

CONTRASTING UNITED STATES AND EUROPEAN PRACTICES IN ROAD DEVELOPMENT

Address given by Thos. H. MacDonald, Chief, U. S. Bureau of Public Roads, at the Twenty-fourth Annual Meeting of the American Association of State Highway Officials
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The subject assigned provides the opportunity to choose not alone from the technical interests and practices of the moment, but from the wealth of highway experience resulting from the longer years of older countries. It carries the challenge to present those phases and implications which are now of the greatest importance to the highway officials of our own country responsible for the development of maximum highway service values.

The adjustment of our thinking to world trends coincident with the formulation of future policies is timely. All the States have not, as yet, reached insistent turning points, since there are so widely varying conditions of highway development, finances, traffic requirements, public opinion, and of the many elements that determine the course of highway administration. Yet the turning point has been reached very definitely in many States, necessitating, if real leadership is to prevail, sound new programs reaching far into the future. Since our highway travel has become nationally integrated, all of the States are forced into competitive relationship in sharing the income from the road user, particularly from the really huge tourist business. The choice, if the opportunity is now intelligently grasped, can be within the determination of the State highway departments to advance

the standards of traffic service through evolution, or to permit, through failure to exert the expected leadership, changes that are inevitable, to come through revolution.

The numbers of motor vehicles in operation even in single States of this country are a marvel to the whole world. The highway problems of diverse nature thus created on a national scale can be met successfully only by aggressive action based upon factual data, and motivated by unafraid imagination. To accomplish large-scale progress the coordinated efforts of State and Federal Governments are too essential and at best too insufficient for the now foreseen needs to be weakened by any fear of trespass upon prerogatives by either.

Criticisms are made that the conception and development of our highways have been inadequate. It is of no real importance to what extent such criticisms are fair, informed, or even intelligent. It is a fact that through the highway improvement actually accomplished by the State highway departments and the Bureau of Public Roads, a mileage of surfaced roadways sufficient to network the nation has been brought into existence in less than two decades from pioneer conditions. Over these highways there is a daily motor traffic movement reaching such huge dimensions that the total of all the other motor traffic of the world sinks into insignificance when compared. This is the situation now. It is a fact also that, because of the extensive studies in progress for the past three years through the State-wide highway planning surveys, the highway officials alone

have the exact data as to the adequacy and the inadequacy of our present road facilities. How much traffic is moving, where it is moving, what it is costing, what can be done quickly to ameliorate defects, are only single elements in the basic information available to the State and Federal highway officials on which to formulate a sound future program. In passing, it is of interest to note that the indicated future realistic pattern of our most important highways bears no resemblance to the many visionary plans which have been urged.

The man and the motor car together form an independent transportation unit not responsive to regimentation or orientation. The very simple purpose behind the planning surveys is to find what the motorized public is doing, in what numbers, and to design facilities that will permit the flow of traffic safely and quickly over the routes that people wish to travel and for this reason will travel. This method of approach only can give the right answer to the highway program, and right now the best brains in both the State and Federal highway departments should be engaged as a first priority upon the analysis and consolidation of the survey data which, intelligently projected into the future, become per se the highway plan of tomorrow.

The profound influence which the formulation of such a sound highway development plan will have upon future generations may be very inadequately visioned from the major changes in our social and economic structure which have actually occurred during the relatively short time the motor vehicle has been in universal service. The

participation of the delegates from this country in the VIIIth International Road Congress held in the Netherlands, and the subsequent inspection trips in many other countries of Europe, provided a broad comparative background of the results of national highway policies. This is not an advocacy that we should or should not be governed by or adopt the policies and methods of other countries; rather, that we should intelligently appraise the results of the cycles of time through which the older countries have gone as an invaluable experience from which we can profit sans cost. We must give heed to the fact that as the United States matures, we inevitably approach some at least, of the conditions apparent in the older countries. Just as the States which today are initially developing their major highways, are able to improve upon the work of the States which first engaged in constructing State-wide systems, and to avoid the deficiencies now apparent in these older systems, so as a nation we may take from the experience of these older countries very much more than technical details or methods developed under a wholly different economy. If we would profit from the centuries of experience through which these countries have lived, we must anticipate the trends that will best utilize the inherent possibilities of highway administration in reaching a more happy and more stabilized environment for the people of our own country.

The technical reports submitted for reduction to conclusions which formed the basis for the discussions at the sessions of the Congress gave a very adequate cross section of highway technical thought throughout the European countries. Problems of highway design and construction have a remarkably common international aspect. In the prepared discussions of the six general subjects programmed, including the standard types of construction, highway accidents, designs to segregate traffic, and soils, it is evident that the advances in technical development are now so widely distributed that there was an almost unanimous agreement among the countries upon the nature of the problems. A notable change between the discussions at this Congress and those of earlier years was in the harmony of interest of all the countries in the detailed problems of both cement concrete and bituminous road construction. In earlier Congresses there was a noticeable lack of interest by many European countries in cement concrete roads. Their attention was then fixed upon the bituminous types, stone setts, and the various macadams. This interest was reversed on the part of the United States. Now, due to the very wide adoption of cement concrete by all of the countries represented at the Congress, and the great increase in the use of bituminous materials by the United States, there is a notable agreement upon the problems remaining to be met in these fields. This is illustrated by the brief mention of specific problems recorded in the conclusions of the Congress.

For example:

"Joints are still the weakest feature in concrete road construction."

"Concrete surfaces laid since 1934 *** have proved satisfactory *** except *** on bad subsoil."

"The use of dowels has increased."

"Surfaces of bricks, laid on sand without a prepared foundation, are not suitable for roads carrying fast and heavy traffic."

"The general use of iron block paving cannot, for the time being, be expected on account of its high first cost and the difficulty of maintaining a non-skid surface."

"Rubber surfaces are still expensive in first cost and will be limited to places where special value is attached to absence of noise and vibration."

"The inter-action between binding materials and aggregates especially as regards the displacement of bitumen by water needs special attention."

"Improvement and standardization of practical testing methods for bituminous binding materials, mineral aggregates, bituminous mixtures and the wider exercise of control testing in construction demand attention."

Doubtless these appear to be trite statements of common problems that add little to our knowledge. Yet it is an international recording that we do not as yet have many details of design and construction perfected. It is a recognition that continuing scientific attention must be given to such details before we overcome known weaknesses. These are, as a class, typical of the questions that have long been with us.

Another class of subjects introduced, not for the first time, but as relatively new questions, on which there has been a great advance in knowledge recently, is designed to play very important parts in our developing technique. Representative of this class is the general subject of soils, now rapidly evolving as a fundamental science in its relation to highway construction. It was particularly fitting that this topic should be given major attention by the Congress in the Netherlands. Here is a country unique in the universal prevalence of soil problems without parallel in any other highly developed nation of the world. That large sections of the agricultural lands of the Netherlands have been reclaimed literally by pushing out the sea, is proof that the engineers have learned to cope successfully with soil and drainage problems. The securing of foundations on which to build even reasonably stable roadbeds has been further complicated by the existence of thick layers of peat which have been generally prevalent in the drained areas. In some cases where not too deep this peat is removed and replaced by sand fills to form the road embankments. In other cases where the thickness is too great to permit removal except at great expense, the embankments are built upon fascine mattresses. The dimensions of these mattresses are designed after careful determination of the bearing capacity of the soil. An extreme case of different and difficult road foundations is illustrated by the floating of a street pavement on bales of compressed peat, designed not on the capacity of the underlying soil but the buoyancy

of the supporting material. It is easy to understand that any real progress in the development of durable roads in the Netherlands must be closely correlated with thorough laboratory and field tests of the soils involved. In addition to the Netherlands, important contributions to this developing science were made, in particular, by Sweden, Germany, England and the United States.

The indication that the highway officials are including in their field a much broader recognition of utilization problems was the careful consideration of the subject of accident reporting on such a basis that the results between countries will be reasonably comparable. The League of Nations has taken action to suggest the unification of the statistics of road traffic accidents, and the Congress adopted a recommendation to appoint an international committee to give further attention to a form of accident reporting that might be used universally. Certainly this is a movement which the United States can well endorse and support. Out of the discussions came a unanimous agreement that each road accident should be investigated and a record made of the locations, particularly as to frequency, for the purpose of determining if road conditions are a cause, and of formulating an emergency program designed to eliminate hazards thus disclosed.

An interesting discussion had reference to the light-reflecting characteristics of road surfaces, in which was pointed out the distinction between the light intensity of an illumination from fixed units and the light reflected to the drivers of motor vehicles from surfaces illuminated by headlights.

In both these groups of questions, the characteristics of which have been indicated by the examples given, it is evident that a very large amount of serious, well-trained laboratory research and field observations is being conducted by the highway administrations of the various important countries, their universities and technical schools. In general, the enlarged fields of scientific investigation and research related to highway transport have been somewhat later developed in the European countries than in the United States. There are some exceptions, and it will be profitable for the United States to keep close contact with the progress in the solution of technical problems which will inevitably follow the more intensive work now being done upon them.

All that has preceded is largely introductory to the larger subjects from which it is possible for us in this country to obtain great value. These are not so much matters of the exact technical designs or construction methods, but the definite demonstrations of the fact that there comes a turning point in the relationship between a nation and its highways where a re-study, and based on this, a recasting, of highway policies are necessary. Out of the wholly new and very different undertakings which are under way in a number of the older nations, we are privileged to evaluate the conditions which preceded their determination, the methods employed in their execution, and the results which have been so far achieved. There are a number of general facts which must be remembered in comparing or contrasting

conditions in other countries with those of the United States. In the European countries under discussion distances are relatively short, and population is relatively dense. A schedule of some of these actual figures is attached for comparison. For example, on a national basis, the United States has 43 persons per square mile, Great Britain 510, and the Netherlands 674. The network of roads existing in individual countries was developed over centuries for the purpose of serving animal and foot traffic for short distances and at slow speeds. Because of the limitations of land, rights-of-way are generally narrow. The buildings hugged closely the sides and the daily activities overflowed into the roadways which were quite characteristically congested with all kinds of undisciplined, slow-moving traffic of man and beast. There was little conception of communication between the countries by highway. Upon these wholly localized highways was superimposed the motor vehicle, an antithesis in its characteristics to every existing use of the highways. In the United States, on the contrary, a very considerable part of our more modern highway development has taken place after the motor car became not only the vehicle for which particular provision must be made, but also after it became the predominant type of highway traffic. From this brief resumé it is possible to see why there is universal agreement among the European highway engineers that a first principle of highway design is adequate provision for the segregation of traffic. In this lies an important precept which, if accepted in our future work, will mean the meeting

of the most fundamental of all of our highway problems. We do not face the bicycle traffic of Belgium or of the Netherlands, or the rural pattern of France where the population live in villages and night and morning fill the highways with horse-drawn traffic, stock going to pasture, and all the localized movement of agricultural implements incident to farm operations. We do not face the horse-drawn traffic of Hungary amounting now to perhaps 65 percent of total traffic, even on the main roads. It is not necessary to burden the discussion with illustrations that reach the same conclusion. There is unlimited support for the basic principle that the highways must be designed to provide for all the activities in which people engage. We see in short focus and thus loosing large, the motor vehicle, but there are also the pedestrian, the cyclist, and the animal traffic on our own highways. Even the motor vehicle must be considered in terms of local and long distance use. If we fairly look at all these aspects of highway use, there are no roads which do not justify that provision in the design to be made for more than one type of traffic.

The more broadly we analyze highway usage in every country, the more surely we reach the conclusion that the early English conception of the highway is correct. The highway evolved not as a physical facility but as an inalienable 'right of the individual to pass'. This inherited tradition may account for much of the resistance to, and disregard of, traffic regulations today. There is a vast difference between requiring and compelling observance of traffic regulations.

In this difference lies the cause of many of our accidents. In European countries, which we think of as having greater regard for the law, those who use the highways certainly do insist upon the 'right to pass' in every conceivable form of transportation, and to use the highways without any more consideration for other traffic than we show in our own country. It is apparent that this 'right to pass' is a universal demand of the individual, and so the highway design cannot approximate perfection until provision is made for every form of use that is a proper interpretation of this right. This does not mean that all types of use must be provided for within the limits of single rights-of-way. The new special motor roads in the Netherlands include in the design two separated roadways for motor traffic, a bicycle paved path on one side, a wide pedestrian path also paved on the other, and at some distance removed, local roads adequately surfaced for land service and animal traffic. Here is a conception of a highway service that, complete in its component parts, may be used safely by all normal types of traffic, which quality should be reflected in many miles of highways in this country in the future. It may be urged that some of these types of traffic do not exist now in numbers to justify special provision for them, a valid objection as to the immediate need; but it is not the important point. The essential feature is the provision now for the land necessary for the development of each traffic facility when it is necessary. As our country matures and becomes more congested in population, we shall have the need for a combination

of these or comparable highway facilities. This discussion permits a comparison as to the degree that the most advanced types of road building in a number of the European countries are meeting the requirements for universal service.

It may be thought from current news articles that appear from time to time that these countries have adopted a single type of super-highway improvement such as, for example, the German autobahnen. Such is decidedly not the case. Covering the period since the World War, the highway activity common to all the European countries has been the rehabilitation by reconstruction and modernization of a large mileage of the existing major highways. In some countries this program has been supplemented by beginning a system of special motor roads. The decision to undertake a system, limited or extensive, of special motor roads, was made after it became apparent that the existing highways could not be changed so radically in design as to serve fully the modern motor vehicle. Since we are in many States in the process now of attempting to rebuild existing highways to serve more adequately motor traffic, it is possible to obtain illuminating information from the actual experience in certain European countries. When we think of the problem of the United States to provide a mileage of roads adequate for the use of approximately 30,000,000 motor vehicles, it is important to get a conception of the extent to which other countries are projecting the special motor road type in ratio to the mileage of all roads.

Italy was the first country to undertake the building of a special motor road, termed an autostrade, a road built upon a right-of-way to which access from local roads was excluded, and all cross traffic carried over or under. This road was opened in 1924. In 1937 three hundred and ten miles of such roads had been constructed, of which the major mileage radiates from the City of Milan. The total approximates 3 tenths of one percent of the public road mileage. The first road was built as a toll road, and as such has not proven a financial success. The conclusion drawn from this experience is that a subsidy amounting to at least half of the cost of the original construction is necessary before the financing on a toll basis can be assured.

France had as the original basis of its national highway system about 2,500 miles of the old Roman military roads. It is the single country that has proceeded for a century or more to improve a planned system of national routes. The Ecole des Ponts et Chaussées (Government School of Roads and Bridges) was established by Louis XV to train highway engineers. Napoleon I in 1811 established a system of imperial and departmental roads. For over a century no other country has compared with France in its systematic and competent technical administration of highways. For this reason the characteristics of the national system in location, in alignment and in other details are more nearly adapted to modern motor vehicle traffic than the existing roads of other European countries. So the main activities have been the post-war rehabilitation and the modernization of surfaces over a large

mileage. In common with the trend in this country, it has been necessary for the Government to take a far greater financial responsibility in the rebuilding and maintenance of its principal highways, with the result that the national highway system since 1930 has been doubled in mileage and now totals approximately 50,000 miles.

Special motor roads have been planned and are under construction to the extent of 50 miles, all radial from Paris. On the basis of a total public road mileage of 392,000, the 50 miles constitute a minor fraction of 1 percent. It is apparent that France, outside of metropolitan areas, will rely for a long time upon the modernization of its present highway system to serve its major traffic. But it must be accented that on account of its century old policy of technical competency in the planning and development of its national system, much of the purely rural mileage can be brought to adequate modern standards.

The Netherlands has established plans for a relatively extensive system of special motor roads of about 932 miles, of which it has completed perhaps 60 miles.

England recently designated a national system of trunk line highways comprising 4,500 miles of existing principal highways. Surveys are being made in detail for the purpose of determining the work necessary to bring these to more modern standards. The ratio of motor vehicles to area is 26.6 motor vehicles per square mile, the highest in the world, and the congestion of population makes the acquisition of necessary lands for relocations and better alignment a super task. One

of the prominent highway officials of England remarked that in any direction he started a new highway he ran head-on into a tradition. The present policy contemplates the modernization of present roads with by-passes around cities and narrow streets of villages, and the use of new alignments for sections. No special motor roads have as yet been planned.

The greatest interest of the highway world is now focused upon Germany. The undertaking of a spectacular national system of special motor roads commands attention to an extent that obscures the very comprehensive administration plan covering all roads, which the Third Reich placed in effect in 1934. The status of highway administration in Germany up to that time is quite accurately described as highly decentralized, with a marked lack of uniformity among the States and also among their sub-units - the provinces, counties and communes. The Reich itself exercised only certain rights of supervision, particularly with reference to police regulation, organized taxation and distribution of certain tax income among the States.

The comprehensive program of administration of 1934 was predicated upon centralized control over all roads. An Inspector General of German Roads was appointed, who is directly responsible to the Führer and Chancellor. The man appointed to this important position, Dr. Fritz Todt, is a highly qualified engineer-administrator who most capably carries the great responsibility.

The plan for centralized administration provided these essential elements:

1. A reclassification of all existing public roads, approximately 169,000 miles, into four groups, with the special motor roads constituting a fifth class.
2. The establishment under the classification of a 25,500-mile system of main highways, termed Reich roads.
3. The construction of a system of 4,500 miles of special motor roads on new locations.
4. The financing by the national government of the Reich road system and the special motor road system.
5. The establishment of general supervision over all other roads under the direction of the Inspector General.

So much is necessary for the proper understanding of the relationship of the special motor roads to the German public roads. The conception is to provide for fast, long-distance motor traffic over arterial lines, and to improve existing main roads to supplement these and to serve local traffic. The lay-out of the system for the interior has been largely determined by the location of the 53 larger cities of the country, which are thus to be connected. But the idea is of much greater magnitude. Germany, on the authority of Doctor Todt, is recommending a great international highway system of comparable characteristics. The German planned system reaches the frontiers at the points best suited for the continuance into and through adjoining countries. The

study for plans for a Berlin-Rome motor road is far advanced. Negotiations have been going on with the Netherlands, Belgium and Denmark to determine where the projected routes will join at the frontiers. Germany has enlarged the original undertaking to extend construction at once into Austria and the Sudeten area - so now, in place of 4,500 miles, the total projected is more nearly 7,500 miles. About 1,400 miles have been placed in service and operations are scaled to produce an optimum of 600 miles per year. Thus, a minimum period of ten years of high pressure construction activity is indicated.

The characteristic design consists of two roadways, each seven and one-half meters wide with an outside level curb 1 meter wide and an inside level curb about 1 foot wide - a total paved width for each roadway of about 28.8 feet. The roadways are separated by a center parking of 10 to 16 feet, but some variations are used.

The pictures to follow this discussion illustrate fully the appearance and the large scale design incorporated.

Various views are expressed as to these roads. They are termed by some "military roads" but it must be remembered that a high military authority has stated that the system of roads best suited to serve the social and economic needs of a country best serves the military purposes. It is certain that a system of magnificently located special motor roads is being rapidly developed in Germany, which in all probability will be extended by and through the adjoining countries in course of time, thus forming a network of special motor highways serving all central Europe.

In summary, if we would profit from what we see now taking place in highway improvement, we must, through the use of the planning surveys, develop the systems of highways with the characteristics which are being found necessary or desirable after long experience in the countries of Europe that are giving greatest attention to the development of highway transportation. This means that, based upon the highway planning surveys, we must have first a reclassification of our highways; second, a provision for roadways and paths to serve all types of traffic that exist or that will certainly develop. The characteristics of the motor vehicle for fast, through traffic must be recognized, and this use separated from the purely local use. Third, there must be the beginning of special motor roads in congested areas leading from the very hearts of our cities through the metropolitan areas, designed to permit free flow of motor traffic fully separated from other types, and all cross traffic. Fourth, at the other end of the classification, based on traffic density, is the big mileage of land service roads which must be organized and more rapidly brought to a continuously usable condition. Fifth, in between lies the program of State and Federal-aid systems on which work must continue with a constantly higher level of design standards to meet the traffic service requirements safely. Sixth, to accomplish these improvements a radically new policy of land acquisition must be formulated and put into effect to provide adequate space and to control unsightly and undesirable ribbon development.

These are only partial details of the future programs which are now made possible through the accurate data of the highway planning surveys, if these data are used intelligently to formulate the highway administration policies of the immediate future.

COMPARATIVE HIGHWAY STATISTICS

Country	:Population:		Area in		Persons		Motor Vehicle Registration:		Ratios	
	: in 1000	: persons	: square	: miles	: per	: square	: Passenger	: Others	: Vehicles	: Persons
	:	:	: mile	: mile	: mile	: cars	:	:	: per mile	: per
	:	:	:	:	:	:	:	:	: of road	: vehicle
United States	: 129,337	: 2,973,776	: 43.5	: 25,471,189	: 4,570,103	:	:	:	: 10.0	: 4.3
Great Britain	: 45,266	: 88,745	: 510.1	: 1,798,105	: 564,688	:	:	:	: 13.2	: 19.2
France	: 41,906	: 212,659	: 197.1	: 1,561,421	: 531,050	:	:	:	: 5.6	: 19.1
Germany*	: 73,376	: 214,058	: 342.8	: 1,240,033	: 372,079	:	:	:	: 6.2	: 45.5
Canada	: 10,377	: 3,456,556	: 3.0	: 1,104,150	: 201,989	:	:	:	: 3.2	: 7.9
Australia	: 6,706	: 2,974,531	: 2.3	: 517,430	: 232,323	:	:	:	: 1.5	: 8.9
Russia	: 165,847	: 3,095,728	: 20.5	: 65,096	: 449,344	:	:	:	: 0.3	: 322.4
Italy	: 42,764	: 119,714	: 357.2	: 321,322	: 118,572	:	:	:	: 2.9	: 97.2
Belgium	: 8,300	: 11,752	: 706.3	: 144,093	: 79,677	:	:	:	: 10.7	: 37.1
Sweden	: 6,250	: 173,347	: 36.1	: 134,296	: 57,651	:	:	:	: 2.1	: 32.6
Netherlands	: 8,557	: 12,692	: 674.2	: 93,545	: 54,360	:	:	:	: 11.7	: 57.9
Czechoslovakia	: 15,215	: 54,207	: 280.7	: 79,362	: 26,165	:	:	:	: 2.4	: 144.2
Norway	: 2,895	: 124,964	: 23.2	: 47,183	: 32,576	:	:	:	: 3.1	: 36.3
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*Includes figures for Austria.