Issues Related to Planning for Pedestrian Needs in Central Business Districts

PRIANKA SENEVIRATNE AND PHILIP FRASER

The complexity of pedestrian travel patterns has resulted in the lack of in-depth research and standard procedures for planning and designing pedestrian facilities compared with those for other modes. A pedestrian circulation study was conducted in downtown Halifax, Nova Scotia, to analyze factors affecting the choice of routes. These factors were examined in relation to the physical characteristics of the location, personal characteristics of the trip makers, and the type of trip being made. The investigation of circulation patterns and needs suggests that the primary objective of central business district pedestrians is movement between points by the shortest path and that protection from weather, congestion-free sidewalks, and safety are only secondary concerns. Planning policies and guidelines are suggested that will enable user needs to be better incorporated into the planning process. An attempt is also made to compare these findings with those from other Canadian and European cities. These findings seem to suggest that pedestrians' needs and the difficulty of implementing new planning policies are similar in many ways.

The focus on pedestrians in general has been changing slowly since the early 1970s. However, this vital mode still receives low priority relative to the highly visible and attractive automobile and other transportation systems.

Walking constitutes a very small part of a journey. The average length of a typical central business district (CBD) walk trip ranges from approximately 350 m in a small CBD such as Halifax, Nova Scotia *(1)*, to just over 600 m in central Detroit *(2)*. Those arriving in CBDs by other modes walk approximately 250 m on average between terminals and final destinations *(1, 3)*. However, walking is the prime mode of travel to a vast number of visitors to the CBD. For example, approximately 10 percent walk to and from work in Halifax, whereas the corresponding proportion in Calgary, Alberta *(3)*, and in several larger cities in the United Kingdom *(4)* is approximately 2 and 4 percent, respectively. Walking is also the main mode of travel for intra-CBD trips. For instance, more than 75 percent of intra-CBD trips are reportedly made on foot in large cities such as Atlanta, Detroit, and Norfolk *(2)*.

Recently, Mitchell and Stokes *(5)*, Hitchcock and Mitchell *(4)*, and Seneviratne and Morrall *(6)* investigated pedestrian needs in detail. These studies showed that basic pedestrian needs are not sufficiently addressed by current planning and design guidelines. It is apparent that existing design standards focus on capacity rather than accessibility *(7)*.

The existing planning procedures for the Halifax CBD are reported in this paper and factors are identified that have impeded the complete realization of the objectives of its municipal development plans, such as failure to recognize primary pedestrian needs and the lack of coordination between developers and the municipality. The discussions and suggestions are based largely on data from a questionnaire survey conducted in the Halifax CBD in the fall of 1985.

The population of the city of Halifax and the surrounding urban centers is approximately 290,000. Almost 23,000 have their primary workplace in the CBD (Figure 1). The walking portion of travel to and within the Halifax CBD is included with other modes in Figure 2.

The city of Halifax formulated a Municipal Development Plan (MDP) in 1978, outlining the new policies for dealing with current and future land use and transportation facilities. The ultimate goal of the MDP with regard to pedestrians is to "discourage the use of the private automobile to, within, and through the CBD, and give priority to the pedestrian and public transit" *(8)*.

The city government has, however, been hesitant in implementing its policies related to pedestrians. The recently completed sidewalk rehabilitation program near the waterfront, as shown in Figure 1, which was designed to emphasize pedestrian right-of-way or priority space, was initiated by the Halifax Waterfront Development Corporation. A few other projects, such as the four elevated walkways and the conversion of one block at the end of Granville Street into a pedestrian mall, were done independently by the developers at the time that adjacent buildings were constructed. The city's involvement in these projects has been minimal in terms of implementing its policies related to pedestrians, except at the time that development applications were approved.

DATA COLLECTION

A series of personal interviews was conducted during two consecutive weeks. Pedestrians were intercepted at entrances to buildings, at transit stops, midblock, and on the elevated (enclosed) walkways. A total of 410 interviews were obtained. Survey times were morning, lunch, and midafternoon intervals. These time periods allowed a wide mix of pedestrians with different trip purposes to be included in the sample.

The questionnaire shown in Figure 3, developed after a pilot survey in 1982, proved effective for the purpose. Respondents

Department of Civil Engineering, Technical University of Nova Scotia, P.O. Box 1000, Halifax, Nova Scotia B3J 2X4, Canada. Current affiliation, P. Seneviratne: Department of Civil Engineering, Concordia University, 1455 de Maisonneuve Boulevard West, Montreal, Quebec H3G 1M8, Canada.

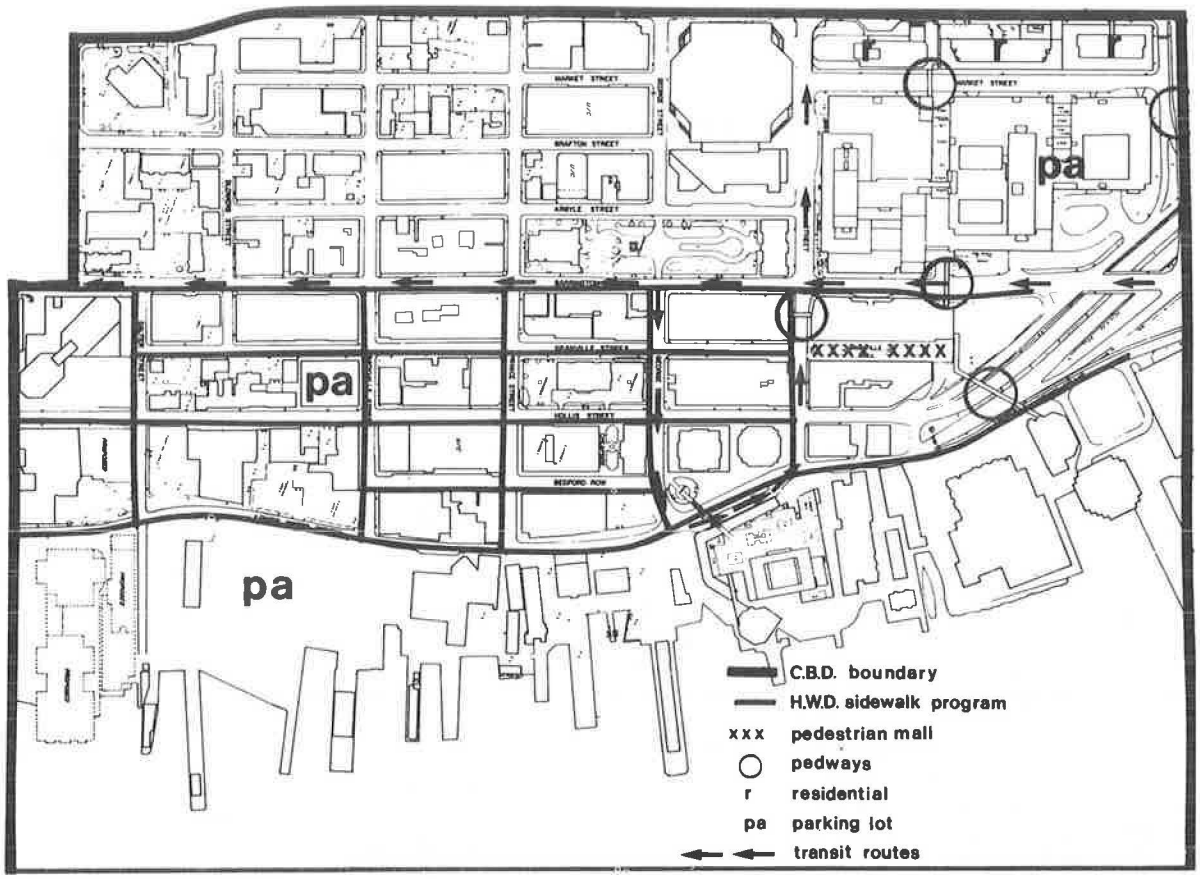

FIGURE 1 Central business district of Halifax, Nova Scotia.

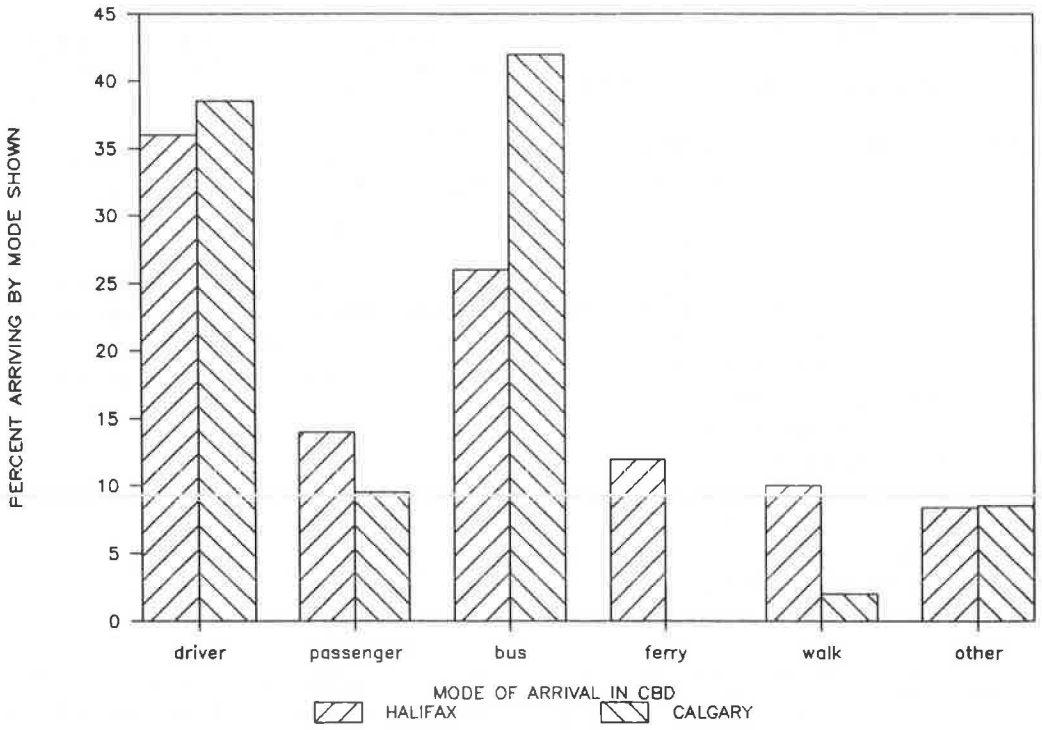

FIGURE 2 Percentage of arrivals in CBD by different modes.

Downtown Halifax
Pedestrian Circulation Study

(1) How did you arrive in the downtown today:

Car driver	_____	Ferry	_____
Car passenger	_____	Bicycle	_____
Drop off	_____	Walk	_____
Bus	_____	Other	_____

(2) Where in downtown Halifax are you coming from?

Parking lot	_____
Bus stop	_____
Ferry terminal	_____
Place of work (office)	_____
Business meeting	_____
Shop	_____
Restaurant	_____
Other (please specify)	_____

(3) What is the main purpose of your visit to this location today?

Place of work	_____	Shopping	_____
Business	_____	Other	_____

(4) Could you please indicate the route walked, from where you are coming on this map. (Indicate direction of travel by arrow).

(5) How would you best describe your decision to choose this walking path? (Select only one)

(i) I always go that way _____
(ii) It is the only route available _____
(iii) It is the quickest route _____
(iv) It has the least number of streets to cross _____
(v) It is the least crowded _____
(vi) It has more shops, stores, restaurants, etc. _____
(vii) It offers most protection from the weather _____
(viii) It has the least number of hills _____
(ix) It offers most personal security _____
(x) Other (please specify) _____

(6) Sex: Male ☐ Female ☐

(7) Age: _____
15-30 _____
30-50 _____
50-60 _____
60+ _____

(8) Time: _____ **(9) Day of week:** _____

(10) Location of survey: _____ **(11) Weather:** _____

FIGURE 3 Questionnaire for pedestrian circulation study.

were willing and able to provide accurate descriptions, and this is reflected in the high number of usable forms finally obtained (87 percent). The most time-consuming aspect was obtaining walking distances. These had to be retrieved from maps and coded with great care in order to minimize the errors. The network was developed based on distances between centers of intersections in the grid network in both CBDs.

The findings of a similar survey in Calgary, Alberta *(6)*, summarized in Table 1, enable one to examine the validity of several assumptions about pedestrian behavior that have been the basis of pedestrian planning procedures for more than a decade. For example, walking trips consist of two distinct types, total walking trips and access or egress trips. The former include lunch-time shopping trips by employees in a CBD or business trips between locations in the CBD (intra-CBD trips). The second type are the trips from the parking facilities and transit stops to places of work, or vice versa. These two types of trips have very different needs. Hence, sections with shopping facilities, restaurants, and similar opportunities, which are the primary destinations of total walking trips, are provided with aesthetic sidewalk surfaces, attractive lighting, and sometimes wider sidewalks. Conversely, access from transportation terminals to workplaces is often left circuitous or congested. The needs of access-egress trips have remained unfulfilled, even though they constitute more than 75 percent of the number of total daily walking trips. For instance, in Halifax there are at least 50,000 daily access-egress trips, whereas total

TABLE 1 RANKING OF FACTORS AFFECTING ROUTE CHOICE

	Characteristics of trip maker											Characteristics of trip													Physical features				
	Sex			Age				Purpose of visit				Trip type								Time of day					Location				
Variable / Route Selection Criterion	Overall sample population	Males	Females	15–30 yrs	30–50 yrs	50–60 yrs	60+ yrs	Downtown employee	Business person	Shopper	Other	Bus to work	LRT to work	Parking to work	Work to restaurant	Parking to business	Shop to shop	Work to shop	Bus to shop	AM peak	Morning	Noon hour	Afternoon	PM peak	Retail core	Retail +15	Office +15	Pedestrian mall	Office core
F_1—Always use	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	3	3	2	3	2	2	2	2	2	2	3	2	3	2
F_2—Only available	3	4	4	4	4	4	–	3	4	5	4	3	3	3	4	2	–	4	4	3	5	4	4	3	3	5	3	4	3
F_3—Quickest	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
F_4—Least # of st. crossings	5	5	5	5	5	5	4	5	6	4	–	4	6	4	5	–	4	4	–	6	4	6	5	5	5	4	5	4	5
F_5—Least crowded	6	5	7	6	6	5	–	6	5	–	5	6	5	4	3	3	–	5	–	4	6	5	–	6	6	6	–	5	5
F_6—Most attractions	4	3	3	3	3	3	3	4	3	2	2	5	4	4	3	4	1	3	2	5	3	3	3	4	4	2	4	2	4
F_7—Most weather protection	7	7	6	7	7	6	–	7	–	6	–	6	–	–	–	–	4	–	–	–	7	8	6	7	8	5	–	–	7
F_8—Least noise/air pollution	8	6	8	8	8	6	–	8	7	–	–	6	6	–	–	–	–	–	–	7	8	7	7	6	7	6	5	–	6
F_9—Most security	9	–	9	8	9	–	–	9	–	–	–	7	–	–	–	–	–	–	–	–	–	–	–	8	9	–	–	–	–
% Using other criterion	14.2	15.5	13.0	9.9	16.1	23.5	14.0	13.1	22.5	11.2	19.3	10.4	12.6	11.5	12.5	12.1	12.3	17.2	7.3	12.2	16.2	15.8	16.3	10.9	13.6	8.4	6.4	34.4	14.2
Total # of respondents	2,685	1,319	1,366	1,050	1,370	221	43	2,077	293	206	104	625	261	131	160	58	81	204	55	566	650	493	447	524	1,049	227	91	131	1,186
% of total sample population	100	49.1	50.9	39.1	51.0	8.2	1.6	77.4	10.9	7.7	4.1	23.3	9.7	4.9	6.0	2.2	3.0	7.6	2.0	21.1	21.1	18.5	18.5	16.6	39.1	8.5	3.4	4.9	44.2

(–)—no respondents in that category based their decision on that criterion. Ranks: 1- most important , 10- least important

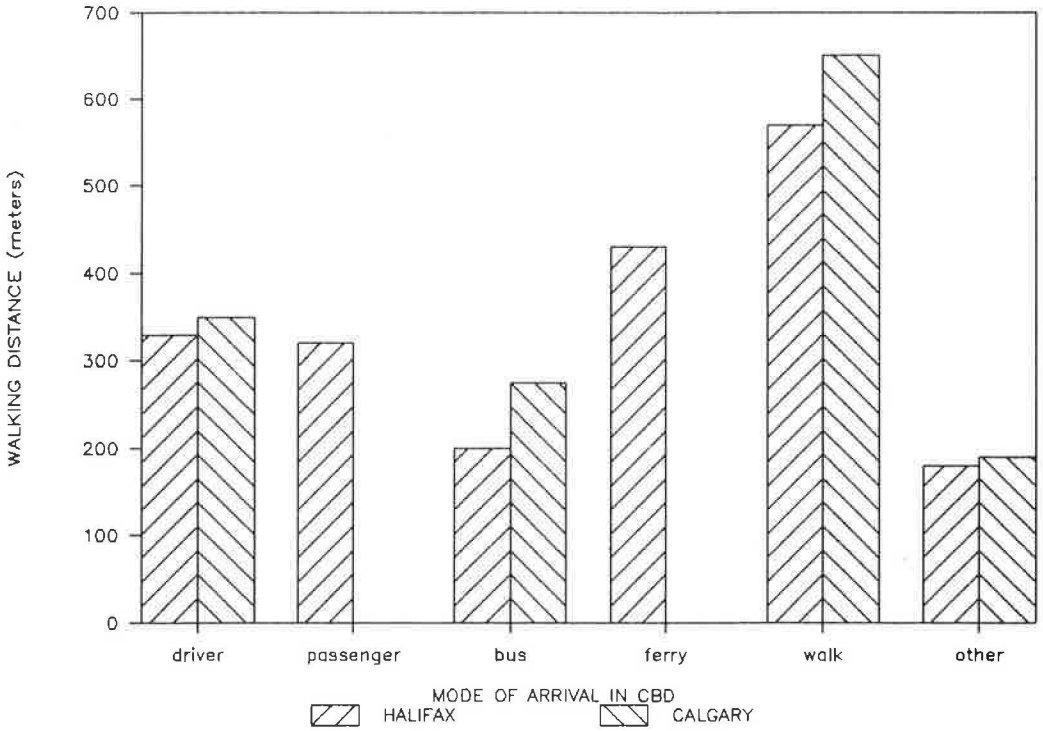

FIGURE 4 Average walking distance by mode of arrival in CBD.

TABLE 2 ARRIVAL MODE IN CBD AND PERCENTAGE USING A PARTICULAR ROUTE-SELECTION CRITERION IN HALIFAX

	Percentage by Route-Selection Criterion									
Mode	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Driver	23.3	4.6	60.5	0	0	2.5	4.6	0	0	4.6
Passenger	17.6	17.6	53	0	0	5.8	0	0	0	5.8
Bus	29	3.3	58	0	0	3.2	0	0	0	6.4
Ferry	28	0	57	57	0	7	0	0	0	7.1
Walk	33	0	25	0	8.3	8.3	0	16.6	0	8.3

NOTE: The following criteria were used: F1 = I always go that way; F2 = it is the only route available; F3 = it is the quickest route; F4 = it has the least number of streets to cross; F5 = it is the least crowded; F6 = it has more shops, stores, restaurants, etc.; F7 = it offers most protection from the weather; F8 = it has the least number of hills; F9 = it offers most personal security; F10 = other (please specify).

walking trips account for less than 20,000 trips a day. Accordingly, the primary need of the access-egress trip, that is, direct access by the shortest path, should also receive the same treatment as or higher priority than the substantially smaller number of total walking trips, for which aesthetics are more important.

Other fundamental characteristics of pedestrian movement and differing needs that became evident from the Halifax study are discussed in the following sections.

CIRCULATION CHARACTERISTICS

Mode of Arrival and Walking Distances

The primary arrival modes of visitors to the CBD and their respective mean walking distances are shown in Figures 2 and 4. It is evident from Tables 1 and 2 that whatever the mode of arrival or the city, the visitor's primary aim is to gain access to his destination by the shortest path.

Criteria for Selection of Route

One of the main purposes of the survey was to determine the primary pedestrian needs, that is, the type, quality, and, of course, the ideal location of facilities desired by pedestrians. Thus, the questionnaire was designed to obtain this information in terms of the factors that pedestrians consider in selecting the route for a particular journey. These factors were expected to indirectly reflect pedestrians' basic requirements. It is difficult or physically impossible to provide for every factor, and hence the subjects were asked to indicate only the most significant factor from the list of 10 (Table 2). This approach also eliminated the need for the respondents to rank the factors in order of importance, although one may argue that the subsidiary factors are equally useful for planning purposes.

Fifty-six percent of the subjects in Halifax selected a particular route because it was perceived to be the shortest path between their origin and destination (Figure 5). The second-largest group of subjects, 25 percent, selected the route because

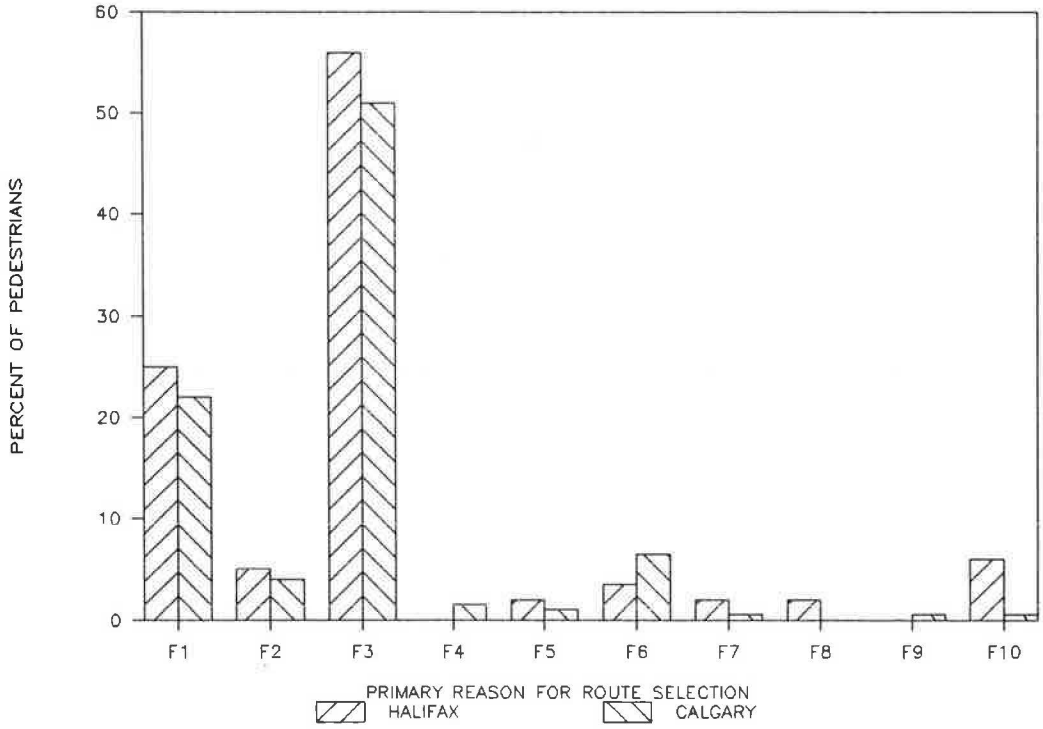

FIGURE 5 Percentage of pedestrians and the primary route-selection criteria.

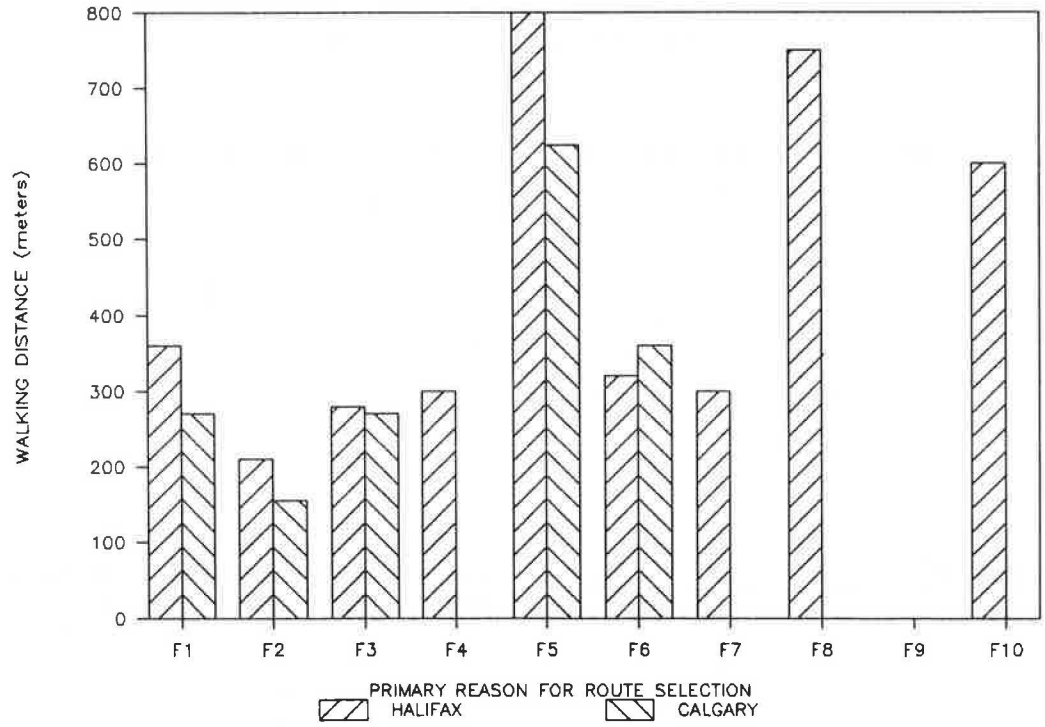

FIGURE 6 Average walking distance and route-selection criteria.

it was their regular one, and 5 percent selected their route because they believed it to be the only one available. The average walking distance of the last group (Figure 6) is less than that of the group that selected the route based on the perception that it was the shortest. This suggests that those who perceive a particular route to be the only available one have settled for a route that in fact is the shortest. This does not reflect an interviewing failure. Figure 6 also shows that in Calgary the pedestrians who selected the shortest path and those who have regular routes appear to walk similar distances, whereas those who chose the only available route walk the shortest mean distance.

In general, therefore, it appears reasonable to assume that at least 80 percent of pedestrians consider distance to be the most significant factor, and protection from weather, safety, congestion on sidewalks, and so on, to be only secondary factors.

This finding is consistent with those in Calgary *(6)* and also in the United Kingdom *(4)*, with the exception of the disabled, the elderly, and those with young children. In Calgary, 51 percent selected routes based on distance, 22 percent chose routes that they always use, and 4 percent chose those thought to be the only available ones. Mitchell and Stokes *(5)* found that in the few instances in which subsidiary factors were mentioned, they related to nonelderly women with children, who indicated that traffic and road crossings were an impedance.

Trip-Maker and Trip-Type Characteristics

Pedestrians, regardless of their age and sex (Table 3), prefer to travel between activities by the shortest path. It should, however, be noted that the subjects in this study were all under the age of 65. The primary needs of the handicapped and elderly are quite different, as indicated by Mitchell and Stokes *(5)*. These groups were eliminated from this study because of their small numbers in CBD areas.

TABLE 3 ROUTE SELECTION CRITERIA BY SEX AND AGE

	Percentage by Route-Selection Criteria			
Characteristic	Path/Quickest	Always Go That Way	Only Route Available	Other
Sex				
Male	60.0	24.0	4.0	12.0
Female	50.0	26.0	6.0	18.0
Age				
15–30	51.0	29.0	6.0	14.0
30–50	62.0	21.0	2.0	15.0
50–60	67	0.0	16.0	17.0

The factors that determined the route and the overall needs, however, were found to vary slightly according to trip type. Trip type is defined according to the origin and destination. For instance, a person's access trip from the place of work to the car is defined as a work-to-parking trip.

The variation from the most common factor (shortest path) was evident for work-to-shopping trips and shop-to-shop trips, or total walking trips. The factors that determined the route for these two trip categories were availability of opportunities and aesthetics (see Table 1).

SOME DEFICIENCIES IN THE TRADITIONAL PLANNING APPROACH

It is fairly apparent that with the exception of a small proportion, pedestrians simply prefer shorter walking distances to any other quality of a pedestrian network. This should be one of the basic premises underlying all pedestrian plans.

Providing the facilities exactly where the pedestrians desire is not always feasible if traffic engineers, transit operators, developers, and merchants have conflicting objectives. For instance, traffic engineers prefer all pedestrian crossings to occur at intersections in order to avoid interruptions to traffic flow and possible conflict between people and vehicles. Transit operators also prefer the location of bus stops and terminals at intersections in order to minimize the number of stop-and-go operations, which affect reliability and travel time. Retailers often speak against pedestrianization schemes, which are thought to affect business through the loss of occupants of the diverted vehicles, who may have come to the shops if they were allowed adjacent parking *(9)*. Developers, especially of office buildings, claim that occupants often demand close-in parking, but recognize that the additional vehicular traffic that will be generated by these developments will affect pedestrian movement in the surrounding areas.

Until a compromise is reached among these conflicting interests, development plans are unlikely to be able to provide for the basic pedestrian need—direct walking links.

For example, one of the MDP objectives is to give "priority to the provision of weather-protected pedestrian routes in the east-west direction." The findings of the questionnaire survey in Halifax summarized in Figure 5 reveal that even on rainy and windy days, only 1.7 percent of pedestrians were most concerned about weather protection. Conversely, the primary need is to go from one place to another by the shortest possible path (*F3* in Figure 5). Therefore, before the need for redefining plan objectives to reflect user needs and the associated difficulties are examined, it is appropriate to consider the pedestrian behavior in general and some fundamental user needs.

Several municipalities have tried some radical approaches to enhance pedestrian comfort; for instance, totally segregated pedestrian networks such as those in Cumbernauld and Stevenage in the United Kingdom, where continuous at-grade pedestrian networks between residential areas and the town centers, and between activity centers in the town have been built. The elevated and enclosed walkways are a common sight in Calgary, Alberta; Des Moines, Iowa; and Minneapolis, Minnesota. Use of both elevated and at-grade segregated systems is relatively low and the claimed improved performance has been measured mostly in terms of observed pedestrian volumes *(11)* rather than the changes and the general level of satisfaction of the users *(12)*. The circuitous nature of these routes is evidently the major deterrent to increased use, although investigations on this aspect are not widely reported. Heglund *(11)* has compared elevated walkway crossings with at-grade crossings and concluded that the walkways attract more pedestrians. Nevertheless, he does not refer to the changes in trip type or trip length for at-grade crossings after the construction of the walkway. In the absence of such information it is unreasonable to estimate the time and cost advantages of alternative routes.

It is evident from most of these examples that pedestrians will benefit the most if the facilities or priority links are continuous and connect the major generators by direct corridors. Also, schemes have been evaluated using diverse subjective measures. For example, most U.K. pedestrian schemes have been evaluated primarily in relation to improvement in safety or reduction in accidents. This measure can be valid only if reference is made to the volume of vehicles and pedestrians. If pedestrianization led to a reduction in both pedestrians and vehicles, the reduction in accidents would not be that significant, because there is a likelihood that accidents would migrate to other locations or that the site would experience a random change in trend—regression to the mean. Furthermore, as Hitchcock and Mitchell *(4)* suggest, pedestrians value their convenience more than their safety.

Comprehensive measures of effectiveness could be changes in pedestrian volumes, walking distances, or travel times; route

choice; delays to vehicles; and, of course, the long-term effects on safety. These indicators may be supplemented by data on changes in trade, rental incomes, and other environmental factors, which are undoubtedly harder to obtain. However, at least an effort to obtain the foregoing information could be the starting point for the development of an effective planning policy for pedestrians in CBDs.

Lovemark *(10)* in the early 1970s commented on many aspects of pedestrian planning. One aspect that has been neglected, even today, is the lack of pedestrian route information. His studies showed that people choose up to 30 percent longer distances along vehicular networks simply because of the convenience of finding their destinations with the least amount of detours, level changes, and waiting as opposed to those using the pedestrian network. In other words, pedestrians receive relatively little assistance in terms of signing, priority in crossing streets, and adequate lighting in enclosed areas within the designated pedestrian networks. Benz and Lutin *(9)* recognized the Manhattan system to be severely deficient with regard to these items. A better balance in these characteristics is critical for the success of special pedestrian systems such as segregated systems and pedestrian-only malls.

CONCLUSIONS

In planning for pedestrian needs, the city of Halifax's present pedestrian-related policies have the potential to adequately provide for pedestrians. However, attention should be focused on pedestrian needs instead of on automobiles.

It is evident that whatever the mode of arrival, pedestrians' primary aim is to gain access to their destination by the shortest path. Therefore, pedestrians will benefit the most if the facilities or priority links are continuous and connect the major generators by direct corridors.

The primary needs of the handicapped and elderly are quite different as indicated by Mitchell and Stokes *(5)*. These groups were eliminated from this study because of the small representation in CBDs. Nevertheless, understanding the needs of the handicapped and elderly along with comprehensive measures of effectiveness would result in a more effective planning policy for pedestrians in CBDs. Also, there is much to be learned about circulation characteristics and effectiveness of pedestrian projects. The findings reported here are based on summer and fall pedestrian movement patterns. It will be interesting to determine the changes in these patterns during different seasons. Lovemark *(10)* and Seneviratne *(3)* have reported on the effect of temperature on pedestrian volumes, but reasons for such changes can only be determined from further observations and pedestrian interviews.

Finally, it is apparent that quality of the environment is only a secondary concern. If the primary objective of the majority of trips is not met, improvements in visual quality are unlikely to provide higher levels of service. Once this objective has been satisfied, the plan can concentrate on the subsidiary elements such as furniture and fixtures or color of walking surfaces.

ACKNOWLEDGMENTS

This research was funded in part by the Natural Sciences and Engineering Research Council of Canada. The authors would also like to thank Michael Poulton for his helpful suggestions and comments on earlier drafts.

REFERENCES

1. P. Fraser and P. Seneviratne. Pedestrian Circulation in Halifax Central Business District. Presented at the Annual Conference of the Canadian Institute of Planners, Vancouver, B.C., Canada, July 1986.
2. M. V. A. Bondada. Intra-CBD Secondary Travel Patterns of Downtown Workers. *Journal of Transportation Engineering*, ASCE, Vol. 108, No. 1, 1982, pp. 15–26.
3. P. N. Seneviratne. *CBD Pedestrian Movement Characteristics.* Ph.D. dissertation. Department of Civil Engineering, University of Calgary, Alberta, Canada, Oct. 1983.
4. A. Hitchcock and C. G. M. Mitchell. Man and His Transport Behaviour, Part 2a: Walking as a Means of Transport. *Transport Reviews*, Vol. 4, No. 2, 1984, pp. 177–187.
5. C. G. B. Mitchell and R. G. F. Stokes. *Walking as a Mode of Transport.* LR 1064. U.K. Transport and Road Research Laboratory, Crowthorne, Berkshire, England, 1982.
6. P. N. Seneviratne and J. F. Morrall. Analysis of Factors Affecting Route Choice of Pedestrians. *Transportation Planning and Technology*, Vol. 10, 1985, pp. 147–159.
7. *A Pedestrian Planning Procedures Manual*, Vols. 1–3. Report FHWA-RD-79/45/46/47. FHWA, U.S. Department of Transportation, Nov. 1978.
8. *Municipal Development Plan.* City of Halifax, Nova Scotia, Canada, 1984.
9. G. P. Benz and J. M. Lutin. Midtown Underground Pedestrian Connections Study. *Journal of Transportation Engineering*, ASCE, Vol. 109, No. 4, July 1983, pp. 487–498.
10. O. Lovemark. New Approaches to Pedestrian Problems. *Journal of Transport Economics and Policy*, Vol. 6, No. 1, 1972.
11. C. T. Heglund. Des Moines Skywalk System. *Journal of Transportation Engineering*, ASCE, Vol. 108, No. 1, 1982, pp. 1–14.
12. C. A. Clyde and H. Johnson. *Attitudes to Environmental Changes in Barnesley Town Centre.* Working Paper. Institute of Transportation Studies, University of Leeds, England, Sept. 1978.

Publication of this paper sponsored by Committee on Pedestrians.