

## ROADSIDES: THEIR USE AND PROTECTION

## THE HIGHWAY DESIGNER'S VIEWPOINT

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We believe that roadside development is rapidly becoming a sort of "second nature" to most highway design engineers; a thought which they hold uppermost in their minds during the growth, under their direction, of a set of basic survey notes into a facility which is functionally correct for the traffic and adjacent land use.

This attitude, however, has by no means been the chiefly prevailing one for a very extended period. It is no far stretch of the imagination to send our thoughts back to the period of a quarter-century ago, and this thought, in turn, sends us to the files to examine some of the plans made in the late twenties and early thirties. We find most of these plans consisting chiefly of a centerline, and a profile grade line. The highways built from these plans, although probably adequate for the traffic of that day, were noticeable, upon their completion, chiefly for the unsightly scars of construction; many projects were outstanding principally for their contrast to the surrounding landscape. Although we have no "then and now" slides to accompany this talk, I believe that most of us can readily bring to mind the meager roadside development of that day, and the contrast which many of our projects of today present, with their blending into the surrounding landscape, and the close attention paid to the utility and safety of the highway as well.

Although we have advanced far, I believe there is still some thought that roadside development should consist chiefly of a casual attempt at beautification. There is, of course, considerably more to the overall picture. When we think of the roadside as "a general term denoting the area adjoining the outer edge of the roadway, and also extensive areas between the roadways of a divided highway," then we readily see - as previously mentioned - that the question of roadside development is almost all-inclusive of the designer's problems in preparing his finished plans for the highway. Although "shoulders" are definitely not included in the above definition, we believe that in some locations the appearance of the shoulders is so intimately related to the other aspects of the project that they, too, might be included in the overall picture.

In further considering this problem from the design engineer's viewpoint, and in light of some of the problems which have been met, we have attempted to set down some definite divisions of the overall problem for detailed discussion. We would list as the number-one question "Right of Way", and number two "Access." These two highly important features of any highway design are certainly among the most important considerations for the attention of the design engineer. In addition, the following categories have suggested themselves: (3) The General Rural Location; (4) The General Urban Location; (5) Recreational Areas; (6) Commercial Channelization; and (7) Intersectional Channelization.

## RIGHT-OF-WAY

It is impossible to overemphasize the importance of wide right-of-way — always in the case of new projects, and whenever possible in the case of rehabilitation of existing highways. We feel that every design engineer should do his utmost to sell the idea of wide right-of-way, if there are still authorities to whom such a selling is necessary. We believe that more highways have been completely outmoded because of lack of adequate right-of-way than from any other one cause. We have previously spoken of the projects of a quarter-century ago. If these projects, although crude in comparison to present-day standards, had been placed on a wide right-of-way, many of their defects could have been corrected during the intervening years, and much of the original investment could be salvaged. But with the narrow right-of-way prevalent in those days, residential, commercial, and industrial development has grown up practically "on top" of the traveled way, and betterment is economically precluded by the very value of this development, which only the highway itself has made possible.

In Maryland we have adopted a right-of-way width of 80 feet for important two-lane roads, and 150 to 200 feet for most divided highways. However, on one of our projects — the Baltimore-Washington Expressway — a right-of-way width of 400 feet was used. On the other hand, right-of-way width for divided highways in urban areas must often be reduced, due to land values, and sometimes widths as narrow as approximately 90 feet have been used.

In the rehabilitation of existing highways, the above standards are adhered to if possible, but in some cases right-of-way costs would be prohibitive and width must be held to a minimum.

## ACCESS

The problem of handling access to the highway, both from intersecting roads and from adjacent property, is one most important to the safety of the highway and even to its useful life. We all know of many facilities which have become hazardous and obsolete due to uncontrolled access.

Maryland has been fortunate in recent years in having legislation authorizing the building of "Expressways" and "Controlled-Access Arterial Highways." Under both of these categories the State Roads Commission is authorized to deny, or rigidly control, access from abutting properties. Under the "Expressway" category, access directly from abutting property is never allowed, and the design engineer must closely study the pattern of all affected properties so that he can provide them access to the nearest existing public way by means of a service roadway usually parallel to the expressway. For the "Controlled-Access Arterial Highway" the access problem for abutting properties is usually handled exactly as for the "Expressway," but in some few cases it has been found necessary to grant large holdings one point of access. Obviously close cooperation with the Right-of-Way Division is necessary, as construction costs versus acquisition costs — for several methods of access handling — must be carefully weighed, one against the other. The problem of access from intersecting highways in the case of expressways is solved by the aid of a close study of the anticipated traffic when the new route is entirely completed. Points of access are usually several miles apart, except where the more highly developed, urban areas are approached. Usually every public road is granted access to the "Controlled-

Access Arterial Highway." For the expressway, all intersecting roads are separated from the grade of the main facility, while for the arterial highway only those of highest traffic density are separated, many intersecting roads being connected at grade. In the case of these latter grade connections, if a study of anticipated traffic and land use indicates a busy intersection in the future, then sufficient right-of-way is taken on the original design to allow for separation in the future.

Maryland also possesses recently enacted legislation which allows the State Roads Commission to designate certain definite points of access for commercial properties abutting on highways carrying 2,000 or more vehicles per day. This legislation will be most helpful in salvaging many highways, or congested portions of them, where commercial development has generated dangerous side friction.

This legislative authorization has already been used to advantage in a number of instances, but not yet to the extent which it is hoped will ensue in the coming years. We believe that the design engineers can readily see the benefit of such authority, and we recommend it for their close consideration.

#### THE GENERAL RURAL LOCATION

In connection with roadside development in the general rural location, I believe that most design engineers will now exert every effort to tie the new project into the surrounding landscape, so that the highway will gracefully blend with the existing terrain characteristics.

Many papers before this body have ably presented the general geometric design features, and we do not feel that they need repetition in detail. To summarize briefly, however, we lean toward turfed shoulders in rural areas, over well-stabilized coarse granular foundations. As previously stated, we realize that some will exclude shoulders from the general thought of roadside development. We believe all designers will subscribe to the use of the flattest slopes economically possible. Opinion is divided as to the necessity of topsoiling. Where it is readily available, we use 2 inches on slopes and 4 inches in turfed median areas. On slopes, care must be exercised to prevent segregation and washing away of the topsoil, either by blending with the underlying material, or serrating the slopes where blending is impossible.

Fairly heavy storms -- say of twenty-five years' frequency -- as well as present and anticipated land use must be considered in connection with cross drainage. Interception of drainage above the highway is important to prevent erosion, and drainage below the highway must be carefully handled, being very important in connection with right-of-way acquisition and good public relations. Median drainage should be analyzed so as to control the spread of water, and to govern the spacing of inlets.

An important roadside-development feature which must be considered in rural locations is the handling of portions of an existing route which is affected in many places by the new project. Where access is controlled, these existing routes, or portions thereof, can be handled along with the service roads. Where the new highway falls into the general uncontrolled rural category, each of these points of contact between the old and new route must be very carefully studied.

In general, the intersection should be revised, if necessary, so as to be generally close to a right angle, say 75 to 105 degrees. Off traffic from the new highway, of course, should be allowed access to the existing route at a much sharper angle.

In rural locations, as well as in all other locations, we must be ever alert to minimize conflict between roadside use and main roadway flows. Commercial and recreational areas should desirably have channelized lanes of entrance and exit, at such angles that off and on traffic will be easily guided from and to the main streams of through traffic. Acceleration and deceleration lanes are highly desirable but, in the case of commercial channelization particularly, we do not feel that they can always be developed.

#### THE GENERAL URBAN LOCATION

The urban project, which the writer pictures for brief discussion, is one where an existing two-lane highway radiates from an important city, and the land use has changed and is rapidly changing from a rural area into a highly commercialized one. The traffic count of 16,000 vehicles per day and the land use dictated a divided highway with curbs, storm water drainage, commercial and intersectional channelization. With the changing land use mentioned and the many commercial establishments along the route, it became apparent that definite points of ingress and egress to and from these commercial enterprises or their parking areas were absolutely necessary. Also it was not possible to think of an absolute ban on parking, so that the section decided upon was a divided highway, providing two 12-foot moving lanes and a 10-foot storage lane in each direction, a 10-foot curbed median, and storm-water drainage. We might say at the outset that we should like to have had a wider median than the one used, but available rights-of-way would not allow this. In connection with this project, every commercial establishment was closely studied, and definite points of entrance and exit were planned; in practically all cases the owner or operator of the establishment was contacted and satisfied before the plans were final. We cannot emphasize too strongly the importance of this commercial channelization in an area such as the one described, because we probably would have had an intolerable condition if haphazard points of ingress and egress were allowed. As recommended for rural locations, the angles of intersection of these entrances and exits were placed so as to blend with off and on traffic. In general, however, it is not possible to obtain as favorable angles of intersection as are obtained in rural areas, and the use of acceleration and deceleration lanes is usually not possible.

The drainage on a project such as this does not offer any unusual problems besides the usual urban drainage problem, the close study of the many small contributing areas, and the solution of the many points of conflict with other utilities. Spacing of inlets on such a project should always be governed by the spread of water from the curb, the roadway being so crowned that all of the drainage flows along the outside curb line. The drainage spread, of course, should be kept well within the storage lane, so that moving vehicles will not encounter this water during a heavy storm.

There is considerable left-turning at intersections in connection with this project, and even in the narrow median described we provided left-turning storage slots 7 feet wide, so as to eliminate, as far as possible, the blocking

of the intersection by left-turning vehicles. Although admittedly narrow, this median and the left-turning storage slots have worked quite well.

Channelized intersections also occur in connection with this project, and, I am sure, in connection with any one similar to it. This question of channelization, as mentioned above, will be discussed in a subsequent section.

I might say that if we had our choice of planning a similar project in an area not yet so densely developed, we would use a median not less than 16 feet wide, with the left-turn storage slots 12 feet wide. This, of course, would give better refuge for stored vehicles, and would also allow a fair area for pedestrian refuge. Other than this, we would find little reason to change any of our design features.

Such very important items as building setback, outdoor advertising signs, and ratio of parking space to store floor space in commercial areas are probably more the function of the local zoning authority than of the highway authority. However, if no zoning authority exists and it is possible for the highway authority to exercise such control, then we would say that it should, by all means, do so.

#### RECREATIONAL AREAS

The highway designer, during his preliminary office and field studies of the project, is in an excellent position to recommend suitable sites which will lend themselves to recreational development.

We believe that most highway engineers will not have to do the actual detail site planning. However, he will be able to see that these areas are so located that they will be well drained, will not impair the safety of the road, can be economically built - if grading is necessary - and at the same time fulfill the requirements of pleasing location and beautiful vistas.

One very important function which the design engineer can be on guard for, however, is to see that highway safety is built into these recreational areas. For anything more elaborate than a simple wayside stop, we would recommend the use of channelized entrance and exit lanes, and deceleration and acceleration lanes as well.

#### COMMERCIAL CHANNELIZATION

We have previously touched on the subject of commercial channelization while discussing access, rural location, and urban location. All of us, I know, are familiar with many examples of arteries which have become virtually choked by intense commercial development, with all its attendant evils of side friction, unlimited entrance and exit areas, and glaring signs closely adjacent to the traveled way. Unfortunately, we have one of the worst examples of this sort of highway between here and Baltimore.

If the design engineer has the authority, by suitable legislation or otherwise, to plan channelization of these areas, he is urged to study closely

each problem and endeavor to arrive at a satisfactory solution. Many examples of desirable details of such channelization have been published, and most of you have standards covering your needs.

In general, successful channelization of such establishments should consist of definitely delineated entrance and exit lanes, preferably curbed. These lanes should be so skewed that traffic can readily flow off of and on to the main highway so as easily to blend with the main streams of traffic. Although acceleration and deceleration lanes are desirable, they cannot always be used, particularly in urban locations where the commercial establishments and parking areas are likely to be closely spaced.

Definite islands should be constructed adjacent to these access lanes, so that only the lanes themselves will be available for entrance and exit. The islands are most effective when curbed. In urban locations, the front of the island may well be placed at the edge of the storage lane, while in rural locations it should be placed about 15 feet back from the edge of the traveled way, this amount of setback actually providing some opportunity for better traffic blending. In all cases, the back curbs of these islands should extend to the right-of-way line.

We do not feel that state highway funds should be expended for this channelization of commercial property, and we have had some measure of success, so far, in having the owner or local authority bear the cost. Here, again, is an opportunity for the design engineer to help develop an idea. We feel that when the advantages of this type of channelization become apparent to many owners, they will be quite willing to bear the cost of installation.

#### INTERSECTIONAL CHANNELIZATION

Special Report No. 5 of the Highway Research Board is titled "Channelization" and contains the following definition: "Channelization of intersections at grade is the separation, or regulation, of conflicting traffic movements into definite paths of travel, by the use of pavement markings, raised islands, or other suitable means to facilitate the safe and orderly movements of both vehicles and pedestrians." This aid to the safety of the highway, and to the free flow of traffic, is very definitely an important feature of roadside development.

We have not found that there are any universally accepted warrants for the use of intersectional channelization, and the design engineer must be on his guard not to use these treatments too frequently. Cooperation with the traffic department of the highway set-up is necessary, and all traffic movements, including particularly turning traffic, must be obtained. If there is some doubt as to present need of channelization, but the intersection appears that it may develop congestion in the future, then, by all means, enough right-of-way should be obtained originally to allow for subsequent channelization.

It is not considered necessary here to discuss in too close detail the actual channelization layout. These details are well covered in many special papers, especially in the A.A.S.H.O. pamphlets, and the Highway Research Board Report previously mentioned.

It is pertinent to mention a very few features which we have found de-

sirable in our experience. In the case of two-lane highways, abruptly placing a median with curbs should be avoided. We now lean toward medians which are flush or nearly so, and of a contrasting color. Also, for such channelizations of two-lane highways, the highway at the channelization and for a fair distance each side thereof should be expanded to dual-highway characteristics. Otherwise, instead of aiding the free flow of traffic, left-turning vehicles will probably choke the flow.

For divided highways, left-turn storage slots should be placed in the median.

Large islands in intersectional channelizations look well and are effective when turfed and provided with mountable curbs. When they are small, however, we now lean to islands of contrasting color, raised only about 4 inches above the adjacent pavement.

We have made no special mention of sidewalks, although, naturally, they will be included in the design, in certain areas, for the safety of pedestrians. In Maryland, our policy is not to build sidewalks with highway funds, and the walks are always paid for by local authorities.

Likewise, utilities - particularly poles and towers - have not been discussed in detail. Poles for parallel lines should be at the extreme limits of the right-of-way, and if the right-of-way is sufficiently wide, they will present no hazard to traffic. Overhead transverse crossings should desirably be 30 feet or more above the roadway, and the frequency of crossing should be strictly limited - say, not more than four to a mile.

It appears that the writer has sketched through most of the high points of highway design, excluding structural design of pavement, subsurface drainage, sub-base, and closely allied items. We feel that it is necessary to do this, because roadside development and almost the whole field of highway design are closely intertwined.

In his paper "Twenty Years of Roadside Development" presented before this body two years ago, Mr. Charles M. Upham stated, "Careful analysis has shown that roadside development is functional with highway safety and highway maintenance --!" We would conclude our remarks with the thought that roadside development is likewise functional with highway design.