

Handling of Limited Access Problems on the National System of Interstate Highways

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One of my earliest employers said to me that the hardest part of any job is getting it. Those were years when engineers were plentiful, but what he meant was that given the opportunity and the time to learn the job, plus perhaps better than average intelligence, any job could be mastered. But the most difficult part is getting the job in the first place. So, in the case of controlled-access highways, the most difficult problem has been to convince not only laymen but highway engineers of the desirability of access control on major arterial routes. This struggle has been going on for a long time. The first expressways with full control of access were constructed in the 1880's. I mean truly free-ways depressed with highway-highway grade separations. I am referring to the highways across Central Park in New York City to accommodate horsedrawn drays carrying freight from steamship and sailing vessels, river to river. It is a happy commentary that these expressways are in use today. For 75 years they were little altered other than to replace granite block with concrete pavement, but in recent years the terminals were changed to Y's and channelized to fit the one-way street pattern.

While there have been park drives with many controlled-access characteristics in Boston, Philadelphia, and elsewhere in operation for many years, modern expressway development for motor vehicle traffic can be considered to have been pioneered by the Park Commission of Westchester County, a northerly New York City suburb, which set the pattern for later expressway work in that and other metropolitan areas. The first one was designed as early as 1914. Its construction was prevented by World War I and it was not put into service until the 1920's, but that expressway plus several others put into operation in the same decade have served increasing volumes of traffic and are just as safe and have just as high capacity now as when they were constructed. This

is due to the fact that they have full control of access with all grades separated.

This problem of selling access control has been pretty well solved. The trend to access control is snowballing. Forty-four states have controlled-access authority, one of which is by judicial decision and another by constitutional amendment.

When the Interstate Highway System reached beyond the designation stage and Congress authorized increased appropriations at higher than the customary 50 percent of Federal participation and there were indications that authorizations in much greater amounts would be forthcoming, the Bureau of Public Roads, in August 1954, issued Policy and Procedure Memorandum No. 20-4. It required ultimate control of access on all Interstate routes. It created, along with favorable comments from most states, some strong opposition. In this short period the opposition has practically vanished and the states are taking the lead in providing for ultimate control of access. Recently, Commissioner Curtiss in commenting on this change of attitude on the part of the states told me as author of this memorandum that it should have been gotten out a year sooner, but there is serious question whether the nation was ready for it any earlier than the date of issue.

Some Problem Solutions

Several problems have arisen in connection with access control on the Interstate system and it is interesting to see the manner in which these problems are met. One of the most serious is the opposition of individual roadside businessmen who feel that control of access means the end of their businesses since direct access will not be available and road users will have to reach these businesses indirectly by way of the safe and properly planned interchanges. There are numerous examples to show that while some individual businesses are adversely affected, most businesses are not.

California has gone a long way in dispelling this myth by analyses of business activity before and after the construction of controlled-access highways. Any one interested in this subject should examine a file of the magazine published by the California Department of Public Works, in which numerous analyses of this nature are published. Against the few businessmen who are adversely affected is the advantage which accrues to the businesses on the existing commercial streets of communities by the relief of traffic congestion. Furthermore, they are not confronted with new competition which develops along noncontrolled-access highways constructed on new location. Where the new location highways are constructed with control of access, competing businesses

do not develop and the relief of congestion in the community enables local business, which heretofore could not reach them, to return to local stores.

Mr. Vogelgesang, in a recent article in the A.S.C.E. Proceedings, referred to the experience with bypasses in Indiana. This state developed many bypasses and some of them pretty far out too. Their lack of access control resulted in the development of roadside businesses which competed with established businesses, increased accidents, and reduced capacity. Indiana's plans for bypasses or belt routes on the Interstate system call for access control.

Access control does not retard the development of adjacent land; on the contrary there is sufficient evidence, such as the study of the Houston, Texas, Gulf Freeway, that proves that land along controlled-access highways develops at a much faster rate than land elsewhere. It is a different kind of business, however; not the individual business that caters to the individual road user but rather large warehouse and manufacturing types of businesses which know the value of closeness to free flow highway facilities. Their owners are not interested in direct access for catering to road users.

An example is Route 128, a freeway around Boston, which has attracted all kinds of industries on well-landscaped sites. The New York State Thruway has estimated that already new industries worth \$150 million have sprung up on adjacent land, which employs 30,000 people with an annual payroll of \$100 million.

Sometimes even the small roadside businessman displays statesmanship and a high degree of understanding of the problems of the state highway departments, if they are acquainted with the facts. Two years ago I was impressed with the attitude of a group of businessmen along U. S. 40 in the western part of Ohio. I was called to Ohio to discuss this problem of access control and attended a public hearing regarding an Interstate route which was to parallel existing U. S. 40 on new right-of-way. Nearly 100 businessmen along present U. S. 40 had organized into an association and were represented by counsel. Counsel told the Commission that they fully realized the need for expressways and would not oppose this Interstate route provided, of course, their section was not alone in being relocated but that it was a route clear across the state. They had, however, three requests to make: (1) that the new highway have full control of access so that competing businesses would not develop along it, (2) that adequate signing would be provided at interchanges to acquaint the driving public with the fact that the businesses catering to road users were located on the existing route,

and (3) that the state would retain the existing route on the state highway system so that it would be properly maintained.

Ohio has determined that about 90 percent of the Interstate system mileage, roughly 900 miles, would be constructed on new location. There was some doubt about assuming the burden of maintaining and additional 900 miles of highway, but it was soon realized that the maintenance cost would be less by locating the Interstate routes as desired on new location than to try to convert the present locations to Interstate controlled-access highways.

This is a matter of simple arithmetic. Where a controlled-access highway is located on new right-of-way, a divided highway, let's say four lanes wide, is constructed. The existing road is two lanes wide so that a total of six lanes must be maintained. If the highway is developed on the existing location the same 4-lane divided highway for through traffic is required and in addition two frontage roads, each two lanes wide, are required for access control, or a total of at least eight lanes would have to be maintained.

Final Location

The principal problem in the hands of highway engineers at this time is that of final location. In rural areas this is not a difficult problem. The states have already received approval of the final location of over 10,000 miles of the 40,000-mile Interstate system. The final location of most of this was determined by reconnaissance to meet the criteria of reasonable directness between control areas and ability to develop to Interstate standards. Some of it required much detailed analysis concerning two or more alternate routes. Sometimes just a comparison of length and rise and fall was enough to eliminate a feasible alternate; sometimes a comparison of cost was also necessary; and sometimes a complete economic analysis was necessary.

It is in the suburban and urban areas that location becomes an extremely difficult problem and it is not unusual for many alternate lines to be considered and studied in great detail. It is extremely difficult to find a location through an urban area that is continuous and free of untouchable areas; such as, tall and costly buildings, cemeteries, public buildings, churches, and schools; and not disrupt the neighborhood's economy in considerable degree.

Recently I went to New York and northern New Jersey to examine the preliminaries on an expressway leading west from the George Washington Bridge out of New York City. The engineers there are studying no less than 17 alternates. Shifting short sections

result in differences in cost running to the millions of dollars per mile. (I was fortunate enough to be taken up in a helicopter by the Port of New York Authority. It is an excellent instrument for reconnaissance work although taking off from and landing on the top of a 20-story building has its drawbacks.) The cost alone is not the only factor in such case for, with the high volumes expected, indirectness which results in additional travel distance can be very costly to the road user and the annual cost thereof should be related to the annual cost of savings in construction effected by such indirectness. A simple method of computing such relationships is given in the informational report by the Committee on Planning and Design Policies of the American Association of State Highway Officials entitled "Road User Benefit Analyses for Highway Improvements," which can be purchased from the Association.

Conversion of Recently Constructed Highways

Another problem confronting highway engineers in connection with control of access is the conversion of recently constructed highways, excellent in every respect except that control of access was not acquired. Several state highway departments are going through the agonizing experience of purchasing access control with the realization that it would have cost just a fraction a few years ago when the highway was built. It is to their credit that they are courageously going back and buying access now with the realization that it will never cost any less. I recently was asked to advise the Georgia State Highway Department on just such a problem. It is constructing an excellent expressway system in the city itself, many miles of which are open to traffic. Approaching this expressway system from the south is a four-lane divided highway which is on excellent location but the right-of-way was acquired without access control. Roadside businesses are developing along it. The State Highway Department is studying the highway foot by foot. Where the land is still open they are acquiring additional width on which to construct frontage roads with liberal space between the through traffic lanes and the frontage roads. Where the land is already developed, as with gas stations and motels, my advice was to avoid the costly procedure of acquiring these businesses. Instead, they could be moved back where feasible and where not they could be left where they are and frontage roads constructed on the existing right-of-way even though it results in narrow outer separations between the through traffic lanes and the frontage roads. After all, frontage roads are local roads and streets. They need be neither straight nor flat. They can deviate at varying distances from the through traffic lanes and follow the contours of the ground. The roadside businesses, incidentally, will not be adversely

affected because they have been surprised to find that motels which were in existence before the expressways in the city itself are doing a thriving business because it is possible for motorists on the expressway to leave at interchanges and reach them. The lack of direct access was more than made up by the fact that the expressway attracted large volumes of traffic which formerly used other arterial streets.

Right-of-way Acquisition for Future Construction

Another problem on access control is the inability of many states to acquire or reserve right-of-way for future Interstate highways. Without some form of reservation, open rights-of-way, particularly in and near urban areas, can be closed in before funds are available for acquisition. It isn't increase in land values that hurts but the need to acquire and destroy buildings when they are not very old. Zoning has some application in this problem but the safest procedure is to acquire right-of-way for future use. California has met this problem by using a revolving fund for acquisition of right-of-way well in advance, usually five years, and when the project advances to construction the amount spent for right-of-way is returned to the revolving fund. The staff of the Highway Laws Project of the Highway Research Board has completed a first draft of a study entitled "Acquisition of Land for Future Highway Use" and hopes to issue it shortly.

There are many more problems in connection with control of access which could be discussed if time permitted. The problems now and hereafter will be those which must be solved to attain control of access, and I am confident that highway engineers will solve them. This is much different from the situation only a few years ago when the principal problem was to convince highway engineers that control of access was necessary and justified to retain the capacity and therefore the usefulness of the highway and to reduce the appalling accident experience.

Another and somewhat different problem on the Interstate system is the answer to the question, "Are we as a nation going to be proud of the Interstate system when it is completed?"

Utilizing Vision and Ingenuity

With an increased highway program superimposed upon a generally accepted shortage in engineering personnel, a necessity for more efficient use of engineering personnel, greater use of subprofessionals and technicians, and standardization in planning, design, and construction is bound to develop. Standardization in many phases of highway development can and should be used to advantage. Many other time reducers such as use of photogrammetry and electronic computers should be employed. Unless drastic traffic controls and costly enforcement measures

are applied, I fear that the pressure for standardization and speed may result in highways which, while their individual design features are of a high order, can be monotonous to the vehicle operator with high accident experience in relation to other controlled-access highways. Induced carelessness due to driving long tangents is not an imaginary phenomenon. It is one of the undesirable products of the efficient type of controlled-access highway which results from design based entirely on standards and lack of the attention to important features not covered by standards.

The Interstate system is the most important national system of highways and should be one to excite our imagination; one in which we can later take pride. This will not come about by standardization and later trimming with a few bushes and trees. It will come about only by conscious intent of the designers of each section to obtain a result which will not only meet the demands of traffic as embodied in the standards but be pleasing as well. As has been demonstrated in building fine expressways now in operation, this will not require added cost and need not take added time.

The Garden State Parkway in New Jersey, which was designed under the general supervision of Harold W. Griffin, was planned, designed, and constructed in as short a time as any other comparable highway, yet the result is extremely pleasing, the accident experience is low, and operation on this fully controlled-access highway is relaxing.

The design was made by first obtaining aerial photographs and contour maps of the general location by photogrammetric methods and placing thereon a centerline for each one-way roadway, coordinating each line with its profile and sight distances ahead. These maps were then turned over to consulting engineers for the final design and the preparation of contract plans, specifications, and estimates. Long tangent roller coaster profiles were avoided, yet the location is reasonably direct. Sight distance is well above standard minimum, yet is never so great as to encourage unreasonably high speed. Right-of-way is not constant in width but varies considerably so that very wide medians are available in rural areas where land costs are low. Narrow medians and narrow rights-of-way were resorted to in urban areas where land costs were high.

The general procedure of locating and designing one-way roadways is recommended for all highways on the Interstate system. Cars are not driven in two directions at one time, and a divided highway is always superior when the designer thinks and works in terms of one-way roads rather than one centerline for a fixed cross section. The design of intersections and interchanges is not included in this discussion but it is well to advise that designing separate one-way roadways is particularly fruitful in intersection design.

Another example is U. S. 240 south of Frederick, Maryland, a divided highway designed for the Maryland State Roads Commission by Wilson T. Ballard of Baltimore. Here advantage was taken of rolling topography to develop two separate one-way roadways which resulted in grading of about 60,000 cubic yards per mile. Studies showed that an alternate with a standard cross section would have required grading of about 280,000 cubic yards per mile. There are many examples throughout the country of similar experiences, and there is little doubt that the more pleasing and desirable type of facility results from design of separate one-way roadways.

In some sections of the country the topography is such that sweeping curved alinement will come about naturally but in other sections avoiding long tangents may result in alinements which will look forced when viewed from high locations. In those states divided into sections there is a strong temptation to follow section lines since some of the right-of-way already is available or to follow half section lines to avoid cutting across farms which often occupy quarter sections. These difficulties can be overcome by conscious effort in design. There is probably no section in the country where advantage cannot be taken of some detail in the landscape to obtain the desired result. Even in section line states there are likely to be some topographic features which disrupt the section line pattern of farms and the cost of cattle passes or other minimum grade separations often are justified.

The judgment of road users is based primarily on what they see and how they can drive. The fact that the highways are efficient and save time will not long counteract the effects of a depressing highway. If drivers see roadsides cluttered with a conglomeration of businesses and advertising signs, if they have to be alert to avoid accidents due to sudden and uncontrolled entrances and crossings, and if they grow weary of the monotonous sameness of long tangents and fixed cross section, they will consider Interstate highways just another group of the same highways they have always driven. Few will know and fewer will care about the toil to provide adequate roadbed support for all vehicles or about the standardization that insured the meeting of financial deadlines. If, on the other and proper hand, drivers have a sense of relaxation, have an ever-changing view, and drive between roadsides that are pleasing and perhaps green, their sense of security, pleasure, and well being will develop pride in the nation's most important national highway system.