David Dillon who was the first to offer his support and encouragement in this pursuit. Professor Dillon, I missed you on this journey.

My thanks, also, to my employer Eastern General Contractors, Inc. and its owners John and Lucille Murphy, and to my co-workers for their willingness to allow me the time to pursue this degree.

I could not have achieved this or any other dream without the unconditional love and support of my family. For that love and support, I am forever grateful.
ABSTRACT

A SUSTAINABLE URBAN VILLAGE FOR THE “SIX CORNERS” & “OLD HILL” NEIGHBORHOODS OF SPRINGFIELD, MASSACHUSETTS

MAY 2013

PATRICIA O’FLAHERTY, B.S.M.E. UNIVERSITY OF MASSACHUSETTS AMHERST
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Directed by: Professor Kathleen Lugosch

In the United States, traditional urban centers, particularly in the Northeast, have suffered from neglect, dilapidation, and the general decay of their built environments over the last 50-60 years. Corresponding with this on the social side are increased poverty, unemployment, crime, and the disruption of the family unit.

Our current knowledge of the disciplines of architecture and sustainability can be applied to a built solution that will yield a greater public good. Good design can improve the lives of people by creating homes, neighborhoods, and villages that are comfortable, secure, and sustainable for all of the activities that make life enjoyable.

Sustainability not only allows us to help save the planet and ourselves, but it also allows for the conservation of the limited resources that might be available to inner-city middle to low income populations. If a family’s or a city’s basic resources are drained by homes and buildings that perform poorly, there will be an impact on the overall quality of life and reduced possibilities for that family (or that city) to improve their standard of living.
Early on, in this process, I had thought about the Six Corners neighborhood of Springfield as a candidate for this design intervention. When an F3 tornado devastated the neighborhoods of Six Corners and Old Hill on June 1, 2011, the problem became clear and I decided to focus my attention on a particularly hard hit area on the border of the two neighborhoods, which has become the subject of this thesis.
PREFACE

As with most of us “would-be” architects, I had an interest in building design and construction from an early age. I was particularly fascinated by the wide range of houses in my hometown of Springfield, Massachusetts. Certainly, there was a great assortment of styles and sizes from the grand mansions of Maple Hill to the simple ranch houses of East Springfield and Sixteen Acres.

As the second of five children, I was glad to help my Dad, as we renovated our basement to add more rooms for a growing family and years later helping him renovate the kitchen, the bathroom, and a variety of other projects. It just seemed special that this place was ours and it seemed that it would always be there for us and we had to take care of it. Watching my Father work with his basic carpenter tools is perhaps what inspired my interest in architecture and building. I was particularly fascinated by home plans and I probably borrowed every book in the nearby neighborhood library that had anything to do with home design.

I have also had long-held interests in the areas of energy efficient design (sustainable design, as we know it today) and the design/construction of zero or minimal energy buildings. The reduction of energy demand is an important goal for our society. It is central to our ability to solve problems of global climate change, political, economic, and financial turmoil resulting from dwindling fossil fuel reserves, and the persistent problems of providing all people with clean air, clean water, food, shelter, education, and happiness.
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CHAPTER 1
BACKGROUND

Introduction

This thesis will explore the possibilities of creating a sustainable urban village in one of America’s inner cities. For this project, I will be studying the small inner city neighborhoods of “Six Corners” and “Old Hill” in the Western Massachusetts city of Springfield.

I will show how our current knowledge of the disciplines of architecture and sustainability can be applied toward a solution that will yield a greater public good. Foremost will be the effort to show how good design can improve the lives of the people by creating homes, villages, and neighborhoods that are comfortable, secure, and sustainable for all of the activities that make life enjoyable.

Can architecture provide this solution? Is the decay of the built environment at least partially responsible for social decay? Perhaps it is the other way around. I believe the former to have some significant level of cause on the latter. Today, the advent and embrace of modern sustainability allows for a new solution to the decline of traditional inner city neighborhoods.

Sustainability is a core issue for solving many problems. It is not that “sustainable” or “green” is just the catch phrase of the day. A home, a school, or any building that is low maintenance and has low energy costs will not deplete the resources of a family, the local school department, or that of a small business.
Additionally, the reduction of energy and material demands is an important goal for our society. It is central to our ability to solve problems of global climate change and of political, economic, and financial turmoil resulting from dwindling fossil fuel reserves. It will help us better address the persistent problems of providing all people with clean air, clean water, food, shelter, education, and happiness.

The problem of decay and failure in our larger cities is not a new one. It has been grappled with since antiquity as cities grew in size and density, attracting the poorer rural peoples with the promise of jobs and a better/easier life.

Urban blight and disinvestment are two of the most prominent challenges facing American cities. In the decades following World War II, urban centers that were once bustling with industry and commerce began to face severe economic decline. (Neighborhood Reinvestment Corp. 2005, 6)

The government unwittingly encouraged this flight and abandonment by promoting policies that encouraged the use of the automobile and the development of suburbia. As the working class increased their wealth, they sought homes in the “country” and businesses and jobs followed them out of the cities. Adding to the problem for the Northern cities was the relocation of industry and jobs to tax friendlier and non-union Southern states or foreign countries.

Because of this urban depopulation, many American cities found that the residents that remained were often low income and minority individuals who lacked the resources and
opportunities that enabled their suburban counterparts to maintain, care for, and expand their homes. (Neighborhood Reinvestment Corporation (U.S.) 2005; 6)

Decades of urban sprawl and lack luster investment have resulted in pockets of blight in some areas of Springfield. (Concordia Goody Clancy BNIM 23) Compounding these problems, in June 2011, an F31 tornado worsened the matter, by cutting a path of destruction through the struggling neighborhoods of Six Corners/Old Hill Neighborhoods. Through the Rebuild Springfield\(^2\) planning process, residents voiced their concerns about vacant and abandoned properties in these neighborhoods. Blighted structures and parcels also contribute to lowered property values and increased criminal activity. The lower property values have led to a lower tax base further stressing the city.

In these neighborhoods, there are several large parcels that used to contain homes, which are now vacant unused land. There are also hundreds of smaller parcels where homes once stood. “Encouraging infill development, expanding green space, building community gardens, merging lots together, selling land with a disposition to abutters, and

\(^1\) On the Fujita scale, an F3 tornado has wind speeds of 150-200 MPH and causes severe damage. The June 1, 2011 tornado cut a 37-mile path of destruction from Westfield to the Central MA town of Charlton. Three people were killed and hundreds of structures were destroyed.

\(^2\) Rebuild Springfield is an organization and a series of studies and community participation events that occurred after the June 1, 2011 tornado. For all the damage that the tornado caused, a wealth of information and ideas resulted from this process and it only remains to be seen if any of the hopes can be implemented.
providing residents and developers with meaningful redevelopment tools are all ways to turn vacant properties into sustaining properties.” (Concordia Goody Clancy BNIM 30)

How urban decay has been dealt with is a poignant story that we still struggle with even today. The problem of providing decent housing for the middle and lower income citizens of our nation does not have a singular or easy solution. Certainly, many issues must be studied to understand past attempts, past failures, and the relatively few success stories. It is a daunting challenge. Much needs to be understood about a great many subjects, if we are to understand how to design homes, villages, and cities that succeed at a human level.

Springfield, Massachusetts

Springfield has historically had the nickname “City of Homes”3, and as a youngster growing up in one of these homes, I felt special that, even though my parents were in a lower income bracket, they owned their own home. The benefits of privacy, clean and brightly lit spaces, a room of one’s own, and a lush green yard to play in were and are formative.

3 The nickname comes from the large variety of architecturally attractive homes in the city, but I also believe that it refers to the large numbers of single and two family homes that you would find in every neighborhood.
Today, if you drive through the city, there are still areas that remind me of that verdant childhood neighborhood, but increasingly urban blight is taking over the city.

There are many reasons for the city’s decline. Springfield is in a stressed state from economic hardship and dilapidation of the physical and social structure. The relationship between physical and social is not entirely understood but I think the volume of literature on the subject of urban renewal, new urbanism, and yes, even on utopian ideals would indicates that it is understood that healing either the physical or the social will enable some healing of the other.

The University of Massachusetts Amherst has a longstanding and valued relationship with Springfield. As a land-grant universities created by the Morrill act of 1862, UMASS Amherst by its charter exists to “serve the Commonwealth, to educate its citizens, to conduct research relevant to its needs, and to engage in public service to address its challenges.” It is the University’s mission to provide benefit to the people of Massachusetts and the campus at Amherst seeks to engage its neighbor to the South with ideas and solutions that help the people of Springfield. This thesis attempts to participate in that mission.
The History of Springfield Massachusetts

It is important to understand the various histories of a place where we are deciding to build. There are cultural, political, geographical, environmental, economic, and personal histories of each place that can have an impact on the site long after the events of these histories may have passed from view. The mere layout of the streets, homes, and businesses as they are today are a function of history. If we are to change these or adapt to them, we must understand them.

William Pynchon and a band of frontiersmen (Springfield was the frontier in the 17th century) came from Boston in 1636 to establish a fur trading and military outpost at the junction of the Agawam and Connecticut Rivers. Pynchon “bought” the land that now contains the towns of Agawam, West Springfield, Longmeadow, and the city of Springfield from the Native American tribes of Agawam. (History and Culture)

The location of the National Armory in Springfield during the early part of the 19th century would determine the future course of the city. The city initially had an agricultural economy, but when George Washington sited the new national armory on a prominent bluff overlooking the Connecticut River, the city’s path to industrialization was charted.

The Armory served both as a storehouse and as a manufacturer of weapons for the United States Government. At its founding, firearms production was a craft as intricate as watch making, and each firearm was a unique item. In the height of battle, however, it was found that these firearms were difficult to clean and repair and their uniqueness made
their parts non-interchangeable. With the invention of the turning lathe by Thomas Blanchard at the Armory, Springfield became harbinger of the industrial revolution in the U.S. and indeed in the world. Mass production of firearms created broad opportunities for smaller firms supporting the Armory and similar industries all along the Connecticut River.

In the 18th century, the power of the Connecticut River was further harnessed. Mills of all types were built and a skilled labor force was established in the city. The Hartford-Springfield valley became the silicon valley of its day. With a highly skilled workforce and the latest technology, the cities along the Connecticut River road the wave of the industrial revolution to great economic success.

In the 19th century, Springfield became a key railroad center. The city grew, and industries such as printing, machine manufacturing, insurance, and finance took hold and prospered. As affluence increased, it became a gracious city with a noted educational system and the grand mansions of Maple Hill and Hill-McKnight were built. (History and Culture)

In the early part of the 20th century, the knowledge core in the CT river valley centered on Springfield and nearby Hartford spawned countless other industries from the production of the first automobiles and motorcycles to a thriving aviation industry that exists to this day.

However, just as the high technology companies of the 1990’s road an information revolution to boom, both waves eventually crashed and the good times ebbed.
Following World War II, there was a proliferation of home building in the city as returning soldiers used the GI Bill to finance new homes. Most of the homes built in the city during the late 40’s and 50’s were single-family ranch or cape style as compared to the multi-family units that had been built before the war.

The late 20th century (1975-2000) saw the influx of new immigrant groups and exodus of white middle-class families to the suburbs. The proliferation of suburban shopping malls, the lack of downtown parking, and an increase in crime decimated the city’s core. By the late 1990’s, the city was suffering significant economic decline and these forces acted on the city’s housing and infrastructure to encourage dilapidation. (History of Springfield from "Springfield, MA - our Plural History.”. http://ourpluralhistory.stcc.edu/index.html and from Phaneuf)

Springfield still has the unique advantage of being at the nexus of New England. Its location at the intersection of principal rail lines and highways make it an excellent hub for commerce throughout New England and the Northeast. There is, in fact, located within Springfield and its surrounding towns a significant number of distribution hubs for major corporations and government agencies. It is also the location of major information and electrical power hubs.

Another key asset to the economy of Springfield is the so-called “Knowledge Corridor”, a dense grouping of Universities, Colleges, and Community Colleges stretching from Hartford, CT to Amherst, MA. These institutes of higher learning are accessible to the people of the Connecticut River valley and provide for a highly educated population.
The community colleges, in particular, have played a key role in providing skilled workers for the region’s industries.

When thinking “location, location, location”, Springfield should be doing much better than it is.

Figure 2 - The Location of Springfield in the Northeastern U.S.

Yet, the story of Springfield is not that much different from many other industrialized cities of the Northeastern United States. Cities of similar size and character such as Hartford, Albany, Buffalo, and Providence have suffered similar declines.
Springfield, Massachusetts is a small city of approximately 160,000 people in the western half of Massachusetts, about 90 miles west of Boston. Holyoke, Springfield’s neighbor to the north, a city of about 25% the size of Springfield has experienced many of the same problems as Springfield and will be looked at as well to analyze problems and solutions to urban renewal.

The Western Massachusetts cities of Springfield and Holyoke have both struggled for decades with ever-changing economies, demographics, and expectations for urban renewal. In both cities, much focus has been given to Main Street renewal and the creation of commercial and industrial opportunities.

In Holyoke, there has been some shifting of the focus to the housing problems of the city, yet in Springfield, new housing initiatives are absent. While there has been constant renovation of existing large projects such as the “Hollywood” and “Armory Commons” developments, life does not seem to have improved much in these neighborhoods. Crime, gangs, drug use, and frequent shootings, stabbings, and killings are prevalent in both areas. Renovation of existing block apartment buildings does not appear to dramatically change the lives of residents.

I have focused in on the “Six Corners/Old Hill” neighborhoods of Springfield as an area that seems as though it longs for someone to look at it and propose something new, something different. Certainly, there are strong neighborhood organizations that have long suffered with unrealized aspirations of turning this little node of the city back from
the brink. Funding is the problem. As Duany would say “Form Follows Funding”.

(Duany)

In our country, the idea of funding middle to low income housing is not popular these days. The taste for fairness and for helping one another (through the Government) has certainly been perverted by the right wing groups and their media. The surge in public housing redevelopment of the 90’s has fallen silent to the wars and insecurity issues of our current time. Billion-dollar bailouts for banks and Wall Street CEO’s and trillion-dollar wars leave nothing on the plate for equitable housing.

It is heartbreaking. As a construction cost estimator, I know what the trillions of never-ending war dollars could do in rebuilding our cities and infrastructure, and in providing decent homes for all. Politics remains a tripping point for our utopian schemes and it is perhaps the reason they are never fully realized. Yet we must persist, we most hope, and dream, and try to make not only our cities and towns, but also the whole global village, a better place to live.

**Rebuilding One Village at a Time**

Springfield has undertaken a significant program to reduce blight and neglect by either cleaning up or demolishing abandoned properties. In most cases, the properties demolished have been vacant for years and have serious water damage and/or structural problems. The city has been aggressively placing liens on tax delinquent properties, and then using the money recovered to further reduce blight. There is also a "clean and lien" component of the program which cleans abandoned vacant lots throughout the City with
the use of liens to help pay for it and to force delinquent property owners’ into compliance. Over the last few years;

- Nearly 1000 properties have been cleaned since the start of the program
- 14 properties are pending demolition
- Almost 100 buildings have been demolished since the start of the program

(Blight Reduction Program)

Unfortunately, there is no component of this program that involves renovating existing properties or building new homes to replace those lost. The lack of both private capital and government investment has yielded neighborhoods such as Six Corners and Old Hill that have seen no significant new housing construction or renovation in almost 40 years. (U.S. Census Bureau)

While the nickname “City of Homes” is amiable and welcoming, it is important to understand what makes up a city of homes. In reality, there is a hierarchal structure:

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City of Neighborhoods
/
Neighborhood of Villages
/
Village of Homes
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In order to rebuild the City of Homes, we need to start rebuilding at the primary level of the home and the village.
Springfield has a unique and special history as a residential city. Its compact business
district and the spines of commercial and industrial activity that fan out along the east-
west and north-south intersecting rail lines have created the basis for the residential
neighborhoods that exist today.

The development of these neighborhoods and of the homes within them have evolved
over time and with the ebb and flow of wealth within the city. It is perhaps the cyclical
nature of the Springfield economy that is responsible for the wide variety of homes that
we see in the city today.
CHAPTER 2

HOUSING AFFORDABILITY AND TYPOLOGIES

One of the reasons to propose such a project as this is that very little is happening to address the affordable (and decent) housing shortage that affect the people of Six Corners and Old Hill. If we journey a few miles into the suburbs of Springfield, even in the midst of the 2008-2011 housing recession, you will find housing being built and being sold.

In this same period, only 200 units of housing have been built in Six Corners/Old Hill 2005, 33 in Six Corners and 167 in Old Hill⁴. This is 1/3 the rate of new construction for the rest of Springfield and ¼ the rate of Hampden county. (US Census 2010 Data)

The affordability of home ownership in Springfield has suffered greatly over the past 10-20 years. An examination of the Springfield Assessors Information, over time, reveals that; in lower income areas, home ownership has decreased and ownership of properties by out of town or even out of state landlords has increased. While Springfield has always been more affordable than cities in Eastern Massachusetts, there has been a 20% drop in affordability between 1995-2005. (Duda) The housing problem in America and in Springfield disproportionately affects those with less than 30% of the median income and those who are in that income bracket in Springfield are disproportionately African

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⁴ The total for Old Hill contains portions of the neighborhood of Pine Point as the data is tracked by the shared zip code of 01109.
American, Hispanic, or the Elderly. (Duda 2) Ironically, the 2010 U.S. Census showed that of the roughly 60,000 housing units in Springfield, nearly 7,000 were vacant.

In other areas of the country, the solution to this problem has been to create mixed income developments such that those with higher incomes help subsidize the units for lower income families. In Springfield, there is such a perception of crime, drugs, gangs and shootings that it would be almost impossible to propose a mixed income development in these neighborhoods. “When you talk about mixed-income strategies …you really have to look at it on a neighborhood basis.” (Duda 38)

**Home Ownership or Rental**

Home ownership is the “American Dream.” Surveys show that most Americans (including lower income households) would rather own their own home than rent. Those that do rent (young adults and the elderly excluded) report that they rent out of necessity rather than by choice. It is common sense, backed by research, that home ownership is preferential for families. Owner occupied homes form the basis of neighborhood social networks, tend to have stable occupancy, provide security and stability for children, and are more often to be better taken care of (I would say loved) than rental housing. Home ownership can also foster financial responsibility, increases confidence, and generates wealth for the family. In a popular National Association of Realtors ad, the economic benefits to the family, local businesses and the community as a whole are touted. In surveys, people who own their own home consistently say they feel happier and more secure than those that rent. (Collins)
In a 1996 survey by Rossi and Weber, they found that among the many benefits of homeownership were:

- Homeowners Provide Continuity and Stability
- Homeowners Stay Longer
- Owners Are Happier and More Satisfied Than Renters
- Ownership Builds Confidence
- Homeowners Create
- Positive Environments for Raising Families
- Home Ownership Improves Neighborhoods
- Home Ownership Builds Wealth

(Rossi)

A study by the Syracuse Neighborhood Initiative found that neighborhoods that have a large proportion of rental properties also have greater problems with abandonment, code violations, and tax delinquencies. Boosting the rate of homeownership helps to stabilize neighborhoods. (Neighborhood Reinvestment Corporation 2000)

Only half of the housing units in Springfield are owner-occupied. In Six Corners, the percentage falls to 10% owner-occupied while Old Hill matches the 50% Springfield owner-occupied rate. There is a marked visual differentiation between the properties in Old Hill and Six Corners, with the properties in Six Corners demonstrating a higher state of disrepair and lack of property care. Turnover rates are also higher in Six Corners than in Old Hill with 60% of the residents having lived in Old Hill for 8 years or more while only 35% of the residents in Six Corners have lived in their units for more than 8 years. (U.S. Census Bureau)
The November 2011 newsletter of the Springfield Neighborhood Housing Services contained several articles about the “Dream of Home Ownership” and about “Moving from Section 8\(^5\) to Home Ownership”. Clearly home ownership is the desire of many in the community. (SNHS Feb-Nov 2011)

The anecdotal conclusion, supported by the recent Rebuild Springfield Study\(^6\), is that home ownership has a more stabilizing effect on a neighborhood than being a renter.

Not that we can discount renting as it is an important part of the housing cycle, especially for young adults, students, and the elderly. Yet for raising a family, home ownership has many benefits. (Seidman 2-3)

**Single Family or Multi-Family**

In Six Corners and Old Hill there appears to be some correlation between the condition of a property and whether it is owner-occupied or has a non-tenant property owner. Again, the conclusion is non-scientific and is made following a photographic study of the streets surrounding the project site and cross-referencing the photos against the city assessor’s information as to owner. (The Cecil Group with Tai Soo Kim Partners 2004, 21)

\(^5\) Section 8 is a state and federally subsidized housing program that helps people rent housing.

\(^6\) The study pointed out the high rate of renters in Six Corners and that declining property values had led to a lack of resources (or will) for land-owners to properly manager and/or to make repairs on the units. (Concordia Goody Clancy BNIM 74)
However, the Syracuse study did find that the presence of 2-3 unit rental properties, as well as larger multifamily properties, helped to drive problems of blight as well as undermining the value of nearby single-family properties. (Neighborhood Reinvestment Corporation (U.S.) 2000)

Just as we cannot discount renting as a viable housing option, nor can we discount multifamily, especially two family units where the owner resides in one unit and rents the other. Multifamily housing, by its very nature, fosters diversity, and often when housing choices are offered in neighborhoods, this, at least opens the door to people of different colors, ethnicities, ages and incomes living together. The case for multifamily housing centers on three issues: demand, density and diversity. . (Seidman 24)

However, having too much multi-family can often lead to affordability issues for the local residents as multi-family properties are higher priced and tend to be in some demand by non-resident investors or speculators. Currently a disproportionate number of units in Six Corners are owned by non-tenant landlords. (U.S. Census Bureau)

**Aging in Place**

Another common sense postulate is that people prefer to grow old in their own homes. (Seidman 48) While there are benefits to the supportive housing options for elderly that we see springing up all around us, these can often be out of reach of the resources of lower income residents.
The author is involved with an elderly ministry program. In visiting and providing meals to a dozen or so elderly residents of Chicopee, Massachusetts once per month, I find that those that are happiest are those that are still living in their own homes. In frequent discussion with Pearl, a 98-year-old woman who lives in the modest cape where she raised her family, she repeatedly extols the virtues of remaining in her home. There is that inherent freedom that comes with this choice and while she does require some level of support from the local elder services organizations and from her family, it is far less than what she might require in a nursing home.

Studies support the idea that aging in place, with supportive services, is not only the most desirable way of aging, but it is more efficient (i.e. affordable) and successful than other elderly housing models. (Lawler 12) Care can be more easily customized to an individual’s needs and can provide “just-enough” care to allow a person to remain independent. (Lawler 1)

ELDERLY HEALTH AND HOUSING

A HEALTH CONCERN CAN COMPOUND A HOUSING CONCERN

A HOUSING CONCERN CAN COMPOUND A HEALTH CONCERN

The same studies point out the correlation between housing and health. An elderly person’s activity rate will be greater in his or her own home. (Lawler 4) I see this in my friend Pearl as she does what she can to take care of her home, her cats, and her garden. This model would be even more successful if her home was more accessible. She really
needs railings in as many places as possible to help her get around, her upper kitchen cabinets have become inaccessible, and she has not been on her second floor for years. Building homes to the Universal Design\textsuperscript{7} standard would help alleviate some of the issues that she deals with on a daily basis.

Part of the reason for including elderly housing in a village of homes is that having mixed-generational housing helps to provide security and assistance for the elderly and this older generation can often assist with childcare for working mothers and fathers. (Lawler 24) Neighbors can be assistive to an elderly resident by helping them with small tasks such as shopping, snow shoveling, and just general well-being checks.

For all of the reasons stated above, I believe the best format for this housing development would be single family, owner-occupied, mixed generation units built close together.

\textsuperscript{7} The Universal Design Standard is further described in the ‘Design’ chapter of this thesis.
CHAPTER 3
SITE SELECTION

Six Corners/Old Hill Neighborhood

The focus of this architectural intervention will be the “Six Corners/Old Hill” neighborhood of Springfield. These two neighborhoods side by side have very similar character and issues. This author has past experience with these neighborhoods having constructed both residences and community center in both neighborhoods\(^8\).

Over the span of 30 years, the author has observed that these neighborhoods tend to be the forgotten neighborhoods of Springfield, when it comes to renewal and revitalization. The June 1, 2011 tornado has helped to focus some attention on the two neighborhoods but even now, other neighborhoods affected by the tornado appear to be recovering faster and with more planned development than Six Corners and Old Hill.

In examining these neighborhoods, the author was able to rely on two studies done, a master plan\(^9\) for Old Hill developed between 2003-2006 and the Rebuild Springfield Study\(^10\) done following the June 1, 2011 tornado. Both studies included community and

\(^{8}\) The author was the builder’s project manager for a group home for eight adults on Manhattan Street and oversaw the construction of the Dunbar Community Center in Old Hill and the J.C. Williams Community Center in Six Corners.

\(^{9}\) Old Hill Master Plan(The Cecil Group with Tai Soo Kim Partners 2004)

\(^{10}\) Rebuild Springfield Study (Concordia Goody Clancy BNIM 2012)
resident participation and provided guidance on the type of redevelopment the people of these neighborhoods would like to see.

![Diagram of Springfield, MA's 17 Neighborhoods]

Figure 4 - The City of Springfield, MA's 17 Neighborhoods

The neighborhoods, like the homes in the city, have gone through various cycles related to the economy and to the arrival and departure of various immigrant groups. The largest expansion of homes and neighborhoods occurred following World War II when the vast suburban like neighborhoods of Sixteen Acres, East Springfield, and East Forest Park grew with mostly ranch and cape style homes.
The “Six Corners” neighborhood is one of the smallest of the city's seventeen neighborhoods. It contains 274 acres of land. Its primary boundaries are portions of School Street and Maple Street on the west; State Street on the north; Walnut Street on the east; and the Mill River on the south. Most of the neighborhood is within a one-mile radius of the Central Business District. The neighborhood has industrial roots as it is home to the Springfield Armory’s Watershops, a mill and manufacturing facility that
supported the Armory up to its closing in 1968. Much of the housing around the Watershops was for workers and there was a general decline in the neighborhood after the closing. (Six Corners)

Figure 6 - The Neighborhoods of Six Corners and Old Hill
The adjoining Old Hill neighborhood is more established than its neighbor to the west. Street after street is filled with neatly spaced “Victorian” style homes. The neighborhood is blessed (or cursed) by the location of Springfield College in its midst. While the college advocates its desire to work with and integrate into the neighborhood, there is evidence that there is a perhaps a subconscious effort to isolate itself from the community.\textsuperscript{11} Old Hill has the benefit of having a master plan prepared in 2006 (with the assistance of Springfield College), while its neighbor Six Corners has really only been looked at in the 2012 Rebuild Springfield Study that followed the tornado.

\textsuperscript{11} An examination of the parcels around the college suggests that properties are often bought and either converted to student rental housing or for parking or for no use at all other than perhaps for buffer space. (Information from the Springfield Assessors Office)
In the proposed project area, past urban renewal efforts and initiatives for community improvements have not been able to sustain momentum due to lack of funding and periodic economic downturns.

The June 1, 2011 F3 tornado tore through these neighborhoods. Thankfully, no one was killed, but many...
were injured, and hundreds of homes were severely damaged or destroyed. As a result of that disaster, a congruous site on the border of the Six Corners and Old Hill neighborhoods, where more than 30 homes were destroyed has been selected for this project.

These two story homes were reduced to rubble or single stories by the force of the tornado. (See Figure 10)

The demographics of the neighborhood indicate a high-density population (for Springfield) of 500-1000 persons per square mile. The number of households per square mile, in the subject area, is low (less than 50). It is interesting to note here that there is a high population density but a low housing density. This would be indicative of mostly multi-family units and of a higher than average number of people per address. (U.S. Census Bureau)

Similarly, the number of workplaces is extremely low (less than 50 per square mile), and it is probably worse than that as the demographics did not make any further breakdown below 50 workplaces per square mile. Not surprisingly, the unemployment rate is one of
the highest in the city at greater than 15%, and again, this is probably worse than indicated as the 15% mark was the highest level tracked. (U.S. Census Bureau)

The predominant housing type in the neighborhood is multi-family with the two family (1 over 1) being the most prevalent. Current zoning reflects this with the neighborhood zoned either for two family or for multi-family residences. The current City of Springfield
Zoning Regulations show that no part of the neighborhood is zoned for single-family residences (which do not prevent them from being there as single family homes are allowed within multi-family areas). Most of the new housing built over the last 30 years have been duplexes or other multi-family types. Only in the last 10 years, has there been an effort to introduce new single-family homes to the area as evidenced by development by the Housing Allowance Partnership (HAP).

One of the more important findings that came out of the Rebuild Springfield study for Six Corners and Old Hill was the need to “preserve and promote the history and character of the neighborhoods as an amenity that enriches quality of life and attracts new residents and businesses”. (Concordia Goody Clancy BNIM 257)
Figure 15 - Walnut Street 1933

Figure 16 - Walnut Street 2010
Figure 17 - Existing Vernacular of Six Corners and Old Hill
Site Selection

The original thinking for selecting a site for this project was to locate an area of the neighborhood where there was at least one large available parcel and the opportunity for several infill projects on individual parcels. When the tornado destroyed the “Hill Homes” development, this parcel along with a large vacant adjacent parcel owned by Springfield College became a gaping wound in the midst of both neighborhoods. It was decided to address this location with the design of a village that blended in with and becomes a part of the larger community of the two neighborhoods.\footnote{Subsequent to the formation of this thesis, the city decided to trade land with Springfield College and use the subject parcel for the new Brookings Elementary School, which had also been heavily damaged by the tornado.}

The site is an “L” shaped parcel with the lower leg of the “L” paralleling the Watershops building and pond and the upper leg running rough south to north along Walnut Street. The terrain is generally flat with an upward slope from south to north. The change in terrain is almost 20 feet but this is disguised by the length of the site and its current lack of any features.

The adjacency of the Elias Brookings Elementary School and associated playground provide the new village with some of its key components. There are also viable strips of
commercial and retail space along Hancock, Walnut, and Hickory, which might blossom if the neighborhood economy improves.

![Figure 18 - Aerial Image of the Project Site before the Tornado](image1)

![Figure 19 - Aerial Image of the Project Site after the Tornado](image2)
There are no trees on the site, the few trees and scrub brush that existed before the tornado were wiped clear by its fury. While there is mature tree growth throughout some areas of Old Hill, Six Corners always lacked a suitable number of trees even before the June 1, 2011 tornado. After the tornado, the neighborhood is almost devoid of street trees and there has been little to no effort by the city to replant. Part of the reason is the lack of a tree belt; sidewalks are immediately adjacent to the road. One positive aspect of this clearing is that the site now has a very nice view of Watershops Pond.

Figure 20 - Project Site before the Tornado
Figure 21 - Project Site Six Months after the Tornado (Note Foundations from Destroyed Homes)

Assets

There are encouraging elements that do give the neighborhoods hope and make them a good place to live for many families and elderly citizens.

A 2006 study identified those characteristics in which the residents of Six Corners/Old Hill take pride. The people are generally good and kind and are family oriented with a strong older generation base. There are lots of churches and community centers. The neighborhood is small enough that it is very walkable. There are many small businesses and many corner stores and resident homeowners take pride in their property’s appearance. (The Cecil Group with Tai Soo Kim Partners)
The site is immediately adjacent to two city parks, the Ruth Elizabeth Park across Walnut Street to the West and the Harriet Tubman Park, which abuts Watershops Pond across Hickory Street to the South. The site is also immediately adjacent to the Brookings Elementary School and is only a short walk from Springfield College.

![Map of Project Site and Adjacencies](image)

**Figure 22 - Project Site and Adjacencies**

There is adequate bus service and bus stops along Walnut Street and Eastern Ave, which are the two major streets that straddle the site. However almost none of the bus stops included seating or shelters. Sidewalks are also narrow and lacked a green buffer between pedestrian and vehicle.

There are many different churches and denominations in both neighborhoods and these are the core strengths of these communities. These are the primary locations for social interaction for this strong faith based community.
Some of the needs that came out of these studies included the need for zoning changes that would benefit the community. A desire for the acknowledgement of historic character of the neighborhood was voiced. A need for daycare centers and for family support centers. Finally, the need for a major supermarket chain location that could offer fresher and healthier foods to the community than are available at the smaller convenience stores that are the predominant shopping outlets in the neighborhood. (The Cecil Group with Tai Soo Kim Partners)

**Challenges**

One of the most prevalent problems is that many properties are vacant and many more existing residential structures are not maintained due to absentee property owners. Dozens of properties have been abandoned and many are now city owned due to property tax foreclosure, yet the city lacks funds to maintain these properties. Parks, open spaces, streets, and sidewalks are also not well maintained. The overall neglect lends an oppressive feeling.

*Figure 23 - Existing Boarded Up Home in Six Corners*
of decay to the neighborhood. (The Cecil Group with Tai Soo Kim Partners)

A study in Austin, Texas, found that “blocks with unsecured vacant buildings had more than 3 times as many drug calls to police, nearly twice as many theft calls, and twice the number of violent calls’ as blocks without vacant buildings.” (Vidma)

Both the Six Corners and Old Hill neighborhoods include a significant amount of aging housing stock. Many homes have a much deferred maintenance and often suffer from poorly applied quick fixes such as vinyl siding, the elimination of porches and exterior details, and no work at all being done on interiors.

Efforts to provide affordable housing opportunities and market rate home ownership have not been able to reverse the deteriorating conditions throughout the neighborhood. Criminal activity including drug use and gang activity is an ongoing problem and has obvious impacts to the overall quality of life within the neighborhood. (The Cecil Group with Tai Soo Kim Partners)

The neighborhoods (particularly Six Corners) are very fragmented due to abundant vacant lots and abandoned homes. This condition is exacerbated by the lack of extensive home ownership. The fragmentation is an obstacle to large-scale redevelopment (similar to the Churchill Homes redevelopment in nearby Holyoke\textsuperscript{13}) because it would require the acquisition of many privately owned homes. A more viable solution might be to design a  

\textsuperscript{13} See Churchill Homes Precedent Case Study in Appendix A
fabric of infill and connectivity that preserves the existing homes (perhaps with necessary upgrades for sustainability) while re-energizing the neighborhood with new publically and privately owned buildings.

Traffic volumes and speeds are excessive on many of the major streets that run through the neighborhood. The streets, which define “Six Corners” and “Old Hill”, are also a major detriment as they divide and isolate the neighborhood. The Old Hill Neighborhood Plan bemoaned the poor condition of sidewalks, signage, lighting, and traffic/cross walk signalization. Residents stated that “streets appear neglected and show no sign of investment by the city.” (The Cecil Group with Tai Soo Kim Partners)

There are many streets that crisscross the neighborhoods in the area of this site. Some of these streets appear to be redundant and might be eliminated. The introduction of traffic circles at Six Corners and perhaps where Walnut Street crosses the Mill River might aid in reducing the amount of stoplights and idling traffic that is adjacent to the site. Other traffic calming measures along with some noise buffering would make the neighborhoods safer and more enjoyable to live in.

The issue of traffic was repeatedly brought up with the major complaint is that traffic on the many street that crisscross the neighborhoods is too fast and there is too much of it. (The Cecil Group with Tai Soo Kim Partners) Traffic densities were highest along Walnut and Hancock streets as these are major thoroughfares for drivers trying to reach other parts of the city such as the colleges and businesses, which are primarily located
along State Street and Main Street. Traffic was cited as a major problem by both studies referenced herein.

![Figure 24 - Traffic Patterns at the Project Site](image)

Open space is poorly maintained throughout the neighborhood and, as Jane Jacobs pointed out, is often home for illegal activities rather than for neighborhood children. (The Cecil Group with Tai Soo Kim Partners)

There is no library in either neighborhood. The closest library on State Street is not within walking distance, especially for children and the elderly. While the J.C. Williams community center is nearby, this is a run by a private religiously based organization and thus has limited funding for hours of operation and programs that can be offered. The Dunbar Community Center is close to State Street and again is not walkable for most residents of the subject area.
There were, unfortunately, a number of additional negative factors that were also identified by the studies. These included; poor lighting conditions throughout the neighborhoods, numerous vacant lots and abandoned houses, too many auto repair/auto salvage yards, lack of home ownership and few responsible landlords, no nice places to eat, a lack of security and police presence, lack of affordable home ownership opportunities, and a lack of maintenance for parks and open spaces.

Additionally, it was felt that out of town speculators where buying properties for the rental income and thus pushing up property values forcing more people to have to rent or leave the neighborhoods.

**What the community wants**

All of the stakeholders agree that there are three core elements to saving the neighborhood. These are repeated herein as listed in the “Old Hill Neighborhood Plan” by The Cecil Group with Tai Soo Kim Partners.

1. **Substantial Housing Revitalization and Infill**

   New initiatives should be established that focus major attention and financial resources on providing more opportunities for home ownership within the neighborhoods.

   a. **Reconfigure Perimeter edge conditions** to better buffer the housing stock and to assist in creating a separate identity for housing areas vs. commercial areas.
b. Integrate Internal Spines so that neighborhood uses can be linked in a thoughtful and meaningful way.

c. Establish neighborhood-housing infill in order to decrease vacant properties and increase home ownership.

d. Housing rehabilitation in and around the neighborhoods should be identified as a high priority and mechanisms should be put in place to assist both private development and publicly assisted development with new housing starts.

e. Programs should be identified, utilized, and in some cases created, that provide assistance for home ownership.

f. Support the conversion of tax-delinquent properties that are obtained by the City into affordable home ownership opportunities through the well-coordinated efforts of nonprofit housing redevelopment institutions, as part of the overall housing strategy.

g. The idea of creating housing infill within the fabric of the neighborhood is a key aspect of redevelopment that will make the single biggest impact on improving the overall quality of life for residents. The magnitude of new housing starts envisioned is not ten, twenty or fifty, but more in the range of one to two hundred new and rehabilitated homes.

2. Strengthening Relationships with The Area’s Institutions and Businesses

Take advantage of the existing fabric of institutions in and near the neighborhood to provide for mutually beneficial relationships that will provide a better future for everyone, including providing for appropriate redevelopment of underutilized areas, creating attractive relationships among residential, institutional, park and recreation areas.
a) Academic institutions near the neighborhood (Springfield College, STCC)
b) Numerous religious organizations within the neighborhood
c) Supportive neighborhood businesses (Baystate Health)
d) Community centers (Dunbar Community Center, J.C. Williams Community Center)
e) Public schools and facilities (Brookings School, Commerce High School)
f) Companies and businesses adjacent to the neighborhood (Mitchell Machine, Verizon)
g) Church leaders and other faith based organizations (Revival Time Evangelical Church)
h) Representatives from several City Departments (School, Public Works, Economic Development, … )
i) Six Corners and Old Hill Neighborhood Councils
j) Representative from local Affordable Housing Organizations

3. Improvements to Infrastructure.

a) Upgrades to the streets, roadways, and general public right-of-ways throughout the neighborhood would make a major impact on the overall quality of life in the neighborhood. An initiative to provide aesthetic, safety, and functional upgrades to the streetscape would go a long way in creating a strong sense of pride and ownership with all residents.

b) Create a clean and safe neighborhood initiative provides an identifiable organization made up of citizens and city officials that supports those issues related to public safety and an attractive neighborhood. Much like a “neighborhood watch group”, this initiative over time can work with community members and the
Old Hill Neighborhood Council to pin point problems and work quickly with City officials to bring resolution and conclusion.
What is a sustainable urban village and what does it look like? Villages throughout history tend to be sustainable until some outside force acts upon them, whether it is an invading neighbor or climate change.

In an urban setting, I picture a street corner or two, a few streets, a quarter mile in either direction as being a village. Traditionally (before the automobile), all the things of life could happen within this village within a city. Children walked to school and parents walked to the local markets. Work may have been found locally or was reached by a bus or via a trolley stop within the village. In the evenings and on weekends, children played near their homes and adults sat on front porch stoops interacting with their neighbors.

From this vision, some common sense concepts arise. Houses must be close to one another, schools and markets must be close by, public transit must be convenient and available. Different activities need to happen at different times of the day and public spaces must serve multiple functions. Walkability and safety are concerns.

There are many buildings and spaces that make up a village, foremost among these are:

<table>
<thead>
<tr>
<th>Homes</th>
<th>Meeting spaces, both interior and exterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>Paths amongst the homes and to other villages</td>
</tr>
<tr>
<td>Places of Worship</td>
<td>Libraries</td>
</tr>
<tr>
<td>General Store</td>
<td>Fresh Food Markets</td>
</tr>
</tbody>
</table>
This might be considered the overall program for this project while the project itself will focus on the site and the housing needed. Homes are at the top of this list as a home is the most personal (and I think most important) of a village’s buildings. A home gives us a sense of belonging and of protection. It embraces our families and us. It is an integral part of our psyche. For children, in their formative years, the home is a crucial element in the development of self-respect and in the ability to be nurtured and to grow and learn. As adults, we may move around quite a bit, but I believe everyone has significant memories of the homes where they grew up. A friend of mine, from a military family, remembers, with great detail, the various far-flung homes and places where she lived while growing up. I thought she might not have the same fond remembrances of childhood home that I have, yet she seems to have taken something special from each of the place she lived despite the trauma of constantly being uprooted.

The Importance of Housing & Neighborhood:

- Formative
- Sense of Self
- Sense of Home
- Pride of Place
- Lifetime Relationships
- Mutual Care & Respect
Another example of an important element in a neighborhood is a library. In large cities, a central library often supports many smaller neighborhood libraries. The purpose of these neighborhood libraries is to provide walkable access to the regional library network; providing services such as book borrowing, periodicals, audio/visual media, access to technology/internet, and community education. The varied users of these libraries include children, people from the neighborhood who might not otherwise have access to these resources, and senior citizens.

Growing up in East Springfield, the greatest building we had in our neighborhood was the small neighborhood library. The countless hours exploring and reading made possible by this building have brought me to where I am today. Putting schools and libraries at the center of neighborhoods allows them to become the “nexus of places, programs, and access to technology to meet community needs.” (Concordia Goody Clancy BNIM 12)

Something most of us do not think of as a challenge is; easy access to a variety of fresh foods. The large supermarket chains and specialty grocers have no stores in Six Corners/Old Hill or in any of the nearby lower income neighborhoods. This has been found to be a significant problem in lower income minority communities across the country. (Treuhaft 6) The stores that do exist in these neighborhoods tend to be smaller corner stores or convenience stores and rarely stock any fresh produce or healthier food products. With access to healthier foods, residents would have a healthier diet and would pay less for their food. (Treuhaft 12)
Having a decent supermarket, a store that carries a larger variety of fresh foods, also provides job opportunities for the neighborhood teens and the working elderly. Most parents would not feel comfortable allowing their teen to work alone in a convenience store while the larger employment base of a chain supermarket provides both security and commensuration with other aspiring youth.

One method of combatting the shortage of fresh produce in inner city neighborhoods, that has gained popularity, is the establishment of community gardens in these neighborhoods. The gardens can be small, such as half of a vacant lot, or large encompassing many parcels of land. In addition to the healthy food, community gardens help bring order, purpose, and value to derelict plots preventing them from being used for the disposal of trash or the commission of crimes. Community gardens are also relatively inexpensive and easy to implement and foster neighborhood cooperation and the development of social relationships amongst neighbors. (Kearney 66) The Rebuild Springfield study also identified the importance of transforming vacant lots into community assets. (Concordia Goody Clancy BNIM 12)
This project deals with replacement housing for families and some of the fundamental things around which we can build are the schools, libraries, other traditional institutions around which neighborhoods are built. (Neighborhood Reinvestment Corporation (U.S.) 2002 50)

Construction and Renovation in these neighborhoods, in and of itself, is important because it can provide jobs to the neighborhood’s residents as well as economic stimuli to the neighborhood as others repair their properties and the purchase of materials and services to support construction and renovation occurs close to the project sites.

There are currently some popular models for neighborhood development, and each has some features that should be incorporated into the design for this project. These models are summarized as follows:

**Smart Growth**

Smart Growth principles have dominated planning and redevelopment thinking for almost a decade now. Smart Growth principles as defined by Krueger and the EPA include:

- Mixed Land Uses
- Compact Building Design
- Create a Range of Housing Opportunities and Choices
- Create Walkable Neighborhoods
- Foster Distinctive, Attractive Communities with a Strong Sense of Place
- Preserve Open Space
- Strengthen and Direct Development towards Existing Communities
• Provide Transportation Options
• Encourage Stakeholder Participation and Collaboration

Smart Growth must also be market based rather than regulatory based. The concept of a New England village is highly desirable to many people, and they tend to stay there if they already live there or move into the village if they do not. Smart growth allows us to create urban villages within the city. This offers the best of both worlds, the activities and opportunities of the big city coupled with the charm and quaintness of a New England Village. As Kruger states, “Recapturing and retaining the New England village atmosphere is therefore not just a means to counter sprawl, but a central part of the state’s (Massachusetts) competitiveness strategy.” (Krueger 1263-1274)

**Traditional Neighborhood Development**

Traditional Neighborhood Development (TND) helps to create vibrant mixed-use neighborhoods with higher densities and a range of complementary uses. TND is characterized by compact, pedestrian-oriented developments that provide a variety of uses, diverse housing types, and are anchored by a central public space and civic activity. TND is based on the principle that neighborhoods should be walkable, affordable, accessible, distinctive, and in Massachusetts, true to the significant historic context of each community. (Smart Growth / Smart Energy Toolkit)

Elements of Traditional Neighborhood Development design include:

• Parks, schools, civic buildings, and commercial establishments located within walking distance of homes
- Residences with narrow front setbacks, front porches, and detached rear garages or alley-loaded parking
- Network of streets and paths suitable for pedestrians, bicyclists, and vehicles
- Narrower streets with crosswalks, streetscaping, and other traffic-calming measures
- In-scale development that fits the local context
- Buildings oriented to the street with parking behind

(Smart Growth / Smart Energy Toolkit)

TND can be used to revitalize existing town centers and neighborhoods or build new ones at transit nodes and in other locations. Current and future public transit stops are important places to consider during the planning stages to maximize access to alternatives forms of transport.

**Transit Oriented Development**

Incorporating many of the TND elements, Transit Oriented Development (TOD) focuses these elements around public transportation hubs. Elements of TOD design include:

- Compact, traditional building and site design
- Buildings are located close together and face wide sidewalks.
- Building entrances are oriented towards transit stops.
- Buildings are normally three stories or higher.
- No blank walls where pedestrians walk.
- At street level, walls are at least 75 percent windows and doorways.
- Short block lengths are preferred.
- Mid-block pedestrian cut-throughs are provided on long blocks.
- Parking lots are located to the rear and sides of buildings.
• A high quality walking and biking environment
• Ease of walking or biking to the transit station is a top priority.
• Pathways are clear and direct with no barriers.
• Sidewalks are wide, crosswalks are well marked, and lighting and landscaping are ample.
• Covered bicycle parking is available

(NJ DOT Transit Village Initiative)

What makes all of this sustainable? It must be affordable and maintainable for the people who traditionally live in the neighborhood. Homes and buildings that are energy efficient are going to be more affordable over the long run, but they may cost a little more and definitely need more attention at the start. A variety of jobs in a village and neighborhood make it more sustainable. If teens and elders can work close to home, it helps stitch and inter-generational fabric. Single adults and parents might work in the neighborhood or travel short distances outside of the neighborhood for work.

The word “Sustainable” must be used in the broader context of not just “Energy, Environment, and Durability” but also in the context of “Person, Family, Health, Income, Culture, and History”. While the former are important to us all, we should not stampede over the latter.

How can we measure the success or failure of these or past efforts?
Success Metrics

It is also important to understand the implementation and success rate of both privately and publically funded initiatives? Within the pattern of success, certain elements might bubble to the surface. What are these success metrics?

Table 2 - Success Metrics

<table>
<thead>
<tr>
<th>Happiness of Residents</th>
<th>Desire to Live in the area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuality</td>
<td>Participatory Governance</td>
</tr>
<tr>
<td>Human Rather Than Industrial Touch</td>
<td>Details</td>
</tr>
<tr>
<td>Ownership</td>
<td>Maintainability</td>
</tr>
<tr>
<td>Pride of Place</td>
<td>Affordability</td>
</tr>
<tr>
<td>Comfort</td>
<td>Security</td>
</tr>
</tbody>
</table>

Failure Metrics

Do all cities/buildings deteriorate with time? I think buildings as we have built them over the past 150 years in America are more likely to deteriorate with time, especially if they are poorly built or not well cared for. The 21st century concept of sustainability might address some of the causes of this deterioration.

How can we judge the success or failure of a particular home or building? How interesting is the home in appearance both inside and out? How well does it define public and private space? How does it feel? Is there this feeling of warmth and coziness that we inexorably seek? Homes that leak, are poorly maintained, or are crammed with junk; immediately receive bad grades.
How do we measure the success of urban villages and particularly the architecture of urban villages in the frame of reference of “Architecture for the Common Good?”

Does it address/heal existing social ills?

<table>
<thead>
<tr>
<th>Crime</th>
<th>Drugs</th>
<th>Gangs</th>
<th>Violet Crime</th>
<th>Youth crime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joblessness</td>
<td>Homelessness</td>
<td>Dilapidation</td>
<td>Neglect</td>
<td></td>
</tr>
<tr>
<td>Poverty</td>
<td></td>
<td></td>
<td>Reliance on Public Aid</td>
<td></td>
</tr>
<tr>
<td>Sprawl</td>
<td></td>
<td></td>
<td>Decentralization</td>
<td></td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td></td>
<td></td>
<td>Pollution</td>
<td></td>
</tr>
<tr>
<td>Traffic Congestion</td>
<td></td>
<td></td>
<td>Highways</td>
<td></td>
</tr>
</tbody>
</table>

Will it create new social ills?

Residents of inner city neighborhoods sometimes fear improvements. If their neighborhoods become more attractive to higher income households, home prices and rents can rise sharply and the traditional residents can be displaced in a process known as gentrification. Careful planning can prevent this by preserving some level of housing as affordable for the traditional residents. (Neighborhood Reinvestment Corporation (U.S.) 2005 2-4)

As in most things, the inclusion of all members of a society in the planning and improvement process is the key to success across a broad front.
CHAPTER 5
THINKING ABOUT CITIES, TOWNS, AND VILLAGES

More Americans than ever before live in inadequate housing or they spend more than half of their monthly income on housing. As the rising population’s demand for housing increases, we are failing to provide affordable, convenient options and the existing stock of inner city housing continues to decay and disappear. (Schwartz)

Strip malls and cookie cutter housing developments do not represent the needs or desires of most Americans. Suburban sprawl and limited transportation choices often fail to serve affordable housing. Even middle income Americans are feeling the affordable housing crunch as home prices escalate. (Schwartz)

Sprawl pulls investment and the tax dollars away from existing communities, and forces the expensive construction of new infrastructure with the resultant loss of environment. If we can create the village feel within existing cities, suburban sprawl and inner city decay might be reversed.

In our cities today, the movement from an industrial based economy to a high-tech and/or service based economy enables us to now transition from the factory towns of the 19th and 20th centuries to a 21st century mode of living. Ironically, there is a desire to revert to the village concept of earlier times, yet with the use of today’s technology and techniques.
The grand Utopian ideas of Howard, Le Corbusier, and Wright are no longer entirely relative to our society, as it exists today. Yet some of their concepts might still have value. An example would be the inclusion of agrarian parcels within the urban village.

There is a romanticism about utopian schemes that perhaps does as much to undo them, as the lack of political will and the overwhelming desires of individuality (especially in the United States). The concept of Utopia (Greek combination of “no place” and “good place”) was presented by Saint Thomas Moore (secularly known as Sir Thomas More) in the 15th century. Like Bellamy’s novel, it is a fictional Platonic style dialogue. It was an early attempt to define/explore an ideal society when faced with the societal evils of the day.

While this work was subject to Mores’ ‘Sitz im Leben’ or setting in life and to the prejudices of his time, it is an important example of how unreal utopian schemes can be. It is as if no utopian scheme can be perfected. Many schemes, including communism, have been experimented with, and yet none have been overwhelmingly welcomed at any time in these past 500 years.
It is important to study the past and the present, as well as understanding our current level of knowledge so that new knowledge can be added to the field for the use of others in solving, not only regional, but also the global housing problem.

In proposing an architectural solution, the past has something to offer. Should we examine the grand unrealized Utopian proposals of the architectural masters of the 20\textsuperscript{th} century? On the other hand, are we in a new age where these concepts are irrelevant? In our setting in Western Massachusetts, the humble solutions proposed and built by local groups over the past few years may be more significant (See Churchill Homes precedent in the Appendix A).

We already know there are many failures in this history, yet there are some success stories and these will be the key to moving forward.

If we examine 20\textsuperscript{th} century architects such as the late Minoru Yamasaki, whose career was unfortunately bookended by the tragedies of the Pruitt-Igoe\textsuperscript{14} Housing complex at his start and by the 2001 destruction of the World Trade Center, 15 years after he had passed away in 1986, what can we learn? Pruitt-Igoe, a 12,000\textsuperscript{15} resident complex was imploded after less than 20 years of existence. It is the epitome of something that is not

\textsuperscript{14} Pruitt-Igoe is often cited as the death knell for Modern Architecture, yet there is evidence that the project would have been successful had it been properly managed and maintained. (Sragow)

\textsuperscript{15} This would be akin to demolishing all of the housing on the UMASS Amherst campus, which also houses 12,000.
sustainable. The implosion of Pruitt-Igoe is often touted as the “day that Modern (meaning mid-20th century) Architecture died.” Not everyone agrees with this statement and former residents of Pruitt-Igoe have come forward to say that it was not all or always bad. (Sragow) Whatever the cause, be it the architecture, the socio-economics, the lack of maintenance, or perhaps the interrelation between many factors, the project was a failure.

At Pruitt-Igoe, as with other large American housing complexes such as Cabrini-Green in Chicago, there seemed to be an inherent inability to understand the human condition, the necessary connections to the natural world, and the importance of maintainability and sustainability.

Have others succeeded, where we, in the United States, have failed? How is housing provided for in Europe, South America, and Asia? The opening of Russia and the former Warsaw pact countries in the mid 90’s is perhaps an unexploited opportunity to study urban and city planning on a totalitarian scale. Following World War II, as America built both its Levittowns and its Pruitt Igoes, our socialist adversaries were building completely new factory towns and cities under the oppressive weight of a vast level of
central control. Did our two systems arrive at different solutions? How successful or how atrocious were each? While these questions are beyond the scope of this treatise, they must always remain in our thought process as we realize that architecture is extremely site/location specific.

**Edward Bellamy**

Edward Bellamy was an early important author of works that dealt with the conflict between the industrial revolution and the agrarian society on which the United States (and in fact most countries) was originally based. He was also an influential part of the history of Chicopee, Massachusetts, an offspring city of Springfield to its north. Bellamy’s utopian romantic tome “Looking Backward” was the source of Howard’s eureka moment in looking at the ills of society. I found it interesting that in looking for a utopian solution for a small neighborhood of Springfield that I should travel back 500 years, work my way forward, and find the genesis of some of the more important utopian ideas just a few miles to the north of the project site selected.

**Ebenezer Howard**

While the works of More and Bellamy were fanciful fiction, they are important because they inspired others to think about this grand scale of planning. Ebenezer Howard, a lesser-known utopian planner, was also one of the first and most influential. (Fishman 23) His core concept of marrying the town and the village was the result of the terrible disparities between the urban and the rural in his early 20th century England. In his time, the cities were dusty, dirty, unforgiving, and crowded places to live. (Fishman 33)
Cities evolved to this decrepit state because of industrialization and it was the attraction of jobs and income that drew people from the rural areas to the city making them so crowded and unhealthy.

In the rural areas, there was greenery, fresh air, healthy food, and clean water. At this time, there were fewer and fewer jobs for the large families that were prevalent and thus the people migrated to the city. It is a remarkable parallel to what is happening in most of our developing world today.

Howard is considered the father of the city planning movement and his model of the “New Garden City” has been used as the basis of countless urban renewal and suburban planning schemes around the world. (Fishman 24)

Howard published “Tomorrow: a Peaceful Path to Real Reform” during 1898 and it was reissued in 1902 as “Garden Cities of Tomorrow”. His idealized garden city would house 32,000 people on a 6000-acre site, planned on concentric patterns with open spaces, public parks and six wide Parisian style radial boulevards, extending from the center. The garden city would be self-sufficient and when it had a full population, another garden city would be developed nearby. The fractal concentric patterns were extended through many levels, from city to town, to village and neighborhood. (Howard)

The forces behind Howard’s Garden city are the three magnets of attraction;

The Town magnet offers the advantages of higher wages, various options for employment, the possibility for advancement, social amenities, amusements, and the
convenience of infrastructure. Opposing these favorable factors are high rents, high
prices, long work hours, squalid apartments, lack of green space, lack of fresh air, and
lack of sunlight. (Howard 47) It is remarkable that the environmental movement of the
1960-70’s, which resulted in the Clean Air and Clean Water act, have reversed some of
these factors in the city. Cities in the West tend to be clean and fresh most of the year.
Nevertheless, it we want to look backward and see what Howard encountered, we need
only look to today’s smog encased cities of China.

The, Country magnet offer beautiful scenery, parks, forests, and pastures. Fresh air,
auditory and visual pleasantries, and low rents. These are offset by low wages, long work
hours (again) offsetting the ability to enjoy the environment, limited opportunities, lack
of amusements, and the lack of controlled water, waste disposal, and nighttime lighting.
(Howard 48) Our high-speed world of today has again, reversed some of these factors.

Howard combined the two magnets. He felt that Town and Country together, just as man
and woman are wed, would be greater and more fruitful in their union rather than apart.
His Town and Country solution was to be the source of new hope and new life. (Howard
48)

Le Corbusier

Charles-Édouard Jeanneret known professionally as Le Corbusier was perhaps the most
widely adapted purveyor of modern city planning. As an architect and designer, he is a
pillar of 20th century architecture and could be called perhaps the greatest architect of the
20th century. Yet it is with many of the projects that followed his “City as Machine” philosophy where we find failure.

In 1922, Le Corbusier presented his plan for "A Contemporary City" designed for three million inhabitants. The centerpiece of this plan was a group of sixty-story, cruciform skyscrapers. These steel-framed office buildings encased in huge curtain walls of glass were to be the workplace for the masses. The skyscrapers were set within large rectangular green spaces where the workers were supposed to stroll on their lunch hour. These plans glorified the use of the automobile and their adaptation in the new Brazilian city of Brasília created an environment so unfriendly to pedestrians that the city was seen as the ultimate failure of modernism. The homes for these unfortunate workers were smaller low-rise, zigzag apartment blocks, surrounding the city core and set back from the street amid green space. (Evenson)

His proposal for Paris would have tragically decimated the city as we know it today, transforming one of the great cities of the world into an inhuman Soviet style superblock. Le Corbusier’s “Brave New World”, perhaps of “1984”, is quite disturbing to us today. The adaptation of his theories (whether correctly or incorrectly) led to the wholesale development of cookie-cutter high-rise apartment buildings in both the United States and behind the Iron Curtain. In the US, many of these were demolished, not long after they were built, as they were determined to be socially unsustainable. I would imagine that following the fall of communism in 1991, that similar demolitions occurred all over Eastern Europe and Russia.
Frank Lloyd Wright

In the middle of the last century, Wright put forth his own Utopian ideals in his plan for a “BroadAcre City” and in the development of his “Usonian” concepts. As with other Utopianists, there is a strong inclination towards an agrarian society. Wright, however, acknowledges modernism and technology in his use of materials and his affection for the automobile. In many respects, Wright’s designs, which spanned most of the 20th century, were more successful, more sustainable than his contemporaries were and perhaps garner him the title of the 20th centuries’ greatest architect.

Usonia was a name Wright gave to the citizens of a culturally reformed United States of North America. (Sergeant 16) While sometimes applied more broadly to Wright’s work, the term has typically been applied to the smaller homes that were built for the middle class between 1936 and 1959. (Storrer and Wright 237) Wright envisioned that these homes could be built for $5,000, for a family of moderate income. In addition to size and cost, Usonian homes were meant to be reproducible. Thousands were to be built, on their own, and communally in his “BroadAcre City”. (Sergeant 123)

Wright’s sense of reproduction differed from his Modernist contemporaries. No two Usonian homes are the same; rather they are familiar to one another by virtue of their construction materials and methods. (Sergeant 94, 110-118) Each Wright home was to be purposely designed for the client and for its site. The reproducibility was the result of Wright’s techniques, materials, and philosophy. (Lind 15-16)
It is from the Usonian homes, for better (if properly implemented) or worse (when poorly copied), that we have the ubiquitous ranch house, the carport, the modest single-story one family dwelling, and garden patios, all of which were so prevalent following World War II. The imitations, however, often lacked key Wright ingredients such as the central hearth, a protective enclave for the family, the blending of interior and exterior, the proper use of the open floor plan and of private niches, and of simple natural details and uniqueness.

Materially, Wright’s Usonians are constructed with panels of prefabricated plywood and insulation covered in elegant Tidewater Cyprus. (Storrer and Wright 277) The floor is simple concrete, formed into a two foot by four-foot grid, and painted terracotta. The slab is installed on a bed of gravel that contains the novel radiant, or gravity, heating system. The masonry masses of the fireplaces and the concrete slab provide excellent thermal storage for the heating system and for solar gain. This is characteristic of passive solar design, but this is mid-century, thirty years before it became popular (or necessary) during the first energy crisis of the 70’s.

Wright’s construction techniques were clearly innovative for his time. The uses of prefabricated insulated panels, radiant floor heating and passive solar design are all features that we might think of as recent developments.

**Jane Jacobs**

In the “Life and Death of Great American Cities” Jacobs' confronts modern city planning and modern 20th century architecture. Understanding how cities work and how people
actually live rather than listening to how they should live (according to the planners of the day), she puts forth tangible factors that affect urban life and how these should be embraced to enrich city living.

Jacobs is not looking for Utopia. She looks carefully at the daily life of people living together in small neighborhoods and describes the elements that make these villages work. Details such as sidewalks, safety, personal contact, and where and how children live and play are important to the health of a neighborhood. (Jacobs) It is here that she puts forth her “eyes on street” concept, that if people live, work, and play on the street/sidewalk (not in the artificial environment or a public park or community room) and if this extends from exterior to interior, the neighborhood will be more safe and less prone to crime. This interaction also promotes friendship and diversity and combats segregation and discrimination. Parks, she argues, are more successful when they are integrated with all facets of city life and used throughout the day (and night) by a variety of different legitimate users.

Jacobs goes on to argue for a diversity of uses in neighborhoods, again, the concept of live, learn, work, and play, all in the same village-scale place. This diversity extends to the type and scale of buildings, streets, and parking, offering opportunities to peoples of all income levels, ages, and abilities. This organism needs density to survive because the less dense (urban blight) the neighborhood becomes, the more the organism breaks down and crime and neglect creep in.
Even where this neighborhood organism is healthy, there is the threat from without of gentrification. The desirability of the healthy neighborhood village entices more affluent people to move in and push the original mixed income residents out. Another threat is the vacuum that can occur when the neighborhood is home to a large college campus or similar organization, such as we see with Springfield College in the midst of the Old Hill neighborhood in Springfield. The fences, parking, and restrictiveness of the college create a boundary condition that can be a barrier to the health of the neighborhood. The affluence of the college (supported by and in fact totally dependent on Federal and State tax dollars in the form of Financial Aid and Student Loans) is used to buy up adjacent property to both create student housing and to isolate itself from a less than desirable (in its mindset) community.

The instability of the population in the Six Corners neighborhood is an example of what Jacobs was talking about. The fact that people come and go with such frequency (it is a rental neighborhood) prevents the community from ever coalescing into a healthy organism.

For Jacobs, the following are key elements;

- Subsidized Housing
- Restriction of the Automobile
- Improvement of the Visual Order with Diversity and not Repetition
- Saving Existing Homes and Places
- Pedestrian Friendliness
Stewart Brand

From Brand’s “How Buildings Learn...” we learn that it is the morphology of residences over the years that is the most evident visualization of people adapting to their environment and making their own living spaces more comfortable and happy for themselves. Interesting studies have been done of the evolution of Levittown. All of the houses were built identically in the late 40’s and yet today, they are all different. Mass produced or “cookie cutter” buildings have become custom, “one-of-a-kind” as perhaps all architecture is meant to be. (Brand 54)

An important consideration of our profession is that the design and construction of the built environment has a much greater impact on all the lives that will encounter a space in its lifetime than might initially be realized. On the drawing board (or computer monitor), the focus is on client, program, site, and materials. However, a building, a place, will affect generations to come, and may have an ever changing program and purpose. The day-to-day operation and function of a building are critical elements in its life and in the success or failure of its relationship with people, the environment, and time. Its ability to withstand or to adapt, to resist or morph, and to always welcome once again are the life force of a structure and will determine its fate.

As Brand indicates, architecture and building are a science dealing with a living, growing, evolving organism. We all know this. I would venture that none of us has ever lived in a home or a room, or worked in an office or a space where we did not at some
point re-think the layout, the functionality, or the décor of our environs and then try to or successfully implement change. (Brand 160)

As Brand notes, the differences in the morphology of buildings are quite dependent on the building type and its ownership. Perhaps one of the alluring aspects of architecture is the concept of creating something that will remain immortal (or at least will outlast our own lifetime). (Brand 115)

Alternatively, it is a tragedy that many buildings today have incredibly short life spans. Brand notes, “Commercial buildings have to adapt quickly…” It is; adapt, grow, get out of the way, or disappear. In the commercial realm, hotels, stores, and restaurants rise and fall with perceptible regularity. (Brand 14)

Homes have the longer lives especially if they are well cared for and loved. Poorly designed or poorly built homes are never really loved. They will not be well cared for and yet the economics of our housing markets dictate that these places last much longer than they should; tormenting generations of occupants.

Christopher Alexander

“A Pattern Language” is the second of four volumes published by Alexander during the 1970’s regarding design, construction, community planning, and general social & family order.

In my initial encounter with this book, I was enchanted by the concept that certain patterns of architecture and of building, which I knew from personal experience made me
happy and content, could be designed and built for anyone in any place. This is crucial to
the success of the homes and places in an urban village. People need to be comfortable
and happy if they are to be “well”.

The text is a design atlas, proceeding from the large scale to the small, from global
concepts to regional and community planning, and finally right down to the nooks &
crannies in the walls.

Examples of design elements from A Pattern Language that can be incorporated in the
design of a home are:

Pattern “#180 Window Place”; as with any of the patterns defined by this work, any
single element must also be considered in its relationship with other patterns. For me, the
concepts of nooks represented by “#203 Child Caves” or “#179 Alcoves” or a “#204
Secret Place” are cherished. When you add to these the various forms of light espoused
by patterns such as “#135 Tapestry of Light and Dark”, “#161 Sunny Place”, “#238
Filtered Light”, and “#252 Pools of Light”, the special view described by “#134 Zen
View”, and the theater offered by “#192 Windows Overlooking Life”; window places
becomes miraculous environments that even now still captivate me and cause me to seek
them out. (Alexander, Ishikawa and Silverstein)

Older buildings with their broad masonry walls (“# 197 thick walls” and “#211
thickening the outer wall”) and oversized glass have many special areas that can be
found.
During the 70’s, in the fields of architecture and building, we were just coming out of three decades of modernism that many felt resulted in cold lifeless buildings. The stripping away of facades and details left society looking at the skeletal basis of construction and this left many longing for the warmth of hearth and home as it was remembered from earlier times.

Alexander is a critic of post-World War II construction and manufacturing. He is espousing the value of craft and of the homemade and bemoaning mass production and the decentralization of family and community. Alexander seems to look backwards rather than forwards to find his canon. It is interesting that almost all of the pictures and pictograms in “A Pattern Language” appear as though they are pre 20th century vintage. (Alexander, Ishikawa and Silverstein)

I have always read Alexander in the frame of reference of self and family and not in the sense of its much broader application across communities. The details and notions of the book are inspiring and thought provoking, but again, to me, in a cocooned manner. Only after starting this research did I realize how these examples could be applied across all facets of society from the grand to the intricate. My affinity for Alexander’s “Patterns”, especially of interiors, is that they can endure decades and centuries providing always comfort and never harm.
CHAPTER 6
CONTEMPORARY KNOWLEDGE OF THE BUILT ENVIRONMENT

Design

The topic of residential design is perhaps the most prolifically discussed of the architectural design typologies. Residences being the most common structure in the world and all of us having interaction on a daily basis with our homes leads it to being a well thought through topic. It is surprising then that residential design can be such a challenge. The arrangement and orientation of spaces, doors, windows, furniture, etc. within the small footprints of a home requires the utmost thought and frequent design iteration.

For some, the easy way out is to create an obese home, a “McMansion”\(^\text{16}\) where all of the spaces and arrangements become easy because there is plenty of room and wasteful duplication of numerous spaces rather than sharing.

I believe that the most important inputs to the design of a home are the needs and wants of the family that will live in the home and the relationship to the site upon which it will

\(^{16}\) In American suburban communities, “McMansion” is a term used to describe a large new house which is judged to be incongruous for its neighborhood and that these houses look and feel inappropriate and are wasteful in terms of space (too much room for too few people) and resources (building materials, electricity, gas). Miles Jaffe. *The Hamptons Dictionary: The Essential Guide to Class Warfare*. Constellation, 2008. Page 82.
sit. For a thesis project, I do not have actual clients so I will try to rely on the feedback and surveys of the people of the neighborhood for which the homes are intended.

In the course of designing for this project, I also wanted to rely heavily on Alexander’s Pattern Language. The book is the crucible of my love of good design and architecture and it played an important role in the selection of this thesis project. I have already highlighted some of the concepts from Alexander and other authors have expanded upon his ideas. These similar resources include “Patterns of Home” by Jacobson, Silverstein, and Winslow and “The Not So Big House” by Sarah Susanka.

From “Patterns of Home” we have the following:

“Inhabit the Site.” If a home inhabits the site, the placement of the home and the views that are created from within are carefully considered. The designer must visit the site and identify the most special view from the site, the most special natural item on the site, be it a tree, a rock, a stream or whatever natural feature that makes that place special. The home should invite this natural world in, through windows or perhaps by wrapping the home to embrace the natural feature. (Jacobson, et. al. 22)

The beauty of a courtyard home is that it not only embraces a natural feature, it allows the home (and its inhabitants) to look back at themselves. Nothing is so beautiful as watching your children play in another part of a warm glowing house as you gaze across an expanse of snow on a blustery winter night from the comfort of your armchair.
The placement of multiple homes on a site should allow for the creation of public and private yards and should enhance the creation of views from all of the homes.

“Create Rooms, Inside and Out.” The design must not only create interior rooms, it must create exterior rooms as well. A house that has wings and walks will help to define both the interior and the exterior. (Jacobson, et. al. 50) This again creates the notion of “a house that can look back at itself”.

“A Sheltering Roof.” The roof is a most important part of the shelter as we camp out on this site. The roof can follow the floor plan and inform of the floor plan. The shifting lines and varying ceiling heights help to further define rooms within and without. (Jacobson, et. al. 74) The roof is the master of the shelter; it is comforting, protective, and fascinating. There should be some livable space up close to the roof, an inhabitable attic, a refuge space or aerie from which to watch the world. We should be able to see a portion of the roof from the inside, to see the brilliance of the sun upon it in the summer, to watch the leaves and snow dance across it in the fall and winter, and to be mesmerized by the cascading waterfall of rain from it in the spring.

“Capture Light.” The beauty of these patterns and the need for a sustainable home intersect in designing for and to the sun. A home should have daylight all through the day. (Jacobson, et. al. 98) This light changes and moves as the day progresses. Morning daylight is different from noon daylight, which is ever so different from late afternoon daylight. There is light that must be welcomed or sheltered from during different times of the day and different times of the year. If a room has light from two sides, it is
possible that one of these will be welcomed and the other might be intrusive. The occupant can open wide to one and close off to the other. A four-sided rectilinear house will have trouble catching the right light at all times. It needs extension, protuberances, alcoves and niches to help it catch the light. Bays and dormers help the home achieve this goal and in the process, we create interesting spaces on the inside, such as window seats, places for plants, and lookouts. Nor should we neglect light from above and the ability to see the clouds moving across the sky during the day and to gaze at the stars at night.

“Create Parts in Proportion.” Many of these patterns deal with the natural world and the natural world can, at times be chaotic and disordered. The human mind also finds comfort in order and by building with some pattern or proportion; the home can meet this need. (Jacobson, et. al. 128) In Wright’s Usonian homes, he used the floor as a grid, each home having a slightly different grid, but based on some unit of measure such as the 3 foot by 6 foot form of a tatami\textsuperscript{17} mat. The home must be balanced in this grid and have some axis of symmetry or ordering system.

“The Flow Through Rooms.” Just as cities and towns require paths and roads to allow for travel to and between buildings, homes must have spaces for flow between rooms.

\textsuperscript{17} A Tatami mat is a flooring material used in traditional Japanese homes. Traditionally made from rice straw, it can also be made from other materials and typically has an aspect ratio of 2:1 (Kodansha Encyclopedia of Japan, entry for “tatami.”)
The entry and exit from the home form a basis for this flow. The whole site must be considered, flow from the street to the house, flow through an entry, flow from entry to public spaces, and restricted flow to private spaces. The entry itself is a room that has both an interior and exterior component, it is one room with two parts and they should be equally allocated for. (Jacobson, et. al. 154)

Like it or not, the car is an important part of the flow of people and goods to a home, this flow should be well engineered such that there is a minimum of resistance while not disturbing other flows or the activities inside the home.

These circulation spaces are not to be dead unused spaces, inhabit them with seating, bookcases, and storage, carefully tucked in so as to not impede the flow and yet still offers places to pause on your journey.

“Private Edges and Common Core.” These paths lead to the center and the center is the public space, the common core, the Living Room, Dining Room, and Kitchen. Around the edges are private spaces such as bedrooms and bathrooms. (Jacobson, et. al. 178) Moreover, let us not think two dimensionally; we can separate public and private with changes in elevation (with careful consideration for those that might have difficulty negotiating these changes).

“Refuge and Outlook.” Something in our primordial existence sends us to the high, secure observation point. Its thick walls and ability to overlook our environment may no longer be a matter of physical survival, but can satisfy our need to watch our world and to
be on the lookout. This lookout can be as simple as our front porch or as complex as a medieval watchtower. (Jacobson, et. al. 206)

“The Places in Between.” In all of our programmatic compositions, we should look for the places in between. These can be opportunities for small bonus rooms, be it a kitchen pantry or a small study/reading nook. (Jacobson, et. al. 230) Down the end of a long hallway can be a cul-de-sac, perhaps brightly lit with windows on three sides, yet only large enough for one or two people.

“Compose with Materials.” Just as we must not neglect the third dimension, or the fourth dimension (time), there are still other dimensions perceived by sight, touch, sound, and smell. This is where materials live. By composing with materials, we add all these dimensions to our repertoire. The contrast between materials can help us define our indoor and outdoor rooms and can even help define spaces within rooms. Materials help relay purpose, rough or smooth, raw or finished, can help us know what each space is intended for. (Jacobson, et. al. 252) Carrying building materials from inside to out, or vice-versa, helps blend that transition. Wright, again, was the master of this, carrying his Tidewater Cyprus planks from inside to out through the glass, to blend the two spaces.

Structure as finish has that ability to comfort and inform. Living with and seeing, touching, and smelling the great timbers that hold up your house allows you to know that all is well and that these trees live on as your shelter.

Sarah Susanka repeats and confirms many of these theorems.
The quality of the design, and of the materials, and of the space is better than excessive quantity of the same. (Susanka 11) In our age of sustainability, it is sometimes surprising to find that the smaller houses of the past (more than 100 years ago, i.e. before petroleum) were more sustainable and lasted longer. (Susanka 14, 27) In the past, when people had limited resources, they learned to live and survive using very little, we, in our time, are being forced by economics, if not the threat of climate catastrophe, to do the same.

The surprising benefit of this is that we often find that small spaces can be more comfortable than large spaces. It is easier to heat, cool, or light a small space. Small spaces are used more often. What is the purpose of building, heating, cooling, lighting, and maintaining a large room that rarely gets used? (Susanka 18)

The creation of alcoves and niches allows us to have all the rooms we desire but in a limited space. (Susanka 33, 59)

How silly is it to find that you and your family are spending all of your time in only a quarter of your home. We should build spaces that we will live in rather than spaces to keep things that you rarely use. (Susanka 34-35) One of my visits to the Theodore Baird House in Amherst, MA occurred when it was being rented to a tenant, who had obviously come from a much larger house, and she had filled two of the three bedrooms with boxes piled to ceiling. Although, I have no way of knowing, I would suspect since she only stayed less than a year, and that those boxes were rarely touched. The rooms were not what Wright meant them to be during this period.
Susanka reaffirms the importance of defining public and private space on the interior and exterior (Susanka 37), of having a quiet spot to read, or study, or just watch the clouds go by (Susanka 47), of varying ceiling heights to break up the monotony of space (Susanka 65), of using lots of daylight (Susanka 66, 80), of creating interior and exterior views (Susanka 83-84), and of creating storage in any unused space by integrating shelving into walls, both full and half height. (Susanka 86-99)

She adds the innovating small house ideas of multi-use bathrooms (Susanka 53), porches or sunrooms that you can use year round (Susanka 55-57), the use of innovative lighting (Susanka 66, 80), and of sliding and/or bi-fold doors (Susanka 82), all to save space. A bathroom is an expensive room to build, yet it serves multiple functions. If these functions can be separated within the room through the use of curtains or preferable doors, more than one person can use the bathroom at the same time.

In New England, almost all homes come with a porch, yet this outdoor room can really only be comfortably used during the summer. This use may be further restricted if the porch is unscreened as no one wants to sit outside at night and be devoured by disease-carrying mosquitoes or microscopic gnats. As a result, porches are infrequently used and often become the repository of unused items that we somehow cannot part with. The design of a porch or a sunroom should envision year round use. This may be as simple as screening with the proper material (and screening from below as well) and allowing for the openings to be closed with glass in the cooler weather. On-demand heating could be provided for those colder days that the sun-porch might be used.
One thing that I have learned from my interaction with the people of these (or other inner city/low income neighborhood), is that they do want to be part of an experiment into some offbeat design, arrangement, or use of materials.\textsuperscript{18} People tend to prefer homes of traditional layout and traditional design. The creation of “boxy” or similar modern styles tends to set the housing off from the rest of the city often given it the stigmata of “project” or of being different. Variety is great but these homes must fit the context of the neighborhood or city.

It is for this reason that I felt it important to work within the context of the existing fabric of traditional homes in these neighborhoods. These homes untouched by vinyl siding have a storybook feel to them that helps to create a sense of community and place.

\textsuperscript{18} The author has participated in the construction or renovation of over 1,000 units of inner city or affordable housing and has worked on churches and community centers in these neighborhoods. Overwhelmingly when topics of design come up, these clients preferred traditional over modern.
Some additional thoughts on design include the concept of Universal Design, Passive House Design, and LEED for Homes, all of which are included in Appendix E for references. Wherever possible, elements from these strategies are incorporated into the project design.
Construction

As architects and builders it is important to explore the various techniques that we can use to create sustainable homes and villages. A sample technique, explored here, is the use of super-insulated walls utilizing a double stud wall construction.

The insulating and sealing of any building can have a very positive impact on its energy performance as well as many other factors such as water-tightness, sound, privacy, and durability.

As an example, a single constructible element, the exterior walls of a residential building can be designed to achieve both greater energy efficiency and greater occupant comfort. Heat loss occurs via conduction, convection, radiation, and mass transport. The improvement of the thermal performance of the exterior walls can help reduce all of these.

Typical home construction in the northeastern U.S. utilizes 2x4 or 2x6 stud wall construction in a platform framing system. The exterior is typically sheathed and sided, and the interior typically receives gypsum drywall. Plumbing piping, heating ducts, pipes, and electrical wiring are run in the stud cavity. These cavities are typically insulated with fiberglass batt insulation.
Figure 31- Modern Residential Wall Section
With this standard type of construction, several items reduce the overall efficiency of the thermal insulation that is used to prevent heat transfer through the wall. The wood studs provide “thermal bridging” resulting in increased heat transfer since wood is more conductive than insulation. The introduction of mechanical and electrical systems into the cavity space can compromise the proper installation of the insulation and the air and vapor barriers. Mechanical and electrical systems penetrate the building envelope on both the interior and exterior and may result in air movement, which reduces the effectiveness of the insulation, and moisture penetration, which can damage the building. Finally, the use of 2x4 or 2x6 studs limits the cavity space available for insulating materials to 3.5 inches and 5.5 inches respectively.

By utilizing a double stud wall system, all of these faults can be addressed and the overall R-value of the wall assembly can be improved.

Although some may view the added thickness of the exterior walls as a problem, there are established architectural traditions that embrace the results. Returning to “A Pattern Language”, Christopher Alexander extols the virtues of “Thick Walls” (Pattern 197), Thickening the Outer Walls (Pattern 211), Alcoves (Pattern 179), and Built In Window Seating (Patterns 180 & 202). (Alexander, Ishikawa and Silverstein)

The added benefits of decreased noise transmission from the exterior, increased strength, and increased security are all desirable features. The techniques are also adaptable to non-residential construction such as schools and businesses.
Advanced Framing

For most of the last 60 years, most homes in the U.S. were built using 2x4 platform framing construction with double top plates, three-stud corners, framed headers, and jack studs and cripples. Advanced framing is an improvement on this method that uses 2x6 construction on 24-inch centers with single top plates, two-stud corners, no jack studs or cripples, and purposely designed headers or no headers at all. This results in 5-10 percent less lumber materials used and 30 percent less pieces, which results in less labor as well. There is more room for insulation, easier installation of mechanical and electrical systems, and better modularity. ("BSI-030: Advanced Framing — Building Science Information" 3/16/2012 <http://www.buildingscience.com/documents/insights/bsi-030-advanced-framing>)

Manufactured Housing

Pre-manufactured housing also known as modular housing is a currently popular method of building more efficiently (i.e. less cost. Manufactured Housing could play a role in addressing the shortage of decent affordable housing in our inner cities.

Five factors primarily drive these efficiencies:

1. Economies of scale in high-volume materials purchase and off-site labor costs can be lower
2. Ability to better coordinate production using assembly-line techniques
3. A controlled environment devoid of weather or other delays, keeping materials dry is paramount to preventing mold, which is a major health hazard

4. Standardized design and materials

5. Reduced costs (primarily time) of securing approval from local code officials

A recent study showed that on-site built homes cost $150,000 to build (not including land costs) and resulted in a mortgage of $964 per month. The same size pre-manufactured home cost $100,000 to build and resulted in $561 per month mortgage. (Apgar 13)

In addition to these efficiencies, modular housing, by the nature of its cellular (box) structure can be much stronger than conventionally framed homes. The additional layer of materials between modules adds strength and soundproofing to a home.

A danger of pre-manufactured housing can be poor design, resulting in a “boxy” look. Modular units coming from the factory are actually called boxes and it takes some additional thought and on-site work to create a visually appealing home.
It is also essential to overcoming negative stereotypes about manufactured housing held by lenders and the general public. (Apgar 5)

Working with the community during the planning stages of the project is important. “Visuals such as site plans and final elevations can help to overcome opposition as they allow the community to see what you have planned rather than imagine the worst possible outcome.” (Neighborhood Reinvestment Corporation (U.S.) 2006)

**Materials**

In our present day, we are blessed (and cursed) with a great variety of materials and technologies to solve the multitude of problems that assail the built environment. If we are to succeed at urban renewal, we must design well, build well, and embrace maintainability and sustainability. Sustainability leads to affordability and this will lead to better maintained and longer-lived buildings that are healthier and happier for their occupants.
“Oh, yes, I should mention, I hate vinyl siding”. Of all the materials we currently use to build homes, this is the most abhorrent (followed closely by Gypsum Board). It is a petroleum based hazardous\(^\text{19}\) composition that is the antithesis of natural materials and sustainability. It is the evil of evils to an older home. Cheap to buy and install, it merely covers up the sores of an older home until these sores become cancers. The leaning and sagging buildings beneath this flimsy wallpaper foretell the coming failure of the structure. Street after street of multi-family homes with poorly applied vinyl siding in a limited color palette is the hallmark of the distressed areas in

\(^{19}\) Vinyl Siding often contains Lead a material harmful to human health and especially dangerous to children under the age of six. Vinyl siding (and other PVC products) also contain carcinogenic materials and produce toxic fumes in a fire. ("Should we Phase out PVC? - EBN: 3:1 - BuildingGreen.Com ")
Springfield and other cities. Springfield’s Historic districts, by banning this material, have maintained some level of dignity that other areas of the city have lost.

Our environment, while fragile, is a powerful force. Today’s wood framed house left untended by human hands can only expect to last 50 years. (Lewis) The materials and methods used in the construction of long-lived buildings must be in harmony with the natural world and not be easily subject to decaying forces.

Energy

While I have taken efforts here to define sustainability in broader terms than it is currently being used in our time, the reduction of energy use remains perhaps one of the most important elements. The reduction of energy use is one facet of sustainability that has the ability to affect the individual, the family, the community, the nation, all people, all living things, and in deed, the future of our world.

Home energy use accounts for the largest percentage of home energy use, and it is generally the most costly. People, regardless of income level, should not have to trade comfort and health for oil dollars. The key to this problem is to keep the heat in the home through insulation, air-sealing, and efficient heating systems. Additional measures such as the placement of energy conserving windows and doors and the ability to capture solar gain in winter are all part of the equation. This project is located in New England, so the primary focus is on heating and preventing moisture penetration from the humid interior air from entering the wall cavity. In a warmer, more humid climate, cooling and moisture penetration from the exterior would be the concern.
This project proposes that it meet or exceed the LEED for Homes™ and Stretch Energy Code requirements. Both of these standards use the HERS® rating system to describe the energy efficiency of residential units. Since the homes being developed for this project are less than 3,000 ft², a maximum HERS rating of 65 is allowed by the Stretch Energy Code. To meet the Stretch Code, minimum U values of .35 for windows and minimum R-values of 38 for ceilings, 20 for walls, and 30 for floors are required. Additional requirements include the Energy Star™ thermal bypass testing, duct air leakage testing, and building air leakage testing, each of which must meet a minimum standard as described in Appendix E. (MA State Building Code 8th Edition)
Data has shown that for new construction, additional first costs are estimated at around $1/SF for a single-family home, including the cost of a HERS rater. This is reduced by half by utility rebates, which translates into around $125 a year when rolled into a 30-year mortgage at 6% interest. However, these investments are also reducing energy bills by about $500/year, resulting in a potential net annual savings to the homeowner of about $400. (FAQ’s for MA Stretch Energy Code Appendix 780 CMR 115.AA)

**Figure 36 - HERS Energy Use Index**

LEED for Homes is a residential green building program that includes a substantial energy efficiency element. The energy and atmosphere requirements of the LEED for Homes program are the minimum Energy Star Home requirements of a HERS 85 rating and a completed Energy Star Qualified Homes Thermal Bypass Checklist. Homes can then earn added points for achieving a lower HERS score. Because LEED for Homes and the stretch code share the same HERS and Energy Star underpinnings they are fully compatible. (LEED for Homes)

The HERS rating is a score, starting at 100, where a lower number is better. A home designed to meet the minimum energy requirements of the local building code would receive a HERS rating of 100. A home that is 15% better than the code minimum would receive a score of 85 and would qualify for the Energy Star rating. LEED for Homes awards points for each point below 85 that a home achieves, therefore a home that meets the Stretch Energy code maximum of 65 would qualify for the Energy Star rating and would receive 20 LEED for Homes points. LEED for Homes adds about $2/ft² to the cost of the home, but these costs are quickly recovered in a few years through energy and
maintenance savings. A Net Zero Home, which does not use more energy than it produces would receive a HERS rating of zero.

Table 4 - Comparison of Energy Ratings Systems

<table>
<thead>
<tr>
<th>National Standard or Program</th>
<th>Efficiency</th>
<th>Prescriptive Verification Method</th>
<th>Performance Verification Method</th>
<th>Residential or Commercial</th>
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<td>IECC</td>
<td>Any percent above code can be specified</td>
<td>Prescriptive form</td>
<td>REM/Design, REM/Rate and RE:SeChk Energy Gauge and others</td>
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</tr>
<tr>
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<td>15% above 2006 IECC plus checklist and performance tests</td>
<td>n/a</td>
<td>REM/Design and REM/Rate Performance Calculations and Home Performance Tests</td>
<td>Typically Residential</td>
</tr>
<tr>
<td>HERS Index</td>
<td>Any designated percent above 2006 IECC plus performance tests</td>
<td>n/a</td>
<td>REM/Rate Performance Calculations and Home Performance Tests</td>
<td>Residential</td>
</tr>
<tr>
<td>NBI Core Performance Guide</td>
<td>30% above ASHRAE 90.1-2004</td>
<td>Checklist used with the Core Performance and Enhanced Performance Requirements</td>
<td>Appendix G in ASHRAE 90.1-2004 referenced in Core Performance as an alternative to the Core and Enhanced Performance Strategy</td>
<td>Commercial</td>
</tr>
<tr>
<td>Advanced Energy Design Guides (AEDGs)</td>
<td>50% above ASHRAE 901-1999 or 2004</td>
<td>The AEDGs are intended as guidance and are not written in code-enforceable language</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>ESV3</td>
<td>20% more efficient than the 2009 IECC</td>
<td>Both prescriptive and performance options are verified by the completion of four inspection checklists</td>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>LEED for Homes</td>
<td>Requires a HERS of 85-0, generally meets or exceeds 2009 IECC</td>
<td>For certification, must provide specified documentation to the USGBC</td>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>LEED 2009</td>
<td>Minimum 10% above ASHRAE 90.1-2007</td>
<td>For certification, must provide specified documentation to the USGBC</td>
<td>Commercial</td>
<td></td>
</tr>
</tbody>
</table>

There is some criticism of the HERS rating system because it does not take into account conservation measures such as not installing a clothes dryer. HERS can also not account for occupant behavior such as running the heat with the windows open or leaving lights on when not needed. Homeowner education is an additional important element of energy sustainability.
Health

There is strong evidence supporting the benefits of green building in terms of energy efficiency and environmental impacts. An increasing number of studies also document the health benefits of certain green building programs. Beatley provides evidence from the National Center for Healthy Housing (NCHH) that affordable green housing provides health benefits to its low-income residents. (Beatley 2-3)

A home that is energy-efficient (i.e. well insulated and tight) is going to be more comfortable. Rapid temperature swings and drafts are eliminated and it is easier for the occupant to keep the home at a comfortable temperature and humidity level.

Proper ventilation is such a home is crucial as it provides for a constant exchange of the indoor air with fresh outdoor air eliminating indoor air pollution, which can be hundreds of times worse than outdoor air pollution. Heat recovery is important in this process so that as my Dad used to say when we left the back door open “You can’t heat the outdoors”.

Another form of ventilation is the removal of Radon gases from the building environment by ventilating from beneath the floor slab and foundation to above the roof. The seepage of naturally occurring radon gas into basements and slab on grade construction can create a serious lung cancer risk.
The chemicals in building materials, human, pet, and plant metabolism and cooking all create harmful chemicals that if not properly ventilated can affect human health. While the latter two are inevitable, eliminating harmful chemicals such as formaldehyde and Volatile Organic Compounds (VOC’s) from building materials can greatly improve indoor air quality. That new carpet smell can be dangerous to your health, especially long after you stop noticing it and yet it is still emitting gases into the air you breathe.

Keeping a home dry and clean during construction and after occupancy will help prevent the formation of mold, which is extremely dangerous to human health and can destroy a home. The control of dirt is important because it through the introduction of soil that mold spores and other allergens are introduced to the home. A clean home will also discourage pest infiltration along with other measures such as the proper sealing and shielding of exterior wall penetrations and transitions. A local architect working on the renovation of a low-income housing development recently commented to me on the modest request from most of the tenants, which was that we just keep the rats out of our basements.

Additional measures include the use of only hard flooring materials, code required in Kitchens and Bathrooms, but also wise in other rooms. Carpet can be difficult and expensive to clean and will inevitably be soiled by spills, pets, or a sick child.

All homes should also have a foundation drainage system, even if there is no evidence of ground water. Ground water levels can change seasonally or with heavy storms, or as the result of nearby construction and water penetration into a basement renders that space
unusable and promotes dampness and mold growth throughout the home. As with radon ventilation, this is a simple and low cost element that should be included even if the local codes do not require it.

One-year post renovation, the health benefits continued to accrue: the percentage of adults reporting good or excellent health (Beatley 6)

The modest improvements in housing design, materials, and construction greatly reduced asthma triggers and symptoms to produce significant health gains. Asthmatic children had nearly two thirds more symptom-free days than in their previous homes and showed dramatic improvements in lung function. Health improvements resulted in a 66 percent reduction in the need for urgent medical care. Moreover, as asthma symptoms and triggers declined, the quality of life for families living in Breathe-Easy Homes improved: fewer sleepless nights, less lost work and school days, increased exercise and outdoor activities, and lower medical expenses. (Beatley 9)

The health benefits of green building are not limited to improving indoor environmental quality alone. Siting and landscaping efforts that include walking and bike paths as part of access to local retail stores and amenities lead to increased outdoor physical activities. Green building standards that promote community gardens and other outdoor improvements help raise not only nutritional and social benefits for participating residents, but also, in some instances, economic benefits. (Beatley 15)
CHAPTER 7

PROPOSED DESIGN SOLUTION

The design for this project will use the best techniques that have been determined from the research, precedents, and theory presented in this thesis to yield a concise and harmonious design for the revitalization of a selected area within the Six Corners/Old Hill neighborhoods.

The design proceeds through a logical process from large to small and take into account the feedback (presented herein) from neighborhood residents, non-governmental organizations, and local officials. Some of the key design elements for this project and the site are presented below.

Streets and Sidewalks

The reworking of streets and sidewalks around the project site, including the elimination of some redundant roadways is an important part of addressing the traffic concerns of residents. As mentioned previously, there is an overabundance of streets that dissect the neighborhood and even dissect the project lot. One of these streets would be removed (see figure 25). The City might also be petitioned to create traffic circles at both the intersection of the three streets at “six corners” and at the intersection of Walnut and Hickory. This along with other traffic-calming measures would help alleviate both idling traffic and speeds in the neighborhood.

Donald Appleyard and Mark Linteli have found that “the heavier the traffic in an area, the less people think of it as home territory.” “Not only do residents view the streets with
heavy traffic as less personal, but also they feel the same about the houses along the street.” A neighborhood can develop a stronger identity if it is protected from heavy traffic. (Appleyard)

Further results from their study found that:

Neighborhood with light traffic - 2000 vehicles/day - 200 vehicles/peak hour - 15-20 mph - Two-way

- Residents speaking on "neighboring and visiting
- "I feel its home. There are warm people on this street. I don't feel alone”
- “Everybody knows each other.”
- “Definitely a friendly street”
- Residents speaking on "home territory"
- “The street life doesn't intrude into the home...I feel my home extends to the whole block”

Neighborhood with moderate traffic - 6000 vehicles/day - 550 vehicles/peak hour - 25 mph - Two-way

- Residents speaking on "neighboring and visiting
- "You see the neighbors but they aren't close friends.”
- “Don't feel there is any community any more, but people say hello.”
- Residents speaking on "home territory”
- "It's an ok place - doesn't require much thought”

Neighborhood with heavy traffic - 16,000 vehicles/day - 1900 vehicles/peak hour - 35-40 mph - One-way

- Residents speaking on "neighboring and visiting”
- It's not a friendly street - no one offers help....People are afraid to go into the street because of the traffic.”
- Residents speaking on "home territory"
- “It is impersonal and public noise from the street intrudes into my home.”
A major concern was that the sidewalks in this part of the neighborhood are narrow and directly about the streets. This can be dangerous for pedestrians and bicyclists, as there is little room for error if a car was to jump the curb and even makes it hazardous for pedestrians and bicyclists to share the sidewalk thus often forcing the bicyclists into the street. The project design recommends creating a tree belt and moving a wider sidewalk inboard of this landscape element. Added benefits are the reintroduction of street trees (long absent from the neighborhood and almost totally removed due to the tornado and 2011 October snowstorm). Seventy-Four percent of the trees in Six Corners and Fifty-One percent of the trees in Old Hill were lost or damaged in the 2011 tornado. (Sherman)

**Streetscape and Landscape Improvements**

By improving the streetscape and landscape across the neighborhood and not just at the project site, the project should feel more integrated with the neighborhood and the benefits of greenery, summer shading, rustling leaves, and cleaner air will extend to all residents.

There is some tension in the project design between creating a communal backyard space and having traditional backyards. The design shows the communal option. It is hoped that the close proximity of the communal play, sitting, and garden spaces to homes will prevent the misuse of these spaces. By creating this communal play, sit, walk, grow space in and amongst the multi-generational housing, it is hoped to achieve appropriate use at all times of the day.
Extend the Project across the Neighborhood

The project also incorporates nearby vacant lots, either for new homes, or for community gardens, or offered as extended yards to abutters. It is recognized in the neighborhoods that crime and drugs occur in the parks and in vacant lots and buildings.

While infill housing is an important element of any revitalization, in a really devastated neighborhood, building a few houses at a time will not have the same impact as revitalizing a larger parcel in conjunction with some infill. (Neighborhood Reinvestment Corporation (U.S.) 2002; 41)

The Creation of a Village

A central element of this thesis is that arranging homes in a village (within a neighborhood) enable a healthier socio-economic environment for the residents. The popular book “It Takes A Village” points out that we have a stake in the lives of our neighbors and that working together across generational and family boundaries is of benefit to all, not just economically, but also physically, emotionally, and spiritually. (Clinton)

While the limited time allowed for the development of this thesis project required focus on the site and homes, the allowance of space for schools, markets, business, a library, and healthcare providers is an integral part of the village.
The location of homes in Six Corners and Old Hill follows a pattern of dense blocks of homes surrounded by open space and water. The intent of this design is to duplicate this density.

Figure 37 - Density of Area around Project Site

The fabric of density has developed holes over the years as homes have been destroyed by fire or demolished due to abandonment or have been bought up by Springfield College and then demolished. The tornado exacerbated the problem and the density is now pot-marked by vacant lots. This project proposes infill housing from some lots and alternate uses for other lots such as community gardens or abutter acquisition.
Figure 38 - Proposed Density of Project

Orientation

The size of the parcel and its “L” shaped configuration present some challenges for the layout of the village. Concepts that were considered were to arrange the homes around courtyards (see figure 39), to randomly arrange the units on the site or to follow the traditional layout of Springfield neighborhoods with front doors facing the street. In Six Corners and Old Hill, the predominant lot layout is a long rectangular lot with roughly 50 feet of frontage on the street and 100 feet deep.
The courtyard arrangement was dismissed as it felt as though the project would be turning its back on the neighborhood since main entries would normally face the interior courtyards. Even if the homes were reversed, some units would have entries that do not face the street. Other homes might end up with awkwardly placed entries even if they did face the street.

The random arrangement started to feel like an imposed order and reminded me of many of the housing projects built in Springfield which social statistics suggest are less than successful in helping families and children.
Since the overall site is aligned north to south, there would be some argument to use a north-south grid such that the long axes of the homes could align to offer maximum Southern exposure to take advantages of the possibilities for Solar Photovoltaic and Passive Solar Gain in the winter. Mimicking the arrangements found throughout the neighborhood and in the other neighborhoods of Springfield seemed to be the best choice in making the project fit well and in meeting the desires of the residents. The benefits of the traditional small front yard and a larger rear yard provide for both public and private exterior rooms. There is a strong culture of interaction from the front porch to the street, so front porches are provided within conversational distance of the sidewalks.

A Variety of Homes

Crucial to the village concept and to the success of the project is the creation of homes to encourage multi-generational (and maybe even) mixed-income housing. Having different types of homes that are suited to single people, couples, new parents, growing families, empty nesters, and retired couples and singles provides for a fabric of support for the village. The project proposes to create these opportunities through a mixture of house size and number of bedrooms.

Diversity in Materials, Textures, and Colors

A component of urban blight is the endless use of drab colored siding with no details. This project will use a variety of exterior siding materials in vibrant colors that are sensitive to the neighborhoods past. Detail elements such as wider window trim, corner boards, water tables, horizontal trim, and the breaking up of facades will enable the
homes to “pop out” from the bland beige, grey, and white that has been so predominant in the neighborhood over the past 30-40 years.

Siding materials are recommended to be fiber-cement board siding due to its durability, longevity, easy maintenance, and fire & weather resistance. Trim materials could also be fiber cement or fiber based such as “Azek”™ or “Fypon”™. Rain screen construction for the siding is important such that the siding is well ventilated and able to dry itself on all sides while moisture penetration into the wall cavity is completely prevented.

Springfield has taken the effort to develop recommended Design Guidelines and these were published in 2009. Among the numerous recommendations, one that is particularly applicable to Six Corners and Old Hill is that of “Gable Front Vernacular”

Essential Elements of the Gable Vernacular (from “Springfield Pattern Book”23)

1. Simple straightforward gable end typically faces the street
2. Wide trim bands define the main volumes
3. A symmetrical and balanced composition of windows and doors on the front façade.
4. Porch columns, roof and details are derived from classical proportions

23 Springfield Pattern Book, prepared for the City of Springfield by Dietz and Company Architects, 2008
Sustainability and Maintainability

Sustainability and Maintainability in all of the above elements using good design, durable materials and equipment, energy consciousness, and resident education about their homes are key elements of a sustainable future.

In addition to the energy and health benefits of sustainable building, one of the most obvious is the longevity of the house itself. Houses should last hundreds of years rather than tens of years. The 50-year lifespan of a new home in the U.S. is absurd. The costs and impacts of building, using up, and destroying homes across a 50 years cycle has enormous impacts on resource and energy use, climate impacts, and of course the costs to the local economy.

The materials used to construct these homes must be carefully selected to be both long lasting, maintenance free and healthy for the inhabitants and the environment.

Key elements for a long-lived home are:

1. Keeping the rain and moisture outside.
2. Adequate overhangs and protected entrances.
3. Concrete Foundations with Drainage
4. Concrete Floor or Basement Slabs with Radon Ventilation
5. Prefinished Fiberglass/Aluminum Windows and Doors
6. Wood or Sheet Vinyl Flooring, Loose Carpeting can always be added, should not carpet be considered a furnishing and not a building material?
7. Veneer Plaster Walls and Ceilings
8. Dense-Pak blown-in cellulose for walls and ceilings (let’s move away from petroleum based products and the cancer causing chemicals they contain)
9. 24/7 low speed, low energy ventilation (Panasonic)
10. Energy Recovery Ventilation
11. Closed Loop Vented Heating Systems

**Education**

While not normally thought of as part of a project design, educating homeowners on how to care for and maintain their homes is a critical element in the long-term success (sustainability) of the village. When you buy a $20,000 automobile, you receive a 1000 page manual and instructions on regular maintenance and care to maintain your 10-year warranty. If you are lucky when you buy your $150,000 home, you might receive a disorganized stack of papers that may or may not include all of the systems in your home and there is little discussion about the required maintenance. It may be presumed that the knowledge of how to care for a home is passed from generation to generation, but I think the large number of ruined and removed structures in Springfield would point to an education shortfall.
So the last part of the design is the “Owner’s manual” for your new home. Our new homeowners would receive education on the basics of keeping their homes healthy;

You Can Take 7 Steps to KEEP Your Home Healthy


(Wiranowski 6)

Presentation Boards

The Design Presentation Boards, which follow, present one possible solution for this project. The design of homes is a varied and difficult problem requiring close attention to the both the site and the needs of the prospective tenants. I would not propose that these particular designs are the final iteration of this process, only that they are prepared considering the influence of the information that is presented herein. In the end, the design of a sustainable urban village for Six Corners and Old Hill would need to evolve in collaboration with the members of the community and the residents. It is my hope that this thesis can act as a starting point for that process and thus eliminate the cost and time of at least a few of those iterations.
Board 1 – City and Neighborhood Context

Board 2 – Challenges and Opportunities
Board 3 – The New Village as Part of the Neighborhood Fabric

Board 4 – Project Site Layout
Board 5 – Traditional Gable Front Vernacular and Site Section

Board 6 – A Variety of Homes for Families, Couples, and Singles
Board 7 – Example of an Energy Efficient Family Home

Board 8 – Example of the Interplay of Homes, Landscape, Play Area, and Parking
CONCLUSION

Living, working, learning, and playing are important parts of all of our lives. The homes, villages, and cities, that we live in, need to support the human endeavor rather than restrict it. Good design and sustainable practices can go a long way toward achieving a more comfortable and secure environment for everyone.

Good and environmentally conscious housing design has enormous and broad benefits for people, families, and the community. A comfortable and secure home can promote physical, emotional, and social well-being and allow people to dream and to create.

Homes and communities approach sustainability by reducing energy & resource use, pollution contribution, and the costs of maintenance and operation. Full sustainability is achieved when these same homes and communities, through conscious arrangement and selection of spaces and materials, nurture and support the people that live in them and provide for a healthier and happier future.
APPENDIX A

PRECEDENT STUDIES

When I began this research project, I already had in mind, at least one very successful project that I knew I would need to look at. That project, Churchill Homes, in Holyoke, MA designed by the firm of Dietz & Company Architects, had stimulated an interest in how this challenge could be addressed from the first day that I opened the construction documents (for bidding purposes) back in 1999.

In looking at other case studies or examples of neighborhood scale development, it was discovered that there are several popular starting points for renewing urban areas. Some projects are based on “Transit Oriented Development” or TOD where the project is centered on a transportation hub or interchange of transit modes. Others, such as Churchill, are “Traditional Neighborhood Developments” or TND and these are based on recreating the traditional ethnic or small town neighborhoods familiar to many Americans.

Finally, sustainability has to be a core element of any proposed solution. While Churchill is not billed as a “green” project, inherent to its design are many features that make it worthy of a sustainable moniker and thus its relevancy to this thesis. With these thoughts in hand, I proceeded to ask the following questions as I evaluated each precedent:

- What is the relevancy of these developments to a proposed 21st century sustainable urban village for Springfield?

  • Is it in an urban/inner city environment?
  • Is there a viable mix of homes for different income levels?
  • Does the example embody sustainable principles?
  • Is there enough data to determine success or failure?
  • Can we evaluate the neighborhood dynamics?
  • Is it feasible, politically and economically for Springfield?

Precedent # 1 - Churchill Homes Development, Holyoke, MA

Churchill Homes as a Traditional Neighborhood Development or “TND” has much relevance to my thesis site in nearby Springfield, MA. Having been involved in the early phases of this project as a bidding contractor and in encountering it frequently over the past few years, I find that I admire the project a great deal and need to understand why I think this is so successful, and is it really so?
History

The site was originally jammed with project row houses built in the 1940’s. Known as “Jackson Parkway”, the former executive director of the Holyoke Housing Authority (HHA), Raymond Murphy, once referred to it as the “last resort for the poorest of the poor”. ("Churchill Homes", "Holyoke Housing Authority", 4/23/2011 <http://www.holyokehousing.org>)

Originally, Irish and Polish immigrants, who worked in the mills, inhabited these sparse and compact dwellings. Over the course of several decades, as the mills closed, these families moved to new lives and new jobs based in the suburbs. Immigrants from Puerto Rico, also leaving economic hardship behind in their own country, came in search of agricultural employment in the Pioneer Valley and began to occupy these units during the 60’s and 70’s. (“History of the City of Holyoke, Massachusetts”, 4/23/2011 <http://www.pathnet.org>)
Holyoke had always been planned community. 19th century industrialists built dams and canals to harvest the power of water in this unique little crook and fall of the Connecticut River. The mills and then the city were built around and constrained by the canals and the rivers.

Workers were needed for the mills and the immigrants sought jobs. Therefore, the water company (which owned almost everything) built these large brick tenements. There were about 85,000 people living in the city at one point. People walked to work because all the work was located right in that canal system, which covered a couple of square miles.
Holyoke did have an early innovative street railway system, but nothing remains of that now. The location of remaining rail lines does not allow for easy rail based transit oriented development.

It was in 1989 that I first visited the Jackson Parkway units as part of earlier futile attempts to upgrade these units. My firm actually performed several contracts for these buildings to add such basic amenities as closets and proper entry stairs, stoops, and porches. Even then, I questioned the wisdom of spending any money on homes where the average room size was less than 10 feet in its longest dimension. The underlying philosophy, I learned later, was that government repaired to the absolute minimum with the cheapest materials in order to keep these units barely livable. Not much thought was given to architecture, and to feel, and how people felt living in these units. Yet this was still home for perhaps as many as 200 families and it would take some serious political will and an innovative government housing program to convince these tenants to temporarily or permanently relocate (with assistance) so that the site could be cleared of all remnants (and hazardous materials) of the former project.

**Financing**

The innovative Government program was one of many that came out of the Clinton administration of the mid 90’s. Entitled HOPE IV, this was a program that many communities applied for, but for which only a few were selected. Holyoke had to compete with much larger cities (with much larger dilapidated housing projects) but was still lucky enough to receive an initial grant of $15 Million. The grant was initially to rehabilitate Jackson Parkway, but just as I had also contemplated years before, the Holyoke Housing Authority decided to raze the site and build a traditional neighborhood development to be known as Churchill Homes. ("The Community Builders: Projects: Churchill Homes”. 4/23/2011 <http://tcbinc.org/what_we_do/projects/churchill_homes.htm>)

Churchill Homes is a mixed ownership development. The Holyoke Housing Authority maintains ownership of the larger multi-family buildings and rents these at below market rates to families and seniors in need. Interspersed with these are dozens of privately owned 1-4 bedroom single-family homes.

The site's mixture of incomes is characteristic of its “New Urbanism” nature. The development has 172 homeownership units and 100 rental units, compared to 219 rental units in its predecessor, Jackson Parkway Apartments. Each unit/building has its own private yard and its own address, erasing the stigma of the shared address that all former Jackson Parkway residents shared.

The financing and sale of these homes benefited from several federal, state, and local programs to help people buy a first home. Sale prices and the resultant mortgages were extremely affordable. A typical unit sold for approx. $120,000 in an era when similar homes (even in Holyoke) were selling for twice that.
While the HOPE IV funds were the catalyst for the project, the eventual project funding came from a wide variety of sources.

**Sources of Funding (Phase I) (from HHA website)**

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<td>Federal Home Loan Bank of Boston Affordable Housing Program grant</td>
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<td>Low Income Housing Tax Credits</td>
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The mixed source financing of the project was unique at the time and brought forth a new idea for public housing; the concept of reviving an entire neighborhood.

Although the Holyoke Housing Authority received only a $15 million HOPE VI grant for the project, this was eventually leveraged with other money to create a budget of about $46 million for the restoration of the entire neighborhood in three phases.

Churchill Homes benefited from a new form of public-private partnership, both in funding and in development. The city, the housing authority, and the developer had to break or loosen many of the traditional rules for public housing and the use of public funds to make the project happen. "If it were not for all the partners we would never have been able to do what we did," said Mr. Murphy in a 2006 interview. (7)

**Design**

To resurrect a traditional neighborhood feel (or maybe even more than just a feel), the designers had to replace the "super-block" plan of Jackson Parkway and other Holyoke developments with something more human in scale.
The developer’s goals for Churchill were that it should look and feel like a natural part of the surrounding area in context and in time. To this end, the designers not only created a regular street grid pattern (actually restoring the street pattern to its pre-housing project configuration) but also designed the residences to fit with the architecture of the surrounding area. The designs mimic neighboring architecture in their setbacks, color schemes, and detailing. The one-way streets recreate a less frantic urban setting. ("Dietz & Company Architects - Exhibition: Churchill Neighborhood Phase 1")

The homes, designed by Dietz and Company Architects of Springfield, MA are in a Victorian style and are neatly placed on the site. Service is to the rear and parking is provided in communal lots adjacent to the site rather than with individual driveways. This creates (especially) on Rt. 5, the appearance of a historical neighborhood such as one might find on Nantucket or in the pricey section of any major city.

The private yards, small front setbacks, and common green space in the neighborhood's center draw inspiration from Jane Jacob's New Urbanist ideas of defensible space. The inclusion of a community center, park, and daycare center reinforce the feel of
community. The site benefited from existing proximity to schools, parks, sport fields, public transportation, and shopping.

As mentioned previously, the development has many energy efficient features, including high performance windows, low-toxicity paints and finishes, pre-cast insulated concrete foundations, and highly efficient heating & ventilation systems.

Design was crucial in the success of Churchill Homes, which won an American Institute of Architects: New England award. Marc Sternick, of Dietz & Company Architects, Inc., and the development’s architect reminds us "It is taking into account what everybody is looking for in a neighborhood and incorporating those principles into a low, or mixed-income development. It means giving low-income residents a reason to take pride in where they live.”

The revival of the Churchill neighborhood opens a new chapter in the history of Holyoke. With the popular project, prominently located at the intersection of two busy
thoroughfares, the image of Holyoke is changing to a place where people want to live and raise their families.

Construction

Churchill Homes, as a construction project in its day, incorporated many new concepts for building that we now see as common sense. These were designed to reduce cost, increase construction efficiency, increase energy efficiency, and make the homes more livable. (5)

Churchill Homes Construction Innovations

Use of advanced framing techniques to reduce the amount of materials and labor needed to construct traditional stick-built homes. These techniques can also increase energy efficiency since there is more insulation and less wood framing in the wall and floor construction.

- 19.2" and 24" On Center Framing
- Less wood framing
- More insulation
- Modular Layout
- Overall building uses 24” module
- Coordinated Window Sizes
- Single Top Plate
- Exterior Walls use steel strapping
- Interior Walls do not need 2nd top plate
- Correct Sizing of Headers

Instead of sizing all headers in bearing walls to accommodate the worst case load and span, size each header for its particular load and span.

SIPS Insulated Headers

Strength + Elimination of a traditional energy loss area
Churchill Homes Construction Innovations

Precast Insulated Concrete Foundation Panels

Higher Strength/Better Quality Concrete means less can be used

Already Insulated/Ready for Finishing

(today we might also use insulated stay-in-place forms)

Low or No VOC materials

Health & Environmental Benefits Obvious

Today we know this as several of the LEED credits

Universal Design

Rather than designing special units for persons with disabilities, make all units universally accessible, this helps alleviate the acute shortage of accessible units that people with disabilities face. As we all grow older, we all will need universal design in our homes so that people can stay in their homes rather than have to leave.

Humidity and Ventilation Control

Humidity control can improve indoor environmental quality by managing moisture that can lead to mold and deterioration. The correct humidity and outside air ventilation with heat recovery solves the problem of very “tight” buildings which are needed for energy efficiency.


Architectural Success
To measure success, we can look at the metrics that I listed in my previous precedent analysis (also listed following this section), but more importantly, let us listen to the people who live in Churchill Homes.

### People

Residents of Churchill Homes invariably greet you with a smile and a story of how happy they are to be living in this development. The waiting list for units is open only intermittently and hundreds apply for the few units that might become available. Everyone wants to live here. (7)

Holyoke of the last century had a reputation as the “arson capital of the world”. Crime, drugs, gangs, and dilapidation were prevalent in the Jackson Parkway neighborhood. Those who are new to the area find it hard to believe that these things took place where the brightly colored attractive development now stands.

Daris Milay Arguelles with her mother Idanid Rodriquez in front of their apartment at Churchill Homes. (Image from MassLive.com)

Churchill Homes is an inner city neighborhood. Unless you live in an inner city neighborhood most of us avoid them as best we can. However, this neighborhood is different. It is encouraging to walk through this neighborhood on a summer evening as the sun is setting and feel the difference. The wide sidewalks, green spaces, and bright colors are worlds away from the neighborhoods that exist only a few blocks to the east, where towering brick buildings with windows falling out are pushed right up against the dark streets with very narrow sidewalks and no trees or landscape.

The pride of ownership and the pride of residence at Churchill are obvious. The units are well maintained even 5-6 years after initial occupancy. A walking tour through Churchill Homes reveals well-tended properties with welcoming front porches and small gardens. Backyards boast barbecue grills, basketball hoops, and other emblems of suburban hearth and home. (Mass-Live Article)
Economic Success

Built in the first half of the first decade of the 21st century, how did this mixed ownership development fare in the economic downturn and housing market collapse of the second half of this decade?

Churchill Homes has fared much better than other urban housing areas. According to the Pioneer Valley Planning Commission, the foreclosure rate in the development was much lower than surrounding communities. In fact, only one home of the 57 privately owned single-family homes was foreclosed on. ("Holyoke's Churchill Homes, Marketed to First-Time, Low-Income Home Buyers, Weathers Mortgage Crisis with Low Foreclosure Rate", Masslive.Com 4/23/2011)

This can be attributed to several factors:

1.) Keeping the initial cost of the home in an affordable range can result in manageable mortgages. In 2005, the homes were selling for approximately $110,000 for a three-bedroom unit and $116,000 for a four-bedroom unit. The homes cost about $160,000 to construct.

2.) Attention to education and counseling of first time low income homebuyers so that they understand and can manage the costs of owning a home.

3.) Energy efficient, low maintenance construction means the home owners do not have to expend precious funds needlessly.

Gentrification

The Churchill Homes neighborhood does not suffer from gentrification. The mix of public and private housing, rental, and owner-occupied units does not seem to have displaced the traditional residents of the neighborhood. Yet only a few of the original Jackson Parkway families live in Churchill Homes and less than 50 of 200 remained in the neighborhood.

Public Acceptance

The existing presence of affordable housing on the site, along with the presence of many other affordable developments in Holyoke, helped ensure public acceptance of the Churchill development. Early community involvement in the project through the conduction of surveys and design charettes involved review and approval by residents, citizens, police, fire, and the city building regulators. The Holyoke Housing Authority and the UMASS Public Policy program established services in the neighborhood to promote economic self-reliance. The community center serves as the basis for programs providing computer learning/job skills, daycare, after-school programs, GED, and ESOL.
The durable and attractive homes, built at a cost approaching $200,000 per unit received some criticism from the middle-class taxpayers who say, "Why are you giving people a $200,000 unit when we have worked all our lives and can't afford a $200,000 unit?" A valid point, but it is important to note that the durability and energy efficiency (which come at a cost) will result in lower costs over time and perhaps prevent dilapidation. How do you measure the value of the social and economic impact on the neighborhood? An area that once contained only publicly assisted housing now contains 172 tax paying homes. Crime and other social ills that plagued these blocks have all but been eliminated.

Findings Based On Previously Established Metrics

How do we measure the success of urban villages and particularly the architecture of urban villages in the frame of reference of “Architecture for the Common Good?”

<table>
<thead>
<tr>
<th>Crime</th>
<th>Drugs</th>
<th>Social Ills</th>
<th>Youth crime</th>
</tr>
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<tbody>
<tr>
<td>Joblessness</td>
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<tr>
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<td>Reliance on Public Aid</td>
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</tr>
<tr>
<td>Traffic Congestion</td>
<td></td>
<td>Highways</td>
<td></td>
</tr>
</tbody>
</table>

Amazingly, with Churchill Homes, there is some evidence that the project has positively addressed all of these concerns.

Will it create new Social Ills?

High-rises High-Rent

Gentrification:

Again, Churchill Homes has not created these new social ills!
This case study explores the concept of sustainable urbanism. I have selected the Bo01 (Live 01) district of Malmö, Sweden. While this city and location are quite different from my thesis site in Springfield, MA, I believe that sustainable concepts that have years of experience and data should offer some insight into the development of a sustainable urban village here in the U.S.

- Compact modern city
- Collective services
- Mixed-Use
- Green Space
- Great Focus on Sustainability (Cold Climate)
  - Socially
  - Economically
  - Ecologically
- Attractive Buildings and Spaces
- Strict Energy Coding for buildings
- High-density center, surrounded by agricultural areas
- Rapid growth
- Affordability, inexpensive sustainable construction
- Low energy buildings, i.e. highly insulated
- Wind and Solar

History

Malmö Sweden, an energy conscious and sustainable city in its own right, hosted a housing exhibition in 2001 known as “Bo01”, which is translated as “Live ‘01”. The exhibition was intended to present visionary types of dwellings for the new century. A core component of these dwellings was that the designs would focus foremost on people, aesthetics, environmental impact, and sustainable technologies. The exhibition site has since evolved into the Bo01 district of Malmö. The town’s planners have placed emphasis on quality housing, architectural diversity, and livable urban spaces. The district has become very popular, not only for residents, but as an excursion location. ("Malmö: Bo01 - an Ecological City of Tomorrow | Sustainable Cities")
Bo01 is located in the West Harbour (Västra Hamnen) “growth” area on the outskirts of Malmö. The area, which is an artificial island, was formerly a heavily polluted industrial area. It has now been transformed into an ecologically sound urban neighborhood of homes, businesses, and recreational areas.

Timeline:

1996  The Municipality of Malmö acquires the artificial island, Västra Hamnen, for the development of a new eco-district.

1997  Planning of the housing exhibition Bo01 and the structure plan for the entire Västra Hamnen area commences.

2000  The plans for Västra Hamnen are adopted. The plan divides the island into areas, of which Bo01 is one.

2001  The housing exhibition Bo01 opens to the public as part of the Västra Hamnen urban development area.

2001  After the housing exhibition, development of the Bo01 area gathers momentum.

2007  A quality program is put into service to clarify objectives for the development of the new district.

Description

The district contains approximately 600 homes along with offices, shops, and service establishments. A goal of the district is to be a leading international example of urban sustainability and environmental stewardship. The success of Bo01 should ground further growth in the West Harbour area in responsible building practices.
In addition to being a sustainable and environmentally friendly development, Bo01 also engages the local environment literally. This human built environment includes nesting boxes built into the structures for local birds and the extensive use of native vegetation.

The district uses wind turbines to provide all of the district’s electricity. Solar panels on the roof of each building provides 20% of the heat, with the remaining heat coming from internal and passive gains as well as from the district’s super-efficient central heating system. Recycled and organic materials, collected from the district, are used at the city’s Biogas plant to provide energy for the city as a whole. Each home contains a computerized energy monitoring system from which residents can monitor the energy use at a glance. The inclusion of many paths and bicycle trails helps limit automobile use and encourages exercise amongst the population.

Aesthetically pleasing common spaces are developed by the creation of sunny places shielded from the wind where people can stop, sit, and gather. Aesthetics are achieved by incorporating pleasant surroundings (plants, views, children playing, water moving) with scales of livable proportions (think of Boston City Hall Plaza as an incorrect way to do this).

Water is conserved in the district. Rainwater is captured in green roofs and slowly directed through a system of ponds and channels that integrate with public spaces.

Quality architectural and building practices are the foundation for the success of this neighborhood. Covenants are in place, which requires a range of architectural expression, varying materials, and the use of sustainable technologies. While dictated by the town planners, residents wholeheartedly incorporate the requirements into their homes and businesses. Education of both the developers and the residents has been a key in the acceptance of the overall plan for the district. The key to the area's success when it comes to creating growth, jobs, and a university lies in the collaboration between the public and private sectors regarding the area's future.

Unique ownership covenants help maintain the income diversity of the district which it is hoped will prevent blight. Despite the ambition of income diversity, the district has been criticized for its upscale leanings. There is limited racial diversity and home prices are twice the national average.

There has also been criticism regarding the sustainability boasts, as many homes have large areas of glass facing the sea (resulting in larger heating bills) and multiple luxury cars per home are common. An innovative program to rent electric cars to the residents was abandoned due to lack of interest.

A better example of sustainable design might be Villa Ākarp, a positive net energy (plusenerghus in Swedish) home in the West Harbour area.
NET ZERO ENERGY HOMES

Villa Åkarp (photo by owner, Karin Adalberth)

As the name implies, the house will generate more energy annually than it consumes. This is achieved by intelligent use of energy conservation techniques, energy recovery, and energy generation. In partnership with the local energy company, the house can purchase “green” energy during the long dark Nordic winters and sell energy back to the utility during the intensely sunny (and long) summer days in northern-most latitudes. The project is a shining example of distributed energy production and gives hope to a future where energy production can be scattered across millions of homes and business; each producing and consuming at alternate times to result in a zero reliance on carbon based (or nuclear) fuels. ("Villa Åkarp – a Positive Net Energy House in Malmö, Sweden · Ziger/Snead Architects")

At Villa Åkarp, materials are an important part of the solution both technically and aesthetically. While the long sunny Nordic summers might be a nice time to be outdoors, the population spends more than 90 percent of their time indoors. As a result, the choice of materials has a significant impact on both comfort and health of the residents.

The use of advanced materials (some produced in partnership with local industries) indicates how a total (or integrated) design approach can achieve both comfort and sustainability.
First Floor Plan, note the thickness of the walls and entry vestibules

Second Floor Plan


The Owner, Dr. Karin Adalberth, (a University Physics Professor), lists the following strategies that enable the home to perform as it does;
1.) Thicker than normal insulation
2.) Constant building ventilation with heat recovery
3.) Minimize infiltration (i.e. air tightness)
4.) Collection of heat (passive & active solar and internal gains)
5.) Collection of electricity (solar photo-voltaics)
6.) Availability of backup heat and electrical in winter time
7.) Water saving fixtures and devices
8.) Energy efficient electrical devices and systems

Unique to the location is the absence of the need for cooling in the summer.

The most crucial design element is the super insulated, super tight building envelope. Nearly 14 inches of Roxull™ mineral fiber insulation is used both as insulator and as fireproofing/rodent resistant insulation. The resulting system has an overall U value of 0.08 W/m², which results in a 75% energy savings as compared to a typically insulated wall of 3.5 inches.

Wall Insulation Detail (14 inches of insulation)


The foundation is also well insulated as can be seen in the detail below.
To achieve air tightness, a continuous air infiltration barrier was carefully installed to prevent “washing” of the insulation, which reduces its overall insulating value. As with any super tight home, heat recovery ventilation is important to maintain indoor air quality. Additional design features included triple glazed windows, gasketed doors, and judicious placement of both. Air locks at the entries prevent the exchange of air with the exterior when people enter or leave the home.

While the house cost approximately $100,000 more than a traditional house in this area, most of these costs can be attributed to the installation of solar heating, PV panels, and the wind turbine. The incredible gains achieved through super insulation and air tightness can have a minimal cost impact on any home.

The Beddington Zero (Fossil) Energy Development (BedZED) is a mixed-use development in South London designed by Bill Dunster Architects. BedZED was developed in concert with London’s largest housing association, the Peabody Trust. (Lazarus)

Composed of 82 homes and 3,000m2 of commercial/live/work space, the project was completed in 2002. The development allows people to live sustainably and to use only their share of the earth's renewable resources, without sacrificing a modern, urban, (and mobile) lifestyle. Importantly, this is accomplished within the cost envelope of a social housing budget. (Lazarus)

BedZED confronts conventional approaches to housing by tackling sustainability in all areas utilizing an integrated design/build approach.

The resultant solution reduces heat, electricity and water demand, eliminates the need for space heating, and reduces water use by one third. The design incorporates facilities and services that make it easier for residents to reduce the amount of waste sent to landfills.
or/incinerators and it encourages the recycling of waste and the reduced usage of automobiles. While BedZED is a high-density urban development, it is still able to provide a healthy environment with excellent access to green space and sunlight.

The Beddington Zero Energy Development (BedZED) demonstrates how an environmentally responsible residential community can reconcile density with amenity and yet minimize its impact on the natural environment. BedZED is a mixed-use development, offering workspace, an office park, daycare, and athletic facilities.

BedZED was constructed on a site once used for waste treatment. Now it houses a dense grouping of solar-powered townhouses, most with their own roof garden and southern-facing conservatories. (Lazarus)

Building innovations and design BedZED generates enough heat and power from renewable resources to make it nearly carbon-neutral. Energy is provided by several means, including a combined heat and power unit fueled by woodchips from the development’s own trees. Photovoltaic panels and tilted skylight units generate solar energy; wind-driven heat recovery ventilation units take the place of electric fans; and photovoltaic cells charge shared electric cars.

All of these elements, along with sod covered roofs and grass-covered terraces (providing insulation); contribute to BedZED’s playful design. These innovations and variations in design have created a community that is diverse in use, building materials, and unit type.

Systems at BedZED (Image from (Lazarus 2003))
The mixed-use development consists of dwellings, live/work units, a community center, and a nursery. By housing residents near amenities, their ecological footprint is significantly reduced.

**Building Physics**

At BedZED, the east-west orientation of the row houses is an important part of the passive solar design. The interplay of the living and working units allows for the optimum benefits from sun/shade for both sides of the program.

Maximizing the southern exposures of buildings increases natural light and cuts down on space heating during the winter. Floors and (particularly interior) walls with a high thermal mass absorb energy during the day, and release it into the building at night.

![Thermal Interplay of Live/Work Units](image)

(Lazarus 2003)

**Materials**

A core element of the BedZED development is that it is “carbon neutral” and an import foundation for this neutrality is the materials that are used. Materials used where carefully selected to provide low environmental impact. This is achieved by using local sources (less transportation costs + helps local economy), using reclaimed materials (lowers cost and less waste to landfills) and by using recycled materials (recycled steel, for example, uses 1/3 of the energy needed for new steel).
BedZED achieves its ecologically friendly status by using the following materials extensively (i.e. not just as “green” gesture):

Local Timber from sources within 35 miles of the project.

Reclaimed Timber from post-consumer waste or demolition projects.

Plywood used was FSC\textsuperscript{24} tropical plywood from Brazil, which is important in supporting sustainable logging practices in a critical world forest resource.

Window Frames avoided ecologically high impact materials such as PVC and Aluminum by again using locally salvaged lumber.

Kitchen Counters are made from waste cuts of Romanian beech wood.

Reclaimed Doors were readily available from the UK’s hundreds of reclamation yards. As a city, hundreds of years old, London’s salvage industry is a thriving and well-used resource. Here is Western Mass; we have the Re-Store, which has become an alternate source for building materials to the “big box” stores.

Reclaimed Steel was obtained by using both salvaged steel from demolition sites, as well as recycled steel. Reclaimed steel was less available than reclaimed wood products and its use meant the bearing of additional risk by the owner, builders, and designers.

Reclaimed Paving (i.e. paving slabs removed during the improvements of public ways) were collected, stored, and then reused at BedZED.

Pre-Fabricated/Pre-Stressed Concrete Floor Slabs provide thermal mass, acoustic insulation, and structure.

Recycled Sand and Aggregate from crushed glass and concrete provide the basis for all new concrete placed in-situ.

Local Concrete Blocks and Bricks minimized transportation costs and incentives were in place to limit the amount of waste (from the construction process) to 3% or less.

\textsuperscript{24} Forest Stewardship Council is an organization that promotes the responsible and sustainable forestry industry.
Insulation used was Rockwool and CFC-HFC-HCFC free polystyrene. Although at BedZED, some HCFC insulation was used in error, nearly jeopardizing the project’s goal of low environmental impact.

Following extensive analysis of the materials used as BedZED and their ecological and economic benefits, Lazarus proposed the following recommendations for the design of a sustainable development: (Lazarus)

1. Specify high quality wood window frames in preference to PVC or aluminum.
2. For any structural concrete, consider using a pre-cast/pre-stressed option.
3. Buy materials locally whenever possible.
4. For polystyrene-based insulation, specify CFC, HCFC- and HFC-free products.
5. Specify recycled aggregates.
6. Insist on reclaimed or FSC certified lumber.
7. Explore the use and availability of reclaimed materials near the project site.

**Future Projects**

RuralZED™ is a zero carbon home designed by the BedZED architects to provide zero carbon low to medium density housing solutions for more rural areas of the UK as compared to BedZED’s urban location in London.

The RuralZED housing system redefines what is possible within the competitive UK housing market. Recent UK legislation will require all new homes to be zero carbon by using on-site renewable energy for heat and power by the year 2016.

Current regulation requires housing to use super-insulation techniques and low carbon heating. Surprisingly, in the UK, the housing development community is working with the Government’s planned sequence of carefully planned increased standards of environmental performance, rather than lobbying against it (as would probably happen in the US).
RuralZED Presentation Brochure

(Peabody Trust 2003)
Figure 49 - Author's Diagram of Issues Related to a Sustainable Urban Village
APPENDIX C

ANALYSIS OF DOUBLE WALL CONSTRUCTION

Table 5 - Cost/Benefit Analysis of the Energy Conserving Potential of Constructing Residential Buildings Utilizing a “Double Stud” Wall Design

<table>
<thead>
<tr>
<th>WALL ASSEMBLY ELEMENT</th>
<th>AT STUDS THICKNESS (IN)</th>
<th>AT STUDS MATERIAL R VALUE</th>
<th>AT CAVITY MATERIAL R VALUE</th>
<th>UNI T COST</th>
<th>UNI T LABOR</th>
<th>UNI T TOTAL COST FOR A 2000 SF HOME (EXTERIOR WALL AREA OF)</th>
<th>TOTAL COSTS ($)</th>
<th>3,840.00 SF</th>
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<tr>
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Note: The table above provides a detailed analysis of the cost and benefit of constructing residential buildings utilizing a “Double Stud” wall design. Each element's cost, material, and thermal resistance value are considered to calculate the total costs and benefits.
### Cost/Benefit Analysis of the Energy Conserving Potential of Constructing Residential Buildings Utilizing a “Double Stud” Wall Design

#### WALL ASSEMBLY "U" VALUE AND MATERIALS COSTS

<table>
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<tr>
<th>FILM</th>
<th>TOTAL COMPONENT R VALUE</th>
<th>TOTAL COMPONENT U VALUE</th>
<th>FRACTION OF WALL AREA</th>
<th>CONTRIBUTION TO U VALUE</th>
<th>WALL ASSEMBLY R</th>
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#### DOUBLE STUD WALL CONSTRUCTION

(SEE FIGURE 2)

<table>
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<tr>
<th>WALL ASSEMBLY ELEMENT</th>
<th>AT STUD DS THICKNESS (IN)</th>
<th>AT CAVITY MATER RIAL R VALUE</th>
<th>AT STUDS AT CAVITY MATER RIAL R VALUE</th>
<th>UNI T MATER IAL COS TS</th>
<th>UNI T LAB OR COS TS</th>
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### Cost/Benefit Analysis of the Energy Conserving Potential of Constructing Residential Buildings Utilizing a “Double Stud” Wall Design

#### WALL ASSEMBLY "U" VALUE AND MATERIALS COSTS

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<th>Component</th>
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<th>Component R Value</th>
<th>Material Cost</th>
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<td>INTERIOR AIR FILM</td>
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</table>

**Total Component R Value**: 24.99

**Total Component U Value**: 0.04

**Fraction of Wall Area Contribution to U Value**: 0.17

**Wall Assembly R Value**: 40.1

**Added Cost of Labor and Materials**: 9,819.43

**Loss in Overall SF of Home Due To Double Stud Wall Construction (See Below)**: 110.00

**Typical Residential Construction Rough (No Finish) Cost Per SF**: 65.00

**Estimated Cost of This**: 7,150.00
<table>
<thead>
<tr>
<th>WALL ASSEMBLY &quot;U&quot; VALUE AND MATERIALS COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDITIONAL SF</td>
</tr>
<tr>
<td>TOTAL ADDED COST OF DOUBLE STUD WALL CONSTRUCTION</td>
</tr>
<tr>
<td>ADDED COST PER SF</td>
</tr>
</tbody>
</table>

COMPARISON BASED ON TYPICAL 2000 SF HOME BUILT IN THE NORTHEAST.
MATERIALS COSTS BASED ON QUOTES FROM GRAND LUMBER, SUFFIELD, CT, AND SANFORD & HAWLEY, WEST SPRINGFIELD, MA
LABOR COSTS BASED ON WESTERN MASS MARKET, R.S. MEANS COST BOOK, 2007 AND PERSONAL KNOWLEDGE

TARGET HOME PARAMETERS

<table>
<thead>
<tr>
<th>SAMPLE PANEL 10'X8'</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 IN</td>
</tr>
<tr>
<td>20 ^2 PANEL</td>
</tr>
<tr>
<td># OF</td>
</tr>
<tr>
<td>13.5 EA</td>
</tr>
<tr>
<td>194 IN</td>
</tr>
<tr>
<td>4 ^2 AREA</td>
</tr>
<tr>
<td>0.16</td>
</tr>
<tr>
<td>TOTAL SF</td>
</tr>
<tr>
<td>0.16</td>
</tr>
</tbody>
</table>

STORIES 2.00 EA 00 TOTAL SF 87 % IS STUDS

HEIGHT 8.00 FT 1,728.

STORIES 2.00 EA 00 TOTAL SF 87 % IS STUDS

LENGTH 0 FT 864.00 FLOOR 13.5 EA STUDS

HEIGHT 8.00 FT 1,728.

PERIMETER 240. 3,840.

PERIMETER 240. 3,840.

EXTRA SPACE USED BY DOUBLE WALL 0.46 FT 110.

LOSS OF SF 00 SF

COSTS TO FINANCE THE ADDITIONAL 16,9 OVER THE LIFE OF A 30 YEAR FIXED RATE 69.4 AP % 3.50 R

ADDITIONAL COSTS OVER THE LIFE OF A 30 YEAR FIXED RATE 914. R

MORTGAGE @ % = 3.50 40 YR $31,082.66
### Table 2
Cost/Benefit Analysis of the Energy Conserving Potential of Constructing Residential Buildings Utilizing a "Double Stud" Wall Design

**WALL ASSEMBLY CONDUCTIVE HEAT LOSS AND ANNUAL COSTS OF ENERGY SAVED VS. ENERGY IMPROVEMENTS**

**ENERGY COSTS OF HEAT CONDUCTION THROUGH EXTERIOR WALLS**

**CONDUCTIVE HEAT LOSS EQUATION:**  
\[ H_l, \text{COND} = U \cdot A \cdot \text{HDD} / \text{YR} \cdot 24 \text{HRS/DAY} \]

**UTILIZED AMHERST MA HEATING DEGREE DAY DATA FROM NATIONAL WEATHER SERVICE WEBSITE**  
6635 HDD

**ENERGY SAVINGS, BASED ON AMHERST WEATHER DATA, AND HEATING WITH #2 FUEL OIL**  
$4.00 PER GALLON  
10/18/2011

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>U</th>
<th>A</th>
<th>HDD</th>
<th>HL_COND</th>
<th>ANNUAL COST</th>
<th>AMOUNT OF FOSSIL FUEL SAVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD STUD WALL</td>
<td>0.047</td>
<td>4,096.00</td>
<td>6635</td>
<td>3.07E+07</td>
<td>$1,094.73</td>
<td></td>
</tr>
<tr>
<td>DOUBLE STUD WALL</td>
<td>0.020</td>
<td>4,096.00</td>
<td>6635</td>
<td>1.32E+07</td>
<td>$470.06</td>
<td></td>
</tr>
<tr>
<td>ENERGY SAVINGS (CONDUCTION AT WALL ONLY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$624.67</td>
<td>PER YR 156.17</td>
</tr>
<tr>
<td>FUTURE VALUE OF SAVED MONEY SPREAD OVER 30 YEARS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$808.12</td>
<td>PER YR</td>
</tr>
<tr>
<td>AUGMENTED COSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>($350.37)</td>
<td>PER YR</td>
</tr>
<tr>
<td>NET GAIN/(LOSS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$916.41</td>
<td>PER YR</td>
</tr>
</tbody>
</table>

**CONCLUSION:**

From the calculation, the improvement in energy performance is not worth the added cost. Even if oil were to increase to $5.00 per gallon, the savings is then approx. $100 per year, so at that point it becomes economical. The break-even point is when oil reaches $4.64 per gallon. The analysis is incomplete; however, since the effect of radiant & convective heat loss must also be calculated and it is likely that the heat loss through mass transfer will also be affected. Additional items to consider are the reduction in the emission of CO2 and global and local implications of a reduction in demand for oil that would result.
APPENDIX D

NEIGHBORHOOD COUNCIL INFORMATION

Maple-High/Six Corners Neighborhood

Neighborhood Council

74 Walnut Street

Suite # B 109 (Mason Wright)

Springfield, MA 01109

President: Melvin Edwards

Phone: 413.736.4493

Fax: 413.627.5080

Email: maplehighsixcorners@yahoo.com

Second Tuesday of the month 6pm

Old Hill Neighborhood Council

99 Eastern Avenue

Springfield, MA 01109

President: Omega Johnson

Phone: (413) 736-4575

Fax: (413) 736-4575

(Meets, 1st and 3rd Tuesday of the month)
### APPENDIX E

**VARIOUS DESIGN STANDARDS**

**Table 7 - Universal Design Standards**

<table>
<thead>
<tr>
<th>Residential Universal Design</th>
<th>Kitchen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exterior</strong></td>
<td></td>
</tr>
<tr>
<td>Level walks</td>
<td>L or U shaped kitchen</td>
</tr>
<tr>
<td>Entrance without steps</td>
<td>Ample clear floor space</td>
</tr>
<tr>
<td>Wide doorway</td>
<td>Eat-at counter with knee space</td>
</tr>
<tr>
<td>Covered stoop</td>
<td>Variable or multi-level counter heights, including sink and cooktop (at least two work-center heights)</td>
</tr>
<tr>
<td>Front door package shelf (outside)</td>
<td>Adjustable height countertop and sink</td>
</tr>
<tr>
<td>Security wiring system</td>
<td>Removable sink cabinet for knee space</td>
</tr>
<tr>
<td>Full-length sidelight panel beside the door</td>
<td>Removable cooktop cabinet for knee space</td>
</tr>
<tr>
<td>1/2 in. maximum vertical edge at threshold</td>
<td>Variable intensity task lighting on counter surface</td>
</tr>
<tr>
<td><strong>General Interior</strong></td>
<td></td>
</tr>
<tr>
<td>32 in. minimum door width</td>
<td>Full extension drawers</td>
</tr>
<tr>
<td>24 in. space on latch side of doors</td>
<td>&quot;D&quot; handle on cabinets</td>
</tr>
<tr>
<td>32 in. wide circulation path</td>
<td>Lever handle faucet (table continues)</td>
</tr>
<tr>
<td>42 in. clearance in hallway</td>
<td>Shallow sink (e.g., 4 in.)</td>
</tr>
<tr>
<td>5' X 5' turning radius in activity areas</td>
<td>Shower spray at sink</td>
</tr>
<tr>
<td>Power casement windows</td>
<td>Anti-scald valve</td>
</tr>
<tr>
<td>Light switches 38 in. above the floor</td>
<td>Elevate dishwasher 6-18 in.</td>
</tr>
<tr>
<td>Electric outlets 18 in. above the floor</td>
<td>Recycling and waste receptacles should have a 36 in. max. ht.</td>
</tr>
<tr>
<td>Thermostat controls 44 in. above the floor</td>
<td>Side by side refrigerator/freezer</td>
</tr>
<tr>
<td>Lever handles on doors or doors without latches</td>
<td>Top-mount refrigerator with 50% of freezer, all of the fresh food compartment and controls within 54 in. accessible reach range</td>
</tr>
<tr>
<td>Rocker or touch switches</td>
<td>Microwave oven bottom should be 24 - 48 in. above the floor</td>
</tr>
<tr>
<td>Non-slip carpet or vinyl floor surface</td>
<td>Easy to clean range top, i.e., glass ceramic cooktop</td>
</tr>
<tr>
<td>Carpet pile height - less than .15 in. and carpet pad - maximum 3/16 in.</td>
<td>Built-in oven with wire racks to pull out at shelf height</td>
</tr>
<tr>
<td><strong>Residential Universal Design</strong></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td>Carpet yarn weight- if 3-ply, greater than 10 oz.; if 2-ply, greater than 15 oz.</td>
<td>30 in. clear floor space beside the oven</td>
</tr>
<tr>
<td><strong>Bathroom</strong></td>
<td>Pull out shelf to transfer food to and from oven</td>
</tr>
<tr>
<td>Ample clear floor space for maneuvering at fixtures</td>
<td>Self-cleaning oven</td>
</tr>
<tr>
<td>Tub with fold-up seat or integral transfer surface, or Whirlpool tub, or 3’ X 3’ shower with transfer seat, or 5’ X 5’ roll-in shower with an accessible threshold</td>
<td>Auto-defrost refrigerator</td>
</tr>
<tr>
<td>Reinforced walls to accommodate grab bars as needed</td>
<td>Avoid controls that can be turned on accidentally</td>
</tr>
<tr>
<td>Offset tub/shower controls to allow operation outside the fixture</td>
<td>Appliances with push bars rather than pull-out buttons</td>
</tr>
<tr>
<td>Lever handle faucets</td>
<td>Appliances with touch controls rather than dials</td>
</tr>
<tr>
<td>Anti-scald faucets</td>
<td>Appliances with horizontal levers that require less force to operate than vertical levers</td>
</tr>
<tr>
<td>Access to lavatory, i.e., wall-mounted, pedestal, adjustable</td>
<td></td>
</tr>
<tr>
<td><strong>Laundry/Utility</strong></td>
<td><strong>Bedroom/Storage</strong></td>
</tr>
<tr>
<td>Storage on utility closet doors</td>
<td>Flexibility of storage</td>
</tr>
<tr>
<td>Accessible storage</td>
<td>Adjustable open shelves</td>
</tr>
<tr>
<td>Broom and mop rack</td>
<td>Adjustable height clothes rod</td>
</tr>
<tr>
<td>Doors swing fully open for access to clothes washer and dryer</td>
<td>Wardrobes with an adjustable hanging bar no more than 54 in. from the floor</td>
</tr>
<tr>
<td>Front loading washer with door hinged on one side</td>
<td>4-6 in. wire or D type pull on furniture drawers</td>
</tr>
<tr>
<td>Elevate dryer height by 12 in.</td>
<td>Lights in closets</td>
</tr>
<tr>
<td>Dryer with door hinged on one side</td>
<td>Shallow (e.g., 12 in.) shelves used in storage where appropriate</td>
</tr>
<tr>
<td>Controls, lint filters, and soap dispensers located on the front of appliances</td>
<td></td>
</tr>
<tr>
<td><strong>Living/Dining</strong></td>
<td></td>
</tr>
<tr>
<td>Avoid reclining chairs that require excessive strength or coordination to operate</td>
<td></td>
</tr>
<tr>
<td>Chair should have firm back support at the correct angle</td>
<td></td>
</tr>
<tr>
<td>Chair arms should not extend more than 1 in. beyond the chair for stability</td>
<td></td>
</tr>
</tbody>
</table>
Residential Universal Design

- Upholstery fabric should be durable, flame retardant, and easily cleanable
- Removable cushions and without welts, ridges, or tufts make maintenance easier, and prevent irritation
- Table height and angles (folding leaves) adjustable
- Round or octagonal tables are more sociable
- Lazy susan improves reach across wide tables
- Anti- or low-glare table surfaces

{{592 DeMerchant, E. A. 1995;}}

Table 8 - Passive House Design Standards

<table>
<thead>
<tr>
<th>Passive House Design</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive House Energy Standard</td>
<td></td>
</tr>
<tr>
<td>Heating Demand (Site): 4.75 kBTU/SF/YR</td>
<td></td>
</tr>
<tr>
<td>Cooling Demand (Site): 4.75 kBTU/SF/YR</td>
<td></td>
</tr>
<tr>
<td>Total Energy Demand (Source): 38 kBTU/SF/YR</td>
<td></td>
</tr>
<tr>
<td>Air Tightness: .6 ACH @ 50pa</td>
<td></td>
</tr>
<tr>
<td>Super insulated, R Values (Roof=65, Walls=45, Slab=34, Basement Walls=35)</td>
<td></td>
</tr>
<tr>
<td>Eliminate Thermal Bridges</td>
<td></td>
</tr>
<tr>
<td>Reduce Air Infiltration</td>
<td></td>
</tr>
<tr>
<td>Capture Heat Gains in winter (People, Equipment, Solar)</td>
<td></td>
</tr>
<tr>
<td>Control Heat Gains Seasonally (Shading and Orientation)</td>
<td></td>
</tr>
<tr>
<td>Solar Thermal for Hot Water</td>
<td></td>
</tr>
<tr>
<td>Heat Recovery Ventilation</td>
<td></td>
</tr>
</tbody>
</table>

{{591 Clancy, J.B. AIA 2005;}}

Table 9 - LEED for Homes Design Standards

<table>
<thead>
<tr>
<th>LEED for Homes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Location and Linkages (LL)</td>
<td></td>
</tr>
<tr>
<td>1 LEED-ND Neighborhood</td>
<td></td>
</tr>
<tr>
<td>2 Site Selection</td>
<td>Avoid Environmentally Sensitive Sites and Farmland</td>
</tr>
<tr>
<td>3. Infrastructure</td>
<td>Site within 1/2 Mile of Existing Water, Sewer, and Roads</td>
</tr>
<tr>
<td>LEED for Homes</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. 2</td>
<td>Select an Infill Site</td>
</tr>
<tr>
<td>4. 1 Community Resources</td>
<td>Within 1/4 mile of Basic Community Resources / Public Transportation</td>
</tr>
<tr>
<td>4. 2 OR</td>
<td>Within 1/4 Mile of Extensive Community Resources / Public Transportation</td>
</tr>
<tr>
<td>4. 3 AND/OR</td>
<td>Within 1/2 Mile of Green Spaces</td>
</tr>
<tr>
<td>5. 1 Compact Development</td>
<td>Average Housing Density &gt;/= 7 Units / Acre</td>
</tr>
<tr>
<td>5. 2 OR</td>
<td>Average Housing Density &gt;/= 10 Units / Acre</td>
</tr>
<tr>
<td>5. 3 OR</td>
<td>Average Housing Density &gt;/= 20 Units / Acre</td>
</tr>
<tr>
<td>Sustainable Sites (SS)</td>
<td></td>
</tr>
<tr>
<td>1. 1 Site Stewardship</td>
<td>Minimize Disturbed Area of Site (If Site &gt; 1/3 Acre)</td>
</tr>
<tr>
<td>1. 2 Erosion Controls (During Construction)</td>
<td></td>
</tr>
<tr>
<td>2. 1 Landscaping</td>
<td>Basic Landscaping Design</td>
</tr>
<tr>
<td>2. 2 Apply 3 to 4 Inches of Mulch Around Plants</td>
<td></td>
</tr>
<tr>
<td>2. 3 Limit Turf</td>
<td></td>
</tr>
<tr>
<td>2. 4 Minimize Landscape Water Demand</td>
<td></td>
</tr>
<tr>
<td>3 Shading of Hardscapes</td>
<td>Locate and Plant Trees to Shade Hardscapes</td>
</tr>
<tr>
<td>4. 1 Surface Water Management</td>
<td>Install Permeable Material for at Least 65% of Lot (If Lot &gt;/= 1/4 acre)</td>
</tr>
<tr>
<td>4. 2 Use Permeable Paving Materials</td>
<td></td>
</tr>
<tr>
<td>4. 3 Design and Install Permanent Erosion Controls</td>
<td></td>
</tr>
<tr>
<td>5 Non-Toxic Pest Control</td>
<td>Select Insect and Pest Control Alternatives from List</td>
</tr>
<tr>
<td>Water Efficiency (WE)</td>
<td></td>
</tr>
<tr>
<td>1. 1 Water Reuse</td>
<td>Rainwater Harvesting System</td>
</tr>
<tr>
<td>1. 2 Grey Water Re-Use System</td>
<td></td>
</tr>
<tr>
<td>2. 1 Irrigation System</td>
<td>Main Shutoff Valve, Sub-Meter, and Third-Party Inspection</td>
</tr>
<tr>
<td>LEED for Homes</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Select High Efficiency Measures from List</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Rain Sensing Controls</td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td>Indoor Water Use</td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td>OR</td>
</tr>
<tr>
<td><strong>Indoor Environmental Quality (IEQ)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>ENERGY STAR with IAP</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Combustion Venting</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Fireplaces w/ Outside Air Supply and Closed Combustion</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Humidity Control</td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td>Outdoor Air Ventilation</td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td>Dedicated Outdoor Air System (w/ Heat Recovery)</td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td>Third-Party Testing of Outdoor Air Flow Rate into Home</td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td>Local Exhaust</td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td>Timer / Automatic Controls for Bathroom Exhaust Fans</td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td>Third-Party Testing of Exhaust Air Flow Rate Out of Home</td>
</tr>
<tr>
<td><strong>6.</strong></td>
<td>Supply Air Distribution</td>
</tr>
<tr>
<td><strong>6.</strong></td>
<td>Third-Party Testing of Supply Air Flow into Each Room in Home</td>
</tr>
<tr>
<td><strong>7.</strong></td>
<td>Supply Air Filtering</td>
</tr>
<tr>
<td><strong>7.</strong></td>
<td>&gt;= 10 MERV Filters, w/ Adequate System Air Flow</td>
</tr>
<tr>
<td><strong>7.</strong></td>
<td>OR</td>
</tr>
<tr>
<td><strong>8.</strong></td>
<td>Contaminant Control</td>
</tr>
<tr>
<td><strong>8.</strong></td>
<td>Permanent Walk-Off Mats OR Central Vacuum</td>
</tr>
</tbody>
</table>
### LEED for Homes

<table>
<thead>
<tr>
<th>2</th>
<th>8.3</th>
<th>Third-Party Testing of Particulates and VOC’s before Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Radon Protection</td>
<td>Install Radon Mitigation System if Home is Located in EPA Region 1</td>
</tr>
<tr>
<td>9.2</td>
<td></td>
<td>Install Ground Contaminant Mitigation System (Outside of EPA Region 1)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Vehicle Emissions Protection</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Materials and Resources (MR)

<table>
<thead>
<tr>
<th>1</th>
<th>Home Size</th>
<th>Home that is Smaller than National Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Material Efficient Framing</td>
<td>Overall, waste factor for framing order shall be no more than 10%.</td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td>Advanced Framing Techniques</td>
</tr>
<tr>
<td>3</td>
<td>Local Sources</td>
<td>Materials Extracted / Manufactured / Produced within 500 Miles</td>
</tr>
<tr>
<td>4.1</td>
<td>Durability Plan</td>
<td>Detailed Durability Plan; (Pre-Construction)</td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td>Third-Party Verification of Implementation of Durability Plan</td>
</tr>
<tr>
<td>5.1</td>
<td>Environmentally Preferable</td>
<td>Tropical Hardwoods, if used, must be FSC</td>
</tr>
<tr>
<td>5.2</td>
<td>Products</td>
<td>Select Environmentally Preferable Products from List</td>
</tr>
<tr>
<td>6.1</td>
<td>Waste Management</td>
<td>Max of 2.5 Lbs. Per Square Foot of Construction Waste Sent to Landfill</td>
</tr>
<tr>
<td>6.2</td>
<td></td>
<td>0.5 Pts. for Each Additional 0.5 Lbs. Per Square Foot Reduction</td>
</tr>
</tbody>
</table>

### Energy and Atmosphere (EA)

<table>
<thead>
<tr>
<th>1.1</th>
<th>ENERGY STAR Home</th>
<th>Meets ENERGY STAR for Homes with Third-Party Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td></td>
<td>Exceeds ENERGY STAR for Homes, 2 Pts. Per HERS Point &gt; HERS 86</td>
</tr>
<tr>
<td>2.1</td>
<td>Insulation</td>
<td>Third-Party Inspection of Insulation Installation, At Least HERS Grade II</td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td>Third-Party Inspection of Insulation Installation, At Least HERS Grade I</td>
</tr>
<tr>
<td>2.</td>
<td>OR</td>
<td>Above Code Insulation; At Least 5% &gt; Local Code Per</td>
</tr>
<tr>
<td>LEED for Homes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1  Air Infiltration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REScheck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2  Air Infiltration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third-Party Envelope Air Leakage Tested &lt;= 0.35 ACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3  Air Infiltration</td>
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<td>OR</td>
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<tr>
<td>Third-Party Envelope Air Leakage Tested &lt;= 0.25 ACH</td>
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<td>3.4  Air Infiltration</td>
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<td>Third-Party Envelope Air Leakage Tested &lt;= 0.15 ACH</td>
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<td>4.1  Windows</td>
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<td>Windows Meet ENERGY STAR for Windows (See Table)</td>
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<td>4.2  Windows</td>
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<tr>
<td>Windows Exceed ENERGY STAR for Windows by &gt;= 10% (See Table)</td>
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<td>4.3  Windows</td>
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<td>Windows Exceed ENERGY STAR for Windows by &gt;= 20% (See Table)</td>
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<td>5.1  Duct Tightness</td>
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<tr>
<td>Third-Party Duct Leakage Tested &lt;= 5.0 CFM25 / 100 SF to Outside</td>
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<td>5.2  Duct Tightness</td>
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<tr>
<td>Third-Party Duct Leakage Tested &lt;= 3.0 CFM25 / 100 SF to Outside</td>
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<td>5.3  Duct Tightness</td>
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<td>OR</td>
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<tr>
<td>Third-Party Duct Leakage Tested &lt;= 1.0 CFM25 / 100 SF to Outside</td>
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<td>6.1  Space Heating and Cooling</td>
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<td>Meets ENERGY STAR for HVAC w/ Manual J &amp; refrigerant charge test</td>
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<td>6.2  Space Heating and Cooling</td>
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<td>Exceeds ENERGY STAR for HVAC by &gt;= 10%, w/ Manual J</td>
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<td>6.3  Space Heating and Cooling</td>
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<td>OR</td>
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<td>Exceeds ENERGY STAR for HVAC by &gt;= 20%, w/ Manual J</td>
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<td>7.1  Water Heating</td>
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<td>Improved Hot Water Distribution System</td>
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<td>7.2  Water Heating</td>
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<td>Improved Water Heating Equipment</td>
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<td>8.1  Lighting</td>
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<td>8.2  Lighting</td>
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<td>ENERGY STAR Advanced Lighting Package</td>
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<td>9.1  Appliances</td>
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<td>Select Appliances from List</td>
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<td>9.2  Appliances</td>
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<td>Very Efficient Clothes Washer (MEF &gt; 1.8, AND WF &lt; 5.5)</td>
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<td>1.0  Renewable Energy</td>
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<td>Renewable Electric Generation System (1 Point / 10% Annual Load Reduction)</td>
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<td>1.1  Refrigerant Management</td>
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<td>Minimize Ozone Depletion and Global Warming Contributions</td>
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<td>Homeowner Awareness (HA)</td>
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<td>1.1  Homeowner Awareness</td>
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<tr>
<td>Basic Owner's Manual and Walkthrough of LEED Home</td>
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<td>LEED for Homes</td>
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<td>Comprehensive Owner's Manual and Multiple Walkthroughs / Trainings</td>
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<td>Innovation and Design Process (ID)</td>
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<td>1. 1</td>
<td>Innovative Design</td>
<td>Provide Description and Justification for Specific Measure</td>
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</table>

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