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BUILDING A SYSTEM OF NATIONAL ROADS THROUGH FEDERAL AID.

By Thomas H. MacDonald, Chief,
Bureau of Public Roads.

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A traveler leaving New York City on July first would reach a point in China, about two hundred and fifty miles northeast of Peking, on August fifth, thirty-five days later, if he journeyed westward twenty-five miles per hour for ten hours each day in the latitude of New York. If the Federal Aid road projects completed during the twelve months preceding July last were placed end to end along his route -- and land and sea were equally satisfactory foundations for the roadbed -- the traveler would have a new roadway of the various standard types for the whole distance, 8,620 miles.

Assuming that the 15,349 miles of projects actually under construction on June 30, 1924, lay ahead of him to the westward, as he continued on his way he would duplicate the experiences which we all have had in detouring around construction gangs and new work. Even his interest in the highly specialized equipment and the new processes used in the work of road building could hardly counterbalance his accumulated weariness. If he persisted in his desire to see all of these projects under construction, he must proceed from his first stopping place northeast of Peking across all of China, Turkestan, the Caspian and Black seas, southern Europe including Spain and Portugal, across the Atlantic Ocean back to New York City, again traverse the whole of the

United States and only bring his journey of nearly 24,000 miles to an end when he is far out in the Pacific Ocean (173° West longitude computed for 41° North latitude) about a thousand miles northwest of Honolulu.

The picture suggests something of the magnitude of this task of building the highways for a nation, even though the activities for but a single year are presented.

This past year's program has not varied greatly in extent from that of the preceding three years, but it does not represent all of the construction activities of the State highway departments or any of the very extensive maintenance and betterment work which they are carrying forward; neither does it represent the construction work of the counties and other local subdivisions independent of State and Federal supervision. So the title of this paper would more truly represent the situation if it were changed to read "The Influence Which Federal Aid is Exerting Upon the Building of the Highways of the Nation."

It was not until after the war that as a nation we really accepted and attacked as a definite objective the building of adequate systems of highways. Highways adequate in mileage and highways adequate for the traffic which had developed almost over night. The undertaking is now only well begun, and the traffic has continued to increase until in many dense population areas the utilization of highway transport has been slowed down and the

normal and entirely justifiable use of the motor vehicle definitely curtailed.

Constantly, as we go forward, and as new and increased demands are made for highway service, the earlier work which seemed good and was, in fact, advanced for the time, appears inferior when compared to the later production. It has been well demonstrated and the public is gradually coming to understand that the national highway building plans and policies are necessarily made up of developing processes and principles because of the constantly enlarged variety and increased quantity of the demands for highway service. The State and Federal Highway Departments are not free to set up and perfect, mile by mile, a road system. Our highway building is going through exactly the same development process as did railway building. It was the occasion for a great celebration when the last spike was driven to complete the first transcontinental railway. It was a great undertaking, a big conception, but how poorly would the physical accomplishment compare with the transcontinental trunk lines of today.

The first job of the highway builder is to make possible the flow of traffic generally throughout the United States. It would not be fair to perfect in detail a system in one section of a State or of the United States and leave untouched for years to come the highways in other sections. The actual operations of construction must be widespread. Such a policy is fair and is the

only possible course to pursue. No highway administration can survive that does not rapidly provide reasonable service throughout the extent of it jurisdiction. On this principle the highways of this country are being developed but it is a dangerously expensive plan unless each process is a part of a sound, pre-conceived plan, and each new project and each additional expenditure of funds, a necessary step in the fulfillment of this pre-conceived plan. That such a definite plan of major highways has been established, looking into the future more than ten years for its initial completion and perhaps a quarter of a century for its perfection in detail, I regard as the most important accomplishment of the Federal road legislation.

Consider the highway panorama of the United States in 1916. In the older settled sections of the country along the Atlantic seaboard, and particularly in the northeastern States, the highway lines were originally fixed by the topography. The population centers were established first by the waterways and second by the highways that were developed inland from the ports. Settlements naturally grew along the highway routes. So the major highway routes were well defined, not only because of their early influence upon the distribution of population, but because prior to 1916 this section had for upwards of a quarter of a century been giving more or less attention to the development of these main routes as a State responsibility. Many of the States being

small in area, these routes were originally used without respect to State boundaries and the work of the several State Highway Departments had served to erase political dividing lines still further.

Quite generally throughout the South, possibly because of the influence of the highways during the period that the country was being first settled and later because of the relative lack of development of rail transportation, the major highways, while conforming to the best topography, followed reasonably direct lines.

In the great agricultural district of the Mississippi Valley the distribution of population in 1916 had been largely determined by the rail lines and the old overland trails which had exerted a material influence upon the location of the rail lines and the earlier settlements had themselves been more or less obliterated. The big mileage of highways had been fixed by law along section lines, the purely artificial subdivisions of the land. The best location for the highways was sacrificed to make square land lines and the earlier routes which had followed the best topography were pushed around here and there until the old trails as they formerly existed physically became a series of right angle turns and followed along the land lines over hill and hollow as did all other roads.

Further West in the high and arid Great Plains Region and through the western mountain section, an irregular development of the area, widely separated centers of population and rugged topography with low valuation of lands, had permitted little in the way of road development except near the larger population centers. The main transcontinental lines of travel were for the most part indifferent trails.

On the Pacific Coast the population centers and the major lines of highway traffic had been determined by the topography and very considerable progress had been made in the development of these major highway lines all the way from Canada to Mexico.

Prior to 1921 possibly two-thirds of the States had more or less definitely separated the major highways from the entire mileage of public roads within the State, but these systems were conceived as a State utility and not as integral parts of a National system of highways.

East of the Appalachian mountains, as stated before, the major traffic flow lines followed the old established routes, but many of these had been improved by the States and the traffic had increased to such an extent that in selecting the roads for the Federal aid system, in addition to these routes, old time roads which had fallen more or less into

disuse were re-developed as modern routes to relieve traffic congestion. The Cherry Valley road in New York is being developed to supplement the Mohawk Trail. The Joppa road, Baltimore to Havre de Grace, and the Conowingo road, Bel Air to Philadelphia, are being developed to supplement the Philadelphia Pike. The Newburyport Turnpike, Malden to Newburyport, Massachusetts, is being rebuilt and widened to supplement the heavily traveled coast road through the larger towns. The Defense Highway, Washington to Annapolis, little used for years, is being widened and reconstructed to relieve the traffic on the Marlboro Pike. Portions of the old National road in Ohio and Indiana, after years of disuse, have again become a part of a major line of travel.

A new development, but one that will grow and become of increasing importance in all sections of dense population, is the opening of new highways adequate to carry larger numbers and heavier units from the very center of the larger cities out into the rural sections.

In the Mississippi Valley the most important section line highways were selected for the primary through routes and these were supplemented by routes of secondary importance. Since the extent of the Federal aid system was determined by the percentage of the total road mileage, the very large mileage of public high-

ways in these large agricultural States leads to the selection of an extensive Federal aid system, a very necessary provision since one of the most important functions of the highways in this section is to provide service for the land.

In the Great Plains and mountain States of the West the seven per cent limit for the Federal aid system has been based upon a public road mileage which is very small compared to the area, resulting in the selection so far of only the most important through routes. The population centers, the mountain passes and other major topographic features, have definitely determined both the selection and the location of these routes. Many of the highways which it has been necessary under the law to consider secondary, will, as the system is improved and new roads added, become primary.

Notwithstanding all of the varying conditions that exist in these major areas of the United States in the physical development, in the administration and financing of the highways, under the requirements of the Federal Highway Act of 1921, the major State highways, through the cooperation of the State Highway Departments and the Federal Bureau of Public Roads, have been correlated and connected. Interstate and intercounty routes are being established regardless of State and local boundaries or major topographic features. It should not be inferred that this accomplishment has been brought about easily

or without a vast amount of work. Probably the most difficult situation a State faces from the political angle is to pick out a system of highways to be improved as the major traffic lines without having that system greatly distorted by selfish considerations. Road selection has been a major work of the State Highway Departments and of State legislatures for many years so that very definite state systems had been established in a large number of the States. Prior, however, to the approval of the Federal Highway System, or sections of that System, maps were prepared showing the distribution of population by counties and important centers. Maps were prepared showing the tonnage of agricultural production by counties. The existing state systems were mapped, studied and adjustments were made to fit these into the nation-wide scheme. The necessary additions and adjustments of the state systems were brought about through regional conferences with the State Highway Departments and the fair minded and generous attitude taken by the administrative officials made possible the welding of the 48 sections into a harmonious whole.

The first approved Federal Aid Highway System contained approximately 167,000 miles. Additions have since been made to bring the total now to 174,350 miles. The States of Delaware, Maryland, Rhode Island and New Jersey have completed the original selection and additions are being made in each of these States. It is a source of satisfaction to note that in these States where

the major lines have been improved it has been possible to reach with the additional mileage agricultural areas and populations not served and to connect these with the main systems. In the other States the percentage of the system improved varies widely. Both Massachusetts and Connecticut have but a few miles left to complete the improvement of the original system. In all of these States the completion of the system so soon is a result of the large amount of work done before Federal Aid, yet, while the roads are listed as improved, it does not follow that the improvements are adequate. Federal Aid funds will in a large measure be used for the rebuilding, widening and perfecting of mileages of road already improved under prior standards. Many of the so-called improved roads in these populous areas are as inadequate for their present-day traffic as are unimproved roads in other sections of the country, so that Federal Aid will find for many years a most useful purpose in those States which have advanced their road building program to the greatest extent. One item alone might well absorb a very large part, if not all, of the Federal Aid allotments in many States, that is, the separation of grades or the relocation of highways to avoid grade crossings of the rail lines.

A very wrong impression is current that Federal Aid ~~if~~ is of usefulness only in the more thinly populated sections of the country. Congestion of traffic in the more densely populated

areas of the Eastern section of the United States is demanding highway facilities that require an immense expenditure of funds and dollar for dollar the Federal road appropriations are probably serving more traffic east of the Mississippi than west. A situation exists in the western part of the United States, however, that can only be remedied by the application of Federal funds, or at least only will be remedied within any reasonable time from this source. In the nine States of Oregon, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico the primary roads alone of the Federal Highway System will aggregate 10,750 miles. Of this mileage 3,290 are unimproved and 2,290 are graded or lightly surfaced, that is, more than one-half of the primary mileage, which includes all the main transcontinental routes, are unimproved or are improved by grading only with a small mileage of light surfacing with selected materials. Of these latter two classes, there are about 1,970 miles graded and 320 lightly surfaced. The only possibility of going forward with the improvement of these roads on an adequate yearly scale lies in Federal funds and it is only just that such appropriations be used since so large a part of the total area is made up of public lands.

The utilization of Federal Aid to serve most efficiently the needs is seriously handicapped, both in the eastern and western States. In the east the limitation of $15,000 per mile

imposes a handicap upon the States that should be removed or very materially modified since it is impossible to build on the main traffic thoroughfares roadways of adequate capacity without expending very much more per mile than double this amount. It is true that the mileages of such roads are limited but it is equally true that the need for this limited mileage is great, measured by the traffic which desires to use them. It is not alone the construction cost for the roadways proper that is serious. In rebuilding these old thoroughfares the original alignments of the roads have been lost and the old surveys, unless in exceptional cases, can not be re-run. It is possible to claim only the actually occupied location and widths of right-of-way. The expenditures for new right-of-way to perfect alignment and to furnish additional widths necessary are very important cost items. In this the Federal funds do not participate, which is an additional argument for greater latitude in the per mile allotment of Federal funds for construction.

In the West there are many sections of the transcontinental routes which are not of so much importance to the State or to the localities in which they lie as are other sections much less important as links in the through routes. On these sections recommendations to the Congress have been made by the Bureau of Roads and by the States that latitude be given in financing these projects to increase the percentage of Federal Aid up to the full

cost of the road. This plan does not increase the allotment to the States or modify in any way the funds allotted to other States but does make possible the use of the Federal funds by the State to serve this truly national purpose.

In view of the controversy which waged a few years ago over the Federal highway legislation, it may be noted that there is gradually being worked out a plan which is, in effect, a combination of the two ideas of Federal Aid roads and of National roads. The combination is more applicable to the national problem as a whole than either policy alone. This is particularly true since as the roads are completed their utilization by the public has resulted in constantly increasing funds from the road user to maintain them. There is every reason to believe that wherever the Federal Highway System is improved the necessary maintenance funds can be secured from automobile licenses and the gas tax to maintain these roads adequately without overburdening the road user.

Hand in hand with the extensive construction program has gone the program of highway research along both physical and economic lines. The physical research embraces all the features of design, width, thickness, materials, use of machinery, and subgrades. The highway transport surveys which have been carried on in Connecticut, Pennsylvania, Cook County, Illinois, the State

of Maine, have no relation to the old traffic counts but are so broad in their character that they form a basis on which to establish a sound policy of highway improvement, both for the present and for the future. The use of a portion of the Federal Aid funds have made the extensive research work of the Bureau of Roads possible and the results are being rapidly incorporated in practice and policies. The Bureau of Roads only takes its fair share of credit for these researches, for the work done by many of the State Highway Departments and by the universities and colleges has been of immense value, but here again many of these studies have been possible only through the use of Federal Aid funds to pay a portion of the cost.

In the building of a really national system of highways perhaps no use of Federal Aid funds is having greater effect than the building of important interstate bridges. This is particularly true in the south and southeastern States where in many cases the most direct routes between important cities have never been developed because of the lack of bridges over important streams and particularly the lack of the expensive approaches necessary over the low and swampy ground which is characteristic of so many streams in these areas. The building of bridges is not only doing away with slow, inefficient ferries but is eliminating distance by making possible the development of short routes that would remain an impossibility for many years without Federal appropriations.

In the accomplishment of all of these objectives truly national purposes are being served. We are getting away from the old theory that interstate and transcontinental routes should be built for the tourist. I pointed out in a recent paper that highway transport surveys show at points near the State boundaries that foreign cars may run as high as fifty per cent of the total but probably all but about 10 per cent was really a local traffic and was interstate only by reason of the nearby location of the State boundary. In the interior sections on the same highway the through travel would average perhaps not more than 10 per cent, so that Federal Aid does not primarily serve long distance traffic although it does serve this purpose. Federal Aid is being used for tying together the 48 States and for developing a system of roads adequate to carry all of the various kinds of traffic moving on the highways of the Nation, whether it be local, interstate or transcontinental. Other related purposes which are being served by the Federal Aid funds and Federal highway laws are the enforcement on a national scale of generally higher standards of engineering, the securing of continuity of maintenance, and, what is more important than all of these, the building up and reinforcement of the State Highway Departments. Upon them must rest largely the future of the highway work in this country. In this connection it is proper to point out that the five-year period provided in the Federal Highway Act of 1921 to bring State laws into harmony

with certain of the requirements of the Act will expire in November, 1926, and it will be necessary for a number of the States to make provision during the coming sessions of their General Assemblies for major enlargements of the funds and authority of their Highway Departments.