THE PERSISTENCE OF OUR MAJOR LINES OF HIGHWAY TRAVEL

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In his admirable work on English Wayfaring Life in the Middle Ages, J. J. Jusserand, former French Ambassador to the United States, quotes an early English author, Horsley, in this manner: "These Roman ways in Britain have frequently been continued as the publick roads, so that where a Roman military way is wanting, the presumption is in favor of the present high road if that be nearly in the same direction." He adds: "There are two reasons for that permanence: - the first is that the roads were built by the Romans to supply needs which have not ceased to be felt." Watling Street, perhaps the most important of these early Roman roads, starts at the Channel ports, one of which is now Dover, and extends through Canterbury, London and on northwest to Wales. Many sections of this location are in use today, though presumably its construction as a Roman way was started in the first century A.D., and probably it was coincident with the line of travel followed back into unrecorded antiquity.

This persistence through the centuries of travel lines is evidenced in other parts of the world conquered and later administered by the Romans, and in the ancient caravan routes of the Far East. Going as far back as history can be traced with any reasonable accuracy, we find this principle holds; - that land travel routes are permanent. We are familiar here with some examples of the continuity of travel routes once established, which date from the earliest years of this nation. The Boston Post Road from New York to Boston is one of these.

The purpose of these references is not an academic expedition into history. The fact that land travel routes are permanent has a real bearing upon the problems which are now confronting the road builders, particularly of the area represented in this group. We must accept the experience of all history that the lines of travel of major character now established will remain and will grow in importance through the life of the nation. (This does not mean the identical location in detail, since the developments and encroachments have made it impossible to redevelop adequately present traffic lines for much of their lengths.) The conclusion is inescapable that through the future of this nation, the major lines of travel as they now exist will follow very closely the same general locations as they now occupy.

This, then, is a proper question: - Are we, as the responsible highway officials, State and Federal, thinking in terms of these roads as they will serve the public in 50 or 100 years or longer into the future, or are we now approaching their redevelopment on what must prove to be a temporary basis unless we depart from practices we have followed in the past?

The routes in process of selection for the interstate highway system, based on the planning survey data, nearly all show for this area a present average traffic use above the limits of efficient capacity of two-lane highways. Of course the raising of these routes to multiple-lane types has been under way for some time, and will continue perhaps at an accelerated rate when construction conditions become more normal. With the known traffic use, all of the routes of this system and of many other major highways will have to be lifted to standards having higher capacities. The growth in traffic in this postwar period has been so much greater than the most optimistic of estimates, that we have reached quantities of traffic in a

relatively few months that had not been anticipated for at least five years, or even longer in the future. If we look at our highways in detail, we find that many of what were considered the most modern in design are already overloaded. This is due in part, of course, to the increased traffic, but it is also true that the type of highway that has been generally built with unlimited access along its frontage, has a rapidly decreasing traffic capacity. This situation will repeat itself constantly unless we make a clean break with the past in the type of design for major highway arteries, and go to the controlled access type of design. This is particularly true in the densely populated areas of the New England and North Atlantic States.

The controlled access highway is not new. Probably the first examples in the United States of this type consist of four streets which cross Central Park in New York City from Fifth Avenue to Eighth Avenue. These were constructed in the 1880's or 1890's for the use of horse-drawn trucking traffic on Manhattan Island from one waterfront to the other without impairing the Park environment. These are of the depressed type. There are other old examples largely in parks or parkways, and even with the passing of time and the necessity for renewal of road surfaces, this characteristic of controlled access perpetuates their utility and enhances their value with time. The examples of such highways around New York City, the Merritt Parkway in Connecticut, the Arroyo Seco Highway out of Los Angeles, the Shirley Highway and Pentagon System across the Potomac from Washington in Virginia, have already proven their service value. In other countries there were some developments, the most extensive of which were the German Autobahnen, which were planned perhaps with military motives, but certainly without the benefit of the thorough knowledge we now possess of how traffic uses the highways.

The essentials of the design of controlled access highways are:

Provision for traffic entrance or exit at predetermined locations only.

Access roads which feed traffic into the main stream directionally over acceleration lanes.

Exit in the same manner.

Elimination of all cross traffic at grade.

Adequate shoulders for disabled vehicles.

The opposing traffic flows are separated by a median strip, and parallel roads to serve adjacent property must be provided or foreseen in the future.

These general principles are common knowledge among highway officials, and have generally been incorporated in the legislation which has been enacted by the States. Comprehensive laws recognizing this type of highway have been passed by 24 States; these include California, 1939; Colorado, 1941; Connecticut, 1939; Florida, 1943; Illinois, 1943; Indiana, 1945; Kentucky, 1946; Louisiana, 1942; Maine, 1939; Maryland, 1941; Massachusetts, 1943; Michigan, 1941; New Hampshire, 1943; New Jersey, 1945; New Mexico, 1945; New York, 1937; Ohio, 1941; Oklahoma, 1945; Pennsylvania, 1945; Rhode Island, 1937; Texas, 1943; Utah, 1945; Virginia, 1942; West Virginia, 1939.

It will be noted that some of the States in this area are among those granting earliest authority for such highways. Missouri in 1945 incorporated authority to limit access in a revised constitution, which is the first instance of such recognition by organic law. Oregon and Wisconsin, perhaps other States, permit acquisition of access rights. There are special laws providing for specific highways, notably of the Parkway designation. The Federal Highway Act of 1944 authorizes this type of construction on the Federal-aid system.

Coupled with the necessity for the extension of legislation providing for this type of construction in all the remaining States is the serious need for legislation permitting more efficient land acquisition. Probably one of the best of such laws is that of New York State. There is general need for a different approach to the matter of land acquisition. Traditionally this has been regarded as a concomitant of construction costs. Without debating the merits of this idea here, the fact that the funds are not made available for land purchase prior to the time that the whole project is financed, is one of the very serious handicaps to efficient or expeditious handling of the construction program. This is a matter upon which a great deal more information should be given the public until there is general acceptance of the idea that land must be acquired well in advance of construction operations if we are to practice maximum economy. In passing, it may be noted that one of the greatest difficulties the cities face in undertaking a public works program, is in the limitation generally prevailing that land costs must be provided for with the construction funds. This precludes advance planning and the advance acquisition of the necessary land.

So much for certain legal and financial aspects, which it is not the purpose of this discussion to explore further.

Since so many undertakings are now under way involving the construction of controlled access highways, there are two areas in which recent detailed studies have disclosed their ruling importance affecting the standard of the design adopted. The first of these is lane capacity. While this may be regarded as only a detail of the design, the capacity functioning of all of our highways depends upon the capacity of the individual lanes, and the studies of such capacities have been matured to an extent that permits their use with a high degree of confidence.

The following characteristics all have a bearing upon lane capacity; the number, length and steepness of grades, the percentage of the length of the highway on which curves and grades restrict sight-distance, the percentage of commercial vehicles, the width of lanes, the presence of adequate shoulders, and the clearance of obstacles at the side, and perhaps other factors which are common to all highways, including the controlled access type, and in addition, for normal highways, particularly in cities, the presence of parked cars, loading zones, turning movements at intersections and cross traffic and pedestrian movements.

Late in 1946 traffic flows on our major highways passed the volumes of 1941 which was the prior peak year, and this with around 1,800,000 fewer vehicles in operation. It is difficult to forecast the use or the attempted use of our highways as new cars continue to flow from the factory.

The conditions producing the present traffic congestion in urban centers, and the difficulties of both movement and parking by those upon whose patronage all retail business established in these areas depends, have not yet reached their peak. These conditions are in large part produced by the rapid decrease in lane capacity of the city streets as they approach the city center and the volume of cross traffic increases. The major reason for the congestion in the central business areas is the limited lane capacity at intersections. The actual observed capacity of a large number of intersections shows very low volumes. Over 35 percent of the intersection approaches where there are no street car tracks, but where parking is permitted, show volumes of between 300 and 400 vehicles per 10-foot lane per hour of the green light. Those accommodating between

200 and 500 per hour of green light include 67 percent of the intersections of like character which were studied. If these volumes are reduced in proportion to the time that the "go" signal operates, the possible hourly volume is small indeed. Incidentally, one of the best arguments for prohibition of parking on business streets lies in the fact that if parking is prohibited the observed average 10-foot lane capacity is 688 vehicles per lane per hour of green light, or approximately double that for streets on which parking is permitted.

For various reasons this interference by parking decreases progressively outward from the more congested business areas. While off-street parking provides a partial relief for business area congestion, there is a second essential improvement, - that of the controlled access belt expressway located in proximity to the business district, which will accomplish two purposes - one, that of providing access to the near vicinity of the desired destination, and two, that of taking off the city streets the traffic which is not bound for the business area. The major arterial roads traditionally radiate from the business centers. These normally extend beyond the city limits and become the main rural highways. Upon these through traffic accumulates and as it approaches the business centers is greatly increased in volume by the urban traffic itself.

Recent studies in a number of cities of varying sizes indicate that this mass of traffic which must move into and through the hearts of the business districts reaches the very heart of the cities because of the road pattern and not because the destination is always there. The observations thus far made show that from 35 to 50 percent of this traffic does not desire to go into the business area. Here is the second sustaining reason for the express highway.

Turning from the lane capacities of congested city streets, which, unless relieved by the major undertakings here indicated, will result in a continuance of the decreasing property values, in the flow of business and the transfer of retail business to the suburban communities, let us examine briefly the requirements of the design to permit maximum lane capacity of the controlled access road. Again, observation indicates that there are conditions under which a lane may accommodate as many as 2,000 vehicles per hour. These conditions are that there are a minimum of two lanes for travel in one direction, that all vehicles shall move at approximately the same speed, that the percentage of commercial vehicles is small, that there is adequate width of traffic lanes, that there are adequate shoulders and clearance of obstacles beyond the edge of the traffic lane, that sight distance at curves and grades is nonrestrictive, and that there are no improperly superelevated curves or interferences from cross traffic of vehicles or pedestrians. The more closely these conditions can be approached, the higher will be the resulting lane capacity.

Four-lane, divided highways generally show a somewhat higher volume per lane than highways of more numerous lanes; one reason being the difficulty of providing nonrestrictive egress and ingress facilities for the much larger capacities of the wider highways. In practice there are few situations where multiple-lane controlled access highways may be provided without any of the restrictive influences. We believe that for the ordinary highway carrying all classes of traffic, 1,000 vehicles per lane per hour is a practicable working figure for design purposes on sections

removed from urban areas. In areas where there is a very considerable volume of commercial vehicles, the practicable figure should be lower, in some cases as low as 800.

Because of the preponderance of passenger vehicles during peak hours morning and evening in urban areas, the maximum practicable working capacity for each lane in the direction of heavier travel is 1,500 passenger cars per hour. This will permit speeds around 35 miles per hour, which is reasonable for the comparatively short distances to be covered, and for the short periods of peak travel. For such highways the lane width should be not less than 12 feet. Any less width results in lowered capacity, and any obstacles at the side must have a clearance of at least six feet from the pavement edge.

An essential to maintain lane capacity is shoulders outside the traffic lanes adequate to park disabled vehicles. One disabled vehicle not only blocks the lane it occupies, but reduces the capacity of the adjoining lanes. This fact was not recognized when the German Autobahnen were designed, and only one-meter outside shoulders were provided. The paved width was approximately 29 feet of roadway in each direction, and there were few if any places where this paved width did not adequately carry the traffic even with a parked vehicle along one edge. The resultant accidents, largely rear-end collisions, forced the engineers to the conclusion that adequate shoulders must be provided, and this had been definitely determined upon when war broke.

Rates of grade should be limited to those on which commercial vehicles can maintain traffic speeds. In rolling terrain where this is

not possible if commercial vehicles constitute 20 percent of the traffic they will reduce lane capacity to as low as 69 percent of that for passenger vehicles. In mountainous terrain the effect is greater.

The need for off-lane loading facilities for busses is apparent from the figures given for lane obstacles.

There is one other ruling requirement for maintaining lane capacity, and particularly for building safety into the road, and that is adequate sight distance for the anticipated speed of traffic. Data are now available on which to determine the effect of both horizontal and vertical alignment on highway capacity for different operating speeds.

The importance of the travel habit surveys and their application to highway design is equally as tempting a subject as the lane capacity studies to discuss with the responsible highway officials and technicians in this area. The very important uses which the highway departments of New Jersey and Connecticut, and perhaps other States, are making of the data gathered in this manner, for design purposes, is the most reassuring evidence that the serious highway problems of this area will be met in an adequate manner. These detailed studies of how and for what purposes the public as individuals use our highways, assure the permanency of the results which are certain to follow the application of the principles thus disclosed to highway development. After 2,000 years of history we can yet apply what was said of the early roads: "**** the roads were built by the Romans to supply needs which have not ceased to be felt."