

Presented at the meeting of the Society of Automotive Engineers, Detroit, Michigan, January 8, 1946.

HIGHWAYS OF THE FUTURE

By Herbert S. Fairbank, Deputy Commissioner
Public Roads Administration, Federal Works Agency

Highways of the future will differ from highways familiar to the past mainly in a better adjustment of their design and capacity to the character, purposes and volume of their usage. This, I believe to be the broadest possible characterization of the change that is likely to occur in the kind and condition of the entire highway system in the coming years.

It is applicable at the one extreme to the relatively small part of the total road and street mileage that serves, and will continue to serve, the principal arterial traffic streams between and within the cities. It is equally applicable at the other extreme to the much greater mileage the function of which will remain, as in the past, the gathering of the great arterial streams from, and their distribution to, the farms and the city homes and places of business and industry that are both the sources and the destinations of all highway movement.

The achievement of this change is the central purpose of the plan of integrated highway improvement envisaged in the Federal Aid Highway Act of 1944.

What, in detail, will be the character of the future highways? How and at what rate will the evolution of superior adaptation of facility to function occur? To these questions no single answer can be given.

The one term, "highway," comprises in its various uses such widely different entities as the traffic arteries of great cities, the streets of similar function in small towns, the residence streets of cities small and large, the principal rural trunks joining the cities, and the local roads of rural communities. Each of such parts of the highway system is essential to serve some part of the totality of highway transportation and each, in the ideal, must be fitted to the efficient performance of its particular function. But the achievement of that ideal fitness implies a diversity of structural character in parts of the highway system as wide as the differences that distinguish the several functions to be performed.

The difference in function is one of degree as well as of kind. For example, there are in all cities existing streets that perform a largely arterial function, differing in this respect from other streets that perform mainly a collecting and distributing function. But the magnitudes of the arterial movements to be served vary greatly with the sizes of the cities. So, while it may be reasonably anticipated that the future will see in all cities a substantial physical adaptation of the routes of arterial movement to the peculiar needs of such movement, it is not to be expected that the functional design and operation of the new arteries will be the same in towns of 25,000 population as in cities of a million inhabitants.

The country over there are rural highways, generally those joining most directly the larger cities, that serve the principal flows of intercity arterial movement. Such routes are being recognized by

inclusion in the national system of interstate highways which is in process of official designation. But while all parts of such a system will possess in common the character of principal intersity arteries of their respective regions, the magnitudes of their arterial functions and the degrees in which they combine also local collecting and distributing functions will vary widely with the character of their respective regions, and the sizes and distances between the cities they connect. So, likewise, it is to be expected that in the future improvement of such routes there will be a substantial difference of design and manner of operation.

And, not to labor the point, but rather to direct attention to an especially wide range in degree of service between roads of like general function, there are in various parts of the United States and in each several part rural roads that will be classed as principal secondary or feeder roads, performing in all cases predominantly the functions of traffic collection and distribution, that will serve in that character traffic varying from scores to hundreds and perhaps thousands of vehicles daily. Correspondingly, it is to be expected that the fitting structural improvement of roads of this class in the future will manifest an especially wide range of design characteristics.

Public administration in the past has approached most nearly a clear recognition of function and responsive action in provisions made for improvement of the more important rural arteries included in the Federal-aid and State highway systems. The undeniable fact that roads have been included in these systems that a correct functional

classification would have omitted, and other roads have been omitted that functionally have merited inclusion, is due mainly to unclear perception of conditions essential to proper selection. The further fact that the present condition of these systems falls short of an adequate structural adjustment to required function, is traceable to factors associated with the pioneer period that produced the condition.

In that period the number of motor vehicles increased many fold; the character and performance ability of the vehicles was progressively altered in ever widening departure from those of the animal-drawn vehicles, their predecessors in use of the highways. Conceptions of highway function and character were correspondingly altered, and sections of the system more recently improved approach in character standards of utility presently considered desirable. But many sections of earlier design and construction survive to perform at present a still useful, but inadequate service. The sections earliest improved were generally those which at the time served the larger volumes of traffic. In most cases they remain today the more heavily traveled parts of the highway system, and though in most cases their original design has been somewhat improved by subsequent construction, the necessary expenditure for initial improvement of less important parts of the system has left of the always limited available revenues amounts insufficient to effect in full the required expensive modernizing improvements of the older and more important sections. Such sections are located generally at the nearer approaches to the cities, and this accounts for the fact familiar to all travelers that driving difficulties increase generally as they enter the outskirts of the cities on their routes.

That passage through the cities themselves is a horror to be avoided whenever opportunity affords, is a teaching of travel experience that accounts for the popular belief in city by-passes as a solution for all urban traffic problems. But while the gross inadequacy of routes into and through the cities is sufficient cause for the through traveler's distaste, the idea of the by-pass as a remedy unfortunately collides with the fact that by far the greater part of the traffic approaching the cities on main highways must generally enter them to reach its final or intermediate objectives. In view of this fact, the provision of by-passes is properly rated as a lesser part of the remedy, of aid mainly to the smaller fraction of through traffic; the needs of the larger volume of city-entering traffic and of the still greater internal arterial movement with which it merges upon entrance are to be met only by the more difficult and expensive improvement of city arteries. Delayed recognition of this greater need and earlier provisions of highway law prohibiting expenditure of Federal and State funds on routes within cities, have combined with insufficiencies of city revenue to postpone overlong the construction of the more ample city arteries now urgently required. But, facing these extraordinary needs now clearly recognized, the cities cannot ignore the simultaneous necessities of reconstruction and maintenance of a large mileage of ordinary streets.

Nearly two and a half million miles of rural roads, five-sixths of the entire rural mileage, remain as they always have been under the administration of thousands of county and lesser governments. The

plain fact is that past expenditures on this large part of the highway system have been made with little consistency of plan and purpose. In consequence there exists a wide disparity between the present condition of these lesser roads, section by section, and the traffic service they must afford.

The first need as we enter upon a new period of activity in highway building is to recognize clearly that the streets of our cities, the main rural highways, and the lesser rural roads are elements of a composite whole - a total system of highways - serving as a whole the totality of highway transportation that should be unaffected in its natural development by political boundaries and the partitionment of highway administrative authority. It should be the aim of all future road building, by whatever authority and financial provision it may be accomplished, to progress steadily toward the eventual creation of an appropriate balance between the needs of efficient and economical highway transportation and the condition of every part of the entire road and street system serving those needs.

Though limitations of available means will continue to prevent a complete realization of the finally desirable state of each section of highway in a single constructive operation, all work that is done should be informed by a clear conception of ultimate plan, and should make conscious provision for the future inbuilding of planned features omitted in the immediate undertaking. There should be a general appreciation of the fact that the roughing-out of a highway system in this country is finished, and that all that is hereafter done should contribute directly to an envisaged and well proportioned final form.

This, in view of the existing multiplicity of highway administrative jurisdiction, calls for a degree of concordance of purpose and action difficult of achievement. It may be regarded by some as a visionary hope that makes too little allowance for the frailties of human nature. But, in essence, it is the purpose of the Federal Aid Highway Act of 1944 and the measures that are being taken to give effect to its provisions.

It is the purpose that illuminates the provision made in the Act for Federal participation and intermediation in the planning and construction of highways of all three principal categories - the streets of cities, the primary rural arteries, and the rural secondary and feeder roads. It is the purpose underlying the Act's direction to select and designate a national system of interstate highways, so that such most important intercity arteries may be clearly recognized and coordinately planned by the many authorities that must have a part in their planning. It is the purpose that accounts for the requirement that the funds provided for secondary and feeder roads are to be expended only upon the more useful roads of that category and that State highway departments are to cooperate with county and local authorities and the Federal agency in selecting systems of such principal secondary and feeder roads for improvement.

It is the same purpose that motivates the determination of State highway departments, while they are engaged in designation of the interstate and secondary road systems, to review and, as need appears, to reform or advise the reformation of the Federal-aid and State highway systems, so that the composition of these systems may be more rationally

adjusted to their intended function. It is responsive to that purpose that the Public Roads Administration proposes as guides to a proper selection of the secondary road systems, first, a careful study of the relation of such roads to the promotion of a more efficient agriculture and better conditions of rural life in order that the most useful roads may be included, and, second, a realistic estimate of the potentialities of applicable revenue accrual in order that the size of the selected system may be adjusted to a reasonable expectation of timely improvement.

It is the same broad purpose that inspires the State highway departments and one city after another in undertaking surveys to ascertain the origins and destinations of the myriad movements that occur daily between the various city sections and between the city and external points, in order that a proper location may be determined for new arteries to accumulate such movements near their sources and conduct them with a minimum of local interference as conveniently as possible to their destinations.

And it was to implement this same central purpose of the new Federal Act, the same essential objective of all future road building activity, that the American Association of State Highway Officials recently adopted and promulgated codes of desirable standards to be applied in the design and construction of roads of the interstate system, and in the construction of secondary and feeder roads.

The framing of the Federal Act was founded upon years of organized study of the existing state of the entire highway system and its further improvement needs, carried on by the Statewide highway planning surveys. The facts gathered by these surveys have been analyzed by the State highway departments and now enlighten the policies and decisions of those departments. The same gathering of facts, nationally accumulated, was the sound basis of two reports to Congress, one by the Public Roads Administration, transmitted in 1939 under the title, "Toll Roads and Free Roads," and the other by the National Interregional Highway Committee, transmitted in 1944 under the title, "Interregional Highways." The clarifying analysis of highway problems and the recommendations made for appropriate solutions in these two reports are the roots of the 1944 Act, and will exert a powerful influence in shaping the program now commencing under the provisions of the Act.

The report of the Interregional Highway Committee, will be especially effective in determining the character of the principal arterial highways of the future. It proposes standards in great detail to which the design of such highways should conform. They are standards informed by a long view ahead, and are not yet generally accepted in all details for present application, but time will bring their more complete acceptance.

These standards of the future call for a judicious employment of the device of controlled access to protect the arterial traffic from dangers of frequent and unheralded emergence of vehicles from

abutting property. They call for wide rights of way, not less than 224 and up to 300 feet wide. They require shoulders wide enough to accommodate standing vehicles clear of the traffic lanes, firm enough to withstand infrequent use in emergency by vehicles moving at high speed, and free of dangerous difference of level at the line of junction with the paved surface.

They prescribe flat slopes for the sides of embankments to lessen the danger of accidental departures from the roadway, and curvature, spiraled and superelevated for safe negotiation at expected vehicular speeds. They specify the provision of sight distance everywhere sufficient to permit the safe stopping of vehicles moving at the design speed, and wherever financially feasible, on 2-lane sections, sufficient to permit the long view ahead which is necessary to allow the faster vehicles to pass slower ones without danger of collision with vehicles moving in the opposite direction.

Lane width of 12 feet is the uniform requirement of these standards and two lanes are specified for roads carrying traffic less than 2,000 vehicles per day, a volume that will not be exceeded in many years even on most of the more important rural highways. Roads serving between 2,000 and 3,000 vehicles a day would be constructed with two lanes where it is possible to provide safe passing sight distance, but with four lanes, two for each direction separated by a median strip, where safe passing sight distance is unobtainable. For traffic volumes between 3,000 and 15,000 vehicles daily in rural areas and all lesser volumes in cities, divided four-lane highways would be

provided; and volumes above 15,000 vehicles daily in rural areas and above 20,000 in urban areas would be served by six lanes divided.

The standards recommended by the Interregional Highway Committee contemplate the separation of grades at all railroad crossings, and on the more heavily traveled routes a similar separation at intersections with other highways, with interchange ramps to provide for turning traffic. Where intersection grades are not separated, the proposal calls for a median strip 40 feet wide, enough to provide safe central stopping space for most vehicles.

Minimum height clearance of 14 feet and generous side clearance would be provided at all bridges and underpasses. On short bridges carrying the highway the width between curbs or rails would be sufficient to accommodate the full width of the approach pavement and its shoulders.

The standards contemplate a complete avoidance of the necessity for stop-and-go signals to halt traffic on the interregional highways, and a minimum of essential cautionary signing. They suggest in detail the form and placement of direction, route identification, and speed limit signs.

It will be apparent that these proposals look to the creation of highways superior in geometric design to the best existing highways. They look to a provision for utmost freedom of safe movement for traffic of the volumes for which they are designed which, at the suggestion of the Committee would be that estimated to develop in a 20-year future.

They would be highways fitted to accommodate vehicles as wide, as high, and as long as the most liberal of State laws now permit. Highway officials anticipate no future need for greater vehicular dimensions. The strength of bridges as proposed would be sufficient to carry all essential and economically defensible gross and group-axle loads. The one feature in which designers of vehicles are most likely to find disappointment is the proposal for strength of pavements and road foundations. In this respect the Committee concurred with the virtually unanimous opinion of highway authorities that there should be no effort now or in the future to provide pavement support for axle loads exceeding 18,000 pounds.

The proposals of the Committee were addressed to a definition of the desirable character of roads forming sections of the interregional system it recommended for designation and construction. A practically identical system is now in process of official designation as the interstate highway system. The standards appropriate for this system of most important highways will be much too exacting for lesser roads, nor will they be needed for the safe and efficient functioning of such roads. The objective to be sought in modification of the maximum standards for applicability to roads of subordinate categories will be that of providing an economically supportable facility of movement for traffic of the kind and volume to be accommodated.

The incentives to closer cooperative action by authorities of the Federal, State, city and county governments provided by the Federal Aid Highway Act of 1944, continuance of the research and fact gathering

of the highway planning surveys, and the harmonizing influence of the American Association of State Highway Officials and the Public Roads Administration will promote the better adjustment of design and capacity to the character, purposes and volume of usage which I have ventured to describe as likely to be the principal distinction of the highways of the future.