TOWARD A TYPOLOGY OF TRANSPORTATION-RELATED URBAN DESIGN PROBLEMS AND SOLUTIONS: CASE STUDIES OF SMALL AND MEDIUM SIZED CITIES IN THE EASTERN UNITED STATES

Author

Siddhartha Sen, Ph.D.
Associate Professor and Program Coordinator
Graduate Program in City and Regional Planning Program
Institute of Architecture and Planning
Morgan State University

National Transportation Center
Morgan State University
Baltimore, Maryland

April 1999

DISCLAIMER

Technical Report Document Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle	5. Report Date
Toward a Typology of Transportation-Related Urban Design Problems and Solutions: Case Studies of Small and Medium Sized Cities in the Eastern United States	April 1999
	6. Performing Organization Code
7. Author Dr. Siddhartha Sen	8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Center Morgan State University 1700 E. Cold Spring Lane Baltimore, MD 21251	10. Work Unit No. (TRAIS)
	11. Contract or Grant No.
12. Sponsoring Organization Name and Address U.S. Department of Transportation Research and Special Programs Administration 400 7th Street, SW Washington, DC 20590-0001	13. Type of Report/Period Covered
	14. Sponsoring Agency Code

15. Supplementary Notes

Supported by a grant from the U.S. Department of Transportation, University Transportation Centers Program

16. Abstract

This report explores the relationship between urban design and transportation through a review of the literature and an analysis of case studies of small to medium sized cities of the northeastern and southeastern United States. A detailed analysis of case studies has been conducted to develop a typology of transportation-related design problems and solutions for small to medium sized cities. Multiple methods were employed for analyzing the relationships. These included a literature review, graphical analysis and documentation, and other methods employed in urban design. The report first presents a review of the literature on the relationship between urban design and transportation. The next section of the report presents examples of transportation design problems faced by the cities employed as case studies. This section also discusses the viable solutions to these problems. The analysis is related to the literature discussed in the first section as well as to the demographic, economic, and historic characteristics of the cities. A "typology" of transportation-related design problems and solutions for small to medium sized cities emerges from this discussion.

17. Key Words	18. Distribution Statement		
Urban Design Transportation			
19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
unclassified	unclassified	47	

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGMENTS

The author thanks the National Transportation Center (NTC) at Morgan State University for funding supplied to accomplish this research. Thanks are also due to the following Graduate Research Assistants: Zachary Howard, Amitabh A. Sule, and Nancy Wilson.

INTRODUCTION

This report explores the relationship between urban design and transportation through a literature review and an analysis of case studies from small to medium sized cities of the northeastern and southeastern United States. The case studies were initially collected from a joint grant that I held with the School of Architecture at the University of Maryland from 1993 to 1998.[1] A subsequent grant from the National Transportation Center for the summer of 1998 enabled me to expand the insights gained from this previously mentioned grant into concrete conclusions through further research. A detailed analysis of case studies was conducted to develop a typology of design-related transportation problems and solutions for small to medium sized cities. Multiple methods were employed for analyzing the relationships. These included literature review, graphical analysis and documentation, and other methods employed in urban design (for a detailed discussion of these methods, see Moudon, 1992).

The report first presents a review of the literature on the relationship between urban design and transportation. The next section of the report presents examples of transportation-related design problems faced by the cities employed as case studies. This section also discusses the viable solutions to these problems. The analysis is related to the literature discussed in the first section as well as to the demographic, economic, and historic characteristics of the cities. A typology of transportation-related problems and solutions for small to medium sized cities emerges from this discussion.

[1]This National Endowment for the Arts Grant, sponsors the Mayor's Institute on City Design, Northeast. The Mayor's Institute was set up by the National Endowment for the Arts in 1986 to develop a multi-disciplinary dialogue by encouraging constructive debate to improve the understanding of the design of American cities and the role of mayors in the design process. It consists of a series of small forums where participation is limited to twenty people: half are mayors and half are urban design experts. Each mayor presents a design problem from his or her city. Each case is analyzed by the mayors and design professionals, who working together, discuss how an appropriate design process can help solve the problem. Until the spring of 1998, there had been four regional institutes and a National Institute. The Southeastern Institute was generally held by Georgia Tech for this period, except for a combined Northeastern and Southeastern Institute in 1997.

LITERATURE REVIEW

Defining urban design and transportation from the researcher's disciplinary background -- urban planning -- serves as a good prelude to the discussion that follows.[2] Contemporary urban design emerged in the 1960s and was born out of a search for quality of urban form (Moudon, 1992). It constitutes the interface of architecture, urban planning, landscape architecture, surveying, property development, environmental management and protection, and a host of other disciplines (Oc and Tiesdell, 1996). This search for quality urban form continues to date, focusing on urban environments that have both functional and aesthetic appeal to those who inhabit them. From an initial predominately aesthetic concern with the distribution of building masses and space between buildings, urban design is now primarily concerned with the quality of the urban public realm, which is both social and physical. Urban design has a "qualitative" and "normative"[3] approach to knowledge.

This qualitative approach is in sharp contrast to the predominant "quantitative" and "substantive" approach[4] in the urban planning sub-field of transportation. The transportation sub-field is primarily concerned with large-scale quantitative modeling and more recently with applications of Geographic Information Systems to modeling (see for example, Ferguson, 1994; Choi and Kim, 1994).[5] Fortunately there are also qualitative, design, and policy oriented studies that explore the relationships between urban design and transportation (see for example, Calthrope, 1993; Robertson 1990, 1993 a, b). This report draws from this second group of studies to develop a typology. Before presenting this literature, it is useful to review the historical relationship between urban design and transportation.

---

2. The planning profession has its roots in landscape architecture, architecture, civil engineering, and social reform. The first planning programs were offered in the early twentieth century from landscape architecture and architecture departments. The first social science-oriented program was started at the University of Chicago in late-1940s. Planning programs grew rapidly in the 1960s, and today the profession is interdisciplinary, drawing from social sciences, architecture, landscape architecture, civil engineering, law, and public administration (for a detailed discussion see, Scott, 1969, Hemmens, 1988, Association of Collegiate Schools of Planning, 1996).

3. "Normative" knowledge emphasizes what should be.

4. "Substantive" knowledge emphasizes what is and why is it so.

5. The quantitative thrust in transportation planning arose from 1960s, when planning schools "abandoned" their traditional thrust on practice and physical planning (broadly defined as land use planning; for detailed discussion on land use planning, see Kaiser, et. al., 1995) in order to gain academic legitimacy within universities (Hemmens, 1988). In addition to the hiring of social scientists, this quest for academic legitimacy led to the hiring of civil engineers, economists, and geographers who introduced quantitative modeling to transportation planning.

The relationship between urban design and transportation dates back to ancient times. City design in the ancient cities of Mesopotamia, Egypt, and India stressed the laying out proper roads and triumphal avenues as a key ingredient for good design. Later, Greeks and Roman stressed the importance of laying out adequate roads as an integral part of city design. In fact, as early as the first century BC, the Roman architect and engineer Vitruvius advised that streets should be laid out to control winds that bring humidity and disease into the city (Southworth and Ben-Joseph, 1997). Subsequently, street design became an integral feature of Roman cities, which had paved streets with elevated sidewalks.

Concern for aesthetics of street design resurfaced during the Renaissance in fifteenth century Europe as architects such as Alberti, Palladio, and Scamozzi stressed the importance of street layout. Leon Batista Alberti (1404-1472), the most influential architect of the time, suggested several guidelines for street design in his classical work, *De Aedificatoria.* According to Alberti, noble and powerful cities should have straight streets that carry an air of majesty and greatness, while small towns and fortifications should have winding streets for defensive and aesthetic purposes. He further suggested that winding streets make the "passenger" discover a new structure, thereby increasing the aesthetics of the town (Southworth and Ben-Joseph, 1997).

The simple geometry of straight streets was aesthetically pleasing to Renaissance architects for its pure form and the potential for dramatic vistas to civic and religious landmarks. As a result, straight streets were superimposed on medieval cities with their existing maze of winding streets. The aesthetic appeal for the grid iron pattern was also exhibited in the Renaissance suburbs built for the new mercantile class during this period. An Italian architect, Andreas Palladio (1518-1580), suggested several guidelines for street designs that would improve the quality of the city. He suggested the segregation of pedestrian from carts and cattle traffic. He also recommended the construction of porticos on both sides of the streets in order to protect the pedestrians from harsh weather. He advised that streets outside the city gates should be lined with trees on either side, with provision for the segregation of pedestrians from carts and cattle traffic (Southworth and Ben-Joseph, 1997).

Grand avenues were a prominent feature of the Baroque city of eighteenth-century Europe (Eisner, Gallion, & Eisner, 1993). Using grand streets to transform and beautify the city was also exhibited in nineteenth century civic designs. For example, Baron Haussmann, a bureaucrat in the city administration of Napoleon III, constructed tree-lined sweeping boulevards in Paris in 1870s to beautify the city (Hall, 1988). Selected by Napoleon III in 1853 to execute a beautification plan for Paris, Haussmann used these sweeping avenues to connect old plazas and create new ones over a period of 17 years (Eisner, Gallion, & Eisner, 1993).

Simple geometric patterns of streets were the key element in early efforts of city design in the seventeenth and eighteenth century United States (Eisner, Gallion, & Eisner, 1993; Levy, 1997; Scott, 1969). Early

U.S. city design consisted of the laying out by early settlers or surveyors of cities (e.g., Williamsburg, Philadelphia, and Savannah) with formal axes, and grid- iron street systems interspersed with squares. A slight variant of this form was the radial plan adopted in such cities as Annapolis. Diagonal avenues and circles were the primary design features of this radial plan. A dramatized version of this plan was that of Washington, DC, which was adopted in 1791and designed by Major Pierre Charles L'Enfant, a young French designer. In the early nineteenth century, many cities (e.g., Buffalo) overlaid radial streets over the grid iron pattern (Eisner, Gallion, & Eisner, 1993).

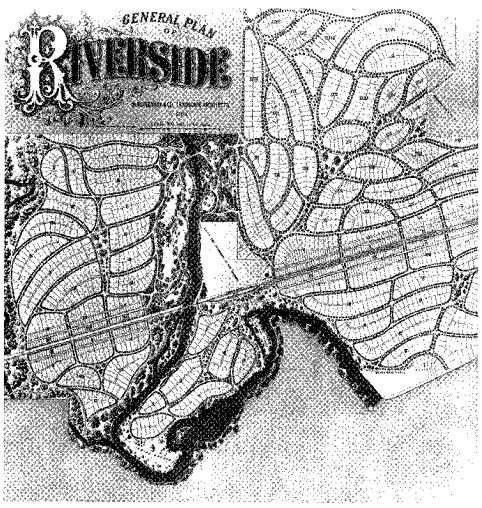
Figure 1: Major Pierre Charles L'Enfant's Plan for Washington D.C.

Source: Eisnel, Gallion and Eisner (1993).

Expansion of the railroad industry from the mid-nineteenth century was not only a major urbanizing force but also brought about a standardized approach to street layout consisting of a rectilinear grid-iron pattern of streets. The pattern's predominance was attributable to that fact that is was easy to survey and lay out. Railroad companies, which were in the business of land development, could easily lay out towns using the standardized grid-iron plan on land given to them by the federal government as an incentive to develop railroads (Southworth and Ben-Joseph, 1997; Weiss, 1987).

Architects and landscape architects in England as well as the United States reacted adversely to this monotonous grid iron pattern by adopting curvilinear patterns in the designs of suburban streets. As

early as 1823, John Nash's design for the English suburb of Park Village avoided the formal eighteenth century pattern of solid streets and squares (Souhworth and Ben-Joseph, 1995). In the United States, Frederick Law Olmstead and Calvert Vaux's 1868 plan for Riverside, Illinois, consisted of curvilinear, tree-lined streets with the absence of sharp corners. Olmstead was in fact a strong critic of the grid-iron pattern, which led him to adopt the curvilinear pattern in design approach. Houses were set back 30 feet from the road to please the eye. The residential roadway had pedestrian walkways on both sides. Trees were planted between the pedestrian path and the roadway as a means to visually separate pedestrian and vehicular traffic.



Olmsted and Vaux finally realized their suburban vision in Riverside, Illinois in 1868. Their design transformed a featureless tract of land into a romantic, picturesque landscape. *(Courtesy of the National Park Service, Frederick Law Olmsted National Historic Site)*

Figure 2: Frederick Law Olmsted and Calvert Vaux's Plan for Riverside Illinois

Source: Southworth and Ben Joseph (1997).

Using grand boulevards was an integral design element of the "city beautiful movement" in the United States at the end of the nineteenth century (Burgess, 1997, Hall, 1988; Hines, 1979). The movement also advocated ordinary street improvements, good paving, street furnishings, and planting in its design agenda (Southworth and Ben-Joseph, 1997).[6]

The garden city movement of the early twentieth century had strong guidelines for street design. Originally conceived by the Englishman Ebenezer Howard, this grand vision called for a system of small,

---

[6]The event that is often considered to be the beginning of the city beautiful movement is the Chicago's World Fair of 1893. The fair was held to commemorate the 400th anniversary of Columbus' voyage to America. Daniel Burnham, an architect, assembled a team of architects and landscape architects and built a number of elegant buildings, sculptures and gardens on the fair's site to show what a city could look like (Hines, 1979). Subsequently, a movement to beautify cities arose all over the United States.

self-sufficient cities surrounded by a greenbelt connected through a good network of transportation systems. Hundreds of communities ranging from early Radburn, New Jersey (begun in late-1920s), to the later day Columbia, Maryland (begun in early-1960s), were influenced by the movement (Burgess, 1997, Hall, 1988).

Radburn was the brainchild of the Regional Planning Association of America (RPAA), which was formed in 1923 by a group of like-minded architects, engineers, economists, and urban critics such as Lewis Mumford, Clarence Stein, Henry Wright, and Clarence Perry (Birch, 1980; Burgess, 1997; Hall, 1988). The unique contribution of Radburn was the separation of the pedestrian and automobile realms. In Radburn, large residential neighborhoods (known as super blocks) were outlined by arterial roads (Girling, 1993). These arterial roads acted as feeders to lanes that ended in cul-de sacs, thereby creating a hierarchy of streets and eliminating unnecessary traffic in residential areas. Pedestrian pathways were an integral part of the plan (Levy, 1997). The segregation of pedestrian and vehicular traffic in the Radburn plan became a salient feature of new towns in the United States ranging from those built in the 1930s to the later day Columbia (Birch, 1980).

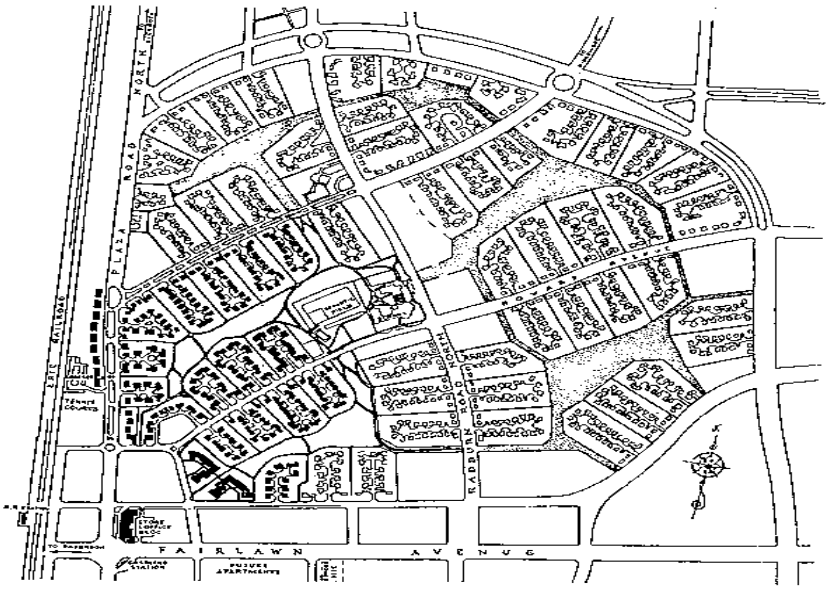


Figure 3: Plan for Radburn, New Jersey.

Source: Calthrope (1993).

During the same time, Clarence Perry presented his now-famous concept of the neighborhood unit, which segregated vehicular and pedestrian traffic and had a hierarchy of streets (Hall, 1988, Levy 1997). The concept was first developed by Perry at a meeting of the American Sociological Association and the

National Community Center Association in 1923, and was further developed in his 1929 Regional Plan for New York.

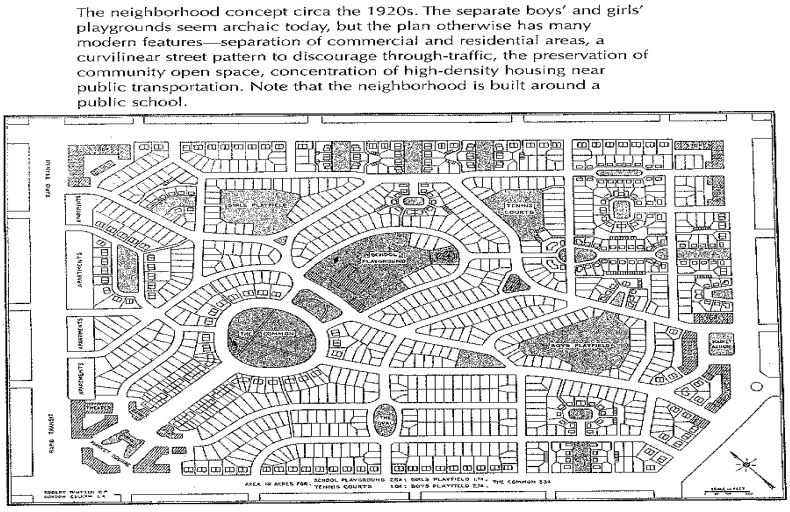


Figure 4: Clarence Perry's Neighborhood Unit.

Source: Levy (1997).

Post World War II planning saw the mundane expansion of the suburban tract development. The importance of the street in the vitality of urban life resurfaced in the 1960s with the work of social scientists such as Jane Jacobs (1961). Urban designers such as Kevin Lynch added to the resurrection of social and symbolic functions of the street during the period (Ellin, 1996). The 1960s and 1970s also saw a wide variety of literature on pedestrian malls (Wolfe, 1962; Contini, 1969; Barmbilla and Longo, 1977; Rubenstein, 1978). However, the interest in this type of research has diminished with the decline in construction of such malls (Robertson, 1990).

The 1980s saw the continuation of publications that dealt with pedestrianization and the role of streets in urban design (Appleyard, 1981; Whyte, 1980, 1988). However, the most influential design paradigm dealing with transportation and urban design in the 1980s and 1990s is the one developed by the "new urbanists" or "neotraditional urbanists" (Calthrope, 1993; Duany and Plater-Zyberk, 1992; Katz, 1994; Kelbaugh, 1989; Krieger, 1991). "New urbanism," or "neotraditional urbanism," emphasizes the pedestrian in designing suburbs. The two most popular variations of the theme are the Traditional Neighborhood Development or District (TND) and the Transit Oriented Development (TOD) or Pedestrian Pockets (PP). The TND is a new development that is designed with an emphasis on pedestrians. Developed by the architectural firm of Andreas Duany and Elizabeth Plater-Zyberk, it is based on the grid of straight streets and boulevards that are lined by buildings grouped by architectural styles. The PP, developed by architect Peter Calthrope, entails the retrofitting of existing suburbs with

new growth areas along with concentrated pedestrian pockets around public transportation hubs. Ideally, PP should be located along strategic points of a regional transit system, such as light rail. PPs are mixed-use communities with an average of a one-fourth mile walking distance to the transit stop.

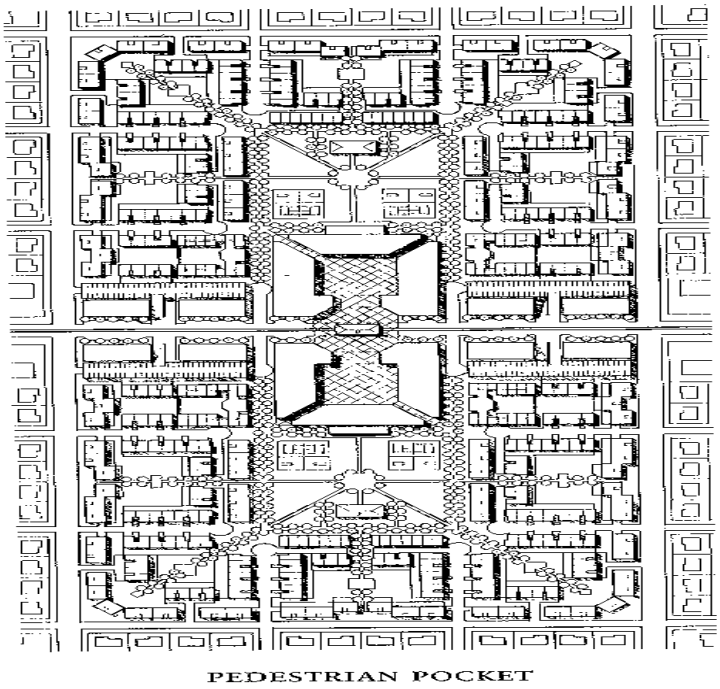


Figure 5: Plan for Pedestrian Pocket.

Source: Calthorpe (1993).

Let us now turn to typologies and policy and design guidelines for transportation-related design problems in urban environments. A review of the literature suggests that there are two salient types of transportation-related design problems associated with cities. These are (a) deterrents to pedestrianization and (b) the effects of automobiles and highways on the urban form. Each of these problems and their possible solutions is discussed below.

In recent times, Roberston **(**1990, 1993a, b) has written widely about pedestrianization in North American cities (also see Whyte, 1988 in this context). Robertson identifies four deterrents to pedestrianization:

1) Low priority given to pedestrian transportation in comparison to the automobile. To cite one example of low priority for pedestrians, traffic lights are generally timed for efficient movements of automobiles, not pedestrians. Given such priorities, the pedestrian usually finds it difficult and dangerous to cross busy streets.

2) Increasing distances between destinations, which makes walking unattractive. Even in relatively dense downtown areas, the vast amount of space devoted to automobiles in the form of parking lots and ramps, deep landscaped setbacks of newly constructed office buildings that occupy entire blocks, and expansion of downtown activities beyond the core act as deterrents to walking.

3) Obstacles found on the sidewalks such as traffic signs, parking meters, traffic signal poles, telephone poles, streetlights, mailboxes, trashcans, and newspaper machines. Such objects not only take up pedestrian space but also keep the pedestrian alert in order to avoid running into them. This makes walking an unpleasant experience.

4) Poor quality of the pedestrian environment. Among other factors, people choose to walk only if the route offers high levels of interests and aesthetics in terms of people, activity, and architecture. Many downtown blocks are dominated by blank walls of modern office buildings, shops with no direct access from sidewalks, parking ramps and lots, and abandoned buildings. These factors prompt the pedestrian to walk by quickly rather than enjoy the walking experience. Often fear of a lack of safety in such environments deters people from walking.

Specific strategies for pedestrianization of downtown areas identified by Robertson include the following: widening of sidewalks, discouraging automobile traffic, climatization of the pedestrian environment, improving safety and security, increasing attractiveness of sidewalks, improving the quality and quantity of sitting spaces, changing zoning ordinances, and segregating pedestrian from vehicular traffic.

Among these strategies, widening of the sidewalks is the simplest one. Policies to discourage traffic could include reducing the number of parking spaces, increasing the cost of parking, and placing more restrictive time limits for parking. Climatization techniques include climate controlled underground concourses, skywalks, heated sidewalks, and covering of sidewalks with canopies. Strategies to improving safety include better lighting and foot patrols by police officers. The attractiveness of the sidewalks can be improved by including colorful storefronts, outdoor exhibits, and attractive landscaping and encouraging kiosks, fruit and vegetable stands, sidewalk cafes, outdoor eating, and artists and street performers. The quality and quantity of sitting spaces can be improved by orienting the seating toward the sun and improving the view from the seating, by facing it towards the heaviest pedestrian flow. In addition to traditional benches, other forms of seating such as moveable chairs, wide ledges, and steps should be encouraged. Mixed-use zoning should be encouraged to promote residential activity in the downtown areas. Zoning changes should also encourage deep setbacks from sidewalks to interrupt continuous streetwalls, which are not conducive to walking. Zoning that requires high parking ratios

should also be discouraged. Underground concourses, underground transit systems, skywalks, and grade level pedestrian malls are the most common methods of segregating pedestrian and vehicular traffic.

As pointed out by Robertson, three types of pedestrian malls have commonly been implemented in the United States. The first type consists of a traditional pedestrian street designed for exclusive pedestrian use. The second type is the shared mall that permits limited automobile use such as one lane of one-way traffic. The third type is the transit mall which accommodates both pedestrian and transit use. A skywalk consists of a network of skybridges over streets, second story corridors within buildings, and various types of activity hubs. Robertson also points out making downtown areas more pedestrian friendly increases the image of the downtown area, which in turn will promote economic vitality, especially for declining downtowns.

The new urbanists have also proposed several pedestrianization strategies (Calthrope, 1993; Moule and Polyzoides, 1994). Although most of these strategies are directed towards pedestrianizing older suburbs or designing new pedestrian-friendly ones, some of the design principles are also applicable to other situations. According to the new urbanists, local streets should be simple, memorable, and direct, avoiding circuitous routes. Any street should always be a part of a street network. Connectedness, continuity, and a formal pattern within this network are essential for pedestrian friendliness. Streets should converge into common visible destinations such as core commercial areas and parks. Wherever possible, streets should frame vistas of public buildings, parks, and natural features. There should be a variety of streets based on pedestrian and vehicular use. New urbanists strongly discourage the use of any particular street for vehicular traffic only. Streets should also allow automobiles, bikes, and pedestrians to make local trips without crossing or following arterial streets by providing multiple and parallel routes between core commercial, residential, and employment areas.

The new urbanists also suggest that architectural character, sidewalks, street trees, and on-street parking could enhance the pedestrian friendliness of the streets. The aesthetically pleasing architectural characteristics of streets include the following: proportionate relationship of building heights to right of ways; variety of scale and space within streets through landscaping; adequate interface of arcades, porches, stoops, stairs, balconies, eaves and cornices, loggias, chimneys, doors, widows, quadrangles, courtyards, and patios to ensure life on the streets; and adequate design block and lot sizes and shapes. Ideally, block dimensions should be between 250 feet to 600 feet and blocks should be square, rectangular, or irregular in shape. Such dimensions and size allow buildings to reach to the edge of blocks, thereby forcing parking away from undesirable locations, such as the sidewalk, to desirable locations such as an underground parking area in the middle of the block or on the street. Lots should also vary in widths to allow for a variety of building types.

Figure 6: Architectural Character, Sidewalks, and On-street Parking Encourage Pedestrian Friendliness. Source: Calthorpe (1993).

Sidewalks providing unobstructed paths of at least five feet should be required on all streets. Wider sidewalks are desirable for commercial areas to accommodate larger volumes of pedestrians and seating. Street trees should be required on all streets and should be placed no further than 30 feet apart in planter strips or tree wells between the curb and the sidewalk. Choice of trees and planting techniques should create a unified image for the street and provide an effective canopy.

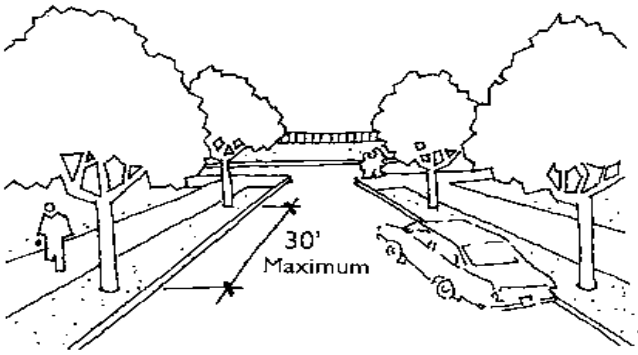


Figure 7: Street Trees should be placed no farther than 30 feet apart in Planter Strips in Tree Wells. Source: Calthorpe (1993).

On-street parking should be encouraged on all streets except arterials. Even redevelopment and infill sites should be retrofitted to provide on street parking and landscaping. Parking garages are acceptable if their ground floor at the sidewalk is for pedestrian-related uses. Absorption of parking and servicing

loads by alleys should be encouraged in order to free up the outer faces of the blocks for pedestrian traffic.

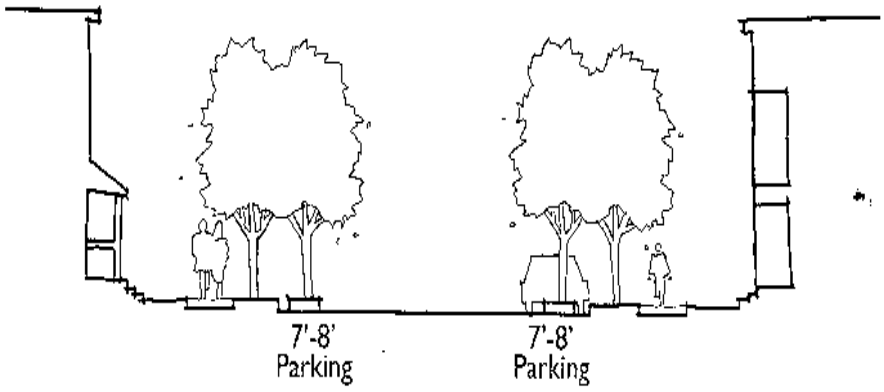


Figure 8: On-Street Parking should be encouraged.

Source: Calthorpe (1993).

Other pedestrianization strategies include minimized block radii to slow vehicles at intersections, landscaped medians to reduce apparent street widths, narrower street widths, two-way streets that improve pedestrian crossing safety, properly designed curbs, and accommodation for the handicapped.

Some of Appleyard's (1981) recommendations for traffic control devices for pedestrianization are still valid today. The devices that can be used outside residential areas include speed limits and narrowing streets; traffic signals and cross walks; street bumps and humps; raised crosswalks and platform intersections; entrance gates; narrowing of streets, traffic circles, and islands; semi-diverters; and diverters. Imposing speed limits is also a simple means of traffic calming. Appropriate use of traffic signals and crosswalks can ensure pedestrian safety at intersections. Speed bumps and humps can be employed as effective traffic calming devices. Rumble materials that make noises or cause vibrations are likely to slow down traffic. Platform intersections and raised crosswalks give the impression that they are pedestrian territory, and hence are likely to slow down the traffic. Entrance gates can create an impression to the motorists that they are entering a community territory and may prompt them to slow down.

Techniques for narrowing street widths include physical reduction of street widths and a corresponding increase of sidewalk areas, promotion of on-street parking, and provision of green strips and trees or play spaces. Traffic circles and islands also provide some reduction of speed. Semi-diverters are physical barriers that permit traffic only in one direction. Diverters are physical devices placed diagonally across

four way intersections to turn them into cul-de-sacs. These can range from temporary barriers such as iron railings, concrete blocks, bollards, and wooden poles to permanent barriers such as parks or landscaped termination to streets.

Figure 9: Raised crosswalk. Source: Appleyard (1981).

Left: Figure 10: Street narrowing technique. Right: Figure 11: Gateway as part of rehabilitated street.
Source of both images: Appleyard (1981).

Figure 12: Traffic Circle. Source: Appleyard (1981).

Figure 13: Temporary Barriers. Source: Appleyard (1981).

Figure 14: Permanent diagonal diverters. Source: Appleyard (1981).

In the context of this report, it is useful to discuss the critiques of the automobile and the highway's effect on the urban form. Although these range from the early "Radburnists" to the later day new urbanists, Lokaitou-Sideris' (1996) and Tranick's (1986) work echoes the major arguments that have been forwarded on the effect of automobiles and freeways on the form and design of American cities.

Lokaitou-Sideris and Tranick argue that American cities have been shaped by the need for automobiles, which have created "cracks" or "lost spaces" in the city. Lokaitou-Sideris (1996) defines "cracks" as gaps in the urban form, residual underdeveloped places that are under-used or deteriorating, physical divides that purposefully or accidentally separate social worlds, and spaces that have been bypassed by development or where new development has created fragmentation. She points out that freeways and highways superimposed on the American city have not only asserted their dominance over the human-made and natural landscape, but also have created numerous cracks by segmenting urban form, dividing urban parts, and creating "gray zones" along their embankments and ramps.

Trancik's "lost spaces" are similar to Lokaitou-Sideris' "cracks." He defines lost spaces as undesirable, ill-defined urban areas that make negative contributions to surroundings or users. Lost spaces fail to connect elements in a coherent way. Trancik, too asserts that the automobile is a major cause of these cracks. He points out that the construction of highways from the 1940s created cracks by isolating neighborhoods, replacing the avenue with the artery, and making the street lose its social meaning as a multipurpose place. Cracks or lost spaces can also be seen along other channels of transportation amenities such as surface parking lots and edges of freeways. Facilities that were abandoned with the advent of the highways such as waterfronts and train yards are also indicators of cracks in the city.

According to Lokaitou-Sideris, (1996), these cracks can be filled by urban design. At the building level, one should consider how the buildings relate to the street, the orientations of entrances, the type and articulation of ground floor uses, the relationship between open and enclosed spaces, and the hierarchy between public, semi-public, and private spaces. She claims that design elements should reinforce bonds of public space to the rest of the urban structure. Public spaces should become connectors rather than buffers between areas. Public spaces should be linked to surrounding districts through block walkways, arcades, paeseos, and through integration of streetscapes. Lost spaces such as empty lots, riverbanks, parking lots, freeway leftover space, and abandoned railroad lines should be reclaimed through urban design.

Trancik's (1986) suggestions about lost spaces are similar. He sees lost spaces as opportunities for design. According to Tranick, we should reclaim these spaces by transforming them into opportunities for redevelopment by integrating such spaces into the historic fabric of the city. Dysfunctional and incompatible public plazas, streets, and parking lots can be transformed into viable open spaces through urban design

TOWARD A TYPOLOGY OF TRANSPORTATION-RELATED URBAN DESIGN PROBLEMS AND SOLUTIONS

The following cities are employed as case studies for this report:

1. Easton, Pennsylvania
2. Greenville, South Carolina
3. Groton, Connecticut
4. Hagerstown, Maryland
5. New Bedford, Massachusetts
6. Newton, Massachusetts
7. Orange, New Jersey
8. Reading, Pennsylvania
9. Wilmington, Delaware
10. York, Pennsylvania

Each case study includes a brief city profile, an overview of transportation-related design problems, and proposed solutions to those problems.

The analysis revealed that pedestrian unfriendliness and cracks or lost spaces are the major transportation-related design problems found in these cities. Many cities have the simultaneous existence of pedestrian unfriendly streets and cracks or lost spaces. Despite the simultaneous existence of cracks, lost spaces, and pedestrian unfriendliness, we can still categorize the design problems of these cities into two broad typologies: 1) problems associated with pedestrian unfriendliness; and 2), problems associated with cracks, lost spaces, and pedestrian unfriendliness. These typologies and their design solutions are discussed below with specific examples from the cities.

Pedestrian Unfriendliness: Problems and Solutions

Greenville, South Carolina

The City of Greenville, South Carolina, is located on the rolling hills between Reedy River Falls and Paris Mountain. According to the 1990 census, the population stood at 58,256 with a median annual household income of $24, 124. In terms of ethnic composition, 62.9% were White, 35.2% Black, 1% Hispanic, and 0.9% of other races.

The preservation and renovation of the ruins of the historic textile mills along Reedy River and the creation of a waterfront park to celebrate the adjacent falls have added a strong tourist attraction for the renewed downtown. In addition, the construction of the $42 million arts entertainment complex next to

the park, called the Peace Center, has made the downtown a popular destination for tourism and cultural activities.

Design Problems

The primary transportation-related design problem of Greenville, South Carolina, is to develop a pedestrian connection from a new sports arena to the downtown area. The sports arena (Bi-Lo Center) holds 17,000 spectators and will host about 132 events a year, including sixty nights of hockey, arena football, circuses, and trade shows. In the recent past, Greenville has striven to enhance existing downtown resources and to add new amenities. Enhancements have included landscaping public spaces, highway improvements, and supporting retail activity on Main Street through economic development. New amenities include the Peace Center, a 2100 seat performing arts center, and the Bi-Lo Center, a sports arena. The pedestrian-unfriendly nature of I-385 (Beattie Street) to the east presents a special concern. Beattie Street is a high-speed road, and this is not a good for environment for pedestrians.

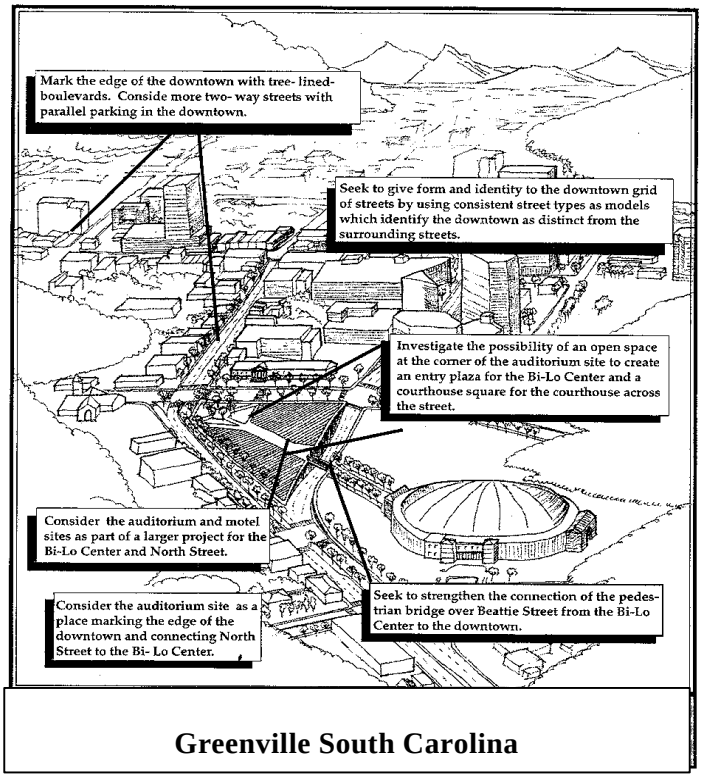


Figure 15: Design Solutions: Greenville South Carolina

Design Solutions

Drawing from the literature on pedestrianization strategies, one can develop specific solutions to create the pedestrian connection from the Bi-Lo Center to the downtown area. The city could seek to strengthen the linkage of the pedestrian bridge over Beattie Street from the Bi-Lo Center to downtown. The city should also consider an expanded lexicon of street types to help give character to the downtown region. Effort should be made to give form and identity to the downtown grid of streets system by using consistent street types as models that will identify the downtown grid as distinct from surrounding streets. Tree-lined boulevards could be used at the edge of the downtown grid to help identify the center from the surrounding streets. Downtown streets, such as North Street, can then be changed from one way traffic streets to two-way traffic streets with parallel parking.

Groton, Connecticut

The City of Groton, Connecticut, has and area of 39.5 square miles and lies at the banks of the Mystic River. According to the 1990 census, the population numbered 45,144 with a median annual household income of $30, 660. In terms of ethnic composition, 92.1.3% were White, 4.4% Black, 2.5% Hispanic, and 1.5% of other races.

The Mystic area's historic port and shipyard and the scenic river vistas draw thousands of visitors from all over the country every year. The area's many colonial and Revolutionary War historic sites and numerous parks and recreational facilities are enjoyed by locals and visitors alike.

Design Problems

The primary transportation-related design problem of the Mystic section of Groton is making the residential area more pedestrian friendly by avoiding parking problems and excess traffic resulting from tourism. The historic Mystic area is located on both the Groton and Stonington banks of the Mystic River. Mystic has developed a substantial tourist trade. Seasonal tourism to the Mystic seaport and other destinations has recently been increased by the opening of the new gaming casino in nearby Ledyard. The desire to enhance tourism and development possibilities for the town is at times in conflict with the wishes of the town's residents. Many are concerned that the increase of tourism is having a detrimental effect on residential districts, particularly during the summer months. Despite this, many merchant and town leaders believe that there is economic potential in catering to the tourist trade. Recent agreements limiting tour buses and tourist parking on residential streets have addressed many of the concerns of the residents.

Issues regarding streetscape, historic preservation, and renovation as well as increased visibility and access to public parking are frequent areas of discussion and concern to residents and business leaders alike. Land on which to build visitor parking lots in the immediate Mystic vicinity is almost non-existent. During high tourist season, the problem is compounded by limited access to privately held public parking areas and extremely narrow pedestrian sidewalks. In addition, the town would like to coordinate land-use planning that is conducive for pedestrians, bicycles, and cars alike.

Design Solutions

In order to avoid the pedestrian-unfriendly environment brought about by tourism, the city could encourage alternative transportation models, such as bicycles and water taxis. It could simultaneously investigate incremental pricing for parking, whereby short-term parking is double or triple the cost of long-term parking downtown. Structured parking in the downtown Mystic area rather than surface lots should be advocated. The possibility of combining the use of the parking garage and public rest rooms could be considered. Since the problem is one of a regional dimension, the city could schedule regular regional planning meetings or roundtable discussions with neighboring communities.

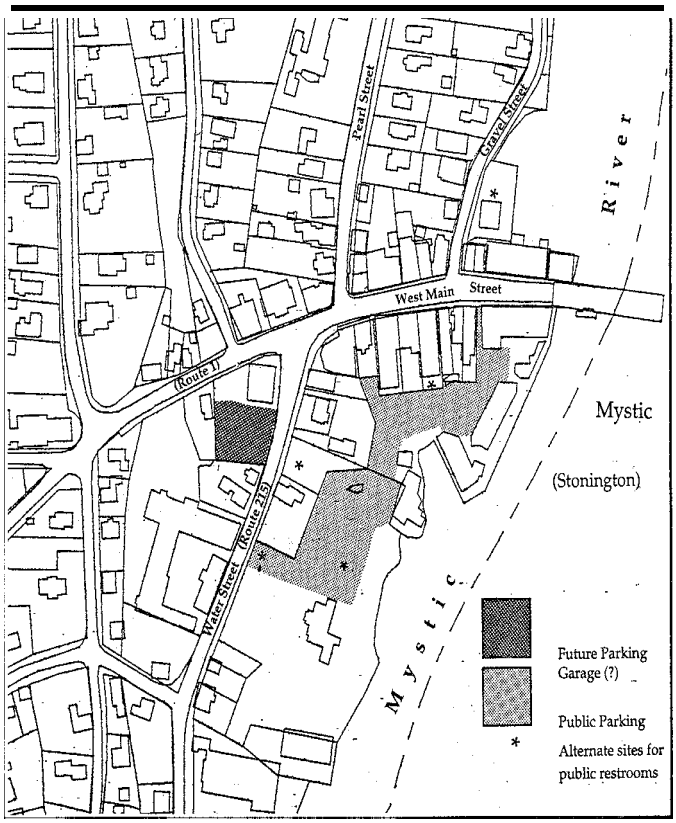


Figure 16: Design Solutions: Groton, Connecticut.

Hagerstown, Maryland

The City of Hagerstown, Maryland has an area of 8.5 square miles. According to the 1990 census, the population stood at 26, 276 with a median annual household income of $34, 003. In terms of ethnic composition, 92.9% were White, 6.0% Black, and 1.1% of other races.

Hagerstown serves as a crossroads for the area, with the intersection of highways I-70 and I-81 occurring southwest of town instead in the downtown Public Square, the original crossroads. The town's population has remained at its early twentieth century level, and the downtown economy has shifted to a reliance on institutional and commercial activity. Major retail has moved to the city's edge and beyond, with power stores along US-40 and the regional mall to the north near the US-60.

The city's center was spared the demolition of the 1960s urban renewal because of a lack of funding. The restoration and redevelopment programs of the 1970s and 1980s, plus the 1988 Comprehensive Development Plan and 1993 Downtown Master Plan, have resulted in the restoration of the historic buildings and facades, adaptive reuse, and careful redevelopment of demolished sites.

Design Problems

The major transportation-related design problem of Hagerstown, Maryland, is pedestrian unfriendliness in the vicinity of Public Square. Located at the city center where Washington Street (US40) and Potomac Street (US60) intersect, the Public Square historically served as the major regional crossroads. The first City Hall, built in the center in the eighteenth century, functioned both as an open-air market and courthouse. Farmers could drive their wagons through the ground floor archways to sell their goods. In 1818, City Hall was rebuilt one block north of the square at Potomac and Franklin Streets, its present location. In the late nineteenth century, the Square featured a central fountain but otherwise it has been left open to traffic, including trolley cars earlier in the twentieth century.

Washington Street was open to two-way traffic until the late 1940s, when it was converted to one-way east thoroughfare. Westward bound US Route 40 traffic was moved to Franklin Street one block north. Subsequently, many of the major downtown streets became one-way in an effort to ease congestion. Potomac Street is one-way south through the downtown area. The Square accommodated curbside parking until it was redesigned in 1976. The new design eliminated curbing and incorporated an arc of bollards to separate sideways from street, a failed solution which was remedied by eliminating bollards and adding trees in the mid-1980s.

The Public Square continues to function as a traffic square for pedestrians and cars, and it is the major transfer point for buses. Interstate trucks, such as 18-wheelers, pass through the Square not only for

local deliveries, but as a shortcut from US I-81 to businesses and suburban shopping centers along US 40 southeast of downtown. The Square consists of four quadrants unified by distinctive brick paving. It also contains a kiosk and fountain, and it is the site of restored buildings housing government offices and retail shops. A bus shelter, police kiosk, and the local branch of Frostburg State University are located at the northwest end of the Square. In the southwest quadrant, there is yet another kiosk and a large planter. This ground area is currently unoccupied. The southeast quadrant has a low wall and stair to accommodate a change in elevation; it also contains a ten-story apartment house with ground floor retail shops. The Square has a lack of curbing (a hazard for both pedestrian and vehicles) and a heavy flow of commercial traffic. These issues have a negative effect on the city's desire to foster a community-oriented city center.

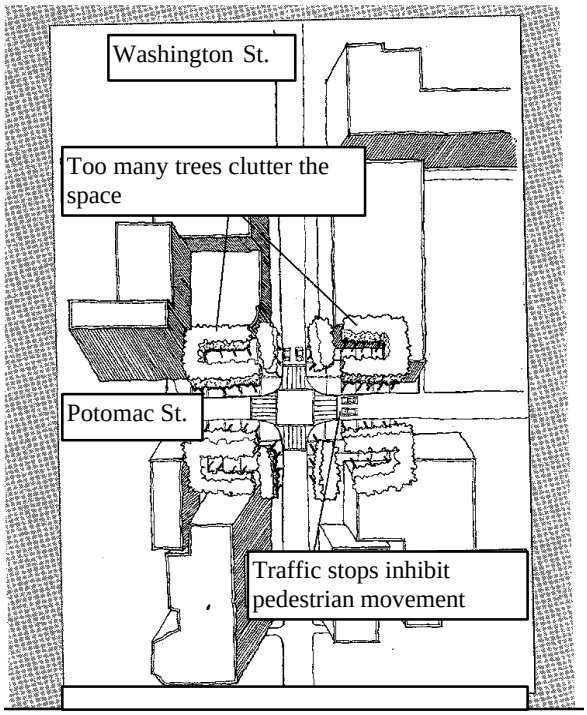


Figure 17: Design Problems: Hagerstown, Maryland.

Design Solutions

It is clear that a high volume of trucks distract from the ambiance of the square. Thus, traffic calming is a design objective. A monument in the space might also help to control traffic. Using different paving textures to signal entry into the space will also help to control traffic. Another simple solution is to pull

the stop line of traffic back to the line of buildings at the edge the public square. Establishing a weight limitation on Washington Street to reduce truck traffic and its related noise would also be helpful. Other pedestrianization strategies include encouraging the continuity of the pedestrian experience through landscaping.

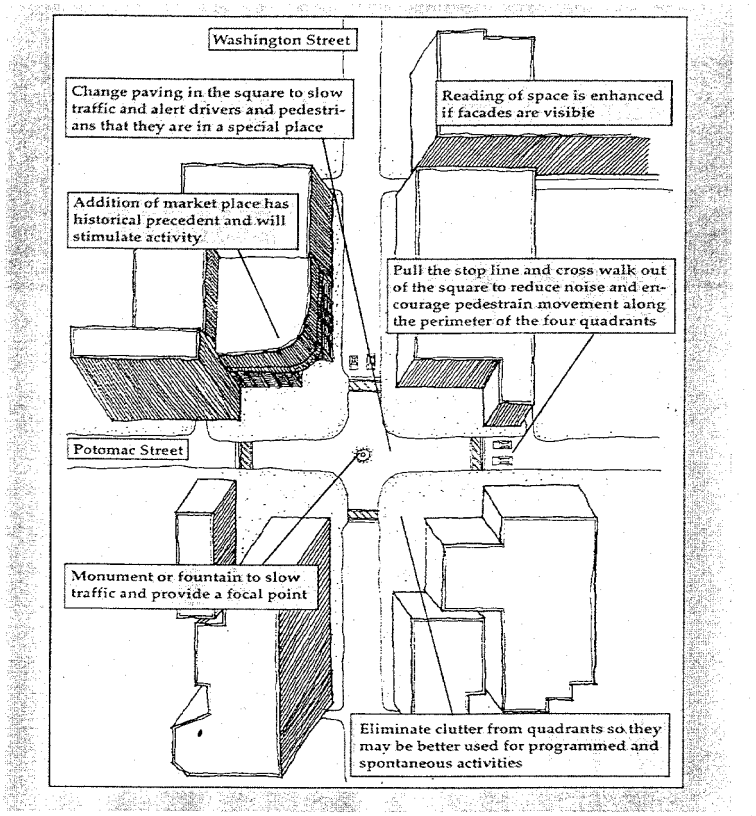


Figure 18: Design Solution: Hagerstown, Maryland.

Cracks, Lost Spaces, and Pedestrian Unfriendliness

Easton, Pennsylvania

The City of Easton, Pennsylvania, has an area of 3.8 square miles and lies at the junction of Lehigh and Delaware Rivers. According to the 1990 census, the city possessed a population of 26,276 and a median annual household income of $26,365. In terms of ethnic composition, 84.3% were White, 9.3% Black, 4.4% Hispanic, and 2% of other races.

Easton's population peaked in the 1950s and had stabilized at about 26,000. Recently the city has aggressively been seeking to revitalize the downtown area by developing tourist attractions such as the Two Rivers Landing Museum and the Crayola Center, both of which have exceeded expectations forecasted for visitors. Attention has been focused upon the Center Square for initial redevelopment activities, one of which is the relocation of City Hall to the Center Square area from a site some distance from downtown

Design Problems

The primary design problem of Easton is pedestrianization of its public square and reclaiming cracks in the downtown. Through most of its history, Easton's economic base has been primarily manufacturing and light industry. Today, the city is trying to regain and maintain vibrancy by capitalizing on its historic past and emphasizing tourism. A showcase Crayola store, the Crayola Factory, a National Canal Museum, and a Visitor Center are already attracting visitors. The museum is located in the heart of downtown at the public square, known as Center Square, and attendance has exceeded all expectations. However, many visitors enter by the rear entrance adjacent to the parking garage, rather than the front entrance, which opens onto Center Square. As a result, the retail spillover to Northhampton Street and the rest of downtown has been less than anticipated.

Part of the visitor absence in the downtown area is attributable to a perceived shortage of parking downtown. In reality, ample parking exists, both on streets as well as in garages. Cracks in the form of vacant storefronts and a perception of decline also contribute to a sense that the downtown is not a place to shop. Although some restaurants and other attractions have opened around Center Square, questions remain concerning how much the new attractions can continue to help reinvigorate downtown Easton and the surrounding region. Deterrents to pedestrianization include the difficulty of crossing to the center of the Square, the speed of automobiles negotiating the space, and also the discontinuity of sidewalks and crosswalks.

Design Solutions

Easton should consider using traffic calming devices such as stone paving to control the flow and speed of traffic around the circle of Center Square. Using similar paving strategies outside Two River Landing to accommodate flexible needs and uses will also be useful. The corner quadrants of Center Square should not be designed solely as parking. Designing them as small paved areas that could be used as parking areas on selected days and other uses on other days can promote pedestrianization. Simple landscaping strategies such as avoiding small, less useful patches of grass and curbing, and making sidewalks consistent in form and material are also likely to promote pedestrianization. To further improve the quality of the pedestrian experience, the city could consider a small kiosk that might help to "launch" visitors to other parts of the downtown area. Other strategies to enliven the area would be to encourage restaurants and stores located around the square to use the adjacent sidewalk as outdoor seating areas.

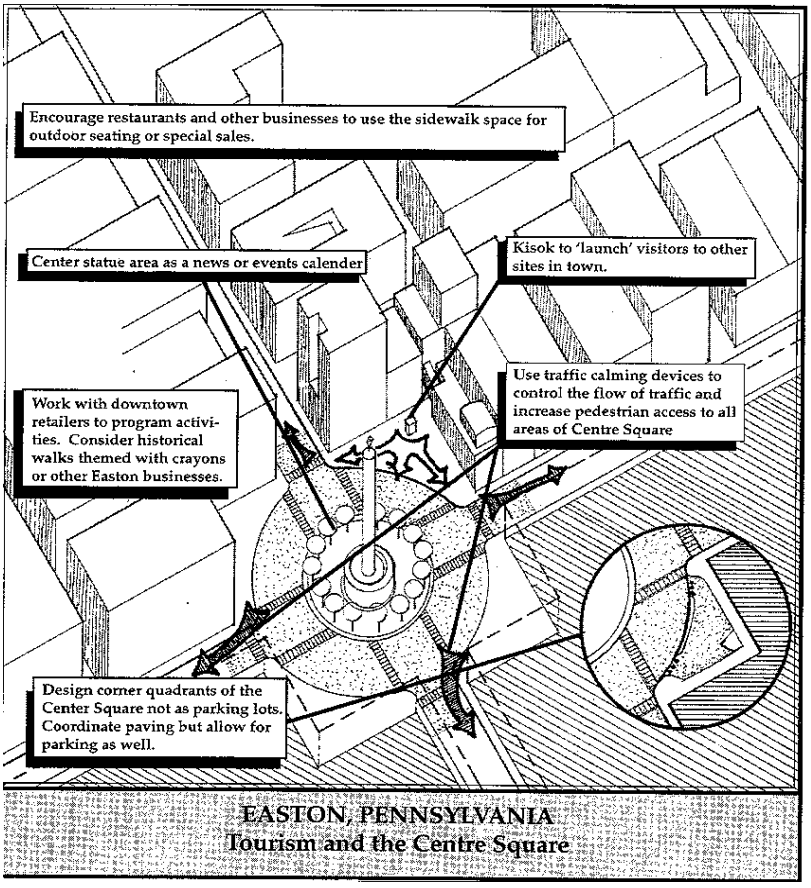


Figure 19: Design Solutions: Easton, Pennsylvania.

New Bedford, Massachusetts

The City of New Bedford, Massachusetts, is 20.14 square miles and is located on the northeastern shore of the Acushnet River. According to the 1990 census, the city possessed a population of 99,922 with a median annual household income of $22,674. In terms of ethnic composition, 84.4% were White, 3.5% Black, 6.7% Hispanic, and 5.4% of other races.

Currently, 74% of New Bedford's economy consists of small businesses. More than 71% of all businesses employ less than 10 employees and less than 2% employ over 100 employees. The services, retail, and apparel production industries employ the majority of the population at low wages.

Textile manufacturing, fishing and port-related activities have provided the region with a diverse economic base. The successful completion of the Waterfront Historic District, combined with the preservation of historically relevant sites, buildings, and streetscape, has helped New Bedford to focus upon its potential as a tourist destination.

Design Problems

The primary design problem of New Bedford, Massachusetts, is to reclaim a crack or lost space by reconnecting the waterfront district with the downtown area. With the success of the Waterfront Historic District, tourism in New Bedford is on the rise. Attractions such as the Whaling Museum and the Custom Houses are places visited by tourists and residents alike. These recent successes in New Bedford have refocused attention on the relationship between the working waterfront and the downtown areas. The recent New Bedford Heritage Park Plan was created to continue the efforts begun by the remaking of the Waterfront District. This plan recognizes the need for the city to re-establish its historic link with the port and continue efforts focused upon New Bedford’s potential for tourism and industry.

Urban renewal efforts of the recent past created a lost space or a crack in the form of a physical rift between New Bedford's downtown and the waterfront. John F. Kennedy Highway, built to connect the downtown area with the neighborhoods and the ferry terminal to Nantucket to the south, has physically separated the waterfront from the town in concept and in detail. Several east-west streets of the historic district currently dead-end into concrete barriers along the edge of John F. Kennedy, and the actual roadbed of the highway is elevated several feet above historic streets. Access across the highway from the downtown areas occurs in two places: on an elevated pedestrian bridge at Rodman Street, and further south at the intersection of Kennedy Highway and Union Street. Pedestrian access to the waterfront is a key to future development of both the historic district and the port area. The Heritage Plan calls for increased visibility of a pedestrian crossing at Union Street with landscaped medians, streetscape patterns, and traffic signals.

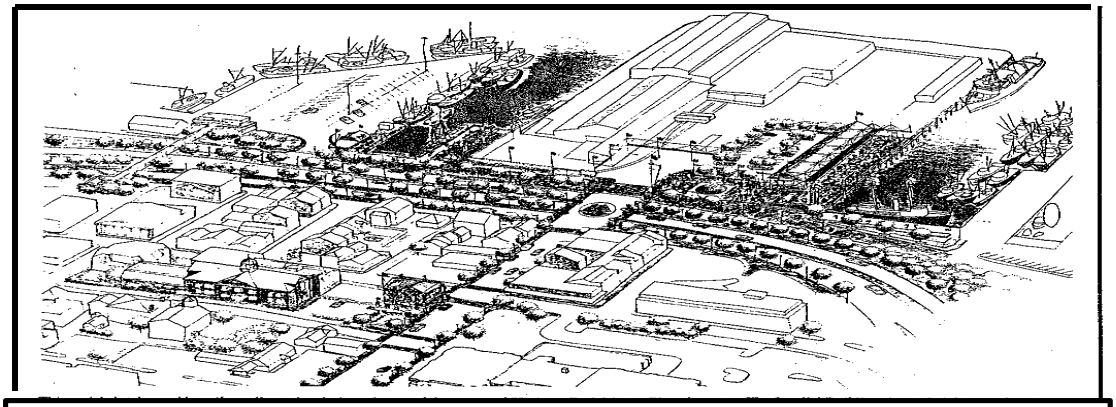


Figure 20: View of Proposed Heritage Park Master Plan, New Bedford, Massachusetts.

Design Solutions

Drawing from the literature on pedestrianization, lost spaces, and cracks, one can develop several specific solutions to reclaim these cracks and make the connection between the waterfront and the downtown area. If elimination of Kennedy Highway is not a possibility, then the city could consider closing the downtown portion of the highway one day a week for street festivals and other public activities connected with the port and the historic district. The city could investigate the incorporation of MacArthur Drive into the new Kennedy Boulevard. Slowing down traffic along Kennedy Highway by decreasing the width of the vehicle right of way and adding a public park or similar landscaped area adjacent to the historic district are desirable. Investigating the possibility of tapering the current two lanes of southbound traffic to one lane on Kennedy Highway from a high-speed highway to an urban boulevard is also highly desirable.

The city could retain the ramp at the North Water Street from Kennedy Highway. This will facilitate easy movement into the historic district and into the adjacent parking garages. The city could investigate the possibility of another at grade crossing with a traffic light for pedestrians at Rodman Street. Facilitating the flow of traffic with timed lights is desirable. The city could also consider the long-range possibility of lowering Kennedy Highway to the same level as the adjacent Front Street. This might make the connection from the water front to the historic district more apparent. In addition, the city should consider the elimination of a large portion of the grade parking on the wharf area and redesign the area with space for programmed activities and pedestrian gatherings. Finally, the city should consider confining automobile traffic to a perimeter drive with parallel parking and an open space in the center of activities.

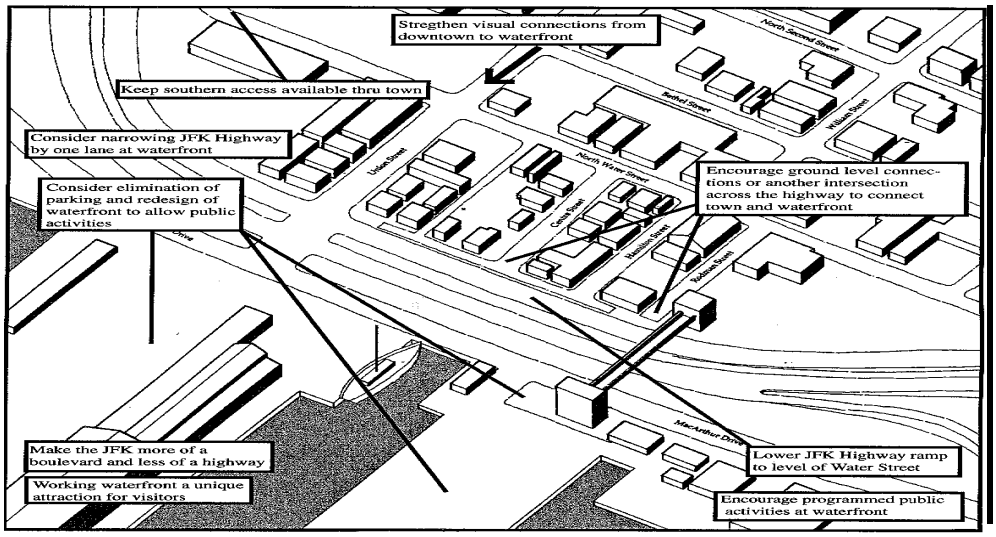


Figure 21: Design Solutions: New Bedford, Massachusetts

Newton, Massachusetts

The City of Newton, Massachusetts, has an area of 18.3 square miles and is located six miles west of Boston. According to the 1990 census, the population stood at 83,983 with a median annual household income of $59,719. In terms of ethnic composition, 90.0% were White, 2.0% Black, and 8.0 % of other races.

Newton is a community of tree-lined streets with single and two-family houses on large, well- landscaped lots. Although recent decades have seen the construction of a significant number of multifamily dwellings, single-family houses continue to dominate. Businesses in Newton are generally small and service-oriented, with the service industry accounting for fifty percent of firms and retail trades for eighteen percent of firms. Newton has become a desirable place to live and work due to its proximity to Boston and to the efficient highway and public transportation systems. Its attractive neighborhoods have maintained high property values, and the residents benefit from a well-run municipal government and a nationally recognized school system. Newton's many parks, bicycle and fitness trails, state of the art library, golf courses, public pool, museum, symphony orchestra, resident group theater, and lake add to its civic amenities.

Design Problems

The major transportation-related design problems facing Newton, Massachusetts, are the cracks and pedestrian unfriendliness of Needham Street. The significant traffic and parking problems in this street are in part attributable to the lack of adequate land-use controls under the pre-1987 manufacturing zoning. The Needham corridor is located in the southeastern part of Newton. The corridor consists of approximately 110 acres made up of nine-two commercial/industrial parcels along a one-mile long section of a State-owned highway. Approximately 300 businesses, in 2.45 million square feet of commercial space, in predominately one-story buildings are found in the corridor. The parcels range in size from .25 acres to 16.6 acres with an average density of 22,000 square feet/acre or a Floor Area Ratio (FAR) of 0.5. Mixed Use 1 zoning along Needham Street allows office use, research and development (R&D) uses, and retail and industrial uses by special permit. Mixed Use 1 makes up eighty-nine percent of the area. Mixed Use 2 zoning, which differs from MU-1, primarily in that retail is permitted without need for a special permit, accounts for eleven percent of the area.

Decades of development along the corridor have resulted in cracks such as inadequate setbacks, excessive curb cut (driveway openings), and conflicting and inefficient land uses. All this has resulted in poor traffic circulation, pedestrian hazards, and a negative impact on adjacent neighborhoods. Recent development pressure has been and will continue to be predominantly retail, which results in high tax-revenues for the city. However, retail is a high traffic generating land use. The city's current efforts to enforce landscaping, signage and setback requirements are evident in a number of recently approved projects on smaller sites.

Design Solutions

Drawing from the literature on reclaiming cracks and lost spaces and pedestrianization strategies, several design solutions can be developed for the Needham Street corridor. For example, streets should connect to other streets, not just to parking lots. Needham Street also needs other street options for traffic. The city could introduce a secondary street system to provide drivers with more options in navigating the area. Additional streets might also allow for the reorganization of curb cuts, which could be placed on the secondary streets to improve the flow of traffic on Needham Street. Reduction of curb cuts and adding streets should be combined with parallel parking.

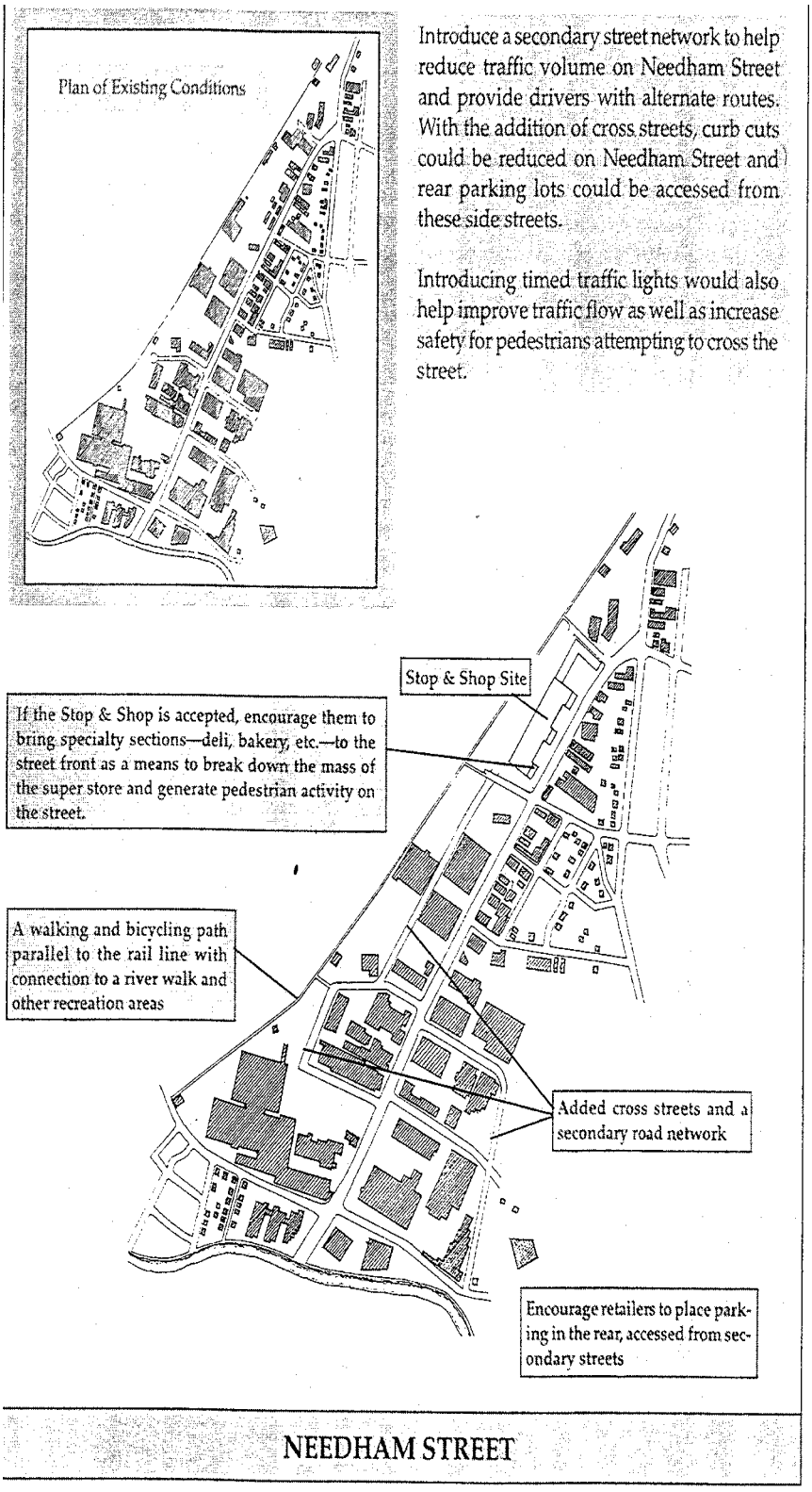


Figure 22: Design Solutions: Newton, Massachusetts.

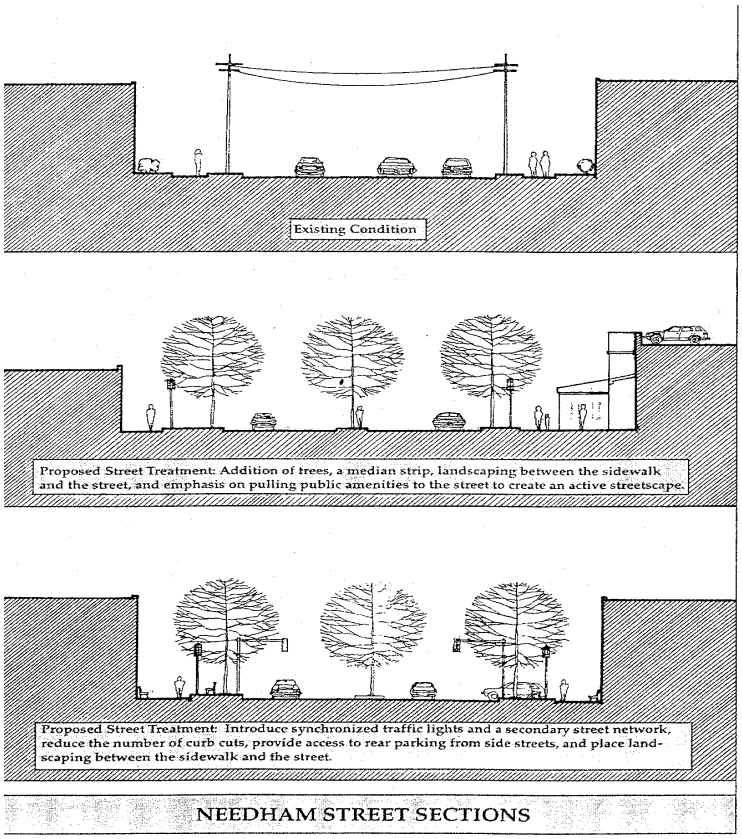


Figure 23: Design Solutions: Newton, Massachusetts.

To make the street more safe and pedestrian friendly, the sidewalks could be pulled away from the street edge. The city should consider introducing a landscape buffer between the sidewalk and the street. This might be something that individual retailers could be asked to do. Timed traffic lights could enhance traffic flow while simultaneously providing pedestrians with safe places to cross the street. Promoting mixed-use zoning can spread out pedestrian activity. A bike trail parallel to the train right-of-way at the rear of the site might be integrated with existing trails in the area, or with the proposed river walk along the Charles. One way to reclaim cracks or lost spaces is to avoid the typical formula of excessive asphalt parking. Mixing uses will reduce traffic trips. Greater density and uses may make structured parking necessary.

Orange, New Jersey

The City of Orange Township, New Jersey, has an area of 2.2 square miles. According to the 1990 census, the population stood at 29,925 with a median annual household income of $34,262. In terms of ethnic composition, 24.0% were White, 70.3% Black, and 5.7% of other races.

Orange is home to a set of thriving retail businesses that attract shoppers from many surrounding communities. The town also boasts of some of the finest eateries and restaurants in the area. The Peppermint Entertainment Complex attracts renowned musical artists from around the country. Orange has a number of noteworthy historical landmarks, including the Orange Public Library and the Military Common. In 1982, Orange citizens voted to change Orange from a city to a township, and its name to the City of Orange Township.

Design Problems

The main transportation-related design problem for the City of Orange Township is a crack or a lost space in the Transit Station and Plaza, located a block away the Main Street. Although the transit station was revitalized recently, the area around it has not received the same attention. In particular, the east and west bound sides of the station are not integrated, except for an underground pedestrian connection. Currently this connection is neither pedestrian friendly nor safe. The station not only offers train service but also provides bus stops and parking.

The City of Orange Township has experienced the ebb and flow of economic conditions. The growth of regional malls, such as Livingston and Willowbrook, has had an adverse impact on local economic opportunities. In addition, the City of Orange Township has been affected by suburban sprawl and a deteriorating housing stock. The main thoroughfare in the city is the Main Street. Along Main Street is a mixture of commercial, institutional, retail, and residential buildings. The width of the street allows for a festive atmosphere where residents and people from neighboring areas come together once a year to celebrate. Main Street has undergone periodic revitalization in the past, but due to increasing vacancies, some of the residential units have become dilapidated, and retail businesses are in economic stress.

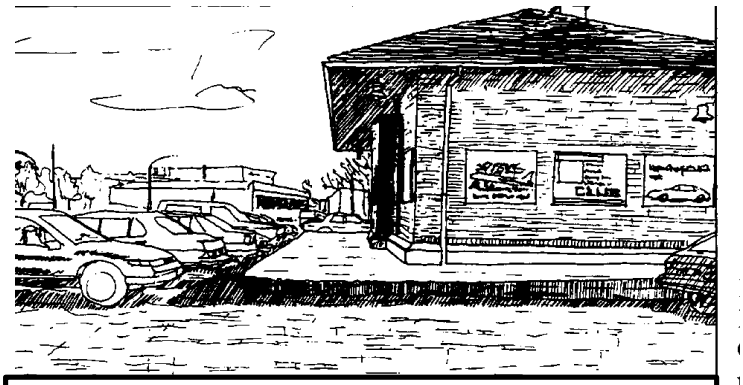


Figure 24: Train station in Orange, New Jersey

Design Solutions

The key to revitalizing the transit station and plaza areas is to explore a strategy that connects Main Street and the train station. One solution would be to bring commercial or retail activity to the station. An attempt should be made to make the plaza more of a destination rather than just a place from which to catch a train. If commuter traffic from the train is insufficient to generate viable retail activity, it will be important to program activities that will enliven the area and supplement existing events and businesses. Public space, retail, and transportation could compliment each other in this area.

Several design-oriented solutions can be employed to make the connection between the Plaza and the Main Street. One should think of the train station building as a landmark and gateway to Main Street. Thus, it is necessary to create a gateway piece on the Main Street to recognize the location of the train station. It is, however, important to maintain an unobstructed view from Main Street into the Plaza in order to provide a visual link into the space and to re-associate it with other important places in Orange. An open arcade could provide shelter to pedestrians during inclement weather as well as contain a variety of coffee shops, newsstands, and other kiosks. The asphalt paving in the plaza should be removed to re-expose the existing cobblestones. The change in material would alert drivers and pedestrians that they are in a special area. Corners are also important detail areas to emphasize for connections from street to train plaza.

Other solutions to reclaiming this lost space are relocating parking to the sides of the station to encourage pedestrian activities, easing of transportation choices in the areas to increase ridership and the use of the station plaza, and improving the signage and information screens on train departure and arrival times.

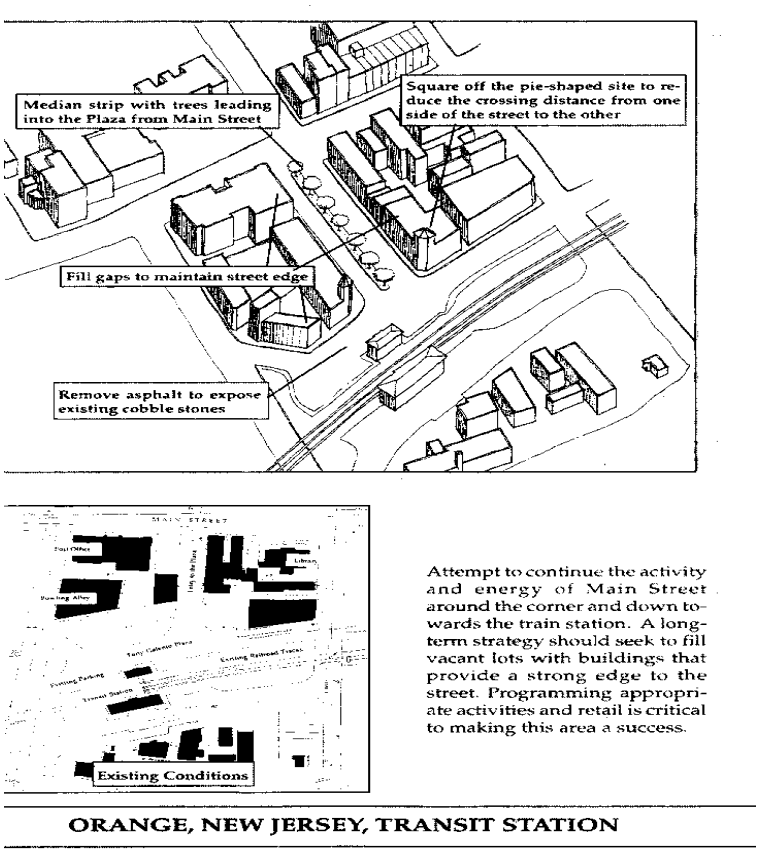


Figure 25: Design Solutions: Orange, New Jersey.

Reading, Pennsylvania

The City of Reading, Pennsylvania, has an area of 9.9 square miles and it is located along the Schylkill River. According to the 1990 census, the city possessed a population of 78,380 with a median annual household income of $32,510. In terms of ethnic composition, 71.6% were White, 8.8% Black, 18.5% Hispanic, and 1.1% of other races.

Located only 55 miles northwest of Center City, Philadelphia, Reading has easy access to the established roads, rail, and air transportation systems of the northeastern corridors. This strategic location affords Reading an opportunity to not only promote its own economic and industrial markets, but also tap the resources of other industrial and agricultural bases throughout the northeast corridor.

Reading's local economy has been growing, with the service sector benefiting most. A recent major expansion of office space in the downtown area of Reading stems from the growth of engineering, finance and insurance operations. Retail factory outlets have also helped to attract more than 12 million shoppers to the area annually. Reading also serves almost 12,000 students with its colleges, university and

technical schools. In addition, several private businesses and special skills and vocational schools offer a varied and flexible curriculum to meet community needs.

Design Problems

The major design problems facing Reading are cracks and lost spaces in the downtown area. The traditional downtown has been unable to draw shoppers who come to the well-known retail outlets on the outskirts of the city. Since these retail shops are not within easy walking distances of Reading's downtown area, they are not connected or associated with the center of the city. Thus, there is a vast amount of "lost space" between the downtown and the outlets. Furthermore, a redevelopment failure of the 1960s and 70s in the central business district has resulted in the proliferation cracks in the form of vacant lots and the general demise of the downtown retail district. Many current projects are revitalizing the downtown area: the renovation and expansion of City Hall, a new Berks County services building, and a facelift for Penn Square and its reopening to traffic. However, the problem of attracting shoppers to downtown still remains.

Design Solutions

The city could use federal funds to establish a public transportation connection between the downtown area and the outlets. The city should also pursue the placement of a transit center adjacent to a proposed civic center. A transit center could have a link via the existing railroad right-of-way to the outlet areas with either a bus or trolley designated for the purpose. However, any transit link from downtown to the outlet area should be as direct and as convenient as possible. The possibility of using the civic center lot for shopper parking should be explored. During the day, parking might be free (or at a reduced rate for up to two hours), and shuttle service from the Penn Street area to the outlets can also be considered.

Wilmington, Delaware

The City of Wilmington, Delaware, has an area of 10.5 square miles and is located within the vicinity of the Brandywine and Christina Rivers. According to the 1990 census, the city's population stood at 71,529 with a median annual household income of $32,510. In terms of ethnic composition, 42.1% were White, 52.4% Black, and 5.5% of other races.

Industry and population expanded in Wilmington throughout the First and Second World Wars but began to decline in the 1960s and 70s. Automobile travel made suburban living more attractive to those who

could afford it, and several areas of the cities were cleared for construction of new highways. In the 1980s, banking, finance, and insurance replaced manufacturing as the leading businesses in Wilmington.

Design Issues

Wilmington's design problems consist of lost spaces or cracks that act as deterrents to revitalization of the lower Market Street district. Once the residential, commercial, and cultural center of early Wilmington, the lower Market Street area is now characterized by cracks consisting of deteriorating buildings and underutilized resources. Lower Market Street is now a Registered Historic District, but its image suffered from building vacancies, demolition for installation of parking lots, and ahistorical renovations of buildings occupied by local businesses.

Although access to the area is easily gained by bus, car, and train, its current appeal is somewhat dampened by the presence of a lost space in the form of a multi-lane Martin Luther King Jr. Boulevard, which feeds directly to Interstate 95, and an elevated Amtrak train viaduct. Both of these elements physically divide Lower Market Street from the open waterfront to the south of Christina River.

The city has recently renovated the streetscape of Market Street from Third to Fourth Streets with new streetlights, new paving materials installed in both street and sidewalk surfaces, and buried utilities. Located nearby and to the west of Market Street is Delaware Technical Community College. To the south of the Amtrak viaduct, a new retail and entertainment project called Riverview Plaza has been proposed. The proposed project would include several levels of structured parking and a multi-theater movie complex. Adjacent to the project area is the historic Pennsylvania Railroad Train Station. To the west is the Delaware Project for the Arts and several renovated warehouses now serving as office buildings. This new project would utilize a currently vacant site that is bordered by the Christina River to the south, the Amtrak viaduct on the north, the modern Amtrak train station at the east, and the Market Street bridge on the west.

Figure 26 (left): Train Station in Wilmington. Figure 27 (right): Looking south on Martin Luther King Blvd.

Photos by Z. Howard

Figure 28 (top left): Entrance to Riverfront Park next to the Wilmington Train Station. Figure 29 (top right): A View from inside the Riverfront Park.

Photos by Z. Howard

Figure 30 (top left): Looking from inside Riverfront Park at the Pennsylvania Building connected to the Wilmington Train Station. Figure 31(top right): A view looking west toward the Station Viaduct.

Design Solutions

Development along the waterfront could help retrieve this area. The city could try to develop a long-range planning effort to redesign M. L. King Jr. Boulevard to accommodate pedestrian traffic. The traffic pattern should be redesigned to avoid high-speed ramps that allow traffic to travel at a rate of speed unsafe for downtown areas. Large turning radii, which lengthen the time required for pedestrians to cross the street, should be avoided. The consideration of a continuous recreational amenity, such as a bike trail, along the river's edge would be useful. In the downtown area, the city could consider the use of building height limitations that would encourage smaller scale development and avoid the need for larger surface parking lots.

Market Street should be seen as a connector stretching between the two rivers, and the city should continue to pursue efforts to preserve the historic architecture of lower Market Street and seek its revitalization. An overview such as this might broaden the conception of what constitutes the downtown of Wilmington and help to underscore the importance of the Christina Riverfront. Other connections from outlying areas could be studied. These access routes could be maintained by the introduction of pedestrian paths or bicycle paths. Low-rise residential complexes could be considered for the waterfront with pedestrian paths and other active and passive public activities along the river's edge.

York, Pennsylvania

The City of York, Pennsylvania, has an area of 5.8 square miles and it is located west of the Susquehanna River. According to the 1990 census, the city's population stood at 42,192 with a median annual household income of $21,812. In terms of ethnic composition, 71.1% were White, 20.7% Black, 7.1% Hispanic, and 1.1% of other races.

As an early manufacturing center, York owes much of its growth and development to its industrial heritage. Like many cities of similar size, the city experienced a surge of expansion after the Second World War. However, later suburban developments shifted a large portion of the population out of the older, central neighborhoods. As the result, York's downtown retail district experienced a sharp decrease in the availability of shopping venues.

In 1972, Hurricane Agnes brought a disastrous flood, which encouraged people to consider the reuse of the town's historic houses. A year later, the York Planning Department completed a preservation plan for the downtown. By the 1980s many families were moving back to the city. Today, the Main Street in York is attracting business to the downtown and assisting local business owners, demonstrating the city's continuing capacity to adapt to changing social, economic, and political climates.

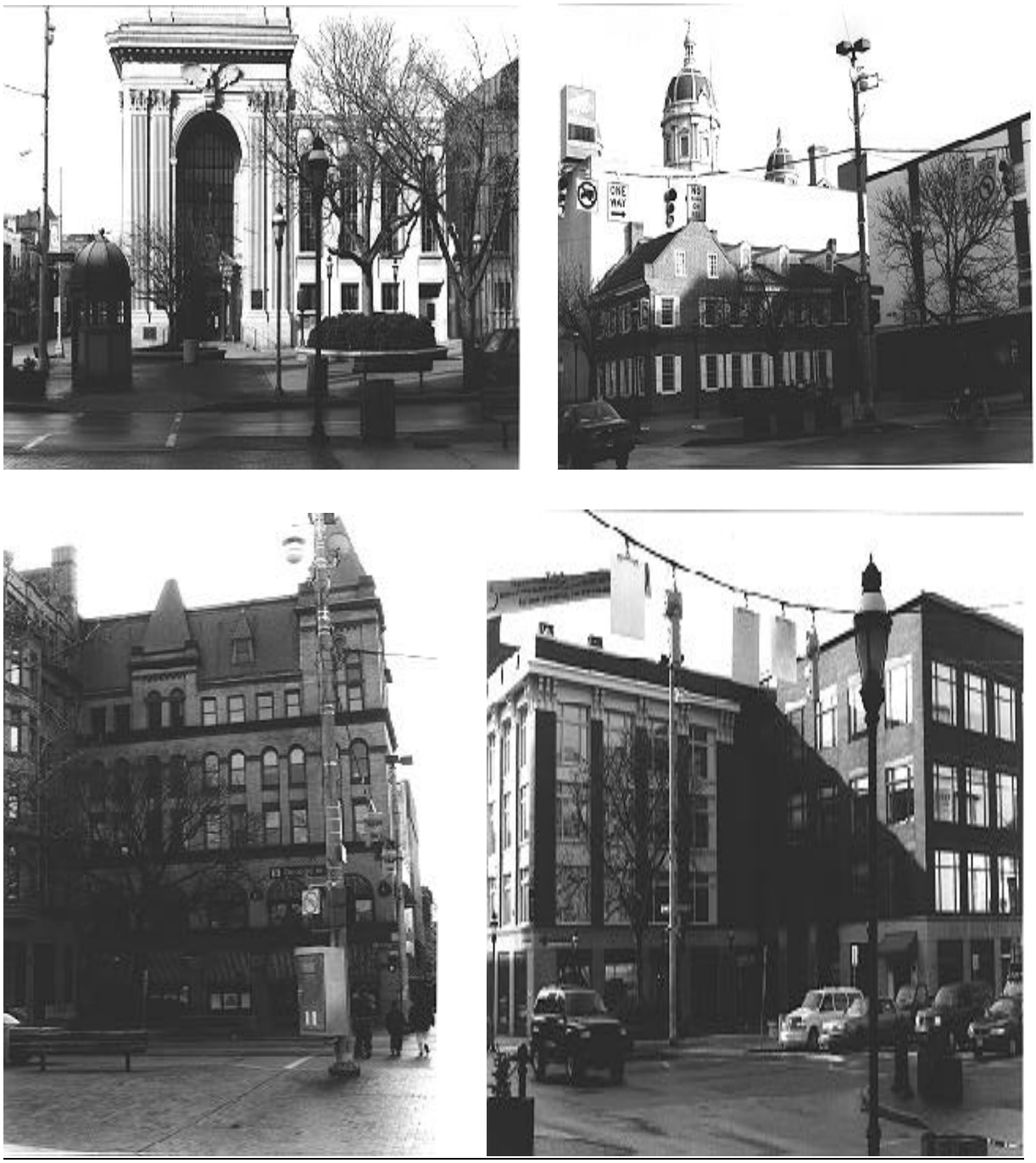
Design Issues

The major transportation-related design issue facing York are car cracks, lost spaces, and pedestrian unfriendliness of its main street, known as George Street. Like many cities of its size, the City of York saw the appearance of cracks in its downtown area from the 1950s through 1975. Department stores closed and businesses moved to the suburbs followed by downtown residents. From the mid-1970s through the early 1980s, significant revitalization efforts resulted in the revitalization of portions of the center city.

In the last few years, attention has turned to George Street. A one-way street over most of its length, George Street has a mixture of houses to the south of College Street and businesses to the north. The businesses on George Street include an auto parts store, drug stores, beauty parlors, barbershops, and dry cleaners mixed with a few upscale clothing and antique stores in the immediate downtown area. A modest streetscape effort was done in May 1995. Several cracks such as old abandoned buildings have been renovated, and a segment of Victorian row homes has been renovated into moderate-income rental units.

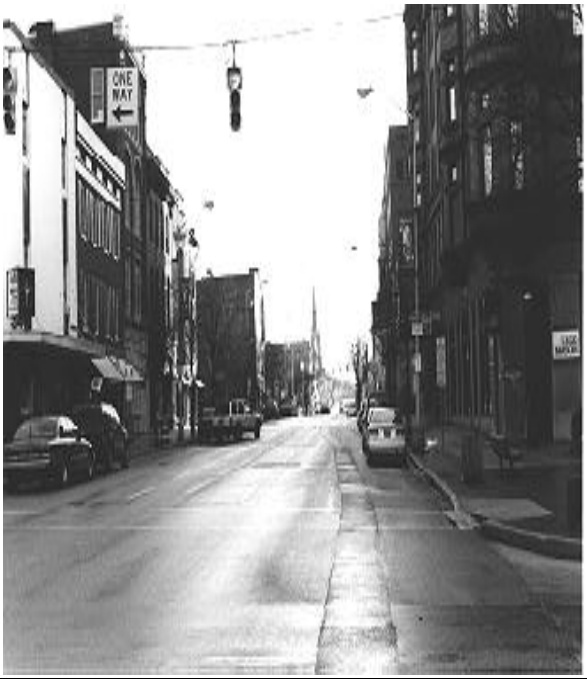
Despite these efforts, George Street does not yet have a vibrant feel. One of the deterrents to pedestrianization are new, lost spaces in the form of commercial-strip style buildings which are set back

from the street behind parking lots. In addition, the one-way street pattern results in several sections of five-lane wide one-way traffic that makes the street pedestrian unfriendly.



Photos by Z. Howard

Figure 32 (top left): The Northeast corner at George Street and Market. Figure 33 (top right): The Southeast corner of George and Market. Figure 34 (bottom left): Southwest corner. Figure 35 (bottom right): Northwest corner.



Photos by Z. Howard

Figure 36 (top right): A view looking north along George Street from Market St. Figure 37 (top right): A view looking south along George form Market St.. Figure 38 (bottom left): A view looking east along Market. Figure 39 (bottom right): An old colonial structure stands at one corner which helps create a sense of history and mixture of architectural periods, the old with the new.

Design Solutions

Varying scale and space within George Street through appropriate landscaping could enhance its pedestrian friendliness and attractiveness. Since the street passes through several different neighborhoods, one should study the design of the street as it relates to the respective neighborhoods and their different activities. A uniform treatment of the street may not appropriately reflect its varied character.

Trees can be planted as appropriate to reflect the changing character of the street. For example, trees may be better suited to the residential zone than the commercial. Other landscaping strategies such medians and plants within the street in selected areas will not only create special places along the street, but also slow down the traffic. “Broken” medians might work in conjunction with other markers to provide a sense of progression into the heart of York.

Simple pedestrianization strategies such as changing to two-way traffic, creating “bulb-outs” or changing materials at traffic intersections, minimizing left turn lanes, and widening sidewalks can be employed. The safety of pedestrians at crossings should be ensured through proper use of signage and signalization. For facilitating pedestrian crossings at mid bloc, raised or mounted pedestrian islands can be employed. The quality of the walking experience can be further improved by intermittently placing benches against the buildings so people can sit and enjoy watching the active street life. The city could also manage loading times for businesses and consider traffic-management strategies to accommodate rush hour traffic. Consideration may be given to establishing a plan to make alleys accessible to service vehicles within the next twenty to thirty years.

CONCLUSIONS

The literature review for this report suggested typologies of transportation-related design problems relevant to the cities that were studied. Pedestrian unfriendliness and cracks or lost spaces are the major transportation-related design problems found in these cities. Many cities have the simultaneous existence of pedestrian-unfriendly streets and cracks or lost spaces. Despite the simultaneous existence of cracks, lost spaces, and pedestrian unfriendliness, we can still categorize the design problems of these cities into two broad typologies:

1) problems associated with pedestrian unfriendliness and;

2) problems associated with cracks, lost spaces, and pedestrian unfriendliness.

Drawing from the literature on pedestrianization, cracks, and lost spaces, we proposed specific solutions to the problems in these cities. To generalize the solutions we developed, strategies for pedestrianization include the following:

- widening of sidewalks,
- discouraging automobile traffic,
- improving safety and security,
- increasing attractiveness of sidewalks,
- improving the quality and quantity of sitting spaces,
- changing zoning ordinances to promote mixed uses,
- segregating pedestrian from vehicular traffic,
- adequate landscaping,
- promotion of on-street parking, and
- improving the architectural character of the street.

Generalized traffic control devices for pedestrianization include reducing speed limits, narrowing streets, increasing the number of traffic signals and cross walks, installing entrance gates, changing paving materials, and promoting street parking.

In general, cracks and lost spaces can be reclaimed by design elements that reinforce bonds of public space to the rest of the urban structure. Public spaces should become connectors rather than buffers between areas. Public spaces should be linked to surrounding districts through block walkways, arcades, and through integration of streetscape. Lost spaces such as empty lots, river banks, parking lots, leftover freeway space, and abandoned railroad lines should be reclaimed by infilling such spaces into the historic fabric of the city.

REFERENCES

Appleyard, D. (1981). Livable Streets: Burkely: University of California Press.

Association of Collegiate Schools of Planning (ACSP). (1996). *Guide to Graduate Education in Urban and Regional Planning* (Tenth Edition). Chicago: ACSP.

Barmbilla, R. and G. Longo. (1977). For Pedestrians Only: Planning, Design, and Management for Traffic Free Zones. New York: Whitney Library of Design.

Birch, E. L. (1980). Radburn and the American Planning Movement: The Persistence of An Idea. *Journal of the American Planning Association* 66(4): 424-439.

Burgess, P. (1997). The Expert's Vision: The Role of Design in the Historical Development of City Planning. *Journal of Architectural and Planning Research* 14 (2): 91-106.

Calthrope, P. (1993). The Next American Metropolis: Ecology, Community and the American Dream. New York: Princeton Architectural Press.

Choi, K., and Kim, T. J. (1994). Integrating Transportation Planning Models with GIS: Issues and prospects." *Journal of Planning Education and Research* 13, 199-207.

Contini, E. (1969). Anatomy of the Mall. *Journal of the American Institute of Architects* 51: 42-50.

Duanny, A. and Plater-Zybak, E. (1992). The Second Coming of the American Small Town. *Wilson Quarterly* (Winter):19-48.

Eisner, S., A. Gallion, and S. Eisner. (1993). The Urban Pattern. (Sixth Edition). New York: Van Nostrand Reinhold.

Ellin, N. (1996). Post Modern Urbanism. Cambridge, MA: Blackwell Publishers.

Furguson, E. (1994). Introduction. Symposium: Recent advances in urban transportation planning methods, models, and research techniques." *Journal of Planning Education and Research* 13, 185-188.

Girling, C. (1993). The Pedestrian Pocket: Reorienting Radburn. *Landscape Journal* 12(1): 40-50.

Hall, P. (1988). Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century. Oxford: Basil Blackwell.

Hemmens, G. C. (1988). "Thirty years of Planning Education." *Journal of Planning Education and Research* 7, 85-91.

Hines, T. S. (1979). Burnham of Chicago: Architect and Planner. Chicago: University of Chicago Press.

Jacobs, J. (1961). The Death and Life of Great American Cities: The Failure of Town Planning. New York: Vintage.

Kaiser, E. J., Godschalk, and D. R. and F. Stuart Chapin Jr. (1995). *Urban Land Use Planning*. Urbana: University of Illinois Press.

Katz, P. (ed). (1994). The New Urbanism: Towards an Architecture of Community. New York: McGraw Hill.

Kelbaugh, D. (ed). (1989). The Pedestrian Pocket Book: A New Suburban Strategy. New York: Princeton Architectural Press.

Kreiger, A. (ed). (1991). Andreas Dunay and Elizabeth Plater-Zybak: Towns and Town-making Principles. New York: Rizzoli.

Levy, J. M. (1997). Contemporary Urban Planning. (Fourth Edition). New Jersey: Prentice Hall.

Loukaitou-Sideris, A. (1996). Cracks in the City: Addressing the Constraints and Potentials of Urban Design. *Journal of Urban Design* 1 (1): 91-103.

Moudon, A. V. (1992). "A Catholic Approach to Organizing What Urban Designers Should Know." *Journal of Planning Literature* 14: 123-133.

Moule, E. and Polyzoides, S. (1994). The Street, the Block, and the Building. Katz, P. (ed). The New Urbanism: Towards an Architecture of Community. New York: McGraw Hill.

Oc, T. and Tiesdell, S. (1996). "Editorial: Re-emergent Urban Design." *Journal of Urban Design* 1, 5-6.

Robertson, K. A. (1990). The Status of Pedestrian Malls in American Downtown. *Urban Affairs Quarterly* 26(2): 250-273.

Robertson, K. A. (1993 a). Pedestrians and the American Downtown. *Third World Planning Review* 64(3): 273-286.

Robertson, K. A. (1993 b). Pedestrianization Strategies for Downtown Planners: Skywalks versus Pedestrian Malls. *Journal of American Planning Association* 59(3): 361-370.

Rubenstein, H. (1978). Central City Malls. New York: John Wiley.

Scott, M. (1969). *American City Planning Since 1890*. Berkeley: University of California Press.

Southworth, M. and Ben-Joseph E. (1997). Streets and the Shaping of Towns and Cities. New York: McGraw Hill.

Trancik, R. (1986). Finding Lost Space: Theories of Urban Design. New York: Van Nostrand Reinhold Company.

Weiss, M. (1987). The Rise of the Community Builders. New York: Columbia University Press

Whyte, W. H. (1988). City: Rediscovering the Center. New York: Doubleday.

Wolfe, M. R. (1962). Shopping Streets and Pedestrian Rediscovered: *Journal of the American Institute of Architects* 37: 33-42.