

Highways as Environmental Elements

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•OUR constantly increasing highway network leaves little doubt as to its impact on our land and lives. Perhaps of comparable significance is the growing recognition that roads are more than merely service arteries and have a great deal to offer in terms of the pleasure and satisfaction we get from seeing them and traveling on them. The implication follows that if they are thus identified as an important part of the landscape they will automatically be developed as an integral part of the environment. Unfortunately, this result lies more in the future than in the past.

A couple of hundred years ago as an agrarian society, we understood and revered the land. When we built roads to connect farms and settlements, this understanding together with limited technology forced locations in total sympathy with the dominant natural environment. The technological growth that catapulted us into an industrialized society provided tools and knowledge to take liberties with nature, to mold and change it to suit our needs and desires, to develop machines that would carry us at faster and faster speeds, and to build better roads for them to travel on. Technology became more the master than the servant. Thus, highways like many other parts of our environment became engineered rather than designed. Attention to functional and structural design far outstripped concern with the highway form. It was easier to develop equations relating alignment to vehicles than people to environments—simpler to cut through a hill than seek a longer but more topographically compatible route. After all, Euclid had proved long ago that a straight line was the shortest distance between two points and in our industrial society efficiency was king.

So we developed an encyclopedia of geometric design principles that made roads good for vehicles if not for people. Collaterally, land developers and politicians were more often than not choosing the corridors to put them in. This worked after a fashion as long as there was lots of land, population growth curves stayed rather flat and the economy put a chicken in every pot rather than two cars in every garage.

At the turn of the century, however, cities began to look with growing alarm at their transportation route problems, and by the quarter century mark this concern was spreading throughout the country. The acceleration of both our economy and our population growth rate at the end of World War II predicted a highway network that might well occupy a significant percentage of our land mass. Stimulated by the projected Interstate Highway System, some hard looks were taken at the concept that highways were not merely pavements in selected right-of-way corridors but important elements in the environments they passed through.

Two other facets of highway design that had their beginnings in the twenties and thirties were also by this time gaining supporters whose collective voices were being heard and who had developed a body of fact to support their beliefs. One dealt with the individual as the important element in the travel process—his behavior, reactions, comfort and safety. The other dealt with the belief that the landscape seen from the road and the road seen from the landscape had a responsibility to be visually pleasant.

As most of you know, the history of the latter is a checkerboard of frustrations and satisfactions. In the twenties we tried to make "roadside beautification" household words which unfortunately rooted too firmly in the engineering and public mind a concept of embellishment and gained for its proponents the still lingering nickname of "pansy-planters." In the forties we called for "The Complete Highway," a quadruped

in which beauty was the left hind leg but which still implied that concern generally stopped at the right-of-way line.

Now we are using words like aesthetics, environmental spaces and visual experiences and saying that the responsibilities of highway location and design extend to whatever can be seen or be affected by the highway's presence. What is more, these things are being said forcefully and repeatedly by some of the most important people in the highway systems of this country.

What is emerging from the confluence of these evolutionary movements is a realization that highway planning is an integral part of the total land planning process. It must therefore be a conceptual process before it can be an engineering process, and it must be based on data relevant to man and his environment as well as vehicles in corridors. As a part of the environment, how it looks can be as important as how it is used.

To be fully effective it must be keyed to the efforts of other planning organizations. Most urban areas have well-established planning agencies and substantial progress is being made through their collaboration with highway organizations in the determination of new urban travel routes. Similar agencies representing each of the larger political and geographical units are either in prospect or already in existence. As these gain identity and stature, opportunities for effective collaboration with highway agencies will multiply.

The principles of environmental design are aimed at creating order among its interrelated parts. Natural order exists in the terrain as it was molded by geological processes. The irresistible forces which have shaped and which constantly modify our land forms are too often underrated in our eagerness to prove that technology can conquer all. Interference with or ignorance of the structural order and morphology of the landscape inevitably borrows trouble if the imposition of man-made elements on it is not handled with subtlety and understanding.

Geomorphology produces both regional and local characteristics which give each land area distinctive form and together with its vegetative mantle creates a functional and visual stability necessary to man's physical well being and mental health. The basic forms of natural order are rhythmic and asymmetrical, the alternation of open and closed visual spaces in limitless yet characteristic variety. Nature has a total scalar quality and may be appreciated in the view from a mountain crest or the stream-bed of a narrow gorge; in the contemplation of a patch of woods or the venation of a leaf.

Man-made order, on the other hand, has only that scale which its creators imparted on it. It finds its expression most often in rectilinear patterns expressed by strong lines and planes, rather than subtle curves and undulating surfaces. It is a simple, easily understood order and man embraced it eagerly in his early escape from the natural environment. Technology helped him in this direction. It was easier to cut along a line than an arc, to construct a tangent than a curve, to create a plane than a warped surface, to establish a rectangular public land survey system than evolve a topographically sympathetic one.

However, the repetition and multiplication of this simple order has made it a complex one whose parts are too often unrelated. The result has been a destruction of order and the introduction of chaos.

The functional and visual shortcomings of our existing man-made environments have been the subject of much study and debate. It is interesting to note that in recent years there has been almost as much concern with appearance as with efficiency. If this means there is to be a renaissance in which aesthetics is openly sought as a necessary component of the daily living experience rather than a slightly embarrassing cultural hobby, it is obvious that our highways are going to share heavily in the responsibility of creating an environment sympathetic to this concept.

We are going to have to learn some new ground rules and develop quite different planning sequences from those we have used in the past. Existing land-use patterns are going to be changing rapidly and the existing highways that helped to create them, as well as be created by them, must join this evolution.

There is a constant upgrading of existing highways to make them functionally and structurally capable of serving their changing roles. Little is being done, however, to

improve their appearance. Control or elimination of non-conforming or visually distressing roadside uses, such as outdoor advertising, automobile graveyards, sub-standard roadside architecture and nondescript unnecessary business signs, is within our legislative and police powers if we choose to implement them. So is the opportunity to relocate misplaced highways and to help in reintegrating properties and land uses where once quiet farm lanes and residential streets have become heavily traveled arteries that separate the land on both sides by much more than the right-of-way width. While these are less glamorous undertakings than new locations for tomorrow's super-highways, they are equally worthy of our best efforts toward improvement.

However, as we do come to grips with new highways, particularly those designed for high speed and limited access, there is the greatest opportunity, and the heaviest responsibility in terms of proper land-use organization and improved visual design, that has ever faced highway planners. Their responsibility is made more complex because it is dual. Not only must they create roads as sculptural ribbons that offer enjoyment as well as safety to those traveling on them, but at the same time they must integrate them with other forms and uses both natural and man made. Controlled access makes roads into transverse barriers rather than integral circulation arteries. They form physical and sometimes visual boundaries to adjacent land units. It is therefore important that they do not bisect reasonable and stable units of existing land use unless they also find solutions for the adjustment of resulting dislocations.

High-speed roads demand a lot of room for pavements, medians, backslopes and interchanges. Scale alone makes them important visually as well as functionally. The huge sums of money available for current and projected highway construction permit location choices heretofore impossible. The forty-year stability of the cost of earthwork, held so by technological improvements in equipment, offers unparalleled opportunity to bring the mountain to Mohammed or to flatten the world. The technology which permits us to span wide rivers, tunnel under harbors, and make million yard cuts too often leads the designer to feel that the environment is servant to the road and he no longer need be sensitive to the subtleties of natural form. Yet to the extent that we arrogantly superimpose our concepts of environmental form on those which have evolved naturally, we are no better than the land developer who, with dollar signs pasted firmly on eyeballs, clears land and levels it before creating yet another monotonous, barren subdivision of tasteless boxes.

Integration with the environment means sensitive adjustment to it. The well-designed highway has a look of permanence and a feeling of belonging to the land. It is neither technically nor visually wise to buck nature. Rivers, valleys, ridges and steep hillsides give a directionality to the landscape that the road should follow. When crossing a valley or river, it is important visually and usually sensible economically to seek the narrowest point. Oblique crossings generally appear arbitrary. Conversely, ridges should never be crossed at right angles. An ascending road should traverse the slope and seek the summit through a saddle. Gently undulating and nondirectional topography permits a great deal of freedom in location but also requires more design subtlety in exploiting slight modifications in the sculptural land patterns.

There are few tangents in nature and thus even in tableland locations curvilinear pavement ribbons appear more harmonious with the landscape. The repetitious rectangular agricultural patterns of our mid-continent farm belt grew, not from a natural subdivision of existing land spaces but from an artificially imposed public land survey system. Reinforced by the now well-established principles of driver reactions under prolonged lineal movement it is probable that we will someday eliminate tangents from our vocabulary of rural geometric design principles.

Highway locations should be developed in relation to permanent rather than transitory features. Topography, rock outcrops, rivers, lakes, and established street patterns are examples of such permanence while property lines, utility lines, railroads, buildings and bridges are representative of transient elements.

Each region has its individual identity whether topographic through geological evolution or man made through industrial or commercial history. Good highway locations will not detract from this uniqueness but capitalize on it by displaying it to the traveler and by helping to define and reinforce the elements which gave it character.

The lifeblood of spatial design is variety, expressed in combinations of rhythmic space volumes and presented in sequence to the viewer whether he is traveling on the pavement of a highway or seeing it from a static vantage point outside of the right-of-way. Herein lies one of the greatest challenges of highway design. To be able to create a lineal land unit that can be traveled safely at high speed and from which interesting sequential views can be presented so as to be comprehended and enjoyed at such speed, then also to handle its location and form so subtly that each part of it becomes a congruous element in an environmental composition seen from a myriad of stationary points calls for highly imaginative skill on the part of the designer.

The quality of detail is important to both the highway user and the stationary viewer and perhaps has more impact on him than basic concepts of location in the macro-environment. He feels and appreciates visual continuity expressed in good cross-section design, in rounded and warped slopes, in daylighted outside berms, in medians that physically and psychologically remove him from the danger and strain of facing opposing traffic, in plant masses that have both functional and aesthetic reasons for their choice and placement.

He understands and values design solutions which provide optical guidance, which control erosion, snow, noise and headlight glare, which screen out undesirable views yet capture pleasant ones. He finds satisfaction in the crisp articulation of pavement, shoulders and accessory structures, and he reacts unpleasantly when these are indefinite or sloppy. His perception is heightened through contrast, lessened through monotony. He reacts to interest and drama in his environment. He likes to be identified with it, not removed from it.

Some of these criteria have been realized on most recently built highways. Few have met them all. There are many conflicts between functional, structural and visual design that need yet to be resolved. There are many entrenched attitudes and procedures that need to be changed. There are many choices yet to be made between the type of free-enterprise system promoted by self-interest pressure groups, such as land developers and the outdoor advertising industry, and the environmental planners concept of public welfare.

We need to improve our office procedures in studying the sculptural form of the highway and its integration into the sculptural form of the land it traverses. The traditional plan, profile, cross-section approach is inadequate to achieve the outlined goals, either as study media or as contract drawings to direct construction. Visualizing lineal form by taking cross-sections at station intervals is like determining the quality of a movie by viewing the frames one at a time. Scale models, of course, are ideal for study purposes, as are aerial mosaics and stereo pairs, and these are being used by many progressive highway planners. However, the detailed grading plan still remains our most useful tool in studying and portraying three-dimensional land forms on a two-dimensional land forms on a two-dimensional media. Its superiority in depicting location, drainage, exposure and topographic character has been well established and its use in the form of continuous-grading plans along projected highway locations should become an established part of contract drawings.

We must recognize that land design cannot be standardized. Identity in the combination of natural, technical and visual conditions is so rare that solutions cannot be preconceived. Each situation is unique and the design that best answers it must therefore be unique.

We need more study and research in the development of light and graceful structural forms with widely spaced supports that could let pavement ribbons soar over a river valley or a man-made environment without interrupting its functional integrity or visual continuity. We could then eliminate some of the monumental embankments and forests of piling that now destroy these relationships and have more freedom in future highway location.

As the proven value of wide medians leads to ever greater separation of traffic lanes and wider rights-of-way, we might well study the possibility of creating totally independent directional lanes separated by hundreds or even thousands of feet and the advantages of returning the spaces between them to compatible land uses under easement control. Thus, we might reduce the dominance of the limited-access arteries in the local environment and lower acquisition as well as the maintenance costs.

We must intensify our search for better materials and methods to help the articulation of the highway structure. Surely there must be better solutions than annually painted pavement markings, reflectorized buttons perched on stakes, ragged gravel shoulders or, worse yet, shoulders and pavements of the same color and material, the institutional quality and oververbosity of most of our signs, and the monotony and sterility of most highway lighting.

We must stop looking at current economics as the major determinant of highway location and form. We have been too prone to project costs in terms of easily measurable criteria such as right-of-way acquisition, earthwork, drainage, structural accessories, and annual maintenance, and conveniently to ignore less easily measured but no less important criteria of environmental integration, driver satisfactions and visual rewards. There are substantial precedents for solving engineering problems in the best fashion, not the cheapest. Why should this not also be applicable for visual design?

We must recognize the need for better synthesis of all the specialists whose contributions are now involved in highway and environmental planning. The traffic, design, pavement, and structural engineers, the economist, ecologist, psychologist, sociologist, the regional planner, city planner, landscape architect, architect, and a host of others all have something to say that should not be ignored. Ideally, as with all conceptual design, this synthesis should take place in one mind. Practically, because of the scarcity of such supermen, we can only hope for a good collective mind or planning team motivated and crystallized by an able administrator.

We need finally to accept the fact that we are dealing with a social environment as well as a physical one and that a social environment is tied as closely to visual values as it is to economics and technology.

An early philosopher once said that "man learns to build wisely before he learns to garden finely." In our contemporary civilization, we, too, have apparently found it far easier to develop technology than to create beauty. Can it be that we are finally entering an era of greater social maturity?