

Redeveloping Modern Housing Sites  
Improving the Livability of the Ground Plane

by

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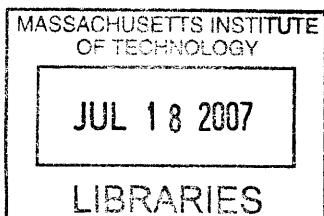
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**ABSTRACT**

Le Corbusier's "towers in the park" urban design plan had a profound impact on city form in the United States. Its precepts were used to inform many urban renewal schemes of the 1950s and 1960s that tore down existing urban fabric and replaced it with towers surrounded by undefined open space. Streets were closed off and rerouted to create "superblocks" for these Corbusian tower/park plans but very soon after urban renewal began, people started to decry its effects. Besides the loss of neighborhoods and harm to people forced to move, the new plans often suffered from safety concerns and isolation. The ground planes of Corbusier inspired plans were disconnected from the public. Over time advocates of traditional city form have pushed new ideas to the forefront of urban design to facilitate a pedestrian-friendly environment, such as new urbanism and smart growth. This paper examines the impact of Corbusier's urban designs versus traditional city movements and suggests a middle ground. Towers are not inherently bad and a form-based approach to city design, such as the one used in Vancouver, successfully integrates both towers and pedestrian-scaled environments. Towers and traditional city form can coexist and benefit from each other to address urban design problems shared by both Corbusier and today's planner.

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•  
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## 1. INTRODUCTION

When the famous French architect/urbanist Le Corbusier, first traveled to the United States in 1935, he was simultaneously mystified and appalled by the “incredible brutality and savagery” of New York’s skyline, which he called the *catastrophe féerique*, or enchanted catastrophe.<sup>1</sup> In response, he proposed the vision of a machine efficient city where everyone would benefit from light, air, and open space. In characteristically polemic fashion, he gave New Yorkers the following advice, “the skyscrapers are not big enough” and “they should be huge and a lot farther apart.”<sup>2</sup> However, the work he had dreamed of accomplishing in this new land, which he assumed would be less fettered by historical precedent, did not immediately flow. No new commissions were garnered on this trip. Nevertheless, a mere 15 years later, the United States would begin to experience the fruits of Le Corbusier’s daring imagination. Housing in urban areas was of critical importance to city officials who witnessed urban flight after WWII and the consequent reduction in tax revenue.<sup>3</sup> In Europe, the issue was all the more pressing after many downtowns had been decimated by war. Soon, the visionary Corbusier would be proven clairvoyant. His love of the machine and his use of standardized parts would be translated into mass housing for those displaced by war. In the U.S., his ideas would also be adopted to house a diverse constituency, notably many of whom were housed in low-income units. Modern towers surrounded by open space began to spring up in many cities across the continent.

However, people would eventually awaken from Corbusier’s dream. His approach to urban planning, as illustrated by his plans for Paris, involved a *tabula rasa* method of razing existing urban fabric and replacing it with towers and open space. What may have seemed bold and necessary to Corbusier, to eradicate slum conditions, proved a hardship to many families displaced by plans inspired by his philosophy. Also, the type of environment that replaced existing neighborhoods was decried by writers like Jane Jacobs. Something that had gone unnoticed to Corbusier, in his freed ground plane schemes, had been lost: a pedestrian environment. Fast forward to between 1996 and 2001, when more than 100,000 units of public housing in towers were torn down to make way for three and four story walk-ups and the question emerges of why this form was discarded.<sup>4</sup> If the amazing amount of tower construction in Dubai is any indication, many people like to live in high-rises. So, why would such an economical, efficient, desirable form of housing be discarded by public housing officials? The problem with Corbusier’s model was the ground plane.

In Corbusier’s “five points of a new architecture,” he describes the new possibilities opened to architects through the use of the modern column, or pilotis:

These results open new prospects for architecture; they present themselves to an urbanism which can find the means wherein to arrive at the solution of the great sickness of our present-day cities. The house on columns! The house used to be sunk in the ground: dark and often humid rooms. Reinforced concrete offers us the columns. The house is in the air, above the ground; the garden passes under the house ...<sup>5</sup>

By opening the ground plane to air, Corbusier may have been addressing slum conditions but his solution also removed pedestrian activity and created undefined areas that proved unsafe for public housing. In towers conceived by private developers, the shared spaces, such as the lobby and grounds, were managed. However, even in private developments, many public spaces adjacent to towers failed to attract people. In the case of public housing, these areas became unclaimed territory and were left to rapidly disintegrate into unsafe areas. The ground plane was not “livable.” In theory, these ground planes had been left open for community activity but “the design proved a disaster. Because all the grounds were common and disassociated from the units, residents could not identify with them. The areas proved unsafe.”<sup>6</sup>

This paper seeks to understand how Corbusier’s modern housing tower typology might be best rehabilitated at the ground plane to improve livability and avoid further social and environmental degradation through their destruction or insensitive design. Despite the failings of public housing, Corbusier’s new housing model was a bold creation designed to address downfalls of livability that he witnessed in overcrowded slums. Corbusier was an architect and urbanist who shook the status quo, just like Picasso did to the art world, and imagined new solutions to the problems of his day. The issues that Corbusier faced are still relevant to urban design. How should we deal with density, the automobile, light, slum conditions and green design? Along with the reactions to Corbusier’s new architecture, all of these issues still shape our discussion of livability.

Livability was defined by the English Parliament in 2003 as being “about building stronger local communities and enhancing quality of life through action to improve the quality of local environments and the places where people live.”<sup>7</sup> In other words and in the case of this thesis, livable space refers to the day-to-day surroundings that facilitate public life not only for the people who live in a particular area but also the surrounding community. The degree to which these surroundings are livable can be measured by how well they facilitate public life, which includes, but is not limited to, community interaction (providing activities of public accommodation), sustainability and safety. For the purposes of this investigation though, only the aforementioned three factors will be considered and only design factors will be inspected in each case.

Just as Corbusier was first an architect and then an urbanist, so this research will concern itself primarily with physical design aspects of livability, and less so with programmatic ones or even social ones, despite one of the main factors of livability being “community” (which is closely tied to both subjects). The issue of community interaction could be a much larger topic in and of itself branching out into various methods of programming space. For instance, many writers have contributed thoughtful and useful advice on how to create successful event spaces or how to program successful retail environments. This research won’t rehash such investigations, despite how well these particular methods may be to increase livability by fostering public life, except to mention the effect of programming the ground plane. Public spaces will be examined mostly from a physical design perspective. This research will take a tactic used by those involved in “form-based code” zoning and focus on form that facilitates multiple uses at the ground plane, which can enliven streets with pedestrian activity and thereby increase livability. As evidenced by many historical buildings, programming and use can change. For instance, many industrial buildings in cities like New York, San Francisco and Boston, to name a few, have been converted to loft housing or artist studios. In each case, the form of the building was more important than the programmatic use.

Likewise, “sustainability” could balloon into a much larger topic. The word itself connotes issues of economic and social well-being, not just green design. However, this paper will also limit itself in the arena of sustainability to only those issues of a physical design nature. By limiting the investigation, a more useful dialogue between Corbusier and the research may be possible. For instance, he wrote about green roofs long before they were in the mainstream of fashionable design.

Therefore, my investigation into the broad question of how to improve the livability of the ground plane in these modern housing sites will focus on three key topics:

1. How to improve community interaction through designing pedestrian environments;
2. How to increase sustainability by promoting green design techniques; and
3. How to advance safety through physical design methods.

“Pedestrian environments” and “green design” includes building, road and open space characteristics. The study of the relationships between these characteristics and human safety has been studied by both urbanists and law enforcement officials. Although these questions could be considered from a policy perspective, as already stated, this research will limit its scope primarily to questions of physical design.

However, the purpose of my research will be to affect current practice. A set of design guidelines will be developed from case study and literature research and tested on a site.

## ***Thesis Organization***

This thesis begins in chapter two with an examination of the inherent strengths and weaknesses of tower forms compared with other residential forms in fostering interaction and promoting safety. The physical dimensions of towers and their relationship to the public sphere (streets and open space) will be investigated. How people perceive space and interact with their environment plays a special role in understanding some of the key areas of improvement in tower design. By investigating how towers surrounded by parks became unsafe, alternatives may emerge. For instance, a whole field of public safety through better physical design was championed by urban planners such as Jane Jacobs and Oscar Newman in response to issues of safety.

One of the greatest criticisms of modern housing by these authors is the often neglected ground plane. Jacobs' work, *The Death and Life of Great American Cities*, argues for greater interaction among neighbors as a deterrent to crime. In fact, she sees the breakdown of community as the precursor of crime. She also argues for greater street activity and a variety of uses. Newman, who built upon Jacobs and C. Ray Jeffery's work to write *Defensible Space*, makes a case for space to be appropriated and "owned" to deter crime. For instance, when referring to the Pruitt-Igoe housing tower, he wrote,

... residents maintained and controlled those areas that were clearly defined as their own. Landings shared by only two families were well maintained, whereas corridors shared by 20 families, and lobbies, elevators, and stairs shared by 150 families were a disaster – they evoked no feelings of identity or control. Such anonymous public spaces made it impossible for even neighboring residents to develop an accord about acceptable behavior in these areas. It was impossible to feel or exert proprietary feelings, impossible to tell resident from intruder.<sup>8</sup>

In contrast to Jacobs and Newman's recommendations, Corbusian towers, which are placed within open plazas and disconnected from the street, can isolate people and create unsafe areas with no clear demarcation of personal ownership. This situation is all the more striking when compared to traditional forms of housing, which provide numerous points of interaction, define a street edge, and possess clearly defined zones of public and private use. Towers which followed the Corbusian model were separated far apart from each other in the first place because

of a reaction to daylight and ventilation concerns. However, people are only able to communicate visually with others from a certain distance. So, these towers lost the sense of community that tighter street sections allow through cross-street visual communication and Jacobs' "eyes on the street." Unlike the towers Corbusier saw on his first voyage to New York, which captivated and repulsed him all at once, his solution was devoid of the street life that they provided and which modern cities such as Vancouver have captured. Vancouver, with its pedestrian streets and modern skyline has attracted the movie industry for its ideal city scenery (and cheap production costs).

The work of Jacobs and Newman is loosely tied to Corbusier's own ideas about human scale, although radically different in application. While Jacobs may have been interested in a scale of neighborhoods that fostered community interaction, Corbusier was more interested in the mathematical proportions of the human body, in the same way Vitruvius and Da Vinci had inscribed a human within a circle and square. Corbusier's fascination with modules and proportion, derived from his study of the human body, is akin to earlier Greek and Renaissance investigations of scale. However, contemporary investigations into the link between art, science and perception have yielded interesting conclusions that both support and upend Corbusier's foray into scale as a progenitor of design. Noted Gestalt psychologist R. Arnheim has commented directly on Corbusier's modular system, discounting it as a tool when used to proportion an entire building form, which is first seen as a whole and then as a collection of parts.<sup>9</sup> While, work done by Kappraff further expounds upon the geometric bases of architecture and its relation to human scale, supporting Corbusier's modular system as a legitimate method of relating human scale to architecture and vice versa.<sup>10</sup>

The issue of scale is one that can be seen not only in terms of building height but building orientation and plan. Modern housing often divorced itself from surrounding urban fabric. In addition to building separation, influenced by a desire to maximize sunlight and breezes, superblock developments also closed off streets and joined together several smaller blocks in the model of "towers in the park," also a Corbusian notion. Effectively, this action closed off public accessibility and interaction, reducing "street life." At the time, U.S. planners were grappling with the dominance of automobile use and feared for the safety of children playing in streets. Their solution was to separate automobile access from open space, preventing automobile access within vast housing estates. However, the combination of separated towers and no automobile access further exacerbated the growing disconnect between neighbors.

Chapter three will investigate several case studies, some of which will show how streets might be reintroduced into these superblocks to reinvigorate a sense of community and safety. Building, block and street design for residential blocks has

been studied by such noted authors as Allan Jacobs, Stanford Anderson and Eva Wong. Allan Jacobs, in his seminal work *Great Streets*, describes a set of parameters that feel right to street design. Anderson expounds upon the city plan of Savannah with its highly sophisticated network of streets as a model pedestrian environment for his paper *Savannah and the Issue of Precedent: City Plan as Resource*. Wong describes the importance of healthy flows of people and cars, warning against fast moving traffic in pedestrian areas from a feng-shui perspective in her book, *Feng-shui: the ancient wisdom of harmonious living for modern times*.

The last set of case studies deal with green design solutions. The rise of LEED (Leadership in Energy and Environmental Design) reflects the growing national consciousness regarding sustainable design. Although Corbusier was not someone you might normally associate with green design, inherent to his tower ideas is an understanding of open space and natural light. His towers are separated to provide light and the ground plane is open to green space. Unfortunately for Corbusier, his admirers failed to achieve the idyllic image he drew in his plans for a Radiant City, which showed people meandering through park land and towers rising above the din of whirring traffic. By tempering Corbusian vision with history and modern green design issues, new understanding and possible solutions to today's issues may emerge.

In the academic year of 2005-2006, MIT conducted two planning studios to research "sustainable residential development." The studios focused on development in Shanghai for their primary research. The results of this investigation produced a handbook for sustainable residential development (SRD). The handbook identified seven key issues affecting SRD: building and population density, public open space, sense of community, transportation, site and landscaping, building typology and climate. In addition, several sites in Shanghai were selected for further study. These sites demonstrate that the ground plane of new developments can be well integrated within the whole plan and that green design can be seamlessly utilized.

In chapter four, Corbusier's tower in the park plan will be reexamined from the perspective of understanding underlying issues and how those issues have changed in time. From this study and everything preceding it, a set of guidelines or principles will be developed for increasing livability in modern housing projects. It is hoped that these principles for reinvigorating the ground plane of modern housing towers will salvage existing (especially low income housing) or redeem future housing by increasing livability. It is my hope that these principles will provide a guide for future housing development and redevelopment by offering alternatives to current construction.

For instance, instead of tearing down a defunct tower, could some of these principles guide a transformation of the building and site? The irony posed by



the very suggestion to keep modern towers instead of razing them and building anew cannot be lost in light of Corbusier's own inclination to tear down places like Manhattan and Paris to rebuild in his vision of the Radiant City. However, if the towers were to be redeveloped instead of razed, resident populations might be saved from displacement and gentrification and new materials would not need to be harvested, lowering carbon emissions. Also, simple tower designs which are still very popular in some countries could be reworked to include a variety of uses on the lower levels that meet the street and better integrate buildings into their urban fabric. There is also the real estate potential of developing income from these lower level uses which get rid of wasted, unclaimed space. So, it's a "win-win" for the public and the private sectors. Prudential Center in Boston followed this pattern exactly. Unused, windswept plazas that were built above street level have been replaced with new uses and a street façade is currently being restored to the streets which once offered only blank walls.

Finally, the lessons learned from examining the aforementioned physical and environmental issues will be applied to a current case to examine if these principles can be realized and what their effect would be. The site chosen for this learning experiment is the West End of Boston, the classic "tower in the park" high-rise project that was built on the ashes of a formerly tight residential area, not too dissimilar to Boston's North End, which was destroyed in the heyday of "urban renewal". Because the West End is currently being redeveloped, the new plan for the area can also be critiqued and used to further refine principles of redevelopment for these types of sites.

The thesis concludes in chapter six that it is indeed possible to effectively transform the ground plane of these projects to improve their livability and development potential. Not only is it possible, it is wise to do so, creating compact, pedestrian environments which are beneficial to people, business and the environment. Ultimately, by creating a pedestrian environment of greater density, the forces of expansion which Corbusier first recognized and criticized over seventy years ago<sup>11</sup> can be calmed. Since Corbusier set foot on U.S. soil and later versions of his dream began to take shape, much has changed. However, the problems he faced still present themselves to urban planners today. This research reexamines his tower-in-the-park scheme and attempts to solve the livability issues of the ground plane in a perspective tempered by time.

- 1 Le Corbusier. trans. Francis E. Hyslop, Jr. *When the cathedrals were white: a journey to the country of timid people* (New York: Reynal and Hitchcock, 1947).
- 2 Alsop, Joseph. "Finds American Skyscrapers 'Much Too Small,'" *New York Herald Tribune*, October 22, 1935, p. 21.
- 3 Rusk, David. *Cities Without Suburbs*. The Woodrow Wilson Center Press. Washington D.C., 1993.
- 4 Smith, Janet L. *Mixing it Up: Public Housing Redevelopment in Chicago*. Paper presented at conference: Area-based initiatives in contemporary urban policy. Danish Building and Urban Research and European Urban Research Association: Copenhagen, May 17-19, 2001.
- 5 Le Corbusier. trans. W. Boesiger & H. Girsberger. *Le Corbusier 1910-65* (New York: Frederick A. Praeger, 1967).
- 6 Newman, Oscar. *Creating defensible space* (Washington, D.C.: U.S. Department of Housing and Urban Development, 1996). p. 10.
- 7 Mr. Tony McNulty, Labor Party, of Harrow East for the House of Commons, British Parliament, April 11, 2003 (<http://www.publications.parliament.uk/pa/cm200203/cmhansrd/vo030411/text/30411w04.htm>).
- 8 Newman, 11-12.
- 9 Arnheim, Rudolf. "A review of proportion." *The Journal of Aesthetics and Art Criticism*, vol. 14, no. 1, 44-57 (Sep., 1955).
- 10 Kappraff, Jay. *Connections: the geometric bridge between art and science* (London: World Scientific Publishing Co., 2001).
- 11 Le Corbusier. trans. Francis E. Hyslop, Jr. *When the cathedrals were white: a journey to the country of timid people* (New York: Reynal and Hitchcock, 1947).

## 2. UNDERSTANDING LIVABILITY: SAFETY, COMMUNITY AND SUSTAINABILITY

As noted in the Introduction, the quality “livability” is central to understanding the problems and opportunities of high rise housing. One way of measuring livability is to consider how well a project performs in three critical areas: safety, sense of community and sustainable design. People are concerned with living in a safe environment and the incidence of crime reduces the feeling of livability. Physical design can play a role to increase safety. This relationship will be examined. Also, a sense of community is important to livability. How well an environment relates to human scale and how many opportunities for interaction with people and places is important to developing this sense. Sustainable design, in terms of “green” design practices, is important to the overall livability of any sight. If natural resources, such as light and water, and man-made resources, such as existing buildings, are neglected then livability also suffers. These topics are discussed in this chapter and a framework for evaluating case studies in the next chapter is provided.

### ***Design for Safety***

*The trodden path is the safest.* – Legal Maxim

Most urbanists agree that if an environment does not feel safe, it is inherently less livable. The TDM Encyclopedia, a mobility manual developed in British Columbia, lists safety as one of the first components of livability.<sup>1</sup> The charter for new urbanism also upholds safety as a benchmark for neighborhoods. Also, the value of home prices in Boston when compared to crime “hot spots” is a good indication of the relationship between safety and livability. Areas of high crime are less attractive to home buyers and thus their demand and price are less than desirable homes outside of high crime areas.<sup>2</sup>

Many traditional cities were comprised of 3 to 5 story buildings and, by today’s standards, narrow streets. This offered an intimate feeling to many city neighborhoods because the form of the places was very compact. It also allowed for ground floor, neighborhood retail to exist and for people to naturally survey their streets, helping to deter a degree of crime. However, after industrialization and

subsequent overcrowding, many cities came to be viewed as claustrophobic, blighted bastions of poverty and crime. As the modernist Sert writes:

In great population centers of the world today man is a victim of urban chaos. His health, his security, and his happiness are menaced in cities inimical to an orderly existence. Instinctively he is aware that his daily life is conditioned by the turbulent streets about him.<sup>3</sup>

The solutions derived by such practitioners of modernity ultimately worsened the livability conditions of many cities by introducing unforeseen problems. For instance, the very idea of separation of uses and separation of buildings, a modernist viewpoint, is antithetical to urbanism. In many cases across the U.S., new public housing built on Le Corbusier's precepts fell victim to crime and neglect. Instead of housing surrounded by gardens and trees for all inhabitants, there were towers surrounded by wastelands where anyone (including criminals) felt free to roam. "These spaces of physical neglect communicated the extent to which both residents and public officials had ceded control over all common areas, making them easy targets for vandalism."<sup>4</sup>

Perhaps for Corbusier, his initial impetus to focus on social issues and planning may have been influenced by his admiration of Daniel Burnham, father of the "City Beautiful" Movement in Urban Design. By the time Corbusier first stepped on U.S. soil, he had already paid homage to Burnham in at least two of his works. His "rational planning of the Ville Contemporaine ... reflects Burnham and Bennett's plan of Chicago. The glazed cruciform skyscrapers in Le Corbusier's project look back to the Chicago bow window, as D. H. Burnham and Co. employed it in the Reliance Building."<sup>5</sup> In addition, Burnham's house atop Twin Peaks, which was built for the architect as he planned the first "comprehensive plan" for the city of San Francisco in 1905, foreshadows Corbusier's own viewpoint as he imagined dramatic changes to Paris in his Voisin scheme. If nothing else, Corbusier certainly took to heart Burnham's admonition to make "big plans."

City Beautiful proponents, such as Burnham, believed in the power of an ordered, civic-minded monumental architecture to uplift society and help relieve moral decay and poverty. The social relationship between quality of the environment and quality of life is well documented (by Michaelson and Whyte, for example). There is also some basis for the idea of architecture influencing people in psychology and feng-shui (an ancient Chinese derivative of Taoist philosophy that helps make sense of the physical environment, among other things). As an example, feng-shui dictates that columns or pillars along a residential façade are undesirable because they connote prison, confinement or "rods that are prepared to strike the building." Conversely, columns along the front of a government or authoritative building are desirable because they "convey the image of strength and

power.”<sup>6</sup> It is tenuous at best though to suggest Burnham’s followers could single-handedly solve such multi-faceted problems as poverty through physical design. For all of their columned facades, they may have done more to lend a feeling to people devastated by homelessness or poverty of being outcasts than truly uplifting their spirits, according to the aforementioned feng-shui teachings. Theirs was a type of architecture symbolic of power and authority and Corbusier is their unlikely descendant.

Corbusier’s particular attention to urban conditions and “architecture or revolution”<sup>7</sup> puts him in line with both Burnham and even Baron Haussmann, who cut wide boulevards through Paris in the 1860s. Unlike his contemporary Frank Lloyd Wright, who foresaw suburbia in his treatise *The Disappearing City*, Corbusier was intently focused on the city as a catalyst for modernity and change. When he first envisioned the *Contemporary City for Three Million People* it was in response to the social ills he had been addressing in his articles in *Esprit Nouveau*.<sup>8</sup> It is relatively easy to draw a connection between the sentiments expressed by Corbusier and the social consciousness of the City Beautiful practitioners. As Robert Fishman writes:

It was, he wrote, “an act of faith in favor of the present.” He believed the time had come for a series of “great works” which would sweep away the “leavings of a dead era” and inaugurate the age of “collective spirit” and “civic pride.” The decision to build the new city would mean that the “radiant hour of harmony, construction, and enthusiasm” had finally arrived. It would be the crucial *act* separating the past from the future;<sup>9</sup>

Modernists broke with the past in many ways. For Corbusier’s vision to be realized, vast swaths of land in a city needed to be transformed. Just as in Paris with his Voisin plan, his dream would not be fully formed in the United States. The result was realizing Corbusier’s vision in a piecemeal fashion, which spelled doom for inhabitants of these inchoate developments surrounded by traditional building fabric.

Through standardization and mass production, housing was supplied for a considerable population. However, the timing of this production could not have been worse. In the U.S., it coincided with an increased affordability of automobiles and acts passed by congress, such as the Federal Aid Highway Act of 1956 and the Housing Act of 1949, which spelled the beginning of urban flight and urban plight. As home buyers’ options outside of the city increased, the desirability of mass housing decreased. Soon, those with financial means could commute to work and live in suburbs while those without financial means were grouped together in Corbusian residential towers.

The form of public housing developments is invariably easy to predict. Any casual perusal of figure ground maps pinpoints these developments effortlessly. They all diverge from their surroundings, as a testament to both a new architectural

form and an imagined social spirit. Instead of keeping the pattern of blocks and buildings of their environment, these developments often remove themselves from the street, turn their buildings at angles opposed to surrounding facades and ignore any sense of scale with background buildings. Instead of making a positive statement through a new architecture, these developments garnered further stigmatization for their residents. As Lawrence Vale writes:

The combination of flat roofs and streetless superblocks distanced public housing from the more desirable models of American domestic life, both urban and suburban. As the modernist conception of “towers in a park” gave way in recent decades to a rediscovery of the value of streets and street life as sources of both vitality and security, public housing projects became seen not as progressive enclaves of slum reform, but as discredited visions that carried many of the worst aspects of slum conditions to a new degree of degradation and isolation. Initially intended to highlight the superiority of a new kind of neighborhood, the same spatial distinctiveness would soon, less generously, be used to stigmatize both the projects and their inhabitants.<sup>10</sup>

In Boston, the West End, a collection of 3 to 5 storey predominantly working-class residential houses on streets resembling the curves of a European medieval city plan, fell victim to urban renewal. The razing of this neighborhood through urban renewal was a result of the Housing Act of 1949, which provided financial incentives for cities to raise undesirable areas to be replaced, presumably, with new modern models of housing and commercial development. This encouraged cities to clear neighborhoods deemed to be “slums” through the powers of eminent domain so they could be redeveloped. However, the West End’s destruction sparked such a dramatic backlash in Boston that further plans to clear other neighborhoods such as the North End of Boston were scrapped.

Other modern housing developments generated a similar backlash when, as they aged, the appalling state of their public spaces became publicized. Another infamous example of a public housing scheme gone awry is that of Pruitt-Igoe in St. Louis. Designed by Minoru Yamasaki, who later designed the original World Trade Center towers in New York, and initially lauded as a symbol of the future, its eventual destruction sounded warning bells to the architectural community. Oscar Newman, then a teacher at Washington University in St. Louis, documented its decade of decline and eventual demise of Pruitt-Igoe and began to formulate his concepts of “defensible space” to address the failings of Pruitt-Igoe. In Newman’s own words:

Occupied by single-parent, welfare families, the design proved a disaster. Because all the grounds were common and disassociated from the units, residents could not identify with them. The areas proved unsafe. The river of trees soon became a sewer of glass and garbage. The mail-boxes on the ground floor were vandalized. The corridors,

lobbies, elevators, and stairs were dangerous places to walk. They became covered with graffiti and littered with garbage and human waste.<sup>11</sup>

In stark contrast to the disaster of the high-rise apartment slabs of Pruitt-Igoe, a traditionally designed assemblage of low-income houses stood across the street, fully occupied and stable. Pruitt-Igoe was lucky to reach 60% occupancy and was so unsafe that women walked in packs just to bring their children to school in the morning. Through studying these two forms, both consisting of similar populations, Newman began to formulate physical design precepts that would become the basis of the current Crime Prevention Through Environmental Design (CPTED) movement. Although this term was originally coined by C. Ray Jeffery, a behavioral psychologist, and later adopted by Newman, the current CPTED movement more closely resembles and deploys Newman's techniques than Jeffery's original writings, which were more theoretical and included not only the physical environment but also the internal environment of the would-be criminal.<sup>12</sup>

Newman's concept of defensible space was based on claiming "ownership" of common space and limiting or splitting up accessibility into circulation that smaller groups of people traversed. He observed that the more people used a common stair or corridor, the more the space was public and the less secure it was from outsiders. People were less inclined to feel ownership for a particular area that was shared by more than only a few people. Newman observed that most crime occurred in the interior public spaces of public housing. In privately developed towers, this space was monitored and protected but public housing barely had enough funds for part-time maintenance workers. The interior public spaces, where no one could establish agreed upon behavior or tell friend from foe became the location of most crime.

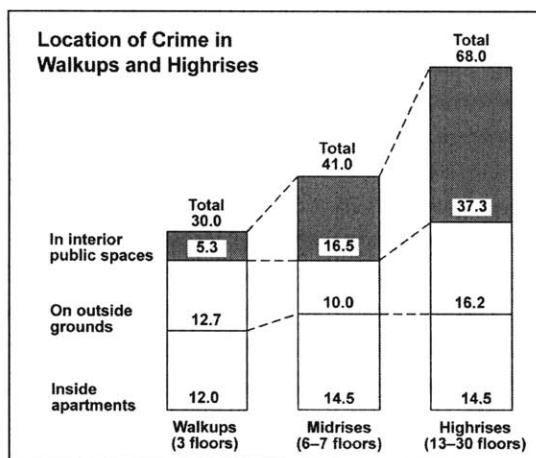


Fig. 2.1 Crime increases as building size (or number of units per entry) increases and occurs predominantly in interior public spaces.<sup>13</sup>

Newman further refined his analysis to consider social factors and produced the following regression analysis based on New York City public housing data:

Social and physical variables	Correlations with dependent variables			
	Indoor felony rate	Indoor robbery rate	Robbery rate	Felony rate
Percentage of population receiving welfare	(1)*.51	(1) .46	(1) .47	(1) .54
Building height (number of units per entry)	(2) .36	(2) .36	(2) .36	(5) .22
Project size (number of apartments)	(3) .27	(3) .26	(3) .25	(3) .22
Percentage of families with female head on AFDC	(4) .44	(4) .41	(5) .36	
Number of publicly assisted projects in area	(5) .25	(5) .26	(4) .33	
Felony rate of surrounding community				(2) .41
Per capita disposable income				(4) .49

N.Y.C. Housing Authority police data for 1967: 87 housing projects. .01 level of significance at  $\pm .27$ , .05 level of significance at  $\pm .21$ .  
 \* Numbers in parentheses indicate rank order of correlation in creating stepwise multiple regressions.

Fig. 2.2 Regression data for social and physical factors on incidence of crime. Note, importance of building height (or number of units per entry) on crime rate.<sup>14</sup>

In summary, Newman found building height, which he used as a proxy for the number of units per entry, to be the most important physical factor in the contribution of crime in public housing tower schemes, with limited resources to hire doormen or other security personnel. Therefore, his design solutions involved a return to more traditional forms of housing that limited access points to allow residents to “self police.” For instance, instead of towers that turn their back on public streets and siphon dozens of people into the same elevator, he advocated walk-ups at the same density with minimally shared entry/circulation systems and a greater sense of ownership of space. Unfortunately, Corbusier’s new vision had failed low-income inhabitants because they were unable to successfully defend their spaces from crime.

Almost undeniably, Newman’s defensible space concepts were bolstered by Jane Jacobs’ book *The Death and Life of Great American Cities*. Cited as a foundational piece for the modern CPTED movement,<sup>15</sup> Jacob’s seminal work continues to inspire planning students decades after its publication. Jacobs’s belief that there should be an obvious delineation between public and private space is an idea in synch with Newman’s work. This delineation of space is evident throughout his designs to increase perceived ownership. Jacobs also believed in the power of pedestrian street activity and a mixing of uses to boost neighborhood safety.

*Death and Life* was a scathing rebuff of modern tenets shared by Corbusier and



the international movement of “rationalists.” In stark contrast to the sanitized city visions of Corbusier, Jacobs advocated places such as Greenwich Village in New York and the North End of Boston as vibrant, complex alternatives. In places such as the North End, the automobile is subservient to the pedestrian, streets are alive with people, blocks are unpredictable but relatively small and street sections are at times very narrow (a definite departure for modernists that pushed building separation to facilitate light penetration). By adopting modernist principles, urban planners had destroyed places like the North End, which require multiple readings, through urban renewal and replaced them with dull, uniform substitutes.

To illustrate how fallacious the modernists’ precepts of social transformation through rational design had been she gave the following example:

In real life, cause and effect are not so simple. Thus a Pittsburgh study, undertaken to show the supposed clear correlation between better housing and improved social conditions, compared delinquency records in still uncleared slums to delinquency records in new housing projects, and came to the embarrassing discovery that the delinquency was higher in the improved housing.<sup>16</sup>

Jacobs believed in the power of community that is fostered in traditional neighborhoods and eschewed modernism’s destruction of such places in favor of segregated uses. Traditional neighborhoods offered a mixing of uses and people along public streets at more hours of the day. The breakdown of community was seen by Jacobs as the precursor of crime. An inability to perceive strangers as outsiders and a loss of “ownership” (to continue themes discussed with Newman) on a neighborhood scale translated into increased criminal risk. The sense of community developed in many traditional neighborhoods is an ultimate deterrent to crime. An oft quoted phrase of hers sums up this premise: “eyes on the street.”

## ***Design for Human Interaction***

*We were born to unite with our fellow men, and to join in community with the human race.*  
– Cicero

### **Mixed Use**

A variety of uses on the ground plane is one of the key elements missing from Le Corbusier’s tower in the park scheme and one of the essential components

needed to fix his plan. Mixed use should be reintegrated into superblocks through the introduction of streets, the lifeblood of commerce. With the reintegration of streets and neighborhood retail on the ground plane (which was present in many areas torn down by urban renewal), both safety and a sense of community is bolstered. As Jane Jacobs writes:

Where our city streets do have sufficient frequency of commerce, general liveliness, use and interest, to cultivate continuities of public street life, we Americans do prove fairly capable at street self-government. This capability is most often noticed and commented on in districts of poor, or one-time poor people. But casual street neighborhoods, good at their functions, are also characteristic of high-income areas that maintain a persistent popularity – rather than ephemeral fashion – such as Manhattan’s East Side from the Fifties to the Eighties, or the Rittenhouse Square district in Philadelphia, for example.<sup>17</sup>

Because the issue of successful commercial environments is so large, this research will only comment to say that it is important to ground floor livability and should be provided for in terms of flexible zoning guidelines that aren’t use restrictive. A form-based zoning approach would be more sensible. The Vanke housing projects, described in chapter 3, approach their construction with flexibility in mind.

## Human Scale

Central to our understanding of community is the issue of scale and how people relate to and perceive their environment. To some, this is an issue of understanding “human scale.” As Dutch architect Herman Hertzberger writes, “Things start to go wrong when the scale becomes too big, when the upkeep and management of a communal area can no longer be left to those directly involved, and a special organization becomes necessary.”<sup>18</sup> This physical relationship was played out repeatedly in modern housing developments. As documented, those with financial means hired grounds-keepers and private security personnel while those without funding, i.e. public housing sites, were doomed to experience how wrong things could get.

Corbusier approached the topic of human scale with his modulator system for dimensioning (see Appendix A). Noted gestalt psychologist, Rudolf Arnheim, and others, have criticized this system though because the issue of human scale extends beyond copying dimensions onto a façade and relates to volumetric, three-dimensional observation as well.

Many factors are involved in how people perceive their environment. Psychologists have demonstrated that both leveling and sharpening can occur in

visual arrays, or the physical environment of an observer. Leveling is the mind's transformation of a scene to close certain aspects of objects in an array that are not necessary for differentiation. Sharpening occurs when differentiating factors in an array are identified and possibly even exaggerated in memory. In other words, "sharpening will occur for those aspects of the figure which are differentiating, and closure, or perhaps leveling, will occur for those aspects which are nondifferentiating."<sup>19 20</sup> For example, four houses each with similar doors but differing number of floors would be perceived first and foremost as differing in height while the similar doorways would diminish in importance and memory. However, if the buildings were of similar height and instead had four distinct entryways (such as stairs to a second floor entry, an entry at the middle as opposed to off-center, an entry with a vestibule and one with an ornate entry) the entryways would be the defining characteristic of the buildings. What this study demonstrates is a concept labeled the law of *prägnanz* by Gestalt therapists.

The law of *prägnanz* is a "tendency to make perceptual structure as clear-cut as possible" and is not to be confused with another tendency, "the tendency toward simplest structure."<sup>21</sup> Arnheim used the example of leveling and sharpening to distinguish between the two tendencies. Friedrich Wulf had conducted a number of experiments in the early 1920s to demonstrate that both leveling and sharpening occurred in memory over time. "Affirming Wulf's point that one can see examples in perception and memory of both simplicity, leveling, as well as the opposite, sharpening, Arnheim explained that both contribute to a "good," *prägnant* result, which he wished to clarify did not mean it was the most simple (reduced, abbreviated) but, on the contrary, the most clear-cut, solution."<sup>22</sup>

These visualization techniques are methods that our minds use to make sense of our environment. What these observations illustrate is our ability to chunk like data in a visual array and notice which aspects differ. This analysis corresponds to observations of how people interact with their surroundings in Kevin Lynch's influential work, *Image of the City*. In it, he notes that *façade* differentiation can be one of the main identifiers of place in a city, especially a city with dense urban fabric.<sup>23</sup>

Although Arnheim and others observed that people employ a variety of methods to simplify their visual environment or reduce it to imageable/memorable qualities, other psychologists have posited that people are also attracted to visual complexity in their surroundings. Our entire environment can be thought of as a combination of many visual forces. J. J. Gibson called this a visual array or visual texture.<sup>24</sup> When the texture is more complex with a variety of colors, surfaces and objects, people are drawn to it. Donderi, building on work done by D. E. Berlyne in 1966, writes:

people and other animals spend more time looking at arrays that are irregularly arranged, have more components, have heterogeneous components, are irregularly shaped, are incongruous, are asymmetric or are random—in other words, complex arrays, which he said were intrinsically more attractive than simple arrays. Within a visual array, there may be some forms that we need to pay attention to, and some that we do not.<sup>25</sup>

Allan Jacobs corroborates this viewpoint in his book *Great Streets* when he writes that “complex building facades over which light can pass or change make for better streets than do more simple ones.”<sup>26</sup>

So, if complexity of façade is a quality that humans are attracted to, at what level is this complexity important? Or, where should designers invest in architectural details? To answer these questions, one must address the limits of what a person can perceive in their environment. Using trigonometry, it is possible to calculate and make rough predictions about how far a person with normal, 20/20, vision can see detail. This range constitutes the distance people relate to well and therefore could be a way of designing for human scale.

### Visual limits

Visual limits to perception are important for urban designers to recognize because they define ranges within which humans will be able to interact with architectural details or perceive another person watching them. These types of interaction affect both perceived safety and level of community interaction. Hermann Snellen invented a method of measuring visual acuity in human beings by using a letter chart and noting when certain letters could no longer be distinguished. He determined that “normal” or 20/20 visual acuity represents the ability of an observer to recognize an optotype, or special target, when it is subtended 5 minutes of arc.<sup>27</sup>

Using the eye socket as an optotype (to determine the literal limit of Jane Jacob’s “eyes on the street”), I have determined that five stories is the maximum height that a street wall should rise. Above this height, many people can’t distinguish eyes looking at them and there is a loss of connection. A building more than five stories tall will fail to provide noticeable “eyes on the street.” See Appendix B for a more in depth explanation.

Maximum # of Stories	5.75
Corresponding Building Height	72'

Fig. 2.3 Summary chart, visual limits. Note: building height assumes an additional 3' on average for parapets, etc. not included in average 12' floor height.

Pedestrian Visibility Optotype = Eye	Mobility of Eye			Average
	Full Range	140° Cone	30° Cone	
Maximum # of Stories	5.75	5.75	2.25	4.58
Corresponding Building Height	72	72	30	58

Fig. 2.4 Eye mobility and range of visual acuity. See Appendix B for more detail.

The relevance of this study is to begin to suggest a range of building stories and street Right of Ways (ROW) that are conducive to human scale and pedestrian activity. Evidently 3 to 5 stories tall is a good “pedestrian” or human-scaled building limit based only on recognition of our selected visual optotype. Obviously, anything lower than this building height is also human scaled. However, buildings beyond five stories tall begin to disconnect residents from pedestrians and may be even more problematic if pedestrians “chunk” the building visually into a larger object.

What is important to draw from this comparison is a general sense of how high buildings should rise before some type of roof differentiation is made in order to better integrate tower buildings into a pedestrian environment, the opposite effect of what Corbusian towers did. It seems that a maximum of about 5 floors is feasible to still support a pedestrian scale.

Fred Koetter alludes to this type of tower and pedestrian base relationship in his master plan for University Park in Cambridge, MA, in a diagram titled “the stratified city,” see figure 2.5. By examining Parisian avenues, which were constrained by a 60 ft. height restriction, Koetter concluded that a constant, pedestrian-scaled base of 5 stories should permeate urban fabric (12 ft. being a common residential floor height). However, Koetter also makes mention of a variable top to this veritable podium by making allowances for larger buildings to rest atop this base.

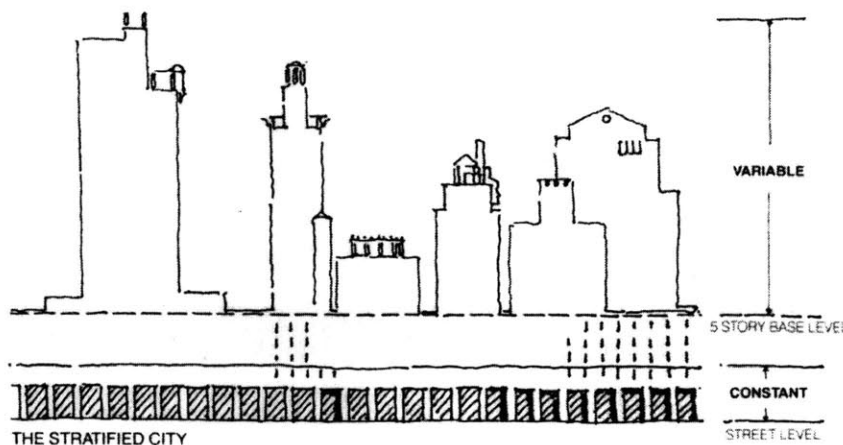


Fig. 2.5 Fred Koetter’s sketch of the Stratified City.<sup>28</sup>

So, the question then becomes, what type of physical dimensions are desirable from a visual standpoint to preserve an entirely pedestrian feel to a street section? In other words, how far of a setback from the building façade should towers be? Figures 2.6 and 2.7 show various tower setbacks for a street 40 feet wide from building façade to building façade. As a somewhat arbitrary starting point, this street width was derived by taking the golden section of a five story building, the height of our podium. Using similar triangles, a series of building heights that are outside of a pedestrian's view-shed can be calculated from given viewpoints.

- X = Tower setback from building façade
- Y1 = Building podium height
- Y2 = Height Maximum from opposite side of street before tower is visible
- Y3 = Height Maximum from same side of street before tower is visible
- 5'6" = Height of pedestrian's eyes from ground

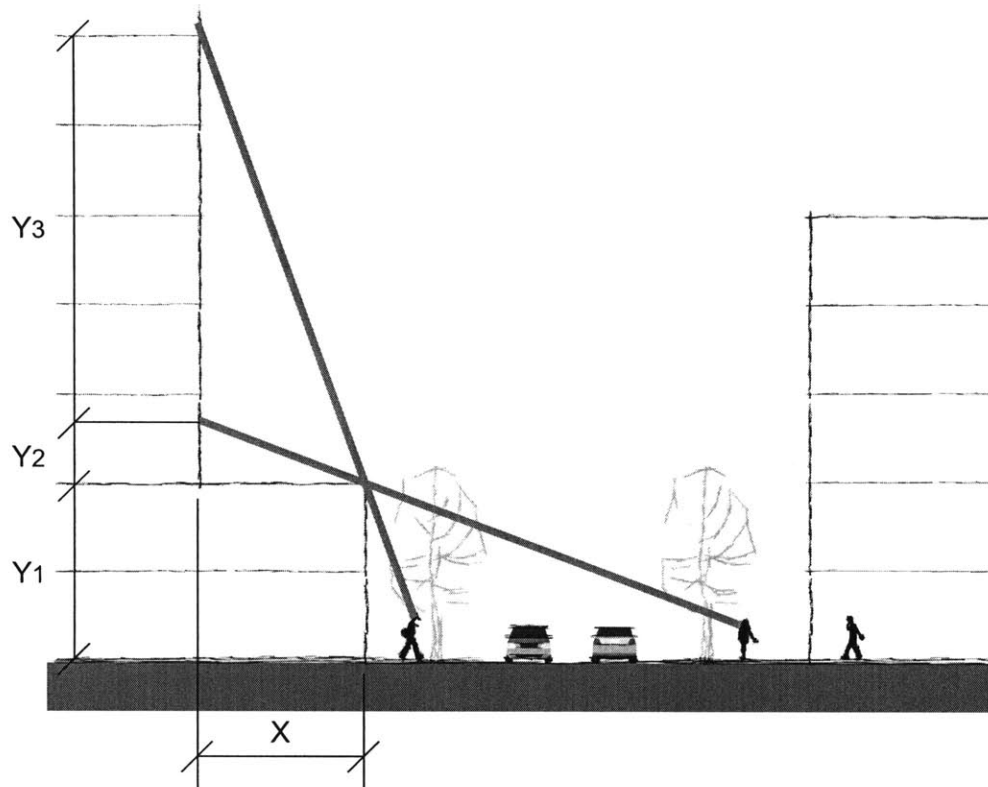


Fig. 2.6 Visibility of towers from pedestrian viewpoints.

Tower Setback (ft)	Height across St (ft)	Corresp. # of Floors	Height same side (ft)	Corresp. # of Floors	Height middle St (ft)	Corresp. # of Floors	Average Height (ft)	Corresp. # of Floors
5	8.43	0.70	50.57	4.21	14.75	1.23	24.58	2.05
10	16.86	1.40	101.14	8.43	29.50	2.46	49.17	4.10
15	25.29	2.11	151.71	12.64	44.25	3.69	73.75	6.15
20	33.71	2.81	202.29	16.86	59.00	4.92	98.33	8.19
25	42.14	3.51	252.86	21.07	73.75	6.15	122.92	10.24
30	50.57	4.21	303.43	25.29	88.50	7.38	147.50	12.29
35	59.00	4.92	354.00	29.50	103.25	8.60	172.08	14.34
40	67.43	5.62	404.57	33.71	118.00	9.83	196.67	16.39
45	75.86	6.32	455.14	37.93	132.75	11.06	221.25	18.44
50	84.29	7.02	505.71	42.14	147.50	12.29	245.83	20.49

Fig. 2.7 Heights before tower visible from given pedestrian viewpoint.

Obviously, the closer one is to the edge of a building, the taller a setback tower can reach before it is noticed. However, to a pedestrian walking across the street from the building, the tower will be more easily noticed because of the decreased angle of inclination between the observer's eyes and the roof line of the 5-storey podium. Taking the average height, for every one foot of setback a tower can grow five feet.

Is there a best rule of thumb to go by when deciding setbacks? New York City is an interesting place to study how this question has been dealt with over the years. In 1916, New York City decided to regulate building size in relation to street width, see figure 2.8; and like Fred Koetter, they studied Parisian streets. What is special about these streets is that building height is a multiple of street width. So, buildings on narrow streets have lower set back lines (actually height was unlimited on 25% of the block) than buildings on wider streets. The 1916 zoning code in New York used a "sky-exposure" plane to limit building mass as height was increased. "This was a specified angle slanting back from the street – sharply on narrow streets, less so on wide ones. If a building had enough setbacks in its lower portions, the tower could go straight up quite a ways."<sup>29</sup> The impetus for this new zoning, the Equitable Building, was a building that shot straight up from the street edge and cast large shadows.

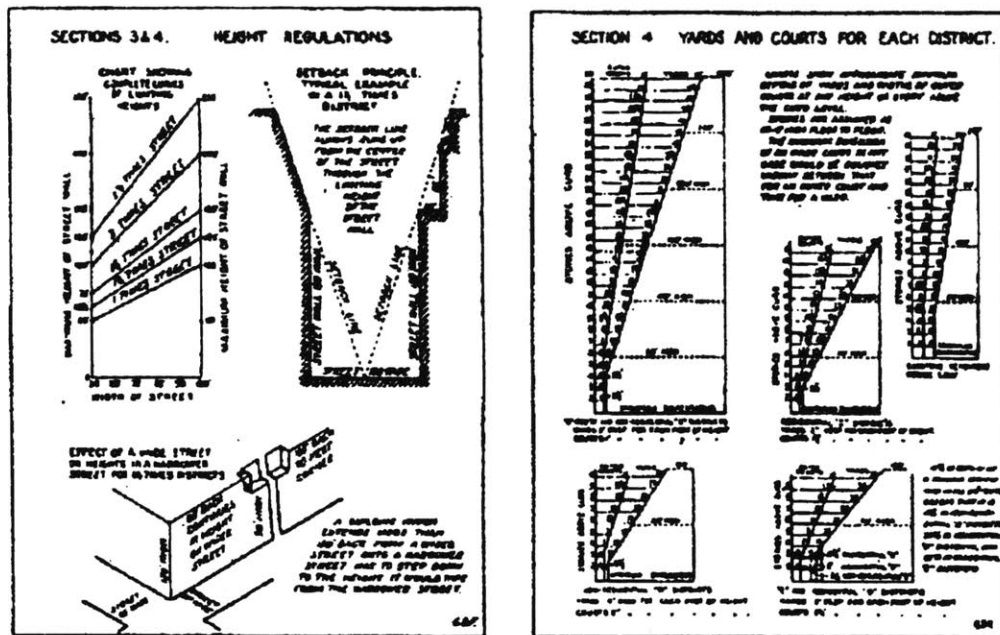


Fig. 2.8 New York City zoning from 1916 related to street widths and sky-exposure planes.

Despite the formation of many successful streetscapes under the 1916 zoning, by 1961 planners believed that a new tactic should be used to determine building size and setback, one that would give them additional control over the creation of public amenities. Instead of using some ratio of street size and sky-exposure plane or anything that related directly to pedestrian scale, FAR (floor area ratio) was used to calculate building volume. This newly created metric was a measure of the total floor area in the building to the area of the site. An initial FAR of 15 was given as a maximum in New York. This figure was derived by studying existing buildings and it was actually a good beginning that preserved some sense of daylight (whether direct or reflected), which was the goal planners were seeking to regulate since the 1916 zoning codes.

However, this initial FAR of 15 soon lost its meaning and subsequent further destruction to the urban environment was soon perpetuated through a concept used in conjunction with FAR called incentive zoning. Planners in NY believed that by allowing developers to increase allowable FAR to 18 (and later higher) by providing a public amenity, everyone would win. The city would get a public benefit like a plaza and the developer would be able to get more money by building about three more floors. However, planners miscalculated the value of these additional floors, as was documented by Jerold Kayden. "For each dollar he put out for a plaza, a developer reaped nearly \$48 worth of extra space."<sup>30</sup> Also, the increase in FAR to 18 often



resulted in bulkier buildings which cast larger shadows and decreased the experience of pedestrians.

Land owners soon realized the increased potential of construction bonuses and adjusted the price of their land. So, developers began to count on the increased FAR in order to continue to make money. Worse still, the type of public amenities counting for increased FAR began to grow to include a slew of other categories, including through-block connectors and interior open spaces, which took public activity away from the street (or in many cases just ended up being weak interior spaces). Lastly, enough of the public plazas were such disasters that people began to question how to turn the tide of bad design.

As FAR increased and building mass ballooned, citizens began to fight back. In New York, groups successfully challenged projects that would produce adverse shadow effects and people like William Whyte documented how public spaces were actually being used. He, along with organizations like the Project for Public Spaces, advocated for increased activation of public spaces through such methods as programming and increased seating. One metric which he devised and which was widely accepted was providing 1 linear foot of seating for every 30 square feet of plaza.

Despite efforts to address the deficiencies in this new style of city building influenced by modern architecture and altered zoning laws, a dramatic break with the past had already happened. Instead of humanely scaled developments which typically were constructed piecemeal over time, large-scale developments that broke with past urban form were propagated. These new developments disconnected from the public by breaking away from the street with their towers buffered by plazas. For all their modern achievements, this new form of construction added only minor increases in density and did more harm than good to the public realm along streets. “The vast, formless open spaces, the leftovers of planning and design focused on the building object, were destructive of neighborhood and “community” as public streets were replaced with unidentifiable and formless areas between buildings.”<sup>31</sup>

### **Compact Development vs. Superblocks and fast cars**

Density and compact development are key elements of new urbanism. Density supports active uses at the ground plane, increasing a sense of community, and compact development allows a greater concentration of different uses, usually within walking distance. For a chart of various urban densities, see Appendix D.

A way to measure the compactness of a site is to check the size of blocks and count the number of resulting intersections within a given area. Allan Jacobs did

this in his book *Great Streets* for a number of cities. There are pluses and minuses to block size. For one, the larger a block is, the greater ability architects have to design podiums with larger setbacks to towers, thus increasing light and allowing a variety of uses on the site. However, as urban sociologists like William Whyte have observed, the street corner is the most pedestrian-friendly, public space in the entire city. It is a moment of intersection, quite literally, that affords interaction between people. With smaller block sizes, increased potential for pedestrian interaction is achieved. Also observed by Whyte is the number one attraction for people: other people. In addition, by limiting the size of blocks, a walking environment is facilitated that has the potential of offering a variety of uses in close proximity to each other. So, if community and safety is to be increased, block sizes should be as minimal as possible.

In contrast to this viewpoint was the concept of the superblock. Pioneered by planners who at the time said they were concerned for the safety of children playing in streets, these new blocks were sometimes six to eight times as large in area as a traditional block. Le Corbusier viewed the old street pattern with its many intersections as inefficient and thus the deletion of streets afforded greater efficiency (and speed). He exclaimed: “TO LIVE! To breathe—TO LIVE! Homes to inhabit. The present idea of the street must be abolished: DEATH OF THE STREET!”<sup>32</sup>

Although Corbusier bemoaned the gridiron form, his own work to increase vehicular movement at the expense of pedestrian (or relegating pedestrian movement to peripheries while giving automobiles dominance over thoroughfares) would upend urban environments. Returning to feng-shui, the idea of the *qi* (pronounced chi), or energy flow, is of primary importance. “Feng-shui” literally translated means “wind-water.” To study the way of the wind and the way of water is to understand flows of energy. In Corbusier’s excitement regarding the machine and automobiles, he overlooked a critical factor in urban planning: the effect of overwhelming flows (in this case vehicular flows).

William Whyte has observed that compactness of streets and buildings is of more benefit to pedestrians than an efficient road network. Although hierarchies of roadways is not discouraged, he notes that if a place wants to encourage pedestrian movement, the automobile should be subservient not glorified, as it seems to have been in Corbusier’s machine-age visions. Praising Boston for its unique pattern of streets among U.S. cities, except perhaps the tip of New York which also deviates from a grid, Whyte writes:

If you wanted to design a street pattern for pedestrian movement you could hardly come up with anything better than the ancient twists and turns of the financial district. Ahead of their time, they tip the scales in favor of the pedestrian over the car. Bostonians are aggressive pedestrians, and when cars get slowed down on a winding street they will often bully them to a dead stop.

Curvy streets and hills slow down cars in places like Boston. The streets themselves vary in size and orientation, giving a sense of mystery to certain places like the North End. Because of this place's complexity, its inhabitants have more control over its streets and pedestrians are often given priority over automobiles, especially on the more narrow streets. Residents know how to navigate these streets but outsiders might get lost, ironically making them safer for residents. Similarly, San Francisco's hills slow down automobile traffic, unless perhaps someone is filming a movie and intends for their tires to leave the ground.

Unlike Boston and San Francisco though, traffic and road engineers over-design roadways in case a motorist exceeds the speed limit (see Appendix C for a discussion of speed limits in pedestrian environments). Therefore, regardless of the posted speed limit, motorists have proven a propensity to travel at speeds greater than what is allowed, often encouraged by these over-engineered roads. So, a new approach should be taken to ensure calmer vehicle speeds in residential neighborhoods.

As mentioned, Boston and the tip of New York may be unique to U.S. cities in their departure from grid form but other cities in the U.S. have taken a new role in automobile management by encouraging a hierarchy of roadways to maximize both connections to the surroundings and maintenance of a pedestrian quality. In Berkeley, CA, planners have systematically closed some streets to through traffic and siphoned traffic to higher capacity roadways, creating a system of roads that adopt some of the positive characteristics of cul-de-sacs while retaining full freedom of pedestrian movement.



Fig. 2.9 Disruption of through traffic in Berkeley's grid system has provided greater hierarchy of roadways and moved traffic away from pedestrian/residential neighborhoods to higher capacity streets.<sup>33</sup>

Besides reducing traffic for homeowners, the added control of vehicular movement has created a greater sense of place and ownership in communities troubled by crime. Returning now to themes already touched upon, Oscar Newman has written about the success of such interventions in creating mini-neighborhoods

out of the Five Oaks, Dayton, Ohio area. Results were immediate after just one year of implementing such a plan to limit through traffic in the area.

Cut-through traffic was reduced by 67 percent, overall traffic volume by 36 percent, and traffic accidents by 40 percent. ... The police department found that overall crime had been reduced by 26 percent and violent crime by 50 percent. ... Housing values were up 15 percent in Five Oaks in the first year, versus 4 percent in the region.<sup>34</sup>

The type of work done in places like Berkeley, CA and Dayton, OH simultaneously help control automobile travel through various locations and facilitate pedestrian / neighborhood environments by retaining street connections to surrounding neighborhoods. Making use of artificial cul-de-sacs to encourage a hierarchy of streets while still preserving pedestrian / bicycle access through is an innovative method of taming the automobile in very large development sites. The common thread between projects such as these is a desire to give pedestrians more control over their environments and not cede all control to automobiles. These examples are still very much connected to existing street grids to enhance connectivity and community. The point of creating these hierarchical road systems seems to be to direct flows of traffic in an organized manner.

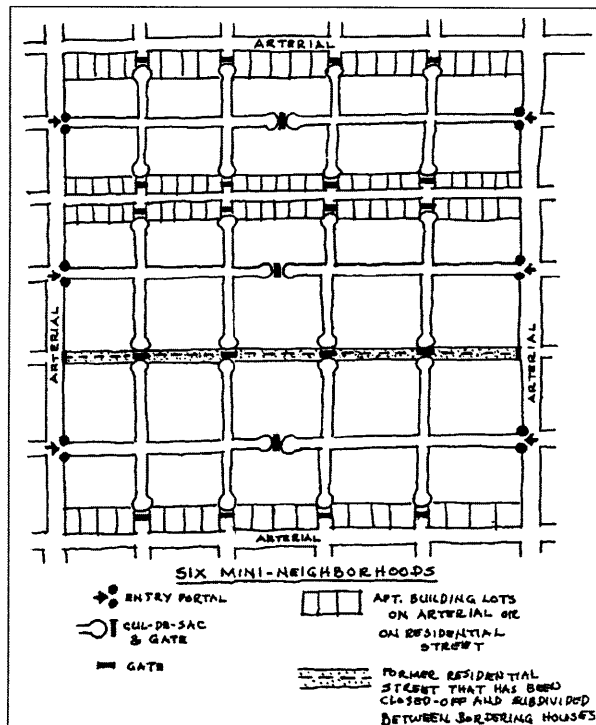


Fig. 2.10 Oscar Newman's plan for creating a hierarchy of streets in the Five Oaks area of Dayton, Ohio. Mini-neighborhoods are created by preventing through access at strategic points and redirecting traffic to higher capacity roads.

Both safety and community are issues that often intertwine in interdependencies when one considers livability. The next section deals with a component of livability, green design, that has some relationships to community and safety but, on a whole, is an issue more independent from the other two components of livability that we seek to improve.

## **Green Design**

*The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired in value. – Theodore Roosevelt*

Since the Americas were “discovered” by Europeans, this land and its natural resources have been viewed with both reverence and financial dreams. Not every U.S. president has shared Theodore Roosevelt’s wise appreciation of the environment. However, in recent years climate change has vaulted environmental issues to our nation’s collective consciousness. Since 1997 and the drafting of the Kyoto agreement, policy makers and social scientists in the U.S. have been surveying public opinion regarding the environment. In the last year, climate change has risen by more than 12 percentage points in importance and is one of the top three concerns of U.S. citizens.<sup>35</sup>

The building industry has followed suit with scientists and other concerned citizens by initiating an incentive-based system for rewarding buildings with high energy efficiency. LEED, or Leadership in Energy and Environmental Design, was developed by the U.S. Green Building Council, or USGBC, and is a system designed to measure various factors of sustainable design. Buildings are rated on a variety of “green” aspects, including site selection/characteristics, water efficiency, energy use, materials/resources selection, indoor environmental quality and innovative design. Buildings that are awarded a number of points may be eligible for four levels of certification as a green building: certified (26-32 points), silver (33-38 points), gold (39-51 points) or platinum (52-69 points). See appendix B for an example of a new construction project checklist for LEED certification.

The USGBC in coordination with the Congress for New Urbanism (CNU) and the Natural Resources Defense Council (NRDC) have come together recently to develop a new rating system for neighborhood development. Still in its infancy, the new checklist reads like a best practices or a common sense checklist for city planning. What is striking is how much green design seems to be just thoughtful,

good design. Site selection makes mention of preserving sensitive animal and plant species, wetlands and water bodies, and avoiding floodplains and steep slopes. The list also encourages brownfield redevelopment, alternative modes of transportation and reduced overall travel. As Whyte advocated, compact, open communities are encouraged. Diversity of use, housing type and income level of inhabitants is preferred. Accessibility is stressed in a number of ways and overall green construction is also encouraged, including credits for reduced water use, building reuse, stormwater management and energy consumption and production on-site. In total, a combination of 58 prerequisites and credits are tallied in the evaluation of neighborhood design with 106 total points possible. The same nomenclature exists in this system as in the LEED new construction system: certified (40-49 points), silver (50-59 points), gold (60-79 points) and platinum (80-106 points).

What quickly becomes clear from reading the new LEED for neighborhood development rating system is how advantageous it is to locate a new development project within an existing city with preexistent transportation systems and established compactness. Infill projects are beginning to seem increasingly attractive to developers, even in notoriously expanding, polycentric cities like Atlanta. In recent years, the city of Atlanta has seen a reinvestment in its downtown and increased development within a 1-mile radius of the center. Within this buffer, former industrial sites are now being transformed into new, often mixed-use developments with access to transportation. Atlantic Station, one such development, has transformed a former brownfield into a high-density, mixed use community and is being touted as “smart growth.” Despite a moratorium on new road construction imposed by the Environmental Protection Agency (EPA) because of failing air quality measurements in Atlanta, Atlantic Station was allowed to receive federal funding to construct a new bridge to connect the project with Midtown Atlanta. The EPA realized the environmental benefits of reducing overall travel time (and subsequent harmful emissions) by encouraging people to live closer to the center of Atlanta.<sup>36</sup> In recent years, the ever expanding city has seen a rubber band effect of contraction to the center as the costs of moving further away, in gasoline dollars and travel time, have increased.<sup>37</sup>

Although Le Corbusier was chiefly concerned with pragmatic, machine-like qualities of the city, his drawings and city plans always carry with them an understanding of nature and light. Also, his plans, post 1930, speak to a second machine age with greater consideration of human values. Today, his plans can be seen as reducing one’s footprint on the land, which benefits the environment. However, as already mentioned, his “towers in the park” scheme was antithetical to community interaction because the towers were isolated from each other and had no street presence or lively ground plane.

Corbusier wasn’t concerned with the same issues we face today in the

environment (emissions control, etc.). He was interested in a different kind of green design. He believed that his schemes would preserve more of the natural landscape. So, it is with some irony that current green roof proponents share a common link with his five points of a new architecture. When it comes to storm water management and reduction in energy costs associated with heating and cooling, Corbusier's second point, the roof-garden, is an idea that has seen considerable investment in recent years. Several studies from Penn State's Center for Green Roof Research indicate that reduction of storm water runoff can be as much as 80%-90% for a small rainstorm (up to 1" of water an hour). For more typical storms (2" of water an hour or more), a reduction of 20% to 40% was indicated.<sup>38</sup>

As Corbusier wrote:

[the roof] must cause the rainwater to flow towards the interior and not to the exterior ... Instead of trying to rapidly drain away the rain-water, one should maintain a constant humidity for the concrete of the roof-terrace and thereby assure a regulated temperature for the concrete. An especially good protection: sand covered by thick cement slabs laid with staggered joints; the joints being seeded with grass. The sand and roots permit a slow filtration of the water. The garden terraces become opulent: flowers, shrubbery and trees, grass. Thus we are led to choose the roof-terrace for technical reasons, economic reasons, reasons of comfort and sentimental reasons.<sup>39</sup>

Our propensity to cover up the ground with surface parking, roads or just about anything else has had direct effects on our water systems. Because water is allowed to travel quickly across such impervious surfaces and into larger waterways, flooding can become more pronounced. Also, groundwater recharge that would normally occur through pervious surfaces is thwarted by covering the ground. Impervious surfaces also generate heat-island effects, i.e. trap solar radiation and release it back into the environment, resulting in more energy use to cool buildings. Green roofs, and new green facades, help mitigate these adverse environmental effects.

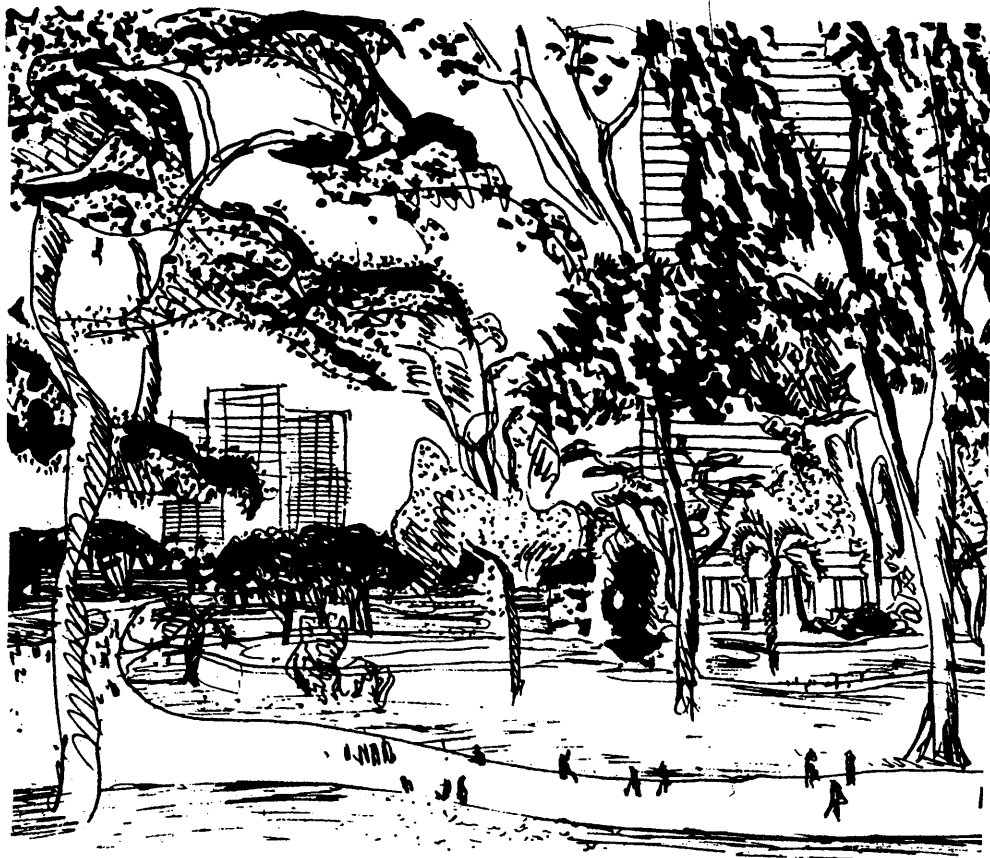


Fig. 2.11 Le Corbusier's drawing from *Ville Radieuse* of parklands surrounding towers on pilotis exaggerates vegetation to convey his overall vision of separated pedestrian and vehicular circulation in his new city. Also, the land coverage is low and there is a lot of room for parkland, illustrating the different measure Corbusier had to determine a successful plan – natural environment.

In light of the increase in emissions caused by suburban commuters, Corbusier must be admired for his focus on the city as a location of population concentration, instead of bowing to the forces of sprawl post WWII to which many cities in the U.S. have succumbed. In a somewhat ironic twist, Corbusier, the lover of the machine and obvious admirer of automobiles, advocated city living as opposed to the visions of his contemporary, Frank Lloyd Wright, who foresaw the suburban environments allowed by automobile travel. In today's discussion of global climate change, the benefits of compact development and reduced automobile dependence are major concerns for environmentalists, putting Corbusier in line with present incentives to develop closer to city centers, or at least in a compact form with reduced auto-dependency (ironically, considering his elevated roadway designs and love of cars).



In Le Corbusier's day, one of the most dominant environmental concerns was light penetration. His buildings both sheltered inhabitants from too much light through brise-soleil and reflected light further into buildings through light trays. Today, buildings such as the Genzyme building in Cambridge, MA have garnered platinum LEED status for their many innovative green components, including light penetration through the use of heliostats on the roof of their building. These devices move with the arc of the sun throughout the day and redirect light onto mirrors which scatter it throughout a central atrium and reduce the need for artificial light inside the building. However, in Corb's era, designers thought of a simpler way to allow light penetration into a building, detach the building far enough away from direct sunlight obstructions, i.e. other buildings. Walter Gropius's light diagrams were perpetuated throughout architectural journals and implemented in many housing developments. Unfortunately, they only added to the community disconnect previously described by further distancing housing slabs from their neighbors.

On closer inspection of these diagrams, such as the one illustrated in figure 2.12, they appear far too simplistic. There is no consideration of place, solar orientation or time of year. Also, these diagrams assume that direct sunlight is needed to a first floor window when reflected light might suffice. These diagrams also don't explain how long the direct sunlight should remain. Lastly, these diagrams discourage variety.

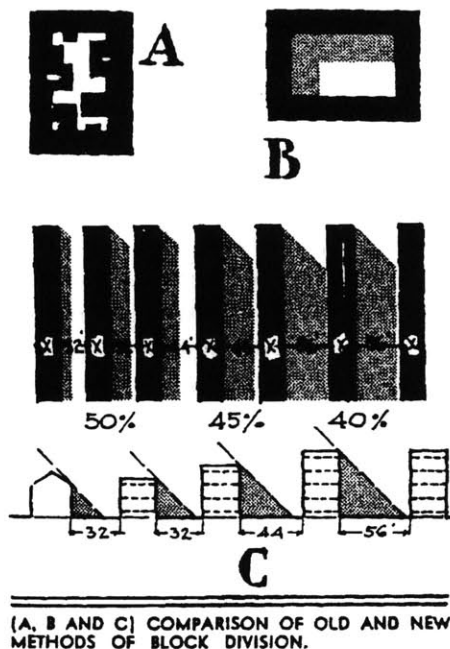


Fig. 2.12 Henry Wright's version of Gropius' original light study diagrams. The rapid adoption of this idea encouraged slab apartment buildings further separated from surrounding urban fabric to allow extra light through to ground floors.

Today, as represented in the Genzyme building, designers are rediscovering “green” methods of design that architects of the past, who couldn’t rely on air conditioning or powerful artificial light, already used. For instance, many buildings in Boston’s Back Bay enjoyed a central staircase with an atrium and light well to allow light penetration deep into the building. Many of these light wells were built over and painted, as was the case at 99 Bay State Road, a former governor’s mansion that built servant quarters on top of the fifth floor, thus obliterating their skylight and light well.

One final avenue to inspect when discussing issues of green design is the future of such rating systems as LEED. Although LEED is a great start to creating positive incentives for an industry firmly responsible for atmospheric carbon increases, there is still definite room for improvement. Future versions of the system in LEED 3 will address the cries of preservationists. Because the U.S. “demolishes over 200,000 buildings a year – generating 124 million tons of debris, enough to construct a wall 30 feet high and 30 feet thick around the entire coastline”<sup>40</sup> It is good that LEED is considering preservation of buildings already in LEED ND (neighborhood design). With more preference given to reuse of existing buildings, the environment is benefited and a connection to the past is retained for future use, allowing cities to retain a greater variety of forms.

Aside from relieving pressure on our landfills, which are currently filled to more than 35%<sup>41</sup> of their entire volume with construction and demolition waste from our building industry, existing buildings possess something called embodied energy. “A building’s embodied energy is the energy used in its production and, eventually, demolition. This includes the energy required to extract, process, manufacture, transport, and assemble materials, as well as the energy required for related equipment, services, and administration.”<sup>42</sup> When new buildings (even platinum LEED certified ones) are constructed, the biggest percentage of energy use in their first 20 years is spent on their initial construction, not what is consumed in heating or cooling or any other energy use, regardless of the level of “greenness” the building possesses. Add to this fact the average life-cycle of home mortgages (only 7.5 years) and it becomes evident that if we want to truly decrease our energy consumption and production of carbon, we must reuse existing buildings.

## ***Conclusion***

From the preceding literature review, the following qualities of livability will be used to evaluate the case studies of the next chapter:

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**Safety**

*Local surveillance*  
*Controlled Access*  
*Traffic calming*

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**Community Interaction**

*Scale*  
*Street Life*  
*Mixed Use*  
*Compact development*  
*Density*  
*Preservation*

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**Green Design**

*Sunlight*  
*Water absorption*  
*Preservation*  
*Sustainable design*  
*Compact development*

Each of these qualities will be further examined and refined through case study research. The following chapter will examine cases of how urban designers created a highly livable ground plane by focusing on or otherwise improving these criteria of livability.

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### 3. CASE STUDIES IN LIVABILITY

The case study research will examine built and unbuilt places that meet a certain criteria. The project must have kept existing towers but transformed the ground plane in some way that increased its livability (community interaction, sustainable design, safety or some combination of any two or all three factors). The case may also include towers that take a different approach from Le Corbusier's tower in the park design from the beginning and produce a more livable, pedestrian friendly environment at the ground plane. As control cases, two examples of traditional city form (sans towers) will be examined and compared along similar criteria of livability. Each project or place will be evaluated for how well it performs in the aforementioned qualities of livability (safety, community interaction and green design).

The case study places are organized in the following order, from small/ incremental to large scale development projects:

#### *Traditional City Form*

##### Savannah, GA

The original 1733 plan for Savannah has been heralded "the most intelligent grid in America, perhaps the world" by urban designer/writer John Massengale. Also the Project for Public Spaces, a non-profit organization created to further William Whyte's *Street Life Project*, ranks Savannah's system of public squares as among the finest in the nation.<sup>1</sup>

##### North End, Boston, MA

Written about in Jane Jacobs's book *The Death and Life of Great American Cities*, the North End is widely regarded as a pedestrian friendly environment. It is included as a comparison not only for other cases in this chapter but also to contrast the Le Corbusier inspired development of its neighbor, the adjacent West End, described in chapter five.

#### *Redevelopment of a Modernist Plan*

##### 100 Cambridge Street/Bowdoin Place, Boston, MA (former Saltonstall building)

The redevelopment of a modernist plan, the Saltonstall building is now considered a model for future redevelopment in Boston based on the success of its design.

*Hybrid City – Mixing Modern with Traditional in New Large Scale Development Plans***Vanke Housing Plans, Shanghai, China**

Also a large scale development, the Vanke plans have focused on “sustainability” (including mostly themes of economic, social, and environmental sustainability) to create new housing communities of high environmental quality with a mix of towers and pedestrian places.

**Concord Pacific Place, Vancouver, British Columbia**

Design guidelines have shaped Vancouver into a model for other cities to emulate. Concord Pacific Place is a new large scale development that combines towers with street walls of a pedestrian scale and mixed uses on the ground plane.

***Traditional City Form Cases***

Of the long list of cities that fall under the designation “traditional,” I chose two special cases from the United States to focus on issues of livability. Because this research is focused mainly on how Le Corbusier’s plans were translated into form in the United States during the urban renewal era, I felt compelled to choose “traditional” U.S. cities for comparison sake. Boston is unique because of all the cities in the United States, it most closely resembles an “organic” European town plan. Most other U.S. cities are based on the efficient gridiron form, aside from perhaps the tip of Manhattan which also has curving roads which had formed in response to natural development forces. Savannah possesses a unique grid as well and a unique set of public parks that far outshine the left-over spaces around towers inspired by Le Corbusier. Savannah may come closest to truly integrating a livable, open space network throughout its city form. Both cities are superior examples of pedestrian friendly environments, allowing a wide variety of uses to be found in short walking distance. These two places will be evaluated for livability concerns and then compared alongside the remaining cases.

**Savannah, Oglethorpe’s original 1733 town plan**

James Oglethorpe’s plan for Savannah, GA stands out among almost all other grided towns. As Stanford Anderson has indicated, its unique configuration has facilitated certain uses on specific streets. Some streets are more disposed to retail uses while others are better suited to institutional or residential use. Without forcing any definite land use, aside from a suggestion of public uses along the greens, Savannah’s streets naturally oriented commercial use and residential use. In his

symposium paper entitled *Savannah and the Issue of Precedent: City Plan as Resource*, Anderson examines the distinctive qualities of the Savannah plan including its:

1. additive grid;
2. no determined focus;
3. range of street and parcel types, yielding a marked level of differentiation;
4. co-present readings of whole and parts;
5. parcel and block sizes, and organization, that inhibit radical changes of the public space via private development decisions.<sup>2</sup>

This last point, relates to an important quality of human scale that was preserved. The human scale of Savannah was preserved by a number of factors. First, and foremost, its small block size prohibits typical large-scale development projects.

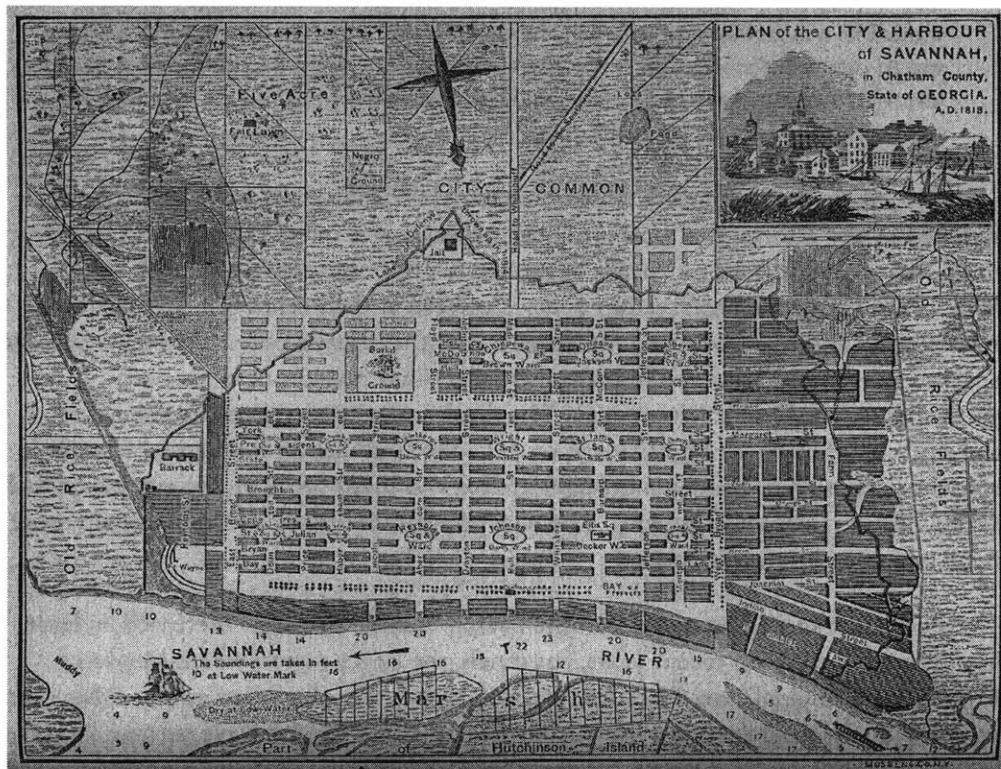


Fig. 3.1 City plan of Savannah, c. 1818, showing the progression of Oglethorpe's unique grid.

Second, disinvestment and steady population shifts in the state of Georgia beginning after the introduction of rail to the area and changes to resource production, hitting a high mark after WWII, resulted in de facto preservation. Luckily, when real threats to the historic core began to surface, the city also began to see a rise in reinvestment and real preservation efforts.

Before WWII or even the Civil War, the Georgia Historical Society (GHS) was founded in Savannah in 1839. However, with the advent of modernism when historic buildings were beginning to be destroyed and parks were beginning to be bisected to allow automobiles and trucks unfettered access, a few concerned citizens stood up and began the roots of what would become the city's historic preservation guidelines for the original Oglethorpe plan. From 1955 to 1968, they laid important groundwork for preserving the downtown of Savannah. They actively sought investors to restore historic buildings and prevent takeover bids by larger developers bent on altering the historic narrative of the city.

The women who founded the HSF [Historic Savannah Foundation] at that time wanted to win private support to promote public preservation programs. Their aim was to establish the idea that it was more rewarding to invest a million dollars in a city's historical structures than to develop and build new structures that clashed with the city's architectural and cultural heritage.<sup>3</sup>

One of the biggest forces for preservation in the city, beginning in 1979, was initiated by the efforts of a local art college, Savannah College of Art and Design, or SCAD. Administration officials began buying real estate throughout the city and, in spirit with the preservation courses offered at their school of architecture, rehabilitated and restored many buildings across the historic core. This reinvestment sparked renewed interest and improvements by other neighbors to property surrounding SCAD redevelopments. The result was a rise in property values across the city.<sup>4</sup> In addition, as SCAD grew, so did a new population demographic: college students. These new residents brought life back to many areas of the city which had seen a drop in pedestrian activity. The new population also was able to sustain more retail and overall safety increased.

Perhaps it should be noted that the overall "sense" of safety increased, at least in the historic core. In recent years, Savannah, the larger region which surpasses Oglethorpe's original plan, has suffered from high levels of violent crime. Also, even some of the original parks on the outskirts of the historic plan have seen an increase in perceived danger after hours. These trends underlie how difficult a problem crime is. The current CPTED movement only addresses crime deterrence through design but the issue is multifaceted and very tricky to solve. Despite the problems the city faces, the historic core retains a favored perception and it seems that most crime is committed outside its manicured streets and buildings; at least this information is what tour guides disseminated when I asked about safety while visiting the city in



2006.

Despite their sometimes usurpation by “undesirables,” the city squares and the overall open space framework is perhaps the most defining single element of the entire city. These small parks are of perfect size for leisurely sitting and they allow extra light, air and beauty to soak into the city. Because Savannah has so many of these parks interspersed throughout the city fabric, the city’s ability to absorb storm water is greatly increased. In the historic core, over 73 acres of the entire 559 acres is devoted to open space, or over 13%.<sup>5</sup> Also, the live Oaks which fill these parks and boulevards with their twisting, gnarled branches are almost magical and form the main connecting element between open spaces. Without these trees, I doubt Savannah would retain such an amazing feeling. They add just as much to the atmosphere of the city as do the historic buildings. Besides their importance to Savannah’s open space network, the live Oaks also provide definition to Savannah’s unique streets, especially along wider avenues, see figure 3.5.

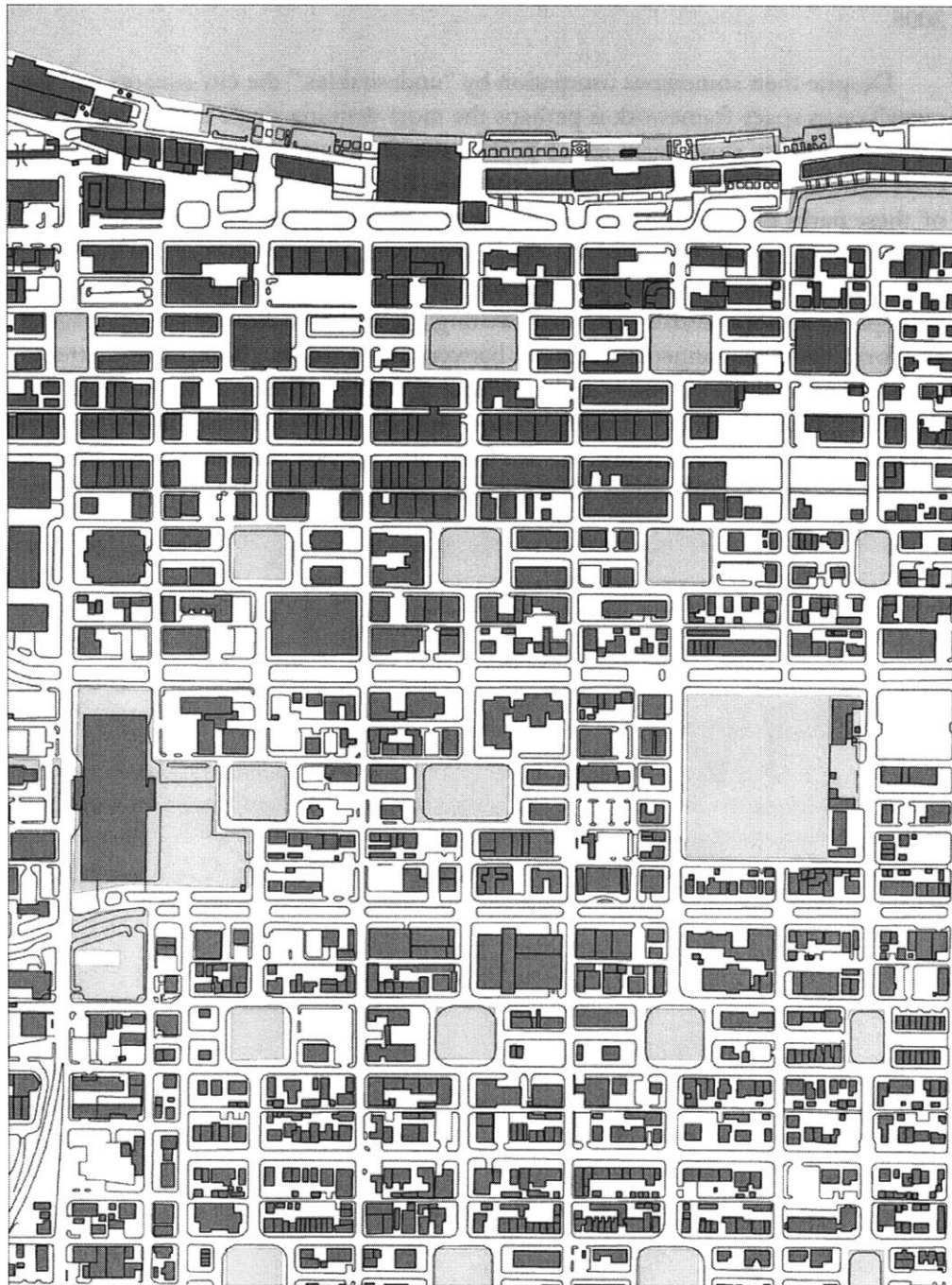


Fig. 3.2 The system of small parks permeates Savannah's historic core even today, despite the intrusion of a few parking garages on public squares. Presently, the upper left square, shown darkened in this map, is being transformed into underground parking to restore the original open space to the city.

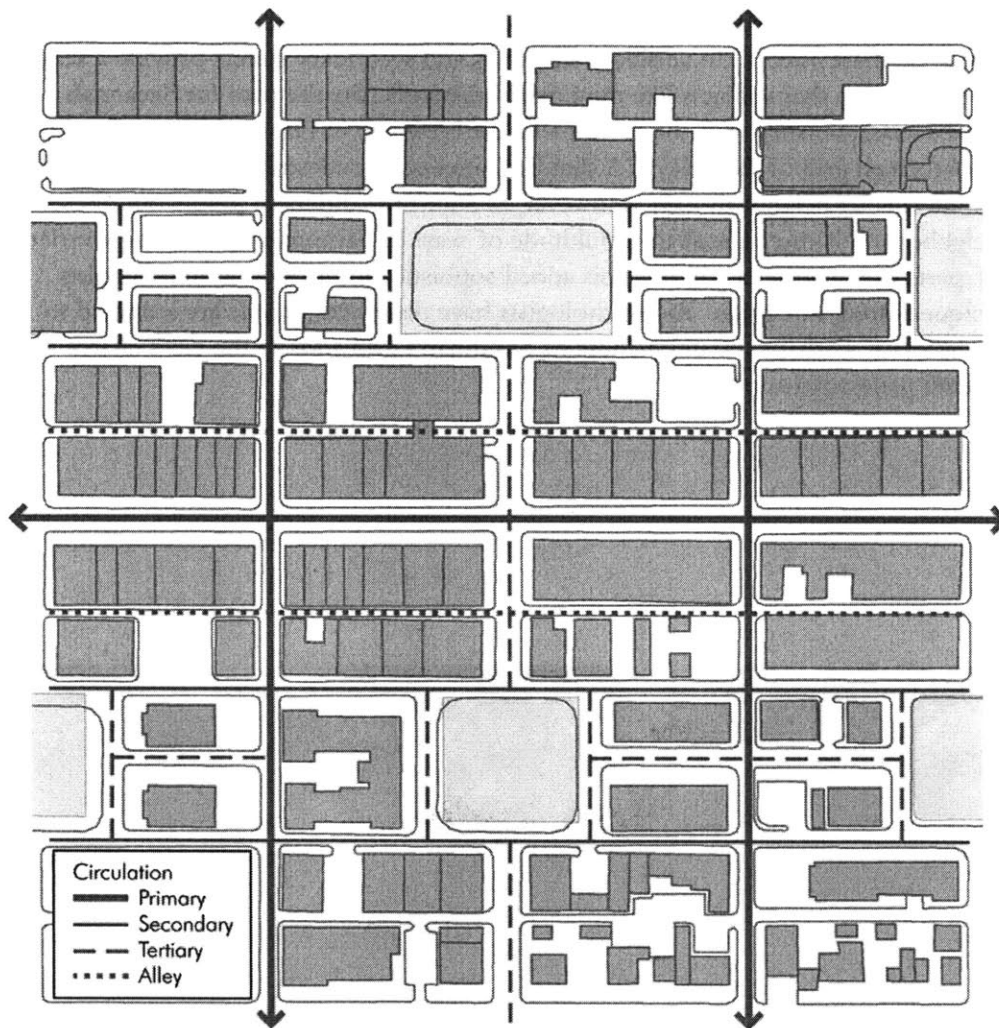


Fig. 3.3 Savannah's unique hierarchy of streets impedes vehicular traffic on north-south streets that have parks. Alleyways and secondary streets provide a very open city plan that still acts like sophisticated mini neighborhoods. At the basic level, each Ward of the repeating grid contains a public square with trust lots flanking the green that typically are used for public/institutional buildings. There are housing rows with inner alleyways to the north and south of the public space and service roads on alternating north-south streets not on access with parks.

Because the plan of Savannah calls for a number of different street types, the pedestrian feel of the city is increased. This hierarchical plan reveals itself to possess sophisticated traffic calming abilities. Streets running north-south that are not on access with the parks act as service/access roads, see figure 3.3. Along streets bifurcated by parks, the pedestrian is given primacy. Their path is unbroken while cars are forced into naturally slowing, circuitous routes. So, vehicular traffic

is impeded along north-south streets, which have parks, even despite the greater width of these streets. In addition, alleyways and secondary streets provide a very open city plan that still acts like mini neighborhoods. So, the plan for Savannah shares characteristics with the work of Oscar Newman in Dayton, OH or the transformed grid of Berkeley, CA that both increased pedestrian control and helped define smaller neighborhoods. However, as Stanford Anderson points out, these neighborhoods can be read in a multitude of ways in Savannah, combining a variety of parts to construct a whole. This added sophistication makes Savannah's plan unique among U.S. grids. As psychologists have observed, people are attracted to complexity. Perhaps the uniqueness of Savannah's grid adds to the city's charm and overall pedestrian appeal.



Fig. 3.4 Along streets bifurcated by parks, the pedestrian is given primacy. Their path is unbroken while cars are forced into naturally slowing, circuitous routes.



Fig. 3.5 On wider avenues, street definition is preserved by amazing 200-year-old live Oaks. These special trees permeate the historic core of the city, providing structure and connection to the open space system.



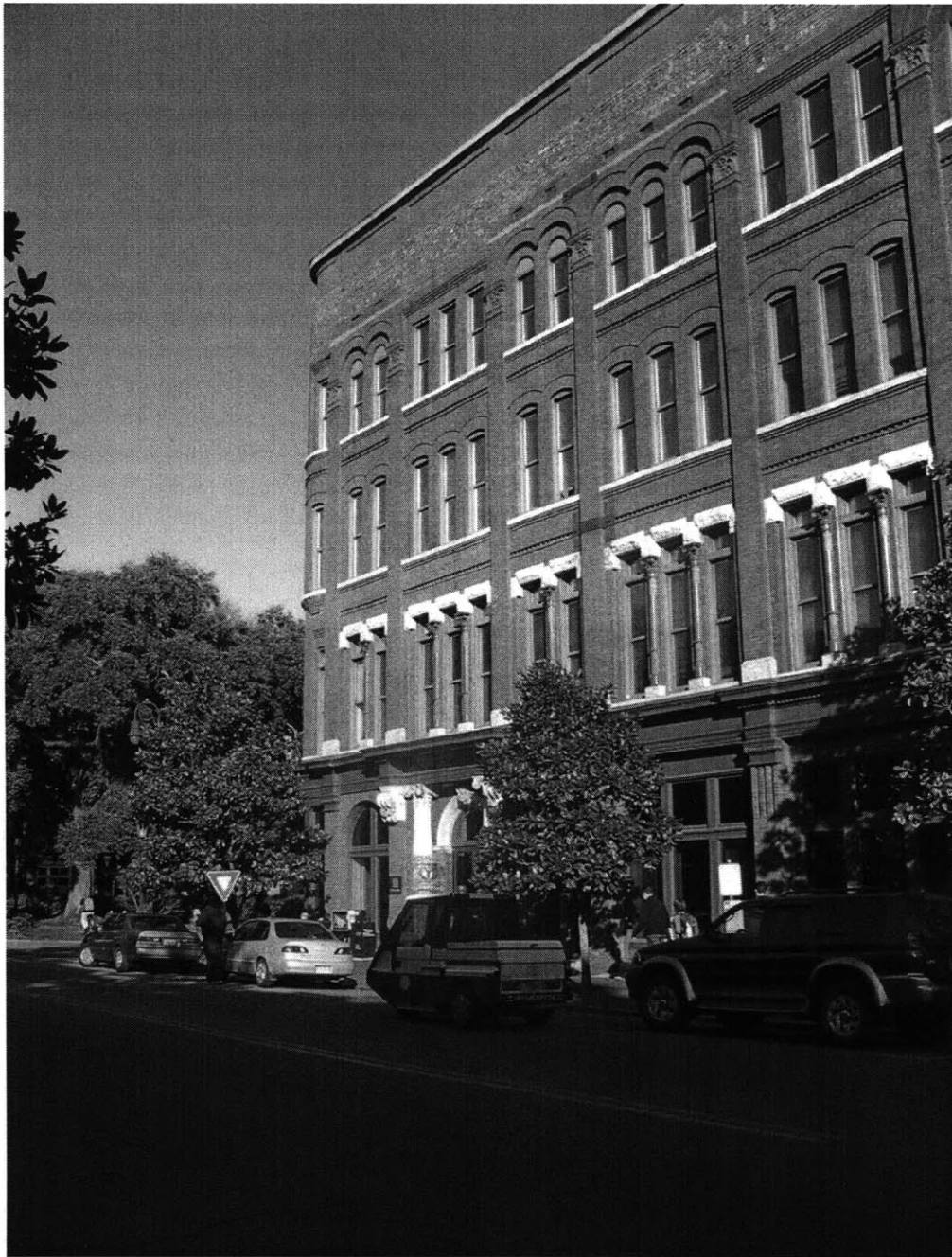


Fig. 3.6 Buildings, such as the one above restored by SCAD, rarely rise above five floors in the historic core. Three to four floors is most common.



Fig. 3.7 Piano nobile second floor entrances are not uncommon in Savannah.

Savannah Streets	Street Width	Façade to Façade
Alleyways	10 to 15	20 to 25
E-W Through	20 to 25	40 to 50
E-W Parks	30 to 40	65 to 75
N-S Service	25 to 30	40 to 45
N-S Parks	35 to 40	70 to 75
Average	27	50.5

Fig. 3.8 Savannah street widths by type.<sup>6</sup>

### **Boston, the North End**

Just as the intricate network of streets in Savannah facilitate a pedestrian environment, so do the curving streets of the North End in Boston, see figure 3.9. Again, we see a fairly constant building height of four to five stories permeating the fabric of the North End. However, instead of an intricate grid like Savannah or a modified grid like Berkeley or Dayton, here curving roads calm traffic and imbue the area with a special neighborhood quality. To an outsider, these streets would

not seem familiar or easily traversed, accomplishing the same role as the modified Dayton plan of Oscar Newman's design to increase safety through controlled site access.



Fig. 3.9 & 3.10 The North End of Boston and Hanover Street. This area of Boston was spared the urban renewal of the neighboring West End. Instead, its human scaled four to five story buildings were saved and a pedestrian environment was preserved.



Fig. 3.11 Hanover Street at dusk, March 2007. This street may be the most heavily traveled street through the North End. Yet, it is still only one lane in either direction with one lane of parking on each side. In addition, its curves further slow traffic. An early object building, the steeple of a church, frames this view.



The street widths are also very narrow and pedestrian oriented. Even the main street traversing the North End, Hanover Street, is fairly narrow, see figures 3.10 and 3.11. Only two lanes of traffic are allowed to flow through the neighborhood. Therefore, if one decides to travel down Hanover Street, they most assuredly are attempting to penetrate the system of traditional streets for a purpose. In other words, they likely have business in the North End of some kind.

Because of their diminutive widths, streets in the North End have strong definition. What is perhaps a very interesting coincidence is the ratio of street width to building height in the North End approximating the golden mean almost nine times out of ten, see figure 3.12. This may be pure coincidence though and certainly not a scientific study demonstrating once again that people are drawn toward this ratio. However, it may have unconscious benefits for the pedestrian because of the symmetry and tension embodied in its ratio. At the very least, these streets would be described by Allan Jacobs as possessing strong street wall definition and this quality helps strengthen the pedestrian experience by creating a sense of place.<sup>7</sup> In contrast, “Radiant City principles would transform the traditional relationship between streets and façade-oriented housing, eliminating the street corridor in a residential district.”<sup>8</sup>

Source	Average ROW	Golden Mean	Building Height	Height/Golden Mean
Boston GIS	37.47	60.62	56.86	93.8%
B.R.A. CAD	36.43	58.95	53.67	91.0%
Average	36.95	59.78	55.27	92.4%

Fig. 3.12 North End street widths versus building heights and golden mean. ROW is a measure of distance between opposing building facades.<sup>9</sup>

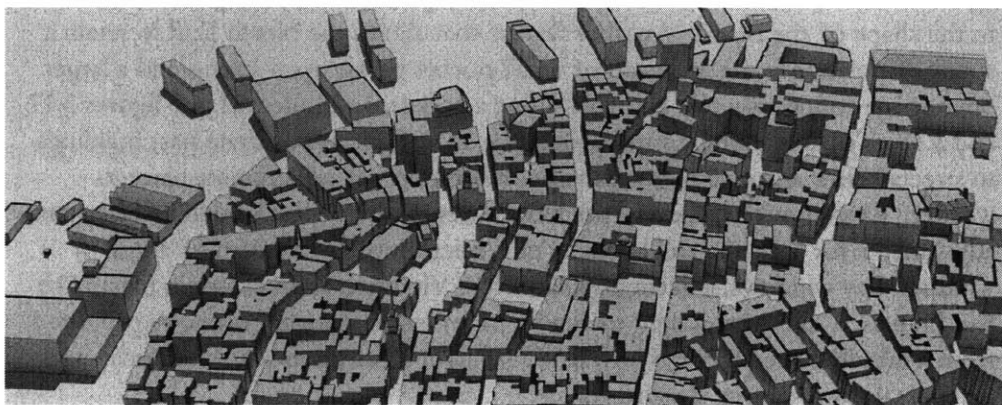


Fig. 3.13 North End CAD model, courtesy of the Boston Redevelopment Authority.<sup>10</sup>

The North End's irreverence of the modern automobile is further exemplified by various parades and festivals through its streets that temporarily exclude the limited on-street parking that does exist. Although people may bemoan the inconvenience, there are also some who have decided to change their way of life. I've spoken with one such family, the Isherwoods, who have cast off their attachment to automobiles after living in the North End for about ten years now. Instead of contributing to air emissions, they walk or use public transportation. When an automobile is needed, they simply use a Zip Car (an automobile ride share system) or car pool with friends.<sup>11</sup>

Le Corbusier may have been focused on razing traditional city districts like the North End because he was concerned with horrid living conditions in many industrialized cities. Yet, it was an error of conflating physical form with low incomes and overcrowding. In fact the North End fabric can and now does provide wonderful livability, but at a density appropriate to the buildings not at the overcrowded densities of the turn of the 20<sup>th</sup> century.

Like Ebenezer Howard and the Garden City movement proponents, Corbusier viewed the city as a dark, filthy, overcrowded place that yet simultaneously possessed great potential because it was a central place. Because Corbusier was anti-sprawl, as Mardges Bacon points out, he "explained that modern building techniques could bring about an 'architectural revolution' that allowed a choice between two contradictory states: suburbs laid out as 'horizontal (or sprawling) garden cities' or urban centralization employing what he called 'vertical garden cities' on 'artificial sites.'"<sup>12</sup>

When walking around the North End, light isn't such a rare commodity as one might imagine from a casual look at its plan. Because the North End's streets are not on a north-south-east-west grid, light is able to pass through the area in the same way light is able to penetrate into Manhattan, which possesses a tilted grid to conform to the shape of the island. Another feature that allows the North End to retain a sunny disposition is the inclusion of small pocket parks/open spaces and a larger open space connecting two churches along a pedestrian boulevard, see figures 3.17 and 3.18. These seemingly small provisions allow light to penetrate past buildings to streets below and give pedestrians a comfortable, yet still intimate place to wander. Even though not every site has the benefit of a tilted grid like Manhattan, adjustments for light can still be made on a micro-level by the turn of a wall or window. Bay windows, a detail popularized in Victorian architecture in places like San Francisco, allow extra light to enter a room by their angled windows projected from a facade. Overall, the North End's sunlight absorption seems balanced and certainly not warranting slum clearance.

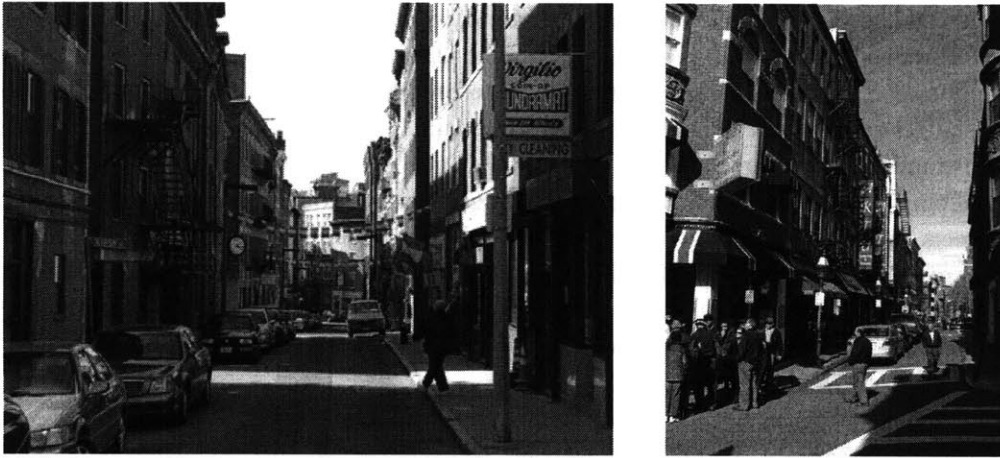


Fig. 3.14 & 3.15 Solar orientation matters just as much as building height for these two streets in the North End. Salem Street, on the left, is still in shadow at 10:30AM, March 31 while Prince Street is not.

The following summary chart represents a study of the streets of the North End to determine the actual amount of sunlight allowed to penetrate to the depths of its cavernous streets. Utilizing known altitude and azimuth angles for the sun, one can determine the amount of sunlight able to reach a first floor window in the North End.<sup>13</sup>

Street	Sunlight from 8AM-5PM (# of hours)		
	Winter	Summer	Average - All Seasons
Charter	1.8	6.3	3.8
Clark	0	9.0	3.6
Fleet	0.9	9.0	4.3
Fulton	2.7	8.1	5.0
Hanover	1.8	9.0	5.6
Moon	3.6	5.4	4.3
N Bennet	1.8	6.3	3.8
North 1	2.7	5.4	4.1
North 2	0	9.0	4.5
Parmenter/ Richmond	2.7	7.2	4.7
Prince	2.7	6.3	4.1
Salem	0.9	9.0	3.8
Sheafe	0.9	9.0	4.3
Tileston	1.8	3.6	2.7
Unity	1.8	4.5	3.4
Wiget	0	9.0	3.4
Average	1.75	7.42	4.24

Fig. 3.16 Available sunlight penetration to first floor windows in the North End of Boston.

This table concludes that sunlight penetration to the North End, which is comprised of compactly developed 4 and 5 story buildings, is adequate. A guideline used by Chinese architects to design for sunlight is to prescribe minimum building separation distances to allow for at least 1 hour of direct sunlight during winter months to a ground floor window.<sup>14</sup> The North End has nearly twice as much average light reaching the ground floor during winter months as this goal prescribes despite some streets having no direct sunlight. So, perhaps such guidelines are not as important as creating a diversity of pedestrian experiences that the North End's varied streets offer. Every street doesn't need to necessarily follow the same sunlight quota; just because one street may have more sunlight than another, doesn't mean that the others should all be changed.

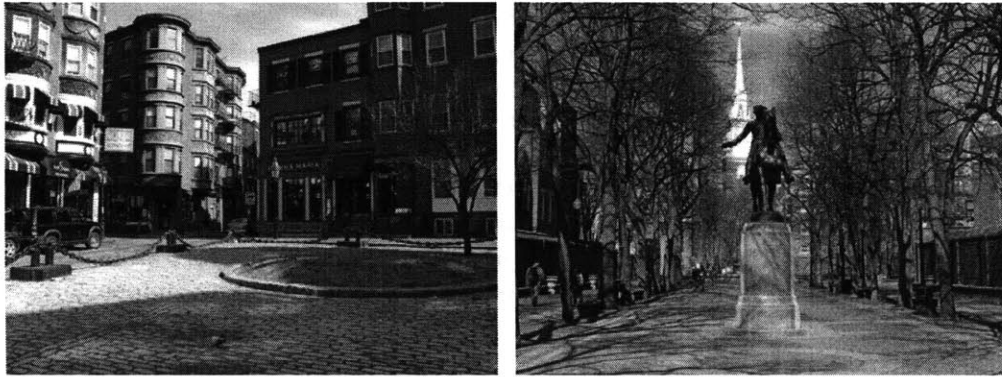


Fig. 3.17 & 3.18 Small pocket parks and longer pedestrian ways give the North End added character and provide ample light and “breathing room.”

Lessons learned from these “traditional” pedestrian neighborhoods:

### Savannah

#### Safety

##### *Traffic calming*

*Savannah's unique plan enables built-in traffic calming, increasing pedestrian safety. By causing automobiles to navigate around public squares, their speeds are naturally reduced.*

##### *Crime*

*Although crime has been problematic for the larger city of Savannah, its historic core remains relatively safe. Lighting, store fronts and many individual entries help define a street wall with potential for internal community surveillance.*

#### Community Interaction

##### *Scale*

*Street wall of constant 3 to 5 stories relates well to pedestrians.*

*Hierarchy of intimate to through traffic streets encourages pedestrian experience without hampering automobile circulation. Pedestrians are given priority along park streets.*

*Mixed Use*

*A variety of uses enliven the pedestrian experience in each ward of Savannah's historic grid. This great diversity of uses at the ground plane includes public institutions, offices, retail, restaurants, residential units and open space.*

*Compact development*

*Savannah's relatively small block size facilitates a pedestrian walking environment by providing quick access to a variety of ground floor uses.*

*Density*

*Although compact in form, Savannah's historic core is not bustling with residents (perhaps it is with tourists). If more residents lived in the core, retail would be more successful. The addition of college students attributed to SCAD's increasing enrollment has helped create more retail demand.*

*Preservation*

*Restored buildings bridge a human connection to place and time and make possible an engaging pedestrian experience.*

---

*Green Design*

*Preservation*

*Existing (often historic) buildings were recycled and contribute to the narrative of the historic core both increasing a sense of human interaction with buildings and conserving energy by avoiding entirely new construction (thus preserving the embodied energy of the reused building).*

*Sustainable design*

*Existing buildings retrofitted on the interior respond to energy concerns of today.*

*Sunlight*

*Savannah's small building heights allow ample light to filter through during winter months, which rarely dip far below 40° F. Its live Oaks offer appreciated shade for this often balmy climate.*

*Water absorption*

*Savannah's integrated green space and systematic tree plantings help soak up storm water during storms.*

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**North End, Boston**

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**Safety**

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<i>Traffic calming</i>	<i>The “organic” pattern of curving streets naturally slows automobile traffic, allowing pedestrians to gain an advantage over automobiles. In addition, many of the streets are sufficiently narrow to also slow cars.</i>
<i>Local surveillance</i>	<i>The close grouping of buildings with ground floor activities enables a relatively safe environment.</i>

**Community Interaction**

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<i>Scale</i>	<i>With an average right of way less than 40 feet and an average building height less than 60 feet, the character of the North End retains an intimacy with pedestrians.</i>
<i>Mixed Use</i>	<i>A mix of uses along the ground plane creates an exciting pedestrian experience. A vibrant restaurant scene exists in the North End and additional retail and businesses line some of its most prominent streets, such as Hanover Street. The smells from pastry shops and restaurants add to the pedestrian experience of the North End. Cultural amenities also exist in highly visible locations, such as the pedestrian way book-ended by two churches, one of which is a popular tourist destination because of its involvement with Paul Revere’s “midnight ride.”</i>
<i>Compact development</i>	<i>By building on relatively small blocks, a strong pedestrian environment is created with a diversity of uses within walking distance.</i>
<i>Density</i>	<i>In Boston’s explosive population growth era, fueled by immigration, North End landlords built multistory buildings to house as many people as possible. Over time however, the population density dropped to reasonable living conditions. The area is still dense but is also more livable.</i>
<i>Preservation</i>	<i>Because so many of the buildings of the North End have survived intact, the area has become a tourist destination and a valuable example of historic settlement patterns while remaining a “living” neighborhood.</i>

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**Green Design**


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<i>Preservation</i>	<i>The North End has been spared from urban renewal and retains its building stock which preserves the embodied energy of these structures.</i>
<i>Sustainable design</i>	<i>Buildings are being remodeled by new users but it is unknown how much sustainable design plays a role in their retrofits, aside from the overall trend of the building industry to provide energy saving windows and other building materials as possible remodeling selections.</i>
<i>Sunlight</i>	<i>Pocket parks, winding streets and an average building height just less than 60 feet (five stories) allows ample sunlight to the North End even in winter months.</i>
<i>Water absorption</i>	<i>The North End has only minimal amounts of open space, pervious surfaces or green roofs. This deficiency could be improved.</i>
<i>Compact development</i>	<i>Because of the North End's proximity to public transportation and limited parking options, a walking lifestyle is encouraged, which benefits the environment.</i>

Savannah and Boston both demonstrate the type of pedestrian environment that was lost during massive urban renewal schemes but that might also be reintroduced or reinterpreted on the very sites that replaced them. Through reintroduction of human scaled streets and sensitivity to the pedestrian experience, superblocks could be transformed. The one criticism of particularly Savannah is the low population density of its historic quarter. With a higher population density, ground floor businesses could have more activity. The next examples examine how Le Corbusier's tower in the park plan could be reinterpreted or retrofitted to meet a higher degree of livability.

## ***Redevelopment of a Modernist Plan***

### **100 Cambridge Street/Bowdoin Place (former Saltonstall building), Boston, MA**

The original Leverett P. Saltonstall office building in Boston marked the beginning of a shift toward modernism in the city; it was one of the first modern buildings built in the Government Center area of Boston, a major redevelopment initiative of the urban renewal era 1960s. Existing city fabric was torn down and replaced with the 22-story state office tower and plaza in 1965, while plans for the new city hall and other federal and state office buildings were simultaneously underway. The Saltonstall tower clashed with the surrounding red, brick buildings of Beacon Hill and access to the plaza along Cambridge Street was complicated by topographic changes on the site, dooming its use.

After 34 years of state office use, the Saltonstall building was caught in the middle of serious asbestos problems and was forced to close its doors. Facing lawsuits and the prospects of a major clean-up at the very least, the future of the site was unclear. Then, in 2002, Governor Swift announced plans to redevelop the entire site as a mixed use complex. The 580,000 square feet of office space would be transformed from class B or C to class A through asbestos removal and gut-rehab. State office uses would still occupy lower floors (2-12) of the tower but top floors (13-22) would be available for private businesses. Perhaps most innovative though was the addition of 75 new housing units, of which 25% were slated for affordability, and an additional 34,500 square feet of new ground floor retail. These new housing units and retail spaces would occupy the former split-level, unused plaza and restore a street edge that had vanished after 1965.

The redevelopment of the Saltonstall building meets many of our previously discussed components of livability. Although it was not initially a housing project, the type of redevelopment accomplished around this defunct, 22-story modern office building provides a parallel vision for redeveloping modern housing sites. MassDevelopment and Elkus-Manfredi Architects partnered to develop this mixed-use project. By wrapping new program around the base of the setback tower, a new street presence of pedestrian scale was accomplished. This mix of new street level uses also activated a previously unused, windswept plaza. Fittingly, the project has also shed its former designation and is now referred to as 100 Cambridge Street or Bowdoin Place.





Fig. 3.19 The location of the Saltonstall building in Boston is adjacent to both Government Center (the political center of Boston) and Beacon Hill (a traditionally affluent neighborhood of four and five storey brownstone houses in an English architectural style, as evidenced by the existence of places such as Louisburg Square which borrows from the London style of residential parks). The site is bounded by Cambridge Street to the north, Bowdoin Street to the West and Somerset Street to the East.<sup>15</sup>



Fig. 3.20 The original plaza off of Cambridge Street suffered from topographic changes and was a tiered space that few people utilized. The space adjacent to the sidewalk is barren, without any attempt made at differentiating it from the normal sidewalk pattern.<sup>16</sup>

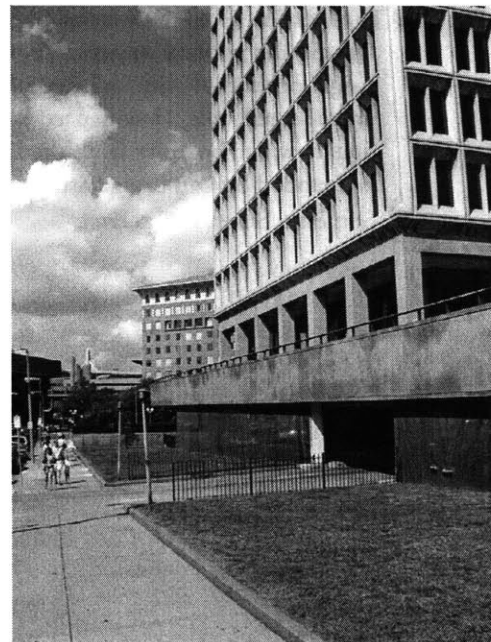


Fig. 3.21 & 3.22 The original tower divorced itself from the street with an uninviting blank wall.

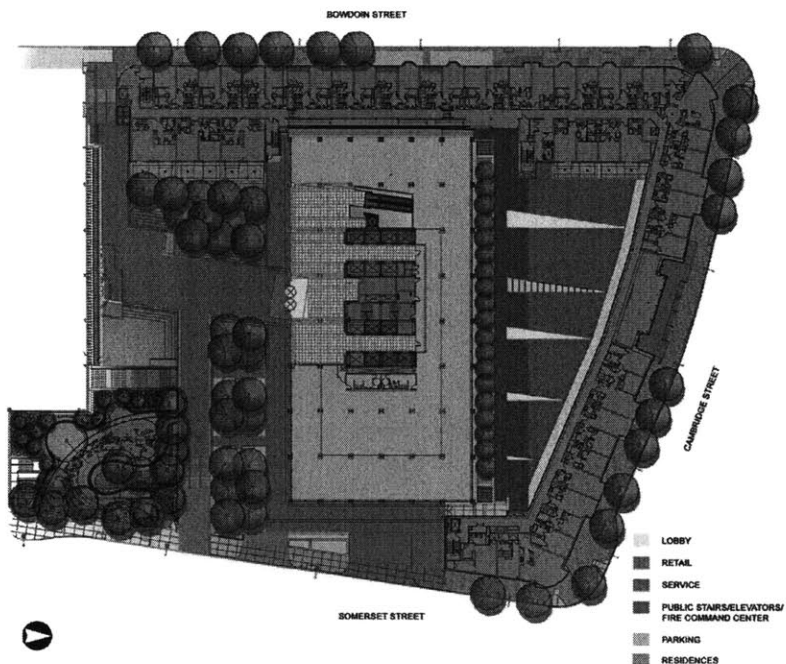


Fig. 3.23 Redesign addresses the street with new development as shown in a second floor plan.

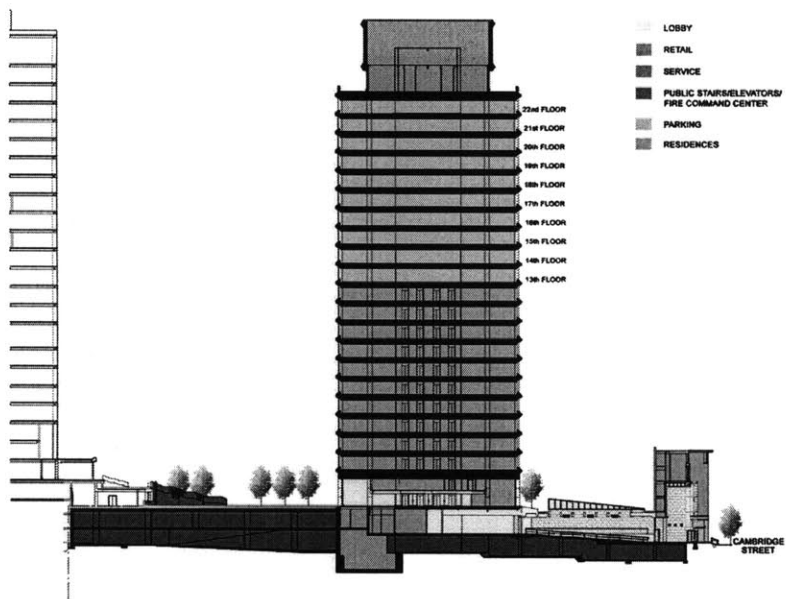


Fig. 3.24 Both Cambridge and Bowdoin streets are now lined with retail and housing in the redesign. The topography of the site is solved through a lobby entrance off of Cambridge Street. The height of the new street addition reaches approximately 60 feet at five stories.



Fig. 3.25 New housing along Bowdoin Street reconnects the site to adjacent Beacon Hill's red brick buildings while providing rhythm, variety and human scale to its façade. Its five story height relates well to people.

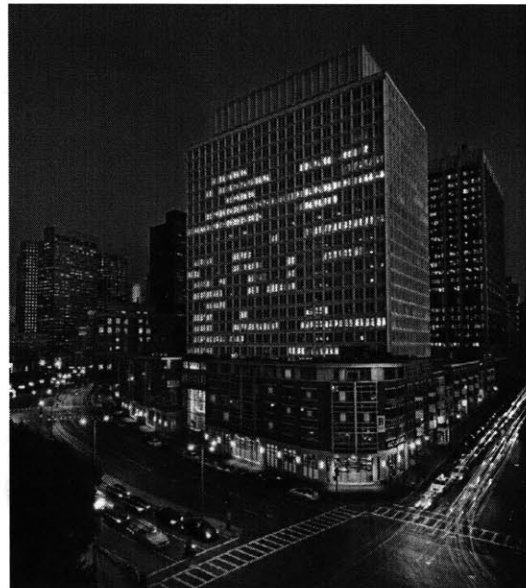
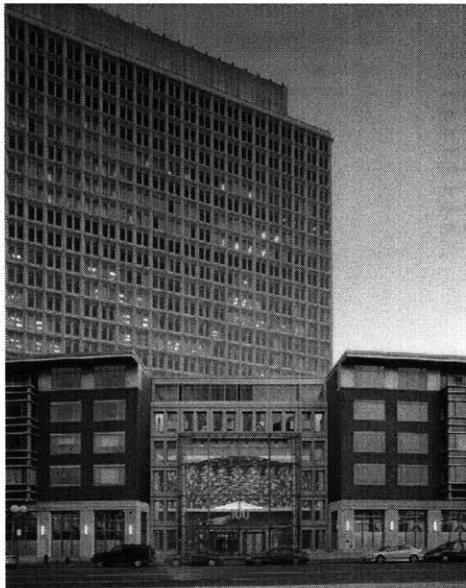


Fig. 3.26 & 3.27 New entry lobby for tower off of Cambridge Street. The tower may also be accessed from a rear plaza/park. The tower is buffered by pedestrian scaled housing along Cambridge and Bowdoin streets.

In addition to shoring up an unused plaza with street level activity, a pedestrian scaled base and the possibility of some activity on the site past 5pm through the introduction of residential product, a few environmental considerations were also addressed on the site. In addition to asbestos clean-up and recycling of the entire Saltonstall building, thus preserving its embodied energy, more than 45 percent of the new materials in the state office building were from recycled sources. Also, the HVAC system was updated from steam to an electric system of higher efficiency.

This is what the Urban Land Institute had to say in a recent study of the project:

The creative reuse of an abandoned structure that otherwise may have been demolished or stood vacant for years, 100 Cambridge Street/Bowdoin Place proves that even the most sterile government building can be reborn with the right plan in place. ... Located in an area of town that is being revitalized with new construction and development drawing more business and residents to Cambridge Street, the building has both benefited from and contributed to the rebirth of the neighborhood.<sup>17</sup>

Some pitfalls exist with the project but most of them are related to the office crash following September 11, 2001, which made leasing the space slower than expected but eventually successful, and the challenge of dealing with the topography of the site. Currently, the lobby entrance off of Cambridge Street is made more difficult by the need to not only traverse the distance of the former plaza to get to the tower but also rise a few feet in elevation to reach that destination as well. Because this problem is so specifically related to the site, it should be discounted as an overall barrier to this type of redevelopment tactic. However, it raises an important general observation: how one reaches the tower and their interaction with street-front lobby connections is important. The Cambridge Street entrance announces its presence through the use of a giant public art display, visible in figure 3.26.

Lessons learned from the redevelopment of the Saltonstall building and plaza:

#### **100 Cambridge St/Bowdoin Place, Boston**

##### **Safety**

###### *Local surveillance*

*The combination of ground floor retail and residential uses provide activity and “eyes on the street” past typical 9 to 5 office hours.*

###### *Controlled Access*

*Access to the tower is controlled and secure with a new street entrance, security personnel and video surveillance. Residential units along Bowdoin Street have multiple entrances, providing rhythm to the street wall and reducing the ratio of users per entrance, a key point of Oscar Newman’s “defensible space” guidelines.*

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**Community Interaction**

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<i>Scale</i>	<i>Addition of street level development of 5 stories reduces the scale of the tower and connects it to the pedestrian environment</i>
<i>Mixed Use</i>	<i>Variety of uses means a more active street wall and more engaging pedestrian experience.</i>
<i>Density</i>	<i>Increased housing density on site provides additional activity after work day ends and the ability to support some neighborhood retail.<sup>18</sup></i>

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**Green Design**

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<i>Preservation</i>	<i>Recycled existing tower, which saved its embodied energy.</i>
<i>Sustainable design</i>	<i>Green building practices were used on new construction.</i>
<i>Sunlight</i>	<i>The new housing lines the street and allows for sunlight to reach either side of its building envelope as well as the existing tower.</i>
<i>Water absorption</i>	<i>The addition of trees and a small garden on the site provides some storm water mitigation but, overall, this criterion could be improved.</i>

The Saltonstall building's successful redevelopment has brought back street life to the site by providing a pedestrian-scaled podium of mixed-use. The next two examples approach the issue of increasing livability of tower/park designs from another perspective, designing successful solutions from the beginning.

### ***Hybrid City Form – the new modern city model***

#### ***Mixing Modernism with Traditional City Form in New Large Scale Developments***

Instead of fixing the past by retrofitting old towers, the following two cases look at how towers can be integrated into a highly livable environment from the start. These cases are both large scale in nature and on foreign soil, as opposed to the previous cases. In many ways, they represent a kind of melding together of the best qualities of each of the historical approaches to city design; both traditional and modern tenets are espoused.

### **Vanke Housing Plans, Holiday Town, Qibao and Baima**

The following case turns to a foreign venue, China, and the housing projects of the Vanke Corporation, China's largest housing developer. Traditionally, Vanke has built projects in the classic Corbusian model; however, they have come to recognize many of the limitations of the model identified in this thesis. Over the past several years, Vanke has sponsored a series of research studies at MIT to improve the quality of their housing products, along the lines of economic, social and environmental sustainability. The Vanke developments in China have looked to sustainability as a vital component of their dense housing schemes. The cases studied by the 2005-2006 MIT Shanghai studios offer a window into how modern towers might increase livability by responding to sustainability issues.

The two reports produced by the MIT research studios share common ties with several aspects already mentioned in literature review and other case studies. For instance, the type of development suggested calls for a highly livable environment of pedestrian oriented activities mixed with higher density residential units (some in towers). Safety and controlled access is encouraged to build community. Accessibility also carries the meaning of availability of resources and opportunities to all people. However, the main focus of the reports is how new development might be sustainable. To this goal, they combine all three criteria of livability under the common umbrella of "sustainability," arguing that the word means more than simply green design. In other words, environmental sustainability one of the three livability components focused on in this research is only an element of overall sustainable development which includes community, safety and connections to amenities. As such, when reading their reports, one could substitute the term "livability," as discussed in this research, for "sustainability" and find a shared meaning.

Three sites in and around Shanghai, China were the locations that the students chose to develop their sustainable/livable precepts. Because Shanghai receives a large amount of rainfall and ironically has a shortage of available water, one of the first considerations for the class was how this potential resource could be harvested instead of lost under current conditions. The main response the class initiated was water retention and reuse through green roofs and other collectors and pervious surfaces to allow ground water detention and recharge.

The degree of water reuse was examined on two bases. One, an aggressive approach looked at maximizing water uses while a second method looked at minimizing impacts. Given the realities of California's current water predicament and their radical suggested steps (such as runoff detention from snow caps into new reservoirs), the more aggressive suggestions of the Vanke study seems appropriate. Some of the suggestions include:



- Use dry or composting toilets in townhouses, villas, and mid-rise units
- Recycle and filter gray water for use in all non-potable household applications
- Recycle and filter rainwater for potable household use<sup>19</sup>

New building construction was advised to make use of green building materials and the sites were examined in relation to public transportation, often offered to urban, compact dwelling configurations. In addition to focusing on overall transportation issues, the study also addressed site circulation. The currently gigantic block structures of the sites were broken into smaller block sizes and more streets were introduced, both vehicular and internal pedestrian ways.

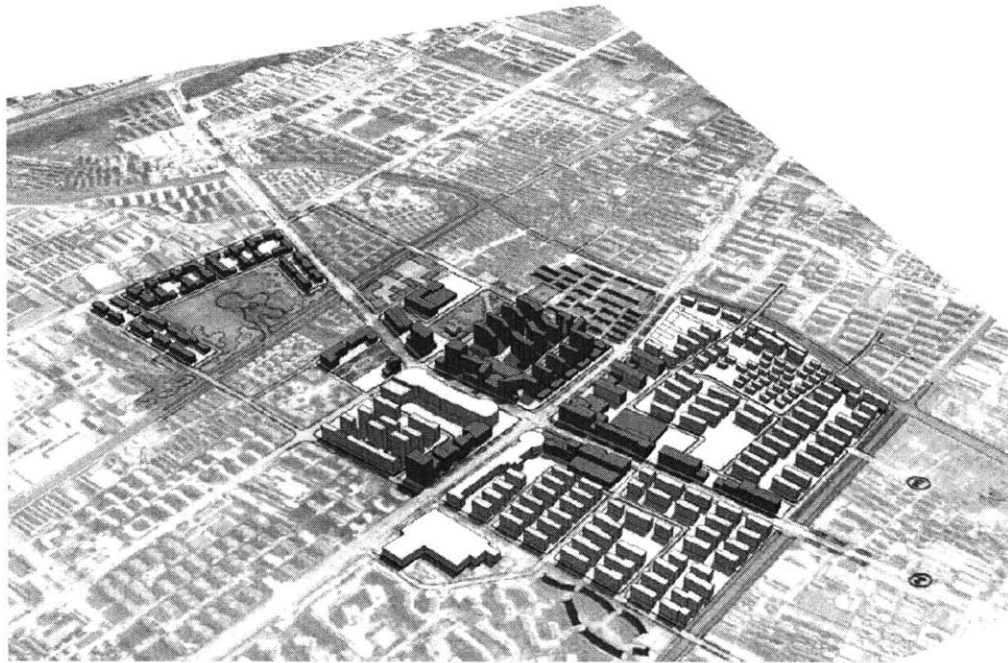


Fig. 3.28 Qibao development scheme, illustrated by Tim Terway for MIT/Vanke studio.<sup>20</sup>

Sunlight was an issue viewed by some of the students as well. The placement of new towers was sensitive to surrounding residential units. In the scheme below, new towers are located to the north and east of the site, limiting on-site shadows.

In addition, there are many other aspects of the projects that fit identified criteria of livability. Ground level retail and low-scale development are common themes to both plans. In addition, the large amount of green space is a benefit not only to the environment but also to its inhabitants. Also, a clear differentiation between vehicular and pedestrian space exists in both illustrations. The plan below (fig. 3.29) breaks main vehicular traffic from the smaller streets and further still from the dedicated pedestrian paths. Also, the main street with its retail and mixed



uses offers a lively pedestrian environment. The plan above (fig. 3.28) breaks down blocks into smaller areas and reconnects streets to an existing network to increase circulation and street life into the site. A clear hierarchy of roads is present, from the crossing main streets, which form an armature for mixed use to the smaller residential roads that discourage overwhelming traffic flows. In addition, open space is clearly defined and attractive, not at all left-over space.

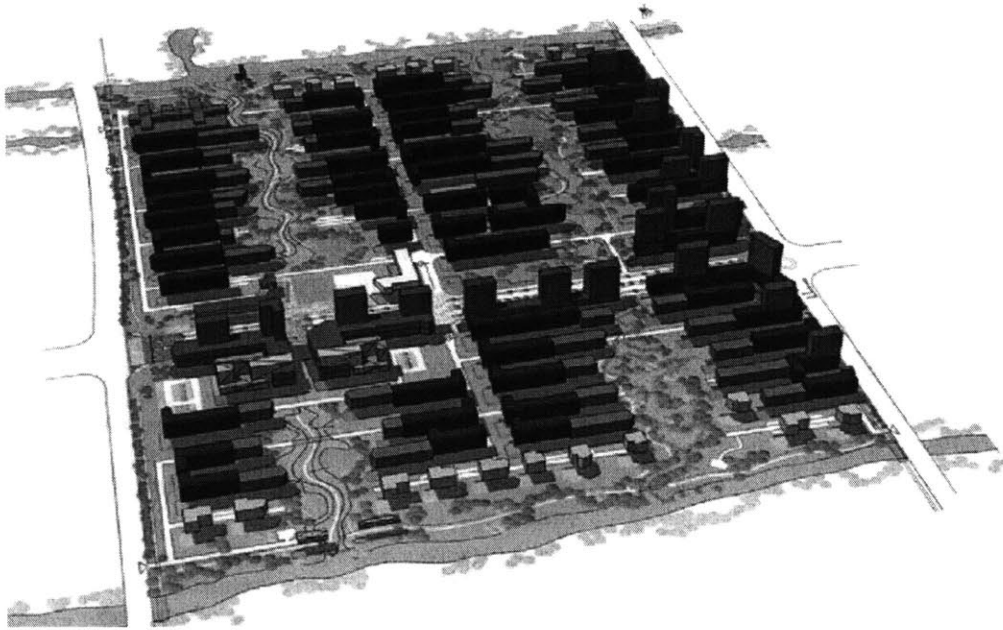


Fig. 3.29 Baima development scheme, MIT/Vanke studio.<sup>21</sup>

Although these sites were new development projects, the studio also considered the ramifications of building lifecycles and encouraged flexible design to lengthen building use. Because buildings constitute a major investment of resources and carbon emissions, increasing their lifespan reduces adverse environmental impacts.

Lessons learned from Vanke housing plans:

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**Vanke Housing Plans**

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**Safety**

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*Traffic calming to  
Local surveillance*

*Vanke has identified needs of its residents and provided security for varying age groups. Children are protected from vehicles through road and playground design/location, teenagers are given semi-private space that remains free of "blind spots" and adults are provided ample lighting for their return from work at night. In addition, places for seniors to congregate are designed to provide extra "eyes on the street" during the day.*

*Controlled Access*

*Keycard access to buildings, video surveillance and security personnel are all used to secure areas.*

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**Community Interaction**

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*Scale*

*Walk-up apartments and townhouses were used on several sites with towers rising from a base of similar height. This combination provided a pedestrian scale and a diversity of housing options to facilitate a broader spectrum of residents.*

*Street Life*

*One of Vanke's main goals is to increase accessibility by providing alternative transportation options and also connecting housing developments to existing road networks to bring street life and resources to its residents.*

*Mixed Use*

*Mixed commercial and public uses were included on main streets, which added to the livability of their designs.*

*Density / compactness*

*Large, oversized blocks are replaced by smaller, more manageable and pedestrian scaled blocks. These smaller blocks encourage a more compact city form, bringing resources closer to people and encouraging walking.*

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**Green Design**

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*Sustainable design*

*Flexibility is one the main tenets of new housing designs for Vanke. The lifecycle of buildings is considered and multiple uses are facilitated over that time through flexible design.*

*Sunlight*

*Towers were located with sensitivity to solar orientation (i.e. in northern areas) to cast fewer shadows across the site. Also, sunlight was used to harvest or conserve energy through the use of photovoltaics and passive heating systems.*

***Water absorption***

*Not only was storm water runoff captured in Vanke designs through green roofs and other filter / collection systems, it was also reused for a variety of purposes, thus reducing demand on Shanghai's precious clean water reserves.*

The Vanke development corporation, with the aid of MIT faculty and students, have progressed their housing designs along greater levels of livability. The next case looks to a city which has become a model for using design guidelines to shape its skyline and ground plane into a livable mix of modernism and traditional city values. That city is Vancouver, British Columbia.

**Concord Pacific Place, Vancouver, British Columbia**

Located on the grounds of a former industrial site and later location of the 1986 World Exposition, Concord Pacific Place constitutes a gigantic swath of the downtown area of Vancouver. Approximately 204 acres (166 land, 38 water) is currently being developed to house almost 15,000 people in a combination of townhouses and some 47 towers, upon completion. The project, initiated by the city planners' desire to redevelop the former industrial site and directed by their design guidelines, is a model of livability. Not only does it combine modern elements with traditional city sensibilities to provide the best of both philosophies, it provides an example to other cities of what is possible with design guidelines and a commitment to place-making.



Fig. 3.30 Aerial view of Vancouver with Concord Pacific Place's vast development area highlighted and under construction.

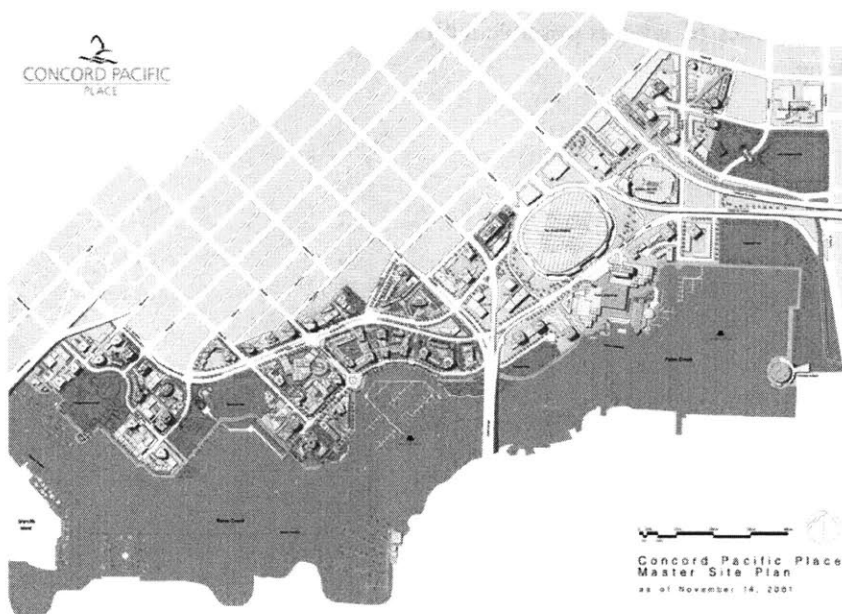


Fig. 3.31 Plan for Concord Pacific Place, courtesy of Concord Pacific Group, Inc.

The main organizing principles of the project are to:

- integrate with the city;
- build on the setting;
- maintain the sense of a substantial water basin;
- use streets as an organizing device;
- create lively places that have a strong image;
- develop neighborhoods; and
- plan for all age groups, with a particular emphasis on children.<sup>22</sup>

The project accomplishes all of these goals to a surprisingly well level. In fact, the latest issue of *Planning* has an article about Vancouver in which its author, Isabelle Groc, calls Vancouver the “poster child for family-friendly downtowns.”<sup>23</sup> The amount of public amenities and uses within close walking distances is ideal for children (and adults). As Groc writes, “kids don’t have to look too far in their surrounding environment to ... [find] much more: the Dorothy Lam Children’s Centre, the David Lam Park equipped with swings and play structures, the Elsie Roy Elementary School, the seawall, all within walking distance of residential developments. ‘Our classes go on walking field trips to the public library, the art gallery, the symphony, the aquatic center, Science World. It is such a rich location’ ...”<sup>24</sup> By offering a diverse set of uses, the livability of this project is very high, not only for children but also for a variety of age demographics.

In addition to public spaces, a retail environment along the main east-west road links the site to the rest of the city. This engaging retail environment is supported by the great population density housed in the various towers. These towers don’t detract from the pedestrian experience either because they are setback from the street wall. “Thus the foreground view at street level is of the scale and rhythm of the townhouses and retail functions, and the bulk of the towers becomes apparent only in the longer view.”<sup>25</sup> In addition, the actual bulk of the towers is minimized by their small floor plates. By mandating views, the city encouraged a slender tower form. This resulting form is also beneficial for light penetration. Each of the towers must be separated by at least 80 feet as well to preserve light, privacy and views.

The project is designed with walking and pedestrians in mind. With this view, parking requirements have been dropped to the minimum required parking ratios, which according to the developer is still unnecessarily high.<sup>26</sup> The project also calls for a sense of urbanity and uses streets to connect to the rest of the city and bring activity and life into the site. These streets are aided in a sense of safety by the active street wall created and the “eyes on the street” provided by the added residential units above retail.

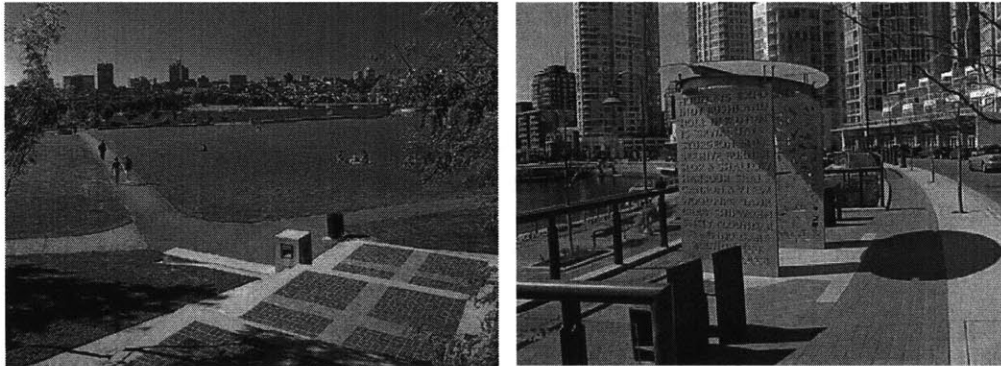


Fig. 3.32 & 3.33 Detail is given to both green space and hard-scaped pedestrian open spaces, courtesy of Concord Pacific Group, Inc.

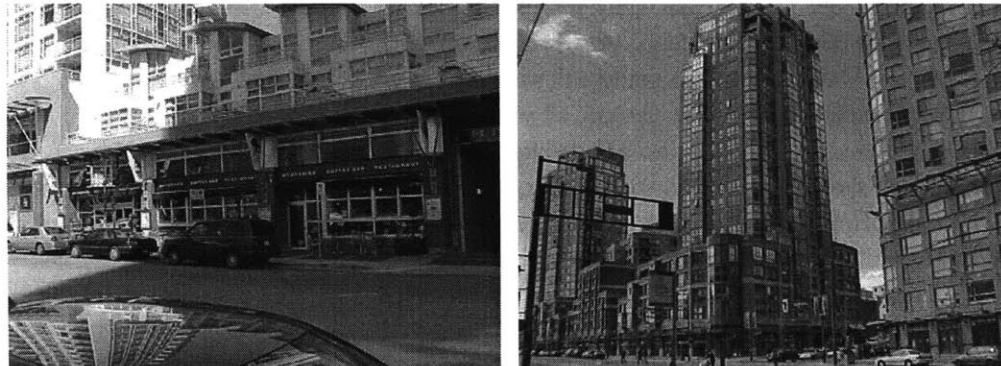


Fig. 3.34 & 3.35 Towers are setback from the street edge and rest atop a pedestrian scaled base with mixed use residential over retail (or other uses), courtesy of Concord Pacific Group, Inc.

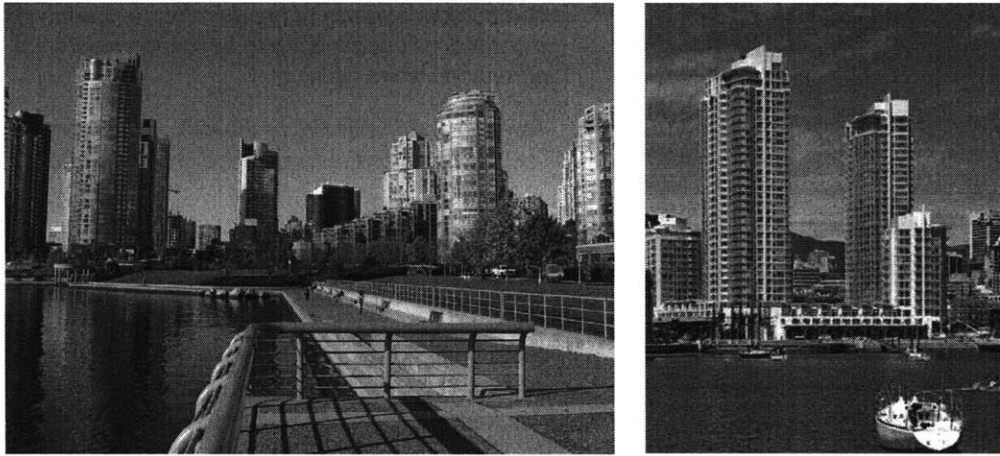


Fig. 3.36 & 3.37 From afar, these towers seem to belong to another Corbusian inspired plan. However, on closer inspection, they actually rest atop a pedestrian scaled base, obscured by trees in the photo to the left. Open spaces are given close attention and provide a variety of options for pedestrians to enjoy; the pedestrian way adjacent to the water is a desirable place to jog but also has a variety of uses along its path, see plan above (figure 3.31), courtesy of Concord Pacific Group, Inc.

Lessons learned from Concord Pacific Place:

### **Concord Pacific Place**

#### **Safety**

##### *Local surveillance*

*By designing a pedestrian scaled low to mid-rise street wall, public and private space is more clearly demarcated. Also, the housing along these streets and pedestrian ways provides "eyes on the street" surveillance.*

#### **Community Interaction**

##### *Scale*

*Special attention is given particularly to the first three stories of the development to create an engaging pedestrian environment. Towers are setback from the street edge to provide differentiation to a low to mid-rise pedestrian scaled street wall.*

##### *Street Life*

*New streets are connected to the existing network of streets to bring activity into the site.*

##### *Mixed Use*

*The ground plane of these tower/townhouse developments invariably provides space for engaging public or commercial uses.*

**Compactness**

*The compact nature of the development allows a great deal of amenities to be in close distance and encourages walking.*

**Density**

*The population density of the project facilitates various retail endeavors on the ground plane.*

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**Green Design**

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**Sunlight**

Sunlight quality is strong. Not only is the site on a tilted grid, which maximizes solar angles, but it also prohibits really bulky skyscrapers from being built. The slender towers offer more room for light to penetrate.

**Water absorption**

A number of open spaces add to the ability of the site to manage storm water. In addition, a few buildings in Vancouver are beginning to experiment not only with green roofs but also green facades.

By using a set of design guidelines intended to increase the pedestrian experience and closely working with developers and architects, Vancouver planners helped shape the city into a more livable place. In contrast, Toronto planners wished they had taken a similar approach:

Vancouver's design preoccupations contrasted sharply with those of Toronto. Toronto built 30,000 new housing units, some 19,000 net additions, in the margins of downtown in the decade after approving its 1976 Central Area Plan, but it specifically eschewed floor-space ratio controls in favour of controls on unit or dwelling per hectare. This delivered taller, fatter buildings often awkwardly angled to the street so as to ensure prime views of the downtown skylines and the lake beyond, creating significant microclimate problems and discomfort for the pedestrian. There were similar difficulties with the control of downtown development, partly because of the lack of zoning requirements and design guidelines, and partly because politicians repeatedly became involved in giving density bonuses in return for amenities, heritage conservation or social housing. This approach was the antithesis of Vancouver's, and contributed to the demise of Toronto's pro-development council in 1988. Consultants commented that Toronto had palpably failed to define publicly acceptable forms of development. This was where Vancouver succeeded.<sup>27</sup>

## **Ranking**

The following chart ranks each of the case studies along various criteria of livability. The preceding examples of pedestrian environments (Savannah and



the North End) will present a base line to determine ranking above or below the performance of these places. In the event that one of the two (Savannah or the North End) has a higher degree of livability in a certain area, that higher value is what will be compared with the case sites. For instance, Savannah's open space network is better at absorbing water than the North End's largely impervious surfaces; so, it will be compared to the cases. Also, it is recognized that Savannah and the North both are areas of high livability, as I have presented the issue. To merely be average when compared to them is a complement.

### *Safety & Community*

<b>Pedestrian-scaled buildings</b>	Worse	Slightly Worse	Savannah North End	Slightly Better	Better
Saltonstall Redevelopment			X		
Vanke Housing Plans			X		
Concord Pacific Place			X		
<b>Pedestrian uses at ground plane</b>					
Saltonstall Redevelopment		X			
Vanke Housing Plans			X		
Concord Pacific Place					X
<b>Hierarchy of integrated streets</b>					
Saltonstall Redevelopment	X				
Vanke Housing Plans		X			
Concord Pacific Place		X			
<b>High density / compactness</b>					
Saltonstall Redevelopment		X			
Vanke Housing Plans			X		
Concord Pacific Place				X	

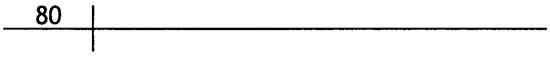
### *Green Design*

<b>Preservation</b>					
Saltonstall Redevelopment			X		
Vanke Housing Plans	X				
Concord Pacific Place	X				
<b>Sunlight penetration</b>					
Saltonstall Redevelopment			X		
Vanke Housing Plans				X	
Concord Pacific Place			X		
<b>Control water runoff on site</b>					
Saltonstall Redevelopment		X			
Vanke Housing Plans					X
Concord Pacific Place			X		

The next chapter will synthesize these case study observations and the available literature already discussed to arrive at a list of design principles for redeveloping modern housing sites.

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- 1 Erwin, Thomas. "Squares of Savannah." *Making Places Newsletter* (Project for Public Spaces, Dec. 2005), accessed Feb. 6, 2007 from [http://www.pps.org/info/newsletter/december2005/us\\_canada\\_squares](http://www.pps.org/info/newsletter/december2005/us_canada_squares).
  - 2 Anderson, Stanford. Savannah and the Issue of Precedent: City Plan as Resource. For U. of Maryland, March 1986, rev. June 1987. Paper presented at the University of Maryland Symposium, "Settlements in the Americas: Cross-Cultural Perspectives" held Mar. 14-15, 1986. "The thesis of this paper and several related topics were presented in a special session titled "Savannah: The Plan of Savannah as a Resource" at the annual meeting of the Society of Architectural Historians in Savannah, April 1979"--Leaf 25.
  - 3 Frank, Karolin. Historic preservation in the USA (New York: Springer, 2002). p. 164.
  - 4 Olin, Samuel. *Urban Acupuncture and Savannah's Rebirth - Institutional Investment*. Lecture given at the Savannah College of Art and Design (SCAD) on January 24, 2006.
  - 5 As calculated from 2003 city of Savannah GIS files.
  - 6 As measured from 2003 city of Savannah GIS files.
  - 7 Jacobs, Allan B. 280.
  - 8 Bacon, Mardges. *Le Corbusier in America: travels in the land of the timid* (Cambridge, MA: The MIT Press, 2001). p. 70.
  - 9 This chart was created by examining two sources of data for the North End, city GIS (geographic information system) and CAD (computer aided drafting) files. The GIS files gave building height as the number of floors in a building. So, to calculate building height, a floor to floor distance of 12 feet was used. The CAD files were a three-dimensional model of the existing site, see figure 3.13. See Appendix C for a more detailed chart of the calculations and sampling involved.
  - 10 Boston Redevelopment Authority Digital 3D Models, accessed on March 28, 2007 ([http://www.cityofboston.gov/bra/BRA\\_3D\\_Models/Index.html](http://www.cityofboston.gov/bra/BRA_3D_Models/Index.html)).
  - 11 Isherwood, Todd. "Living in the North End." Interview conducted April 29, 2007.
  - 12 Bacon, Mardges. p. 70.
  - 13 The U.S. Naval Observatory has a free, online resource to calculate sun angles and daylight for any given location and day of the year (<http://aa.usno.navy.mil/data/docs/AltAz.html>).
  - 14 This figure was observed from personal experience at Sasaki Associates during 2002-2005 and recently confirmed by Liang Zhao, an MIT instructor, on May 17, 2007.
  - 15 Figure 3.1 created from 2002 city of Boston GIS files.
  - 16 Figures 3.2 to 3.9 have been provided courtesy of Elkus-Manfredi Architects.
  - 17 Rice, Derek. "100 Cambridge Street/Bowdoin Place." *ULI: Development Case Studies*, vol. 36, no. 18 (July-September, 2006).
  - 18 The density of new housing to the entire site (3 acres) is only 75 units/3 acres, or 25 units/acre. If the existing tower also housed residential units, then the overall density would be well in excess of 50 units/acre (probably closer to 150 units/acre assuming a mix of single and multiple bedroom units).

- 19 Lee, Tunney F. and Zhao, Liang, instructors. Vanke vision: sustainable residential development in Shanghai: Vol. 2. planning studio (Cambridge, MA: MIT Department of Urban Studies and Planning, 2006). p. 32.
- 20 Lee and Zhao, 82.
- 21 Lee and Zhao, 55.
- 22 Fader, Steve. "Concord Pacific Place." *ULI: Development Case Studies*, vol. 32, no. 17 (October-December, 2002).
- 23 Groc, Isabelle. "Family Friendly." *Planning*, vol. 73, no. 6, p. 8-13 (Chicago: American Planning Association, June 2007).
- 24 Groc, 10.
- 25 Fader, Steve. "Concord Pacific Place." *ULI: Development Case Studies*, vol. 32, no. 17 (October-December, 2002).
- 26 Fader, Steve. "Concord Pacific Place." *ULI: Development Case Studies*, vol. 32, no. 17 (October-December, 2002).
- 27 Punter, John. *The Vancouver Achievement: Urban Planning and Design* (Vancouver: UBC Press, 2003). p. 108.



## **4. HOUSING DESIGN PRINCIPLES:**

### **INCREASING LIVABILITY**

To modern eyes Corbusier seems both inspiring and frightening. Certainly his passion can be admired by both architects and planners, even if his designs are not universally accepted. Bypassing any personal feelings about the man or his work, the fact that he attempted to look afresh at the problems of his day is fascinating. One reason why he may be considered so controversial, or even considered in the first place, is the fact that he looked outside of current thought and dreamed his own creative answers to real problems. When the status quo is disturbed as he upset it, people often react. Corbusier's futuristic visions had unpredicted and adverse results on people inhabiting designs inspired by him and writers like Jane Jacobs did react. The dark side of Burnham's admonition and prediction to "make no little plans. They have no magic to stir men's blood and probably will not themselves be realized"<sup>1</sup> was fulfilled in Corbusier's city plans. Even though Paris didn't raze its dense city blocks to make way for his towers, other cities did.

Throughout time, urban designers have reacted to both planning philosophies and the problems of their own day. The problems Corbusier faced still exist. Planners and architects are still dealing with the automobile, density, construction costs, and sunlight. Green design may have changed quite a bit in meaning but both Corbusier's generation and ours relate to "green" concerns. While he was more interested in a free ground plane for nature to flourish, current realities of global climate change have focused city designers on energy efficiency, water control and emissions. The following two charts synthesize these differing perspectives:

Le Corbusier 1920-1960		Jacobs/Newman/etc. 1950-1990		2007	
Problem	Solution	New Problem	New Solution	Problem	Solution
Density	High-rise	Safety/crime	Defensible space Low to mid-rise	Density	Hybrid high-rise w/ped. scaled base
Construction costs	Modular Mass-production	Variety/uniqueness	Preservation movement	Cost vs. variety	Mass-produced components Multiple designers of large scale projects
Car	Superblock	Loss of community b/c isolationist form	Compact development New urbanism	Car vs. community	Road hierarchy Modified grids
Slum/sunlight	Building separation	Loss of street definition	Build new Modified sunlight requirements	Street definition	Urban infill Street walls w/high-rise behind
Green space	Towers in the park	Undefined/neglected & leftover spaces Increased crime Disrespected context	Defensible space Preservation movement	Green design	Energy efficiency Natural systems Water conservancy Recycle buildings

Fig. 4.1 Problems faced by urban designers and their various solutions over time.

Mobility vs. Pedestrian experience	
Cars unimpeded	Pedestrian friendly
Big roads	Smaller roads
	Hierarchy of roads
	Alternative access

Open ground plane vs. Environmental concerns	
Pilotis (columns)	Water
Separated uses	Natural systems
	Performance

Sunlight vs. Human scale	
Building separation	3 - 5 story street wall
	Tower setback
	Slender towers

Tabula rasa vs. Recycling	
Build new	Embodied energy
Raze old	Respect context

Fig. 4.2 Comparison of urban design issues.

Whether loved or hated, Corbusier remains an important figure not only for his successes but also for his failings. Because he dared to dream something new, he opened the door for greater understanding and more informed discussion about urban issues. Without taking the machine age to its logical extension, we may not have realized the value of other aspects of urbanism, such as the importance of the ground plane in cities as a region of human interface. Also, many of his ideas regarding mass-production have matured into mainstays of the construction industry. Finally, his towers are a fixture of city form and have been integrated into city fabric in places like Vancouver, with its pedestrian scaled street walls and slender towers on each block. Striking such a balance has allowed the city to accommodate great density while maintaining a comfortable, pedestrian environment. It is this sense of balance that is extended to the set of design guidelines introduced in the rest of this chapter.

## Design Guidelines

*Traffic signals in New York are just rough guidelines.* – David Letterman

*History provides no precise guidelines.* – Douglas Hurd

There is an intrinsic danger in guidelines of almost any kind. They possess power to do harm in the hands of blind guides, ignorant of the heart behind the principles. Conversely, in the hands of wise guides, they can create great livable cities, such as Vancouver. With this in mind, the following principles are meant to be a beginning point, always to be reexamined in light of future needs. Also, they are deliberately basic in nature and not too prescriptive. As an artist, I dream of a blank canvas but as a designer I know that my most creative work is often a result of overcoming constraints.

The following seven guidelines have been gleaned from preceding literature and case study investigation and represent a basic beginning point for facilitating healthy ground planes and pedestrian friendly environments. The first four principles relate mostly to factors of human scale/interaction (labeled community) and safety while the last three deal with issues of green design. The subsequent chart summarizes these principles:

Overarching Livability Issue			Design Principle
Safety	Community	Green	
X	X		<b>1 Pedestrian-scaled buildings</b>
	X		Street wall 3 to 5 stories
	X		Tower setback and slender
X	X		Fronts & backs to buildings
			fronts on pedestrian streets & backs on service streets
X	X		<b>2 Pedestrian uses at ground plane</b>
		X	Allow for flexible ground plane design
X	X		allow multiple uses at the ground plane
			Provide neighborhood infrastructure:
X	X		ground floor public uses
	X		services
	X		retail/restaurant
	X	X	public spaces/open space w/pedestrian furniture

Overarching Livability Issue			Design Principle
Safety	Community	Green	
	X		<b>3 Hierarchy of integrated streets</b> Bring street life into superblocks Connect higher capacity streets to surrounding city streets Additional streets service neighborhood and individual buildings Neighborhood safe – person given priority over car Underground parking Street sections encourage pedestrian over automobile
X	X		
	X		
X			
X			
	X		
X	X		<b>4 High density / compactness</b> Required to support retail uses through increased foot traffic Minimum of 15 units per acre to support neighborhood retail More than 50 units/acre is desirable for urban areas Compact development
X	X	X	
X	X		
X	X		
X	X		
	X	X	
	X	X	<b>5 Preservation</b> Recycle existing buildings
	X	X	
X	X	X	<b>6 Sunlight penetration</b> Slender towers, limited number per block Sunlight quotient for winter months: 1 hour recommended Streets at different angles for maximum sunlight penetration Street trees & green roofs/facades for summer months
	X	X	
X	X	X	
		X	
		X	
		X	
		X	<b>7 Control water runoff on site</b> Use green roofs, green facades, natural & pervious surfaces Corbusier's 5 points of arch. (pnt. 2) meets current green design
		X	
		X	

Fig. 4.3 Chart of design principles and the overarching livability issues they address.



## Pedestrian-Scaled Buildings

*Towers should be slender and setback from the street to allow a pedestrian-scaled three to five story street wall to be developed. This street wall should be detailed with human scale in mind. Buildings should have fronts and backs. Fronts should occur on pedestrian streets while backs should face service roads (see “hierarchy of streets” below).*

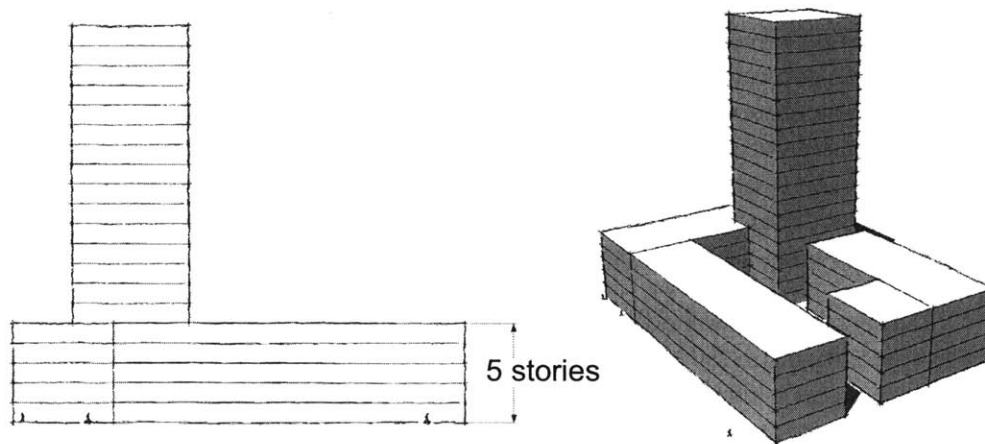


Fig. 4.4 Towers should be setback from the street to allow for buildings that define a street edge or other public uses to occur.

In order to benefit livability factors of safety and community, a pedestrian-scaled street wall is encouraged. The reason why the street wall should be three to five stories tall is based on visual optotype studies, Parisian avenues, and 1916 New York building height studies (also influenced by Paris). From these examples, five stories seems to be the maximum height with which people relate. Put another way, five stories, based on my analysis, seems to be the limit of human scale. Jane Jacobs' maxim of having “eyes on the street” becomes more difficult after five stories and there is a loss of personal interaction with the environment. In addition, this height represents the limit reached in most cities prior to the invention of elevators. So, connection to history and any surrounding urban fabric may be facilitated by keeping street wall heights within this guideline, depending upon the urban area.

The reason for suggesting that towers be slender and setback from the street wall is two-fold. Towers are perceived as objects first, according to Gestalt psychologists like Arnheim, and are not of the scale that people interact with immediately from a short distance, without craning one's neck, because at close distances their form is more difficult to realize. Viewed from further away, a person can appreciate their overall form but again is not interacting with them at a detailed level except to notice big details, such as roof lines. Therefore, mediating between their height and the limit of pedestrian experience at the ground plane by the

introduction of a street wall is a logical method of greeting the public while still maintaining higher density, rents, views, etc. that towers provide. Like Fred Koetter's sketch of the "stratified city," towers can reach upward past this five-story street wall but they must be differentiated through setbacks so as not to interfere with the visual array of pedestrians. Secondly, by moving towers further from the street and especially by controlling their figure to encourage slender towers, sunlight is allowed to spill onto more of the city streets below.

By creating a three to five story street wall, the public life of streets is increased. Empty plazas, incentivized by 1960s zoning practices, broke the street edge. As William Whyte observed, people aren't going to redirect their normal travel paths to take advantage of a plaza or a covered walkway even in light rain/drizzle, unless there is a reason to go there, i.e. it's programmed or it's raining buckets in the case of the covered walkway; people are attracted by other people. Also, well traveled paths, which appear safer, are better defined by a street wall of facades, not empty space.

Defining a street wall does not preclude the existence of parks, plazas or other open spaces/paths in the city. For instance, the North End of Boston has a series of unique places within its fabric, the result of colliding blocks or leftover spaces that open the area to increased light or activity such as the basketball courts and North Square at either end of Prince Street. One area is programmed with athletic uses and the other with restaurant and cultural attractions, possessing many human-scaled details, such as paving changes and intricate/diverse building facades (Paul Revere's house is located in North Square). One of the main points of increasing livability in Corbusian tower/park schemes is to design such open spaces carefully, see "pedestrian uses at the ground plane" below.

The idea of a human-scaled street edge is to contrast the "towers in the park" scheme of Corbusier that created undefined open space and overwhelming object buildings. There is a place for objects in the city but not at the expense of public spaces and streets. The whole city can't be a collection of objects or the special character of such objects is lost by lack of differentiation. One must have a visual background to register changes in the environment against. Shanghai has been erecting towers for a while now, some very beautiful and others rather bizarre, but the Bund and its collection of lower-scaled buildings is where people congregate, not in the left-over spaces between towers surrounded on all sides by massive roadways.



Fig. 4.5 & 4.6 Modern towers and park vs. street life across river: Shanghai, China (2006).

As mentioned, towers should be setback from the street wall to maintain a pedestrian scaled environment. However, the question arises of how far to distance the tower from the street wall. The 1916 zoning codes for the city of New York considered the question as it related to street sections and sky exposure planes. Even in 1961, with a revision to the zoning, a ratio of about 2.7 feet of building height to 1 foot of building setback was used. This figure corresponds to my own study of building setback to observer's viewpoint if the person were standing in the middle of a road. When calculated, I found a 2.9 to 1 ratio of building height to setback.

However, people don't normally walk down the center of a street, unless they happen to be walking along a grand boulevard like Commonwealth Avenue in Boston's Back Bay. Usually, people inhabit the sidewalks adjacent to building facades. As such, they rarely view a tower from the middle of the street. Towers are either seen from the same side of the street at a very steep angle or more commonly from farther away or, at closest, across the street where the angle is shallower and allows greater visibility beyond the building façade. If one were to only account for the same side of a street, a tower could rise very tall before it was noticed. Conversely, if one's only consideration was the view from across the street, the tower would be almost prohibitively small, if the intention was to disguise its presence behind the street wall. Since this scenario is not the case and we are only concerned with maintaining a street wall, more consideration should be given to the sky exposure plane calculation. It seems that towers could rise at a steeper rate given that the same side of the street seems to be more important than the opposite side. From my research, the ratio could be increased from 3:1 to 5:1 for any tower setback less than fifty feet. Past fifty feet, other considerations should be used to determine tower height, such as sunlight or city skyline preferences and towers might be allowed to rise even higher if they are slender (of the 70' by 80' variety).

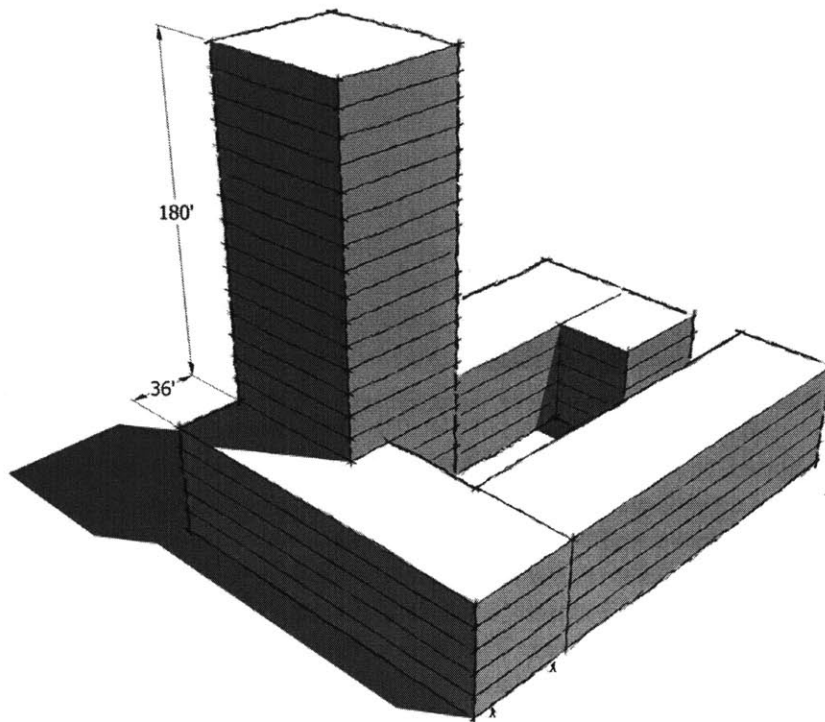


Fig. 4.7 Towers that are setback less than fifty feet should rise at a maximum ratio of five feet of building height for each foot of setback.

This larger ratio may seem overly generous, given historical precedents. However, this ratio is respectful of visual perception while also being tempered by another principle pertaining to sunlight penetration described below. Without elaborating too much, the number and height of towers in any one place would be limited by their accumulated shadow effects. So, one tower might rise at the 5 to 1 ratio but others in its immediate vicinity would be limited by the amount of sunlight blocked when multiple towers are considered. Vancouver reduced its shadow impact by limiting the number of skyscrapers per block to only two in many cases past 1970.<sup>2</sup>

Lastly, buildings should present their most interactive facades to pedestrian streets, leaving their service entries below grade or along service roads. This practice will help facilitate a lively street wall with greater potential for human interface. This example of enlivened street through alleyway service is found in many successful pedestrian environments such as Savannah, as Stanford Anderson points out in his paper on the city's unique plan. In Boston, Newbury Street is an example of such a pedestrian oriented street. It maintains a thriving retail presence and pedestrian activity even in a city not known for its particularly gracious weather. Part of this success can be attributed to a street wall unbroken by uninviting service entries, which are put behind the street wall along an alleyway.

## Pedestrian Uses at Ground Plane

*An assortment of pedestrian oriented uses ought to inhabit the ground plane, providing an engaging, lively street edge. Buildings should be designed for adaptability, with higher ground floor heights. Successful open space designs facilitate both movement through and relaxation within their space. 1 linear foot of seating should be supplied for every 30 square feet of plaza space. Finally, the number of units sharing a common entry should be minimized or secured with digital and human surveillance.*

A more active and engaging ground plane is possible through a mixed use approach to street wall design. These uses include public spaces of a cultural nature like art galleries, service industry uses such as laundromats, a variety of retail types, restaurants and open space. To provide for these uses, the first floor of buildings should be taller than subsequent floors and designed with flexibility and adaptability in mind. For instance, if a typical residential floor to floor height is 12 feet, then the ground floor might be 15 to 18 feet high or more if needed, as in the case of grocery stores.

Also, open space should be carefully designed to include both paths and spaces to sit and relax. Open space can take a variety of forms, such as natural town commons or plazas. If the latter is used, William Whyte's benchmark of 1 linear foot of seating for every 30 square feet of plaza is recommended.

In response to matters of safety, buildings should be designed to minimize the number of residential units that share a common entry. Oscar Newman's "defensible space" paradigm addressed safety concerns by limiting the number of units accessed per common entry to a building. However, the converse is true on the street, it is preferable to have as many individual entries as possible along a street to expand/claim space and increase activity levels. Also, by their very nature, towers require many people to enter a single point. So, tower entries should include additional security measures such as keycard access, security personnel and video surveillance. A portion of rents or condo fees would need to be set aside for this added security. Although the lobby at the Saltonstall building is somewhat problematic, the overall redesign of an empty, uninviting plaza with added residential units at the street and some ground floor retail is a good example of the type of redevelopment possible.

## Hierarchy of Integrated Streets

*Large development sites, either new or former superblocks, should provide streets that are integrated into an existing city network and bring street life into the site. These new streets should be organized into a hierarchy of roadways to facilitate both automobile and, more importantly,*

pedestrian flows. People should be given priority over cars in their neighborhoods to facilitate a pedestrian environment and encourage safety. Underground parking should be utilized to minimize both the amount of structured parking on ground floors and visual barriers for pedestrians. Street sections should be narrow enough for pedestrians to feel a connection to either side of the street and that priority is given to their experience over the automobile. The following chart summarizes common road widths for various street types:

Neighborhood Road Type	Street Dimension (feet)	Right of Way (feet)
Alleyway	15 - 20	20 - 30
Secondary	24 - 30	40 - 50
Primary	up to 40	up to 70

It is important, especially on primary and even secondary neighborhood streets, to provide ample pedestrian space. Sidewalks should be at least 8 to 15 feet wide along these streets with enough room for street trees. Larger streets with higher automobile capacity may flow at the edges of neighborhoods, allowing traffic to naturally avoid neighborhoods unless the neighborhood is an intended destination, reducing through traffic and increasing pedestrian experience and control.

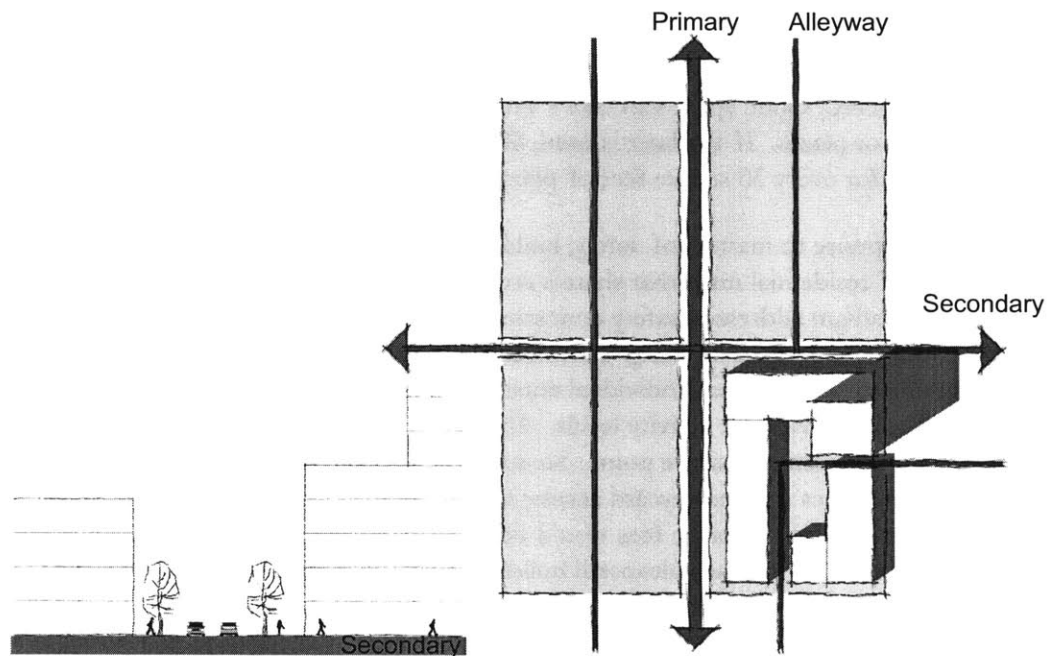


Fig. 4.8 A hierarchy of streets should be used in neighborhoods to facilitate lively street walls and still provide services to buildings.

Road sections will vary based upon use but judging from my study of the North End and evidence from Allan Jacobs's book *Great Streets*, the range from 40 to 60 feet in width from building façade to façade is a good street dimension for pedestrian scaled activity. Interestingly, with street walls limited to five stories, the right of way

of 40 feet, an average found in the North End, relates closely to the golden section (i.e.  $40 \times 1.618 \approx 64$ ). Also, 60 feet in width provides a street section of about 1:1 and corresponds to what Allan Jacobs calls strong definition. He notes that most of the exemplar streets he “studied seem to fall within a range (vertical to horizontal) of from 1:1.1 to 1:2.5”<sup>3</sup> with the wider variety being strengthened by strong tree planting.

It seems reasonable to suggest a larger street width if it were to be so meticulously planted as the grand boulevards that Jacobs studied. However, if strong tree planting were not provided and instead were filled with vehicular traffic, the character of those streets would be adversely affected for pedestrians. It is the intent of these dimensions to give pedestrians more control over their environment by both reducing the influence of automobiles and keeping street widths close enough for pedestrians to feel connected to activity or opportunities on both sides of the street. This second goal is achieved through strong street definition.

Also, this guideline is intended for a certain type of city form which is both urban and pedestrian in character. It is not to suggest that all roads should fall within a 20 to 70 foot right of way. The aforementioned hierarchy of streets, ranging from 15 to 40 feet wide, is intended for neighborhood dimensioning. Arterial or other higher capacity (and wider) roads are intended to reside at the natural edges of these neighborhoods. These higher capacity streets should also be carefully designed but are less important to sustaining a vibrant pedestrian environment within a given neighborhood; they act within the larger network of city accessibility and transportation.

There should be a variety of road types to support a city and not all places need to be pedestrian friendly but the examples we are concerned with should be. Since the focus of this paper is redesigning and revitalizing urban towers often surrounded by parks, the reintroduction of streets into superblocks is a given assumption, especially in light of Jane Jacobs and William Whytes’ studies on pedestrian activity. The street is a way of bringing activity and safety to unprogrammed or unsafe open space. The process of reintroducing streets into superblocks should be mindful of what original designers wanted to achieve, separation of traffic from pedestrian environments. A hierarchy of streets is a more balanced approach to calming traffic while also keeping livability high (as opposed to eliminating streets and creating superblocks that isolate buildings from pedestrian activity).

## High Density / Compactness

*Greater density, in terms of residential living units per acre, increases foot traffic, which in turn enables more diverse uses to exist on the ground plane. In turn, this potential greater diversity of*

*use increases livability. A minimum density of 15 units/acre should be sought for housing projects to support neighborhood retail. In urban areas, this number could rise to 50 units/acre. Given the type of hybrid tower & street wall mixed-use housing typology the research has advocated, this level of density should be easily attainable.*

*Density also refers to compactness and not just population. Many older cities of the world have compact city plans with a great variety of destinations within a short walking distance. Because the pedestrian experience is advocated to increase livability, compactness of form in terms of block sizes should also be sought.*

Density encourages community and greater safety through more “eyes on the street.” It also facilitates ground-floor, neighborhood retail options that require a certain amount of people to service. In addition, it even relates to the environment. By locating more people in one place that can make use of shared infrastructure and public transportation, less automobile use is required, less green fields are needed for an expanding population and infrastructure, such as plumbing and wiring, can service more people using less materials by taking advantage of economies to scale that exist in compact development, and especially in towers. As population increases, towers could be used more frequently to accommodate city growth.

It should be pointed out that this particular guideline is relevant mostly for North American and some European models. In the United States in particular, a more mobile middle class has added to increased suburbanization since WWII. Most U.S. cities do not compare with many Asian, Indian or other industrializing cities across the globe in terms of population density. Therefore, it is not appropriate to suggest that all cities should be denser given realities in other parts of the world. However, for U.S. cities, greater density has been argued by proponents of New Urbanism, Sustainable Communities and Smart Growth who all share common roots in compact city development.<sup>4</sup>

It has been suggested by some scholars, including Allan Jacobs, that a level of at least 15 units per acre is necessary to support urban communities with some neighborhood retail. He goes on to describe a level of 50 units per acre in urban areas, which he says is achievable without going above four stories.<sup>5</sup> Elizabeth Kamell’s thesis on residential blocks suggests a number slightly larger than this level for urban areas. The average density, including streets, for her study of urban areas was 76.6 units/acre. Excluding extremes and modernist schemes, this number fell to 62.2 units/acre.<sup>6</sup> Obviously, since we are redesigning modernist sites, densities are expected to rise perhaps even higher.

Density also connotes compactness of form, not just numbers of people, which is largely determined by policy makers. Since this value lies within the realms of design, it is easier to influence. However, because this last factor is tied so closely



to the context of a particular city or site, no formal block size will be advocated in these guidelines. However, the spirit of compactness, variety and interest to the pedestrian experience should be considered when designing a site, along with the previous guideline of connecting to existing street networks. Larger blocks may be necessary for certain types of development, but in deference to the pedestrian experience, block sizes should be as small as is feasible and logical. See Appendix E for a comparison of various block sizes.

## Preservation

*Existing towers should be saved from destruction and integrated into the design of new developments. Any new development should meet LEED “certified” green building standards.*

Recycling existing buildings preserves their embodied energy, presently one of the most important factors for the USGBC to address. Because many new buildings are responding to environmental concerns, as documented by LEED, even the most energy efficient new building is actually worse than an existing building that has been environmentally improved. The percentage of energy spent in creating a new building is the highest component of its overall energy use by the time an average person moves away from it. Even 50 years after its completion and combined yearly energy expenditures, 16 percent of the total energy exhausted by the house is spent in its initial construction.<sup>7</sup>

In January of 2007, officials released the first green building legislation for the city of Boston. Under the new laws, any development over 50,000 square feet is required to achieve at least the “certified” level of LEED. This level seems a reasonable request to ask of any new addition or redesign of an existing housing tower as well.

## Sunlight Penetration

*The amount of sunlight reaching a ground floor window during winter months should be encouraged through designing slender, setback towers and limiting the number of towers per block, reducing overall shadow intensity. 1 hour of direct sunlight, calculated based upon actual solar orientation, is recommended but not a rigid absolute, especially not for every city, given variations of available light. Street widths and street wall distances should remain intimate and not further separated by this guideline.*

*Intense summer sunlight should be mediated through green roofs, green facades and deciduous street trees, which provide shade during summer and sunlight during winter.*

Sunlight penetration is an issue that planners and modern architects have grappled with for many years. The sunlight calculation performed on the North End case study demonstrated a level of sunlight that was at times minimal and at other times merely adequate during winter months. The North End would have been cleared by urban renewal standards. Conversely, the area is highly valued as a pedestrian environment. Likewise, Manhattan's tall buildings may cast long shadows over the city but its streets also provide plenty of pedestrian activity. Corbusier's admonition that the city should have taller towers set further apart was a false polemic, I believe. Therefore, what is important to follow is a guideline of moderation. Neighborhood streets should remain intimate in character while towers should not be allowed unrestrained construction.

The model followed by Vancouver has been successful in allowing adequate sunlight while preserving a street wall. City planners have modified design guidelines for a number of years to limit too many towers on one block or towers that are very bulky, which cast large shadows. Some of their guidelines prescribe a minimum distance between towers of 80 feet and a maximum number of two towers per block.<sup>8</sup> In the case of Concord Pacific, the 80 foot buffer was kept to preserve some sense of privacy and facilitate views but some larger blocks include up to four towers.

Although available sunlight, especially during winter months, is appreciated by pedestrians, too much sunlight during summer months is also a problem. Because sunlight increases heat island effects in cities and results in greater energy consumption to cool buildings, green design techniques should be used to combat these negative effects. Traditional deciduous plants and trees help reduce solar heat gain during summer months while still allowing sunlight during winter months. Also, green roofs and green facades make a significant impact in reducing heat gain during summer months, as documented by Penn State's Center for Green Roof Research. The next section deals with another environmental benefit of green roofs, storm water management.

### **Control Water Runoff on Site**

*All water runoff should be contained on-site. Green roofs, green facades, and both natural and man-made pervious surfaces should be utilized.*

California is leading the way on several environmental fronts. At a recent press conference this year, Governor of California Arnold Schwarzenegger announced aggressive legislation aimed at curtailing future state water shortages predicted as a consequence of global climate change. The governor detailed plans to build above ground water storage to capture runoff and melting snow and release the water to

inhabitants during summer months. Currently, the state has seen a reduction in available water during the summer as snow fall has decreased or melted away earlier than expected.

There are many environmental issues related to water that successful redesign of modern housing sites can address. Recharging water tables and water detention are both important issues. Because many tower-in-the-park schemes already possess a large degree of land to deal with water absorption, new development on the site should attempt to continue providing the same level of water service or increase it. Impervious surfaces and stress on the city drainage system should be minimized.

When Corbusier first envisioned his five points of a new architecture, green roofs played a central role. Long before they were vogue for environmentalists, Corbusier dreamed of a free and open ground plane with buildings atop columns and green roofs that together would increase total “ground” cover above 100% on any site (natural plane plus green roof). Although the history of green roofs technically predates Corbusier by many hundreds of years, the modern era of green roofs was made possible by the flat concrete roof, a Corbusian idea, which was able to support the added weight of a green roof.

Although Corbusier chose the green roof mainly for architectural considerations (it was envisioned to create a constant level of humidity and temperature to reduce expansion/contraction forces on reinforced concrete) green roofs provide a number of other benefits. Today, there are many energy pluses associated with green roofs, including reduction of heat island effect, heating and cooling costs and replacement costs because the lifespan of green roofs is longer than traditional roofs. Green roofs also reduce storm water runoff and filter pollutants. Finally, green roofs possess what Corbusier called the “sentimental” reason to choose them. They are often a source of beauty, definitely a pedestrian-friendly design consideration.

The next chapter will test these principles on a real location: the West End of Boston.

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1 Moore, Charles. “XXV Closing in 1911-1912”, *Daniel H. Burnham, Architect, Planner of Cities, Volume 2* (Boston, MA: Houghton Mifflin, 1921).

2 Punter, John. *The Vancouver Achievement: Urban Planning and Design* (Vancouver: UBC Press, 2003). p. 77.

3 Jacobs, Allan B., 279.

- 4 Williams, Dr. Katie. "Can urban intensification contribute to sustainable cities? An international perspective." *Urbanicity: for local government & urban development*. (<http://www.urbanicity.org>, 2007).
- 5 Jacobs, Allan B., 304.
- 6 Kamell, 71-74.
- 7 Hadley, 47.
- 8 Punter, 77.

## 5. A WAY FORWARD

Approaching tower construction in cities with careful design guidelines is a way of reconciling Corbusier's vision with today's livability issues and preferences. As Vancouver suggests, this approach is useful for creating pedestrian friendly, urban environments. However, in addition to creating new environments, older environments should be made more livable, as the Saltonstall example illustrated. This chapter deals with one of the most infamous urban renewal projects in the United States, the West End of downtown Boston, as a starting point to test the design principles of the preceding chapter. In conclusion, the use of such design principles on urban places is discussed as an effective method of regulating form and creating places of benefit to urban dwellers.

### DESIGN INVESTIGATION: THE WEST END

The West End of downtown Boston had all the markings of a Corbusier styled tabula rasa plan. In the heart of Boston, a fragile neighborhood of tight, winding streets was razed clear and rebuilt with towers in a park, à la Ville Radieuse. After examining the history of the site and its transformation, the principles described in the preceding chapter will be applied to the urban renewal plan to determine what areas should be redeveloped and suggest how they might be reformed.

Opportunities exist not only to redevelop the site based on the preceding principles of chapter four but also to compare those principles and the resulting plan they guide to a current redesign plan for the West End. The West End went through a lengthy process to determine how best to re-imagine the neighborhood. Current development is already occurring on the site. So, we can test our design principles against both the original urban renewal plan and the current redevelopment plan for the area.

### History

*Those who cannot remember the past are condemned to repeat it.* — George Santayana

I'm reminded of an anonymous quote, "Those who've heard Santayana are condemned to repeat him." However, there is good reason why his saying is so

often reiterated, it's hauntingly true. Luckily in the case of the North End of Boston – sister neighborhood to the West End, people did learn from their mistakes. Championed by people like Jane Jacobs, the North End was spared the heavy, irreverent hand of demolitionist planners who had called for its demise. The West End, however, was forever changed.

Until the late 1950s, the West End consisted of a working-class population and a housing fabric continuous with its neighbors of Beacon Hill and the North End. Although the West End's population was devoted to the area, it was deemed a slum by urban renewal standards. Located near to the center of town and on the banks of the Charles River, the site was considered ideal by private developers and pressure to redevelop the area became irresistible to city planners, motivated by federal subsidies for renewal. So, the West End was razed and handed over to a developer that built modernist housing projects that displaced the people living there. Modern towers were constructed and streets were closed or rerouted to create superblocks. The result was so jarring and socially catastrophic that similar plans for the North End and other areas of Boston were halted. Now, almost 50 years have elapsed and the new West End with its “If You Lived Here, You’d Be Home Now” slogan towers is old and finally being improved. It is in this environment that the question of how best to redevelop modern housing sites might be answered.

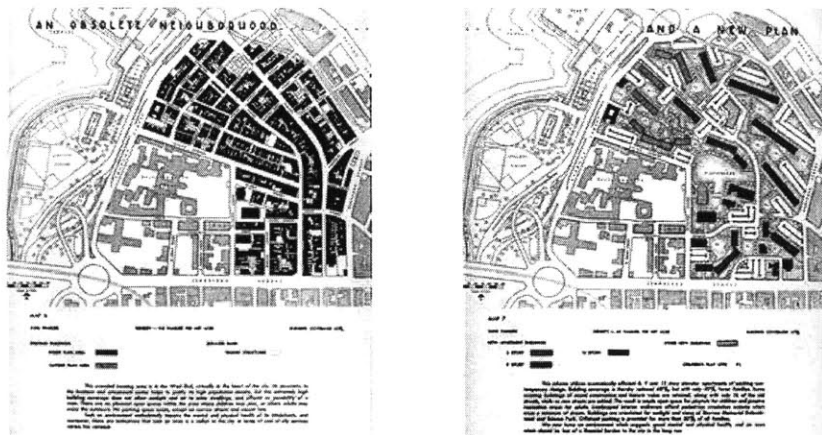


Fig. 5.1 Infamous maps showing the existing fabric of the West End's unique blocks on the left and the new plan which was proposed for the land.



Fig. 5.2 Aerial photograph of the West End of Boston integrated into its surroundings from 1946; the West End is the region outlined.

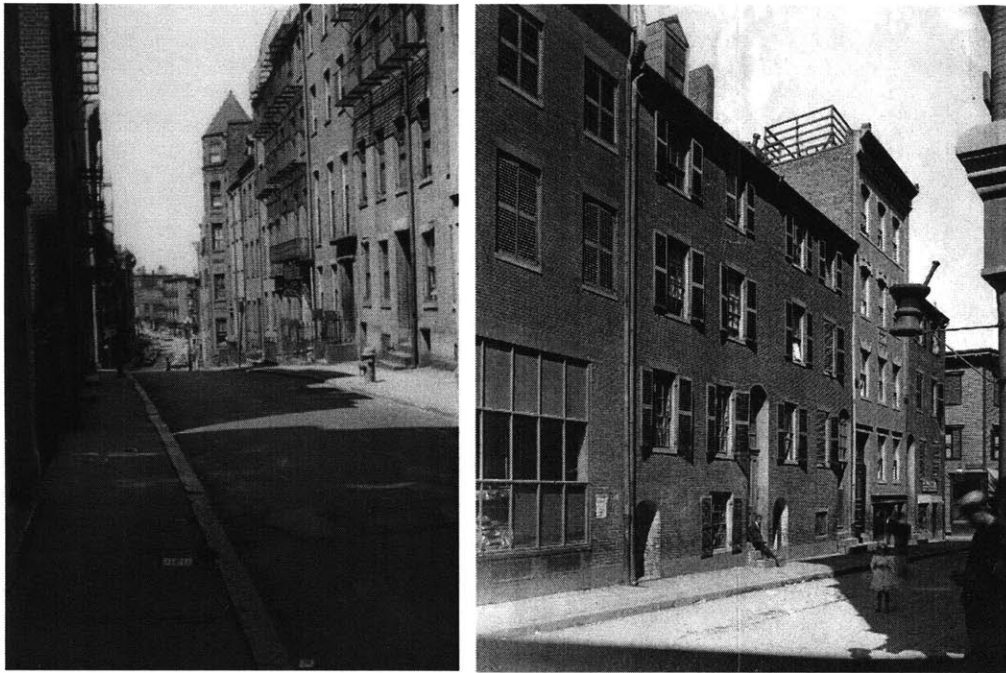


Fig. 5.3 & Fig. 5.4 Photographs of West End streets prior to urban renewal, courtesy the Bostonian Society.



Fig. 5.5 Photograph of West End street prior to urban renewal, courtesy the Bostonian Society.



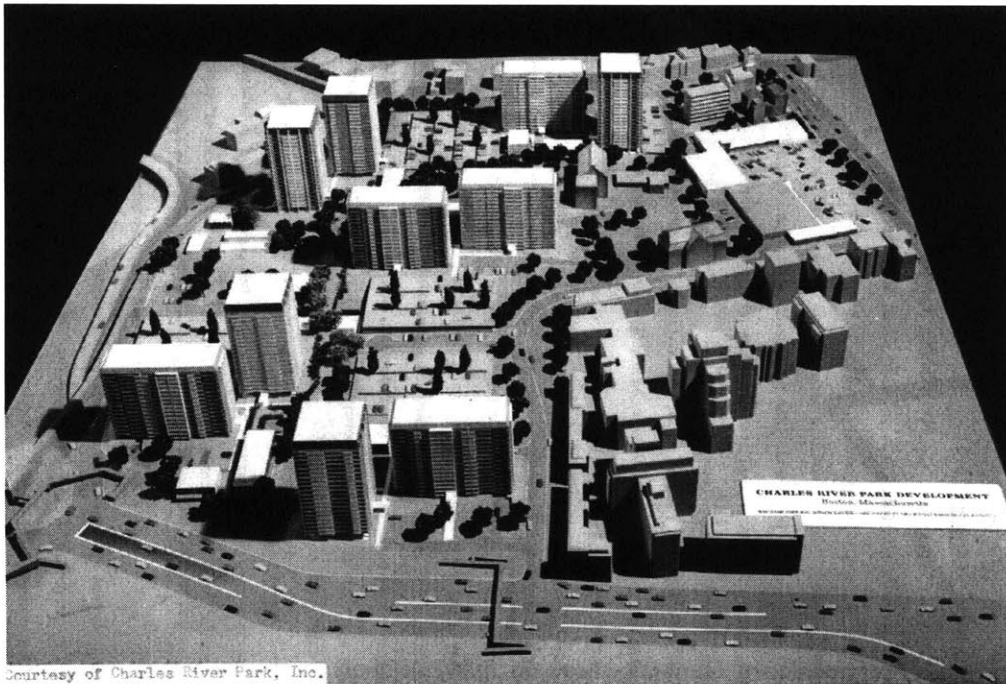


Fig. 5.6 Photograph of redevelopment model for the West End, courtesy Charles River Park, Inc.

Several factors contributed to the West End's demise. First, beginning as early as 1926, Cambridge Street was widened, separating the West End from Beacon Hill. At the same time, a controversial plan to build a highway along the Esplanade, the river park running along one side of the West End, was discarded in 1929 because of opposition. A park called Charlesbank was a popular resource for local children and would have been cut off from the West End by the new highway. However, the plan was reinitiated by politicians and planners in 1948. Facing renewed opposition, the West End senator pleaded, "In the name of decency, please leave this park [Charlesbank] alone for the sake of our underprivileged children."<sup>1</sup> Despite opposition, the plan proceeded and cut off the West End from parkland and recreation space. The final physical act of separation occurred with the introduction of the elevated Central Artery highway in 1959 but by this time, the West End was already slated for destruction.



Fig. 5.7 The widening of Cambridge Street in 1926 contributed to the West End's growing isolation, courtesy the Bostonian Society.

In addition to physical separation, the residents of the West End suffered from political and social separation. Once the land was deemed a slum and targeted for urban renewal, residents with financial means moved away. The population dropped “from 12,000 in 1950 to an estimated 7,500 in 1957.”<sup>2</sup> Noted sociologist, Herbert J. Gans conjectured that the remaining class of people in the West End were predisposed to distrust government and were therefore hindered in their efforts to stave off the wrecking balls. Rosario Tosiello also adds history and ethnicity to the discussion of their failed fight against urban renewal. Italian-Americans comprised the largest group of people living in the West End just prior to its destruction. Their sense of isolation in a government and social structure largely comprised of Irish-Americans at the time added to their passivity in the face of eminent domain. Because Italians were not in positions of political authority even in the North End, which was the strongest Italian neighborhood in Boston, residents of the West End maintained a fatalistic view of their situation.<sup>3</sup>

Fifty years later, the West End is a place populated by a new social constituency of greater financial means who are afraid of any further development to the site. Quite the opposite of the failed public housing at Pruitt-Igoe, the grounds and lobbies of the West End are monitored by security. Rebecca Barnes, former Chief Planner for the Boston Redevelopment Authority writes that “residents see the residential West End as an oasis in the city creating a very desirable place to live.”<sup>4</sup> She goes on to concede that the characteristics of the Corbusier inspired plan for

the area although “spacious” feels devoid of the type of urban qualities normally associated with city life, “shops and restaurants.”

### ***Current Plans***

Despite resident’s opposition to change, the Boston Redevelopment Authority (BRA) approved Equity Residential’s plans to redevelop the site in 2005 with the addition of over 300 units of housing in towers located at the intersection of Blossom Street and Storrow Drive and another further into the site along Blossom Street. Also, smaller, multi-unit, brick houses are planned for the interior of the site along a current pedestrian path. The only development caveat placed on Equity was a five-year construction moratorium after their first phase of building.<sup>5</sup> So, whether the residents of the West End like it or not, the area will be different. Given its proximity to the center of Boston and its spectacular views, it’s easy to understand the continued pressure to develop the land.

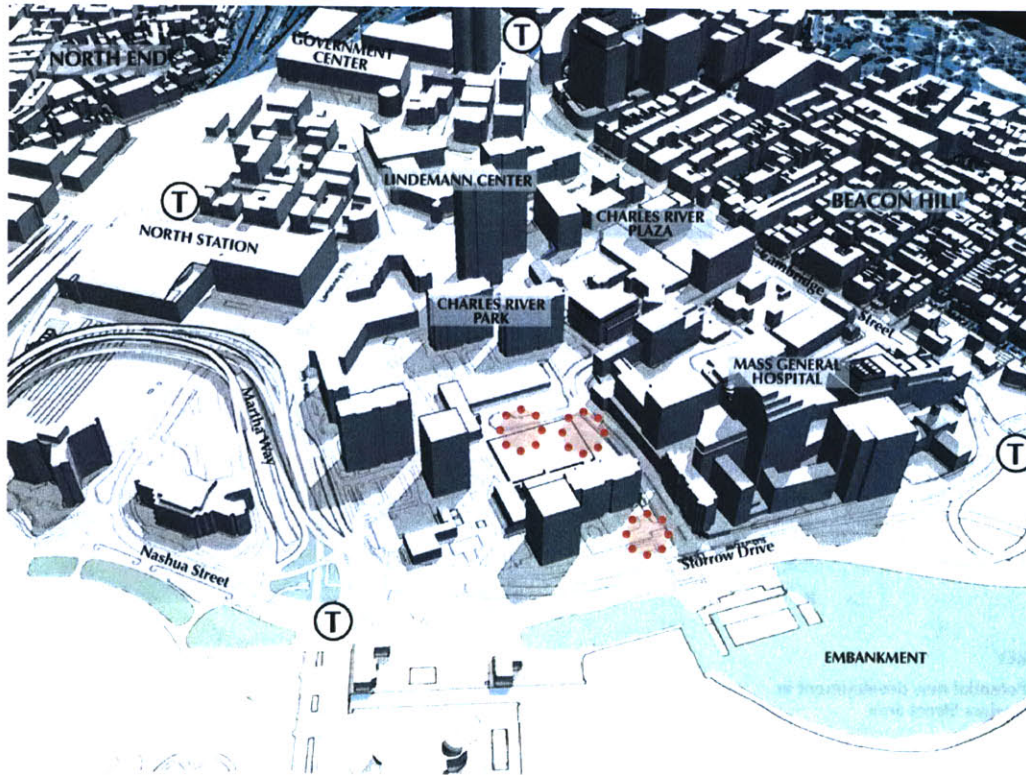


Fig. 5.8 Existing conditions and approved development sites in the West End (illustrated by red circles).<sup>6</sup>



In order to both gain input from West End residents and prepare them for the eventual redevelopment of their neighborhood, the BRA held a series of design charrettes with residents. The following graphics illustrate the BRA's three guiding development scenarios for the site. They were used in talks with local residents in 2003 to help garner their input about what type of development was most preferred for the site. Each scheme includes development projects for Cambridge and Nashua Streets, which were outside of the plans of the Charles River Park development, the Corbusier influenced development at the focus of our research. Together, they provide a glimpse into how the entire area is currently being viewed by planners. Each of the top two schemes introduces pedestrian-scaled streets into the site with buildings reaching a maximum of 6 stories tall with retail possibilities at the ground plane. The final scheme is more of the same "towers in the park" for the area.<sup>7</sup>

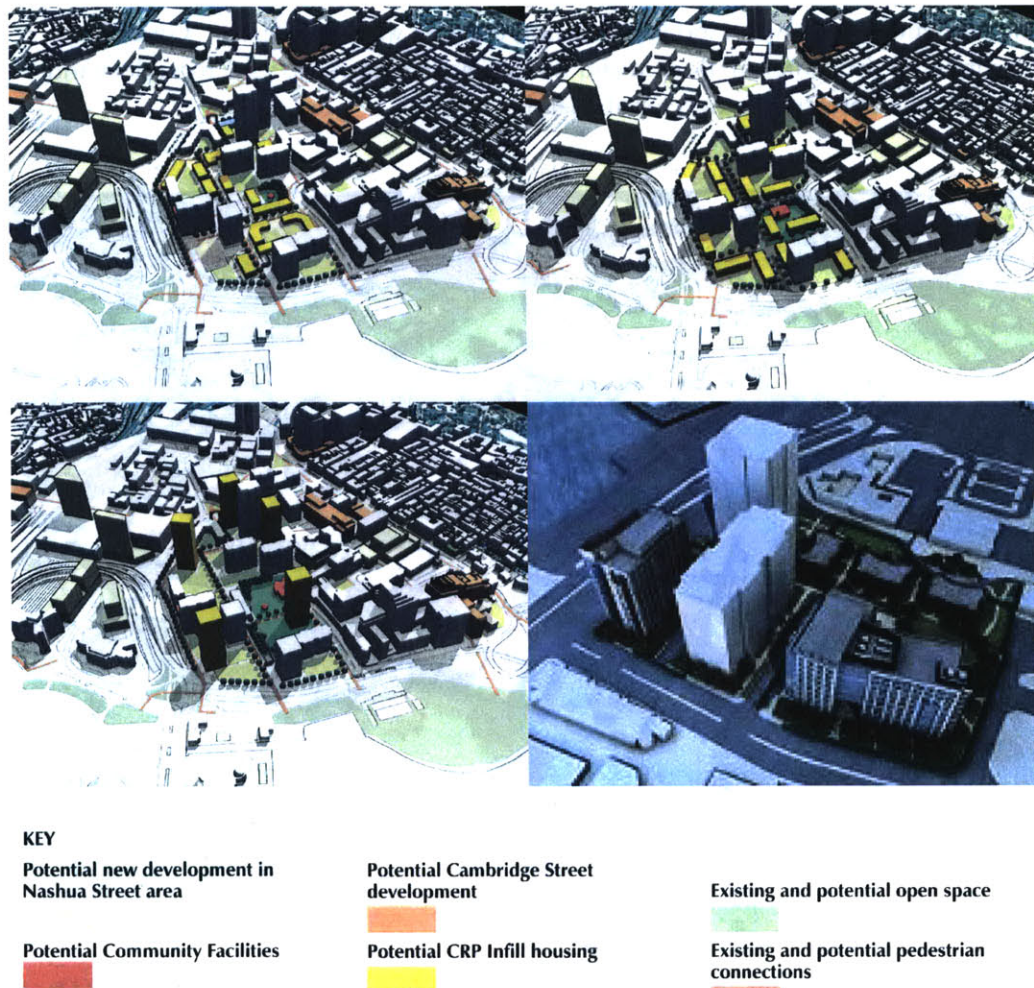


Fig. 5.9 Three development schemes for the West End produced by the BRA and a model of the scheme chosen by Equity Residential.

Residents reacted to the schemes with a variety of their own designs during charettes. One of the central concerns of the residents, who mostly designed low-scale, minor development plans, was preserving views from existing towers. These low-scale developments, akin to the first two BRA plans, preserve a maximum of tower views while increasing housing units and density to a small degree. Most of the low-scale developments also preserved open space on the site. However, some residents, realizing the push to develop the site to a greater density, suggested the addition of one or two more towers that would house a greater population and only minor access to the new buildings to preserve views and discourage connection to the outside.<sup>8</sup> A certain sense of being a “gated community” reveals itself in plans that reflect a preference on the part of residents to maintain a degree of isolation.

Perhaps influenced by the wide range of design preferences on the part of West End residents, Equity Residential’s master plan for the site combines elements of tower and low-scale development in a clumsy, disappointing way that fails to maximize the usefulness of either design method. Ignoring even the BRA’s initial planning schemes, Equity seems to have placed additional towers that block a maximum of views from existing towers and added an anemic collection of low-scale housing units that fail to form a legitimate street edge and merely consume open space. Both the tower and low-scale developments are unconnected and fail to make the West End a more livable place.

In light of the design guidelines of the preceding chapter, the first two BRA schemes share a common goal of creating a pedestrian environment while the last BRA scheme sacrifices pedestrian-scaled development and inserts more towers with inactive ground planes divorced from the street. However, the first two schemes also don’t add any towers either, missing an opportunity for greater density to support ground floor retail. Also, they lack a hierarchy of streets and have no central destination.

Overall, the new West End may end up a combination of new towers and new six-story buildings. However, it doesn’t seem yet that the area will have a better sense of identity. The overall plan for the area, now in Equity Residential’s hands, doesn’t fulfill the highest potential value for the site in terms of livability.

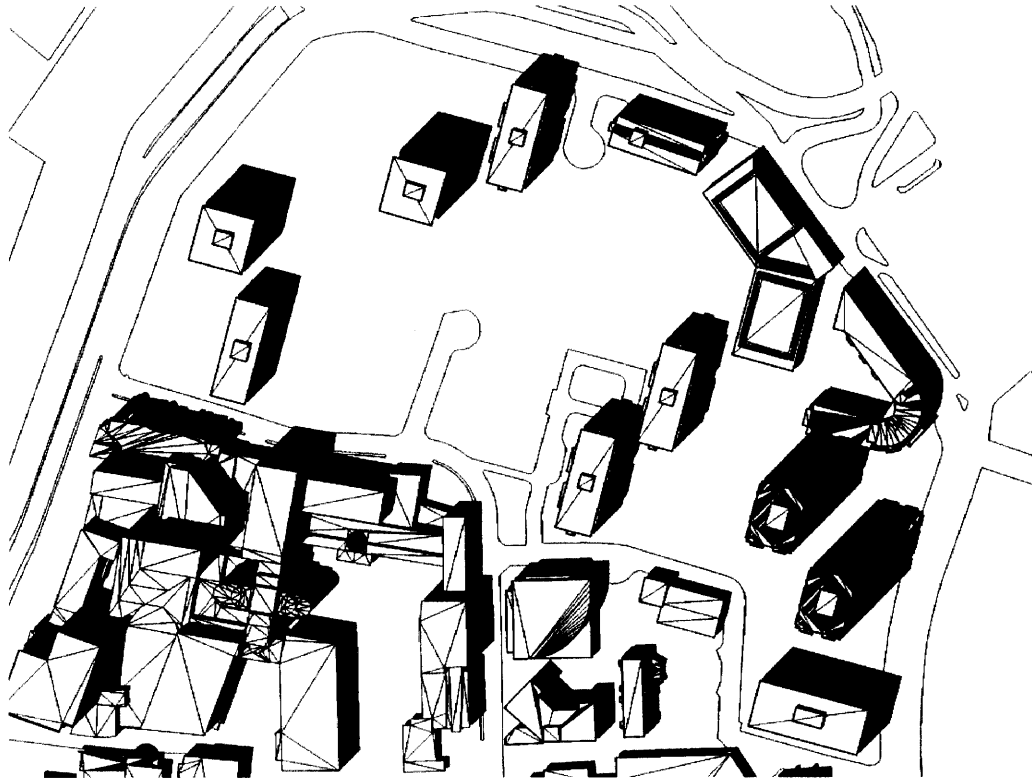


Fig. 5.10 Charles River Park, a Le Corbusier inspired plan that seems cursed to repeat urban design that is insensitive to people, given the current direction of development plans.

### ***A New Plan***

Instead of making more design mistakes, the city would do well to follow Vancouver's example and adopt a set of design guidelines that would increase the livability of the West End, instead of do more harm to the neighborhood. Based upon the preceding chapter's design principles, the following scheme for developing the West End establishes a pedestrian scaled environment and adds over 1,000 units of housing. The former Charles River Park is transformed into a real neighborhood with a central place and enough density to support vibrant street level uses.

The new plan for the West End establishes a hierarchy of streets through the Charles River Park. Two main roads run north-south and east-west, crossing in the center at an open space (see figure 5.11). Smaller service roads run behind buildings and into interior courtyards for tower residences to allow fronts and backs to buildings. The public street is preserved throughout and because of the natural



orientation of the land the streets have some character to them. A few run at different angles to respond to the river and surrounding streets or former pedestrian paths that crossed between towers. Main streets are wide enough for two lanes of traffic, two lanes of parking and 15-foot pedestrian sidewalks, enough room for street trees. Additional parking will be accommodated below grade in parking garages. Overall, these streets are intended to reconnect the site to surrounding streets while preserving a pedestrian, neighborhood feel.

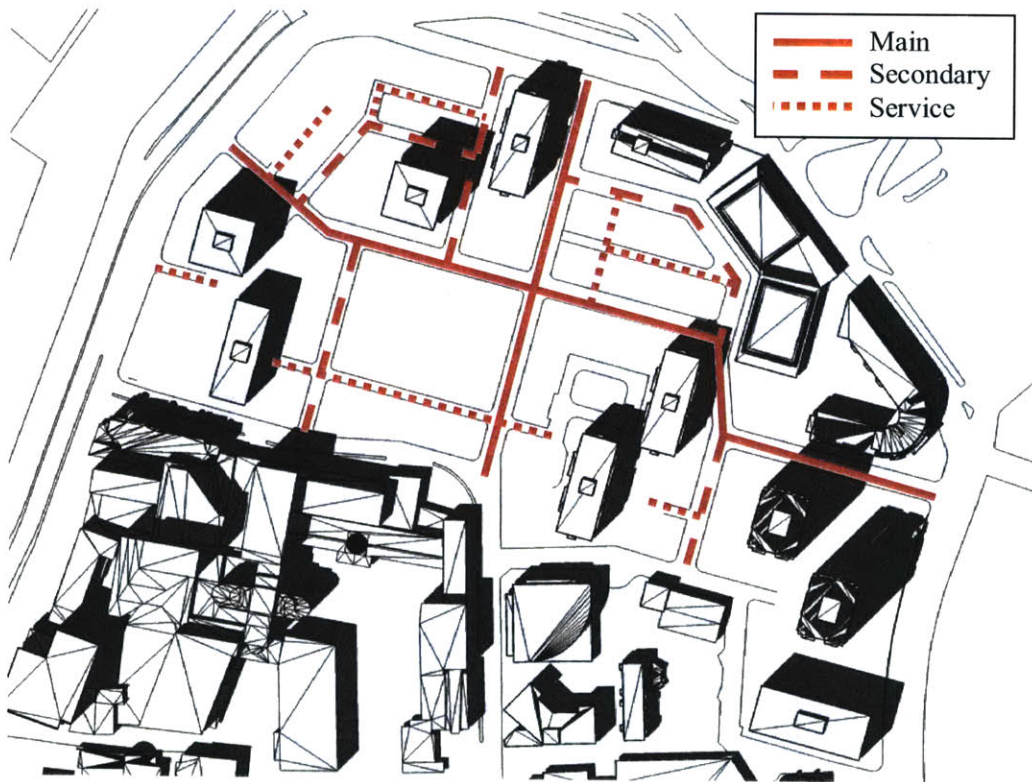


Fig. 5.11 Hierarchy of new roads on site connects to surrounding and facilitates a new pedestrian environment.

The pedestrian experience will be supported by both a new street wall that reinvigorates the ground plane of existing towers and new open space. Existing towers were preserved on the site while new street walls were created with new four to five story buildings. In some cases, the new buildings wrap around existing towers and in other cases they run around them, creating interior courtyards. In either scenario, a new pedestrian street wall was created in which towers were setback. This new pedestrian environment is amplified by the creation of two well-defined open spaces (figure 5.13). These main spaces are located at the middle of the site, where the two main streets cross. They allow for existing plantings to be preserved and a new retail presence to emerge, something currently lacking, and create a neighborhood green in the tradition of New England village centers.

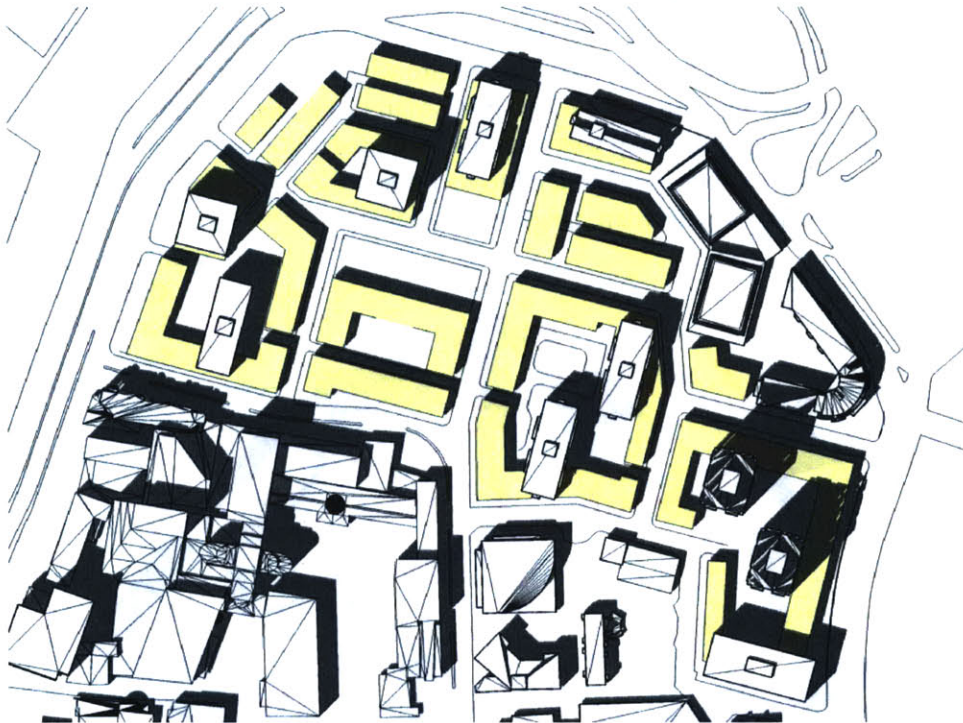


Fig. 5.12 New street walls are created by the addition of four to five story buildings.

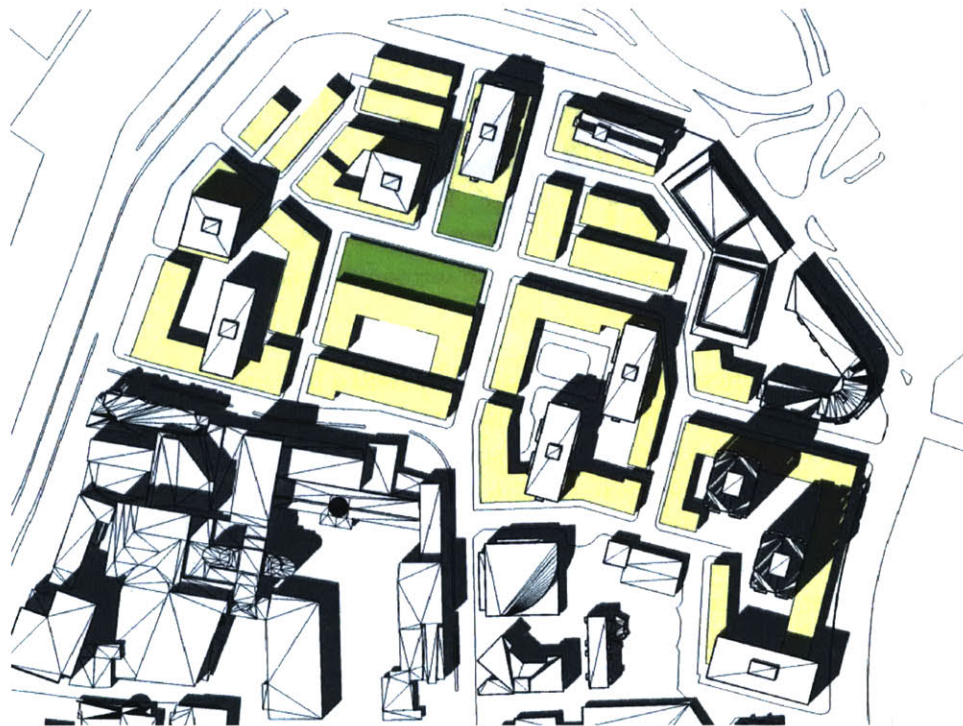


Fig. 5.13 New central open space is well defined and establishes a place in the tradition of New England village centers.



In keeping with Vancouver's example, new towers were added to the site that are more slender than existing towers and still capitalize on river and city views. The smaller tower, at the northwest edge of the site takes advantage of views without hindering nearby tower views. Likewise, the taller tower in the center of the site also maximizes views without encumbering the views from existing towers. Also, because of their slender form (approximately 70 ft. by 80 ft.) sunlight is allowed to more easily penetrate into the site, in contrast to the bulky existing towers that cast larger shadows. Luckily for the West End, the orientation of these existing towers, to maximize river views, also suppressed shadow casting, except in the case of the southeast tower which was oriented and placed on the site in the worst possible way and casts maximum shadows.



Fig. 5.14 New towers take advantage of river views while preserving existing views. Their slender form also helps reduce shadow impacts.

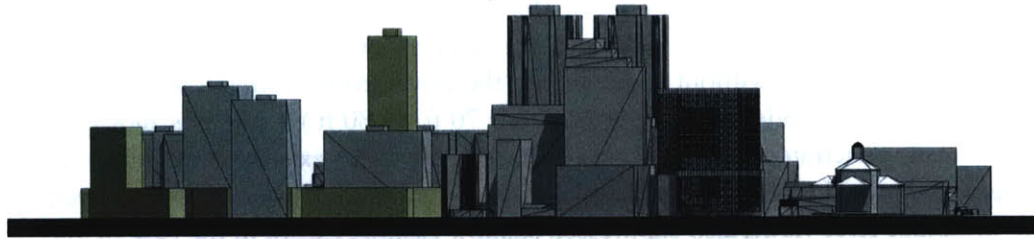


Fig. 5.15 View of scheme from the Charles River. The new towers are more slender than their 1960 counterparts, following the Vancouver model, allowing light to enter the area.

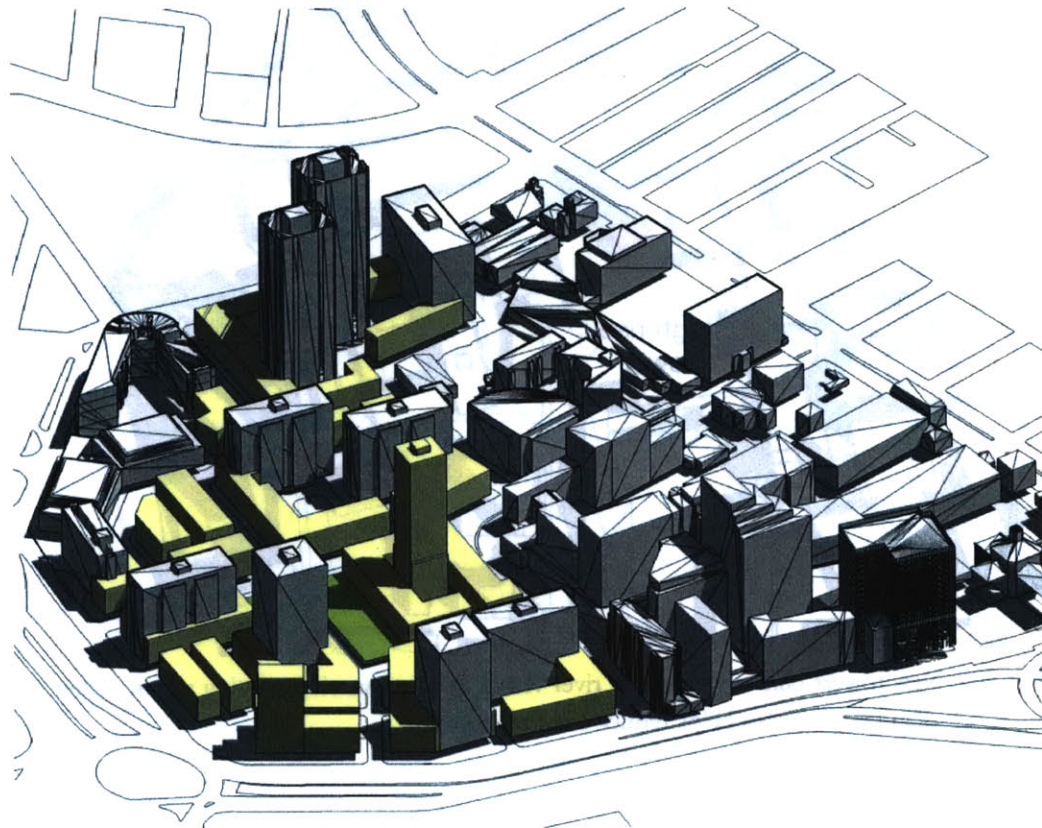


Fig. 5.16 Axonometric view of the West End with new program. A new system of streets and pedestrian scaled buildings of 3 to 5 stories weaves through the former superblock. New internal streets and public spaces facilitate greater possibilities for community interaction.



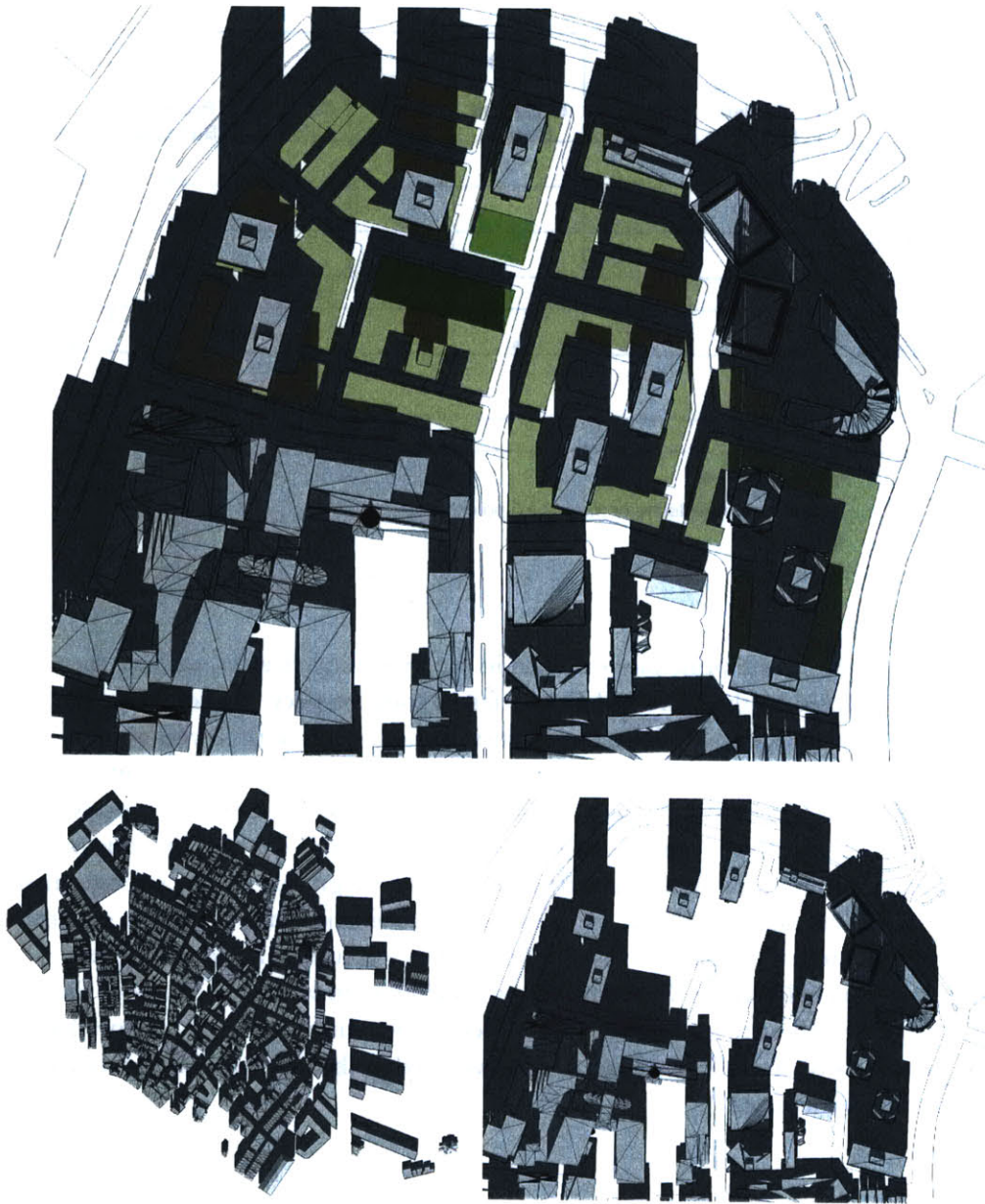


Fig. 5.17 Winter shadows at noon for the new plan (top), existing towers (bottom right) and the North End (bottom left). Because of its tilted configuration, the new West End plan is able to capitalize on sun angles to permit direct light into its streets at peak hours of sunlight and even during winter months, similar to the North End.

Lastly, the design upholds green design tenets by preserving existing towers and using green roofs and some green facades. Green facades could be retrofitted onto existing towers as well to mediate their bulkiness and provide a new visual amenity while still providing environmental benefits to the neighborhood.

Comparison of Livability Criteria <i>West End Schemes</i>	Pedestrian Scaled Buildings	Mixed Use Ground Plane	Hierarchy of Integrated Streets	High Density	Compact Form	Preserve Buildings	Sun	Conserve Water
BRA Scheme 1 & 2 Low-scale	●	▲			●	●	●	
BRA Scheme 3 Towers				●		●	●	▲
Equity Residential	▲			●		●	■	
Thesis Design Principles	●	●	●	●	●	●	●	●

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**Key**


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- meets guideline
- ▲ almost meets guideline or misses full potential
- <blank> fails
- fails badly

So, based on the principles outlined in the preceding chapter, each of the schemes offered by the BRA and Equity fail in some respect. By contrast, the illustrative proposed redevelopment discussed above adds both towers and lower buildings to maximize the benefits of each and reknit the community. An overarching lesson of the thesis, therefore, is that it is not an either or proposition when it comes to towers and lower-scaled buildings. They can work in unison to produce a better environment and their successful integration can be stronger than their individual representation. However, design guidelines are needed to ensure successful integration, as demonstrated by Equity's failure to achieve a higher degree of livability in the West End despite including towers and some low-rise buildings (which were separated). The potential benefit of design guidelines based on principles of livability, such as those advocated in this thesis, is demonstrated in places like Vancouver.

## **CONCLUSION: REDESIGNING MODERN HOUSING SITES**

Le Corbusier is one of the most controversial figures in urban design of the last century. He is either sanctified or vilified by architects and urban planners. Even today, a balanced view of his work and concerns remains somewhat illusive in many corners of academia. However, if one is able to transcend the polemical, flashpoint response to Le Corbusier, then one will see that the issues he confronted in his time are still just as much relevant today as they were when he struggled to address them.

Corbusier, the architect and artist, was influenced by advances in artistic thought such as cubism and advances in technology brought about by the machine age. Like Picasso was to the art world, so was Corbusier to the intertwined worlds of architecture and urban planning. Corbusier understood architecture enough to know how to make something completely new and of his age. However, Corbusier the humanitarian/reformer also focused his talents on social issues. He was very concerned with upgrading the conditions of people living in overcrowded slums. Unfortunately, despite his sincerity, his bold solutions also introduced an entirely new set of problems related to livability and ground plane disconnection. Today, we are dealing with the same issues of density, mass-production, the automobile/mobility, and slum conditions as Corbusier faced but with the added issues of livability that his tower/park designs exacerbated (i.e. worsened ground plane, isolated buildings, etc.).

The research into the type of modern housing that Corbusier inspired, his towers in the park scheme, has yielded design principles to redress what was lacking in his original concept, a pedestrian-friendly ground plane. By shattering the status quo of his day, Corbusier discarded a past that was encumbering new designers and their designs. However, in doing so, he also ended up depriving his new designs of some of the underlying benefits to traditional design that facilitate pedestrian-friendly, livable environments. In attempting to erase the overcrowded, tight, dirty, dark streets of slums, he swung the pendulum of design philosophy to the other extreme with towering buildings devoid of street walls – easy for large scale, single owners to develop, but poor for urban life. Consequently, urbanism, or the inherent livable qualities of compact cities, was obliterated in these tower/park schemes because they produced anti-places through their lack of street definition and disconnection to movement systems that are the lifeblood of urban economic and social activities. By combining the attractive high-rise living experience with the ground plane of traditional city form, a new set of design principles are achieved that address the same problems Corbusier faced.

The livability of developments that have followed such guidelines has clearly improved compared to ones that have not. The Saltonstall plaza's redevelopment has created value for the city of Boston and is considered a model for such types of redevelopment.<sup>9</sup> Also, Vancouver has benefited from a concerted effort of planners to employ design guidelines in the formation of their city as compared to Toronto planners, who admitted in hindsight that they should have done so.<sup>10</sup>

So, it is indeed possible to effectively transform the ground plane of these tower-in-the-park projects to improve their livability and development potential. The Saltonstall building did it and the design guidelines that produced livable streets in Vancouver demonstrate it too. Not only is it possible, it is wise to do so, creating compact, pedestrian environments which are beneficial to people, business and the

environment. Ultimately, by creating a pedestrian environment of greater density, the forces of expansion to suburbs which Corbusier first criticized over seventy years ago in Chicago calling them “the great waste”<sup>11</sup> can be calmed. The design principles covered in this research suggest that the towers in a park scheme be transformed to towers in a pedestrian block.

Cities should take a form based approach along the lines I have suggested in their codes. Vancouver is a model of how this process could take shape. The Saltonstall building and the Prudential Center in Boston are both examples of redevelopments of formerly inhospitable environments into pedestrian oriented environments integrated with their surroundings. These projects are the result of urban designers, whether architects, planners or developers, being concerned with increasing the value of the projects by focusing on livability criteria. Towers are not inherently bad but they must be carefully placed and designed with the context of the city in mind. Although rising high into the sky, towers should relate well to the public and be integrated into an existing street network. This thesis demonstrates a way forward.

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6 Courtesy of the Boston Redevelopment Authority.

7 Courtesy of the Boston Redevelopment Authority.

8 Barnes, Rebecca, ed. *A framework for planning and development of the West End area* (Boston, MA: Boston Redevelopment Authority, 2003).

9 Rice, Derek. “100 Cambridge Street/Bowdoin Place.” *ULI: Development Case Studies*, vol. 36, no. 18 (July-September, 2006).

10 Punter, John. *The Vancouver Achievement: Urban Planning and Design* (Vancouver: UBC Press, 2003). p. 108.

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## **APPENDIX A:**

### **SCALE SYSTEMS IN ARCHITECTURE**

History is filled with studies of scale, proportion and other mathematical relationships in architecture and more broadly, art. To some, it has been a struggle to define beauty, to others a searching of higher order in the universe. Jay Kappraff, who has been teaching about the mathematical bases of our three dimensional world for several decades, asserts that all good design should have the following three characteristics abundantly found in nature: repetition, harmony and variety. In addition, he stresses, “Many architects and artists would add to this [list] a fourth requirement that the proportions of a design should relate to human scale.”<sup>1</sup> Corbusier was a pupil of both history and mathematics and his work, particularly in the discussion of human scale, deserves attention. Some, like Kappraff, might argue for the use of such systems but others, like gestalt psychologist Rudolf Arnheim, would argue against its value.

Human scale can be used to justify many approaches to design but many are not so good (i.e. the towers in the park). Focusing on proportions can help some designs and hinder others. Looking to the human body to help design objects much larger than it presents a certain illogic. It reminds me of the pre-Galileo arguments that the Earth was the center of the universe. People tend to have a very “people-centric” view of their environment. Taking this view to architecture is tempting because architecture is at its most basic about providing shelter for human beings. However, every system has its limits.

The following appendix looks at Corbusier’s fascination with dimensions in his creation of the modulator. It gives a brief overview of the system itself and the role it played in a new architecture. Finally, this appendix ends with an exposition of the limitations of the modulator system.

#### ***Le Corbusier’s Modulator***

Corbusier certainly wasn’t the first to be entranced with mathematical relationships. The study of numbers and geometrical relationships in the natural universe may have been a way for some early civilizations to illuminate or represent the divine. For instance, the Greek mathematician and philosopher Pythagoras is believed to have brought something called the “sacred cut” from Egypt to Greece

in the sixth century. Later, this mathematical operation would be performed by Romans and architects in medieval Europe.<sup>2</sup>

To ancient geometers, the circle symbolized the unknowable part of the world (since its circumference was proportional to the irrational number  $\pi$ ) while the square represented the comprehensible world. Squaring a circle was a means of expressing the unknowable through the knowable, the sacred through the familiar. Hence the term sacred cut.<sup>3</sup>

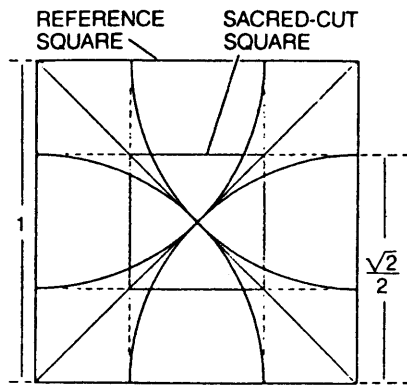


Fig. 1 – Image depicting internal square derived from the sacred-cut of a reference square.<sup>4</sup>

The Greeks and Romans, who used such a proportioning scheme, could combine dimensional lengths in a way that Corbusier would later mimic. “The sacred cut appears to have been used to proportion the design at all scales from the overall dimensions of the courtyard to the individual buildings to the rooms within each building and even the tapestries on the wall.”<sup>5</sup> Other civilizations also made symbolic use of numbers in their writing and combined them. As later religious scholars have pointed out, the Jews may have been using a symbolic number system in their writings. For instance, the number 10 signified completion because we have ten fingers and ten toes and the number three was a proxy for divinity. So, if a number such as 1,000 were to occur, it might mean something that was  $10 \times 10 \times 10$  or ten to the power of three,  $10^3$ , or divine/ultimate completeness. For instance, Exodus 20:6 says, “but showing love to a thousand generations of those who love me and keep my commandments.”<sup>6</sup> The writer didn’t intend to convey that God stopped loving people after 1,000 generations but rather that God loved his people forever.<sup>7</sup> The Jews, as well as their neighbors the Egyptians, were aware of another important mathematical ratio which Corbusier would adopt: the golden mean.

“When a line segment is divided into two disjoint subsegments in such a way that the ratio of the whole to the longer part equals the ratio of the longer part to the shorter part, then that ratio is the golden ratio.”<sup>8</sup> Showing up in King Solomon’s temple, Egyptian pyramids, Greek temples and dozens of other structures throughout antiquity, the golden mean is often considered the perfect ratio of beauty,



a measure that transcends learned or societal/cultural appreciation. Within its embodied dimensions lies the full measure of harmony and unpredictability. Noted Gestalt psychologist, Rudolf Arnheim argues:

First, we acknowledge that the organism [a person] has certain general biological needs. It requires clarity and simplicity for the purpose of orientation; balance and unity for tranquility and good functioning; variety and tension for stimulation. These needs are better satisfied by some patterns than by others. The square and the circle are simple and balanced. A slight deviation from a simple shape is ambiguous, hard to identify. A rectangle of the ratio 2:1 may disturb us by pretending unity and rectangularity while threatening to break up into two squares. The proportion of the golden section – in which the smaller part is related to the larger as the larger to the sum of both, and which yields a ratio of roughly 8:5 – may successfully combine unbreakable unity with lively tension.<sup>9</sup>

In mathematical terms, the golden mean (given the Greek symbol  $\varphi$ , or Phi, after Phidias, the Greek architect who used the ratio in his design of the Parthenon) is a ratio expressed as such:

$$\frac{a+b}{a} = \frac{a}{b} = \varphi.$$

or, represented by the following irrational number,

$$\varphi = (1 + \sqrt{5})/2 = 1.618 \dots$$

Corbusier would use this ratio in series in the same way Pythagoras, Plato, Alberti, and Palladio had used harmonic relationships in series. These forebears' methods had ceased to carry clout after people questioned the basic premise that what was pleasing to the ear was also pleasing to the eye. However, since  $\varphi$  was employed by Renaissance artists to modulate the human body, see fig. 2.4, Corbusier would make much use of it. In the same manner Vitruvius had begun, Corbusier developed a system of measurement based on the human body. His system, called the Modulor (which he had the audacity to patent), used the golden mean and a double Fibonacci series, see figure 3.

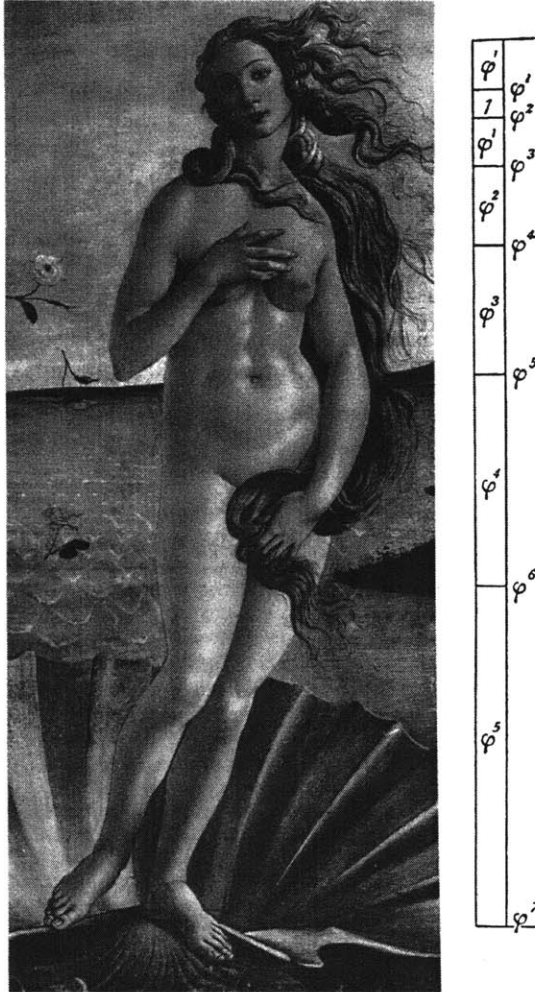


Fig. 2 – Theodore Cook’s analysis of a Botticelli Venus’  $\varphi$  relationship demonstrates how well Renaissance artists were versed in mathematical proportions.  $\square$

A Fibonacci series follows the following rules:

$$F(n) := \begin{cases} 0 & \text{if } n = 0; \\ 1 & \text{if } n = 1; \\ F(n-1) + F(n-2) & \text{if } n > 1. \end{cases}$$

For example: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144 ...

Le Corbusier labeled his double Fibonacci series the blue and red series, where the value of the blue series is twice the red series value. For instance, he chose the height of a 6 ft (183 cm) person as a reference point. From this height the red series (in centimeters) is 27, 43, 70, 113, 183 ... and the blue series is 54, 86, 140, 226

... Albert Einstein even admitted to Le Corbusier that the Modulor “is a range of dimensions which makes the bad difficult and the good easy.”<sup>□</sup>

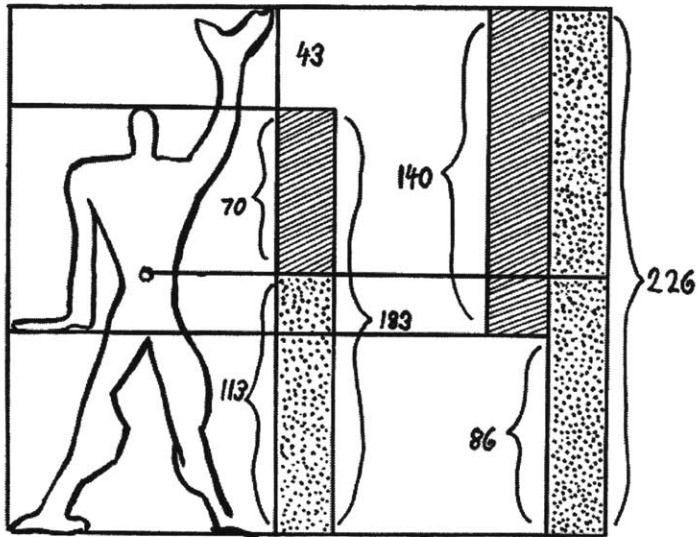


Fig. 3 – Le Corbusier’s Modulor man and double Fibonacci series.

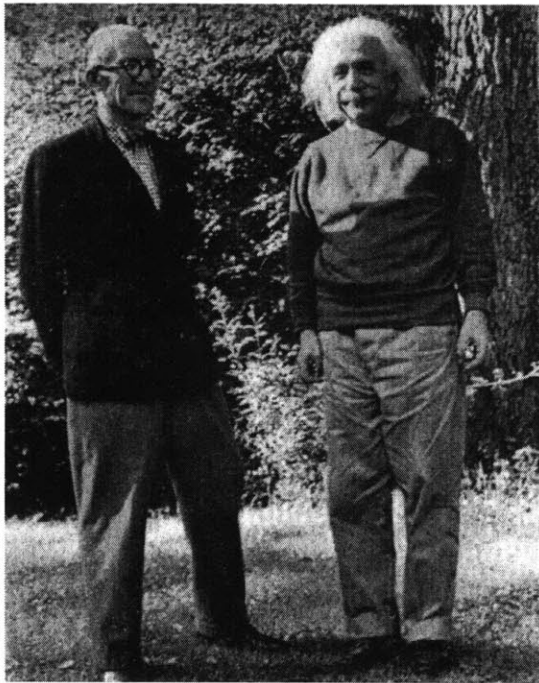


Fig. 4 – Le Corbusier and Albert Einstein, who believed in the inherent dimensional properties the Modulor man concept utilized.

Despite praise from Einstein and bestowed honors such as presidency of the Provisional International Committee for the Study of Proportion in Art and Modern Life, Corbusier also received criticism from authorities in the field of art and psychology, most notably, Rudolf Arnheim. Although not as internationally famous as Einstein, Arnheim studied at the same university Einstein taught and learned psychology from the founders of Gestalt psychology. He taught at several universities, such as Harvard, and is responsible for advancing art criticism through employing Gestalt psychology techniques. Gestalt psychology “is a theory of mind and brain that proposes that the operational principle of the brain is holistic, parallel, and analog, with self-organizing tendencies; or, that the sum of each part is less than the whole subject.”<sup>21</sup> To put it simply, gestalt psychologists believe human beings organize their environments first from a big picture view then to smaller details, the big picture being most important.

A simple test follows:

Ty to se if yu cn rd ths sntnce.

Because we are trained to see patterns and larger picture themes, our mind fills in the missing letters in the above sentence, “try to see if you can read this sentence.”

Arnheim’s main criticism of Corbusier’s modulator is that it suggests a bottom-up hierarchy instead of a top-down visual understanding. Arnheim believed in the whole object being more than the sum of its parts. So, to suggest that combining smaller dimensions in series would produce a great whole might have seemed ignorant to him. An example Arnheim used to defend his position was an oak tree. Its leaves and subordinate branches and bark can be understood as individual elements. However, taken as a whole, the mind perceives the tree as a larger object first and not the combination of many small objects.

So, an overemphasis on dimensions alone might lead to an ugly overall composition. On the surface, this viewpoint discredits the merits of the architect in his/her role as a creative designer. However, perhaps it is meant more as a warning. In the hands of a lesser creator, dimensions don’t spell success.

Arnheim believed in the inherent properties of the golden section but also pointed out that despite studies showing a preference for such a ratio, use dictates dimensions too:

The tendency to simple shape is inherent in any one unit but often modified by the context ... A telling example can be found in Fechner’s studies. When he asked observers to choose between rectangles of different shapes, he found a preference for proportions approaching that of the golden section. But when he measured the proportions of hundreds of museum paintings he discovered that on the average a

considerably shorter rectangle was preferred: about 5:4 for upright pictures and about 4:3 for horizontally extended ones. A moment's reflection shows why this should be so. In an empty rectangle the ratio between the two linear distances – roughly that of our postal card – is pleasant enough. But when it comes to a pictorial composition that is to be read not only in the directions of the two main dimensions but as a more closely knit whole, in which every point of the area is to be relatable to every other, the distances in the longer dimension would be relatively so large as to be practically unbridgeable.<sup>10</sup>

In summation:

Preference for the particular degree of rationality to which a given pattern aspires is in itself the expression of a deep-seated attitude ... As long as the analysis of rational shape remains a tool of the fully developed mind it can help to make perceived order explicit. When it replaces vision and stifles expression it becomes a game in vacuo.<sup>11</sup>

So, Corbusier's modulator may have given dimensional sense to some objects but it doesn't necessarily translate into "human scale," especially if it is used to dimension a tower. A passerby still observes the building, especially if it is divorced from its surroundings, as a whole, as an object. If this object dwarfs the human, an observer might still understand a window detail as some factor of human scale but the building itself would first be understood as a whole, ala the oak tree vs. its leaves phenomenon.

In addition to these criticisms, the very choice of a male 6 feet tall for use in the modulator limits the dimensions it produces to a person of that height. Obviously, not everyone fits this description.

Perhaps the greatest legacy of the modulator, however, was its influence on and use by Corbusier in mass-production of building materials. Pre-fabrication of buildings or elements of buildings off-site has become commonplace today because of the efficiency and cost-saving advantages it presents.

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1 Kappraff, Jay. *Connections: the geometric bridge between art and science* (London: World Scientific Publishing Co., 2001). p. 2.

2 Kappraff, 29.

3 Watts, DJ., and Watts, C., "A Roman apartment complex." *Scientific American*, vol. 255, no. 6, 132-140 (Dec. 1986).

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6 Moses. Exodus 20:6, the Holy Bible, New International Version, (Grand Rapids, MI: Zondervan Publishing House, 1984).

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- 8       Wikipedia. *Irrational Number* ([http://en.wikipedia.org/wiki/Irrational\\_number](http://en.wikipedia.org/wiki/Irrational_number), February 17, 2007).
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- 10      Cook, Theodore. *The curves of life* (New York: Dover, 1979).
- 11      Boesiger, W. & Girsberger, H. *Le Corbusier 1910-65* (New York: Frederick A. Praeger, Publishers, 1967). p. 291.
- 12      Wikipedia. *Gestalt psychology* ([http://en.wikipedia.org/wiki/Gestalt\\_psychology](http://en.wikipedia.org/wiki/Gestalt_psychology), April 10, 2007).
- 13      Arnheim, 56.
- 14      Arnheim, 57.

## APPENDIX B:

### LIMITS TO VISUAL PERCEPTION

The following investigation is made to derive a limit of visual perception. The relevance of this study is to begin to suggest a range of building stories and street Right of Ways (ROW) that are conducive to human scale and pedestrian activity. What is important to draw from this comparison is a general sense of how high buildings should rise before some type of roof differentiation is made.

Visual limits to perception are important for urban designers to recognize because they define ranges within which humans are able to interact with architectural details or perceive another person watching them. Visual acuity in human beings represents the ability of an observer to recognize an optotype, or special target, when it is subtended 5 minutes of arc.<sup>1</sup> This study will use an eye socket for its optotype. The observer will attempt to differentiate the optotype from street level looking upward at an angle to various eye levels on the floors of a building next to him/her. This arrangement is designed to observe the limits of Jane Jacob's "eyes on the street."

#### Visual Limits

*The eyes are the mirror of the soul* – Yiddish Proverb

Perhaps this proverb belies the almost mystical mathematical importance of a circle, in this case the pupil as a doorway to the soul, much like a circle was viewed by Egyptians as a "symbol of the sun and of its divine eternity ... [belonging] to that parallel but timeless and invisible realm where the gods dwelled, and the justified dead ... went to join them."<sup>2</sup> Or, maybe this proverb conveys the way our faces communicate our inner thoughts. Darwin observed in 1872 that facial expressions are largely universal, regardless of culture. This theory was later affirmed by showing photographs of various facial expressions to highland natives of Papua New Guinea who had never been exposed to foreigners.<sup>3</sup>

In either case, we will assume a few basic dimensions to determine a corresponding range of dimensions that supports human scale and is conducive to increased potential community and by Jane Jacobs' estimations, increased potential safety. Although mathematics will be used to calculate optical limits

and corresponding building dimensions, this study has limitations. For instance, perhaps the optotype should be larger or we should calculate values for vision of greater clarity than 20/20. My research will not take into account the effects of shadow, atmosphere or perhaps many other visual effects that could influence interpretation of optotypes. It will also not be based upon observation, only what is mathematically possible given perfect lighting and 20/20 vision. Finally, the average height of a male will be used, which will make the resulting calculations slightly off for other human beings of differing height (especially so for children or people who vary greatly in height from the average used).

First, we will assume the following:

Average Floor Height for residential construction = 12'

Average Eye Line = 5'6" from floor/ground

Optotype = Person's Eye

Average Eye Socket = 2"

Average Height of Male = 5'11"

20/20 vision allows recognition of an optotype subtended 5 minutes of arc

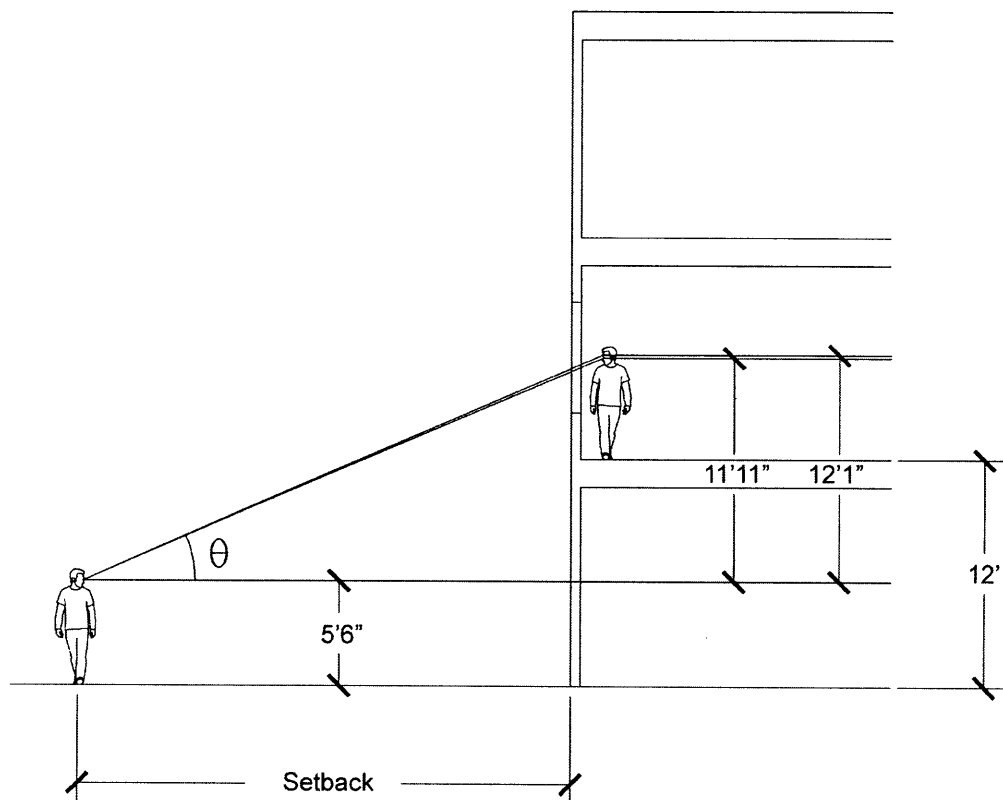


Fig. 1 – A passerby looking at an angle  $\theta$  toward a person's eyes at a second floor window.



From the preceding relationship, the following trigonometric equations become evident:

$$\tan\theta = (11'11'') \div (\text{Setback})$$

$$\tan\theta^* = (12'1'') \div (\text{Setback})$$

$\theta^* - \theta$  = Angle of optotype (eye) subtended along visual receptors of observer's eyes.

Once we arrive at this angle, we simply convert degrees to arc minutes by multiplying by 60. Since we want to derive a limit of visual perception, we will then divide this answer by 5 to observe how far away an eye needs to be before it no longer subtends 5 arc minutes. The following chart illustrates the visual limits described above. Building height is represented by the number of floors. The extra division of units provides smoothing to the graph and allows others to assume different floor heights than what I've chosen by converting floor number to building height.

Building Setback from Observer	Floor Number																					
	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.3	3.5	3.8	4.0	4.3	4.5	4.8	5.0	5.3	5.5	5.8	6.0	
2	57.3	17.6	5.7	2.7	1.5	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
5	22.9	16.9	9.4	5.4	3.4	2.3	1.6	1.2	1.0	0.8	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	
10	11.5	10.5	8.4	6.3	4.7	3.5	2.7	2.1	1.7	1.4	1.1	1.0	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	
15	7.6	7.3	6.6	5.6	4.7	3.8	3.1	2.6	2.1	1.8	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	
20	5.7	5.6	5.3	4.8	4.2	3.7	3.2	2.7	2.3	2.0	1.8	1.5	1.4	1.2	1.1	0.9	0.8	0.8	0.7	0.6	0.6	
25	4.6	4.5	4.3	4.1	3.7	3.4	3.0	2.7	2.4	2.1	1.9	1.7	1.5	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.7	
30	3.8	3.8	3.7	3.5	3.3	3.1	2.8	2.6	2.3	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	
35	3.3	3.3	3.2	3.1	2.9	2.8	2.6	2.4	2.2	2.1	1.9	1.7	1.6	1.5	1.3	1.2	1.1	1.0	0.9	0.9	0.8	
40	2.9	2.8	2.8	2.7	2.6	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	
45	2.5	2.5	2.5	2.4	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	1.0	0.9	
50	2.3	2.3	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.1	1.0	0.9	
55	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	
60	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.6	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	
65	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	
70	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	0.9	
75	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	
80	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	
85	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	
90	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9	
95	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	
100	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.8	
105	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.8	0.8	
110	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	
115	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	
120	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	
125	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	
130	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	

Fig. 2 – Visual Limits – 5 minutes of arc at various building setbacks and heights (visual optotype = eye).

As one might expect, the visual limit approaches infinity as building setback reaches zero and number of floors reaches one. This unlikely situation would occur only if two people were so close that their eyes were nearly touching (an unrealistic assumption for urban design). Also, as the building distance from an observer reaches 115', the optotype is no longer distinguishable. Likewise, a building more than five stories tall will fail to provide noticeable "eyes on the street."

Maximum # of Stories	5.75
Corresponding Setback	57'6"
Corresponding Building Height	72'
Maximum Setback	115'
Corresponding # of Stories	1

Fig. 3 – Summary chart, visual limits. Note: building height assumes an additional 3' on average for parapets, etc. not included in average 12' floor height.

The relevance of this study is to begin to suggest a range of building stories and street Right of Ways (ROW) that are conducive to human scale and pedestrian activity. Evidently 3 to 5 stories tall is a good “pedestrian” or human-scaled building limit based only on recognition of our selected visual optotype. Obviously, anything lower than this building height is also human scaled. However, buildings beyond five stories tall begin to disconnect residents from pedestrians and may be even more problematic if pedestrians “chunk” the building visually into a larger object.

Hans Blumenfeld has written about human scale dimensions based upon observation. His work separates the dimensions of buildings into two categories: *human* and *intimate* scale. The difference between these two nomenclatures is that human scale signifies the ability of an observer to recognize human form whereas intimate scale relates to identification of facial expressions.<sup>4</sup> For human scale, Blumenfeld suggests a maximum façade dimension of 36 feet wide by 30 feet tall at a distance to the observer of 72 feet. For intimate scale, the dimensions are reduced to 24 feet wide by 21 feet tall at a distance of 48 feet.

Blumenfeld based his human scale dimensions on observation. He assumed a 27° visual cone for clear vision and at this “snapshot” he calculated a set of dimensions. So, it isn’t surprising that the dimensions I calculated are larger than Blumenfeld’s lengths because I assumed people could move their heads around. As Allan Jacobs points out, people aren’t really confined to a 27° visual cone because they can always move their head and focus their gaze somewhere else.<sup>5</sup>

Also, pedestrians move through streets and observe buildings in perspective. Without delving into a more rigorous study of perspective, such as the likes of Rudolf Arnheim in his various essays on the subject from 1954 to 1996, we will only place two further visual limitations: binocular vision and focused vision. Binocular vision occurs in a 140° radius (or 70° to either side) and is the limit of vision that appears three dimensional from the use of both eyes. Beyond 140° eyebrows, nose and other facial features obstructs vision. We will assume that focused vision occurs in a 30° radius (or 15° to either side). Assuming that a person is fixing his or her head in a parallel direction to the street, the person would only become aware of certain objects within a more confined field of vision. Placing these further limitations yields the following results:

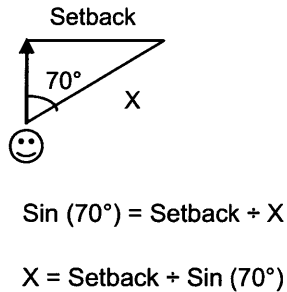
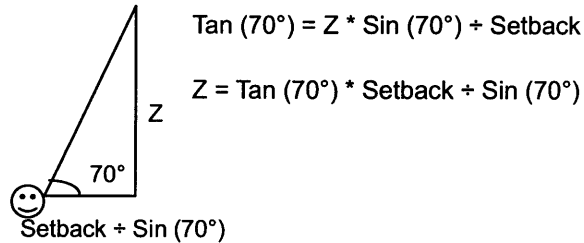
**Horizontal Cone of Vision****Vertical Cone of Vision**

Fig. 4 – Cone of Vision for Binocular Vision.

Repeating the same process as before, I find the following conclusions:

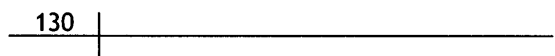
Pedestrian Visibility Optotype = Eye	Mobility of Eye				Blumenfeld Scale Study	
	Full Range	140° Cone	30° Cone	Average	Human	Intimate
Maximum # of Stories	5.75	5.75	2.25	4.58	2.5	1.75
Corresponding Setback	57.5	55	25	46	72	48
Corresp. Building Height	72	72	30	58	30	21
Maximum Setback	115	105	25	82	72	48
Corresp. # of Stories	1	2.5	2.25	2	2.5	1.75

Fig. 5 – Summary table, eye mobility vs. Blumenfeld scale study. Note: Blumenfeld # of stories is calculated based upon 12' floor heights in order to correspond with eye mobility study.

When comparing these two studies, it is essential to note that Blumenfeld's work assumes a direct view of the façade whereas I've assumed a certain cone of vision parallel with the direction of pedestrian movement, except in the case of "full range" of eye mobility. So, when comparing setbacks, one should look to the "full range" column to compare with Blumenfeld. Given these characteristics, it is not surprising that the 30° cone compares most closely to Blumenfeld's human scale values. However, it is important to also remember that people don't always view visual arrays in a streetscape like Blumenfeld might wish. We are able to move our heads around and perceive objects from various points of view.

What is important to draw from this comparison is a general sense of how high buildings should rise before some type of roof differentiation is made in order to suggest a height that is most compatible with human interface. It seems that a maximum height of about 5 floors should be implemented to support pedestrian scale. However, this height need not limit the entire building; there is no reason why a tall building can't rise from a 5-storey base, as previously demonstrated by the research in this thesis.

- 1       Wikipedia. *Visual acuity* ([http://en.wikipedia.org/wiki/Visual\\_acuity](http://en.wikipedia.org/wiki/Visual_acuity), February 17, 2007).
- 2       Aleff, H. Peter. *Ancient creation stories told by the numbers* (<http://www.recoveredspace.com>, April 14, 2007).
- 3       AbbeNormal. *Facing the now* (<http://ourpla.net/cgi-bin/pikie.cgi?FacingTheNow>, April 14, 2007).
- 4       Jacobs, Allan B. p. 278.
- 5       Jacobs, Allan B. p. 278.



## APPENDIX C:

### PERCEPTION AND MOVEMENT

People's reaction times when driving are important to know when designing a neighborhood layout and hierarchy of streets. Street speeds and stopping distances are important to be aware of also. The following appendix gives more in depth information regarding the subject of stopping distances and connects to the previous appendix on visual limits by examining how movement affects perception.

#### *Scalar Multipliers*

The chart of Appendix B assumed a stationary person. When this assumption is incorrect, as in the case of a person traveling in an automobile, a scalar multiplier must be applied to an optotype to determine how large it must be to still be recognized. This multiplier is in proportion to the speed traveled. A direct correlation between community and safety is present when determining what automobile speeds are conducive to pedestrian neighborhoods and when permissible speeds become dangerous to crossing pedestrians. The following chart documents the correlation between speed and size. The size is merely a factor of the speed in miles per hour translated to inches. So, if the observed optotype was an inch tall, it would need to be seven and a third inches tall to still be recognized for a person traveling at 25 mph.

Speed (mph)	Size (in.)
15	4.40
20	5.87
25	7.33
30	8.80
35	10.27
40	11.73
45	13.20
50	14.67
55	16.13

Fig. 1 – Scalar factor for optotype recognition. An observed optotype of an inch should be

multiplied by the size factor corresponding to the given travel speed to normalize the effect of motion.

## ***Stopping Distances***

Automobile stopping distances can be calculated using the following formula:

$$d = v^2 \div 2\mu g$$

Where,

$d$  = stopping distance

$v$  = vehicle speed

$\mu$  = coefficient of friction between tires and road

$g$  = force of gravity ( $9.8 \text{ m/s}^2$ )

We will assume two friction coefficients:

Wet conditions: 0.4

Dry conditions: 0.8

Given the aforementioned assumptions, the following chart is calculated:

Speed (mph)	Stop Distance (ft)		
	Wet	Dry	Avg.
15	19	9	14
20	33	17	25
25	52	26	39
30	75	38	56
35	102	51	77
40	134	67	100
45	169	85	127
50	209	105	157
55	253	126	190

Fig. 2 – Stopping distances for given vehicle speeds and road conditions.



Combining the two charts and using an optotype of a person, multiplied by a given scalar factor, the following chart is calculated:

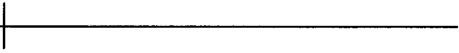
# of Lanes	Total Setback	Distance to Observer	Speed (mph)								
			15	20	25	30	35	40	45	50	55
1	7.5	43	21.00	15.75	12.60	10.50	9.00	7.87	7.00	6.30	5.73
1 (+parking)	15.5	89	10.20	7.65	6.12	5.10	4.37	3.92	3.40	3.06	2.78
2 (+parking)	26.5	153	5.97	4.48	3.58	2.99	2.56	2.24	1.99	1.79	1.63
3 (+breakdown)	37.5	216	4.22	3.17	2.53	2.11	1.81	1.58	1.41	1.27	1.15
4 (+breakdown)	48.5	279	3.26	2.45	1.96	1.63	1.40	1.22	1.09	0.98	0.89
5 (+breakdown)	59.5	343	2.66	2.00	1.60	1.33	1.14	1.00	0.89	0.80	0.73

Fig. 3 – Visibility vs. stopping distance. Visibility is represented by the bottom curve and everything above it is visible. Stopping distance is represented by the top curve and everything below it represents stoppable distances for the given speeds.

In the above chart, visibility is based on an optotype of an entire person and is represented by the bottom curve; everything above it is visible. Stopping distance is represented by the top curve and everything below it represents distances that can be stopped at given speeds. The double line represents the ability of people to travel in multiple lanes. Therefore, everything below it is relevant only in a hypothetical sense. Since people can travel at a given speed limit in a lane closest to pedestrians, the first two rows are most relevant.

Therefore, the above study suggests that 40 mph is a maximum speed for urban settings in order to better facilitate safety. However, if children are to be factored into this calculation, an even slower speed is recommended (the above study suffers from the same assumption of a person being 5'11" tall). Also, if such a person were to walk into the way of an automobile traveling 40 mph at a distance to the machine less than 100 feet, on average, they would be hit. So, for residential neighborhoods, the speed limit should be adjusted to 25 mph or less. For instance, 15 mph offers an average stopping distance of 14 ft.

Given the nature of drivers and their proclivity to ascend to the upper limits of engineering standards for roadways, which are invariably above the posted speed limits, the need for other traffic calming strategies, such as ones described in this research (hierarchy of streets, pedestrian scaled widths, etc.), is clear.



## APPENDIX D:

### DENSITY COMPARISONS OF URBAN SETTINGS

The following chart, adapted from Elizabeth Kamell's research, compares block densities of several urban cities:

City			Density (units/acre)	
			Block only	With Streets
Barcelona	1888-1914	Cerda Block	52	37
Barcelona	1935-1980	Cerda Block	113	80
Berlin	17th c.	Friedrichstadt/Mehring Platz	63	50
Boston	1874-1910	Back Bay Beacon	139	89
Boston	1872-1900	Back Bay Commonwealth	86	45
Boston	1868-1910	South End	133	78
Gaithersburg	1988	Kentlands	12	4.7
Naples	17th c.	I Quartieri Spagnoli	78	50
New York	1930	London Terrace	456	288
New York	1930	San Remo	109	75
New York	1928	Paul Dunbar Garden Apt.	149	101
New York	1920	Gas Town	161	107
New York	1908	Apthorp	153	74
New York	1943-1949	Stuyvesant Town*	143	119
Philadelphia		2400 Block	62	34
Philadelphia	late 19th c.	St. Albans Place	59	35
Philadelphia		2000 Block	50	32
Vienna	1927	Karl Marx-Hof	54	46
Vienna	1924	Schuttauohof**	187	110

NOTE: \*Stuyvesant Town is a towers-in-the-park scheme and \*\*Schuttauohof is a superblock. All blocks represent urban residential densities.<sup>1</sup>

1 Kamell, 71-74.