CONGRUENCE AND MEANING:
THE INFLUENCE OF CONSISTENCY BETWEEN URBAN FORM AND ACTIVITY UPON ENVIRONMENTAL KNOWLEDGE

by

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(1959)

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(1961)

SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF

PHILOSOPHY

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

March, 1967

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Submitted to the Department of City and Regional Planning on March 1, 1967 in partial fulfillment of the requirements for the degree of Doctor of Philosophy

ABSTRACT

The research investigates environmental meaning. It attempts to demonstrate that there are measurable correspondences -- congruences -- between urban form and activity, and that the regularities in these relationships have a major influence on the amounts and kinds of meanings which the environment transmits and which people can acquire. The effectiveness of the environment in transmitting meaning was hypothesized to be a function of its environmental characteristics -- of the form and activity attributes and the congruences between them. Predictions were made about the influences of congruencies between form and activity types, between the visual intensity of forms and the busyness of activities, and between the exposure of forms and the importance of activities. Predictions were also made about the effects of various personal characteristics such as social class, sex, familiarity, travel mode and place of residence, on the extent and complexity of environmental knowledge.

A number of physical form and activity attributes of central Boston were surveyed, coded and mapped to see how and where they were related. Then, an interview was conducted to find out what a controlled sample of people knew about the form and activity of the area. The interview subjects responded to the questions by filling in large base maps, and their responses were coded graphically, using the same format as that of the surveys. The parallel forms facilitated identification of the environmental factors that influence individuals' knowledge of the area. The effects of the controlled personal variables were analyzed by subsample comparisons.

A major determinant of whether or not a place was meaningful was the personal experience of the subject, and the more direct and frequent the experience, the more meaningful the place. Aside from expediting the acquisition of meanings, the principal role of congruence was that its absence acted to prevent a place from being known. The environmental characteristics, and particularly the exposure to pedestrians of information about the activity attributes of places, were also important determinants of personal knowledge. The differences controlled for in the research sample were not found to significantly influence the extent of the patterns of meaningful places, though they did somewhat influence their complexity. It was concluded that by the design of the environment itself -- through the spatial organization of activities and the establishment of a congruent and expressive system of forms -- the city designer can significantly influence the achievement of a more meaningful environment.

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P R E F A C E

Without the support and efforts of many people, this dissertation would not have been possible, and I would like to acknowledge some of these many and varied debts. In doing so, I of course assume complete responsibility for any errors of fact or evaluation.

This study could not have been accomplished without the generous financial support of the Department of City and Regional Planning of the Massachusetts Institute of Technology, and the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University. Cornell University, through the James Eidlitz Travelling Fellowship, afforded me the opportunity to experience the unfamiliar environments of many Asian cities, and the subject of this research is a direct result of these stimulating experiences.

Profs. John T. Howard, Lloyd Rodwin, Aaron Fleisher and Donald Appleyard provided valuable criticism of the aims, methods and evaluations of the study. To Prof. Kevin Lynch I owe particular gratitude, for his support and encouragement, for his insightful and challenging criticism, and not least for a broadened outlook toward the responsibilities and possibilities of city design.

The application of computer techniques to this research are directly due to the enthusiastic support given by Prof. Howard Fisher, director of the Laboratory for Computer Graphics, Harvard University. My thanks also go to the staff of the Harvard University Computation Center, who provided technical assistance and to Miss Mary Hyde and Miss Diane Dutton, who made valuable contributions to the analysis programs developed in the research.

It would not be feasible to name all the other people deserving of my thanks. To all of them -- to the many people with whom I discussed the research; to those who gave of their time to be subjects; to the interviewers; to the people who assisted in the massive coding effort and the preparation of the research graphics; and to the many individuals and organizations who provided data for the study; I am grateful for their cooperation.

My greatest debt is to my wife, for her valuable comments throughout all stages of the research, for her editorial assistance, and above all for her encouragement and patience in what must have seemed an endless effort.

Carl Frank Steinitz
Cambridge
March, 1967

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A DIVERSITY OF MEANINGS

...VACANT BRICK SMALL FEAR OLD POOR CARS PROFIT PEOPLE LIVE HERE...

The meanings of the environment are as varied and complex as the people and purposes for which they are important. They are the knowledge that is latent in the forms and activities of the environment to which people are exposed. They are the knowledge that people gain as they learn the characteristics of their environment and they are the knowledge upon which people then base the many plans of action by which they satisfy their various individual and social purposes.

The meanings that people associate with places vary widely. There are, of course, the personal, idiosyncratic associations that people have with places -- they like them or not, they live or work there, they had a pleasant or unpleasant experience there, they got lost there. Social connotations are also meanings -- that people of a certain kind go there, that others do not; that an area is predominantly rich or poor, Negro or white, Italian or Chinese. Meanings also include what one does there -- there are work places, residential places, recreation and transportation places. Some places are more important than others, and their meanings may include the economic or political power resting there. Some are older and have signifant historical meanings and some are meaningful for their cultural importance. The meanings of a place also include the many values derived from the appearance of the place -- its form can be aesthetically pleasing or ugly, informative or not. It can also be functionally adequate or highly inefficient.

All these are things people can and do learn about the environment, (and there are surely more). And <u>all</u> of them are meanings. Indeed, a comprehensive definition of environmental meaning cannot be made except as a function of its diverse components.

The environment becomes meaningful as one learns and evaluates its characteristics and acts on the basis of that knowledge. The exact nature of the learning process is the subject of psychological controversy, and several explanatory models have been proposed.[1] The models have in common the assumption that knowledge is action oriented, and though they differ in their accounts of the nature of the internalization process, all posit cyclical feedback processes in which the environment acts as the field of

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[1]E.g., Tolman (1951), Allport (1955), Osgood (1957), Bruner (1957) and Miller, Galanter and Pribram (1960).

potential information about which man must predict in order to act. He seeks and receives cues which are coded and stored in a set of accessible categorizations and representations. While these may be fragmented, or distorted at any time or place, they provide the basis for action plans. The categories and representations are tested for their reliability -- their predictability -- in subsequent actions, and they are revised and reformed as necessary.

A basic distinction must here be made between meaning and information. Information is not a fixed quantifiable commodity but rather a potential of the signals which are needed in any given interaction. The less predictable an identification, or association, the more information will be needed in order to make a satisfactory certain prediction. If a person is ignorant or uncertain, a given observation will offer him considerable information, for the amount of information in a message is a function of the amount needed for the statistical reduction of probability. In contrast, if one is relatively certain in advance of the results of an observation -- if a place is meaningful and its characteristics are known and predictable -- then the actual observation provides a minimum of information. Thus information is the product of ignorance and uncertainty, while meaning can be considered synonymous with knowledge and certainty.

ACTIVITY: A PRIMARY MEANING OF THE ENVIRONMENT

That the environment should make possible a diversity of personal meanings is unquestionably desirable. However, this diversity must be encompassed within a framework which clearly conveys those public meanings that are necessary for common social behavior. For while people may vary in the amount and content of the idiosyncratic meanings that they obtain from the environment, and while they may internalize and use their knowledge in different ways, one aim and resultant of that knowledge is highly common -- the obtaining of a general sense of the pattern of shared activities. Activity meanings are among the most generally needed, if not _the_ most needed, meanings to be derived from the environment. In order to satisfy action-plans, which often involve decisions to go somewhere and to do something, people must share a knowledge of what is happening, and where.

The environment should communicate the _type_ of activity in an area or place. A person should be able to find and identify activity-places, and once known, he should be able to describe them. The relative _intensity_ of an activity should also be communicated. One should be able to identify the busiest places, and he should be able to direct someone else to them. A person should also be able to accurately evaluate the comparative _significance_ of places.

He should be able to find and identify the most generally important activities, and, once known, he should be able to describe them to someone else. Armed with a sense of these three aspects of environmental knowledge, actions to satisfy individual and group needs should be made easier, both to plan and to execute. A primary test of a meaningful environment must therefore be whether or not these publically necessary meanings are potentially available -- and whether they are acquired.

This research studied how these three meanings are transmitted in a particular urban environment -- central Boston -- and how they are acquired by its population. The term 'meaning' was operationalized as that knowledge of form and activity which was relevant to these three aspects of environmental meaning.

Not only must the environment be comprehensible but it also must have the capacity to stimulate individual growth and to offer the potential for more extensive and complex knowledge, for greater knowledge broadens the range of possible choice for action. An environment in which meaning is limited can be experienced as hostile and frustrating, and this is probably most severely felt by the poor, urban newcomers, and young people. One common requirement of these groups is that they need to know more -- faster -- in order to increase their choice of action. And these groups, for whom a more meaningful environment is most critical, form a major segment of the urban population. The choices of different segments of society cannot be equal if their knowledge is radically different, whether caused by the restrictive activity patterns of ghetto life, or by the inability to pay in order to participate. It is not enough to say that a person doesn't know what he is missing, for "What choice has a man who doesn't know what his choices are?" (Malamud, The Fixer, 1966, p. 12). Unfortunately, equivalent knowledge may not eliminate inequality of real choice, for the same economic or social reasons may preclude action. However, increasing the disadvantaged's knowledge of the urban environment may be a necessary first step.

> ...one of the things that we can do about the city is to look at it, to try to see it, not merely as an instrumentality for making money, but a place for allowing the individual to achieve his highest promise.
>
> And with that in mind, you would try to construct a city or reconstruct a city in ways which would encourage a more gracious sense of human possibility. You would teach, if at all possible, the immigrants who come, whether they are black or white or brown, that there is certain knowledge which one must have in order to live in the city without adding too much discomfort to his neighbors.[1]

A concomittant phenomenon to the well documented increase in urbanization has been a growth in the heterogeneity and mobility of urban society. People with more

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[1]Ralph Ellison, Author of The Invisible Man, in testimony before the United States Senate Subcommittee on The Crisis of the Cities, New York Times, Sept. 4, 1966, p. E3.

diverse background experiences must be absorbed into urban environments which must then have the capacity to satisfy their requirements -- to assimilate without destroying. Furthermore, increasing residential mobility implies that a person will have to adjust to several urban environments within his lifetime. While many urban experiences can be carried over, many cannot; for cities are not yet so similar that people can immediately adjust to new ones. The environment should allow this adaptive learning process to occur with minimal stress.

Learning about the environment is a significant part of a young person's development. While his action needs are possibly not as critical as those of an adult newcomer, his cognitive needs -- his desire for self assurance and a sense of environmental mastery -- are likely to be more so. These are highly dependent upon his ability to gain and use his knowledge efficiently.

The aesthetic evaluation of the forms of a city will also be influenced by their communication of meaning. Forms whose qualities fail to include meaningful associations with experience or purpose, are, for many people incomplete and unsatisfying.[1] And the more that one knows about an area

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[1]The influence of function in the aesthetic evaluation of form has long been debated in the fine arts and in architecture. An extreme position may be summarized in the words of Greenough (1843, ed. 1947, p. 71), "I define Beauty as the promise of Function; Action as the presence of Function; Character as the record of Function."

and the more meaningful it becomes, the more one's knowledge is likely to influence his aesthetic responses.

> Let us for a moment imagine a public space beautifully articulated with a single seat meaningfully situated under a tree. The sun is relentless. I am very tired and very surprised to encounter a place so well accommodated to my inclination and so apparently beautiful too. Now, what if I discover a warning: wet paint! on the seat at the last moment? Or one that says: for whites only!? The space for me -- hot, tired and perhaps dark skinned, is all at once no longer the place I thought it was. Will I still think it beautiful now that it is impossible for me to experience whether it really is.
> Van Eyck, in Smithson (1962, p. 593)

The analogy supercedes scale, and can be applied to the aesthetic evaluation of the cityscape. Thus, while the space, the motion sequence, or the unified cityscape can be beautiful and exciting, they are likely to be more so if they are also meaningful -- if they can be related to purposeful action.

The benefits to be derived from a more meaningful environment are thus highly significant. They include the intrinsic values of knowledge and understanding, a greater sense of individual identity, potential for easier city action, an increase in choice through a greater knowledge of the possibilities for action and, an important incentive to the aesthetic appreciation of the urban environment. Clearly, the creation of a more meaningful environment should be a primary goal of city design.

CHAPTER TWO: MEANING AND CONGRUENCE

THE SELECTION OF MEANINGFUL PLACES

In any particular environment, some places are more meaningful than others -- more people know them, and know more of their characteristics. While people may vary in the amount and content of the idiosyncratic meanings which they obtain from the environment, the environment itself varies in the effectiveness by which its places and organization transmit meaning. If city designers hope to influence the creation of a more meaningful environment, they must first discover the characteristics of people and places which influence this variability.

The quest for activity meanings can be aided or hindered by man's needs and capacities. Few people (if any) can have a complete conception of the whole city, for the amount of potentially meaningful information in the environment far exceeds an individual's ability to perceive, store and utilize it. And environmental information is only a part, albeit a highly significant part, of the total barrage of information to which a person is exposed (Meier, 1962, Ch. 7). Therefore people are necessarily selective, both as to the places that they know and to what they learn about them. They will seek and acquire these meanings on the basis of their individual needs and purposes, and according to their familiarity and past experiences. Since the immediate perception, encoding and use of meaningful information occurs as part of a more general process of adaptive development, people vary in their need to know depending upon their stage in this learning process and their past experiences. The unsure newcomer needs to know more about his environment than does the habitual user who only requires the minimal amount of information necessary for orientation and identification. Some people are more sensitive to their environment than others, are more inquisitive, and place a higher intrinsic value on knowing it well. For these people a given environment is likely to offer more complex meanings and richer experiences.

Yet personal differences can only provide a part of the explanation for the variability in meaningfulness. The form of the environment can also expedite or retard the acquisition of the meanings that people seek. The information that is latent in the physical form of the environment -- in what places look like and how they are spatially organized -- is widely experienced, is generally publicly accessible, and can be directly meaningful. While other sources of information -- television and newspapers, film and gossip -- certainly contribute to the total of a person's knowledge about the urban environment, none of these sources offers as extensive an experience as that gained from the more direct experiences of participating in activities and seeing what there is to be seen as one moves about the city.

Places can vary widely in their potential to transmit meanings. They can be highly legible and have a multicplicity of potential sources of information, or they can be obscure, making it extremely difficult for people to learn their characteristics. They can be public, demanding that people know their activity attributes and welcoming their active participation, or they can be private, secretive and exclusive. In their temporal nature, meaningful cues can be permanent, recurrent or ephemeral, and, most importantly, they can be precise and true or they can be vague and misleading. But for all its variability, the environment must provide regular sets of form -- activity associations so that people can learn them, share them, and use them with the assurance that they are meaningful.

While the knowledge of the activity attributes of the environment can be analytically separated from knowledge of its form characteristics, they seem to be highly related in reality. Lynch (1960), in his pioneer research on how people organize their environments, divided the mental image into "identity, structure, and meaning." (p. 8) Purposely omitting meaning as a prime focus of his study, Lynch developed the hypothesis that a person's knowledge of the form of an urban area is a function of its imageability -- "that quality in a physical object which gives it a high probability of evoking a strong image in any given observer" (p.9). He developed a system of analysis which, while concentrating on the organization of a person's knowledge of the form of his environment was nonetheless rarely free of activity content and meaning. The "images" derived for Boston, Jersey City and Los Angeles included both form elements and their activity connotations, the latter often implied in names such as "central market," "harbor," "theatre," etc.

Gulick (1963) redefined imageability as: "A set of qualities of, or associated with, an object, which maintains in the beholder conscious visual awareness of the object." His hypothesis based upon this definition states that: "Imageability is determined by the beholder's perception of the visible form of an 'object' combined with his consciousness of some social or behavioral significance which he associates with it." (p. 193).

Hassan (1965) hypothesized that the variation in "imageability" among places is a function of the degree of their visual exposure from the movement systems. He selected for study a limited number of the elements which had been shown to be imageable in Lynch's study, measured their exposure, and found correlations of over .90 between their relative imageability and their exposure. However, since Hassan failed to measure the characteristics of elements that were <u>not</u> imageable, his study cannot explain why certain places become known rather than others. Certainly the magnitude of his findings leave little room for alternative explanations such as that of Gulick, and indeed, for any non-visual variables such as activity meanings. The validity of Hassan's findings must be verified in more inclusive research.

Several other studies have investigated how people see and structure their environments. Vigier (1965) made use of tachistoscopic devices to evaluate the recognition of forms. By controlling the visual presentation time of photographic images, recognition threshholds were precisely measured. Carr and Kurilko (1964) conducted experiments which investigated viewing experiences from highways. They made use of an eye-marker camera to record central points in viewing fields and to analyze the frequency and duration of focal views. While useful in testing selectivity in perception, these techniques are not directly adaptable to measures of meaning. Places which are looked at more are not necessarily more meaningful, and, depending on one's purpose, places which are more meaningful are not necessarily more often noticed.

While one can develop a highly accurate and widespread sense of the physical form of an environment without content meaning (and enjoy it as an aesthetic experience), this knowledge is of little utility. The values of imageable forms -- be they freedom from the psychological terrors of ambiguity in an ill-defined and weakly structured environment, clearer orientation as one uses the environment, or the ability to communicate the environment more easily to others -- seem to require in common the ability to obtain meaningful activity associations from the perception of form.

At the other extreme, one can, in theory, acquire a sense of the organization of activity in an area without visually experiencing its form. Indeed, a considerable portion of a person's knowledge about an area may be based upon indirect, non-visual sources of information -- books, newspapers, and gossip. Even the powerful descriptive methods of political economic and social analysis, full of spatial implications, rarely refer to visual characteristics. Yet in the real world of city-action, there would seem to be little value to just knowing the activity pattern, to having the content without the form.

In order to be of maximum utility, awareness of the physical form of the environment and knowledge of its activity characteristics should be complimentary and reversible. Knowing the activity of a place, one should be able to describe its form; and seeing its form, one should be able to identify and evaluate its activity. An aim of this research is to investigate the environmental influences that lead to this more flexible knowledge of form and activity. It is proposed that a key variable in the selection of meaningful places and in the learning of their characteristics may be regular and predictable "fit" between the characteristics of urban physical form and the attributes of its associated activities -- the congruence of form and activity.

THE CONGRUENCE OF FORM AND ACTIVITY AS AN EXPLANATORY VARIABLE

We expect our environments to exhibit congruence -- we assume that similar perceptual clues will be associated with similar meanings (Gibson, 1950; Bruner, 1957; Wallach, 1958). Through learning processes, we develop the belief that there is a correspondence between the forms of places and the nature of their events and it is this "perceptual constancy which makes effective behavior possible, from the simplest actions to the most complex, from walking across a street to striving for a sane social order. Without some degree of constancy mere survival would be impossible." (Ittleson, 1951, p. 285.) A key aspect of learning is therefore identification of the recurrent regularities in one's experience and the ordering of these constructs with the help of models which can be used to guide action. These models will then be useful "...only as long as the items allotted the same label share some important quality, such that a common response to them will be rewarded (or reinforced)." (Berlyne, 1957, p. 330.)

Unless behavior can be based upon such predictable foundations, it can be inefficient and ineffective. The veridicality of perception, the degree to which the meaning associated with a perceived form is "true," is highly dependent upon the congruence of the environment in which action takes place. If a categorization which was established on the basis of a visual impression does not stand up to the test of a closer look, or if its consequences are not consistent with expectations, then the model by which an individual develops environmental meanings will be partially or wholly invalidated and will have to be revised (Bruner, 1957; Berlyne, 1960). The costs of such errors are the inefficient use of past experience: the individual must devise new strategies to reorder the category model by which he codes, stores and uses perceptual clues, he must relearn the non-veridical parts of his environment; and his confidence in the prediction of meanings associated with other similar forms may be seriously undermined.

If the concepts to be learned are consistent, fewer constructs must be acquired to obtain a given level of understanding and meaning. Similarly, fewer representations, be they words or images, may be needed to describe a given relationship. And since the fewer alternatives that are possible, the less difficult it is to identify any single meaning, learning a congruent set is more economical than learning the same number of constructs when they are not consistently related. Thus in a more congruent environment, one needs to learn, to order and recall less, but one ends by knowing more. On the other hand, at the extreme of complete incongruence, one would not be able to generalize at all from past experience. The process of learning about the environment, and of using that knowledge, would become extremely difficult since each new place might be a totally new place, providing no past cues for categorization. The meaningfulness of unfamiliar places would be nil -- and the amount of information which would be required to identify them would be extremely great.

In this reaearch, congruence is defined as consistency between the physical form characteristics of an environment and the spatial organization of its activities. The emphasis in this formulation is on the form -- activity regularities which may influence personal prediction and knowledge. This is in distinction with the concept of functional "fit" proposed by Alexander (1964) which analyzes the suitability of a form to the functional requirements of its activity.[1] Nor is congruence to be taken as the direct translation of the activity into form, e.g., that long thin flows should be formed in long thin forms (though if this <u>were</u> consistently the case, it might lead to the congruence defined in this research.)[2]

An evaluation of congruence can be applied to both qualitative and quantitative form-activity relationships. For example, if the visual quality of cleanliness is consistently found with rich people's residences, then a wealthy and dirty neighborhood could be considered incongruent. Similarly, if the physical size of a hospital is related to its patient capacity, then a large hospital with a small capacity for patients might be incongruent. Congruence can be defined at many scales: for a large number of individual places considered independently

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[1]Alexander (1964) defined functional congruence negatively as the absence of incongruence. He points out that it is always easier to see "wrongs" than "rights" and to identify problems than solutions. He further argues that the design process, the process of achieving good fit is a negative process of neutralizing the obstructions, perceived incongruities, or forces which cause misfit.

[2]For a more general definition, see <u>Webster's New International Dictionary</u>, <u>Second Edition, Unabridged</u>, Springfield, Mass.: 1958 G. & C. Merrian Co., 1958, p. 563: "congruent...relating to, or predicable of, the same subject; differing from each other, but predicable as true of the same state of things; as congruent propositions..."

or for their spatial structures in terms of the geometric distribution patterns of ranked component places. Both the "place congruendes" and "pattern congruencies" are potentially important in a study of environmental meaning. Both were evaluative in this research; places were considered independently, and pattern congruences were measured in terms of the spatial correspondence among place values.

A statement of congruence is a relative and not an absolute relationship, and its specific validity is limited in context and time. For an individual, the context is his area of past experience, and the form-activity sets that have been learned in one context are not necessarily transferrable to another.[1] Since analyses of congruence are static, they say little about why and how the state has developed, and this is especially the case in older cities which are more complex, have undergone many changes, and have strong historical associations.

Congruence asserts that there is a consistent association between two variables, but not necessarily a cause and effect relationship. The basic method of analysis used in determining congruence was the comparison of the

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[1]The context for the research must therefore be large enough to approximate the "life space" of the people for whom meaning is being measured. Furthermore, it must also be large enough so that there is a possibility that incongruences will exist. For without this possibility, the effects of congruence cannot be tested.

co-variance of independent variables as revealed in the similarities among the spatial distributions of their data values.[1] The use of co-variance analysis raises the issue of whether a "strong" consistent relationship, as evidenced by a high correlation or close map correspondence, can be considered a "causal" relationship. Duncan, Cuzzort and Duncan (1961, pp. 108-109) make a useful distinction between "causal relevance" --connectedness, and "causal specificity" -- cause and effect. While it is possible to demonstrate that various relationships are powerful, it is not possible to determine definitely which of a given set is the primary cause of the set's existence. Though limited to descriptions of relationships, evaluations of congruence are still valuable and can have significant consequences.

[1] See Chapter 5 for a detailed description of the methods and measures used in the analyses of congruence.

KINDS OF CONGRUENCE

Just as there are many kinds of meanings, there are many different kinds of congruence. The meanings of physical form upon which the research focussed were the type, intensity and significance of activities, and since the expeditious acquisition of these activity meanings may be a function of their regular co-occurrence with physical form clues, three kinds of congruence were defined, measured, and tested for their effects. They were _type congruence_ -- the consistency between the activity type of a place and its form type; _intensity congruence_ -- the consistency between the busyness of the activity of a place and the visual intensity of its form; and, _significance congruence_ -- the consistency between the importance of the activity of a place and the exposure of its form.

Type Congruence

Can one identify an activity by looking at its form? Can the form of a place be described if its activity is known?

The expectation that type congruence is a general precondition of cognition has been previously examined largely from the viewpoint of psychological theory and experimentation. Its direct relevance to environmental meaning has not yet been tested. If the goal of a more meaningful environment is accepted, the implications of type congruence for the acquisition of basic qualitative knowledge must be understood.

Type congruence involves a basic issue for the designer -- that of how different a place can be and still be recognizable, and for any place. there can be a conflict between establishing an individual image or maintaining its identity as part of a larger, more general group of places. Consider roadside eating places: the need for an identifiable type congruence may be why all Howard Johnson restaurants look more or less alike (and why their food tastes more or less alike as well). It may also be why a new and individually owned roadside restaurant, seeking an identity, builds a distinguishable, though not necessarily distinguished form. A major form determinant in the resolution of this conflict could well be what "type" meanings the place is expected to transmit to a general public, the context within this meaning is to be learned, and the likelihood of establishing a new type congruence.

Intensity Congruence

Can one determine the busyness of a place from seeing its form? Does intensity congruence or the lack thereof affect the ability of people to describe the forms of places that have busy activities?

It can be anticipated that intensity congruence will be general -- that intense activities have extensive spatial requirements, and that places with more intense activities have a greater visual impact in terms both of spatial size and potential information. The premise that activity intensity and spatial intensity are closely related is fairly well understood. It has been the subject of considerable urban research[1] -- and the repeated findings of consistency have provided a basis for many of the techniques developed in city planning, for example those used for building volume projections. The expectation, fundamental to advertising, that visual impact draws people and that the presence of more people in turn generates more potential visual intensity, is less well understood. While a sense of busyness is generally considered to be a primary aspect of urban life, city designers are largely unaware of how this meaning is transmitted and how it can be manipulated. The role of intensity congruence in the evaluation of busyness needs to be investigated.

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[1]E.g., see Davidson (1954); Mitchell and Raplein (1954); Carroll, Creighton and Hamburg (1961); and the Chicago Area Transportation Study (1962).

Significance Congruence

Do the most highly exposed forms accommodate those places which have the most important activities? And, are the most important activities located in the most often noticeable forms?

Significance congruence is an often stated design goal,[1] and city designers have long recognized that in addition to providing functionally adequate accommodation for people and their interactions, the physical environment has an important symbolic role to play in signifying the social order. It is not by accident that the acropolis, the castle, the cathedral, and, in turn, the factory and the office building, have been situated and designed to be highly noticeable. To the citizen, the vassal, the penitent, the mill girl and the organization man, their physical assertiveness has had profound meaning -- one not only constantly saw them, one had to know their place. In the past, however, only a few dominant civic interests have been consciously reflected in the design of the cityscape. The places which are perhaps a more important part of daily city life -- the living and

[1]E.g., Crane (1960), Appleyard (1965), and Scott-Brown (1965).

working places -- have been left to the adequacies or inadequacies of traditional practices. Today, in our complex and pluralistic society, with many interests striving for power, the effects of significance congruence -- or the lack thereof -- need to be better understood, and particularly with regard to their role in the transmission of importance as a meaning.

The major research aim was the empirical investigation of how these particular environmental meanings are influenced by the characteristics of form and activity and their congruence. Specifically, how do they help people to know or how do they prevent people from knowing? For whom and in which places are specific attributes most important? What kinds of congruence are crucial and which meanings do they most help to communicate? And how should the concept of congruence be incorporated into the policies and practices of city design?

CHAPTER THREE: THE RESEARCH HYPOTHESES

There is an obvious need for a greater understanding of the interaction between form and activity and of its role in the transmission of meanings. Since the real world of city life cannot easily be manipulated, this knowledge must be gained through observation of existing situations. The hypotheses that are proposed represent a first attempt to link the meaningfulness of the environment -- as measured by the knowledge of its form and activity characteristics -- with its actual form and activity characteristics and their congruence. The environmental hypotheses seek to explain the influences of environmental differences. They are presented as general propositions and are applied in turn to type, intensity and significance meanings. They can be tested, in future research, with other kinds of meanings and in other contexts. The personal variable hypotheses are presented to explain the potential differences in knowledge within the sample, for those subject variables that were controlled in the research.

ENVIRONMENTAL HYPOTHESES

Hypothesis 1: There is a high overall level of congruence between measurable values of form and activity. This Hypothesis was proposed to test the general level of consistency of form and activity in the study area. Three specific congruence predictions were derived from the general hypothesis: a) that there is a high degree of consistency between form types and activity types; b) that the more intense activities are those with the more intense forms; and c) that the more important activities are located in the more visible forms;

Hypothesis 2: The higher the value of the form of a place -- the more common its type, the greater its intensity, the more it is visible -- the greater the knowledge of its form;

Hypothesis 3: The higher the value of the activity of a place -- the more common its type, the greater its intensity, the greater its importance -- the greater the knowledge of its activity;

Hypothesis 4: Meanings tend to be reversible -- the ability to describe the form characteristics of a place is highly related to the ability to identify its activity attributes; and

Hypothesis 5: The higher the level of congruence of a place, the greater the overall meaningfulness of that place -- that is, the greater the frequency with which the form and/or the activity of the place is known.

Hypotheses 2, 3, 4 and 5 were proposed to explain how and why places are meaningful. Separate tests were made of each of these hypotheses -- in the analyses of type, intensity and significance. Restated: The places whose types are best known are more common and congruent (type congruence); the places which are known as being busiest are more intense and congruent (intensity congruence); the places which are known as being more important are more significant and congruent (significance congruence).

PERSONAL VARIABLE HYPOTHESES

Distance, Place of Residence: Proximity was expected to result in a more extensive and complex knowledge of both form and activity.

Sector, Place of Residence: It was anticipated that a person's sectorial travel would be reflected in sectorial patterns of both form and activity knowledge and in more extensive and complex knowledge of his own sectors.

Length of Time of Residence: A longer time of residence was expected to result in a more extensive and complex knowledge of activity. Since all of the people interviewed had been generally exposed to the physical form of the area, a longer time of residence was not expected to significantly affect the knowledge of form. However, short time residents were expected to be relatively more knowledgeable about form than activity, having seen relatively more of the forms than they had had the opportunities to learn the characteristics of activities.

Travel Mode: The automobile road network is more widespread and continuously above grade than the mass transit system, and the automobile user has more direct contact with the environment than does the passive mass transit passenger. Therefore it was predicted that automobile users would have both more extensive and more complex knowledge than would the mass transit users. In addition, they were expected to be relatively more knowledgeable about physical form than the mass transit users.

Socio-economic Class: It was anticipated that lower class people would have a somewhat more extensive and complex knowledge of both form and activity than would middle class people. Furthermore, it was expected that the places in their subjective knowledge patterns would reflect class differences in actual city use, and particularly of residential and retail commercial areas.

Sex: It was predictedthat men would have a generally more extensive and complex knowledge of both form and activity, since they (presumably) have wider urban interests and experiences. Women were expected to have a greater knowledge of the retail commercial and entertainment areas.

Age: It was predicted that subjective knowledge would increase during the learning process, reach a relatively stable peak level, and then decline. Younger adults were therefore expected to have more extensive and complex knowledge of form and activity than older people. The decline was expected to affect the knowledge of form more than the knowledge of activity, since continuing city use becomes more habitual and less dependent upon general identification from form clues.

CHAPTER FOUR: THE RESEARCH DESIGN

The methods and procedures used in this research were specifically designed to test the hypotheses previously described. However, they were also intended to be a generalized analysis system, with applicability for the testing of similar hypotheses in other study areas, or for the testing of hypotheses dealing with other kinds of congruence. A secondary aim of the research design was the testing of the application of various computer aided analysis and display methods to research in city design.

The principal study area for this research was in the central area of Boston, Massachusetts (fig. 4.1). It was defined as that part of the Boston peninsula bordered by the Charles River, the Boston Harbor, the Fort Point Channel, and Massachusetts Avenue.[1] The area is approximately four square miles and is thus comparable in size to many other metropolitan central districts. A second analysis

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[1]The same area has been the subject for other city design studies, notably Lynch (1960) and Hassan (1966). This study area had many other advantages, not the least of which was easy accessibility for the author. In order to probe the effects of incongruence it was imperative to find examples of it. Since Boston has had a comparatively long historical development, there was a greater possibility for incongruencies to have developed -- for example, as a result of activity changes without concomitant form changes. The area has a wide range of form and activity types, a complex street system and a mass transit system. This complexity, occurring within an area that is manageable by a single investigator, afforded an adequate base area for the hypotheses being tested.

FIG. 4.1 THE STUDY AREAS

—— THE TOTAL STUDY AREA

– – – THE DOWNTOWN CORE

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area, the downtown core (fig. 4.1), was delimited so that tests could be made of the implications of smaller context size and of potentially greater subjective familiarity. This area was designed to include the principal retail commercial, office and entertainment areas of Central Boston.

The term place is used to signify the basic spatial unit of the study for which data were collected. It is the area on the basis of which form and activity attributes were surveyed, congruence was ascribed, the interview was coded and all relationships were observed. It was intended that the research design be able not only to describe the characteristics of meaningful places, but, even more importantly, to decide also the places which are not meaningful. Only in this way can evaluations be made of the relative strength of the determinants of the selective knowledge which is meaning.

In principle, the place unit should be volumetric. However, technical data-handling limitations demanded the adoption of a two dimensional, areal data unit. Among the alternatives considered in the choice of a place unit were: ownership units, blocks and their combinatory units such as political and census divisions, units of form differentiation, units of activity differentiation, and uniform mapping units. The comparative advantages of these alternative place units are evaluated in Appendix A. It was decided that a uniformly mapped grid cell system best fit the research requirements. Consideration of the variety and complexity of the form and activity variables being investigated was of particular importance in this decision.

The size of the place unit -- the grid cell itself -- was a necessary compromise between the desire for a small unit and the need for a large unit. The analysis system required that a single data value be assigned to each cell, regardless of the actual homogeneity of that area. When the unit is small, the assumption of homogeneity within cells is more likely to be valid, for the "natural" boundaries of the various variables can be more closely approximated. With a smaller unit, the study can be considered in finer detail, and thus can be more useful as a basis for design and control. The larger unit, however, is more manageable since there are fewer units within a constant study area. The actual size was critically affected by the capacity of the research tools to handle data. The availability of computers for data storage and analysis, and the Symap computer program for graphic data display, allowed the use of a smaller unit and a larger number of elements than had been used previously in urban research. The place size selected for the research was one acre and the total study area was covered in approximately

FIG. 4.2 THE PLACE GRID

1800 grid cells.[1]

THE SURVEY

The primary source of data for the form and activity attributes is a field survey which was conducted during the summer of 1965. A reconnaissance was made of all the streets in the study area on weekdays between the hours of 9 A.M. and 3 P.M.[2] The data resulting from this field survey consist of a photographic record[3] and notes for each place unit. Other data were obtained from secondary sources, including the Boston Redevelopment Authority, the Massachusetts Bay Transportation Authority, the Sanborn Map Company, and an extensive telephone survey.

Appendix B contains the photograph atlas. The locations and photographs of the specific places and areas

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[1]Some other grid cell sizes include: Penn-Jersey (1961) 1/100 square mile (6.4 acres); Ceccarelli (1964) 200 meters square (10 acres); Artle (1959) 250 meters square (15.2 aces); Chicago Area Transportation Study (1958) 1/4 mile square (40 acres).

[2]According to Foley (1954), these hours afford the widest distribution of urban activity and the greatest actual city use.

[3]The photographic record consists of one photograph for each place, taken in good daylight conditions with a 35mm lens. The picture was taken perpendicular to the face of the place being noted and, whenever safe and possible, from the center of the street or other public right of way. Contact prints of the photographs were trimmed and mounted in their grid locations in an atlas (Appendix B). By joining the atlas sheets, a photograph map of the study area to a scale of 1" = 200 can be formed.

given as examples in the text are also included in this Appendix.

Each place had to be characterized by a single value for each variable. Since the grid cell unit did not necessarily correspond to the actual differentiation or complexity of either form or activity, a system of selection[1] had to be established whose aim was the identification of the data value that was most characteristic of the place. The limitations of a selection system are inherent in the requirement of a single measure for each place variable. In this case, the system emphasized visually dominant ground level characteristics. The system

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[1]Since the grid system that was applied to define spatial units did not coincide with the existing street and building pattern, it was necessary to use a street map and a grid overlay in order to identify the streets in which potential data measuring points might be located. The data were recorded from a view point of the major road or public right of way within the grid cell, as measured by traffic volume. If there was a road intersection within the grid cell, the viewpoint was near the intersection and on the major road. If there was no road within the grid cell, the viewpoint was taken from the major pedestrian right of way.

The following rules were established as the basis for this selection system: If the areal scale of differentiation of the variable coincided with the grid cell, it was coded without application of a selection system. If the area of differentiation was larger than the grid cell, it was coded without selection. If the area of differentiation was smaller than the grid cell and was of mixed character the use of selection rules was required. For vertical mixture, the ground level characteristic was measured as the basic variable value. The upper levels of below assumed homogeneity within the place unit. In addition, the data measure was taken at the place itself, and for some characteristics, the salient data measuring point might be at a distance. Since localized meaning was the basic focus of the research, there was less emphasis on the attributes of roads and other flow facilities, except where they were the typical or dominant features of a place.

Environmental attributes which were thought to influence the specific meanings being investigated were classified and selected. Criteria for an urban classification system have been enumerated by, among others, Lynch and Rodwin (1958), Cole (1960), Lynch (1961), Jacobs and Jones (1962) and Reissman (1964). These criteria include: establishment of clearly defined, unambiguous and mutually exclusive categories; inclusion of all relevant variables; applicability throughout all phases of the study and for all research analysis techniques; applicability at larger and smaller scales and, for the purposes of comparative

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grade values were recorded as supplementary data, but they were not used in the primary analysis. For horizontal mixture, the first attempt was to reflect the typical or most common characteristic within the grid cell. If no typical characteristic could be identified, the most visually dominant element -- the most eye catching part of the scene -- was recorded.

research, in different cultural settings; and, an economical format which is both orderly and compact. Table 4.1 lists the environmental variables which were investigated. The reasons for the specific selection of variables are discussed in Chapter 5.

The survey variables are those which come from primary data sources such as the field survey. The summary variables are combinations of various survey variables and were generated by computer program subroutines. The congruence variables were obtained from analyses of the co-occurrence of the relevant form and activity summary variables. The summary variable results and the congruence analyses are presented in Chapter 5. The measurement and findings about the individual survey variables are presented in Appendices D, E, F, G, H, and I.

TABLE 4.1
THE ENVIRONMENTAL VARIABLES

Analysis Variables	Summary Variables	Survey Variables
Type Congruence	Form Type	Construction Type Transparency Height Quality
	Activity Type	Activity Type, 2 Digit Code
Intensity Congruence	Form Intensity	Floor-Area-Ratio Rooted Sign Size Visible Activity Visible Objects Non-Visual Information Form Stereotype Form Information Intensity
	Activity Intensity	Destinations Hours Per Place Person Hours Per Day Person Hours Per Night
Significance Congruence	Form Exposure	Visibility Area Vehicular Flows Vehicular Exposure Mass Transit Flows Mass Transit Exposure Pedestrian Exposure
	Activity Significance	Realm Decision Significance Symbolic Significance
	Form Recency	
	Activity Recency	

It was recognized that there is considerable variation among environmental variables in intrinsic objectivity.[1] Some, such as building height, are unequivocably quantifiable, but others, such as symbolic significance, are necessarily measured by "expert consensus." The measures used in this study were defined as objectively as possible, and the following operational procedures were established to ensure the maximum degree of objectivity and reliability. When necessary, two or more observers chose the view to be photographed in the original data collection process. When possible, two or more coders independently coded the variable. When necessary, experts who were knowledgeable about the variable under consideration did the coding and evaluation. A conscious effort was made to avoid the coder's own class biases and the tendency to make any given place consistent across different variables. In addition, checks of the coding

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[1]That environmental variables -- particularly those related to the visual characteristics of physical form-- can be objectively measured is a controversial concept. According to Ricci's existential view, "Nothing is objective. Not the subject that has become object. Not the mathematical average of the subjects compared to the object. Not even the sum total of every subject's viewpoint toward the object." (1962 p.) On the other hand there is the assumptive basis for research in the social sciences -- "that subjective data are indeed accessible to verifiable scientific knowledge." (Firey, 1947, VIII) This study is based upon the view that the reaction of people to their environment -- and the environment itself -- can be subjects of objective investigation and scientific research. Indeed, this view is necessary if planning and design are to be founded on testable theory rather than intuition and preconception.

were available for some variables in studies by the Boston Redevelopment Authority and other public agencies, and in other research carried out in the same study area.

Environmental variables also exhibit considerable variation in their stability, especially when seen in relation to a time scale of a year or more. There are "permanent" variables (e.g., floor-area-ratio), "cyclical" variables (e.g., traffic flows), and "ephemeral" variables (e.g. non-visual information such as noises and smells). In addition, some places change radically due to destruction and/or construction. The great majority of variables that were coded in the study were either permanent or regularly recurrent, and all were considered to be stable for the purposes of the research.

The value scale adopted for each individual survey variable was a function of the number of distinctions that could be made with confidence.[1] In some cases, such as decision significance, only presence or absence of the characteristic could be reliably inferred. In others, such as vehicular views, very fine gradations were discriminable. A limit of ten levels of differentiation was

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[1]A general discussion of scale and index systems, and their limitations, can be found in Selltiz, Jahoda, Deutsch and Cook (1962, pp. 350-370) and in Green's chapter on attitude scaling in The Handbook of <u>Social Psychology</u> (Lindzey, 1954, pp. 338-341).

established for all variables and the extreme values on each variable were arbitrarily set as equivalent so that the measures could be quantitatively compared. In establishing a scale, the high and low values for the variable were determined on the basis of the maximum and minimum values found in a search of the data, and all places were then measured in comparison with the range on a linear scale.[1]

A basic issue in the measurement and scaling of many environmental variables and one critical to the application of computer technology to design is that of the quantification of qualities. Unless rational methods can be devised for the assignment of quantitative values to the different qualitative characteristics, there is no consistent way of using these important data for statistical analysis. Therefore, in addition to surveying the relevant qualitative variables, the research developed two methods of assigning them quantitative values.

Many environmental qualities could be directly measured and places assigned quantitative values based upon their

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[1]In the display of the data, several variables, notably form and activity type freqnency, were logarithmically rescaled in order to graphically differentiate among the many low frequency places. The analysis programs, however, were all based upon the linear scales of the original data.

having "more" or "less" of the particular quality. For example, places which were more visually open were assigned higher values of form transparency than were places which were less visually open. When a qualitative variable could not be directly and quantitatively measured but was strongly related to another variable which could be measured, it was sometimes possible to assign values as a function of the second variable. For example, places with different construction types were assigned quantitative values as a function of the potential building height of their types, with the non-building types scaled low and steel and concrete construction (with their potentially great height) given high values. Another method of assigning quantitative values to qualities was based upon their frequency, the commonness of the particular quality within the study area. For example, residential activity type places were assigned values in relation to the per cent occurrence of residential places within the study area. This is a contextual measure, and is based upon the size of the study area and the number of data points within it.

For the purpose of this research, congruence was operationally defined as the consistency with which a given form attribute appeared with an activity characteristic, and conversely, the consistency with which a given activity attribute appeared with a form characteristic. Analyses of congruence were applied to both qualitative (e.g. type congruence) and quantitative (e.g. intensity and significance congruence) form-activity relationships.

Three general levels of qualitative congruence were defined:

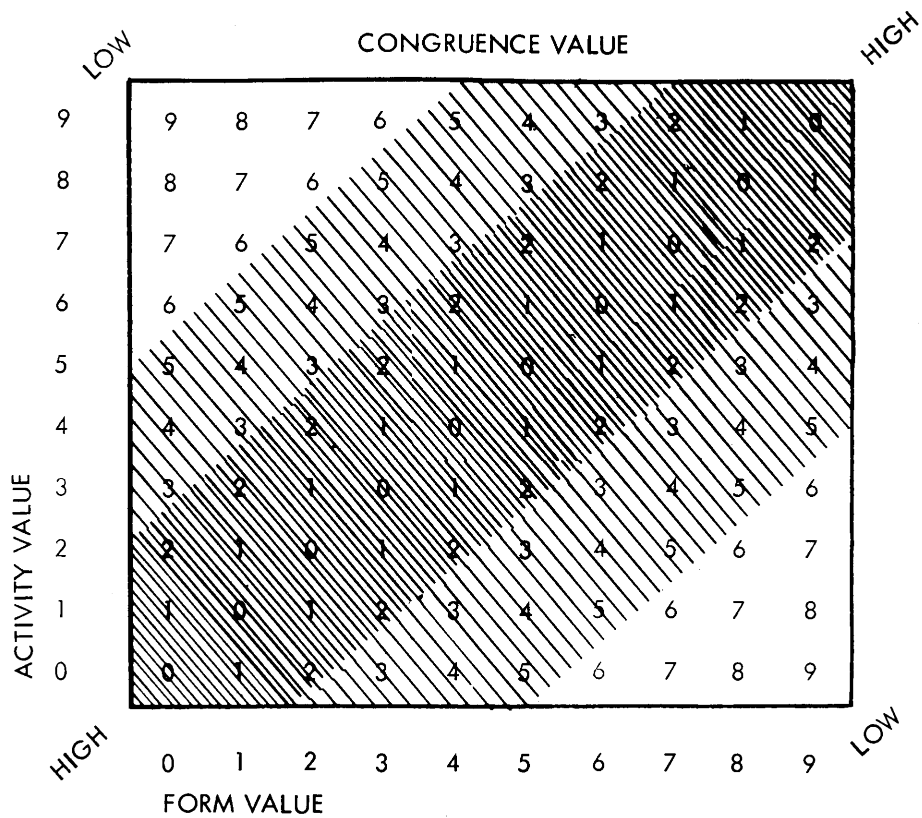
1) Where both a form and an activity are uniquely or highly coincidental with each other. This is the highest level of congruence. It is a defining and predictive relationship in that when either the form or activity of a place is known, the other is also determined.

2) Where a form is highly coincidental with an activity but the activity has several forms, OR where an activity is highly coincidental with a form but the form has several activities. These relationships are defining and predictive in one direction only, and are indeterminate in the other. They are considered to be congruent but with a lower level of congruence.

3) Where neither the form nor the activity is highly coincidental with the other. This is an indeterminate relationship, in which neither the form nor the activity is predictive. It is defined as the lowest level of congruence.

As a quantitative relationship, congruence is higher when the difference in relative value between the form and activity variables is smaller (fig. 4.3). For example, a congruent relationship would be that in which the most intense form was coincident with the most intense activity, the least intense form was coincident with the least intense activity, and all other forms and activities were coincident with their relative rankings. An overall quantitative congruence level for an area can be stated as a correlation coefficient and it can be graphically expressed by a scatter diagram in which all places are distributed according to their form and activity attributes. Since congruent places are those which have equivalent form and activity values, the peaks of the scatter diagram in a congruent situation will form a ridge on the diagonal between (low, low) and (high, high).

FIG. 4.3 THE SMALLER THE DIFFERENCE BETWEEN THE FORM AND ACTIVITY VARIABLE VALUES, THE HIGHER THE CONGRUENCE.



The basic method of analysis used in this research was co-variance analysis. Comparisons were made of the similarities among the spatial distributions of the data values of independent variables. All comparisons were made for the total study area. When warranted, further comparisons were made within the area defined as the downtown core (fig. 4.1, p. 36). The survey used the following specific methods, which are described in more detail in Chapter 5.

1. Visual inspection of the mapped distributions to determine general patterns of covariance and to identify specific place examples;

2. A general statistical analysis computer program, DATA-TEXT, to produce a correlation co-efficient matrix for the different variables. DATA-TEXT also provided frequency distributions for each variable and was used for the frequency analysis of type congruence;

3. A matrix analysis of type congruence, in which the distribution of all combinations of form and activity type were compared for their concurrence frequency; and,

4. A scatter diagram computer program to generate frequency distributions for two-variable sets. This program is a flexible one which cumulates places according to their variable values on a matrix scaled by the two variables.

The adoption of computer techniques of data storage, analysis and display made possible investigation of a large number of variables for a large number of places. All data were coded and stored on IBM cards[1]. Both the

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[1]The following stored data can be made available for use at Harvard and M.I.T. or for duplication from the author, c/o The Joint Center for Urban Studies, 66 Church Street, Cambridge, Massachusetts, U.S.A.
1. The SYMAP base map format for Central Boston (cards);
2. The survey (graphic display, cards and tape);
3. The interview (original questionnaires, graphic coding, cards and tape).
(See Appendix C for the data card key and the list of coded variables.)

data and the analysis results were displayed using the SYMAP computer[1] program. The SYMAP display format is shown in fig. 4.4.

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[1]SYMAP, which has been developed by Mr. Howard Fisher of the Laboratory for Computer Graphics of Harvard University, generates maps of spatially distributed data which are located according to predetermined base map positions. The program uses combinations of the standard computer printout symbols to achieve a ten level black-white tone range which corresponds to a large-small data value range. Because of the proportion of the printout characters of the 4 X 4 symbol place unit, the base map has an anamorphic scale. Options in the program allow for the rescaling of raw data, e.g., to a right expanding logarithmic scale, and for extensive mathematical manipulation. The program produces both contour and flat tone maps. Contour maps show the variation of the data over the whole study area and are analogous to the contour lines which indicate elevation on topographic maps. In flat tone maps, the area of the place unit is filled with the symbol tone appropriate to its data value. In order to identify the place units more easily, only flat tone maps are used in this presentation, and they are reproduced with an acetate overlay showing the principal roads and shoreline of the study area.

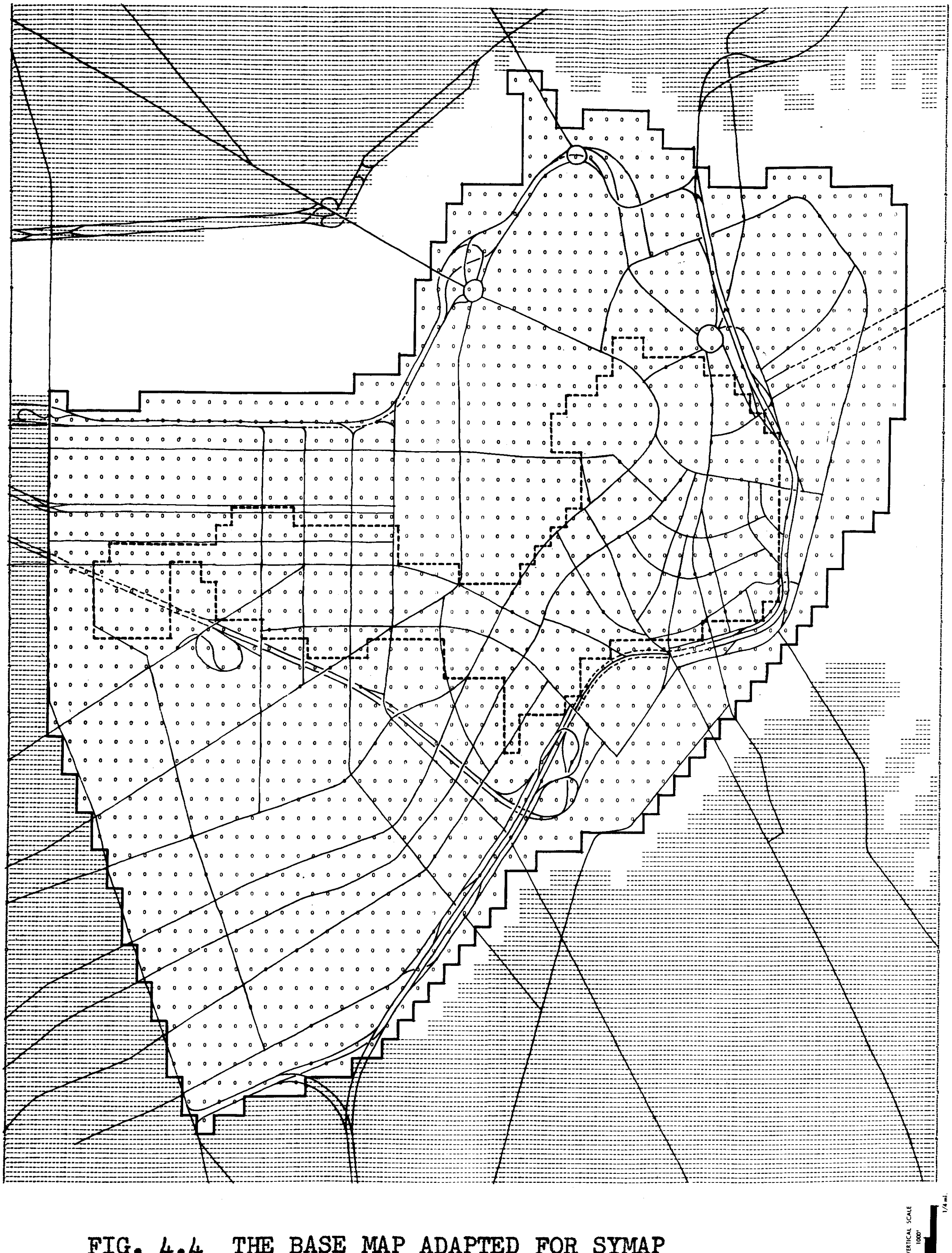
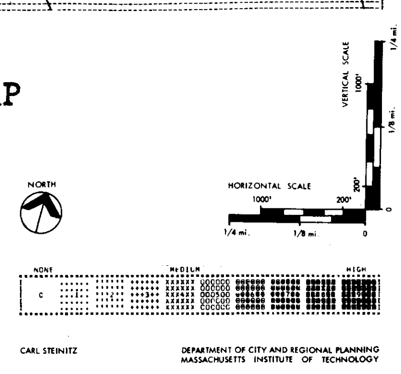


FIG. 4.4 THE BASE MAP ADAPTED FOR SYMAP



BASE MAP OF THE STUDY AREAS

TOTAL STUDY AREA

DOWNTOWN CORE

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THE INTERVIEW

The principal purpose of the interview research was to identify and measure the meanings of places -- that is, to discover which places were best known, how they were identified and described, and for whom they were meaningful.[1]

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[1]The spatial structure of form knowledge has been probed in interview techniques devised by Lynch (1960) and developed by DeJong (1962), Gulick (1963) and Appleyard (1966), in which subjects are asked to draw maps of their environments. They are free to select from and represent the areas in question as they know them (and as best as they are able). Interview techniques have also been developed for research on city use and activity patterns and particularly on travel patterns. The Penn.-Jersey Transportation Study (1961), the Boston Regional Planning Project (Smith, 1964) and other such studies have used interviews extensively to establish patterns of city activity use, notably traffic routings. The major advantages of the interview techniques are that they can be adapted to various scales of relevance, that the subject is free to select and structure his response, and that specific questions can be directed to the particular research interests.

However, when applied to measuring meaning, the interview techniques must operate under a major assumption. Since an interview protocol cannot be exhaustive, all places which are included in a response must be considered meaningful. The selection of places by the subject is taken as an indication that they are more meaningful than non-mentioned places. However, places which are not responded to are not necessarily meaningless. Granting this assumption, interview-map techniques are a feasible method for obtaining relevant data on the meaningfulness of places.

The criteria for the interview protocol included: allowing the subject to freely recall and structure his responses; probing both the spatial extent and complexity of the subject's knowledge of the relevant environmental variables; producing data which were comparable in scale with the results of the survey of form and activity; an easily administered procedure which required no special competence on the part of the interviewer or the respondent; and relative ease in processing results and the minimizing of the need for coder interpretation and other potential sources of error.

The interview devised for this study used both free and directed questions. It consisted of two parts: a preliminary set of questions which established the subject's sub-sample categorization and his use of and familiarity with the study area; and a questionnaire which elicited his knowledge of the type, intensity and significance of the study area's form and activity. The form and activity questions began with a "free" question -- in which the subject formed his own categories and selected his own order of response. The questions then became more directed, in an attempt to generate greater spatial coverage and complexity in the response. The subject responded by writing and drawing directly on large base maps of the study area with his responses color coded by question for ease of analysis. By having the subjects respond directly on base maps, the effects of subjective variation in representational ability were minimized, and many of the difficulties and ambiguities of the analysis and coding of freely drawn maps were eliminated. None of the subjects reported any difficulties in responding to the base maps. (See Appendix J for the complete version of the Interview Protocol.)

The interview protocol was designed to be administered by interviewers who did not have a specialized familiarity with the subject matter of the research. It was therefore possible to obtain and use interviewers who were residents of the districts from which the sample was selected and with whom the subjects would feel at ease. The interviews were conducted between December 1965 and February 1966.

In order to test the potential influence of various personal and group differences, a selected sample was chosen. The factors which were expected to significantly affect response patterns -- an individual's personal and social characteristics, his capacity and processes of information internalization, and his representational styles -- were either controlled in the sample or were assumed to vary randomly.

The sample consisted of 48 persons. Each subject regularly and frequently used the study area. Four variables formed the basis of the sample selection and were controlled in the analysis: 1) the subject's place of residence, both as a function of its inner or outer city location, and as a location in a directional sector from the downtown core area; 2) his length of time in residence in Boston; 3) his principal mode of transportation to and through the study area; and, 4) his socio-economic class. Also used in the selection of the sample, but not as well controlled were 5) sex and 6) age. Within each of six residential districts one person represented every combination of residence time, transportation mode and socio-economic class. These variables were evenly distributed in the selection of the total sample and were therefore self-cancelling. While not evenly chosen, sex and age were sufficiently well distributed to be in effect self-cancelling. For a detailed description of the sample, see table 6.1.

The subjects responses, written directly on the base map, consisted of words describing places and areas, lines representing area and place borders, and linear elements such as roads. Despite the descriptive freedom allowed by the research technique, no other response modes were used. The use of the base map made possible a topologically specific analysis of which places were known in any given subject's responses.

The research method required that the response patterns for the total sample be compared with the various surveyed form and activity attributes. Therefore the first measure of meaning obtained in the interview analysis was a summary measure of the extent to which the particular places in the study area were known. For each place, extent was defined as the percentage of the total sample who identified or described that place.[1] A further tablulation was made of the descriptive terms used by people in differentiating among places. All of the descriptive words used to describe the form of the study area and its activity pattern were transcribed in their exact place location on an acetate overlay and both were analyzed for their content.

The analysis of subsample differences was made in terms of both response extent and response complexity. The extent of a person's knowledge was measured by the percentage of the total number of places within the study area that he could identify or describe. The complexity of his knowledge was operationally defined as the number

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[1]See Appendix K for a more detailed description of the coding process and for the graphic response summaries.

of differentiated elements and/or descriptive categories he included in his responses.[1]

As to the qualitative content of meaning, it is virtually impossible to ascribe more importance to one aspect of a person's knowledge than to another in a general evaluation. Any aspect may be paramount for a particular individual or a specific purpose. The kinds of knowledge on which the research focussed -- type, intensity and significance -- were therefore investigated separately. While each aspect was quantified in turn, no attempt at weighting or comparative evaluation and combination was made.

All data were tabulated and stored on IBM cards in the same format as that of the survey variables. The interview response patterns were graphically displayed using the SYMAP program, in a manner comparable to the format of the field survey of form and activity. The flat tone computer map was photostated through a plastic overlay showing the street system, in order to provide easy reference points for the various places. (See Appendix C, The Data Card Format.)

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[1]Other aspects of the meaningfulness of an environment to an individual can be investigated: the time that it takes him to acquire a particular meaning, the effort he expends, the importance of the meaning, its usefulness, and its permanence. While these may also be the bases of quantitative measurements, they require more sensitive instruments, and were therefore not included in the measures of meaning developed in this research.

The analysis method used in the testing of the hypotheses was the comparison of the spatial patterns of the interview responses with the surveyed form and activity variables and their congruence. The methods used were similar to those described previously in the discussion of the survey method: visual inspection, the DATA-TEXT correlation matrix program and the scatter diagram program.

The scatter diagram program was used to analyze the distribution of the total set of interview responses as a function of the place variables and their congruence. Its program was adapted to: 1) cumulate all the relevant form and activity responses for each place by subject; 2) distribute these sums on a scatter diagram whose axes were the values of the form and activity variables; 3) cumulate the total mentions according to these form and activity value sets; and, 4) normalize the total mentions according to the frequency of occurrence of the different sets. The resulting scatter diagrams were graphically displayed using the SYMAP program.

In interpreting the resultant scatter diagrams,

fig. 4.5a represents the dominance of form values,

fig. 4.5b represents the dominance of activity values,

and

fig. 4.5c represents the dominance of congruence.

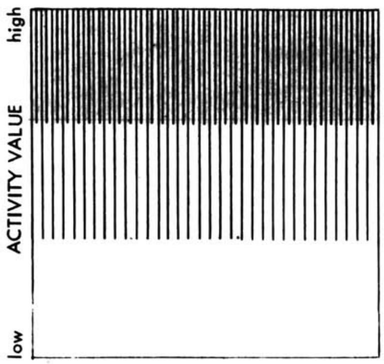

FIG. 4.5a

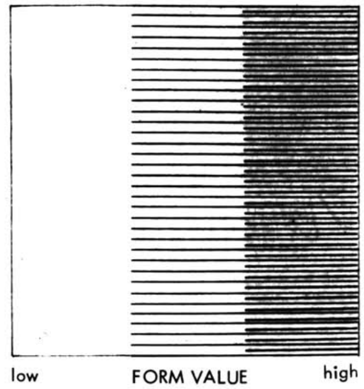

FIG. 4.5b

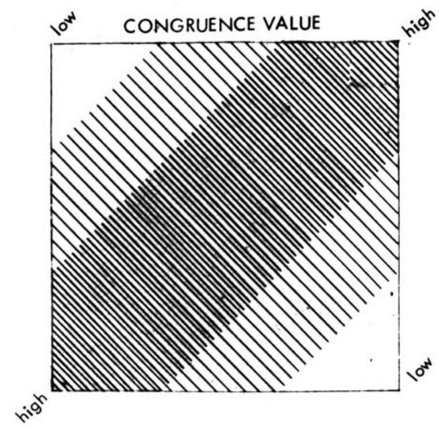

FIG. 4.5c

If the hypotheses are confirmed: if the places whose types are best known are more common and congruent; if the places which are evaluated as being busiest are more intense and congruent; if the places which are evaluated as being more important are more significant and congruent, then the resultant scatter diagrams should resemble fig. 4.5d.

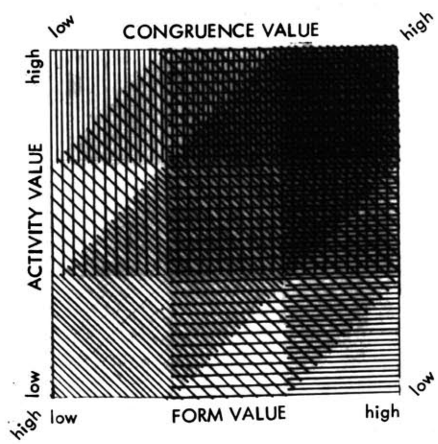

FIG. 4.5d

The analyses of the hypotheses included all the places in the study area except those which were roads or other flow facilities. The size of the place unit did not allow for the inclusion of the whole "secondary" road system and rather than arbitrarily including only a part of this network, it was felt that the research would have a clearer focus if it concentrated upon the localized activity places.

Since both the environmental characteristics and the characteristics of the subjects are variables, the analysis techniques were designed first to control the subject variables while testing the knowledge of the various environmental attributes, and then, to compare the relative influences of these personal variables.

CHAPTER FIVE: THE SURVEYS OF FORM AND ACTIVITY, AND THEIR CONGRUENCE

This chapter describes the surveys of the form and activity characteristics of the study area. The survey results provide a basis for the evaluation of type, intensity, and significance congruence. They thus test Hypothesis 1: that there is a high overall level of congruence between the objectively measurable values of form and activity. Three specific predictions about congruence were derived from the general hypothesis: a) that there is a high degree of consistency between form types and activity types; b) that the more intense activities are those with the more intense forms; and c) that the more important activities are located in the more significant forms. The chapter presents the findings that are relevant to these three predictions.

In addition to their type, intensity and significance, the places of the study area were surveyed for their recency. This measure of the relative newness of places was included so that the effects of recent changes upon the knowledge of places could be explored. Changes in both form and activity were noted, with the expectation that they would be highly related to one another.

THE FORM TYPE SURVEY

The isolation and measurement of the attributes of form type -- the physical qualities of the environment -- presents one of the most difficult issues in environmental research. At one extreme is the view that form can only be considered as a total experience and that not only are its attributes inseparable, but they can be interpreted in an infinite number of ways. While acknowledging the variation in form constructs, Gibson (1951, p. 403) contends that the ambiguity of this "wholeness" concept is intolerable when considered in the context of the need for experimental research. While it is clearly impossible to define and isolate all of the attributes of form type, it is possible to categorize many of these aspects and to identify those which are more frequently used in subjective differentiation, description and evaluation.

Several systems have been developed for the classification of urban physical form and they can be generally grouped according to their purpose and focus. Categories which are used primarily for the analysis and recording of site development, such as those used in the Sanborn Insurance Maps (1953), emphasize physical features like construction type, condition, financial value, etc. Systems which focus primarily on urban activity patterns, such as those developed by Mitchell and Rapkin (1954) and Rannells (1956) emphasize those interior and locational form characteristics that determine whether the physical environments are adaptable to the accommodation requirements of activities.[1] Several other studies have developed descriptive systems for the analysis of the sensually perceived aspects of form and space, including Kepes (1961), Theil (1961) and Appleyard (1966). The categories in these systems emphasize exterior characteristics such as spatial configuration, surface texture, color, and shape. Research emphasizing personal spatial associations, for example, Cullen (1961) and Jacobs and Jones (1962) tends to stress the great variety of detail and individuality to be found in physical form and space. Several systems have also been developed for the analysis of the roles of form elements in the visual structuring of the environment, notably those of Williams (1954), Lynch (1960), Maki and Ohtaka (1961) and Maki and Goldberg (1962).

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[1]A potential difficulty of this activity oriented approach is seen in Guttenberg (1959), where form types were often named according to their typical activity purpose. Those systems which seek to understand the form-activity relationship without bias, notably the schemes proposed by Lynch and Rodwin (1958) and Lynch (1961), achieve a clearer analytic separation between form and activity.

Since the study required a system which combined functional physical characteristics and their perceivable qualities, none of the existing systems could be directly adopted. It was therefore necessary to design new descriptive classification types. The criteria adopted for the establishment of the salient form type variables included: identification of form constructs that were in common subjective use,isolation of the form attributes from activity associations, establishment of a limit of 100 form variable combinations -- form types -- due to the capacity to analyze data; and identification of the individual variables which, when taken in combination, created the greatest number of significant type distinctions.

In order to identify the form qualities which were most commonly used in making descriptive distinctions among places, a number of interviews were conducted. The interview protocol, a pretest of that used in the research, was given to five subjects. Their responses to the question, "How would you describe the visual character of Central Boston?" were written on a large base map of the study area, and were analyzed and categorized. On the basis of the pretest results and existing classification systems, four general form type categories were established: site development, surface character, apparent quantity and associated affect. The following variables, representative of these categories, were then selected for intensive study:

Construction Type: open space development and/or principal building method;

Transparency: the exposure of the "inside" of a form;

Height: the height of open space and/or building development; and,

Quality: the maintenance quality of the exposed surfaces of a form.

Construction type was considered an important form variable because it is closely related to the potential spatial capacities of structures, particularly to their height and span. Construction type also reflects differences in cost and permanence and, in an older city like Boston, historical developments in technology and style.

The second form type variable, transparency, also carries with it a powerful set of associations. The ability to see into a place symbolizes openness and welcome, while the inability to penetrate visually indicates privacy and exclusion. The transparency of a place tends to be a functional requirement of its activity type. Banks, clubs, residences and factories are often visually closed; parks, other outdoor recreation places, and commercial facilities which seek to attract customers are often highly transparent.

Building height was chosen as a form type variable because it has been a traditional indicator of relative intensity and importance. It symbolizes concentrations -- of people and of power.

The last variable, form quality, has strong affective associations. The places that look "the best" tend to be associated with "the best" people. It was also anticipated that places with extreme values of form quality -- whether high or low -- would be noticed most often.

(See Appendix D, Form Type Survey Variables, for descriptions of the ways in which the individual variables were measured.)

The spatial distributions of the form type variables had the following intercorrelations:

TABLE 5.1 CORRELATION MATRIX, FORM TYPE VARIABLES

	Construction Type	Transparency	Height	Quality
Construction Type	--			
Transparency	-.64	---		
Height	.80	-.58	---	
Quality	.05	.06	.02	---

The very high positive correlation between construction type and height reflects the use of potential height as the basis for deciding which quantitative values to assign to the various (qualitative) construction types. The two variables are thus highly interdependent by definition. Quality varied independently from the other type variables. Its spatial distribution exhibited a high degree of clustering and may therefore have had a significant effect upon subjective knowledge, particularly in discriminating among districts. There were significant negative correlations between transparency and construction type and between transparency and height. These correlations were primarily attributable to the high transparency of places which did not have buildings and to the tendency of large buildings such as those in the downtown office areas to be visually "closed."

To compare form type with the other variables, a single quantitative measure of its spatial differentiation had to be adopted. The distinctiveness of a form type was determined by the frequency with which it occurred among all of the places in the study area. In the analyses, form type was operationalized as all combinations of construction type and transparency. These two variables were selected because their combinations provided the greatest degree of functional discrimination among the places in the study area. Quality was not selected for this combination because while it may have had a significant influence on the appearance of a form, it was felt to be less important to its capacity to meet the needs of the different activity types.[1]

The form type frequency of a place was measured by the percent occurrence of its combination of construction type and transparency values among the total number of places in the study area. The value scale was logarithmically rescaled in the graphic display (fig. 5.1) in order to sharpen differences at the lower frequency levels.

Two general patterns emerged. First, there were several strongly homogeneous districts of common form types: the less transparent four-to-five story, brick, buildings in the Back Bay and Beacon Hill and in parts of the South End and North End; the large open spaces in the West End urban renewal area, the Boston Common, and the yards of the South Station area. On the other hand, there were also large and often clearly defined areas in which unique form types were concentrated: the Prudential Center area with its mixture of low and tall, more highly transparent, steel and glass buildings, the

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[1]While only two variables were combined for the measurement of form type frequency, all of the form type variables were maintained separately throughout the analyses so that their individual influences on meaning could be evaluated.

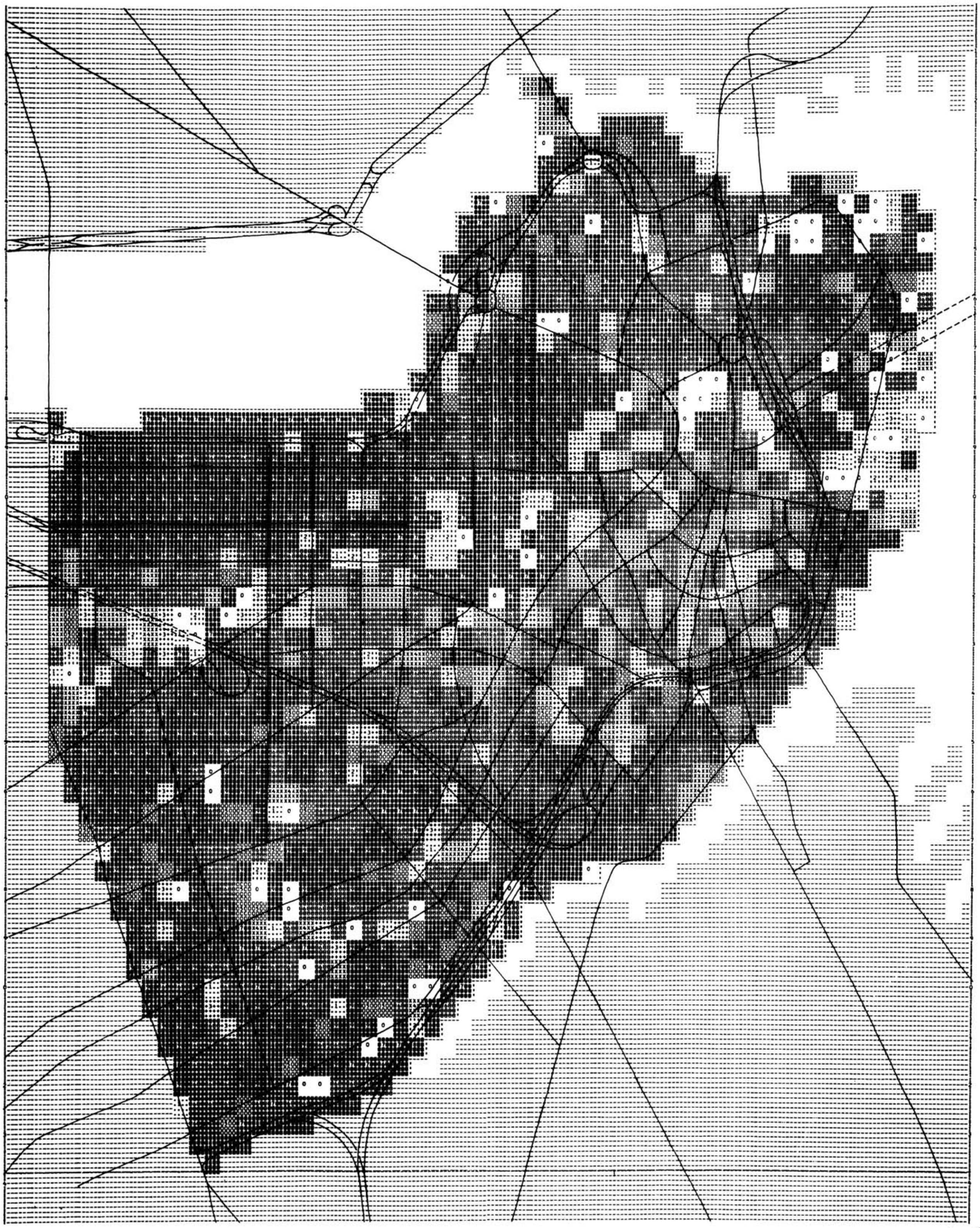
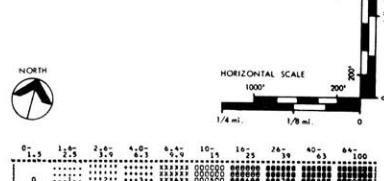


FIG. 5.1 FORM TYPE FREQUENCY



FORM TYPE FREQUENCY:
THE OCCURRENCE OF A FORM TYPE WITHIN THE STUDY FIELD
(FORM CONSTRUCTION TYPE + FORM TRANSPARENCY)

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Washington Street area in the downtown core with its highly transparent but otherwise mixed buildings; and the waterfront area along Atlantic Avenue with its clutter of assorted stone and metal structures. In almost all cases the quality of these areas was mixed at a finer scale than their differentiation by type. Since there were both strongly uniform and highly varied areas, it was possible to test the implications of form type homogeneity upon meaning.

Second, the places of sharp formal contrast were distributed throughout the study area. The Government Center buildings, the taller elements of the Prudential Center, the large stone buildings around the State house contrast strongly with their surroundings; but so do many of the older brick loft structures in the South End and North End, the stone structures in the Boston Common and the Esplanade open spaces, and the massive stone buildings in the waterfront area. Thus there was at least some basis for seeing if formal contrast was in and of itself a factor in the meaningful selection of places and areas.

THE ACTIVITY TYPE SURVEY

The classification of activities has been a constant effort of city planning research. The many facets and ambiguities of "activity" have been outlined by Guttenberg (1959), Rannells (1961) and Chapin and Hightower (1965). They distinguish several attributes of urban activity, each of which has been, or can be, the basis for the formulation of an activity classification system.

A basic distinction among activities made by Lynch (1961) and Chapin and Hightower (1965), is that between flows -- movement and communications between places -- and localized activities -- those that are spatially fixed. The principal focus of this research was on the meanings of places, and the analysis emphasis was therefore on the classification of localized activities.[1]

Many planning agencies have produced activity classification systems designed to suit their particular

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[1]Mitchell and Rapkin (1954), Rannels (1956), and Webber (1963), have analyzed activities with their focus being upon establishments -- the individuals, groups or institution engaged in an activity, and their linkages -- the transactions among them. A principal operational difficulty in the analysis of establishments and linkages is their relative spatial instability. Establishments are considerably more numerous and less spatially fixed than land uses, and as Webber (1963) notes, they are becoming increasingly so.

planning purposes and area characteristics.[1] Attempts at developing more widely applicable systems of activity classification have been generated by the increasingly centralized role of government agencies in planning. Among the more successful of these is the system developed jointly by the Urban Renewal Administration and the Bureau of Public Roads (1965), which is based in large part on the Standard Industrial Classification Manual (U.S. Bureau of the Budget, 1957). The concept of localized activity which is most frequently used in all of these studies is that of land use -- the repeated pursuits of individuals and organizations as they relate to specific spatial locations.

A further distinction can be made within land use between occupation and industry. Occupation is the functional process which is pursued by a person in a place, for example, food manufacturing and food retailing.[2] Industry distinctions are based upon the kind of object to which these functions are applied, for example, clothing manufacturing and transportation equipment

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[1]For example, see the Public Administration Service (Detroit, 1962), The North East Illinois Metropolitan Area Planning Commission (1961) and Smith (Boston, 1964).

[2]The U.S. Bureau of the Census (1950), Mitchell and Rapkin (1954) and Shapiro (1957) have developed classification systems based upon occupational function.

manufacturing.[1] Both occupational function and industry can serve to differentiate the activity meanings of urban districts, and typical district names include "The shopping district" (occupation), "The clothing district" (industry) and "The food wholesaling district" (both occupational function and industry).

None of the many existing systems of activity classification was suitable for direct adoption and it was therefore necessary to construct an activity classification system specifically designed for the purposes of this research. The criteria adopted for the activity type classification system included: applicability to the coding of all the places in the study area, a maximum of 100 activity type categories, flexibility in the combination of categories,[2] more equal emphasis on productive and non-productive activities,[3] and segregation of form attributes from the activity categories.[4]

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[1]The classification systems of industries include those of the U.S. Bureau of the Budget (1957) and the Penn-Jersey Transportation Study (1961).

[2]A digitized coding system, for which the four digit (9,999 category maximum) code of the Urban Renewal Administration and Bureau of Public Roads (1965) serves as a model, is easily combinable.

[3]Most of the activity classification systems have emphasized economically significant activities, and particularly manufacturing. Since this research investigated the knowledge of the "general public" of a full range of urban activity, more attention was given to activity categories such as recreation, services and retail commerce.

[4]Several of the existing activity classification

A two digit system was developed for the classification of activity type and is presented in Appendix E. The occupational function of an activity was indicated by the first digit and, where applicable, the industry was indicated by the second. This two digit classification system was used in the field survey of activity type. Appendix E, fig. E.1 contains the pattern of activity types in the study area. The classification was also used as the basis for the establishment of the quantitative measure of the differentiation of activity -- activity type frequency, which was defined as the percent occurrence of an activity type among all the places of the study area. The activity type frequency values were logarithmically rescaled in the graphic display (fig. 5.2) in order to sharpen differences among the relatively unique places.

The distribution of the frequency of activity types indicated that they were more highly differentiated than form types. Several formally homogeneous districts had within them considerable variation in activity type, notably the school and office activities in the otherwise residential Back Bay, the commercial activities in the

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systems have included physical development characteristics in their activity categories. This is particularly evident in the use of such residential categories as "row house," "mobile home," etc. The activity distinctions used in this research were specifically designed to exclude form characteristics from the attributes of activities.

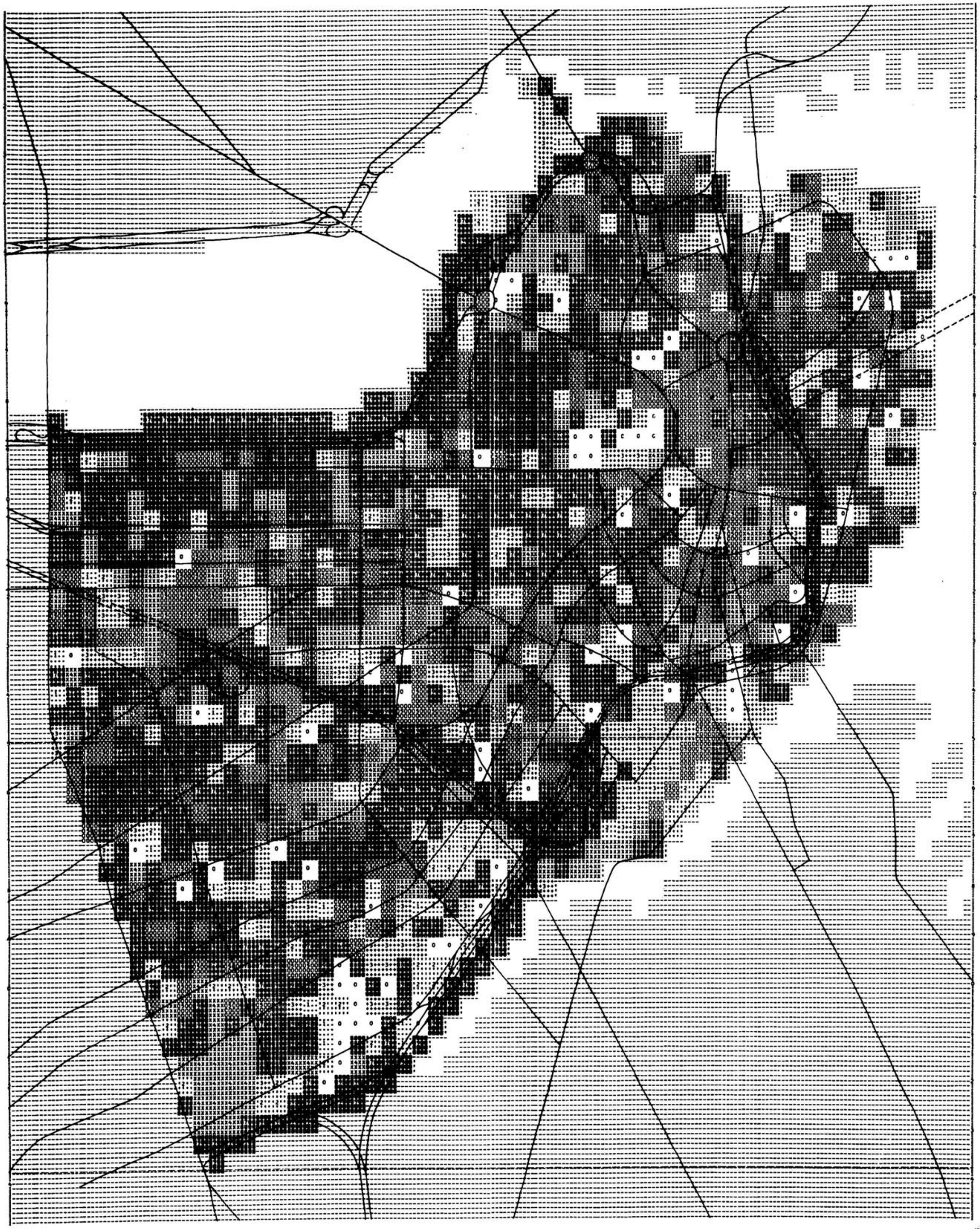
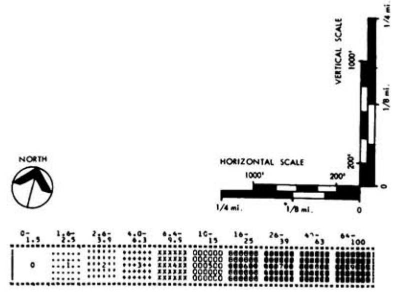


FIG. 5.2 ACTIVITY TYPE FREQUENCY



ACTIVITY TYPE FREQUENCY:
THE OCCURRENCE OF AN ACTIVITY TYPE WITHIN THE STUDY FIELD
(2 DIGIT CODE)

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North End, and the industry in the South End. The nature of the activity type frequency distribution raises questions as to whether people are responsive to activity structures which are not formally differentiated and whether they are more knowledgeable about areas with single, or dominant, or mixed activities.

TYPE CONGRUENCE

Type congruence was measured by the consistency with which a given form type appeared with an activity type, and conversely, the consistency with which a given activity type appeared with a form type. It is a relationship between the type qualities of places and it was established within the context of the study area. Two methods were developed to analyze type congruence and to express it quantitatively.

In a matrix analysis, the places of the study area were distributed by their form and activity types, as qualities, on a matrix of all possible type combinations. The consistency of the co-occurrence of the form and activity types was measured quantitatively and this measurement provided the congruence level for any place which had a particular set of type characteristics.

A frequency analysis compared the relative frequency of the form type of a place with the relative frequency of its activity type. The covariance of frequency provided the measure of congruence. Thus, the highly congruent places were those where common activities were found in common forms and those where unique activities were located in unique forms.

Matrix Analysis

The form-activity type qualities of all the places were distributed on a matrix whose axes represented all of the form types and all of the activity types in the study area. Table 5.2 contains the matrix which indicates the frequency of occurrence of each of the combinations of form and activity type present in the study area.

First, an analysis was made of the activity types. Three quantitative distribution levels were defined:

1) a dominant form: in which a form represented more than half of the total occurrence of the activity type;

2) a major form: in which two forms were approximately co-equally present with the activity type and where each occurred more than twice as often as the next most numerous form; and,

3) a minor form: in which a form was seldom found with the activity type.

Then an analysis was made of the distribution of form types among the activity types, and the same quantitative levels were defined:

1) a dominant activity: in which an activity represented more than half of the total occurrence of the form type;

2) a major activity: in which two activities were approximately co-equally present with the form type and where each occurred more than twice as often as the next most numerous activity; and,

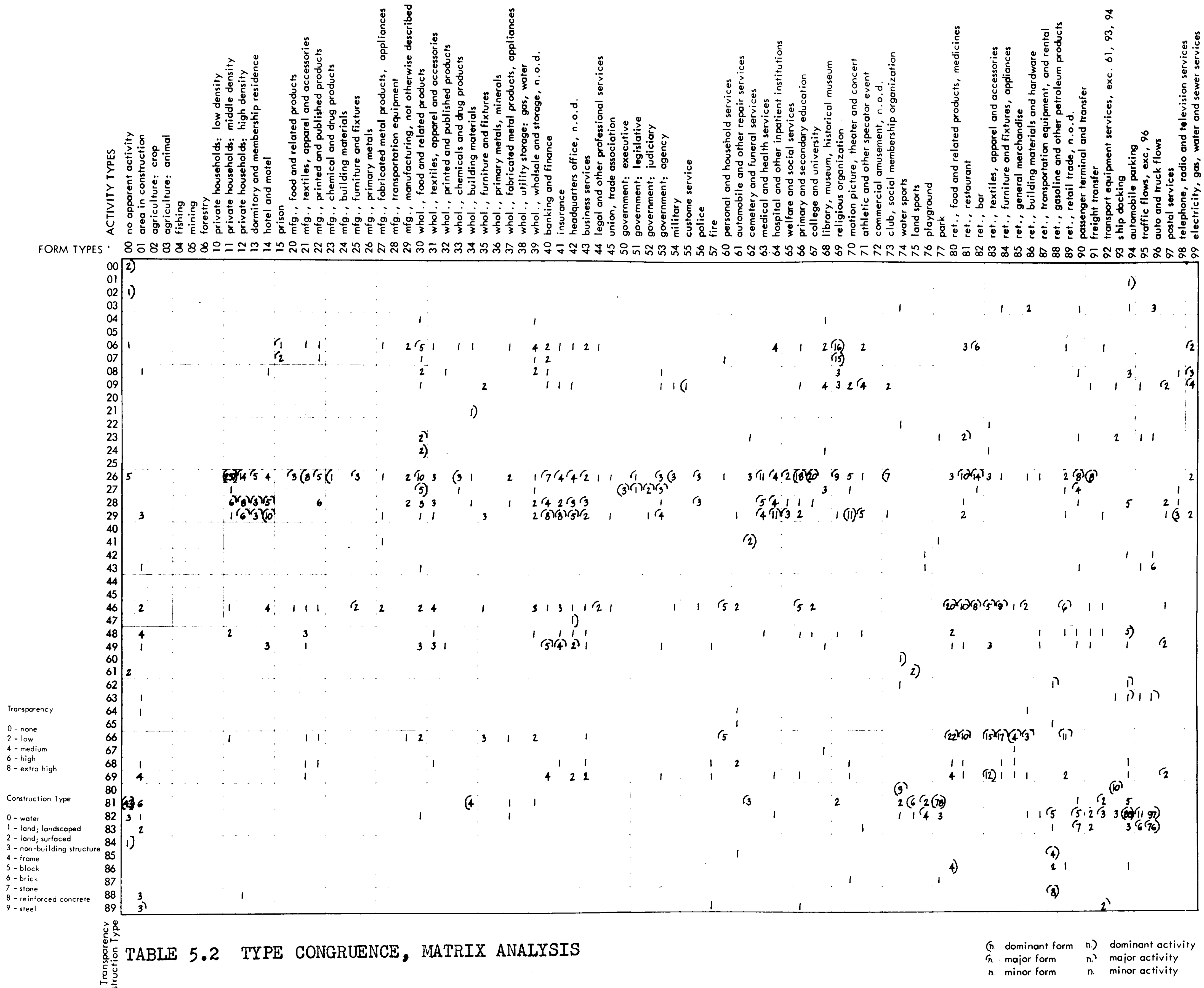


TABLE 5.2 TYPE CONGRUENCE, MATRIX ANALYSIS

3) a minor activity: in which an activity was seldom found with the form type.

The congruence value of any combination was measured by the relative distribution values of its component form type and activity type. There were nine possible combinations. The highest level of congruence was that in which both the form type and activity type were dominant and the lowest level was that in which both were minor. The congruence level of any place was the congruence value of its combination of types.

While no summary value of type congruence was devised to express the matrix congruence of the total study area, visual inspection of the SYMAP display of the matrix analysis results (fig. 5.3) indicated a generally high level of congruence, thus confirming hypothesis 1. The places that were most often highly congruent were those with residential and recreational activities and those whose major functions were transportation flows. Among the less congruent places were those with relatively unique activities occurring in more frequent form types, and many of these places were in the downtown core area. Other less congruent places were ones whose current activities are located in forms built for past purposes, for example the educational institutions in Back Bay, the North End market area, and some manufacturing areas in the South End. It is interesting to note that

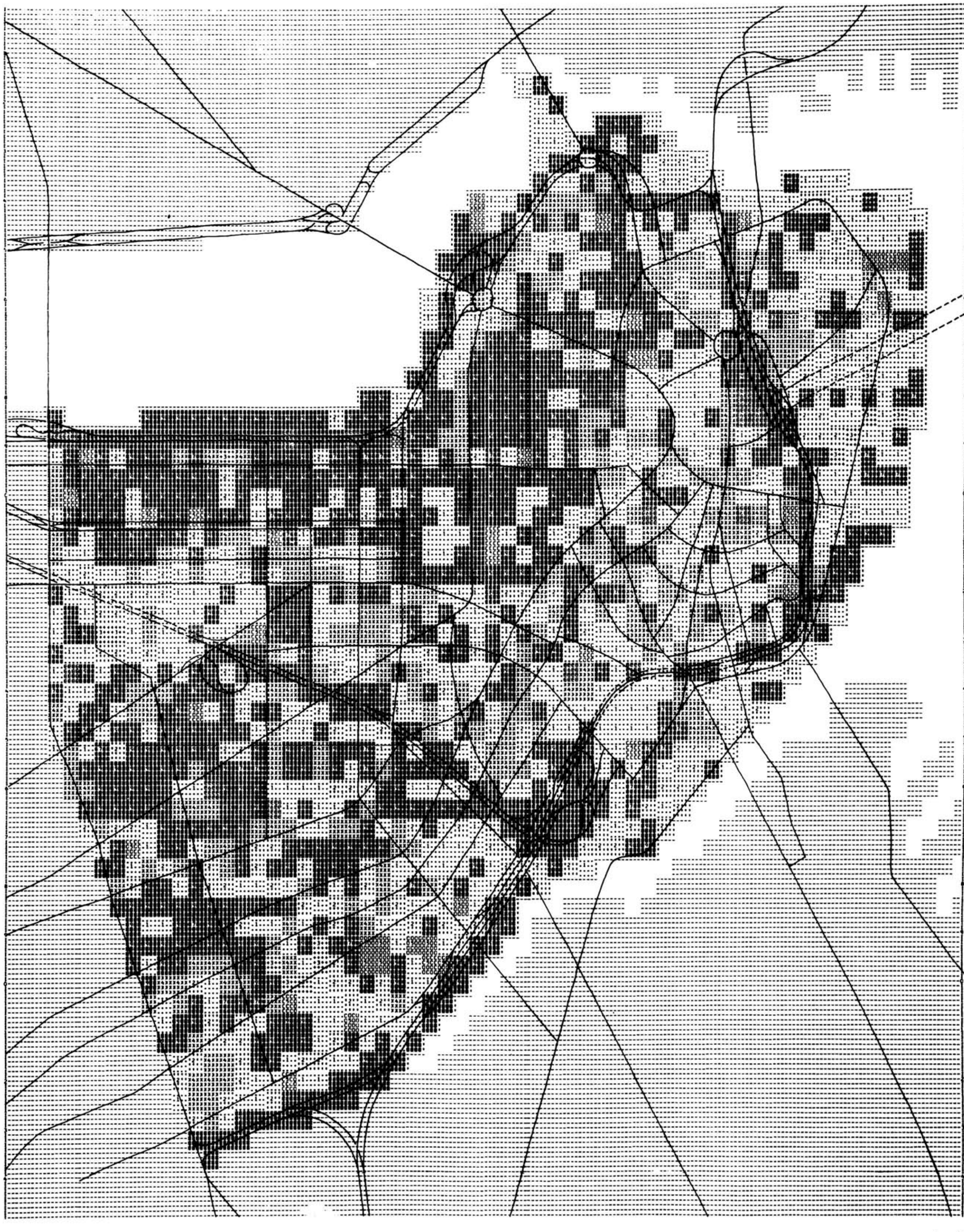
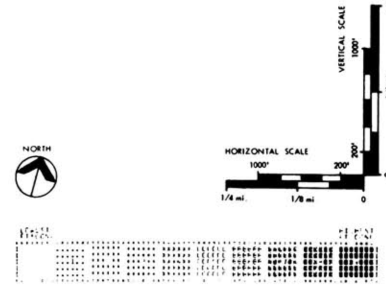


FIG. 5.3 TYPE CONGRUENCE, MATRIX ANALYSIS



TYPE CONGRUENCE (MATRIX ANALYSIS):
THE SINGULARITY OF THE FORM TYPE OF A PLACE
RELATIVE TO THE SINGULARITY OF ITS ACTIVITY TYPE

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that the places whose activities were found with less congruent form types were those which had the largest signs, the significant negative correlation between matrix congruence and rooted sign size (.-34) indicating that incongruence requires compensatory advertising.

Frequency Analysis

The relative frequencies of the form and activity types were presented previously (figs. 5.1 and 5.2). As quantitative attributes, form type frequency and activity type frequency were highly correlated within the total study area (.54) thus confirming Hypothesis 1. A scatter diagram which distributes the places according to their frequency values provides confirmation of the high level of type congruence for the total study area (fig. 5.4). Most of the places in the study area were highly congruent, with their frequencies clustering at the extreme value points. Places of high congruence tended to be those whose form and activity were more common within the study area, notably residential and commercial places, roads and parks. Another kind of highly congruent place was characterized by relative uniqueness in both form and activity. These two kinds of congruence accounted for most of the places in the study area. However, there were a substantial number of less congruent places which had common forms and unique activities. These places were identified in the graphic

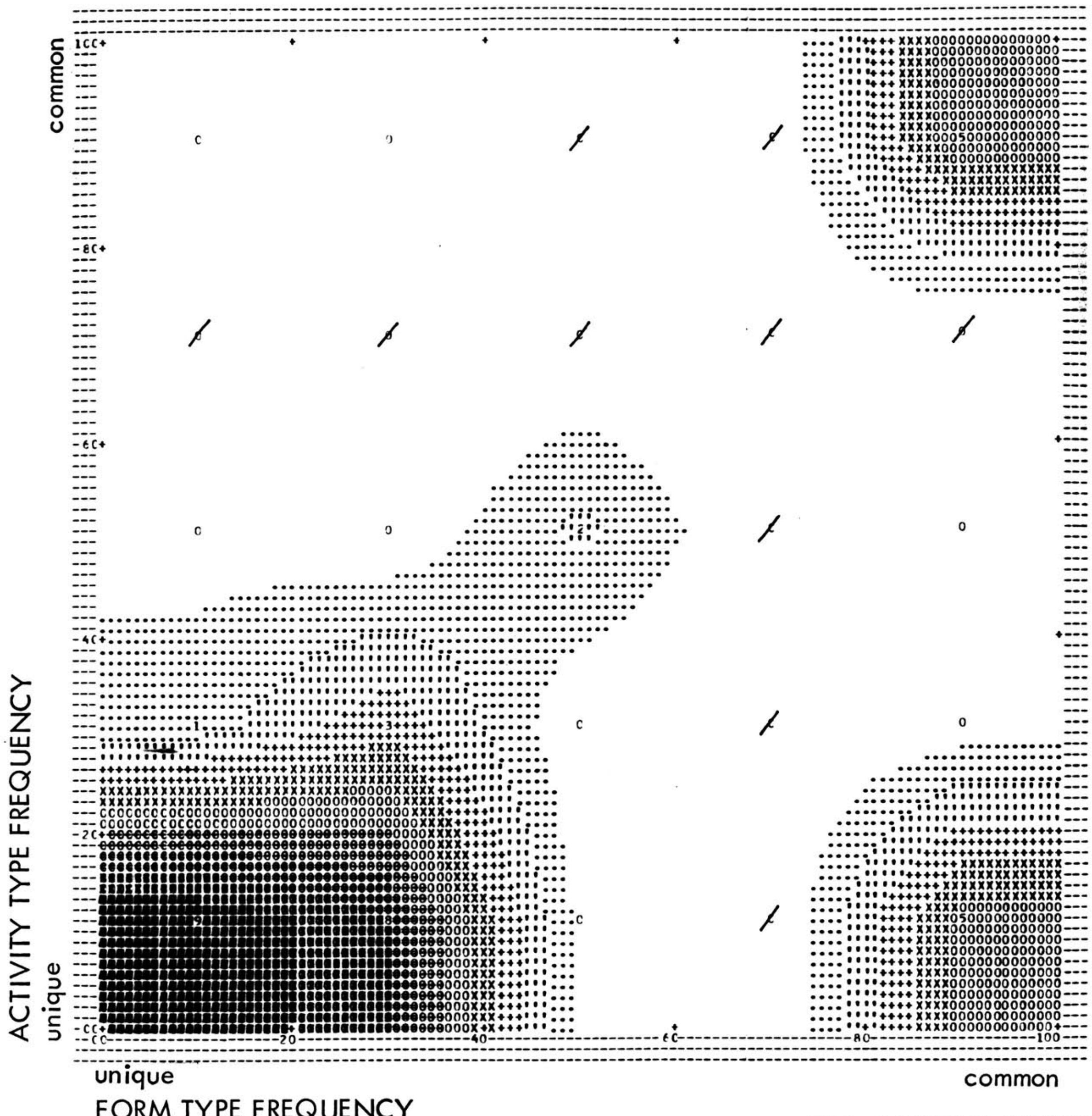


FIG. 5.4 TYPE CONGRUENCE, FREQUENCY ANALYSIS SCATTER DIAGRAM

THE PLACES OF THE STUDY AREA DISTRIBUTED ACCORDING TO THEIR FORM TYPE FREQUENCY AND ACTIVITY TYPE FREQUENCY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	40.10	80.20	120.30	160.40	200.50	240.60	280.70	320.80	360.90
MAXIMUM	40.10	80.20	120.30	160.40	200.50	240.60	280.70	320.80	360.90	401.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00
MAXIMUM	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00

LEVEL	NO CASES	1	2	3	4	5	6	7	8	9	10
SYMBOLS	/	0	....1....	''''2''''	++++3++++	XXXX4XXXX	OOOO5OOOO	····6····	····7····	····8····	····9····

display of type congruence, frequency analysis (fig. 5.5). As in the matrix analysis, these less congruent places were principally those relatively singular services, institutions and industrial activities which occurred in the more common form types, usually associated with residential and commercial activities. There were virtually no places which were low in congruence because their forms were unique and their activities were common. The absence of this possible combination, which is often associated with roadside strip development, reflects the long established and generally restrained visual character of central Boston.

Comparison of the Matrix and Frequency Analysis

Both type congruence analyses indicated that there was a high level of type congruence in the study area and thus both confirmed Hypothesis 1. In general, places which were highly congruent in the frequency analysis were also highly congruent in the matrix analysis. The places which were less congruent in the frequency analysis were also less congruent in the matrix analysis. However, several of the places which were less congruent in the matrix analysis had higher congruence values in the frequency analysis. These were places whose form and activity frequencies were low and they were mainly concentrated in the downtown core area.

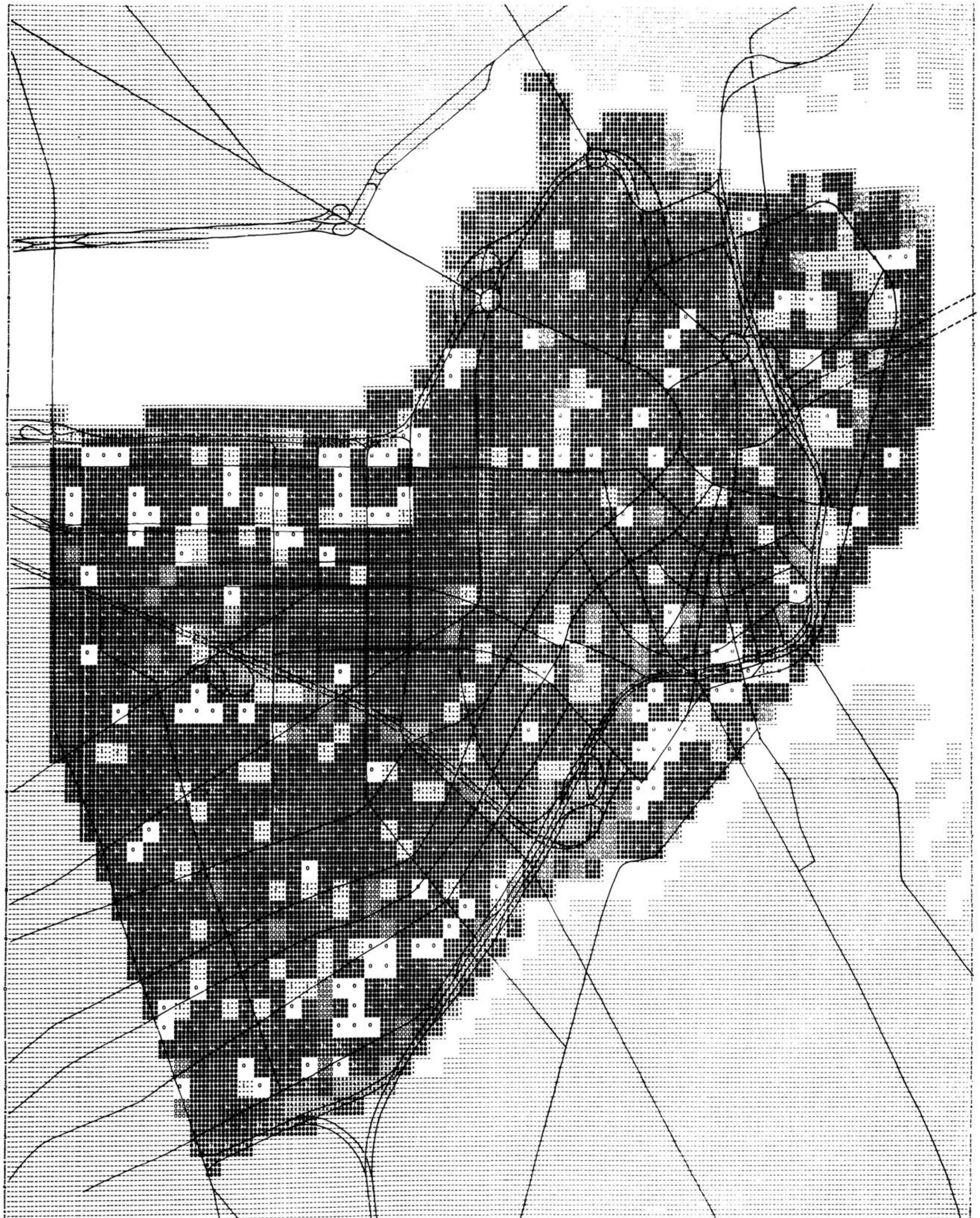
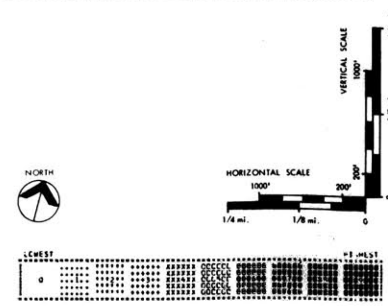


FIG. 5.5 TYPE CONGRUENCE, FREQUENCY ANALYSIS



TYPE CONGRUENCE (FREQUENCY ANALYSIS):
THE FREQUENCY OF THE FORM TYPE OF A PLACE IN RELATION TO THE FREQUENCY OF ITS ACTIVITY TYPE

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At the scale of this research, the matrix method was considerably more sensitive and thus more reliable than the frequency analysis, and particularly when applied to the places whose form and activity types were relatively unique. The superiority of the matrix analysis was due primarily to its analysis of relative distributions, as compared to the analysis of absolute differences in the frequency method. Furthermore, since frequencies tended to polarize at the extreme values, congruence determined by frequency was also polarized. This caused the extreme result contrasts in the frequency analysis map when compared with the more even distribution of the matrix analysis map. However, the extreme congruence values of the frequency analysis could be redistributed by rescaling to approximate the distribution of the matrix analysis.[1] It was concluded that at the scale of this research, the advantages of the matrix method outweighed the advantages of the frequency method.

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[1]On the other hand, the matrix analysis procedure was laborious, particularly since a large number of places and variables were involved. It was not programmed for the computer and was done by hand. The frequency analysis had the advantage of being computerized, and its relative efficiency over the matrix method increased as the number of places and variables increased.

THE FORM INTENSITY SURVEY

Two principle attributes of physical form were combined in an attempt to evaluate the visual impact of physical form. These were spatial intensity -- the relative presence of physical space, and information intensity -- the relative potential impact of the various sources of information present in the form of a place.

Floor-area-ratio was selected as the most suitable measure of spatial intensity. This variable measures the spatial capacity of a place to accommodate activity. Since the definition of floor-area-ratio includes measures of horizontal coverage and vertical height, it also carries with it a sense of relative spatial enclosure and it can therefore be used as a measure of the perceptual impact of spatial quantity.

As has been previously discussed in Chapter 1, the actual amount of information intensity is a function of the amount of information received. Since it was expected that this input varies greatly among individuals, it could not be measured directly with either efficiency or confidence Therefore, rather than attempting to measure the actual information received, the index of form information intensity represented a measure of the potential information transmitted by a form.

Certain limitations were established to make this particular survey manageable. The survey of information potential was directed toward information about localized activity. It omitted flow system information because the scale of the place grid did not allow inclusion of the entire secondary street system. Like the other survey variables, the information sources were measured at their place, and only "rooted" sources were included -- those which were present at and related to the activity of the place.[1] An attempt was also made to take into account the impact of speed of movement upon the perceptibility of information sources. Since most people move in the city as pedestrians and/or in slowly moving vehicles, the measurement scales were established toward their view and therefore include the more detailed value ranges present in the study area. Some information sources were included in the survey despite their relative instability and, as in the case of non-visual information such as noise and smell, their relative inaccessibility to perception from enclosed vehicles.

Five sources of potential information were identified, with the index of form information intensity being derived from their unweighted combination:

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[1]The distinction between "rooted" sources and others is made in the M.I.T. Student Report, Signs in the City (1963) p. 11.

Rooted Sign Size: the size of signs which pertain to their place;

Visual Activity: the exposure of the participants and processes of an activity;

Visible Objects: the exposure of the tools, products and other objects related to an activity;

Non-Visual Information: sounds, odors, and other non-visual indicators of an activity; and

Form Stereotype: the symbolic representation of an activity by a form.

The presence of rooted signs indicates that information about the activity of a place has to be conveyed to potential users. The impact of rooted signs was measured by their surface size and their content. In the analysis of the descriptive content of signs, it was found that when a place had a sign, it was almost always limited to information about its activity type.[1] Therefore, since sign content did not contribute to a sharpening of differences among signs, the measure of the strength of their potential impact was limited to their relative surface size.

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[1]The frequency distribution of sign content was:

1.5% Form, Activity and Location: e.g., "Boston Public Garden"

4.9% Activity and Location: e.g., "South End Hardware"

46.4% Activity Name: e.g., "The Maternity Shop"

0.3% Form description: e.g., "White Tower"

46.8% miscellaneous or no sign: e.g., "John's," "67 Shawmut Avenue"

Visual exposure in the form of a place of the processes and participants of its localized activity provides another source of information. Visible activity is related to form transparency in that busy places which are more visually open are more likely to expose their activity. While visible activity is subject to periodic fluctuation, the field survey was timed to measure it at its peak potential.

The objects which are associated with activities also provide potential information. They include such diverse items as park benches, construction cranes, garbage cans and shop displays. The information potential of visible objects is particularly evident in transportation facilities such as automobile parking lots, where the dominant visual characteristic is often the parked cars themselves.

Further sources of potential information are the often ephemeral sounds, odors and other non-visual activity indicators. The non-visual senses cannot generally be extended over great distances. However, the perception of non-visual information is often associated with direct activity participation, thus heightening its potential impact. For the non-participant, non-visual information is more likely to be conveyed in outdoor places where sounds and smells can be transmitted.

The symbolic representation of an activity by a form -- its stereotype -- represents the information potential of such form characteristics as shape, scale, and texture. Quantitative evaluations of stereotype strength, which were highly dependent upon context, were made independently by several coders. The values of potential information impact were quantified according to the degree of specificity of the activity information which could be derived from the form. Thus if the shape of a place provided no means of identifying its activity it was coded as having low stereotype value. If it could be generally categorized, such as an "office building" or a "factory" it was coded as having medium stereotype value; and if it could be specifically identified, for example "the courthouse" or "the Public Gardens," it received a high stereotype value rating. (See Appendix F, Form Intensity Survey Variables for more detailed information about the individual variables.)

The spatial distributions of these information sources had the following intercorrelations:

TABLE 5.3 CORRELATION MATRIX, INFORMATION SOURCE VARIABLES

	Rooted Sign Size	Visible Activity	Visible Objects	Non-Visual Information	Form Stereotype
Rooted Sign Size	---				
Visible Activity	.05	---			
Visible Objects	.12	.27	---		
Non-Visual Information	.01	.42	.20	---	
Form Stereotype	-.23	.18	.22	.06	---

Non-visual information was strongly related to visible activity. However, this high correlation was based mainly on the striking overall absence of both variables within the study area. Both high visible activity and non-visual information occurred principally at construction sites and other open-air places such as the North End food markets. The exposure of visible objects was also linked to visible activity, but was much more widespread. The more indirect information variables -- rooted signs and stereotypes -- were negatively correlated and can perhaps be considered to be compensatory. Thus, when the shape of a place is not easily recognizable and/or when its activity is not directly perceivable, signs are necessary to convey whatever information is required for the functioning of the place.

The measure of the information intensity of a place was based upon an unweighted combination of the five information source variables. Almost all places had minimal levels of information intensity. Form stereotype was frequently the principal source of potential information among the low valve places, and particularly those in residential areas, while signs and visible objects were the principal information potential components of the high intensity places such as those of the major retail commercial area.

The overall measure of the form intensity of a place was based upon an unweighted combination of its spatial intensity and information intensity. The concentration of visual impact in the downtown core is clearly shown in the graphic display of form intensity(fig. 5.6). Both the information component and the spatial component of the overall measure had their value peaks in this area. However the intense places tended to either have one or the other. Form information intensity was negatively correlated (-.21) with the measure of form spatial intensity, floor-area-ratio. The larger forms often tended to be bland, while the places with high potential information such as those of the retail shopping area and the entertainment district often occurred in lower to middle size buildings.

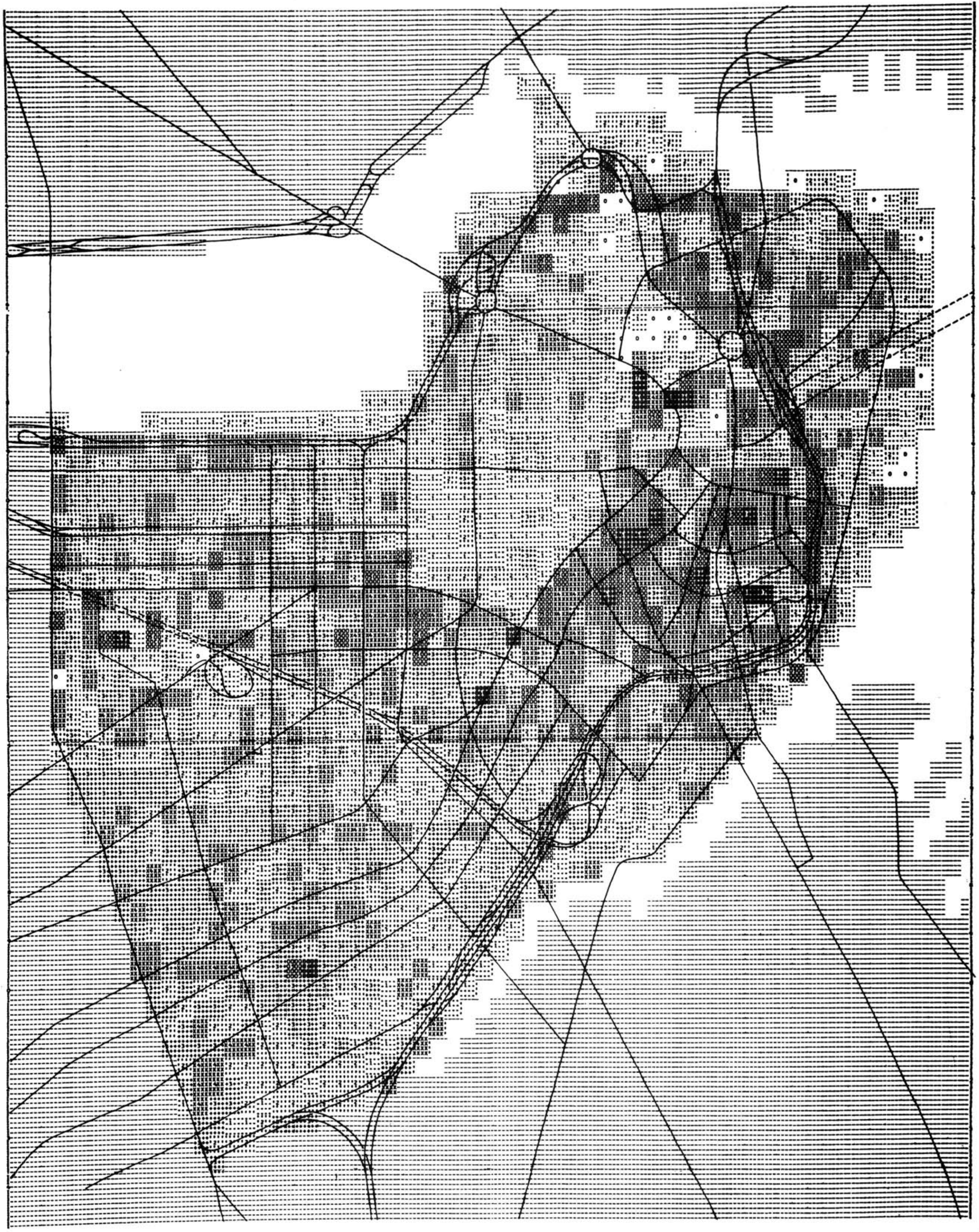
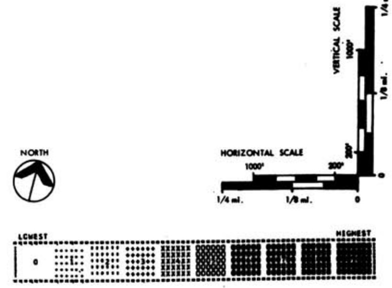


FIG. 5.6 FORM INTENSITY



FORM INTENSITY:
(SPATIAL INTENSITY + INFORMATION INTENSITY POTENTIAL)

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The varied spatial clarity of the downtown core in the concentration of intense forms is also of interest. The area was most sharply defined along its common edges with the Boston Common, fairly well defined by the Government Center and Central Artery, and weakly defined towards the Back Bay and particularly towards the South End. It was expected that this variation in border definition would be reflected in the personal descriptions of intense areas.

THE ACTIVITY INTENSITY SURVEY

The measurement of activity intensity, the "busyness" of a place, has two principal dimensions; people -- the number of persons who participate in the activity of a place, and time -- the amount of time that they spend in that activity. Traffic counts, origin and destination studies, census counts and other means of determining the person population intensities of places have long been basic tools of urban planning. The analysis of how people spend their time is a more recent development in activity analysis, with significant research having been conducted, among others, by Meier (1959, 1962), and Chapin and Hightower (1965). Among their research tools has been the time budget, a measure of the relative amounts of time that a person spends in his various daily activities.[1]

---

[1]Additional measures of activity intensity can be derived from data on transportation flows, energy consumption, financial transactions and communication flows. While inter-place transportation flows are often used for planning purposes (e.g., Carroll, Creighton and Hamberg [1961], Chicago Area Transportation Study [1962], Smith [1965]), localized flows have rarely been systematically investigated. Energy use, as measured by metered electric consumption on dollar expenditures, is used by electric companies as a basis for estimating the potential energy requirements of different populations and activities. Similarly, telephone communication flows, as measured by telephone call counts on toll receipts, are used in estimating potential service requirements. Financial flows, as measured by dollar receipts and expenditures, have been used to measure commercial activity intensity in the development of population models (e.g., The Penn-Jersey Transportation Study [1961]), and the

In this study, the measure of activity intensity was a combination of the total number of persons for whom a place was a destination, and the total number of person-hours spent there. The resultant value therefore gave greater activity intensity values to places with larger population turnovers. To measure this compound variable, it was necessary to obtain measures for the component parts -- the number of persons for whom the place was a prime destination and the average duration of each stay. In measuring person hours per place, the average number of hours per person was multiplied by the number of people (destinations). Two values were obtained for each place -- person-hours per day (from 7 a.m. to 7 p.m.) and person-hours per night (from 7 p.m. to 7 a.m.) (See Appendix G, Activity Intensity Survey Variables for more detailed descriptions of the individual variables.)

The component measures of activity intensity show the following intercorrelations:

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potential purchasing power of client populations has always been a prime determinant of commercial location decisions. None of the information needed to make these additional measures was readily available for the study area and therefore the measurement of activity intensity was based solely on data for people and time.

TABLE 5.4 CORRELATION MATRIX, ACTIVITY INTENSITY VARIABLES

	Destinations	Hours per person per place	Person-hours per day	Person-hours per night
Destinations	---			
Hours per person per place	.03	---		
Person-hours per day	.78	.26	---	
Person-hours per night	.36	.42	.30	---

A comparison of day-time and night-time activity intensity indicated basic differences in their relative contributions to activity intensity. Day-time activity intensity, concentrated in the commercial and office areas of the downtown core, was primarily a function of many people spending few hours. Night--time activity intensity, which occurred mainly in residential and entertainment areas, was based on relatively fewer people, but longer hours. A comparison of the spatial distributions of day and night activity intensity further confirmed the cyclical pattern of daily use of the study area, the most striking examples of which were in the commercial and office areas of the downtown core.

The measure of activity intensity was the sum of destinations, person-hours per day and person hours per night. By including destinations, greater consideration was given to those places which had a higher and more rapid user turnover. Figure 5.7 indicates that, as could be expected, activity intensity was concentrated in the downtown core office, commercial, and entertainment areas. The major concentration of office employment in the downtown financial district, the cluster of insurance and other offices near the John Hancock building, and the newly developed Prudential Center are clearly shown. In addition, three other concentrations are identifiable: the Boston City Hospital area, the Massachusetts General Hospital area, and the Boston Garden (the often frequented center for professional indoor athletics).

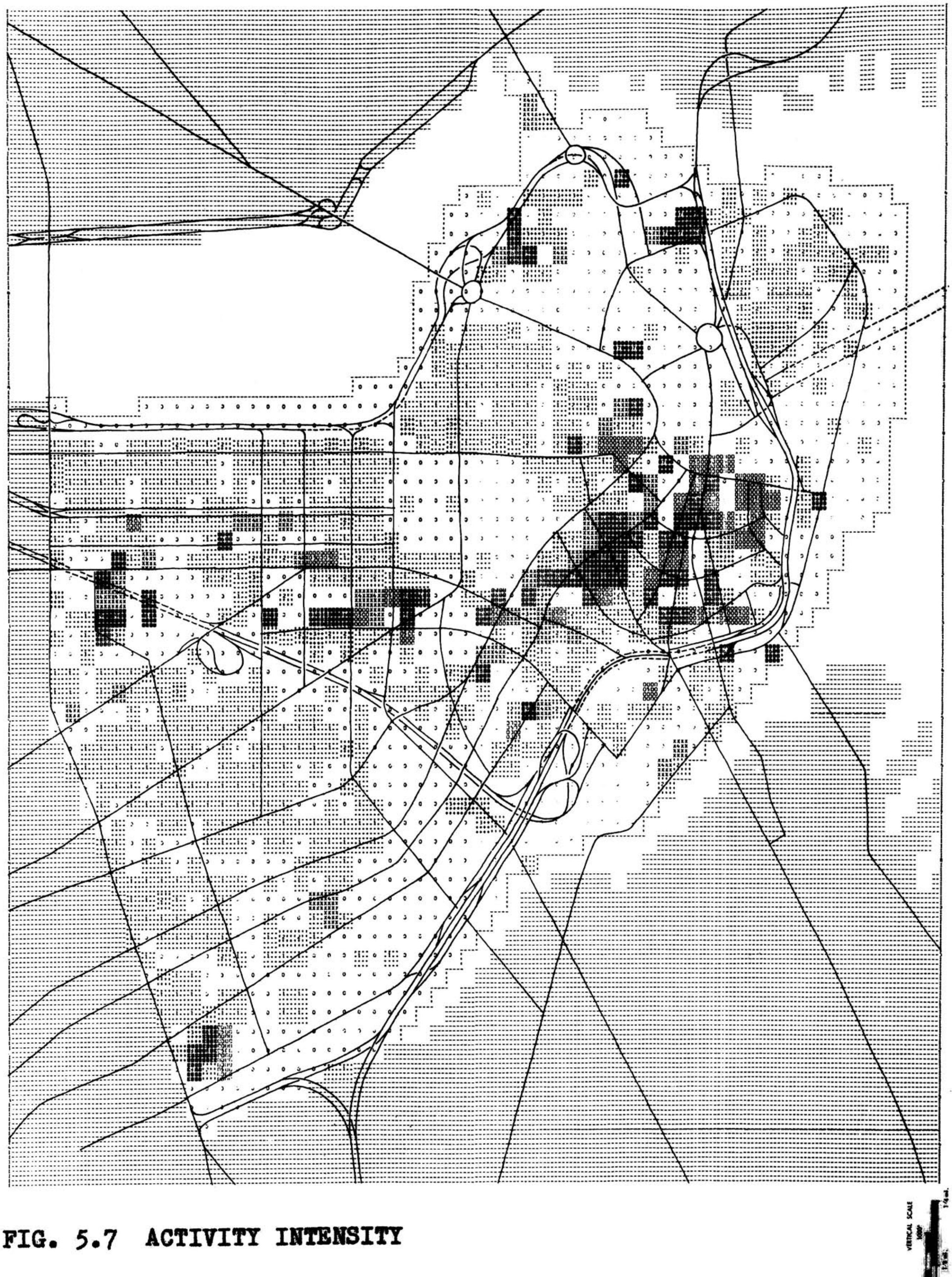
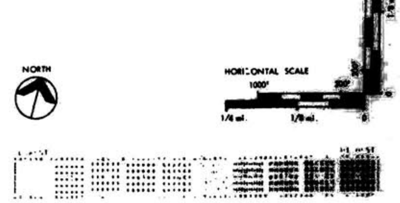


FIG. 5.7 ACTIVITY INTENSITY



ACTIVITY INTENSITY:
(DESTINATIONS · PERSON HOURS DAY · PERSON HOURS NIGHT)

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Intensity Congruence

Intensity congruence was measured by the consistency with which form intensity was concurrent with activity intensity. It was a contextual measure, established within the range of intensity values present in the study area.

According to the correlation analysis there was a highly significant relationship (.49) between the form intensity and activity intensity values of the places in the study area thus confirming Hypothesis 1. The scatter diagram distribution of the places according to their intensity values (fig. 5.8) indicates that the high correlation was based upon a large concentration of places both of whose form intensity and activity intensity values were low. The eccentric concentration of intensity values in fig. 5.8 was caused by the frequency distribution of form information intensity, in which the scores for most places ranged between "3" and "6," with few scores below and fewer above.

The graphic display of intensity congruence (fig. 5.9) showed that highly congruent places were concentrated in residential and recreation areas. Among the less congruent places, there were several major construction projects within the study area such as the Government Center and the Prudential Center. In those areas, form intensity,

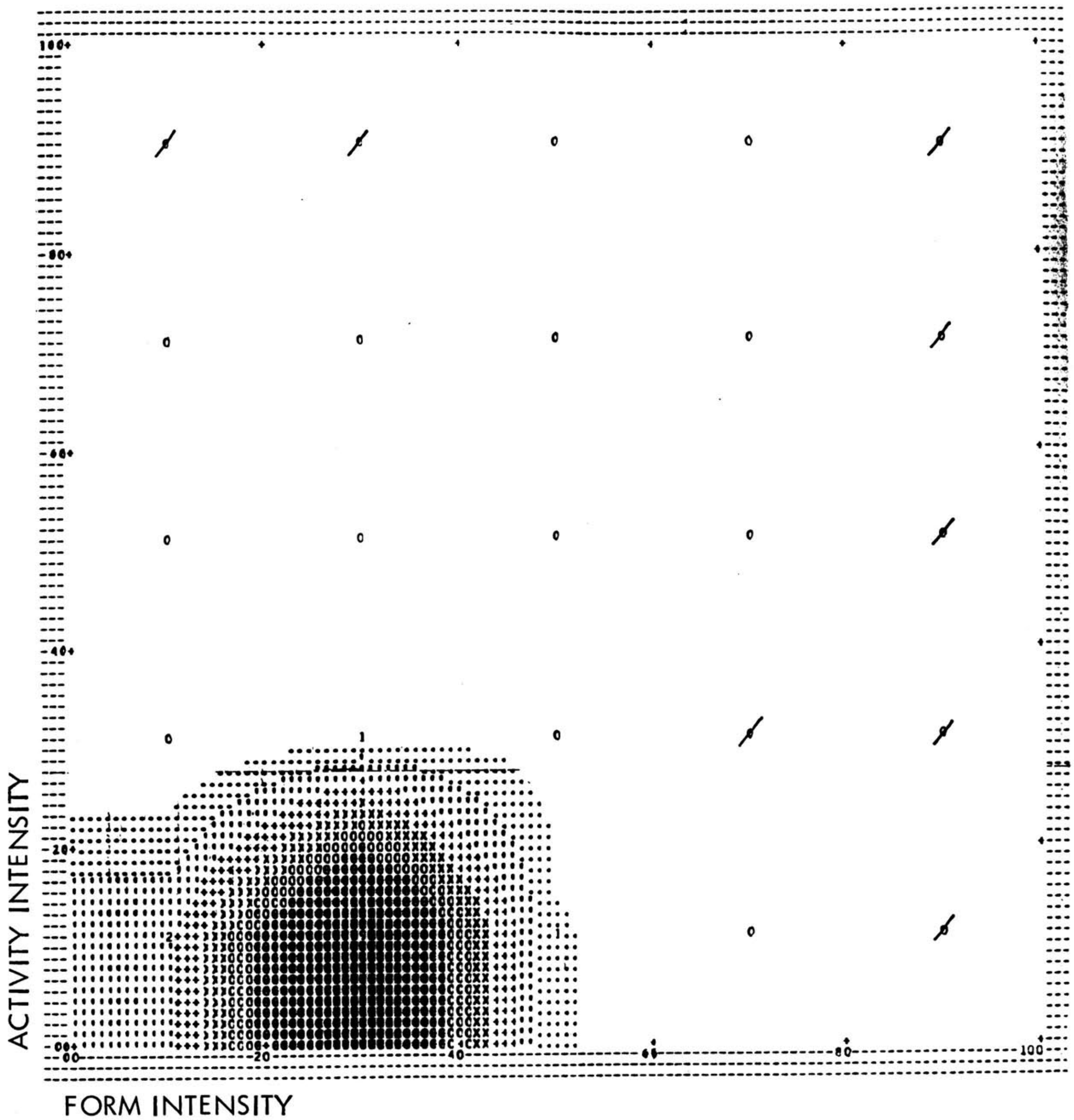


FIG. 5.8 INTENSITY CONGRUENCE, SCATTER DIAGRAM

THE PLACES OF THE STUDY AREA DISTRIBUTED
ACCORDING TO THEIR FORM INTENSITY
AND ACTIVITY INTENSITY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

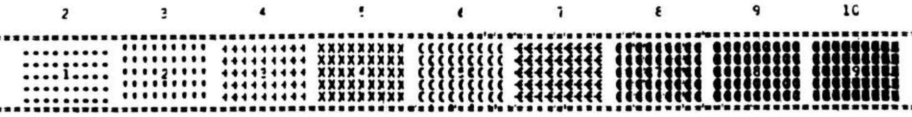
MINIMUM	0.00	92.80	185.60	278.40	371.20	464.00	556.80	649.60	742.40	835.20
MAXIMUM	92.80	185.60	278.40	371.20	464.00	556.80	649.60	742.40	835.20	928.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00
MAXIMUM	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00

LEVEL NO CASES 1 2 3 4 5 6 7 8 9 10

SYMBOLS / C



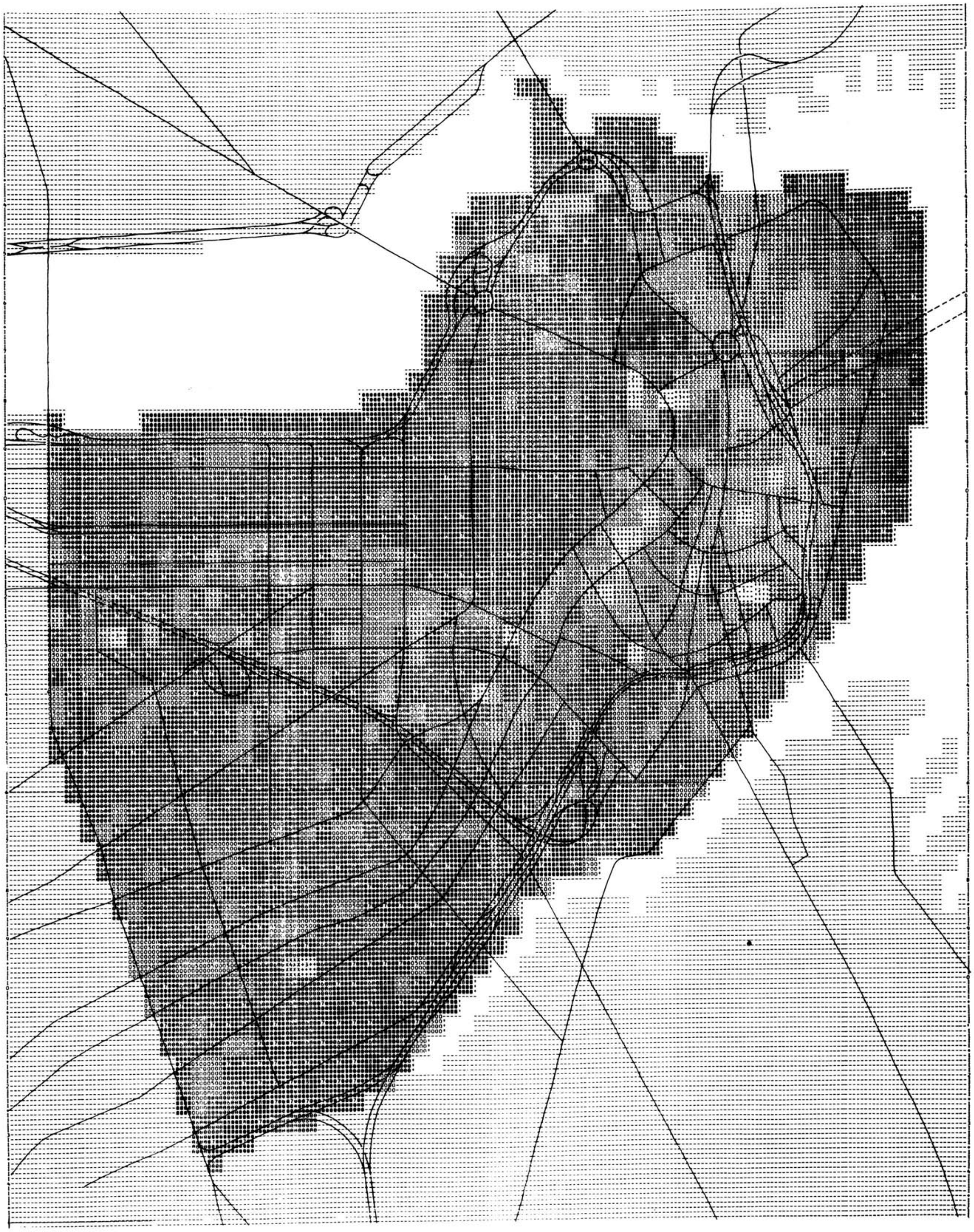
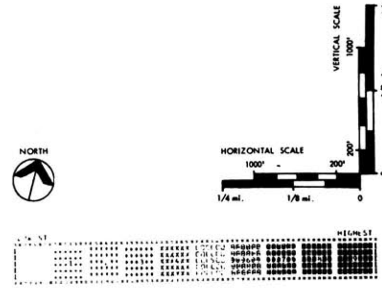


FIG. 5.9 INTENSITY CONGRUENCE



INTENSITY CONGRUENCE:
THE INTENSITY OF THE FORM OF A PLACE IN
RELATION TO THE INTENSITY OF ITS ACTIVITY

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and particularly spatial intensity, was very high, but since they were not occupied at the time of the survey, their activity intensity was low. Other areas whose form intensity was relatively higher than their activity intensity included the entertainment district and the market area around Haymarket Square. In these areas, it was the form information potential component of form intensity which exceeded activity intensity. There were also several areas which were less congruent because their activity exceeded their form intensity. For instance, in the downtown shopping area where the concentration of activity intensity was highest, information potential was also relatively high, but spatial intensity was low. On the other hand, in the banking and insurance office districts where activity intensity was high, spatial intensity was also high but information potential was low.

THE FORM EXPOSURE SURVEY

The exposure of the form of a place was taken as the principal determinant of its relative significance. Other factors contribute to the significance of a form and to its relative dominance. Contrast, vividness, focal position in a viewing field, prominence in a sequence of views, association with a point of decision, all of these increase the likelihood of a place being noticed and being considered visually important. Yet all places are ultimately dependent for their relative visual prominence upon the number of people who are able to see them. Therefore the basic if cruder measure of exposure was adopted for this research.[1]

Form exposure was measured by the number of people to whom a place was potentially visible, both from within the place and from all other places in the study area from which it was exposed. First, the area from which a place was visible was determined. The visibility area of a place indicates its relative formal and locational dominance. With all other factors held constant, places with larger visibility areas have a greater chance of being seen. The measure of visibility area was the

[1]The procedure which was used to measure exposure generally follows that developed by Hassan (1965, 12-23). However unlike Hassan's study, exposure was measured for the entire study area and not only for known places.

number of places from which a given place was exposed to potential viewers, and places range in visibility area from the interior portion of the War Memorial Auditorium which can only be seen from within, to the Prudential Building which can be seen from a large area of Boston.

The viewers are the people who are on the different transportation routes that are within the visibility area of a place. Of the various transportation modes, only the vehicular, mass transit and pedestrian systems had large enough concentrations of people to be coded in the measure of form exposure. The vehicular, mass transit and pedestrian flows were therefore determined and every place in the study area was measured for its potential exposure from each of these three systems. The common factor in these variables was the number of potential viewers, and their value scales were designed to be combinable.

The distance of a place from a viewer affects its potential exposure and also the chance that it will be screened by some form which is closer, and the effect on form exposure of viewing distance was considered in the coding.[1] The location of a place in the normal field of

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[1]The coding accounted for viewing distance as follows: a place was given full value for its internal viewers; a place was given full value for viewers with an unobstructed view of its lower levels; and, a place with an obstructed view of its lower levels but a clear view of more than half of its height was given the value of its viewers multiplied by the reciprocal of the distance between the viewers and the place.

vision from a transportation vehicle also affects its potential exposure, the design of the transportation vehicle determining the extent of this area. The measurement of the vehicular viewers of a place was based only upon those persons in whose normal view field the place was located. A normal view field was assumed to be that within a 45° cone centered on the axis of the road. While most automobiles prevent upward viewing, the area cut off is not within this normal view area. In most of the mass transit vehicles used by the M.B.T.A., the arrangement of seats along the car sides only allows views across the car and through the opposite window, and in rush hour traffic even these views can be obstructed. The value scale for mass transit views took this fixed one-sided viewing into account.[1]

---

[1]Several other variables affect the exposure of form. Light clearly affects exposure, and particularly of the information sources which allow a place to be identified. The urban scene can vary greatly between day and night. However, since most of the viewing trips by which place exposure was measured were daytime trips, conditions of adequate light were assumed to exist. Both the perceptivity and the information needs of a viewer affect what he looks at. A person whose familiarity with an area or route is habitual has less need to identify all of its elements than a newcomer. He must identify only those places which are critical to maintaining his familiar route orientation and reassuring his territorial sense. It was assumed that these personal attributes of viewers are randomly distributed in the total population, and that they could therefore be omitted from this measure. The speed of motion of a viewer affects the time which he has available to see a place. Except perhaps in peak rush hour traffic jams, the expressway driver has far less viewing opportunity than does the casual pedestrian. The

(See Appendix H, Form Exposure Survey Variables, for more detailed information about the individual variables.)

The spatial distributions of the component measures of form exposure had the following intercorrelations:

TABLE 5.5 CORRELATION MATRIX, FORM EXPOSURE VARIABLES

	Visibility Area	Vehicular Exposure	Transit Exposure	Pedestrian Exposure
Visibility Area	---			
Vehicular Exposure	.54	---		
Transit Exposure	.22	.28	---	
Pedestrian Exposure	.19	.12	-.02	---

The relative extents to which the three systems expose the places in the study area are indicated by their correlations with the exposure potential of the visibility area (.54 for vehicular views, .22 for transit views and .19 for pedestrian views), and by the frequency distributions of their exposure values.[1] The most striking

study assumed that the minimal time needed for place identification was available to potential viewers on both the slower pedestrian and the faster vehicular and mass transit systems.

[1]See p. 108 for this footnote table.

relationship among the three viewing systems -- vehicular, transit and pedestrian -- was their lack of spatial correspondence. Pedestrians were generally concentrated inside the retail commercial center of the downtown core. The vehicular viewers were more generally distributed, but they were principally on the arterial road network which goes around the downtown core. The transit system, which has its own routes above ground, becomes an underground network when it approaches the downtown core, and so its exposure potential is cut off. There were relatively few places in which the systems overlapped but some of these were places with large visibility areas -- the tallest buildings and those on larger open spaces.

The summary measure of form exposure was operationalized as the combined values of its principal component systems: vehicular exposure, mass transit exposure,

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Exposure Value	Vehicular	Transit	Pedestrian
0 - none	37.8%	85.4%	71.7%
1	25.5		16.9
2 - low	16.5	3.0	6.8
3	7.4		2.2
4 - medium	2.1	3.0	1.3
5	2.0		0.1
6	1.0	8.1	0.5
7 - high	1.5		0.0
8	0.4	0.4	0.2
9 - extrahigh	5.8		0.3

The percentages are based upon the total number of places in the study area. Note particularly the relative percentages of non-exposed places.

and pedestrian exposure (fig. 5.10).[1] The dominance of vehicular exposure reflects the use of person-views as the common scale in measuring exposure. In general, the most highly exposed places were those seen along the most heavily travelled vehicular paths, notably the Storrow Drive and the Central Artery. However, places and areas which were seen from major roads and also from the above grade mass transit routes were the most highly exposed, among these being the Prudential building and the Sheraton Boston Hotel, the John Hancock building, the new apartment towers in the West End urban renewal area, and the cluster of buildings in the North Station area including the Hotel Madison and the Boston Garden.

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[1]While combined for the purposes of analyzing significance congruence, the component measures were maintained separately as well so that their individual effects could be compared.

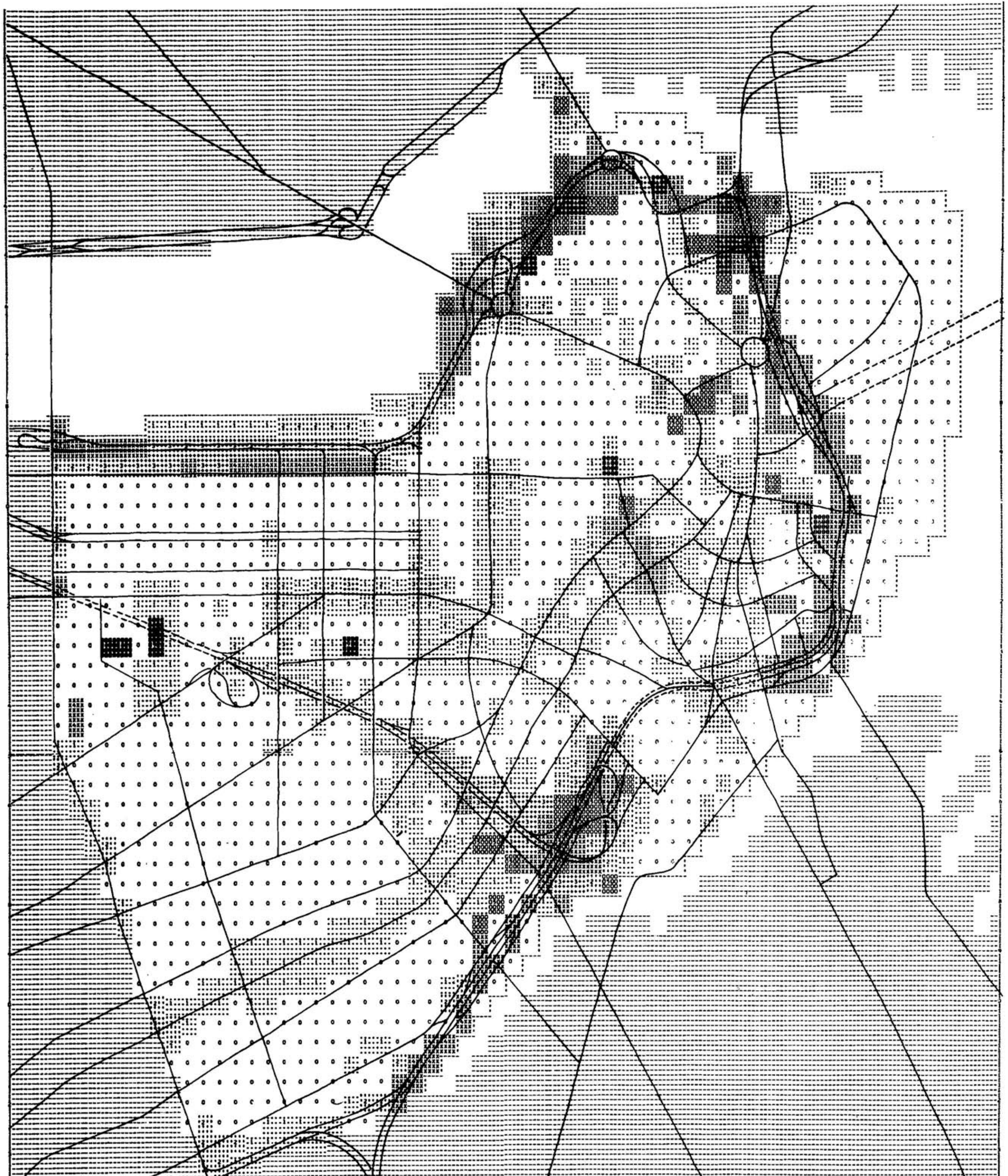
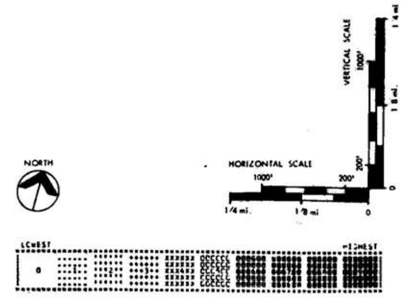


FIG. 5.10 FORM EXPOSURE



FORM VISIBILITY:
(VEHICULAR VIEWS + TRANSIT VIEWS · PEDESTRIAN VIEWS)

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THE ACTIVITY SIGNIFICANCE SURVEY

The importance of the activity of a place was determined by the relative number of people who were affected by it and the profundity of that effect.

A basic variable in the analysis of activity significance is the service region of an activity. More important activities have wider service areas which include greater populations.[1] Webber (1963) applied the term "realm" to this construct and identified a hierarchical order of realms based upon spatial area and related to population potential. In this research, the realm of a place was estimated from indicators such as its name, signs, activity type and frequency.

The evaluation of the ways in which an activity affects an individual or a total population can be extremely complex and difficult. In order to simplify these measures, two general categories of activity effect were established -- decision significance and symbolic significance. Places with high decision significance were defined as those where the key decisions are made which affect the political and/or economic well being

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[1] This assumption was based in part on Foley (1950), especially Table 4 "Selected Facility Uses Ranked According to Localization."

of the people of the study area. Places with high symbolic significance were defined as those which are important for their social, cultural and/or historical value. The measures of decision significance and symbolic significance could not be directly derived from surveyed characteristics of the environment. Instead, they were based upon the judgments of several persons who were highly knowledgeable about Boston. The categories for these judgments were dichotomous because of the difficulties involved in making more subtle evaluations. (See Appendix I, Activity Significance Survey Variables.)

The component measures of activity significance had the following intercorrelations:

TABLE 5.6 CORRELATION MATRIX, ACTIVITY SIGNIFICANCE VARIABLES

	Realm	Decision Significance	Symbolic Significance
Realm	---		
Decision Significance	.23	---	
Symbolic Significance	.26	.14	---

The spatial distributions of decision and symbolic significance, and their relatively low correlation, indicates that places tend to be important for either one or the other reason. However, both places of high decision significance and those of high symbolic significance had greater realms.

The measure of activity significance was derived from an unweighted combination of the values of realm, decision significance and symbolic significance (fig. 5.11). The places with the most important activities were generally concentrated in the downtown core, notably the many financial, insurance and other office areas with regional influence, the center of government around the State House and City Hall and the principal retail establishments in the shopping district. The major transportation terminals, the hospital complexes, and certain historical and religious places were also of major importance.

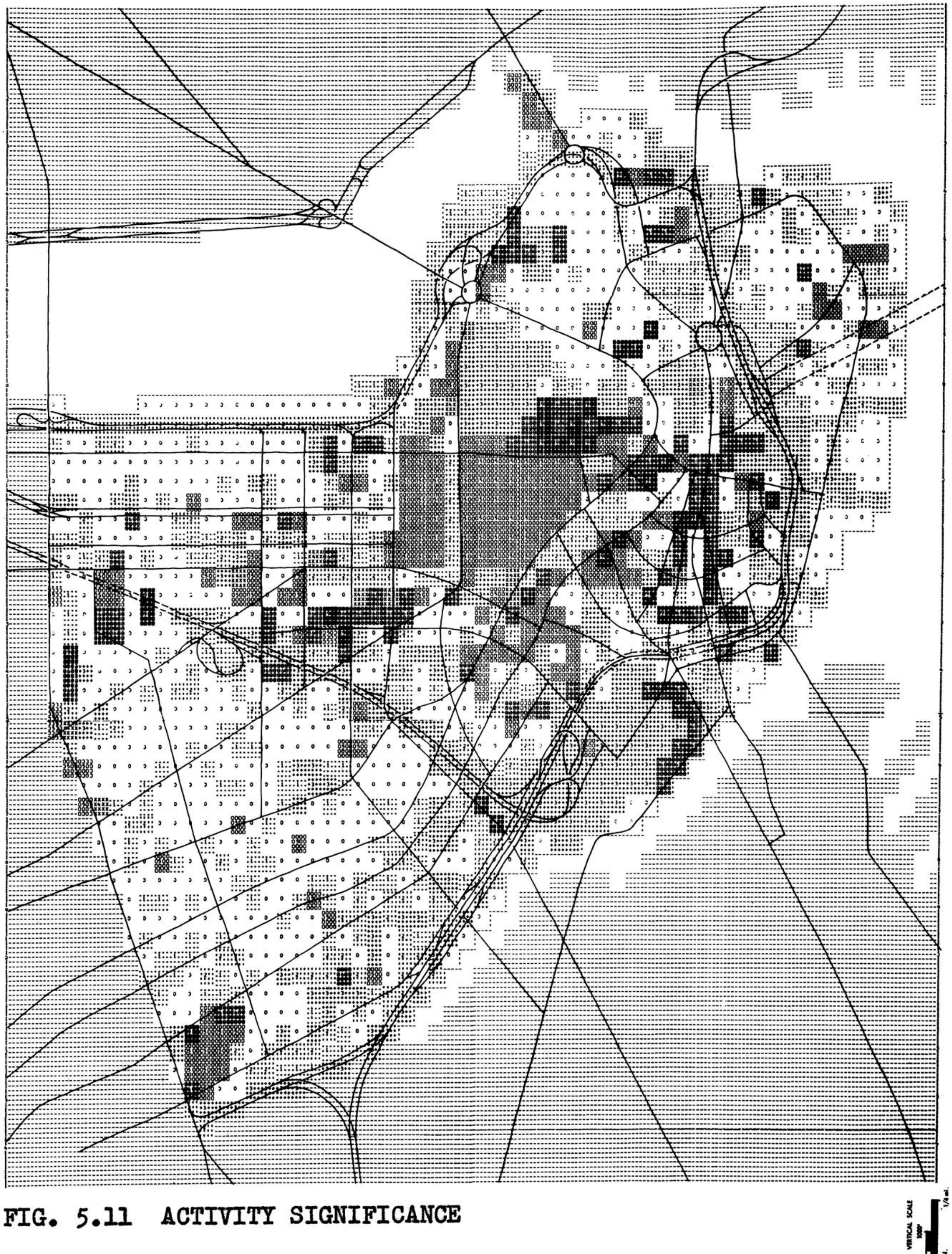
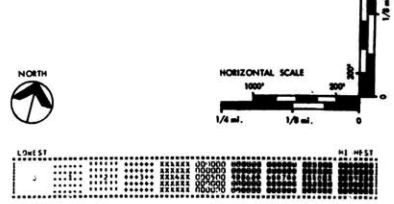


FIG. 5.11 ACTIVITY SIGNIFICANCE



ACTIVITY SIGNIFICANCE:
(REALM + DECISION SIGNIFICANCE + SYMBOLIC SIGNIFICANCE)

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SIGNIFICANCE CONGRUENCE

Significance congruence was measured by the consistency with which exposed forms were concurrent with important activities. It was a contextual measure, established within the range of values present in the study area.

The correlation between form exposure and activity significance was .26 for the total study area. While it was significant and confirmed Hypothesis 1, it was the lowest correlation among the three congruence measures of the research. Analysis of the relationships between activity significance and the component form exposure variables indicated that the pattern of the more spatially restricted pedestrian views had the highest correlation with activity significance (.33). Neither vehicular views (.16) nor transit views (-.01) generally exposed the more important places. The scatter diagram which distributed places according to their significance values (fig. 5.12), indicates that the magnitude of the significance congruence correlation was mainly a function of the large concentration of places both of whose form and activity attributes were in the lower value ranges. It also shows that as either the form or activity value of a place increased, its relative level of congruence decreased. Thus, the few places that had highly significant

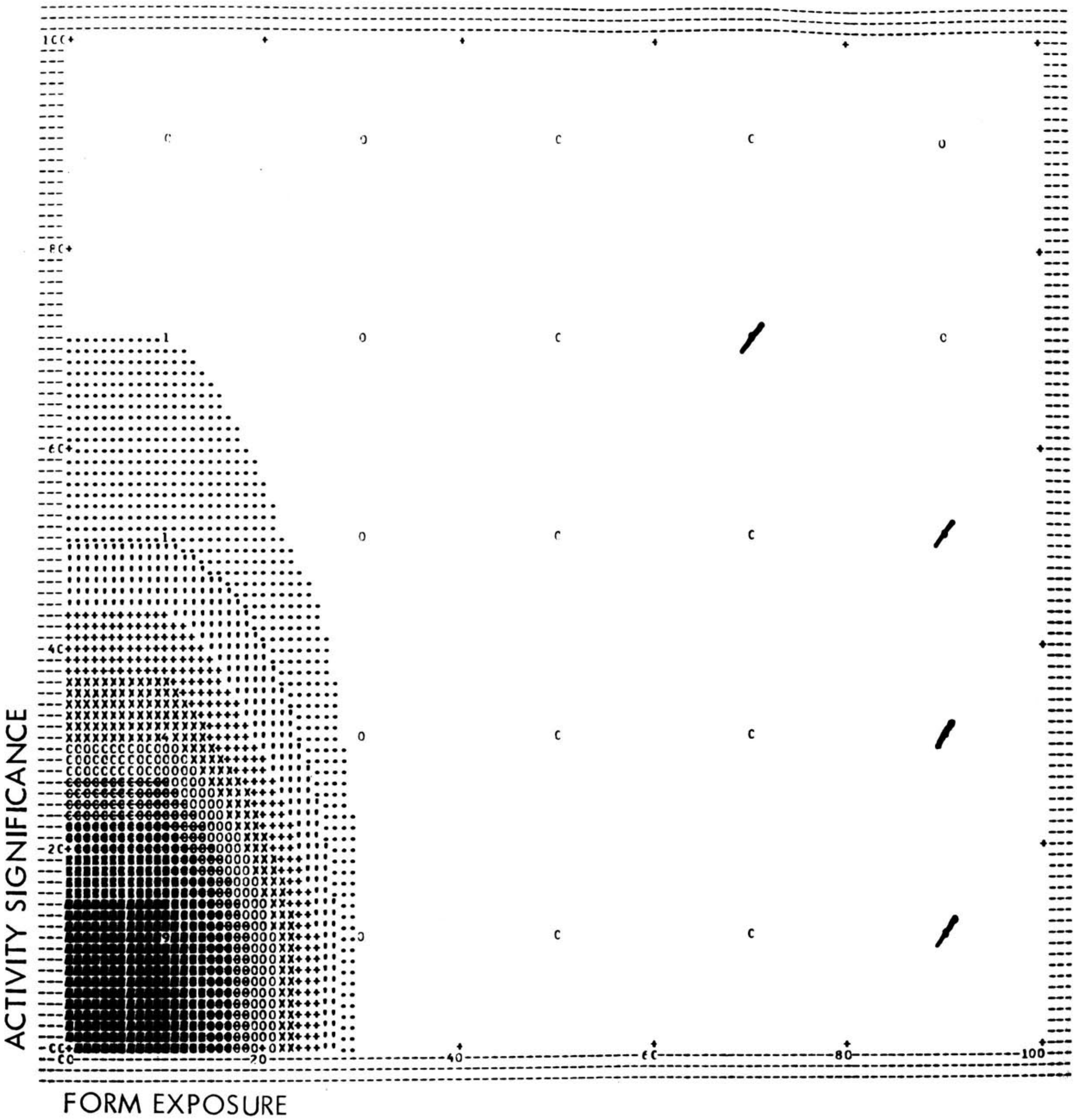


FIG. 5.12 SIGNIFICANCE CONGRUENCE, SCATTER DIAGRAM

THE PLACES OF THE STUDY AREA DISTRIBUTED
ACCORDING TO THEIR FORM EXPOSURE
AND ACTIVITY SIGNIFICANCE

ABSOLUTE VALUE RANGE APPLYING TC EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	71.50	143.00	214.50	286.CC	357.5C	429.CC	5CC.5C	572.00	643.50
MAXIMUM	71.50	143.00	214.50	286.00	357.5C	429.CC	5CC.5C	572.00	643.50	715.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TC EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

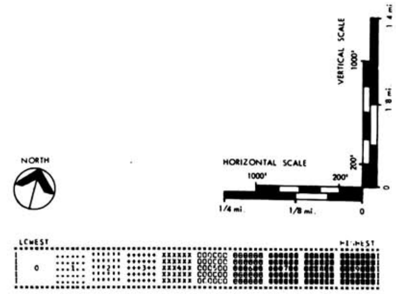
MINIMUM	0.00	10.00	20.00	30.00	4C.CC	50.CC	6C.CC	7C.00	80.00	90.00
MAXIMUM	10.00	20.00	30.00	40.00	5C.CC	60.CC	7C.CC	8C.00	90.00	100.00

LEVEL	NO CASES	1	2	3	4	5	6	7	8	9	10
SYMBOLS	/	C	....1....	''''2''''	++++3++++	XXXX4XXXX	OCCO5OCCC	€€€€6€€€€	●●●●7●●●●		

activities tended not to occur in highly visible forms, and the forms which were highly visible were generally not those whose activities were important.

From the graphic display of significance congruence, (fig. 5.13), it can be seen that most of the highly congruent places whose activities were relatively unimportant and whose forms were not highly exposed, tended to be located outside of the view areas of the major transportation flow systems. The majority of residential places were in this category. The relatively few places which were highly congruent and which had high values of form exposure and activity significance, included some of Boston's major landmarks suchas the Prudential Building and the John Hancock Building, and some of the most important districts such as the shopping areas along Washington Street and Boylston Street. In the case of the landmark examples, their form exposure was due in the main to their high visibility from both the vehicular and mass transit systems, while pedestrian views accounted for the high form exposure of the shopping districts. Among the less congruent places, there was a relatively large number of places whose activities were highly important but which were not generally visible. The "inner" part of the financial district, the historic places in the North End, the working offices of the State House and its adjacent office

FIG. 5.13 SIGNIFICANCE CONGRUENCE



SIGNIFICANCE CONGRUENCE:
THE VISIBILITY OF THE FORM OF A PLACE IN
RELATION TO THE IMPORTANCE OF ITS ACTIVITY

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buildings, the City Hospital and much of the entertainment district were relatively underexposed. Conversely, many of the places that were located along the major transportation routes were far more visible than their activity significance warranted. These included the residential edges of the Back Bay and Beacon Hill, the highly visible residential towers in the West End Urban Renewal area.

RECENCY

The places of the study area were also classified as to the recency of their form and activity types, in order to test the effects of change upon subject knowledge. The more recently changed places tend to be different and contrasting because of their newness, and many of them have received significant publicity as part of "the new Boston." Both the form and activity type of each place was assigned one of three recency values -- less than one year old, one to five years old, or more than five years old.

Relative recency was identified from comparisons between aerial photographs taken in 1959 and 1965, changes noted in the annual revisions of the Sanborn Insurance Map (1953), the land use maps of the Boston Redevelopment Authority (1962-1964) and from the field survey. It was assumed that changes in intensity and significance were concomitant with type changes.

An analysis of the spatial distributions of form and activity recency (figs. 5.14 and 5.15), and their extremely high correlation (.83), confirmed the dependent nature of these change variables. While most places which changed altered both their form type and their activity type, there was a time lag between form changes such as the construction of a new road or building and

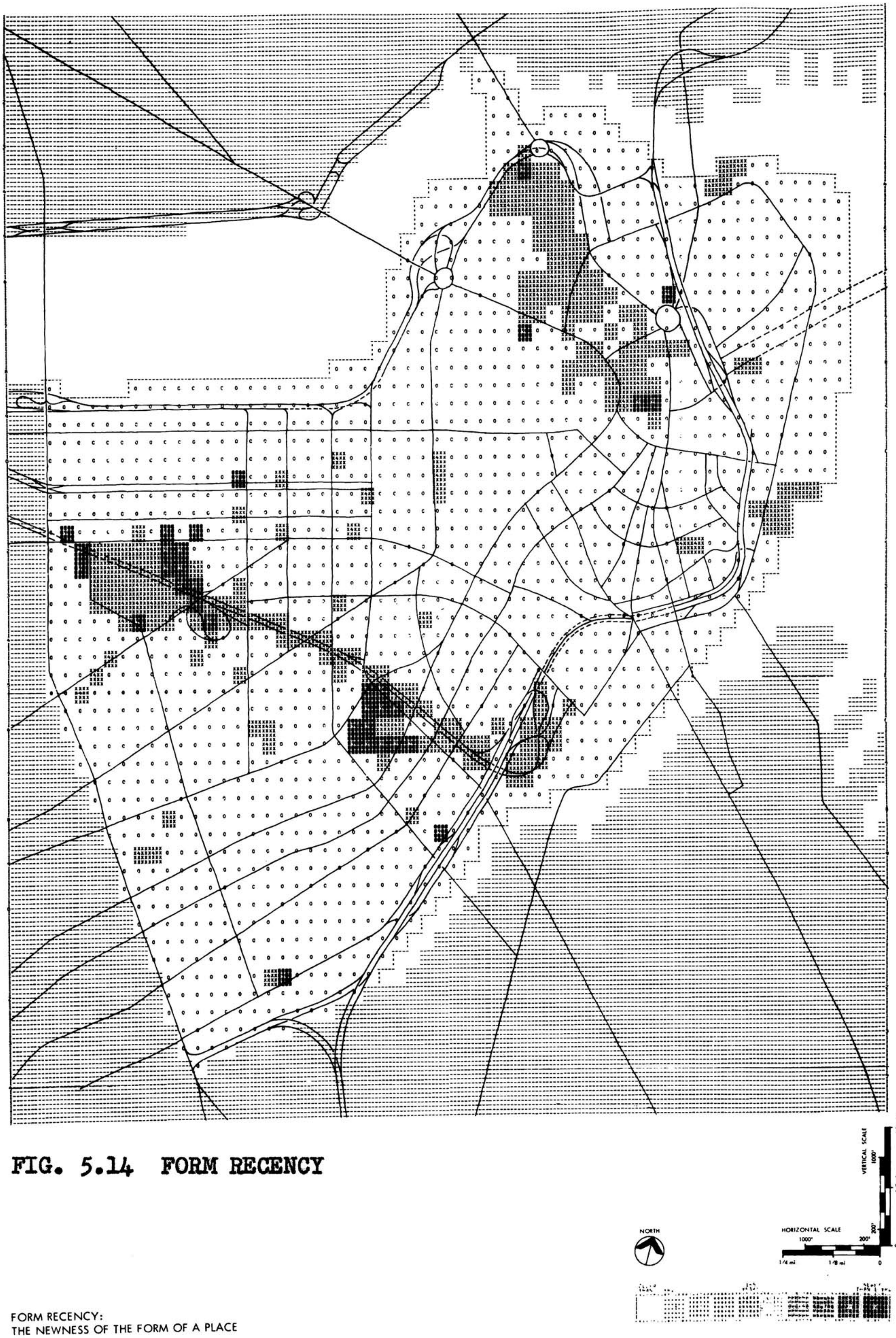

FIG. 5.14 FORM RECENCY

FORM RECENCY:
THE NEWNESS OF THE FORM OF A PLACE

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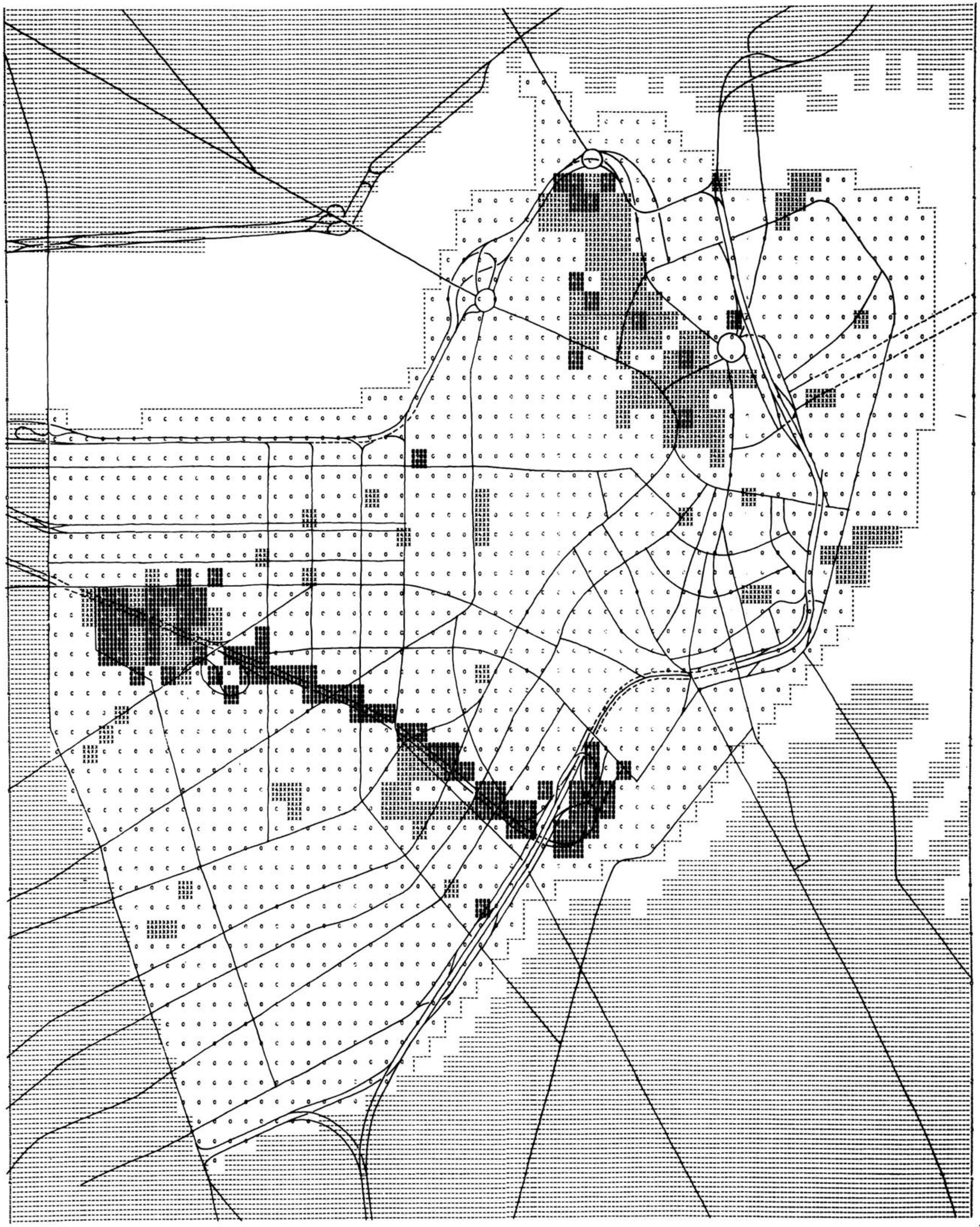
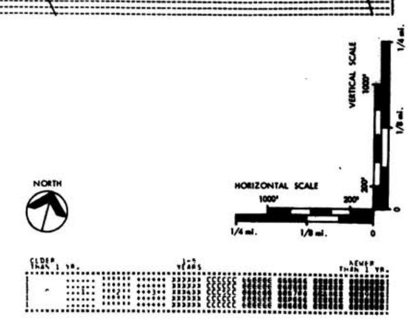


FIG. 5.15 ACTIVITY RECENCY



ACTIVITY RECENCY:
THE NEWNESS OF THE ACTIVITY OF A PLACE

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their new activity use. It is interesting to see that even in a city in which a comparatively large amount of new construction is taking place, relatively few places were affected by recent change.

SUMMARY

Hypothesis 1, that there is a high degree of congruence between form and activity, was generally confirmed by the survey findings. The places in the study area exhibited high levels of type and intensity congruence. Similar activities tended to have similar forms, and the singularity of an activity type was expressed by the uniqueness of its form. In the same way, the busyness of an activity was generally reflected in the visual intensity of its form. As regards significance, the overall level of congruence was not as high. Most places were relatively unimportant and unexposed and thus congruent, but the places with significant activities were not generally those whose forms were highly exposed.

There were several interesting subsidiary findings. In the type surveys, both form and activity types were similarly distributed within the study area, with several mutually defined districts, but with activity types often being more finely differentiated within these areas. The more unique types were concentrated in the downtown core, highly contrasting places were found throughout the area, and the sharpest type distinctions were along the edges of the Boston Common and the downtown core area. Low values of type congruence were generally due to the presence of a singular activity in a common form, and one which was not usually the original purpose of that form. The negative correlation between type congruence and the presence of rooted signs indicated that signs were often a necessary means of transmitting information about activities, and notably in places whose forms were not directly expressive.

In the intensity surveys, signs and form stereotypes were found to be the most prevalent sources of potential information. There was also a clear difference between the distribution of daytime and nighttime activity intensity, demonstrating the cyclical pattern of city use in which the downtown core is very busy during the daytime but is relatively "dead" at night. The significance surveys indicated that there was a striking lack of spatial overlap among the viewing fields of the three major transportation systems. In general, the vehicular and mass transit systems failed to expose the places with important activities, particularly when compared with their exposure from the heavily travelled pedestrian ways.

CHAPTER SIX. THE MEANINGS OF PLACES; THE INTERVIEW

The results of the interview survey of the subjects' knowledge of form and activity are presented in this chapter. The interview results were used to test the hypotheses that were proposed to explain why places are meaningful:

Hypothesis 2: The higher the value of the form of a place -- the more common its type, the greater its intensity, the more it is exposed -- the greater the knowledge of its form;

Hypothesis 3: The higher the value of the activity of a place -- the more common its type, the greater its intensity, the greater its importance -- the greater the knowledge of its activity;

Hypothesis 4: Meanings tend to be reversible -- the ability to describe the form characteristics of a place is highly related to the ability to identify its activity attributes; and

Hypothesis 5: The higher the congruence of a place, the greater the overall meaningfulness of that place -- that is, the greater the frequency with which the form and/or the activity of the place is known.

Three separate tests were made of each hypothesis -- in the type, intensity, and significance analyses.

The interview methods have been described in Chapter 4. The protocol (Appendix J) was administered to a selected sample in order to investigate the influences of certain personal variables. Table 6.1 presents the personal variables and their distribution in the total sample.

TABLE 6.1

THE SAMPLE

Personal Variable	Number of Subjects
Total Sample	48
Place of Residence	
Roxbury	8
South End	8
Chelsea	8
North End	8
Cambridge	8
Beacon Hill	8
Distance	
inner city: South End, North End, Beacon Hill	24
outer city: Roxbury, Chelsea, Cambridge	24
Sector	
Northeast: Chelsea and North End	16
Southwest: Roxbury and South End	16
Northwest: Cambridge and Beacon Hill	16
Length of time of residence in Boston	
short: 4 years or less	24
long: 20 years or more	24
Travel Mode	
vehicular: most frequently an automobile driver and/or passenger	24
transit: most frequently a passenger on the MBTA	24
Socio-Economic Class	
lower: maximum income of $4000/year and/or low occupational ranking and/or not a high school graduate	24
middle: minimum income $6000/year and/or high occupational ranking and/or a high school graduate	24
Sex	
male	25
female	23
Age	
20-29 years old	16
30-39 years old	18
40+ years old	14

FREQUENCY OF USE

While everyone in the sample used the study area frequently and was generally familiar with it, there might have been specific differences due to some places being used more often than others. The places and routes within the study area that were most often used were determined in the preliminary interview questions:

How do you usually get to Central Boston?

How often do you ride the MBTA?
Which line do you take?
Where do you most often get off?

How often do you drive to Central Boston?
What are your common routes going into the city?
What are your common routes returning?

Where do you go most often in Central Boston?
For what purpose do you go?
How frequently do you go?

While many places, areas and routes were mentioned in response to these questions, the cumulated pattern of responses in fig. 6.1 clearly shows the overwhelming concentration of non-residential city use in the retail commercial district along Washington Street. The entertainment district was the second most frequently used area. The pattern of most frequent use by the sample was highly correlated with the overall pattern of destinations (.52), thus confirming the representative nature of the sample. The effects of greater frequency of use were tested separately in each analysis, along with the surveyed form and activity variables and their congruence.

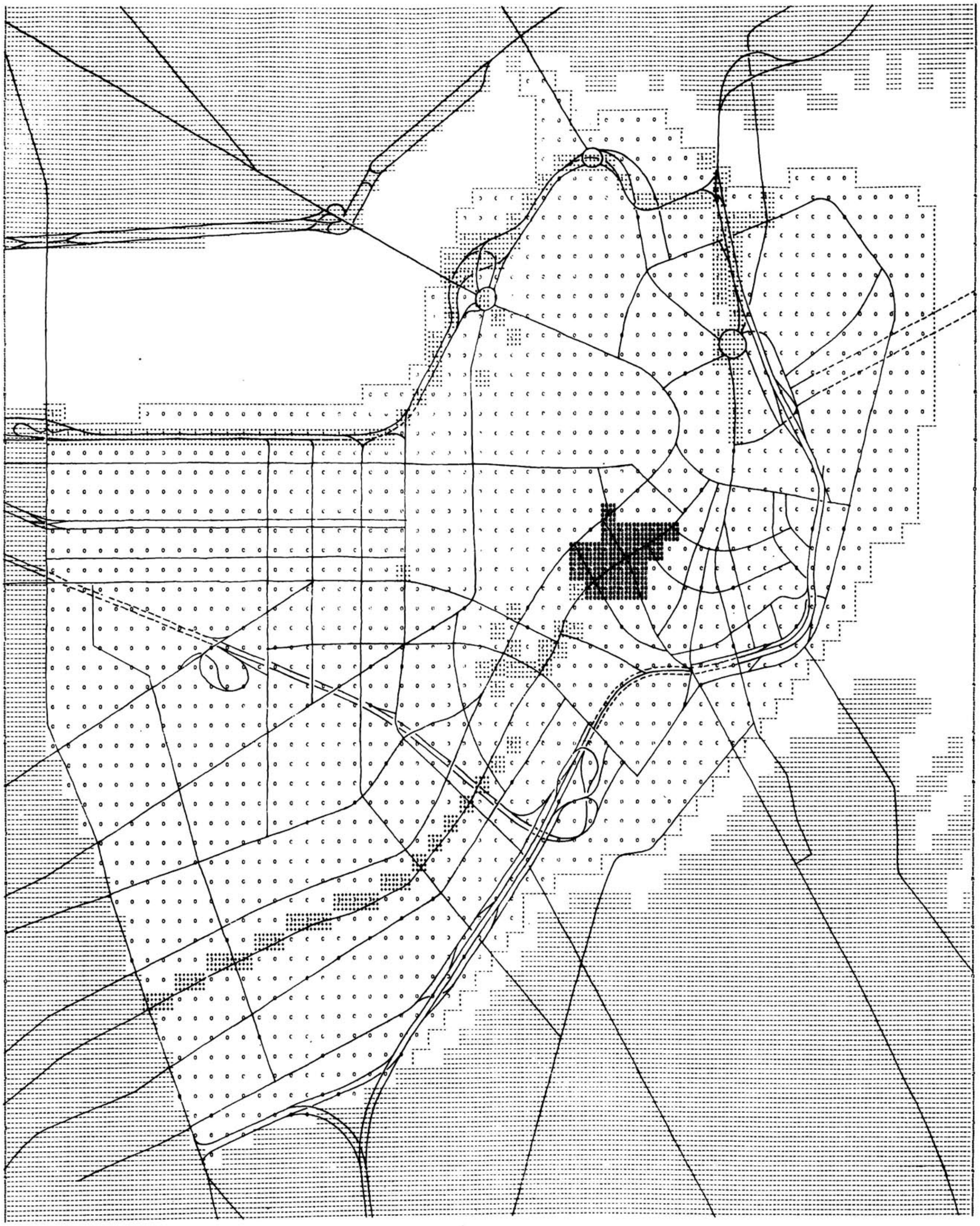
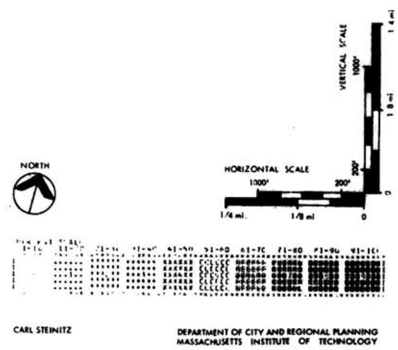


FIG. 6.1 MOST FREQUENTLY USED PLACES



TOTAL SAMPLE (48)

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MOST FREQUENT USE - FAMILIARITY

TYPE RESPONSES

Form Type

(Free) How would you describe the visual character of Central Boston? Would you indicate on this base map what the different parts of the area look like, being as complete and detailed as possible? Use words, sketches, outlines -- anything that you need in order to adequately describe the visual character.

(Area) Would you include what (this area) looks like? (Point to areas not previously included.)

(Check List) Would you include and locate the following -- a description of the places and areas

by their construction type
by their open space development or
by their building height
by their quality of maintenance

These questions were designed to measure the extent, complexity and categorization of the knowledge of form type. The subject was first asked a question in which he freely chose the areas of response and determined his own descriptive categories. He was then asked to describe those areas which he had not mentioned, still operating within his own descriptive categorization. If he had not done so previously, the subject was then asked to describe the study area in terms of the set of form qualities which were elicited in the pretest and which were measured in the field survey.

The free question (fig. 6.2) was coded separately from the total response pattern (fig. 6.3) in order to identify the places whose form characteristics were most salient.[1] The responses to the total question set are necessarily more frequent and spatially extended than those to the free question. However, their extremely high map correspondence and correlation (.94) indicates that the basic response pattern was firmly established by the free question. While the number of place mentions was increased by the area and check list questions, few additional places were mentioned often enough to substantially alter their relative standings from the initial response pattern.

Table 6.2 presents the correlations between the form type responses and the survey variables. The ability to describe the physical form characteristics of the places in the total study area was highly correlated with their relative form type frequency, thus supporting Hypothesis 2. It also was strongly related to activity type frequency and type congruence. Most of the places that were described were highly common and congruent, notably the many four to five story brick buildings that characterize most of Boston's inner city residential areas. While several of the more

---

[1]See Appendix K, figs. K.1 and K.2 for graphic summaries of the free and total responses to the form type questions. Note the similarity between figs. 6.2 and 6.3 and the "Image" of Boston reported in Lynch (1960, p. 19, fig. 3).

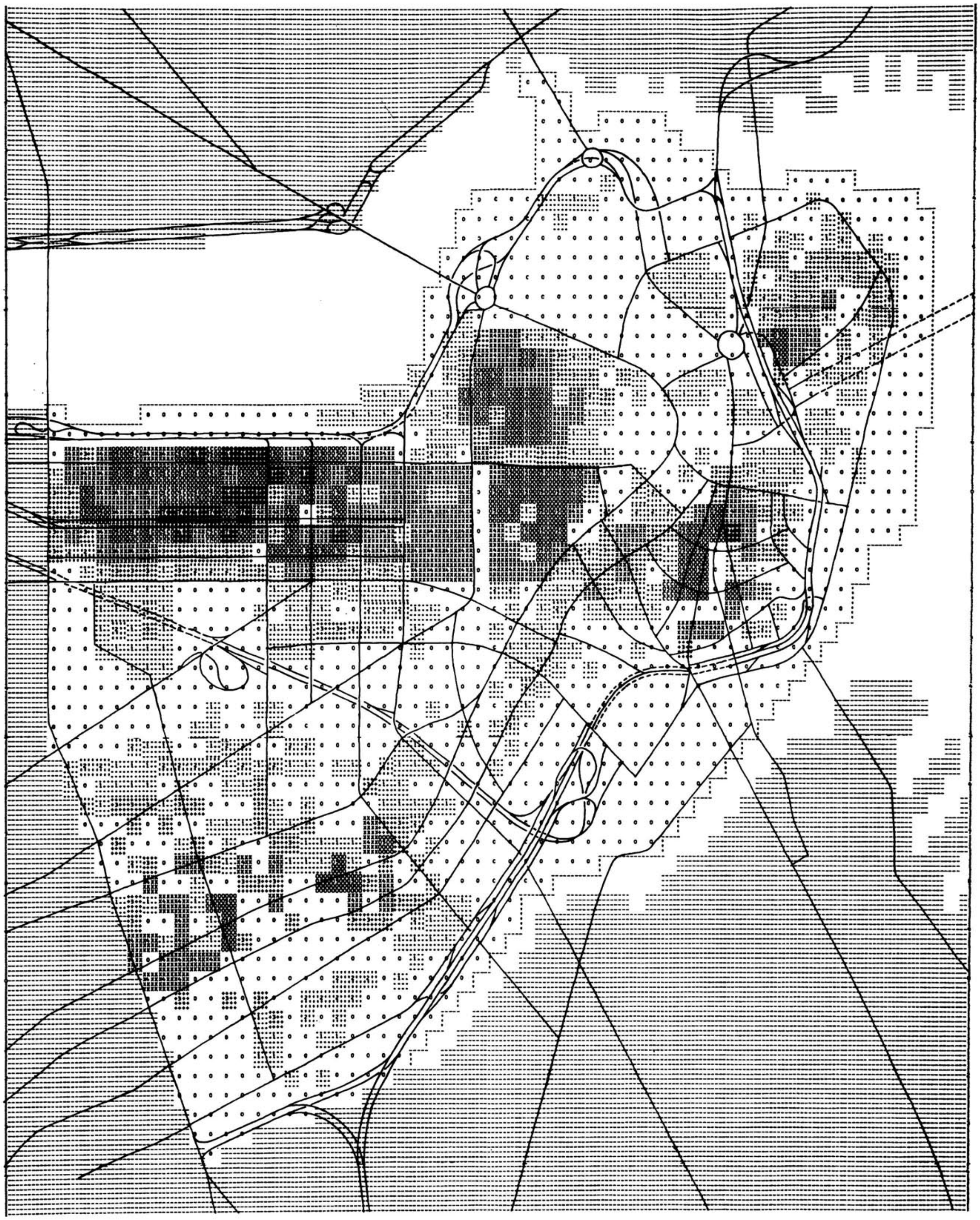
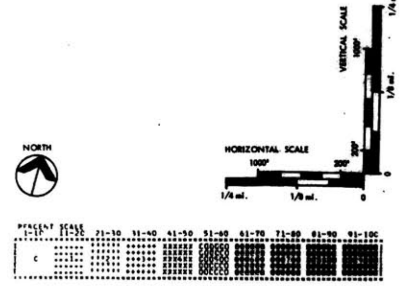


FIG. 6.2 FORM TYPE, FREE RESPONSES



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FORM TYPE (FREE)

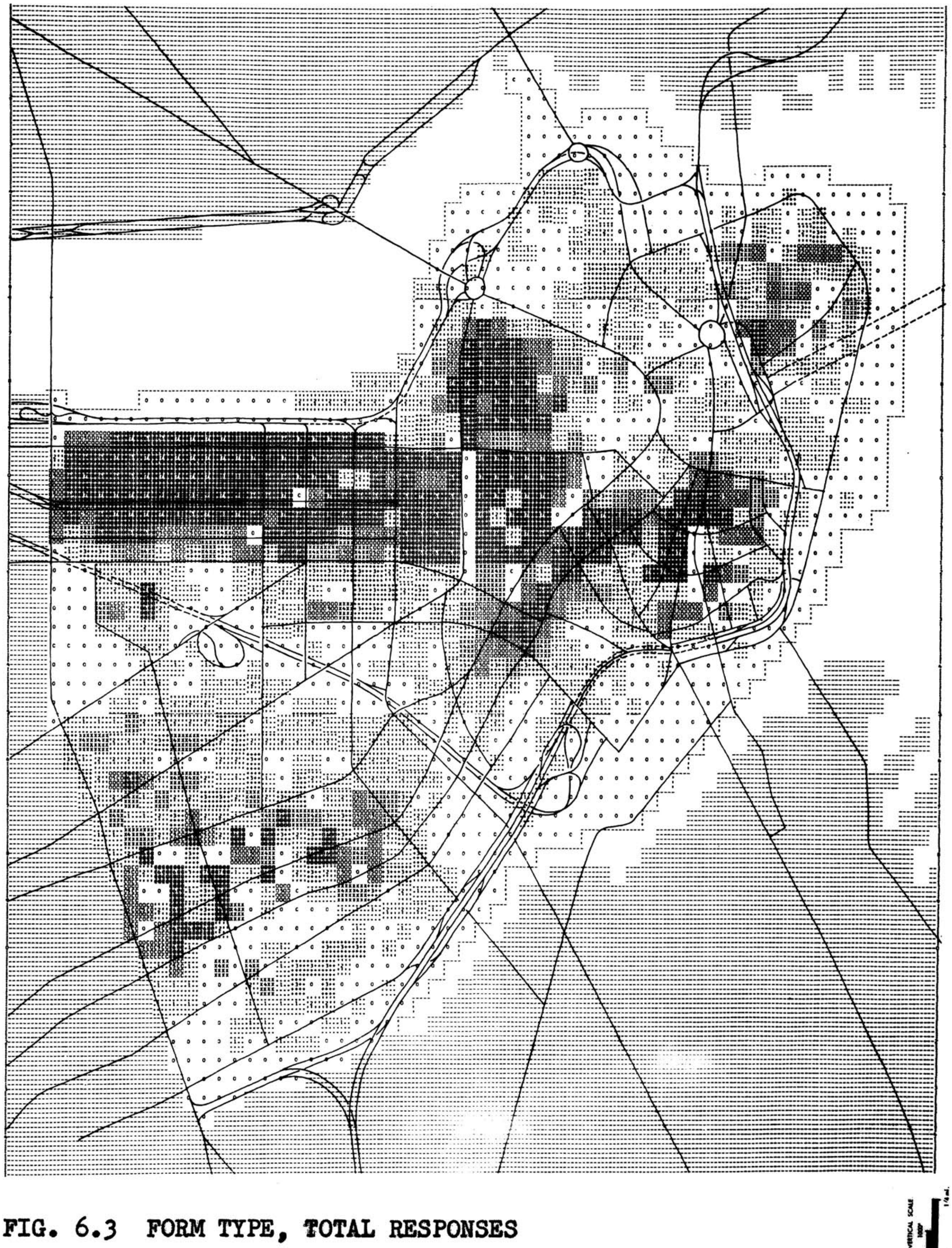
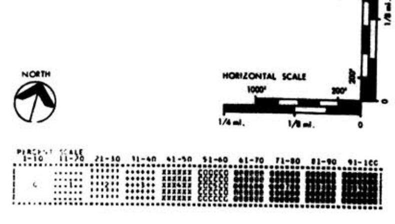


FIG. 6.3 FORM TYPE, TOTAL RESPONSES

TOTAL SAMPLE (48)



FORM TYPE (FREE, AREA, CHECK LIST)

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TABLE 6.2 CORRELATIONS BETWEEN THE TYPE RESPONSES OF THE TOTAL SAMPLE AND THE SURVEY VARIABLES

	TYPE RESPONSES			
	Form Type, Total Response		Activity Type, Total Response	
Survey Variables	Total Study Area	Downtown Core	Total Study Area	Downtown Core
Form Type Frequency	.30*	-.03	.25	-.12
Construction Type	---	---	---	----
Transparency	-.05	-.01	-.06	.07
Height	.19	.44**	.14	.20
Quality	.10	.11	.15	.01
Activity Type Frequency	.33*	-.10	.50**	-.11
Type Congruence (Matrix)	.31*	.02	.37**	.09
Type Congruence (Frequency)	---	----	---	----
Form Intensity	.16	.46**	.17	.32*
Floor-area-ratio	.21	.43**	.16	.20
Rooted Sign Size	-.17	.19	-.24	.08
Visible Activity	-.00	.10	.10	.24
Visible Objects	-.13	-.03	-.13	.11
Non-visual Information	-.07	-.02	-.01	.07
Form Stereotype	.15	.17	.30*	.16
Form Information Intensity	-.02	.14	.05	.22
Activity Intensity	.21	.41**	.27	.38**
Destinations	.16	.41**	.22	.43**
Hours Per Place	.18	.09	.33*	.07
Person Hours Per Day	.15	.37**	.19	.33*
Person Hours Per Night	.20	.20	.27	.13
Intensity Congruence	---	----	---	----
Form Exposure	-.05	.13	-.03	.13
Visibility Area	-.08	-.01	-.06	-.02
Vehicular Exposure	-.07	-.04	-.07	-.08
Mass Transit Exposure	-.10	.12	-.13	.05
Pedestrian Exposure	.15	.36**	.23	.45**
Activity Significance	.08	.14	.07	.24
Realm	-.10	.15	-.18	.17
Decision Significance	.10	.16	.17	.11
Symbolic Significance	.17	-.01	.24	.19
Significance Congruence	---	----	---	----
Form Recency	-.12	-.08	-.11	-.02
Activity Recency	-.11	-.07	-.07	.02
Frequency of Use	.15	.47**	.32	.84**

With a sample size of 48 subjects, correlation coefficients of greater than .28 are statistically significant at the .05 level (*) and correlations of .36 are significant at the .01 level (**). Source: Edwards (1950), table 6, p. 408.

unique places that were highly exposed and more frequently used were also often described, neither form exposure nor use-familiarity was a general predictor of form description.

However, within the downtown core area, the ability of subjects to describe physical characteristics was highly correlated with frequency of use. In this area, where most of the forms were relatively unique, description was not related to form type frequency. The spatial intensity of the exposure of building height from the pedestrian ways correlated highly with form description, as did activity intensity and particularly that of day time activity.

Thus, in the total study area, the places which were most often described were those which were most common, while in the downtown core, where most places were relatively unique, direct participation and pedestrian visual exposure were the major determining factors in place description.

Figure 6.4 presents the distribution of words used by the subjects in describing the physical characteristics of the study area. The descriptive terms are tabulated in table 6.3. There was a general correspondence between the density of verbal responses and the knowledge of places. The most frequently used descriptive category was form quality and both "good" and "bad" characteristics

FIG. 6.4 FORM DESCRIPTIONS

TABLE 6.3

FORM TYPE: DESCRIPTIVE CATEGORIES

Form Type	803		
Open Space development		110	
Landscape character			36
Road Character			13
Sidewalk character			10
Construction Type		161	
Wood			18
Brick			101
Stone			18
Concrete			14
Steel			5
Height		183	
Low			18
Medium			45
High			119
Transparency		8	
Quality		293	
Good			117
Good Lighting			16
Bad			140
Bad lighting			14
Miscellaneous detail		48	
Form Intensity	171		
Densely built up		48	
Information intensity		123	
Signs			32
Visible activity			47
Visible objects			22
Form Stereotype			101
Form Exposure	19		
Form Recency	47		
Old			20
New			27
Personal Affect	20		
Like			17
Dislike			3
TOTAL RESPONSES	1060[1]		

[1]The total represents the combined sum of all the words used in describing the forms of all the places in the study area by the total sample.

were mentioned by most of the subjects. While both extremes were mentioned almost equally often, the physical forms of particular areas tended to be described consistently -- either negatively as in the case of the South End and North End, or positively as in the case of Beacon Hill and the Back Bay. The most common construction type -- brick, was the one most often described. High buildings, which are relatively unique in the total study area, were frequently described in the areas in which they cluster. Thus height tended to be mentioned not as a unique and contrasting feature, but in descriptions of districts. Information sources were also commonly mentioned, and subjects often freely described forms in terms of their stereotyped associations (e.g. church, hospital, etc.). Recency was less of a descriptive factor than expected, and both very old and new places were evenly mentioned.

ACTIVITY TYPE

(Free)	Would you describe what regularly occurs in the area included on this base map--what are its major activities? Please indicate these activities in their locations directly on the base map, being as complete and detailed as possible. Use words, symbols, outlines -- anything that you need in order to adequately describe the activity pattern. As you write, would you also speak out loud.
(Area)	Would you include what the activities are (here)? (Point to areas not previously included.)
(Check List)	Would you include and locate the following: Utilities; transportation terminals; shopping areas; recreation areas; entertainment areas; institutions and public services; office areas; government places; manufacturing areas; wholesale districts; residential areas; the major streets; highways and other transportation routes.

These questions were designed to probe the extent, complexity and categorization of the subjects' knowledge of the activity types in the study area. The subject was first asked to freely describe the activity pattern of the study area. He was then asked about those areas not previously identified, still using his own categorization. If he had not done so previously, the subject was then asked to locate and identify places in terms of a check list of activity types which generally corresponded to the one digit code of activity types used in the survey.

In order to identify those areas and activity types that were most salient, the free question (fig. 6.5) was coded separately from the total set of responses (fig. 6.6).[1] As in the form type question, the basic response pattern to the activity type questions was established by the free question. This is clearly indicated by the extremely high map correspondence and correlation (.97) between the free and total responses.

Table 6.2 (p. 135) also presents the correlations between the activity type responses and the survey variables. Within the total study area, the ability of the subjects to identify the activity type of a place was highly correlated with its activity type frequency, thus confirming Hypothesis 3. Most of the well known places had common activities and were congruent. However, many of the relatively unique activities concentrated in the downtown core area were also frequently identified. These were often places of high activity intensity, whose intense forms were highly exposed to pedestrians. Frequent use was a strong indicator of activity identification in the total study area and an even more powerful one in the frequently used downtown core.

The predictive roles of the various information sources varied depending upon the context. In the total

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[1]See Appendix K, figs. K.3 and K.4 for graphic summaries of the free and total responses to the activity type questions.

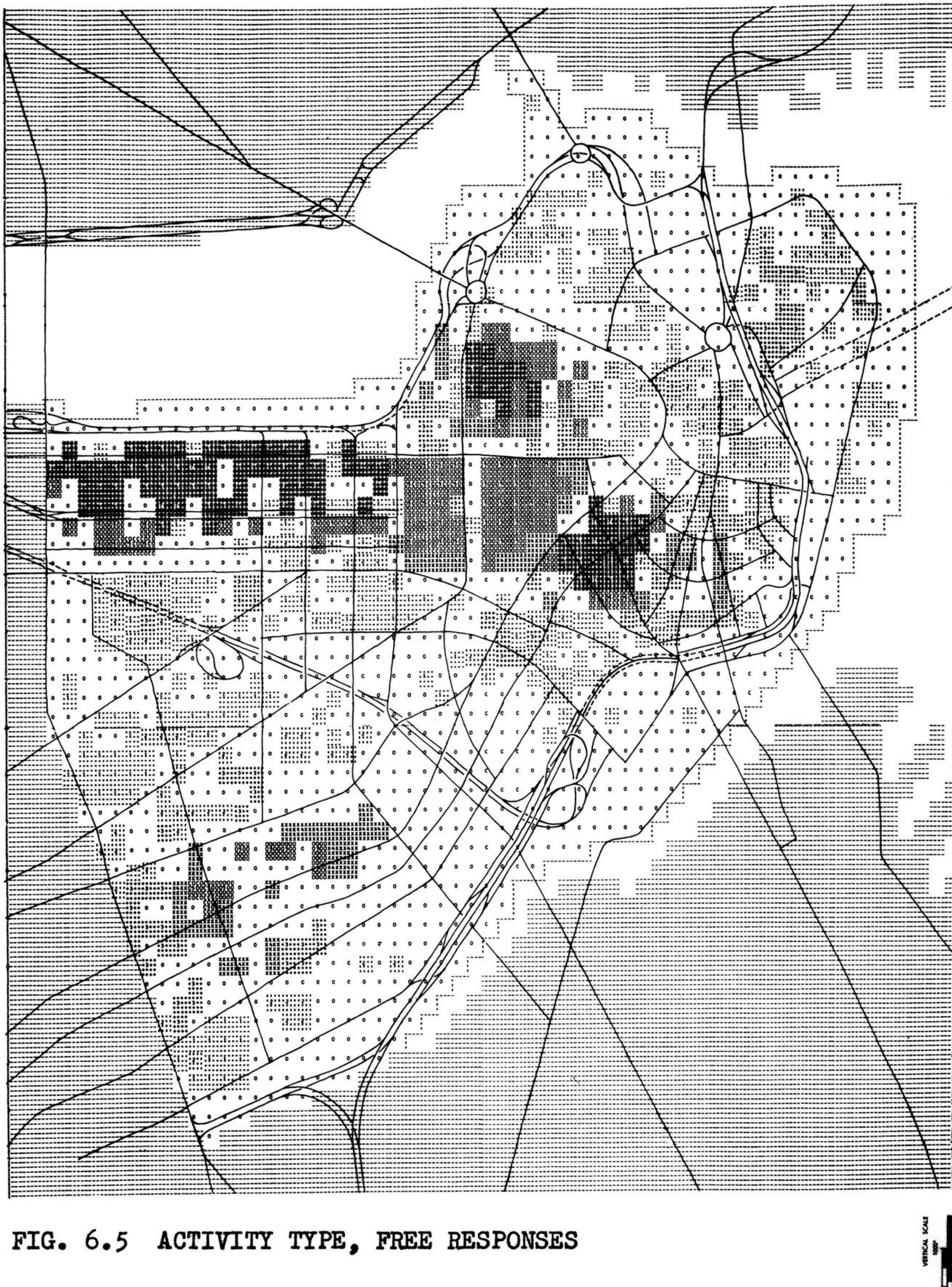
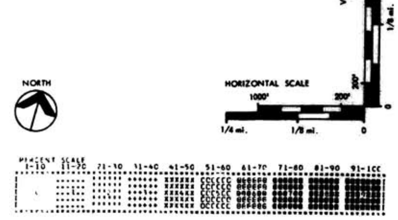


FIG. 6.5 ACTIVITY TYPE, FREE RESPONSES



TOTAL SAMPLE (48)

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ACTIVITY TYPE (FREE)

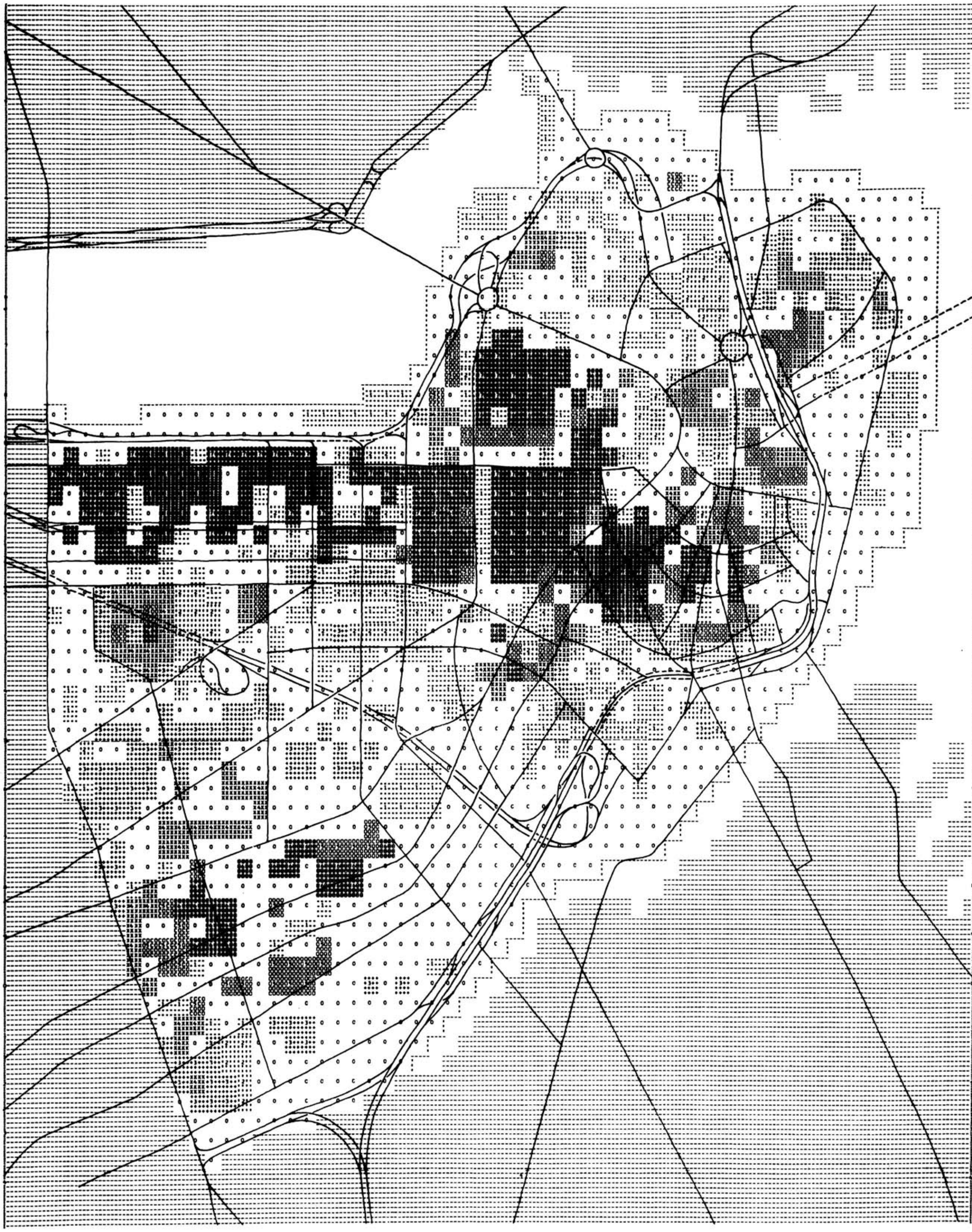
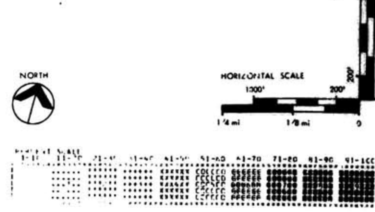


FIG. 6.6 ACTIVITY TYPE, TOTAL RESPONSES

TOTAL SAMPLE (48)



ACTIVITY TYPE (FREE, AREA, CHECK LIST)

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area the pattern of activity type responses correlated most highly with form stereotype. In the downtown core, the principal information correlate of activity identification was visible activity. The effect of context was therefore similar for both form description and activity identification. In the total study area which was used less frequently, associative variables such as type congruence and form stereotype were the more powerful predictors of meaning, while in the more familiar downtown core, direct and immediately perceived variables were more important.

The distribution of the terms used by the subjects while identifying activities are presented in figure 6.7. Table 6.4 presents a tabulation of the descriptive terms into the activity type code categories. As with the form descriptions, there was a general spatial correspondence between word densities and meaningful places. Residential and retail commercial places were most often differentiated. Recreational places were relatively more often described than their frequency of occurrence would warrant, governmental activities were less so, and manufacturing activities, which could be considered important from the viewpoint of the environment as a tool of education, were relatively ignored.

FIG. 6.7 ACTIVITY DESCRIPTIONS

NORTH

SCALE

1000' 200' 0

1/4 mi. 1/8 mi. 0

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TABLE 6.4

ACTIVITY TYPE: DESCRIPTIVE CATEGORIES

Activity Type		
No apparent activity, construction	24	
Construction		21
Residence	288	
Hotel and motel		16
Manufacturing	20	
Wholesale commerce and storage	46	
Food and related products		22
Textiles, apparel and accessories		11
Finance, business and professional services	135	
Banking and finance		22
Insurance		36
Government and Public Safety	94	
Government: executive		37
Personal and public services	166	
Hospital and other inpatient institution		56
College and University		29
Library, museum, historical museum		48
Religious organization		11
Recreation	217	
"Recreation"		51
"Entertainment"		55
Motion picture theater and concert		19
Athletic and other spectator event		17
Club, social membership organization		9
Park		57
Retail commerce	264	
Food and related products		47
Restaurant		29
Bar		10
Textiles, apparel and accessories		11
Transportation, communication and utilities	180	
Passenger terminal and transfer		101
Ship docking		9
Auto and truck flows		54
References to activity intensity	34	
References to activity significance	13	
References to specific categories of people	49	
Miscellaneous	17	
TOTAL RESPONSES	1547[1]	

[1]The total represents the combined sum of all the words used in describing the activities of all the places in the study area by the total sample.

THE CHARACTERISTICS OF MEANINGFUL PLACES: TYPE

Within the total study area, the ability of subjects to identify the activity of places was very highly correlated with their ability to describe the form of those places (.66). The presence of a high level of reversible knowledge confirms Hypothesis 4. The finding was replicated in the downtown core where the correlation between the form and activity responses was lower, but still strong (.45). The subjects' response patterns were even more highly correlated than were those of the surveyed form and activity variables -- in both the total study area (.66 vs. .54) and in the downtown core (.45 vs .16). Clearly, if a place is meaningful, people tend to know both its form and its activity characteristics.

The number of times that the form and/or the activity type of a place was mentioned correlated significantly with form type frequency, with activity type frequency and with type congruence, thus supporting Hypothesis 5. The important role of congruence is indicated in a scatter diagram which distributes the total type responses of places according to their surveyed values of form and activity type frequency, and normalizes for the occurrence of the form-activity sets (fig. 6.8). Most of the subjects' responses were directed to congruent places with

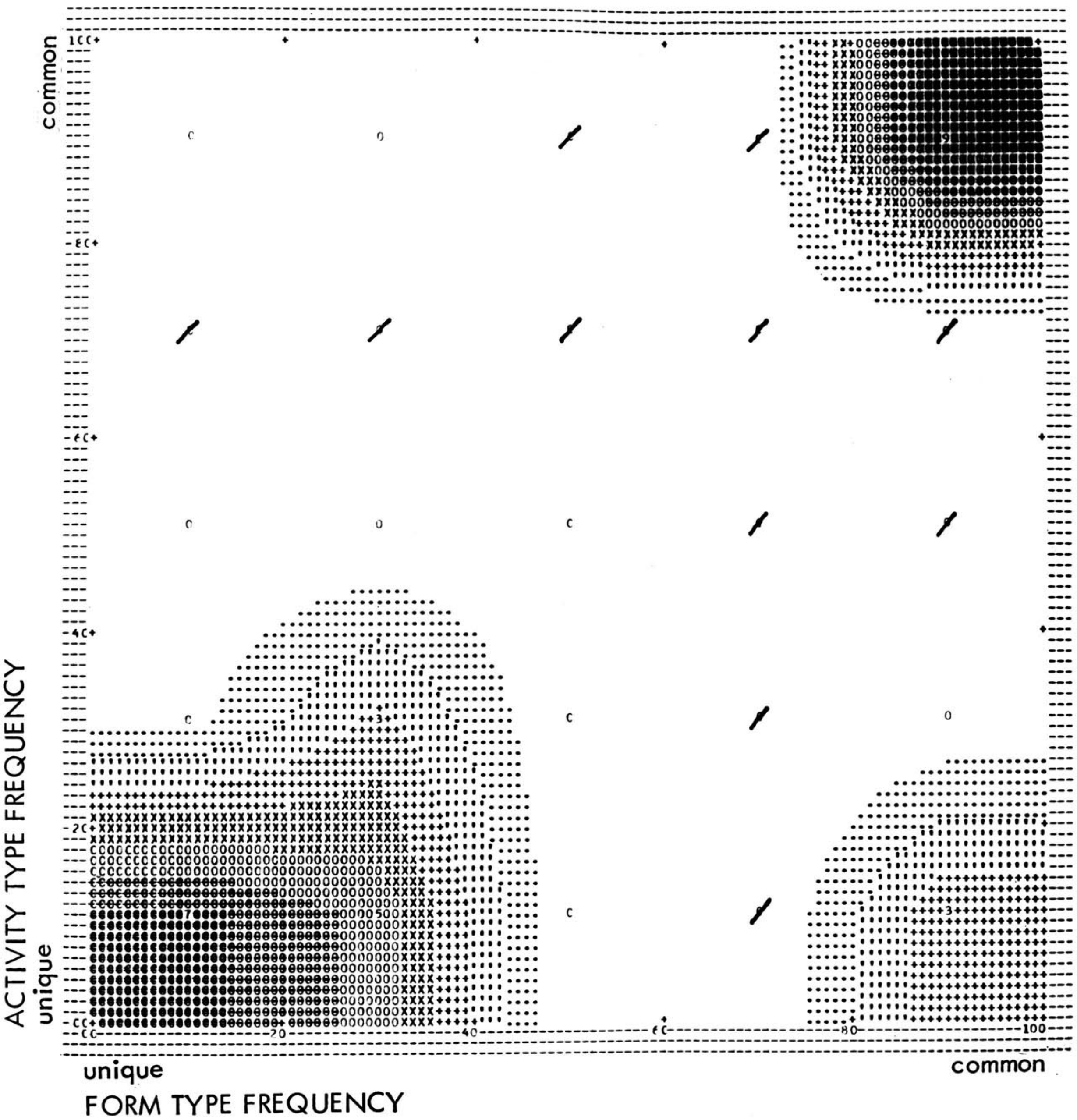


FIG. 6.8

TYPE RESPONSES PER PLACE
DISTRIBUTED AND NORMALIZED FOR SURVEYED
FORM TYPE FREQUENCY AND ACTIVITY TYPE FREQUENCY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

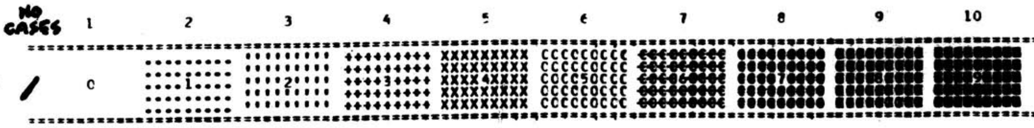
MINIMUM	0.00	1250.00	2500.00	3750.00	5000.00	6250.00	7500.00	8750.00	10000.00	11250.00
MAXIMUM	1250.00	2500.00	3750.00	5000.00	6250.00	7500.00	8750.00	10000.00	11250.00	12500.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00
MAXIMUM	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00

LEVEL NO CASES 1 2 3 4 5 6 7 8 9 10

SYMBOLS



both common and unique types being frequently mentioned relative to their occurrence. However, some less congruent places were mentioned, notably those whose activities were unique (and important) but whose forms were common. Subjects tended not to describe places whose forms were unique but whose activities were common. There was a second group of places which did not conform to the general finding -- those which were highly congruent but which were not often mentioned. Visual comparisons of the map distributions of the total form and activity type responses with those of type congruence from the matrix analysis indicated that the places of high congruence were more spatially widespread than were the interview responses. Thus, as could be expected, many places were simply not known --despite their congruence. It was concluded that while high type congruence does not guarantee frequent interview responses, the absence of a high value of type congruence acts to prevent places from being well known.

The extent of a person's form knowledge was somewhat greater than his activity knowledge. There were more places whose forms were described than whose activities were identified.[1] Many of these places were concentrated in some of the larger areas which had homogeneous

[1]The mean per cent of places whose form characteristics were described by a subject was .28. The mean per= cent for activity identification was .23.

concentrations of common form types. In these areas, activities tended to be less well known in those places whose activity types were relatively unique and which were less congruent. For example, the schools in the Back Bay and the shops in Beacon Hill were less well known than the predominant residential places in these areas. Many of these less congruent places were in the inner parts of districts where the form character extended homogeneously over a larger area than the predominant activity. Similarly, the forms of many of the outer tall buildings around the financial district and the lower quality places with many signs around the entertainment area were more often described than their activities. The places whose activity types were better known than their form characteristics included some of the major institutions such as the Boston City Hospital, the Massachusetts General Hospital, and the Boston Public Library. Places in some of the larger construction projects such as the Prudential Center and the Government Center were also in this category, but perhaps because of the publicity surrounding their names, these places were better known for their projected than for their current activities.

A visual analysis of the graphic response patterns to the type questions (Appendix K, figs. K.2 and K.4) further demonstrates the important roles of both congruence and activity in the organization of the response patterns.[1] Larger and relatively homogeneous districts were dominant, but internal activity differences were often distinguished within otherwise similarly defined form districts. There were two socially distinct sides of Beacon Hill, two major activity subdivisions in the Back Bay, and several in the South End. Edges were most pronounced where both form and activity changed, but also sometimes where only activity distinctions were made. Landmarks whose activities contrasted with their surrounding or neighboring districts, such as the Hotel Madison and the Customs House, were less often mentioned than landmarks which marked similar activity areas, such as the State House and the John Hancock Building. Few diversified nodes were prominent (Copley Square and Park Square being conspicuously undermentioned), but several that were associated with single activities were well

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[1]The protocol was designed to produce specific responses to places and areas, and not to elicit the more generalized image structures that have been studied by other investigators (Lynch [1960], DeJonge [1962], Gulick [1963], Appleyard [1966]). The subjects were not asked to freely represent their knowledge patterns on an empty sheet of paper. Indeed the pattern of streets presented on the base map, which permitted more literal interpretation of known places and areas, itself gave considerable order to the responses. However, the edges by which place characteristics were grouped and defined clearly indicated a structural organization of the area on the part of the subjects. This structure is describable in the categories developed by Lynch.

known as the "center" of that activity, such as the intersection of Washington and Summer Streets in the shopping district and Haymarket Square in the food marketing district. Because of the protocol base map, paths were rarely significant in their own right. They were important mainly as edges between districts, and they gave considerable clarity to those edges. Of all of the structural elements, the strongest were the edges of congruent districts that were reinforced by a busy path.

Two principal conclusions were drawn: 1) the knowledge of form and activity types is founded on congruent attributes, and particularly those which are distributed so as to form mutually distinguishable areas; and, 2) the knowledge of activity types has a powerful influence on the ways in which a person differentiates his environment -- indeed, they may have a more powerful influence on the formation of spatial distinctions than do the characteristics of physical form.

INTENSITY RESPONSES

Form Intensity:

Where are the most densely built up parts of Central Boston?
Would you mark or outline them on the map.
Where are the places and areas in which you can most easily tell what is happening?
Would you outline or mark them on the map.
Would you indicate the areas where you can see the most and largest signs?
Would you show where you can see the most people participating in the activity of the place or area?

These questions were designed to prove the subjects' knowledge and structuring of form intensity. They were directed to the following differentiating attributes of form intensity: floor-area-ratio, form stereotype, rooted signs and visible activity. Subjects were asked to mark only those places with high intensity values, and places not identified were assumed to have lower values. In the graphic analysis each question was coded separately and the four resulting overlays were superimposed and reproduced. (See Appendix K, fig. K.5 for the graphic summary.) Fig. 6.9 contains the combined responses to the form intensity questions, obtained by adding and mapping the variables in a subroutine program comparable to that used in the survey of form intensity.

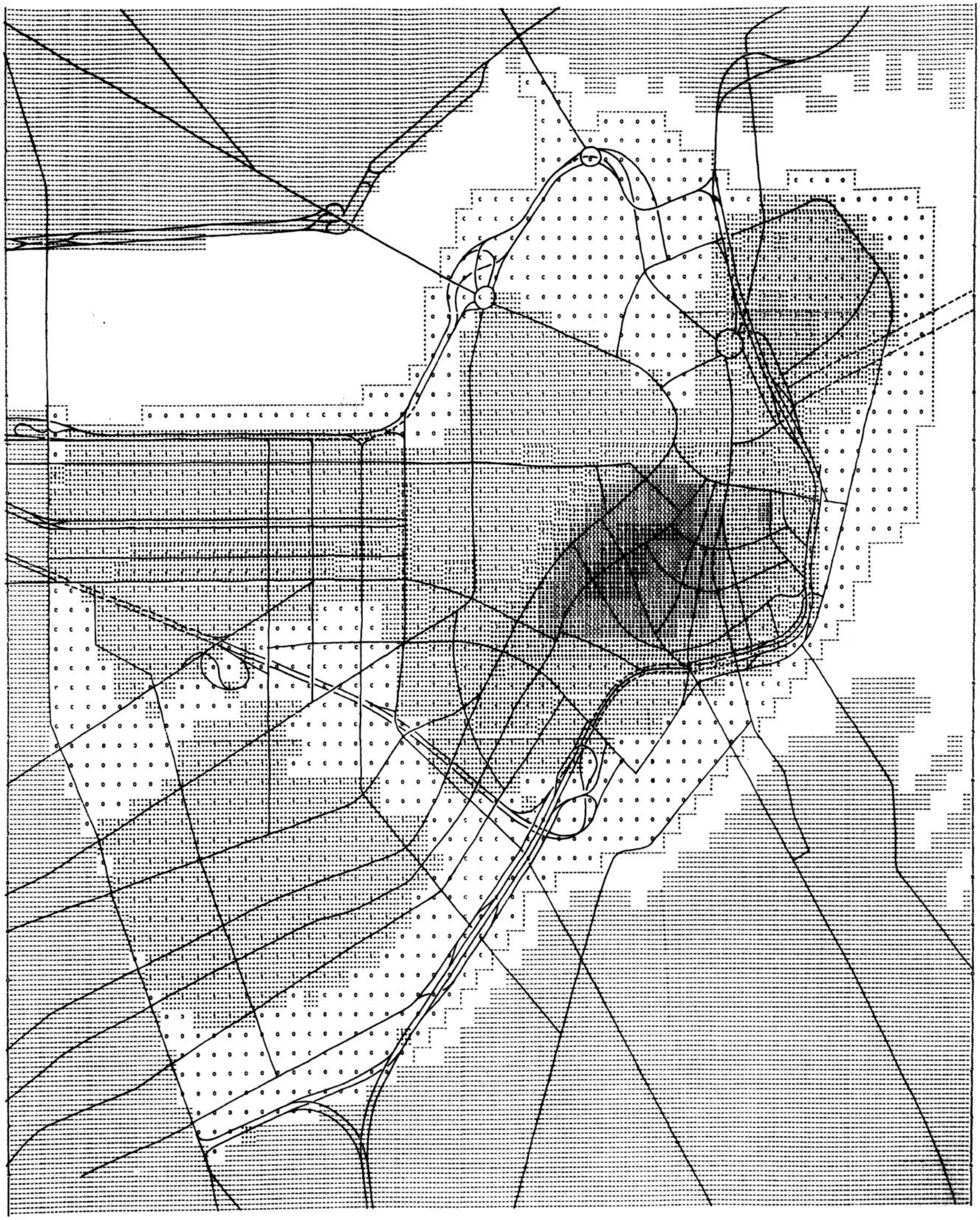
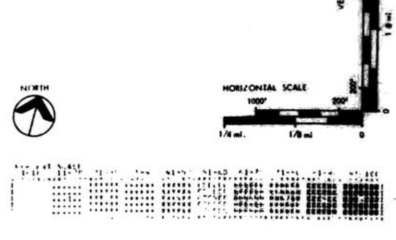


FIG. 6.9 FORM INTENSITY RESPONSES



TOTAL SAMPLE (48)

FORM INTENSITY (SPATIAL AND INFORMATION POTENTIAL)

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Table 6.5 presents the correlations between the combined form intensity responses and the survey variables. In general, the description of form intensity was significantly correlated with surveyed intensity, thus providing additional confirmation of Hypothesis 2. This finding was also substantiated in the downtown core area. Activity intensity was another important correlate of the subjects' evaluations of form intensity, but the major determinant of responses, both in the total study area and in the downtown core, was frequency of use. Pedestrian exposure also played a major role, particularly when compared with views from the vehicular and mass transit systems which were negatively related. Clearly the vehicular and mass transit systems do not adequately expose the most intense forms.

In the downtown core, where most of the visually intense forms are located, there was an even more striking contrast between the high positive correlation of form intensity evaluation with pedestrian exposure and its negative correlations with exposure from the other viewing systems. The places described as being intense in the downtown core again had intense forms, particularly as indicated in large signs, and busy activities.

There were several interesting findings about the component aspects of the evaluation of form intensity.[1]

---

[1]As well as being combined in the overall form intensity response, the responses to the individual form intensity questions were separately included in the correlation analyses.

TABLE 6.5 CORRELATIONS BETWEEN THE INTENSITY USES OF THE TOTAL SAMPLE AND SURVEY VARIABLES

Survey Variables	INTENSITY RESPONSES: Form Intensity: Total Study Area	Form Intensity: Downtown Core	Activity Intensity: Total Study Area	Activity Intensity: Downtown Core
Form Type Frequency	-.02	.03	-.19	-.04
Construction Type	---	---	---	---
Transparency	-.05	.04	.06	.08
Height	.29*	.21	.28*	.18
Quality	.02	-.09	.14	-.04
Activity Type Frequency	-.04	.00	-.18	.02
Type Congruence (Matrix)	---	---	---	---
Type Congruence (Frequency)	---	---	---	---
Form Intensity	.38**	.33*	.38**	.34*
Floor-area-ratio	.28*	.22	.27	.18
Rooted Sign Size	.22	.30*	.28*	.28*
Visible Activity	.17	.13	.20	.19
Visible Objects	.02	.07	.09	.12
Non-visual Information	-.01	-.14	.02	-.12
Form Stereotype	.05	.13	.01	-.29
Form Information Intensity	.16	.20	.20	.26
Activity Intensity	.37**	.32*	.44**	.33*
Destinations	.38**	.38**	.55**	.40**
Hours Per Place	-.04	-.19	.50**	-.24
Person Hours Per Day	.39**	.32*	.48**	.33*
Person Hours Per Night	.07	.03	-.16	.02
Intensity Congruence	---	---	---	---
Form Exposure	-.03	-.07	-.03	-.05
Visibility Area	-.18	-.35*	-.01	-.29*
Vehicular Exposure	-.16	-.31*	.02	-.26
Mass Transit Exposure	-.12	-.14	-.18	-.11
Pedestrian Exposure	.42**	.45**	.66**	.54**
Activity Significance	.09	-.07	-.06	-.05
Realm	.06	.17	.26	.18
Decision Significance	.14	.04	.26	.06
Symbolic Significance	.02	-.05	.16	-.02
Significance Congruence	---	---	---	---
Form Recency	-.18	-.31*	-.07	-.32*
Activity Recency	-.17	-.30*	-.04	-.29*
Frequency of Use	.52**	.65**	.56**	.76**

With a sample size of 48 subjects, correlation coefficients of greater than .28 are statistically significant at the .05 level (*) and correlations of .36 are significant at the .01 level (**). Source: Edwards (1950), table 6, p. 408.

In identifying the most densely built up areas, the subjects' evaluations accurately reflected the surveyed spatial intensity, as measured by floor-area-ratio (.27). However, the response pattern was also influenced by frequency of use, which correlated (.35) with the denseness evaluation. Some of the high density areas that were less frequently used by the sample, for example the financial office district and the insurance districts, were seen as being less spatially dense than they actually were, while some lower density areas, for example the residential areas in the North End and South End were described as being relatively more dense than their actual spatial intensities.

The responses to the questions that probed the perception of information intensity were also strongly affected by frequency of use. The areas that were more frequently used were seen as having more visible activity (.50) and more signs (.53), and were the areas in which the subjects felt that they could more easily tell what was happening (.48).

The surveyed pattern of visible activity, which was strongest in areas outside of the downtown core (e.g., in the wholesale markets and in various construction projects), was a less important determinant of the subjects' visible activity responses (.19) than were frequency of use (.39), activity intensity (.39), and particularly destinations (.50).

The actual distribution of rooted signs was a prime determinant of the descriptions of signs (.37), indicating a high awareness of their presence. However, as to the question of easy identification of what was happening, none of the objective information measures was nearly as significant a determinant as was frequency of use.

ACTIVITY INTENSITY

Activity Intensity: Which of these places and areas are the busiest? Please outline or mark them on the map.

The question was designed to probe the knowledge of the distribution of activity intensity. The subjects were asked to identify only those places of high intensity value, and non-mentioned places were assumed to have lower values. The graphic coding is displayed in Appendix K, Fig. K.6 while the computer analysis is mapped in fig. 6.10.

Table 6.5 also containes the correlations between the activity intensity responses and the survey variables. In identifying the busiest places -- those which had the highest activity intensity, the responses accurately reflected the surveyed pattern of activity intensity, thus confirming Hypothesis 3. There were some exceptions to these generally accurate appraisals, notably three areas of high surveyed activity intensity with less intense forms -- the Boston City Hospital area, the Massachusetts General Hospital area, and the North Station-Boston Garden complex.

In the total study area, the distribution of daytime activity was the major activity intensity determinant while the night time activity pattern was unrelated to

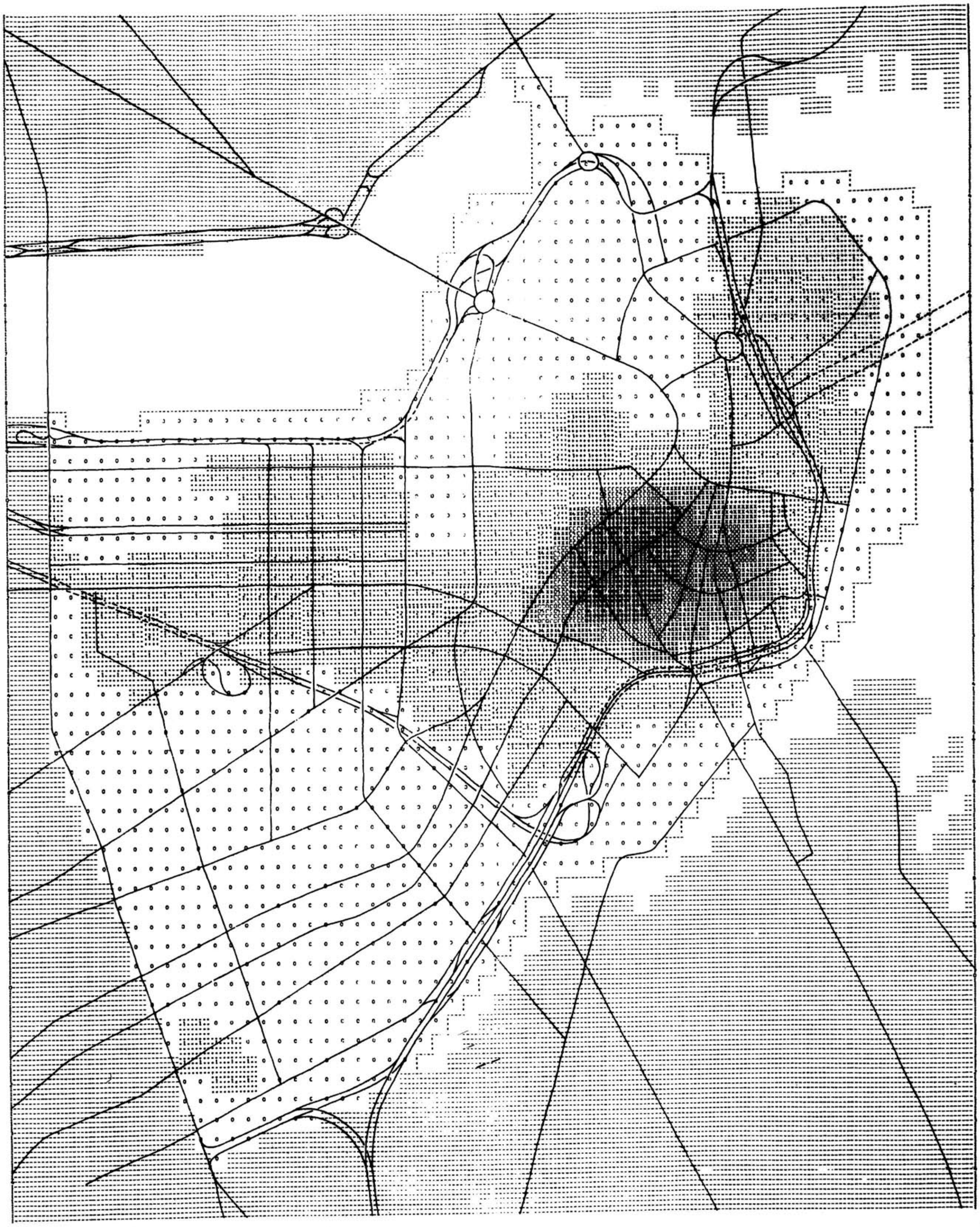
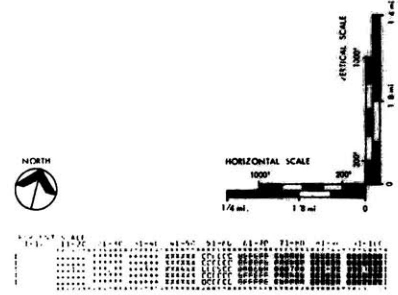


FIG. 6.10 ACTIVITY INTENSITY RESPONSES



TOTAL SAMPLE (48)

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ACTIVITY INTENSITY

the evaluation of busyness. As expected, frequent use was also highly correlated with the attribution of activity intensity to a place. The places which were identified as having intense activities also had high values of form intensity and were highly exposed to pedestrians. Of the various information sources, the presence of rooted signs was the only significant correlate.

There were no substantial differences between the response patterns in the total area and the downtown core. In sum, places which were perceived as being busy actually had this character and, in general, the surveyed structure of activity intensity was accurately perceived.

THE CHARACTERISTICS OF MEANINGFUL PLACES: INTENSITY

In the questions investigating the evaluations of form and activity intensity, the respondents were asked to identify only the highly intense places. It was assumed that places which were not identified as being highly intense were consciously seen as being less intense than the mentioned places. While it is possible that these less often mentioned places were simply not known, the wide spatial distribution of the knowledge of form and activity type suggests that ignorance was less important than purposeful selection in shaping the patterns of the intensity responses.

The subjects' descriptions of form and activity intensity were very highly correlated within the total study area (.80). In the downtown core, the correlation was even higher (.92). These high correlations, again, confirm Hypothesis 4. As in the type analysis, the evaluations of form and activity intensity were more closely related than their surveyed values (.80 vs. .49 in the total area; .92 vs. .41 in the downtown core).[1] There were some exceptions however. Important centers

[1]An inspection of the graphic coding showed that the interview responses tended to be more coarsely districted than the survey measures. Thus, while the interview form and activity responses were extremely closely related, both responses were sometimes in error. This phenomenon was particularly likely to occur in those areas where fine gradations in actual environmental intensity were discriminable.

of power like the State House and parts of the financial office district were among the relatively few places whose activities were described as being much more intense than their forms. In contrast, the evaluation of form intensity exceeded that of activity intensity in portions of the North End and South End. These areas with their narrow streets appear to be relatively more densely built up than is warranted by their essentially residential character.

In general, the subjects' appraisals very closely reflected the findings of the surveys. The total frequency with which the form and/or the activity of a place was evaluated as being intense correlated significantly with both form intensity and activity intensity. The survey variables which most influenced the subjects' evaluations of form and activity intensity were high frequency of use, high floor-area-ratio, many signs, destinations for many people, and high pedestrian exposure. These were all influential in transmitting the sense of busyness in a place.

The important role of intensity congruence in accurate evaluation can be seen in the scatter diagram which distributes the place responses according to their form and activity intensity values, and then normalizes the distribution by the frequency of occurrence of the value sets (fig. 6.11). The diagram demonstrates that the

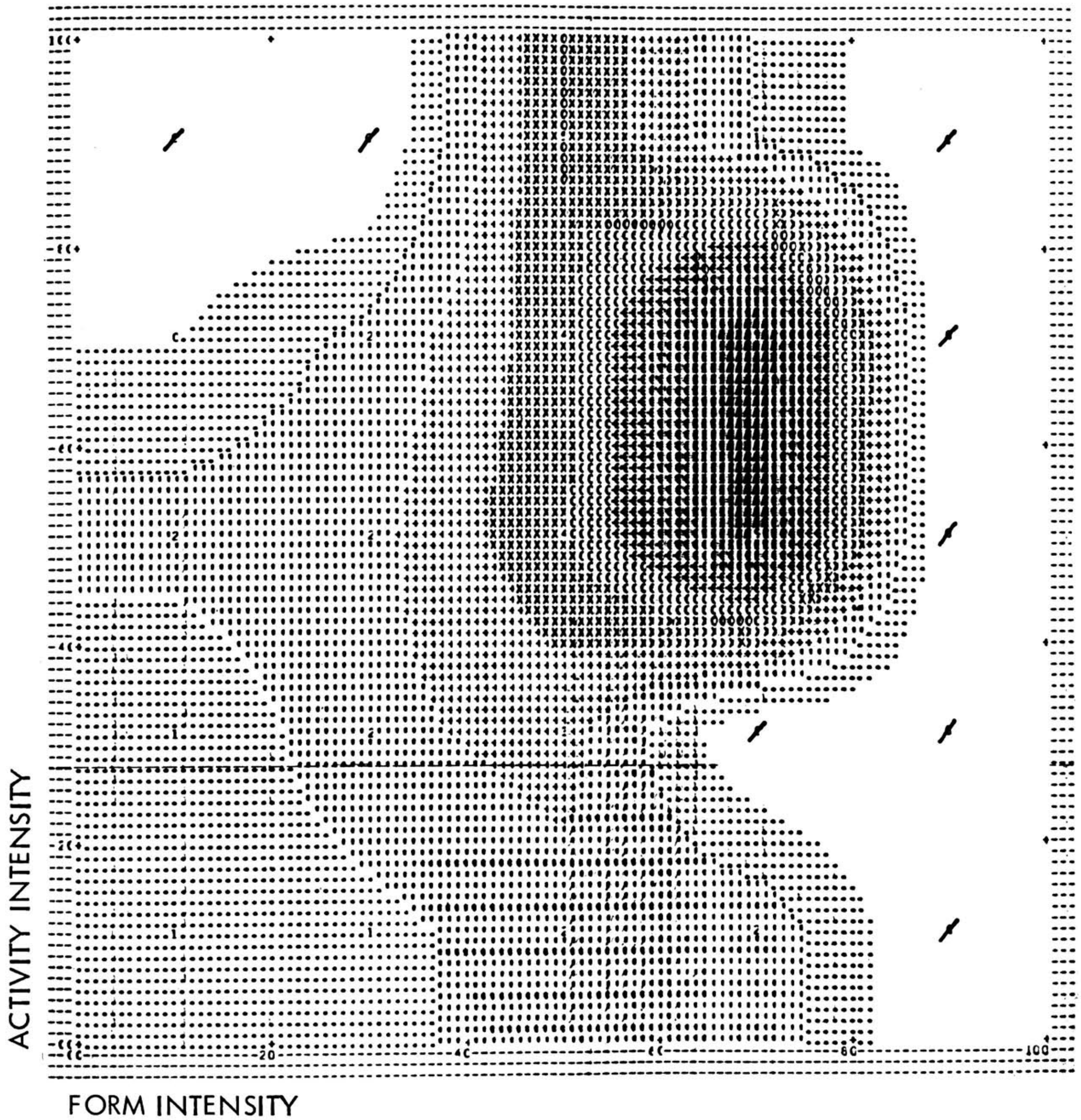


FIG. 6.11

INTENSITY RESPONSES PER PLACE
DISTRIBUTED AND NORMALIZED FOR SURVEYED
FORM INTENSITY AND ACTIVITY INTENSITY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	C.CC	7.0C	14.0C	21.00	28.00	35.00	42.00	49.00	56.00	63.0C
MAXIMUM	7.CC	14.0C	21.0C	28.00	35.00	42.00	49.00	56.00	63.00	70.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	C.CC	10.0C	20.0C	30.0C	40.00	50.00	60.00	70.00	80.00	90.00
MAXIMUM	1C.CC	20.0C	30.0C	40.0C	50.00	60.00	70.00	80.00	90.00	100.00

LEVEL	NO CASES	1	2	3	4	5	6	7	8	9	10
SYMBOLS	/	C	....1....	''''2''''	++++3++++	XXXX4XXXX	((((((((				

greater the form and activity values and the higher their congruence, the more often a place is described as intense, thus providing support for Hypothesis 5.

SIGNIFICANCE RESPONSES

Form Exposure: Which are Central Boston's most noticeable physical features? For example -- those that are the most striking, those that can be seen for the longest time ... Please outline or mark these places and areas on the map.

The question aimed at identifying those places and areas whose form characteristics were most generally exposed to and noticed by people. Subjects were only asked to identify highly noticeable places and all non-marked places were assumed to have lower values. Appendix K, Fig. k.7 displays the graphic coding of form significance, and the computer analysis is mapped in fig. 6.12. Table 6.6 presents the correlations between the form exposure responses and the survey variables.

The most noticeable places in the total study area were highly exposed to pedestrian views but, with the exception of the highly visible Prudential Center, neither high vehicular exposure nor high exposure from the mass transit system significantly affected their selection. Thus while Hypothesis 2 was not confirmed from the general measure of form exposure, the pedestrian exposure component provided a partial confirmation. The low correlations of vehicular and mass transit views indicate that high potential exposure from these flow systems does not guarantee high noticeability. The most noticeable places

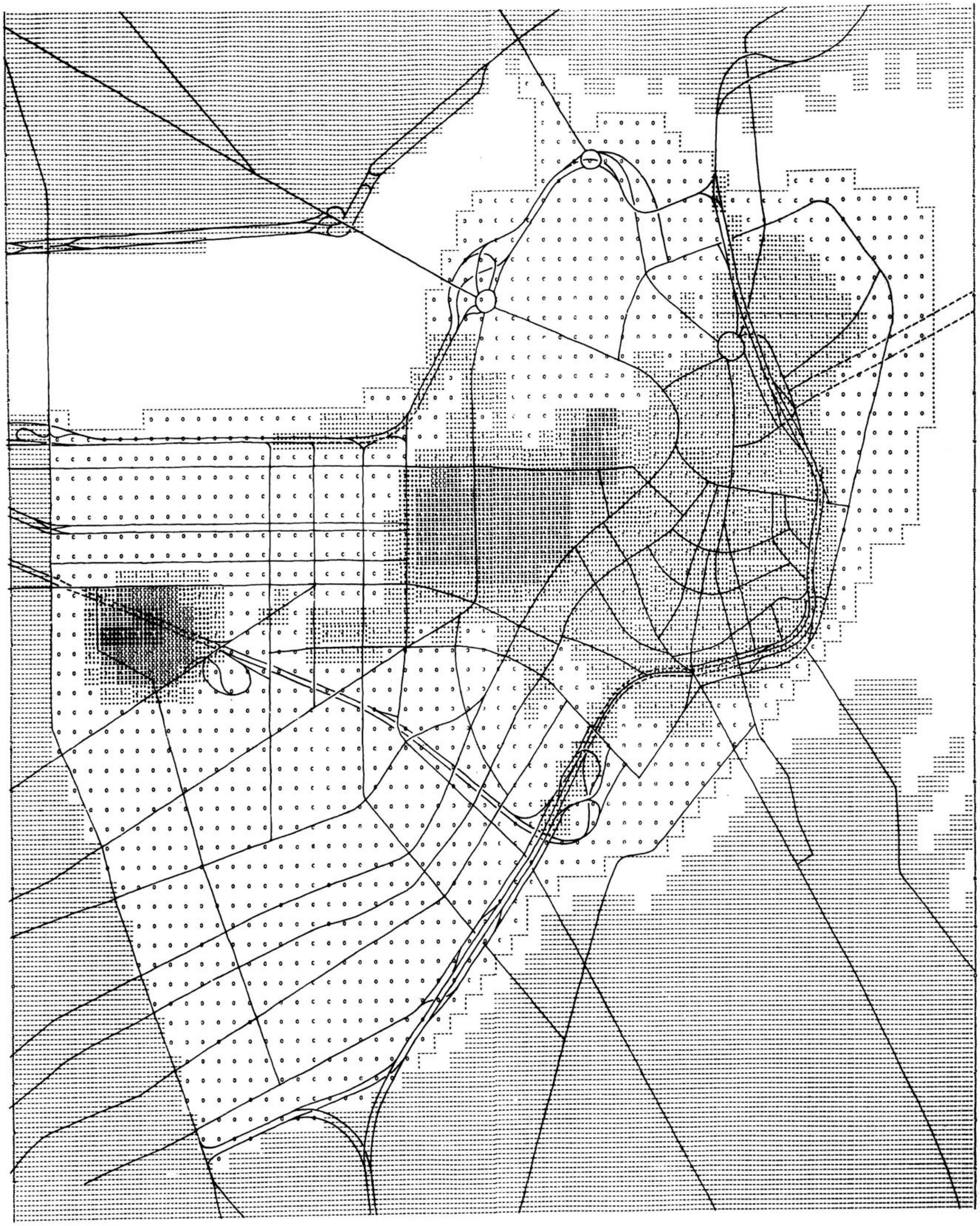
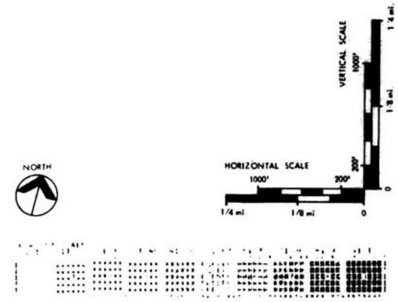


FIG. 6.12 FORM EXPOSURE RESPONSES



TOTAL SAMPLE (48)

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FORM SIGNIFICANCE

TABLE 6.6 CORRELATIONS BETWEEN THE SIGNIFICANCE RESPONSES OF THE TOTAL SAMPLE AND THE SURVEY VARIABLES

	SIGNIFICANCE RESPONSES			
	Form Exposure		Activity Significance	
Survey Variables	Total Study Area	Downtown Core	Total Study Area	Downtown Core
Form Type Frequency	-.23	.16	-.17	-.03
Construction Type	---	---	---	---
Transparency	.21	.02	.09	.06
Height	-.04	.05	.23	.23
Quality	.26	.09	.20	-.11
Activity Type Frequency	-.17	-.11	-.15	-.01
Type Congruence (Matrix)	---	---	---	---
Type Congruence (Frequency)	---	---	---	---
Form Intensity	.03	.03	.42**	.32*
Floor-area-ratio	-.04	.05	.22	.23
Rooted Sign Size	.00	-.11	.17	.13
Visible Activity	.17	.10	.18	.21
Visible Objects	.02	-.03	.05	.08
Non-visual information	.05	-.02	.02	-.03
Form Stereotype	.04	.02	.03	.14
Form Information Intensity	.08	-.02	.15	.19
Activity Intensity	.20	.18	.42**	.30*
Destinations	.34*	.19	.52**	.37**
Hours Per Place	-.22	-.03	-.14	-.12
Person Hours Per Day	.20	.12	.47**	.36**
Person Hours Per Night	-.02	.00	-.03	-.07
Intensity Congruence	---	---	---	---
Form Exposure	-.03	-.02	.17	-.06
Visibility Area	.18	-.09	.03	-.25
Vehicular Exposure	.07	-.05	.03	-.20
Mass Transit Exposure	-.12	.25	-.16	-.09
Pedestrian Exposure	.40**	.21	.61**	.48**
Activity Significance	.40**	.16	.38**	.13
Realm	.24	.02	.25	.15
Decision Significance	.22	.14	.30*	.15
Symbolic Significance	.36**	.14	.26	-.00
Significance Congruence	---	---	---	---
Form Recency	.14	.22	- .05	-.20
Activity Recency	.19	.31*	-.03	.18
Frequency of Use	.19	.30*	.53**	.67**

With a sample size of 48 subjects, correlation coefficients of greater than .28 are statistically significant at the . 05 level (*) and correlations of .36 are significant at the .01 level (**). Source: Edwards (1950), table 6, p. 408.

also had significant activities, and particularly activities of symbolic significance. However, while they were also the object of many destinations, they were not necessarily places which were used frequently by the sample. The three areas whose forms were most often evaluated as noticeable were the Prudential Center, the Boston Common and Public Garden, and the State House. While these areas had the attributes mentioned above, their forms were also strongly differentiated from their surroundings, and visual contrast seems to have increased the noticeability of these important places.

In the downtown core, frequently used places and those with recent activities were more often evaluated as being noticeable. However, none of the other surveyed variables was strongly related to the subjects' responses in this area. The most striking aspect of the subjects' evaluations of form exposure in the downtown core was the lack of influence of vehicular exposure. The concentration of traffic (even of rush hour traffic which is standing still) on the Central Artery, and the finding that many important places are highly exposed from this route seemed to make very little difference in the appraisal of noticeability.

ACTIVITY SIGNIFICANCE

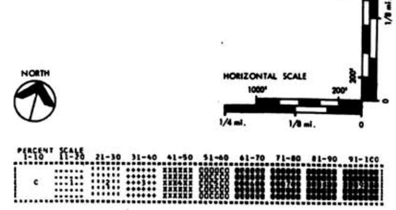
Activity Significance: Which of these places and areas are the most important to Boston and its People?
Please outline or mark them on the map.
Would you also write down why they are important.

This question probed the evaluation of the relative importance of the activities of the study area. It aimed at identifying those activities which subjects evaluated as being significant to the total population, and not just to themselves. They were asked to mark only highly valued places and all other places were assumed to have lower values. The graphic coding of activity significance is displayed in Appendix K, fig. K.8. The computer analysis is mapped in fig. 6.13. Table 6.6 (p. 168) also includes the correlations between the activity significance responses and the survey variables.

The evaluation of activity significance in the total study area was generally an accurate reflection of the surveyed values of activity significance, thus confirming Hypothesis 3. The places which were noted as having the most important activities also tended to be those which were most frequently used by the sample and which had high activity intensity, particularly many destinations.

FIG. 6.13 ACTIVITY SIGNIFICANCE RESPONSES

TOTAL SAMPLE (48)



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ACTIVITY SIGNIFICANCE

Since their selection was closely related to daytime activity intensity, they were also highly exposed to pedestrian views. The activity significance responses were also related to form intensity and their principal form type correlate was building height. The places and areas which were most often evaluated as having important activities, e.g. the downtown shopping area, the financial district and the government offices around the State House, combined several of these attributes. They tended to be frequently used places with important and busy activities which were physically expressed in large buildings, highly exposed to pedestrians.

In the downtown core area, frequency of use, pedestrian exposure, intense activities, and intense forms were the dominant determinants of the evaluation of the activity importance of places. Since the downtown core area contained most of the places which were surveyed as having important activities, this variable was less of a factor in the subjects' evaluations. The costs of the lack of exposure from the vehicular and mass transit systems were obvious in their lack of influence in the response patterns.

THE CHARACTERISTICS OF MEANINGFUL PLACES: SIGNIFICANCE

In both study areas, there were sizable correlations between the subjects' evaluations of form exposure and activity significance, and, in both cases, these correlations were higher than those of the surveyed significance congruence (.57 vs. .26 in the total study area; .33 vs. .20 in the downtown core). These findings provide additional confirmation of Hypothesis 4. However, the high correlations between the evaluations of form exposure and activity significance were primarily attributable to the accurate but low rankings of most places.

The striking feature of the subjects' responses was the extent to which they accurately reflected the findings of the surveys of form and activity significance. The great majority of places received low significance rankings, a small number of places were described as having highly noticeable forms, and a small number of different places were known for their highly important activities. Aside from activity significance and form exposure to pedestrians, the surveyed variables which most influenced the evaluations of place importance were frequency of use and activity intensity. Vehicular exposure was conspicuously lacking in influence.

The role of congruence in the evaluation of significance can be seen in a scatter diagram which distributes and normalizes the responses according to their surveyed form exposure and activity significance (fig. 6.14). Places tended to be evaluated as significant primarily because of their important activities, with high significance congruence increasing the likelihood of evaluation. The places whose forms were described as being highly noticeable tended to have significant activities, but the activities that the subjects identified as being important were not always located in highly exposed forms. Thus, as in the results of the type and intensity analyses, significance congruence does not guarantee a high response, but its absence can act to prevent one.

FIG. 6.14

SIGNIFICANCE RESPONSES PER PLACE
DISTRIBUTED AND NORMALIZED FOR SURVEYED
FORM EXPOSURE AND ACTIVITY SIGNIFICANCE

ABSOLUTE VALUE RANGE APPLYING TC EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	3.40	6.80	10.20	13.6C	17.CC	2C.4C	23.80	27.20	30.60
MAXIMUM	3.40	6.80	10.20	13.60	17.CC	2C.4C	23.8C	27.20	30.60	34.00

PERCENTAGE OF TOTAL ABSCLUTE VALUE RANGE APPLYING TC EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	10.00	20.00	30.00	4C.0C	50.CC	6C.CC	7C.00	80.00	90.00
MAXIMUM	10.00	20.00	30.00	40.00	50.0C	60.CC	7C.CC	8C.00	90.00	100.00

LEVEL	NO CASES	1	2	3	4	5	6	7	8	9	10
SYMBOLS	/	C	1	2	+3	X4	05	6	7	8	9

CHAPTER SEVEN: THE EFFECTS OF PERSONAL DIFFERENCES ON THE MEANINGFULNESS OF THE ENVIRONMENT

THE ANALYSIS METHODS

The effects of the various personal variables were tested by comparing subgroup responses to the form and activity type questions. The sample was designed so that comparisons could be made between subgroups which varied in only one respect, all other variables being matched (See table 6.1 for a description of the sample design.). The type questions were chosen as the basis for the comparative analysis because their responses reflected the overall knowledge of the subjects more closely than did the questions that probed for the selective evaluations of the intensity and significance of places.

The influences of the personal variables on both the extent and complexity of responses were examined. For each subsample, the extent of knowledge was measured by the number of different places described or identified, and by their frequency of mention. The complexity of knowledge was measured by the number of discrete elements into which the form description and activity identification responses were divided.

The influence of a personal variable upon the extent of response was reflected in the correlation coefficient expressing the relationship between the response patterns of the subgroups. If the responses were very different, the correlation would be low -- providing evidence that the personal variable was an important determinant. If the responses were very similar, the correlation would be high -- evidence that the personal variable had a negligible effect. In the tests of the effects of the personal variables on response complexity, dichotomous cross-tabulations (2 X 2 tables) were used. The total set of scores was divided at the point of mean response complexity and the scores of subjects in each group were designated as high or low. The chi-square statistical test was used to determine whether there was a significant difference between subsamples in the relative proportion of high and low scores. Several of the subgroup responses were graphically displayed by The SYMAP program in order to determine which specific places or areas produced differences in knowledge. Table 7.1 summarizes the results of the analysis of subsample differences in response extent.[1] Table 7.2 presents the complexity differences.

---

[1]A number of supplementary methods were used in the analysis of personal differences in response extent. Correlations between the various survey variables and subjects' responses were obtained for each subgroup. Since there were no differences greater than .15 between the survey-subject correlations for any set of personal variable subsamples, these results are not reported separately. Also, the total number of mentioned places and the mean percentage of subject-mentions per place were calculated for each subgroup. Again, since there were no substantial differences, these results are not reported separately.

TABLE 7.1 CORRELATIONS BETWEEN THE PERSONAL VARIABLE SUBGROUPS, SIMILARITY OF RESPONSE EXTENTS

Personal Variable	Form Type Response Extent: Total Area	Form Type Response Extent: Downtown	Activity Type Response Extent: Total Area	Activity Type Response Extent: Downtown
Inner City Outer City	.80	.84	.60	.84
Short Residence Time (low familiarity) Long Residence Time (high familiarity)	.85	.80	.88	.87
Automobile Mass Transit	.90	.81	.92	.91
Lower Class Middle Class	.92	.89	.92	.85
Female Male	.90	.86	.89	.83

TABLE 7.2 PERSONAL VARIABLE SUBGROUP DIFFERENCES IN RESPONSE COMPLEXITY, DICHOTOMOUS CROSS-TABULATION TABLES

Personal Variable	Form Type Complexity				Activity Type Complexity			
	Free Response		Total Response		Free Response		Total Response	
	(0-8)	(9+)	(0-15)	(16+)	(0-13)	(14+)	(0-32)	(33+)
Inner City	13	11	12	12	12	12	12	12
Outer City	11	13	14	10	15	9	12	12
Short Residence Time (low familiarity)	10	14	15	9	18	6*	16	8*
Long Residence Time (high familiarity)	13	11	11	13	9	15	9	15
Automobile	10	14	12	12	13	11	14	10
Mass Transit	14	10	14	10	14	10	10	14
Lower Class	12	12	14	10	13	11	12	12
Middle Class	12	12	12	12	14	10	12	12
Female	10	13	11	12	14	10	9	14
Male	14	11	15	10	12	12	15	10
20-29 years old	4	12*	7	9	9	7	7	9
30-39 years old	9	9	8	10	10	8	8	10
40+ years old	11	3	11	3	8	6	9	5

DISTANCE: PLACE OF RESIDENCE

Since every person in the sample frequently used the downtown core area, tests of the effects of distance were based upon place of residence. Inner city residents, those who lived within the study area, (the North End, the South End and Beacon Hill) were contrasted with outer city residents (Roxbury, Chelsea and Cambridge).[1] While the differences in distance between the inner city residences and those of the outer city were not large in a regional context, it was expected that the proximity of the inner city residents to the study area would be reflected in more extensive and more complex knowledge of both forms and activities.

The prediction was generally not substantiated. The form descriptions of the inner and outer city subsamples did not vary in extent or complexity for either the total study area or the downtown core. The activity identification responses of the place of residence subsamples were also very similar in the frequently used downtown core area, but there were differences in response extent for the total study area. A visual inspection of the total area activity responses (figs. 7.1 and 7.2) indicated that the inner city residents had more extensive knowledge and that this superiority was particularly

[1]The specific outer city residential districts were chosen because the subjects who used the mass transit system can enter the study area on elevated lines. This permitted the test of the effects of travel mode differences. Their selection also minimized entry direction biases.

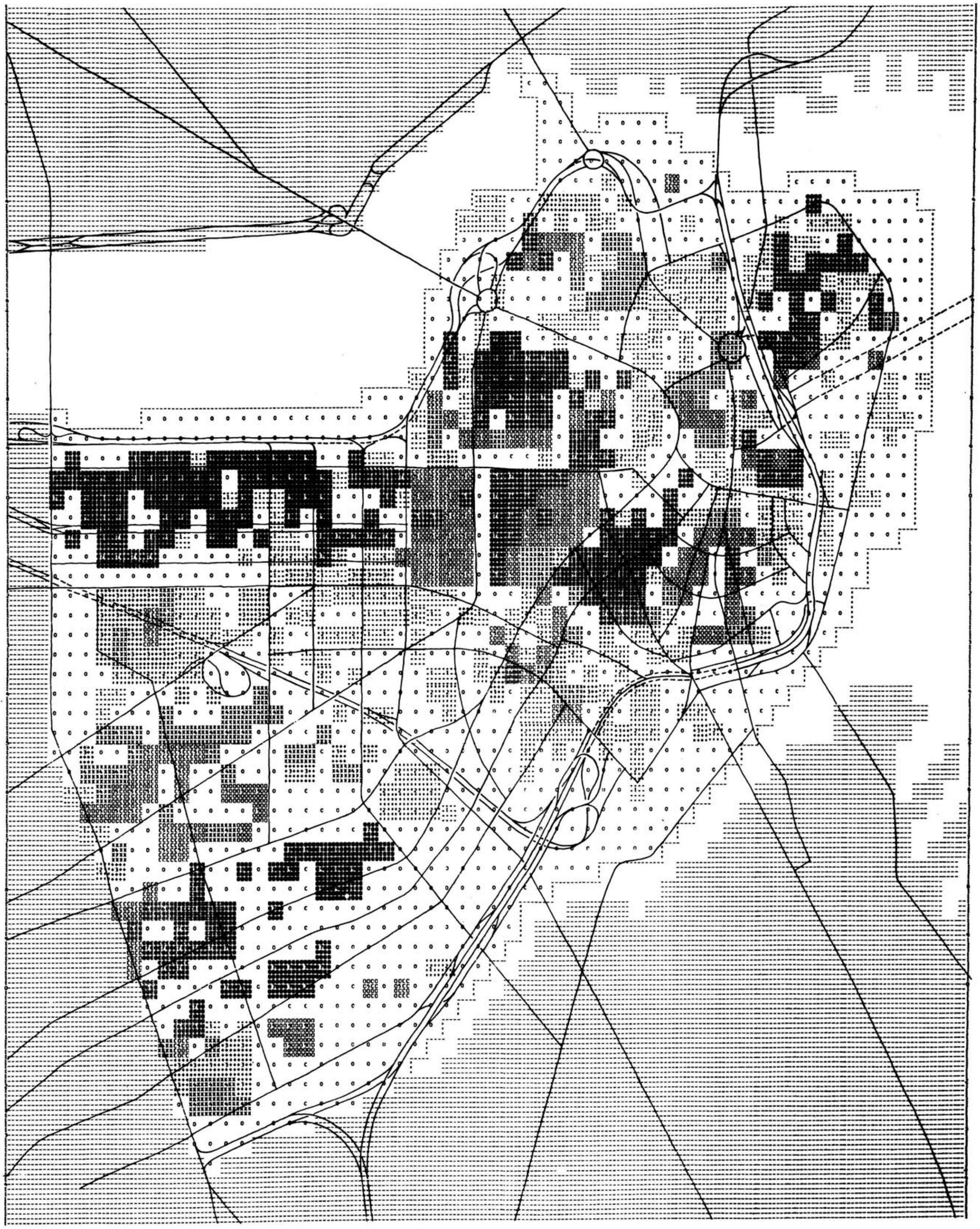
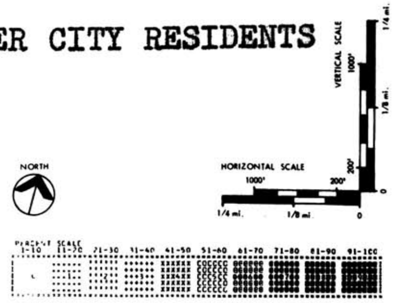


FIG. 7.1 ACTIVITY TYPE, TOTAL RESPONSES, INNER CITY RESIDENTS

INNER CITY RESIDENTS (NORTH END, SOUTH END, BEACON HILL) (24)



ACTIVITY TYPE (FREE, AREA, CHECK LIST)

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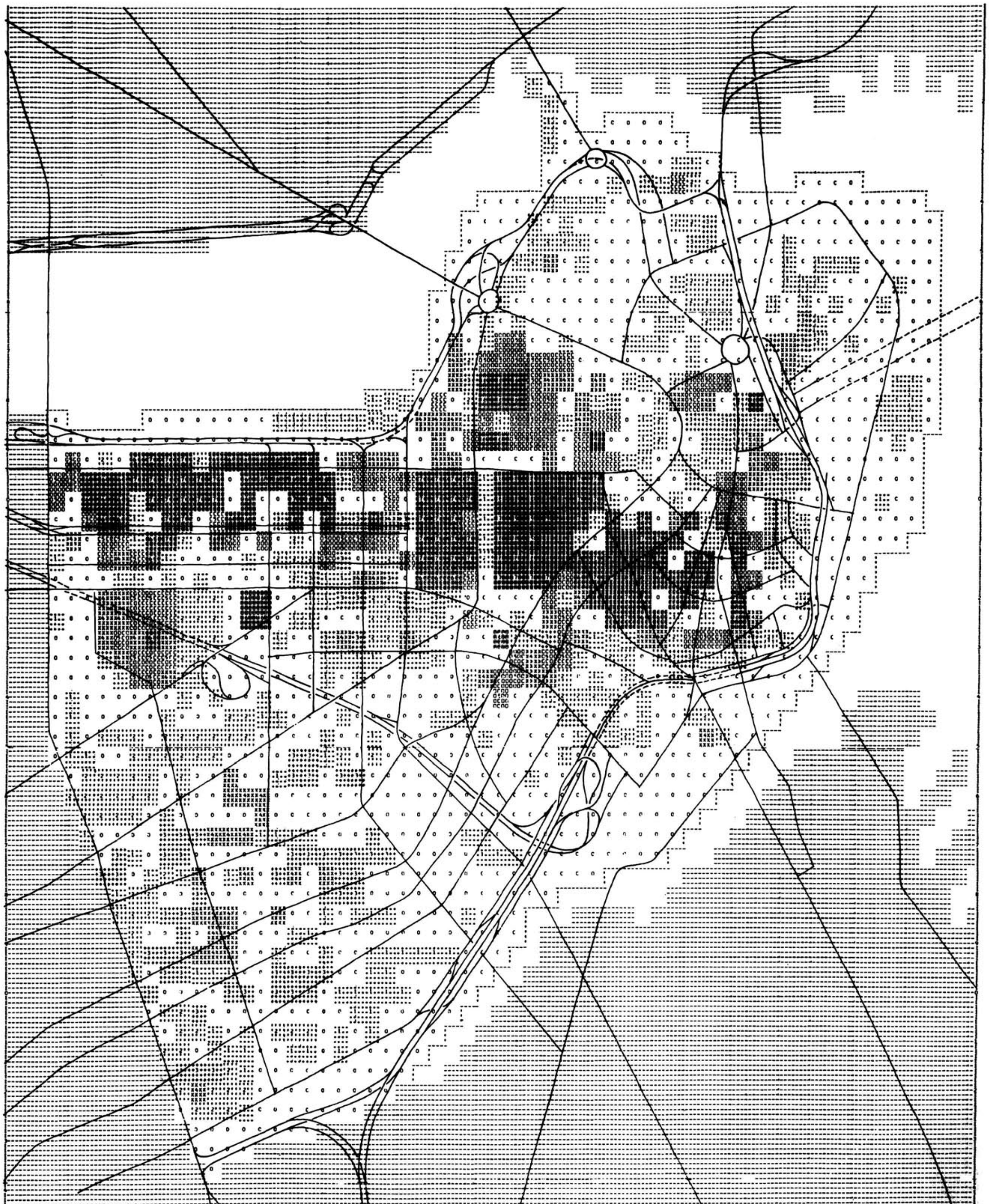
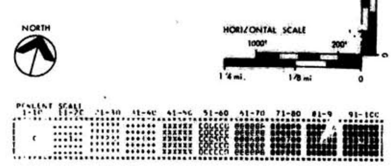


FIG. 7.2 ACTIVITY TYPE, TOTAL RESPONSES, OUTER CITY RESIDENTS

OUTER CITY RESIDENTS (CHELSEA, ROXBURY, CAMBRIDGE) (24)



ACTIVITY TYPE (FREE, AREA, CHECK LIST)

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pronounced in residential areas. There were no differences between the subsamples in activity complexity.

SECTOR: PLACE OF RESIDENCE

The analysis of the effects of travel between the residential sectors and the downtown core was not as well controlled as were the tests of other personal variables.[1] Since it also involved three subsamples, only visual comparisons were made of the graphic coding of the total form and activity responses (See Appendix L for the graphic summary coding sheets.)

The subjects who lived in the Northeast and Northwest sectors were more similar in their responses than either of these groups was to the Southwest sample. While it is likely that route overlap accounts for some

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[1]There were significant racial and ethnic differences among the samples obtained from the three sectors. In the Southwest sector, the Roxbury sample was mainly Negro, while most of the South End subjects were of Middle Eastern descent; in the Northeast sector, the respondents from both the North End and Chelsea were primarily of Italian origin; and in the Northwest sector, many of the subjects in both Beacon Hill and Cambridge, were white Anglo-Saxon Protestants. Another factor which may have influenced the analysis of sector effects was the exact location of the entry routes into Central Boston. There is some overlap between the entry ways from the Northeast and Northwest sectors, while the routes from the Southwest are clearly separate.

of the similarities, it cannot explain all the differences among sector subsamples in the extent and complexity of responses. The Southwest respondents -- those from Roxbury and the South End, clearly knew more about the total study area than did those in the other two groups. While the Northeast and Northwest subjects knew the areas within the sectors that they traversed to enter the downtown core, they were relatively ignorant about the Southern portion of the study area. The opposite was not the case; the Southwest subjects not only knew their own sector but they also exhibited a high degree of knowledge about the northern portion. Since a large proportion of the Southwest sample was Negro, this finding may mean that greater knowledge not only reflects exposure to and direct participation in activities, but that sometimes the possibility of exclusion can also give meaning to a place.

LENGTH OF TIME OF RESIDENCE

Length of residence time was chosen as the general measure of familiarity under the assumption that the longer one lives in an area, the more contacts one has with it. The sample was divided into those subjects who had been living in the Boston area for a relatively short time, from 0 - 4 years, and those who had been residents of the area for more than 10 years.[1] It was anticipated that a longer residence time would result in a more extensive and complex knowledge of activity. However, since all the subjects had had some exposure to the physical form of the study area, it was expected that their knowledge of form would not vary significantly.

Long and short time residents did not differ in the extent of their form or activity type responses, either for the total study area or within the downtown core. There were, however, differences in response complexity. For form responses, the complexity contrasts were minor. Short time residents gave more complex responses to the "free" question where the places mentioned presumably had the most salient form characteristics, but the total

[1]The less familiar group had a mean residence time of 2 years and an average age of 28 years, while the more familiar group had a mean residence time of 25 years and an average age of 35 years.

complexity of the long term residents was greater. The substantial differences were in the activity responses, where the more familiar, long term residence group gave significantly more complex responses to the total set of activity identification questions. The effect was most pronounced in the free responses. Thus, greater familiarity resulted in a much more detailed and complex knowledge of the activities of the study area.

TRAVEL MODE

The influence of travel mode was analyzed by grouping the subjects into those who travelled primarily by automobile and those who usually used the rail mass transit system (M.B.T.A.). Since all the respondents walked from their parking areas and M.B.T.A. stations to their destinations, the major difference between transportation modes was in the entry and through route characteristics. Since the automobile routes are both widespread and continuously above grade in contrast with the underground mass transit system, and since the driver has more direct contact with the environment than does the passive mass transit rider, it was expected that the automobile users would have a more extensive and complex knowledge of the area. In addition, it was further expected that the automobile subsample would be more oriented toward physical form than would the mass transit group.

There were no substantial differences between the travel mode subsamples in the extent of their form or activity knowledge, either within the total study area or in the downtonw core. Again, the only differences were in the complexity of responses. While the complexity of total form responses was similar in the subsamples, analysis of the responses to the more subjectively important free question indicated that the automobile subsample gave more complex form responses. Thus while the overall form knowledge of the two groups was similar, perhaps reflecting their common pedestrian experiences, form orientation was somewhat more salient for automobile users than for mass transit riders. However, in the activity responses, the pattern was reversed. The total activity knowledge of transit riders was somewhat more complex. Thus, the two subsamples knew the study area equally well, but while the automobile users were a little more likely to perceive the physical form of the environment, the mass transit users were slightly more oriented towards activities.

Socio-economic Class

It was expected that the lower class subjects -- those who had a maximum annual income of $4000, low occupational ranking and/or had not graduated from high school, would have a somewhat greater knowledge of the study area than would the middle class respondents -- those who had incomes over $6000 per year, high occupational rankings and/or had at least graduated from high school.[1] This expectation was based

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[1]The focus on income, occupation and education as measures of class was derived from Shevsky and Bell (1955). The subjects were categorized on the basis of information obtained by the interviewer.

on the theory that the middle class generally tends to avoid the central city. It was further anticipated that the activity knowledge patterns would reflect some of the social class distinctions of the residential and commercial sections of the study area.

The analysis of the extent and complexity of form and activity knowledge indicated no differences between the subsamples in either the total study area or in the downtown core. While the overall response patterns were highly similar, graphic analysis of activity responses revealed some specific differences between the social class subsamples (figs. 7.3 and 7.4). Both groups were equally familiar with the principal retail commerce area along Washington Street, but the middle class sample had a substantially greater knowledge of the upper and middle income commercial area around Boylston and Newbury streets. The middle class group was also aware of the areas that had changed recently -- the Prudential Center, the Government Center and the West End redevelopment area. On the other hand, the lower class group was more familiar with the established centers of employment -- the financial and office districts and the wholesale markets. While the similarities between the subsamples were far greater than the differences, the patterns of activity knowledge reflect in minor ways both use and social affinity.

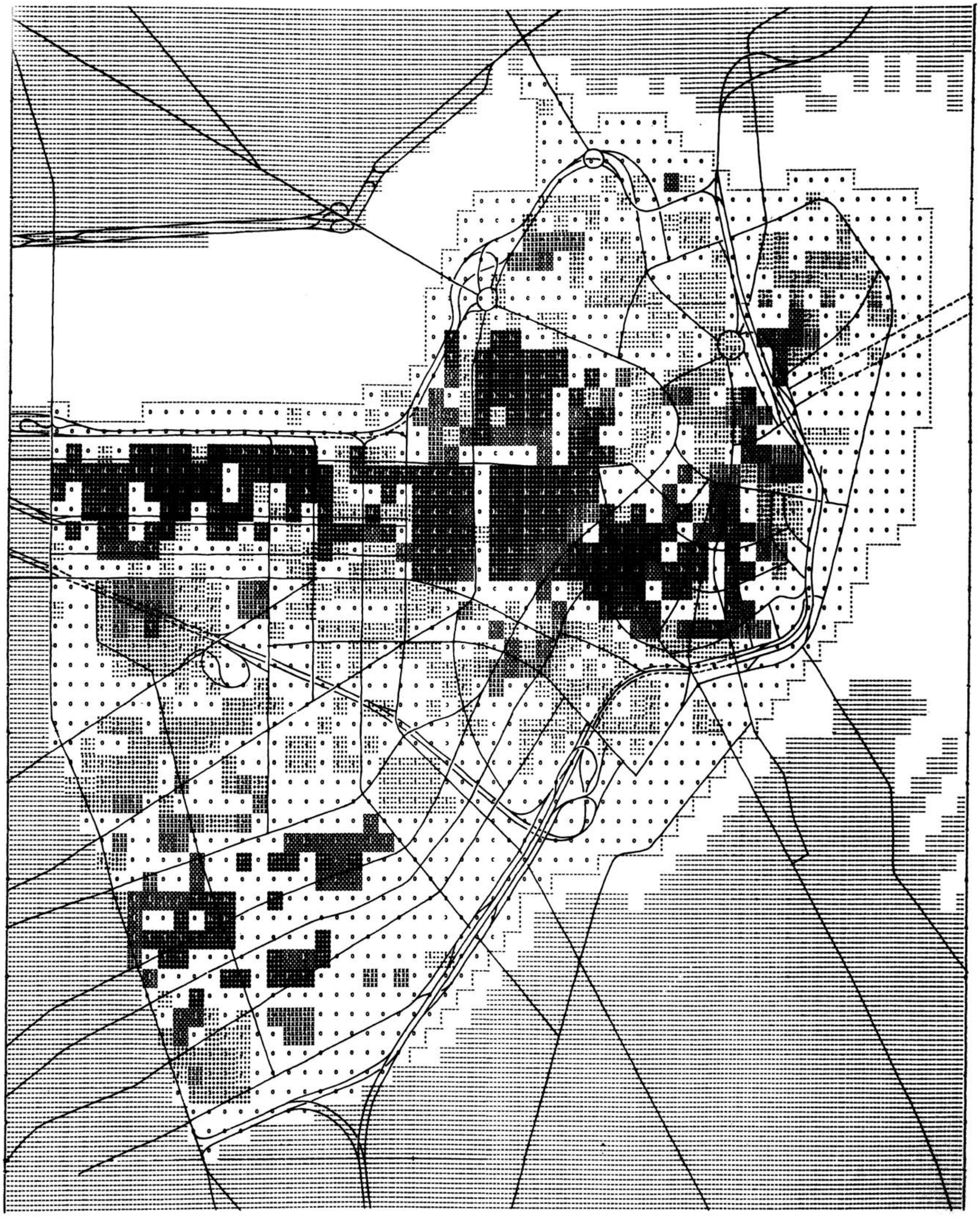
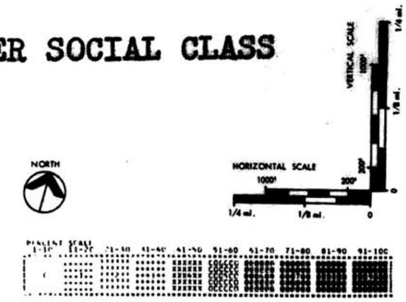


FIG. 7.3 ACTIVITY TYPE TOTAL RESPONSES, LOWER SOCIAL CLASS



LOWER SOCIAL CLASS/INCOME (24)

ACTIVITY TYPE (FREE, AREA, CHECK LIST)

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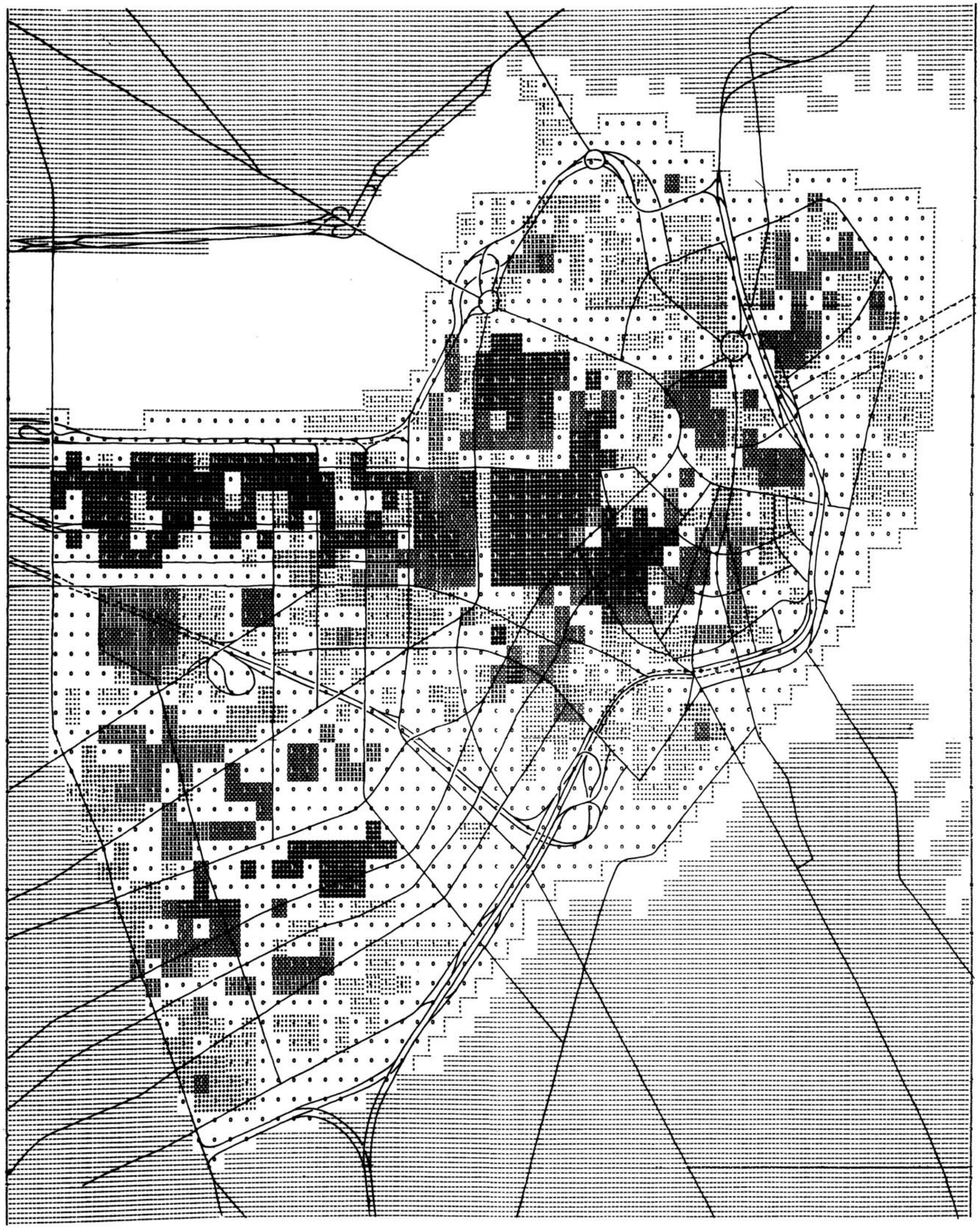
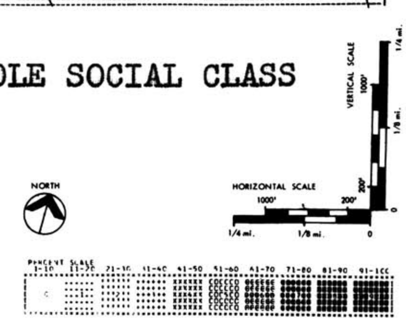


FIG. 7.4 ACTIVITY TYPE, TOTAL RESPONSES, MIDDLE SOCIAL CLASS



MIDDLE SOCIAL CLASS/INCOME (24)

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ACTIVITY TYPE (FREE, AREA, CHECK LIST)

Sex

While sex was not a principal variable in the selection of the sample, there was a fairly even distribution of men and women among the respondents. It was expected that men would have a more extensive knowledge of both the form and activity of the study area. The presumption was that women would be primarily familiar with shopping and entertainment areas while men would have had generally wider urban experiences.

The major expectation was not substantiated by the analysis. There were no differences between men and women in the extent of form or activity knowledge, either in the total study area or in the downtown core. However both the form and the activity knowledge of the women was more complex, the greater complexity resulting from a more detailed knowledge of the shopping and entertainment areas.

Age

Age was also not a principal sample selection variable and its analysis was further complicated by the relationship between age and residence time (familiarity). The subjects, all adults, were divided into three age groups: 20-29 years old, 30-39 years old, and 40 years and older. Because there were three groups and because they were not controlled for other personal differences, no comparisons were made of differences in the extent of their form and activity responses. The analysis of complexity did not reveal any differences between the younger two groups. However, there was a substantial decline in complexity among the eldest subsample, particularly in the complexity of form descriptions.

CHAPTER EIGHT: SUMMARY AND CONCLUSIONS

SUMMARY: WHY PLACES ARE MEANINGFUL

The survey of form and activity characteristics was independent of the analysis of the knowledge of these attributes. The form and activity characteristics of the places in the study area were first surveyed for their type, intensity and significance attributes and, as expected, they were generally congruent. Hypothesis 1 was generally confirmed by the survey findings. The places in the study area exhibited high levels of type and intensity congruence. There was a high degree of regularity between form types and activity types, and between the most intense forms and the busiest activities. The overall significance congruence of the study area was also high, but most of the places were relatively insignificant, and the places with important activities were not those whose forms were the most visible. Among the more interesting subsidiary findings of the survey were: that type incongruence required the compensatory presence of signs for identification: that the occurrence of type incongruence was generally due to a unique activity being present in a common form (and not the activity for which the form was originally built); that rooted signs and form stereotypes were the most prevalent sources of potential information; that there was a highly cyclical difference between daytime and nighttime activity intensity; that there was a striking lack of spatial overlap between the views from the various transportation systems, and that compared with pedestrian movements, the vehicular and mass transit systems failed to expose the places with significant activities.

A selected subject sample was then interviewed in order to establish their knowledge of these form and activity attributes. In general, there were significant correlations between the form responses to the directed questions of the protocol and the surveyed form characteristics, and between the activity responses and the surveyed activity characteristics -- thus confirming Hypotheses 2 and 3. Hypothesis 4 was confirmed in its prediction that knowledge of the form of a place tends to be associated with that of its activity. The strength of the tendency to interrelate place meanings was evident in the repeated finding that the form-activity response correlations were higher than the levels of surveyed congruence. Thus, once a place was known, it tended to be known for all of its salient form and activity characteristics.

While finding that there is a measurable consistency between urban form and activity, and that people tend to have a highly reversible knowledge of places is important, it is the relationship between them that is crucial to city design. The central focus of the research was upon the ways in which the environmental attributes of form and activity act as potential transmitters of meaning. The key issue was therefore, which places were meaningful, and why. Table 8.1 presents a summary table of the significant correlations between the survey variables and the interview responses.

Direct personal participation -- frequency of use-- was the most consistently high correlate of whether or not a place was meaningful. No other variable played so powerful a role, whether in the description of place type, the evaluation of intensity or the appraisal of significance. If a person often used a place, he was likely to be more accurately aware of all of its form and activity attributes. This is evident from the consistently higher correlations between the interview responses and frequency of use in the downtown core area, as compared with those in the total study area. On the other hand, if a person never used a place, he was less likely to know any of its characteristics.

TABLE 8.1 SIGNIFICANT CORRELATIONS[1] BETWEEN THE INTERVIEW RESPONSES AND THE SURVEY VARIABLES

Survey Variables	Form Type		Activity Type		Form Intensity		Activity Intensity		Form Exposure		Activity Significance	
	Total Area	Dntn Core	Total Area	Dntn Core	Total Area	Dntn Core	Total Area	Dntn Core	Total Area	Dntn Core	Total Area	Dntn Core
Form Type Frequency	.30	-	-	-	-	-	-	-	-	-	-	-
Construction Type	-	-	-	-	-	-	-	-	-	-	-	-
Transparency	-	-	-	-	-	-	-	-	-	-	-	-
Height	-	.44	-	-	.29	-	.28	-	-	-	-	-
Quality	-	-	-	-	-	-	-	-	-	-	-	-
Activity Type Frequency	.33	-	.50	-	-	-	-	-	-	-	-	-
Type Congruence (Matrix)	.31	-	.37	-	-	-	-	-	-	-	-	-
Type Congruence (Frequency)												
Form Intensity	-	.46	-	.32	.36	.33	.38	.34	-	-	.42	.32
Floor-area-ratio	-	.43	-	-	.28	-	-	-	-	-	-	-
Rooted Sign Size	-	-	-	-	-	.30	.28	.28	-	-	-	-
Visible Activity	-	-	-	-	-	-	-	-	-	-	-	-
Visible Objects	-	-	-	-	-	-	-	-	-	-	-	-
Non-Visual Information	-	-	-	-	-	-	-	-	-	-	-	-
Form Stereotype	-	-	.30	-	-	-	-	-	-	-	-	-
Form Information Intensity	-	-	-	-	-	-	-	-	-	-	-	-
Activity Intensity	-	.41	-	.38	.37	.32	.44	.33	-	-	.42	.30
Destinations	-	.41	-	.43	.38	.38	.55	.40	.34	-	.52	.37
Hours Per Place	-	-	.33	-	-	-	.50	-	-	-	-	-
Person Hours Per Day	-	.37	-	.33	.39	.32	.48	.33	-	-	.47	.36
Person Hours Per Night	-	-	-	-	-	-	-	-	-	-	-	-
Intensity Congruence												
Form Exposure	-	-	-	-	-	-	-	-	-	-	-	-
Visibility Area	-	-	-	-	-	.35	-	.29	-	-	-	-
Vehicular Exposure	-	-	-	-	-	.31	-	-	-	-	-	-
Mass Transit Exposure	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrian Exposure	-	.36	-	.45	.42	.45	.66	.54	.40	-	.61	.48
Activity Significance	-	-	-	-	-	-	-	-	.40	-	.38	-
Realm	-	-	-	-	-	-	-	-	-	-	-	-
Decision Significance	-	-	-	-	-	-	-	-	-	-	.30	-
Symbolic Significance	-	-	-	-	-	-	-	-	.36	-	-	-
Significance Congruence												
Form Recency	-	-	-	-	-	.31	-	.32	-	-	-	-
Activity Recency	-	-	-	-	-	.30	-	.29	-	.31	-	-
Frequent Use	-	.47	.32	.84	.52	.65	.56	.76	-	.30	.53	.67

[1]With a sample size of 48 subjects, correlation coefficients of greater than .28 are statistically significant at the .05 level and correlations of .36 are significant at the .01 level. Source: Edwards (1950), table 6, p. 408.

Among the characteristics of the environment, the exposure of physical form characteristics to pedestrians was the most important determinant of a person's knowledge, both about the form itself and about the attributes of its activity. Views from the more widespread road and mass transit systems were less significant influences on place knowledge than were the slower (and often destination oriented) pedestrian views. This finding was substantiated in the personal variable analysis which found no major differences between mass transit and vehicular users. While vehicular and mass transit exposure may become relatively more important in the selection of meaningful places in an unfamiliar area, or in another study area where more of the destinations that people are likely to have are highly exposed, they generally do not have the immediacy and the impact on meaning that pedestrian views have. Thus, for any individual, personal contact was a primary determinant of the selection of the places and areas which were the most meaningful, and the more direct the contact, the greater its influence.[1]

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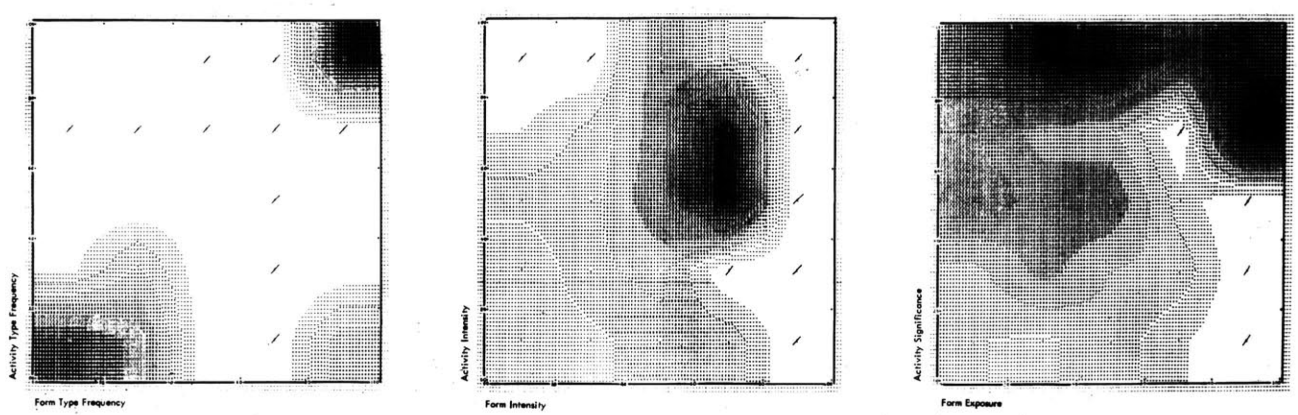
[1] While the finding that pedestrian exposure was a relatively more important determinant of the personal knowledge patterns than either vehicular or mass transit exposure confirms a major finding of Hassan (1965), the absolute importance of that exposure was considerably less in the present study than in his research. The intenstions and design of this research were different from those of Hassan but there are enough similarities -- particularly between the total study area

Congruence was an important factor in the meaningfulness of places, as predicted in Hypothesis 5. This can be seen in the scatter diagram analysis in which the interview responses to places were distributed and normalized according to the surveyed form and activity characteristics of those places. Figure 8.1 presents the scatter diagram analyses of the type responses (8.1A), the intensity evaluations (8.1B) and the significance evaluations (8.1C).

8.1A TYPE RESPONSES | 8.1B INTENSITY RESPONSES | 8.1C SIGNIFICANCE RESPONSES



High type congruence greatly increased the ability of a person to identify activities correctly and to

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form type responses and the verbal responses reported by Lynch (1960, p. 146) -- to raise serious questions about the validity of his finding of correlations greater than .90 between exposure and imagability.

describe their forms accurately. It was also a principal factor in the accurate evaluation of the relative intensity and significance of the places in the study area. However, high congruence cannot guarantee that a place will be meaningful, since some places always remain outside the realm of a person's perception and knowledge.

The most powerful function of type congruence was that its absence tended to prevent places from being meaningful. If the type congruence of a place was low, its form was less often described and its activity was less frequently identified. While the presence of signs and other information sources may counter this tendency, they did not significantly influence the pattern of type responses.

The scatter diagrams also illustrate the roles of the form and activity variables and their congruence in the evaluation of "busyness" and "importance." Places became known as being busy as either their form or activity became more intense, but they were most often and accurately evaluated as intense when both of these values were high and congruent. Conversely, the places whose form and activity intensities were lowest were least often evaluated as being busy. Thus, the absence of a high degree of congruence among the places with more intense forms or activities again tended to prevent them from being appraised as being busy.

Places became known as being important as their activities became more significant but not necessarily as their forms became more highly exposed. It took relatively less activity importance for a place to be evaluated as important than it did form exposure. Places whose form exposure and activity significance values were low, were rarely appraised as being important. The forms of places were not evaluated as being highly noticeable unless they were associated with significant activities. The finding that some important activities were known despite their having low form exposure indicates that incongruence can be overcome by direct experience over time.

In sum, the activity attributes of places and their pedestrian exposure were the most powerful environmental determinants of whether or not places were meaningful;and, the principal influences of congruence were that its absence acted to prevent a place from being meaningful and that its presence led to more accurate evaluations.

A visual analysis of the graphic response patterns of the form type and activity type questions (Appendix fig. K.2 and K.4) illustrated the significant roles of activity knowledge and congruence in the spatial structuring of the study area. Using the structural categories described by Lynch (1960), the following general characteristics were observed. Larger and relatively homogeneous districts dominated the responses, with activity distinctions often made within otherwise superimposed formal districts. In general, every time a form district was delineated, a mutually defined activity district was also indicated.[1] However, there was also knowledge of many sharply defined activity areas within the grosser form districts. Edges were very pronounced where both form and activity changed, and even sometimes when only the activity characteristic changed. Landmarks whose activities were different from their surrounding or neighboring area were less often mentioned than landmarks which marked areas of similar activity. Few diversified nodes were prominent, but several that were associated with a single activity were well known, as the "center" of that activity. Paths were important mainly as edges between districts, giving considerable clarity to those edges. They were rarely significant as movement channels.[2] Of all the

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[1]Two exceptions were the construction areas in both the Prudential Center and the Castle Square Urban Renewal Area. In both of these, the form of the area was clearly identifiable because of its emptiness, but its activity was relatively undefined.

[2]This was undoubtedly due to the interview protocol which deemphasized the flow system, and also to the use of a base map which included the streets. The subject therefore had less need to identify paths.

structural elements, the edges of congruent form-activity districts which were reinforced by busy paths were the strongest.

These findings indicate that "imageability" as defined by Lynch (1960) is highly dependent upon meaning, but that the knowledge of activity can sometimes be held independently of form.[1] They generally support the hypothesis of Gulick (1963), that "imageability" is a function of visual differentiation combined with significant social or behavioral associations. The greater distinctiveness of activity attributes indicates that protocols which are primarily designed to elicit a form "image" must be expanded to include an independent assessment of activity knowledge. The form image is likely to be of most use when it is congruent and true -- when it reinforces actual activity distinctions. Activity knowledge is also likely to be greater when congruently reinforced by form distinctions. However, when form does not visually

[1]A more imageable environment is likely to be a more meaningful one. Lynch's comparative analyses of the central areas of Boston, Jersey City and Los Angeles indicate that proportionally more of Boston and Los Angeles is highly "imageable" than is Jersey City. While the potential activities of these three central cities may be similar, it is likely that their perceptual accessibility is not -- it is probably more difficult to know what is happening and to choose and find places in Jersey City than it is in Los Angeles and Boston.

express the activity pattern, the activity pattern with its subtler distinctions will not only dominate a person's meaningful knowledge, it may well eliminate solely formal attributes from consideration.

There were a number of ways in which the specific contexts of this study influenced the findings. First, the relative roles of personal contact and environmental characteristics in determining the meaningfulness of places were affected by context. In the larger total study area whose places were generally not used as frequently, the environmental characteristics, and notably congruence, were the principal determinants of the meaningful places. However, in the smaller and more often used downtown core area, direct personal participation and pedestrian views were more important determinants of which places were meaningful and of how they were known.

All subjects were (necessarily) selective, and on the average they responded to approximately one-fourth of the total study area. Their knowledge patterns tended to overlap in the generally used downtown core, and to exhibit sectorial patterns in the rest of the study area, with the sector between home and downtown being best known. If a larger study area had been chosen, it is possible that this sectorial effect would have been even more pronounced, and that the role of vehicular visibility would have been more important.

There remains the question of what happens in a context in which overlapping city use does not occur as frequently. How does environmental knowledge develop when different subgroups do not consistently use common paths or have common destinations? What happens in a city whose use patterns are segregated by race or income or even age? Here we definitely need more research.

A further finding which may be closely related to the context of the research is the absence of consistent relationships between recency and meaning. Boston is a relatively old city and the general form and activity pattern of its central area has been established for a long time. The older areas were the best known ones despite the relatively large (for an American central city) amount of recent change. Whether this would be the case in a rapidly growing or a totally new city, in which growth tends to bring with it a wide variety of concomitant changes, remains to be tested.

PERSONAL VARIABLE DIFFERENCES

The most significant finding of the personal variable analyses was that longer residence time resulted in greater complexity, and particularly in more complete knowledge of activities. Undoubtedly, residence time results in more use and familiarity, and thus affords more opportunities to learn the activity characteristics of even sometimes incongruent places. In addition, the inner city residents had a somewhat greater knowledge of inner city residential areas than did the outer city residents. The South End and Roxbury samples were familiar with a greater portion of the study area, and particularly the residential areas, than were the other subgroups. While the effects of the racial and ethnic composition of these two residence subsamples could not be clearly separated from their sector travel, the speculation was advanced that the predominantly Negro Southwest sector sample knew more places because they had to -- that in addition to knowing the places that everyone else knows, they must also be familiar with the areas in which they are not welcome.

In general, however, there were strikingly few differences within the sample in the places that were meaningful and there were no substantial differences in the influences of any of the survey variables. Whether subjects lived in the inner or outer city, whether they travelled by automobile or mass transit, or whether they were lower or middle class, they gave highly similar responses to the interview questions. While there were some differences, they were not in which places were known but rather in how they were known; the diversity of words used to describe them and the apparent complexity of knowledge. The general absence of major personal differences supports the conclusion that whether places are meaningful or not is primarily a function of their actual environmental characteristics. That is not to dismiss the possibility that important personal differences cannot be found. Surely the effects of racial discrimination and/or poverty are not adequately known. Nor do we know enough about the influences of membership in particular ethnic groups. Additional research on the implications of other personal variables should be undertaken but the most useful findings will be those which tell us what <u>not</u> to do--what is clearly dangerous or ineffective, e.g. verbal street signs for illiterates. Furthermore, it would be advantageous to establish which personal variables do not have to be taken into account in establishing design policies.

These findings raise the issue of whether or not a normative (anonymous) population can be the client of city design or whether a population must be considered as a multitude of different individuals operating in shifting sets of groups. There is little doubt that some particular needs of special subgroups can be defined and that the detailed peculiarities of a group of people can be catered to in design. Individual descriptions do vary and no two people produce absolutely identical response patterns. Yet, for the personal variables controlled for in this research, the similarities in selection, evaluation and description were far greater than the differences. The findings of this study indicate that there is some justification (as well as efficiency) in designing for a common denominator, and that as far as major design policies are concerned, the designer can and should be guided by the needs of a normative client.

THE PROCESS OF ACQUIRING MEANING

As has been previously stated, the research essentially provides a static test of the meaningfulness of the environment. While not specifically designed to test for changes in the knowledge of the sample over time, comparisons of the residence time and age subsamples offer some basis for speculation about the possible nature of the process of acquiring meaning.

The general characteristics of meaningful places and areas are learned during the period of initial contact with an urban environment. This period is likely to be of less than two years duration for an adult newcomer, while for a native resident it probably takes place during the teenage years. The principal determinants of which places become meaningful during this period are participation in activities and perception of the publicly exposed form characteristics as one walks through the environment. The consistent tendency toward the reversibility of meanings, be they the knowledge of place type, intensity, or significance, indicates that if any one of the form or activity attributes of a place is learned, the other characteristics also tend to be assimilated. If places are highly congruent, this associative learning is expedited, and it is therefore likely that the costs of incongruence are greatest during the initial period of meaning acquisition. Since the perception of form is the principal extensive environmental experience, type congruence is a prime factor in determining whether the activity of a place is correctly known, and this is especially in the less frequented areas. Similarly, intensity congruence is a major determinant of whether the intensities of places are accurately described and identified, and, while significance congruence does not guarantee that a place is known, it generally determines the accuracy with which relative importance is evaluated.

The initial period of rapid learning is followed by a longer time span during which recurrent patterns of city use become habitual. During these adult years, further contacts are made with the less frequented areas, particularly with other residential areas. While the extent of knowledge does not increase appreciably over that gained in the initial learning period, there is a significant growth in the complexity of that knowledge -- the same places become more meaningful. This greater complexity reflects a deepening understanding of the workings of the urban environment, and particularly of its activities, as evidenced in a change towards activity-based meaning as the principal determinant of place knowledge. While the increase in activity awareness is expedited by high congruence, it also reflects the adaptive ability to learn the characteristics of a sometimes incongruent environment.

Following long years of active city use there seems to be a period during which there is a relative decline in knowledge. In this period, often accompanied by advanced age, activity attributes remain the principal determinants of environmental meanings, while awareness of form characteristics declines. Whether this decline is due to less active participation in the various urban activities, reflects continued habitual city use, or represents a failure to assimilate the new characteristics of changed places cannot be clearly determined from the results of this study.

Further research explicitly directed to a study of the environmental learning process is required to substantiate this inferred theoretical model of the stages in the process of acquiring meaning.

DESIGNING A MORE MEANINGFUL ENVIRONMENT

Both people and their environments are in a constant process of change -- of generating new needs and of adapting to new conditions. In this continuous process, the impetus to change can come from either the environmental context or the individual perceiver. New technical possibilities, physical obsolescence, or changes in "style," can produce major form changes, or changes can be generated by new, growing, or even declining activities. On the other hand, an individual may become bored and seek more varied physical surroundings or he may desire new or different activity experiences. Any and all of these possibilities for change have the potential to alter patterns of personal knowledge. Given the frequency of change, city designers have many opportunities to guide changes toward particular aims, among them the goal of a more meaningful environment. In doing so, they can focus upon people, their environment, or, preferably, both.

INCREASING MEANING THROUGH EDUCATION

City designers should not underestimate the efficacy of educating people to know and use the characteristics of their environment. The important role of direct personal experience in the interview responses indicates that this may be the single most rapid and efficient way of increasing meaning.

In his discussion of the "educative city," Dyckman (1960) indicates the potential of city design for producing a more "open" environment by making the uses and purposes of the city more apparent. Ricci (1962, p. 179) makes a similar point about "x-raying cities," in which "the city presents itself to your sight somewhat like certain architectural structures painted on medieval tablets, with the walls removed so as to reveal the life inside." Clearly, far greater use could and should be made of the environment itself as a tool of education, and particularly for the younger people and newcomers who are in the earlier stages of learning about a specific area. The goal of these person-oriented programs should be to increase the awareness of the range of possibilities -- of both the variety of forms and the choice of activities, for it is only through increased awareness and its resultant experiences that the environment can become more meaningful to its inhabitants.

Programs which involve direct participation would be of greatest benefit, whether these be school trips or individual explorations. Mass media and other indirect sources of information could also be used more widely for discussions of urban problems and opportunities, and for more extensive advertising of places and events.[1] In all of these programs, increased knowledge of both form and activity should be fostered. The youngster going to a Chinatown restaurant for the first time or to the electric power plant to learn what happens there should also be instructed to note what these places look like. The newcomer taking a tour of an area should not just look at places, he should be directed inside to see what is happening behind the apparent surface. In both cases, the more reversible the acquired knowledge, the more likely it is to be retained and, thus, the more meaningful the place is likely to become.

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[1] While the effects of mass media exposure were not directly considered in this research, it was found that specific recent places were often well known, notably those new places which had received considerable mass media publicity as symbols of the "New Boston" -- the Prudential Center and the Government Center.

INCREASING MEANING THROUGH ENVIRONMENTAL DESIGN

While city design has been thought of as dealing primarily with the physical environment, it is evident that this is far too limiting a conception. The dominant roles of direct participation and of the activity variables in the transmission of meanings indicates that in order to be effective, city designers must become considerably more concerned with the organization of the various activity patterns. The key decisions about activity location, the organization of the transportation systems (and particularly pedestrian ways), the distribution of destinations, and the homogeneity of districts should be increasingly influenced by policies based upon design goals. However, what will be of most importance to the achievement of a more meaningful environment will be the increasing of real activity choice -- the encouragement of variety in activity types and not just formal diversity, the achievement of actual accessibility and not just visual exposure, and the working for full barrier-free participation and not just an increased awareness of possibilities.

The important role of activity in a person's environmental knowledge also indicates that architecture and urban design, which have been thought of primarily as form giving arts, must become far more conscious of the ways in which meanings are to be transmitted. Some of the more popular approaches to large scale design -- the anonymous megaforms, the adaptable building systems, the unitized growth forms _et al._, while undoubtedly of value, must be broadened to include consideration of how people will know what is happening, particularly if undifferentiated (and less congruent) forms cannot tell them. The specific information sources, the transparency which offers visible activity and objects, and particularly the rooted signs, may well become crucial to the effective working of specific buildings and large scale environments. Yet these are rarely considered as basic and significant in the processes of design and too often they are a necessary afterthought. Besides the values of space, form and motion, the values of meaning must be ginven consideration, for if meaning cannot be achieved, the former values will also suffer.

The ability of the city designer to increase the meaningfulness of a place or area will be highly dependent upon its context, and at least two extreme situations must be considered for their implications on design policies. One is that of an existing and relatively stable urban area such as Boston. The other is that of a new urban development with either an unknown public, or, in the case of a new city in a newly urbanizing country, a public for whom urban life may be a totally new experience. While the design aims may be similar in both contexts, the actual strategies available to designers to achieve those aims will vary. The roles of the various kinds of congruence in the formulation of design policies and the methods required for implementation and/or control will differ, as will the ability of the city designer to predict with reasonable confidence whether the intended meanings of a proposed design will actually be transmitted and achieved.

In an existing and relatively stable environment, the scale of change is likely to be smaller and more incremental, with infrequent major programs such as new inner city highways or large urban renewal areas. Most of the designer's opportunities will probably involve particular places and even specific characteristics of those places -- their signs, transparency, quality, or perhaps their relocation and rebuilding. If the context of a new design proposal and the characteristics of the population for which it is intended are stable (and they are likely to be relatively stable in an existing central city) then predictions about meaningfulness can be made with greater confidence. While by no means a simple matter, the predictive ability in an existing and relatively stable context far exceeds that in a totally new environment -- if for no other reason than that research on samples can be conducted and generalizations can be based on the findings.

One of the important and potentially effective roles for city design should be the identification of those places which are <u>not</u> known, but which should be. Such a design strategy demands that the intended public meanings to be conveyed by places and areas be stated far more explicitly than they are currently. These intended meanings would include whether the places desire clear identities as types, whether they want to be known as being busy places, and whether they seek to convey an impression of importance. It also demands that the conflicts about whether meanings should be conveyed or suppressed be resolved, notably questions such as "do the slums get shown or hidden?" The form of the city can do either, but this research clearly shows that a form which does not congruently convey the realities of its activities will be shortlived in its effectiveness as a transmitter of meaning. Once the reality is known, by direct experience or from secondary sources, the importance of its form message is likely to be superceded.

In essence, this design strategy would test the effectiveness of an existing environment by comparing the meanings that it conveys with its intended meanings.

First, the characteristics of form, activity and congruence in the area under study should be surveyed, much on the order of this research. If possible, more complete data on secondary sources of information should be included, notably mass media "exposure." The process of establishing the conveyed meanings should also be similar to that used in this research -- a sample interview to determine what people know. Even though this study found no major personal variable differences, the sample in another context should be controlled for as many personal variables as might possibly influence the patterns of knowledge.[1] Once these meaning patterns are established, they can be compared with the intended meanings, both for specific places and areas. The degree to which the difference between intended and conveyed meaning is influenced by the personal variables can be determined by controlled comparisons among the various subgroups. The effects of the form attributes, the activity characteristics, and particularly of their congruence or lack thereof, can also be determined. Armed with these empirical data, policies and designs should then be proposed which would alter those conditions which seem to prevent places from being known. Specific policies

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[1]A subsample of outer suburban residents who infrequently use the downtown core area should certainly be included, as could tourists, businessmen and other visitors.

dealing with the various kinds of congruence are presented later in this section. Though the design policies dealing with type, intensity and significance congruence are presented separately, they are often linked, and if the opportunity exists to change one aspect, the others can probably be changed as well.[1]

A variation of this strategy might be to conduct the interviews first, and then to focus the survey stage upon the characteristics of those places and areas which were not meaningful. In addition, if significant personal differences are discovered, the surveys can concentrate upon these environmental variables which provide possible explanations for the subgroup differences. This procedure might be more efficient in meeting a specific design problem or in evaluating a specific place, but it would not permit more general analyses of the differences between known and unknown places, and of the effects of congruence in a larger context.

A second and related role for city designers should be to give opinions about proposed changes, whether privately instigated or due to public action. Among other

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[1]Note the general similarity between this strategy and the process of design proposed by Lynch (1960, 115-117). Yet the key difference is the focus on <u>activity</u> meanings. However "strong" a form image and however well it conforms to the visual goals that underlie its form, if it does not convey activity meanings that can be verified by experience it will not be meaningful, and even its form image may not be maintained through time.

considerations, these opinions should include predictions about the probable meaningfulness of the proposed places, including whether or not they conform to the public policy of conveying desired meanings. The city designer could exert considerable influence upon the specifics of proposals, especially if he had the "tools" proposed in the first strategy -- the surveys, the range of interviews and the statement of public goals. Indeed, if the public meanings of a place were key determinants of its form (as they often are for commercial establishments and institutions), the service provided by this analysis and prediction tool would probably be much sought after by the developers themselves.

Here the advantages of computer methods become apparent. The currently used parcel and building files of cities could easily be adapted to include form as well as activity data and could be used for measuring congruence as well as for computing taxes. And if an existing place can be adequately described so probably can a new one. A proposed place could therefore be described and evaluated in terms of its projected context. In a situation in which there were so many changes that the context itself was undergoing fundamental alteration or growth, or in which the basic characteristics of the population were changing, a computerized analysis tool would have its most significant advantages. Not only would it provide more rapid and economic evaluations, but it would provide far more up-to-date information than would otherwise be available, since it would have taken into account the incremental changes in both persons and places as they occurred.

Consider the problem of creating a meaningful environment in a new, rapidly growing and changing context, in which the characteristics of an intended population are also changing or are even unknown. A paramount design goal might then be that of generating an immediately meaningful environment into which a newcomer can quickly and easily adjust. Yet it is in just such a situation that the ability to predict whether or not a design proposal will be as meaningful as intended is often extremely difficult. Without knowing the characteristics of the intended population of users, it is difficult to estimate what the general reaction will be to the new environmental experience. This is particularly true if the forms to which the future urban residents must react are new to them, perhaps even having been transferred from foreign contexts. One can only plead the case for evaluation of personal knowledge patterns at as early a stage in the development of the urban area as possible, and for the development of what should be more accurate predictive tools, as the city grows.

The urgent need for immediate meaningfulness, combined with a relative inability to predict what will be meaningful may indicate the desirability of the simplified clarity of a series of design principles based on congruent form-activity relationships, with less emphasis on complexity and the less-than-total congruence which might otherwise be desirable. In its extreme form, the design policy would be that unique, busy, and important activities should have singular, intense and noticeable forms; and that common, less busy, and relatively unimportant activities should have common, bland, and less noticeable, background forms. A corrollary set of goals would be that aside from personally significant meanings, the environment should transmit meanings in a system of priorities, starting with the most important, busy and unique places.

In a rapidly changing context, the advantages of using computers for analysis and evaluation -- notably their speed and their ability to incorporate incremental changes -- will be of great importance, and the need to develop accurate predictive tools rapidly may well outweigh the costs of importing an advanced technology. A major use for computers, and one which could lead to an effective design strategy for a changing context, might be the simulation of patterns of city use and the related process of acquiring meaning. Assuming that an immediately meaningful environment is a prime goal in determining which patterns of form and activity to adopt, the effects of alternative city design proposals could be simulated through successive time changes. The adequacy of the different patterns could be assessed in terms of a general scale which measured how many (or which) people would learn how many (or which) places, how soon. The conditions of the simulation need not remain constant. An environment could first be tested for its ability to produce knowledge of specific places very rapidly -- for example, the most important and busy places, and certain types of work places and institutions; then the environment could be tested to determine whether it facilitated later learning of the more general characteristics of the city. Thus, it might be possible both to discover which patterns of urban growth and succession can be most meaningful initially and over longer time periods, and to test specific staged development patterns for their long term values.

INCREASING MEANING THROUGH CONGRUENCE

Type Congruence

The importance of type congruence to the identification and description of places has been demonstrated. Yet despite its clear advantages, type congruence is perhaps the most difficult to influence of the three principles discussed in this research. The primary difficulty is that it is a qualitative relationship, referring to all places. In order to exert effective influence, a strategic policy towards type congruence must be developed.

The opportunity for meaningful change will occur in the more singular places, and this could be the key to a strategic design policy. When there are fewer places of a given type, it takes fewer changes to increase congruence. Furthermore, in the case of central Boston, as in most cities, the more singular places are those which are also more often intense and significant. Since these are likely to be the places that the public needs to know, there is considerable benefit in selecting singular places, and particularly those with intense and significant activities, as the focus for more direct design influence.

A second aspect of a strategic attitude toward type congruence, and one with considerable justification since it minimizes the possibly arbitrary nature of the concept of a type, would be to focus on those places whose activity characteristics are most subject to change, and to influence form so that it more directly reflects the functional attributes of the activity. This can be accomplished in many ways: through the adoption of functional congruence as a visual goal, through increased emphasis on the exposure of activity and objects through transparency, through encouraging a multiplicity of information sources in the same place, or, again, through advertising and education which relate the form and activity.

In attempting to increase type congruence, the designer has available precisely the same alternatives as an individual faced with the incongruence of a non-veridical perception: he can attempt to change the definition of a type, or he can try to alter the condition of incongruence.

In manipulating the definition he must first educate people to the point where they are convinced that what they see is a new category, and then he must train them to expect it. This is sometimes attempted, most often by commercial interests attempting to achieve singular identities through advertising. The possibilities of this approach have rarely been seriously considered by designers and perhaps they should be. Often a small change can be highly effective in differentiating a place, *if people are made aware of it*. Mass transit routes and stations can (and are) being differentiated by well advertised color codes. A unique activity such as a mosque which cannot afford to change its brownstone quarters can hang a flag as a symbol of the unique character of the place. A relatively minor change, when combined with education (or advertising) can also be used for the opposite aim, that of combining diverse places into a single type. This process is well known in commerce, and is typified by the restaurant and gasoline station chains, with their corporate images.

The more professionally acceptable method would be to alter the incongruent condition directly. Here again there are two possibilities. The activity can be changed to suit the form; for example, historical buildings currently used for storage can perhaps be reconverted to their original residential functions. On the other hand, the form can be altered to meet the congruence needs of the activity; for example, an architectural school previously housed in an old and anonymous loft structure can move into a relatively unique and striking new building. Opportunities for influencing the latter kind of change are far more numerous and fall more within the general conception of city design as being essentially physical design.

Two examples of how type congruence could influence design policy can be offered. The first is that of a singular place such as the relatively new newspaper plant of the Boston Herald-Traveler, a fairly unique activity which has recently relocated in a new and highly visible building. Yet its new form is a commonplace industrial building and despite its large sign (and the relative importance of the activity), the place is not known. There was (and is) nothing about the form that can be uniquely associated with this activity, and a policy of type congruence would have recommended that a far more singular appearance be sought. The new Boston City Hall, on the other hand, is a singular and important activity which is being relocated in a unique (for Boston) and highly visible form. Once built, it should rapidly become well known.

Intensity Congruence

Of the three kinds of congruence studied in this research, intensity congruence seems to present the fewest difficulties. The high degree of congruence in even as old and complex a city as Boston is testimony to its natural development. There do seem to be strong and consistent relationships between busyness and visual intensity.

When developing a program of requirements for the form of a new place, the spatial requirements of its intended users are a key consideration, and since space costs money, they tend toward an efficient consistency. Furthermore, the need to eliminate crowding -- the functional incongruence between too much activity intensity and too little space -- is often a prime motivation for rebuilding or moving, both of which offer possibilities for providing more meaningful forms.

Of the information sources, the sense of activity intensity can be most effectively generated by signs and visible activity. In the case of central Boston, both signs and visible activity are generally lacking in busy office buildings, manufacturing places and school facilities, and the actual activity intensity of these kinds of places is rarely known. Even the newer places with these activities fail to make use of these information sources, and to their own detriment, since they continue to be relatively unknown. Sign policies could be based upon the principal of congruence between activity intensity and sign size. Thus signs would not simply be negatively controlled as is too often attempted, but could be encouraged where appropriate. The exposure of visible activity can perhaps best be encouraged by demonstrating its effectiveness as a potential information source. Commercial and industrial establishments are beginning to recognize this fact and to make use of the visual possibilities of highly transparent forms. Influencing the activity programming and exterior characteristics of new places so that greater visible activity will result in busier places should be a role of the city designer. The strongest argument that designers can make for this policy may well be the self-interest of the establishment, for the meaning of the place may be intimately connected with the actual activity values themselves. Busy places must look busy and be known as being busy in order to encourage people to come to them so that they will, in fact, be busy. The development of a meaningful form is an integral -- perhaps even a critical part -- of this reaction cycle.

Significance Congruence

Significance congruence is likely to be the most necessary area of influence for the city designer, and this despite the finding that people tend to know important activities even though they are sometimes not in highly visible forms. People notice the exposed forms first, and then they learn that the important activities are elsewhere, thus learning (and being able to describe accurately) the incongruent situation. This should not be necessary, and it is certainly not an efficient way of providing a meaningful visual experience. Furthermore, if a high value of significance congruence is not achieved, there is every danger that the form of the city will generate a misleading "image," and that the stranger, the newcomer, or the tourist who has not yet learned the really important activities will be misled.

In attempting to increase significance congruence, the major role of city design will be to control the relationship between viewers and places, by influencing site selection and design for new places, and by the design of transportation routes. The important role of pedestrian views in personal knowledge indicates that the views between parking lots or transit stations and major common destinations should be emphasized in new projects. A possible difficulty in developing high significance congruence could be a major change in transportation requirements. This happened in Boston with the building of the Central Artery, an action to which "the New Boston" is only recently reacting by siting new important places so that they are visible and accessible from its path. If the criteria by which the original route was selected had incorporated visual values -- for example, if it had exposed more of Boston's important places -- many of these recent shifts might not have been necessary. And even if, after weighing visual goals with the many others which influence highway route selection, the existing alighnment was judged the best one, far more consideration should have been given to the influence of the resultant exposure pattern. For example, the Government Center might not have included plans for a motel which will block much of the exposure of the new City Hall, and the waterfront redevelopment area might not have been designed so that its major public activities, i.e. the aquarium and (possibly) the U.S.S. Constitution, will be unseen.

Places display strong tendencies toward significance congruence. Throughout history, important activities have sought exposure, and in Boston, the new City Hall, the State Street Bank and the Prudential Insurance Company are good examples. In each of these cases, their former locations were unsatisfactory, both in terms of activity requirements and -- importantly -- the visual "image" transmitted by their forms. In each case a new site with high exposure was selected and a prominent form was designed. These places should all become much better known. What has happened in these three cases is just what a policy of significance congruence should have instigated and would certainly have supported in principle. And if the form of an important activity cannot be exposed, it should be encouraged to manifest its importance in other ways. Unfortunately this often does not occur, especially in activities with older and less congruent forms, and in certain kinds of places such as governmental offices and financial institutions. Here, once again, the best argument for the city designer may be the self interest of the establishment. Important places receive part of their mystique from high exposure -- they always have and will probably continue to do so. The designer should exploit this situation. The best method may be to promote a clear understanding that wide exposure is a key to achieving the aura of importance.

Limitations on Congruence

While it is generally desirable to have a highly congruent environment, the extreme of a totally consistent environment has its dangers as well, for it is likely to conflict with the attainment of several other important goals. The question must then be raised as to when the principles of congruence should not be applied. To this question there is no firm and general answer, but several value conflicts can be foreseen.

First, there is the practical difficulty of sufficiently changing the places in order to significantly alter their congruence. In many cases, the relocation of a place, the rebuilding of an exterior facade, the changing of viewer paths, and/or the changing of activities themselves will simply be too costly and difficult. It will often be more efficient (and politic) to emphasize other means of increasing personal knowledge such as education, advertising, etc. An analogy may be drawn from the practices of retail commerce. Consider what happens to two equivalent and competitive establishments, when one decides to rebuild its store. If the competitor cannot also rebuild, is he not likely to counter attack with a major advertising campaign? Though the effects of congruence on knowledge are the primary focus of the research, there is as yet no comparable research on the effectiveness of other methods of increasing meaning.

Another situation in which conflicting values may occur is that of the historical district, in which exterior appearance is to be preserved and major physical changes, particularly to exterior surfaces, are not allowed. Here, social values foster incongruence in a time sense, in that the activities of such places often change while the forms, by law, cannot. The former meanings and associations are often retained even though they are not true, as exemplified by the samples' descriptions of the school and office areas in the Back Bay and Beacon Hill as being "residential areas." Assuming the values of historical preservation to be legitimate and dominant, other ways must be found to make people aware of the activities currently occurring in such areas -- ways that do not necessarily involve the demands of congruence.

Even in an area which is currently congruent and well known, there will always be the possibility that both elements in a form-activity relationship may not have similar "life spans," and difficulties may arise if a once-congruent relationship is continued automatically as a design tradition, without analysis of its original purposes in the context of present needs. It therefore will be necessary to find ways to increase adaptability -- not only of functional accommodation but also in an expressive sense -- so that congruence can be maintained (or at the least that incongruence can be lessened) while accepting the changes demanded by new requirements.

Perhaps the most serious arguement against design policies based upon congruence is that enforcing consistency between form and activity inhibits the freedom of the activity of a place to determine its own form regardless of what the forms of similar activities look like, and the freedom of the designer of a place to create radically new spatial and formal experiences regardless of their activity content. On the face of it, such controls have very conservative implications. And it remains to be demonstrated whether in reality the design based upon the achievement of congruence is easily adaptable to changing needs. An environment should always include the possibilities for challenge, discovery and surprise, and there is the danger that congruence, misapplied, will result in so few types being developed in an area and in such a blatant and obviously simplified clarity that it becomes stiflingly dull, despite being well known. However, congruence must not be confused with simplicity and consequent monotony.

A congruent environment can be extremely complex, and that complexity is limited only by the capacities of people to distinguish and learn its form-activity relationships. There is no theoretical limit to the possible degree of differentiation among types, but those types must develop consistent congruent relations between their form-activity sets. This then permits great complexity in number, and even in spatial organization, such that exploration, surprise and discovery can take place in space -- that <u>new</u> places can be found and can be meaningful. It also provides for new types to be differentiated, such as the discovery of a Japanese restaurant that <u>looks</u> Japanese.

The designer seeking formal freedom need not be denied that freedom, and the advocacy of congruence should not be interpreted as necessitating slavish following of past traditions and practices. Congruence is consistency. It is a set of relationships and as such is not dependent upon any specific formal characteristics. If the activity is unique, there is no constraint from the viewpoint of type congruence. Indeed the designer would be encouraged to design a singular form which could then be identified with that activity -- as a type. Furthermore the types defined are extremely broad, and can encompass considerable diversity. Here the designer is not alone, as witness the many ways in which individual people have altered even the originally similar and congruent residential areas of the Levittowns, obtaining diversity within congruence.

However, the designer must consider the goals of places: Do they want to appear different or do they want to be known? One does not necessarily follow from the other.

The fact remains that congruent places are more meaningful. Taken from the viewpoint of the goal of increasing environmental knowledge, and disregarding the many other goals which motivate designers and builders, the strong implication of this research is that if a more meaningful environment is to be a primary goal of city design, the extension of congruence is likely to be very much in the self interest of the entrepreneur, the general public, and not incidentally, the city designer.

CONCLUSION

The design ideologies that have evolved to provide solutions to the simpler problems of the past -- formalism, functionalism, and the alternative of no planning or design -- are inadequate to meet the goal of a more meaningful environment, in a changing, increasingly urbanizing world. There is an inherent conflict when either form or activity dominates city design, for neither the activity pattern of a form based design nor the forms resulting from an activity dominated design will necessarily be satisfactory -- let alone optimal. Form does not always follow function, and functions are not always adaptable to forms. As extensions of architecture these attitudes fail at the city scale, and the lack of meaningful predictability is their common and critical liability. Nor can city designers obtain satisfaction from the several other methods which attempt simplifications in order to relate form and activity. The use of predetermined systems for both the physical and social order, the dependence upon hierarchically repetitive units such as superblocks and neighborhoods, the reliance upon only a few categories of activities and the use of only a few prototypical forms--none of these methods alone can be sufficiently complex and flexible. In all of them the city designer abdicates too much. It is therefore becoming vitally necessary to find terms of reference for the study of form-activity relationships that can be meaningful in a dynamic urban situation. The concept of congruence should be one of these. Whether the city designer is organizing a new environment or altering deficiencies in an existing one, whether he is providing minimal guidance in a situation of otherwise self-interested laissez-faire or directly influencing the forms and activities of places, the concept of congruence as a quantifiable relationship with testable costs provides him with a potent basis for analysis, design and evaluation.

Consider:

> "...what will America look like? How will its architecture appear? Will it be the architecture of a Great Society, or continue to be the architecture of an empty promiscuous panorama where no one can distinguish between hospitals and housing projects, factories and colleges, concert halls, civic centers, and airport terminals? The mind recoils from the thought of an America rebuilt completely in the shape of those bland skyscrapers 40 stories high, their walls dead as an empty television screen, their form as interesting as a box

of cleaning tissue propped on end. They are buildings which reveal nothing so much as the deterioration in real value of the dollar bill ...

By all odds, the man of the future will live in just such a landscape."

(Mailer, N., "Cities Higher than Mountains," New York Times, January 31, 1965, p. 16.)

This is a major challenge to city design: If the city designers fail to understand the needs of their "clients" for meaningful surroundings, and if they are without the theoretical assuredness needed to deal with the complexities of rapid change, then their roles in molding the new environments may become increasingly less significant. This should not be the case.

APPENDICES

APPENDIX A. ALTERNATIVE PLACE UNITS

The criteria for the choice of the place unit included: amenability to the classification of both form and activity attributes -- since the variations of form and activity characteristics are not necessarily coincidental, the unit had to be neutral to both; inclusion of the total study area -- the sum of all places had to equal the study area, with no overlap of place units; a small enough unit to provide a level of detail adequate to the purposes of the study and yet a large enough unit to be manageable -- the number of units for practical reasons, had to be related to the means available for survey and analysis; an easily identifiable unit to facilitate data collection and handling; and, uniformity in size and shape for ease in analysis, comparability among places, and flexibility in combining units.

<u>Ownership units</u> -- land parcels under single ownership.

Ownership units are the basis of many of the development controls now in common use. They can be combined to create larger units based on groupings of lots -- e.g. blocks, tax units, etc., and can be divided into subparcels for more detailed analysis. However, they are too numerous and they are not uniform in size and shape, thus making their adoption for a larger area study difficult. The parcels would have to be combined into a larger unit or supplemented by a larger scale system, and, unless this can be done mechanically, ownership units lose flexibility. Because of their variability, they are not easily comparable, and they are not necessarily adaptable to other types of urban data.

Blocks

For a detailed discussion of the advantages and liabilities of block units, see Olds (1961). Their prinicpal advantage is that much of the existing urban data has been tabulated on the basis of blocks and their combinatory units such as census tracts, and election districts. However, they are generally too large for the purposes of this research, particularly since they are too coarse to adequately describe scales of differentiation of either forms or activities.

Form Units -- units of the spatial differentiation of physical characteristics

Form units have the advantages of being clearly related to the interests of city design. They are being used in many types of current building controls. However, they do not necessarily coincide with activity differentiation. They are not uniform for all form attributes and are therefore far too detailed and cumbersome for the study of a large area. In addition, it is not easy to combine form units and they are not readily adaptable for use with other types of urban data.

<u>Activity Units</u> -- units of the spatial differentiation of activity characteristics

The activity units suffer from the same difficulties as the form units. While Land Use units are directly related to planning interests, and are the basis of many existing development controls, they do not necessarily coincide with form differentiation. Furthermore, it is not easy to combine Land Use units because they are not of uniform size and shape. Like form units, they are too detailed for use in the study of a large area.

The focus on establishments is increasing in activity system studies. While these units seem to have great potential as a basis for design and control, they have not yet been actively used for these purposes. Their principal liability is that they are not necessarily spatially fixed. It is difficult to collect, handle and analyze data for establishments. These units are also far too complex and variable for the study of a large area, and they are not easily adaptable for and comparable with other kinds of urban data.

Uniform Mapping Units: A grid of uniform cells with numerical coordinates, superimposed over the study area.

Uniform mapping units are commonly used as the spatial basis for urban research and in other disciplines. The most common unit is the square grid cell, though hexagonal units have also been used. Examples of the use of a square grid cell include:

At a continental scale, William-Olsson (1966)

At a metropolitan scale, Chicago Area Transportation Study (1958)

Penn-Jersey Transportation Study (1961)

Garrison (1962)

Ceccarelli (1964)

At a city scale, Artle (1959)

Rannells (1961)

In other disciplines, Clarke (1956)

Duncan (1961)

Dacey (1962)

An example of the use of a hexagonal grid is in Morrill (1962)

The cell unit is particularly adaptable to quantitative analysis when it is of uniform size and shape. Larger units at different scales can be easily generated by combinations of smaller units. Though a considerable asset for data collection, handling and analysis, cell units tend to ignore the physical, social, legal and economic boundaries which in their own ways are critical to detailed planning and design. However, as the scale of the unit becomes finer, these boundaries are more and more closely approximated.

APPENDIX B. THE PHOTOGRAPH ATLAS

Places are located according to the following notation system: the photograph atlas sheet number followed by the row and column coordinates that locate the place according to the grid in fig. B.1. For example, the photograph of the Boston City Hospital (1:8, 14) is located in Appendix B on atlas sheet 1, in row 8 and column 14.

Key	Name
(24:38,09)	Back Bay
(26:38,24)	Back Bay schools
(27:45,32)	Beacon Hill
(1:8,14)	Boston City Hospital
(27:39,34)	Boston Common
(17:33,18)	Boston Public Library
(18:36,26)	Boylston-Newbury Streets shopping area
(--:63,01)	Cambridge
(--:63,63)	Chelsea
(20:35,41)	downtown shopping area; Washington St.
(19:31,34)	entertainment district
(29:39,48)	financial-office district
(29:44,46)	Government Center
(29:44,49)	Haymarket
(18:32,25)	insurance office district
(18:32,24)	John Hancock building
(33:51,36)	Massachusetts General Hospital
(35:50,56)	North End
(35:46,54)	North End historical places
(35:47,50)	North End food markets
(--:01,01)	Roxbury
(16:34,11)	Prudential Center
(16:33,11)	Prudential building
(10:21,15)	South End
(6:13,24)	South End manufacturing areas
(28:41,39)	State House
(28:43,42)	State Office buildings
(37:55,39)	West End urban renewal area

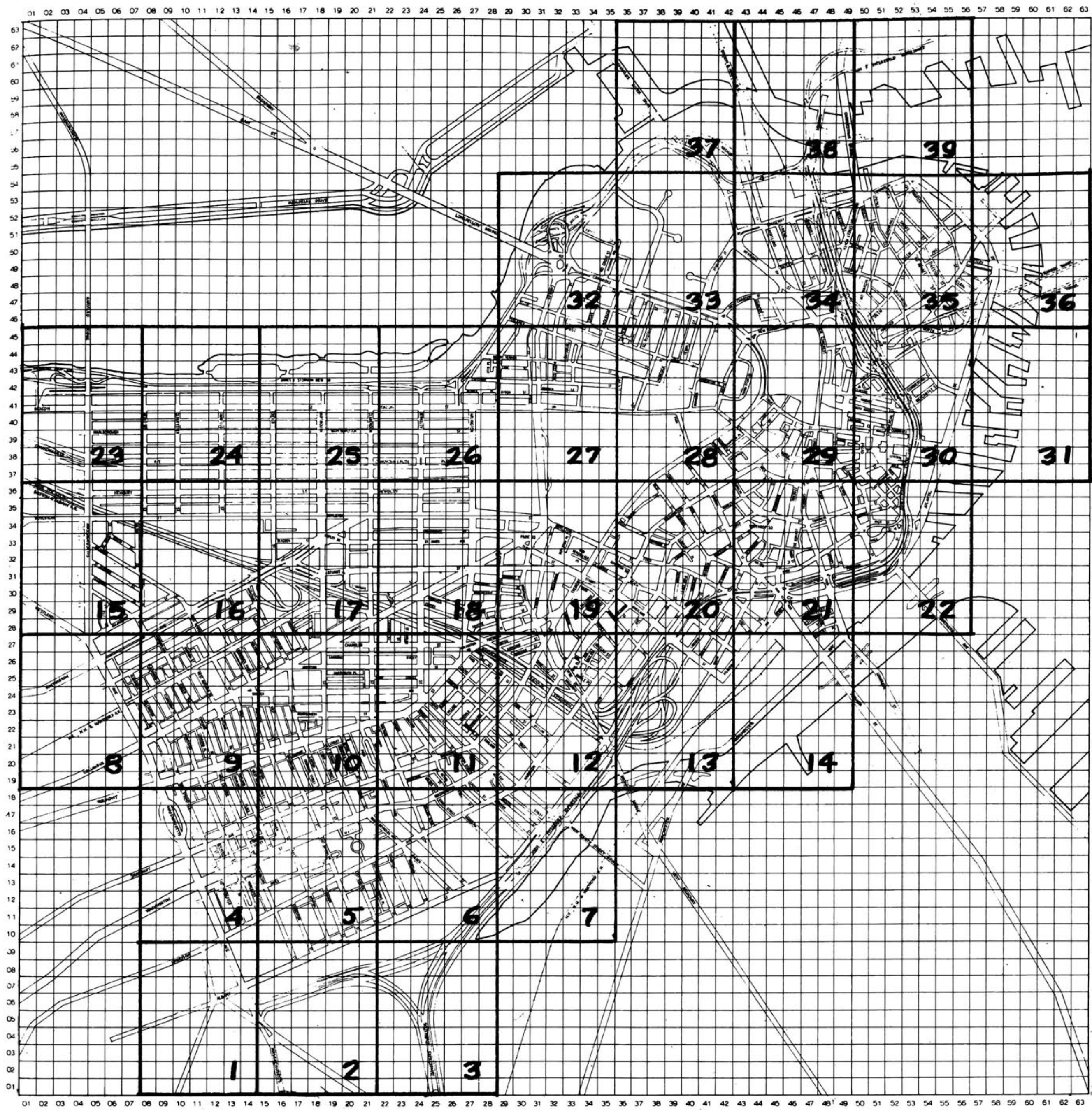

FIG. B.1 KEY TO PHOTOGRAPH ATLAS SHEETS


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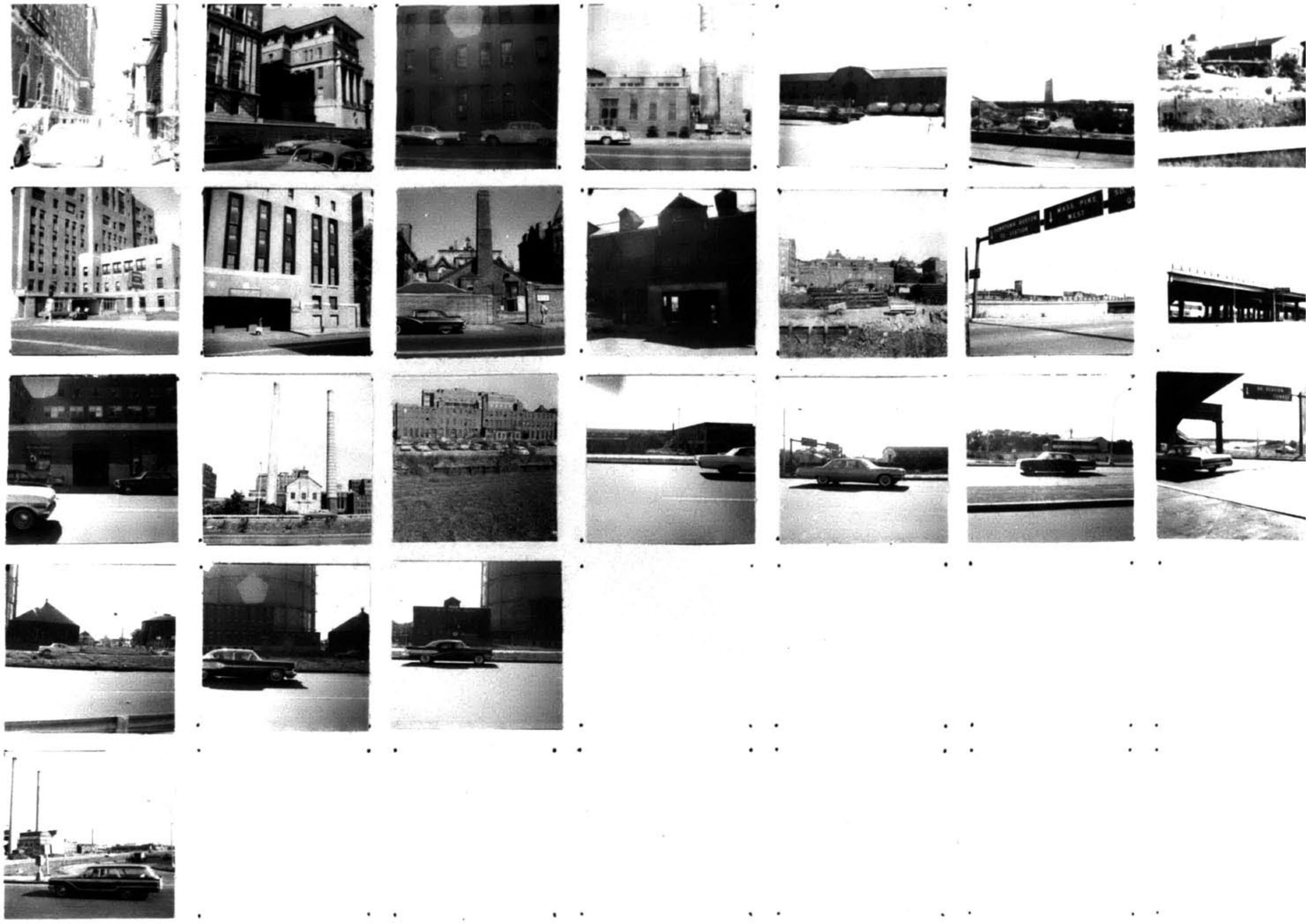

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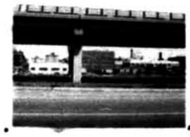


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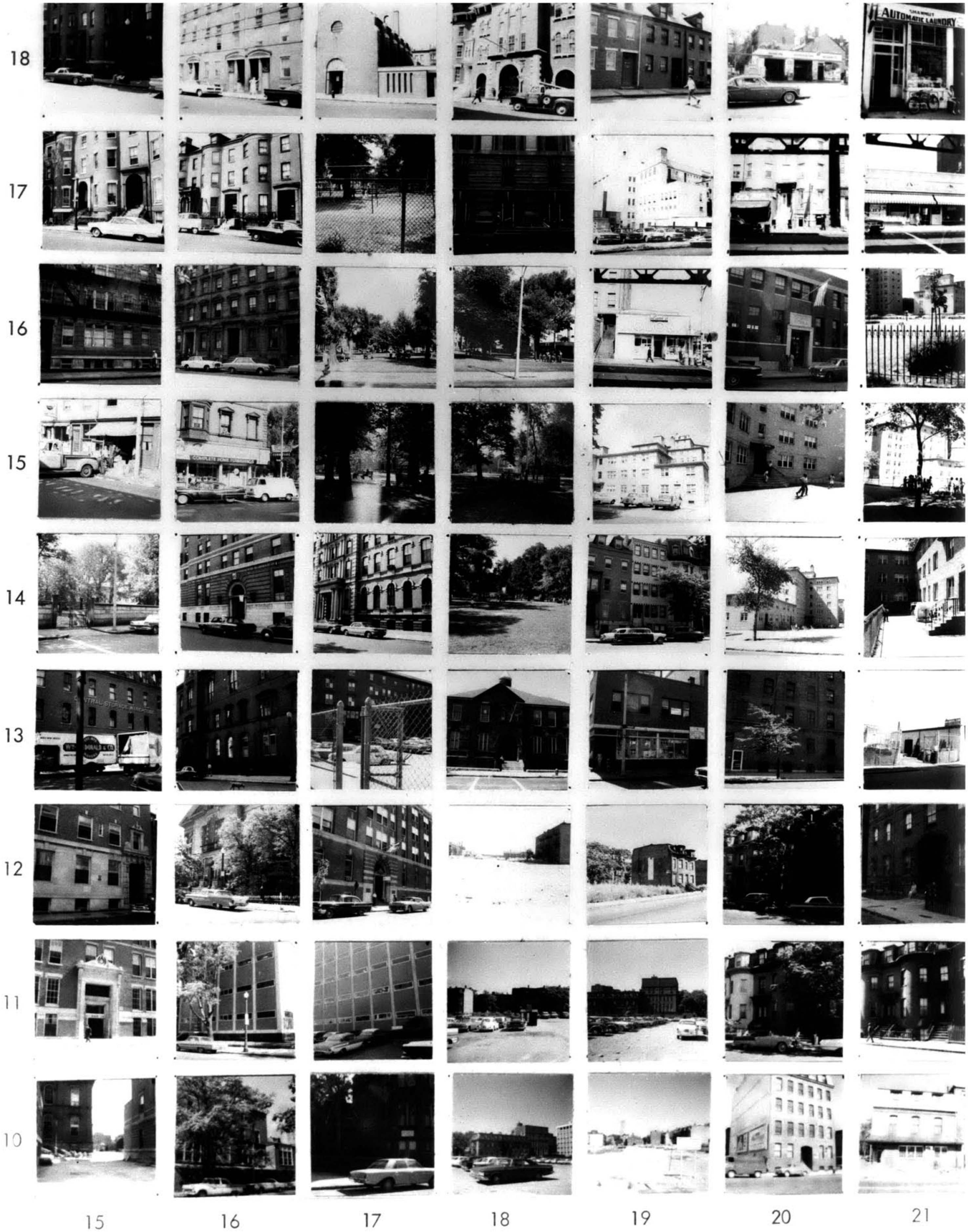
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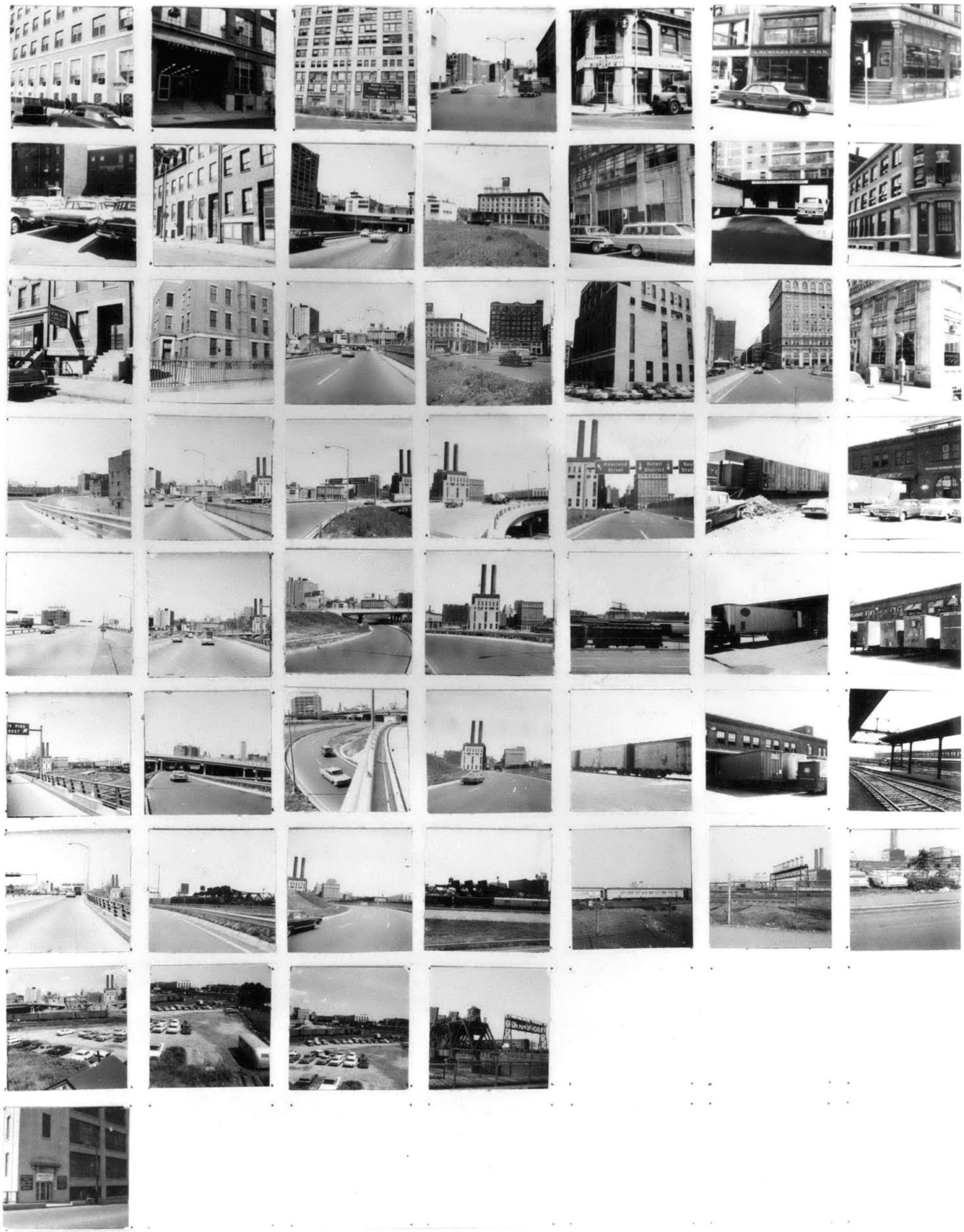

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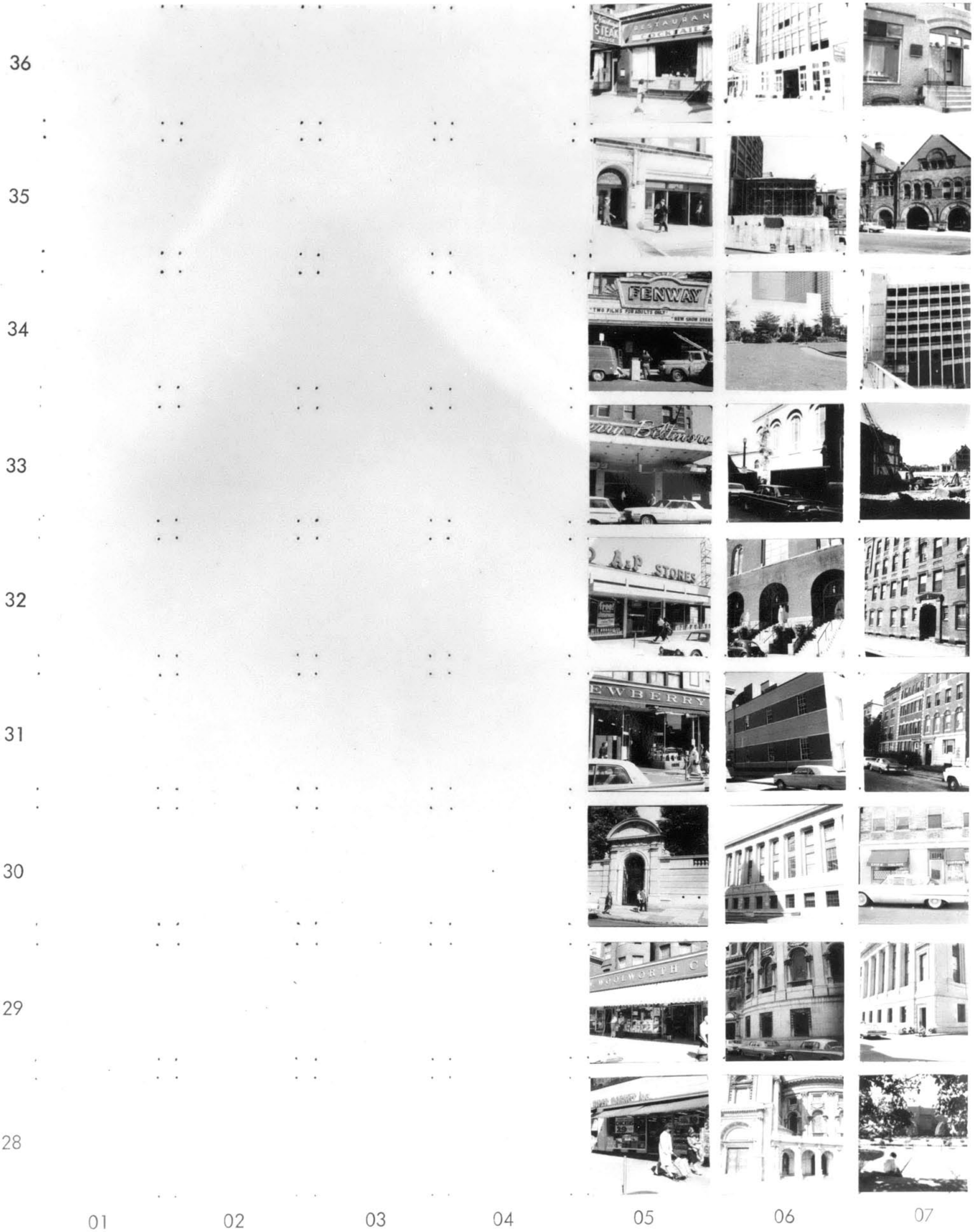

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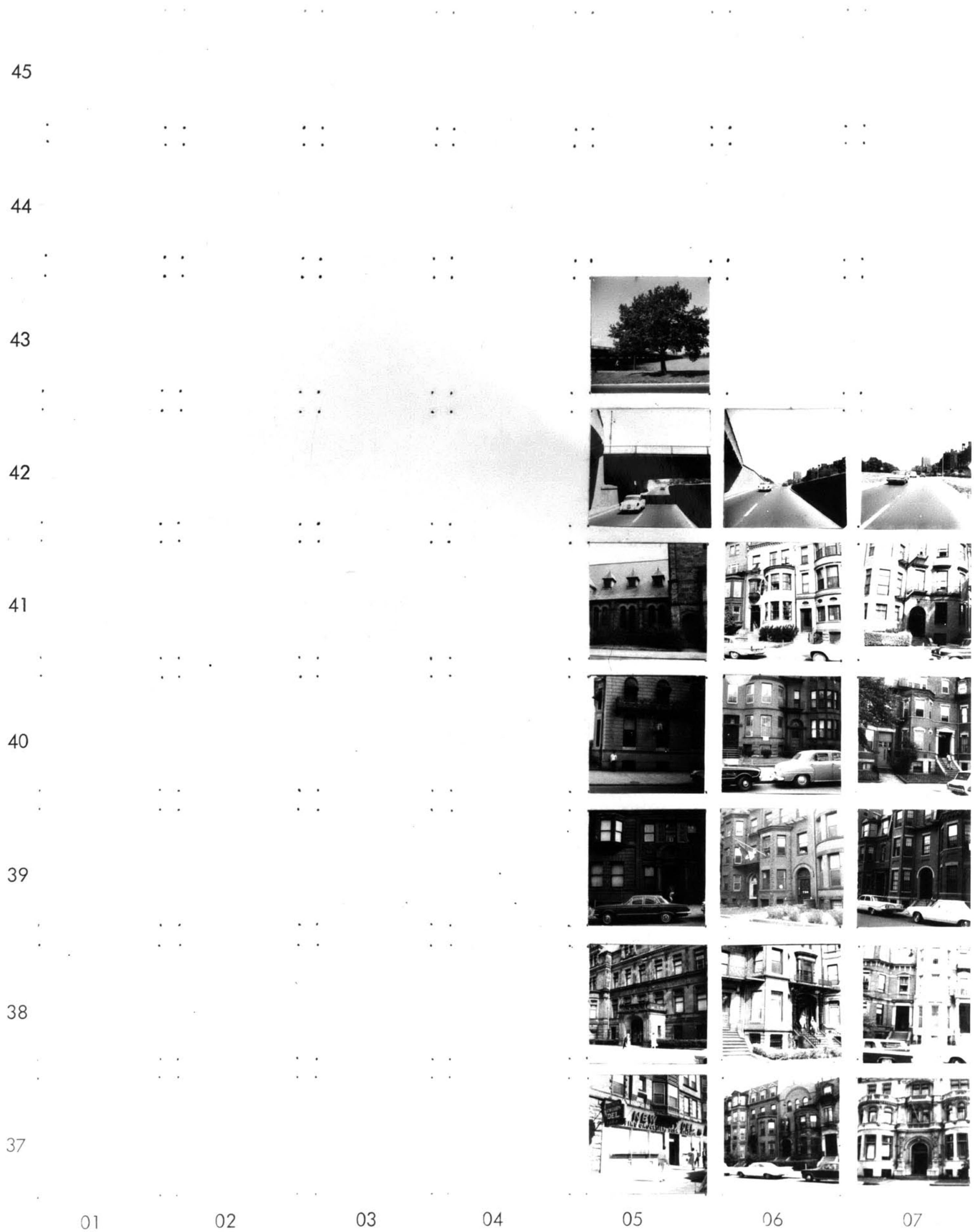
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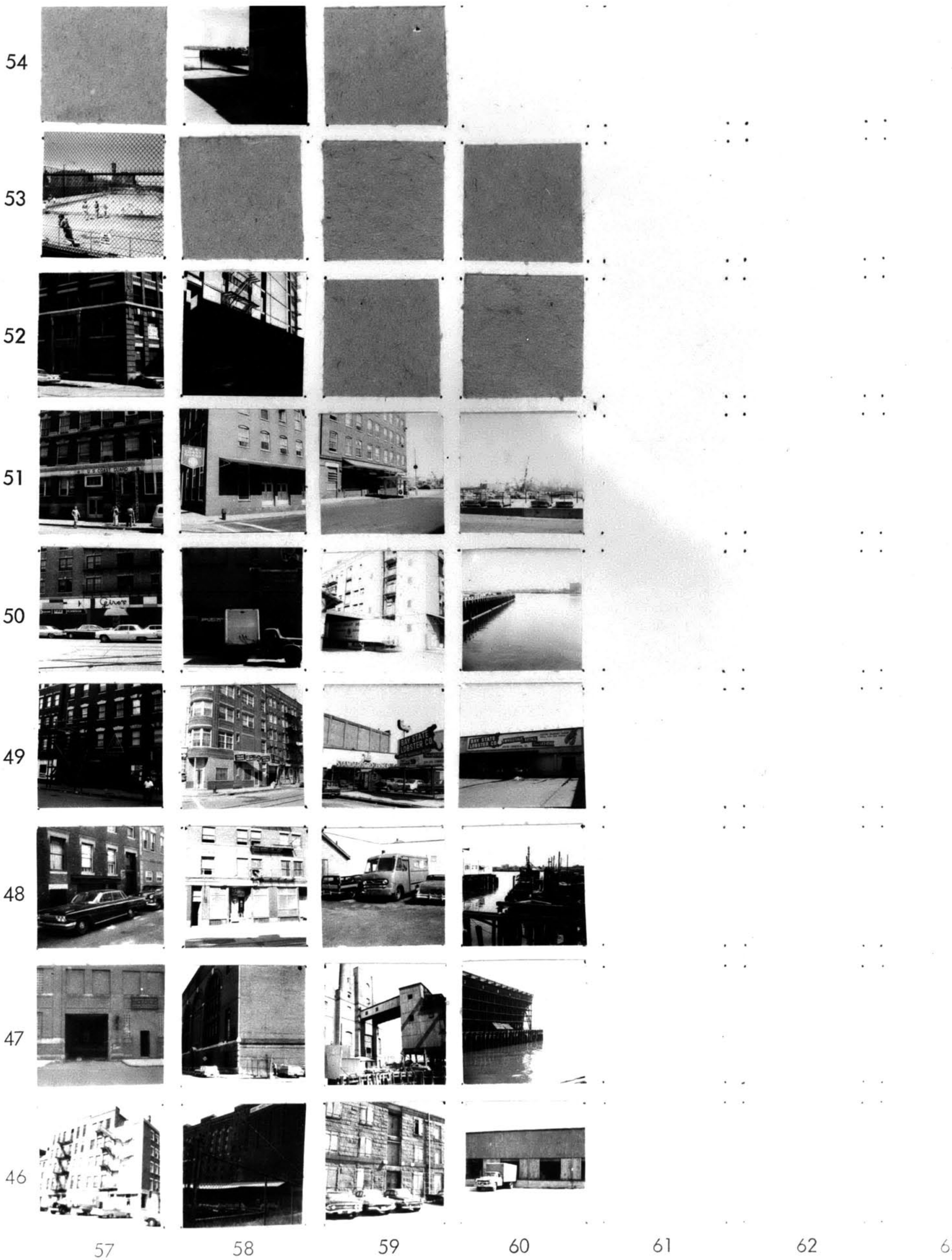
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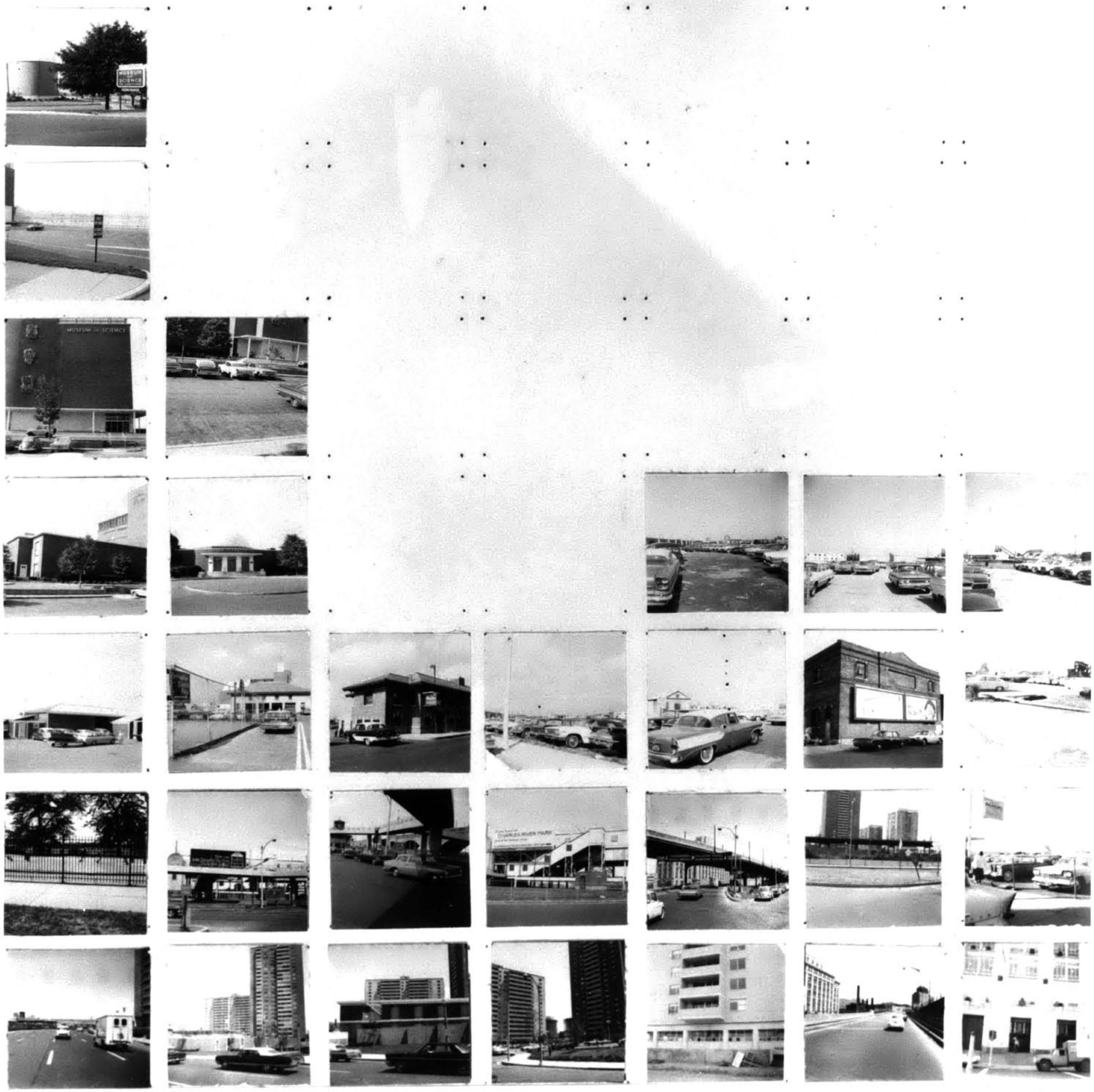

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APPENDIX C. DATA CARD FORMAT

The following data are stored on IBM cards and tape by place. They represent the coded data from the survey and interview research.

Survey	Column	Variable
Card 1	14,15,16	form type frequency (%)
	17	form construction type
	18	form height
	19	form transparency
	20	form quality
	21	form quality, extreme values
	23	floor-area-ratio
	27	rooted sign size
	28	visible activity
	29	visible objects
	30	non-visual information
	31	form type stereotype
	34	visible area
	35	vehicular views
	36	transit views
	37	pedestrian views
	38,39,40	activity type frequency (%)
	41,42	activity type,2 digit code
	44	destinations
	45	persons/place
	46	hours per person/place
	47	person-hours/day
	48	person-hours/night
	51	realm
	52	decision significance
	53	symbolic significance
	56	form recency
	57	activity recency
	61	sign content
	62	common name content
	65	type congruence, matrix analysis
	67	vehicular flows
	68	transit flows
	71,72	activity type 2 digit code (sorting key)
	76	(identification) mapside
	77,78,79	(identification) place number
	80	(identification) data card number

Survey	Column	Variable
Card 2	The following responses are paired, by subject 1st: activity type, (free) 2nd: activity type, (free, area, check list)	
	1,2	subject 11
	3.4	12
	5.6	13
	7,8	14
	9,10	15
	11,12	16
	13,14	17
	15,16	18
	17,18	21
	19,20	22
	21,22	23
	23,24	24
	25,26	25
	27,28	26
	29,30	27
	31,32	28
	33,34	31
	35,36	32
	37,38	33
	39,40	34
	41,42	35
	43,44	36
	45,46	37
	47,48	38
	49,50	41
	51,52	42
	53,54	43
	55,56	44
	57,58	45
	59,60	46
	61,62	47
	63,64	48
	71,72	activity type 2 digit code (sorting key)
	76	(identification) map side
	77,78,79	(identification) place number
	80	(identification) data card number

Interview

Card 3

Column	Variable
The following responses are paired, by subject	
1st: form type (free)	
2nd: form type (free, area, check list)	
1,2	subject 11
3,4	12
5.6	13
7,8	14
9,10	15
11,12	16
13,14	17
15,16	18
17,18	21
19,20	22
21,22	23
23,24	24
25,26	25
27,28	26
29,30	27
31,32	28
33,34	31
35,36	32
37,38	33
39,40	34
41,42	35
43,44	36
45,46	37
47,48	38
49,50	41
51,52	42
53,54	43
55,56	44
57,58	45
59,60	46
61,62	47
63,64	48
65,66	form spatial intensity, total sample
67,68	visible activity, total sample
69,70	signs, total sample
71,72	activity type, 2 digit code (sorting key)
73,74	form stereotype, total sample
76	(identification)--map side
77,78,79	(identification)--place number
80	(identification) -- data card number

Interview	Column	Variable
Card 4	The following responses are paired, by subject 1st: activity type (free) 2nd: activity type (free, area, check list)	
	1,2	subject 51
	3,4	52
	5,6	53
	7,8	54
	9,10	55
	11,12	56
	13,14	57
	15,16	58
	17,18	61
	19,20	62
	21,22	63
	23,24	64
	25,26	65
	27,28	66
	29,30	67
	31,32	68
	The following responses are paired, by subject 1st: form type (free) 2nd: form type (free, area, check list)	
	33,34	subject 51
	35,36	52
	37,38	53
	39,40	54
	41,42	55
	43,44	56
	45,46	57
	47,48	58
	49,50	61
	51,52	62
	53,54	63
	55,56	64
	57,58	65
	59,60	66
	61,62	67
	63,64	68
	65,66	activity intensity, total sample
	67,68	activity significance, total sample
	69,70	major routes, total sample
	71,72	activity type, 2 digit code (sorting key)
	73,74	use-familiarity,total sample
	76	(identification) map side
	77,78,79	(identification) place no.
	80	(identification) data card number

The following data are stored on IBM cards by subject. They represent the description of the subjective personal variables and the coded data from the analysis of response complexity.

Column	Code
1,2	subject identification number
4	residence sector 1. Northeast 2. Southwest 3. Northwest
5	inner/outer city residence 1. inner 2. outer
6	familiarity, residence time 1. 0-2 years 2. 3-5 years 3. 6-20 years 4. 21+ years
7	familiarity, residence time 1. low 2. high
8	travel mode 1. transit (M.B.T.A.) 2. vehicular (automobile)
10	social-economic class 1. lower 2. middle
11	age 2. 20-29 3. 30-39 etc.
12	sex 1. female 2. male

Column	Code
14,15	form (free) elements
16,17	form (free) descriptive words
18,19	form (area) elements
20,21	form (area) descriptive words
22,23	form (check list) elements
24,25	form (check list) descriptive words
27,28	form (total) elements
29,30	form (total) descriptive words
32	form, spatial intensity, elements
33	form, stereotype, elements
34	form, visible activity, elements
35	form, signs, elements
36,37	form intensity, total elements
39	form significance, elements
41,42	activity (free) elements
43,44	activity (free) descriptive words
45,46	activity (area) elements
47,48	activity (area) descriptive words
49,50	activity (check list) elements
51,52	activity (check list) descriptive words
54,55	activity (total) elements
56,57	activity (total) descriptive words
59	activity intensity, elements
61	activity significance, elements

APPENDIX D. FORM TYPE SURVEY VARIABLES

FIG. D.1 CONSTRUCTION TYPE: open space development and/or principal building material

0 - water

1 - land: undeveloped landscaped

2 - land: surfaced

3 - non-building structure

4 - wood

5 - block, metal

6 - brick

7 - stone

8 - reinforced concrete

9 - steel/ glass

The coding system was an adaptation of the classification system of the Sanborn Insurance Maps. The data value was coded from the photograph atlas and checked against the record in Sanborn (1953).

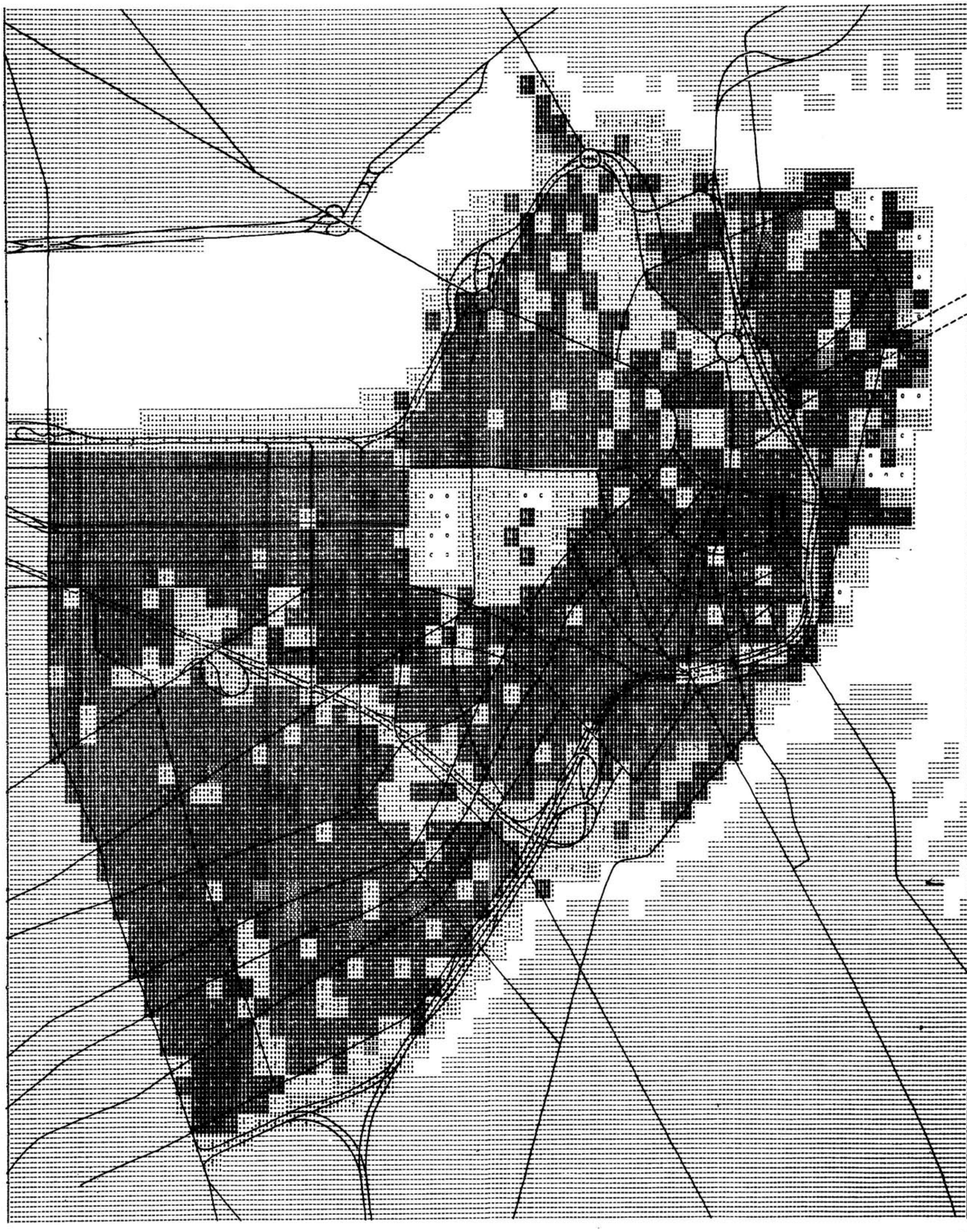
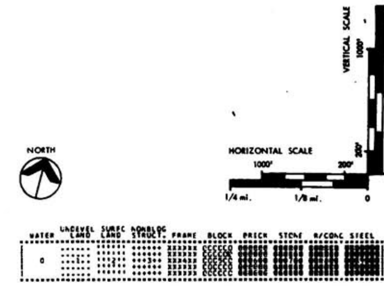


FIG. D.1 CONSTRUCTION TYPE



FORM CONSTRUCTION TYPE:
OPEN SPACE DEVELOPMENT OR PRINCIPLE
BUILDING CONSTRUCTION TYPE

CARL STEINITZ

DEPARTMENT OF CITY AND REGIONAL PLANNING
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FIG. D.2 TRANSPARENCY: the exposure of the "inside" of a form

0 - none

2 - low

4 - medium

7 - high

9 - extra-high

The value code was based upon the exposure of the interior of a place via windows or openings on the lower levels. In the case of open spaces and roads on grade, it was a measure of the degree of exposure of the floor survace. The data value was coded from the photograph atlas.

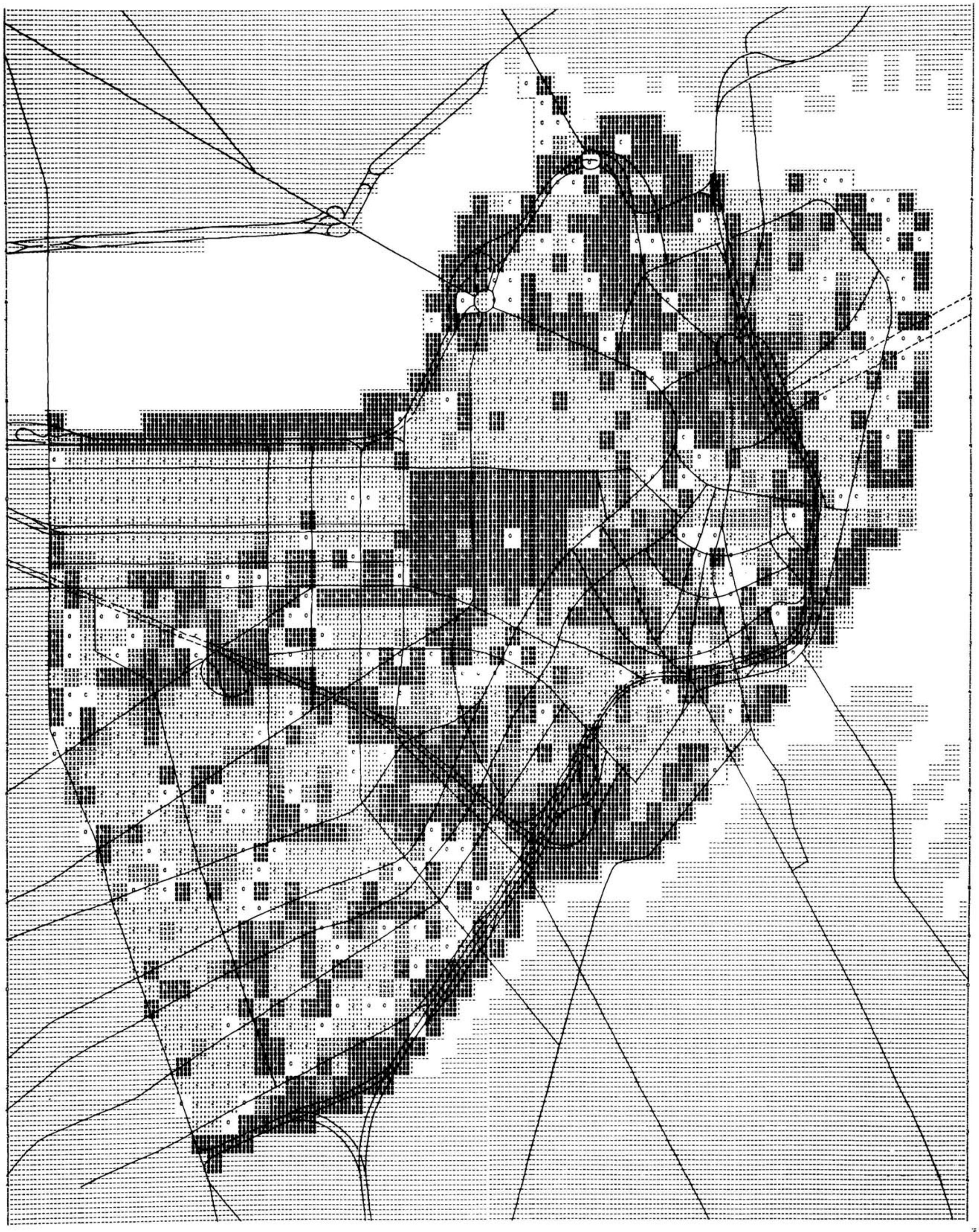
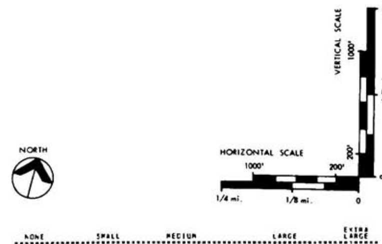


FIG. D.2 TRANSPARENCY



FORM TRANSPARENCY:
THE EXPOSURE OF THE INSIDE OF A FORM

CARL STEINITZ

DEPARTMENT OF CITY AND REGIONAL PLANNING
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FIG. D.3 HEIGHT: the height of open space and/or building construction

0 - 0 (water)
1 - 0 (land)
2 - 1 story
3 - 2,3 stories
4 - 4,5 stories
5 - 6-8 stories
6 - 9-13 stories
7 - 14-20 stories
8 - 21-30 stories
9 - 30+ stories

The value levels were designed to discriminate among the "typical" form height ranges found in the study area. The data value was coded from Sanborn (1953). It was measured in stories with an approximate height of 12 feet per story.

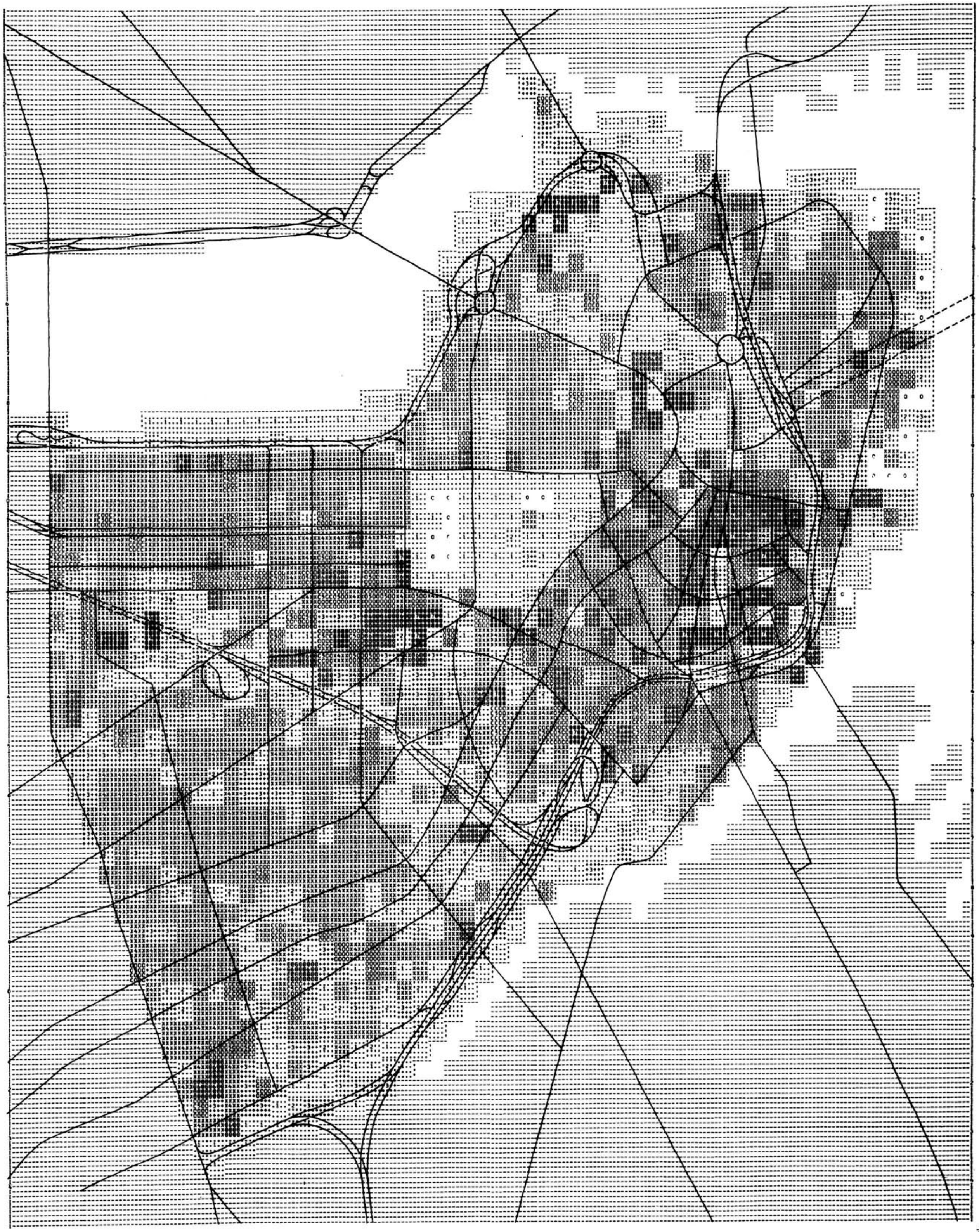
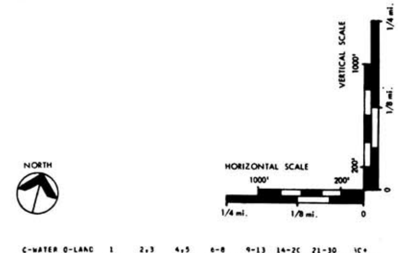
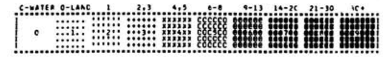


FIG. D.3 HEIGHT



FORM HEIGHT:
OPEN SPACE OR BUILDING CONSTRUCTION HEIGHT



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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FIG. D.4 QUALITY: the maintenance quality of the exposed surfaces of a form

0 - low

4 - medium

9 - high

The value was a judgment based upon the exterior surface quality of the form of a place. While this can be a misleading measure, particularly in the case of the interior qualities of old or remodelled buildings, the variable does represent the perceivable quality as seen by a passer-by. The data value was coded from the photograph atlas and field notes.

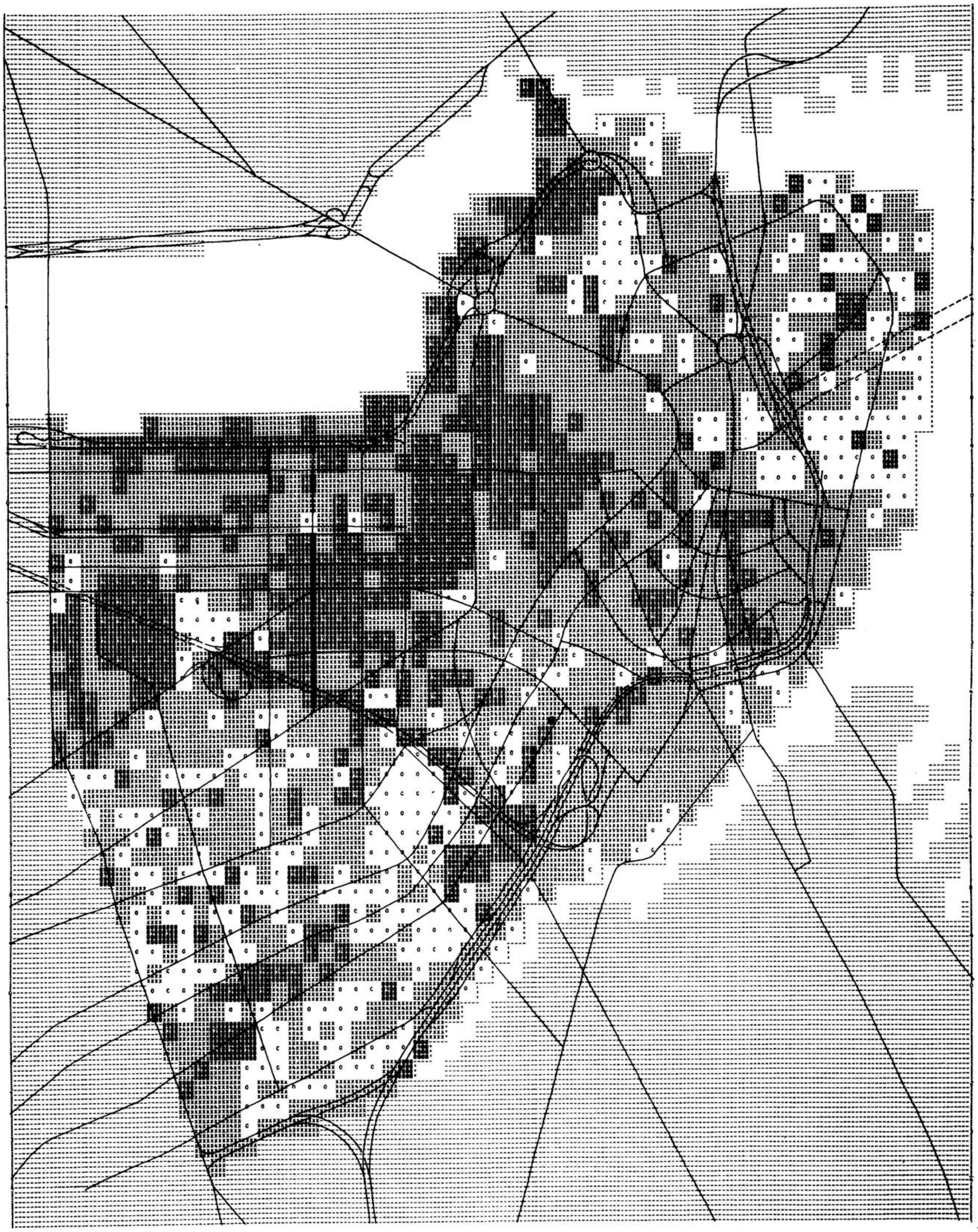
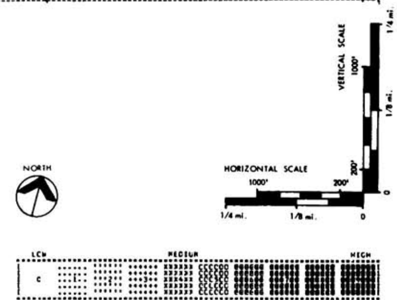


FIG. D.4 QUALITY



FORM QUALITY:
THE MAINTENANCE QUALITY OF THE EXTERIOR OF A FORM

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

APPENDIX E. ACTIVITY TYPE SURVEY VARIABLES

Activity Type, two digit code: The principle localized activity of a place, classified in a two digit code

(0) No apparent activity, construction, resources
- 00 no apparent activity
- 01 area in construction
- 02 agriculture: crop
- 03 agriculture: animal
- 04 fishing
- 05 mining
- 06 forestry

(1) Residence
- 10 private households: low density, less than 50 persons per acre
- 11 private households: middle density, 50-200 persons per acre
- 12 private households: high density, more than 200 persons per acre
- 13 dormitory and membership organization residence
- 14 hotel and motel
- 15 prison

(2) Manufacturing
- 20 food and related products
- 21 textiles, apparel and accessories
- 22 printed and published products
- 23 chemical and drug products
- 24 building materials
- 25 furniture and fixtures
- 26 primary metals
- 27 fabricated metal products, appliances, machinery, exc. 28
- 28 transportation equipment
- 29 manufacturing, not otherwise described

(3) Wholesale commerce and storage
- 30 food and related products
- 31 textiles, apparel and accessories
- 32 printed and published products
- 33 chemicals and drug products
- 34 building materials
- 35 furniture and fixtures
- 36 primary metals, minerals
- 37 fabricated metal products, appliances, machinery
- 38 utility storage: gas, water
- 39 wholesale and storage, not otherwise described

(4) Finance, business and professional services
- 40 banking and finance
- 41 insurance
- 42 headquarters office, not otherwise described
- 43 business services
- 44 legal and other professional services
- 45 union, trade association

(5) Government and public safety
- 50 government: executive
- 51 government: legislative
- 52 government: judiciary
- 53 government: agency
- 54 military
- 55 customs service
- 56 police
- 57 fire

(6) Personal and public services
- 60 personal and household services
- 61 automobile and other repair services
- 62 cemetery and funeral services
- 63 medical and health services
- 64 hospital and other inpatient institutions
- 65 welfare and social services
- 66 primary and secondary education
- 67 college and university
- 68 library, museum, historical museum
- 69 religious organization

(7) Recreation
- 70 motion picture, theater and concert
- 71 athletic and other spectator event, assembly
- 72 commercial amusement, not otherwise described
- 73 club, social membership organization
- 74 water sports
- 75 land sports
- 76 playground
- 77 park

(8) Retail commerce
- 80 food and related products, medicines
- 81 restaurant
- 82 bar
- 83 textiles, apparel and accessories
- 84 furniture and fixtures, appliances
- 85 general merchandise
- 86 building materials and hardware
- 87 transportation equipment, and rental
- 88 gasoline and other petroleum products
- 89 retail trade, not otherwise described

(9) Transportation, communication and utilities
- 90 passenger terminal and transfer
- 91 freight transfer
- 92 transport equipment storage and maintenance, exc. 61, 93, 94
- 93 ship docking
- 94 automobile parking
- 95 traffic flows, exc. 96, i.e. rail, water, air
- 96 auto and truck flows
- 97 postal services
- 98 telephone, telegraph, radio and television services
- 99 electricity, gas, water and sewer services

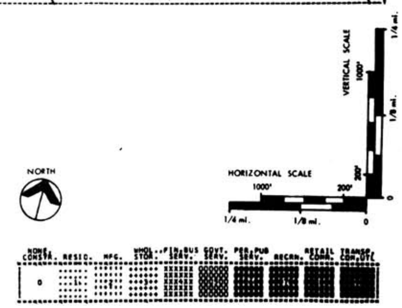
This two digit code was used in the determination of activity type frequency and in the type congruence matrix analysis. The data value was coded from the field survey and photograph atlas and was checked against the notations in the land use maps prepared by the Boston Redevelopment Authority (1962-1964) and in Sanborn (1953).

FIG. E.1 <u>Activity Type, one digit code</u>: The principle localized activity of a place, classified in a one digit code

0 No apparent activity, construction, resources
1 Residence
2 Manufacturing
3 Wholesale commerce and storage
4 Finance, business and professional services
5 Government and public safety
6 Personal and public services
7 Recreation
8 Retail commerce
9 Transportation, communication and utilities

Because of the ten level symbolism limit of the SYMAP program, the one digit code was used for graphic display purposes. The data value was determined on the basis of the collapsed categories of the two digit activity classification.

FIG. E.1 ACTIVITY TYPE, ONE DIGIT CODE



ACTIVITY TYPE, 1 DIGIT CODE:
THE PRINCIPAL LOCAL ACTIVITY OF A PLACE

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APPENDIX F. FORM INTENSITY SURVEY VARIABLES

FIG. F.1 <u>FLOOR-AREA- RATIO:</u> the spatial intensity of site development

0 - 0 (water)
1 - 0 (land)
2 - 1 F.A.R.
3 - 2,3 F.A.R.
4 - 4,5 F.A.R.
5 - 6-8 F.A.R.
6 - 9-13 F.A.R.
7 - 14-20 F.A.R.
8 - 21-30 F.A.R.
9 - 30+ F.A.R.

The grid cell was considered the site limit in the calculation of floor-area-ratio. It was also the unit of measurement when a building occupies more than one cell. The floor-area-ratio was the form height multiplied by the percent coverage of the grid cell. It was coded from a superimposition of the grid on the Sanborn Insurance Map of Boston (1953).

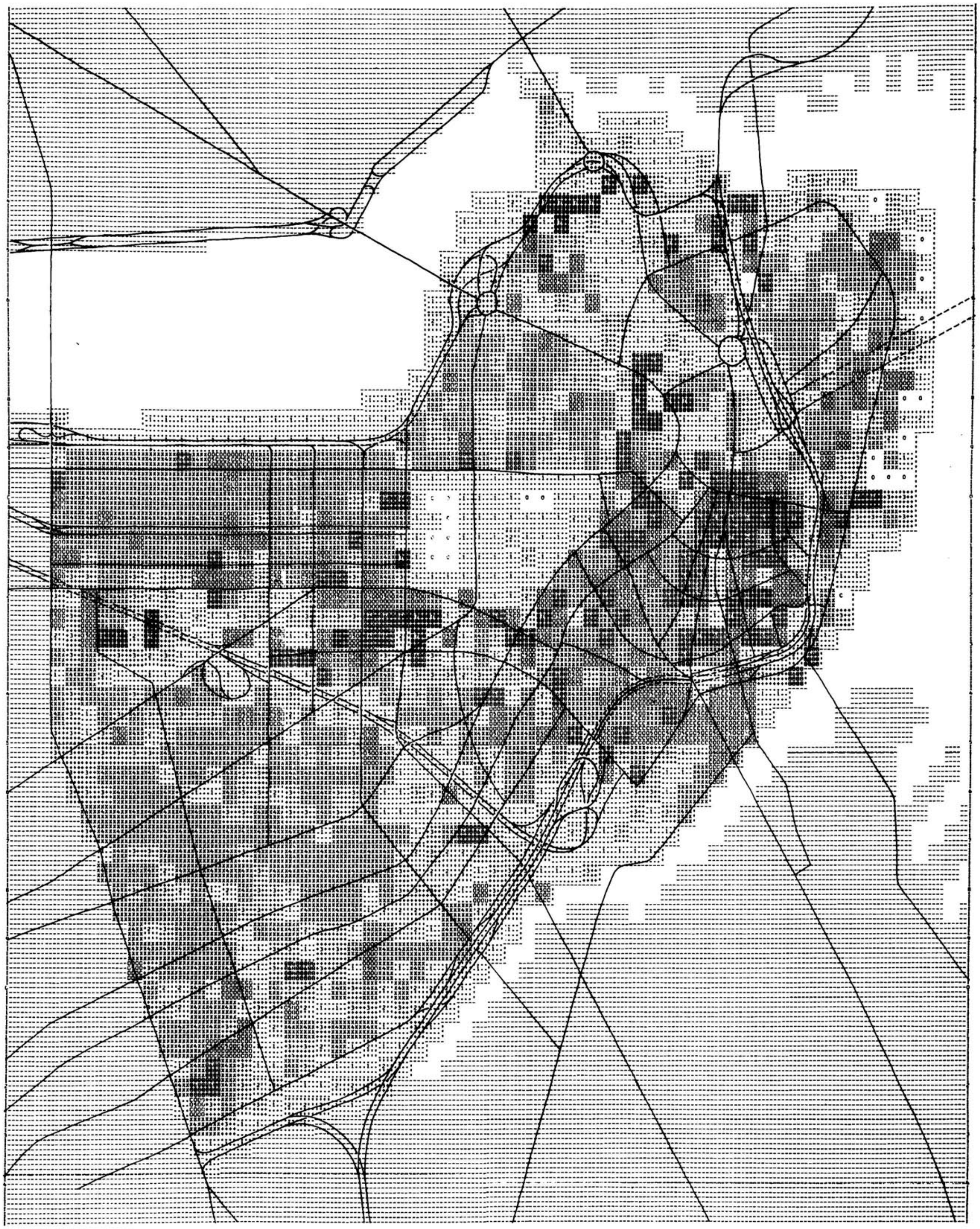
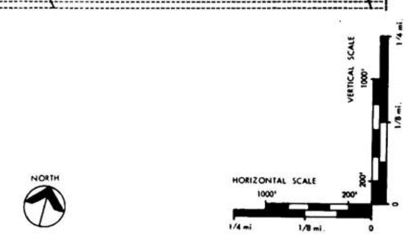


FIG. F.1 FLOOR-AREA-RATIO



FLOOR AREA RATIO:
THE SPATIAL INTENSITY OF SITE DEVELOPMENT
FLOOR AREA / SITE AREA

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FIG. F.2 "ROOTED" SIGN SIZE: The size of signs which pertain to their place

0 - none

2 - small

4 - medium

7 - large

9 - extra large

The variable measures the size of those signs which relate to the principal localized activity of the place. The value was limited to those at the lower floors of a place -- those within the normal field of view as recorded in the place photographs. The presence of a number of "rooted" signs at a place was coded as the value of their cumulative size. The data value was derived from the photograph atlas.

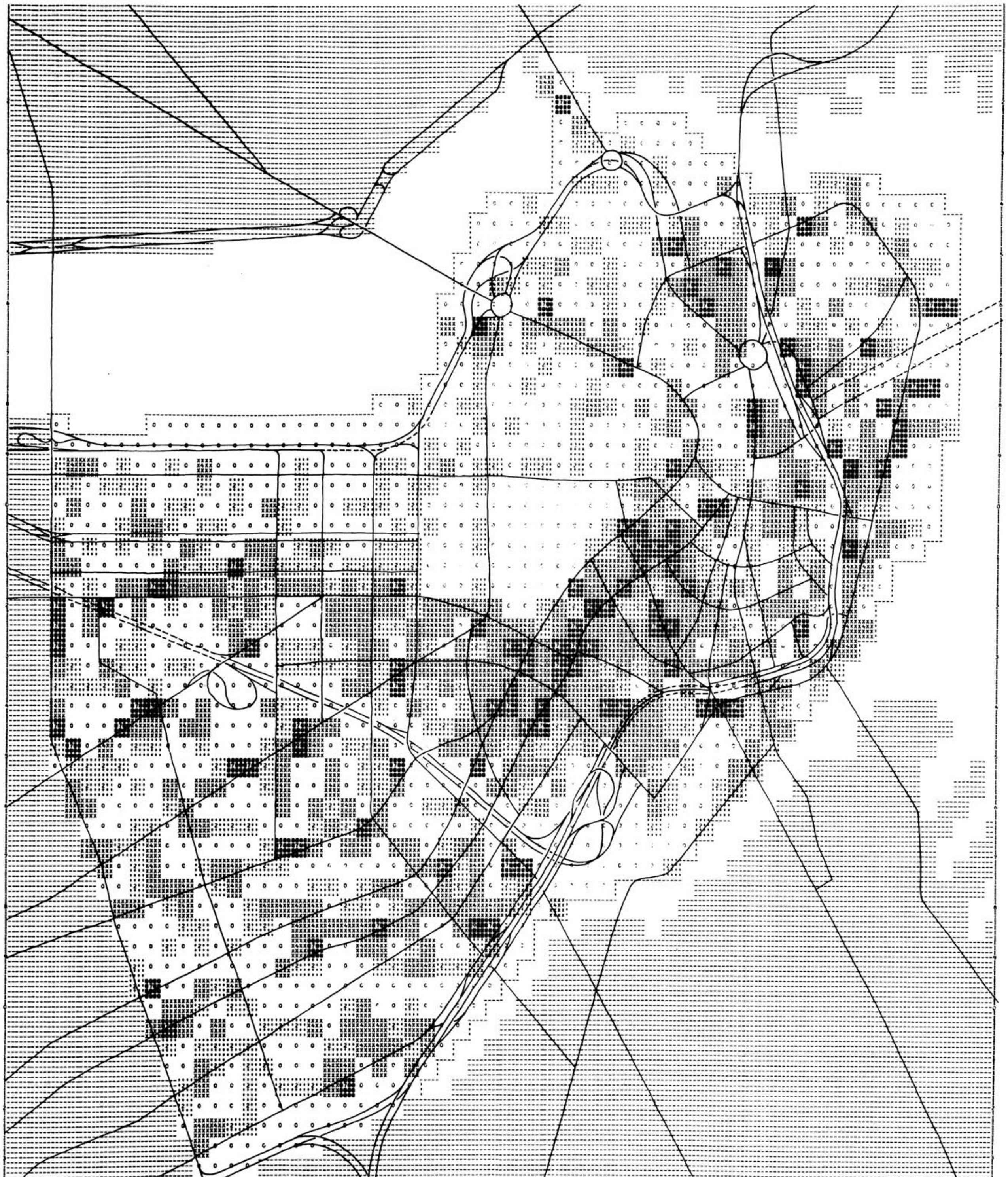
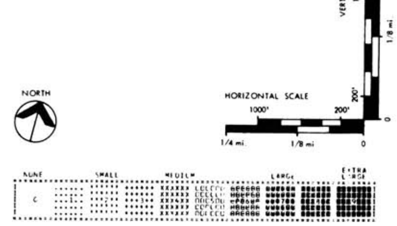


FIG. F.2 ROOTED SIGN SIZE



ROOTED SIGN SIZE:
THE SIZE OF SIGNS WHICH PERTAIN TO THEIR PLACE
(NOT INCLUDING FLOW FACILITIES)

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FIG. F.3 VISIBLE ACTIVITY: the exposure of the participants and processes of an activity

0 - none

2 - low

4 - medium

7 - high

9 - extra high

The variable measures visible activity intensity in terms of the number of people who can be seen participating in the localized activity of the place, and/or the visible motion of mechanical and other processes involved in the activity. It is not a measure of general pedestrian or vehicular flows. The data value was coded from the photograph atlas and from field notes.

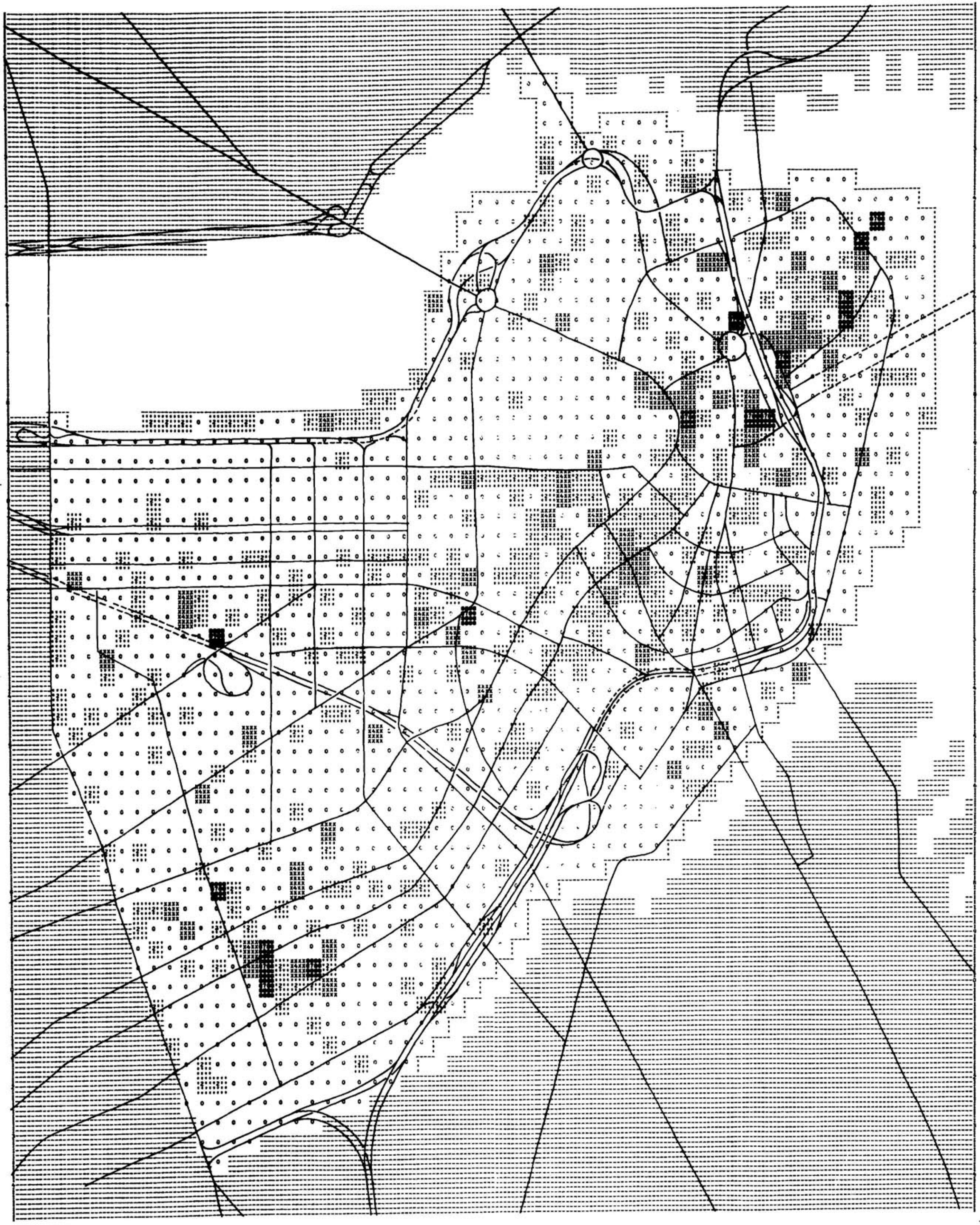
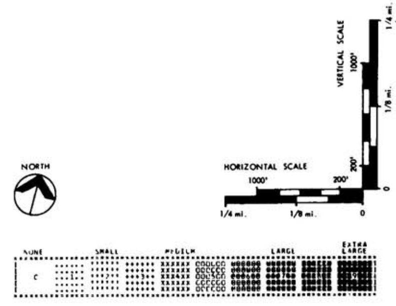


FIG. F.3 VISIBLE ACTIVITY



VISIBLE ACTIVITY:
THE VISIBILITY OF THE PARTICIPANTS
AND PROCESSES OF AN ACTIVITY
(NOT INCLUDING FLOW FACILITIES)

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FIG. F.4 VISIBLE OBJECTS: the exposure of the tools, products, and other objects related to an activity

0 - none

2 - low

4 - medium

7 - high

9 - extra-high

The variable measures the information potential of the visibility of the tools, products and other objects related to an activity. The data value was coded from the photograph atlas and field notes.

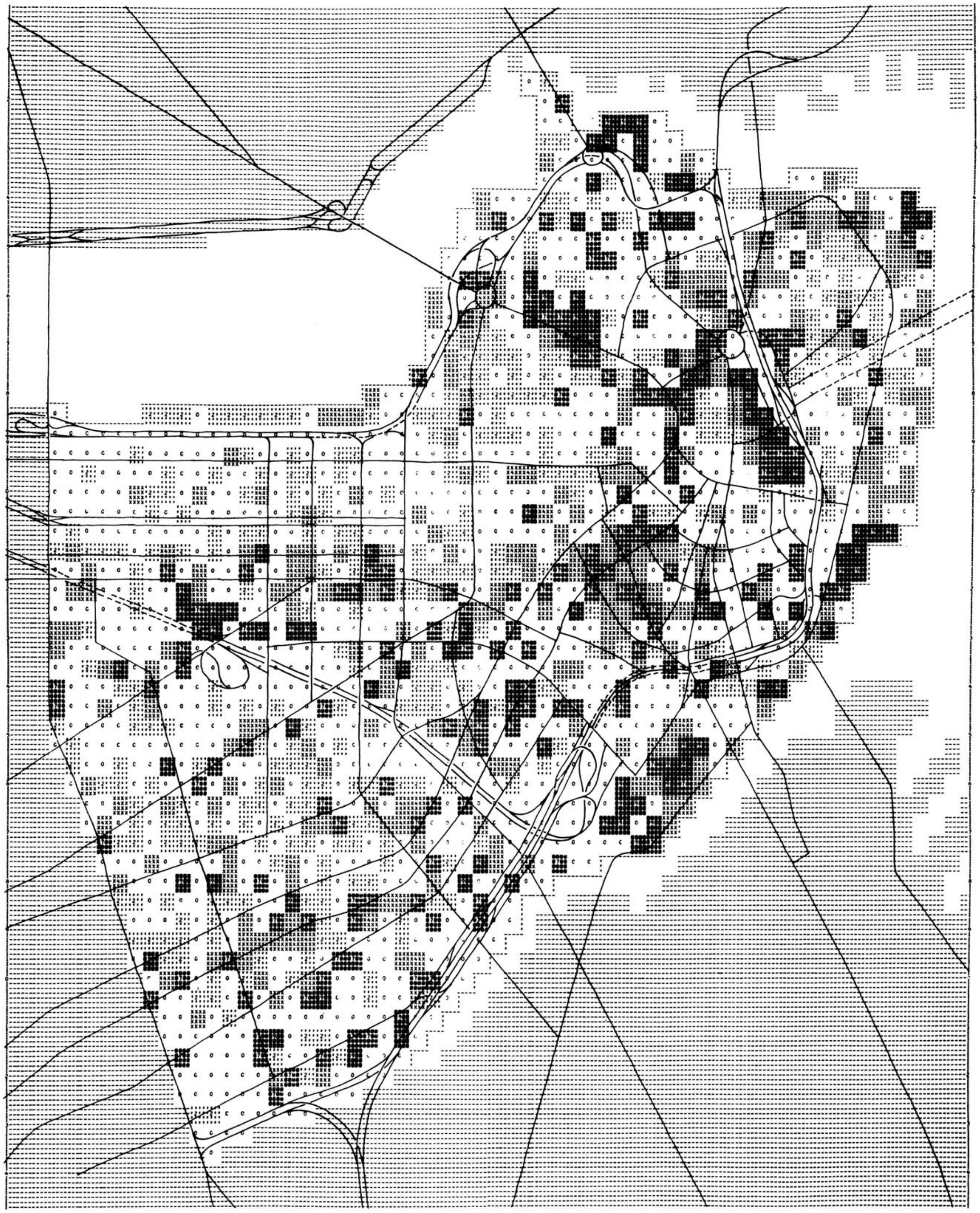
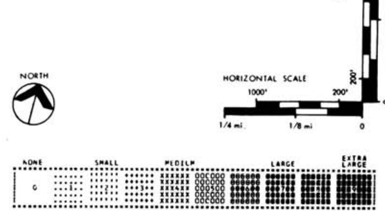


FIG. F.4 VISIBLE OBJECTS



VISIBLE OBJECTS:
THE VISIBILITY OF THE TOOLS, PRODUCTS AND OTHER OBJECTS RELATED TO AN ACTIVITY
(NOT INCLUDING FLOW FACILITIES)

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FIG. F.5 NON-VISUAL INFORMATION: sounds, odors, and other non-visual indicators of an activity

0 - none

2 - low

4 - medium

7 - high

9 - extra-high

The non-visual sources of information about the activity of a place were grouped and measured by this variable. It was the most ephemeral of the surveyed variables. The data value was coded from field notes.

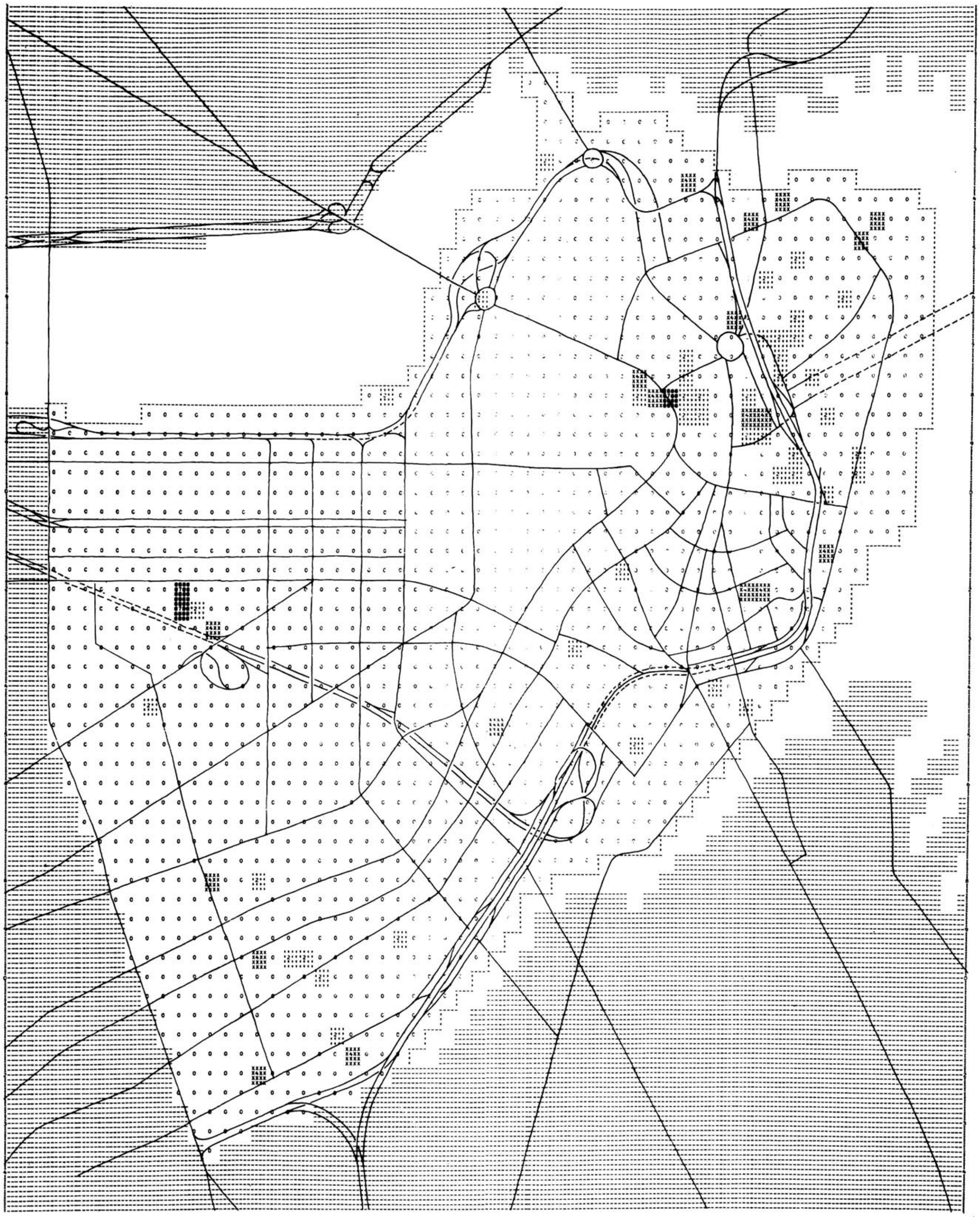
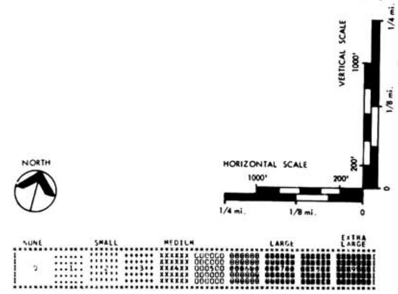


FIG. F.5 NON-VISUAL INFORMATION



NON-VISUAL INFORMATION:
THE SOUNDS, SMELLS AND OTHER NON-VISUAL
INDICATORS OF AN ACTIVITY
(NOT INCLUDING FLOW FACILITIES)

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FIG. F.6 FORM STEREOTYPE: the symbolic representation of an activity type by a form type

0 - none
mismatch

4 - one digit level
activity type code

9 - two digit level,
activity type code

The variable measures the information potential of form qualities such as shape, scale and texture. Its code is quantitatively organized according to the specificity of the activity information to be derived from the form stereotype, as measured by the activity type classification system. The data value was derived from the photograph atlas. It was independently coded by two or more coders.

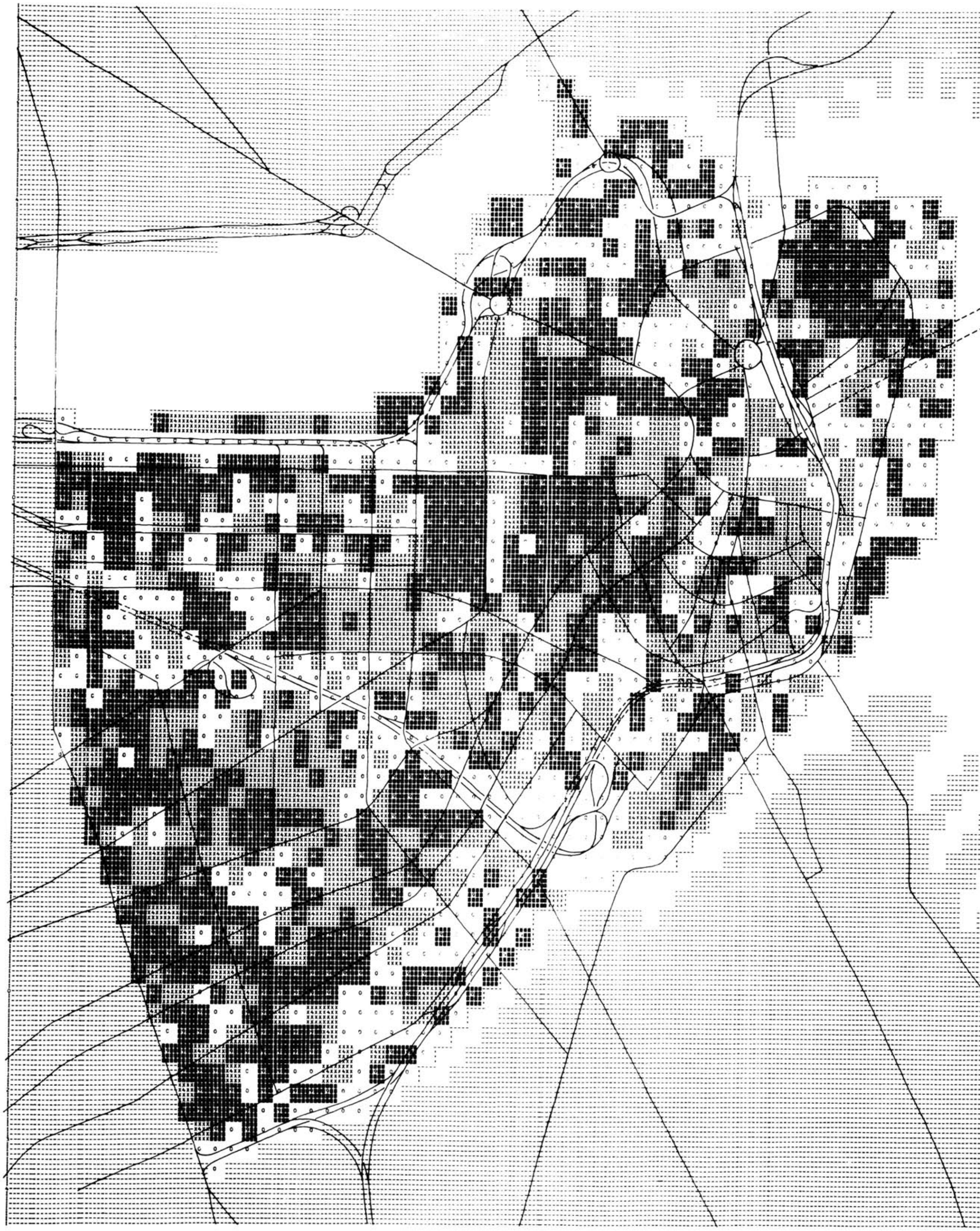
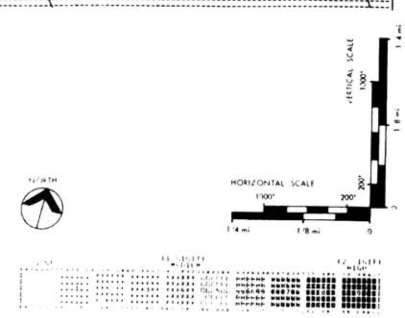


FIG. F.6 FORM STEREOTYPE



FORM TYPE STEREOTYPE:
THE CONVENTIONAL, SYMBOLIC REPRESENTATION
OF AN ACTIVITY BY A FORM TYPE
(NOT INCLUDING FLOW FACILITIES)

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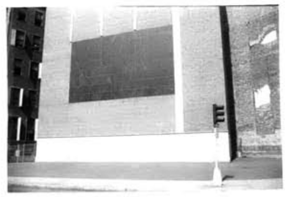
FIG. F.7 FORM INFORMATION INTENSITY: The potential information of a place

0 - lowest
1
2
3
4
5
6
7
8
9 - highest



The value of form information intensity was based on an unweighted combination of rooted sign size, visible activity, visible objects, non-visual information and form stereotype. The value was generated by a computer summary of the values of the component variables for each place.

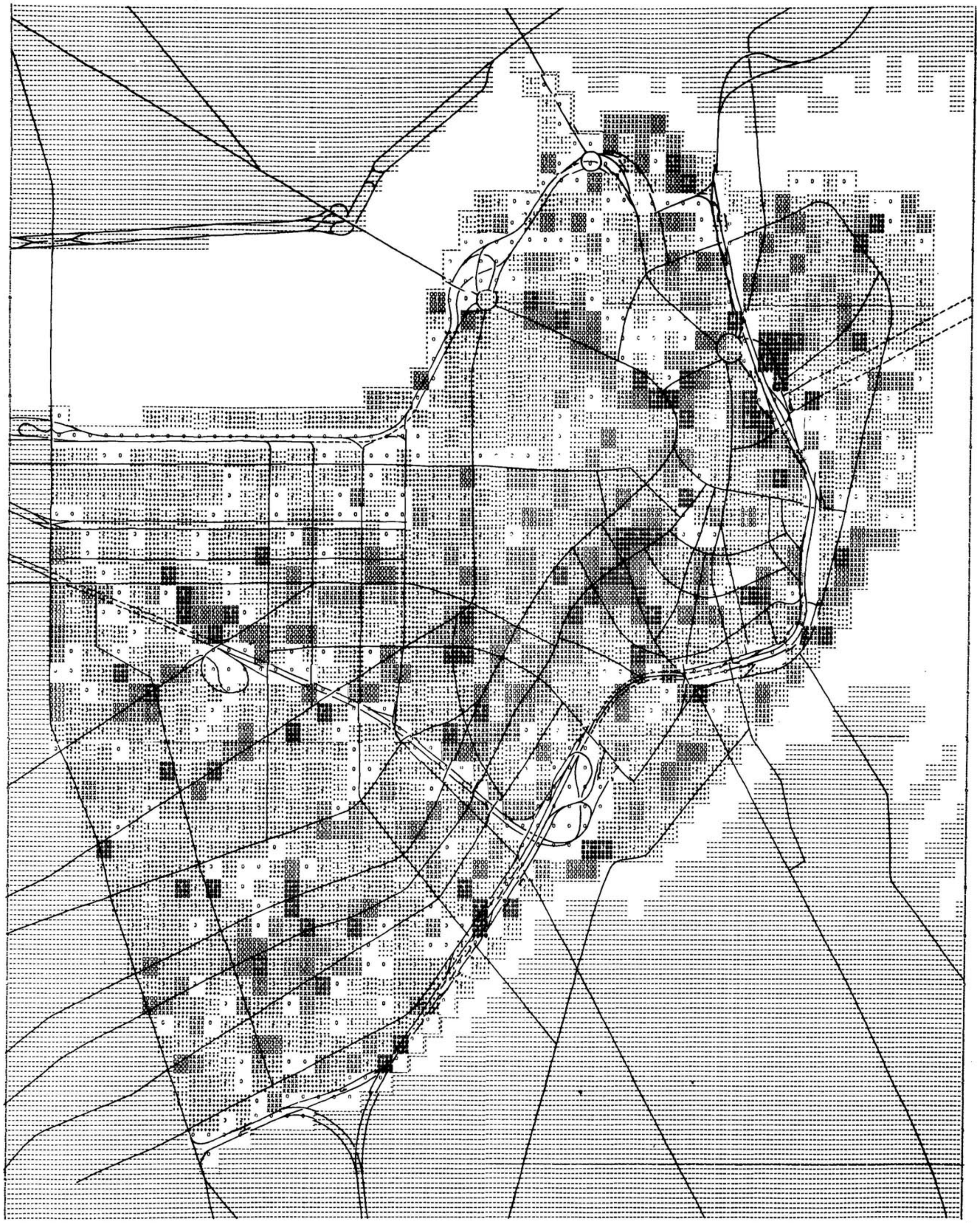
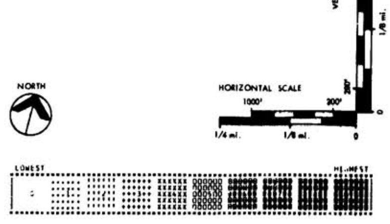


FIG. F.7 FORM INFORMATION INTENSITY



FORM INFORMATION INTENSITY: POTENTIAL
(ROOTED SIGN SIZE + VISIBLE ACTIVITY + VISIBLE OBJECTS
+ NON VISUAL INFORMATION + FORM TYPE STEREOTYPE)
(NOT INCLUDING FLOW FACILITIES)

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APPENDIX G. ACTIVITY INTENSITY SURVEY VARIABLES

FIG. G.1 DESTINATIONS: the peak day number of persons participating in the activity of a place, not including flows

0 -	0 to less than	300	per acre
1 -	300 to less than	600	per acre
2 -	600 to less than	900	per acre
3 -	900 to less than	1,200	per acre
4 -	1,200 to less than	1,500	per acre
5 -	1,500 to less than	1,800	per acre
6 -	1,800 to less than	2,100	per acre
7 -	2,100 to less than	2,400	per acre
8 -	2,400 to less than	2,700	per acre
9 -	2,700+		per acre

Since the grid cell size was one acre, destinations per place unit are expressed in terms of persons per acre.

Information about destinations was obtained in two ways. For residential places, the number of destinations was derived from the analysis of floor-area-ratio and from the U.S. Census of Housing (1960). The average number of destinations per floor area unit within a census tract was obtained by dividing the census tract population by the sum of its residential floor-area-ratios. The data value for a residential place was then calculated by multiplying its floor-area-ratio by this factor. For non-residences, the number of destinations was estimated for the various activity types from distributions of the potential population according to their ratios of average persons per unit floor area. The total number of people to be distributed was obtained from "entry point" data such as the capacity and turnover rates of parking areas,[1] mass transit station admissions data,[2] and estimates of pedestrian traffic from the inner city residential areas. The ratios of persons per unit floor area were derived from a telephone poll of about 250 leading and typical establishments, including most of the places which were thought to have high total destinations. The values of all polled places were coded directly.[3]

FIG. G.2 HOURS PER PERSON PER PLACE — the average number of hours spent by a participant in the activity of a place

0 - 0 to less than 1/2
1 - 1/2 to less than 1
2 - 1 to less than 2
3 - 2 to less than 3
4 - 3 to less than 4
5 - 4 to less than 6
6 - 6 to less than 9
7- 9 to less than 12
8 - 12 to less than 18
9 - 18 to less than 24

The data value was an estimate of the amount of time spent by a typical activity participant in a place. It was also obtained in the telephone poll.

---

[1] A map tabulating off-street parking capacities was provided through the courtesy of Mr. Robert Murphy, Transportation Planner, Boston Redevelopment Authority. The turnover rates were estimated by Mr. Murphy, June 10, 1965.

[2] "One way traffic admitted at Rapid Transit Lines Stations and at Subway entrances, December 2, 1965." This table was provided through the courtesy of Mr. Robert Keith, assistant to the General Manager for Planning, Development and Marketing, Massachusetts Bay Transportation Authority, by letter, March 30, 1965.

[3] (continued on p. 324.)

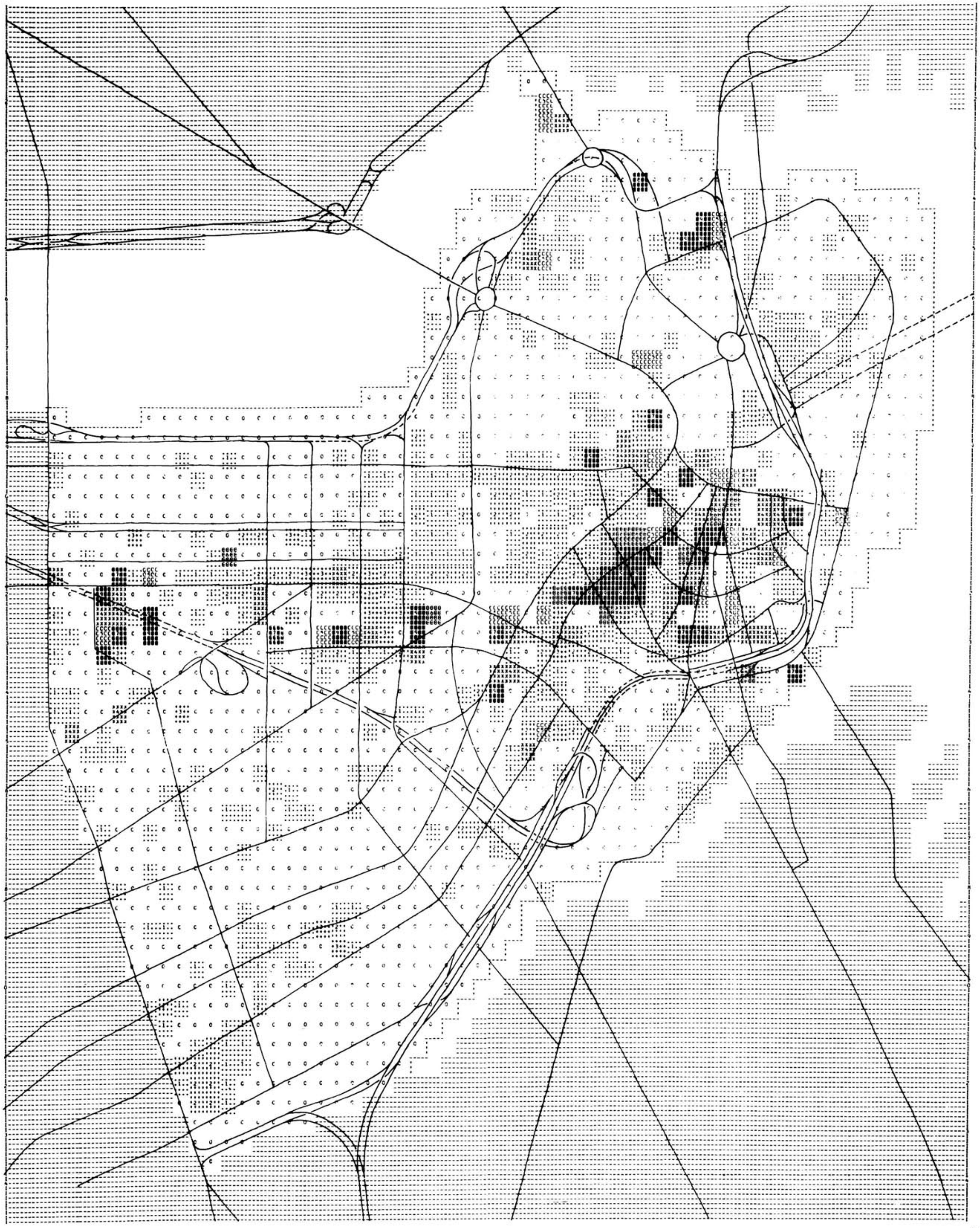
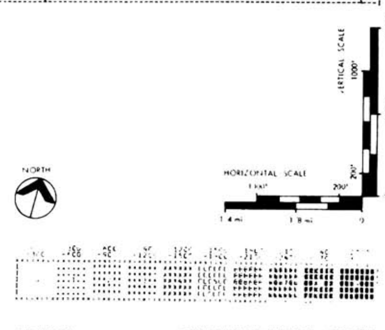


FIG. G.1 DESTINATIONS



DESTINATIONS:
THE PEAK DAY NUMBER OF PERSONS FOR WHOM
THE PLACE IS AN OBJECTIVE OF A TRIP

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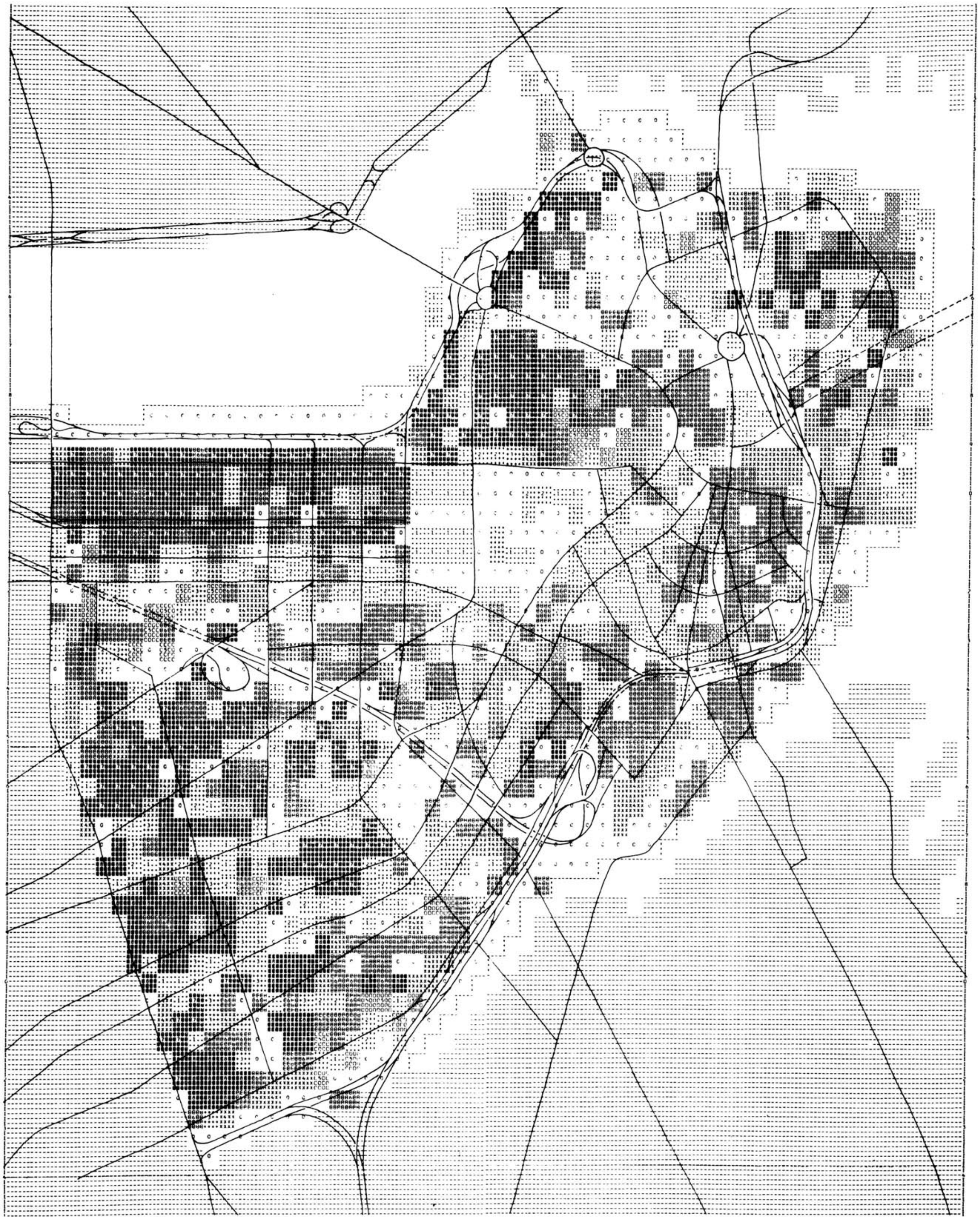
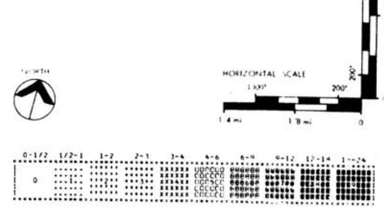


FIG. G.2 HOURS PER PLACE



HOURS/PLACE
THE AVERAGE NUMBER OF HOURS WITHIN A 24 HOUR DAY
SPENT BY A PERSON IN THE ACTIVITY OF A PLACE

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FIG. G.3 PERSON HOURS PER DAY: the total peak day person-hours spent in the activity of a place from 7 A.M. to 7 P.M.

0 - 0 to less than 500
1 - 500 to less than 1,000
2 - 1,000 to less than 1,500
3 - 1,500 to less than 2,000
4 - 2,000 to less than 2,500
5 - 2,500 to less than 3,000
6 - 3,000 to less than 3,500
7 - 3,500 to less than 4,000
8 - 4,000 to less than 4,500
9 - 4,500 +

The value was derived from the data for destinations and hours per person. Based on the activity type of a place, estimates were made of the hours per person which are "daytime" (7 a.m. to 7 p.m.) and those which are "night-time" (7 p.m. to 7 a.m.). This time division, derived from Foley (1952) is particularly useful in the analysis of daily cyclical population movement.

The data value was obtained by multiplying the daytime hours of a place by its destinations.

FIG. G.4 PERSON HOURS PER NIGHT: the total peak day person-hours spent in the activity of a place from 7 P.M. to 7 A.M.

0 - 0 to less than 500
1 - 500 to less than 1,000
2 - 1,000 to less than 1,500
3 - 1,500 to less than 2,000
4 - 2,000 to less than 2,500
5 - 2,500 to less than 3,000
6 - 3,000 to less than 3,500
7 - 3,500 to less than 4,000
8 - 4,000 to less than 4,500
9 - 4,500 +

The data were derived in a manner similar to that of person hours per day. The data value was obtained by multiplying the night-time hours of a place by its destination.

3(continued from p. 321) The resulting distribution of destinations for the places in the study area was also compared with those of Davidson (1954) and Hassan (1965). Although the data for this study are more recent, and the scale is very much finer, the overall patterns are similar.

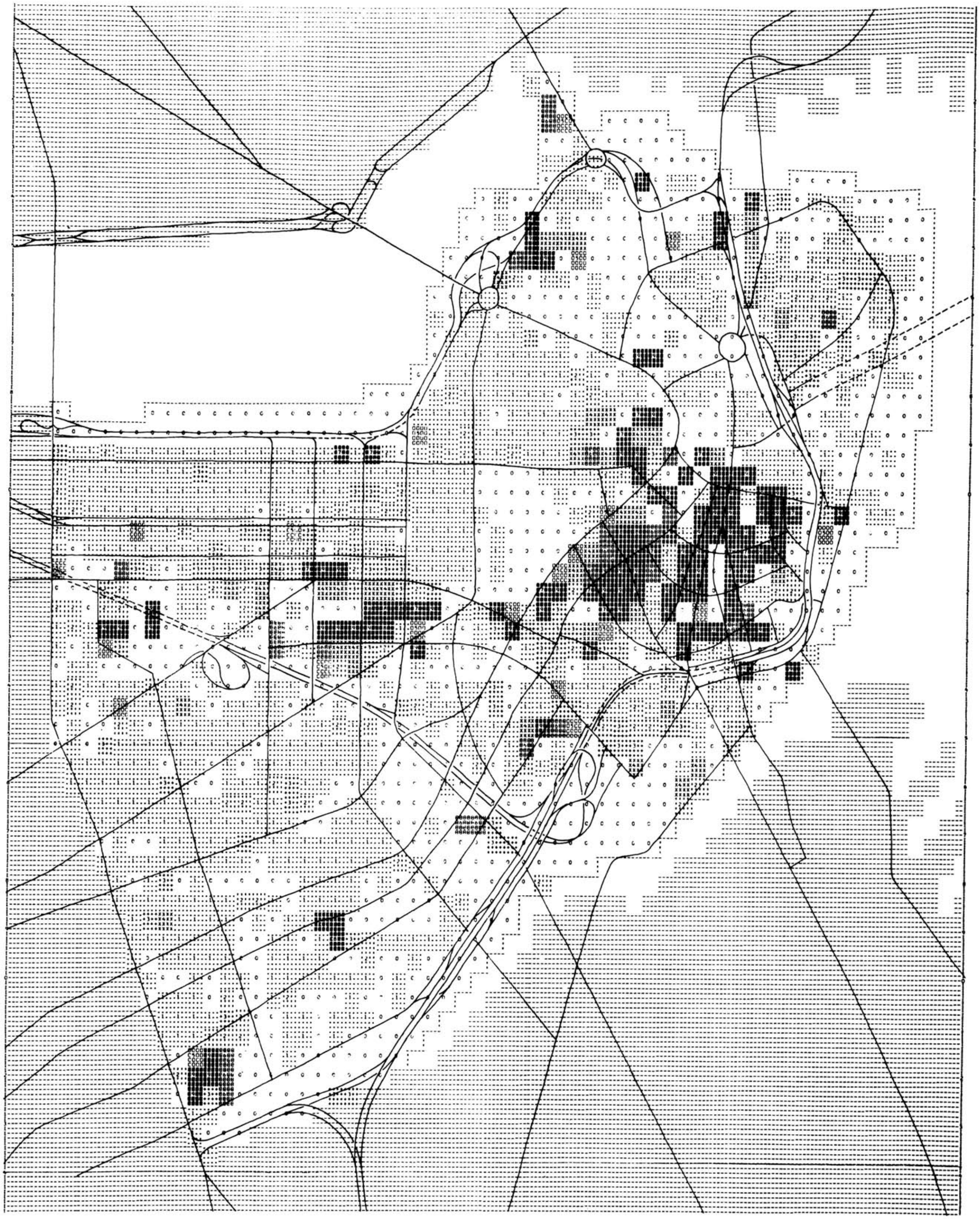
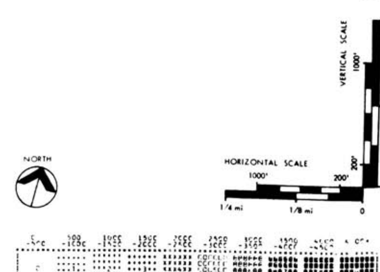


FIG. G.3 PERSON HOURS PER DAY



PERSON-HOURS/DAY:
THE TOTAL PEAK DAY PERSON-HOURS SPENT IN
THE ACTIVITY OF A PLACE FROM A.M. TO P.M.

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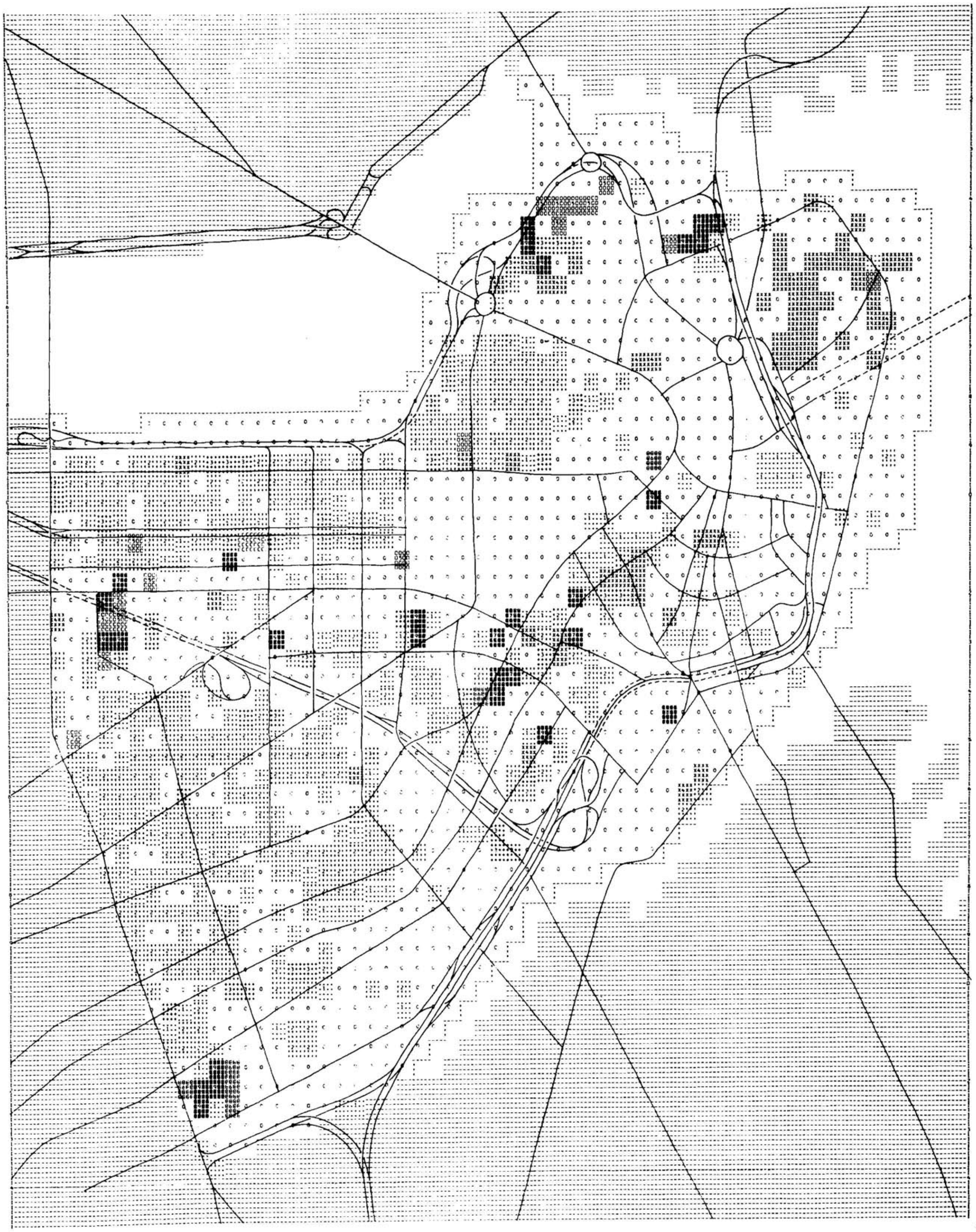
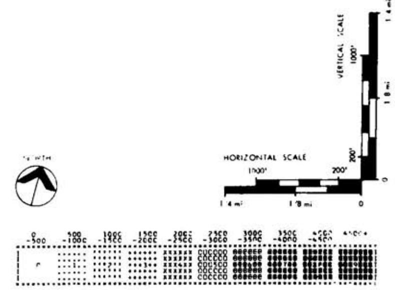


FIG. G.4 PERSON HOURS PER NIGHT



PERSON-HOURS
THE TOTAL PEAK DAY
THE ACTIVITY OF A PLACE, FROM

APPENDIX H. FORM EXPOSURE SURVEY VARIABLES

FIG. H.1 VISIBILITY AREA: the number of places within the study area from which a place can be seen

0 - none (1) e.g. an interior place, a place not on a street

2 - small (2-4) e.g. on a minor street, on a minor corner

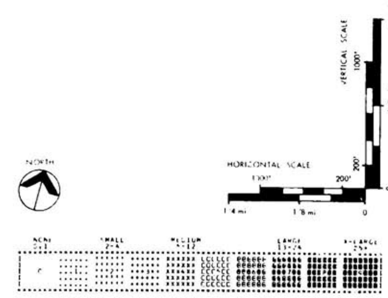
4 - medium (5-12) e.g. on a very wide street, on a major street corner, on a bend of a street

7 - large (13-24) e.g. on the outside bend of a long straight street, adjacent to an open space

9 - extra-large (25+) e.g. on axis of several straight streets, adjacent to a large open space, a very tall element seen from several separate areas.

The value scale was designed to distinguish several general levels of locational dominance. The visibility area of a place was estimated in the field survey and from vertical and oblique aerial photographs of Boston by Aerial Photos of New England (1964, 1965).

FIG. H.1 VISIBILITY AREA



VISIBILITY AREA:
THE SUM OF THE AREAS WITHIN WHICH A PLACE CAN BE SEEN

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FIG. H.2 VEHICULAR FLOWS: the average daily number of person trips on the arterial and secondary street systems

0 - 0 to less than 15,000
1 - 15,000 to less than 30,000
2 - 30,000 to less than 45,000
3 - 45,000 to less than 60,000
4 - 60,000 to less than 75,000
5 -- 75,000 to less than 90,000
6 - 90,000 to less than 105,000
7 - .05,000 to less than 120,000
8 - 120,000 to less than 135,000
9 - 135,000+

The data were principally derived from the 1962 automobile traffic count by Wilbur Smith and Associates (1964). Traffic intensity changes for 1965 were estimated by Mr. Robert Murphy, Transportation Planner, the Boston Redevelopment Authority. Estimates of traffic flows on the prinicpal streets not included in the 1962 traffic count were also made by Mr. Murphy. An estimate of the traffic flows on the Massachusetts Turnpike extention as of June, 1965, was made by Mr. John Reilly, public relations department, Massachusetts Turnpike Authority. The variable only includes automobile flows. Truck traffic flows are not included since they never exceed the '0' code level (0-15,000 person trips per place).

The data value, a measure of person trips was obtained by multiplying the automobile traffic volume by a persons per car factor of 1.5. The ratio of 1.5 persons per car was suggested by Mr. Murphy as being appropriate for Boston's traffic flows.

FIG. H.3 VEHICULAR EXPOSURE: the average daily number of automobile user-trips within the visibility area of a place

0 - 0 to less than 15,000
1 - 15,000 to less than 30,000
2 - 30,000 to less than 45,000
3 - 45,000 to less than 60,000
4 - 60,000 to less than 75,000
5 - 75,000 to less than 90,000
6 - 90,000 to less than 105,000
7 - 105,000 to less than 120,000
8 - 120,000 to less than 135,000
9 - 135,000+

The data value was the number of people who are in the vehicular flows which fall within the visibility area of a place. It is an estimate of the number of automobile users who are potential viewers of a place on an average day.

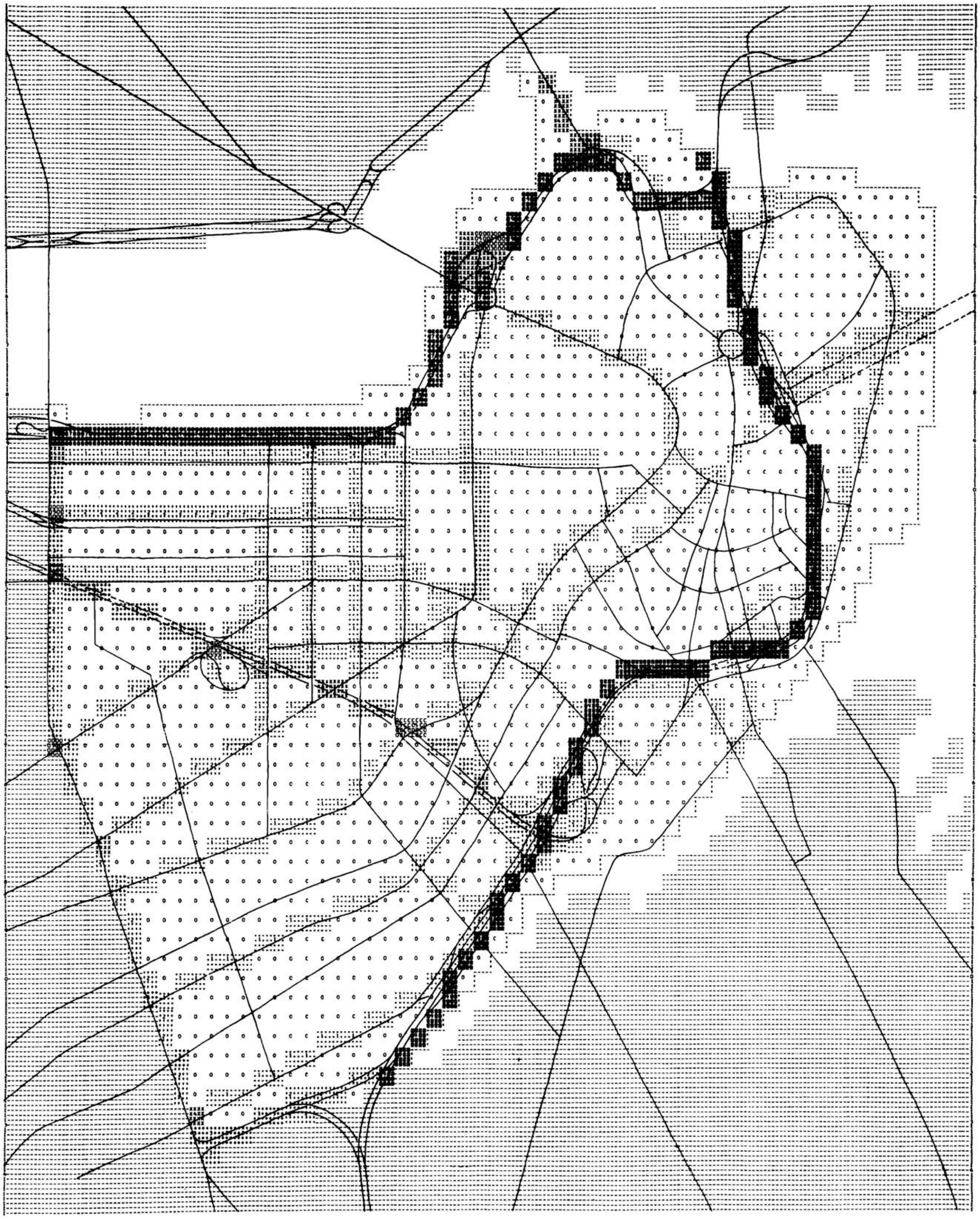
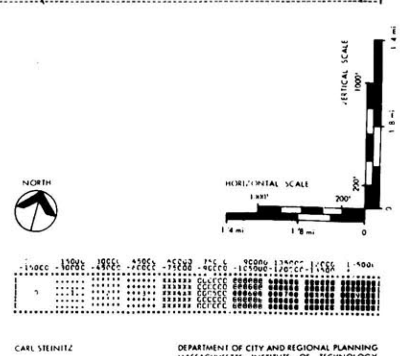


FIG. H.2 VEHICULAR FLOWS



AUTOMOBILE USE

PERSON INTENSITY

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FIG. H.4 MASS TRANSIT FLOWS: the average daily number of person trips on the mass transit routes within the study area

0 -	0 to less than 15,000
1 -	15,000 to less than 30,000
2 -	30,000 to less than 445,000
3 -	45,000 to less than 60,000
4 -	60,000 to less than 75,000
5 -	75,000 to less than 90,000
6 -	90,000 to less than 105,000
7 -	105,000 to less than 120,000
8 -	120,000 to less than 135,000
9 -	135,000+

The variable includes only rail rapid transit trips. Bus and railroad trips were not included since they never exceed the '0' code level (0-15,000 person trips per place).[1] Station to station flows on the rapid transit system were estimated by Mr. Willard Burditt, Schedule Head, Massachusetts Bay Transportation Authority, via personal communication, Feb. 9, 1966, and were derived from a small sample origin-destination study, the results of which were made available through the courtesy of Mr. Dan Brand, Traffic Research Corporation, via personal communication, Feb. 9, 1966.

FIG. H.5 MASS TRANSIT EXPOSURE: the average daily number of transit passenger trips within the visibility area of a place (divided by two to compensate for fixed one side viewing)

0 -	0 to less than 15,000
1 -	15,000 to less than 30,000
2 -	30,000 to less than 45,000
3 -	45,000 to less than 60,000
4 -	60,000 to less than 75,000
5 -	75,000 to less than 90,000
6 -	90,000 to less than 105,000
7 -	105,000 to less than 120,000
8 -	120,000 to less than 135,000
9 -	135,000+

---

[1]The places with the highest concentrations of bus and railroad passengers are:

North Station, railroads:	9500/day
South Station, railroads:	8500/day
Back Bay Station, railroads:	2500/day
Greyhound bus terminal:	1000/day
Trailways bus terminal:	600/day

These figures represent a decline from the values reported in the Massachusetts Transportation Commission, The Boston Regional Survey (1963) Table 69, p. 131, and were estimated by Mr. Robert Murphy, Transportation Planner, Boston Redevelopment Authority.

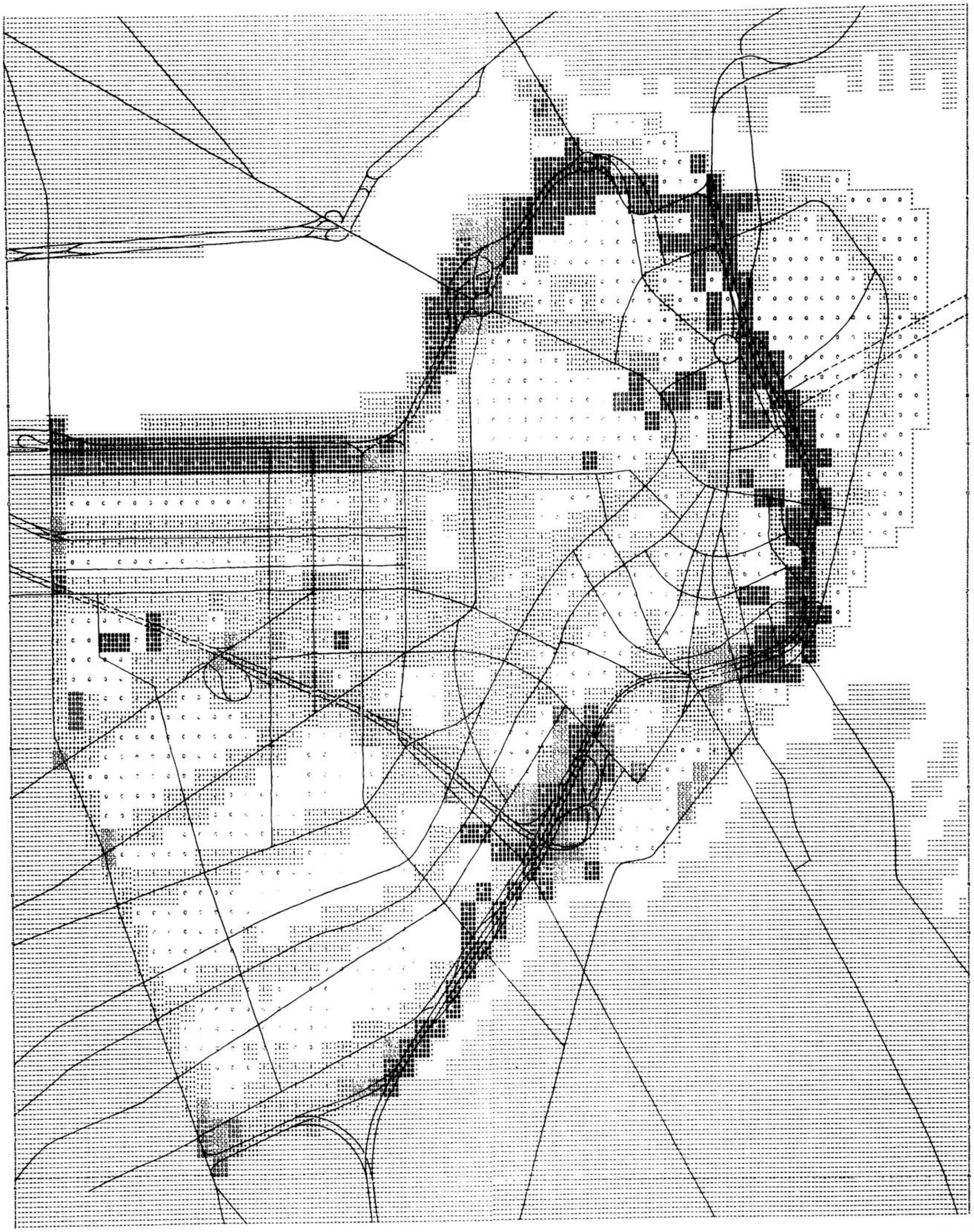
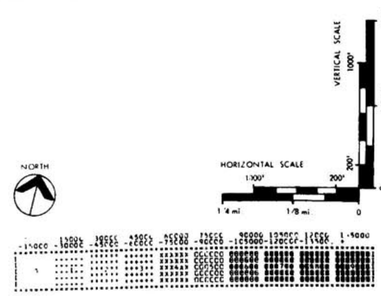


FIG. H.3 VEHICULAR EXPOSURE



VEHICULAR VIEWS:
THE AVERAGE DAILY NUMBER OF MOTOR VEHICLE
USER TRIPS WITHIN THE VISIBILITY AREA OF A PLACE

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The variable is an estimate of the number of mass transit riders who are potential viewers of a place on an average day. It was limited to trips on the M.B.T.A. rapid transit system since the maximum flows for other forms of mass transportation do not exceed the '0' value level. The data value was the number of people who are on the above ground mass transit routes which fall within the visibility area of a place. The value scale takes into account the viewing limitation caused by the interior seating arrangement of the M.B.T.A. cars, in which the passenger is limited to one side viewing.

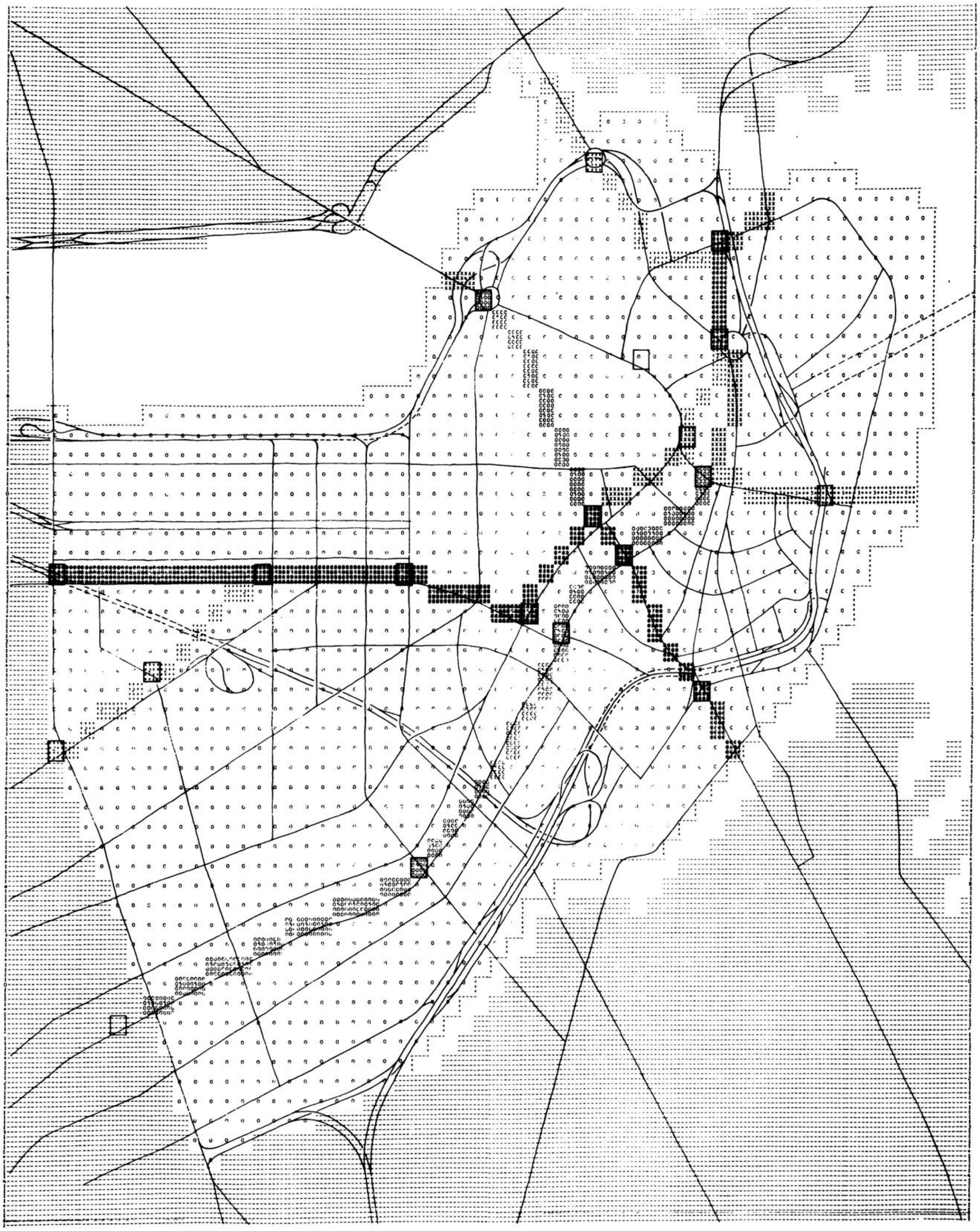
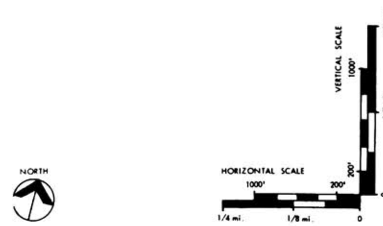


FIG. H.4 MASS TRANSIT FLOWS



TWO WAY MASS TRANSIT FLOWS

FEBRUARY, 19

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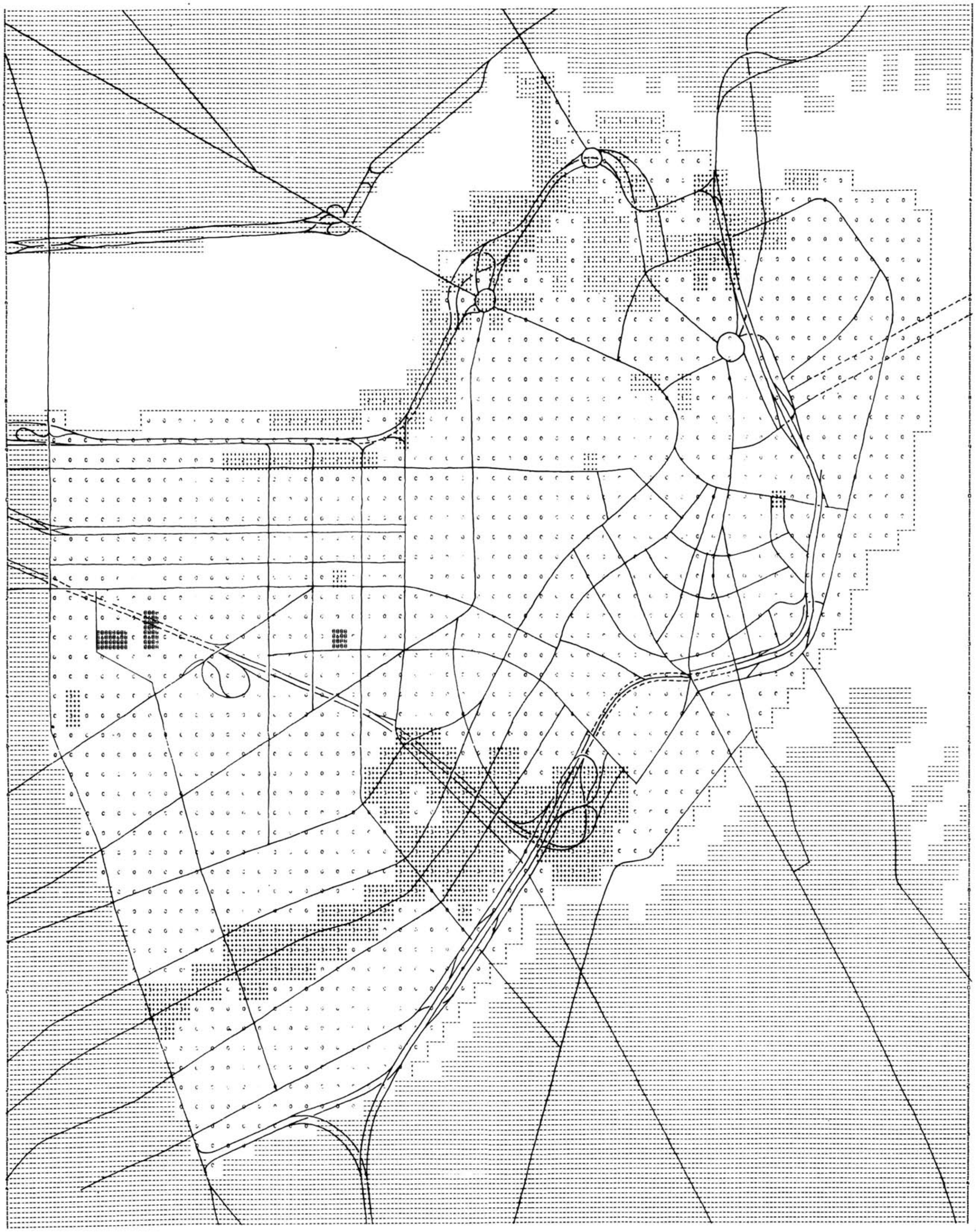
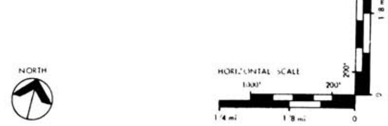


FIG. H.5 MASS TRANSIT EXPOSURE



MASS TRANSIT VIEWS:
THE AVERAGE DAILY NUMBER OF TRANSIT PASSENGER TRIPS WITHIN
THE VISIBILITY AREA OF A PLACE (X 1/2 FOR FIXED ONE SIDE VIEWING)

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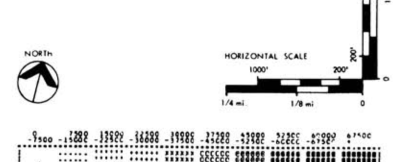
FIG. H.6 PEDESTRIAN EXPOSURE: the average daily number of pedestrian trips within the visibility area of a place

0 - 0 to less than 7,500
1 - 7,500 to less than 15,000
2 - 15,000 to less than 22,500
3 - 22,500 to less than 30,000
4 - 30,000 to less than 37,500
5 - 37,500 to less than 45,000
6 - 45,000 to less than 52,500
7 - 52,500 to less than 60,000
8 - 60,000 to less than 67,500
9 - 67,500 +

The variable is an estimate of the number of pedestrians who are potential viewers of a place on an average day. It measures the number of people who are walking on the streets or other public rights of way which are within the visibility area of a place.

The data value was derived from a distribution of traffic from "entry points" such as parking places and M.B.T.A. stations to destinations.

FIG. H.6 PEDESTRIAN EXPOSURE



PEDESTRIAN VIEWS:
THE AVERAGE DAILY NUMBER OF PEDESTRIAN TRIPS
WITHIN THE VISIBILITY AREA OF A PLACE

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APPENDIX I. ACTIVITY SIGNIFICANCE SURVEY VARIABLES

FIG. I.1 REALM: the service region of an activity

0 - none
2 - neighborhood
4 - district
7 - city
9 - region and greater

The measure was based principally on the activity type and frequency of a place. Other relevant data were obtained from the photograph atlas and field notes such as place names.

FIG. I.2 DECISION SIGNIFICANCE: the economic and/or political importance of an activity

0 - low significance
9 - high significance

High scores on the variable indicate places where decisions are made that are important to the people of the study area as a whole. The value scale was dichotomized because of the difficulty of more subtle measurement.

FIG. I.3 SYMBOLIC SIGNIFICANCE: the social, cultural and/or historic importance of an activity

0 - low significance
9 - high significance

High scores on the variable indicate places which are symbolically important to the people of the study area as a whole. The value scale was dichotomized because of the difficulty of more subtle measurement. The data value was an evaluation based principally upon activity type and was derived in part from guide maps of the study area.[1]

---

[1]"Places of Interest" are identified on maps of central Boston such as those of The Esso, Gulf and Atlantic Oil Companies

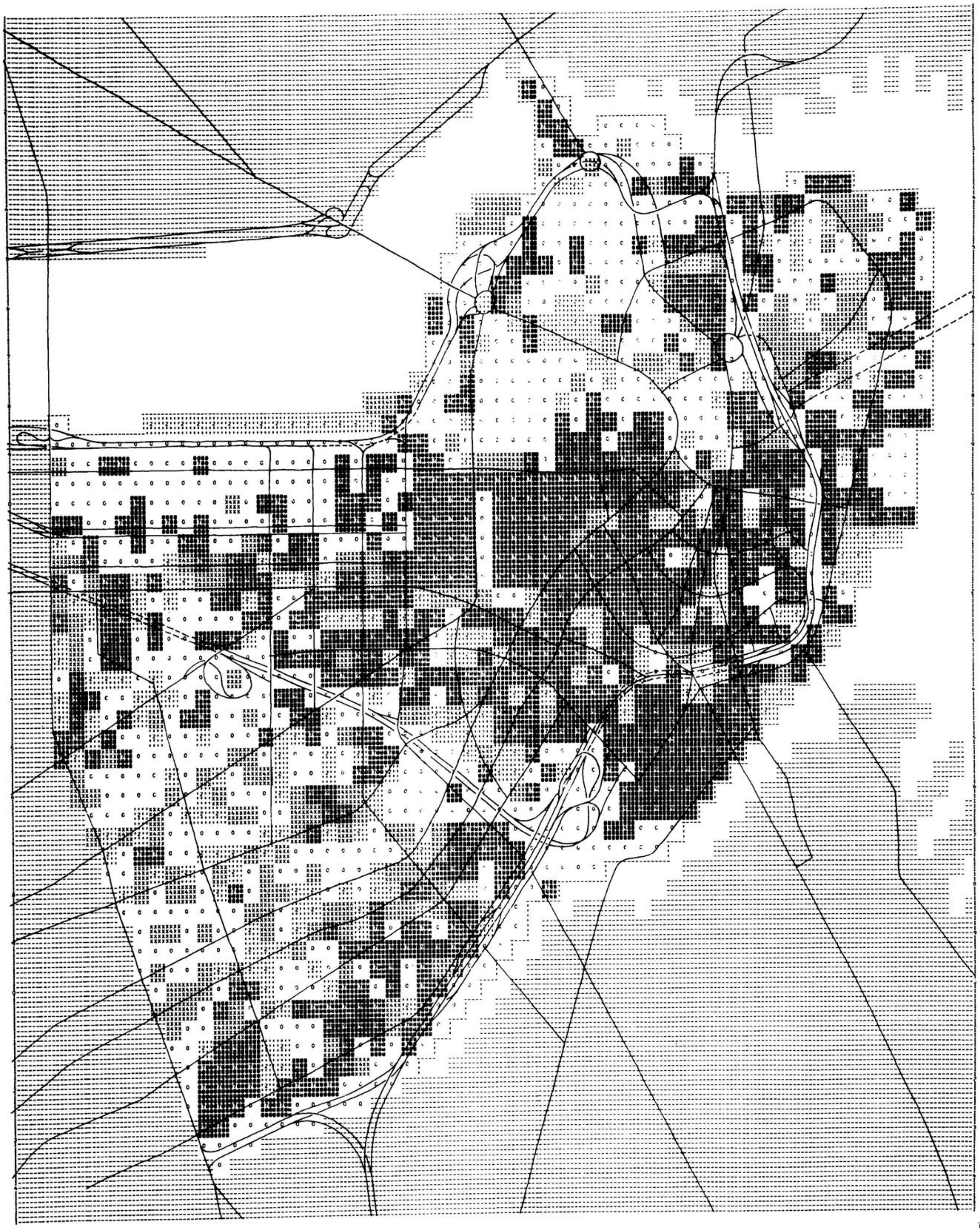
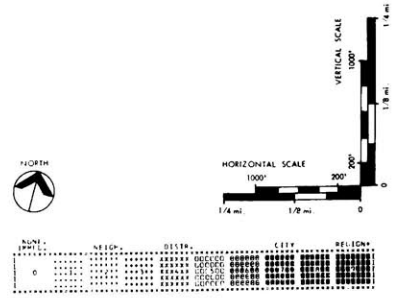


FIG. I.1 REALM



REALM:
THE SERVICE AREA OF AN ACTIVITY
(NOT INCLUDING FLOW FACILITIES

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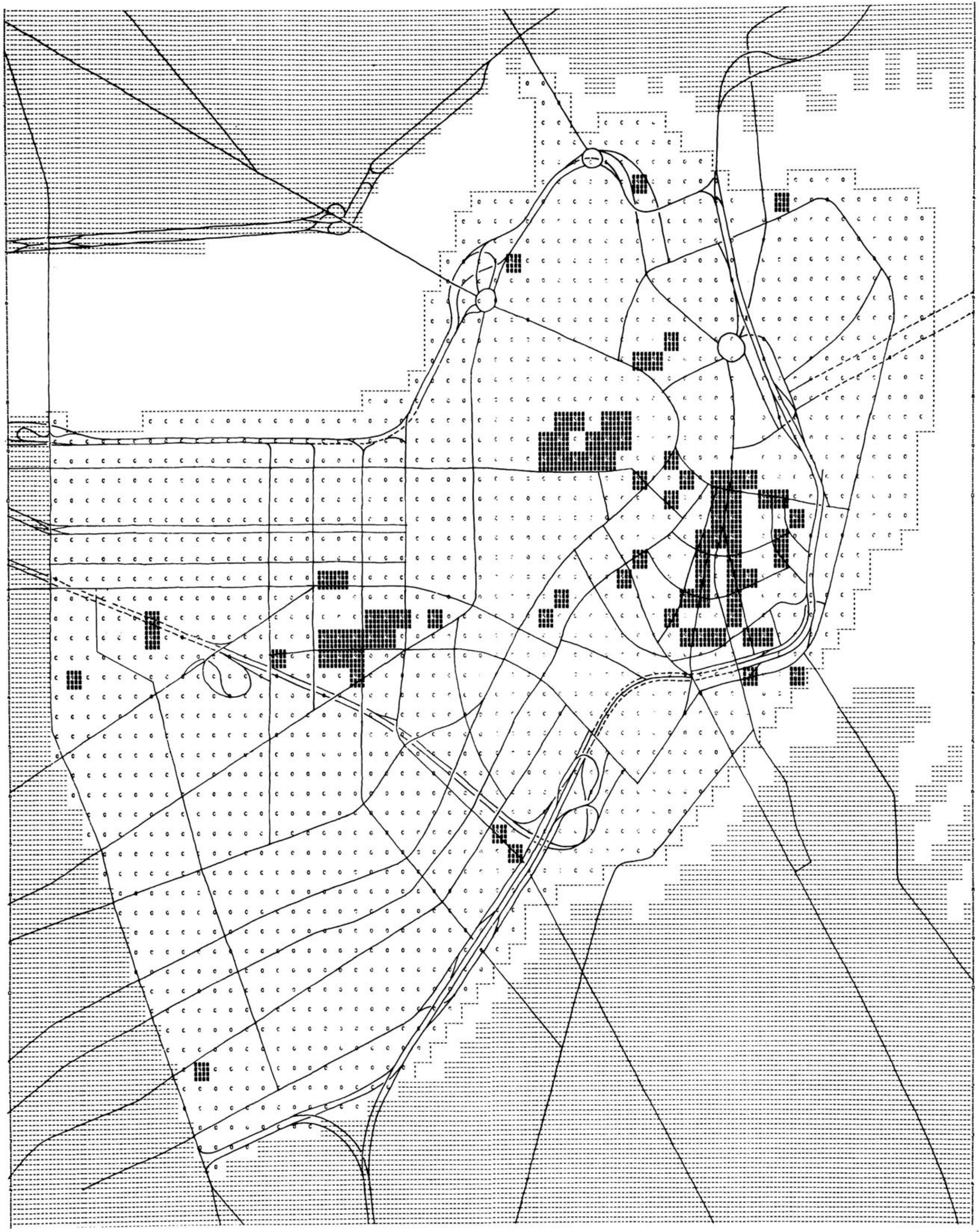
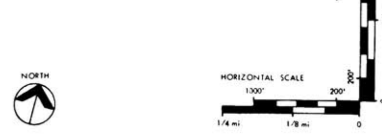


FIG. I.2 DECISION SIGNIFICANCE



DECISION SIGNIFICANCE:
THE ECONOMIC AND/OR POLITICAL
IMPORTANCE OF AN ACTIVITY

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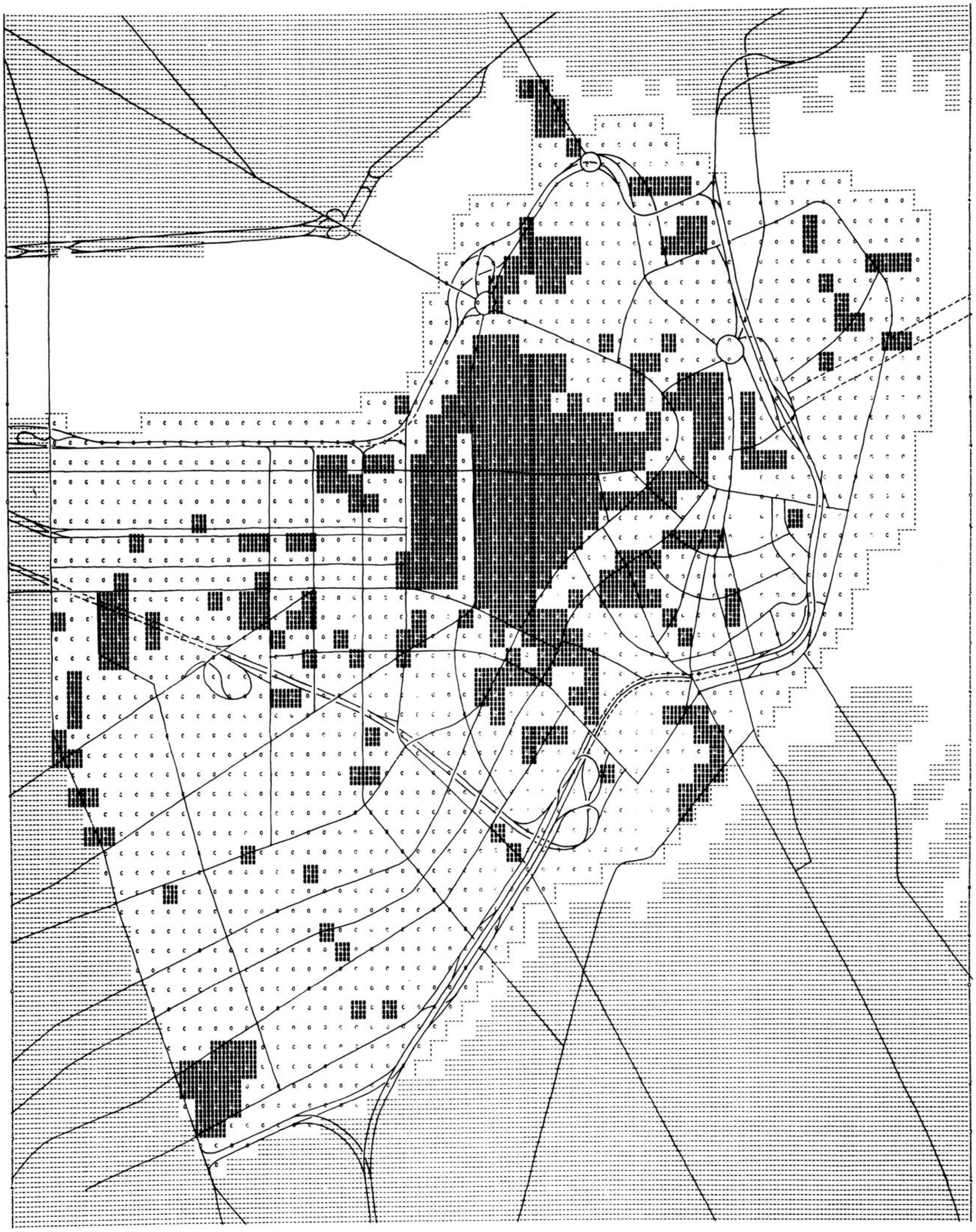
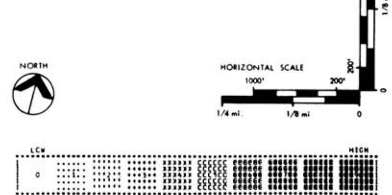


FIG. I.3 SYMBOLIC SIGNIFICANCE



SYMBOLIC SIGNIFICANCE:
THE SOCIAL, CULTURAL AND OR HISTORICAL
IMPORTANCE OF AN ACTIVITY

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APPENDIX J. INTERVIEW PROTOCOL

Preliminary Questions: Name:

Age:

Sex:

Address:

How long have you lived at your present address?

How long have you lived in the Boston area?

Where and when were your previous Boston residences?

What is your occupation?

Where is your present place of work?

How long have you worked there?

Where and when were your previous places of work in the Boston area?

How do you usually get to Central Boston?

How often do you ride the MBTA?

Which line do you take?

Where do you most often get off?

How often do you drive to Central Boston?

What are your common routes going into the city?

What are your common routes returning?

To which areas do you go most often in Central Boston?

For what purposes do you go to each?

How frequently do you go to each?

/Place the first base map before the subject and proceed with the following activity questions, changing the pencil color with each question/

The following questions concern what goes on in Central Boston.

/black/ Would you describe what regularly occurs in the area included on this base map -- what are its major activities?

Please indicate these activities in their locations directly on the base map, being as complete and detailed as possible.

Use words, symbols, outlines -- anything that you need in order to adequately describe the activity pattern.

As you write, would you also speak out loud.

/Example if necessary./

/blue/ Would you include what the activities are (here)?

/Point to areas not previously included./

/green/ Would you include and locate the following:

utilities
transportation terminals
shopping areas
recreation areas
entertainment areas
institutions and public services

office areas
government places
manufacturing areas
wholesale districts
residential areas
the major streets, highways and other transportation routes

[red] Which of these places and areas are the busiest? Please outline or mark them on the map.

[purple] Which of these places and areas are the most important to Boston and its people?

Please outline or mark them on the map.

Would you also write down why they are important.

[Place the second base map before the subject and proceed with the following form questions, changing the pencil color with each question.]

The following questions concern what Central Boston looks like.

[black] How would you describe the visual character of Central Boston?

Would you indicate on this base map what the different parts of the area look like, being as complete and detailed as possible?

Use words, sketches, outlines -- anything you need in order to adequately describe the visual character.

[Example if necessary.]

[blue] Would you include what (this area) looks like?

[Point to areas not previously included.]

[green] Would you include the following -- a description of the places and areas

by their construction type,
by their open space development or
by their building height,
by their quality of maintenance

[red] Where are the most densely built up parts of Central Boston?

Would you mark or outline them on the map.

[yellow] Where are the places and areas in which you can most easily tell what is happening?

Would you outline or mark them on the map.

[orange] Would you mark the areas where you can see the most and largest signs?

[brown] Would you mark the areas where you can see the most people participating in the activity of that place?

[purple] Which are Central Boston's most noticeable physical features?

For example -- those that are the most striking, those that can be seen most often, those that can be seen for the longest time...

Please outline or mark these places and areas on the map.

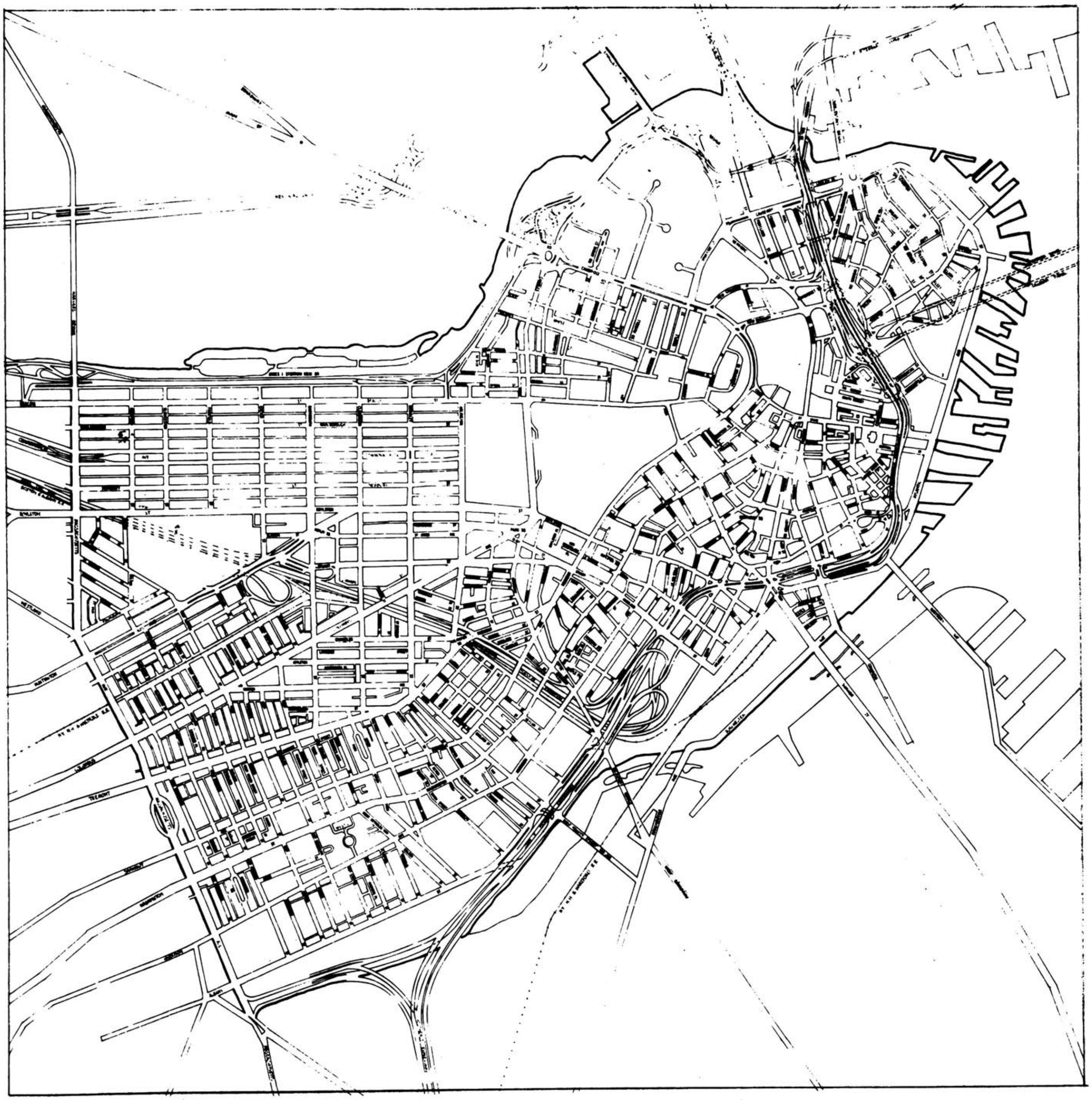


FIG. J.1 INTERVIEW BASE MAP

Actual size used: 36" x 36"

APPENDIX K. INTERVIEW CODING

The process of interview coding was designed to quantitatively measure the responses for their extent -- the number of places which were known, and their complexity -- the number of differentiated elements into which a response was subdivided. The coding system consisted of five points:

graphic coding of the subjective response elements for the total sample;

summarizing the graphic coding into quantitative values of response extent for computer analysis;

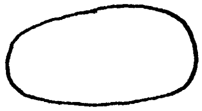
direct computer coding by subject and place of the subjective form and activity type responses;

evaluating response complexity by subject from the number of differentiated elements; and

tabulating the words used by the subjects in describing places.

The principal role of the graphic coding was to delineate the extent of the subjective responses and their structural differentiation. Each of the protocol questions was coded separately, a process which was greatly expedited by the consistent use of color coded responses. A summary of the responses for each question was obtained by placing a transparent acetate sheet over each subject's base map in succession and by tracing his responses in ink according to the following graphic coding key.

Graphic Coding Key



--All lines -- with or without words -- were traced in their location on the base map.

--Mislocated lines (mislocated because of their accompanying verbal description) were traced in a dash line, with an arrow pointing in the direction of the correct location.

--Areal descriptive words without borders (referring to combinations of grid cells) were located in their position on the base map.

--Mislocated areal descriptive words were located in their base map position with an arrow indicating the direction of their correction location.

--Place descriptive words (referring to single grid cells) were located in their position on the base map.

--Mislocated place descriptive words were located in their base map position, with an arrow indicating the direction of their correct location.

In order to generate the subgroup responses which were needed to test the personal variable hypotheses, the extent of the responses to the form and activity type questions were coded for computer use by subject. The transparent overlay with the place grid was placed over each subject's response maps in turn. A place was coded "1" if it was correctly described or identified, with correctness being defined as comparability to the surveys. If a descriptive category had not been surveyed, a "best possible judgment" was made. Places which were correctly noted but which were spatially mislocated on the base map were relocated to correct symbolic grid cells and were also coded "1". Places which were incorrectly described or identified, or which were not mentioned at all were coded "blank." Thus, a subject who drew a border around an area and marked it only as "residential" received the value "1" for only those places within the border which aatually were "residential." All other places were coded "blank." Thus, for any place, the number of subjects in any subsample who mentioned a place was represented by the sum of that place's coded values, "1" representing one subject. Since the data were stored on IMB cards by subject (column) and by place (row), the responses for any given subsample were combinable by a computer program subroutine which summed the responses of the relevant subjects.

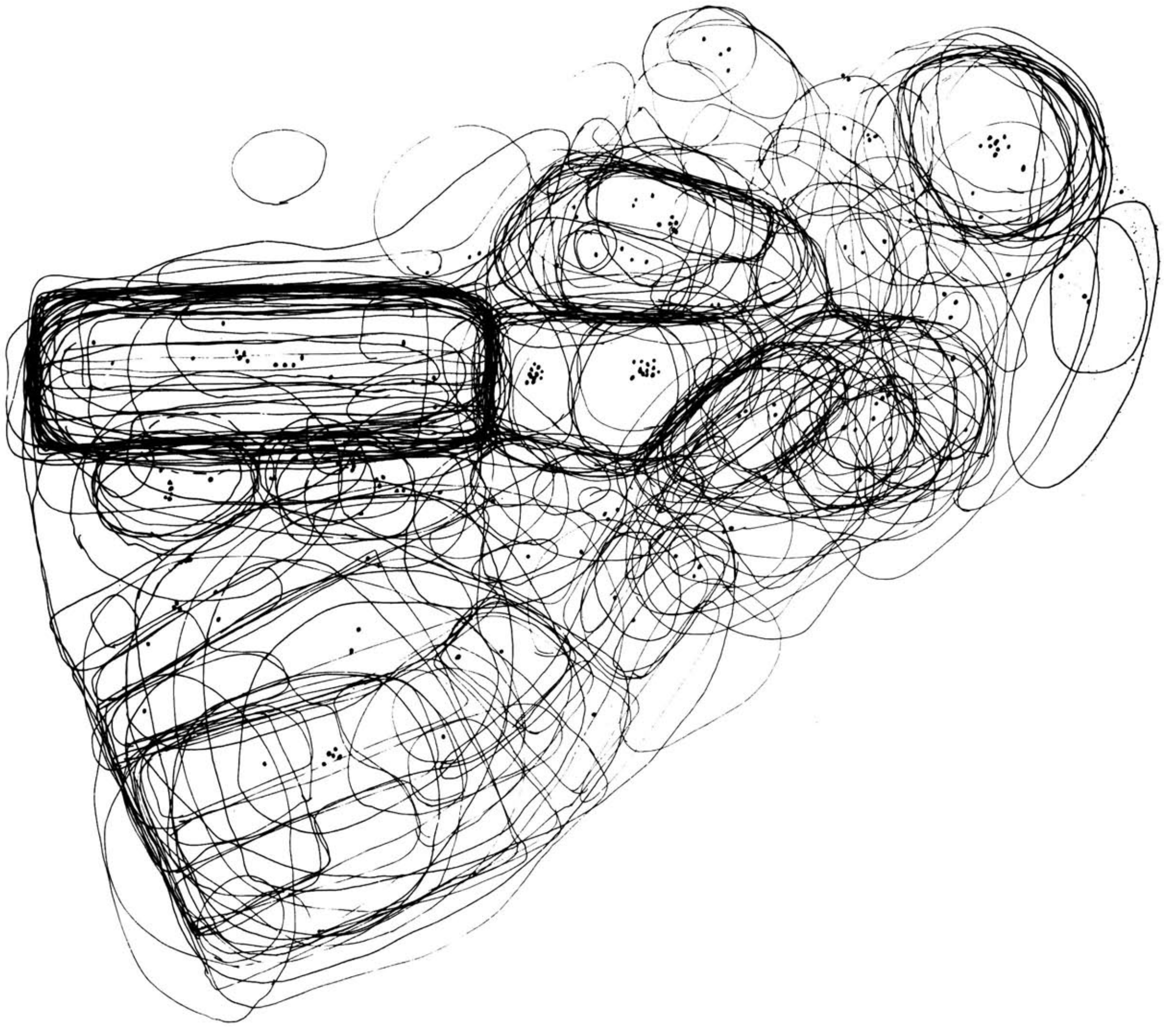


FIG. K.1 FORM TYPE, GRAPHIC SUMMARY, FREE RESPONSES

TOTAL SAMPLE (48)

NORTH

SCALE

1000' 200' 0

1/4 mi 1/8 mi 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

FORM TYPE (FREE)

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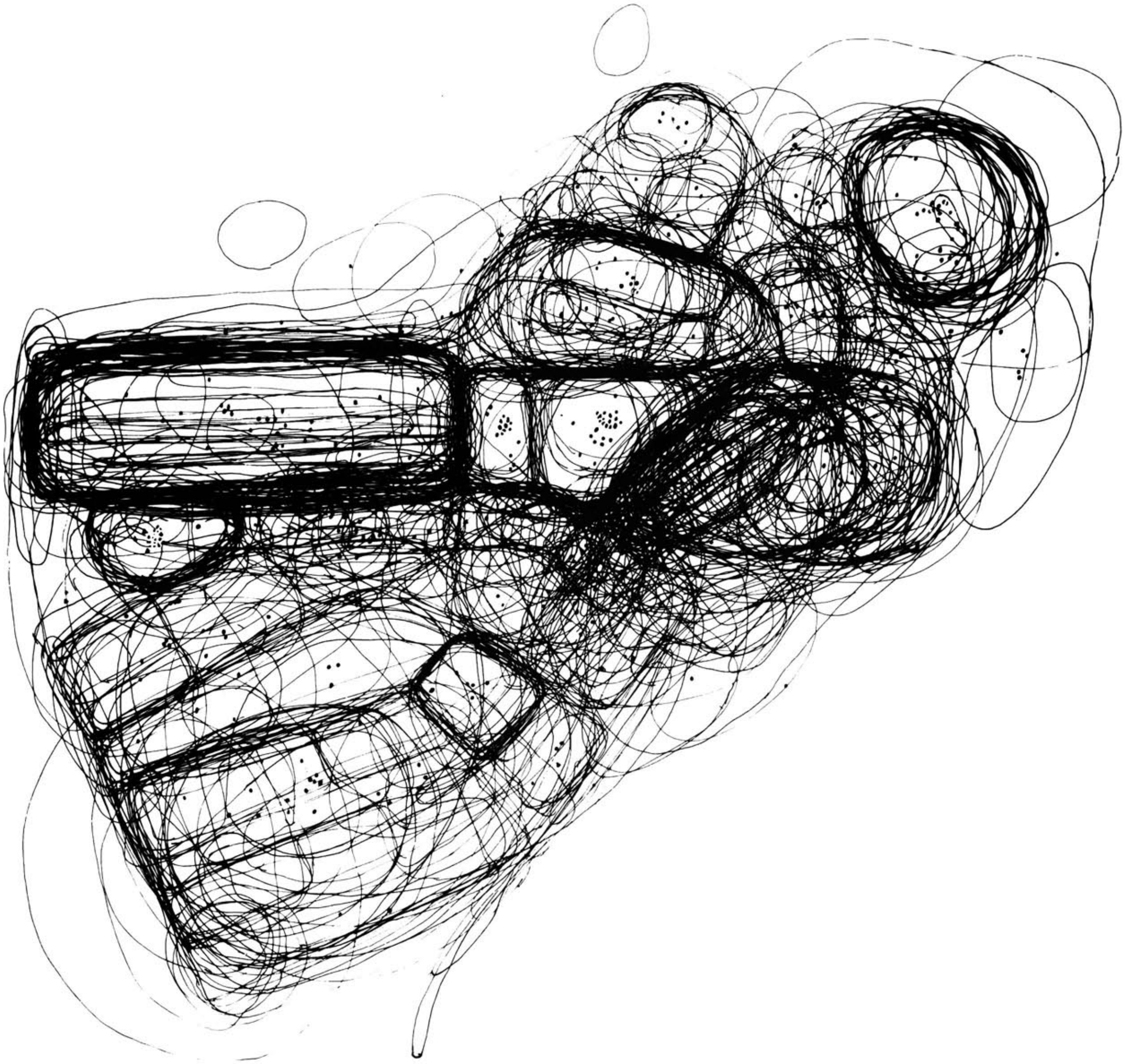

FIG. K.25 FORM TYPE, GRAPHIC SUMMARY, TOTAL RESPONSES

TOTAL SAMPLE (48)

NORTH

SCALE
1000' 200' 0
1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

FORM TYPE (FREE, AREA, CHECK LIST)

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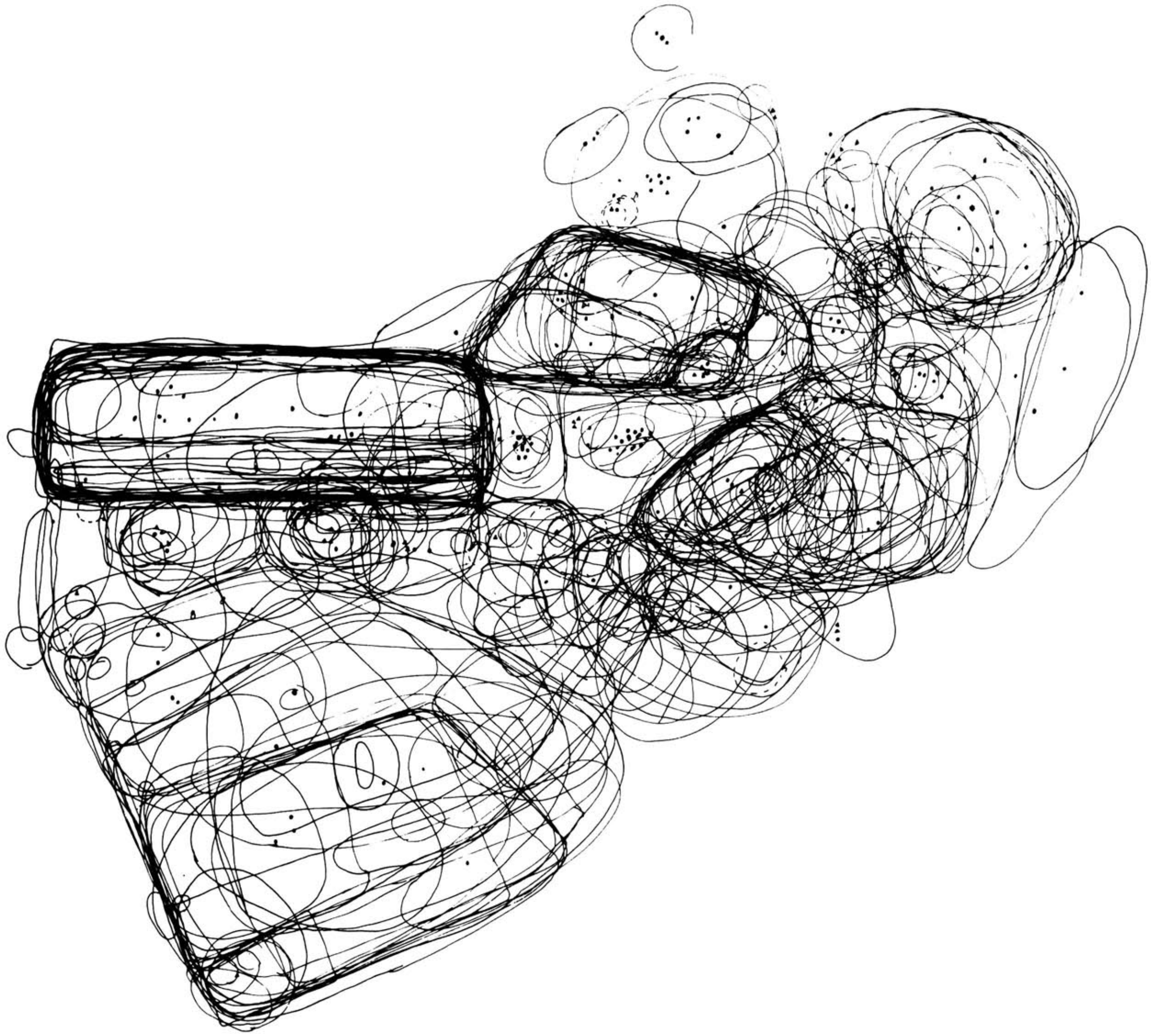

FIG. K.3 ACTIVITY TYPE, GRAPHIC SUMMARY, FREE RESPONSES

TOTAL SAMPLE (48)

NORTH

SCALE
1000' 200' 0
1/4 mi 1/8 mi 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY TYPE (FREE)

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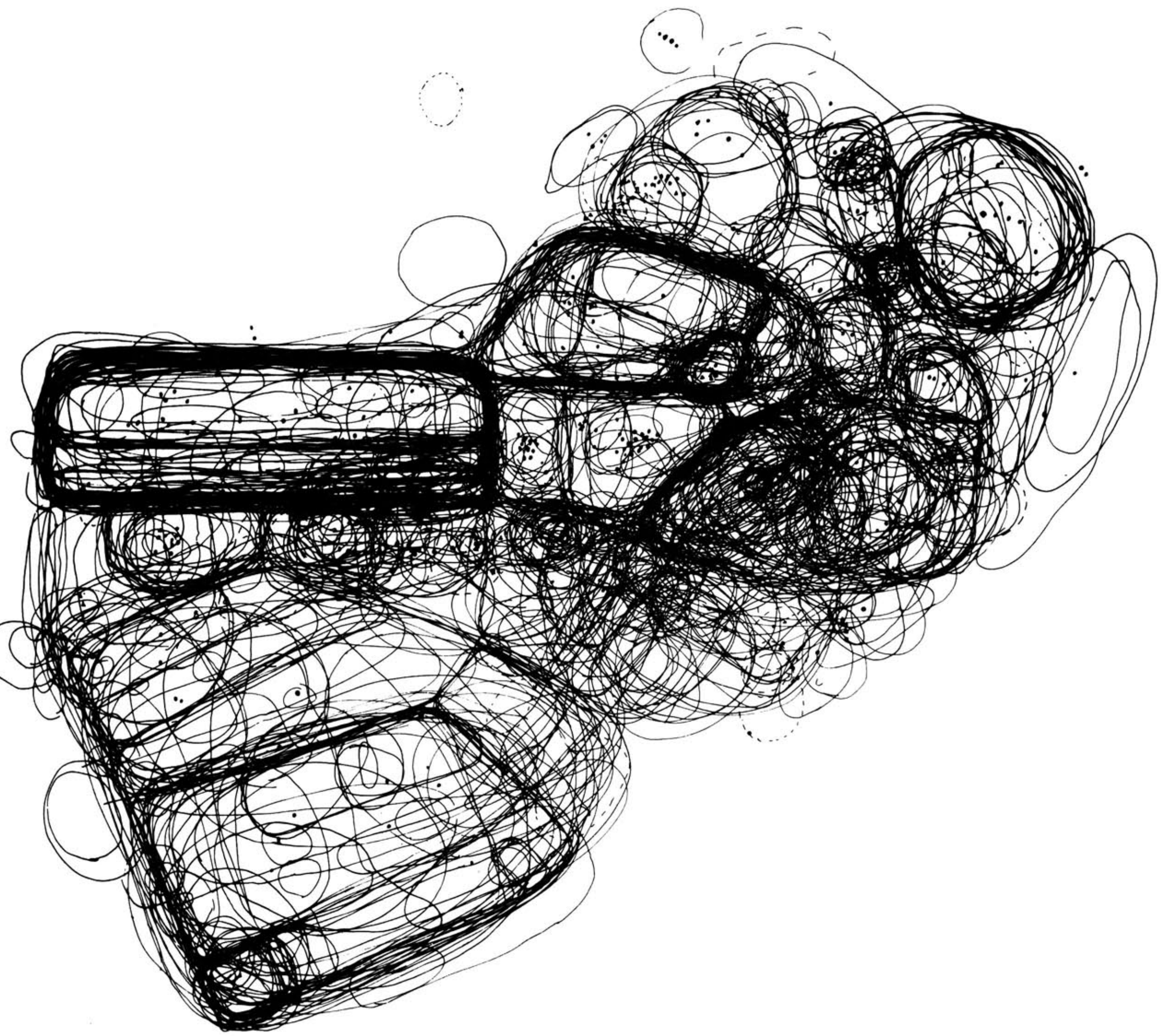

FIG. K.4 ACTIVITY TYPE, GRAPHIC SUMMARY, TOTAL RESPONSES

TOTAL SAMPLE (48)

NORTH

SCALE

1000' 200' 0

1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY TYPE (FREE, AREA, CHECK LIST)

FIG. K.5 COMBINED FORM INTENSITY, GRAPHIC SUMMARY

TOTAL SAMPLE (48)

NORTH

SCALE

1000' 200' 0

1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

FORM INTENSITY (SPATIAL AND INFORMATION POTENTIAL)

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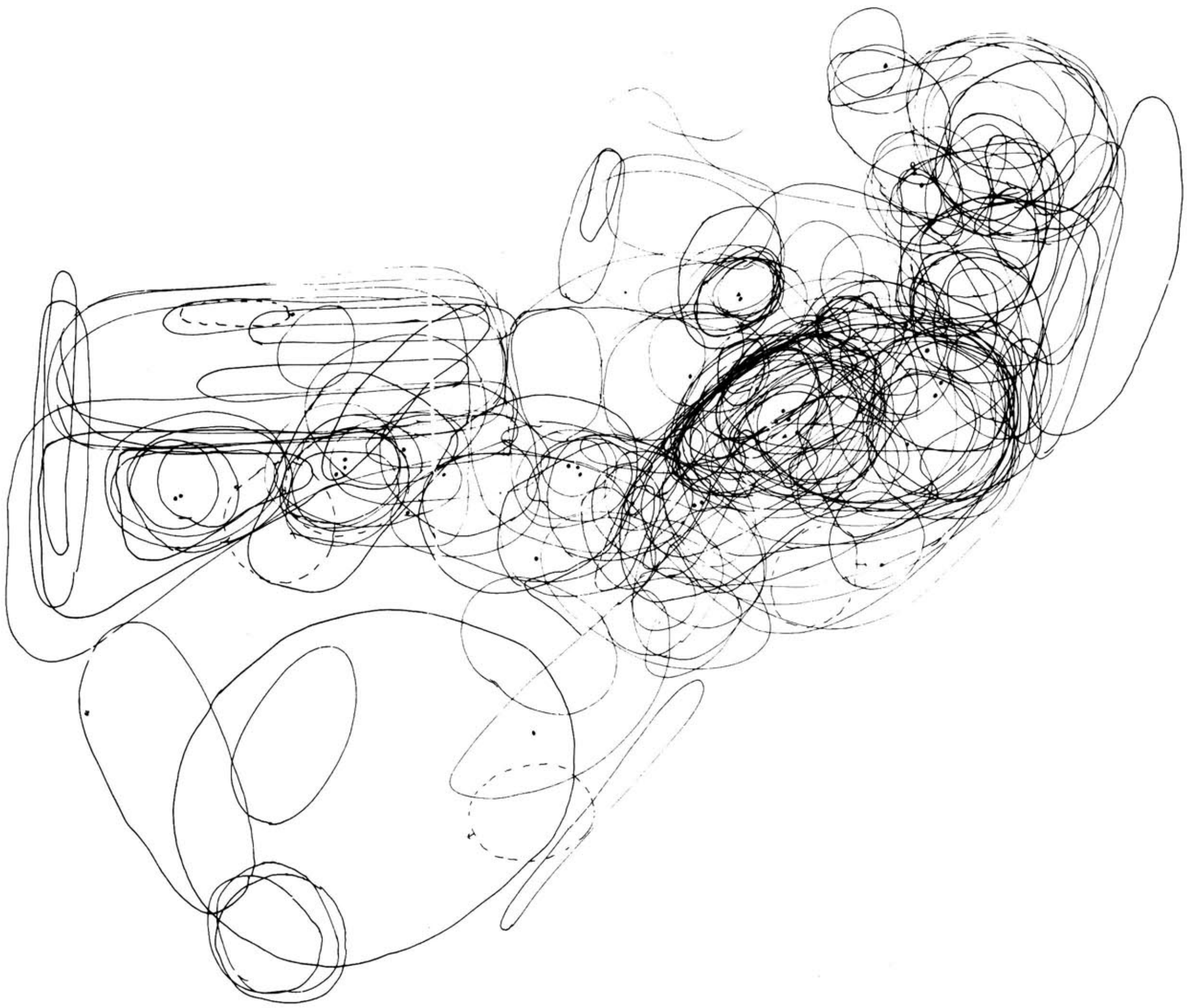

FIG. K.6 ACTIVITY INTENSITY, GRAPHIC SUMMARY

TOTAL SAMPLE (48)

NORTH

SCALE
1000' 200' 0
1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY INTENSITY

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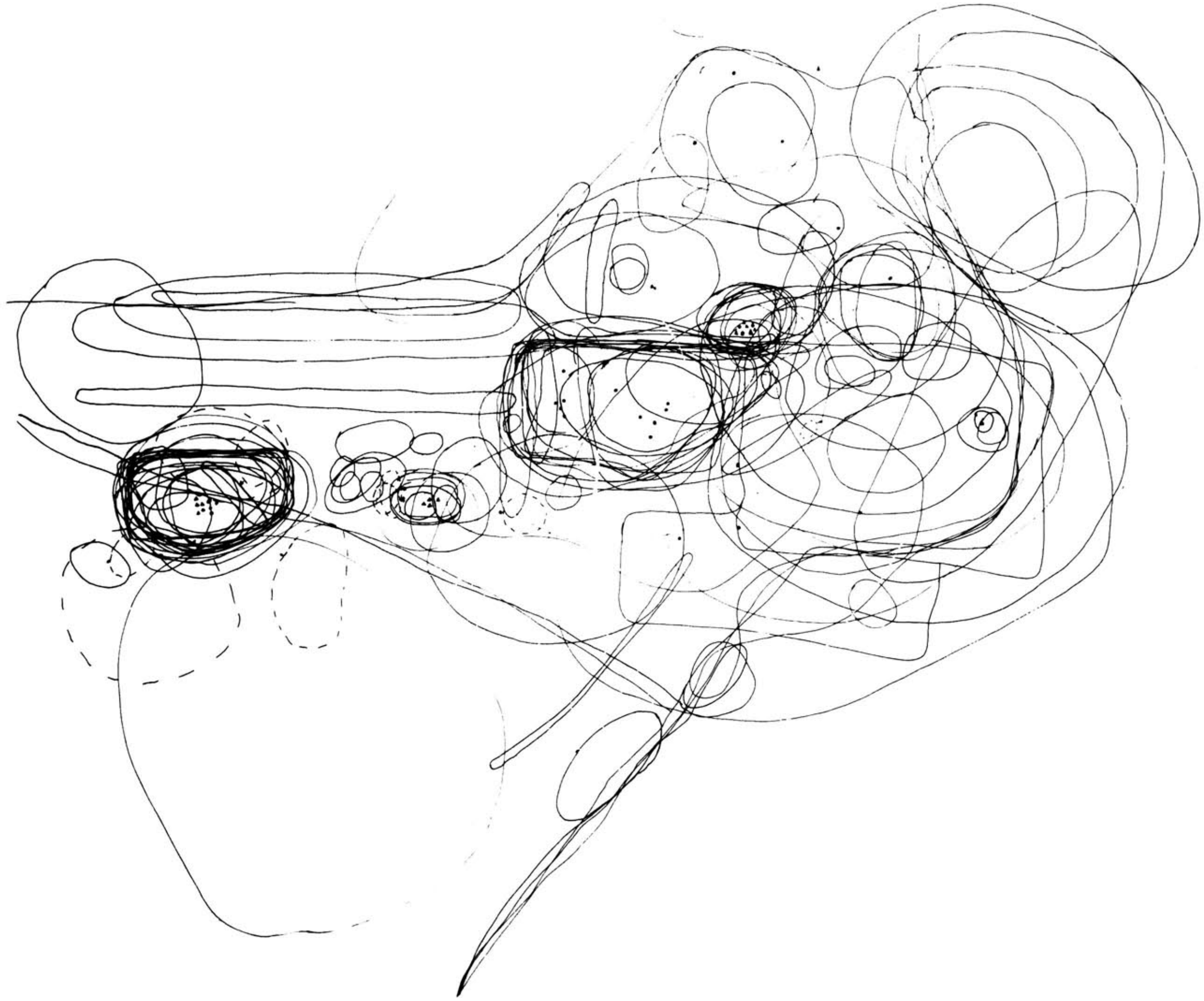
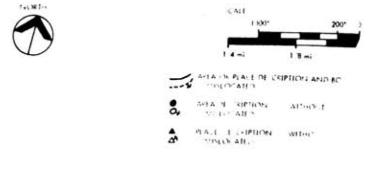


FIG. K.7 FORM EXPOSURE, GRAPHIC SUMMARY

TOTAL SAMPLE (48)



FORM SIGNIFICANCE

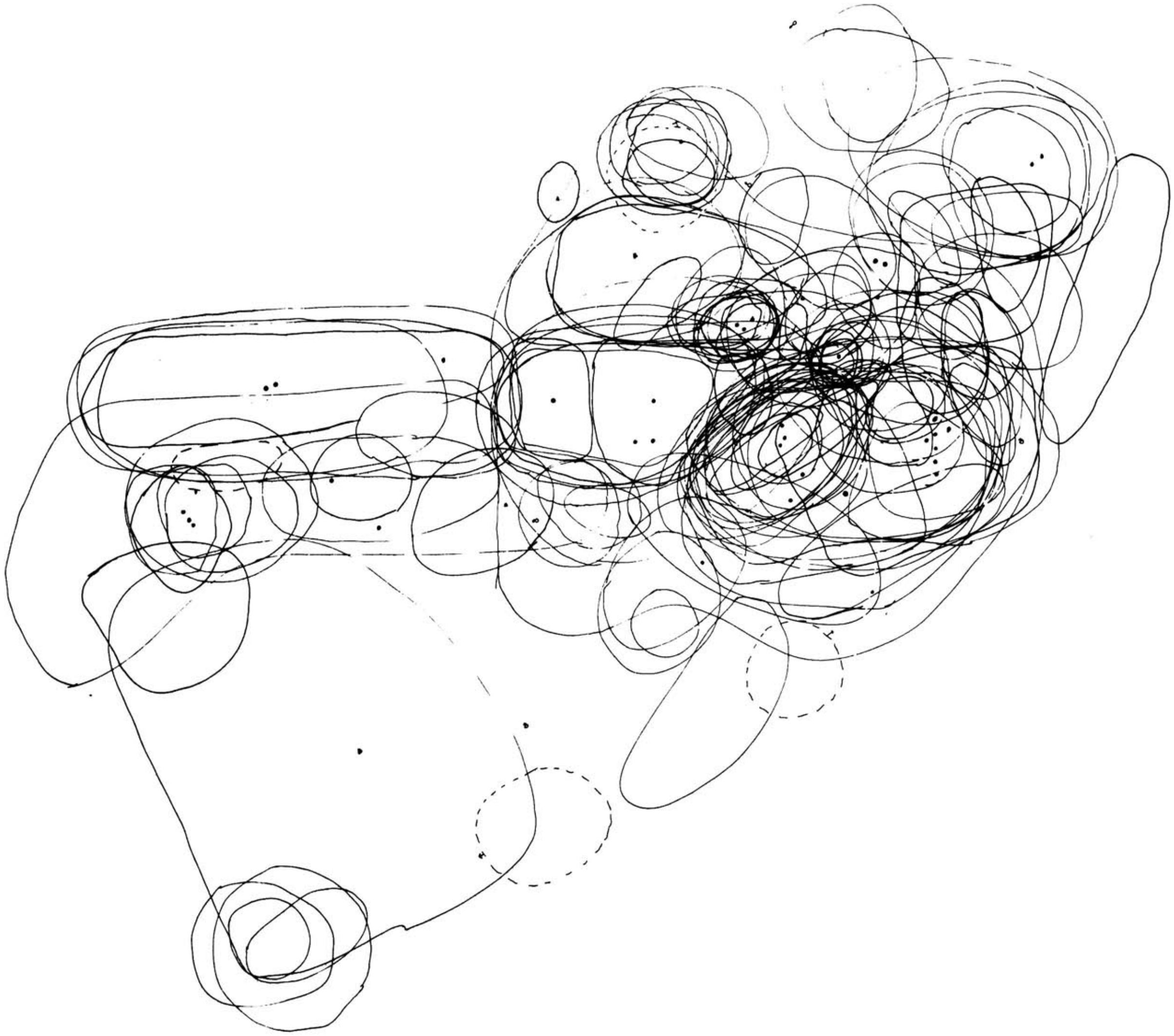


FIG. K.8 ACTIVITY SIGNIFICANCE, GRAPHIC SUMMARY

TOTAL SAMPLE (48)

NORTH

SCALE

1000' 200' 0

1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY SIGNIFICANCE

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APPENDIX L. SECTOR SUBSAMPLES

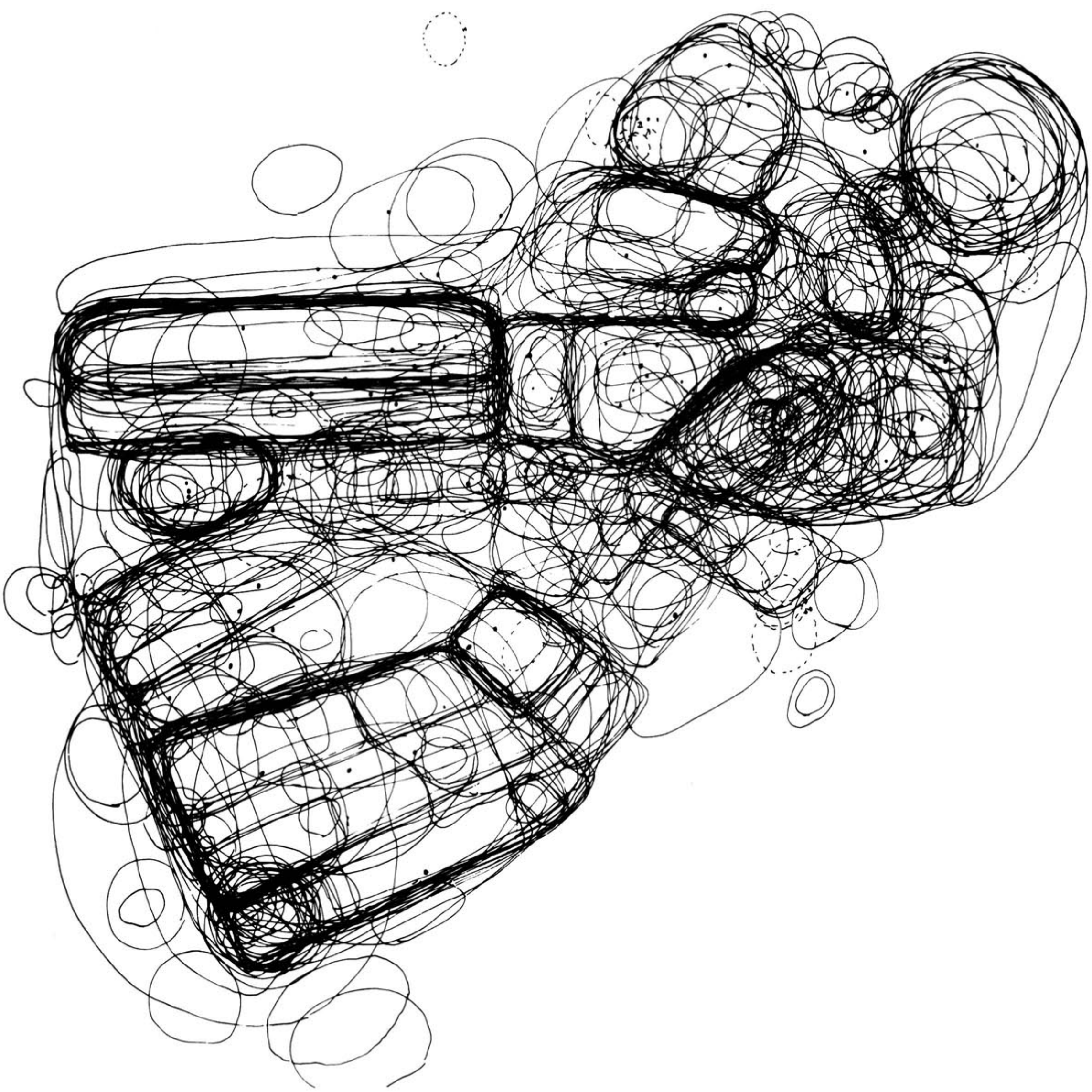

FIG. L.1 SOUTHWEST SECTOR, TYPE RESPONSES, GRAPHIC SUMMARY

SOUTH WEST SECTOR: SOUTH END (8) AND ROXBURY (8)

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY TYPE (FREE, AREA, CHECK LIST)

FORM TYPE (FREE, AREA, CHECK LIST)

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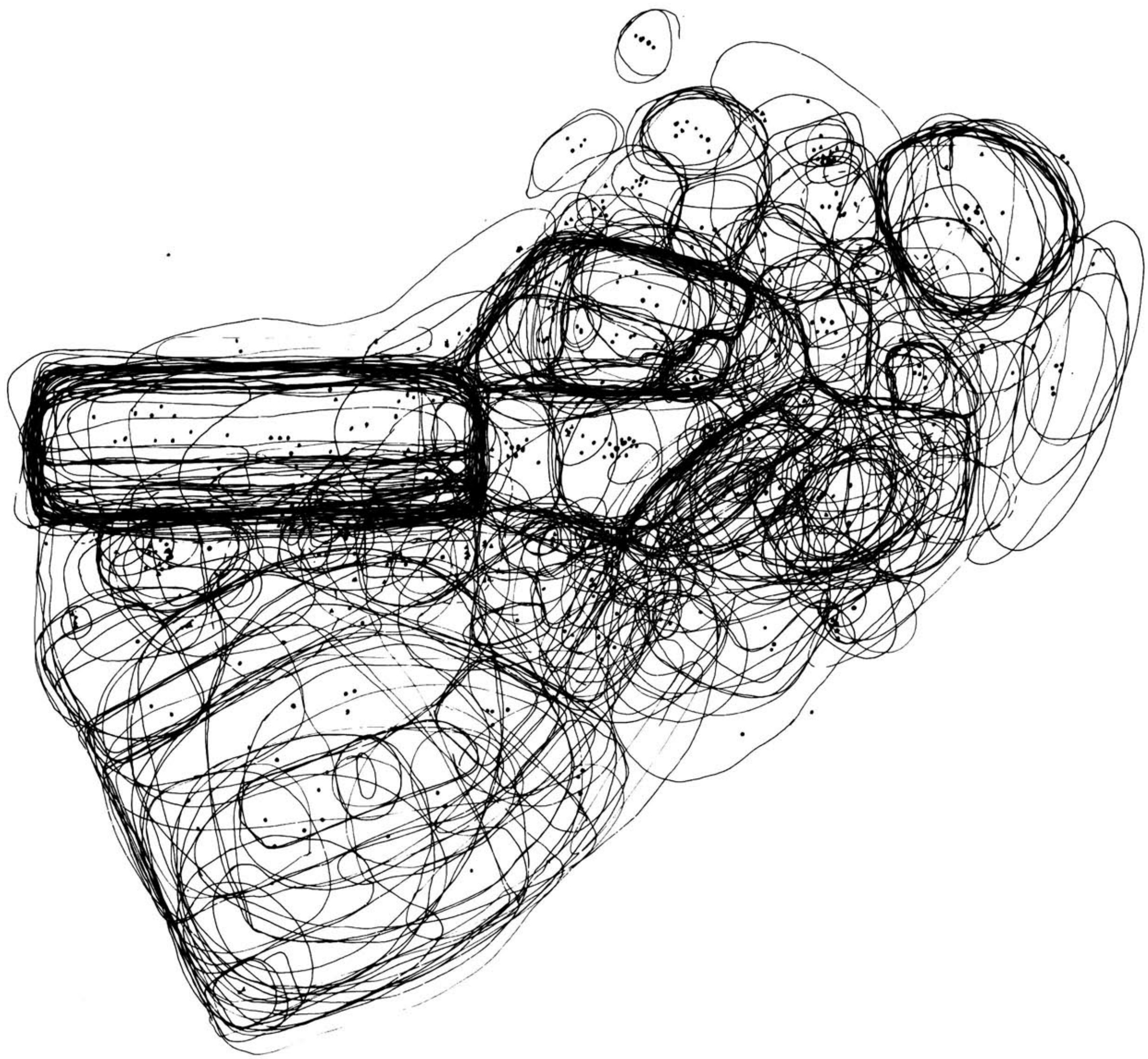

FIG. L.2 NORTHEAST SECTOR, TYPE RESPONSES, GRAPHIC SUMMARY

NORTHEAST SECTOR: NORTH END (8) AND CHELSEA (8)

ACTIVITY TYPE (FREE, AREA, CHECK LIST)

FORM TYPE (FREE, AREA, CHECK LIST)

NORTH

SCALE

1000' 200' 0

1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

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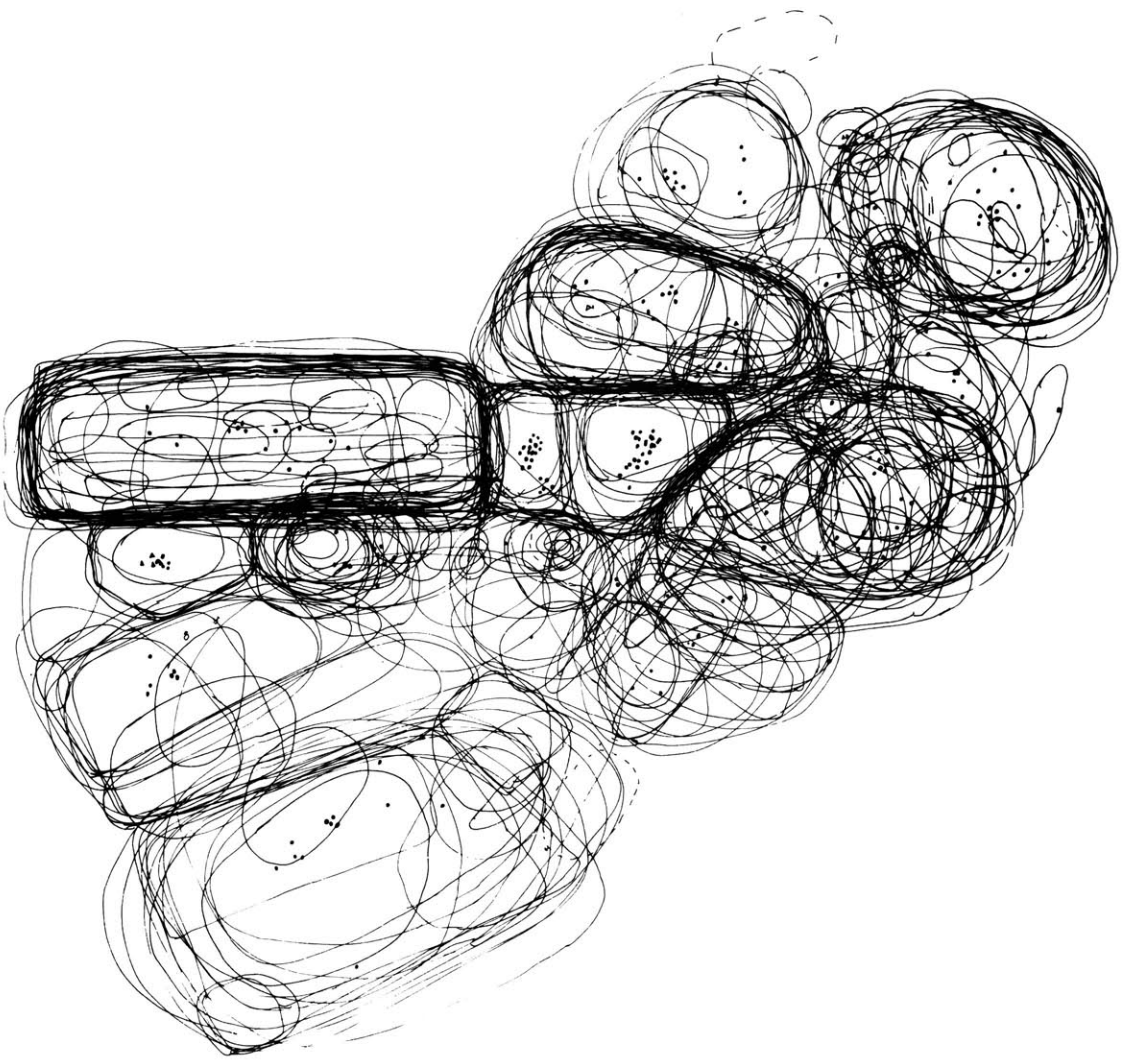

FIG. L.3 NORTHWEST SECTOR, TYPE RESPONSES, GRAPHIC SUMMARY

NORTHWEST SECTOR: BEACON HILL (8) AND CAMBRIDGE (8)

NORTH

SCALE
1000' 200' 0
1/4 mi. 1/8 mi. 0

AREA OR PLACE DESCRIPTION AND BORDER
" MISLOCATED

AREA DESCRIPTION WITHOUT BORDER
" MISLOCATED

PLACE DESCRIPTION WITHOUT BORDER
" MISLOCATED

ACTIVITY TYPE (FREE, AREA, CHECK LIST)

FORM TYPE (FREE, AREA, CHECK LIST)

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BIBLIOGRAPHY

BIBLIOGRAPHY

Aerial Photos of New England, photographs in Architectural Forum, June, 1964, 67-68.

Aerial Photos of New England, photograph in Boston Magazine, October, 1965, 6.

Alexander, C.,"Notes on the Synthesis of Form," Cambridge: Harvard University Press, 1964.

____________, "A City Is Not A Tree," Architectural Forum, April, 1965, 58-62, and May, 1965, 58-61.

Allport, F.H., Theories of Perception and the Concept of Structure, New York: Wiley, 1955.

Appleyard, D., "Designing the Pluralistic City," Unpublished manuscript, October, 1966.

____________, K. Lynch and J. Myer, The View from the Road, Cambridge: M.I.T. Press, 1964.

Arnheim, R., "The Priority of Expressions," Journal of Aesthetics and Art Criticism, 1949, 8, 106-109.

____________, "Perceptual and Aesthetic Aspects of the Movement Response," Journal of Personality, 1951, 19, 265-281.

____________, Art and Visual Perception: A Psychology of the Creative Eye, Berkeley: U. of Calif. Press, 1954.

Artle, R., Studies in the Structure of the Stockholm Economy: Towards a Framework for Projecting Metropolitan Community Development, Stockholm: Business Research Institute at the Stockholm School of Economics, FFI Report, no. 57, 1959.

Attneave, F. "Some Informational Aspects of Visual Perception," Psychological Review, 1954, 61, 183-193.

Audy, J., "The Environment in Human Ecology: Artifacts--The Significance of Modified Environment," in Pan American Health Organization, Environmental Determinants of Community Well Being, Washington D.C.: World Health Organization, December 1965, 5-16.

Bartlett, F.C., Remembering, A Study in Experimental and Social Psychology, London: Cambridge University Press, 1932.

Berlyne, D.C., "Uncertainty and Conflict: A Point of Contact Between Information - Theory and Behavior - Theory Concepts," Psychological Review, [1957] 64, 329-339.

Berlyne, D.E., "Toward a Theory of Epistemic Behavior: Conceptual Conflict and Epistemic Curiosity," in R. Harper, C. Anderson, C. Christensen, and G. Hunka (eds.), The Cognitive Processes, Englewood Cliffs, New Jersey: Prentice Hall, 1964, pp. 563-581.

Beshers, J., "Statistical Inferences from Small Area Data," Social Forces, 1960, 38, 341-348.

Bogue, D.J. and Dorothy Harris, Comparative Population and Urban Research in a Multiple-Regression and Covariance Analysis, Oxford, Ohio: Scripps Foundation, 1954.

Boston City Planning Board, A General Plan for the Central Business District, Boston, 1960.

Boston Redevelopment Authority, 1965/1975 General Plan for the City of Boston and the Regional Core, Boston: Boston Redevelopment Authority, 1964.

Boston Redevelopment Authority, Maps of Existing Land Use: Back Bay, 1962; Downtown North, 1962; Central Business District, undated, circa 1963; South Cove, 1962; South End, 1964.

Boulding, K., The Image, Ann Arbor: Univ. of Michigan Press, 1956.

Brown, D.S., "The Meaningful City," Journal of the American Institute of Architects, 1965, 43, 27-32.

Bruner, J.S., "On Perceptual Readiness," Psychological Review, [1957,] 64, 123-152.

__________, "Social Psychology and Perception," in Maccoby, Newcomb and Hartley (eds.), Readings in Social Psychology, New York: Holt, Rinehart and Winston, 1958.

____________, Toward a Theory of Instruction, Cambridge, Massachusetts: Harvard University Press, 1966.

____________, G.A. Miller and C. Zimmerman, "Discriminative Skill and Discriminative Matching in Perceptual Recognition," Journal of Experimental Psychology, 1955, 49, 187-192.

____________, and L. Postman, "On the Perception of Incongruity: A Paradigm," Journal of Personality, 1949, 18, 206-223.

____________, M.A. Wallach and E.H. Galanter, "The Identification of Recurrent Regularity," American Journal of Psychology, 1959, 72, 200-209.

Buckley, W., "The Politics of Beauty," Esquire, July, 1966, 50-53, 116-117.

Burchard, J.E., "The Urban Aesthetic," Annals of the American Academy of Political and Social Science, 1957, 314, 112-122.

Carr, S., and G. Kurilko, "Vision and Memory in the View from the Road -- A Progress Report," Cambridge: Joint Center for Urban Studies of M.I.T. and Harvard, 1964 (Mimeographed).

Carroll, J., Jr., R. Creighton and J. Hamburg, "Transportation Planning for Central Areas," Journal of the American Institute of Planners, 1961, 27, 26-35.

Cassirer, E., The Philosophy of Symbolic Forms, New Haven: Yale Univ. Press, 1953.

Ceccarelli, P., I Caratteri dell'Urbanizzazione Nell'Area Milanese, ricerca svolta dall' ILSES, Milan, 1964.

Chapin, F.S., Jr., "Foundations of Urban Planning" in W.Z. Hirsch (ed.), Urban Life and Form, New York: Holt, 1963.

________________, and H. Hightower, "Household Activity Patterns and Land Use," Journal of the American Institute of Planners, 1965, 31, 222-231.

________________, and S.F. Weiss (eds.), Urban Growth Dynamics in a Regional Cluster of Cities, New York: Wiley, 1962.

Cherry, C., On Human Communications, Cambridge; Technology Press, 1957.

Chicago Area Transportation Study (Wegener, B.H.), Map Report, Chicago: Chicago Area Transportation Study, 1958.

______________________________, Final Report, Volume I, Survey Findings, Chicago: Chicago Area Transportation Study, 1959.

______________________________, Final Report, Volume III, Transportation Plan, Chicago: Chicago Area Transportation Study, 1962.

Clarke, P.J., "Grouping in Spatial Distributions," Science, 1956, 123.

Cole, M., The Urban Aesthetic: Evolution of a Survey System, St. Louis, Mo.: Cordes Printing Co., 1960.

Crane, D., "The City Symbolic," Journal of the American Institute of Planners, 1960, 26, 280-292.

Cullen, G., Townscape, New York: Reinhold, 1961.

__________, and I. Nairn, "The Scale of the City," Fortune, 1958, 135-140.

Dacey, M., "Analysis of Central Place and Point Patterns by a Nearest Neighbor Method," in Norborg(ed.), Proceedings of the I.G.U. Symposium in Urban Geography: Lund, 1960, Lund: C.W.K. Gleerup, 1962, pp. 55-75.

Davidson, R., "The Travel of Persons to Downtown Boston," Unpublished M.C.P. Thesis, Dept. of City and Regional Planning, M.I.T., 1954.

Davis, K., "The Urbanization of the Human Population," Scientific American, 1965, 213, 41-53.

DeJonge, D., "Images of Urban Areas: Their Structure and Psychological Foundations," Journal of the American Institute of Planners, 1962, 28, 266-276.

Deutsch, K.W., "On Social Communication and the Metropolis," Daedalus, 1961, 90, 99-111.

Doxiades, C., Architecture in Transition, London: Hutchison, 1963.

Duncan, O., R. Cuzzort and Duncan, Statistical Geography: Problems in Analyzing Areal Data, New York: Free Press of Glencoe, 1961.

Dyckman, J., "The Changing Uses of the City," Daedalus, 1961, 90, 111-132.

Edwards, A., Experimental Design in Psychological Research, New York: Reinhart Co., 1950.

Festinger, L. A Theory of Cognitive Dissonance, Evanston, Illinois: Row Peterson, 1957.

Firey, W., Land Use in Central Boston, Cambridge, Mass.: Harvard Univ. Press, 1947.

Foley, D.L., "An Approach to Metropolitan Spatial Structure," in M. Webber (ed.), Explorations into Urban Structure, Philadelphia: Univ. of Penn. Press, 1964, pp. 21-78.

___________, "The Use of Local Facilities in a Metropolis," American Journal of Sociology, 1950, 56, 238-246.

___________, "The Daily Movement of Population into Central Business Districts," American Sociological Review, 1952, 17, 538-543.

___________, "Urban Daytime Population: A Field for Demographic - Ecological Analyses," Social Forces, 1954, 32, 323-330.

Form, W.H. and G.L. Stone, "Urbanism, Anonymity and Status Symbolism, "American Journal of Sociology, 1957, 62, 504-514.

Franzblau, A.N., A Primer of Statistics for Non Statisticians, New York: Harcourt Brace and World, 1958.

Frenkel-Brunswik, Else, "Intolerance of Ambiguity as an Emotional and Perceptual Personality Variable," Journal of Personality, 1949, 18, 108-143.

Gallion, A.B. and S. Eisner, The Urban Pattern, Princeton, N.J.: D. Van Nostrand, 1963.

Garner, W.R. and H.W. Hake, "The Amount of Information in Absolute Judgments," Psychological Review, 1951, 58, 446-459.

Garrison, "Toward Simulation Models of Urban Growth and Development," in K. Norborg (ed.), Proceedings of the I.G.U. Symposium in Urban Geography: Lund, 1960, Lund: C.W.K. Gleerup, 1962, pp. 91-108.

Gibson, J.J., The Perception of the Visual World, Boston: Houghton Mifflin, 1950.

____________, "What is a Form," Psychological Review, 1951, 58, 403-412.

____________, and Eleanor J. Gibson, "Perceptual Learning: Differentiation or Enrichment," Psychological Review, 1955, 62, 32-41.

Greater Boston Economic Study Committee, "A Report on Downtown Boston," Boston: May, 1959.

Green, B.G., "Attitude Measurement," in Lindzey, Handbook of Social Psychology, New York: Addison-Wesley, 1954, pp. 335-369.

Greenough, H., Form and Function, Berkeley: Univ. of Calif. Press, 1947. (First published in 1843.)

Gulick, J., "Images of an Arab City," Journal of the American Institute of Planners, 1963, 29, 179-198.

Gutheim, F., "Urban Space and Urban Design," in L. Wingo (ed.), Cities and Space, Baltimore: Johns Hopkins Press, 1963, pp. 103-131.

Guttenberg, A.Z., "A Multiple Land Use Classification System," Journal of the American Institute of Planners, 1959, 25, 143-150.

____________, "Urban Structure and Urban Growth," Journal of the American Institute of Planners, 1960, 26, 104-110.

Haar, C., "The Social Control of Urban Space," in L. Wingo (ed.), Cities and Space, Baltimore: Johns Hopkins Press, 1963, pp. 175-229.

Hall, E.T., The Silent Language, Greenwich, Conn.: Fawcett Publ., 1961.

Harper, R., D. Anderson, C. Christensen and S. Hunka, The Cognitive Processes, Englewood Cliffs, New Jersey: Prentice Hall, 1964.

Harris, C.D., and E.L. Ullman, "The Nature of Cities," in H.M. Mayer (ed.), Readings in Urban Geography, Chicago: Univ. of Chicago Press, 1959, pp. 277-286.

Hassan, M.Y., "The Movement System as an Organizer of Visual Form," Unpublished Ph.D. dissertation, M.I.T., Cambridge, 1965.

Hawley, A.H., Human Ecology, New York: Ronald Press, 1950.

Hiorns, F.R., Town Building in History, London: Harrap, 1956.

Hirsch, W. (ed.), Urban Life and Form, New York: Holt, Rinehart and Winston, 1963.

Ittelson, W.H., "The Constancies in Perceptual Theory," Psychological Review, 1951, 58, 285-294.

Jacobs, S.W. and B.G. Jones, City Design through Conservation, Vol. I, Berkeley: Univ. of Calif., 1962, (Mimeographed).

Jones, B.G., "Prologomena to a Study of the Aesthetic Effects of Cities," Journal of Aesthetics, 1960, 18, 419-429.

Kepes, G., The Language of Vision, Chicago: Theobald, 1951.

__________, "Notes on Expression and Communication in the Cityscape," Daedalus, 1961, 90, 147-166.

Kluckhohn, C., "Values and Value -- Orientations in the Theory of Action: An Exploration in Definition and Classification," in T. Parsons and E.A. Shils (eds.), Toward a General Theory of Action, New York: Harper and Row, 1951, pp. 388-433.

Korn, A., History Builds the Town, London: Lund Humphries, 1953.

La Rocca, B. Neimann and J. Volpe, "A Topographic History of Boston," Connection, May 4, 1964, 6, 2-7.

Lynch, K., "Environmental Adaptability," Journal of the American Institute of Planners, 1958, 24, 16-24.

_________, The Image of the City, Cambridge: M.I.T. Press and Harvard Univ. Press., 1960.

_________, "A Classification System for the Analyses of the Urban Pattern," Cambridge: Joint Center for Urban Studies of M.I.T. and Harvard University, 1961. (Mimeographed)

_________, "The Pattern of the Metropolis," Daedalus, 1961, 90, 79-98.

_________, "The City as Environment," Scientific American, 1965, 213, 209-219.

_________, and L. Rodwin, "A Theory of Urban Form," Journal of the American Institute of Planners, 1958, 24, 201-214.

Mailer, Norman, "Cities Higher Than Mountains," The New York Times Sunday Magazine, January 31, 1965, pp. 16-17.

Maki, F. and J. Goldberg, "Linkage in Collective Forms: Collective Form Report #2," St. Louis: Washington Univ., 1962. (Mimeographed.)

_________, and M. Ohtaka, "Some Thoughts on Collective Form with an Introduction to Group Form," St. Louis: Washington Univ., 1961.

Malamud, B., The Fixer, New York: Farrar, Straus & Giroux, 1966.

M.I.T. Student Report, Dept. of City and Regional Planning Signs in the City, Cambridge: M.I.T., 1963.

Meier, R.L., "Human Time Allocation: A Basis for Social Accounts," Journal of the American Institute of Planners, 1959, 25, 27-35.

Meier, R.L., "Measuring Social and Cultural Change in Urban Regions," Journal of the American Institute of Planners, 1959, 25, 180-190.

__________, A Communications Theory of Urban Growth, Cambridge: Joint Center for Urban Studies of M.I.T. and Harvard, M.I.T. Press, 1962.

Michelson, W.M.,"Value Orientations and Urban Form," Unpublished Ph.D. dissertation, Harvard University, Cambridge, 1965.

__________, "Social Values, Physical Form," Connection, Summer, 1966, 51-54.

Miller, G., "What is Information Measurement," The American Psychologist, 1953, 8, 3-11..

__________, "The Magic Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," Psychological Review, 1956, 63, 81-97.

__________, and F.C. Frick, "Statistical Behavioristics and Sequences of Responses," Psychological Review, 1949, 56, 311-324.

__________, E. Galanter and K. Pribram, Plans and the Structure of Behavior, New York: Holt, 1960.

Mitchell, R. and C. Rapkin, Urban Traffic - A Function of Land Use, New York: Columbia University Press, 1954.

Morrill, R.L., "Simulation of Central Place Patterns over Time," in Norborg, K. (ed.) Proceedings of the I.G.U. Symposium in Urban Geography: Lund, 1960, Lund, Sweden: C.W.K. Gleerup, 1962, pp. 109-120.

Morris, C., Foundations of the Theory of Signs, Chicago: Univ. of Chicago Press, 1938.

__________, Signs, Language and Behavior, New York: Prentice-Hall, 1946.

__________, Signification and Significance, Cambridge: M.I.T. Press, 1964.

Moss, S., "On Congruency," M.I.T., 1962. (Mimeographed.)

Moss, S., "A Policy for the Visual Form of Industrial Areas," Unpublished M.C.P. Thesis, M.I.T., 1964.

Murphy, R.H., "The Decline of Railroad Commuting in Boston," Unpublished M.C.P. Thesis, M.I.T., 1959.

Northeastern Illinois Metropolitan Area Planning Commission, Land Use Handbook, Chicago, 1961.

Olds, E., "The City Block as a Unit for Recording and Analyzing Urban Data," in J. Gibbs (ed.), Urban Research Methods, Princeton, N.J.: D. Van Nostrand, 1961, pp. 148-166.

Osgood, C.E., "A Behavioristic Analysis of Perception and Language as Cognitive Phenomena," in: H. Harper, C. Anderson, C. Christensen, and S. Hunka (eds.), The Cognitive Processes, Englewood Cliffs, New Jersey: Prentice Hall, 1964, pp. 184-210.

____________,G. Suci, and P. Tannenbaum, The Measurement of Meaning, Urbana, Ill.: Univ. of Illinois Press, 1957.

____________, and P.H. Tannenbaum, "The Principles of Congruity in the Prediction of Attitude Change," Psychological Review, 1955, 62, 42-55.

Parsons, T. and E.A. Shils(eds.), Toward A General Theory of Action, New York: Harper and Row, 1951.

Penn-Jersey Transportation Study, Report on Study Procedures, Data Collection Phase; Report No. 1, Philadelphia, 1961.

________________________, Almendinger, V., Inventory of Data for the Regional Growth Model, Philadelphia, 1961.

________________________, B. Harris, Regional Growth Model, Activity Distribution Sub-model; Paper No. 7, Philadelphia, 1961.

________________________, B. Harris,Penn-Jersey Area Systems; Paper No. 14, Philadelphia, 1962.

Postman, L., J. Bruner and E. McGinnies, "Personal Values as Selective Factors in Perception," The Journal of Abnormal and Social Psychology, 1948, 43, 142-154.

Pratt, C., "The Role of Past Experience in Visual Perception," Journal of Psychology, 1950, 30, 85-107.

Public Administration Service, Land Use Classification Manual, (Developed by the Land Classification Advisory Committee, Detroit Metropolitan Area Regional Planning Commission) Chicago, 1962.

Rannells, J., The Core of the City, New York: Columbia Univ. Press, 1956.

__________, "Approaches to Analysis," Journal of the American Institute of Planners, 1961, 27, 17-26.

Read, H., Icon and Idea, London: Faber and Faber, 1955.

Reichek, J., "On the Design of Cities," Journal of the American Institute of Planners, 1961, 27, 141-143.

__________, "Urban Design 'Principles,'" Paper delivered at American Cultural Center, Paris, March, 1946. (Mimeographed.)

Reissman, L., The Urban Process, New York: The Free Press, 1964.

Ricci, L., Twentieth Century Anonymous, New York: G. Braziller, 1962.

Robinson, A. and R. Bryson, "A Method for Describing Quantitatively the Correspondence of Geographical Distributions," Annals of the Association of American Geographics, 1957, 47, 379-391.

Rossi, P.H., Why Families Move, Glencoe, Ill.: The Free Press, 1955.

Rotondo, H., "Adaptability of Human Behavior," in Pan American Health Organization, Environmental Determinants of Community Well Being, Washington, D.C.: World Health Organization, 1965, pp. 37-40.

Ruesch, J. and W. Kees, Nonverbal Communication, Berkeley: Univ. of Calif. Press, 1956.

Sanborn Map Co., Insurance Maps of Boston, Massachusetts, New York: The Sanborn Map Co., 1953.

Santayana, G., The Sense of Beauty, New York: Scribner's, 1936.

Selltiz, C., M. Jahoda, M. Deutsch, and S. Cook, Research Methods in Social Relations, New York: Holt, 1962.

Shapiro, I.D., "Urban Land Use Classification," Land Economics, 1959, 35, 149-155.

Sherman, S.M., "On Forming and Reforming Towns and Cities," Journal of the American Institute of Planners, 1963, 29, 134-143.

Shevsky, E. and W. Bell, Social Area Analysis, Stanford, California: Stanford Univ. Press, 1955.

Smith, L., "Space for the CBD's Functions," Journal of the American Institute of Planners, 1961, 27, 35-42.

Smith, M.B., "Socialization for Competence," Items, Social Science Research Council, New York, 1965, 19, 19.

Smith, W., and Associates, Coding Manual: Comprehensive Traffic and Transportation Inventory, Commonwealth of Massachusetts Boston Regional Planning Project, New Haven, 1964.

____________________, Comprehensive Traffic and Transportation Inventory, Commonwealth of Massachusetts, Boston Regional Planning Project, (preliminary draft of final report), New Haven, 1964.

Smithson, A. and P. Smithson, "Team 10 Primer, 1953-62," Architectural Design, Dec., 1962, 32, 559-602.

Solomon, A.L. and L. Postman, "Frequency of Usage as a Determinant of Recognition Threshold for Words," Journal of Experimental Psychology, 1952, 43, 195-201.

Sommer, R., "The Significance of Space," American Institute of Architects Journal, May 1965, 63-65.

Strauss, A.L., Images of the American City, New York: Free Press of Glencoe, 1961.

Thiel, P., "A Study . . . Architectural and Urban Space-Time Sequences," 1958-59. (Mimeographed. 6 papers.)

Thiel, P.A., "Sequence-Experience Notation," Town Planning Review, 1961, 32, 35-53.

Tolman, E.C., "A Psychological Model," in: T. Parsons and E.A. Shils (eds.), Toward a General Theory of Action, New York: Harper and Row, 1951, pp. 279-364.

U.S. Bureau of the Budget, Technical Committee on Industrial Classification, Standard Industrial Classification Manual, Washington, D.C.: U.S. Government Printing Office, 1957.

U.S. Bureau of the Census, Census of Population, 1950: Classified Index of Occupations and Industries, Washington, D.C.: The Bureau, 1950.

______________________, Census of Housing, 1960, Boston, Mass., Washington, D.C.: Government Printing Office, 1961.

Univ. of Calif. Student Report, Dept. of City and Regional Planning, Webber (ed.), Studies in Metropolitan Planning, Berkeley: Univ. of Calif., 1959.

______________________, Dept. of City and Regional Planning, Webber (ed.), Urban Form and the Urban Plan, 1960.

Urban Design Committee, A.I.A., "The Practice of Urban Design: Guide Lines for the Visual Survey," Journal of the American Institute of Architects, 1963, 39, 79-94.

Urban Renewal Administration, Housing and House Finance Agency, and Bureau of Public Roads, Department of Commerce, Standard Land Use Coding Manual, Washington, D.C.: U.S. Government Printing Office, 1965.

Vance, J., "Emerging Patterns of Commercial Structure in American Cities," in K. Norborg (ed.), Proceedings of the I.G.U. Symposium in Urban Geography: Lund 1960, Lund, Sweden: C.W.K. Gleerup, 1962, 485-518.

Van Eyck, A., in A. Smithson and P. Smithson, "Team 10 Primer," Architectural Design, Dec. 1962, 32, 579 & 593.

Vigier, F., "An Experimental Approach to Urban Design," Journal of the American Institute of Planners, 1965, 31, 21-31.

Wallach, M.A., "On Psychological Similarity," Psychological Review, 1958, 65, 103-116.

Webber, M., "Order in Diversity: Community Without Propinquity," in L. Wingo (ed.), Cities and Space, Baltimore: The Johns Hopkins Press, 1963, pp. 23-54.

_________, "The Urban Place and the Nonplace Urban Realm," in M. Webber (ed.) Explorations into Urban Structure, Philadelphia: Univ. of Penn. Press, 1963, pp. 79-153.

White, R.W., "Motivation Reconsidered: The Concept of Compentence," Psychological Review, 1959, 66, 297-333.

Whitehill, W.M., Boston; a Topographical History, Cambridge: Belknap Press, 1959.

Whyte, W.H., Jr., The Organization Man, New York: Simon and Shuster, 1956.

William-Olsson, W., "The Status and Knowledge of Urban Settlements in Europe West of the U.S.S.R.," Ekistiks, 1966, 21, 32-34.

Williams, S.H., "Urban Aesthetics - An Approach to the Study of the Aesthetic Characteristics of Cities," Town Planning Review, 1954, 25, 95-113.

Wingo, L. (ed.), Cities and Space, Baltimore: The Johns Hopkins Press, 1963.

Zajonc, R.A., "The Concepts of Balance, Congruity, and Dissonance," Public Opinion Quarterly, 1960, 24, 280-296.