

T H E D E S I G N O F
P E D E S T R I A N S Y S T E M S
I N R E S I D E N T I A L A R E A S

by

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ABSTRACT

Until relatively recently the pedestrian has been largely ignored in the planning process. It was therefore decided to focus in this study on the pedestrian. The setting was confined to low and medium density residential areas for three reasons: (1) most pedestrian planning has been done in the central business district; (2) much of it in the past has been ad hoc but emerging analytical techniques useful for high density areas were considered beyond the scope of this study to employ; and (3) many of the solutions appropriate for high density areas are not applicable in areas of lower density.

The objective was to formulate preferable alternatives and improvements to the typical pedestrian system in low and medium density residential areas from an analysis of scientific and design literature. As this suggests, the study was concerned with an aspect of the design portion of the planning process. It was proposed to formulate a number of patterns in order to arrive at the objective.

Patterns are a recently evolved design method. Each pattern has four components: (1) a context or specific setting,

(2) a specific problem which reoccurs in the described context, (3) a prescription describing a physical or functional relationship or design image which will prevent the problem from occurring, and (4) discussion which describes the problem more fully and presents the data--empirical, if available--upon which the prescription is based. Hence patterns are reuseable design ideas or images; from them actual designs are generated for use in any situation with the same context.

The use of patterns had important implications for this study: their formulation constituted the basic methodology, and the patterns formulated were the product or results.

The major groups of pedestrians--pre-school and school children, housewives and retired persons--were isolated as a result of two surveys, and major pedestrian planning objectives--convenience, activities and comfort--were defined in order to have a concise basis from which to formulate the patterns.

Each of the patterns formulated was of a broad, generic nature applicable to all user groups, although concerned with only one or two objectives. As a test of their validity the patterns were applied to two residential areas in metropolitan Vancouver. While some of the patterns were able to be applied to the built environment, it was considered that the inability to apply all of them did not render them invalid for reasons inherent in the application process.

It was concluded that the empirical data used in the formulation of the patterns together with the application of the patterns to the existing environment gave strong indications that the objectives had been met.

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CHAPTER I

INTRODUCTION: THE STREET AND THE PEDESTRIAN

Outline of the Problem

Until relatively recently the planning process has tended to ignore what would seem to be a logical subject for concern: man walking and the street in a specific context as a setting for pedestrian movement. What immediately follows is intended to provide some background to and an indication of how and why the subject of this study was chosen.

The relative neglect of this major land use, the street, and its users is surprising but, as Rudofsky pointed out in 1969, in no area of study had a book been written to that time "about the street proper, pedestrian or otherwise".¹ Lynch had found, however, that for most people with some knowledge of a city, "the paths were the predominant city elements".² Paths consequently became one of the five elements in his typology of urban elements which contribute to the image which people hold of a city. Although Lynch had classified paths generically as channels for movement and hence included transit lines, canals and railroads as

well as streets and walkways, the interest here is in the latter two. Streets, comprised of roadways, flanking boulevards and sidewalks, typically use from one-quarter to one-third of all land in a city. Besides being transportation channels and a major land use and source of open space, streets obviously provide access to buildings on them. They establish without our real awareness of it the patterns and rhythms of movement, as well as "the course, even the nature of events in the city".³ As "the most potent means by which the whole can be ordered",⁴ paths should be imageable; that is, capable of producing a strong image to the senses.

The person on foot moves much more slowly and is naturally able to cover much shorter distances than he has the potential to do in a vehicle. Although he has no protective metal shell, he does have the ability to retrace his steps quickly, stop or turn almost as he pleases. Because of these characteristics the pedestrian is much more open through all his senses to impressions of the city and its inhabitants than the driver or rider. Equally, the street itself has much more of an effect on the quality and even on the extent of his journey than for the driver. The layout and nature of the street helps to determine not only where the pedestrian walks but whether he walks.

The street in the past embodied several vital functions and major characteristics of the true urban place. It has, for example, typically indicated urbanity, and inspired civility and loyalty--identification with and pride in a

place. As Rudofsky has vividly described it, the street in history has appeared in a multitude of forms, indicating that it was frequently designed and built with the pedestrian in mind for a large range of continuing social uses. The street has been a very distinctive three-dimensional form reflecting the dynamics of its society.⁵

The concerns of traditional city design with such visual elements as spatial containment, scale and facade tend to become reduced in possibility, inoperative or abandoned in the typical North American grid street. A common assessment of the gridiron is that "a long straight road has little impact because the initial view is soon digested and becomes monotonous".⁶ Halprin has summarized the grid as being "equidirectional, nonterminated, endless, and transport rather than pedestrian-oriented".⁷ The street tends to be a two-dimensional, wide ribbon of black with possibly a few trees and a little grass. And it is only that; it is not the connecting and communicating element and viable open space that is inherent in the nature of the street. Rather than a social and physical entity and an environment in its own right, the modern street is a social and physical nonentity.

The planning literature on pedestrian movement divides naturally into two parts, consideration of the pedestrian in areas of high density, particularly the central business district, and consideration of the pedestrian elsewhere, largely meaning in residential areas, which will be the focus of interest here. The bulk of this literature, like the preponderance of pedestrians, has as its setting the

downtown area.

For distances to a third of a mile man's best mode of transportation is his feet.⁸ In the central business district approximately ninety per cent of all movement is on foot. There are several reasons for the easily observable concentration--and frequent crush--of pedestrians in the downtown. The concentration and multiplicity of land uses in the central business district are large attractors of employees and visitors. To this are added the complications of a large amount of vehicular traffic plus pedestrian walkways strictly wedded to the typical downtown long straight blocks and with carrying capacities suitable to the small populations of their originating period. All these factors combine to produce extremely negative situations, whether seen from the point of view of either pedestrian and vehicular movement, safety, crowding or general visual and aesthetic desirability.

A decade ago Morris and Zisman stated that planning for the pedestrian downtown was generally subjective, based on planners' intuitions and accepted planning theory.⁹ The situation appears to have improved slowly and unevenly since then with attempts to consider pedestrian planning as a subset of general circulation planning and to apply the analytical techniques of the latter.

Measurements of pedestrian flow volume, speed, density and headway (the time and distance separation between pedestrians) have been undertaken to determine system capacity.¹⁰ Actually carrying out such measurements has been much more difficult though than for vehicles because

of the pedestrian's propensity to follow an irregular path. In order to determine trip purposes, primary and secondary generators of traffic, predict future circulation demands, particularly at peak times, etc. other traffic study techniques have been used in some cities in varying degrees of application. These include origin-destination surveys, computer simulation and modeling (eg. gravity models) and, again, have experienced a number of difficulties in application or analysis due to the complex nature of many pedestrian trips (eg. a lunch trip might also include shopping, recreation and exercise, and interest aspects) and the transient nature of pedestrian trip node and linkage combinations.¹¹ Such analytical techniques tend to be useful and can frequently be successfully applied only in areas where pedestrian traffic is high.

The presence of large numbers of both pedestrians and vehicles in the central business district has normally resulted in their separation for pedestrian safety and traffic flow considerations. There are four separation possibilities: horizontal in space or horizontal in time, and vertical above ground and vertical below ground. The primary method of horizontal segregation, aside from the basic devices of traffic lights and parallel systems, has been the pedestrian mall or preceinct. Grade separation may be as simple as an over or underpass across an arterial or it may be as extensive as Montreal's underground system and Calgary's plus 15 (above ground) system. A considerable portion of the literature on pedestrian circulation is concerned with traffic separation and the various schemes, particularly malls, which have been implemented, frequently

on the ad hoc basis on which Morris and Zisman had remarked.

Pedestrian movement problems and solutions in residential areas, like vehicular circulation, are not the same as in high density areas in intensity and not necessarily in kind. Requirements for both types of circulation may be seen as largely a function of population density. Knowledge of pedestrian movement patterns in terms of the activities which generate movement and the degree of conflict in accommodating pedestrians and vehicles are naturally also required for residential areas.¹² But because land uses, for example, are fewer and tend to be more permanent than many uses in the central business district with its multiplicity of generators and very complex linkages, this information may be more easily obtained, frequently by such simple methods as observation. Similarly, certain innovations such as elevated or underground walkways are normally not required within residential areas because the circumstances which lead to their provision in downtowns either do not exist or do not exist on any scale in residential areas. On the other hand, running throughout the literature are a number of factors which are applicable to pedestrians in any setting. These factors could be said to be the equivalent of pedestrian planning goals and include a consideration of safety, security, convenience, continuity, comfort, system coherence and attractiveness.¹³

Certainly it is true that, with one major exception, pedestrian circulation planning practices have effected and/or seriously considered the complete separation of pedestrians and vehicles only where large numbers of both

are expected to intermingle.¹⁴ The Radburn concept, first built in 1929, is, of course, the exception and it has not been widely applied. One of the three essentials of this idea is, according to Clarence Stein, its co-designer, that "pedestrians and vehicles are entirely separated".¹⁵ A number of Radburn-type communities have been built in the United States, while in Canada Kitimat is the only completely Radburn-planned town, although examples of the superblock have also been built in Montreal and Calgary. At Kitimat, as with the other projects, the pedestrian paths run through the interior of the plan; that is, on the opposite side of the houses from the automobiles and through the internal open spaces upon which the houses face. It is claimed, at least in the case of Kitimat, that the paths form a continuous communications link throughout a section of the neighbourhood and "are much more direct than either the use of peripheral streets or sidewalks along roads" in a gridiron system.¹⁶ In Europe a considerable variety of residential schemes of various densities have been planned specifically for the pedestrian. In Canada paths have been provided in the recent townhouse and other multi-family developments, but these are not so much street patterns as merely connectors between dwelling units or from door to parking lot.

This survey of the street and pedestrian circulation conditions and planning practices has suggested three things: (1) that the street is historically an environment for people, a potential which is now largely ignored; (2) that pedestrian planning has, with the exception of the Radburn concept,

focussed on the central business district; and (3) that, in general, both the analytical techniques employed--or useable--and the solutions sought and built differ for areas of high and lesser densities. In sum, of the many gaps existing in pedestrian planning, such planning in residential areas is one of the larger and the subject suggests that its consideration would not require methods beyond the scope of a study of this nature.

Objective

This study will attempt to formulate improvements and preferable alternatives to the typical pedestrian circulation system in residential areas of low and medium density from an analysis of scientific and design literature. The changes formulated will be applied as a case study or test to two residential areas in metropolitan Vancouver.

The phrase "typical pedestrian circulation system" refers, quite simply, to the constructed sidewalks or otherwise indicated path normally flanking roads on one or both sides.

The term pedestrian is intended to encompass for this study not merely a person walking but a person of any age "riding in or upon a device moved or designed for movement by human power or the force of gravity, except bicycles, and including stilts, roller skates...toy wagons, scooters, tricycles, baby carriages, etc. while upon or adjacent to the highway".¹⁷ In addition, the term pedestrian will equally apply to those persons engaged in any other activity complementary to the use of the path such as sitting, meeting

with people and similar events.

Residential areas include districts of both single and multi-family housing from low to medium density. In terms of persons per acre low density is generally considered to be up to 70 while medium density is approximately from 70 to 120 persons per acre. In terms of dwelling types it includes single family houses, duplexes and various forms of multi-family housing to the scale of the walk-up apartment building. The reason for excluding areas of higher density should be clear from the earlier discussion which suggested that largely different solutions are required in high density circumstances.

To conclude this clarification of terms it may be noted that the term path will be normally used to apply to the way for pedestrians, while the term street will be used in connection with vehicles.

It is normally assumed that people do not walk in the "suburbs" (the scope of this study reaches beyond the suburbs, of course). With good reason the city core is seen as being oriented towards man on foot and mass transportation while the suburbs necessitate willing dependence on the private automobile. In addition, pessimism may be expressed regarding the revival of the street because of the very character of modern life in North America.¹⁸ Possibly because considerable effort is put into making interiors livable, an aspect not necessarily true of countries where the street has been highly developed, anything exterior to the dwelling unit serves only as a release into a more public environment rather than a better one. Buchanan

suggests though that "the possibility that our daily surroundings, outside our houses and offices, be amenable to design in the same way (as interiors) for our delight and convenience is slow in being understood".¹⁹

In any case, the extent of demand for walking which is not being met for various reasons is simply not known. As a corollary, neither is the extent of possible over-use of the automobile as a result known. Interesting evidence that even suburbanites will turn to walking as a major form of recreation when the environment provided for it is amenable was found in a survey of American open space communities (eg. Reston, Radburn, Georgetown South, Crofton).²⁰ Of families interviewed, over 40 per cent claimed that they walk more in their present community, with as many as 75 per cent at Reston stating that this is the case.

Scope

Although the residential areas in the City of Vancouver are almost entirely laid out in gridiron form and the suburbs are a mixture of grid and curvilinear forms, the scope of the study will not be bound by type of physical layout. Rather, its scope will be confined by considerations of density only and, as explained above, will be applicable to areas of low and medium density.

It is not the intent of this study to examine the economic and legal aspects of the alternatives proposed. A consideration of economic aspects would involve evaluating improvements, which might be very difficult to quantify, against the current system. Legal aspects of pedestrian

paths include zoning and subdivision regulations and land law.

Organization

No mention has been made of methodology in this Chapter as the methodology selected involves a recent and still evolving technique--patterns and pattern language. Chapter II will therefore review this methodology in some detail. Chapter III will describe a number of aspects of the residential setting and pedestrians. In Chapter IV the patterns for residential pedestrian circulation systems will be presented. The application of these patterns to two residential areas in metropolitan Vancouver will be shown in Chapter V. Finally, Chapter VI will present the conclusions.

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CHAPTER II

METHODOLOGY: ENVIRONMENTAL PATTERNS

It is intended to give a detailed explanation in this Chapter of the methodology-the formulation of patterns--since it is almost completely unknown to planners, is still in a somewhat evolutionary state, and partial explanations of it are scattered through a number of journals and publications. Before discussing the methodology itself, the planning process will be briefly reviewed in order to clarify the approach being taken in this study and that aspect of the planning process to which the methodology pertains.

The Planning Process: Design

The objective of this study is, of course, to formulate improvements and preferable alternatives to the existing pedestrian system in residential areas. This implies a specific emphasis on design. The planning process consists of three basic, interdependent parts: the definition of goals and objectives, the collection and analysis of data, and design. Considerable disagreement or confusion exists

concerning what is meant by the third or design phase. Stuart states, for example, with reference to pedestrian system design, that "the urban design of pedestrian spaces involves the visual aspects of such physical details as street furniture, sidewalk fixtures, and incidental sidewalk activities".¹ This suggests a rather restricted scope. Something of its true breadth can be realized by thinking of design as a problem-solving activity: "The problems design sets out to solve are the results of relations between people and between people and nature. Its success is measured by the completeness with which it analyzes and solves the problem".²

Although the design process has historically been one emphasizing the intuition of the designer and his traditionally held beliefs, in recent years it has attempted to move to a state dependent on rational processes by developing explicit design methodologies. Along with this change, an emphasis on environmental design involving the accommodation of both biological and non-biological requirements of humans has also emerged.³ Some reflection of this change began to be felt in the reformulation of the characteristic functionalist goals of modern design to include a response to psychological variables.⁴ With the publication in 1964 of Notes on the Synthesis of Form, in which a way of stating design problems that would draw attention to functional origins was outlined,⁵ Christopher Alexander became a major design methods theorist. This attempt at design theory was "based on the idea that every design problem begins with an effort to achieve fitness between two entities: the

form in question and its context. The form is the solution to the problem; the context defines the problem. In other words, when we speak of design, the real object of discussion is not the form alone but the ensemble comprising the form and its context. Good fit is a desired property of this ensemble which relates to some particular division of the ensemble into form and context."⁶ Those forms which are suitable in a certain context are said to exhibit good fit, while those that do not are examples of misfit.

Notes represented a link between the increasing interest in the relation between human behavior and the man-made environment and interest in design methods. Alexander's major concern was to locate examples of misfit or malfunction between the built environment and the complex of human behaviors it should accommodate. He considered that the built environment neither meets human needs nor forms an organic whole, and that two problems are responsible for this.⁷ First, the current practice of design is unable to answer, or even consider, many questions of a social, psychological, economic and technical nature. Further, there is no mechanism by which schematic solutions could "be carried from one project to another, and so improve cumulatively and systematically over time", and by which individual projects could be coordinated.

As an attempt to solve these environmental problems, the Center for Environmental Structure (CES) was established in Berkeley, California. The Center's approach to the solving of these problems has involved the extension of the ideas presented in Notes (with certain changes unnecessary to

detail here). It has developed two complementary concepts, that of environmental patterns and environmental pattern language. The patterns are meant to be applicable to any part of the environment from a building interior to regional land use distribution. The patterns and the pattern language will be explained in detail in the following two sections since the actual formulation of patterns constitutes the methodology for this study.⁸

Environmental Patterns

The Oxford English Dictionary gives one definition of patterns as "a model, design, plan, etc. from which something is to be made". This is approximately the meaning which patterns take here. To think of them as "atoms of environmental structure" conveys a similar meaning.⁹ Any single pattern is concerned with one physical and functional issue. A pattern consists of four parts; to formulate a pattern four aspects must be considered:

1. Context - This defines the setting or situation in which the pattern is applicable. It is typically very brief and could simply be, for example, a residential area as defined in the hypothesis.
2. Problem - This is a conflict between tendencies that is likely to occur in the stated context.¹⁰ A tendency is a testable statement of fact suggesting something which people will actively try to satisfy when given the opportunity.¹¹ This should be interpreted in the broadest possible sense.

This explanation of a problem suggests an

orientation towards behavioral user requirements. Although this has occurred in practice, the patterns are equally applicable to other types of problems such as economic and technical ones.

3. Prescription - This is the proposed design image describing one way of "solving" the problem or preventing the stated conflict from occurring. It is a directly applicable and reuseable design image or generating principle. It is unlike a descriptive verbal recommendation or performance standard--the typical planning procedure--because it describes a physical image which can adapt to the uniqueness of each situation while suggesting the implementation of organizational principles which are valid in every situation.

It has been the custom of the CES to include with each pattern a small schematic sketch providing a shorthand visual summary of the prescription. This is frequently supplemented with a photograph of an existing situation which illustrates the pattern, at least to a degree.

4. Discussion - The context, problem and prescription are usually relatively succinct statements. In this fourth part the problem may be described in fuller terms. Most importantly, the evidence--empirical, design-based or occasionally, when necessary, intuitive--on which the prescription is based is described in detail.

The use in design of prototypes, which are by

definition generalized designs, is of long standing. Individual designers acquire through experience their own prototypes which could be called private patterns. Both formal prototypes and private patterns have much in common with the idea of environmental patterns. But both have weaknesses. Prototypes do not adapt well; they offer standardization rather than uniqueness when applied to different situations.¹² Designers' patterns have the disadvantages which being private entails: they tend to be uncoordinated with other efforts and they are basically unknowable and not available for criticism by others.¹³

Environmental patterns attempt to overcome the weaknesses of prototypes by reconciling "the uniqueness of each community with the fact that certain organizational principles are valid from one community to another".¹⁴ To be able to do this patterns must be like a "generating principle"¹⁵ in which a basic idea remains constant yet the whole pattern is adaptable to local circumstances. The frequently quite generalized context contributes to the generative nature of a pattern. But more important is the prescription. For a pattern to be generative its prescription must describe not a specific spatial requirement, parameter or standard, but rather a physical or spatial relationship. Although the prescription is necessarily set out in written words, its effect must be to draw attention "to just one major physical and functional issue, rather than to some verbal or preconceived issue".¹⁶

Environmental patterns attempt to overcome one weakness of private patterns with their frequently intuitive basis

by being backed up whenever possible by scientific data which suggest or indicate that the formulated problem does exist and provide a basis for the prescription. In addition, the use of patterns externalizes the design process. That is, being formalized or put in a readily communicable form allows them to be public and hence open to criticism. This openness to criticism is regarded as one of the major advantages of patterns for it allows the patterns to evolve.¹⁷ In fact, it is expected that patterns may change as new empirical evidence becomes available or as patterns are built, used and found from practical experience to require modifications. Sources of error or improvement may occur in any of the four parts (context, problem, prescription and discussion) of a pattern.¹⁸ For example, the problem either may not actually occur in the given context or may not occur to the extent claimed. Or the spatial relationships defined in the prescription may not satisfactorily solve the problem. Additionally, patterns are expressions or reflections of a culture and hence subject to change along with that culture. It should therefore be clear that patterns (or, practically speaking, both their problem and prescription elements) are like scientific hypotheses rather than absolutes, and, like their strictly scientific counterparts, remain valid though never absolutely proven, only until new evidence is found which suggests that they be modified or abandoned.¹⁹

Patterns approximate what have been called minimum units in design.²⁰ The most crucial practical question then is how patterns or, assuming a given context, the problem and

prescription, are actually arrived at. It appears from examination that problems may be isolated in a number of ways including:

1. by direct observation;
2. by derivation from empirical insights; for example, certain behavioral research has clarified human social requirements, at least some of which cannot be accomplished without physical changes in the environment;²¹
3. by following up hunches about possible problems;
4. by deriving more minor problems from ones which are of major importance for the specified context; and
5. by being revealed in the literature.

The process of finding a prescription has been summarized by Silverstein:²²

Every whole statement about structure of the environment has a double nature. (1) It proposes some form as the appropriate setting for some human function, and (2) It presents evidence to corroborate the proposal. (1) is grounded in subjectivity. It comes from the private vision of a form-maker; it is the intuition that puts you out on a limb. (2) is anything--analysis, conjecture, simulation, interview, personal experience--which assures you and the people around you that the limb you have created in (1) is sound (or unsound and to be avoided).

Perin has said that Alexander's way of integrating research findings from the behavioral sciences into patterns is a major methodological contribution.²³ But she has suggested that, in the final analysis, patterns "accomplish nothing more than simply stating as fully as possible the particular circumstances surrounding a particular designing event", since "any designer reading them would naturally

have to adapt their ideas to his particular population, climate, budget, available materials, topography, political situation and, not least, to his own imaginative capacities, experiences, biases, insights."²⁴ This criticism is accurate in a sense but it ignores precisely some of the things that the formulation of patterns attempts to achieve. The fact that patterns are intended as generative design images explicitly recognizes that, unlike the specific solution, they may be used repeatedly and hence subject to a range of external modifying influences. More importantly, they frequently deal with problems ordinarily ignored and offer an image rather than an abstraction as a prescription to a problem, which can be made available for public discussion and normally be empirically confirmed.

Environmental Pattern Language

Given patterns, the question arises as to how they are to be used to create complex and complete forms. The environmental pattern language, is, most simply, "a system which coordinates the patterns with one another".²⁵ Or, if a pattern is seen as a generating principle for a single space relationship, then pattern language is a "system of three-dimensional space relationships capable of generating environmental form".²⁶

From a practical point of view pattern language has three purposes, which are more implementable when a large number of patterns are involved:²⁷

1. to allow the uniqueness of each site and situation to be provided for;

2. to indicate the hierarchical ordering of the patterns. From past experience, it is apparent that some patterns are of major importance for the whole design while other ones neither affect nor are affected by other patterns;

3. to indicate which patterns are concerned with a specific part of the whole in order that they may be considered at the same time.

The theory of the language is still incomplete. The major difficulty has been to find a simple way of communicating how exactly the patterns are to fit together.²⁸ Increasingly though, patterns have been viewed by the CES as providing a means for any person to create his own environment by selecting those patterns that suggest to him what he wants in, for example, his house. This approach de-emphasizes the need for a "language" per se and accords with the feeling that to formalize strictly any design method is to abstract it from the real world and, in the case of patterns, reduce their effectiveness and intent.

It is not the intent of this study to arrange the patterns formulated into a pattern language for pedestrian systems. A large number of patterns will not be formulated and it is envisaged that they more frequently than not would be used only a few at a time rather than as an ensemble. The need for a language for the reasons given under points (2) and (3) is then nullified.

Duffy and Freedman have argued that one flaw in the pattern format is that it suggests that there is a single and best solution to solve a problem or do away with a conflict. They suggest that this is a unilateral and mechanical approach which, while it may work for simple technical needs, cannot with social and cultural problems. It appears that their argument is possibly based on a

misunderstanding of Alexander's intent with regard to the context aspect of patterns for he has stated that

A language is so organized that a person who has a particular context in mind can obtain all the patterns appropriate to the context from the language in the order most suitable for combination. This ordered set of patterns, in the proper order, is called the sublanguage for that context. Every culture has its own language, which defines the total environment for that culture. Every subculture in a culture, and every institution in a culture, has its own language, which defines the total environment for that culture.²⁹

Effects of the Man-Made Environment on Behavior

Implicit in the discussion of patterns has been an attitude towards the effects of the man-made environment on behavior which, because it tends to be regarded rather anomalously in planning (and in the social sciences generally), will be discussed here in order to clarify the attitude taken towards it for the purpose of the patterns. Further, this subject would seem to have considerable relevance for pedestrian circulation systems which, after all, control for most purposes the movement patterns of the pedestrian.

The phrase "effects of the man-made environment on behavior" is used here instead of the possibly more familiar term "environmental or physical determinism" because use of the latter term implies an assumption, while the real question appears to concern the extent to which humans are viewed as behaviorally dependent variables and the environment as an independent variable or the reverse. In any case, it is generally accepted that the existing environment is one of three interdependent classes of phenomena which

affect a person's behavior (the other two being genetic endowment and history of interaction with the environment).³⁰

Traditional environmental determinism, with its belief in the designer's ability to shape human activity, concerns the extent to which the built environment shapes peoples' lives, ignoring their personal characteristics. One of the major assumptions has concerned, as Michelson puts it, "how much the physical environment influences who comes together with whom".³¹ Both Keller and Michelson have found in their resumes of the sociological literature concerning the physical environment as a variable possibly affecting human behavior that

Other things being equal, differences in physical and functional distances may well influence social contacts and relations in that the closer the distance between two or more residents, the more likely they would recognize one another by sight, sound, and perhaps, name. We cannot say the friendlier they would become because they may not go beyond these superficial contacts. In some instances, however, these superficial, physically maneuvered contacts do develop into more enduring personal relationships. The reasons for this must lie in the fact that physical distance and siting do not play an independent or a 'determining' role in social relationships. Something intervenes to minimize or maximize their influence. These intervening variables may significantly alter the direct impact of physical factors on social life.³²

One definite intervening variable seems to be homogeneity in social class; another may be the need for mutual aid.³³ In essence, social relations among neighbors appear to be minimally affected by physical design.

A second approach concerning the effects of the man-made environment on behavior is that of the environment as

a set of limiting conditions which offer possibilities for or inhibit or prevent particular types of interaction based on physical possibilities and opportunities.³⁴ This position is quite different from the traditional environmental determinism. It is not a claim that the physical environment per se influences behavior, but rather, that certain behavior will be difficult or impossible without the physical structures to support them or allow them to be possible. It is this behavior-supportive effect of the man-made environment on behavior which is encompassed by patterns. Environmental changes necessary to support desirable behavior are the basis of the problems. It is, in Alexanders' words, "finding form for the environment that is...firmly based on the demands of human nature".³⁵

Use of Patterns in This Study

The objective of this study is to formulate alternatives and improvements to the existing pedestrian system in residential areas. This is to be done by using the design method explained in this Chapter. This method will also result in the "product" or design images which are the objective of the study. It should therefore be clear that the data from which the patterns will be formulated will be presented as an integral part of the patterns and that this study will not contain a completely separate presentation of data as is normal in such studies.

To recapitulate--and it is important to understand this: taken as a whole, the patterns with their four part format (context, problem, prescription and discussion)

constitute both the methodology, which produces the product, and the actual product, the pattern or reusable design images. Strictly speaking, the patterns are the final product only insofar as this study is considered. In actual practice the conversion of the patterns into built would be the final product.

To assist further in understanding this dual nature of patterns it may be useful to describe the analogy that has frequently been made between patterns and pattern language, and spoken languages.³⁶ A language consists of a body of words and the method (ie. rules of grammar) for generating an infinite number of sentences. Patterns correspond to rules of grammar (method) which, as reusable design ideas or generating principles, generate form.

Reference was made earlier to both the increasing consideration of human behavior variables in the design process and the use in the formulation of patterns of empirical data to "prove the hypothesis" of each pattern in effect. As recently as 1966, however, Sommer stated that "the entire art of design rests on empirical underpinnings so weak that no consensus exists about what arrangements are efficient, beautiful, or even relevant to a given activity".³⁷ Studer has agreed that "we haven't the conceptual tools, nor do we have an adequate empirical understanding to precisely correlate environmental and behavioral variables".³⁸ The primary reason for the weak empirical basis would seem to be that social scientists have typically thought of and studied humans according to three systems--cultural, social and personality--ignoring

the physical system and particularly the man-made environment almost completely.³⁹ The emerging field of man-environment studies has made initial efforts at remedying this imbalance though it is still at such an immature stage of development that its paradigms have not yet been accepted.⁴⁰ Most frequently referred to as the field of environmental psychology, it is not, as the name would suggest, limited to a consideration of the individual but rather "with behavior as it is expressed at all levels of social organization".⁴¹ Because of this barely hatched state of man-environment studies, evidence for patterns has been "anything--analysis, conjecture, simulation, interview, personal experience".⁴² It is somewhat misleading, however, to assume that all corroborative data must come from the field of environmental psychology. A body of older research or research done outside this specific field is also relevant. Attempts will be made to use empirical data wherever possible in this study, but this state of the field explains why it has been necessary to refer in the objective to the use of "scientific and design literature" as evidence for the patterns.

Summary

This Chapter has described in detail the methodology for the study, the formulation of patterns composed of a context, problem, prescription and discussion. In their entirety these also form the product of the study; that is, reuseable design images for use in the design of pedestrian circulation systems in residential areas.

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CHAPTER III

THE CONTEXT: RESIDENTIAL AREAS AND PEDESTRIANS

This Chapter is concerned with a number of items which must be defined in order to understand how and why the patterns to be presented in Chapter IV have been formulated. The meaning of the term residential areas and a description of some of their typical aspects will be outlined. The major categories of pedestrians and the central objectives of pedestrian planning and design will also be discussed, as it is from a correlated consideration of users and objectives that it is proposed problems for the patterns be derived.

Residential Areas

No attempt will be made to view residential areas explicitly as, or order them into, neighbourhoods as Keller has defined the term; that is, as local areas with "physical boundaries, social networks, concentrated use of area facilities, and special emotional and symbolic connotations for their inhabitants".¹ The reason for this is practical: it has been realized that few people conceive

of any given residential area in neighbourhood terms in the same way that they may be designated neighbourhoods in planning terms. The variable, even individual views of what constitutes the neighbourhood are dependent not upon physical layout and official designation, but rather upon individual neighbouring activities and use of local facilities and services. At most, residential areas will be regarded as neighbourhood units in the pure sense of that concept--as service areas providing "a link between territorially bound activities related to work, residence, schooling...recreation".²

Jane Jacobs has vividly described her urban ideal with the "exuberant diversity" of its streets and districts. She has also described in some detail the uses of paths for safety, contact and assimilating children, pointing out that "a city sidewalk by itself is nothing. It is an abstraction. It means something only in conjunction with the buildings and other uses that border it, or border other sidewalks very near it."³ What pedestrian paths should border on, in her view, in order to achieve liveliness and interest is based on four conditions: the district must serve at least two primary functions; "most blocks must be short; that is, streets and opportunities to turn corners must be frequent"; the buildings must vary in age and condition; and there must be "a sufficiently dense concentration of people".⁴ Similarly, Alexander has described for his experimental project in Lima a "paseo..., a system of looped pedestrian paths connecting a system of activity nuclei...volley ball courts, public gardens, movie

house, bars, swimming pools".⁵ These descriptions of paths and their necessary surrounding activities have been mentioned here because they serve as an excellent contrast to the typical low or medium density residential area.

In formulating alternatives and improvements to the existing pedestrian system in low and medium density residential areas it is necessary to consider the realities of such areas. The patterns to be proposed are not meant to apply solely to any specific layout, but also to apply generically to all layouts of the appropriate densities. But they naturally cannot be abstracted from the actual characteristics such areas typically tend to exhibit as a result of their density and, to an extent, zoning regulations which forbid mixtures of land use.

From the social point of view it is interesting to note that Hall has described the grid--and this applies to curvilinear forms as well--as being sociofugal.⁶ Things are strung out along it; it is, in other words, a form which effectively keeps people and things apart. Both Jacobs and Alexander are concerned with maximizing pedestrian activity in areas with many opportunities for making this possible. In contrast, many suburbs have, at most, a single non-residential focus in the form of a meagre collection of shops offering basic goods and services.

From the physical point of view there is the sheer physical distance inevitably involved in areas of single family housing. Even the width of the street is a notable distancing factor. The street right-of-way has historically been based on the length of the surveyor's chain or 66 feet,⁷

although some relatively recent practice has reduced this to 50 feet for local residential streets.⁸ Included in this width are roadway, gutter, curbing, boulevard and sidewalk. In addition, a typical front yard setback is 25 feet, making the total width between facing buildings 116 feet. Eckbo has remarked that the street will dominate communities visually "whenever its width from building to building exceeds about twice the height of those buildings".⁹ In many streets the dwellings are in height not much more than one-tenth of the measurement separating them from the dwellings opposite. Cullen, though speaking in the British context and about British New Towns, states that "the main impression of prairie planning is that of vastness, the feeling that the little two-storey houses are far too puny and temporary to match up to the monumental, overpowering space. The last thing it does is suggest a stroll; the unhappy pedestrian is left with a feeling of hopelessness in face of a terrifying infinity of wideness punctuated at intervals by seas of concrete."¹⁰ In the North American context though there is empirical evidence to indicate that this typical residential area vastness or lack of enclosure is considered desirable by residents.¹¹ One of the classical problem areas in discussions of provisions for pedestrians, that of distance, scale and movement involving an experiencing of sequence or succession of perceptions or experiences having continuity, tends to lose many of its opportunities for implementation, if not its validity. There is, in effect, little in residential areas to support pedestrian behavior. As Morris and Zisman

have remarked, "few people, aside from those seeking exercise, will walk just because there is a tree-lined street with wide sidewalks available".¹²

Pedestrians in Residential Areas

People walk for purpose, pleasure or some mixture of both. Morris and Zisman have more finely defined types of walking as terminal trips such as to and from the bus stop, use trips destined to some specific land use function such as stores, and health and pleasure walks for exercise and enjoyment.¹³ This study was begun with the belief that there is not a great deal of walking done in residential areas and that certain categories of users constitute a sizeable proportion of all pedestrians. To confirm this the anthropological technique of observation was relatively nonrigorously applied to an area in Vancouver bounded by Granville and Cambie Streets, West 41st Avenue, and Southwest Marine Drive. This constitutes much of the areas popularly referred to as Oakridge and Marpole. Since neither area has any officially defined boundaries, the boundaries chosen were all arterials. Granville and Cambie Streets contain commercial development at a number of points. This area embodies a considerable range of housing types and socio-economic groups. Marpole has two basic types of housing, walk-up apartments and very modest, mainly old single family houses. One could guess that a sizeable proportion of the population is lower middle class. There are a large number of young couples in the walk-ups and older persons in the housing. Oakridge has several town

house and high rise apartment developments inhabited mainly by childless couples, good quality single family houses and Vancouver's only regional shopping centre. The population is middle and upper middle class.

During the first two weeks in October, 1971 selected coverage of this area was made by a windshield survey each non-rainy day (10 days) at various times ranging from 7:30 A.M. to 7:30 P.M. Figures on actual numbers of pedestrians sighted were not kept as the major purpose of the survey was not an accurate count but rather an impressionistic confirmation regarding numbers and types of walkers. As far as accurate counts of pedestrians are concerned, it would be almost impossible using the observation technique to comment accurately on the actual incidence of pedestrianism without a survey observing all major intersections and traffic generators on a continuous basis and correlated with the total area population. Such a survey was beyond the means of this study. On the other hand, impressions could be made relatively readily regarding the groups in the area who typically walk. School children to high school age (when they are often dependent on transportation) dominated the total percentage of pedestrians. They were followed by mothers and pre-schoolers, and pre-schoolers alone playing in the right-of-way. The two other obviously categorizeable groups were older, probably retired persons, both male and female, and housewives of all ages. The school childrens' trips were obviously for a purpose while a majority of the others probably had a basic purpose as well, though some element of pleasure or at least exercise

was undoubtedly involved. A very mixed population was seen at bus stops and in the areas adjacent to the major commercial areas. Some proportion in the latter circumstances would have been drivers in the first instance.

Besides this informal survey another survey of a different nature was utilized to confirm impressions regarding pedestrians. This was the Vancouver Activity-Travel Study undertaken in the Planning School during the summer of 1971 as part of the Inter-Institutional Policy Simulator (IIPS) study of metropolitan Vancouver. The sample was chosen from within seventeen census boundary tracts in metropolitan Vancouver and was not considered to be necessarily representative of the population of the metropolitan area. No purpose would be served by describing these boundaries here. A questionnaire asked for, among other things, an activity time budget for the day (twenty-four hours) following receipt of the questionnaire. The data obtained concerning the incidence and kinds of pedestrianism within the metropolitan Vancouver population is highly imprecise at best because the activity budget was not answered or improperly answered by a sizeable number of persons and the weather (an obviously crucial factor in walking for pleasure in particular) was not recorded for the day on which the activity budget was actually completed by each person. A summary of the raw data¹⁴ indicates that approximately one-third of the total number of respondent households (including those who did not complete the activity budget portion of the questionnaire) did some walking. Probably the single most common journey,

since school trips did not occur during the summer, was the trip to and from the bus stop, while trips to facilities, particularly grocery stores, was second and trips for pleasure third. The pedestrians were mainly elderly persons, housewives and school children on vacation. The total sample indicates, however, some bias towards elderly persons.

The general impression received from the two surveys is that there may be more walking in residential areas than popular opinion holds to be the case but that it is rather sporadic with specific flows in the early morning to school and the bus stop and the return of these persons in the late afternoon. Despite the considerable biases resulting from the population composition of the two areas in which the observational survey was undertaken and biases in the activity budget survey as well, it seems apparent that the major groups of pedestrians are school children, mothers with pre-schoolers and housewives generally, and elderly persons. This conclusion corresponds with one which might have been arrived at intuitively. The major groups of persons habitually present in residential areas and those with least access to private transportation are the defined groups. Some variation in pedestrian composition will occur according to the age and socio-economic characteristics of specific areas. Upper income families are likely to have two automobiles, thus reducing or eliminating the housewife's tendency to walk. New suburbs will have very few elderly pedestrians. Nevertheless this does not affect the conclusion regarding the major

groups of pedestrians.

Prelude to Formulation of the Patterns

It was learned over half way through this study that a sizeable number of patterns for pedestrian systems have been formulated by the CES, though many have not yet been published.¹⁵ It was decided, therefore, to attempt to rationalize to the extent possible the largely intuitive process described in Chapter II by which the problems for patterns have been isolated, based primarily on the observer's ability to discern real problems, in order to arrive possibly at some different results.

It was mentioned in Chapter I that prominent throughout the literature on pedestrians are a number of factors which could be termed objectives or goals in planning for pedestrians. Among the terms used in the literature are continuity, clarity, imageability, convenience, comfort, safety, security, legibility, and aesthetic and liveliness aspects. It was considered that the use of a limited number of major, general objectives accorded well with the general purposes of this study which is concerned with the formulation of patterns for generalized residential settings. Also, the study concerns an element of the residential environment which is relatively non-specialized and is subject in most circumstances to a wide range of users rather than specific populations for whom specialized objectives might be defined.

It was thus decided to formulate a matrix using the two paramount aspects of the pedestrian system--the major groups of users and the objectives to be embodied within

the system--in an attempt to isolate problems more systematically. Many of the terms used in the literature referring to pedestrian planning objectives tend to be synonymous or at least overlapping in meaning when they are applied in practice. A consideration of these terms originally led to the selection of four--convenience, activities, comfort and safety--as covering the range of terms and meanings adequately. Ultimately safety was deleted and will be discussed in the following section. The remaining three terms were used as the objectives in the matrix and are defined here in order to clarify the reasonably expansive meanings assigned to them.

1. Convenience - The dictionary definition of convenience is "ease in use or action". This definition generally accords with the meaning given the term in the literature. Ease of use implies directness, the ease with which all parts of an area can be reached.¹⁶ An aspect of directness is continuity.

2. Activities - In the literature there is a concern with the common design considerations of distance, scale, spaces and facade as aspects which encourage the pedestrian and make walking enjoyable.¹⁷ Fruin, typically, refers to "the sense of excitement that should be created by an urban space", but does not extend his meaning in practical terms, while Benepe mentions "delight". Lynch has referred to the imageability of physical objects. The use of the term activities is meant to include these ideas, but

it also goes considerably beyond the typical ideas expressed in the literature. Its purpose is to encompass as well some of the actual or potential pedestrian behavior which the present system does not support.

3. Comfort - This refers to those aspects or qualities which make the path more comfortable to use.¹⁸ It will be used here to apply specifically to considerations of climate, width, gradient and surfacing.

The matrix as formulated for the three objectives and four groups of users is shown in Table I on the following page. Each group of users was considered in relation to each objective and a series of questions was asked: for example, what factors of the pedestrian path mean convenience to housewives? what are the requirements of housewives with regard to the convenience of a pedestrian path? what, if anything, do housewives do which suggests a requirement for convenience in a path?

Table I. Major User Groups and Pedestrian Path Planning Objectives

Users	Objectives		
	Convenience	Activities	Comfort
Pre-school Children	No direct relevance; generally use at most only a few hundred linear feet of path most directly accessible to their homes.	Play centres around three major types of play objects: traditional and static equipment such as slides and swings; sand, water and earth; wagons, tri-cycles, toys, etc. all requiring hard surfaces for use. ¹⁹ Paths should be suitable for the last activities.	Use paths for play purposes, tending to remain in a specific area rather than move along the path. Therefore, should be in the sun as much as possible and protected from the wind.
6 to 14 Year Olds	Require direct routes to school. Children in particular follow desire lines if at all possible.	Require greater space and are much more energetic in scope than pre-school children. ²⁰ Thus much play is unsuitable for integration with the path. Rope skipping, marbles, roller skating, etc. are frequent activities utilizing the path.	Same as for pre-school children.
Housewives	Require direct routes to and from all residential area facilities if they are to reach them by walking. This is particularly true when carrying parcels.	Taking pre-schoolers for walks is an important activity; therefore, require provisions for sitting. Meeting people by chance at store or other facilities and stopping to visit is a major way of seeing many people.	Degree of sun preferred is an individual matter but require same protection from other climatic factors as children. Use paths for both purpose and pleasure or a combination of both; eg. pushing a baby carriage.

Table I.- Continued

Users	Objectives		
	Convenience	Activities	Comfort
Older Persons	Same requirements as for housewives.	Walking is a major form of recreation which could help to overcome "one of the most common social deficits of older people...,the involuntary reduction of social interaction". ²¹	Use path for both purpose and pleasure or a combination of both; eg. exercise. Since much walking is for exercise, require protection from climatic factors and places to sit and rest or watch activity.

Safety

Safety refers generally to the reduction of pedestrian-vehicle conflict. In the literature on pedestrians safety is explicitly or implicitly assumed to be a major objective of pedestrian planning. It appears to be an international phenomenon that pedestrian casualties are highest in the 5 to 14 years or over 65 years age groups.²² Pedestrian fatalities are invariably highest in the latter group. These accidents appear to be caused almost inevitably by the pedestrian committing an unsafe act. The elderly pedestrian tends to treat vehicular traffic with disregard or contempt or misjudge traffic because of failing senses.²³ Young children, on the other hand, suffer from gaps in language, vision, perception and comprehension.²⁴

There are eight recognized engineering means (as opposed to persuasive and enforcement measures) for dealing with pedestrian traffic.²⁵ The most common and basic of these is, of course, the sidewalk itself. It appears to be an assumption in much of the more technical literature that sidewalks are normally provided. The Institute of Traffic Engineers is typical and it considers four to five foot sidewalks, usually on both sides of the street, essential except for very low densities.²⁶ Sidewalks are considered by the Institute to have certain specific functions, including:

1. providing for maximum safety for children playing;
2. protecting children walking to and from school and elsewhere in the neighbourhood;

3. providing for adults walking to and from neighbourhood shopping, transit stops, etc.²⁷

It is thus worth noting that the British Columbia Municipal Act states that municipal councils may provide and regulate sidewalks but it does not give them authority to require developers to provide sidewalks, although a number of municipalities in fact do require this under their comprehensive development regulations. In Central Mortgage and Housing Corporation's Site Planning Handbook it is stated only that "at least one sidewalk is recommended along a collector street. A 4-foot width for sidewalks is considered to be a minimum but 5 feet is more desirable".²⁸

Other safety provisions include crosswalks, signals, barriers, safety zones and islands, tunnels and overpasses, lighting, and signs and special markings. All of these provisions are subject to considerable misuse by children and elderly people.

Experience with the superbblock, a kind of safety zone, has indicated that the loop or cul-de-sac streets originally intended only for vehicles are also used as the main foot-paths and childrens' play area.²⁹ Complete pedestrian-vehicle separation in residential areas of the Radburn type has had many advocates, but users endeavour to depart from the original idea whenever more convenient routes lie via the road system. Thus Lynch, for example, has stated that "at the normal residential scale at least, complete dissociation of foot and vehicular travel now seems neither necessary nor desirable, except for the traditional separation

of street and bordering sidewalks".

In the context of formulating patterns the range of possibilities, with the exception of relying on certain types of site layouts or formulating elaborate and unlikely means of segregation, appears to be restricted to the above technical devices with the provision of pedestrian ways the most basic. Any or all of these could be formulated as a pattern but there seems little point in this. It is worth noting that, as far as is known, the only pattern specifically concerned with safety which the CES has formulated is in connection with a housing project in Lima.³¹ It consists of a rather elaborate "knuckle" solution at any point where a pedestrian path crosses a major road, which basically requires a marked narrowing of the road at such a point and a "knuckle". Therefore, important as safety is as a pedestrian planning objective, it was decided not to include it with the objectives selected for the formulation of patterns. Aspects of safety will appear in one of the patterns in any case.

Summary

Some of the realities of the low and medium density residential setting have been described in this Chapter in order to give an indication of the constraints for pedestrians inherent in such areas. The major groups of pedestrians-- school children, mothers and pre-schoolers, housewives and elderly people--have been identified, and three broad pedestrian planning objectives--convenience, activities and comfort--have been described. Safety was discussed separately

as a more intractable objective. Finally, the major groups of users plus the objectives have been brought together in a matrix in order to indicate some user requirements and problems which the patterns might be formulated to support.

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²⁴School Safety, U.S.A., "The Child Pedestrian," Vol. 5, No. 4 (March-April 1970), pp. 5-6.

²⁵Jason C. Yu, "Pedestrian Accident Prevention," Traffic Quarterly, Vol. XXV, No. 3 (July 1971), pp. 394-401.

²⁶Institute of Traffic Engineers, "Recommended Practices for Subdivision Streets," (Washington, D.C.: The Institute, 1969), p. 2.

²⁷Ibid., pp. 4-5.

²⁸Central Mortgage and Housing Corporation, p. 8.

²⁹See, for example, Ritter, p. 321.

³⁰Kevin Lynch, Site Planning, 2nd edition (Cambridge, Mass.: The M.I.T. Press, 1971), p. 127.

³¹Alexander et al, pp. 84-86.

CHAPTER IV

PATTERNS

Format of the Patterns

In Chapter II the patterns were described as being composed of four elements: a context, problem, prescription and discussion. The setting or context for this study is, of course, low and medium density residential areas. As it is intended to keep the patterns sufficiently broadly generic to apply to this and not more specialized contexts, the context will not be restated in the patterns. Thus each pattern will be presented in the following format: title, problem, prescription (both verbal and visual) and discussion.

In the preceding Chapter a matrix of objectives and users was presented. In working out the patterns it was found that this format provided useful guidance and rationalization to the process. It was also found that in their final form most of the patterns were not identifiably derived from any single user-objective relationship. Some of the patterns, in fact, exhibit a

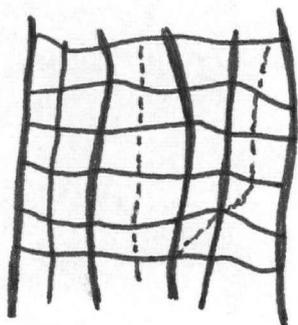
certain degree of overlap between objectives. The identification and correlation of patterns with objectives and users will be presented at the end of the Chapter.

Patterns

Paths Are Short Interconnections

Problem: People may be unwilling or even unable to use local facilities if they are not convenient or easily accessible enough to walk to.

Prescription: Provide paths which are interconnected like a net and do not run for more than about 420 feet without meeting intersecting paths at right angles or on a diagonal oriented towards local facilities.



Discussion:

Whether to take a journey or not is influenced by a number of factors, including "the physical effort of moving, the mental effort of navigating, the deprivation of some other satisfaction that could be enjoyed during the travel time",¹ and a calculation of the distance and time involved, particularly if it is a walking journey. There are three kinds of separation of people from other people or objects

in space: perceptual, accessible or functional, and actual physical distance.² Perceptual distance is a function of personal interest in an object. Accessible distance is the distance actually traversed in moving between two points. Both perceptual and accessible distance are necessarily linked with physical distance or the linear distance between two points, although they are partially independent of it. There is evidence though that, no matter what these distances are, the length of trip that will be tolerated is related to its purpose. For example, a survey of distances walked to bus stops in predominantly multi-family housing areas by public transit users in Washington, D.C. found that the mean distance walked by persons of various socio-economic levels ranged between only 494 and 727 feet.³

The pedestrian himself determines in part by his walking speed the distance he is likely to be able to walk or to consider walking. An average person can cover, for example, about 880 yards (one-half a mile) in ten minutes when walking purposefully or 733 yards when walking at an average speed, while the elderly or a young child may cover only 440 yards in that time.⁴

Although it is recognized that tolerated walking distances are dependent on a number of variables, just what range of distances might be acceptable for different users undertaking various types of trips is not known.⁵ Neither is it known how many persons are potential pedestrians but are unable or unwilling to walk because of the distances or conditions involved.

Enumeration of these factors serves to emphasize that walking is determined by a number of complex and inter-related variables. Despite these aspects, however, the fact remains that the major groups of habitual pedestrians in residential areas, the elderly, housewives and school children, are pedestrians because they lack access to private transportation. Because public transportation normally is located on the periphery of such areas, it cannot be used for access to local facilities. Hence many must walk if they are to use those facilities. The elderly in particular may find walking very far difficult if not impossible physically, while housewives will frequently want to be able to make a trip in the minimum amount of time.

Pure physical distance obviously cannot be changed in any manner though the other two types of distance may be. From observation it is apparent that the accessible distances to local facilities are frequently considerably further than pure physical distances. Curvilinear layouts in particular often do not provide pedestrian paths which are as direct as possible to local facilities. To compound the problem the physical distances involved in residential areas based on the neighbourhood unit idea are determined by the number of children required to support an elementary school and thus on the density of family dwelling units rather than on a specific distance which would ensure pedestrian access to local facilities.

One of the few studies to attempt to measure the importance of convenience or direct access (in the case specifically in connection with the housewife's walk to

local shops and the subway commuter's walk to the station) was carried out in two Tokyo wards by Tyrwhitt. While some of the results cannot be applied to Canada for obvious reasons of culture and context, it was found generally that what was most wanted was "a very direct route without turnings or crossings".⁶ In practical terms, therefore, convenience can mean keeping actual distance as short as possible. Although this question may be considered from the point of view of the location of facilities, this is beyond the present scope.

Lynch has described three main forms of circulation systems: linear, radial and grid.⁷ The linear form is a specialized one consisting of a single line or parallel series which is unsuited to pedestrian travel unless, of course, the layout itself is only a linear development. The radial form gives the most direct line of travel but is most useful for traffic having a common origin, interchange or destination. At the neighbourhood and pedestrian system level a system of radials would be appropriate for areas developed as neighbourhood units with all local facilities clustered in a central area. But because many neighbourhoods do not follow this plan and because the radial system does not provide for any shift in or additions of centres of activity, it is unsuitably rigid for a neighbourhood pedestrian system.

The third form, the grid, may take the form not only of the ubiquitous rectangle but also of a triangle and hexagon. Grids seem eminently suited to pedestrian requirements. They are, in general, useful where traffic is

shifting and widely distributed. If a grid system is thought of as a net, which has minor expansions and contractions, rather than a set of rigid rectangles, then the intent of the pattern will be clear. The interconnections which typify a net must be maintained to give the pedestrian both choice and directness in travel. For as Jane Jacobs has noted, "any physical cutoffs to foot traffic in particular are destructive in cities".⁸ But directness cannot usually be achieved if each leg is long. Two legs may meet perpendicularly and/or be joined to constitute one or more sections of triangular grid, provided such diagonals are oriented in the direction of local facilities. For, above all, the circulation system linking spaces should be the logical outcome of the relationship among the activities people are carrying out. Additional legs which produce, in effect, a triangular grid allow both greater choice and a nearer approximation of pedestrian desire lines since they allow travel in an additional direction. In addition studies have shown that the formation of a map image is easiest where there is a street plan with, among other things but most importantly, a regular pattern.⁹ The process of orientation is made easier in such areas, particularly when the paths are clearly connected with one another.

What should the length of any individual leg be before it meets a bisecting leg? It is suggested that each leg be no longer than about 420 feet. This length quite obviously does not require extended detours to move from one point to another. This is the distance that old people and young

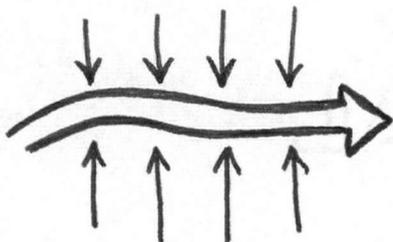
children are able to walk in about three minutes. Although there is no evidence to confirm this, it intuitively seems that such persons should have the opportunity to change direction after approximately three minutes. This allows, in effect, an increased opportunity to explore the environment, to take a variety of paths to one's house.

The suggested length is also supported by other reasons not directly related to considerations of convenience. In an area of single family houses it is the length of space required for seven houses placed in a straight line on the typical 60 foot lot. Research by William H. Whyte in Park Forest, Illinois over several years suggested that the approximate maximum number of houses to enjoy social interaction was seven.¹⁰ Gans, commenting indirectly on Whyte, found that in Park Forest "block size (with regard to social interaction) is significant only insofar as a small block may feel itself to be more cohesive because all sociability takes place within one group".¹¹ Jane Jacobs advocates short streets, though to generate "exuberant diversity".¹² She points out that successful blocks in New York, Boston and Philadelphia are short and specifically mentions that the length of certain East Side New York blocks is 400 and 420 feet.

Paths Enable Social Encounters

Problem: The pedestrian in residential areas frequently neither meets anyone he knows or recognizes on the street nor even sees anyone else. Neighbours may not even run into one another and thus have little contact.

Prescription: Place paths where they will provide an opportunity for a maximum number of encounters between people to take place.



Discussion:

It is normal, even inevitable practice to place pedestrian paths parallel to the road. There are times when this is a useful and necessary convention. But in most situations there is no reason for it beyond convention. Pedestrian shortcuts to ensure that no journey need proceed more than about 420 feet in the same direction will inevitably not be paralleled by the road system if individual blocks of land are longer than that.

Gutman, a sociologist, has commented on the process

by which site plans can influence behavior.¹³ His comments apply equally to one aspect of the site plan, the path, if at a reduced intensity.

The residents of housing developments are social animals, too, who require the support of others for their own mental well-being and for the initiation and maintenance of the cooperative organized activities upon which group life and the survival of society itself ultimately depend. To establish and carry out these activities the occupants of plan areas must be able to communicate with their neighbours and with other persons and families living nearby. Social communication relies upon the use of the senses, the human faculties of receiving mental impressions through the bodily organs and through the awareness of changes in bodily states. Site plans acquire some of their significance from their capacity to facilitate or thwart the use of the senses; in other words, through their power to regulate the communication process among the residents and other users of a plan area.¹⁴

Caplow and Foreman found, in researching friendship patterns in a university married students subdivision which grouped back-to-back houses in rows of five facing each other, that everyone sharing a given sidewalk was extremely likely to know everyone else whose front door looked out on that same sidewalk.¹⁵ People were much less likely to know others whose homes and even doors may actually have been closer to theirs but whose front door did not look out on the same sidewalk. Lynch has noted with reference to the Radburn-type layout with row housing at Chatham Village, Pittsburgh that acquaintances are made along the common paths rather than across the park.¹⁶

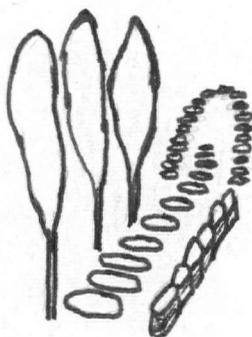
Given the appropriate physical position, the path must also be an appropriate distance from dwellings if it is to serve its intent. The maximum distance at which a person

can perceive the individual facial expression of another is 48 feet, with 80 feet being the limit for facial recognition.¹⁷ Blumenfeld has suggested that the 48 foot distance is therefore correct width for streets. Outdoors a distance of 40 feet is still a relatively intimate distance. Optimal distance over 40 feet must thus be determined by the degree of publicness or privacy desired.

Paths Have Special Identities

Problem: Although streets should provide the major visual scenes in urban areas, in residential districts they are often monotonous, with commercial streets the worst offenders. There is nothing about the path itself to make the pedestrian aware that he is on a particular path.

Prescription: Give paths, and in particular those around commercial areas, identities which will convey distinctive images to the pedestrian.



Discussion:

The difference between older residential areas with their large, mature trees and often small scaled lighting and newer areas with either young trees or none at all is readily observable to any pedestrian. The first has a certain feeling about it which appeals to those moving at the speed of the pedestrian. It possesses a specific image and a cohesion. There is a sense of being in a

defined environment. The buildings become less noticeable and their shortcomings tend to be overlooked. In newer areas though there is no defined sense of the path qua path. It is merely something to walk on past buildings whose contrived differences are, as a result, highly noticeable. From Jane Jacobs point of view at least, this monotony results from a homogeneity of use which aesthetically carries with it a superficial order but a deep disorder because it fails to convey direction.¹⁸ With some exaggeration she has said that "in places stamped with the monotony and repetition of sameness you move, but in moving you seem to have gotten nowhere. North is the same as south, or east as west."¹⁹

Although only a small amount of empirical research has been done as yet to demonstrate it, in the design literature there is considerable comment about the need of individuals for a sense of spatial identity. Attempts made to provide for this sense require establishing a differentiation from other, similar areas or a "sense of place", which Lynch sees as "the cornerstone of a handsome and meaningful environment".²⁰ Carr has enlarged somewhat on this idea by expressing it as a requirement to enhance the unique qualities of environmental settings. "By emphasizing the special character of places we can encourage the formation of individual or small-group attachments and meanings. It is also a way of increasing variety and novelty."²¹

A concern with enclosed space, facades, blocked vistas, focal points and a coherent unfolding of sequences

among other aspects is thus an important part of the literature on pedestrians. The intent in the use of these elements is to increase the pedestrian's enjoyment and pleasure in the visual scene, to create a visual impact as well as a sense of identity. But opportunities for using these elements tend to depend on intensive building. Jacobs, commenting on one particular type of visual emphasis, the street interruption, has said "If a street is, in truth, a long repetition of one kind of use, providing thin activity, then visual interruption does not clarify the existing form of order here. Visual enclosure of practically nothing (in terms of city intensity) can hardly be more than a design affectation."²² There are other elements though, more implementable at any scale, which can also contribute to making the environment more visually powerful. They are what Cullen has termed "content", meaning "the fabric of towns: colour, texture, scale, style, character, personality and uniqueness".²³ Any of these aesthetic aspects can contribute to the image which the path and its surroundings convey to the pedestrian. The latter factors such as colour and texture contribute in particular to that aspect of an object which Lynch has called identity in the sense of individuality or oneness.²⁴

Imageability is the term used by Lynch in The Image of the City for what other writers variously refer to as clarity, identifiability, continuity, legibility and coherence.²⁵ To be imageable requires that an element have a quality "which gives it a high probability of evoking a strong image in any given observer".²⁶ Paths in the broadest sense, meaning any channels for movement, were

isolated by Lynch as one of the five elements contributing to the image of a city and "the most potent means by which the whole can be ordered".²⁷ In his studies Lynch found that aspects which give any individual path its recognizable and memorable image include the concentration of special use or activity along a street, particular spatial qualities such as extreme narrowness, special facade characteristics, to lesser extents pavement, texture and planting, path continuity, directional quality resulting from some type of gradient, scaling or being able to sense one's position along the total length and alignment or reference to a larger system.²⁸ Lynch has specifically stated that

The key lines should have some singular quality which marks them off from the surrounding channels: a concentration of some special use or activity along their margins, a characteristic spatial quality, a special texture of floor or facade, a particular lighting pattern, a unique set of smells or sounds, a typical detail or mode of planting.... These characters should be so applied as to give continuity to the path. If one or more of these qualities is employed consistently along the line, then the path may be imaged as a continuous, unified element. It may be a boulevard planting of trees, a singular color or texture of pavement, or the classical continuity of bordering facades.²⁹

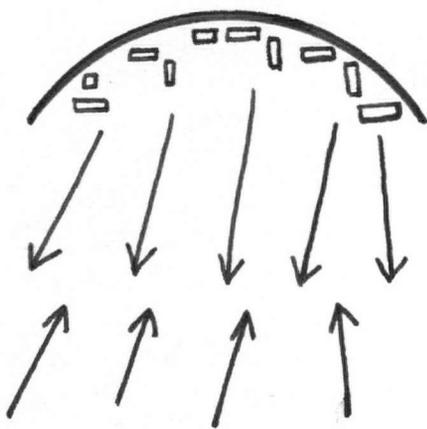
Given the characteristics of low and medium density residential areas, some of these singular qualities cannot be achieved. Both Lynch and Jacobs have mentioned though a number of aesthetic elements that would be suitable: distinctive planting, coloured and textured surfaces, awnings and other coverings. These elements

have a dual aspect; they constitute a functional aesthetic. Not only do they help to make the path imageable and unify the total street scene but, if properly applied, they also have useful protective functions; that is, if imagination is used in providing items to protect the pedestrian such as shade trees and overhead protection, they should provoke distinctive images of a particular path for the pedestrian as well.

Paths Accommodate Pedestrian Activities

Problem: Residential areas rarely have any places (except possibly a park) where pedestrians can sit and rest, or watch passers-by and general activity, or meet people in an informal outdoor setting, or sit in solitude and perhaps enjoy a view.

Prescription: Provide places at points of both activity and quietude which will allow the pedestrian to engage in other activities of the pedestrian than walking.



Discussion:

If the pedestrian path is viewed as a behavior setting; that is, a common, small locality in which the physical setting and behavior are adapted to one another,³⁰ it is

evident that the residential area pedestrian path is unable to support fully pedestrian behavior. The path is typically seen as a single rather than a multiple use aspect of the environment. It is rare to find even a bench except at a bus stop or misplaced in a park. Walking is not the only activity of the pedestrian which is directly related to use of the path. A large number of other activities are possible: sitting and merely watching the world go by where there are interesting things to see; sitting and enjoying a view in a quiet spot where it is also possible to read; standing or sitting to chat with acquaintances encountered by chance; playing; and sitting and resting.

Tyrwhitt's study of two Tokyo wards identified places where people stopped to chat. It found that "a pattern began to emerge and it seemed that almost every gathering place was either just near the entrance to a building where some kind of social activities were carried on...or else at the approach to a shopping centre. In other words, people gathered at the threshold of their objective."³¹ This situation might be expected even intuitively. Such foci, which may involve only the shopping centre and perhaps one or two other points in most residential areas, are naturally where there will be any concentration of persons in low and medium density areas.

Tyrwhitt's finding also illustrates the simple fact that what people are primarily interested in is other people. It is known, however, that "one of the most common social deficits of older people is the involuntary reduction of social interaction. Physical barriers or distances have a

direct effect on the occurrence of a transaction between people....Observation suggests that interaction rate is highest in spaces where 'sitting-and-watching' behavior occurs, assuming that these locations are protected against weather."³² As well, much has been written about the unhappy isolated suburban housewife. For these persons in particular, provision of a specific socializing space is actively the provision of a prosthetic or behavior-supportive environment. But as well as providing a socializing space for those who seriously lack contact with others, the path brings together, because it is public, those who do not and probably do not care to know each other in a private social fashion yet find it interesting and enjoyable to meet them in a casual public way.³³ It is not only interaction which may be carried on at a pedestrian place, however; solitary activities of a purposive nature such as reading may also be an adjunct of pedestrianism.

Pedestrian activity places can have a wide variety of forms. There is a need for a specific definition of space for several reasons. Most importantly, research has shown that if the physical form of an object in the built environment does not accurately convey the attributes of its activities it will be underused or badly used.³⁴ Also, spatially unstructured spaces tend to be avoided because the potential user "finds it difficult to relate to such a space and to spend time in it because of lack of environmental clues which would aid him in carrying out activities".³⁵ There is a much greater tendency for interactive behavior to occur if the environment provides designed artifacts to

support such activities.

Goffman has described the necessity of the individual in a public place to appear involved or engaged in order not to invite suspicion and to be at ease himself.³⁶ In a park, for example, it is accepted that an individual can merely sit. Thus the form of an activity place must suggest that it is a place where merely sitting is acceptable behavior.

When designing for elderly people Lawton has advised that "structure and orientation that would maximize possibilities for viewing the behavior of...more active people" should be considered.³⁷ Other research has indicated that there is an inevitable tendency to congregate, when given the choice of a number of seating areas, in the positions giving a wide visual field full of interest generating activity.³⁸

Such a sitting space should be arranged against an existing wall or have a low wall of its own which not only prevents drafts, but gives a sense of enclosure and place. Also, as Sommer has noted with reference to restaurants, early arrivals in a public place appear to seek wall positions from which they can watch later arrivals and which apparently give them psychological support.³⁹ Further, in order to be used a place must, as Alexander has noted, have a southern orientation since people will refuse to sit in the shade.⁴⁰ Some shade must be provided though, preferably by trees.

Alexander has suggested, as another kind of pedestrian place, public discussion places.⁴¹ These are seen as frequently spaced sidewalk circular rooms about ten feet in diameter

which the sidewalk is adapted to hold. They are intended for discussion only. The suggested diameter is apparently determined by the length of social distance between persons which varies from four feet at the close phase to twelve feet at the far phase.⁴² This space is also sufficiently large to contain two housewives with baby carriages.

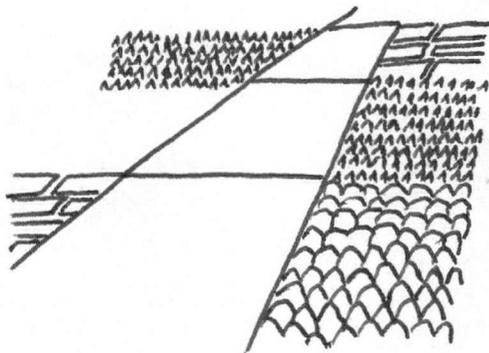
Adults are not the only pedestrians for whom facilities for interaction are required. At shopping centres, for example, children are either made by their parents to wait by the entrance, particularly in the grocery store, or to walk about the stores in, for the children, a tiring and boring fashion. Simply arranged play equipment plus some seating for their parents would solve this problem.

The second order of pedestrian place required is facilities for solitary activities. The only experiment to observe specifically the need for facilities in connection with solitary activities found that solitary behavior is tied to physical artifacts to a much higher degree than interactive behavior.⁴³ It occurs where the attention of the person engaged in no specific activity can be held by a focal point of interest; for example, a view or activity. For those engaged in such solitary purposive behavior as reading, a place sheltered from the mainstream of circulation is required.

Paths Are Protective Devices

Problem: Pedestrian paths which cause discomfort or are unsafe because of climatic factors, insufficient width, gradient or surfacing are at best unpleasant and at worst deter or prevent use.

Prescription: Make paths protective devices for the pedestrian.



Discussion:

In itself the pedestrian path is frequently considered to be a protective device, the most simple form of pedestrian and vehicle separation. But factors to which the pedestrian is vulnerable while on the path, or which are a constituent or integral part of the path can cause discomfort, or an

imagined or real lack of safety, or both. From this point of view the path as a channel for movement is protective to the degree that it permits comfortable or pleasant use by protecting the pedestrian from climatic factors--sun and shade, wind, rain and snow--as well as safely and comfortably accommodating the pedestrian by being of a satisfactory width, gradient and surfacing.

Each of these factors will be considered individually in order to assess what it means in terms of making the path a protective device. The first set of factors concerns climate, aspects which affect the pedestrian in a direct physical manner.

1. Sun and Shade - Paths which are placed along the north side of buildings will be in the shade and frequently uncomfortably cool. The fact that this side is much cooler than elsewhere is illustrated by the fact that snow remains last on the north side of buildings. One of Alexander's patterns has commented on the need for south-facing open space because open space in the shade is not used by people. The same situation applies to paths, though perhaps not to such an extent because people are usually moving on paths, while in open space used for sitting they are usually at rest. It is particularly observable downtown, however, that people prefer the sunny side of the street--unless it is too hot. People prefer the sunny side but only as long as some shade is provided in order that they do not face unrelieved heat.

2. Wind - Generally in Canada the prevailing wind is from the west while the coldest winter wind is from the north.

Path direction should attempt to avoid these two direct orientations or provide shelter by running along protective buildings.

3. Rain - Totally covered paths are probably infeasible anywhere. Cover should therefore be provided where it will be most useful. The pedestrian will feel the rain more when he is standing or must move slowly. In residential areas two of the most common spots for this are at commercial centres and bus stops. Protection should therefore be given against the rain at these points.

4. Snow - The provisions for wind and rain apply to snow as well.

The second set of factors concerns path width, gradient and surfacing. Unlike the climatic factors, these have a definite psychological discomfort-causing aspect as well as a physical one.

1. Width - The typical requirement for path width in residential areas is four or five feet. These widths are for what could be termed primary paths, the public paths linking housing with other facilities. Secondary paths are narrower ones used to link, for example, dwelling groupings within a small site. However, items in common use in such sites with young families are baby carriages and tricycles. The former usually measure about 25 inches and the latter 20 inches between outer rear axles. Where these are likely to meet frequently--and conflict--width of the path should be determined by, for example, the width of two baby carriages plus passing space.

In commercial areas, whether shopping centres or ribbon

developments, two elements are dependent on width considerations. An area of shops automatically elicits window shopping but too frequently sidewalk width does not accommodate this activity which takes an average of eighteen inches of space.⁴⁴ Secondly, the commercial area is one of an apparently irreconcilable conflict between the desire for vehicular accessibility and environmental quality, creating a noise and fume-filled environment for the pedestrian.⁴⁵ Merely increasing the width of the pedestrian way is one incremental solution to this problem. For example, a comparison of the commercial strip at Granville Street and 70th Avenue in Vancouver with the one at 41st Avenue and West Boulevard indicates that they have paths of approximately 22 feet and 10 feet respectively. Although Granville has much more vehicular traffic than 41st Avenue, it is considered, if subjectively, that the negative environmental aspects are felt much more on 41st Avenue.

People who are specifically connected with children such as parent groups, safety councils and school officials frequently have definite views on whether or not there is increased hazard from having the path immediately adjacent to the road or separated from it by a planting strip.⁴⁶ Also, some people apparently suffer from a fear that they are not entirely safe from automobiles when on paths adjacent to the road. The normal solution is to put a strip of three or four feet of grass between the road and the path. Since this strip is to some extent for reasons of psychological comfort and safety (it is also used for burying wiring and pipes under), the use of a strip of large pebbles or plant

ground cover would create more of a barrier to the roadway than the usual grass. This would result in a seemingly safer distance between moving vehicles and pedestrians and help to prevent children from riding wheeled toys into the road.⁴⁷

2. Gradient - Studies have demonstrated that gradient does not have as much of an effect on walking speed as might be expected.⁴⁸ For grades of up to six per cent, for example, there are no statistically significant differences in walking speeds according to age, sex and grade categories. A 20 per cent grade decreases normal walking speeds by only 25 per cent. But the psychological effects of gradients are more important than the physical effects. Cullen has observed that every place has its own datum-line: "to be above datum produces feelings of authority and privilege; to be below feelings of intimacy and protection".⁴⁹ Thus there is little physical reason to avoid gradients and some psychological reason to use them. Recent research has indicated optimum design standards for ramps and stairs for handicapped persons.⁵⁰ Although optimal design for handicapped persons may not be optimal design for all, it seems a relevant standard for use in residential areas with many elderly pedestrians and housewives pushing baby carriages or carrying parcels. The standards suggested for ramps indicate that the slope should not be greater than one inch per foot (8.33 per cent grade) and should have handrails and a level platform at 30 foot intervals and at ramp ends. Stairs should have a maximum riser of 7 inches.

3. Surfacing - Surfacing is capable of causing negative physical effects and potentially positive psychological

effects. It should be applied with the possible pedestrian activities to be performed on it and its behavior in wet weather in mind. The floor of plazas is at present one of the few areas to receive special surfacing treatment, but it is apparent that many become slippery and dangerous when wet.

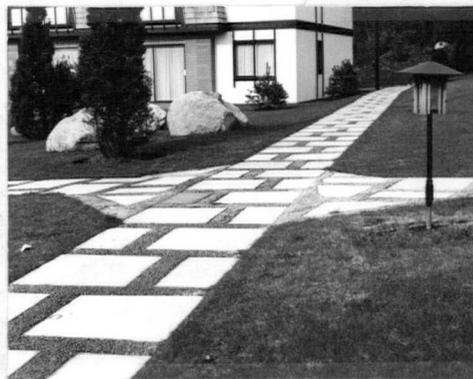
In some of his early work concerning what make the city memorable to people, Lynch found, based on peoples' recollections of childhood, that the entire floor of childrens' environment is very important since it is an everyday part of their lives.⁵¹ The texture of sidewalks of brick, gravel, cobblestone or boards held no visual appeal for children but were rather major annoyances because of their interference with such activities as roller skating and their seemingly greater injury-inflicting potential for falls occurring when running and playing. In another early study, this one based on actual walks with adults, Lynch found that the path surface drew a surprising amount of attention with regard to its pleasant visual and textural effects.⁵²

Malt has suggested several purposes for which different surfaces offering visual and aural clues could be used.⁵³ All of these suggestions embody protective aspects: "(1) To carry traffic or safety markings for motorist or pedestrian; (2) To define parking areas; (3) To identify 'rooms' or special street spaces such as intersections or crossings".

Paths Are Like Water Courses

Problem: Paths are often not followed because they do not seem to flow in the direction and manner that pedestrians seem determined to walk.

Prescription: Make pedestrian paths like water courses, which always follow a way of least resistance, travelling in a smooth direct channel for rapid movement but meandering for more leisurely movement.



Discussion:

It is not uncommon to see a path trodden into the grass leading away from a built path. New destinations may naturally arise which do not lie along the route of established paths. But it is more probably that the path does not go

to an established destination in quite the manner it should. Its users therefore make their own paths to shorten the journey, make it easier to walk, or perhaps even to make it more interesting. This problem has two related aspects: how well the path flows through the topography just as the stream is able to flow through rises and falls of land taking the way of least friction, and how well the channel suits the type of flows it must carry.

Simonds has drawn an extensive analogy between a pedestrian path and a stream.⁵⁴ The basic principle of both types of movement is that they follow a course of least resistance which attempts to make the distance between two points the shortest possible. A quickly moving stream requires a straight, smooth channel. Curves, unless gradual, will be worn back to straight lines by both pedestrians and a stream seeking the shortest course. Slow movement is the obverse: "casual foot traffic, like a quiet stream, takes a meandering course".⁵⁵ Lynch found though that confusion results from "a long succession of turnings, or by gradual, ambiguous curves which in the end produce major directional shifts".⁵⁶ The extreme example of this is, of course, the Venetian calli. A path which retains its basic direction, though it may contain many slight turns, will not be confusing because users apparently endow a path with an irreversible direction.

At the confluence of two or more streams there is a swelling or enlargement to provide for the greater intensity at the meeting point. The path should also reflect in its shape the ability to handle and merge pedestrian streams

at intersection points.

The observations made by Simonds have been noted by Fischer as being characteristic of animal movement.⁵⁷ In animals haste or quickened pace results in a locomotor straightening or stretching of the path. It is interesting that this straightening automatically reduces contact with the environment and is caused by a desire to spend as little time as possible in "foreign" space. Fischer has noted that "Hediger's maxim that 'animal paths are never straight over longer stretches, but tend to meander' is, biologically speaking, by no means a contradiction of one of Leonardo da Vinci's most celebrated observations: 'Every process in nature is completed along the shortest way possible'."⁵⁸

Summary

A short tabular summary is given here indicating which objective or objectives each pattern is concerned with and the specific aspects of the objective, if any, that it treats. It is considered that the patterns as formulated are not, with the exception of "Paths Enable Social Encounters", specifically oriented to any one or more of the user groups originally identified in Chapter III. If anything, this general applicability may be considered an asset, although the specific needs of the various groups are still provided for.

Table II. Patterns, Objectives and Users

Pattern	Objective	Aspects	Users
Paths Are Short Interconnections	Convenience	Directness, continuity, shorter walking time and distance	All groups
Paths Enable Social Encounters	Activities	Social behavior	Elderly persons Housewives
Paths Have Special Identities	Activities Comfort	Imageability, identity, physical comfort	All groups
Paths Accommodate Pedestrian Activities	Activities	Generally behavior-supportive	All groups
Paths Are Protective Devices	Comfort Safety	Physical comfort as affected by climate, sufficient width, grade, surfacing	All groups
Paths Are Like Water Courses	Convenience Comfort	Suitability of path to purpose and to mental and physical behavior	All groups

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CHAPTER V

APPLICATION OF THE PATTERNS TO RESIDENTIAL AREAS

The purpose of this Chapter is to describe the attempt to apply in practice to two actual residential situations the patterns formulated. If a truism, it is also an inescapable fact that the only absolutely valid and certain method of testing a design or, in this case patterns which would be translated into actual designs, is to build the designed object and use it. This application, then, is to attempt to test by the only method possible here the validity of the patterns. The two residential areas selected in metropolitan Vancouver will be described first, followed by a discussion of the methodology and finally the application itself.

Two Residential Areas

In metropolitan Vancouver it is unusual if not nonexistent for residential areas to be designated as neighbourhoods or even for districts to have official boundaries. It was decided, therefore, to select for the purposes of this study

two areas which appeared by reason of such factors as arterial boundaries and possession of at least a school and commercial facilities to constitute basic residential areas which might offer some scope to the application of the patterns.

In Vancouver an area bounded by 59th Avenue, Granville and Oak Streets and Southwest Marine Drive, a portion of the large area popularly known as Marpole, was selected. The Granville Street boundary alone includes both sides of the street since they are both commercially developed. The second area chosen is one section of land in southeast Richmond in the area bounded by Francis Road (not yet built), No. 4 and No. 5 Roads and Steveston Highway. The location of these two areas within metropolitan Vancouver is shown in Figure 1 on the following page. Layouts of both areas are shown in Figures 2 and 3 on pages 95 and 98 respectively. For this study these two areas will be referred to as Marpole and Southeast Richmond. The reasons for their selection will become clear from a brief description of each.

Marpole began to be settled during the early years of this century since it is adjacent to the North Arm of the Fraser River with its historical industrial uses. Very generally, the topography slopes gently south towards the river which lies just beyond Southwest Marine Drive. The layout is of a type much favoured in the late nineteenth and early twentieth centuries. Although a grid with long narrow blocks, this pattern is broken by the introduction of a diagonal road, Park Drive, running southeast from Granville Street. This has the effect of producing a number of lots and blocks in different shapes and sizes. It is one

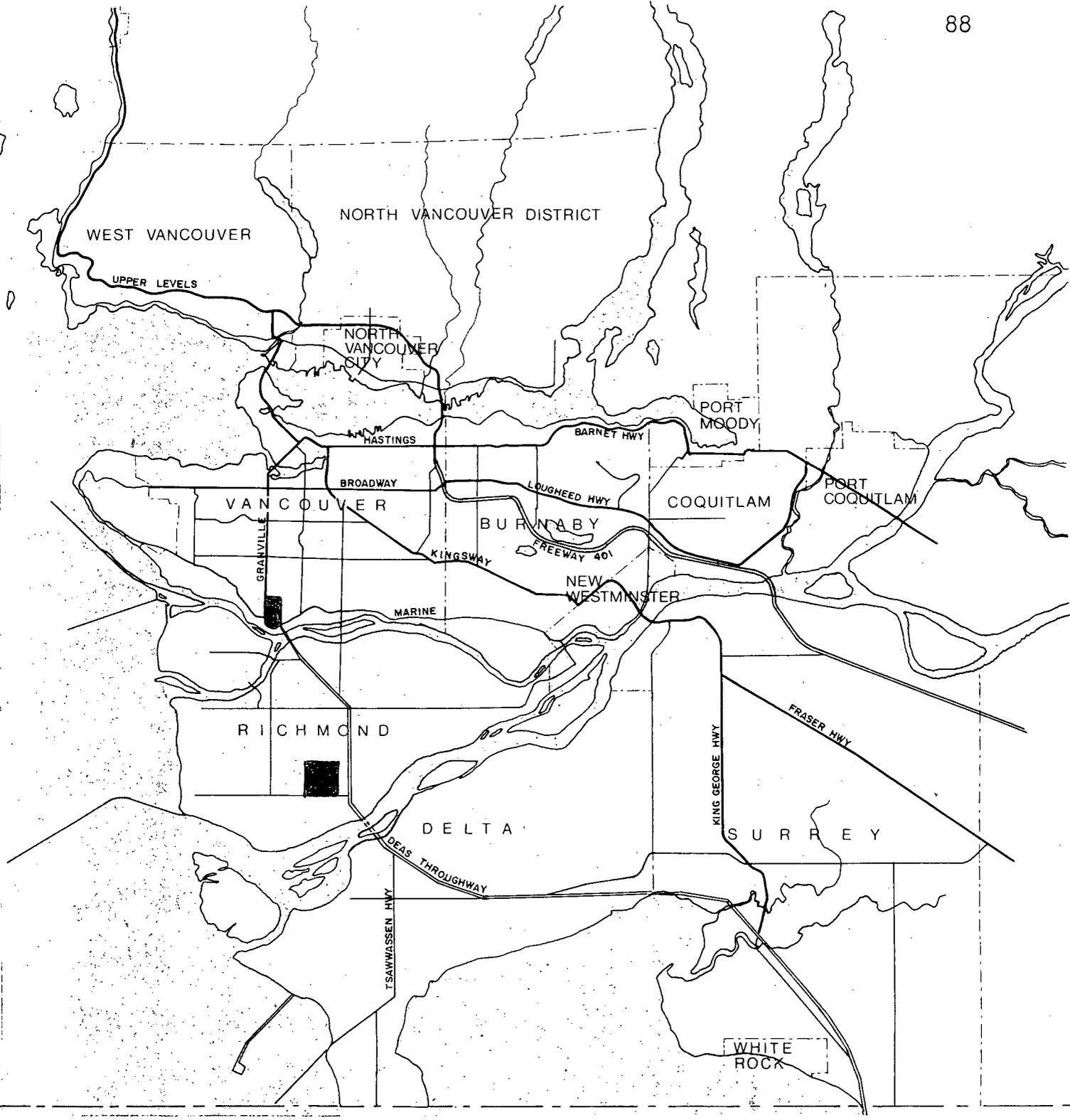


Figure 1. Location of Marpole and Southeast Richmond Study Areas within Greater Vancouver



of the few areas in Vancouver in which the blocks run north and south. 70th Avenue serves as a kind of demarcation line. North of it the blocks run up to 775 feet in length and the housing is single family while south of it the blocks average about 400 feet in length and the area is almost entirely three-storey walk-ups. A typical single family lot is 33 by 120 feet. The houses are generally small and modest, and a wide variety of ages are mingled together. Recently some of the oldest houses have been replaced by new ones. Succession of the single family houses south of 70th Avenue by walk-up apartments began 15 to 20 years ago; the process is now almost complete. While most right-of-ways in the area are 66 feet, the standard of development both north and south of 70th Avenue varies remarkably from block to block in terms of the presence or absence of paving, gutters, curbing, sidewalks, boulevard trees and overhead wiring. Much of the population in the single family housing is older, probably retired people, while a majority of the persons in the apartments are young couples.

As Richmond, which is a bedroom suburb of Vancouver, does not have any designated neighbourhoods either, an area of one section, the most southeast one, was selected. The section lines exist from early surveys and the roads now serve effectively to divide Richmond into quarter-section areas with an elementary school in most of the completely settled quarter sections. Since Richmond is a part of the Fraser River delta, the topography appears completely flat. The layout in the study section consists of two very large double crescents, a few culs-de-sac and modified grid and

curvilinear forms. In other words, it has a little of most layout forms except the strict grid. The crescent portion was the first built in about 1957. Building has continued at periods since then, primarily in the form of small developer-built subdivisions rather than individually. As Figure 3 indicates, a considerable portion of land is still undeveloped or is in small acreages.

All of the housing is single family on lots of various sizes and shapes with the exception of a very few duplexes and one condominium town house development of 89 units in the most southwestern part of the section. Different development standards have been required during various stages of development. The oldest parts have no curbing, gutters or sidewalks although there are gravel shoulders of varying widths sometimes paralleled by drainage ditches. The right-of-way was originally 60 feet but is now 56 feet.

Local facilities are very sparse, as Figure 3 illustrates. Both schools have large grounds. One has an insignificant tot lot in one corner. A junior high school is presently under construction on the site of the old C.B.U. radio station. The only commercial facilities are located in the Shellmont Shopping Centre in the geographic middle of the section. The population is predominantly young families.

The two study areas chosen incorporate about as many types of physical layout as are available in metropolitan Vancouver. They also contain the two basic forms of commercial development, the strip or ribbon form and the shopping centre.

Methodology

In the design process in order to solve a problem the designer precedes the actual detailed design with the formulation of a program, an analysis of a project "with all its essential relationships and impacts".¹ For the site or building designer this can include at its fullest not only an investigation and analysis of the site but, if the population is known, statistical descriptions of its age, sex, income, mobility and education, and surveys of attitudes, cultural characteristics and preferences. The extent of the program will, in practice, depend on a number of factors including the time and resources available and the nature of the item being designed. Paths are an aspect of the physical environment which are particularly vulnerable to use by changing or indeterminate populations. As well, it is apparent that many aspects of a path system do not have a sociological content; they do not require analysis in such terms. Of the six patterns formulated, for example, it seems likely that only for "Paths Accommodate Pedestrian Activities" and "Paths Enable Social Encounters" would it be desirable that there be any behavioral analysis of the user populations, if they could be determined.

Patterns are generic ideas or organizational principles, not generic designs. Their use does not preclude the program; rather, the patterns as ideas are interpreted or even modified according to the requirements of the program. This means that in practice each time any specific pattern is used its application and the final design may be somewhat different.

One of the reasons for selecting two disparate study areas was because the patterns might possibly be slightly differently applied in the two areas. A further reason for selecting two areas is that not every pattern is applicable or must necessarily be used in every design situation.

The design process and the place of patterns in it have been briefly outlined in order to clarify the practical use of patterns. The attempt here to apply the patterns formulated is, however, to determine their fit in general terms in the residential environment. No purpose would be achieved if this application were to follow the process described above. Therefore, the application will consist of a verbal description of the possibilities or lack of possibilities for using each of the patterns in each of the settings. The verbal description will be illustrated with photographs supporting or expanding on the statements. Also, with the main interest being in determining the feasibility of the physical application of the patterns, a physical analysis only of the two areas was made. The survey was done initially by windshield followed by an examination on foot of specific areas and aspects.

It should be pointed out that there is a certain assumption in both the formulation and use of patterns that they will be used in de novo situations. No example of their use in already existing situations is known. There is theoretically no reason, however, why this should not be possible. The major problem in applying patterns to a built environment is that any given aspect of the environment may involve features of such a basic organizational or structural

nature that no amount of modification would make the implementation of a specific pattern possible. Or the fact of being built may foreclose certain possibilities suggested by patterns; the scope for their application may simply not exist. The application of the patterns formulated to two built environments is thus necessarily a very imperfect test at best. In the following section on the actual application of the patterns, each pattern will be discussed for both areas in order that the analysis will be more complete; that is, in order that it can be explained why each pattern could or could not be implemented.

Application of the Patterns

Paths Are Short Interconnections

Problem: People may be unwilling or even unable to use local facilities if they are not convenient or easily accessible enough to walk to.

Prescription: Provide paths which are interconnected like a net and do not run for more than about 420 feet without meeting intersecting paths at right angles or on a diagonal oriented towards local facilities.

Application:

Marpole



Long blocks

The study area, which is indicated in Figure 2 on the following page, is unusual for a grid pattern since it has blocks of many different lengths. In the section north of 70th Avenue this is caused largely by Park Drive which runs on a diagonal. Consequently the blocks are from a couple of hundred feet up to 775 feet in length. South of 70th Avenue the blocks are all pedestrian length; the maximum length is 450 feet. Some blocks are bisected with a lane across one or both ends.

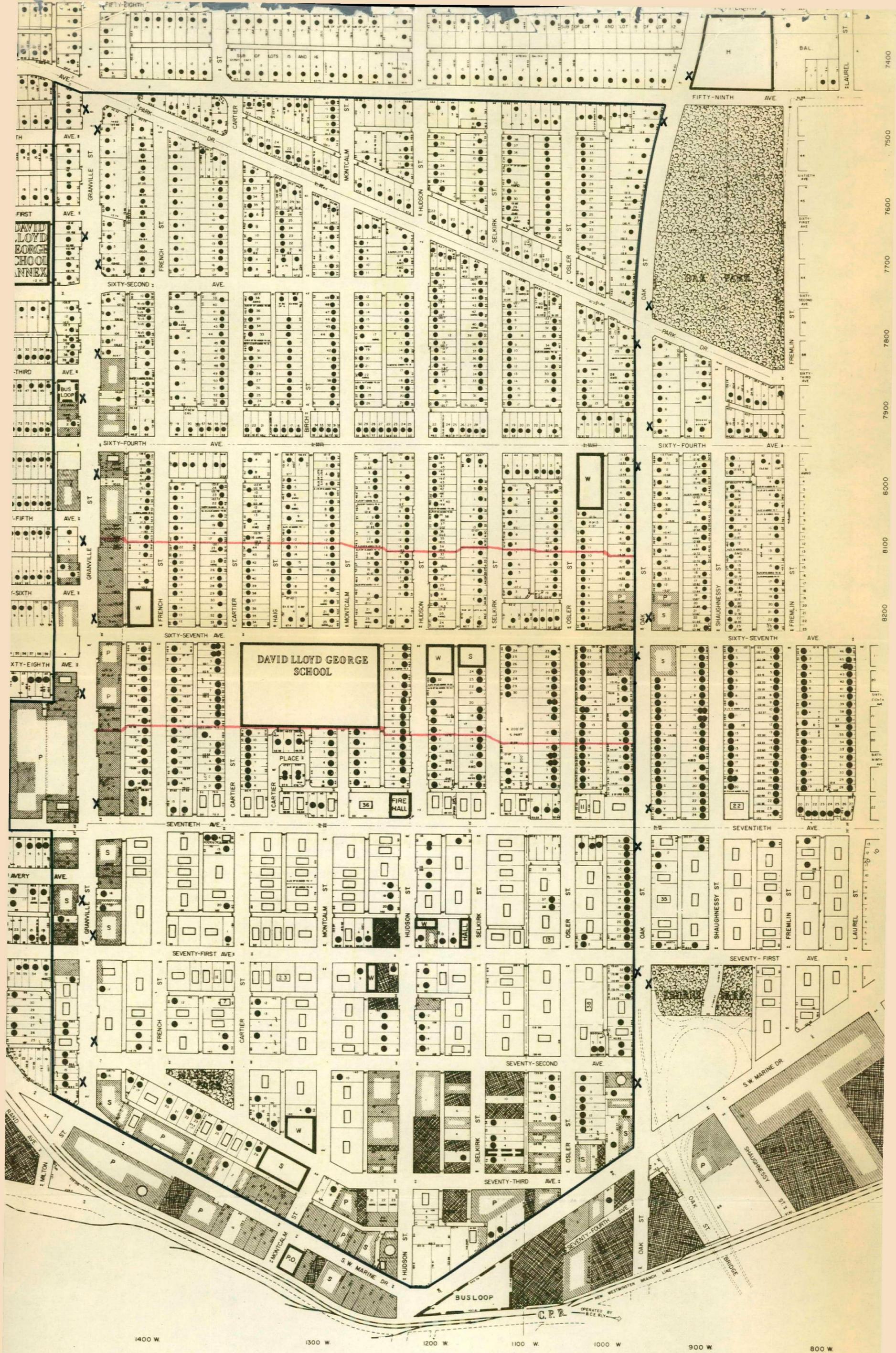
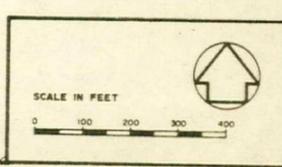


Figure 2. Study Area, Marpole District, Vancouver

Key:
 — Study Area Boundaries
 X Bus Stops
 — Proposed Pedestrian Shortcut

LEGEND (SEE SEPARATE LAND USE KEY FOR DETAILS)	
● SINGLE FAMILY DWELLINGS	■ RETAIL, PERSONAL SERVICE, INDOOR COMMERCIAL RECREATION
□ DUPLEX	■ SAME AS ABOVE, COMBINED WITH RESIDENCES
□ APARTMENT-OR BOARDING HOUSE (NUMBER OF UNITS)	■ HOTEL, MOTEL, TRAILER COURT (NUMBER OF UNITS)
□ INSTITUTIONAL, CIVIC (S-SCHOOL, W-HOUSE OF WORSHIP, H-HOSPITAL)	■ AUTOMOTIVE, WHOLESALE, OUTDOOR RETAIL AND COMMERCIAL RECREATION (S-SERVICE STATION, P-PARKING LOT OR STRUCTURE)
	■ MANUFACTURING, WAREHOUSING, MAJOR REPAIRS, GRAVEL OPERATIONS ETC.
	■ TRANSPORT, UTILITY, COMMUNICATION
	■ PUBLIC PARKS AND RECREATION
	■ PRIVATE OPEN SPACE (GOLF COURSE ETC.)



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Movement patterns are to Oak and Granville Streets for buses downtown, to Oak Park, to the school and to a small commercial area on Oak and a major one on Granville. The exceptional variability in block length and presence or absence of lanes across the block width even in the same tier of blocks makes the introduction of pedestrian shortcuts unusually difficult. Further, in practice it might be impossible to achieve because of the many 33 foot lots which leave no room for a pedestrian right-of-way.'

Figure 2 indicates the study area boundaries, bus stops (normally near corners) and possible pedestrian shortcuts in two tiers of blocks. The shortcut in the block running between 64th and 67th Avenues attempts to go through the middle of the blocks since several of them are 775 feet long without a break and this also allows its location opposite a bus stop on Granville. The shortcut in the block running between 67th and 70th Avenues provides a direct path to the school as well as a mid-block opening on Granville in the most intense of the commercial blocks along it. Shortcuts have not been indicated in the blocks between Park Drive and 64th Avenue. Their great variety of lengths makes any suitable midpoint line impossible to determine. Further, there are no definite movement patterns in that direction except one bus stop at 63rd Avenue and Granville and the school annex, which must be reached using the school safety patrol at 62nd Avenue.

Southeast
Richmond



Long blocks

The study area is indicated in Figure 3 on the next page. The portion of the study area lying north of Albion, Aragan and Seaton Roads has been ignored for purposes of applying this pattern. It is now both going and about to undergo development, and it is interesting to note that a few pedestrian shortcuts are being incorporated into the original design.

Movement patterns, with the exception of inter-house movements are, in the east and west half sections to the schools within each of those portions respectively, and, for the entire section, to the commercial facilities in the centre. A future important movement pattern will be to the junior high school in the northwest quarter section.

Many of the blocks are exceptionally long. The two on Shell Road East and West, for example, are 1,275 and 1,200 feet respectively. In this specific case it has not been attempted to divide them into three equal parts in strict conformance with the pattern because it would seem to serve no real purpose since Shell Roads East and West flank the CNR right-of-way which can be crossed only at the school.

The suggested pedestrian shortcuts are indicated in Figure 3. Three of them in the southeast quarter section provide access to the school. Access is presently possible

at only two points located rather closely together. Approximately 2,000 feet of street allow no access to the school grounds. All the other suggested pedestrian paths are based on extensions of existing right-of-ways and allow either or both shorter journeys or ones that provide for greater choice of route.

Paths Enable Social Encounters

Problem: The pedestrian in residential areas frequently neither meets anyone he knows or recognizes on the street nor even sees anyone else. Neighbours may not even run into one another and thus have little contact.

Prescription: Place paths where they will provide an opportunity for a maximum number of encounters between people to take place.

Application:

Marpole



The pedestrian ways naturally parallel the road system throughout Marpole. The photographs illustrate the lanes in both the single-family and multi-family parts where they are used intensively for access to automobile storage. Whether or not the positioning of paths here would be justified for the reasons on which the pattern is based, it is not feasible because of their use in connection with automobiles and garbage.

Both photographs suggest how close the buildings are together, making the idea of a pedestrian net set at right

angles to the street, for example, difficult if not impossible to achieve. This difficulty was mentioned in connection with pedestrian shortcuts in the single-family area for the application of the pattern concerning short paths.

It might also be suggested that in a multi-family area such as the one illustrated, in which there is virtually no open space aside from the mandatory street set-back, one is not apt to encounter persons at all. When the inhabitants of such buildings are outside, they are in the process of either entering or leaving the building. In Marpole, therefore, it is not possible to consider changing the placement of the pedestrian paths.

Southeast
Richmond



Typical lane

Basically the same comments and conclusions may be made for Southeast Richmond as for Marpole. As lanes are no longer required, only a portion of the study area has them, as is indicated in Figure 3. Being paved, they are in better physical condition than those in Marpole but are also used for access to outdoor automobile storage. Possibilities do not now exist for implementation of a pedestrian net at right angles, for example, to the road system since all yards facing away from the street are fenced. Thus the existing placement of pedestrian paths cannot be changed.

Paths Have Special Identities

Problem: Although streets should provide the major visual scenes in urban areas, in residential districts they are often monotonous, with commercial streets the worst offenders. There is nothing about the path itself to make the pedestrian aware that he is on a particular path.

Prescription: Give paths, and in particular those around commercial areas, identities which will convey distinctive images to the pedestrian.

Application:

Marpole



Granville St.



Selkirk St.

The application focussed only on the commercial area since the residential streets vary considerably, with a number of them possessing a distinct identity as the photograph of Selkirk Street illustrates.

Granville Street is a typical commercial ribbon development; in fact, it might be any development anywhere. The only unified element is the street lighting which on site does not convey any image during the day, although it

does at night because the poles are closely placed on both sides of the street. The stores are different sizes, heights and of different finishes, none of a very distinctive nature. Thus any, and preferably more than one, of the imageable elements could be used. It would seem that any single element by itself would not have sufficient impact to convey a distinctive image in such a setting. The use of a textured surface, for example, would be insufficient to overcome the barren appearance of this path.

Southeast
Richmond



Aragan Road



Seaton Crescent



Shellmont Shopping Centre

Southeast Richmond proved to be difficult to apply the imageable elements to in a satisfactory manner, with the exception of plantings. This is the typical solution in residential areas, although many parts of the study area do not utilize them except sporadically on private property.

The photograph of Aragan Road shows one type of street within the area which, though a number of years old, has done little to become visually distinctive. It is considered that there is no practical solution to a street of this nature besides planting with its time-consuming requirements for maturation. The photograph of Seaton Crescent has been included to illustrate the effect planting is able to achieve. Unfortunately this crescent is one of the very few streets within the study area to have a considerable amount of planting of any age.

The shopping centre structure has incorporated textured path surfaces, plantings and overhanging roofing. Until the stores are actually reached though the pedestrian does not have a sense of being at the major activity focus in the section. Part of the problem is caused by one side of the centre facing on the CNR right-of-way, and by having, as is typical, the parking lot in front of the stores. These are difficulties which imageable elements are unlikely to be able to overcome completely. But bordering the two open sides of the centre's area with special lighting, plantings and a built path, which does not exist now, would help to define the site itself and, in fact, provide the only defined site within the section.

Paths Accommodate Pedestrian Activities

Problem: Residential areas rarely have any places (except possibly a park) where pedestrians can sit and rest, or watch passers-by and general activity, or meet people in an informal outdoor setting, or sit in solitude and perhaps enjoy a view.

Prescription: Provide places at points of both activity and quietude which will allow the pedestrian to engage in other activities of the pedestrian than walking.

Application:

Marpole



Marpole Park



Granville Street



Granville Street

The photograph of the bench in Marpole Park is included to illustrate precisely what a pedestrian activity place is not.

There are three activity foci in Marpole at which pedestrian interaction places might be developed. The first is Marpole Park, shown above and in the photograph accompanying the pattern in Chapter IV. The latter illustrates the benches that have already been provided at the small playground in the park.

The second activity area is along Granville Street and particularly in the long block between 67th and 70th Avenues. A major portion of the east and west sides of this block is shown in the last two photographs. It is a good example of commercial ribbon development in that it largely consists of a considerable number of small retail and service shops and one large grocery store. It is theoretically an excellent place for implementation of the pattern because of the large number of people it attracts. But there is no spot which is physically suitable for the development of an activity place. There are a few actual sites but all of them confront automobiles at close range.

The third focus is the half dozen small retail and service shops on Oak Street. The grouping is effectively cut in two by 67th Avenue. Four stores are on the south side of it and three on the north side together with a parking area. Houses flank it on both sides. The stores face on Oak Street and have an approximately 20 foot set back from the right-of-way line. Because of this there is physical space for a pedestrian place, but the space itself is highly undesirable for such use because of the proximity of heavy traffic on Oak Street with its noise and fumes.

The most noteworthy aspect of the major meeting place, Granville Street, particularly between 67th and 70th Avenues is its wide sidewalks--approximately 22 feet wide. This meets, if imperfectly, the idea of one form of pedestrian activity place as specially indicated places on the path. Opportunities for providing solitary type places do not seem to exist because there is no part of Marpole with any particular views nor any part which can be sufficiently removed from the street to retain a focal point of interest yet properly develop it.

Southeast
Richmond



Interaction area



Play area

Shellmont Shopping Centre, a relatively new, L-shaped structure with a good range of retail and service shops is the only real focus in the section. The photograph illustrating the pattern "Paths Are Protective Devices"

on page 72 is another close-up of a portion of the centre. Although it incorporates a number of pedestrian-oriented features--the overhanging roof, textured path surface, width and trees--the only sitting place is the narrow rim of the planters in the above photographs. Their main function appears to be to fill the space and it is apparent that there is much waste space. The general area of the planters would be a suitable site for two types of activity areas: a place for sitting, talking and watching people and a small, children's play area. The area where the planters are presently located would be best for the interaction place because most people who visit the centre appear to walk by it.

There are certain drawbacks to this though which prevent complete application of the pattern. It faces north and west rather than south, but should get sunlight during the afternoon. It is near the road, which is part of the parking lot, and thus faces the parking lot. Since it is necessary to be able to see both in to the interaction place and out from it, only a semi-barrier should be used to effect a minimal vertical pedestrian-vehicle separation. The tree planters set in the roadway beside the curb would produce this semi-barrier effect.

Behind the proposed interaction area is another currently unused spot which is shown in detail in the lower right photograph. Because it is well separated from automobiles on all sides and protected from wind, etc. it suggests a good place for a small, children's play area.

The seating for the interaction spot at its open end would also help to prevent children from accidentally wandering on to the road as well as be a place for parents to sit.

A search of the rest of Southeast Richmond in order to apply other versions of the pattern did not reveal any worthwhile possibilities.

Paths Are Protective Devices

Problem: Pedestrian paths which cause discomfort or are unsafe because of climatic factors, insufficient width, gradient or surfacing are at best unpleasant and at worst deter or prevent use.

Prescription: Make paths protective devices for the pedestrian.

Application:

Marpole



Granville Street

There are two areas in which protective devices might be fairly extensively applied. One is the small commercial centre on Oak Street and the other is the Granville Street commercial area. The Oak Street area will not be discussed since the comments regarding Granville apply to it generally as well.

Granville Street runs north and south and is a six lane, heavily used arterial road. The curbside lanes are used for parallel parking in the study area. The photograph indicates that the path is wide but that other protective

features are missing, although the fact that it is a major pedestrian area and subject to the adverse factors indicated above suggests that protective devices might usefully be applied. It would include, most importantly, overhead protection which would serve the bus stop as well, and be more extensive than the small overhang shown in the photograph. It might also include relatively dense planting since approximately three feet of the path next to the curb is generally unuseable now because of a variety of street furniture on it. Although the width of the path serves as a buffer, the plantings would supplement this.

Southeast
Richmond



Aintree Crescent E.



Williams Road

The commercial area in Southeast Richmond, Shellmont Shopping Centre, provides relatively well with the exception of the parking lot for the pedestrian from the point of view of this pattern. Although the parking lot was observed a number of times, it was not possible to arrive at any satisfactory conclusions as to where pedestrian paths indicated by visually and possibly aurally different surfaces might best be located. It is suspected, however, that no easy solution is available since this is a part of the difficult design question of the pedestrian-driver interface

at shopping centres.

Parts of the study area do not have the concrete sidewalk typically found in residential areas and lack any well defined path as such. In some instances such as that shown in the photograph of Aintree Crescent East this is unimportant. The right-of-way adjacent to the road is broad, often grassed and hence usually pleasant to walk on. In other instances the need for a defined path to act in its most basic role as a protective device in itself is apparent. Williams Road, shown in the photograph, is an example. It is a quarter section road, which in Richmond has the status of a minor arterial, with an open drainage ditch running parallel to it. The worn pedestrian path, which leads to both the shopping centre and the new junior high school, appears unsafe because of these factors. In this example it would also be useful, if there were sufficient space, to include an edging of some type of ground cover or pebbles to further define the path from the road since the road is narrow given its use by heavy vehicles.

Paths Are Like Water Courses

Problem: Paths are often not followed because they do not seem to flow in the direction and manner that pedestrians seem determined to walk.

Prescription: Make pedestrian paths like water courses, which always follow a way of least resistance, travelling in a smooth direct channel for rapid movement but meandering for more leisurely movement.

Application:**Marpole and Southeast Richmond**

This pattern concerns in part laying out paths to fit the topography in such a way that, like a stream seeking the shortest distance between two points, they will correspond to the pedestrian's natural tendency to seek the shortest and easiest channels also. The rigid and completely built layouts of both the study areas, as well as the completely flat topography in Southeast Richmond do not provide any scope to apply the pattern to this particular aspect. Attempts to apply it by searching for places where pedestrians typically depart from the existing path were not successful because of the difficulty of actually locating such spots unless they involve paths worn across grass, or are known from experience.

The second aspect of the pattern concerns the provision of proper channels--straight and direct for fast movement and more meandering for casual movement. The grid suggests

by its nature channels for fast movement while the curvilinear forms in Southeast Richmond suggest slow, meandering movement. The application of the pattern "Paths Are Short Interconnections" was, in effect, an effort to establish a few channels for necessary direct, swift movement. The inability to apply this pattern to the two built environments suggests that it is most applicable to new situations and should be first applied at the time of the initial site surveys.

Summary

It was indicated at the beginning of this Chapter that, although the present test constituted the only feasible one in the circumstances, it was at best very imperfect. The attempt to apply the patterns to Marpole and Southeast Richmond confirms, at the least, this fact. It is apparent that the patterns which have been most useable are those involving, in a sense, detail rather than form. This corresponds with the suggestion at the beginning of the Chapter that applying patterns to the built environment might find certain patterns inapplicable because of their basic structure or organizational character which could not be made to fit with that already existing in the built environment.

Though the inapplicability of some of the patterns to two residential areas offering considerable scope in physical layout is disappointing, there is no reason to assume the inapplicability or invalidity of the patterns themselves. It should be apparent, for example, why it was

not possible to apply "Paths Accommodate Pedestrian Activities" at the point of most intense activity in Marpole. On the other hand, in Southeast Richmond the particular built circumstances of the Shellmont Shopping Centre offered a relatively good opportunity to apply this pattern in two different ways.

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¹John O. Simonds, Landscape Architecture: The Shaping of Man's Natural Environment (New York: McGraw-Hill, 1961), p.44.

CHAPTER VI

CONCLUSION

Summary

The objective of this study was to formulate improvements and preferable alternatives to the typical pedestrian system in low and medium density residential areas from an analysis of scientific and design literature. The objective was implemented by formulating a number of patterns or reuseable design ideas which deal with the requirements of the major groups of pedestrians (and, hence, it could be claimed, of all pedestrians)--mothers with pre-school children, school children, housewives and elderly persons--and attempt to meet major pedestrian planning objectives--convenience, activities and comfort. The formulated patterns were applied to two residential areas as an imprecise test, though the only feasible one available short of actually translating the patterns into physical entities.

Conclusions

Patterns primarily embody incremental improvements or

changes in the environment. In proposing changes their intent, when concerned with social rather than most economic or technical matters, is to allow certain desirable behavior to take place which is thwarted or rendered impossible by the existing physical environment. Their role is, in other words, to provide physical changes of a behavior-supportive nature.

The patterns formulated in this study as improvements and preferable alternatives suggest incremental changes. In being formulated with the major groups of pedestrians (who include those most requiring support beyond the normal from the physical environment) and major pedestrian planning objectives in mind, their main thrust is towards the behavior-supportive. They attempt to change, replace or make additions to what currently exists in order to encourage and provide for all the activities of the pedestrian.

One of the ways in which patterns seek to offer valid prescriptions for improving the environment is by being based, if at all possible on empirical studies. They are in a sense like hypotheses, deriving their problem statements from observations about what seems to exist in the environment, and their prescriptions from available data or, if no data is available, stating a prescription in any case in order that it may be proven or disproven by anyone willing to undertake the necessary research. As further evidence is found, the patterns may be more strongly confirmed, changed or abandoned but they are always subject to change as circumstances in the environment change.

The patterns here have been based on empirical studies

when at all possible. As explained in Chapter II, the field of man-environment studies is in its formative stages. In no part of it is this more true than that concerned with man's behavior in the urban outdoors. There is almost no published research as yet. Consequently some extrapolations have been made from research done in other settings and some of a not strictly scientific nature or design nature has been used.

Since the ultimate test of validity, being built, was impossible, the application of the patterns to two residential areas has attempted to give some indication of whether they are practicable. It makes three things clear: that some are presently applicable; that some are not for reasons inherent in the areas studied; and that patterns are preferably used in connection with the implementation of new environments. This latter factor is indicated because the type of incremental changes patterns suggest are frequently sufficiently basic that they must be considered an integral part of a three-dimensional whole and hence designed as such and not merely as, for example, a strip of concrete laid at any time.

It is concluded that the objective has definitely been met insofar as empirical data has been used in the patterns and it was possible to apply them to the existing environment. Use of design literature does not allow the certainty which empirical data does, but it has allowed the patterns to be formulated in line with current thinking by designers and suggests that the objectives have been met from the point of view of design based on intuition and speculative thought.

Relevance of Study to Community and Regional Planning

Patterns are little known and less used as yet within the planning field, as distinct from related design-oriented fields. It is therefore useful to describe them as a planning technique. Because patterns describe a physical or functional image, they offer to everyone concerned with the planning process a more concrete and hence possibly more conceptually vivid way of describing ideas frequently put into the bland verbal format of planning recommendations and performance standards.

Patterns are also a tool for citizen participation in the planning process. The format of patterns allows laymen to understand what planners propose, to react to proposals in a concrete and constructive manner, and even to formulate their own patterns. For any given situation, people may be aware that certain patterns do not apply to their circumstances either at all or only in part. With concrete physical images to work with they are able to make suggestions to modify the patterns for their use.

Patterns are an equally important tool from the point of view of citizen participation and the political process. Citizen involvement in the actual formulation or modification of patterns naturally reinforces their interest in and actions to support a project whether or not jeopardized by political decisions.

This study is relevant to community and regional planning because, in treating provisions for pedestrians in low and medium residential areas, it advances into an

area in which almost no work has been done, not to mention any attention given yet in Canada. The subject is a very difficult one in dealing with existing residential areas since most in existence today were built with considerations for only the automobile. But changing attitudes touching a number of subjects plus increasing interest in the planning literature, which has multiplied even since this study was begun, indicate that a renaissance of the pedestrian in fact and in planning thought may be at hand. Additionally, the study uses a technique which holds promise of considerable relevance and scope in its use in the planning field.

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