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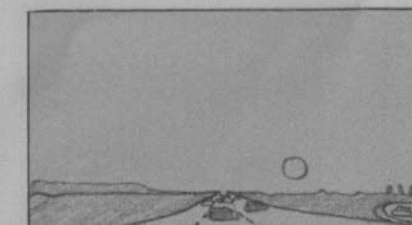
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The findings and conclusions of this book are, as with all Joint Center publications, solely the responsibility of the authors.

The View from the Road BY DONALD APPLEYARD, KEVIN LYNCH AND JOHN R. MYER



Preface

This monograph deals with the esthetics of highways: the way they look to the driver and his passengers, and what this implies for their design. We emphasize the potential beauty of these great engineering achievements, as contrasted with their current ugliness. Since the realization of this visual potential lies in the hands of the men who design them, this monograph is addressed to the highway engineer. We hope that he will find our ideas of use.

Design involves a balanced judgment about many factors, of which visual requirements are only one set. We are convinced, however, that these requirements are among the most important that a road must satisfy, and that they should have substantial weight in final design judgments.

We became interested in the esthetics of highways out of a concern with the visual formlessness of our cities and an intuition that the new expressway might be one of our best means of re-establishing coherence and order on the new metropolitan scale. We were also attracted to the highway because it is a good example of a design issue typical of the city: the problem of designing visual sequences for the observer in motion. But if in the end the study contributes something toward making the highway experience a more enjoyable one, we will be well satisfied.

This monograph results from a study begun under a grant from the Rockefeller Foundation and continued in the Joint Center for Urban Studies of M.I.T. and Harvard. We are particularly grateful to the latter for their support of an expensive process of publication. Some of the basic ideas which underlie it are expressed in a previous study.* Many of the ideas, of course, are part of the general heritage of the design professions, applied to a new subject.

Most of our particular conclusions are the result of a series of studies of existing highways and of people's reactions to them. They have been further modified by our attempt to develop appropriate methods of design. Chapter 1 contains a summary of our findings and conjectures, while Chapter 2 proposes a new graphic language for describing visual sequences on the highway. Chapters 3 and 4 use these concepts and this language to analyze the impact of an existing road, and to illustrate how a new road might be designed.

Richard Peterson organized and conducted the field work for the sketch interviews on the Northeast Expressway. The remainder of the work was done by the joint authors.

Cambridge, 1963
Donald Appleyard
Kevin Lynch
John R. Myer

* Kevin Lynch, *The Image of the City*, The Technology Press and Harvard University Press, Cambridge, 1960.

1. The Highway Landscape

Ugly roads are often taken to be one price of civilization, like sewers or police. The boring, chaotic, disoriented roadscape seems to be the natural habitat of that useful but awkward monster, the American automobile. From this point of view, we spend too much of our lives in the car. It would be better to arrange cities so that everyone could walk to work, or to let automatic devices take the wheel, so that we could pull the shades and watch TV.

The authors take a different position: road-watching is a delight, and the highway is—or at least might be—a work of art. The view from the road can be a dramatic play of space and motion, of light and texture, all on a new scale. These long sequences could make our vast metropolitan areas comprehensible: the driver would see how the city is organized, what it symbolizes, how people use it, how it relates to him. To our way of thinking, the highway is the great neglected opportunity in city design.

The first highway designers were railway men, who learned their trade when grades were flat and alignments straight, when the surrounding landscape was an obstacle to overcome, and cost, power, and safety were questions far too urgent to allow thought for looks. Only the engine driver had to watch the view, and he was paid for his trouble. This attitude is still widespread, even among highway users, who bear with resignation the vacant hours of commutation.

Those who are alarmed by the ugliness of our roadways emphasize the repression of vice, rather than the encouragement of virtue. Roads should melt into the landscape, billboards should be controlled, the scars of construction should be disguised by planting. There is little discussion of turning the highway experience to any positive account.

When so many people spend so much of their time on the road, when they persist in driving for pleasure, it may be that driving is more than a necessary evil. There are other kinds of journeys which are enjoyable in themselves: walking, horseback-riding, boating, rides in amusement parks or on open bus tops. There are even a few roads in this country on which driving a car is a delight. Most often they pass through fine natural landscapes, but there are some pleasant episodes on highways in our big cities: New York, Chicago, Philadelphia, and San Francisco.

There is a tradition of the scenic road in this country, and a few have been built. The original parkways, so quickly engulfed by general traffic, were primarily intended for pleasure-driving, like the old pedestrian or carriage promenade.

In an affluent society, we may well choose to build roads in which motion, space, and view are organized primarily for enjoyment. But even on highways whose primary function is the carriage of goods and people, visual form is of fundamental importance and can be shaped without interfering with traffic flow. It is the landscape seen from these workaday highways that we will deal with here.

Highways have special visual qualities if we consider them as art. We will discuss them from the standpoint of the driver and his passengers, ignoring the issue of how the highway looks from the outside. We will also restrict ourselves to the limited-access highway in the city, although much of our material will be applicable to other roads. We make this restriction because urban highways seem to pose the greatest problems and to promise the richest visual returns.



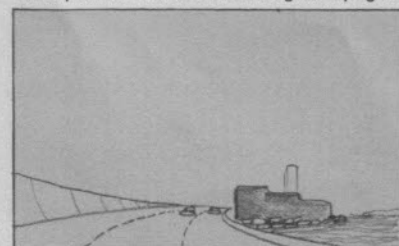
The Golden Gate 1

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For explanation of these drawings see page 58.





Read Up

2 A simple organized sequence in the approach to a Japanese shrine (Goshoinja, Kamakura). Come upon obliquely, the entrance gate stands alone, then reveals the path ahead and some distant steps as an intermediate goal. Recurrent statues mark one's forward progress, and the steps develop into a double flight, partly in shade. Midway through this double flight, above and beyond a light screen, the final goal appears obliquely once more. A small replica of the entrance gate frames the shrine, and behind this begins another sequence. Rhythmic succession, progressive revelation, continuity, recall.

The Highway Experience

If the highway is a work of art, what are the raw materials of that art, and what are its principles? The sensation of driving a car is primarily one of motion and space, felt in a continuous sequence. Vision, rather than sound or smell, is the principal sense. Touch is a secondary contributor to the experience, via the response of the car to hands and feet. The sense of spatial sequence is like that of large-scale architecture; the continuity and insistent temporal flow are akin to music and the cinema. The kinesthetic sensations are like those of the dance or the amusement park, although rarely so violent. These are all arts and situations from which the highway designer may begin to learn his technique.

While the road makes a dynamic impression on the driver and his passengers, it also exists as a static, bulky object in the landscape, a substantial piece of the urban scene for those who live along its borders. This presents a two-faced problem, much as if a theatrical designer had to be concerned with the visual form of his backstage apparatus. However important, it is a problem that we will not consider here.

Even among the users of the road, there are several different kinds of audience. The tourist sees the landscape with a fresh eye; he attaches relatively few personal meanings to it, but is urgently engaged in orienting himself within it. The commuter, or other habitual user of the road, is more likely to ignore larger landscape features in favor of activities, new objects, or the moving traffic of the road. The driver must watch the scene constantly; his vision is confined to a narrow forward angle and focuses on the events in the road itself. His passenger is freer to look or not to look, has a wider angle of vision, and is not necessarily concerned with immediate traffic. Both driver and passenger are likely to be an inattentive audience, whether through the compulsion to watch only a small part of the scene, or conversely through the very freedom to let attention wander. They may be partially preoccupied with conversation, squabbling among the children, or private worries.

Yet at the same time both are a captive audience who cannot avoid remarking, even if only subconsciously, the most dramatic events of a scene which is too mobile and too dangerous to be ignored. In both cases, vision is directed forward, a fact which provides the designer with a means of directing attention. In both cases, there is an undertone of risk, which may be fearful or stimulating.

9 The modern car interposes a filter between the driver and the world he is moving through. Sounds, smells, sensations of touch and weather are all diluted in comparison with what the pedestrian experiences. Vision is framed and limited; the driver is relatively inactive. He has less opportunity to stop, explore, or choose his path than does the man on foot. Only the speed, scale, and grace of his movement can compensate for these limitations.



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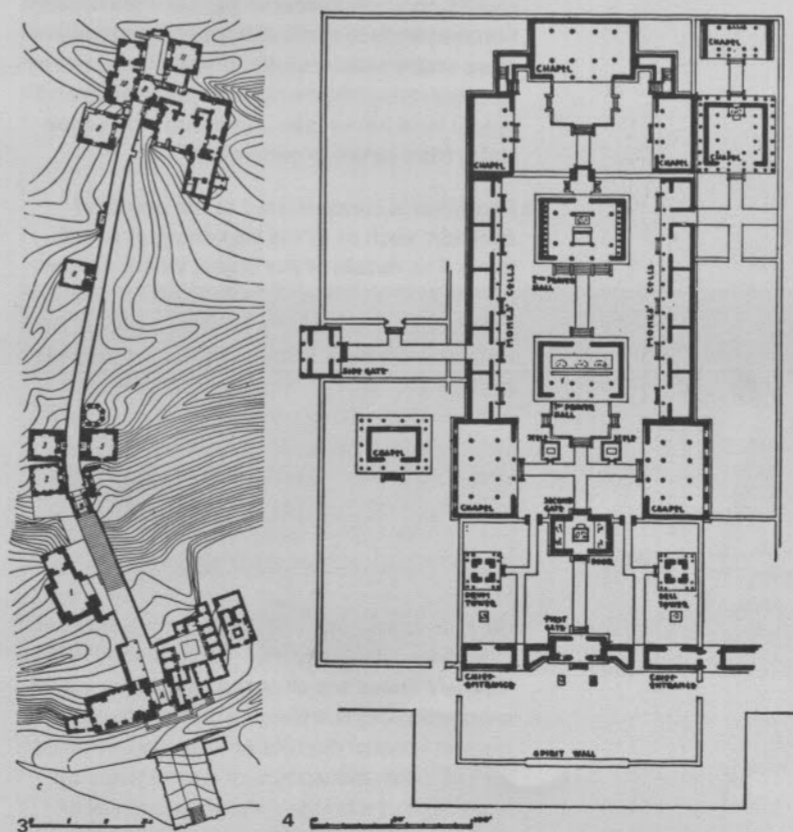
The highway experience has some further special characteristics. It is usually reversible; people may traverse the road in either direction. It is as if a movie or a recording had to be enjoyed when played backward as well as forward. This limits possible effects, or demands some technique of masking the "backward" form while the "forward" form is being sensed.

In the second place, a highway designer cannot be sure that people will watch his drama from beginning to end. They will enter and leave the highway at intermediate points, even if these points are as limited in number as they are on a superhighway. The sequence must therefore be interruptible.

The driving experience can now be described as being a sequence played to the eyes of a captive, somewhat fearful, but partially inattentive audience, whose vision is filtered and directed forward. It is a sequence which must be long, yet reversible and interruptible.

This sequence is made up of many elements; it is convenient to group them according to a presumed progression in the process of visual perception. The incoming light rays evoke immediate perceptions of intensity and color, of textures, motions, and outlines. These perceptions are organized into identifiable objects, which are then interpreted as moving in space. The observer locates these moving objects and spaces in a total structure, orienting himself with regard to the world around him. In addition, he reads meanings into this world. When perceived over an extended period of time, these identifiable objects, motions, spaces, oriented structures, and meanings are organized at an even higher level as complex sequences.

Perception does not in fact operate in such neatly divisible successive steps. The processes are highly interrelated and may be occurring simultaneously. But this analysis singles out the fundamental actions, and arranges them by successive levels of organization. It makes a convenient framework for discussing the highway experience, using the conclusions and speculations which arose from the studies described in Chapter 3.



3 Spatial Sequence in Architecture, The Shah Zindé, Samarkand.

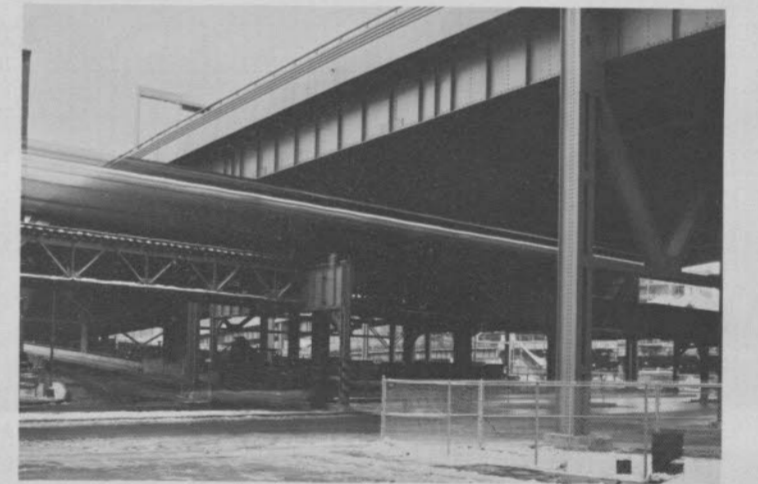
4 Spatial Sequence in Architecture, Bo Lin Ssü Temple, Peiping.



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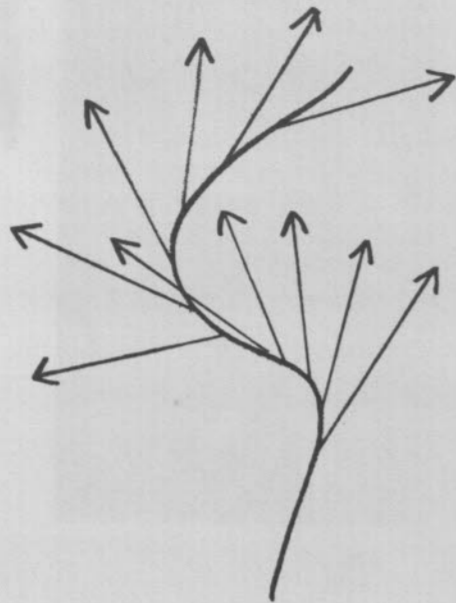
7.8 Looking at a highway and looking out from it at the same points (see arrow in Fig. 6)



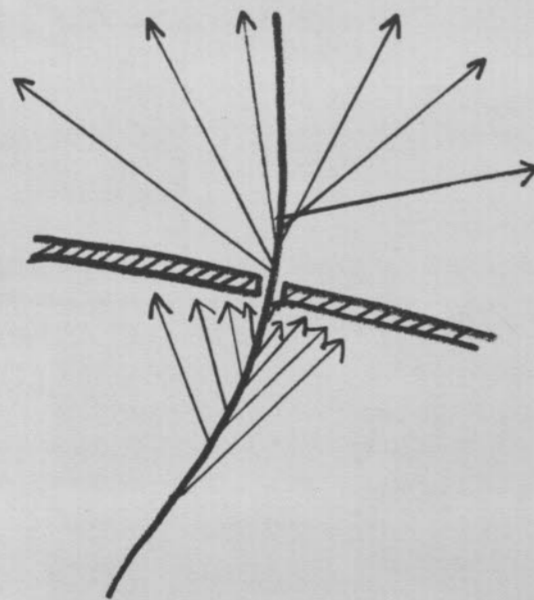
The Elements of Attention

Let us look first at the kinds of identifiable elements which capture the attention of a front-seat passenger. It is clear that these objects occupy a rather limited part of the potential visual field. Along one route on which reactions were tested by us, two-thirds of all objects sighted were straight ahead, and only one-third were to either the right or left. Even then, almost all things seen to the side of the road were obliquely forward rather than perpendicular or backward to the line of travel. On another very open and straight-forward route, one-half of all sightings were straight ahead. The view of the passenger, as well as that of the driver, is strongly focused.

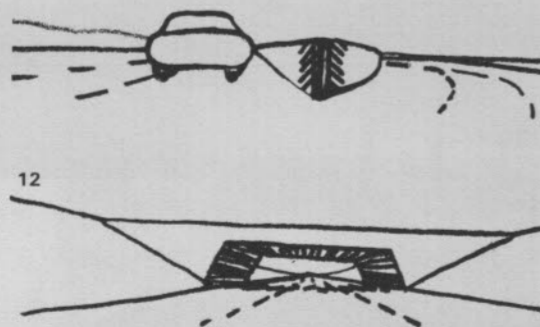
- 10 Tipping and pointing the road is a powerful way of directing his attention. On New York's West Side Drive, for example, observers noted that the focus of attention regularly switched from side to side as the road wove back and forth.



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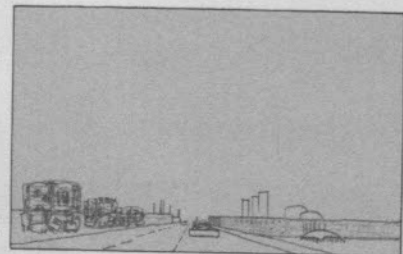
Not only is vision directed forward, but it is also attracted to the immediate environs of the right-of-way—the near and apparently “moving” objects, rather than the larger number of distant, seemingly “stable” ones. Again, on one route, two-thirds of the impressions noted were caused by things in or adjacent to the road itself. The color and texture of the road surface, the shape and rhythm of the objects at the shoulder (signs, guard rails, retaining walls) set the visual tone. In the forward view of the multi-lane highway, most of the visual field is filled by the pavement and the sky. The differentiation of lanes, shoulders, and medians by texture, color, and width will articulate and enliven this scene.

- Even in periods of wide scanning, attention regularly returns to the road itself. The only exceptions to this rule occur in those brief periods where the observer passes some important barrier and, being anxious to reorient himself, surveys a new landscape. This is the moment for visual revelations, when one is sure of an audience attentive to large effects.

But all this is modified by the speed at which the vehicle is traveling. As speed increases, attention is confined to a narrower forward angle, since coming events must be predicted further ahead. As near objects rush past more rapidly, they are harder to perceive and attention may shift to more distant and relatively more stable elements. Landmarks are seen in clusters rather than singly; larger spaces and bigger land forms take command. The scene shifts from detail to generality.*

- 12 Attention is concentrated at the points of decision, such as at the beginning of an off-ramp. The details of the object which divides the ramp from the main roadway will loom very large in the driver's total impression. So will distant landmarks, particularly if they are sharply silhouetted. Similar points of concentrated attention occur when the space is sharply constricted. No one fails to remark structures which approach the road closely enough to make an apparent sidewall, canyon, or tunnel, nor does he miss any overhead structure, such as a bridge, however momentary its appearance. Can any driver be ignorant of his passage under the George Washington Bridge, or his entrance into the Holland Tunnel? These are all opportunities for visual emphasis that will claim attention despite a normal state of distraction. The silhouette of an overpass, the texture of a retaining wall, the shape of a bridge column, guard rail or lamp standard are important events.

*An interesting example of these effects is the stunt movie, *Go Slow on the Brighton Line*. The film has been speeded up to give an apparent velocity of some 600 miles per hour.



17

The quality of light will also affect what is seen, so that a view against the sun, emphasizing silhouette, will be grasped quite differently from one with the sun at the side, where texture and detail become distinct. Artificial light is a resource for directing attention, for changing apparent spatial form, for producing visual sequences. At night, the familiar daytime landmarks and activities may be picked out to give a reassuring sense of continuity.

- 16 The lights of other vehicles indicate and enliven the road. On special occasions, a new world of light may be created, or displays of light may be made. The nocturnal panorama of Los Angeles from Mulholland Drive is a classic example.

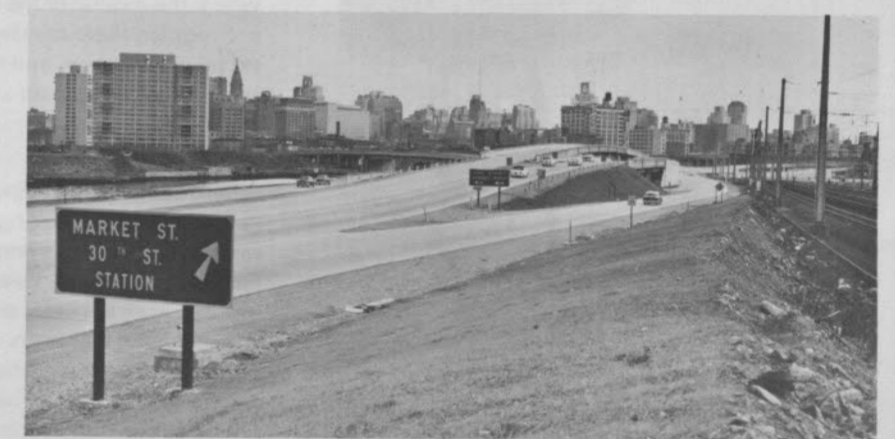
If we consider these visual resources, we see that the road designer has many ways of directing and shaping the driver's impressions, even if he can do little to form the larger environment in which the road is inserted.



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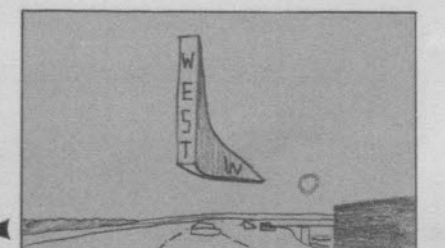
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The Sense of Motion

Beyond the concentration on near detail, the fundamental sensation of the road, continuously referred to, is the visual sense of motion and space. This includes the sense of motion of self, the apparent motion of surrounding objects, and the shape of the space being moved through. These factors are all intertwined, since the visual judgment of motion is based on the apparent motion of exterior objects and is interpreted as being motion in relation to the enclosing spatial form.

The sense of motion of self is perhaps the primary feeling. True kinesthetic sensations are slight in a steadily moving car on a modern highway. The driver receives some cues through his controls, but if the passenger shuts his eyes it is very difficult for him to distinguish steadily held turning movements, levels of speed, or even gentle climbs or descents. Bodily sensations become strong only at points of abrupt changes in speed or in angle of climb or fall. Automobile riders depend on vision to give them a sense of the motion they are undergoing. They interpret the apparent motion of surrounding objects, which they know to be really fixed, to be the result of their own progression. These clues may include the passage of roadside detail, 18 the apparent rotation of near objects around far objects, the seeming outward radiation of 19 detail and textures from the point dead 20 ahead, and the illusion of growth as objects approach. Changes of direction are gauged from more complex relations. Occasionally, where the motion of the car is rather simple and regular, there may be a sudden reversal of sensation, and the landscape will seem to be rolling past under the wheels of a stationary vehicle.

Where surrounding objects are far off, or few, or featureless, or moving with the vehicle, then the sensation is one of floating, of no forward movement. This is the experience one has in an airplane, and the effect is felt on very elevated highways or those of simple alignment which have bare, open shoulders. Such a sensation may be a relief as an interlude, or as an opportunity to see things of special interest. But our superhighways can induce sleep, frustration, or excessive speed, simply because of this long-continued visual torpor, this apparent inability to reach a goal.

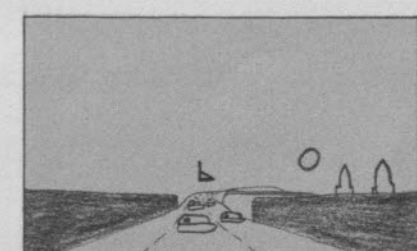
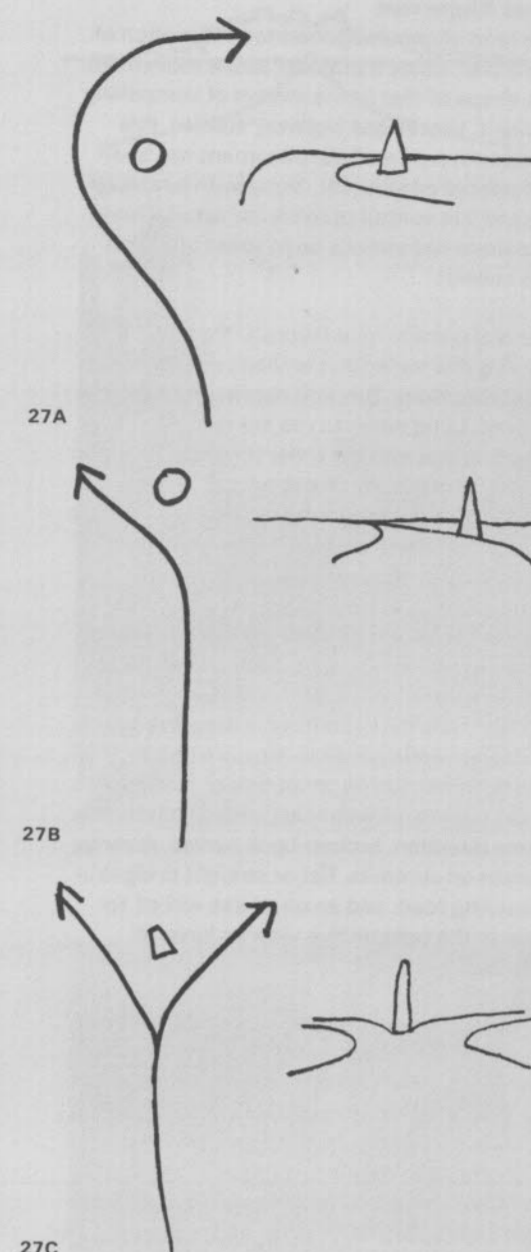
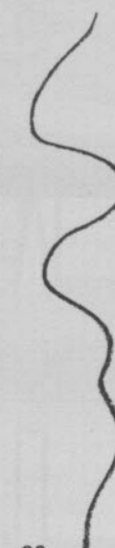
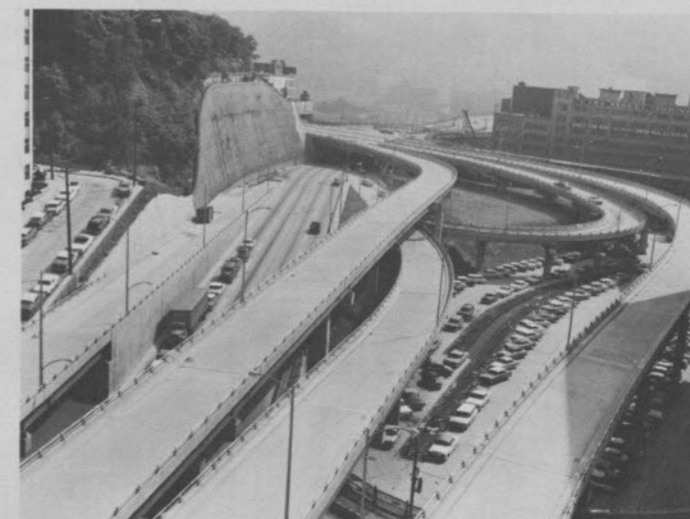
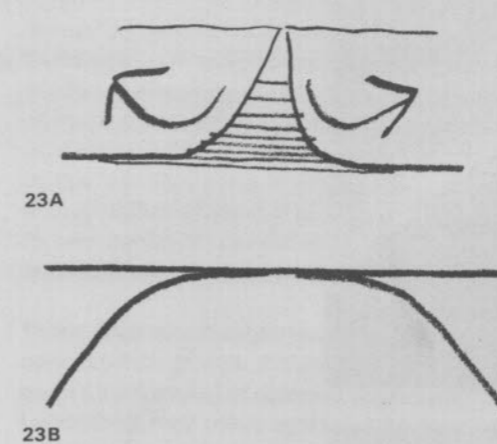
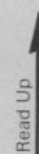
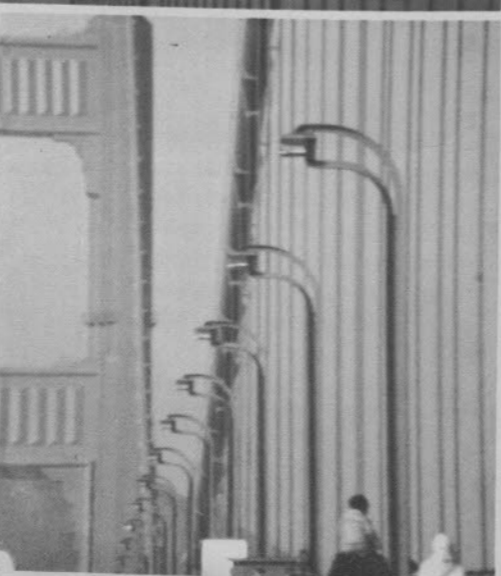
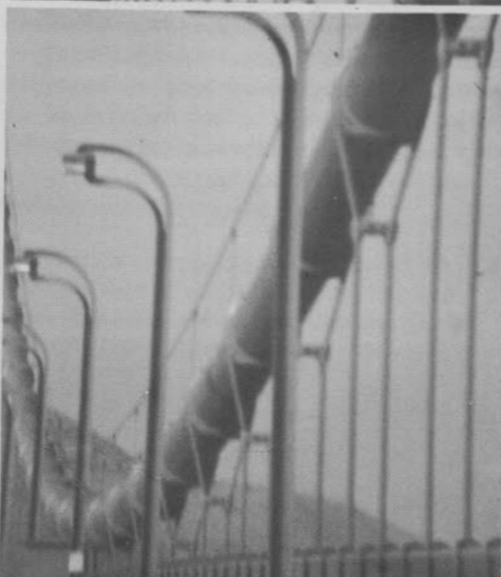
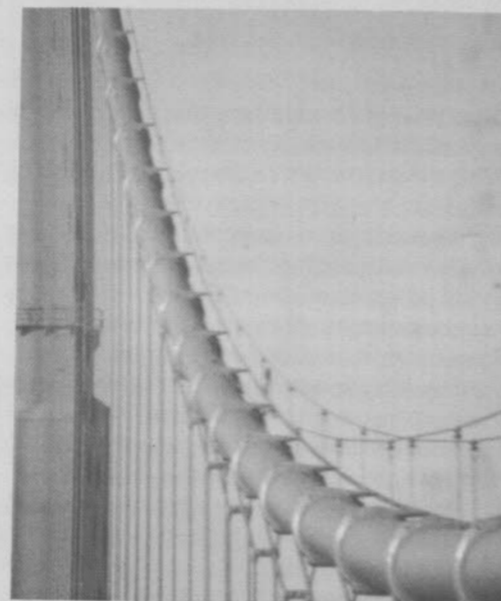
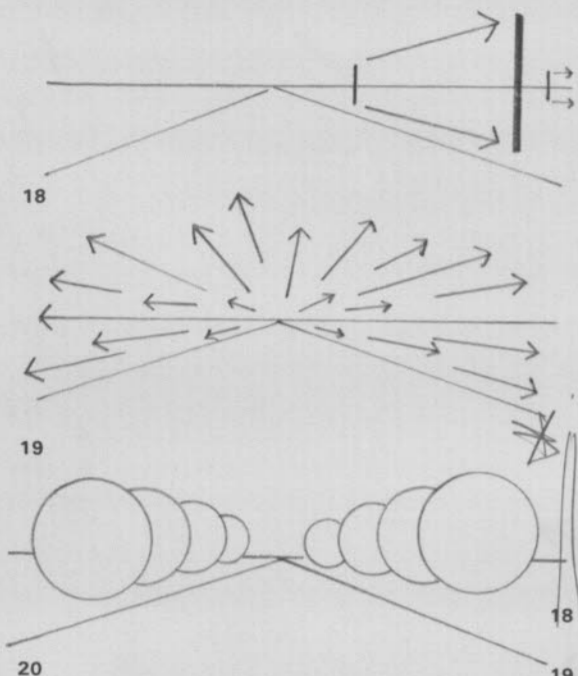
21 Objects might therefore be placed along the road simply to reassure the driver about his real motion, or even to accentuate his real motion, if it is desirable that he slow down. Perhaps most frustrating of all is a sense of local aimless movement (as in humping up and down), when it is coupled with this lack of apparent forward progression in the larger landscape.

Conversely, where the near environment has many highly articulated objects, the sensation may be one of great velocity, so that the apparent speed at 30 miles per hour on a narrow forest road may be much greater than at 60 miles per hour on a wide open freeway. Things passing overhead are especially remarkable, but the detail close at hand— at the roadway edge or on the pavement—is also effective: the textured walls of a cut, the rhythm of lights, pickets or telephone poles, or the passage of pavement joints or patterns underneath. All of these, according to their frequency and closeness, reinforce the sense of speed. Apparent speed also seems to be heightened on the downgrade or on a sharp curve, while tempo slackens going upward. Thus a curving dip occurring where speed-marking detail becomes close and frequent will impart a doubled sense of velocity, and vice versa.

The sense of varied motion is inherently enjoyable if continuous and not too violent. A strong dipping turn was one of the memorable moments of one route. An amusement ride capitalizes on this by creating an entire sequence of such motion sensations. Similar

25 sequences, though of a milder sort, may be
found on highways: for instance, the rhyth-
mical humping of the New Jersey Turnpike,
26 or the repetitive sweeping turns of the ap-
proach to Boston over the Mystic River
Bridge.

Motions of this kind are most satisfactory if explained—explained not logically but visually. Puzzling variations in the line are minor irritants. If the road forms a hump, it should seem to be rising over something; if it sinks, it should flow down into something or be forced down by an object overhead. If the road turns, it should pivot about something or be deflected by some other object; if it diverges, it should be split by something. These objects clarify the motion, make it explicit and seemingly easier to perform. Although they may be relatively insignificant in size, they are crucial in the driver's view.



Road Alignment

The road alignment generates the motion of the driver. Since it predicts future movement, the shape of that line is always of compelling interest. In previous highway studies, this perspective view of the alignment has been considered paramount, along with landscaping and the control of roadside detail. Therefore there has already been some study on this subject.

General opinion now favors a "flowing" line, curving and varied but without visual breaks or interruptions. Smooth continuity is most desired. Long easy curves are recommended, blending one into the other through transition curves of gradually changing radius. Extended straight tangents, or even any straight lines at all, are to be avoided as too monotonous. Similarly, long vertical curves are deemed best, fitted easily one to the other, without apparent straight grades between. Horizontal and vertical curves should be of the same order of length, and their vertices and perhaps their points of inflection should coincide where possible. In more detail, the designer avoids small dips or humps, short curves between tangents of nearly the same direction, broken-back curves, reverse curves on summits, flat or straight bridges in a curving road, and so on; these will all appear in the perspective view as kinks in the road.*

In general this is a sound approach, for if it is skillfully carried out and well matched to the landscape, the highway is both easy to drive and has a harmonious appearance in perspective. Particularly if the road swings smoothly from point to point of a fine and rather open natural landscape, it gives the same sense of vital rhythm and movement as a skier's track. It is, in fact, a rather well-developed artistic style.

These are techniques of gaining a specific effect, not basic principles. Continuity of movement is the essence of a road, but drama and even continuity may also be served by sharp changes in alignment. A kink, a sudden sheering off, a long straight slash may sometimes be part of the artistic intent. The dipping turn in Boston's Northeast Expressway, described in Chapter 3, was undoubtedly felt to be an awkward kink by the road's designers. Yet it is a powerful event.

Nevertheless, continuity of line will be the prevailing tone of a pleasant road, and it is also clear that the appearance of the road line in the forward space is an important feature of the landscape. Therefore it is useful to study this appearance in advance, either by perspective drawings, by sketches of the road on photographs, by outline drawings on transparent plates through which the landscape is viewed in the field, or by making simple three-dimensional models of the centerline, which can be viewed by moving the eye or a periscope along the model (see Chapter 2).

*See: F. W. Cron, "The Art of Fitting the Highway to the Landscape," in *The Highway and the Landscape*, W. B. Snow, editor; C. Tunnard and B. Pushkarev, *Man-Made America*, part 3: "The Paved Ribbon."



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The Motion of the Field

While the apparent motion of objects in the landscape is used as a clue to interpret self-motion, it is also a delight in itself. Objects well up and fall behind, break in two as they pass overhead, slip sideways, or rotate. The dramatic "growth" of the United Nations Building as it is approached from the south on the East River Drive in New York City is an example of the effect of putting a large object very close to the road. Boston's Mystic River Bridge, seen sideways in the approach, has enough differentiation of form to make visible its own apparent rotation as one swings around to approach its entrance.

These apparent motions become intricate dances when groups of objects are seen together from a road of complex alignment. Landmarks may move against a background or a foreground, be caught in a moving frame, be masked and revealed, or rotate first one way and then another. Two important landmarks may come into conjunction, to give a powerful sense of being "on line." The road ahead is interpreted as a sequence to follow, and is thus itself seen as moving through the landscape. It may launch itself toward a landmark, or may feint, jog, swerve, or slide past it. All of these impressions are dramatic material to the designer's hand.

Things in the landscape which are in real motion exert a corresponding fascination. The driver will compare his own motion with that of a distant train, watch the ascent of an airplane, or see the stately progress of a tug or an ocean liner. He will be interested in the trace of other motions—other roads, a jet-stream, or a railroad—and the way in which they intersect or pass by his own. The "spaghetti" of a modern intersection can excite as well as terrify.

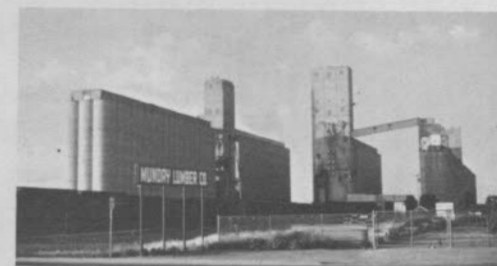
Most impressive of all is the motion of the accompanying traffic, to which he is forced to be attentive, and which even his passengers will watch with subconscious concern. The maneuvers and idiosyncrasies of nearby cars may be the principal visual impression for a preoccupied driver to whom the road is highly familiar. At night he will follow the head- and tail-lights of other cars and the blinking lights of the road signals and advertisements. Sometimes this mobile world will lapse into chaos.

The total visual field may seem to be generally stable, with near objects moving against a larger background. If these close objects are removed, one has the "floating" sensation referred to above. Occasionally, when the road makes a sweeping turn or the view is very restricted, then the visual field becomes a dynamic one: rotating, rushing, or growing. This is a powerful (and potentially unsettling) effect.

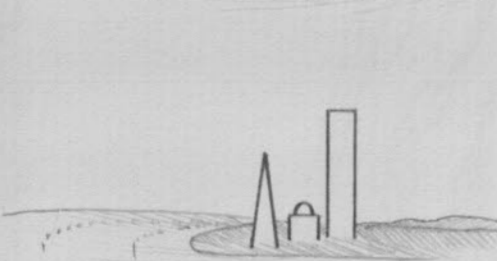
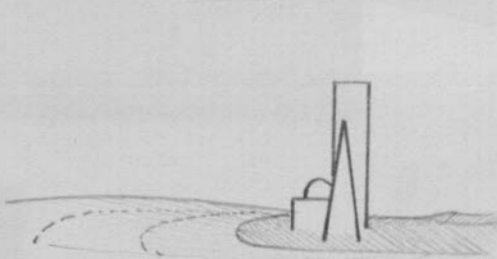
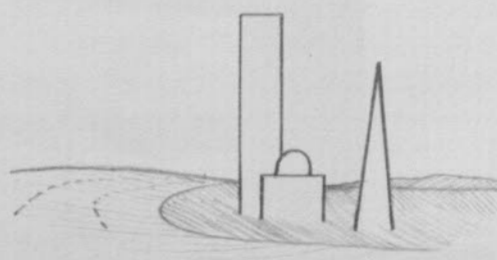
Most static of all is the distant view down the axis of the road, on which the driver can fix his attention without losing touch with the road, and which is too distant to be "growing" at an appreciable rate. Particularly if the road should be sloping down at this point, it may be possible to present a view which is meant to be looked at carefully, and which in some way epitomizes the city or some important part of it. Such "classical" views of a city (Boston along the Charles, San Francisco across the Bay, Manhattan from across the Hudson) are important experiences, so important that they may be remembered as visually static and long-continued even if in reality they are seen only briefly and in motion. Such views may be valuable even if glimpsed somewhat to the right or left of the road axis, or through long slots which open momentarily in an oblique forward direction.

There is an optimum viewing distance for examining most objects, depending on the amount of detail desired. Optimum viewing distance in a theater determines the price of seats. The cinema tells its story with dramatic changes in the separation between camera and actor, from close-up to long shot depending on what is being said. So it is on the city highway: the designer can decide what he wants to emphasize—a total skyline, a distinct character, a single landmark—and adjust his viewing distance accordingly. As in the cinema, contrasting distances will keep his sequences legible and eventful.

Where the road or terrain slopes upward against an important axial view, the dramatic effect of truncation, or of foreground-background discontinuity, may be achieved. Examples of this are the startling presence of the towers of Manhattan seen over the Jersey flats, or the floating dome of Florence's cathedral, which rises over the hills as one approaches on the road from Poggibonsi. A rising road may be used to direct attention to the sky, conferring a sense of quiet contemplation and also the expectation of a view to come.



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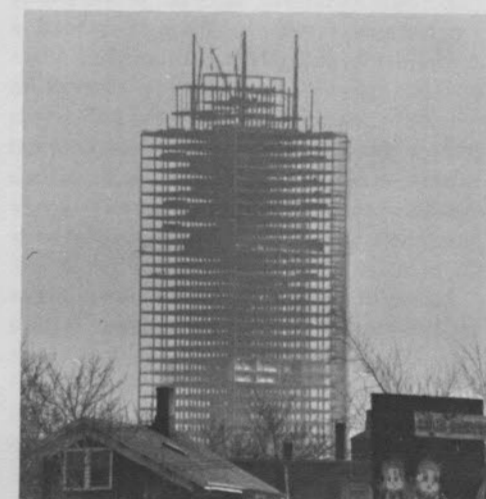
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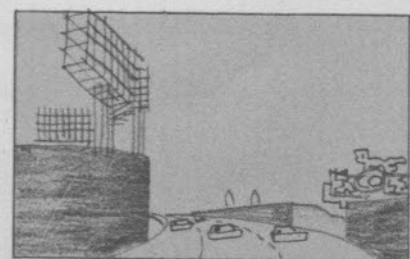
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The Sense of Space

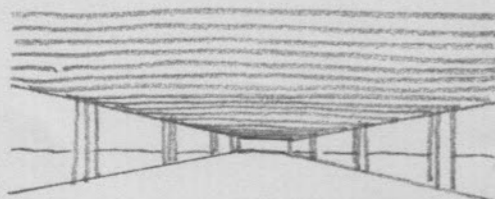
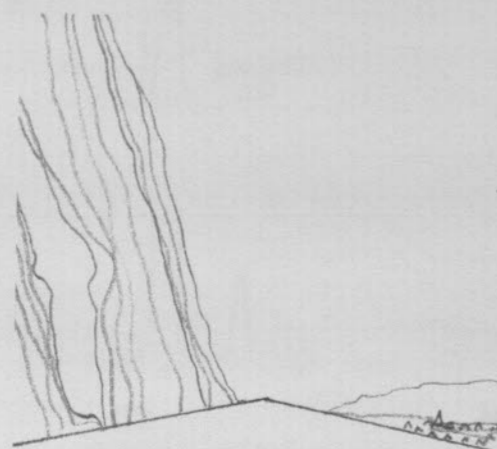
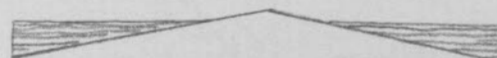
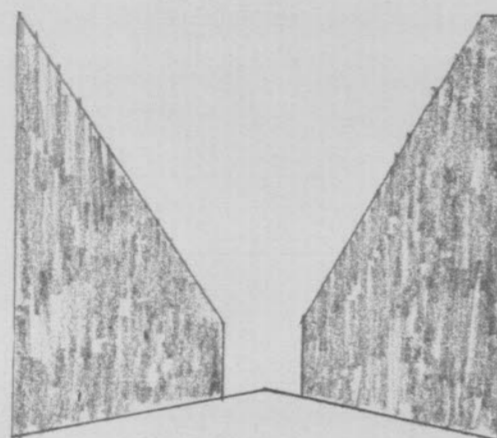
The visual field is interpreted not only as series of remote views, or a collection of objects in motion, but also as a space, a void within which the observer can move, visually or physically. The basic sensation of space is one of confinement and of the dimensions of that confinement. But this sensation may be modified in many ways: by space

- 38 form or its proportions, by the character of the defining elements or objects in the space, by the position of the observer. One can be low down in a concave shape, or high up in a convex one. A space can be narrow or wide, with solid or jagged, opaque, netted, or transparent walls. It may open out in front or to the side.

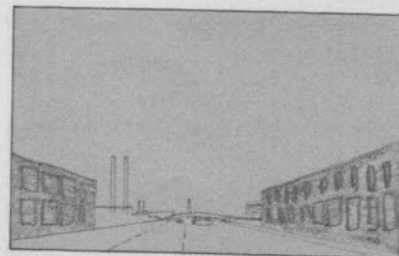
The sensation is modified by the speed at which one is traveling, so that an opening which is readable at 60 miles an hour is formless and vast at 3 miles an hour. Similarly, perception is affected by the circumstances under which the driver is moving: a road which is open at the sides may seem pleasantly spacious under normal conditions, but if that road is filled with fast traffic, there will be an uncomfortable sense of being pushed off. Moving at superhighway speeds, the driver needs constant assurance that he is occupying his proper position in space, and that there is no danger that he will lose that position or that other objects will intrude upon it.

- 39 Confinements are always notable, whether made by cuts, tunnels, tall buildings, or the sides of hills. Overhead enclosures, such as bridges or even overhead signs, seem to be especially significant. So are the moments of spatial freedom, as when the road rides up over an eminence, the city falls away, and the driver is aware of the sky or a distant panorama.

- 40 Spatial contrast, as when Boston's Central Artery passes North Station and "comes out" into the inner city, makes a strong visual impact. Spatial change may be perceived as a unified sequence, as in the approach to Hartford from the Wilbur Cross Highway: one crosses the river while elevated, descends into a cut, thence into a short tunnel, and finally bursts out into the central park. The road in Philadelphia's Fairmount Park and the Rockefeller Parkway in Cleveland share a simple effect of this kind: the repetitive experience of passing under a succession of bridges, each of different quality. The East
- 41 River Drive in New York City subjects the driver to a dramatic series of riverside spaces, progressing from open to sidehill, to tunnel, to open-walled tunnel, to cut and sidehill again. Such a sequence can be a thrilling one.



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The Extension of Self

One of the strongest visual sensations is a relation of scale between an observer and a large environment, a feeling of adequacy when confronted by a vast space: that even in the midst of such a world one is big enough, powerful enough, identifiable enough. In this regard, the automobile, with its speed and personal control, may be a way of establishing such a sense at a new level. At the very least, it begins to neutralize the disparity in size between a man and a city. The reverse sensation occurs when a car breaks down, and the driver must move on foot over the vast hills and endless tangents of the modern highway. The scale relation is gone.

The sense of personal mastery of space is strongest on skis or on a motorcycle, where the vehicle is small and delicately controlled, where one is "outside" in contact with the environment, and where it is impossible to make body motions within the vehicle which are irrelevant to the motion through the landscape. The sense of mastery is the product of both maneuverable velocity and of sensuous contact. Split lanes, by narrowing the traffic way and allowing it to be more responsive to local form, increase the intimacy of contact. The design of the vehicle itself may do much to encourage this sense. The car might be smaller, easier to open up or to see through, more sensitive to the "feel" of the road. Exterior sounds might be rebroadcast within the car. On the other hand, were movement to become too vivid, the driver might react by reducing speed. In any case, by making the motion of the car vivid with respect to the landscape, and the exterior spaces clear in their relation to the car's occupants, the highway designer can increase the driver's sense of mastery and connection.



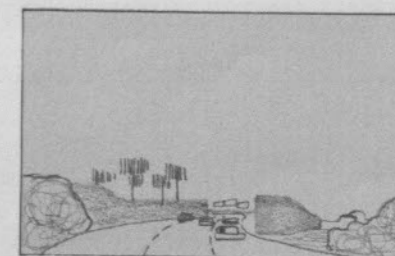
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Goal Approach

At the next level of organization, the driver is engaged in building a locational image of his environment, and in orienting himself within this image. In the most direct sense, movement along the road consists of a succession of approaches to goals. These are the prominent landmarks or focal points which the observer moves towards, attains, and passes by, or which represent his final destination. By them he measures his progress and foretells his future. They may be distant goals which symbolize the final destination and change only slowly. Or they may be nearer objects, which are approached more rapidly and which divide the road into visual segments.

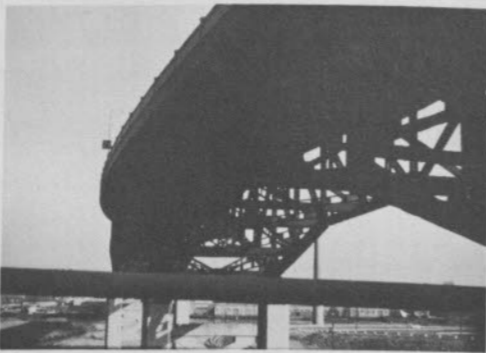
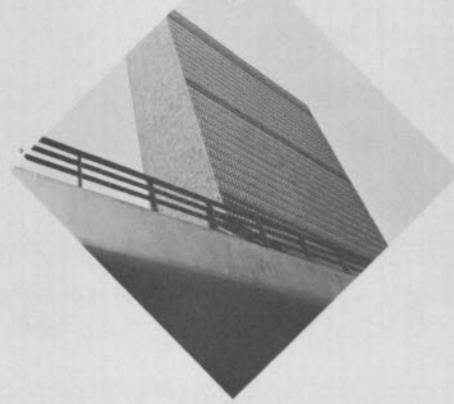
If a goal is not always visible, it should reappear consistently, so that the sense of forward progress is not long absent. Goals may be organized as a simple succession, one following another in a continuous chain. On the prairie, a road may go from one tall silo to the next. Or the sequences may overlap: a driver may pass a whole series of nearby goals while he is still within sight of a more distant one.

On the Northeast Expressway approaching Boston, as one goal is attained, the following one is already in sight. The approach interval is roughly the same for each, and this provides a basic rhythm. Within these intervals are several smaller approaches, and overlapping them are two longer ones indicating the final goal. In a similar way, the towers of Manhattan indicate the eventual destination of the New Jersey Turnpike, which is meanwhile maneuvering through a monumental industrial landscape. There is a pleasurable tension, on both roads, between the persistent view of the distant goal and the succession of events that pass along the immediate roadside.

These goals may be disappointing, however, if they are not visibly attained. On the Northeast Expressway, Fenno's Hill is satisfying because it is sighted, approached, and passed by—with a chance for a backward look. But the Custom House Tower, which has been sought so patiently, at the last moment drops behind lesser buildings and disappears.

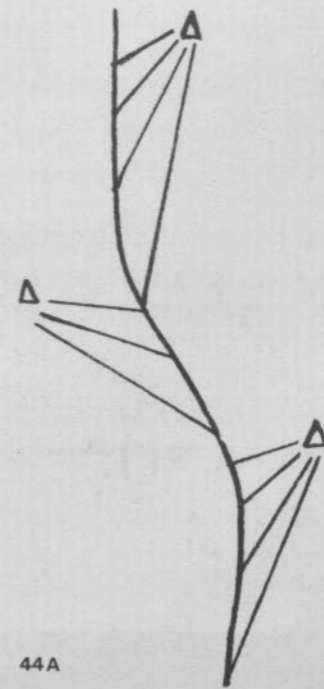
Masking the goal temporarily may add to the excitement of the trip, if when the goal is revealed again it shows a new face or a new intensity. But where a dip in the road blots out the main landmarks and their return to view reveals nothing new, the effect is one of disappointment. Similarly, it is an anticlimax when the Central Artery breaks through the "edge" of Boston at North Station, only to find itself still in a peripheral region.

Other kinds of prolongation of the approach may be interesting, such as the way in which the Boston road seems to search for a way to reach the Mystic River Bridge, or to cut through a hill. The railroad approach to Manhattan from the east, over the Hell Gate Bridge, has a similar quality: the train sweeps in a wide arc around the Manhattan towers, approaching them indirectly.

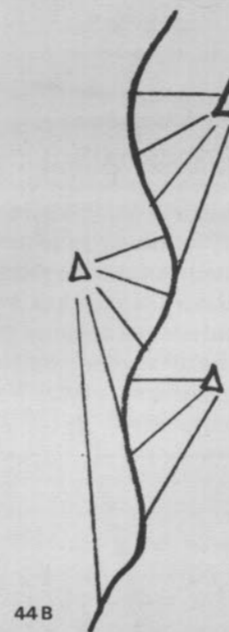


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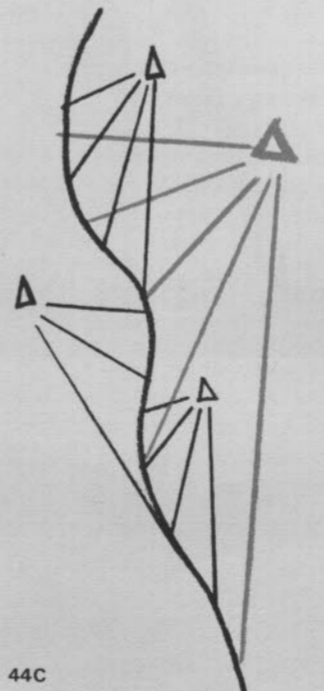
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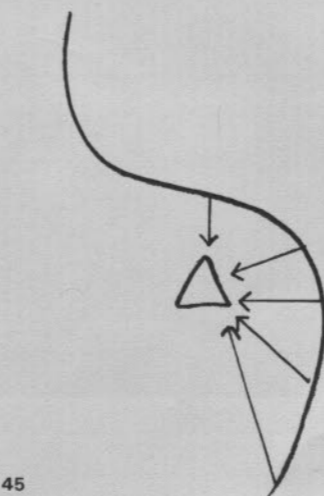
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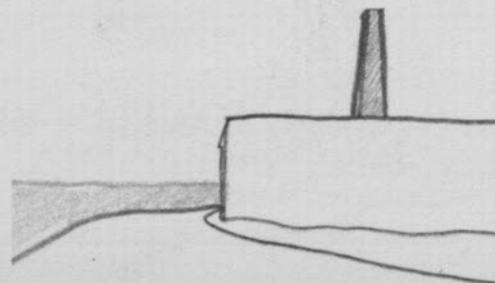
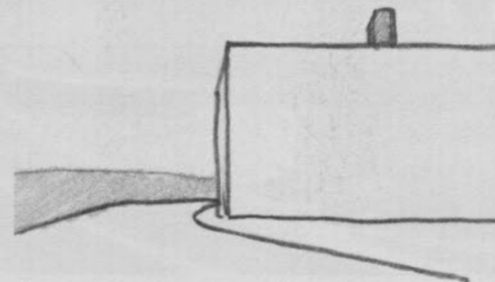
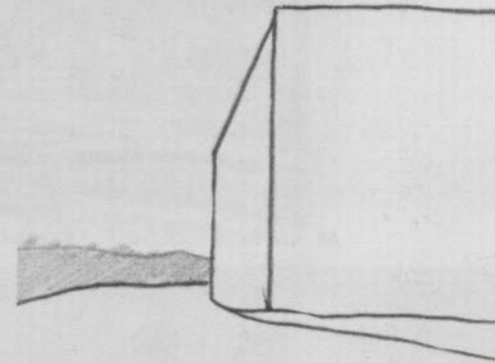
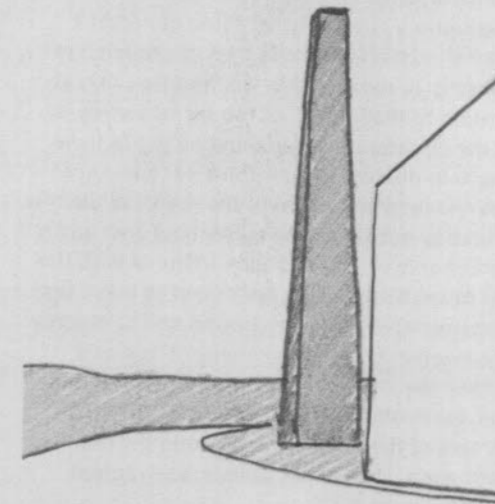
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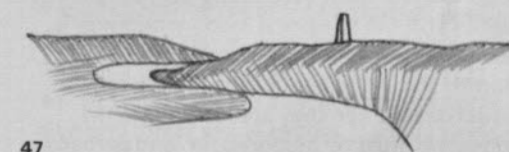


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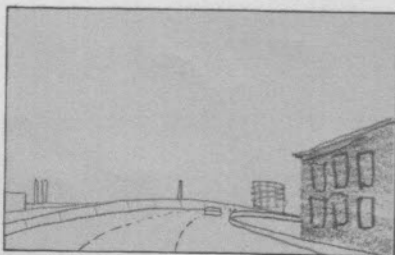


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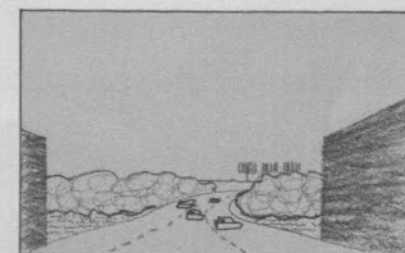
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Approach to the United Nations Building on the East River Drive, New York City



Orientation

Beyond the sense of direct progression to a goal, the driver and his passengers are orienting themselves in the general environment, locating its principal features and discovering their own position with relation to them. In part this is a practical, and in part an esthetic, activity. Finding a way through the intricacies of a modern city is a demanding performance, and one cannot depend entirely upon such conventional aids as directional signs, at least not without some emotional insecurity. When not aware of general location with respect to the landscape, a driver is likely to make mistakes and is sure to be under stress.*

In addition, there is a positive pleasure in being able to recognize the urban scene and to fit it together.* * The fast highway is a new means for making the structure of our vast cities comprehensible to the eye. If consciously designed for the purpose, they could present the city as a vivid and well-ordered image.

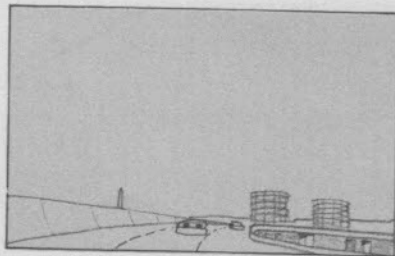
The shapelessness of central Boston, as presented to the driver approaching via the Mystic River Bridge, is disappointing, and the frequent periods of orientation blindness are disquieting. New York's East River Drive, on the other hand, is satisfying just because it is so visibly located along the river at the very edge of a great city.

The image of the highway itself may also be clarified. Successive sections may be visibly differentiated so that they can be recognized as distinct parts. Thus the motorist can see that he is "in the hilly part," as well as "approaching the center." The general alignment may be made to appear as a simple geometric form. Continuities of edge, surface, or rhythm may be used. Typical sequences and gradients may be developed, and the sequence in one direction may be made recognizably different from the sequence in the other. The road ahead may be exposed, and strategic points may be articulated. The form of intersections may be clarified, so that turning decisions become self-evident, and the shape is congruent with the principal flow of traffic. Applications of many of these ideas are illustrated in the imaginary designs in Chapter 4.

Even where the general images of the city and the highway have been clarified and their interrelation established, there still remains the difficult task of linking the road to its immediate environs. This is most crucial where the driver is about to make the transition to the local landscape of streets and buildings.

48 The highway and the city street are two separate worlds, mysteriously connected, and coming off the ramp of a modern highway is usually a moment of severe disorientation. Ramps should be carefully connected to the visual destination they are leading to; the transition must be prepared for, and perhaps prolonged. For example, off-ramps might be rather long, projecting out from the road for some distance and be directed toward their destination. On-ramps, on the other hand, can be clear even when short, if they run parallel to the expressway being entered.

* See: *Driver Needs in Freeway Signing*, Automotive Safety Foundation, Washington, Dec. 1958.
 ** See: *The Image of the City*, op. cit.



While the access ramps are the most crucial points at which connection must be achieved, the highway should have some general fit with the local landscape through which it is passing. In the city, this will mean paying attention to the "grain" of the surface streets; in the country, the road must be made to lie easily in the topography (or new topography may have to be built to fit the road). While this rule may not always be a practical one, and a designer may at times wish to break with the old mold, such breaks are bound to leave ugly and unusable pieces of ground and to destroy

49 the relation between highway image and landscape image. The Central Artery of Boston, for example, tramples across the local streets of the market district, and the result is confusion, disordered spaces, and ragged building ends.



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Meaning

Finally the driver seeks to find meaning in what he sees: to relate the visible objects to the stock of ideas in his mind. The sight of activity, or a sense of the meaning and use of areas, is an important pleasure of the road. For the Sunday driver on the rural highway, the chance of seeing country people and country life may be a principal motive for his drive. Unfortunately, the sight of other people is a pleasure progressively denied to the highway driver. The colorful activity of Boston's food market is hidden from drivers on the artery almost overhead. New York's East River Drive, on the other hand, affords a clear view of fascinating river traffic. The Schuylkill Drive in Philadelphia visibly contrasts the meanings of park and dense city. The activity of an airport or the bustle of new construction

50 may be the major events of a commuter's trip. The road itself serves the highly meaningful function of circulation: the sense of accompanying traffic may be made more vivid by hills, curves, amphitheater spirals, or the interplay of various lanes. One result of the current tendency to depress the urban highway, or to "buffer" it from the rest of the city fabric by landscaping, may be to reduce the roadside to dull meaninglessness.

Would it be possible to use the highway as a means of education, a way of making the driver aware of the function, history, and human values of his world? The highway could be a linear exposition, running by the vital centers, exposing the working parts, picking out the symbols and the historical landmarks. Signs might be used for something more than giving directions or pressing a sale. They could point out the meaning of the scene: what is produced there, who lives there, how it grew, what it stands for. Even where they are used as advertisements, they may be grouped or controlled to enhance environmental meaning; advertisements may be favored which relate to the building they are attached to, or which herald the approach of some facility or service. Local broadcasts might be made to explain the history or function of an area, or even the local news, to the passer-by.

The various aspects of a highway—its sequence of space and motion, its role in the environmental image, the meaning it helps to express—are only separable in an academic sense. The position of an object is part of its meaning and is read while moving through space. Its presence helps to communicate that motion, and its meaning makes its presence important. The most powerful experiences occur when all three levels are working in unison, when a tower rooted in community history is the visible goal of a trip, and the visible pivot about which the road turns. The pivot of motion on a highway today is all too likely a temporary shanty, and its goal a whiskey advertisement. On the other hand, a historic building, or the central stock exchange, cannot be seen.



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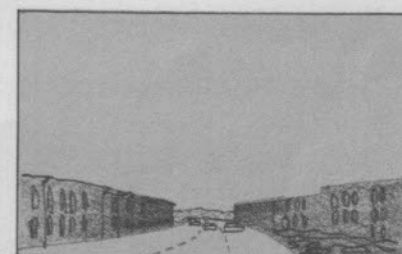
Rhythm and Continuity

Using all these elements, the basic artistic problem of the highway is the shaping of its sequential form. In such form, the principal aim is to preserve continuity while developing, embellishing, and contrasting the material. The road itself furnishes an essential thread of continuity, but it must be supported by successions of space, motion, orientation, and meaning which seem to be parts of a connected whole. An overlapping of goals may do this, or a repetition of previous movements on a new scale, such as the passing of similar hills in successively deeper cuts. Continuity in memory can be also appreciated, as when the buildings of a district known to the pedestrian are recognized and enjoyed from the new viewpoint of the highway. A basic rhythm of attention will strengthen the sense of continuity, whereas too sudden a change in the tempo will snap the thread.

Tempo and rhythm are the primitive essence of any sequence. The tempo of attention appears to be a sensitive index of the quality of the road. In most cases recorded by us, where this tempo was rapid, attention was concentrated on near objects straight ahead in the road; where this tempo was slow, observers were scanning from right to left, giving more attention to far objects. The first case was coupled with a sensation of rushing, forced attention, and heightened tension, the second with a slow floating quality—a leisurely tasting of the landscape. The periods of concentration added spice to the total experience, but they became oppressive when long continued, as in a tunnel. Uninterrupted scanning may be wearying, too, unless the general landscape is of particular interest. When there is a slow tempo and little to concentrate on but the road itself, there is a sense of torpid boredom. The long flat highways of the prairie are notorious for this quality, but it is shared by the new freeways everywhere, which suffer an alarming frequency of accidents due to inattention.

It may be that there is an optimum range for the time interval between strong impressions: that longer intervals cause boredom, and shorter ones bring on strain and confusion. Were this true, it would mean that a road-scape should have a basic beat, a regular frequency with which decisions and interesting visual impressions are presented. This beat could be varied, but the variation should be coherent and within the optimum range. Since it would be measured in time units, the actual location intervals would depend on the speed of travel.

If a fundamental rhythm of attention, within the optimum range, were assigned to a road or a group of similar roads, the driver would know when to expect points of decision and major visual events. Various kinds of channels—freeways, collectors, local streets—might be given particular visual rhythms consistent with their function and mode of transport, so that rhythm itself served to differentiate and clarify the transport hierarchy. Thus it would be possible to say that on a given road the frequency of visual events was too rapid or too slow, or that this frequency varied in an incoherent manner. Multiple ramp decisions in a downtown area might be examples of visual events which come too fast, and whose frequency has been built up too suddenly.



Sequential Form

The traditional way of managing a sustained temporal continuity is to set in motion a drive toward a final goal. This drive may be interrupted, prolonged, and embellished at rhythmic intervals, but it never entirely loses forward momentum, and it achieves its destination at the climax, subsiding then to a conclusion with tension resolved. Climax should not be too long delayed, nor should tension, once developed, be thrown away in anticlimax.

This is a useful model for highway design, but it suffers from the handicap that the audience enters and leaves at different points, or may be proceeding from end to beginning rather than vice versa. Thus the sequential form may have to be more like a magazine serial, in which an underlying total development depends on separate episodes, each with a self-contained form of its own; or forms may have to be symmetrical, with climaxes at both ends, so that a two-way audience can be played to; or the unified climactic form may have to be abandoned for the articulated but "endless" composition, of the kind typified in jazz or medieval polyphony, or such tales as "Br'er Rabbit." Alternatively, it is possible to make each of the two directions on a road a different composition, through the use of split lanes or differential masking. But here the designer risks inducing severe disorientation for the driver.

In any case, the balances and connections are not static ones, where position and mass are disposed around a pivot. They are balances over time, in which dissonances and distortions call forth compensating reactions in later intervals. This is the counterpoint of music. In future sophisticated designs, it may be possible to use some of the more advanced devices of counterpoint: two or three progressions played simultaneously and meeting, diverging, and reacting against each other. A sequence of motion might be played against a sequence of space, for example.

The problem of transition will be faced repeatedly in the highway, as the road moves through areas of different use or form. There are models for this problem in sequential grammar. For example, one characteristic

53 A may gradually melt into the other, like a movie dissolve:

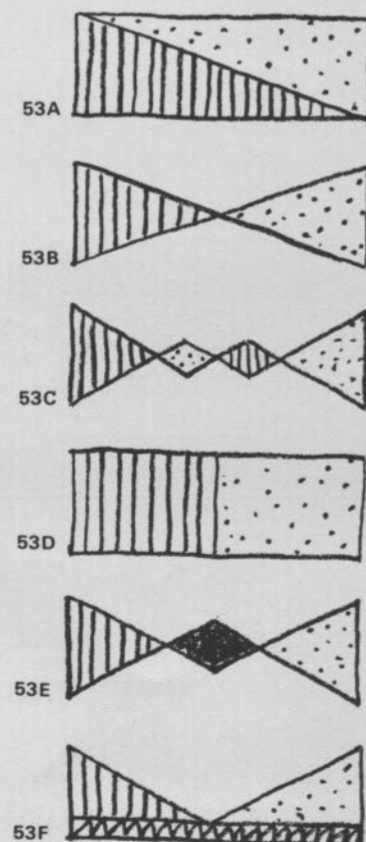
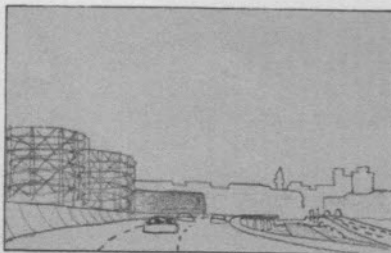
53 B Or the first may disappear before the second builds up:

53 C The latter model may be embellished by an alternation of character before the new character is fully established, by use of hints and echoes:

53 D The transition may be abrupt and shocking:

53 E The change may be mediated by a minor connecting link of a different kind, as when the Holland Tunnel stands between New Jersey and Manhattan:

53 F Contrariwise, connection may be maintained by a continuous invariant characteristic, or ground:



All of these are abstract models for the management of transition, or for the maintenance of continuity in the midst of change. Contrast and change are the meat and drink of highway design, and no effect can be so powerful, for example, as the emergence from spatial confinement into a spatial expanse—provided that continuity is maintained. Some examples of the development of sequence, contrast, and transition appear in Chapters 3 and 4.

The Objectives of Design

The principal objectives in shaping the highway visual experience may now be summarized. The first is to present the viewer with a rich, coherent sequential form, a form which has continuity and rhythm and development, which provides contrasts, well-joined transitions, and a moving balance. This form may be built out of the sensations of space or those of motion (both of self or the external environment). It may be constructed from modulations in light, color, or texture, from roadside detail, or perhaps even via secondary senses such as sound, smell, or touch.

The second objective of the design is to clarify and strengthen the driver's image of the environment, to give him a picture which is well-structured, distinct, and as far-ranging as possible. He should be able to locate himself, the road, and the major features of the landscape, to recognize those features with surety, and to sense how he is moving by or approaching them.

The third objective is to deepen the observer's grasp of the meaning of his environment: to give him an understanding of the use, history, nature, or symbolism of the highway and its surrounding landscape. The roadside should be a fascinating book to read on the run. Ideally, all three objectives should be achieved by means which interlock at every level.

We believe these objectives can be achieved in highway design. Usually, alas, one aspires to nothing more than an absence of irritation on the road.

2. Recording Highway Sequences

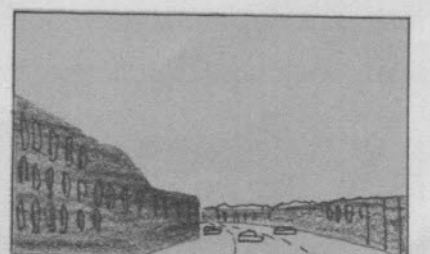
If we want to change the view from the road, the first essential is to develop a technique of recording, analyzing, and communicating its visual sequences. Without such a technique, we are unable to express or refine design alternatives, short of building and rebuilding full-scale roads. This would be analogous to music without a notation, or architecture without drawings. Both are possible (and have occurred), but the growth of the art is thereby restricted. This chapter will discuss the problem of recording visual sequence, both in its objective and subjective aspects.

Many of the elements that go into making up a visual sequence can be recorded in conventional ways. A detailed map, showing the location and elevation of the road, plus topography and other natural features, land use, building mass, and open space, furnishes much information. This may be supplemented 54 by oblique and ground photographs, for detail and three-dimensional effects. The aerial obliques should be taken from many viewpoints; the ground obliques must capture the sequence of views at reasonably close intervals. Very often, a quick perspective sketch in the field is more valuable than a photograph, since it eliminates unnecessary detail and exaggerates vertical elements, just as the eye records them. If the sequence being recorded is a proposed design rather than an existing reality, then we must depend on base maps and sketches without photographic aids.

These methods of representation have already been developed, and if the user has enough interpretative skill, they give him the information from which he may reconstruct the resulting visual sequence. Chapter 4 describes an imaginary highway design for Boston that was constructed primarily from such techniques. But they also have many disadvantages. In particular, they fail to select essential elements from the mass of things potentially perceivable; they require the user to reconstruct a third dimension; and they present the material as a static, over-all pattern rather than as a dynamic sequence. Even skilled designers are misled by these shortcomings.



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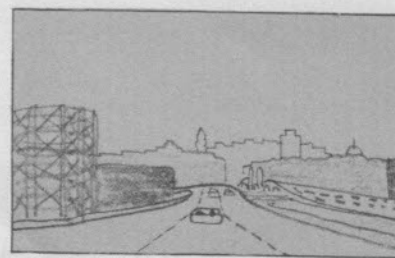
The sense of reality is improved if a scale model is prepared, showing the road and its environs, and perhaps allowing for placement of the road in alternative positions. The situation is still seen as an over-all pattern rather than as a sequence, but it occupies three-dimensional space. Details may have to be carefully executed, or even exaggerated, especially just at the roadside. Nevertheless, quick and rough study models, made of such inexpensive and pliable materials as cardboard, Plasticine, balsa, or Styrofoam, are an essential part of the process of designing a spatial composition.

It is also possible to capture some sense of sequential effect from a model, if the eye is brought down by some optical means to a simulated position on the road surface and then is moved along that surface at a speed which corresponds to the real speed at the model scale. This can be done crudely by a small mirror, and much better by a hand-held periscope or one on a mobile mount.

55B We now have a technique that records *sequence*, but the record is perishable and visible to only one person at a time. Therefore it is still not adequate for comparability, nor for communication to groups of people.

55A We are thus tempted to go to motion pictures, which record sequences in a permanent form that can be shown to large groups of people. Movies may be taken of existing highway sequences, either at normal speed or at exaggerated speeds, to convey in brief the essentials of the major visual effects. We have made a number of such highway movies, which are quite useful in conveying the sense of motion. There are technical problems of support for the camera to prevent vibration, but the most serious difficulty is the inherent difference between the camera and the human eye. The eye has a very small angle of acute vision, coupled with a very broad angle of hazy vision. It perceives the details of objects by searching the visual field in a quick irregular motion, while sensing the spatial relationships of the whole field partly by means of blurred, peripheral sight. The camera, on the other hand, is a staring eye of uniformly acute vision over an angle of moderate size. In one way, it records too much, if we want to simulate the workings of a human eye; in another way, it records too little by reducing peripheral vision. Furthermore, its center of attention does not leap from object to object as does the eye. There are also other differences, such as the absence of binocular vision and a fixed rather than a variable depth of focus; but these seem to be less important here.

The net effect of these differences is that a movie, taken while looking ahead along a road from a moving platform, looks "flat" to us, and seems to be taken either from a tunnel or with blinders on. Its attention appears to be fixed with insane intensity. It can have a hypnotic effect and will exaggerate such features as road curvature, traffic, or the visual "growth" of objects at the roadside. It will neglect many other elements, such as the sense of total space, or the appearance of more distant objects in the landscape which are not directly ahead.



There are techniques for circumventing these defects. Several co-ordinated cameras may be used, and their film may be projected on a wide-angle or curved screen, so that the observer is presented with a view which extends to the periphery of his vision. There results a marked sense of three-dimensional reality, and the eye of the observer can scan the whole scene much as it would in reality. The technique is difficult and expensive, however.

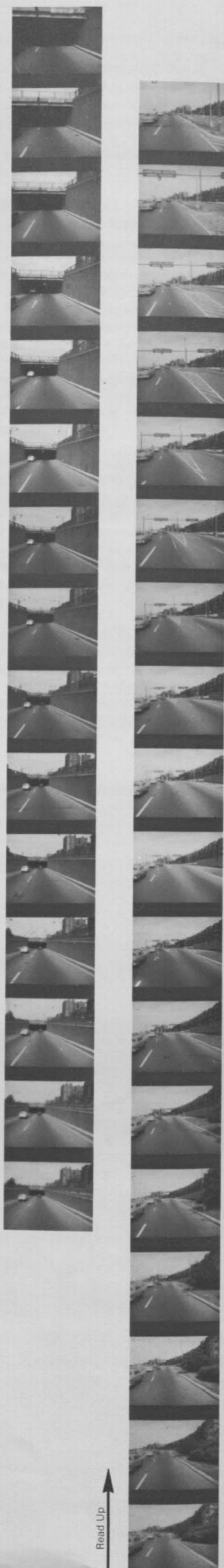
To simulate the scanning of the human eye, the camera may be pointed at one object after another, while the vehicle is moving. The result is vertigo for the observer, since he has no compensatory mechanism to assure him that the world is stable when the visual field is moving so rapidly. Movie cameramen have therefore developed many compromise devices, such as the panning shot, the dissolve, the close-up. These symbolize the scanning, selective action of the eye, but in a very slow and formal way, so as not to disturb the equilibrium of the observer. These techniques require a skilled operator, and must perforce select the visual elements and interrelations to be shown. The result is a work of art (whether good or bad), which has already interpreted the scene.

Despite these problems of technique and cost, a motion picture gives such a direct sense of sequence that it is a valuable adjunct to studies in map, sketch, and model form. Multicamera, wide-angle films are useful as permanent recordings of important existing sequences. Selective camera work, in the more conventional style, can be used to record brief sequences, details, or special aspects, as supplements to other records. Motion pictures may be employed to communicate, as a work of art, the character or meaning of a sequence, after that sequence has been thoroughly analyzed and understood. High-speed movies may be used to compress the outstanding events of a trip into a brief compass.

55C It is also possible that the advantages of movie presentation may be brought to bear on the study of proposed designs via the use of scale models. If a motion-picture camera can be coupled to a mobile periscope, then movies of apparently correct scale could be made of any desired path of motion through a model. Thus the visual effect of a great number of alternative paths through a given environment could be recorded and compared, or the appearance of proposed new environments could be predicted as they would be seen by the moving observer. The view of a pedestrian—or that from an automobile, airplane, or any other vehicle—along any trajectory and at any velocity could be easily simulated. This would be valuable not only in highway layout but also in many phases of architectural, landscape, and city-planning design.

Such an instrument has been partially developed by us, but it presents problems of lighting, exposure, and particularly of mounting and moving the periscope. Even when perfected, the resulting films will still encounter the difficulties of simulating peripheral and scanning vision. The periscope itself, however, has already been developed to the point that it is useful for the direct visual inspection of scale models.*

*This type of model-viewing periscope is now manufactured commercially by Optec Ltd., 54 Upper Montagu St., London W1, England.



55B



55C
A periscope movie
of a model
of the same road.



An Abstract Notation of Motion and Space

All of these techniques suffer from disadvantages of cost or complexity, of failure to abstract the essentials, or of inability to communicate the sense of sequence. It would be useful to devise a simple graphic technique of recording visual sequence, employing easily made, easily understood, reproducible drawings on paper, which could compress the essence of the experience into a small space. Such a technique would allow the rapid communication and comparison of sequence alternatives, stripped to their essentials.

Our proposal for a technique of this type borrows heavily from the previous work of Philip Thiel,* who has worked on this question in depth. The technique does not present sequence directly as in a movie, but rather symbolizes it by placing elements along a continuous line or staff, as in musical notation. This is probably an inevitable feature of any simple presentation on paper.

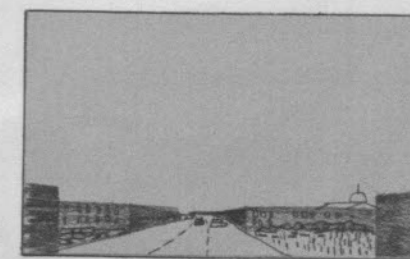
Any abstract notation, however clear it may be logically, is never at first intuitively obvious. The reader should be warned that it will take time and some practice before any such system will seem to communicate the "feel" of a complicated experience of motion.

Our studies have led us to think that the essential experience of the highway consists in the perception of roadside detail, the sense of motion and space, the feeling of basic orientation, and the apparent meaning of the landscape. The sequence of roadside details that are significant at the scale of the entire road—changes in lights, signs, rails, or paving texture—is easily recorded. The sequence of meaning (beyond that of simple functional meaning) is quite difficult to analyze. We therefore chose to develop techniques for communication of: (1) locational orientation, and (2) the experience of motion (both of self and of surroundings) through a changing, light-filled spatial form.

The perception of motion and space may be analyzed into the following parts:

1. Apparent self-motion: speed, direction, and their changes (stop-go, accelerate-decelerate, up-down, right-left).
2. Apparent motion of the visual field: passing alongside, overhead, or underneath; rotation; translation; spreading or shrinking of outline or texture; general stability or instability; apparent velocity or lack of it.
3. Spatial characteristics:
 - a. Presence and position of enclosing objects or surfaces, their solidity and degree of enclosure.
 - b. General proportions of the space enclosed; scale with respect to the observer; position of the observer.
 - c. Quality of the light which makes the space apparent: intensity and direction.
 - d. Relationship of spaces in sequence: jointing and overlapping.
 - e. Direction of principal views, which draw the eye toward different aspects of the spatial enclosure.

*See his unpublished memoranda: "The Urban Spaces at Broadway and Mason," August 1959; "An Architectural and Urban Space-Sequence Notation," August 1960, his article in the *Town Planning Review* for April, 1961, entitled: "A Sequence-Experience Notation," and that in *Landscape*, Autumn 1961, "To the Kamakura Station."





56

All these characteristics must be shown in their sequential and concurrent relation to each other. The following proposal indicates all these elements as occurring along a vertical base line, scaled to elapsed time, which is intended to be read in sequence from bottom to top. In the background are drawn regularly spaced lines to indicate time intervals.

APPARENT SELF-MOTION

56 In our system, the central line is overlaid by a band representing apparent self-motion. This band widens to show ascent and narrows to show descent, just as if it were composed of two exaggerated vertical profiles of the road, laid flat and attached base to base. The band is bent right or left to symbolize turning movements. To maintain progression along the base line and to symbolize the subjective sense that sharp motions are entities to themselves, the band is broken and then picked up again. Finally, the band is marked with horizontal lines to represent apparent velocity; the greater the speed, the closer together are the lines. Stops are shown by white bars across the band.

APPARENT MOTION OF THE VISUAL FIELD

57 The apparent motion of the visual field is shown by small arrow symbols, directly alongside or on top of the self-motion band. These are drawn in a contrasting color:



moving alongside or overhead
apparent sidewise movement
apparent rotation
apparent growth or shrinkage
apparent immobility

These refer to the characteristics of the general field and are shown at the point where they are perceived. If a single important feature is being referred to, a dot is appended:

These are also shown where they are perceived and not where they are physically located. Increase in apparent velocity of the field is indicated by increasing the length of the arrow.

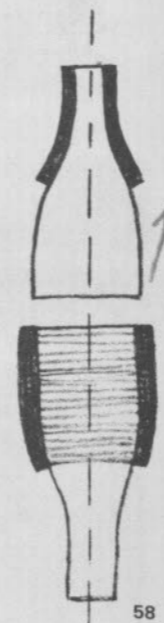
SPATIAL CHARACTERISTICS

To the right of the motion band is a succession of cross-sectional diagrams showing the characteristics of the space being traversed. Enclosing surfaces are represented by solid lines; screens or other objects, which give a sense of enclosure without completely blocking vision, are indicated by dotted lines. Overhead, underneath, and side surfaces or screens are drawn in diagrammatic section, while those in front are shown as a facing oval.

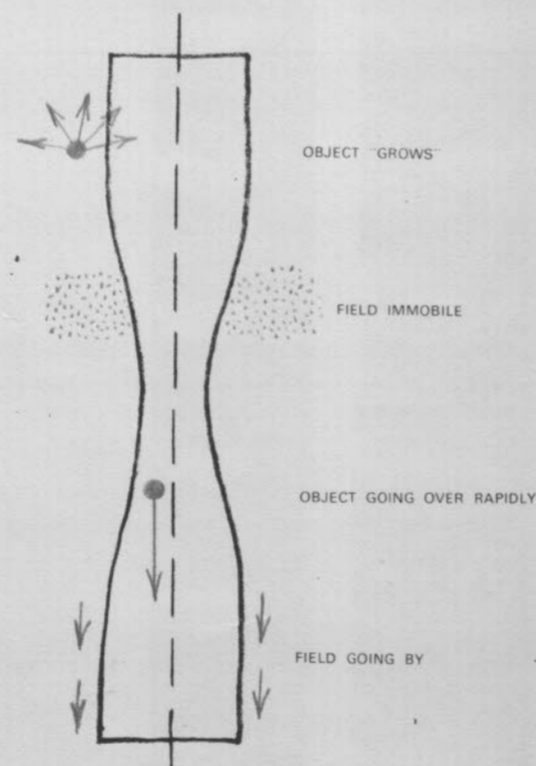
To the right of the space section appears a small separate symbol of another color, to indicate the degree to which the total space is defined. A circle indicates a space sharply and clearly bounded, and a cross, a space so ill-defined as to be imperceptible, or almost so. These two symbols can be combined to show gradations of total definition:

DROPPING INTO A CUT

RISING INTO A TUNNEL



58



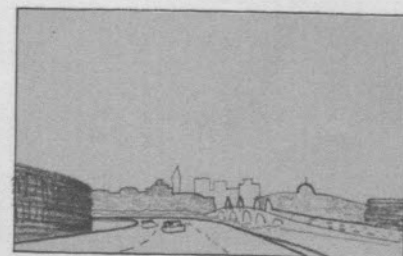
57

○ STRONGLY DEFINED
⊗ DEFINED
⊗ SOMEWHAT DEFINED
⊗ ILL DEFINED
⊗ UNDEFINED

SOLID FLOOR AND LEFT WALL, SCREEN OVER

SOLID FLOOR, SCREEN AHEAD

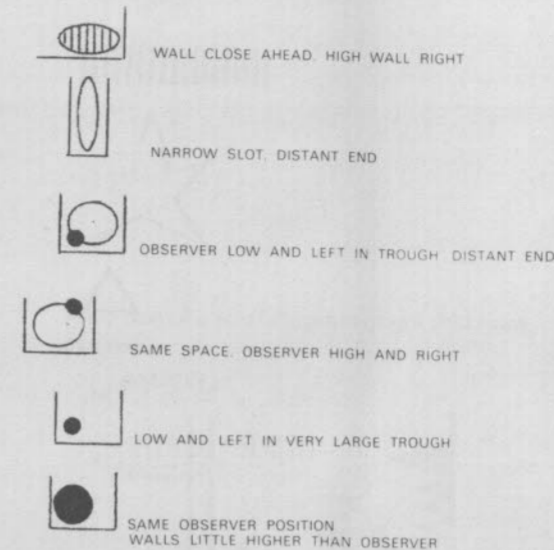
SOLID RIGHT WALL AND AHEAD, SCREEN UNDER



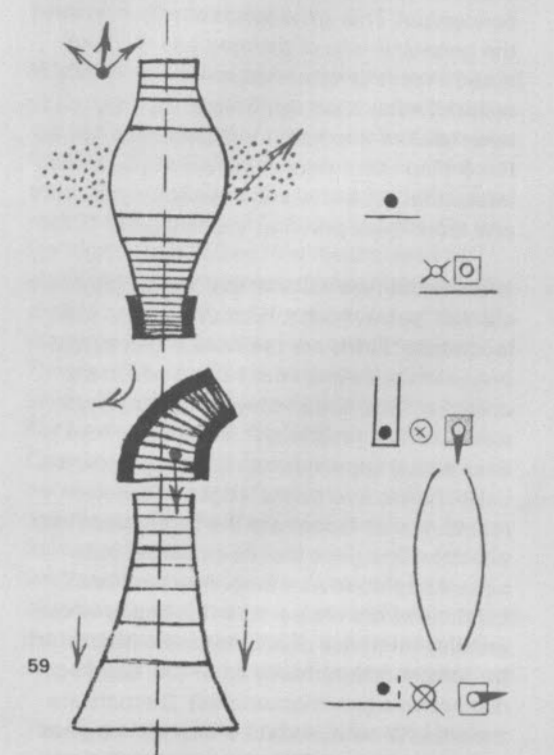
58 Where strong confinement occurs at the side of the road, a black edge is added to the motion band. Where the road passes under a bridge or into a tunnel, a dark tone is laid over the motion band. These symbols reinforce the sense of important visual events, even though they are repeated in the sections. Arrows of separate color are placed at the edge of the motion band to indicate major views which affect the spatial sensation.

PROPORTION AND SCALE

The general proportion of the space is shown by the relative length of lines in section, or by shading on the oval symbolizing the frontal surface, a light oval being distant and a dark oval close. The position of the observer in the space is represented by a dot in the section. General scale of the space is indicated by the relative size of the observer dot: a large dot symbolizes a small space in relation to the observer, and vice versa. The section is located so that the observer dots are in vertical line and occur at the point in the road to which the section refers.



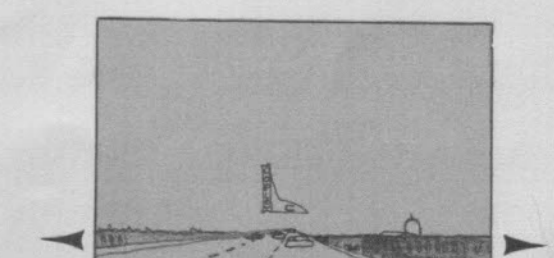
An illustrative total diagram, recording a brief highway sequence, might then look like this:



59 The diagram, reading from bottom to top, can be translated in this way: The road is dropping with gathering speed in an ill-defined space which has a floor and a screen at the right, and is brightly lit from the left, and in which the general visual field is moving past the observer. This space gradually merges into a small, deep, and narrow slot with the observer at the bottom. Before this transition is completed, however, an object flies rapidly overhead, the road swings right (still dropping), and the visual field on the left rotates clockwise. The light becomes dimmer and enters from above. Suddenly, at the lowest elevation of the road, while apparent speed is at its highest, the observer bursts out of the slot into a vast, ill-defined plain and rises high above it. The light is bright again and comes from the rear. The road rises, and apparent speed slacks off, until at the peak of the climb the observer seems to "float," and an important view opens up to the right. The road then drops again toward a prominent object on the left which appears to be growing; speed begins to pick up, and the sequence ends.

This puts the experience in a concentrated form. It has at least three deficiencies. First, it must be read as three parallel columns. This is probably inescapable, considering the number of elements being presented.* Second, the space sections do not read as easily in sequence as do the other elements, since they have been "laid flat" on the paper, while the other symbols are map or point representations. Setting such sections upright along the line, as in a simple three-dimensional paper model, would solve this difficulty but would immediately complicate drafting, handling, and reproduction. Third, fluctuating characteristics, such as activity and light, are not adequately handled. As it stands, the system has reasonable merit and will be used below to describe a real highway.

* In this regard, it may be interesting to compare this technique with a recording system developed for ballet. See: *Labanotation*, Ann Hutchinson, New Directions, New York, 1961.

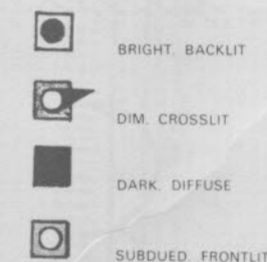


LIGHT

The quality of light in the space is shown in another separate diagram of contrasting color to the right of the space section, including a base tone showing general intensity from bright to dark, and a shaded dot symbol indicating the direction of the light:

● backlit
○ frontlit
⊗ crosslit

diffuse (no dot)



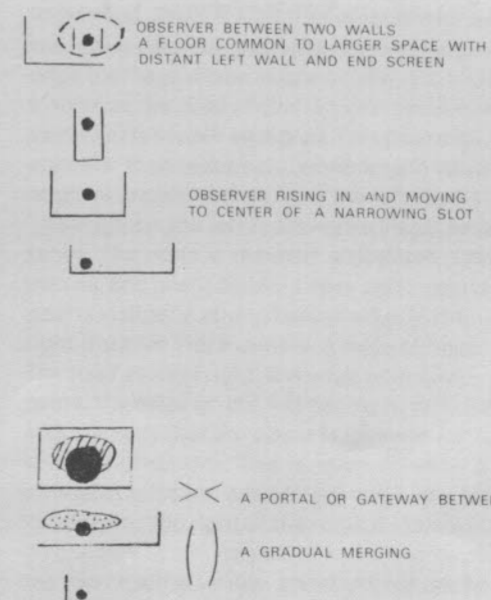
This is a bare minimum specification. The illumination has qualities of shape, movement, texture, and color which are not covered by this simple symbol. The light will normally change from hour to hour, or season to season, and be markedly different at night. The symbol can only be used to indicate a predominant condition of the light, or the condition at some special time under study (the rush hour, for example).

OVERLAPPING AND CHANGING SPACES

Spaces that are perceived concurrently can be shown overlapping in section. Where the spatial form is essentially constant, one diagrammatic section serves for the entire sequence. Where progressive change in the space is significant (widening, narrowing, change of observer position), a series of diagrams may be used.

The duration and nature of the transition from one space to another is shown by symbols to the right of and between the diagrammatic sections, and in contrasting color as follows:

() a gradual merging
X an intervening portal or constricting gateway
— an abrupt shift
⊗ dissolution and chaos between two spaces



To this whole representation it would be desirable to add a sense of the activity which fills and characterizes these spaces, the intensity of accompanying traffic in particular. Since this is a fluctuating quantity, like the lighting, we have yet to find an easy way to handle it. Sooner or later, however, we must find a means of adding the nature and intensity of the activity to our analysis.

The Notation of Orientation

Space and motion is the immediate essence of a highway run. But there is an important aspect of the trip which is more complex and conceptual. This is the sense of orientation—the general image of the road and the landscape that develops in the mind, partly as a result of what is presently visible, partly as a result of the memory of past experience. Recording this image demands a subjective interpretation, but we can use some concepts and techniques previously developed. * *

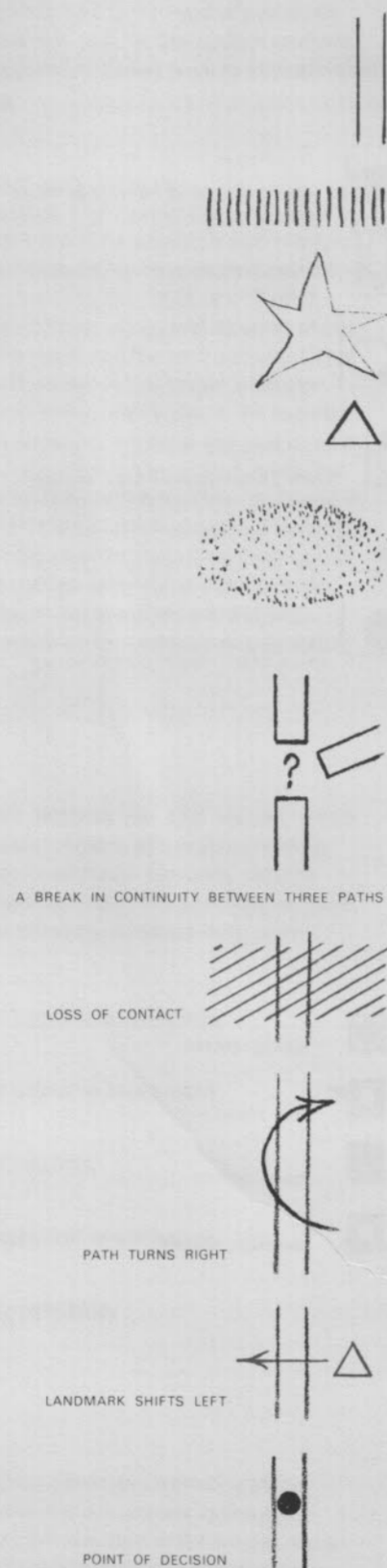
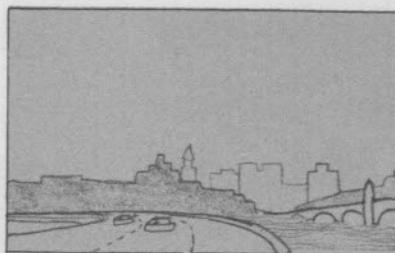
In particular, we will use the "image elements": paths, nodes, districts, edges, and landmarks. Paths are the lines in the mental image of the environment along which the observer feels he can move (highways, railroads, canals, walkways). Edges are those lines which appear as barriers or boundaries (lake shores, riverbanks, edges of developments, walls). Nodes are the focal points into which he imagines that he can enter (city squares, railroad terminals, intersections). Landmarks are the points in his image which are only reference positions, and within which he does not customarily enter (tall buildings, distinctive signs, monuments). Districts are the areas of some extent which he imagines as being relatively homogeneous and identifiable (residential neighborhoods, office districts, large parks). All these elements may be located and remembered from the highway, just as in any other experience of the large-scale environment. The highway itself is of course a path, with more or less clarity of form and direction. On its course it goes through nodes, breaks through edges, crosses other paths, enters districts, passes landmarks. Thus it is both an image element and a sequence made up of image elements.

Since the highway experience is one of continuous forward-directed movement, the approach and attainment of successive goals is an important feature of it. In addition, the driver seeks to gain some sense of the structure of the surrounding environment, outside the road itself.

An orientation sequence diagram must therefore show the following things:

1. The image strength and continuity of the path, plus the sequence of elements that are associated with the path itself, and the points at which the driver must make locational decisions.
2. The principal goals along the trip, showing when they are visible, whether they are attained, whether there is a "back reference" to them, and how they overlap and succeed one another.
3. The location, relation, and strength of the image elements of the "outside" environment, including periods of loss of contact.

* * See *The Image of the City*, op. cit.



We have used the shorthand given below. The various elements are shown along a vertical axis to the same scale of elapsed time as the space and motion diagram, and are symbolized as follows:

paths

edges

nodes

landmarks

districts

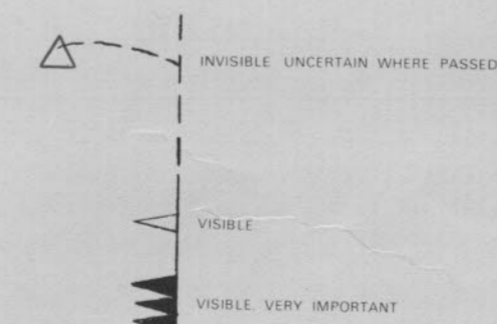
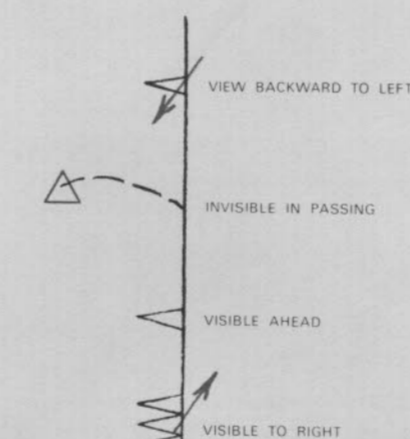
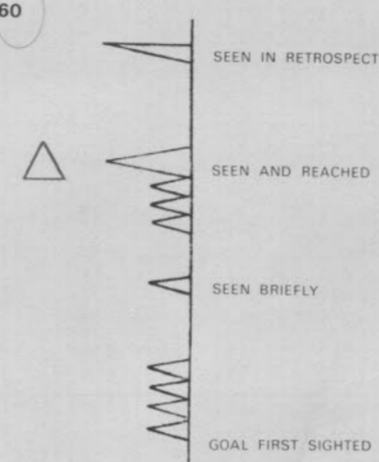
They are shown where they are physically located, not where they are perceived. Increasing intensity, clarity, and importance are indicated by increasing the size and darkness of the node or landmark symbol, darkening the district tone, and thickening and darkening the line of path or edge. Elements directly associated with the path, and the path itself, are shown in black. "Outside" elements are in another color.

Loss of continuity, or of ability to recognize the path or its relation to an intersection, is represented by a break in the path line, plus a question mark. Loss of contact with the "outside" image (as in a tunnel or cut) is shown by an overlay tone of the color of the outside elements. Major apparent turns of the path with respect to the outside image, or major apparent motions of the outside elements, appear as superimposed arrows. Points of decision are shown by black circles in the path.

60 The total distance within which a single goal is at least occasionally visible is indicated by a vertical line to the right of the image diagram. Along it, triangular projections represent the periods in which it is potentially visible, and a triangular "pennant" points to the element which was the goal at the moment of arrival. Visibility marks after the arrowhead indicate that a backward look is possible. These lines and their projections are in black.

Where the goal is never visibly attained, there is no arrowhead, and a dotted line ties the goal line to the element to which it refers. Where the goal is not only not attained but fades out uncertainly, with no back reference, the line also fades out in dotted lines. Small red arrows superimposed on the visibility mark indicate viewing directions other than straight ahead. Darkening of the line means that the total approach is an important one. Darkening of a visibility or arrival mark shows that this particular moment is important. These lines can be arranged from left to right in order of length, so that successions and overlaps can be shown.

60

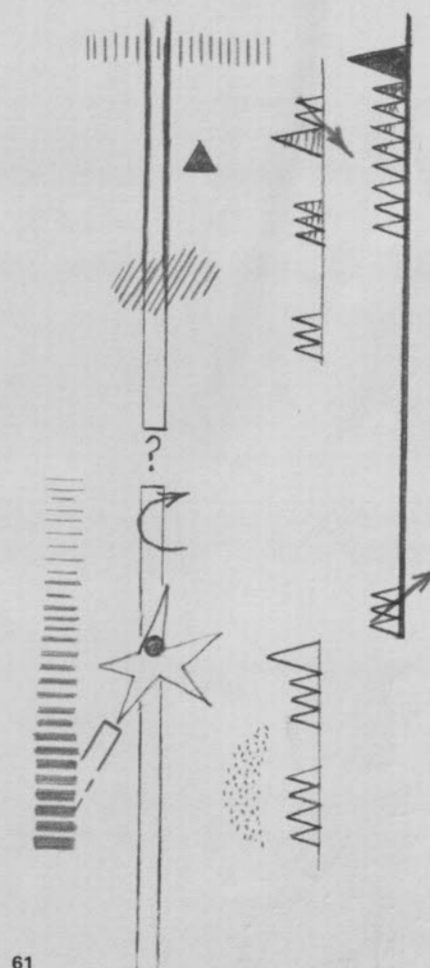


SHORT APPROACHES



OVERLAPPING, IMPORTANT APPROACH

A portion of a total diagram might then look like this:



61 This diagram can be translated in the following way: At the beginning, reading from bottom to top, there is a district of indefinite outward extension on the right, and a strong edge (perhaps a lake shore) on the left, while a node on the road ahead (an intersection, for example) is visible as a goal. This goal disappears, then reappears, while a path whose origin is unclear enters from the left rear. The edge on the left is losing its visual importance. The node is reached, a decision point occurs, and immediately a new and important goal is visible: a strong barrier edge in the right distance (for example, a ridge of hills). The road swings right, the edge goal disappears, the edge on the left begins to fade out, and the path that the driver is on loses its sense of continuity. This is resolved when a new goal appears: a landmark (such as a tall building) to the right of the road. But this disappears again, no part of the scene beyond the road itself is visible, and there occurs an image blackout, although the path maintains its continuity. Suddenly, both the landmark and the strong edge are visible again, and the path that the driver is on becomes stronger as a visual element. The landmark disappears and then is suddenly and visibly arrived at and also seen from the rear, while the edge goal maintains its visibility, now straight ahead. The image of the path itself becomes very strong, and so does the sight of the approaching edge (the ridge of hills), which is reached and pierced at a climactic moment.

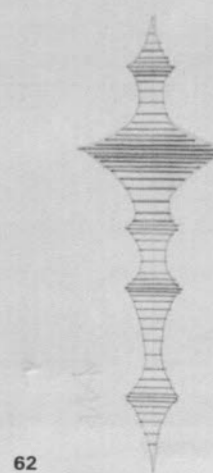
This seems to be a satisfactory system, unless the track of the road is very complex and the relation of the outside image to the path is not stable. In that case, the diagram may have to be broken into parts.

With these two diagrams, the one symbolizing space and motion and the other orientation, we can quickly record the essence of the view from the road. It will be necessary to read them together, since the perception of space-motion and of orientation overlap. Ideally, as we have noted before, the means used to clarify both (and to express meaning as well) should be the same. A better notation would compress both aspects into one diagram. This may be possible in individual cases, where the elements used are relatively few. For an example, see the imaginary design in Chapter 4, page 38. It will sometimes be necessary to cross-refer the elements from one diagram to another, or to duplicate information, as when the view of an important landmark is shown on the space-motion diagram at a point where it radically influences the motion sequence itself. In any case, the two diagrams must be read as one experience.

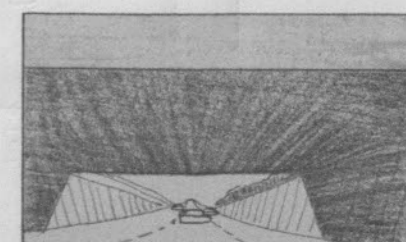
The diagrams would be supplemented by a conventional map, by notations as to significant detail, and by photographs or perspective sketches. They can also be reinforced by a series of rough study models, or perhaps by motion-picture studies. Undoubtedly, the diagrams would have to be simplified or added to for individual cases, in order to become as expressive as possible for a particular purpose.

Since the diagrams contain the kernel of the visual effect, they might be evaluated independently of the other material, and from them a more concrete design may be developed. They will therefore serve the function of the preliminary rough sketch in ordinary design procedure. While referring to conventional maps showing "fixed" elements (major topography, desire lines, connections to be made, areas and structures to be avoided, existing strong visual elements), the designer can quickly sketch out and evaluate a whole series of alternative compositions of motion and orientation. The chosen scheme will guide the detailed design of the road.

He may wish to use an even more abstract notation, which simply shows the location and timing of major visual events, or the level of general visual intensity, without further specification. Such a diagram, which would look like a time graph, or a variously shaded band, would be useful to analyze or express the basic rhythmic structure of a road.

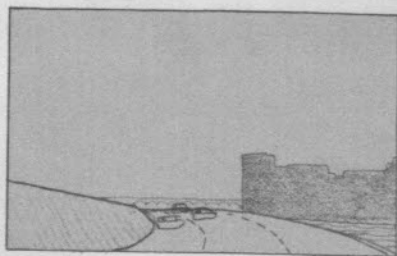


62





63 The Northeast Expressway



3. Analysis of an Existing Highway

This monograph is based on various tests of the visual impact of the highway. The substantive results have been summarized in the first chapter, but we must also describe the tests themselves in order to identify the source of our conclusions. To illustrate both source and method, this chapter will concentrate on the test results from one particular route.

Our conclusions were built up from the study of many urban highways in the East: Route 2, Storrow Drive, and the Northeast Expressway in Boston; the approach to Hartford over the Connecticut River; the East River and West Side Drives in New York City; the Jersey Turnpike from Newark to New York; the Schuylkill Expressway in Philadelphia, as well as the approach to the central part of Philadelphia through Fairmount Park; the Rockefeller Parkway in Cleveland. We have drawn upon the visual experience of many other roads, but we have studied the above roads in some detail. All of them were chosen because they have at least some quality as sequences.

The basic technique used was the one common to all artistic criticism: numerous repetitions of the experience, and its analysis and evaluation both on the spot and from memory. The process was aided by the use of tape recorder, camera, and sketch pad to record momentary impressions. Our conclusions are therefore based largely on the reactions of alert and presumably sensitive and educated observers. The reactions of other subjects might be expected to be less sharp; but what scanty evidence we have indicates that they would not differ markedly in kind, at least among other middle-class people to whom the road is not a matter of long habit. The greatest divergences are likely to occur among people of another class or culture (about which we know nothing), or possibly among daily commuters along a highway, on whom we have extremely little data.

Our guess as to commuters is that they would respond in the same (if in a somewhat muted) way wherever the visual sequence was a powerful one. Elsewhere on the road they might be able to shut out the view from conscious attention, although if they were stimulated to look they would enjoy even these mild and familiar scenes, much as we find pleasure in driving through a well-known countryside. On the other hand, except again for dramatic sequences, a daily commuter, even if he chooses to look, may possibly find pleasure or meaning primarily in other kinds of phenomena: novelties such as new construction, changing activity or signs, new detail, moving traffic. We lack information on this.

During our investigations, we made all trips in the daytime, in the presence of normal city traffic, but not at rush hours. Thus they do not convey the night-time view or the experience of the road in very heavy traffic.

Most of our data comes from this subjective evaluation, but other kinds of tests and records were also made. The use of photographs, sketches, and motion pictures has already been noted. We experimented with recording a continuous stream of verbal impressions, given without pause and at such speed that the observer loses much conscious control of his observations and must say the first thing that comes into his head. These were done for a number of the roads, particularly the Northeast Expressway in Boston, by several research personnel. These recordings were transcribed and timed, and analyzed for the tempo of attention, for the objects of attention, and for some of the more obvious

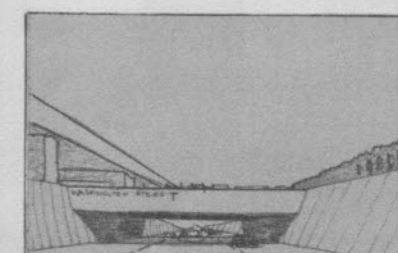
signs of emotional reaction. When several runs are compared, they prove to be valuable indices of where attention is compelled to focus on a common object and where it ranges more widely.

A similar graphic technique was used on the Northeast Expressway only, and was carried out by a somewhat wider sample of people (twenty subjects; mostly, but not entirely, middle-class and professional). Here the subject was given a small pad of paper and required to sketch the scene at an extremely rapid tempo, averaging three drawings per minute. Again he is under such pressure that he cannot consciously control what he records. The sketches were timed to indicate the location in which each was made; they could then be arranged in rows one above another, all drawn to a common time scale. Thus it was possible to see what the entire set of subjects recorded at similar points on the road.

The drawings are necessarily crude, and many of the indications are so compressed as to be unintelligible to those who do not know the road. Each subject was asked to identify all ambiguous elements of his drawings immediately after the run was complete. Most of the subjects had at least minimum graphic skill (little as this may be apparent under such conditions!), but a few were completely untrained. The latter drawings exhibit a poor ability to connect parts. They have a fragmentary look, but the content is still similar to the more highly connected drawings. It would be interesting to expand these tests among other groups, particularly among the daily users of a route.

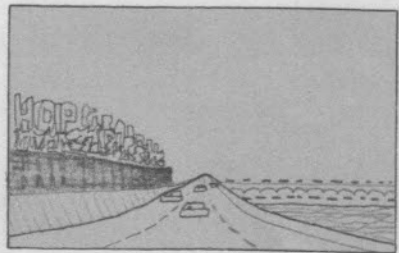
This sketch technique gave us further data on the tempo of attention and the objects of attention. At climactic moments, attention is "forced," and the drawings by many people are surprisingly similar. Considering the vast quantity of objects that could potentially be recorded, the high selectivity and general concurrence was striking. Features such as the forward view of the roadway, spatial confinement at the side or overhead, outlines silhouetted against the sky, roadside detail, obstacles to vision or movement like large buildings or the rear ends of trucks, and long axial views appear again and again. Detailed results of these verbal and graphic recordings are woven into the analysis described below.

Other tests of the subjective impact of the road might be imagined: the correlation of physiological reactions to visual events, or laboratory experiments in which the highway experience is simulated and varied in a more controlled fashion. There might be testing of other groups: those with different degrees of familiarity, or with different temperament or background. Responses of subjects who are placed in different positions in the car might be studied. (Our examination dealt primarily with the case of the front-seat passenger.) None of these other tests have been attempted by us.





64 Map of Northeast Expressway



The Approach to Central Boston via the Mystic River Bridge

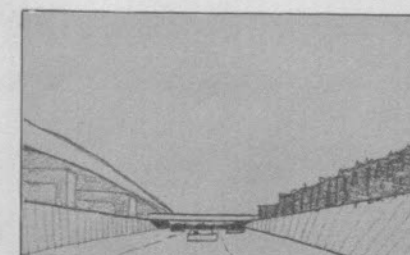
Boston affords at least one interesting example of the approach to the central city: the Northeast Expressway, which comes in at a high level over the Mystic River Bridge. It traverses strong topographical and urban forms and has a decided shape of its own. In its variety and its tempo it illustrates many of the visual possibilities of urban highways: panoramas, fast concentrated motions, the interplay of major and minor goals. It has many visual flaws, and yet it affords a dramatic approach to the city. This is the approach that Whitehill refers to in the opening words of his book on the history of Boston:*

"Only residents of Essex County and Maine and New Hampshiremen, traveling by car, approach Boston with any decency. From the upper deck of the Mystic River Bridge, particularly in the early morning, a marvelous panorama of the city in Monet-like blues and grays unfolds itself."

A study was made of this route from its intersection with Squire Road in Revere to the Fort Hill exit in the heart of downtown Boston, a distance of 6½ miles. This trip takes 12½ minutes at an average speed of 32 miles per hour. Map 64 shows the general layout of the road. From the flat ground near the Revere airport, it runs southwest through a thinly settled area and then turns southeast to pass around the nose of Fennos Hill. It swings southwest between Mt. Washington and Powder Horn Hill and makes a similar double turn once again as it enters Chelsea and comes into line with the Mystic River Bridge. It crosses the river at a high level, crosses a smaller channel on another bridge, and descends across the eastern end of Charlestown, to turn southeast once more as it traverses the mouth of the Charles River in a region of railroad yards and docks. Passing alongside North Station, it enters Boston proper, still at an elevated grade, skirting Haymarket and Dock Squares and curving around the eastern edge of the financial district. Although the expressway now continues on south past South Station, at the time of our test it terminated at the Fort Hill exit, where the off-ramp turns sharply to the right and descends to street level between massive old buildings.

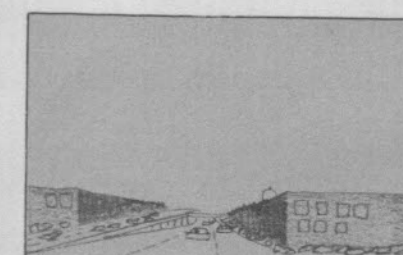
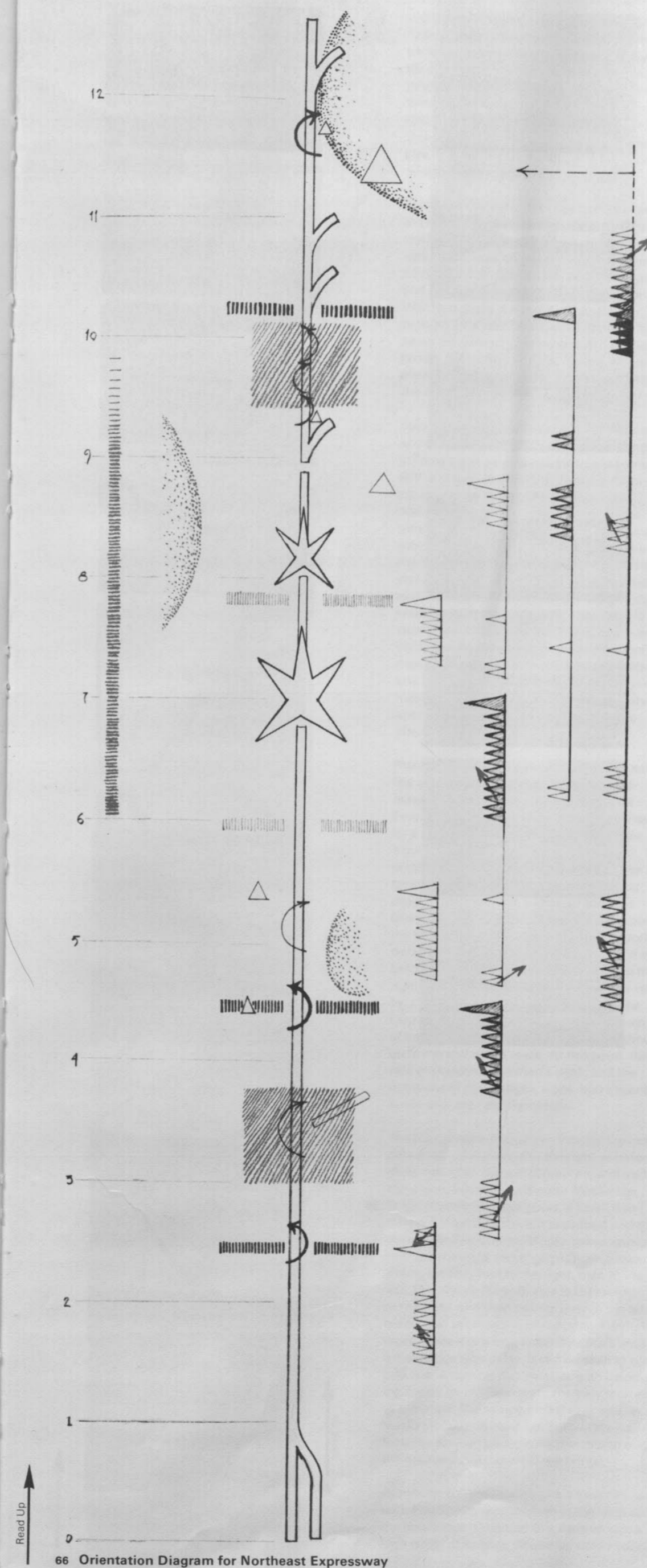
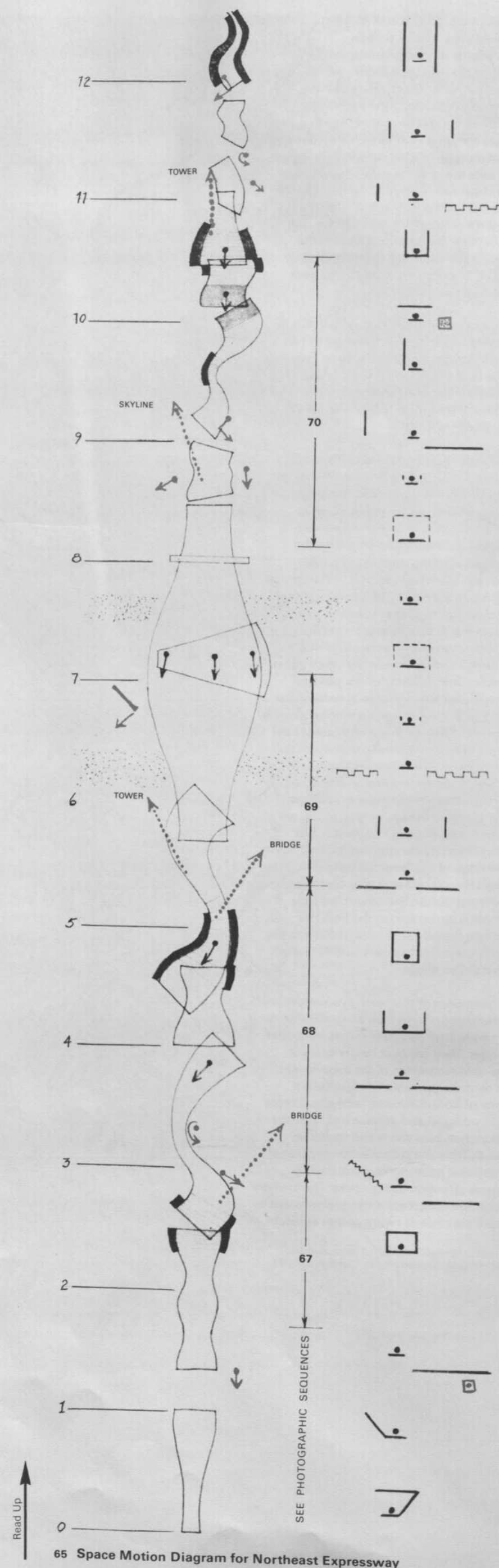
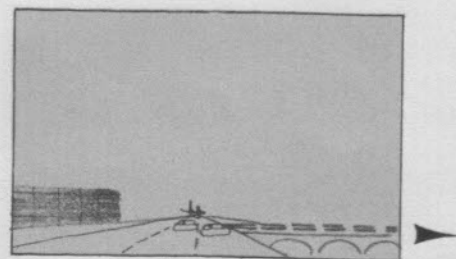
The impressions of this road given below are primarily those of two men who took the trip many times, both as driver and as front-seat passenger. They are built on the basis of on-the-spot recordings of the experience. These recordings were verbal (in both a "stream-of-consciousness" and also a more considered style) and graphic (rapid on-the-spot sketches, plus slides and movie sequences). The view is fundamentally that of the front-seat passenger who is paying conscious attention to the scene. The analysis by these two observers was supplemented by the rapid sketches of twenty other subjects.

*Walter Muir Whitehill, *Boston: A Topographical History*, Harvard University Press, Cambridge, 1959.



Sequence Diagrams

Some of the visual components of this experience are graphically presented in Figures 65 and 66, drawn to a time scale, in which the course of the road has been diagrammatically simplified to a straight line. The time markings on the conventional map, Figure 64, allow the reader to relate it to these special drawings. Figure 65 is a diagram of the passenger's sense of motion and space, while Figure 66 illustrates his orientation—his image of the total landscape. Both of these diagrams follow the conventions developed in the previous chapter.



A Trip on the Northeast Expressway

Let us describe a brief trip on this road, as it might impress a typical passenger. At the start, after rising up onto the road by a short ramp, there begins the first, or familiarization, phase. Attention is confined to the road itself, to the signs and accompanying traffic, to the fly-by of small close objects which give the basic sensation of speed. In the late afternoon in winter, when most of the trips were made, the road points at a low sun, and the glistening of the sky and of the road and car surfaces is a notable feature. The attention to silhouetted objects is heightened.

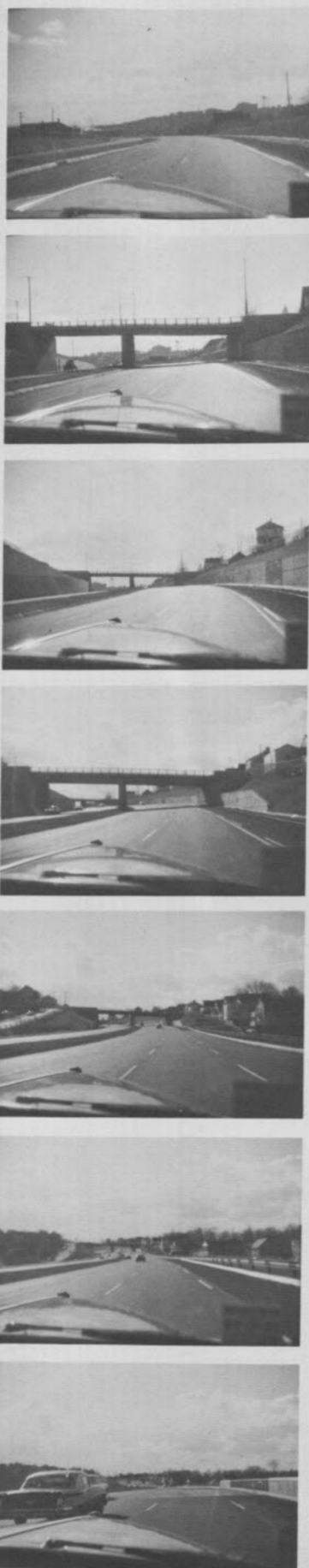
In the beginning there is little to orient the observer, and he has to trust the road for direction. The route lacks those elements of distant direction in which it is so rich farther on. A foretaste view of the Custom House tower, for example, or a sense of the water edge paralleling the route to the left, would be of great value.

Soon the original interest in the ordinary features of the road and in the basic sense of speed diminishes, while the outside landscape is still of weak quality. This part of the trip, from minute 1 to 1½, is most like the run of ordinary highway-driving. Attention still centers on the road ahead, but the tempo of observation falls off markedly. The tempo of the sketching by the sample group also slackened at this point.

As the road approaches the northern spur of Fennos Hill, the interest begins to rise again. At first it is not clear how, or if, the road will pass this barrier. The cut is turned at an angle to the road and is therefore invisible. The approaching ribbon of road that may point it out is obscured by a small mound and dip in the vertical alignment at minute 1½. This mound passes over a road which is largely invisible to the observer, and so the hump is for him an inexplicable irregularity in the line. Changes of level can be quite exciting, but small variations, whose origins are not visually explained, act only as minor irritants.

Once past this hump, the approach to Fennos Hill suddenly becomes clear, and excitement mounts as the road plunges into the cut, under the two bridges overhead, and makes a sweeping left turn. Visual speed is intensified by the spatial confinement and the bridges passing overhead, and the cut marks the passage of an important edge in the orientation scheme. The turning of the road adds to the interest, conveying a sense of centrifugal force and apparently causing the far landscape (which is framed by the cut and the bridges) to move swiftly sideways. This strong impression is reflected in the concentration and tempo of attention.

On bursting out of the cut, the observer's eyes sweep the far landscape and immediately pick up the next major event, Powder Horn Hill, whose principal landmarks (a hospital and a water tower) are seen in the framed view while the observer is moving through the first bridge. There is an apparent 90-degree turn to the left (actually the turn is nearer 60 degrees), and the observer finds himself moving along the back side of Fennos Hill, whose rocks and slopes make a pleasant contrast to the urban scene at the right. This backward view of an orientation element al-



Read Up
67



Read Up
68



Read Up
69

ready passed gives a satisfying sense of completion and continuity. The spatial contrast between the confinement of the cut and the sense of the open but still defined valley between the ridges is equally satisfying. For a time after coming out, the sketches of various observers show a striking similarity as they focus on certain features, such as the hill opposite, a factory on the left, and the curving sweep of the road ahead.

The basic motion of the road here is interesting and pleasant. Having approached Fennos Hill on the left-hand side, the road has reversed and now approaches Powder Horn Hill on the right. It shortly reverses itself again, and puts Powder Horn Hill once more on the left. Thus there is a sense of scouting or probing for a way to cross the barrier. This same movement is repeated later, on the approach to the Mystic River Bridge, where the observer feels that he might be searching for the road into Boston.

Between the two hills there is another small and unexplained dip (minute 3½). The motion in itself is not unpleasant, since it is combined with a sweep to the right, pivoting about a housing project. But, like the mound at minute 1½, the dip is rather puzzling; the tempo of attention slows down; there is a moment of confusion and doubt as to the road's intentions. Momentarily deprived of visual interest, the observer awaits his release with heightened attention. On rising to the crest, he expects some announcement: a view of the city, a new landmark, or a more vivid view of a previous goal. But the confinement of the dip is succeeded only by a bland and featureless horizon. Confinement and hiding, without equivalent visual intensity upon release, is a disappointment to the observer.

Powder Horn Hill is approached on the left, to the accompaniment of an increasing frequency of comments and sketches. Like Fennos Hill, this new ridge is also traversed by a cut crossed by two overhead bridges, at a point where the road swings to the left. The crossing of this second ridge, in fact, is an intensified repetition of the earlier crossing: a deeper, narrower cut, a sharper turn, the bridges closer together. This intensification of the earlier experience gives a sense of both continuity and forward progression. Just as before, the framed view slides quickly to the right. Industrial chimneys and gas tanks roll by, then the Mystic River Bridge, then the Custom House tower. These basic themes of orientation now continue to be visible almost up to the end of the route. At this point, the rate of sketching reached a peak, and the notations of cut, bridges, signs, and distant landmarks are notably similar.

The road passes through an industrial district, dips down, and swings to the right as before. Here, however, distant objects are still visible; there is no break of continuity. Within the larger rhythm of major goals, a small two-towered church on the left is sighted and then passed by. The Custom House tower appears over the rooftops and engages in an amusing sliding motion, first to the right, then to the left. The Mystic River Bridge is at first far to the right, and then swings over to the left, giving that same sense of scouting. Furthermore, since it is a long linear landmark with a distinctive silhouette, it can be seen to turn into line: a turning that persists with increasing speed and tension up to the very moment of entrance. The tempo of sketches and remarks slackened off here, but certain typical features appear, particularly the church and the approaching mouth of the bridge.

At minute 5½, the road begins a long rise, and, with a sudden break-through at the level of the housetops at minute 6, it rises up into a high world of its own. Attention slows notice-

ably, and the observer begins to scan right and left and to pay more attention to distant objects: industry, the sea, boats, the Boston panorama. While traveling at the same real speed, he feels that he is going much more slowly, and that he is able to enjoy the whole landscape in a leisurely way. He would be able, that is, except for the usual annoyance of a balustrade rail just at eye level, an annoyance that now becomes most irritating since it blocks off sweeping views. This little rail appears again and again in the drawings.

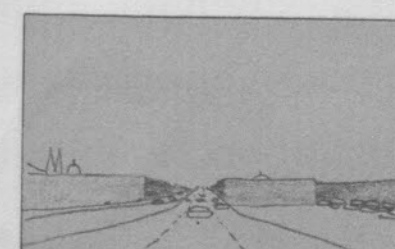
This leisureliness is not yet the boredom of the early stretch at minute 1½: there are interesting panoramas on all sides. But since the primary purpose of a road is motion, one might guess that the leisure would change to boredom if it were too prolonged, unless the landscape were proportionately intense. Our highways may be stupefying partly because they fail for long periods to give a sense of motion to the driver.

Although the proportion of distant objects noticed now rose significantly, it is interesting to see that there still was a regular return to the objects in the road itself. Even the non-driving passenger seems to check his immediate, moving environment.

The Mystic River Bridge is finally reached at minute 7, and gives a strong impression of motion while the trusses pass overhead and alongside. Logically enough, the crest of the long rise is in the bridge itself, the visible river and ocean fully explaining the long climb. One reaches the crest with anticipation and, surmounting it, picks up a new goal: The Bunker Hill Monument on the right. At the same time the toll barrier appears, just at the end of the bridge.

Coming down over the crest to the toll barrier, the observer is brought to a halt at minute 8 to pay his toll. Thus the moment of anticipation at the crest of the long rise has been stretched and intensified, and the observer, pausing momentarily, is ready for a climax. Since the road now points down, directly toward Boston, it would now be opportune to reveal the entire city. Unfortunately, when the toll barrier is passed, a second bridge appears, smaller than the first, an inexplicable bridge, since the Mystic River is presumably past. (The new bridge crosses the Little Mystic Channel.) This bridge blocks off the city panorama, and when the latter is revealed again, its impact is already dulled by the long wait.

It is still a compelling view, however, and the observers sketch as rapidly as they can, before and after the second bridge, noting many common features: the skyline, industrial chimneys, distant landmarks. There is a strong sense of the central city and its many recognizable skyline objects: the Custom House, the State House, the John Hancock Building, the Court House, the Old North Church, North Station, the Hotel Madison. Unfortunately, this view has no recognizable general form, nor is its relation to the water in any way clear.



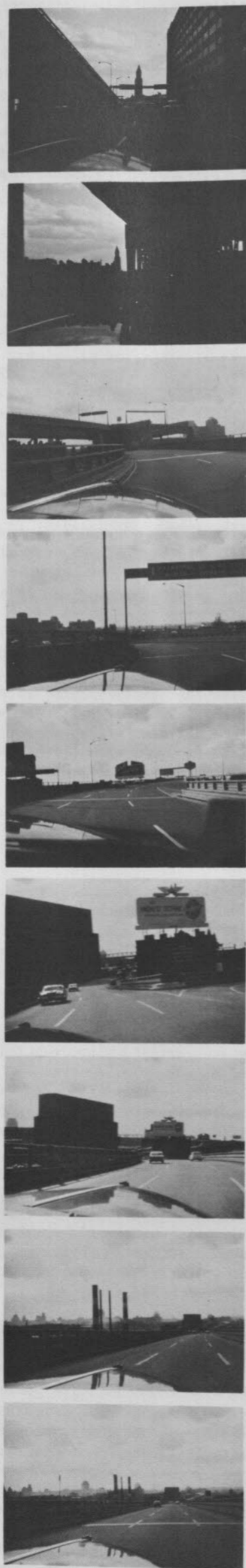
The road now sweeps down, focusing attention ahead. On the left are docks, factories, and a set of brightly painted chimney stacks, which seem to move and grow in an interesting way. At the right is the Bunker Hill Monument, now drawing abreast, so that the road appears to pass a gate marked by pylons on either side. Both of these objects were drawn by almost everyone. The road seems to gather speed, pointing at a tangle of traffic lanes below, which convey the sense of a big city, and produce a feeling of doubt, or even concern.

At minute 9, the road enters an exaggerated dip at Charlestown, an unforgettable experience of motion and space occasioned by the intersection at City Square. The road plunges steeply down, directly at a small building which divides the roadway like the cutwater of a boat, then veers left to avoid this building and, at the very bottom, sweeps up and over in an ascending reverse curve to the right. The alignment of the road is strongly reinforced by the little "divider" building, and then by the lofty windowless wall of a warehouse on the left, seen as the road climbs out of the hole and is pressed back to the right. Finally, as the road rolls over the top, it again swings left and toward the city.

This is a strong motion experience, as well as a sharp break in orientation continuity. It caused a rapid increase in the tempo of observation, both verbal and graphic. The key elements in the sequence are drawn repeatedly. More drawings are produced here than at any other time on the trip. The motion experience is strong enough to carry the observer through the break in orientation, and the break itself intensifies the Boston approach, last seen as a general panorama and now, after this momentary hiding, to be entered directly. Coming up the crest, there is a sense of disappointment as before, since the horizon is empty and the expected view of the Charles River does not materialize. But the pace of movement carries the observer beyond the turn, and as the road swings left, he sees Boston for the second time, now close at hand.

At minute 10, still scanning, he is swept under the stub end of a roadway at a higher level, oppressive but exciting. The sketches are typically heavy and black. This ceiling comes over him too fast, before he has been able to adjust to his closeness to the city. There is a sense of darkness, confusion, and strain. Under the girders he sees the base of the Custom House again, and suddenly he slides sideways to the right and rushes toward the gap alongside the massive bulk of the North Station, with the Custom House much enlarged and directly on axis, and the signs flying by overhead. This is a climactic moment. Hardly one sketcher failed to record it.

On bursting through this apparent wall around the central city, the observer again scans the landscape. The objects in view are now all nearby objects; he has arrived. The wide road sags away before him, bending slightly left (like an echo of the hill crossings?). The city behind the wall opens out into a rather formless bowl, whose edges are undistinguished, except for the presence of the Custom House, now shifting right.



The observer's elation gradually ebbs away. He is not at the city center; after all, but in some fringe region. The tempo of attention slows again, though not as drastically as before, since there are a number of interesting objects and signs around him. While verbal comment drops off, the rate of sketching is maintained for some time. If the observer knows Boston, he may regret his inability to see any evidence of the market activity below him, or to sense the presence of the nearby ocean. The bustling market area appears gray and chaotic from the rooftop level; one of the finest harbors on the Atlantic coast is two blocks away but has disappeared without a trace.

Meanwhile, the observer is faced with two off-ramp decisions in rapid succession: the first to Haymarket Square, the second to Dock Square. The tempo of decision, so placid before, has increased alarmingly. The acceleration of this tempo, although perhaps a natural feature of the center, has in this case been extreme.

The Custom House now slips off to the right, sinks behind lower buildings, and becomes visible only fleetingly down the side streets. This major goal, which has been apparent from an early stage of the trip, is now neither decisively reached nor visibly passed by, since the surrounding buildings block off the view as it comes alongside and falls behind. This failure adds to the disappointment of the arrival.

Meanwhile, the road reaches the edge of the open bowl, and pivots sharply to the right around the end of an old mercantile building. Attention is focused momentarily on its brick and stone, and the marks of old stair treads on its end wall. This pivot building not only marks the turn but strengthens its sensation, much as one can swing quickly around when one grasps and pivots on a corner post. The building appears frequently in the drawings.

The road now takes on, for a short time, a new and pleasant motion. Running level, it weaves gently from side to side, passing close by the upper stories of the commercial buildings at the fringe of the office district. This weaving motion, pleasurable in itself, directs the attention now to this and now to that side of the building wall, picking out various features for attention. The closeness of these structures, and the fact that they are already familiar in a different context as seen from the streets below, greatly adds to the interest of the scene. For the moment, one seems to be on tour. The spatial proportions are quite pleasing.

A new "divider" appears, a yellow cutwater, with its sign directing the observer to his exit. The path sweeps down to the right, past a new parking garage which slowly rotates on the left. The tempo gradually slows, and the vehicle sinks down into the dark slotted spaces of the central city. For the last time, the sketchers concur in recording these key features.

Although this exit lacks the satisfaction of a strong terminus to the journey, it has a commendable feature. While most expressway exits are quite sudden and plunge quickly into the confusion of the lower streets, the Fort Hill exit descends straight ahead for some distance. As he gradually enters the heart of the city, the observer has time to adjust himself to the new scale, and to reorient himself. A short, turning ramp often leaves the observer dizzy and adrift.



71 Rhythm and Locus of Attention

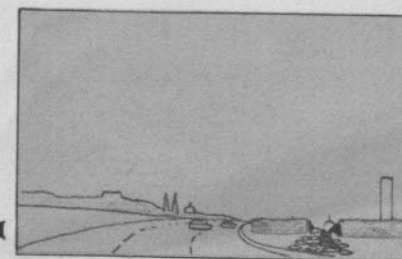
The Trip in Review

Going back over the whole experience, it is interesting to analyze, in a rough quantitative way, the items mentioned in the rapid recording of verbal impressions. Roughly two-thirds of the sightings were directed straight ahead, and only one-third either to right or left. Even in the latter case, almost all things seen were obliquely right or left rather than perpendicular to the line of travel. Vision in motion is apparently strongly focused, even for the passenger.

Two-thirds of the remarks had to do with nearby and apparently moving objects, rather than the potentially larger number of distant, "stable" ones. Almost two-thirds of the impressions were caused by things in or adjacent to the right-of-way. As a result, half of all the comments had to do with things which were in the right-of-way, were near and apparently moving, and were in the central sector of vision. This limited portion of the landscape was disproportionately important as the source of visual material. How these characteristics varied during the trip is illustrated in Figure 71, which shows, in the case of one observer, the timing of his comments and the relative distance and angle of the things to which he refers.

If the total of recorded comments by the two men who studied the road in detail is broken down by subject matter, we can summarize them in the following table:

Number of comments	
Subject matter	
168	Features of the Roadscape Itself:
	signs
	the structure of the road system
	detail and texture of the edge
	traffic
	pavement
128	The Sense of Space and Motion without Other Specific Reference
94	The Meaning of the Surrounding Landscape:
	activity and use
	topography, natural features
	structures at medium distance
81	The Sense of Orientation, Location and Approach
61	Miscellaneous:
	silhouette
	light, weather, and sky
	detail and texture not at the road edge
	plants
	people, etc.
532	Total Comments



The correspondence of these data to the general categories discussed in Chapter 1 may be remarked. Beyond the concentration on the details of the roadscape (in which the signs were particularly important), the fundamental sensation, continuously referred to throughout the trip, was the visual sense of motion and space, including the sense of one's own motion, the apparent motion of surrounding objects, and the shape of the space being moved through.

Attention otherwise centers on orientation (including the sense of approach, the location of major urban and natural features with respect to self, and the noting of distant landmarks), and on reading the meaning of the surrounding landscape: its activities, buildings, and natural features. These four elements—the roadscape proper in detail, the impression of space and motion, the sense of orientation, and the meaning of the landscape being traversed—appeared to be the basic components of this particular highway experience. Our studies of other roads lead us to guess that these same four elements are generally the basis of the highway experience.

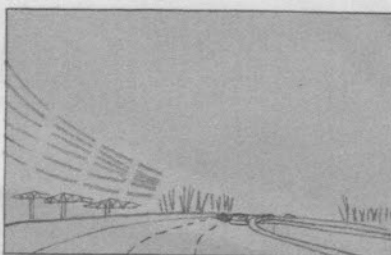
It is difficult to compare the sketches directly with the verbal comments, since parallel categories are not easy to construct. But if we classify all the objects drawn in all the sketches, and compare the frequency of notations in each class with the total number of notations, we can construct the table to the right.

Almost all the groups above the 5 per cent line appear not only with that average frequency, but with rather similar frequencies in most of the individual sketch sequences.

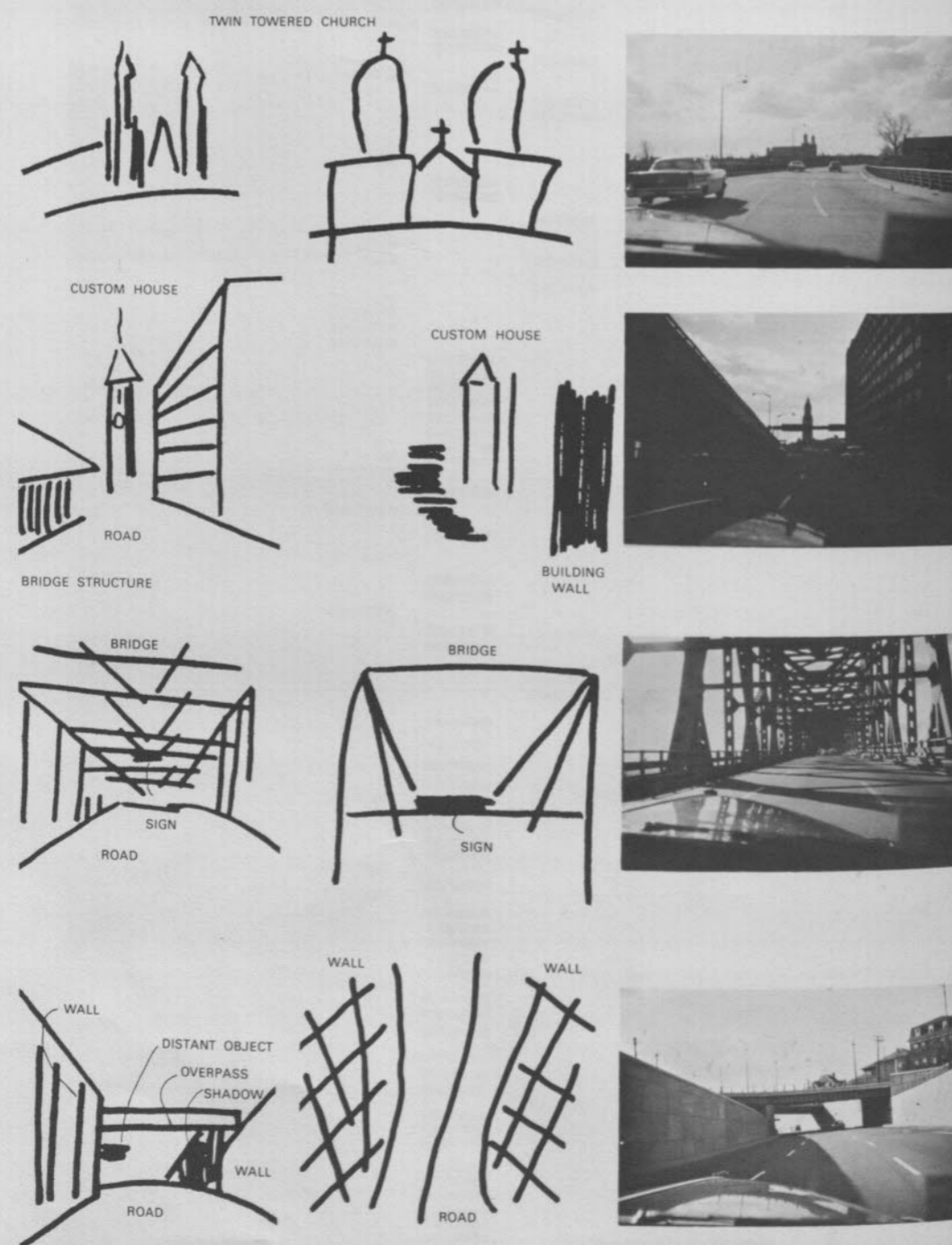
The repeated appearance of the perspective view of the road is especially striking; to achieve the frequency noted in the table, it appears each time in the great majority of the sketches of every observer. The impact of things passing overhead is also notable, as is that of the buildings or other large objects which occur right at the roadside. These last are most often either buildings on the outside of a curve, toward which the eye is directed by the pointing of the car, or buildings which seem to "direct" the course of the road: dividers, pivots, or obstacles visibly avoided by the alignment.

It is also remarkable that the isolated objects which are recorded, whether lamps, chimneys, or towers, are typically vertical objects seen in silhouette. Another striking feature is the importance of objects in axial view as the road comes out of confinement: the water tower, the Seagram's sign, the Custom House tower.

Contrary to expectation, traffic appeared rather seldom in the drawings, and very irregularly. Some observers noted it often, most not at all. Perhaps it was more difficult to note, or the subjects felt that they "weren't supposed" to draw such things. Where it did appear, the view most frequently shown was the rear end of a large truck which tended to block the view. There was substantial traffic on the road, but it was not at a peak. Sketches during the rush hour might have shown more cars.



Number of times objects in class are drawn, as per cent of total objects drawn	Class of objects drawn	
	20-25%	shape of the road ahead
	10-15%	objects overhead large objects at the edge of the road
	5-10%	distant landmarks sense of confinement at the side guardrails, and other edge detail skylines
	2½-5%	signs lampposts traffic hills



72 Skilled

Unskilled Observers

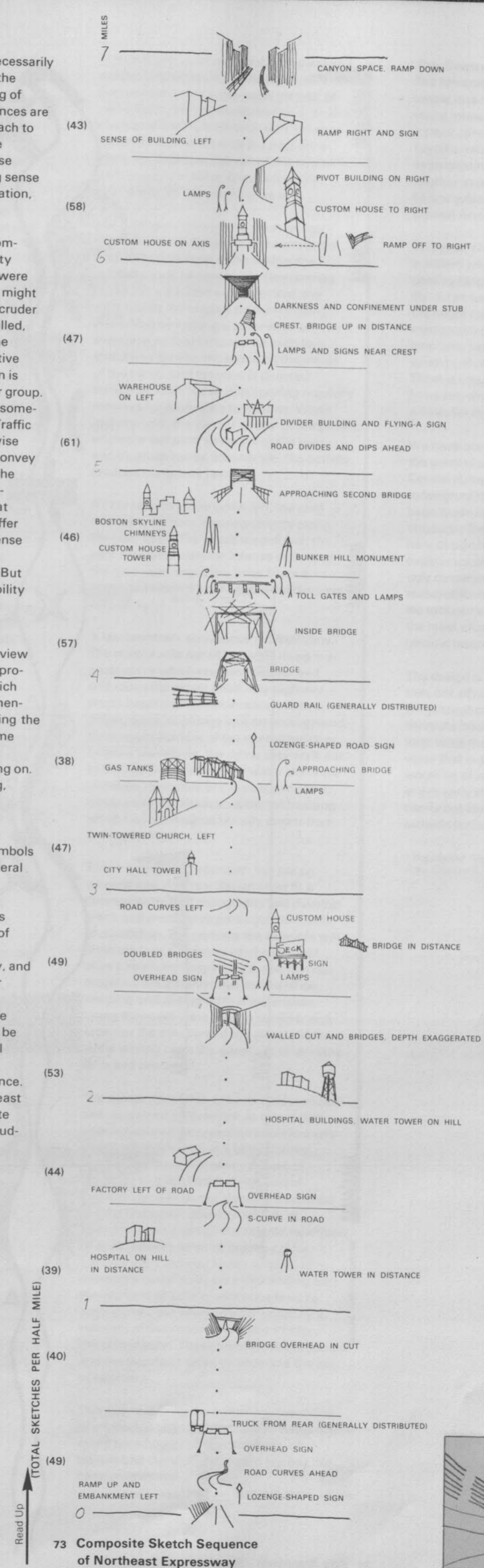
Camera Eye

As far as we can judge, and this is necessarily a very subjective judgment, most of the drawings convey a very strong feeling of motion and sequence. Certain sequences are commonly drawn as such: the approach to the bridge, the dip at City Square, the entry past North Station. Even in these crude drawings, there is also a strong sense of spatial character, of general orientation, and of silhouette.

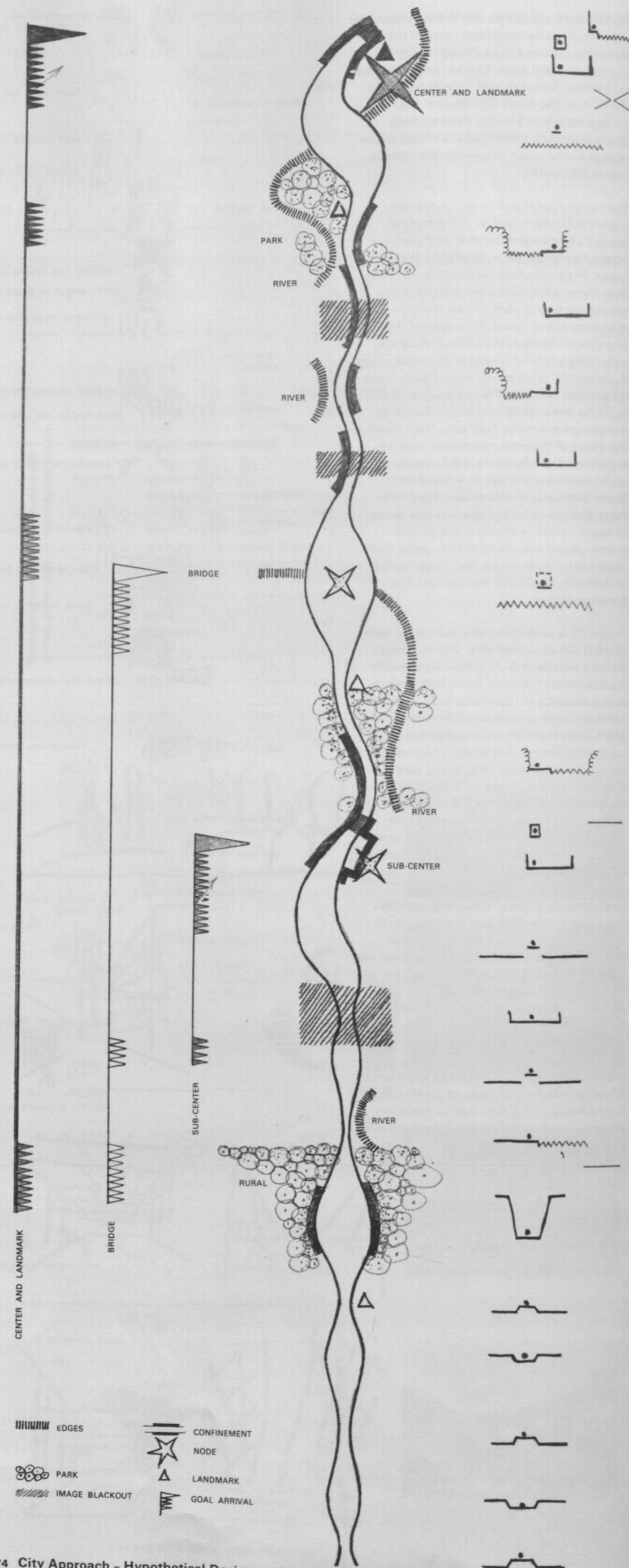
The majority of the sketchers were competent draftsmen, but six of the twenty subjects had no graphic skill, and we were interested to see what difference this might make. Their sketches were obviously cruder than those done by the graphically skilled, showing a lack of ability to connect the elements noted down. But a quantitative analysis of the classes of things shown is surprisingly similar to that of the other group. Buildings at the roadside were drawn somewhat more often, and so were signs. Traffic and hills were rarely recorded. Otherwise the groups are much the same. Both convey the sense of dynamic movement and the importance of silhouette, while the unsophisticated drawings note somewhat fewer elements of orientation. They differ most sharply in the conveyance of a sense of space, which is strong in the skilled drawings and very weak in the others. But most likely this is simply due to an inability to indicate graphically the connections between things.

Figure 73 is something of a composite view of what the sketchers saw; that is, it reproduces a sketch (in a simplified style which approximates the most usual detail) whenever a majority of observers were making the same drawing at approximately the same point. Thus it shows where attention is focused or forced, and what it is focusing on. It does not reflect the tempo of drawing, however, since in some portions many sketches are being made but of diverse objects, and in others few drawings are made but of all the same things. The symbols alongside the sketches indicate the general tempo of drawing.

Undoubtedly, most of these impressions were never considered by the designer of this highway. He was involved with the problems of cost, traffic capacity, safety, and structure. He can hardly be censured for failure to produce a work of art, if this was never his conscious aim. But it is the thesis of this paper that highways could be conscious works of art, that the material is at hand with which to make driving a coherent and delightful esthetic experience. Therefore we have discussed the Northeast Expressway as if it were such a deliberate attempt, analyzing its failures and applauding its successes.



73 Composite Sketch Sequence of Northeast Expressway



4. Methods of Design

If we look at highways as works of art experienced by the driver, what effects of space or sequence might be achieved? As a first illustration, we have constructed an imaginary approach to an imaginary city.

74 This is shown in Figure 74, which illustrates how a simplified analysis of both space-motion and orientation can be shown in one drawing.

A radial highway is directed toward the center of a large city located on the banks of a river. The road will enter the metropolitan area from hilly farmland and will pass by an urban subcenter, approaching the main center along the general line of the river. How might such an approach be organized?

A basic rhythm is established as the road rises and falls over the rolling rural hinterland. In a dip, the highway passes a solitary landmark (building, pylon, gateway, sign) which symbolizes the city and announces a view. The pavement rises to ascend the next ridge, the topographic boundary of the main river system. The road rises high, yet penetrates the ridge in a deep cut, a strong spatial confinement. On the downgrade, framed in the walls of the cut, the driver enjoys a sustained axial view of the city center to which he is going, marked by some tall buildings. He sees a great bridge in the middle distance, which foretells his future course, and he senses the entire city before him.

The road drops to the valley bottom; the distant view disappears. The driver makes contact momentarily with the river, on his right-hand side, and then enters an outlying urban region. From this point, the highway continues to rise and fall, just as it did in the rural area, but now it rises on artificial elevated structures.

At the next rise, the driver sees the bridge again in the middle distance, while the subcenter appears close at hand. The road sinks; he loses sight of all but local detail, while activity builds up. When his vehicle rises once more, the driver finds the subcenter immediately before him. He descends into it in a sweeping turn, entering an urban space where activity reaches an initial peak of visual interest.

The road shoots through a short tunnel and suddenly emerges in a park, which recalls the rural land of the approach. Instead of rising again, the approach rhythm is picked up by a sweeping horizontal turn, bringing the driver into touch with the river once more. He begins to rise out of this riverside park, passing another landmark which symbolizes an approaching view.

The road goes up onto the great bridge which has been foreseen, and crosses the river. From the crest of the bridge, the central core is in view again. Descending to the flat urbanized valley bottom, the road recalls the original rhythm of rising and falling by making a succession of sweeping horizontal turns. At each turn, structures confine the space on the inside of the curve, and the view is directed outwards. Thus the spatial opening regularly reverses from one side to another. When looking right, the view is of city development, while the leftward views are of the river and its green banks. Meanwhile, the activity gradient continues to rise.

At the second curve to the left, the road re-enters the park, running directly along the river itself. The space is confined; the park contrasts with the intense activity of the road; and above the trees floats a truncated view of a tall central building, now very close.

A last landmark announces the final view. The road breaks out of the park, rising in a great curve which crosses the river and embraces the center itself. The highway drops down through an intensely active urban space, to plunge into an underground terminus at the foot of the central building. Leaving his vehicle, the driver may walk out to the riverbank, where the water skirts the intensive inner core of the central district, close under the shadow of the tall building which has symbolized the city center from the beginning.

This is a simplified situation, but not an unusual one. Any real design must fit a detailed pattern of topography and development, and must serve particular demands of circulation. But perhaps the example will illustrate that a highway can be thought of as a sequential experience, and that our diagrams are a convenient means of expressing and designing that experience. Using them, we were able to consider and organize the structure of the moving view, while leaving open the questions of detailed form and character.

The design illustrates a few simple possibilities: sustained progression to a final goal interwoven with approaches to preliminary goals; establishment of a basic rhythm, transmuted but not broken; the use of elevation to give distant views, and of curves to give sideways views; the contrast of rural and urban development, or of open and closed space; the regular repetition of such features as contact with a river, announcing a view by a prior symbol, or entering a nodal point via a descending turn; the gradient of activity which leads up to each climax, but which is interrupted by a moment of hesitation or suspense before the culmination. These techniques of contrast and development serve to underline the act of approach.

This example is no more than an illustration of method. It lacks real content and neglects many possibilities of light and form, of texture and detail. The outward trip has not been considered.

The Central Artery, Boston

The foregoing, as a purely hypothetical example, has neither the problems nor the visual interest of a real case. To present a more concrete illustration, and to explore specific methods and problems, let us turn to an existing situation. We proceed to make another imaginary design, but this time it will be one which is based on Boston's proposed Central Artery.

This artery is an inner-ring road of expressway standard which will encircle central Boston, coming tangentially to the central business district at one point, and which will receive the major radial expressways draining the metropolitan area. Although part of this inner ring has now been constructed, the location of other parts is controversial. There is one published route for this artery, however, which has been the route used as a basis for our analysis.*

We have accepted the basic concept and the general pattern and function of the Central Artery, but have relocated and redesigned it as if no investment had yet been made in plans, land acquisition, or construction. The criterion governing this imaginary design has been the visual, esthetic experience of those driving on the road. The only constraint imposed was that of general reasonableness as to cost and traffic function. No attempt was made to find the cheapest or the most efficient layout, above this level of general reasonableness.

The design is therefore a theoretical construction, not advanced as something better than the present official proposal, but used to illustrate how roads might be shaped if visual form were the dominant criterion. It is obvious that in actual practice other criteria would be of equal or greater importance. But in this early stage of development we can clarify our ideas best by emphasizing the esthetic factor.

*The Master Highway Plan for the Boston Metropolitan Area, Charles A. Maguire and Assoc., Boston, 1948.

The Boston Image

Our first step was to put down the basic organization of the central city, as it can be grasped through land-use maps, topographic maps, area photographs, and general experience. This pattern of organization was

75 charted on a map (Figure 75).

The original settlement of Boston was on a peninsula at the mouths of the Charles and Mystic Rivers, which form a good harbor as they run into a combined estuary. The peninsula was made up of several hills, fringed by tidal flats and connected by a narrow neck with the mainland. In time, the hills were leveled, the tidelands reclaimed, and the neck greatly enlarged. The harbor now reaches up the Mystic River, while the Charles River has been dammed to make an ornamental basin.

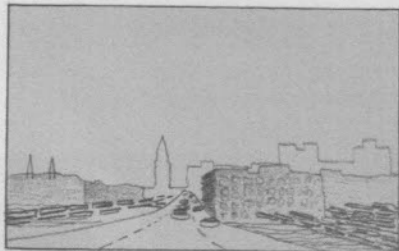
The downtown area has expanded and developed into several districts of diverse activity. Shopping has grown down Washington and Tremont Streets, pivoting around the Common and up Boylston to Copley Square, the higher-quality shopping center. The financial district still centers on State Street and Post Office Square, while a new business center is growing up around Copley Square.

To the State House and Court House on Beacon Hill will be added new city, state, and federal buildings to form a government center running from Beacon Hill down to Dock Square. Cultural activities have become focused in the Huntington Avenue and Copley Square areas. A new cluster of office buildings is planned on the railroad yards just west of Copley Square.

The old street system radiates out from the original hub; the majority of the radials fan out along the old neck, while a few cross the Charles and the inner harbor on bridges and in tunnels. The railroad lines converge on two termini at the north and south, the southern lines slashing across the neck in an awkward diagonal line. Just to the north, across the inner harbor, lies Logan International Airport. On this pattern of circulation is now being imposed still another element, the new expressway system.

How well is this organization perceived by the inhabitants of the city? From the air the form of a city might express its function in a relatively clear way, but on the ground, where it is seen and experienced by the people who use it, the city may make a very confused image in their minds. The nature of this image was deduced from the results of interviews made in connection with another project.*

* Reported in: *The Image of the City*, op. cit.



A selected group of Boston residents were asked to indicate their knowledge of the layout of the central peninsula, and from these interviews a composite map of the commonly remembered parts of the city was made (Figure 76). These surveys were conducted on a limited scale, using a small group of people and covering only the central part of our area. But the results have been confirmed in other ways. The charting of such a map provides very useful information, for one primary aim of this highway design is to repair and reinforce this city image and to orient the driver to it. Among the weaknesses of this image, the following stand out as the most significant:

1. The location of water in the city is confusing. The Charles River is lost soon after it has flowed past the Longfellow Bridge, because it is interrupted by the Charles River Dam and various road and railroad crossings. The water surface is sliced up into so many fragments that it disappears as a continuous visual form. The Fort Hill Channel on the South Bay suffers from a similar disruption.

The unknown origin of the Mystic River in the industrial flatlands behind Charlestown is also puzzling, and even the harbor itself is so cut off from the main traffic streams that its shape and presence is perpetually elusive. Boston is a port, and yet many people never see the sea, even though it is within a short distance of the downtown area.

2. The hub or radial pattern of downtown Boston, with its irregularly converging routes, is another source of disorientation. There is no clear compass direction, so that people use other more local elements in finding their way. These characteristics will be troublesome for a ring road.

3. Several parts of the central city are invisible from the official expressway route: Scollay Square, Tremont and Washington Streets, the Boston Common, Boylston Street. These four lack integral landmarks which are visible from the "outside."

4. The bend in the axis of the central district at the Common presents its own orientation difficulty. The loosely clustered cultural center of Huntington Avenue and the Fenway lacks landmarks or clear connections to the rest of the city.

5. Inner-ring "grayness" is a characteristic of almost every American city. The central core is recognizable, familiar, and often dramatic, but the surroundings are featureless and unknown. Thus, although the low hills of Roxbury, Somerville, East and South Boston surround the central peninsula, they are not very tall, and their landmarks—local churches and town halls—are seldom seen from the building-enclosed streets. Skyline views are infrequent in Boston, with the exception of those seen from the Charles River Basin.

6. Almost the whole south side of the peninsula fades away in the image, for this is an area of transition, of extensive railroad yards, of old and new industry—a region of formlessness, scattered objects, and ragged enclosure. From ground level there seems to be no order beyond that of the downtown landmarks in the distance, and the glimpse of the hill of South Boston by the sea. Only from the air or from high up off the ground can the lines and directions of the railroad tracks be understood. The lack of visual connection between the north and south side of the peninsula constitutes a further problem.

The strength of an image in the minds of city dwellers depends on three things: its visual impact, its functional or symbolic meaning, and whether anyone is there to see it. A dramatic but relatively meaningless advertising sign may be impressive, or a relatively small but significant church spire may be remembered. But both have to be within the visual reach of a sufficient number of people. The dock area in Boston, for instance, is both visually exciting and symbolically important, yet it is blocked off from the main viewing points, remaining blank on the image map.

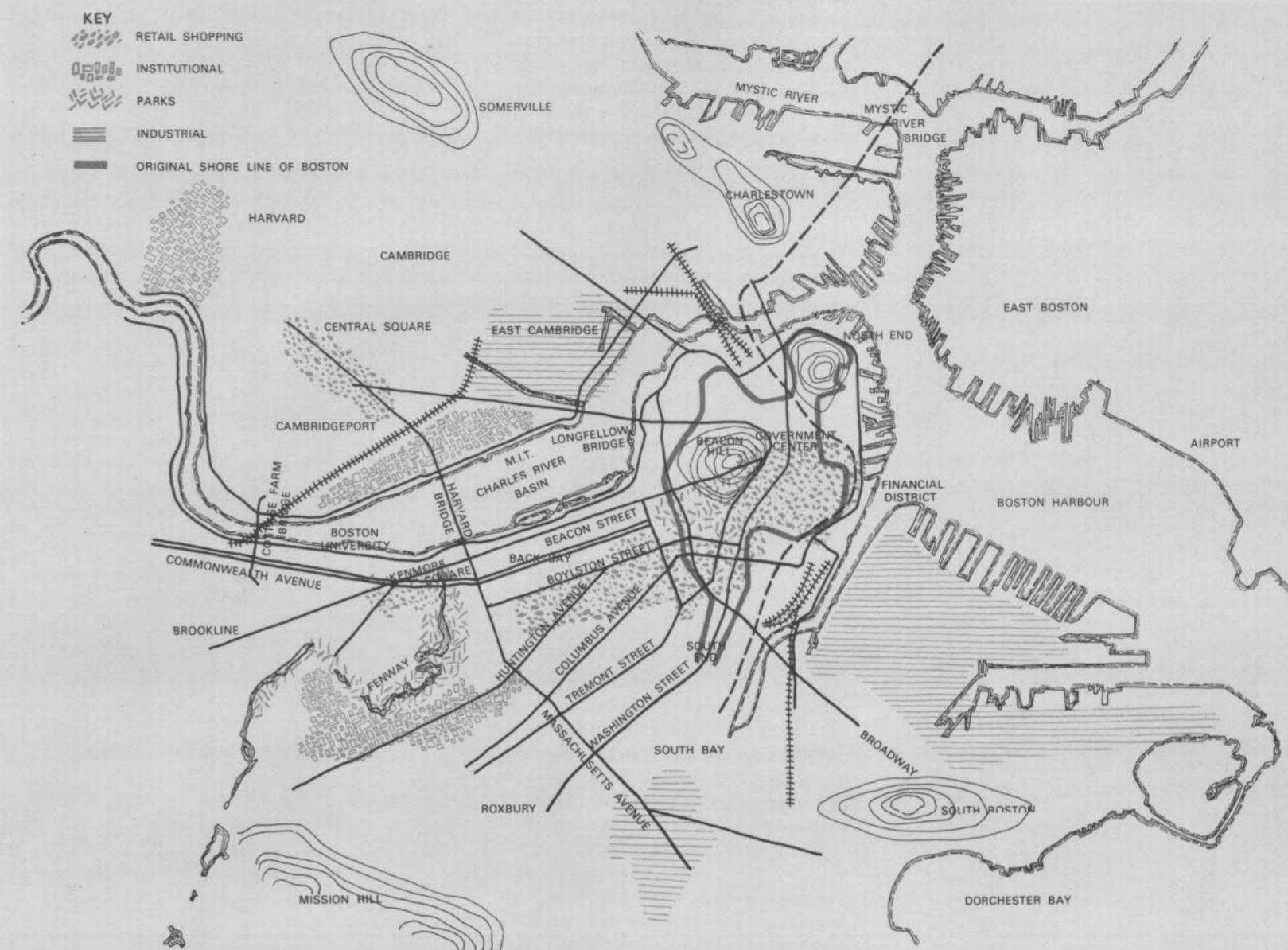
Some of the visual potentialities of Boston can also be listed:

1. From the air and on a plan, the layout of the central peninsula, surrounded by water, and even the radial street layout seem very clear. This order may at present be very difficult to decipher on the ground, but at the scale of an expressway this could be resolved.

2. The presence of large open spaces around the central peninsula—the Charles River, the harbor, and even the large tracts of the railroad yards outside North and South Stations—maintains a sense of free space around the center where one can stand back and look at the city.

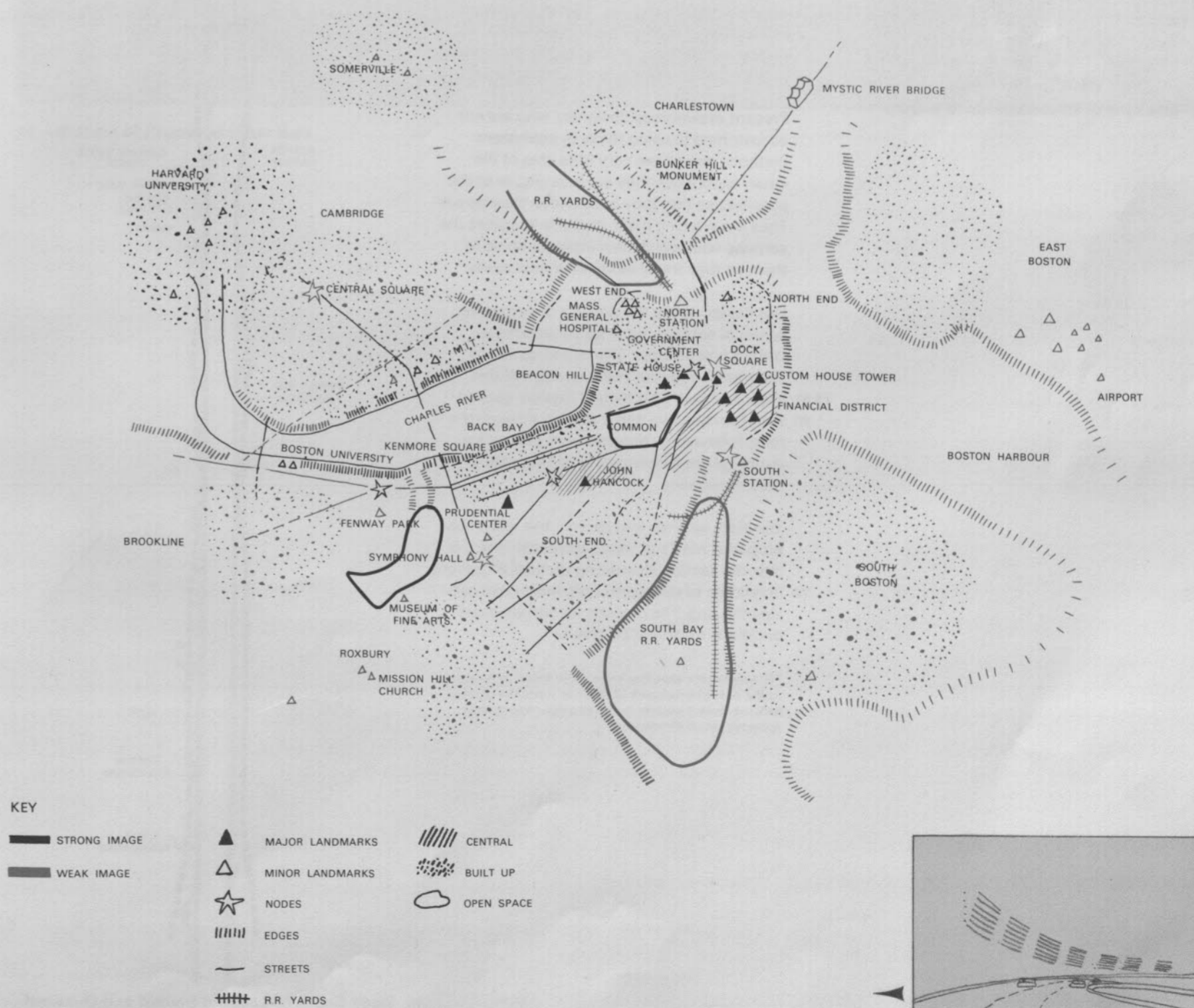
3. The surrounding hills indicate specific locales, with their town halls as in Somerville, or churches as in Charlestown, South Boston, and Mission Hill. These landmarks, which greatly increase the apparent height of the hills, could be much better appreciated if the road were built high enough to look over the rooftops.

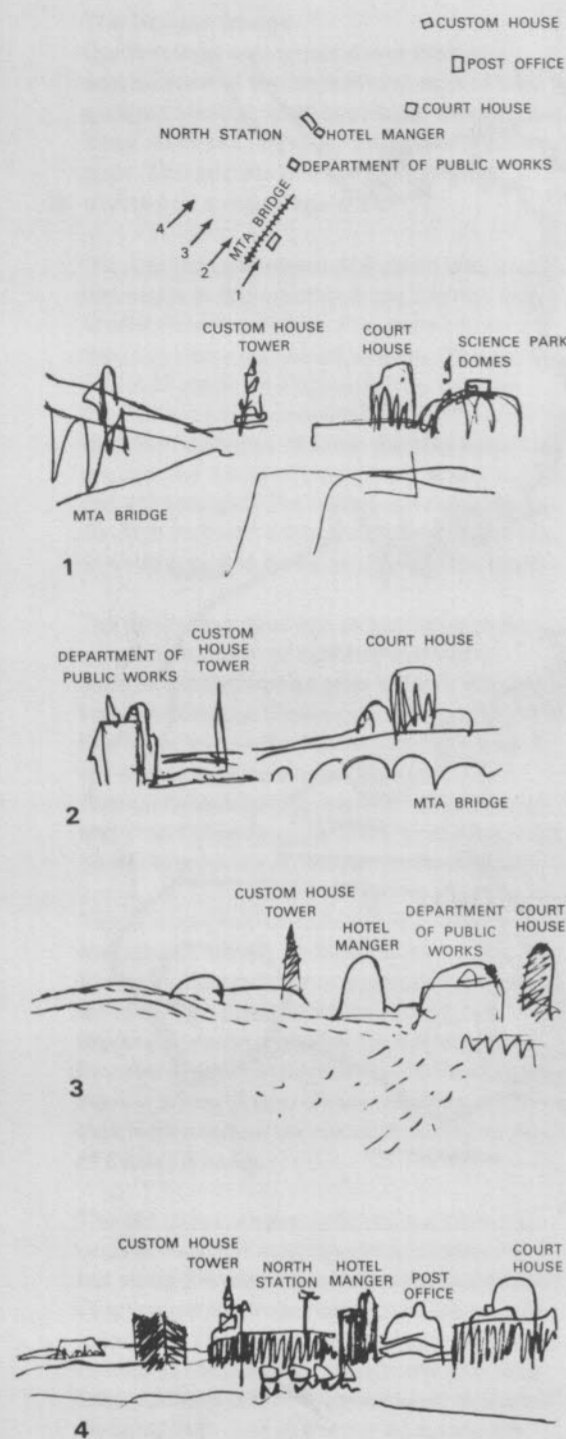
4. The downtown districts are varied and have distinctive landmarks: the Government Center with the State House and the Court House; the financial district with its high buildings; the new office center which is to contain a fifty-story tower over half again as high as the already overpowering John Hancock Building. Each of these clusters of landmarks is quite different in character, possibly excepting the confusion between the Court House and other office buildings. Although very much out of scale with Boston as it stands today, the proposed new office center (the Prudential Insurance Company development) will nevertheless provide, together with the John Hancock Building as the other pole, a clear axis down the peninsula, which will tell travelers how they are oriented to downtown. The square plan of the proposed tower, however, may cause some confusion when the building is seen alone, since every side will appear the same.



75 Map of Structure of Boston

76 Existing Image of Boston





77 Example of Reconnaissance Sketch

Design Procedure

Detailed explorations were made along the general alignment of the officially proposed route, to study the character of the districts passed through, the possible landmarks, nodes, vistas, etc. Excursions were made off the route to gain an idea of possible alternative locations. Important views of the city were also studied. Skyline relationships between different landmarks were noted from

77 different positions and different heights.* The coincidence and overlapping of landmarks give certain viewpoints a more concentrated importance than others. Thus the view from the Cottage Farm Bridge, which takes in the towers of the financial district, the State House on Beacon Hill, and the Charles River in front of all, sums up a great part of central Boston in one glance. This view would be seized upon as a basic reference point.

The form of the city has to be seen from different viewpoints, from different heights, and even from different speeds, so that the range of possibilities can be grasped before choices are made. The designer must place himself in the position of a motorist traveling along a road that isn't there. He imagines buildings cleared away and new buildings where none now exist. He pictures the future form of the road in front of him, placing himself high up in the air. A helicopter would be of great use, while some sort of mobile extension ladder might also be helpful. This particular survey was carried out by climbing buildings of different heights.

The static view is also very different from the moving one, and sometimes a study from a moving vehicle is more useful, even if not in the precise projected location. Other techniques can be used in addition to direct field reconnaissance: a visual recording of alternative routes taken through a carefully made scale model, the layout of routes on oblique aerial or ground photos taken from different angles, or the study of possibilities by means of the notation developed in Chapter 2.

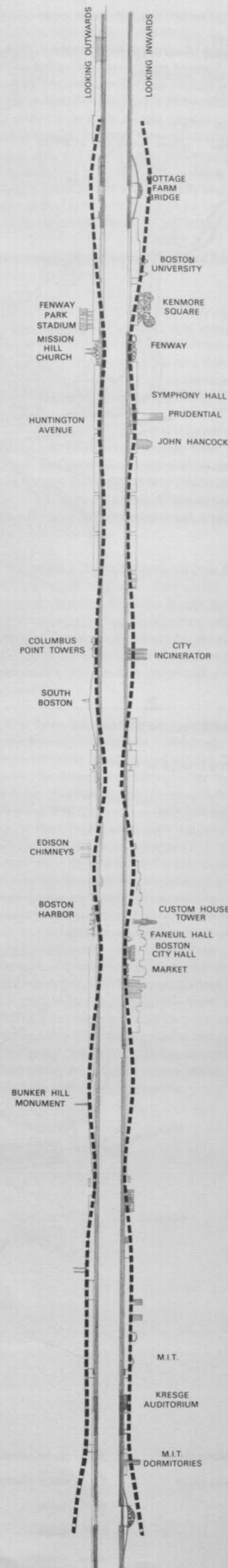
Present expressway designers who are not accustomed to using these or equivalent methods must have very little idea of the visual experience they are creating, or of the possibilities that they have within their power. They are working blind, and one imagines the surprise with which new vistas open up to them as they travel along their new roads.

Our design, while the product of extensive personal surveys, must be considered a limited first attempt. The drawings which illustrate it begin with the location of the

79.81 proposed road on a map of Boston, plus an
80 aerial perspective and a section through the road, followed by progressively subjective drawings interpreting different aspects of the road experience.

The plan, section, and perspective show the proposed road's physical relationship to the city, the section illustrating vertical alignment
78 in relation to structures both inside and outside the ring. The reasons for certain basic decisions must first be given.

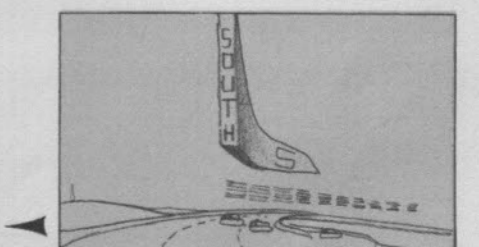
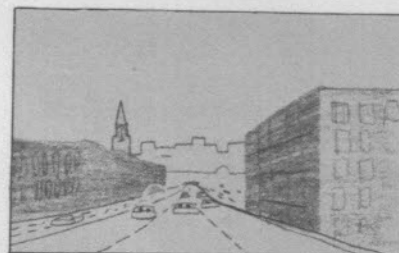
* Diagrammatic sketches were often found to be more useful than photographs of skylines, since the camera reduces distant objects out of all proportion to their apparent visual dimensions.



78 Road Sections Looking Inward and Outward

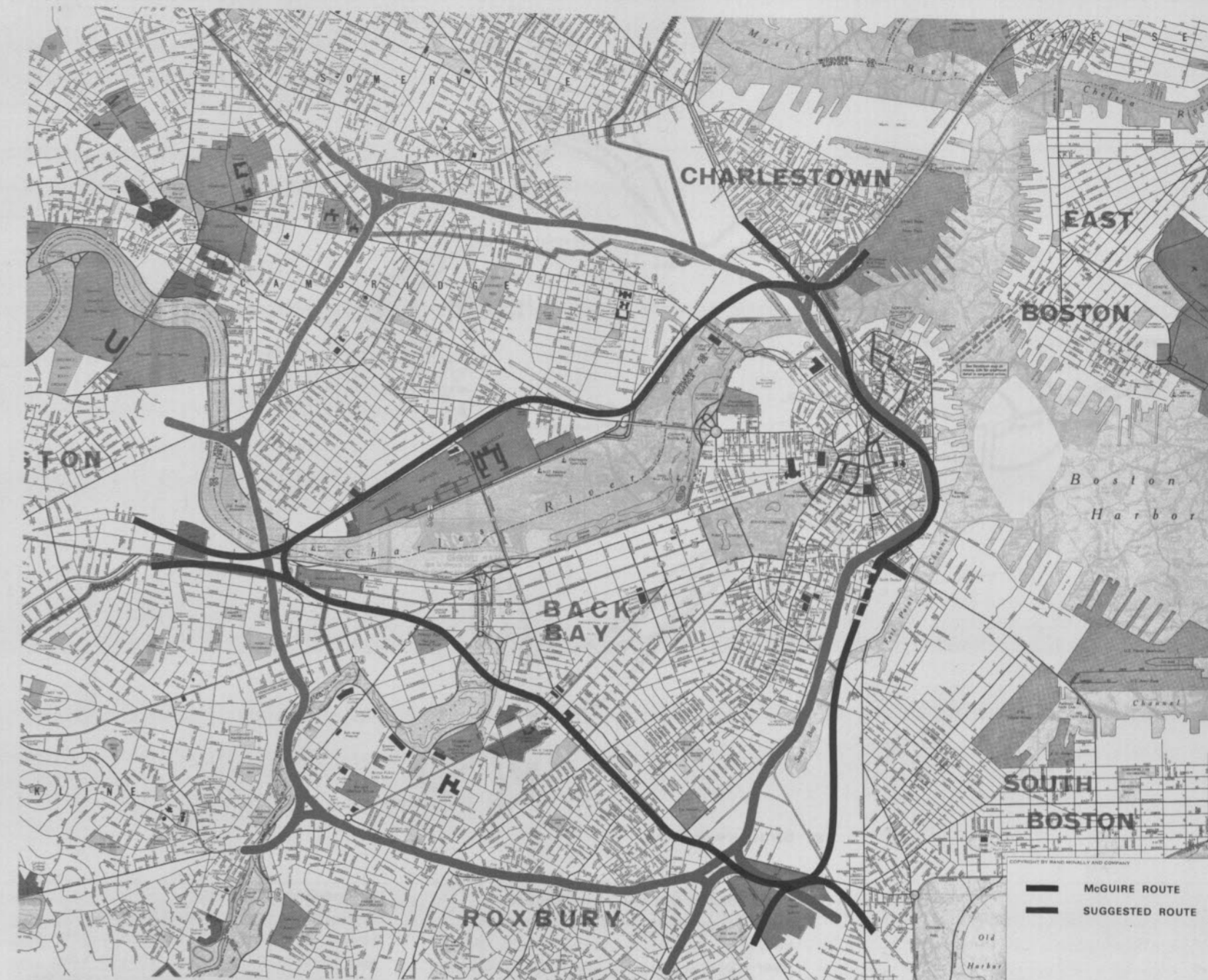
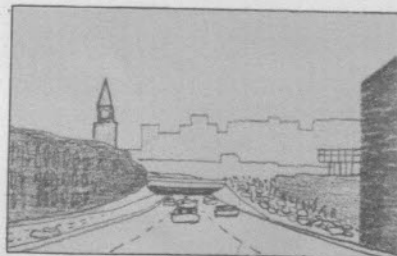


79 Location of Proposed Inner Belt





80 Bird's Eye Perspective



81 Comparison of Proposed Route with Official Route

The Size and Eccentricity of the Ring

The first noticeable difference between this proposal and the official scheme is that our location encloses the city in a tighter ring. The official route suffers grave disadvantages in its western portion, since it travels low through residential areas and is consequently "lost." The alternatives are either to take the road further out onto the slopes and along the summits of Boston's surrounding hills or to bring it closer in.

Unfortunately, the structure of Boston would not be so comprehensible from those hills as it might appear. The confused path structure, the dense foreground development, and the lack of any really high viewing points result in oblique views of the city which are indecipherable at the speed of the motorcar. In this case, a carefully told sequence may be clearer than an over-all view.

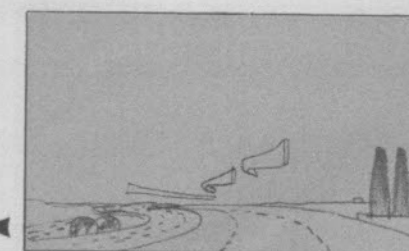
There are advantages in taking the road extremely close to the center: close contact is always exciting. Unfortunately, it is not always comprehensible; expressway speeds require that a certain distance be held between road and city if the sense of that city is to be communicated. The ring has therefore been tightened, in comparison with the official line, just enough to allow each part of the road to be within proper viewing distance of the center city. At the same time, eccentricity has been maintained, allowing the eastern part to run close to the center. An equidistant ring would be monotonous, an experience of unvarying impact, and lacking in the sense of arrival at a goal.*

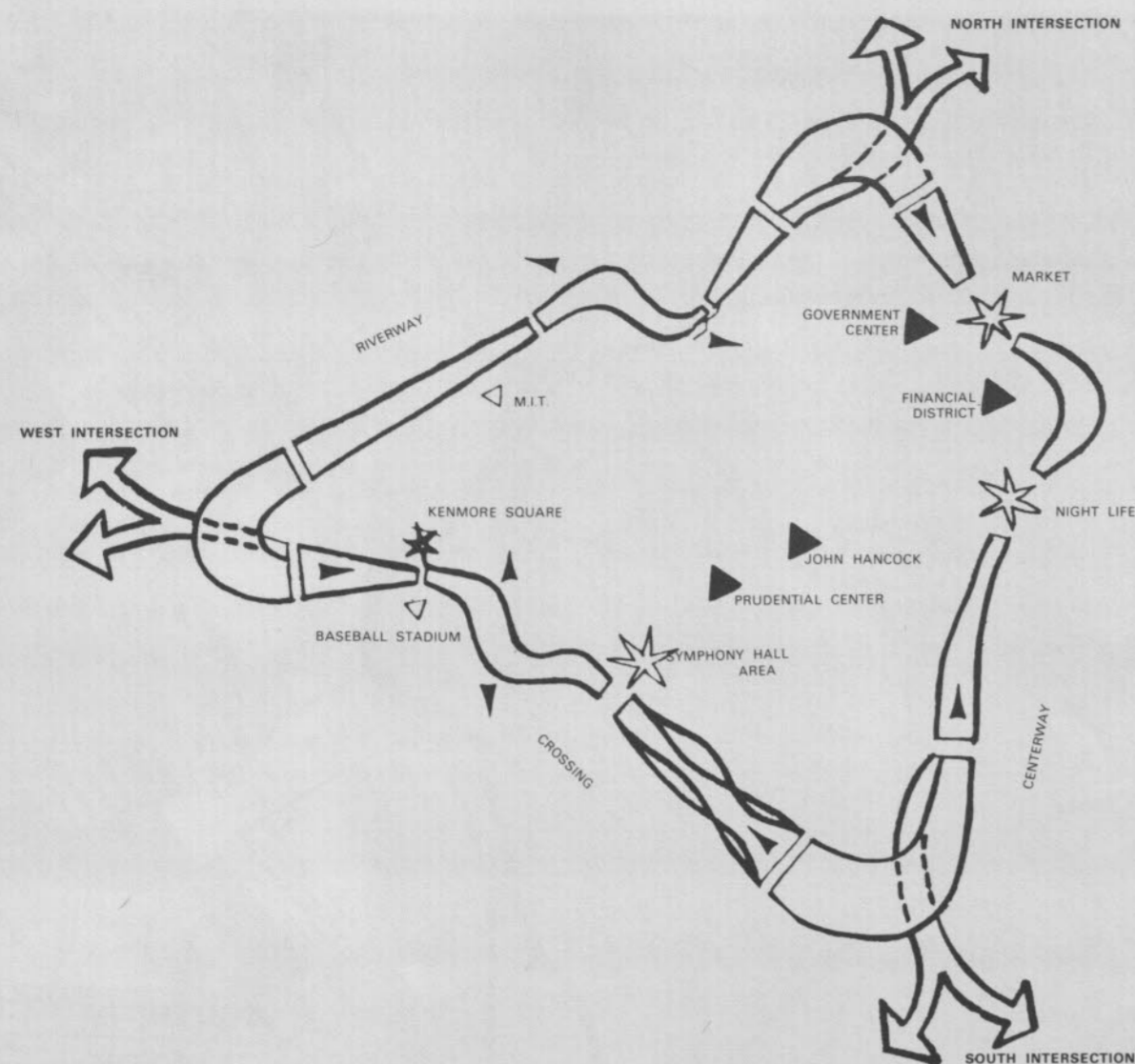
*It is true that if the ring were enlarged on the east, if the road leaped over the harbor entrance on a great bridge, a magnificent panorama of the city from across the water would be opened up. In this case, we are restrained by the excessive cost, and questionable function, of such a location.

Orientation of the Road System

A circular road presents a difficult problem in orientation. The radials under the official scheme enter the belt at many different points and would be very troubling to hold in mind. This is solved here by gathering these radials together at three key points on the ring road, the points representing the directions north, south, and west. The bulge on the eastern side contacts the sea, with off-ramps at Sumner Tunnel to cross the harbor.

82 The ring road now becomes a triangle rather than a circle, with a large three-way intersection at each apex. It would now be possible to grasp the general direction of the radials: those going north leave from the northernmost point, and so on. (In the official plan, Route 2 traveling west joins and leaves the belt at the northernmost point.) The clustering of radials into three groups of two would simplify decision making: instead of choosing one out of six exits, the driver would choose one out of three. The problem of the urban expressway is to reduce the number of decisions that have to be made at high speed in heavy traffic, rather than to avoid boredom, as on many rural roads. For anyone crossing the center city, it would be necessary to negotiate only one leg of the triangle. Each leg would have its own recognizable character: the section passing through Cambridge we shall call the Riverway; the one which sweeps around the city center, the Centerway; and the third leg, which returns across the old peninsula, the Crossing.





82 Structure of Trip

The Fixing of the Main Intersections

The location of the intersections becomes very important in this type of scheme. The river-crossing at the Cottage Farm Bridge has been chosen as the western apex of the triangle. There is already a definite break here in the continuity of the river. If a new bridge were built elsewhere, the Charles River would be so broken up into small stretches of water that its breadth and continuity would be lost. Moreover, from the Cottage Farm Bridge the river widens into the Basin, to provide one of the finest long views of the city skyline. The north and south intersections are located in the railroad yards outside North and South Stations, open areas where there is space for the construction of large intersections commanding good views. The harbor is the climax of the Centerway and might be considered as a symbolic eastern intersection, were there roads that went out to sea.

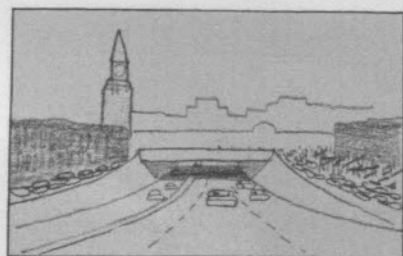
Orientation to the City

The new ring road is related to the city in several ways, so that an incoming traveler will recognize and comprehend what he is approaching. The city core stretches northeast-southwest from the old harbor on the Centerway to the midpoint of the Crossing, at Symphony Hall. There is a bend in this linear core, as noted above, but the Prudential-John Hancock section parallels the Riverway. So there are two poles about which the route runs: the older and the newer centers. The driver is always approaching some sort of goal, for no sooner has he passed through the downtown area at the eastern end than he is moving out and along towards the Prudential-John Hancock pole at the western end. The approximate nature of these directions is perfectly adequate, since a motorist cannot gauge exact angles.

The Riverway and the Centerway emphasize the form of the peninsula; the Crossing confines it at its neck. This effect would be strengthened if the "buried" southern edge of the peninsula were more sharply demarcated by means of open land or the control of building bulk.

Two of the large intersections have been located in the railroad yards, where there will be no disruption of the street and block system. The third intersection is also freed from the street pattern by being placed over the river. Wherever possible, the legs run with the "grain" of the local structure.

The detailed bearings of the road have been chosen to direct the traveler's eye to certain aspects of the central area. For example, it is arranged so that he can separate and identify different groups of landmarks, since he sees each one separately at a certain point on his trip. In this way, a more analytical approach is made to the city, while the relation between parts is maintained by general views and overlapping shots. Greatest reliance must be put on relatively stable features: major activity concentrations, growth directions, basic circulation, topographic form, or key historic symbols.



At the same time, views are directed to the more important landmarks outside the central area, so that the motorist can locate himself with regard to the exterior, which will be a help when searching for the desired radial to get out of the city. Thus, the Harvard University towers, Somerville's City Hall, the Bunker Hill Monument in Charlestown, the airport and the harbor, the hill of South Boston, and the Mission Hill Church in Roxbury are built up as important external landmarks.

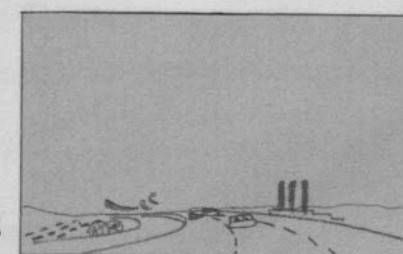
The characteristics of each leg of the road should be considered separately, since much traffic will probably use only one of the legs at a time. Each stretch of the road has also been designed twice: a sequence for the travelers moving in each direction, although these experiences have been related.*

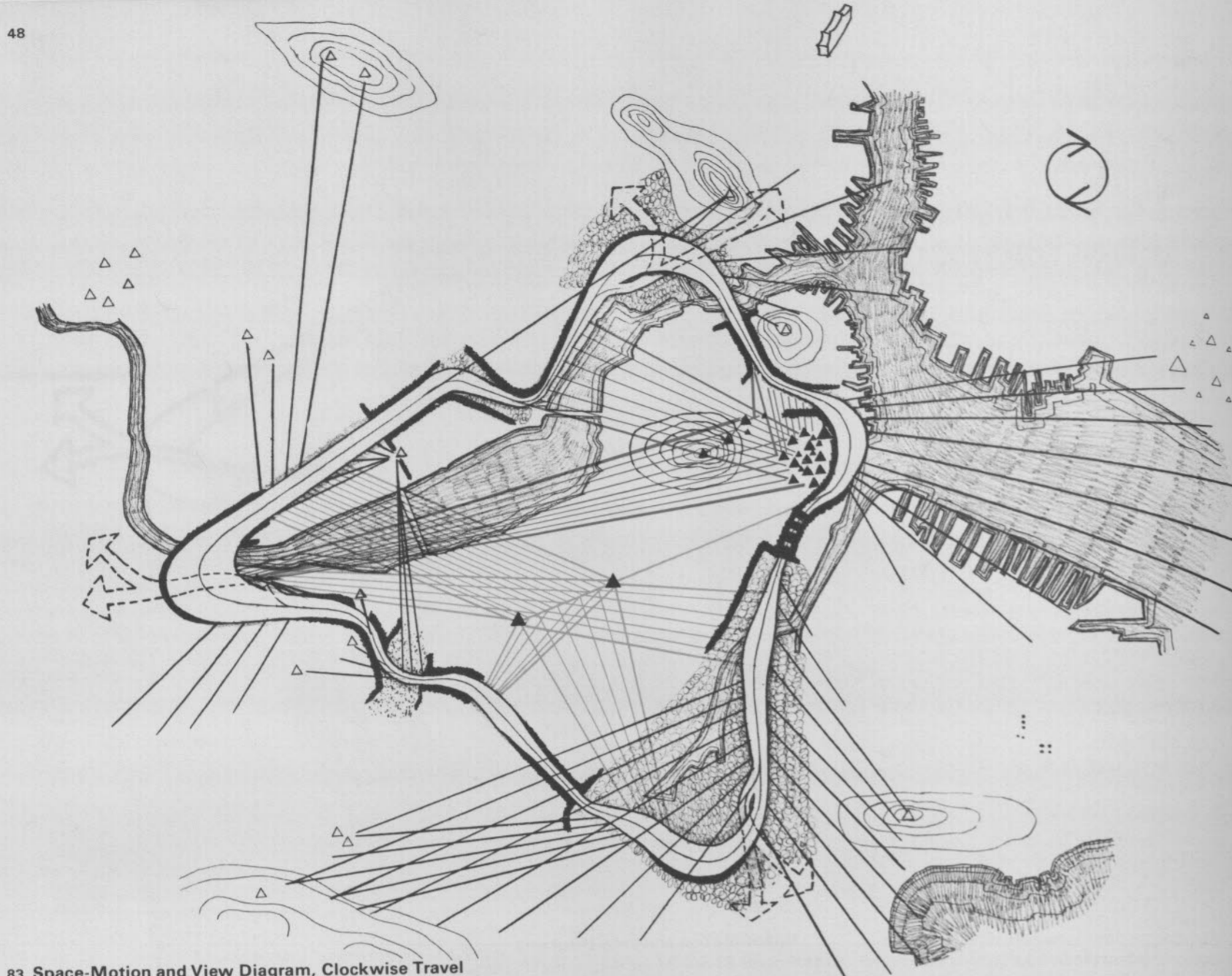
*The lanes have been split at certain points, but only in the vertical dimension. Splitting horizontally was considered, but the restricted nature of the areas being passed through, with their relatively small scale, seemed to suggest that this would only cause more confusion.

Space-Motion and View Diagrams

Figures 83 and 84 are diagrams of the sense of motion and space produced by the road, as it would be experienced when travelling in the two opposing directions. From these diagrams the different aspects of the three legs can be seen: the Riverway with its kink, the Centerway with its bulge, and the Crossing with its close confinement. This space-motion combination tends to direct the eye, and when the intended views are linked up to the objects seen, a more complete idea of the experience is given. Views are seldom seen at specific points, but can be seen over a certain stretch of road. At what part of the stretch the object will be seen cannot necessarily be predicted. For this reason a series of sight lines issues from the road along the stretch within which a particular object will probably be seen. Furthermore, when the view to be seen is a panoramic one—the harbor, for example, rather than a specific landmark—the view lines radiate over the whole area.

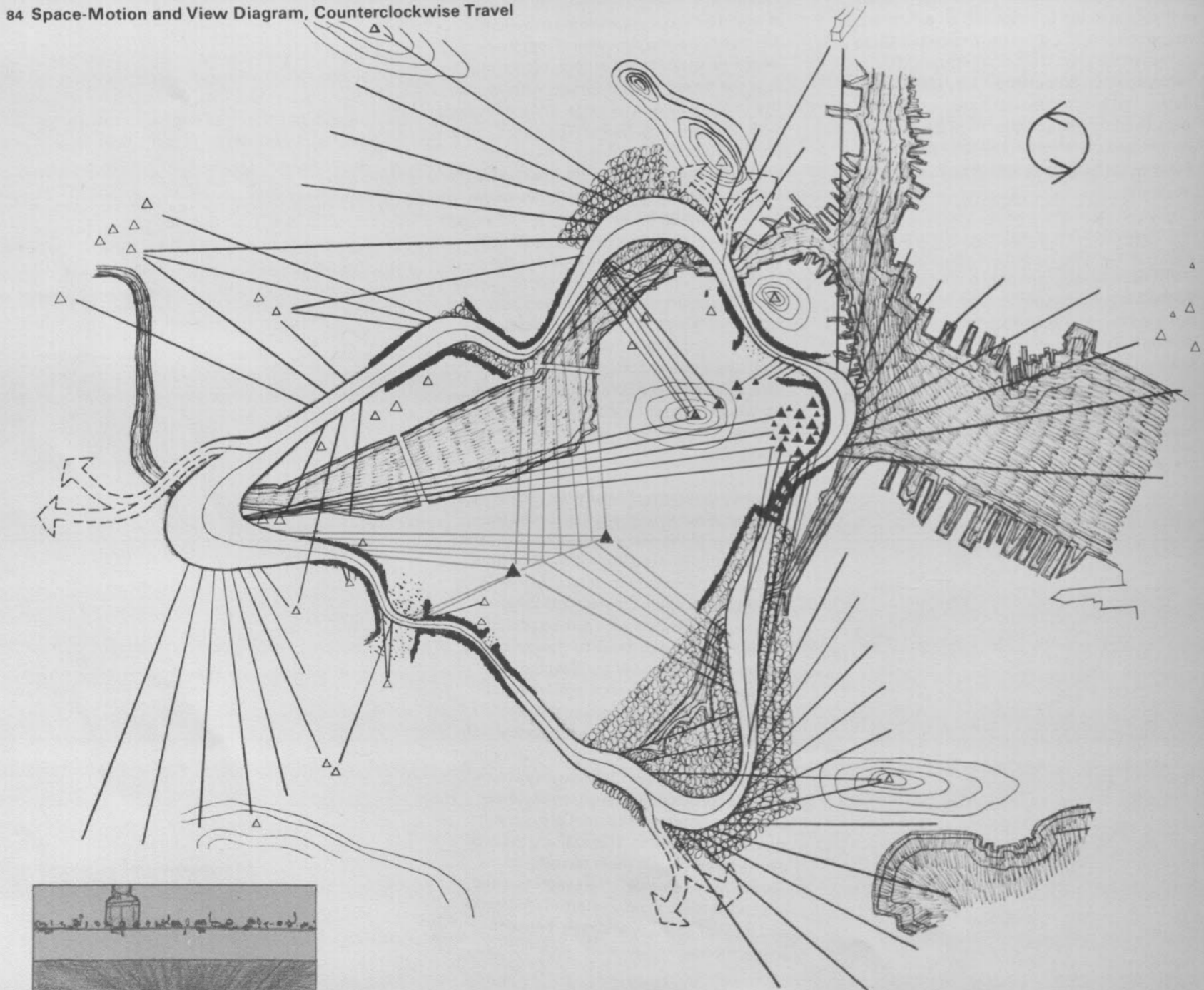
The two diagrams of clockwise and counter-clockwise movement emphasize the separateness of the two experiences. The same objects may be seen but will be seen from other directions, and therefore they will look different and relate differently to other landmarks. The two main groups of landmarks—on the one hand, the towers of the financial district and of the Government Center (which also mark the Washington Street shopping area), and on the other, the Prudential-John Hancock towers which mark Copley Square and the Boylston Street shopping—are drawn in distinctive colors. If this route is followed with the sketches and commentary, the pattern of experience should become clear. This drawing in particular explains the alternate focusing on "inside" and "outside," the separation and relating of these main clusters of landmarks, and most of all the relationship between space, motion, and view.





83 Space-Motion and View Diagram, Clockwise Travel

84 Space-Motion and View Diagram, Counterclockwise Travel



The Riverway

The Riverway has been consciously related to the Charles River. At the West Intersection, the road crosses the river at right angles, about 80 feet in the air over the existing Cottage Farm Bridge, and comes out of the intersection behind M.I.T. at rooftop level. This first part lies parallel to the river, allowing general views of Cambridge, the John Hancock Building, and the Prudential Center. Passing around M.I.T., it then goes briefly into the confinement of the East Cambridge industrial area before turning down the old canal line towards the State House, the Court House, the Government Center, and the Longfellow Bridge, one of the historic entries into the city. The third stretch travels right along the river's edge, then up and over the MTA bridge, past the Museum of Science and the Charles River Dam, restoring continuity to the river by linking up the views of the water.

The North Intersection is situated in the railroad yards. The road turns around in front of Charlestown, with views of the Bunker Hill Monument, the Mystic River Bridge, and the harbor in that order, and on the inside with a rotating view of downtown. The road turns slowly to the right, into line with the financial district.

Following this same leg in the opposite direction, the traveler starts high at the North Intersection, with views out to Somerville and East Cambridge across the railroad yards. The first straight stretch down to and along the river gives Prudential and John Hancock a good exposure, with back glances at downtown and the State House, before the road sinks to water level near the Longfellow Bridge. The bridge is seen in profile this time, before the road curves up through an industrial area to give a second view of Cambridge: the City Hall, Central Square, and the towers of Harvard University. The stretch alongside M.I.T. is without strong incident, except for the local interest of the Institute buildings. This section simply follows the river at a distance of a few hundred yards and allows time for panoramic views of Cambridge and parts of the Crossing. It is not necessary to follow along the very banks to maintain a feeling of contact with a river. The different relationships that the road has with the river along this leg will tell much more about the nature of the river than would a road that merely parallels it.

The central kink in this leg enables sideways or broadside viewing of important landmarks, principally that of the State House, which acts as the climax for the eastward-moving traveler. The whole road is tipped towards downtown, as the outer lane is raised above the inner lane at the intersections and curves. The confined center section serves to contrast and hold together the two outer stretches.

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The central kink in this leg enables sideways or broadside viewing of important landmarks, principally that of the State House, which acts as the climax for the eastward-moving traveler. The whole road is tipped towards downtown, as the outer lane is raised above the inner lane at the intersections and curves. The confined center section serves to contrast and hold together the two outer stretches.

The Centerway

The road takes a wide curve at the North Intersection and then, crossing the river at some height, plunges through the river-edge buildings into downtown, swooping towards the Post Office Building and descending to slightly below ground level. It passes the Government Center and City Hall very closely on the right and goes through Dock Square and the food markets, smothering itself in the city, and passing through a public amphitheater. Then it swerves left, up and out over the harbor, gaining a view out to the sea and the airport before turning around and back toward the towers of the financial district. At this point the road would look directly down the Prudential-John Hancock axis, as it descended into the tunnel. The tunnel would serve as the second downtown climax point (the food market being the first), and some underworld environment connected with the city's night life would light up the tunnel. It might also be possible to expose some of the "insides" of a city: the subway track, the masonry "roots" of buildings, or the system of great conduits. Out in the open air again, the road rises to the third-story level, moving freely in the open space of the railroad yards, winding in relation to the tracks just as it did in relation to the river, and then turning out towards the sea and Dorchester Bay before entering the big South Intersection.

The approach to downtown from the south begins as a long, winding passage through open space, with the John Hancock Building and Prudential Center coming closer on the left, South Boston on the right, and ahead the shapeless mass of towers which is the financial district. The State House may be seen at one point if the road is high enough. This would be an important view to increase the connection between the two sides of the peninsula. The tunnel and the curve out to the harbor is similar to the southbound experience, but the road turns back to give the traveler a view of the City Hall and Government Center. It descends into the market area, and as it runs out to the north intersection, it picks up views of Bunker Hill and the Mystic River Bridge.

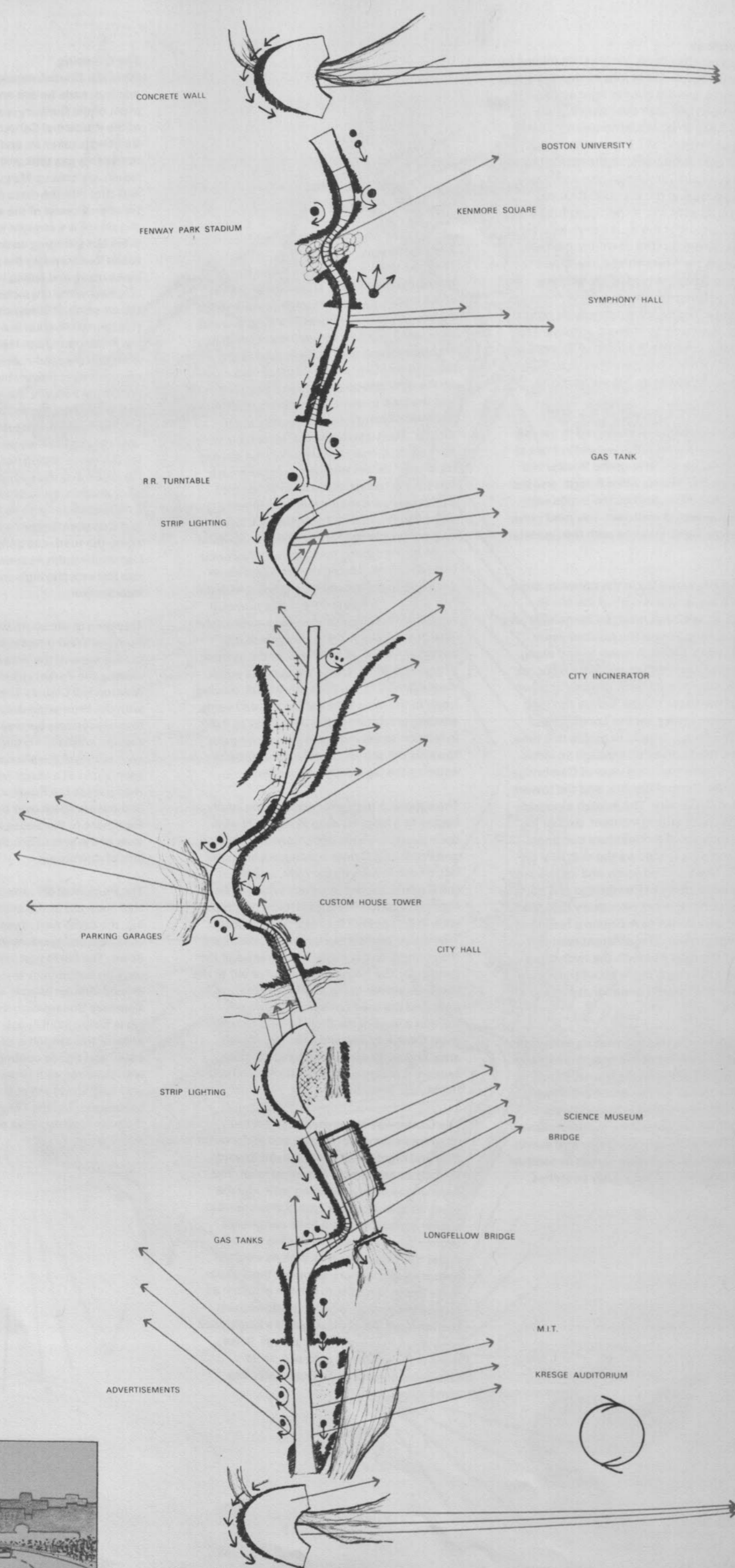
The Centerway is dominated by the two downtown climaxes: market and underworld (day and night), with the bulge out towards the harbor and airport as central relief. The approaches differ, one being open and the other confined, but the type of movement is similar enough for them to be considered symmetrical. The scale of this leg is much larger than the other two, with its views of harbor, ocean, airport, shipping, the Mystic River Bridge, and South Boston industry, as well as the central focus of the downtown section itself. All of these give it a heightened quality not found on the other legs. It lies more or less parallel to the sea, as its end views of harbor and Dorchester Bay emphasize.

The Crossing

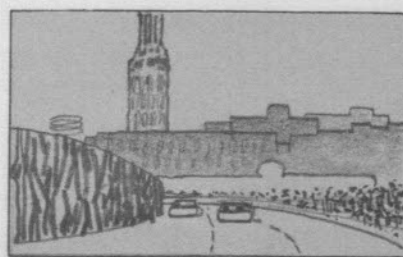
From the South Intersection, a turn to the north is made before entering the confinement of the Roxbury residential area. A view of the Prudential Center and John Hancock Building is taken in, and the road, swerving between a gas tank and a railroad roundhouse, glances up Massachusetts Avenue and cuts into the mass of housing one or two blocks west of the avenue. Here the alignment is a straight line, confined on both sides but swinging up and down over the old roads that travel up the peninsula, with both lanes rising and falling independently to emphasize the obstacles being crossed. At the crossing of Massachusetts Avenue and Huntington Avenue lies the main off-ramp for the Prudential-John Hancock center, and after this the road curves left with the changed direction of the street pattern and enters the Fenway, curving right and left, low among the trees. The curves here, besides echoing the natural forms, allow the user to take in views up and down the Fenway for reference. Going north, the dome of M.I.T. indicates that the river is near again, and after another curve between the Boston University stadium with its high electric lamps and Kenmore Square with its advertising signs, the road runs parallel to the river and Commonwealth Avenue and soon begins to rise towards the high and narrow West Intersection.

Traveling to the south while coming down from the West Intersection, one gets a panoramic view of the area to be traversed, including the Parker Hill Hospital and the Mission Hill Church. The road comes in line with the Prudential-John Hancock group, before descending between Kenmore Square and the stadium. Through the Fenway the twin spires of the Mission Hill Church are seen again as a check reference. Then the road passes the Prudential off-ramp, bends, and travels south over the rolling vertical alignment to the South Intersection, with a view of the sea, of South Boston, and to the left, of downtown.

The Prudential off-ramp and the Symphony Hall node act as the central climax on this leg, the south part of which is rigidly straight, confined, and residential, moving only up and down. The north part is more free-flowing, passing horizontally through the Fenway and around circular objects like the stadium and Kenmore Square with its giant advertising signs facing in all directions. The whole character of this stretch is generally of a small scale, and tightly confined, without contact with water or with large open spaces. The only long views are at the beginning, the glimpses out of the Fenway in the middle, and the brief rooftop views on the southern stretch.



85 Space, Motion, and View, Clockwise



Interpretative Drawings

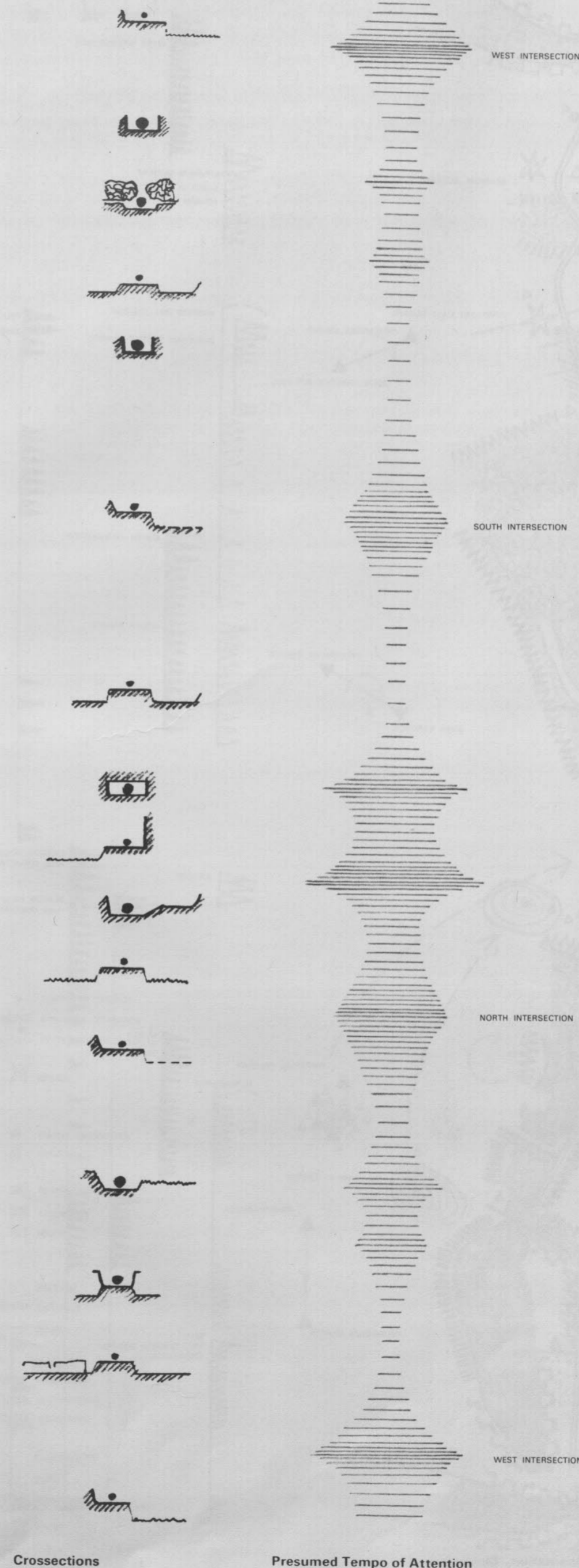
Our illustrative design is conceived as one complete, sequential experience of motion, space, light, texture, and orientation. In developing and analyzing the design, we have found it necessary to represent this total subjective experience in some abstract, short-hand way. This problem has been discussed at some length in Chapter 2, but it arises here again as soon as one wishes to communicate the character of a design, or to weigh it critically against other alternatives.

Therefore we made a number of drawings to interpret selected aspects of the subjective experience of driving the new ring road. Films might present this material in the sharpest way, but a graphic technique, reproducible on paper, is needed for speed, economy, and communication to a large audience. However, the presentation of a sequential experience on a single page requires special effort from the reader, who should have before him only what can be seen at one point, remembering what has gone before, and not yet aware of what is to come.

Road Environment

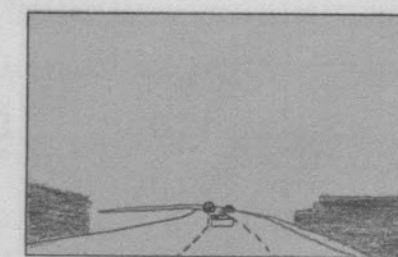
Our drawings are drawn to a time scale (minutes at an average speed of 45 miles per hour), and are laid out in linear sequences, as the events are experienced. Since it is difficult to imagine what such a journey is like from a circular plan, the route has been straightened out by breaking it at the corner intersections so that it can be read as a continuous sequence. This causes some distortion and confusion, but it is a special problem that would rarely arise, since most routes extend roughly in one direction.

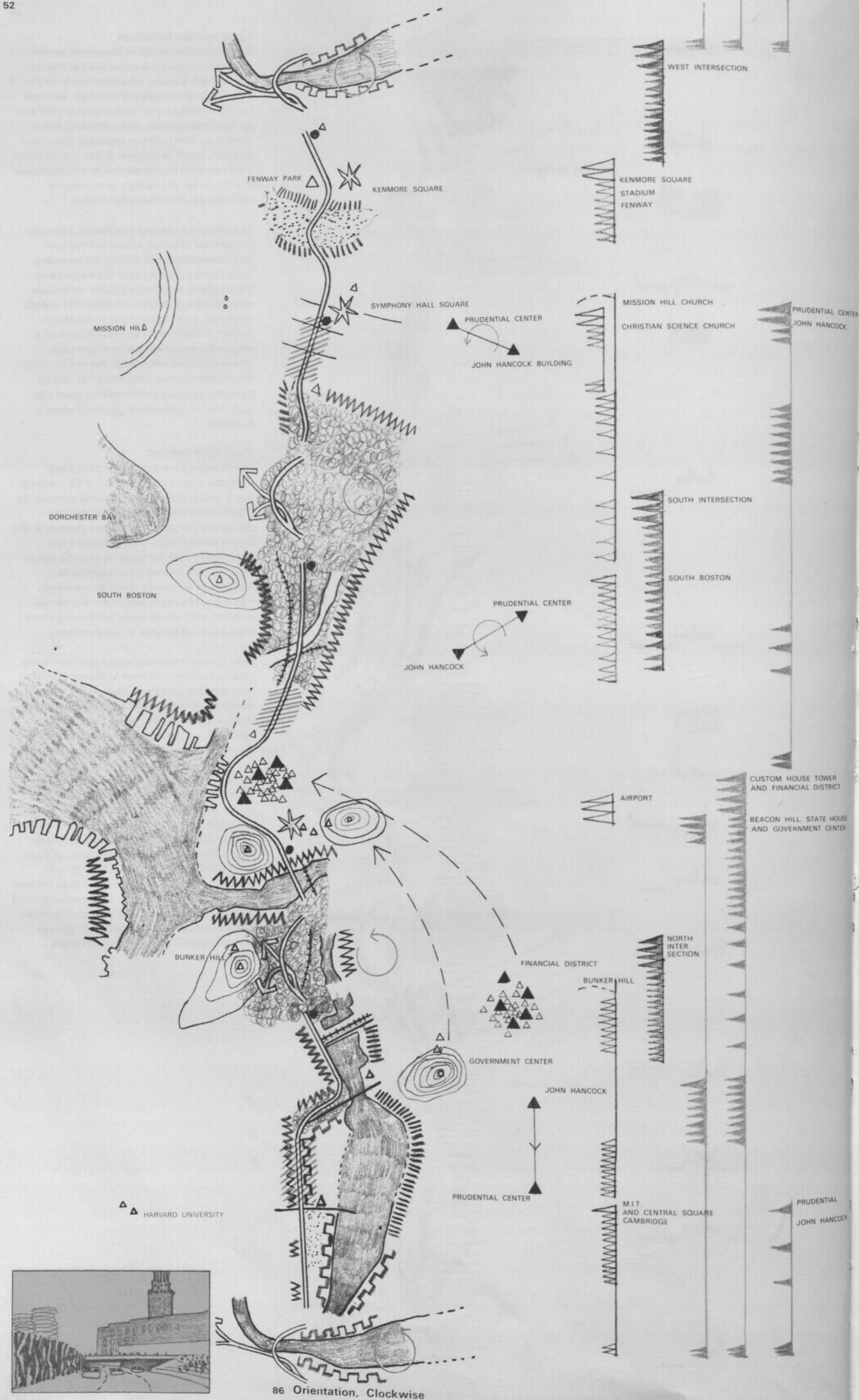
Now the environment begins to relate to the road rather than the road to the environment as in the first drawings. We see the spaces and the character of the confining walls, the relation of the road to rivers, hills, and the open railroad yards, and the kinds of activities and areas which are passed. Figure 85 shows the sense of motion and space, drawn according to the conventions of Chapter 2. To the right is added a diagram of the resulting tempo of attention, the basic rhythm of the recurrent intersections, each followed by a double climax of visual intensity. Similarly, figure 86 overpage gives the observer's general orientation to his surroundings, and illustrates the successive approach to various goals, showing the play of external landmarks and the road intersections against the major destinations in the city core. Both figures 85 and 86 are drawn only for the clockwise trip.



Crossections

Presumed Tempo of Attention





86 Orientation, Clockwise

Some Comparisons with the Official Route

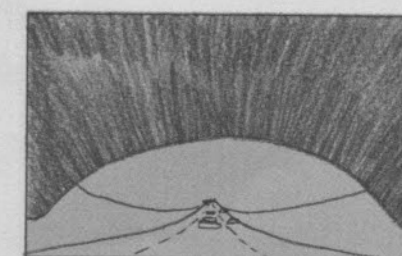
If we now turn aside for a brief critique of some visual features of the official, or Maguire plan, we can clarify some of our own reasoning still further. In the Maguire plan the route crosses the Charles River at the Cottage Farm Bridge as in our scheme, but then the road cuts across Cambridgeport near Central Square, and goes on to meet Route 2 in the constricted railroad yards on the Somerville border, before turning right to return to the river through the North Station yards. Thus it runs far out from the center, enclosing East Cambridge, which is an area of little importance compared with downtown Boston. The route loses all contact with the river and with the downtown area until the last moment, when without preparation it plunges past North Station. There is not so much as a glimpse of the famous State House; this would indeed be a blank and mysterious journey.

On the eastern leg, or Centerway, the Maguire route has now been built, and its character can be assessed directly from driving experience. It has many good qualities, for it comes in high from the north and curves around the financial district before descending into the Summer Street Tunnel. But skirting the center at rooftop level is also unsatisfactory, for there is no sense of arrival: the road seems to veer off from the heart of things. Furthermore, although it is at points less than a block from the harbor, the ocean is never seen. Fringe buildings as well as the balustrade and cant of the road block the view; and the road is never directed at the water. On the other end beyond the tunnel, the official route runs close to the side of the peninsula, too close under the building wall for the inbound travelers from the south to get a good view of downtown.

Although both ends of the proposed Crossing (the South and West Intersections) fall in the same place as those on the official route, the Maguire line travels further out through Roxbury: past the hospital area and over a stretch of the Fenway. It will be depressed, and it is difficult to see what pleasure there will be in driving it. Except for the Fenway, the route will travel through residential areas as mysterious and dull as those of Cambridgeport. The Fenway itself will be culverted and made to disappear.

It will seem to be a most devious way of going downtown, the goal toward which most motorists will be directed. The change of direction will be confusing and disruptive, since the road curves slowly through a gridiron street pattern. As the motorist rides in his confined channel and cuts the old blocks at different angles, the change in direction will be incomprehensible to him.

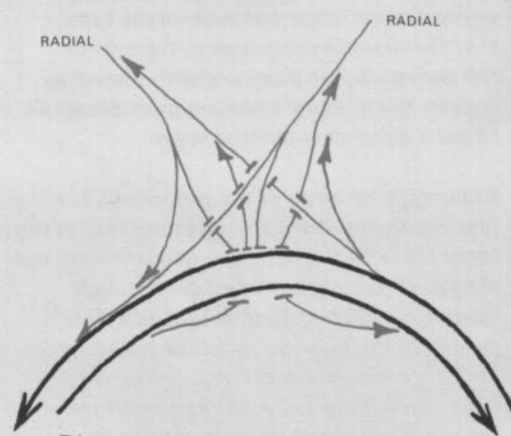
Reference to our own proposal will clarify the way in which we intend to overcome these difficulties.



Road Detail

Once the general location is settled, a whole set of road details can be used to emphasize and direct the motorist's view. The traveler may be oriented, in a direct visual way, through detail and choice of materials without complete reliance on road signs.

The North and South Intersections have been built up as strong forms which can fill the vacuum of their surroundings. They are designed as three-level T-intersections, 50 or 60 feet high, and might be diagrammed as follows:



87 Diagram of Intersection

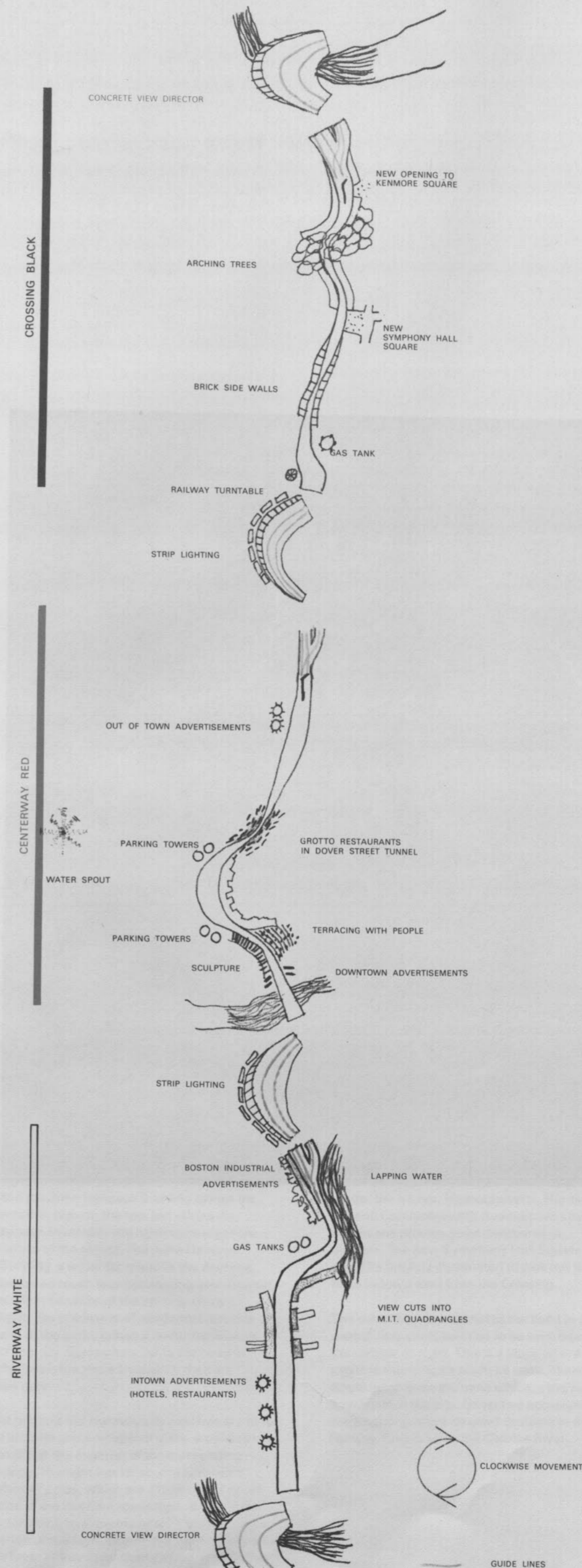
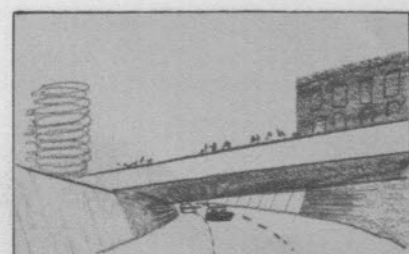
Huge lamps are proposed, so that those curves will be lit up at night. In all cases the lanes of the ring road run side by side, with the outer one at a higher level, while the radials are in two levels. At the West Intersection the roads pass almost over the present Cottage Farm Bridge and will arrive at the highest point on the whole route, consistent with the most important view.

Each leg of the route would be surfaced in a different color or texture, symbolized on the drawing (Figure 88), so that a driver will instantly know which leg he is on. In our proposal, the Riverway would be white, the Centerway red, and the Crossing black. At intersections each radial would have its code color; and colored stripes would direct the motorist onto his chosen route.

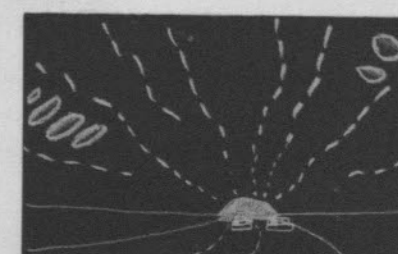
The downtown climax is built up by advertising signs in selected places, controlled as to size and other characteristics, and finally by parking towers. These advertising signs would be mounted on cylinders, cubes, and pyramids, revolving slowly as their messages change. They would be lit, at night, from the inside. The approach along the Riverway would include advertising signs for hotels and events taking place in Boston, would pass signs for local products in the industrial area, and would finally go by advertisements for downtown entertainment. On the way out again, signs for travel outside Boston and for nationwide industries would predominate.

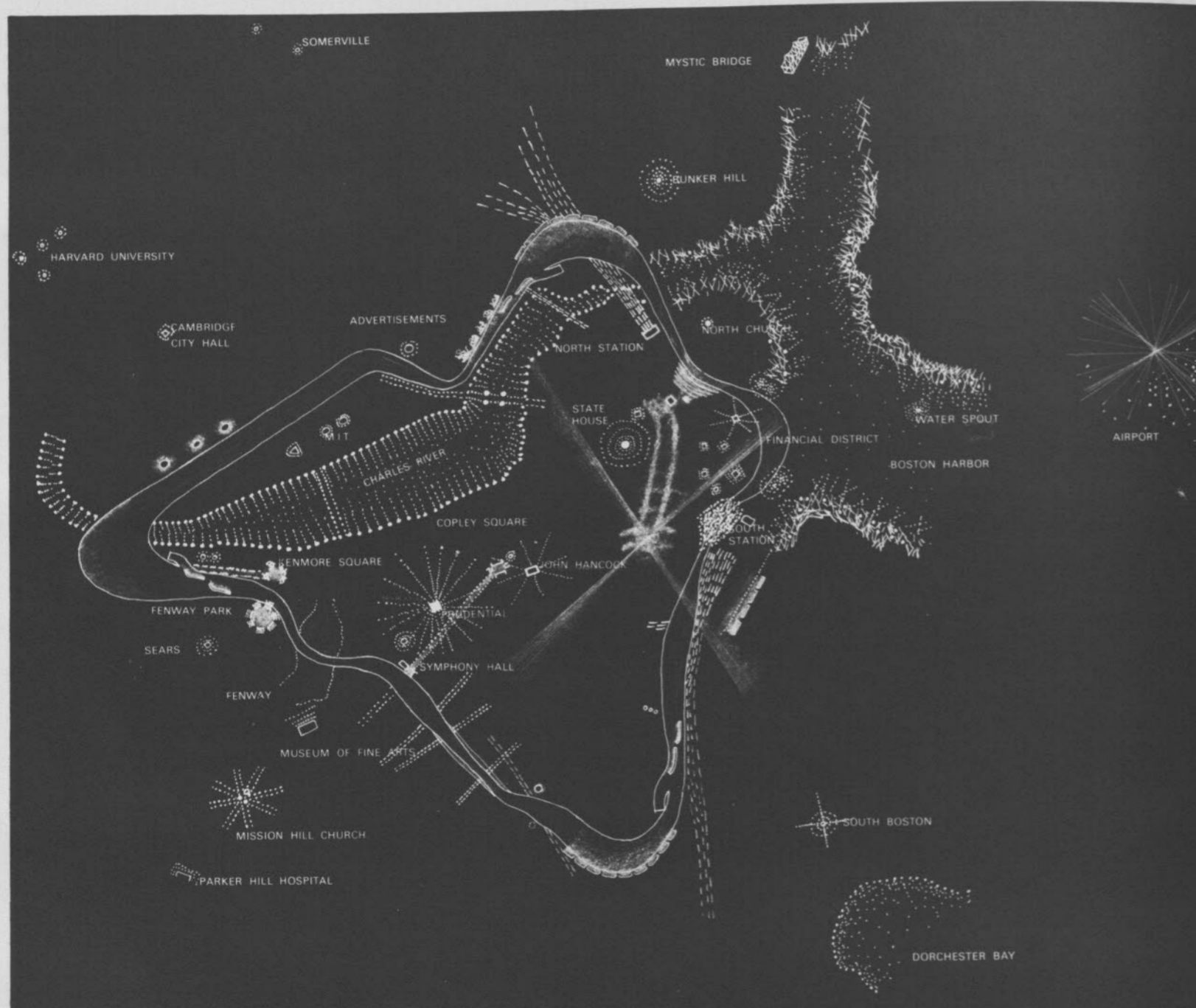
At the market area, the road descends to a lower level than surrounding streets, and wide steps are built out and up to Dock Square. As in an amphitheater, people could sit and stand on these steps looking at the cars, and the driver could reciprocate. On ceremonial days this would be a public grandstand, assuming that many parades and arrivals of the future will occur on the main highways. In the Summer Street Tunnel, on the other side of the seaward bulge, an underground restaurant is proposed, with lights and colored windows looking out and down onto the road. This section could be grottolike and would act as a nighttime complement to the market climax. The modern freeway has become an abstract world where people are scarcely seen. The sight of people would be an important characteristic of these special centers. On the bulge between these two points, the financial district forms the solid internal wall, while the external view of the harbor is framed by high parking towers. A giant water spout would be placed across the harbor, similar to the one at Geneva.

Where the route is depressed through parts of the residential area, sculpture, painting, or signs might be used to depict some characteristics of the region being traversed. The Symphony Hall area would be opened up by pulling down some buildings to form an open plaza. Through the Fenway the road curves and drops in among the trees. Many other devices might as easily be developed to enhance the interest and clarity of the scene.

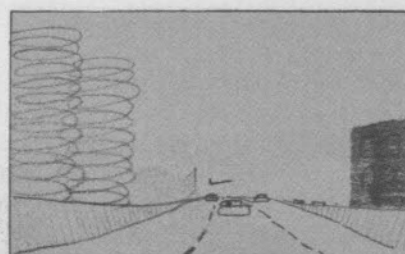


88 Diagram of Road Detail, Signs and Pavement





89 Night Diagram



The Night Scene

At night a new order reigns in the city. The chaotic skylines, jagged spaces, erratic signs, forms, and shapes disappear into the darkness, to be replaced by luminous dots, strips, and diffused light. The path system becomes clearer. Light is needed for circulation, and so cars, street lights, shop windows, and advertising signs build up from the softly lit residential streets to the clamor of lights on the commercial avenues. The more prominent intersections or nodal points gain extra emphasis with stop lights, directional signs, or drugstores; and certain areas, such as entertainment districts or shopping centers that are open at night, become nocturnal landmarks.

The daytime landmarks are often lit up at night, or maintain some form of lighted sign. The dome of the State House is floodlit, and the John Hancock Building carries its weather sign on the top, but others disappear. Invariably the lighting changes the nature of the object. The John Hancock Building, a squat fat tower in the daytime, becomes much less dominating and slimmer at night because of the vertical strips of light. The blackness of residential districts and of the parks is also a nocturnal feature of the city. Sometimes lights are hung in the trees, but more frequently they are left dark.

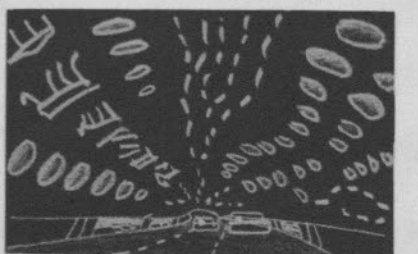
At present the highways themselves are lit to a uniform and unpleasant glare, emphasizing traffic at the expense of the surrounding scene. The light has its source high upon slender poles, which are a dominant impression of the daytime roadscape. It would be interesting to experiment with greater articulation of the light, or with the removal of poles in favor of low-level illumination, or with the use of light to break open the visual prison of the pavement.

Our lighting proposals have followed the general principle of the entire design:

- 89 emphasis and clarification of the existing pattern. Many of the lights shown on the drawing already exist. The principal daytime reference points must be lit up and should have a similarity to the sunlit form. To change the pattern of the city at night might be exciting, but also confusing. The higher landmarks, such as the Prudential Center and John Hancock Building, would have beacon lights. The green and red lights of the railroad yards and the blue ones of the airport could be more clearly associated with these methods of transportation.

The reflectivity of water has already been utilized to some extent by the continuous lighting down both sides of the Charles River. This would contrast with the gloomy yellow lamps shining on masts and tops of ships that border the harbor. Massachusetts, Huntington and Commonwealth Avenues are already well lit and provide good directional indicators. The new Symphony Hall Square could be brightly illuminated to pick out the main in-town road from the Crossing.

The entertainment district at the bend in the central core could be lit up to be seen from the outside at night. This is a place where rotating searchlights could be used. These would emphasize the bend which is the night-time heart of the city. On festive occasions extra lighting might be used: lanterns in the Fenway, fireworks on the Charles River.



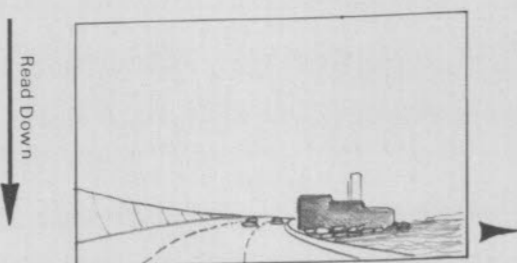
A Running Commentary on a Clockwise Trip

To complete our picture of this imaginary expressway, let us pretend that we are driving around the loop in a clockwise direction. (This trip may be followed on the previous drawings, or on the sequence of diagrammatic perspectives, Figure 90, which appear alongside the text commentary and which are keyed to this text by reference in the margin to the number of each perspective. An arrowhead at the side of the drawing indicates an open view in that direction. The sequence of perspectives has also been repeated on the lower corners of the pages throughout the book, so arranged that they can be seen as a moving sequence by riffling them in front of the eyes. For the complete trip, start at the drawing on the lower left hand corner of page 2, and run forward to page 64. Continue from the lower right hand corner on page 63, and run back again to page 1.)

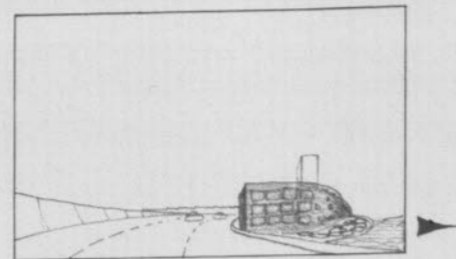
1 We begin high up on the bridge, crossing the Charles River at between 45 and 50 miles per hour. The direction stripes on the road have just gone by, and the pavement is now almost white in contrast to the previous dark surface of the Crossing. The oncoming lane on our left is higher than we are, creating a wall which blocks most of the view to the left except for glimpses down through the bridge structure to the river. The wall pushes our eyes to the right, to one of the best views of Boston. At this height the river widens out towards the silhouette of Beacon Hill, with the golden dome of the State House seen against the background of the towers of the financial district. Further to the right the huge tower of the Prudential Center dominates the whole city, and behind it, pointing towards downtown, lies the old John Hancock Building. There is hardly time for a glance across the flatlands and low hills, the industry and sporadic landmarks of Cambridge and Charlestown.

3 As the upper stories of a warehouse rush towards us on our right, we can tell how high we are. The view is momentarily confined, and we turn our eyes straight ahead down the gently sloping road racing at rooftop level, skimming the Cambridgeport residential area on the left and then the M.I.T. campus on the right. The M.I.T. domes move in relation to one another, the Aalto dormitory unfolds, and Kresge Auditorium revolves across the turf towards us. The river, and above it the Prudential tower, can be seen through the trees running parallel to us.

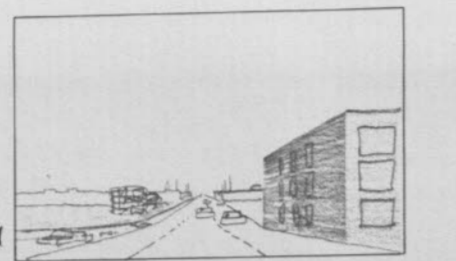
6 We cross Massachusetts Avenue and plunge past M.I.T. into dense industry, a power station, chimneys, and then a cluster of advertisement signs for downtown hotels and other entertainment. Straight ahead rises the pinnacle of the Bunker Hill Monument, and the view begins to open out again. A large gas tank lies slightly to the right, but growing quickly in size, it comes across the line of vision and veers to the left as we ourselves turn right and begin to descend towards the river again. We pass another pair of gas tanks on the left and are now looking straight at the State House on Beacon Hill, the Court House to its left, the Longfellow Bridge below, and behind, again, the towers of the financial district.



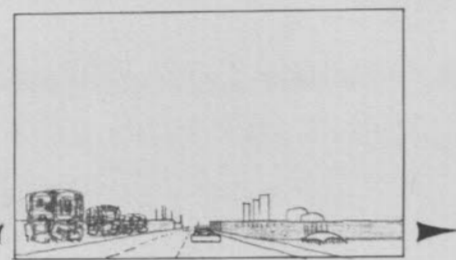
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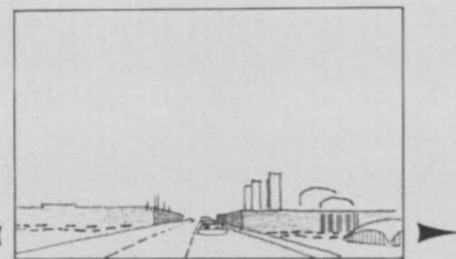
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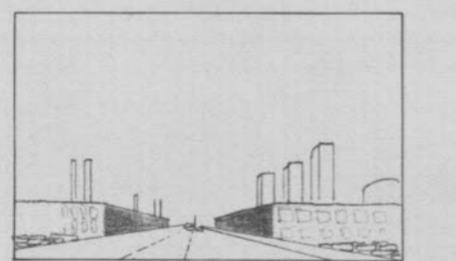
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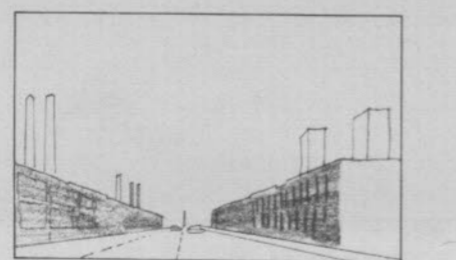
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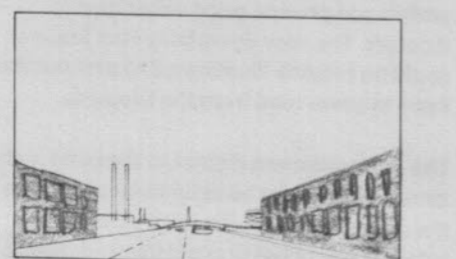
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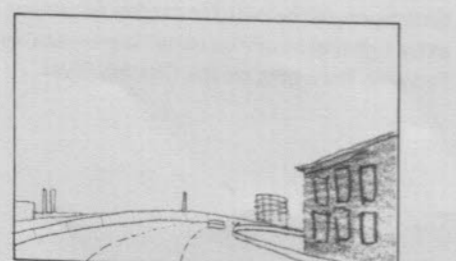
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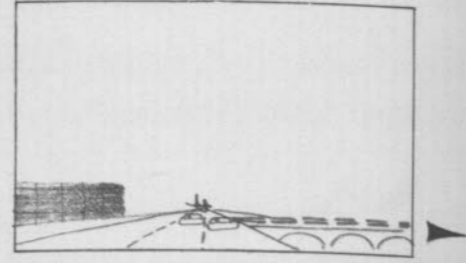
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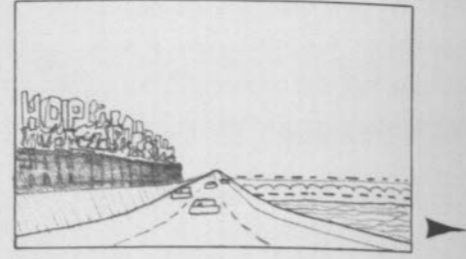
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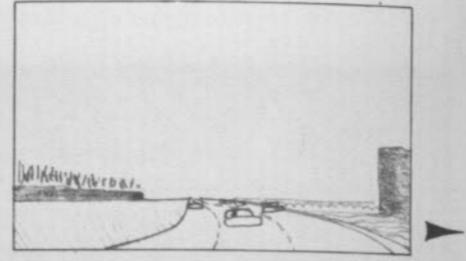
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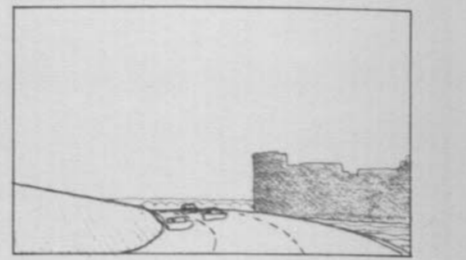
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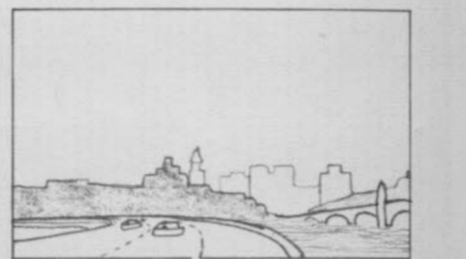
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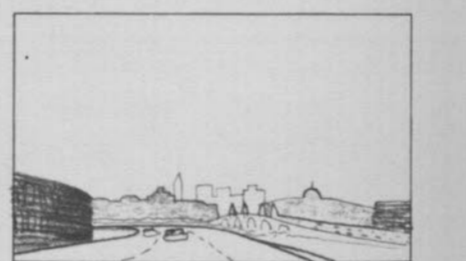
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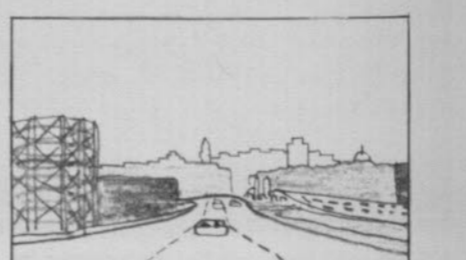
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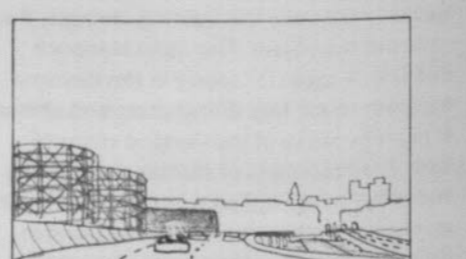
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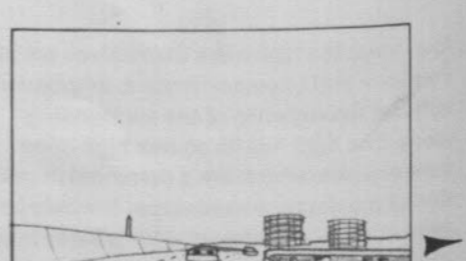
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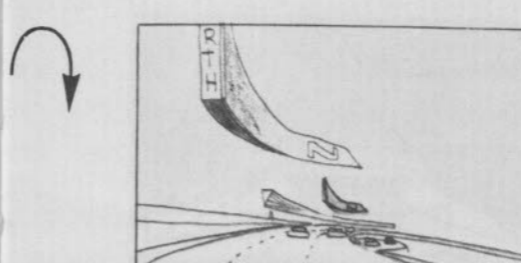
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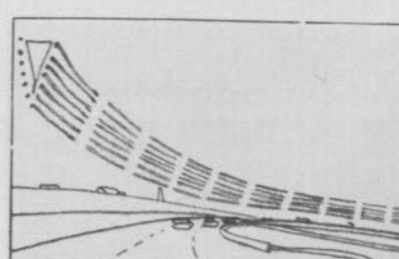
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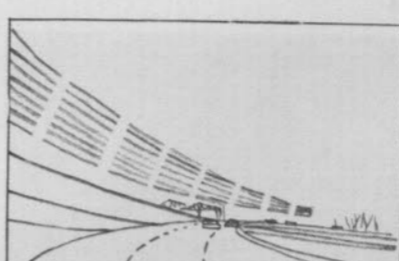
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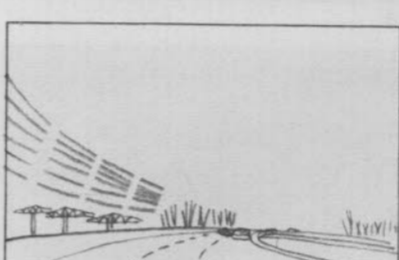
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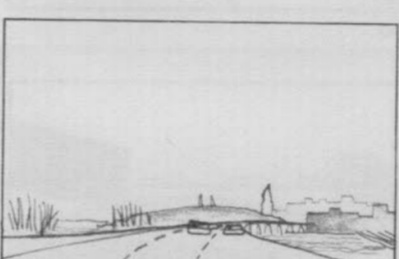
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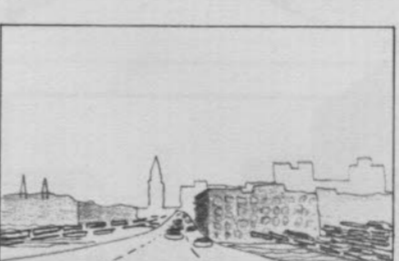
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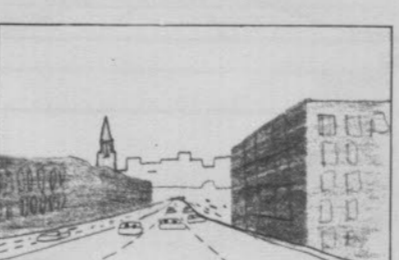
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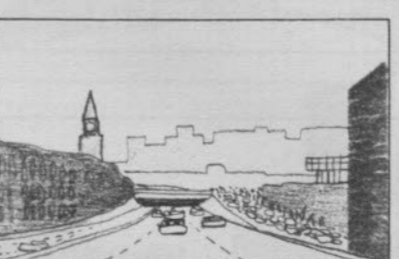
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24



25



13 The road slopes down to the river, paralleling a small channel of water, but confined on both sides. Straight up ahead comes the foreshortened Longfellow Bridge, that old granite pile, its pepperpots leaping out of the dark jumble of Beacon Hill rooftops with their dominating dome.

14 After a glance back up the river to the right, we swoop down to the left of the bridge and arrive at water level, parallel again to the river. The sense of water strikes us for a moment. Then we are rising again, slowly, up

15 and over the Charles River Dam and the white domes of the Museum of Science. The downtown towers come into view over the new apartment structures of the West End to our right, and soon we see that Bunker Hill is

16 again straight ahead of us. We are going in the same direction as before. Still rising, and now two or three stories above the river, we cross the MTA lines, the road, and the railroad yards, as the huge North Intersection comes into view. Route 93 snakes away to the left along the railroad tracks; Bunker Hill and the Mystic River Bridge indicate the Northeast Expressway; and the hill and churches signify

17 Charlestown. The signs read NORTH, the direction stripes guide the northbound traffic into the intersection, and the road surface changes from white to red. We ourselves curve under the high arc lamps which stand like sentinels on the skyline, guiding our eyes around the curving road which turns slowly and grandly into the city.

The confusion and excitement of the intersection, with its signs and ramps, take place below or on the left-hand side, leaving clear the view of the center city as we turn in relation to it. We are high again, looking across the large expanse of the railroad yards and the river. The hills of Boston rotate in front of us, and as we turn, the outer lane lowers, and we glimpse Bunker Hill through the intersection structure. We seem to bounce off the hill and cross the river at right angles. There is a fleeting glimpse of the harbor and the Old North Church on our left; the railroad tracks are running parallel on our right into North Station. Now we plunge through a wall of buildings into the heart of Boston.

The gentle downward slope of the road allows us a generous view of the area directly in front of us. We are directed right at the Post Office Building in the center of the financial district. Red brick warehouses and advertisements roll by on either side. The Custom House tower slides in from the left, and the space widens out into a large basin. The road descends now to ground level, and then into a widened cutting.

- 27 The market is very close on the right and at the same level. The bustle of people and the crates of vegetables can almost be felt. Behind them rise the new office blocks of the Government Center, and we are under the first bridge, past the off-ramp to Dock Square. Just beyond, people are sitting on the wide steps to our right, which gently descend from Dock Square itself. There is a momentary glimpse of Faneuil Hall before we are completely dominated by the overbearing mass of the Custom House tower looming right up front, and almost over us.

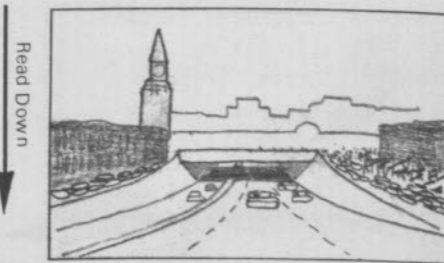
- 31 The road, just in time, curves quickly to the left to avoid the obstacle. It rises suddenly, skirting the edge of the financial district, and passes the first pair of downtown parking towers on the left. A high fountain of water tells us that the harbor is near; then the whole view opens up and we look away across the water to the airport, and beyond that to the ocean itself.
- 35 The road turns inland into line with the axis of the John Hancock and Prudential buildings, seen in the distance. The second group of parking towers pass by on the left, and we drop underground beneath the towers of the financial district. The tunnel is brightly lit, then gradually dims until the sides and roof turn into glass as we pass into an underworld restaurant: colored lighting, people eating at tables, jazz bands, perhaps an audible burst of music. At a lower level, a subway train is crossing our path.

- 42 After a slight curve, daylight appears at the end of the tunnel. We rise to the open air and continue up to the sky, flattening out at the third-story level, feeling free in the air, crossing the Fort Point Channel and the railroad tracks. We reorient ourselves by two visible landmarks on the right, the Prudential and John Hancock towers. Downtown is directly behind us, and we are heading towards the three chimneys of the city incinerator,* which we pass on the right.

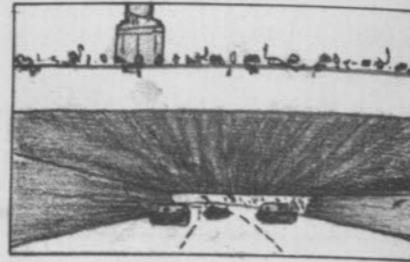
- The railroad tracks do not confine the eye; the road is high, and the views are wide. There is time to look around. To the left the hill of South Boston hides the sea, except in the left distance, where Dorchester Bay and some islands can be seen. Ahead the lamp standards of the South Intersection stake out a skyline; to the right twin church spires, hospitals, and the hills rise just above the Roxbury rooftops. Some out-of-town advertisements crop up, as we approach the intersection itself.

- 48 The Southeast and Southwest Expressways can be seen winding into the distance, the direction stripes appear again, and the road surface changes from the red of the Centerway to the black of the Crossing. As we turn more than 90 degrees back toward the city, what was on the right is now on the left. Mission Hill has shot over to that side, and we almost face the Prudential and John Hancock buildings. The south edge of the city stretches away on the right to downtown, and the road we have just been on reappears.
- 52 We snake left and right through circular structures, a gas tank, and a railroad turntable.
- 54 After a glance down Massachusetts Avenue, we are in the residential area of Roxbury. The space is confined here as the road descends under Washington Street and rises again over Columbus Avenue. There is a strong sense of the main cross streets, with brief vistas towards the downtown section, but the alignment of the road does not deviate: it holds rigidly to the existing street pattern. The closeness to residential buildings is nowhere so evident as along the Crossing.

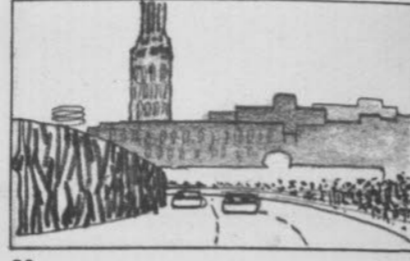
*The present location of the road places the city incinerator directly on axis. Here is a case where too much importance is given to a comparatively unimportant object (cynics may disagree).



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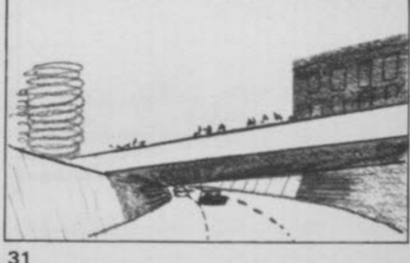
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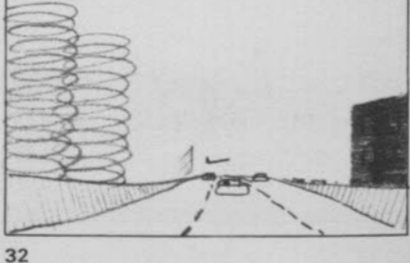
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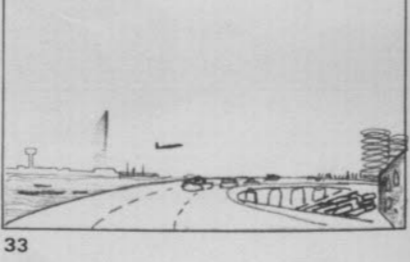
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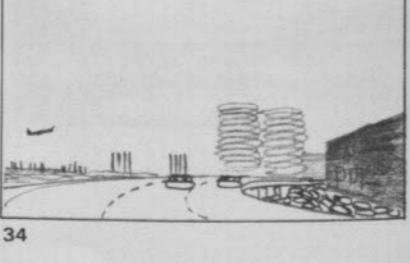
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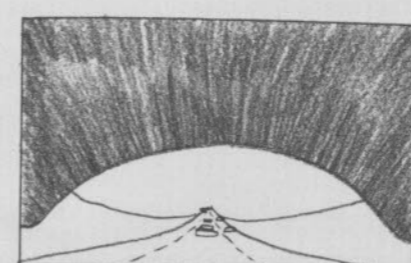
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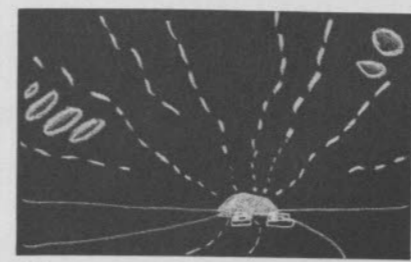
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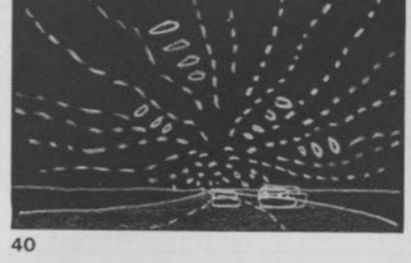
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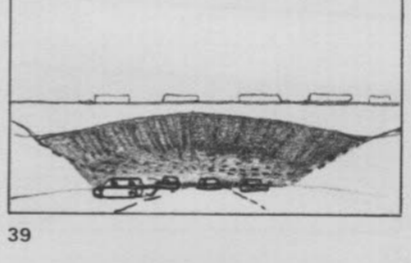
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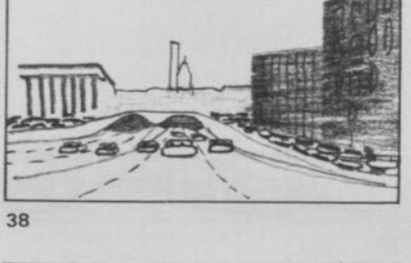
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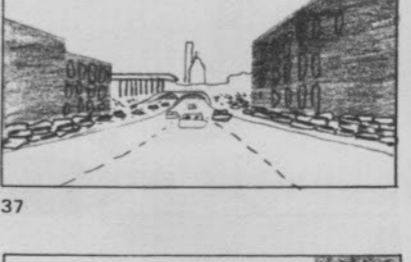
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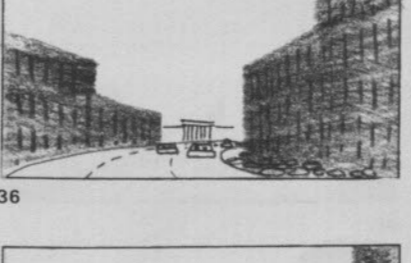
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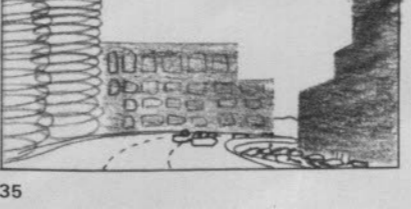
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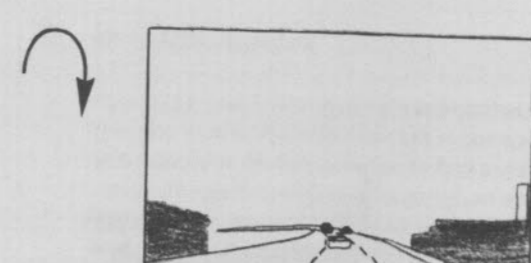
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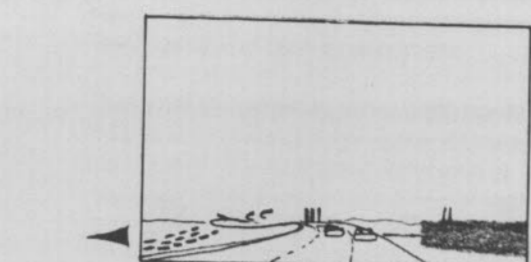
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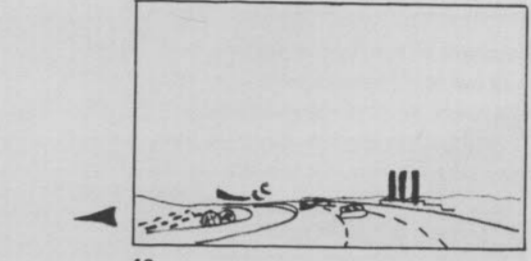
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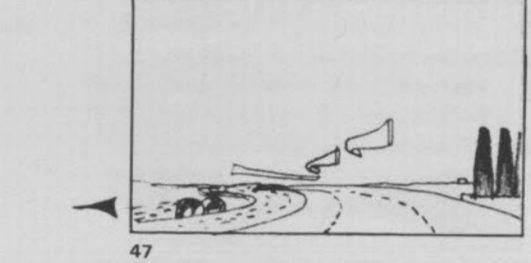
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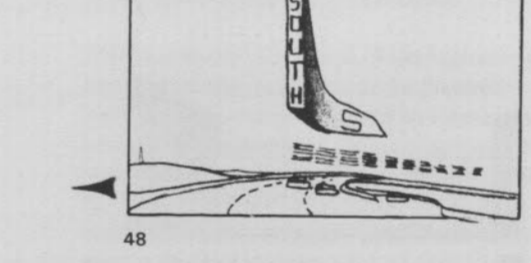
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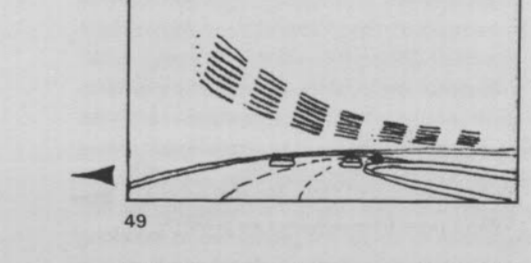
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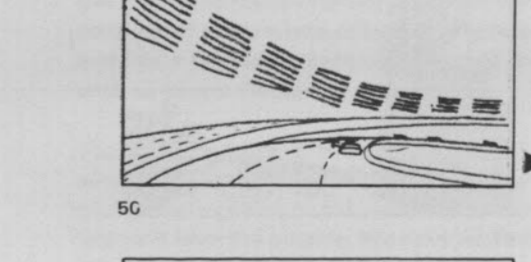
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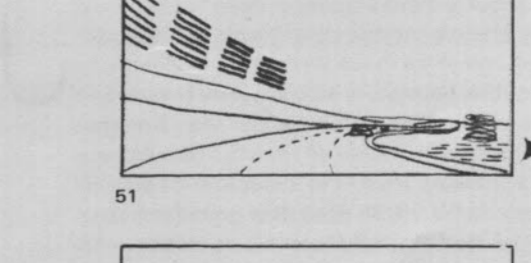
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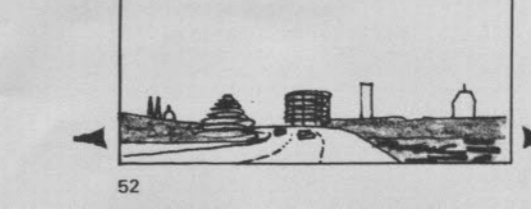
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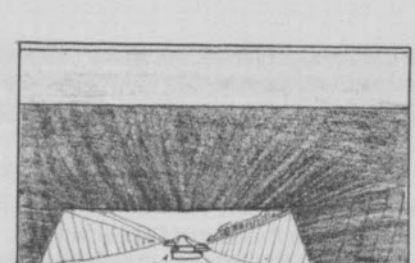
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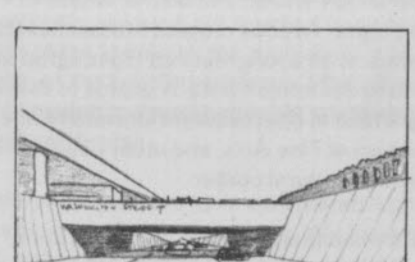
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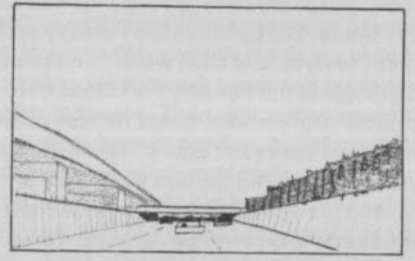
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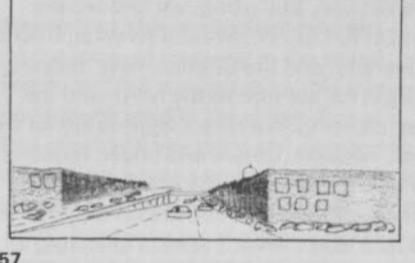
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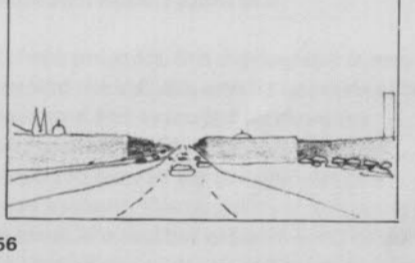
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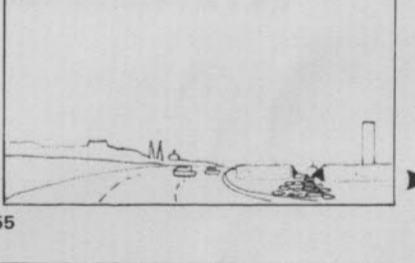
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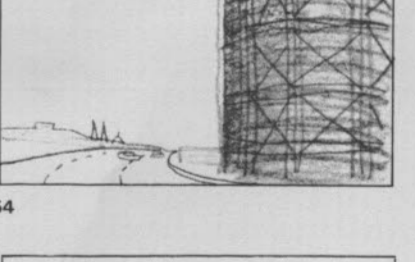
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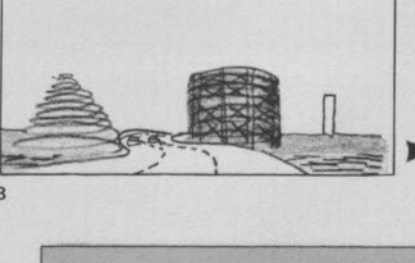
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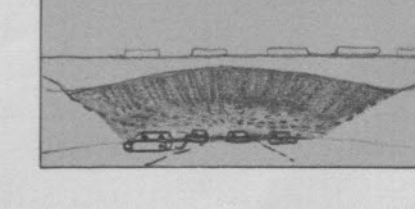
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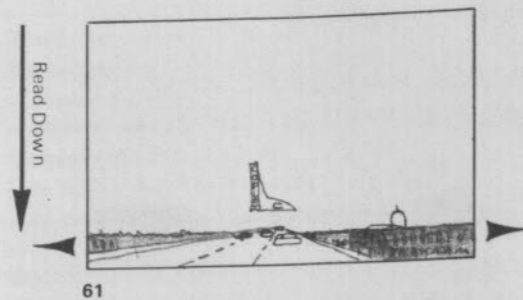
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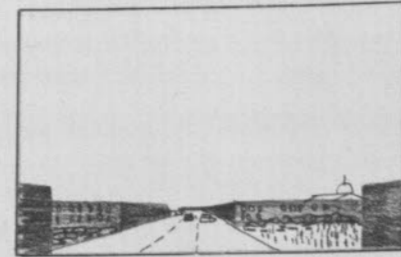
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61 Past Columbus Avenue, the space opens out across the railroad tracks. There is a cross vista of John Hancock; the Prudential appears across the rooftops, and advertisements warn us again that a climax is near. We approach the Symphony Hall node. There is the off-ramp to the Prudential Center and the high-price shopping district. The walls of buildings open out on the right-hand side to show shops, traffic, and bustle, where Huntington Avenue crosses Massachusetts Avenue, with a long vista up Huntington to the new downtown area. A glance to the left might take in Northeastern University, the Museum of Fine Arts, and other buildings of Boston's cultural center.

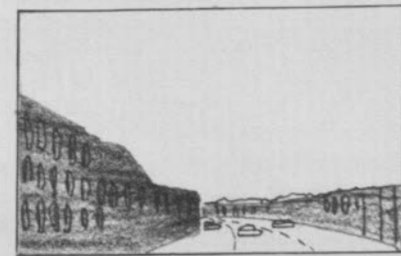
63.64 We immediately re-enter a housing area, curve to the left, and see trees in front of us. The Fenway envelops the road, which drops and curves in response, giving a view of the M.I.T. dome. We go down the Fenway and across the river, and then we are underneath and alongside the Fenway Park Stadium. The circle of enormous lamps rotates overhead, as we curve left again. The advertising signs over Kenmore Square flash from left to right, and the space opens out to the right as at the Huntington Avenue opening. Close confinement follows for a brief moment before we start to rise straight up to the West Intersection. Still rising, we find we are parallel to Commonwealth Avenue, Boston University, and the Charles River, heading straight for the turn to the north and the river-crossing. We take the off-ramp for the west, swooping down and under, heading up the river. We choose the Massachusetts Turnpike, curve left, and are on the road, with the river and Harvard towers following us on the right and the sun setting in front of us, if it is evening and we are lucky.



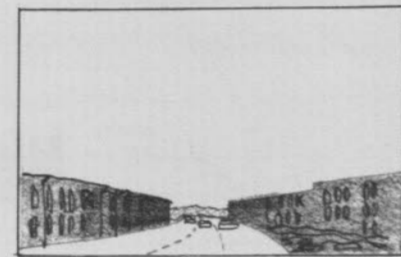
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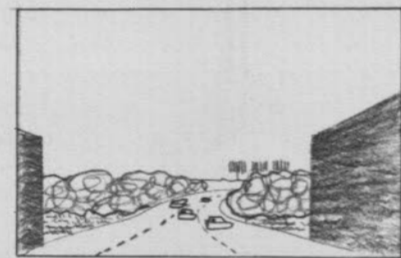
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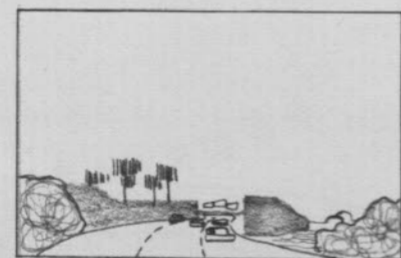
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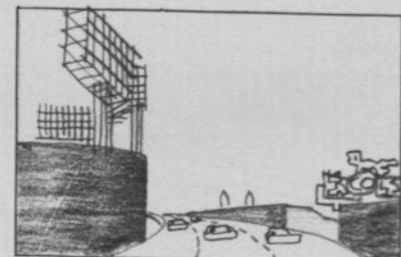
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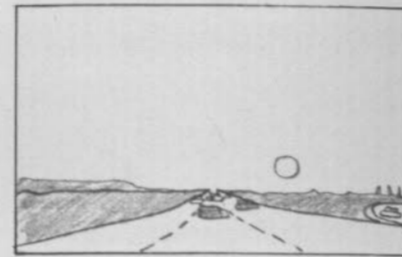
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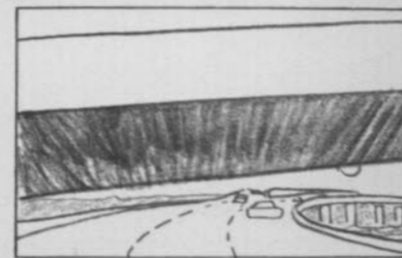
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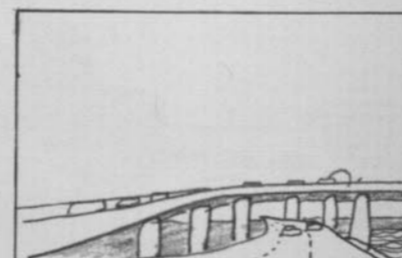
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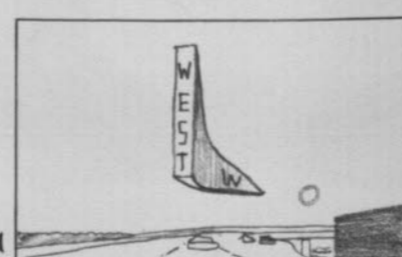
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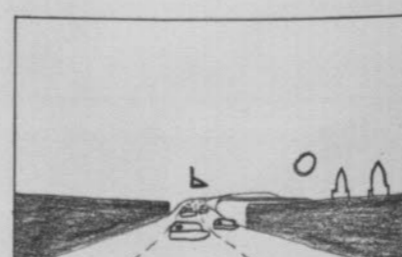
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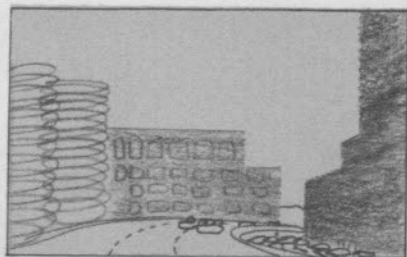
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5. In Conclusion

This study was motivated by the promise of the new world of vision inherent in our speed of movement, and by a desire to find a visual means for pulling together large urban areas. We hope we have at least succeeded in making a case for considering the view of the driver when a road is being designed. Perhaps we have also indicated the factors that will have to be dealt with, and the techniques that could be used in dealing with them.

These are speculations about highway design, first efforts toward analyzing the highway experience. The crucial test will come in applying these ideas to actual design problems, and in evaluating the results obtained. Here the techniques of design and of analysis can be refined, and our grip on principles strengthened.

Not only would we learn much of technical interest from a serious attempt in this direction, but a road built for vision in motion would be a concrete example of what the highway experience could be, an example far more powerful and evocative than any number of paper projects. It might be possible to lay out such a road as a national experiment, if special resources for design and execution could be provided.

An experimental road would be the proof of the pudding. But there are other, more academic efforts that can be useful. The recording technique can be developed. We need to increase our skill in making predictions of the visual effect of a proposed sequence, whether from a study of the existing landscape by a hovering vehicle, or by means of three-dimensional models seen by moving viewers or motion-picture cameras.

The fragmentary analyses of the highway experience presented here can be pressed further. In particular, it would be interesting to study the view of the daily commuter, the man who makes up a major part of the public for whom the road is designed, and whose view is probably markedly different from the groups studied to date.

It would be useful to extend the analytical techniques to different kinds of movement: other types of automobile paths, such as ordinary city streets, or to other kinds of carriers—subways, railroads, buses, even boats, escalators, or airplanes. If automated highways become general, then the nature of the highway audience will also change. The problem of designing for vision in motion is everywhere fundamentally the same, but characteristic solutions will be greatly affected by the speed and mode of movement. The experience of a city is basically a moving view, and this is the view we must understand if we wish to reform the look of our cities.

There are a number of factors which this study has expressly avoided. One is the impact of the highway on the people who must look at it from the outside. We have neglected this aspect of the road partly because it is currently receiving some attention, and partly because our work required a sharper focus. The effect of a road on its surroundings is an extremely important aspect of its design, and this inward view must be integrated with the outward view. Unfortunately, the two views are radically different by nature. How may they be co-ordinated, or at least prevented from conflicting with each other? When the driver wants an elevated platform from which to view his surroundings, while the stationary citizen wishes the road to be out of sight, how do we arbitrate the issue?

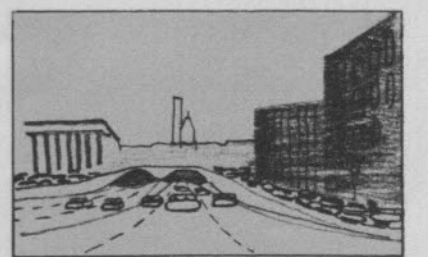
Even within the scope of this monograph, there are a number of facets which have been touched upon only very briefly. They include the questions of vehicle design, or the details of the roadway and its lighting, both of which have a major impact on the highway scene.

We have dealt primarily with the phenomenon of continuous motion and have passed more lightly over the problem of transition. In particular, we have not touched upon the design of the terminus: the parking lot, the garage, or the building entrance. Most often this transition in speed and scale is visually abrupt and brutal.

For the most part, we have considered highways as single linear sequences. We have not dealt with a network of highways, or, more properly, with a *system of movement* in a city. Studying separate sequences is only prelude to dealing with the entire experience of movement, in all modes, considered as occurring in a continuous network traversed in many complicated ways. Then one comes on problems of intra-system conflict, of differentiating and relating the functional parts, of transfer and succession, of branching and intersecting sequences, and of the possibilities of area or "solid" sequences as distinguished from purely linear ones.

To some extent, this monograph has discussed the issue of meaning in the visual landscape, and the way in which this meaning is communicated to the driver. But our greatest emphasis has been on orientation and visual form, and on meaning primarily in reference to the meaning of motion and of the road itself. The meaning of the city landscape is a thorny subject, and there are many possibilities of analysis and design that remain to be brought out in regard to it.

In all these respects, this monograph is only a foray into the subject, and its gains must be consolidated and extended by more systematic operations. But enough has been developed to expose the possibilities of a highway esthetic. We might now test some of these ideas in a real but experimental design. Our highways are no mean achievements in the history of technology. Will they also be remembered as works of art?



Bibliography

American Association of State Highway Officials.
A Policy on Arterial Highways in Urban Areas.
Washington, 1957.

Automotive Safety Foundation.
Driver Needs in Freeway Signing.
Washington, December, 1958.

Bakker, H. B., A. E. J. Nap, and G. A. Overdijkink.
De Schoonheid van de Weg
(*Aesthetic Aspects of the Road*).
Het Nederlandsche Wegcongres,
's-Gravenhage, 1959.
(Photographs with captions in English
and other languages.)

California Department of Public Works.
"A Plan for Scenic Highways in California."
March 15, 1963.

Casson, Hugh.
"The Temple of Heaven, Peking."
in *Architectural Review*, December, 1955.

Cron, F. W.,
"The Art of Fitting the Highway to the Landscape,"
in *The Highway and the Landscape*,
W. Brewster Snow, ed.,
Rutgers University Press, New Brunswick, N.J., 1959.

Crowe, Sylvia.
The Landscape of Roads.
The Architectural Press, London, 1960.

Cullen, Gordon.
Townscape.
The Architectural Press, London, 1961.
pp. 9-21 and 224-227.

Gibbels, J. L.,
Location and Road Focus,
in *Roadside Development*,
Highway Research Board,
March, 1940, pp. 41-43.

Gibson, James J.,
The Perception of the Visual World.
Houghton Mifflin, Boston, 1950.

Hennessey, Desmond,
"Motor Roads in the Modern Landscape."
in *Architectural Design*,
September, 1956.

Jackson, J. B.,
"Other-Directed Houses,"
in *Landscape*, Winter, 1956-57.

"The Abstract World of the Hot-Rodder,"
in *Landscape*, Winter, 1957-58.

Lorenz, Hans, and F. A. Finger, eds.,
Trassierungsgrundlagen der Reichsautobahnen.
Volk und Reich Verlag, Berlin, 1943.

Lynch, Kevin,
The Image of the City.
The M.I.T. Press and Harvard University Press,
Cambridge, 1960.

Martienson, R. D.,
The Idea of Space in Greek Architecture.
Witwatersrand University Press,
Johannesburg, 1956, pp. 117-143.

Repton, Humphrey,
Sketches and Hints on Landscape Gardening, 1795,
Chapter 7, "Approaches";
reprinted in Repton, *The Art of Landscape Gardening*,
John Nolen, ed.,
Houghton Mifflin, Boston, 1907.

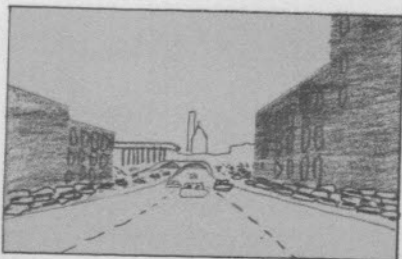
Simonds, John O.,
Landscape Architecture,
the Shaping of Man's Natural Environment.
F. W. Dodge, New York, 1961.
Chapter 5, "Circulation."

Thiel, Philip,
A Sequence-Experience Notation,
in *Town Planning Review*, April, 1961.

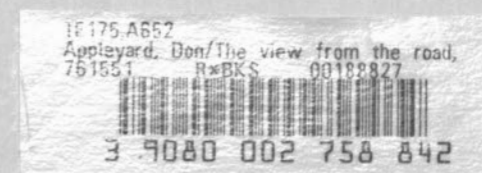
Tunnard, Christopher, and Boris Pushkarev,
Man-Made America, Chaos or Control?,
Yale University Press, New Haven and London, 1963,
Part Three, "The Paved Ribbon."

Photographic Credits

- 1 Harry Moul, San Francisco
- 2 Philip Thiel, Seattle, Washington
- 3 Hans Blumenfeld, "Scale in Civic Design,"
Town Planning Review, April, 1953.
- 4 Andrew Boyd,
Chinese Architecture and Town Planning, 1962.
- 5 Ewing Galloway, New York
- 14 Pennsylvania Department of Highways
- 16 A Pennsylvania Department of Highways
- 16 B Pennsylvania Department of Highways
- 24 New Jersey Turnpike Authority
- 25 Pennsylvania Department of Highways
- 28 Cement and Concrete Association: photographer,
S. W. Newbery, London, England
- 29 Pennsylvania Department of Highways
- 30 California Department of Public Works
- 32 American Automobile Association
- 36 B National Capitol Planning Commission
- 39 Pennsylvania Department of Highways
- 40 Massachusetts Department of Public Works
- 41 A. Devaney, Inc., New York
- 42 Hall Winslow, New York
- 48 Pennsylvania Department of Highways
- 49 Dave Lawlor, Boston, Massachusetts
- 50 Ewing Galloway, New York
- 63 Aero Service Corporation, Philadelphia, Pennsylvania
- 64 Massachusetts Department of Public Works
- 79 Aero Service Corporation, Philadelphia, Pennsylvania
- 80 Harvard Trust Company, Cambridge, Massachusetts
- 81 Rand McNally and Company, Chicago, Illinois



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MAY 29 1991	OCT 31 1996	SEP 30 2003
OCT 19 1991	MAY 21 1996	APR 01 2004
DEC 22 1991	APR 02 1997	MAY 15 1997
MAY 06 1992	MAY 15 1997	AR 29 2006
DEC 15 1992	OCT 14 1997	OCT 14 1997
NOV 03 1992	DEC 11 1997	MAR 18 2005
	MAY 21 1999	DEC 11 1997
	FEB 28 2000	

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