

A CHOICEFUL URBAN FORM

by

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ABSTRACT

A Choiceful Urban Form James Ralph Hull

"Submitted to the Department of Architecture on June 17, 1968 in partial fulfillment of the requirements for the degree of Master of Architecture."

Although the program used for this inquiry into urban design was for the development of a new town in Finland, the resulting thesis does not represent the design of such. In fact, it does not pretend to portray a specific city at all, but instead is merely a creative look at one aspect of the human environment, that of urban form.

The design of a city must take into account the particular idiosyncracies of a multitude of individual lives and institutions, all of which information was unavailable to me in this situation. Therefore, I have based the development of an urban form upon a particular generalized notion of a most basic need of modern urban man - an Expanded Personal Choice. Since this concept contains what I believe to be the essence of a changing way of life, I have attempted to create a new concept of physical form and space which would be able to respond maximally to the forces inherent in this increased choice.

The physical urban form presented as part of this thesis is therefore but one example of how I have interpreted and manifested human choice into a design solution. It is an outgrowth of three goals with respect to the urban inhabitant: 1) To provide a heightened awareness of and choice of interpretation of personal position in time and space, through the medium of a complex 3-dimensionally conceived physical form; 2) To expand choice of human activity through increased accessibility supplied by an integrated, high-speed, individualized transportation system; and 3) To respond to particular conditions of natural site, sun, human functions, and physical urban growth.

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INTRODUCTION

In searching for a rationale on which to base the design of a new city, the question arose in my mind, "How can a new physical urban environment effectively respond to the changing needs of modern life?" Most immediate urban problems, it seems, could best be solved by social instead of mere physical means. This question, then, became of utmost importance in my subsequent search for a contemporary urban form, because I believe that the meaning of such a physical design can only be measured in terms of its response to the particular life situations it affects. Therefore, instead of beginning with the problem of producing an artful urban design I will first concentrate on life needs. Jane Jacobs backs up this approach in stating:

"Instead of attempting to substitute art for life, city designers should return to a strategy enobling both to art and to life: A strategy of illuminating and clarifying life and helping to explain to us its meanings and order - in this case, helping to illuminate, clarify, and explain the order of cities."¹

Artist Jesse Reichel also adds his support to such a procedure.

"A city is not art; it is life. Its form is a multidimensional tracing of the content of life of individuals and of the society. However, as one consciously tries to understand the content of life, and find its form, one begins to make art."²

¹Jacobs, Jane. The Death and Life of Great American Cities. New York; Random House, 1961, p375

²Reichel, Jesse. "On The Design of Cities." Journal of The American Institute of Planners. May, 1961, p141

Therefore, the conception of a physical urban design must begin with an analysis of the life patterns which this form will contain. However, I feel that such an analysis, if it is to be thorough enough to have any real validity, cannot only be done by the designer, but must be intensively carried out by specialists in planning, sociology, psychology, etc. This must also be done in relation to a specific group of people who are to be the users of the environment. Subsequently, it is then the duty of the designer to synthesize such specific information into a physical reality.

This situation then brings me to the question of procedure for an urban design student studying under limitations of time and facilities in an age of specialization and recognized interdisciplinary complexity of each detail. One must, therefore, decide on a set of priorities which may not necessarily lead toward the perfect overall urban design, but toward enriching the particular interests of the student. This specialized involvement then should lead eventually toward a meaningful contribution to a specific aspect of urban design.

Just as Marshall McLuhan says that "the medium is the message," I believe that in some cases "the process is the product." Therefore, I consider the significance of my thesis to be not only in the resultant physical design but also in the rationale surrounding the process by which this design comes into existence.

The program for a design competition of a new town in Finland was used for my design inquiry because it provided specific existent conditions of site, transportation linkages, and relation to other cities; in addition to population projections from which I could derive relevant building types and areas.

I must emphasize, though, that this thesis does not in my mind represent the design of a specific city. Instead, I have used this program as an exercise in helping me to better understand the interrelationships of urban form, space, and transportation, as they respond to the forces of nature as well as those forces inherent in a generalized view of modern city life. This design, then is not a city because it is not based on the particular needs of a specific group of people - those needs which are an outgrowth of custom, regional influence, level of industrialization, etc.

In groping for some constant with which to develop a physical urban design, I was struck with the almost unanimous realization of the concept of "increased personal choice" as being perhaps the most significant aspect of modern life in an affluent industrialized society. I have therefore used this basic phenomena of life as a unifying force throughout this study.

THESIS DEFINITION

My thesis is that an ideal concept of urban design must begin as a response to the most basic human qualities and needs of contemporary life; and that one of the foremost needs is for an urban form that can respond to the quality of expanded personal choice in modern living.

I believe that this increased choice is perhaps the most basic indicator and initiator of changing modern life styles, especially in the affluent industrialized societies that I am most familiar with. I also think that a new concept of physical form can grow out of this condition which' is uniquely relevant to our times.

I will not waste words on the current dichotomy between physical conditions and life needs, and the requirement for better city planning, etc, because I have heard and read many other such statements with what I believe to be little resultant change in the actual physical form. As Jesse Reichel has said: "It is my opinion that planning is using advanced techniques, sciences, and social thought to produce cities whose forms date back at least six hundred years. These forms express ideas which are in opposition to the processes of life today." ³

Therefore, instead of further adding to this diatribe of current urban conditions, I will concentrate my energies on solutions to new form. To begin, I will give support to the phenomena of choice as a basic tool of design, by pointing out what I believe to be the indicators of this increased personal choice in several phases of life. Then I will use this tool directly to influence and generate a changed theory of urban space and form.

³Reichel, op. cit., pl41

EXPANDED PERSONAL CHOICE

Increased choice has come about through changes in three major aspects of life: 1) Education; 2) Affluence; and 3) Mobility.

Education of the masses has led to increased understanding of the physical and spiritual world, thereby constantly breaking down traditional beliefs and opening up nearly all knowledge to increased choice of interpretation and change. Education has given countless numbers of individuals an increased choice as to their particular life work. It has given the tools with which to individually question every existing form of institution and environment, therefore allowing great choice in selection of personal living conditions.

Affluence has enabled modern man to have a far greater choice as to how he will spend the limited number of days and minutes of his life. When he is no longer tied to an all consuming task that produces for him a mere subsistence level of life, then he must make increased decisions as to how he will use both his material wealth and the wealth of stimuli available to him through an infinite number of activities. His affluence has allowed him to take advantage of the opportunities available through education and travel by rapid transportation means.

Increased mobility, I believe, has had a more profound effect upon modern life than is perhaps generally recognized. Modern forms of high speed movement have increased the number of activities available to a person of limited time by lengthening his "radius of accessibility", thereby greatly expanding the number of people, places, and activities accessible to him. This condition then, greatly increases his choice as to what he does and what his interests are to be. But, of

importance to the urban designer, it also changes the traditional concept of spontaneous human interaction at the local level, for it tends to engender in each person a sense of alienation toward the man in the street. This is true because mobility-induced specialization of interest has decreased the amount of reliance one feels toward "just anyone" who happens to occupy a similar physical location.

Therefore, mobility enables people to make choiceful encounters with other people in situations of common interest, which are not limited by propinquity but occur in widely diverse places. Melvin Webber has indirectly responded to this condition of mobility by stating:

"Much of the social interaction occurs at the expanding urban places, but increasingly, interaction transcends the places at which people live. Those who share in this spatially dispersed communication are in some degree participants in urban communities that are of a non-nodal sort urban communities having spatial forms that are vastly more dispersed than we have been ready to recognize.⁴

Collectively, these three phenomena have brought about the new consciousness beginning to prevail in our age. It is, indeed, a heightened level of understanding of the freedoms and limitations inherent in the physical environment, in addition to the traditional concepts of beauty and ugliness. This, then, is the level of human consciousness which must be responded to by the urban form.

⁴Webber, Melvin M., "The Urban Place and Non-Place Urban Realm." In Explorations into Urban Structure. Philadelphia: University of Pennsylvania Press, 1964, pp79-153

EXPANDED CHOICE MANIFESTED IN A CONCEPT OF URBAN FORM

I will now attempt to relate man's facility of increased personal choice to the realization of an urban form. This form should utilize expanded choice in invoking a heightened awareness of one's personal urban involvement.

Complexity of Form

One way to achieve this choiceful condition is through a complexity and intricacy of space and form. An environment so conceived could therefore offer a great variation of visual experiences. Perhaps the formation of these spaces should have inherent in it a sense of ambiguity, the purpose of which is to invoke questioning and conscious choice of interpretation by the individual in such spatial involvements.

A recent article by Amos Rapoport and Robert Kantor supports the need for such form, as a result of psychological tests.

"Simplicity and clarity in the intent of much of environmental design is questioned from a number of points of view. Among other work, recent psychological research shows that humans prefer ambiguous, complex patterns in their visual fields and that this seems a fundamental perceptual preference, applying even to infants and laboratory animals. The overall finding in this area of research is that there is an optimal range of perceptual input preferred generally by subjects with both too simple and chaotically complex visual fields disliked. Building in open-ended, complex, involved, allusive ways is suggested to be more psychologically satisfying than the traditional simplicity and control of the environment sought by many designers."⁵

⁵Rapoport, Amos, and Kantor, Robert E. "Complexity and Ambiguity in Environmental Design." Journal of the American Institute of Planners. July, 1967, 210-221, p.210

Definition of these complex urban spaces could be determined by such variables as: Variation of enclosure, conditions of light, contrast and variety of activities, relation to movement systems, and relative conditions of continuity versus separateness of space. (Although these variables are the same as those which have produced the same boring formal solutions for two thousand years, I believe that new analysis, interpretation, and current technology can produce an urban form more directly responsive to contemporary life.) An example of one complex characteristic of urban space is the possible ambivalent feelings of enclosure created by building forms which flow around and sometimes over a space, as a continuous involutory projection.

M.I.T. psychologist Warren Brodey speaks of the concept of "Visual Preview" in perception. Most everything about modern life, from electronic communication to the quickened pace of events, has shortened this length of preview. The complex urban environment can also physically decrease this visual preview and in so doing increase the rate of perceptual change - making life more of a happening.

Imageability of Form

Another important conceptual aspect of the urban environment is its overall imageability of form. The relative clarity of a simple plan based on activity organizations which result in linear, hierarchical, or variation of gridiron forms, is not necessarily relevant to a population whose social and political systems form a far more complicated multi-dimensional societal structure.

As Christopher Alexander has said:

"There are virtually no closed groups in modern society. The reality of today's social structure is thick with overlap the system of friends and acquaintances forms a semi-lattice, not a tree--- when we think in terms of trees we are trading the humanity and richness of the living city for conceptual simplicity which benefits only the designers, planners, administrators, and developers."⁶

Therefore, the ideal contemporary urban form should have the ability of evolving freely in a three-dimensional context, unrestricted by preconceived and limiting rigid patterns of growth. For, as Marshall McLuhan has stated, "The mark of our times is its revulsion against imposed patterns."⁷

Such form would suggest the necessity of certain guidelines governing its evolution, and a concept of integrated transportation which will be discussed later.

The greater variety and complexity possible under these conditions could lead to a situation of imageability requiring a heightened perception for environmental understanding. If the means of mechanical mobility in this situation were limited to manual control, then the ability to find one's way would become a major limiting function; however, if access to all places can be available by automatically-controlled vehicles, then this is not so much a problem. In fact, in such a situation, certain complex spaces and forms might take on

⁶ Alexander, Christopher. "A City is Not A Tree." Forum, May, 1965, p62

⁷ McLuhan, Marshall. Understanding Media: The Extensions of Man. New York; McGraw-Hill, 1964

existential qualities when perceived by human minds which are free of worrisome relational understanding (that sense of position which forces one to relate each individual form to a usually rigidly-conceived framework of surrounding environment.)

3-Dimensionality of Form

Of great importance in the determination of complex urban space is the use of 3-dimensionally-conceived forms. I define such forms as those of involved resolution necessarily requiring initial conception by actual manipulation of 3-dimensional components. A sculptor might define his form as that which cannot be understood in its essence by diagrammatic means, but must be born and later experienced out of a totally 3-dimensional tactile and visual encounter, both in space and time. The architectural forms of the current city are merely inflated line drawings which were conceived on paper and in most cases should have stayed there. For the essential characteristics of most prevalent building shapes can be easily, and perhaps best, depicted by a few two-dimensional representations.

Since the complexity of a truly 3-dimensional form increases with the square of the number of variables in a 2-dimensional shape, understanding of such an urban form requires a multitude of experiences from an infinite number of points in space and time. Therefore, a man within such an organization is aware only of his particular position at an instant of time; and to realize this instantaneous feeling of awareness, he must consciously sense his particular existential surrounding and relate himself to it, knowing that an instant later his relation to it might change. This type of involvement is closely related to the greatly expanded number of choices and pressures of modern life which have led to an

increased importance on immediate experiences - living life for the present.

Since I believe that a close correlation can be drawn throughout history between art, life, and the city, I would like to include another statement by Jesse Reichek which I think by association tends to support and parallel my search for urban form.

"Until the first decade of the twentieth century the multiforms of the baroque painters or single focus of the renaissance painter continued to be the means of structuring forms, ordering space, and describing acts. Then certain hints emerged of new means of structuring. Motion, flux, changing relationships, growth, physical and psychological time as expressed in the superimposition of objects upon objects, acts upon acts, thoughts upon thoughts, are some of the factors with which the single or multi-focus diagrams cannot deal. Painting since 1900 has recognized this and has attempted to find some new conception or order, some structure, which would more appropriately express our contemporary life."⁸

⁸Reichek, op. cit. p142

EXPANDED CHOICE MANIFESTED IN ONE PHYSICAL SOLUTION OF URBAN FORM

Since this project was initially proposed as the design of a new town, I will begin by explaining the reasoning behind my design at this scale.

First of all, if a great range of personal choice is to be of utmost importance in this environment, then there must be provided a wide range of residential alternatives - from single family houses to high-rise apartments with their implied correspondingly different life styles. Therefore, all types of housing must be available to the inhabitants based on variables such as cost, density, surrounding open space, style, and accessibility.

Density

If alternative conditions of both highly active and passive environment are to be available to the inhabitant, then it seems there should be a wide range of density, since theoretically the degree of activity of an area is directly proportionate to the number of people living in the immediate surroundings. However, this is true mainly where walking is the chief mode of transportation, and mechanically-increased mobility changes this relationship because people are able to move greater distances between their dwelling areas and activity nodes. Therefore, the increase in mobility brought about by possible new-technology urban movement systems may very well change the entire method of distribution of activities in an urban area. However, since this becomes an entire planning process in itself, which is outside my particular interests in this thesis, I will assume that both these extremes of density will be needed, and concentrate my efforts on the condition of a high density, multiple-use environment.

Transportation

If it can be assumed that these two conditions of density will exist, then it also seems natural that the areas of lower density must be at a greater distance from the highly populated central activity zone. Under conventional means of transportation, walking and automobiles, this thereby implies a decrease of accessibility to this core area. However, if people are to really have a choice as to their particular mode of residence then they should not be handicapped by this restriction. A truly choiceful urban environment must therefore provide a system of transportation which gives these outlying areas approximately equal accessibility to activity nodes as their high density counterparts. As Jane Jacobs has written: "The point of cities is multiplicity of choice, but it is impossible to take advantage of this multiplicity of choice without being able to get around easily."⁹ This necessity would therefore preclude the conventional automobile because of inherent restrictions of manual operation and resultant age limitations on use. The scale of size inherent in the hardware required for a typical automobile system, and its limitation to horizontal movement, also makes this mode unfeasible for use in the high density urban environment.

Therefore, it is apparent that the ideal urban form, if it is to offer maximum choice, should supply an alternative means of individualized rapid movement as an integral part of the environment.

Some planners would argue for a return to walking in a compactly-designed new city, and therefore against the need for a relatively high speed intracity transportation system.

⁹Jacobs, op. cit., p340

However, I feel that such a system is desirable for a great majority of people whose lives are faster and packed with more experiences than ever before, thus making time ever more important to them. I also believe that given greater freedom from physical need through technology, man will lead a full life based on increased intellectual, creative, social, entertainment, and recreational pursuits, if a correspondingly greater choice of these are immediately accessible to him. This assumption therefore especially necessitates greatly increased mobility as well as concurrent development of communications, social design, and physical planning as a solution to enlarging the degree of personal choice and meaning available to urban man.

Tubeway Mobility System

Initial analysis of the requirements for a modern comprehensive transportation system for the urban environment would suggest several basic topics for consideration: 1) human need; 2) spatial needs; 3) system components; 4) efficiency; 5) human effect.

1) Human need. The rapid rise of the automobile has made evident the need for increased individuality and freedom of movement which can only be met by individual vehicles instantly responsive to personal needs. Minimum trip time is often of importance, although the system must also allow for an optimum range of travel times and amenities such as visual contact and open air touring. Personal safety is also of utmost importance, as is freedom from physical and mental stress while moving. Immediate accessibility - without necessity of transfer within the city - is also of primary concern. Greater mobility is desirable for people at both extremes of age, young and very old. Vehicle space should be large enough to accommodate 1-6 persons and the system should be able to handle slightly larger vehicles moving freight.

2) Spatial needs. The high density urban environment necessarily requires greater amounts of human movement but also has less ground space available for this need. This situation would therefore suggest that increased movement space could be gained by using space below the ground or in the air above it. Without considering cost (which varies with unforeseen technological innovations), it seems that since most human activities occur above ground, that an air-space system would allow greater accessibility (at an infinite number of levels) than a subterranean one. Therefore, if the vehicle weight and current size requirements could be reduced substantially, it might be possible to build a completely 3-dimensional system which could allow almost unlimited space for movement. Such a matrix of relatively small diameter tubes would ideally require a vehicle that could move horizontally and vertically with equal effectiveness within the system, thus eliminating the need for transfer between vehicles at the ground level.

This vehicle would need to be about six feet in diameter to seat four people comfortably and six in a pinch, but still be small enough to be related to the average 1.4 passengers usually carried. The resultant volumetric relationship between vehicle and passenger size proves to be about 7.5:1 - far less than the 50:1 ratio of the average automobile! Total necessary movement space would also be lowered by the fact that electronic control of vehicles could safely direct them at high speeds with virtually no space between; also, since each vehicle would not have to carry its own power source or be rigidly designed for uneven roadways, etc., perhaps it could collapse or fold and be mechanically placed for storage, requiring a total space possibly only one-fourth its expanded volume. These considerations, without accounting for on-and off-ramp space, therefore mean an overall volumetric relationship between one man and the required minimum system space to move him of approximately 1:20 or one fiftieth the

required ratio of the current automobile system!

Although secondary emergency access roads would have to exist at ground level to handle large equipment, most freight can be broken down into pallet sized volumes and transported separately to their exact destinations with a savings of time and money allowed by driverless vehicles. Vertical movement of non-separable objects larger than that of the passenger-size capsule would occur through supplementary means such as freight elevators, permanent building cranes or helicopters.

As I mentioned before, under certain high density conditions this system might be almost entirely attached to or within building forms, requiring only a few supplementary connecting links which can be supported by or suspended from building structures. These links could be portable and controlled by the city to even out loads caused by phasing problems inherent in the system growth.

3) Systems components: As has already been mentioned, the system would be based mainly on approximately six foot diameter tubes and lightweight omnidirectional capsules. A central computer would control the movement of all vehicles within the system, with contact (via telephone wires) being made with it through small push button consoles within each car. These would allow the passenger to communicate information concerning destination, overall speed, bodily acceleration and cost levels, etc. Propulsion for the system might be supplied through a linear induction electric motor, where each capsule would merely have several fins at its perimeter which would fit into electro-magnetized slots providing propulsion, braking, switching and even air suspension through the repulsion effect of similar poled magnets. A nice side effect of this type of contact is the constant access to

telephone and also electric power for television, etc. The vehicle can therefore be extremely light in weight, allowing minimum static and dynamic loading on the tube system and relatively long spans where needed. Where desirable, tubes can be made of steel-reinforced clear plastic or may even be open troughs at places where maximum visibility or open-air touring (retractable top capsules?) are desirable. However, it must be emphasized that visual understanding is a function of speed and distance from object viewed, so visibility is dependent upon route and related environmental forms. Therefore, to retain this quality where desirable, some control over these factors would have to exist.

Due to the efficiency of this system containing through-lanes of constant speed and separate acceleration and boarding tubes, it is ideal for high-rise buildings because it is inherently more efficient than an elevator system where only one capsule can move in an entire tube. Therefore, while taking only as much or even less space than a conventional elevator core, this system can provide for the buildings' own needs as well as providing thruway transportation for others. If all buildings were interconnected, each structure would add to the entire urban movement system, thereby increasing accessibility between buildings - a desirable quality even for developers. This idea is not really new because it's the same principle as providing a sidewalk which serves not only its own occupants, but also others who are going by to other destinations.

Certain standard levels for different directions of horizontal movement might be imposed to develop straight thru routes and coherent patterns throughout the system. In lower density areas the network would be mainly two-dimensional in structure, but quite different than conventional roadways. Because safety is removed as a determinant of speed, and access in addition to constant movement is controlled electronically, every road can become a through artery if it can con-

tain an adjacent acceleration lane. Therefore, little-used residential streets (tubes), for instance, could be used as thruways up to the capacity inherent in their size without decrease in safety, appearance, or accessibility. This means that concentration of movement along enlarged lines for added speed will not have to occur, and every point can be equally accessible to every other point. The computer can automatically spread peak loads throughout the infinite number of equal-speed routes within the system. If time is of the essence to the passenger, then he knows that the computer will take him the quickest route, all things being considered, even if it is indirect and a longer distance. Short distances or desired slow speed can be handled completely on the accessway. If an unlimited number of off and on points are available, then congestion at traditionally concentrated access points is avoided.

This is similar to a fine-grain grid system with the addition of controlled-access interchanges at every crossing, allowing high speed uninterrupted movement along any route. This access control would be handled by the computer in accelerating vehicles on accessways to the thruway speeds and even allowing constantly moving thru-vehicles to cross at a point in the same plane, with very little separation between, if exact positions and relative speeds are known by the computer. This condition would require a certain minimum distance between vehicles, however, which would have to be somewhat greater than the size of the capsule; therefore, a maximally-loaded system of closely-packed vehicles would require a vertically separated crossing. Necessary highly concentrated origin-destination points that require maximum accessibility would occur at crossing points and rely on automated vehicle handling equipment to prevent congestion. Excess capacity for the standard 2-dimensional grid could be handled by adding additional

elevated routes to spread the load near the point of concentration, since these points are usually represented by some type of vertical structure anyway.

4) Efficiency. Several aspects of the system allow greater efficiency than that of the automobile. Its central electronic control not only provides for complete safety and removal of mental stress associated with driving, but allows movement of the vehicle without occupants. This might mean that one capsule could take father to work in the morning, return untended to take the children to school and then return to be used by mother all day long before being sent back to fetch the old man home from work in relaxed comfort. This aspect also allows continuously circulating driverless taxis providing cheap but personal public transportation. Although both these innovations place greater loads upon the system, they reduce required storage cost and space, in addition to saving human time.

Although comparative energy costs are not available between the gasoline engine of the automobile and the electric linear induction motor, it seems that it should take less power to propel a light weight vehicle which does not have to lug around a heavy engine, drive-train, and weighty safety bumpers, and resist direct tire and wheel bearing friction. Also, theoretically, a vehicle with no moving mechanical parts except for a few electronic controls and switching devices, should require less maintenance and last longer (although interior decorating may change).

One of the most important indexes of efficiency would be the cost of the tubeway and its coiled stator, compared to the cost of traditional roadways and/or vertical elevator shafts and equipment. This would be a function not only of material and labor, but also the space required and resultant capacities of each.

Roadway maintenance costs are also minimum because the only contact between vehicle and road is air friction. Additionally, the traditional problems of snow, rain, ice, and leaves, which plague an open roadway, are nonexistent in relation to a closed tubeway; thus enabling greater safety as well as decreased maintenance costs.

The spanning ability of the structurally-efficient tubes, in addition to their ability to support near-vertical movement, enables the system to open up mountainous and previously undevelopable land to human settlement without necessitating massive carving up of the natural terrain for roads. Since the tubes are relatively small in size and lightweight they can be economically supported in the air or put into the ground, allowing maximum functional use of the land and air rights, and taking off the least amount of space from the tax rolls. These characteristics of the system also allow a maximum ease of flexibility and growth.

It is true that the capsules in such a system are tied to the energized tubeways, since they are not self-powered. However, most automobiles are similarly reliant upon a smooth roadway for mobility, and cannot operate off the beaten path; and elevator cars are certainly connected to their shafts for operation. Therefore, the real problem is not the interdependence of vehicle to track, but of transition from one mode to the other. This would occur in several ways depending on personal needs and the particular vehicular conditions of the situation into which the new system is placed.

It would seem that the creation of a new town is the ideal condition in which to start with such a new mode of transportation. For if all new structures are built incorporating this movement system, then the new city would merely

require several transition points at its perimeter where transfer between vehicles would occur. Therefore, the city would have its own separate system of horizontally and vertically moving individual vehicles which would be analogous to the elevator of a single high building. Just as transfer is usually made from automobile to elevator car at the ground level of a building, so transition occurs from auto, truck, plane, train, helicopter, etc. to exact-destination vehicle at the edge of the city. It might be that in the future such a system would be prevalent throughout the regional environment, thereby allowing intercity as well as intracity accessibility without need for transfer between vehicles.

5) Human effect. Perhaps the most important consideration of such a comprehensive urban transportation system is the ultimate effect it will have upon its population. We are just now starting to realize the effects, good and bad, that the automobile has had upon the Americans whose enthusiastic use of it has changed both their lives and natural environment.

An obvious advantage is the increased mobility for children and elderly people alike. Electronically controlled movement for young children can free mother from her taxicab duties and also increase the number of friends available to children. It can ease the mobility problems of pre-driving-age teenagers, as well as make racially and economically mixed central schools equally available as equal opportunity for all children. Greater mobility for older people might stop flight to the "retirement communities" and retain their much-needed knowledge and diversity of ways and opinions in the urban environment. Extra years of readily accessible, efficient movement, coupled with increased life spans will help retain social contact, entertainment, and meaning in old age.

Although movement within a new city using the described transportation system would reduce the active function of driving, it would allow increased personal time for other chosen physical activities. The environment could also allow alternative modes such as walking, bicycles, and perhaps even small slow speed electric cars.

Physical Form

Considerations of Transportation

Since building forms support and sometimes carry within them the described tubeway system, they actually become part of the transportation system themselves. They must, therefore, be related in some way to the sense of continuity inherent in the functional interrelatedness of urban form. Because accelerated mobility is such an integral part of modern city life, traditional individual building forms can no longer remain aloof from new higher speed forms of intracity movement. Marshall McLuhan acutely senses this dichotomy of urban form and motion and is able to capture its meaning in words.

"All means of interchange and of human interassociation tend to improve by acceleration. Speed, in turn, accentuates problems of form and structure. The older arrangements had not been made with view to such speeds, and people begin to feel a draining away of life values as they try to make the old physical forms adjust to the the new and speedier movement."¹⁰

The concept of urban building form must therefore change its selfish image to become partly a function of the integrated transportation system and also a function of visual imageability in relation to high speed movement. Perhaps the

¹⁰ McLuhan, op. cit p95

concept of a "flowing" form relates better to dynamically perceived human understanding than do individual staccato shapes, each of which is separately statically conceived. Such dynamic form should change shape in a progressive incremental way, instead of by abrupt scissures, if it is to be best understood by a speeding person. However, the urban environment must contain a great variety of types, sizes, and shapes of building forms which relate to many different modes of transportation. The visual understanding of these forms individually and as a whole is dependent upon differences of speed and distance from which they are observed.

Considerations of Urban Space

What I consider, however, to be the most important difference of design approach in developing a new physical urban form is the primacy of urban space over building structure as a determinant of form. This leads to a change in procedure from the usual condition where preconceived forms are positioned within the environment to determine spaces. Instead, one must start with a mental conception of large-scale 3-dimensionally-defined space, based upon an idea of what the human feeling should be within this space. Then follows development of structural forms which generate and enfold these spaces, and contain the functions of urban life. The term "involutionary" perhaps best describes such inwardly curving spatial forms which "involve" the urban inhabitant in the fabric of city.

Considerations of Sun

Since the program that I used in my design inquiry was for a town in Finland, the extremely low angle of the sun (6° max. height of sun in midwinter, 53° max. in summer) was a major consideration in the development of an urban form.

I had two goals with respect to the sun: 1) To give every apartment resident the choice of sun exposure in relation to his dwelling unit; and 2) To relate major urban spaces to this low sun condition.

As one solution to the necessity for residential sun exposure, I decided to create apartment units which would be exposed to natural light both on the sunny south side and also the shaded north. This condition then would allow choice as to winter and summer uses of outdoor terraces, but always insure one orientation toward the sun. In the high density core of the city, this requirement for sun was manifested in the design of medium-to high-rise residential splines which are thin linear forms allowing apartments to span their depth and open up to both sides. To best facilitate the integration of outside-living terrace spaces, these forms rise diagonally instead of vertically. The angle of incline is variable to provide a range of terrace sizes, since they are formed by the roof of the dwelling below and therefore proportionate to the amount of relative setback of the vertically-stacked units. This condition therefore provides for an increased choice of apartment types to suit different family needs.

In the context also of urban spaces the sun is very important in the northern region where the amount of natural light is extremely limited much of the year. Therefore, those spaces needed primarily for daytime use of shopping, schools, recreation, etc., were designed with maximum sun exposure as a foremost criterion. Spaces which are shaded much of the time by large building masses are used for activities not as reliant upon sunlight, such as offices and facilities used mainly at night, like entertainment.

Diagonal building forms can be especially related to this low angle of sunlight if used properly; for if slanted toward the sun the space formed on the underside is still directly lit and the opposite space on the side in shadow is less enclosed and open maximally to the sky.

Considerations of Function and Growth

The overall plan of this urban form and its related activities is determined by generalized patterns of use and accessibility. The transfer to urban vehicles from outside modes of transportation, which occurs at the perimeter of the city, has a strong effect on organization of the form and function within. Since there exists a direct relationship between the tubeway movement system and the building structures to which it is an integral part, it seems logical that areas requiring a greater number of movement channels are also those of highest density.

The above condition, then, would determine the relative density of city areas as a function of vehicular flow and accessibility. In the initial stages of a new city which is designed to serve a regional population, most movement is externalized, which means that most trips originate either outside or inside the city and involve crossing the transition points. Therefore, the city would begin to grow more densely near these points, to take advantage of greater accessibility to outside transportation means. This process would therefore provide more routes of movement radiating from these points, with decreasing numbers in direct proportion to density and need as forms extended outward from them.

In this situation of externalized movement it would seem natural to place the facilities used mostly by the regional population nearest to the perimeter transition points. Such activities as shopping, lodging and some forms of entertainment would be located there. The expressions of urban life which are most symbolic of the entire regional population, however, would occur in the middle of the core area, thereby equalizing accessibility from perimeter points and requiring perceptual experience of the entire city upon access by their participants. Government center, museum, concert hall, sports center, and college are examples of such central facilities.

If the city later becomes more self-sufficient, then this growth and density would change as a response to the resultant conditions of internalized movement. In this case the central areas of the urban core would begin to fill in and become more uniform in density throughout, thereby equalizing accessibility within this area. However, if future growth is of similar nature as in the beginning, the requirements of externalized movement would increase need for transfer facilities. The city would thus respond by elongating its perimeter to allow for more transition areas and at the same time enlarging the amount of space available within.

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APPENDIX A

CLASSIFICATION OF SPATIAL CHARACTERISTICS

Space - Volume A

Characteristics

Low space - floor to ceiling 8'-10'.
Depth not more than 30' from external surface.
Access to natural light and air and view is mandatory.
Small live loads.
Small span structural system.
Space highly fragmented both externally and internally.

Typical Uses

Dwelling
Hotel Room
Hospital or nursing ward.

Space - Volume B

Characteristics

Floor to ceiling 12- - 15-
Depth 30'-40' from exterior surface
Natural light, air and view desirable
High degree of environmental control
Medium span structural systems (30' x 30')
High degree of flexibility allowing for rearrangements.

Typical uses

Elementary School
Junior High School
College
Technical Institute
Library

Space - Volume C

Characteristics

Floor to ceiling 12'-15'
Depth-distance from external walls unlimited
Natural light and air not mandatory
High degree of environmental control

Medium span structural system (30' x 30')
Heavy live loads
High degree of flexibility allowing for rearrangement

Typical Uses

Offices
Research Laboratories
Commercial: Supermarket
Department Store
Shops
Restaurant

Space - Volume D

Characteristics

High space floor to ceiling, more than 30'
Some natural light desirable
Wide span, more than 60' heavy loads
High degree of environmental control

Typical Uses

City Hall
Museum
Art Gallery
Place of Worship
Gymnasium
Multi-purpose Hall

Space - Volume E

Characteristics

High space, floor to ceiling more than 35'
No contact with external surface required
Wide span more than 60'
Heavy live loads
Natural light and air not desirable
High degree of environmental control

Typical Uses

Auditorium
Theatre
Cinema
Bowling Alley

Space - Volume F

Characteristics

High space floor to ceiling 20' +
Access to natural light and air not necessary
Wide span 60' x 60'
Heavy live loads
Some environmental control

Typical Use

Industry
Warehouse
Mechanical Plants
Parking (floor to ceiling + 8')

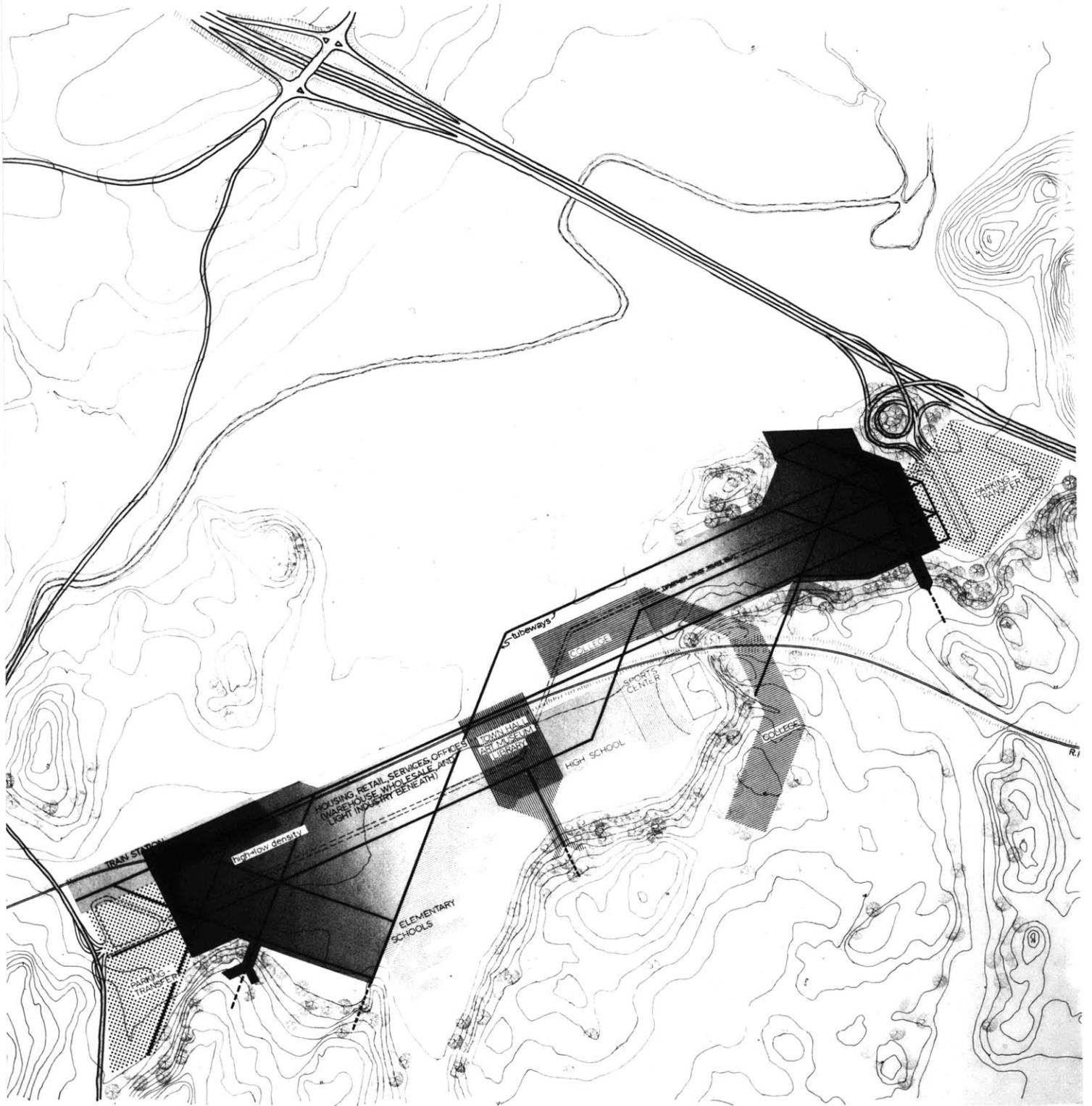
Space - Volume G

Characteristics

Open spaces exposed to elements
Manipulation with grade
Exposed horizontal surfaces of structures

Typical Uses

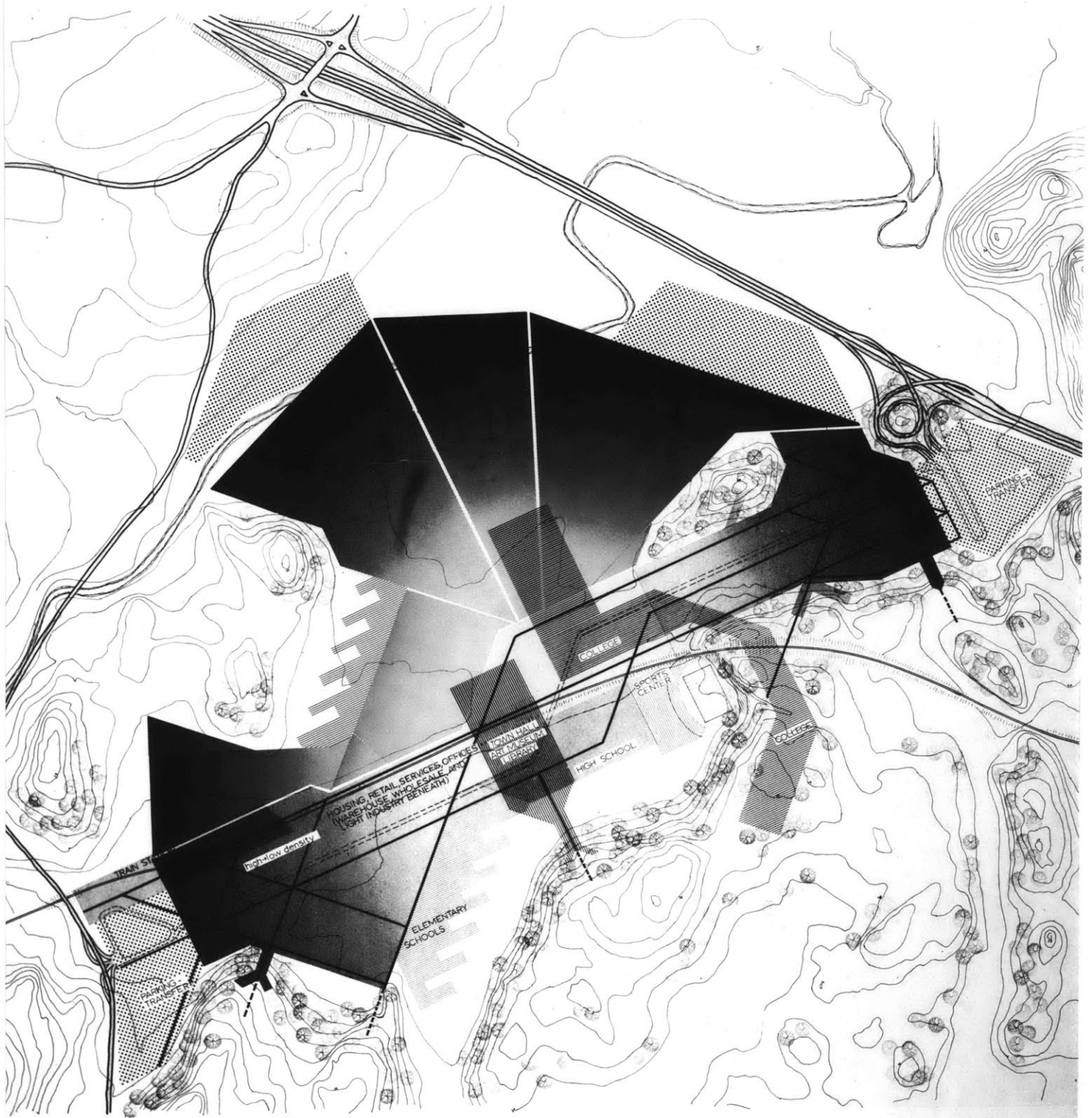
Parks
Lakes
Dams
Gardens
Patios
Piazzas
Roads, etc.



ESPOO TOWN CENTER

Schematic Functional Relationships

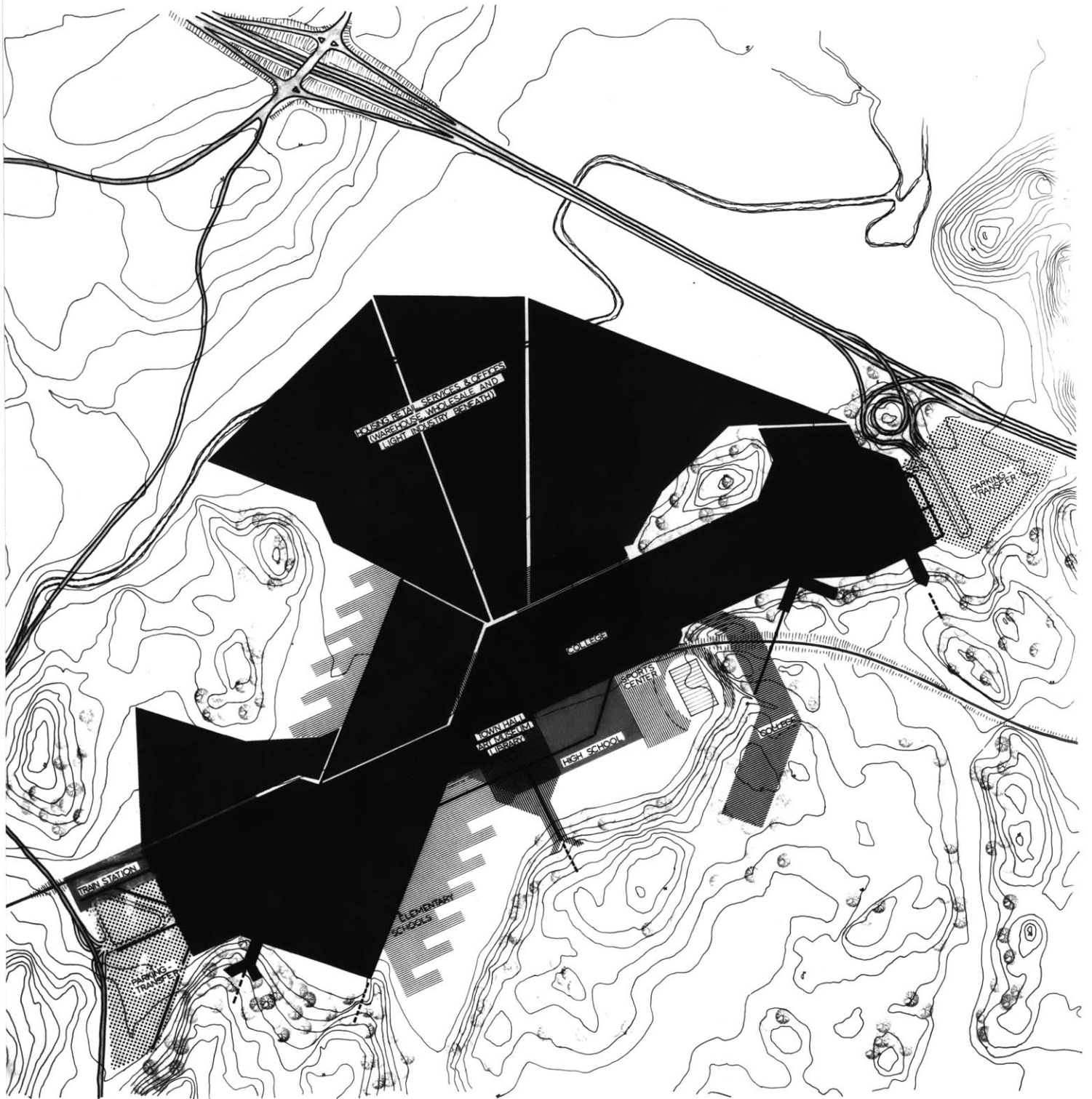
initial stages
 TOWN POPULATION - 15,000
 REGIONAL POPULATION - 100,000



ESPOO TOWN CENTER

Schematic Functional Relationships

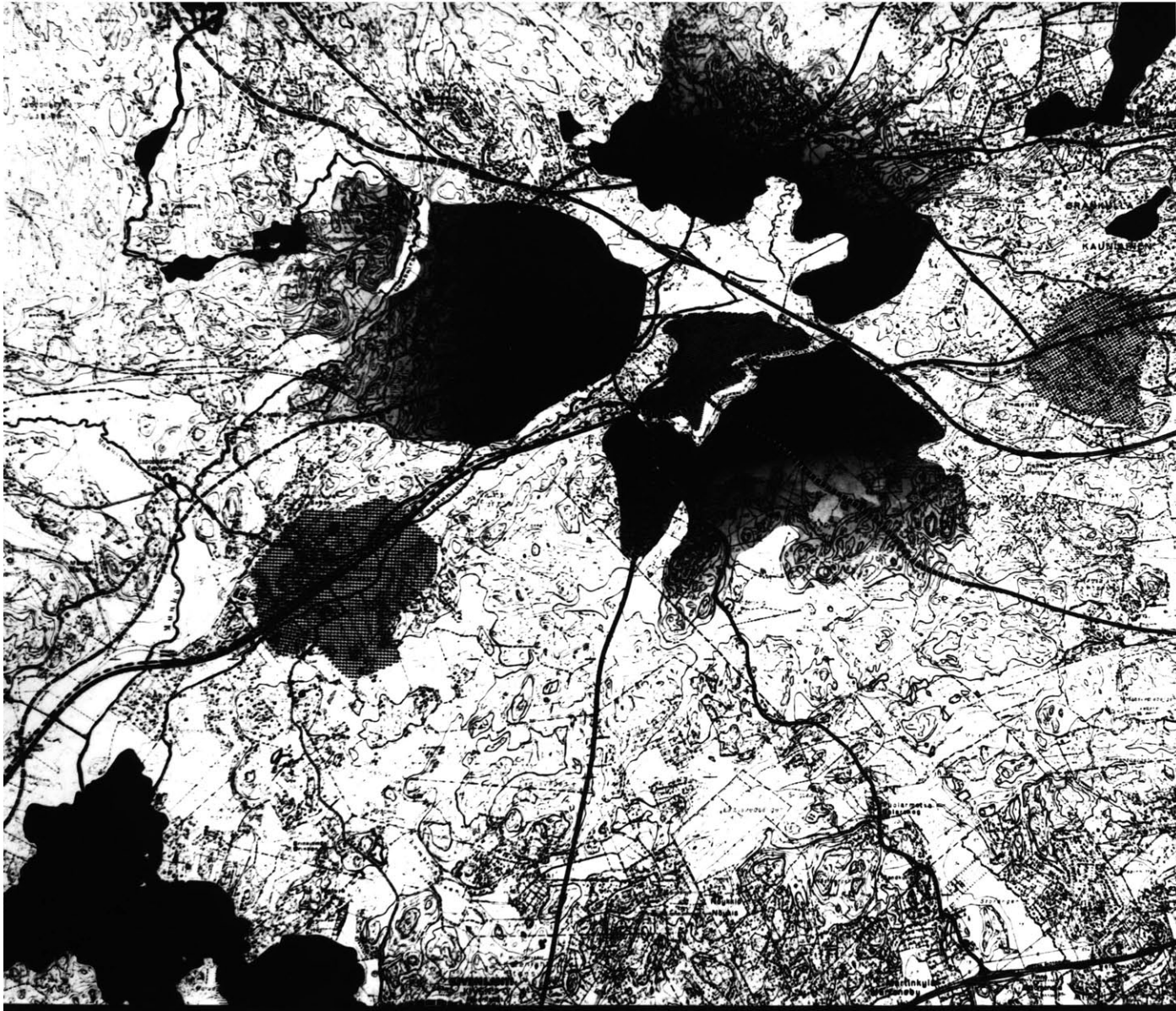
future growth
 IF MAJOR POPULATION
 EMPLOYED OUTSIDE CITY
 - externalized movement



ESPOO TOWN CENTER

Schematic Functional Relationships

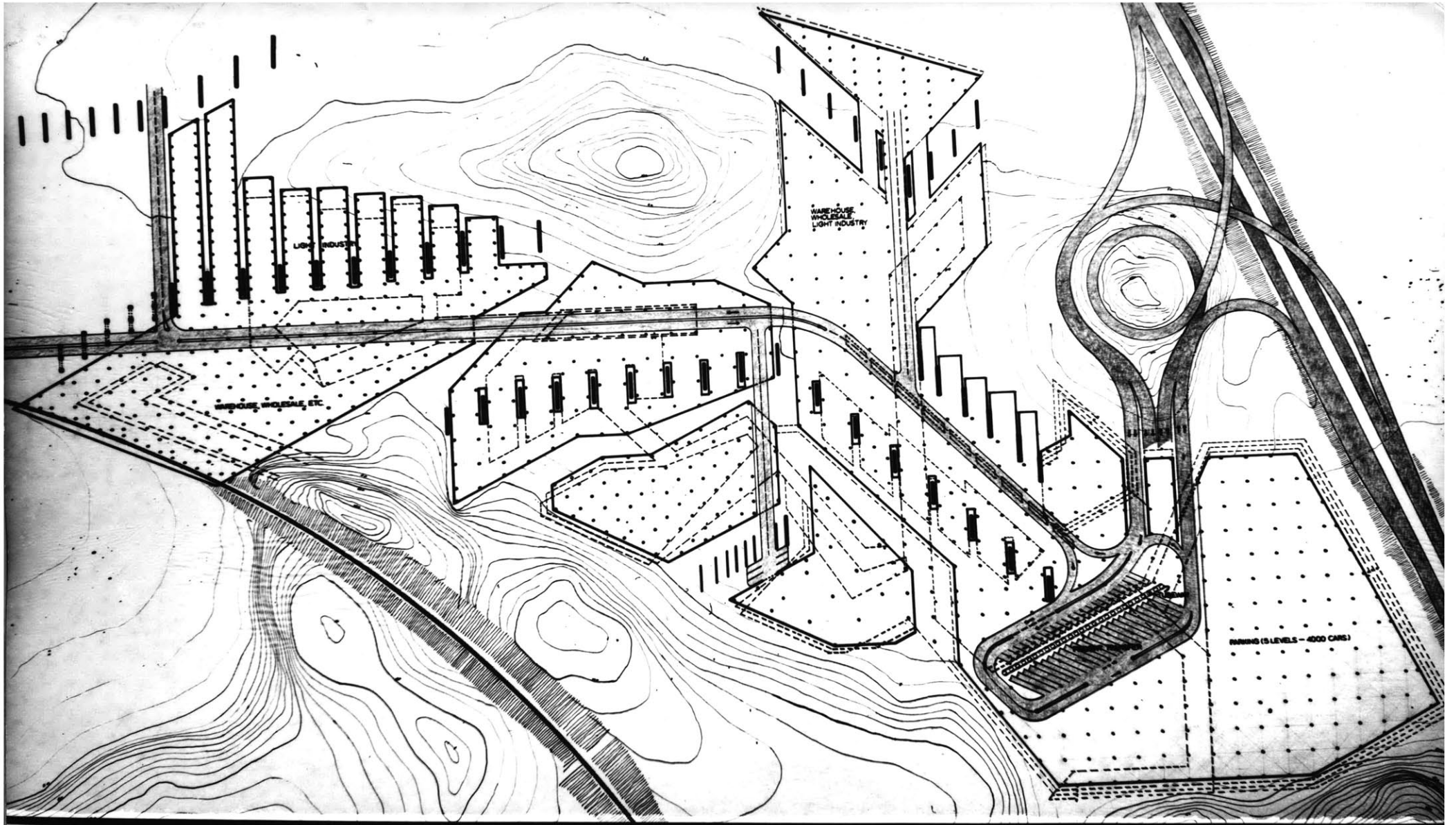
future growth
 IF MAJOR POPULATION
 EMPLOYED WITHIN CITY
 -internalized movement



regional relationships and growth

A CHOICEFUL URBAN FORM

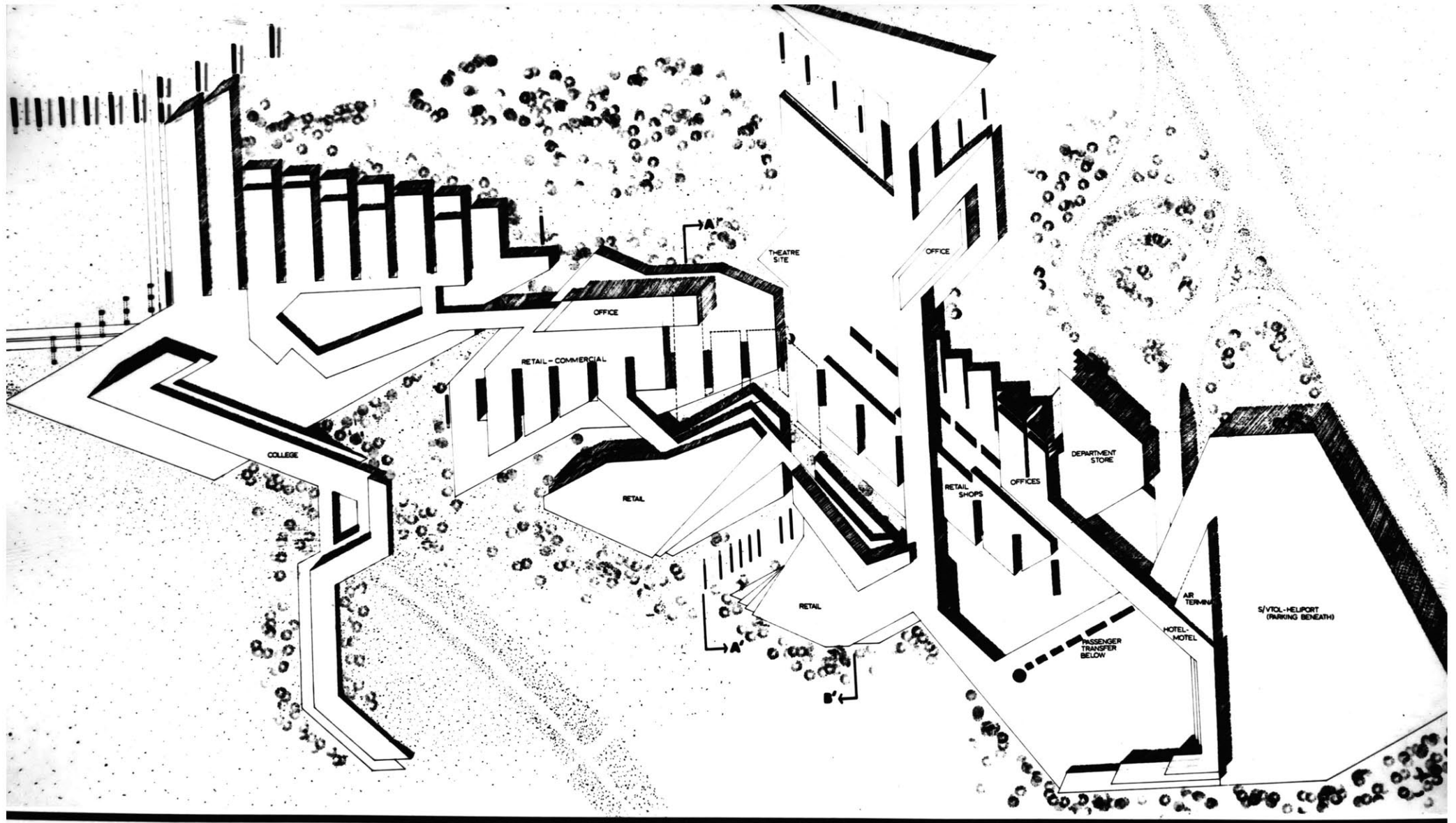
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
 MASTER OF ARCHITECTURE - URBAN DESIGN
 JAMES R HULL 1968



partial core plan - level 1

A CHOICEFUL URBAN FORM

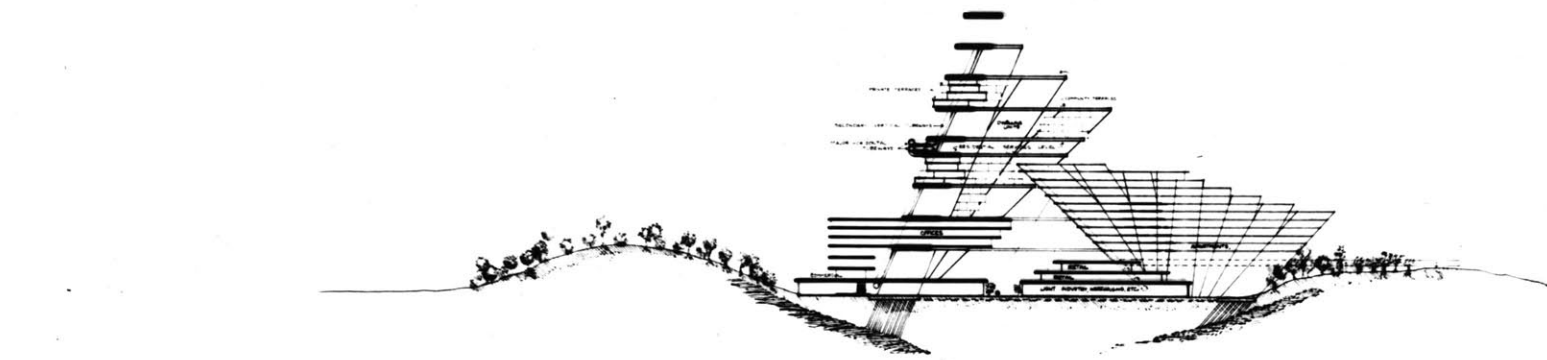
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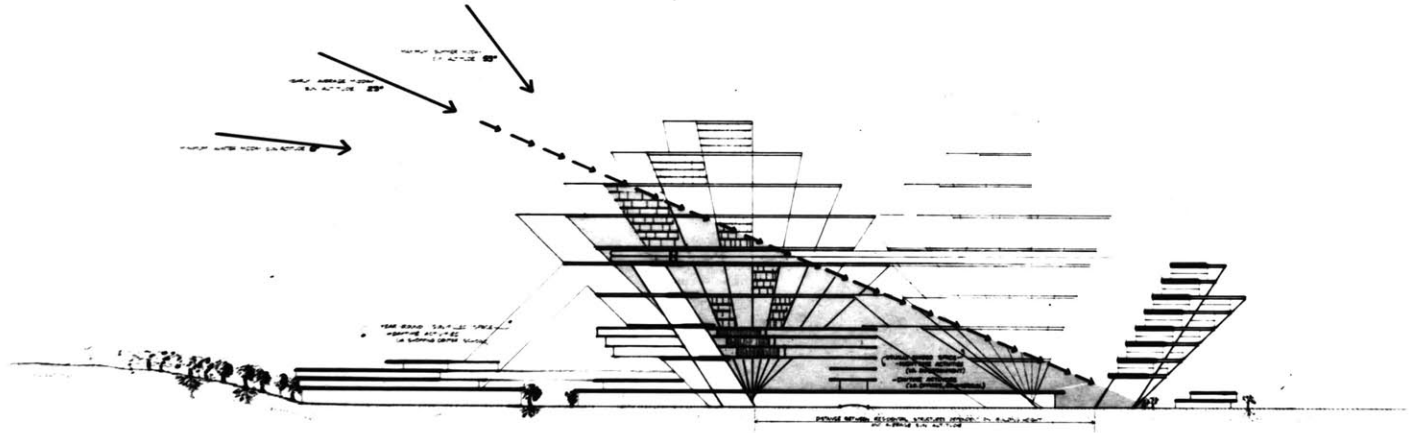
partial core plan - levels 2-5

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section A-A



section B-B

core sections

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