Considering the Pedestrian

Site Planning in the Suburbs

STEVEN A. SMITH

The following is the first in a series of articles that are based on the findings of National Cooperative Highway Research Program Project 20-19(2), Pedestrian Convenience and Safety on Suburban and Rural Highways. The objectives of the project were to develop a planning and implementation methodology to assist planners, designers, decision makers, and the public in providing convenient and safe pedestrian movement for suburban areas having a heavy traffic corridor with adjacent pedestrian magnets, and for rural areas that are in transition to suburban areas. The final report from the project was published in two volumes, NCHRP Report 294A *and* NCHRP Report 294B, *in June 1987.*

Following completion of the research, the NCHRP panel guiding the project determined a need to further disseminate the findings to a wider audience through preparation of a series of short articles for various periodicals, a training course, and a video. Two more articles in this series will appear in future issues of TR News.

During the past four decades the American population has shifted from urban centers to more dispersed settings in suburban and rural areas, resulting in growing traffic volumes and a substantial increase in dependence on the automobile. At the same time, renewed interest in physical fitness and greater appreciation of aesthetics and the environment have encouraged more walking, jogging, and bicycling throughout the United States. These trends are incompatible.

Steven A. Smith is Associate Vice President, JHK & Associates, Riverside, California.

Walking, however healthy a pursuit, is not likely to become the predominant mode for suburban and rural trip making, but it should be recognized that some people want to walk, others must walk, and more are likely to be walking in the future. Unfortunately, the pedestrian has usually gone unnoticed as urban areas have developed.

The challenge is to make land development and transportation systems more sensitive to pedestrian needs. This involves not only building sidewalks but determining how land uses can be arranged to facilitate and promote the walking trip. It means thinking about the small things that make a place conducive to walking. It means taking a pragmatic approach to the role of walking in daily life, recognizing that the automobile, or some form of personal vehicle, is with us to stay. Opportunities for pedestrian, bicycle, and transit linkages should not be forgotten. Pedestrian needs can often be treated quickly and simply, sometimes at little or no cost. Site planning is one of the major planning and design activities that shape suburban communities. The pedestrian should be an integral design factor in site planning, from the initial concept through the final drawings. This is the definition of "pedestrian-sensitive" site planning—treating the pedestrian not as an afterthought but as a natural part of the whole site-planning process.

The pedestrian must be considered in all situations. Examples of how this could be accomplished for three common land areas—residential development, shopping centers, and mixed-use development—are presented. Principles used for the other development types can be found in discussions by Smith et al. (*1*).

Residential Development

Residential development consumes the major part of suburban land area and is where much of suburban walking takes place, primarily for school and recreation purposes.

Street Width

Street width and configuration have much to do with the pedestrian orientation of a residential area (or lack thereof). Wide, straight streets with long blocks encourage high-speed vehicular traffic. The Dutch "Woonerf" design, which limits the space available for the automobile and restricts its movement, has often been cited as a model pedestrian-oriented residential street concept, but a simple, narrow street design can be nearly as effective. The pedestrian orientation can be enhanced through use of the minimum-width street to serve the anticipated traffic volume. For residential areas, this means greater widths for collector streets (usually two moving traffic lanes and two parking lanes), and lesser widths for local streets. The report, *Residential Streets: Objectives, Principles, and Design Considerations*, provides guidelines on the selection of residential street widths (2). These street widths are appropriate for the functional classes of local and collector streets, and can accommodate most snow-clearing operations. Locations that receive heavy snows may require slightly wider streets. Contrary to much of the thinking of the past, however, wider does not mean better for residential streets. Keeping street widths under control is one of the keys to creating livable residential areas. Wide streets not only penalize the pedestrian through longer crossing times and higher vehicular speeds, but also add unnecessarily to the cost of development.

Block Length

Reduced block length for local streets can also be used to control speeds and reduce point-to-point walking distances. The only negative feature is the slight reduction in the yield of residential units and greater devotion of land area to pavement. Care must also be taken to avoid the "maze effect," which makes direction finding difficult. Where blocks are long, pedestrian paths through the middle of blocks ("cut throughs") should be considered and can be required in subdivision regulations. When curvilinear streets are provided, intersections and pedestrian crossing points should be located on straight, not curved, sections, which provide for ample visibility of pedestrians.

Walkways

Although a shoulder can serve as an adequate walkway for low-density residential development, a delineated walkway along the road edge is preferable for pedestrian safety and comfort. Experience has shown that pedestrian accidents are about twice as likely to occur on road sections without sidewalks as on those with sidewalks.

The argument is sometimes made that the omission of sidewalks helps maintain the rural character of an area. Although the latter may be a worthy design objective, it can often be achieved through use of a winding asphalt pathway in place of the traditional curb, gutter, median, and sidewalk. The pathway can be placed outside the ditch line, with an easement to cover possible width beyond allowable roadway right-of-way. Winding asphalt pathways 4 feet wide are quite adequate to serve pedestrian needs in such settings and blend readily into the rural character. Wider pathways are desirable in areas in which bicycle traffic is also anticipated.

An internal pathway system, placed toward the rear of residences, is an attractive amenity for resident recreation but does not eliminate the need for sidewalks on the street right-of-way. A separated system intended primarily for resident recreation is generally inadequate to serve utilitarian trips, unless it uses the most direct routes between magnets. This has been verified in new communities, such as Columbia, Maryland, and Chesterbrook, near Philadelphia. Residents of these communities indicated a desire for more sidewalks, especially along the major roads. Worn footpaths along the road edge in some areas attest to this need.

Other Planning and Design Principles

In pedestrian-sensitive site planning, it is also necessary to consider the following:

- To the extent possible, visibility should be maintained between the pathway and the residences or roadways for security reasons.
- The pathway system should be in place before any residents move in because residents may object to having the pathways constructed after they settle into their homes.
- To reduce costs, the natural features of the site can be used to plan a recreational walkway system. Joint drainage-pedestrian easements were employed in Brandermill (a planned unit development near Richmond, Virginia) to minimize costs. This included several tunnels that served the dual purpose of drainage (only needed at flood level) and grade-separated pedestrian crossings.
- Utilitarian paths should be addressed separately from recreational pathways by determining the most direct paths between origin and destination. Links between schools, libraries, parks, and neighborhood shopping centers should be given serious consideration in the layout of the residential area.
- Pedestrian connections should be made through the middle of long blocks and at the ends of culs-de-sac. More room can usually be provided between homes to give a sense of separation. Occasionally, the extra width can be provided in conjunction with drainage or utility easements to minimize costs. The American Planning Association document *Model Subdivision Regulations* (3) contains language for inclusion of mid-block and cul-de-sac connections in local subdivision regulations.

Suburban Shopping Centers

Suburban shopping centers have been among the most visible outgrowths of an automobile-oriented society. Although on one hand the shopping mall affords an almost ideal, climate-controlled pedestrian environment, pedestrian connections from the periphery of the site are often ignored

Cost of underpasses was reduced in Brandermill, near Richmond, Virginia, by planning pathways in conjunction with flood-level drainage.

or considered only as an afterthought. Although many other physical and financial considerations drive shopping center development decisions, pedestrian access is a more important design element than is usually acknowledged. This concern is becoming more widely recognized as outparcel office development springs up around the centers and there is more potential for generating pedestrian trips from the site periphery.

Approximately 2 percent of trips made to a regional mall are typically walk trips. Smaller neighborhood or community centers generate 2 to 8 percent of arrivals by foot, but 15 to 20 percent have been noted in some cases. Retail sites in suburban activity centers receive a much larger walking percentage, indicating the importance of compact mixed use in the promotion of pedestrian travel. Several principles for pedestrian-sensitive planning for shopping centers are summarized in this section. These can apply to both the regional shopping mall and smaller shopping centers.

Locating Linkages

The most important pedestrian linkage from the shopping center to a major adjacent development should be identified. If the center is well linked in one direction, a great deal has been accomplished. Other potential pedestrian paths to adjacent magnets should also be mapped to determine whether reasonable connections could be made through parking lots.

The primary pedestrian walk trip paths (and secondary desire lines, where practical) should be incorporated into early site design schematics. In this way, paths can be coordinated with automobile access intersections and road and mall entry points. Only by orienting the parking and traffic circulation schemes around the pedestrian linkages will effective pedestrian pathways be provided. Pedestrian connections must be direct or they will not be used.

Parking Lot Location and Setbacks

Although it is nearly always assumed that parking will be placed in front of a suburban shopping center, this arrangement may not be appropriate in every case. Large setbacks from the roadway usually ensure that the shopping center will be inconvenient to reach from across the street. Parking should not always be placed in the front; instead, consideration should be given to locating stores in nearby locations from which potential patrons may be drawn. Shopping centers can locate parking in the rear to maintain proximity of the stores to locations across the street. Placing parking in the front may still be the right decision, however, especially if higher-density residential development is located behind the center.

Structured Parking

In settings in which the economics of the situation warrant it, the distance from the shopping mall to the adjacent uses along

the primary pedestrian desire line can be minimized by incorporating structured parking on the side of the shopping center from which most of the pedestrian trips are being attracted. Opportunities to provide same-grade access points should be exploited.

Traffic Control Through Landscaped Islands

The control of traffic through parking-lot landscaping is one of the most important features of pedestrian-sensitive site design. A thoughtful landscaping plan not only controls traffic flows and speeds, but also provides locations for pedestrian refuge, both for those who park on-site and for others walking in from off-site.

If it is not possible to place the pedestrian path parallel to the parking aisles, a "stepping stone" approach can be used, in which landscaped islands are placed along the pedestrian desire line. These islands will not only serve as a refuge for the pedestrian in an otherwise open parking lot, but will also channel and discipline traffic flow. A design used in Oxford Valley Mall in Langhorne, Pennsylvania, employs a series of islands leading pedestrians in from the site periphery.

Special pedestrian aisles in parking lots, separate from vehicular driveway aisles, are not recommended for widespread application. Research has indicated that less than 25 percent of parkers will actually use the pedestrian walkways. Most will use the vehicular aisle instead. Special pedestrian aisles may be appropriate where pedestrians are being guided between major destinations directly to and from the building entrances. They are not appropriate for most parking-lot aisles, except for those aisles located directly in front of a major building entrance.

Pedestrian-Vehicle Conflicts

The delay in pedestrian access can be minimized by limiting or eliminating the number of points at which traffic is encountered. Alternatively, right-of-way can be assigned to pedestrians instead of motorists (e.g., the use of stop signs at locations where the maintenance of traffic capacity is not critical).

Creative entry configurations can help reduce pedestrian-vehicular conflicts. For example, placing most traffic circulation activity adjacent to buildings on a ring road. Although ring roads have been primarily used at shopping malls, the concept is also applicable to many smaller centers by simply locating the major circulation driveway on the periphery of the site instead of immediately in front of the stores. However, care must be taken to maintain traffic discipline and safety at points at which this circulation road intersects driveway entry points from adjacent streets.

Speed Control

If substantial vehicular traffic next to the store frontages is unavoidable (e.g., at supermarkets), special attention must be paid to controlling speeds. Many centers accomplish this through speed bumps, crosswalks, or stop signs at pedestrian crossing points. One of the more creative examples is a raised walkway across the traffic lanes. Vehicles must cross at the pedestrian level over what might be described as an exaggerated speed bump. However, this arrangement must be coordinated with pedestrian pathways through the parking lot.

Mixed-Use Development

Suburban mixed-use development began with the new communities movement in the 1960s but has evolved to include many smaller developments. These smaller developments do not create an entire community, but they are more complex in pattern and development process than single-use projects. This development type is characterized by a single owner or developer who maintains long-term control over the character and quality of development that occurs, most often starting the project from the raw land stage. It includes a mixture of synergistic uses such as offices and hotels, retail or service commercial uses, housing, and perhaps even cultural or recreational facilities. Because of this synergy, total development density may exceed that of stand-alone office and industrial parks. Mixed use, in the context of this discussion, represents a single-owner site, with emphasis on commercial activity.

Relationship of Home and Work Location

Mixed-use development provides the highest potential of any development type for people to live close to work and community services. At the most, however, only 5 to 7 percent of those employed at a mixed-use center walk to work. Others may prefer a housing style not available near the mixed-use center. Higher-density housing on the site, surrounded by a mix of lower-density multi-family and single-family homes, would appear to optimize the potential for pedestrian commuting. Such developments facilitate transit service and ridesharing arrangements with their associated walk linkages.

Midday Travel

The travel characteristics of midday trips at mixed-use centers are highly dependent on the spatial relationship among land uses. Data tabulated from surveys of workers in office buildings in Fairfax County, Virginia, indicated that 20 to 30 percent of midday trips from office buildings in mixed-use settings were made by walking (mostly for shopping and eating). Only 3 to 8 percent of midday trips from office buildings not located in mixed-use settings were walking trips. Thus, the proximity of mutually attracting land uses is an important element of convenience for those who live and work there, and has a significant effect on midday automobile use. Even at mixed-use centers, however, there can be much variation in the spatial relationship among uses. The more compact forms will always be advantageous to pedestrian travel, but care must be taken to preserve space for pedestrian amenities (e.g., benches and kiosks).

Design Philosophies

A variety of mixed-use design philosophies exist, ranging from superblocks to parkway-type arrangements. The more dense and preferred arrangements incorporate structured parking, but this is not always economical in the early stages of development. Plans should be made for a staging process to structure parking at a

continued on page 31

endowment by the East Japan Railway Company to foster advancements in teaching and research related to transportation.

A current member of the TRB Executive Committee, Sussman served as Chairman of TRB's Committee for the Study of Long-Term Airport Capacity Needs and as a member of other TRB committees including the Task Force on Advanced Vehicle and Highway Technologies and the Committee on New Transportation Systems and Technology.

Safety and Health Professionals Honored

Four safety and health professionals have been inducted into the Safety and Health Hall of Fame International. Each was cited for lasting, valuable contributions to his field.

John Paul Stapp, who was awarded the National Medal for Technology by President Bush in September, is a former flight safety researcher for the U.S. Air Force. He has become a leader in the development of the automotive industry's occupant protection and automobile crash standards.

George E. Smith is noted for his research on causation of electrical contacts and deaths. The National Safety Council has indicated that under his leadership, on-the-job deaths associated with electrocution have dropped by 50 percent nationwide since 1974. Smith was also active in efforts to create the Occupational Safety and Health Administration.

Earl D. Heath has occupied key positions in the safety field and was involved in planning and implementing the Occupational Safety and Health Act of 1970.

William H. Franey, a member of the National Committee for Uniform Traffic Laws and Ordinances since 1959, led efforts to obtain funding for the Federal Highway Safety Act and fought for mandatory safety belts, motorcycle helmets, driver's license compact, and violator compact issues. He was among the first to identify the importance of providing treatment for driving-while-intoxicated recidivists.

Pedestrians *continued from page 13*

later date to maintain development flexibility.

The superblock will be most pedestrian-oriented internally, but poses greater access problems from the perimeter and longer walking distances from the parking lots and garages. The superblock, almost by definition, embodies a compact, dense, land-use form beneficial to pedestrian travel. Internally, opportunities exist to build pedestrian plazas and even enclosed areas. However, it may be distant from other sites, particularly residential uses. The peripheral roadways should be planned with pedestrian crossings in mind. Because there is usually some flexibility in driveway location, signalized intersections can be placed in locations at which the major pedestrian flows are expected.

A grid system can also be an appropriate pedestrian-sensitive design, but should incorporate structured parking, minimal setbacks, and keep major through roadways on the periphery of the site. In many respects, a mixed-use development based on a grid system is a small downtown, where people can park their automobiles and conduct their business on foot. Although it may not have the convenience of being fully enclosed, weather protection can still be provided with canopies and covered walkways. Most mixed-use grid systems are found in redeveloping activity centers as development takes place around an already-defined street network. However, the grid layout is perfectly acceptable for new mixed-use areas. The key to making it work, from a pedestrian point of view, is keeping heavy traffic volumes out of the center and having enough uses to generate pedestrian trips.

The spine-and-grid system is essentially a grid but is usually elongated with curvilinear streets. As long as the uses remain compact, this scheme can be as pedestrian-oriented as the superblock and grid, but in suburban areas the tendency is to be dispersed. Although these lower-density park-like settings appear to be pedestrian friendly, the distance between uses minimizes the pedestrian trip-making potential. High-density spines can work, but they are usually more spread out than the other types.

Although most people will be dependent on the automobile to reach a mixed-use site, once there they should be able to move about exclusively on foot. However, the

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large size of some projects leads to a scale that is not practical for walking from one end to the other, especially if the FAR (floor-area ratio) is low. In such cases, two or three nuclei of developments can at least make the subcenters walkable. The term "urban village" has often been used to describe large suburban mixed-use development projects, incorporating a high level of amenities along with higher densities. It is a worthy pedestrian-oriented design strategy to pursue.

Summary

Site planning is a well-accepted part of the development process. Unfortunately, the pedestrian often gets lost in the shuffle of other major decisions. To prevent this, it is necessary to include pedestrian elements at each stage of the planning and design process, from the initial conceptualization of site orientation to the final details for traffic controls. This is the essence of pedestrian-sensitive site planning. It involves integrating pedestrian components into the development process from concept to formal site-plan submission. It means simply remembering that pedestrians are there and that they need to be accounted for in the design process along with buildings, utilities, and automobiles.

References

1. S. A. Smith, K. S. Opiela, and L. L. Impett. *NCHRP Report 294A: Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas.* TRB, National Research Council, Washington, D.C., 1987.
2. *Residential Streets: Objectives, Principles, and Design Considerations.* Urban Land Institute, American Society of Civil Engineers and National Association of Home Builders, Washington, D.C., 1974.
3. *Model Subdivision Regulations*, American Planning Association, Washington, D.C., 1989.

LTPP *continued from page 17*

nance and rehabilitation tactics to control or remedy distress. Improvements to design and maintenance models derived from these findings will reach standard practice in three to five years.

Spin-off Products

The products of data analysis will not be available for a while, but other products generated by LTPP studies soon will reach the implementation stage. Many of the LTPP data-collection and data-management techniques are adaptable to pavement management systems. SHRP-developed nondestructive test equipment calibration and quality assurance procedures are being converted into standards by ASTM and the American Association of State Highway and Transportation Officials. New traffic data collection techniques and new or improved materials test methods will improve the reliability of existing design procedures. LTPP has spurred the development of automated weigh-in-motion and vehicle-classification technology. Research in these areas will aid other sectors of highway engineering such as traffic planning and "smart roads," and there are more research benefits to follow.

None of these spin-off products was high on anyone's list of critical needs. As they are implemented, however, they will stretch scarce highway dollars. By that measure, LTPP has been successful.

The End of the Beginning

The National Research Council's stewardship of LTPP through SHRP has been successful. The period of this stewardship will end in June 1992—leaving 15 years of research to be guided and evaluated. No single organization could provide for all of LTPP's needs; thus it was agreed among AASHTO, FHWA, and the National Research Council to divide the duties. FHWA will assume day-to-day operational management of the studies. The Research Council will retain the advisory role of the SHRP Executive and Pavement Performance Advisory committees through new Transportation Research Board panels. Steps have been taken to achieve the transition from direct National Research Council management to the new arrangement. FHWA has created an independent division to manage the operation of LTPP and appointed Paul Teng, long experienced in pavement research at both the state and federal level, as Division Chief. On his appointment, Teng was loaned to SHRP to learn about the management of LTPP. He will serve as the manager of headquarters operations during his assignment at SHRP. Teng's involvement in all aspects of the program will prepare him for full operational management of LTPP by mid-1992.

With the strong advisory role of the National Research Council through TRB, the commitment to success shown by the member agencies of AASHTO, and the status and independence that the new LTPP division will enjoy at FHWA, the coming transition will mark not only the end of one beginning for LTPP studies, but signal the start of another.