AN ADAPTABLE URBAN STRUCTURE

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OBJECTIVES
OBJECTIVES

The rapid growth of urban complexes in the Northeast of the United States and the construction of Interstate Highway 95 parallel to Route 1 between Boston and Providence has made settlement in the area between these two cities imminent.

While this project has a given site, there are many existing conditions which suggest that a prototype solution will have more value as an academic study. It is therefore the intention of the author to emphasize in the solution the parts of the program which are the most typical of principles which are universal in character. The conditions which are most individual or regional in character have therefore received less emphasis.

Urban Values

It is therefore the purpose of this thesis to determine a method for this settlement which will be orderly and provide maximum value to its inhabitants.
OBJECTIVES (CONTINUED)

Adaptability
It is also the purpose of this thesis to establish an urban structure which is adaptable both in terms of change and future growth.

Circulation
The existence of the city is a priori evidence of the desire of men to come together. Therefore the study of ways to make this convenient is primary. Circulation in this thesis forms the structure of the city.

Activities
The activities in the city such as industry, government, education, etc., are the products of the interaction of men. Their functional relationships and growth patterns are important and are solved diagrammatically in this thesis.

Housing
An analysis is made of the proper arrangement of living units in relation to one another, to space, to other activities in the city, and their social implications. This phase is carried to an architectural statement.
URBAN VALUES

"When architects decide that the focus of their efforts should be not the building but the experiences people derive from it, when we involve ourselves with mental processes as well as with physical accommodations, we deal directly with the elements that will operate during the life of our structures."\(^1\)

While the author stresses the need for adaptability to growth and change, it is true that what exists to begin with is the issue of greatest importance. The proper structure for the city is an expression of the value of city life. It is therefore well to analyze what these values are. They exist both in material and intangible ways.

The Value of Order and the Resulting Liberties

For the purpose of this discussion it is necessary to make a specialized distinction between freedom and liberty.

\(^1\) ID Designs / Community Colleges, Department of Architecture, Rice University, (Houston, 1962) p. 46.
The mountaineer alone in his cabin in the wilderness has perhaps the ultimate in freedom. His only restrictions are his own limitations and those imposed on him by nature. Within this framework he is free to do as he wishes.

As men come together conflicts of interest occur. It becomes necessary to impose additional restriction of activity. Freedoms are lost. It is, for instance, necessary to impose restrictions on the use of an automobile. If all were free to drive anywhere at any speed, no one would have the courage to venture on the streets. It is therefore necessary to curb freedom. However, if this is done with altruistic intentions and with order, certain liberties continue to exist and others are created.

Complete freedom in a social structure would result in anarchy and chaos. But the important fact is that liberties within a structure of order can offer a range of possibilities far greater than the freedom of the mountain man. The order, however, must be consistent, unified, and adaptable. Above all it must be clear.

It is therefore philosophically valid to impose orders such as the control of density, land use, and traffic.

Two examples of the imposition of order which produces values:

Without requiring high density near the rapid transit system, the rapid transit could not be financed and people could not have the liberties its use provides.
Without controlling the path of the automobile and the distribution of activities, service vehicles and shopping traffic would penetrate residential areas.

It is therefore necessary for the planner of the city to be willing to restrict freedom of activity if by so doing he offers more of value than he has taken away.

As we continue to find the proper orders, new liberties will develop. Life in a city will become clearer and will offer liberties far beyond those which now exist—both in degree and kind. The form of the city will become the analogue of these values.

An important realization is the fact that our cities are now the expression of the conglomerate mean of our existing values and systems.

For the architect who is unsatisfied with the forms of our cities to try to design within the average of the values which exist, and within the systems we now have would be ridiculous. He would be wiser to work with a camera and produce a photographic collage of what exists.

New forms must imply new systems and new values, and conversely, new values will imply new forms and systems. Perhaps what is not clear is that as order becomes more universal, unanticipated
liberties and values will result. We must be ready to give them form.

The Value of Specialization, Diversity, and Joint Use.

Men establish order and organization in the city to pool their resources. As density increases greater opportunities occur to affect this.

"...in the city of today there are certain highly cherished objectives which residents can achieve only by sharing facilities."\(^1\)

These objectives extend the gamut of activities from commercial, religious, social, educational, and recreational through to the most mundane services such as streets and public utilities. Increases in density not only serve to generate a desirable increase in the frequency of use; it also provides a more economical method of creating such facilities and services.

In a rural community where the density may be one family per ten square miles, an individual must provide a great deal of his own services. He may raise a portion of his food, build his own buildings, even construct and maintain his own roads.

As density increases, men specialize in providing these and other services. They usually become more efficient by specialization

URBAN VALUES (CONTINUED)

and therefore more is available. Diversity results.

Men may share things which do not demand exclusive individual use, and by statistical average use them more efficiently. By pooling their efforts they may enjoy things which they could not have as a result of individual effort. Museums, good shopping, golf courses, well equipped parks, or stores of any kind cannot be supported without a number of people within easily accessible distance. Therefore, these activities often are a product more of density than total population and we would expect to find them at greater frequency and specialization in the high density areas.

Society has established orders which work very well in some cases—particularly commerce. A man in an organized society would never think twice about grinding his own flour. It is strange to think that many Americans still feel so strongly about owning and maintaining their own land. A typical American suburb uses land inefficiently, and very little value is afforded. An understanding of this principle of urbanity would indicate that what quantities of land needed for private individual use be left attached to the house. A portion of the rest may be turned over to joint use. It would be cheaper to maintain, could be better equipped for recreation. The remainder is saved. This becomes more efficient and therefore more economical. However, inherent in this change are certain losses which some are not willing to accept.
The Value of Communication

A third value of the city is one of communication. This is true in the broadest sense of the word, but here it will be dealt with in terms of person to person communication. Men place great value on learning. We learn from our own experiences and through communication we learn from others. Margaret Mead has said that we call men wise who have lived long enough with their society to understand it well and operate efficiently within it.

The city designer is able, through the distribution of mass and space, to increase the opportunity of communication with others, to encourage the chance meeting, to provide a vessel for social interaction. People are naturally gregarious. While we can think of many instances where communication between men is difficult, it is hard to imagine architectural situations where communication is impossible. However, just as men will often surmount great obstacles to converse, so will they often overlook many latent opportunities. It is the obligation of a designer who considers communication a value to overtly encourage social interaction and to avoid a design which is simply passive. It is difficult to conceive the worth of an urban structure which was so planned that truly heterogeneous neighborhoods could exist, where real social intercourse between people of all age groups, income brackets, and ethnic backgrounds can occur, where petty suspicions, snobbery, and prejudice are forgotten. We can learn more from people who have had different
URBAN VALUES (CONTINUED)

experiences than those of our own, but the sad fact is that the
tendency of residential sectors in the United States turns more
towards stratification of people with like experiences. Still the
goal of heterogeneity must be strived for in residential areas.
Moreover, it must be realized that heterogeneity is a value only
if it is accompanied by good communication.

As density increases, the probability of finding a wider diversity
of kinds of people within a neighborhood is greater. The design
of public space to overcome natural tendencies of standoffishness,
which is inherent between people of different backgrounds, becomes
more important. (In places of extremely low density, neighbors
are more likely to form associations no matter how different back-
grounds are, because the choices are narrower.)

Summary
The interpretation of these values into guides for design is neces-
sary. These principles may be expressed in this form. As density
increases:

1. there is more order; it must be clear.
2. freedoms decrease; liberties increase and are created.
3. activities become more diverse, intense and varied.
4. joint ownership increases (cooperative or public property
   occurs).
5. space for chance meeting increases and encourages social
   interaction.
ADAPTABILITY

Adaptability in this report is concerned with both growth and change. However, as growth is only a specialized type of change, it is not always dealt with separately.

The Reciprocal Shift of Importance Between Interstate 95 and Highway 1

The most probable change which may have the biggest effect is that some time in the next fifty years, Highway 1 may become more important than Interstate 95 as a regional connection.

(A history of the improvement of parallel highways such as Interstate 90 and Highway 9, and Highways 24 and 138, leads to this speculation. Importance of one highway over the other shifted back and forth through the last 250 years. One will be an early trail--parallel to it will be a new post road, then the early wooden turnpikes will be built on the site of the trail, then the state will improve the post road and the turnpikes go broke,
ADAPTABILITY (CONTINUED)

and so on until the present turnpikes and limited access roads are built.)

If we can understand this to be a pattern on which to base future predictions, one would expect Highway 1 to develop the next stage of highway sophistication. In the case of this project this shift in importance will work very nicely to keep the town center vital.

One of the most consistent principles of growth of city centers is that they grow in the direction of maximum accessibility. If this continues to be true, the growth of the center in this project will reverse itself every time the importance of Highway 1 or Interstate 95 changes.

Diagram showing change in the direction of growth of the center as the importance between Highway 1 and Interstate 95 shifts. Growth is prevented in the direction of the residential areas (a natural tendency) by the nature of the circulation system.
This thesis locates industry outside of the space between Highway 1 and 95 and places it along the southeast side of Highway 95. A college and a regional hospital are located along Highway 1. If this sort of distribution were to continue, a valid improvement in highway sophistication would be to move private automobiles to a new automated Highway 1 in about 1985 and to keep Highway 95 for industrial and service traffic.

The possibility of some major change in the private machines of transportation exists. However there is little indication of what this change might be. This point is discussed further under the section on Circulation.

Growth of Primary Activities

It is clear that a city is likely in this location. However, less clear is the knowledge of exactly what will serve as its economic base and what activities will grow to particular importance.

Since it is not a city with a specific role such as Chandigarh, Brasilia, or the English industrial satellites, provision must be made for the seeds of commerce, retailing, industry, government, medicine, education, and entertainment. The possibility exists of one of the activities decaying while another expands to become the major economic base of the city. Therefore, the location for
ADAPTABILITY (CONTINUED)

a free unrestricted method of growth for individual activities is important.

Diagram of activities showing growth possibilities

It is of primary importance that the residential areas form established levels of activity which adjust properly as growth occurs.

Growth of Residential Sectors and Centers

In the section on urban values the point was made that as men work together within an orderly system new values are created. It is expressed in the idea of "the whole equals more than the sum of the parts".
ADAPTABILITY (CONTINUED)

The point is also made in the section on housing that men should have the choice of a full range of levels on which to operate—from a cluster of houses around a court, to a city, regional, national or international level. These two principles form the concept of growth and form in the residential areas.

Summary

Specific goals have been set which must be met as the city grows:

1. New growth must integrate properly with older systems so that they may combine to form the new values that the total may produce. A system must be established for the guidance of orderly future growth to affect this.

2. The center must remain central and accessible.

3. Residential areas must remain intact and not be fractured by commercial or industrial growth.

4. New activities must be allowed to enter at proper locations, and existing activities must be allowed to grow unencumbered.

5. Major traffic arteries must not be gorged with traffic from new perimeter locations.

6. A system must be established for the guidance of orderly future growth.
These diagrams are based on principles developed in the section Urban Values.

If neighborhoods are arranged in a 1,1,1 relationship (fig. 1) and growth is continued on this basis, there is no advantage to older neighborhoods as new ones are added, and conversely. In the system used in this thesis (fig. 2) each neighborhood has a center—a cluster of activities such as churches, schools, shopping, and a transit stop. When two neighborhoods exist together (fig. 3) a joint center is formed for a more intense level of activity. The joint center is central for two neighborhoods and a new whole is formed. In this thesis the first stage exists with four neighborhoods each with its own center, but each combination has a center. There are three different levels of activity. The main city center is enlarged because it also serves a regional role. As the town grows the system continues to develop providing centers of activity at each level of combination. At the future stage (fig. 5) there are four different levels of intensity.
CIRCULATION
CIRCULATION

In the report New Town Development, the Hook Study (RIBA Journal, February, 1962), Mr. John Craig, Town Development Officer, makes the statement: "...supposing you had been an architect...(in 1900) looking at the horsedrawn traffic, what sort of a town would you have now if you had planned on the basis of two horses per family, each with adequate stabling?"

Although there is speculation on the near future with predictions of automated highways, no one is willing to make distant predictions with assurance. However, there do seem to be two principles on which one might base predictions.

The first principle is that any new system that is developed will probably not spring full blown into existence generating its own circulation network, but will be a development derived from, and adaptable to, existing circulation systems. Route 1 passing through the site is an extension of the old Washington Street
connection across the Shawmut Penninsula and is one of the oldest highways in the United States. Indeed in other parts of the world gas powered vehicles are now traveling on roads that once carried Roman chariots. It is therefore likely that the street system will be the heritage of any new transportation system, be it asset or liability, and therefore should be designed with this in mind.

The second principle is one of increasing development in parallel transportation systems: one carrying non-stop terminal to terminal or node to node traffic, the other carrying local-stopping traffic. This is obviously the case in the relationship of new Interstate 95 to Highway 1, just as with Interstate 90 (Massachusetts Turnpike) to Highway 9, and Highway 24 to 138. Many other similarities may be drawn: the subway traveling from node to node with surface bus or trolley parallel routes, airline non-stop and local-stopping routes, and even non-stop express and local elevator systems in high buildings.

The questions arise as to how far down in the descending order can this principle be sensibly applied within the street system, what are the implications on the form of the city, and of course finally, what does one sacrifice for the system. These questions are discussed in the following paragraphs.
For the purposes of this report the terms "controlled access" and "free access" are used to designate the difference in the two types of roads within the system. This is to exclude the usual connotations and expectations of "limited access" and "service road" which do not apply well to this system.

In this plan the descending order of controlled access and free access roads continues down into the smallest neighborhood unit. Cross country highways use a limited access system with intersections spaced many miles apart. Urban freeways necessarily place them much closer. However, these are grade separation interchanges which are land consuming and expensive to build. Within the system of this plan, once one leaves the controlled access road to the center from Route 1 or Highway 95 all intersections are on grade and controlled by lights and stop signs where necessary. The speed on the controlled access roads is not high, probably in the 30 to 40 m.p.h. range, and traffic is slowed at the nodes or residential centers with grade access to the activities located there. In each instance where one leaves a center in the direction of the next center of smaller size, there is an immediate intersection allowing access to the adjacent residential sector. The primary advantage is that intersections occur infrequently, and even when the system reaches its smallest order, the interruption and danger of traffic emerging from driveways or parking
CIRCULATION (CONTINUED)

spaces is eliminated. In addition to the basic quality of relatively direct traffic flow, it becomes apparent that if all activities requiring any kind of public contact are located at the various centers, there is absolutely no traffic without a residential destination (or origin) on residential or free access streets. Thus it becomes possible for people to travel between all the various activities of the city without passing a single residential driveway.

The interesting development is that the neighborhood units themselves form a true hierarchal relationship. Two neighborhoods with small centers form around a larger center, which then combines with another group to form a new nucleus and so on. While there is an overlying controlled access network, direct neighborhood to adjacent neighborhood access still exists. It therefore became clear that there were considerable advantages even at a very small scale.

The implications on the form of the new settlement indicate that at the nodes the density would be expressive of a concentration of activity. Also, since the controlled access streets carry faster and greater amounts of traffic, the architecture related to them must be of appropriate scale, generating rhythms appropriate to the speed of the traffic. Since the rapid transit
CIRCULATION (CONTINUED)

line follows the same order as the automobile distribution system and since there are great liberties of accessibility which result from this, the density build up in relationship to the higher orders of the circulation system should be evident. The smaller scale architecture is related to the slower streets.

It is also reasonable to expect that if a future, faster means of transportation is developed along the controlled access system, the use of reasonably straight streets with no sharp crooks or bends would be advisable.

The sacrifices for the system are primarily economic, but these are not great. The greatest expense is for providing grade separations for pedestrian crossings where they occur outside of the water system. Initially it was expected that since there were parallel systems there would be a certain degree of redundancy inherent and the cost of pavement and use of land might increase. These increases could have been justified, however, on the basis of the economic advantages of time saving communication within the city and on the basis of removing all through traffic from close proximity to a unit. As the plan developed it became clear that while there is an increase in the total length of streets, the actual square footage of street area may be reduced, and that because of the hierarchal nature there is a savings
resulting from the use of an appropriate application of the proper road bed specifications which are related to the intensity of use. Since the street widths are not actually engineered from traffic computations, this can only be an estimate.

Finally, because of the very low order of intensity within the streets serving the detached and semi-detached houses, driveways and setbacks can be very small, resulting in both land and economic savings.

To summarize then it may be said that the circulation system has two parallel components: one is controlled access and non-stop in character, and the other is a free access, local-stopping distribution road. The controlled access is essentially a gridiron with nodes at the intersections. The nodes are transition joints from areas of one character to another or from one level of neighborhood unit to another and should be expressed in the circulation system. These nodes (or centers) also distinguish in the system the intersections between one controlled access road and another from the intersection of a controlled access road and a free access road.

In the future the nodes may serve as terminal points for a high speed public transit system or points where one's automobile may be programmed into some automated system which would then take over
and deposit the vehicle at some other pre-selected node. In the meantime the system serves well for the existing automotive means of transportation.
Interstate 95 is a controlled access road from Boston to Providence which is paralleled by Route 1 serving activities along the way (free access). Route 1 and Interstate 95 have connections at intervals.

As Highways 1 and 95 pass by the new town site, Highway 1 becomes controlled access and free access roads are placed on either side of both highways. A limited access road is provided to the city center and paralleled by free access roads.

The system then continues to develop into the residential areas connecting all centers with controlled access roads. Immediately after leaving each center there is a choice of continuing on controlled access to the next center or transferring to the parallel free access roads.

To close the system a link between each of the smallest centers is provided. The free access roads for the smallest controlled access road are connected to the free access roads to the largest controlled access roads.
ACTIVITIES

This discussion is divided into five sections. Their titles and the information they cover follow:

Centers: the distribution of those activities within the city which serve the inhabitants

Regional: the distribution of those activities which have regional importance

Park-Pedestrian System: a description of the role of the system within the city

Transit: a conceptual explanation of the function of the transit system.

Residential Density: the philosophy guiding the distribution of density
This city is based on the concept of a hierarchy of centers which provide a structure for the individual parts and which unify the whole. They are numbered in the diagram at left to make reference to them clear.

Neighborhood Centers (1)
The smallest center serves about 6000 people. It contains an elementary school, one of the smaller churches, and minimum convenience shopping. The store is a present day "general store" with a small stock of food, drugs, liquor, and hardware. Also in the center there is a rapid transit stop and a postal distribution point.

Joint Center (2)
This is the center which organizes two neighborhoods and offers the next level of specialization, intensity, and diversity. In it appears a junior high school, the city's larger churches, and more shopping which would include those convenience goods contained in the neighborhood center but with a wider variety of inventories.
ACTIVITIES--CENTERS (CONTINUED)

In addition it would have a newsstand (with books), perhaps a small tavern, a barbershop, coin laundry and dry cleaners. Located here may be certain extensions of larger organizations such as a window for the payment of utilities or handling of mail.

Joint Center (3)

At the initial phase this center is only partially complete. It is an open joint which will become the center for four neighborhoods when a later stage of growth is achieved. At first it contains only a filling station, a garage, a fire station, and a transit stop.

At the later stage as a center for four neighborhoods, it develops a still larger range of convenience goods and also minimum shoppers goods (clothing, variety, books, flowers). There is a barber shop, a beauty salon, laundry and dry cleaners, and perhaps a bank. In addition to the fire station there will also be a police station, a branch Post Office, and a branch library.

Town Center (4)

There is a full range of convenience, shoppers, and secondary shoppers goods as part of the regional and town shopping center.

As a part of the city center there is the high school; the major office and financial activities; a newspaper; printers; hotel;
ACTIVITIES--CENTERS (CONTINUED)

the entertainment functions such as skating, movies, restaurants;
a municipal office building; police station; city auditorium;
Post Office; and exhibition gallery.

For the residents within the city center itself there are also
those activities existing at the neighborhood center level--an
elementary school and churches.

College - Medical Center (5)

There is a center provided between the college and the clinic-
hospital complex which contains minimum shoppers goods. It is
expected that this center will contain those activities which
usually develop near a college and are supported by the students,
such as a clothing store, book store, restaurant and beer parlor,
and as growth occurs, perhaps a theater. Again there is a tran-
sit stop.

Industrial and Transportation Center (6)

The industrial and transportation center exists north of Highway
95 and becomes the central distribution point for people and goods
entering or leaving the city. The bus station, heliport, a res-
taurant, and the train station (if a railroad line is brought in)
would be here, allowing goods and people to shift transportation
systems at one point or be transferred quickly by the transit
system to the city center.

The central office for the control and promotion of the industrial park would be here.

In the future an extremely rapid ground public transit might be located parallel to Highway 95 serving with great speed a series of towns along the way, from Boston to Providence and beyond. This would parallel the rapid transit in the city and give the same hierarchy as provided by the limited and free access roads.

These centers are strongly related to one another and the relationship is consistent. Thus the relation of the town center to the region is similar to the relationship of the major residential center to the town center and so on down into the smallest residential center. While the intensity of these centers may vary, they offer a diversity of levels of activity which is in character and scale with the areas they serve.
The following activities have strong regional significance and have been located outside of the belt between Highways 1 and 95 to allow easy accessibility. The diagram at the left makes clear the relative positions.

Industry

The program for the city assumed that much of the industrial force would be employed in the Mansfield Industrial Park. Subsequent visits to Mansfield uncovered the fact that the Mansfield Industrial Park has been patently unsuccessful in developing, and that industry is actually leaving the area.

With the addition of Interstate Highway 95 the author believes that industry can be attracted to the area if given a proper site. Therefore, a strip parallel to Interstate 95 and easily accessible from it would be a location for research and light industry. The advertising value due to the location near the highway and the accessibility afforded by Interstate 95 and the transportation
ACTIVITIES--REGIONAL (CONTINUED)

center would be attractive to corporations seeking new sites.

College and Clinic-Hospital

The college and clinic-hospital are located northwest of Highway 1. Both of these activities will serve the region as well as the town. Their proximity will encourage the possibility of medical or nursing schools. They both have some need for a quiet area, and both have a need for reasonable closeness to transient lodging facilities (which are placed along the free access road parallel to Highway 1).

It is expected that the college will begin as a combination liberal arts and community college but will experience rapid growth to the university level, thereby contributing to the growth and improvement of the civic, cultural and educational facilities located at the northwest end of the town center and also contributing substantially to the total population.
ACTIVITIES--PARK-PEDESTRIAN SYSTEM

The park-pedestrian system forms a gridiron that penetrates the core of all residential sectors. It then wraps around the rear of the college in a large reservation at one end and moves through the industrial park at the other end. Thus for one with sufficient energy it becomes possible to walk entirely around and through the city within the system.

The centers are linked with a pedestrian system which is manicured in landscape character. The core of each neighborhood unit is penetrated by open, more natural land with existing tree cover selectively thinned to provide healthy growth and appropriate clearings. This relates to the lower density detached houses which are tucked beneath this foliage.

The system is linked to the waterways wherever possible. (In some cases, where reasonable, the waterways have been slightly altered.) In other places it becomes necessary to slightly dis-
tort the park system to relate it to the waterways. Since it is necessary to bridge the water for automobile circulation, it becomes quite simple to channel pedestrian traffic under the same bridges. In other cases where the park system crosses the controlled access roads, grade separations are provided.

It is felt that the park system and public educational system could be integrated under the same authority and a public physical education and recreation system using school gymnasiums and public park land could be developed for the whole population rather than just the school itself. The vision of the locked school yard is appalling to one who believes that a basic urban principle is the joint use of facilities.
ACTIVITIES--TRANSIT

The transit system follows the identical path below the surface that the controlled access roads do above the surface. It distributes both people and goods.

The author believes one of the most sophisticated methods of transportation to be the electric elevator. It is highly automated and can be operated without an attendant. Its relatively small capacity and often frequent number in banks reduces waiting to a minimum. It is interesting that men begin to be impatient after waiting over twenty seconds for an elevator but are willing to stand for fifteen or twenty minutes waiting for rapid transit.

The system envisioned for this city would operate much like automated horizontal elevators. There is much in the comparison that would be valuable on a city scale. The small unit size could reduce waiting to a minimum, and because of its automation it could be available at all hours.
ACTIVITIES--TRANSIT (CONTINUED)

Just as elevators carry goods as well as people, and because all activities in the city other than residential are on a transit stop, all could be serviced from the transit system. This would eliminate nearly all service vehicles from the streets.

The system could be used for infinite purposes--to distribute mail, to transport clothes from small collection points to a central laundry and cleaners, or to transport a shopper's sacks of goods from the point of purchase to a pre-determined terminal.

Such a system in the age of man orbiting the earth is conceptually well within reason. All these functions are now being performed vertically by elevators.
In a city which has uncontrolled development of housing there are two major factors which contribute to a build up in density.

1. proximity or access to an activity which is a frequent trip destination (employment, shopping, schools, public transportation, etc.)

2. amenity of the location (view, exceptional topographical features)

The first factor is obviously reasonable on the grounds of convenience. A less obvious justification is that the higher densities will nurture activities which in turn attract residential development. Thus the highest densities would be expected to occur near
the town center or along its main access routes. There will also be a tendency to increase density adjacent to various residential centers.

The logical approach to the plan of the residential areas therefore is best served by providing conditions where both factors are found simultaneously. This approach would tend to differentiate more between high and low densities. (The opposite approach would create a more even distribution and would seem schizophrenic in concept.)

However, the amenities of the site do not always exist in an order which can be given a clear structure of accessibility. Also the issue of economics tends to confuse the pattern. A man with adequate funds may want a house on an acre of land in a spot where great amenity exists. A location with poor amenity may provide the inexpensive land needed for low cost, high density housing.

The need for a stronger order to produce a clear pattern of density exists. This order is related to accessibility and the transit system.

The support of a transit system is not dependent on the total population but on the number of people it can serve per unit of length.
ACTIVITIES--RESIDENTIAL DENSITY (CONTINUED)

If adequate density can be maintained along its routes, it can be supported in a town of any size.

The values of accessibility provided by such a system would justify rigid control of minimum densities and offer a strong order for their distribution.

While the author is not prepared to defend in depth the economics of rapid transit and required persons per acre for support, the following points can be made: In Boston underground transit serves areas averaging about forty persons per acre. (It is also supported by distributing people to the bus system which operates beyond.) The fare in Boston is twenty cents per journey, and another forty cents is subsidized by the city.

While the system in this thesis is not served by a bus system beyond, the density within 400 feet on either side is about 100 persons per acre and drops for the next 300 feet to about thirty-five persons per acre. These are the areas within easy walking distance of the transit. Since all the activities within the town have transit stops, and because of the economics of automation and the use of the system for service (perhaps at night), one could believe that its use would be intense. And it is intense use that will amortize the system.
HOUSING

This discussion is divided into five sections: one dealing with the total structure of all the houses, one dealing with the reasons for the selection of particular types, and three sections dealing with the selected types. They are titled:

Neighborhood Structure
Residential Types
The Detached House
The Row House
Elevator Apartments
The concept of a neighborhood is elusive. The social neighborhood for one family may be entirely different from the neighborhood of the family next door. Indeed, it will probably be somewhat different for husband and wife. Some personalities tend to operate well in small groups; other cathect more successfully in larger populations. On the other hand, one does tend to generate friendships with those nearby, and as distance increases, the relative percentage of acquaintances diminishes. Therefore a residential plan which expresses activity on a multitude of levels beginning with a small cluster of residential units and ending with the relationship of the town to the region is proposed. There are neighborhood units, but they have centers rather than edges.

While each neighborhood unit has a center, it is related to a larger center which serves to link it with another neighborhood unit and its center. This larger center is related to the main city center. In each center are located the activities which
would best relate to the area within its sphere of influence... i.e., an elementary school in the smallest unit, a junior high at a larger size, the senior high at the largest, or a small stock of groceries, drugs, and sundries at the smallest center and a greater variety and diversity of goods at the larger residential centers.

Typical American housing developments employ front and side yards that are virtually worthless. They are inadequate as spatial experiences, useless as acoustical or visual separation, and provide no outdoor living space or social encouragement. Furthermore, they are land consuming and maintenance liabilities. They are carry-overs of the rural characteristics of eighteenth and nineteenth century America, where a home in the middle of a plot of land (and land ownership itself) was a symbol of status. However, space has been squeezed so tightly, and the designs have become so monotonous that values once very real have disappeared.

There are other forms that are traditional but which under contemporary situations have failed to undergo the proper mutation. Many traditional American homes before the acceptance of the automobile had front porches on which the inhabitants of the house sat and greeted their neighbors as they passed. This acti-
vity was valuable in promoting chance social contacts. The rear was used for stables and services. The impersonal automobile and its accompanying increase in traffic has introverted the home so that now its outdoor space faces the rear. The result was that the neighborly quality was lost and the rear, which in most cases retained its service uses, became confused in character.

Logical development then is to provide automobile and service access to one side of the house and relate the other side to a private outdoor space. This space in turn relates to a semi-private area serving a cluster of residences, thus regaining some of the neighborly qualities of the 1800's. The semi-private area would be a node in an over-all pedestrian system which would in turn connect to other semi-private areas and to public spaces of special character. The pedestrian system in one direction connects housing of different densities contributing to a desirable heterogeneity.
HOUSING--RESIDENTIAL TYPES

Lewis Mumford in a Philadelphia address said, "The aspects of culture which make a city livable, cannot be effectively pursued where personal individuality and choice are absent. Today's buildings should... (avoid) designs based on standardization and mechanical repetition." While the first statement is certainly correct it may be argued that great variation and a wide individual choice are possible in a system of standardization which would allow orderly variation.

The major decision involved in selecting housing is the choice of a particular residential type. Although there are wide variations, five basic types exist: the detached house, the semi-detached house (duplex), the row house, the walk-up apartment, and the elevator apartment (high-rise).

The author has chosen to exclude semi-detached housing as a type that is confused in character. The great freedom of individuality in the detached house is lost, but two units together do not provide enough sequence to be architecturally satisfying.

The walk-up apartment is also an unsatisfactory type. The relationship to exterior space is poor. In the detached house, the low density offers an opportunity of openness. The interior of the row house may be related to a private court, and the vertical separation of the ground plane to the windows of the apartment tower offers strong indoor-outdoor relationships. In the walk-up the opportunities for a satisfying interior-exterior spatial relationship are poor. None of the three mentioned relationships applies. The only valid opportunity is to relate the interior of a walk-up apartment to a semi-private court for a group of units, and this is less than satisfying.

The walk-up is also difficult to use with other types. It crowds elevator apartments and harms the values implicit in the "room in the sky". It overbears the row houses, and while there is contrast in size and scale, it is not adequate to be exciting.

Most important, there are no values produced by the walk-up apartment that are not more clear and intense in one of the other types.
HOUSING--RESIDENTIAL TYPES (CONTINUED)

Economy is perhaps the best justification for the walk-up. The elevator and the space required for vertical circulation make the high-rise apartment a more expensive unit per square foot.

However, economy was an objective in the design of the elevator apartment. Since the values of this type are greatest in the upper floors, it is felt that these residents should pay for the advantages, thus providing an economic level for the lower floors similar to the walk-up.

As to the proportionate quantity of the various types of housing, the important issue is that there be a choice. As long as there is a choice, the demand (or lack of demand) for a particular type can be determined and the proportions corrected in later growth stages. However, a decision must be made, and in this plan densities considerably higher than normal for American cities are employed. The limitations are primarily imposed by the housing types chosen and the relative quantities of each.
HOUSING--THE DETACHED HOUSE

The Form and Relationship of Units

"Most people, the world over, believe that they would be happier in a detached house, that a house is completely surrounded by land and therefore separated from all others. This preference for isolation may be justified, but many would consider it anti-social--as expressing a desire to shut one's family away from the community--and as snobbish--the bigger and more isolated the house the better the owner has 'done for himself'.

"The ideal detached house is specially designed to meet the occupier's requirements, like a tailor-made suit. Houses have a very long life and since the needs of the family change in a comparatively short space of time, the 'ideal home' is soon no longer perfectly suited to the occupier. The owner may be fortunate enough to be able to build a new house, in which case the one he has abandoned will be taken by a family who will be content to adjust their behaviour to it."
"The ideal detached house is generally envisaged as standing in its own landscape setting aloof from the other building. That is the right way to site it, for its forms are generally too personal to be closely related to other buildings, when they do come together, there is almost bound to be conflict. It is significant that photographs of 'architect-designed' houses nearly always exclude glimpses of adjacent properties."¹

The detached house implies an opportunity for the greatest freedom. Highly individual expression is possible. Careful attention to the topography, respect for existing trees, and a highly programmatic expression is implied. The form may be completely individual.

It is true that occupancy changes in detached houses are probably less frequent than in row or apartment units, and therefore the individual floor plan should have its strongest expression.

When one flies over an American suburb and sees rows of detached houses with ten foot side yards it becomes patently clear that here is really the expression of row houses. A straight street with detached houses uniformly set back defines and encloses space, but it does this loosely and monotonously. The row house can become this wall and control space very well, but the proper

expression of the detached house is a building in space. Not one which defines space.

The greatest value in the detached house is the freedom afforded its owner in controlling its expression. Since it is an individual product, it must avoid any sort of alignment with its neighbors. However, the detached house can exist in a pure expression only when its neighbors are out of sight, or distant enough so that there is little possible relationship. This requires too much land to work in the city, so some modification must be made if the detached house is to be used at all. And used it must be.

In this thesis the detached house exists in clusters of two, three, or four around common motor courts. It is through the automobile that they are related to the rest of the city, and it is through the auto court that they must sacrifice some of their freedom. Because they all form a composition about a single court, they must be sympathetic in character. However, this is the implicit modification by the city and an urban value results. Joint use of a common motor court implies economy through joint amortization. Social interaction may occur across it. The possibility of a commonly owned swimming pool or tennis court exists. Contact and use of the rest of the city exists through the motor court.
Landscape Character

The landscape character implied is natural. Trees are left because major land moving is not required. Clearings may be created in scale with the housing clusters, but they are loose and not geometric. The fact that man and the city exist should have some effect, however, and therefore one would expect the ground to be cleared of stumps and undergrowth and suitable, green ground covers provided.

Primarily one must say that detached houses in the city are most properly considered as in an informal park. It is the proper attitude, for to try to create the illusion of virgin territory, or natural woods completely untouched by man, is false and inappropriate. This is a valid way to live, but not in the city, or even at the edge of it.

Relation of Internal to External Space

Because of the privacy that the large dimensions between houses afford the detached house, the interiors may have intimate, even continuous relationships with exterior space. While one would expect some rooms in the detached house to be snug and enclosed, many possibilities exist for strong penetrations of the outside space. This is the kind of housing where nature can play an extremely valid role. The most public property is the motor court, which has a very low intensity of use and therefore does not cause any particular problems of shielding.
Social Implications

The resident of a purely independent detached house has no social ties implied by the architecture. (This is the image of the mountaineer in the wilderness again.) However in this thesis the purity has been modified and there are some references that can be established.

There is a probability that associations would be formed across the motor courts, and two, three, or four family micro-neighborhood social units formed. These houses exist in land that is park like in character, and the large town park areas are found there. It is probably that here people from detached houses will mix with people from row and elevator housing. Also the schools, shopping and churches will create interaction.

However, the strongest link between the detached houses and the city is by the automobile circulation system. It is likely that this is the form of transportation most often used by them. Since the automobile is capable of covering large distances quickly, it becomes reasonable to expect that these people relate to the entire city, and to a larger extent, to the entire region more than those living in the other housing types. It is here that one would expect to find people who commute to other areas frequently, either for business or recreation.
HOUSING--THE ROW HOUSE

"The terrace (row house) is the dwelling type with which architects have created their most splendid urbane compositions, and that which has been most degraded by the speculator. At its best it can be seen in the squares and streets of such Georgian towns as Bath and Cheltenham, and at its worst in the nineteenth-century working class housing of Birmingham, Manchester, and other industrial cities. It is a building type loved by those who seek to create a beautiful urban environment; and disliked by the general public."

The Form and Relationship of Units

The row house in this thesis is a party wall house which has its own garage and its own private entrance. Since it exists in physical contact with others there is an accompanying loss of individual freedom in establishing the forms. While repetition of unit after unit would be boring, variation must exist within

a common system. Materials, scale, the order of magnitude of the mass, fenestration, and rhythms must all be worked together. When these elements are handled with order however, individual liberties and values result. These exist in social interaction, control of space, and economy of means.

The row house is primarily a wall. With it comes the wonderful ability to completely define space. It should be treated as a wall and related to other row units as one would organize walls. Row houses create space and enclose it, rather than exist within it. They can create areas (or ceilingless rooms), slots, or establish planes which interrupt the continuous flow of space. The size of these slots or rooms may be scaled to the activities which exist within them. For instance, when the automobile passes through rapidly, there should be a wide smooth slot. The rhythms must be large; the rooms must be big.

As the automobile moves more slowly through row houses, rhythms should occur faster, the rooms should be smaller and the slots should be narrower. Probably the road should curve and long, straight-line vistas should be avoided. Sequences should be studied. Space should open and close in varying degrees.

Landscape Character

Since the row house creates greater density, the presence of man
and his acts is stronger. More earth must be moved and trees destroyed. A larger percentage of land is covered, and there is less opportunity to allow "natural" landscape character. The spaces created by the row houses must be clear, both in themselves and in their effect on the observer. The landscaping then properly should be carefully located to reinforce these spaces and work to clarify them. It is difficult and unnatural to attempt to retain natural vegetation. It is wiser, cheaper, and more sound architecturally to bulldoze the land to conform to more important design precepts and develop landscaping in more sophisticated patterns. As density increases, landscaping becomes more geometric and manicured.

This is not to say that if existing topography or landscaping (such as sharp, uniform slopes or well defined hedge rows) were strong that they should not be a design concept.

However, this is not true in this thesis. The topography is uneven and while the large general slopes are recognized in the distribution of the architecture, the small scale modulations have been altered in the areas where the row houses exist.

**Relation of Internal to External Space**

Since the density of the row house developments is considerably higher than the detached houses, the public areas are used with
more intensity. Furthermore, there is not the blessing of abundant space to provide privacy.

This makes it necessary to carefully plan exterior buffer spaces which become transitions. In this thesis they are courts and provide the private outdoor spaces. In the detached house the interior has a strong relation with nature—the great outdoors. In the row house the relation is to a court. It is far more intimate.

Social Implications

The row houses offer the strongest possibilities for building strong neighborhood ties. There is high density without sacrificing easy access to the ground. Since there is convenient access to the outdoors it is easy to provide exterior, joint use recreation areas where neighborhood ties may be formed. It is a housing type which is more efficient in its use of land than is the detached house. It is more urbane because of greater joint use of exterior spaces and high density. The opportunity for chance meeting exists to the highest degree.

It is this issue of chance meeting which has been stressed in the section on communications under Urban Values. There must be a vessel to provide the opportunity and encourage interaction.
In the area of the row houses there is a series of parks within the fabric of pedestrian circulation which is designed to promote entry and activity. This is best explained in the following diagrams:

If a park, or "social vessel" is provided adjacent to a circulation path, the opportunity exists to enter it, but the act is not overtly encouraged.

In this design the circulation path is bent around and through the area in such a way as to encourage entrance and participation.
The Form and Relationship of Units

The form of the apartment tower is dictated more strongly by the problems of structure, mechanical distribution and vertical transportation than programmatic distribution of rooms within.

In the apartment towers there is probably more transience than in the other housing types. The individuality of an owner is not seen on the surface of the building, rather it is found in the arrangement of the furniture within, in the placement of a picture on the wall. The exterior expression is of a general space, capable of being subdivided in infinite patterns.

Adaptability becomes a major issue in the buildings of this type. The probability of redistribution of space and the accompanying need for relocation of mechanical distribution exists and must be planned for.
Housing—Elevator Apartments (Continued)

While the towers must exist as shafts in space in some ways similar to the detached house, the multitude of people living within produces different implications. They must be carefully fitted into the pedestrian, transit, and automobile systems, and related to public spaces in a way which links them to the other residents of the city.

The loss of freedom in controlling and modifying one's home is greatest here, but the values of density are highest. It exists in close proximity to many activities and has easy access to public transportation with all the liberties this implies.

Landscape Character

The land around the apartment towers is perhaps disturbed the most. Considerable excavation must occur. The character of vegetation is again man made, geometric. However, since the surface of the building should respond to the character of the relationship of interior to exterior space, the top of the tree line or the relationship of the top of buildings around the tower must be recognized. An apartment on the first two floors would not have the character of the "room in space". One would not have the feeling he was in an apartment tower if there was a dense, branch structure outside his window.
HOUSING--ELEVATOR APARTMENTS (CONTINUED)

The detached house attempts a continuous relationship with nature; the row house relates to the outside enclosed court, the apartment tower to the sky--the horizon and the entire surrounding ground plane. In this thesis there is a large auto court which provides a link with row houses around it, but this would be realized only when people enter and leave.

Relation of Internal to External Space

The relationship of the room to space in the apartment tower is entirely different from that of the row house or the detached house. It is a room in the sky--it relates to infinite space. This should be recognized and exploited in the character of fenestration.

There is also a large degree of privacy as a result of the vertical separation of the public areas on the ground and residential spaces many feet above. When these two ideas are taken together the implication is a very open space above.

However, it is a vastly different kind of openness than that existing in the detached house. In the detached house a continuous movement of space is implied. This would be frightening fourteen stories above the ground. The most valid concept is that of a glass cage--with well defined but transparent division of interior and exterior space. A feeling may exist of the "precipice" as
one moves toward the exterior surface many stories up. This must be "designed out" without destroying the wonderful experiences offered by the height and long view.

Social Implication
Privacy is probably at its greatest in the apartment tower. While density is high, architecture effectively compartmentalizes it. While areas exist on the ground plane (in close proximity to the apartment tower) for social interaction, the contact to them from the tenth floor is far more tenuous than the row houses. Since this unit relates best to the transit system, one would expect to find people who relate their activities and associations to the whole city, rather than to the neighborhood or region. (One would not expect a person to work in Boston and commute from an apartment tower in this town.)
ILLUSTRATIONS

The drawings included for this thesis are expressive of the ideas presented verbally in this report. It would be wrong to say that they are the result, for the conceptual level of architecture is often the consequence of design rather than the predecessor. It must be said that the concepts and the design developed concurrently.

The drawings explain:

the regional connections of the new town
the circulation and its relation to the land form
the diagrammatic distribution of activities and the growth system
an architectural concept for housing at the neighborhood level and the fabric of spaces, circulation, and topography related to it
an architectural statement of the three housing types discussed
BIBLIOGRAPHY


