

Comprehensive Survey of Highway Situation in United States --
Demand for Better Highways Confronted by Problems
Requiring Careful Consideration for Solution.

If we were nearing the end of a super program of road building, to finish the task and to provide the last connecting links that would join many miles of completed highways into finished systems, we might justify attacking this year's road building without too much caution. If we had passed through a period of road production of proportions such as are now demanded, we might count on an industrial army, well trained to the task and properly officered. If we had produced in any one year a considerable percentage of the road-building materials now needed, we might with confidence expect the necessary expansion of production from established plants. If we had not for practically three years dammed back a rapidly swelling flood of projected private as well as public improvements, we might seriously expect these to give rural highway construction the right of way, rather than compete with it for labor, materials and transportation because of its extreme importance to the nation as a whole. And, finally if we had ever successfully transported the materials which must be hauled by rail, for the most part in open-top cars, promptly and in the quantities now necessary, we might not now anxiously question the response that our demands for greatly enlarged rail service will receive.

But none of these conditions are true and none have been equaled in the past. Rather we are entering the first year of a decade at least, during which rural highway improvement will dominate the field of public improvements. This statement is made seriously and soberly, and results not from an over-enthusiastic state of mind, but from a contemplation of the very large sums which the public have made available for this purpose, and from the knowledge that the end sought is based upon the fundamental need of the whole nation for serviceable highways. For many years the demand for the construction of better highways has been increasing in all parts of the country. At the same time the wealth of the country has increased and made possible the financing of extensive highway programs. The development of motor vehicles and the consequent unforeseen extension of highway transportation has made it essential that adequate roadways be provided, and these within the shortest time possible. This situation is general. Nationally it found expression in the Federal-aid road act carrying the Federal aid appropriations. In each State it has found expression in legislation providing for the acceptance of Federal aid, the creation or extension of State highway departments, and in the appropriation of funds that will much more than meet the requirements of the Federal-aid road act. In counties and districts the experience has been similar. Not a single State is missing from the ranks of those entitled to be classed as "good-roads States," and the sentiment within the States is overwhelmingly favorable to sane highway improvement.

Some weeks ago, in the columns of this periodical, summaries were given of the funds so large that only estimates could be made, that are now available from State and Federal sources, and it is not necessary to dwell further upon this fact or here to set down a startling array of county and district bond issues which have already received endorsement of the tax payers in order to prove the statement of the extent to which we, as a whole nation, are committed to a program of highway improvement.

Thus, the experiences of the year before us will make highway history rapidly, and the results of this year and the immediate following two or three years will exert a profound influence upon the future progress of highway improvement in this country.

The highway builders of the country have not, up to the present time, been free to exert themselves to the utmost in road production. Prior to the war the programs were determined by the funds available, and during the war highway production was determined by the unavailability, of the elements of construction. The construction achieved during the past year, with the late start, unsettled industrial conditions, the uncertain and insufficient rail transportation for materials and unorganized construction forces, is no criterion of the results which can be achieved this year. The highway departments, contractors and material producers are keenly alert to the situation, and a rate of progress greater than has heretofore been attained is practically assured. Yet the situation calls for an earnest survey of conditions, the adoption of new methods and new policies to meet these conditions, and a realization at the outset on the part of the public that the possible rate of construction will not fully meet demands which are so widespread. This means there will have to be some waiting for completed highways, and a realization of this fact now should be sufficient to ensure the formulation of policies that will be the safest policies to follow over a period of years.

One condition must not under any circumstances be allowed to obtain. There is a limit as to the amount of production which the material resources and available labor of the country can accomplish, and the prices for road construction must not be driven beyond a reasonable level by competition among highway officials. Higher prices and not an increased mileage of completed highways could only result. It is logical, therefore, to attack this year's highway building program with this principle in mind.

It is not possible to meet the situation for increased highways in the same manner that increased local or State building programs have been met in the past, that is, by drawing on surrounding districts for additional equipment, larger labor supplies or new contractors, for at the present time practically every other region is pushing its own construction program with equal vigor, and, with minor exceptions, none have much of any surplus in materials, labor, equipment or trained men which they can spare. Naturally, the development of all of these has been greater in the vicinity of the larger population centers, and it is there that the highest-type roads are needed in the greatest amount. Also, the idea of State bidding against State or county against county, or State against county, or vice versa, is repugnant to a sane, business-like handling of the administrative problems involved in meeting the national problem of how to handle this work without creating a competitive condition which will not only force prices higher, but that will interfere with other industries, increase the already universal shortage of labor, ask impossible performances on the part of the transportation facilities, and in this way interfere not only with production of commodities generally, but help to sustain an unsettled industrial condition. There are no rules or lines of action that can be laid down to guide entirely the course of the administrative highway officials in the face of the present circumstances. The only effective course will be close co-operation between counties and States, neighbor-

ing States, and the State and Federal highway departments. The confidence of the public must be held, and it will not be held if competition forces prices beyond reasonable levels. This is manifestly true, since such a course will not result in the increase of production consistent with the additional outlay.

Production of highways during the ensuing year will be determined largely by four tangible and somewhat independent factors. These are the supply of cars and rail movements of road materials; the rate at which materials can be produced, which is essentially a manufacturing problem; the amount of labor which may be used for this industrial purpose without interference with other production demands, and, finally, the matter of contractors and contractors' organizations and equipment. The success with which any large program for highway construction is carried on necessarily involves the careful consideration of all of these factors and a limitation of the projected production to the available supply of each. Inquiries some time ago addressed to the district engineers of the Bureau indicate that the volume of highway work now under way is already manifesting a pronounced influence on the cost of construction, but the evidence indicates that a more pronounced influence may be expected in the future, which necessitates a prompt and nationwide adjustment of the highway program, so that unreasonable advances in the cost of construction may be avoided. For instance, in the month of October, 1919, there were under construction approximately 1150 projects on which Federal aid had been granted. Of these, 42 per cent, or 485 projects, involved the construction of earth and sand-clay roads. These types involve practically no rail transportation. Nearly 30 per cent of the projects under construction at that time were gravel roads. It had previously been estimated by the Bureau that approximately two-thirds of these projects involved the use of no rail transportation for the movement of surfacing materials. There were, therefore, in the opinion of the engineers in the Bureau of Public Roads, approximately 110 gravel roads under construction which involved the use of rail transportation for surfacing materials. It was assumed that on the balance of the projects for other types under construction more or less rail transportation was also required. This means, according to the Bureau's prior calculations, that approximately 440 Federal-aid projects, depending more or less upon the railroads for the delivery of material, were under construction, which was substantiated by the reports from the district engineers, indicating that during the month of October rail transportation was being used on about 460 projects. To those who were depending upon rail transportation during the closing construction months of 1919 it is not surprising to find that of the 460 projects, 396 were reported to have been appreciably delayed by reason of the inability of contractors to secure cars for the prompt shipment of these materials. It is not necessary to point out the unfavorable and direct result which a continuation of such a condition is bound to have on the contract price of the higher types of pavements, as well as on the period which will be demanded for the completion of such work. It has been pointed out by the Railroad Administration that this condition can be to an extent overcome by the utilization of opentop cars during the spring months, when normally large numbers of cars have stood idle. It would seem that no great amplification of this fact would make more impressive to the road builders or the public generally the fact that during March, April and May as high as 250,000 opentop cars were idle, while during October

of the same year 396 projects out of 440 requiring rail transportation were delayed because of the unavailability of these same cars. For the purpose of keeping down costs and of utilizing our rail transportation more efficiently this Bureau has already pointed out the necessity for use of this equipment when it is available.

The supplying of materials necessary for the construction of pavement surfaces, that is, the sand, gravel, broken stone and such materials, will be dependent upon the plant facilities of the country. By extending the production season the production of the present plants can be greatly increased. Yet in 23 States the reports to this Bureau show that the supplies of material produced within the States is inadequate to meet the present demands for materials, and that not only in these States, but in a total of 40 States, in order to meet any increase in the rate of highway construction, additional facilities for the production of road materials will have to be developed. The present possible supply is such that in 29 States it is estimated that an extended increase in highway construction will cause a definite increase in the cost of materials of construction.

To remedy this condition will take time and involve considerable investment in more or less permanent plant facilities. State after State is now making a survey of the possible material supplies and seriously attacking the problem of a self-contained highway program. Such action is commendable and justifies public confidence in the ability of the highway departments to meet this situation.

The labor situation is difficult. During the past two or three years there has been a tendency on the part of industries to bid against each other for any surplus labor, with the result that the price paid for a day's work has increased tremendously, that the output per man has decreased, and that in general the turn-over has been abnormally high. The effect of this condition upon the prices bid for road construction has been important in the increased price paid, but has probably been even more important because of the difficulty of keeping an organization together long enough to become efficient producers. It is highly important in considering this question that the effect of highway construction should not be reflected unnecessarily in the increased cost or decreased supply of rural and farm labor. Not only must production of foodstuffs be made a first consideration, but the handling of the highway improvement program must not develop opposition to such programs in the rural districts.

Finally, there is a limit beyond which it is impossible for existing highway construction organizations to go in handling new projects because of the amount of equipment at their disposal. As soon as the amount of work that is available exceeds the existing contractors or potential contractors and contractors' organizations there will be a tendency toward a rapid increase in prices, not necessarily because of an effort to extort unfair profits, but because whatever more work is taken than there is equipment and organization available to handle will involve heavy outlays in the nature of capital charges for additional equipment, and the contractor will be forced into competition for labor at probably higher prices.

The reports to this Bureau indicate that in 20 States there is already a deficiency of contractors, and that this is unfavorably affecting the cost of highway construction, and these reports further state that a further increase in the rate of highway construction would adversely affect current prices in more than 30 States. While this condition is serious, it is capable of a solution. Taking all these conditions into consideration, it would appear that the rate of highway construction cannot be greatly increased without causing a serious

trend of prices upward and without necessarily greatly increasing the rate of actual production. But such is not necessarily the case, and it is in wisely adjusting the coming year's program to the various classes of work that production can be increased without unnecessarily disturbing prices or industrial conditions.

About 30 per cent of all Federal-aid projects up to the present time are for grading and draining only, and most of these projects are preliminary to the placing of surfacing material of some character. Approximately 42 per cent cover grading, drainage and the placing of gravel or sand-clay top, used in this sense very generally. These projects also to a large extent are preliminary to more advanced types of road surfaces, but are used where the volume of traffic is such that something that will give better service for a time than an earth surface is desirable. The grading and draining are, of course, common to all types of highway, and whenever a permanent grade is placed on any approved route, definite progress is made toward the ultimate construction of a serviceable highway. If gravel and sand-clay surfaces are laid, a highway satisfactory for light traffic results. Indeed, these surfaces can be maintained in a very satisfactory condition even in the face of rather heavy traffic, and the construction of such roads does not impose any considerable strain upon rail transportation or material production.

In this type of construction machinery and equipment are utilized fully and man labor is reduced to the minimum. There are a great many contractors available who are experienced in dirt moving along the lines of railroad construction who would not be particularly interested in equipping themselves for building higher types of construction. It would, therefore, be exercising the best of good judgment in those districts where the highway traffic is comparatively light, where the paving programs are only starting, where material production is as yet limited and where contractors have not been developed for the higher types of pavement, to proceed with this lower class of construction as rapidly as possible. Such a plan will utilize all of the available equipment, labor and contractors toward a very definite end.

The preparation of permanent grades several years if necessary in advance of the higher forms of pavements is a practice that assures better construction in the end, and as a policy needs no defense in the face of present conditions. Moreover, in those sections where gravel and sand-clay roads can be maintained in reasonably satisfactory condition during the greater period of the year under the traffic which will use them, the demand is for long mileages of such roads rather than high types of construction of short mileages. That is, there is a certain amount of traffic which some State highway departments must provide for to be carried over considerable distances. The pioneer work, that is, the grading and drainage and building of waterways, must come first, and must be done before any other type of construction can be built, and this traffic must continue to be carried, even though it is known that a hard-surfaced pavement will be laid in the near future. The long mileages required will prevent the hard surfacing at a sufficiently rapid rate to keep up with the traffic demands. In no other way can the present traffic needs of many districts be met. However, this suggestion does not apply to those States in which the highway traffic is the greatest, but fortunately in those districts we have now the greatest development of material supplies, number of contractors and amount of contractors' equipment.

Speaking very broadly, when the volume of traffic becomes so large that the construction of gravel and sand-clay surfaces is inadvisable, the next step should be to the ultimate type of surface, that is, the paved surface. There are many questions of design which are reasonably matters for investigation, and there are varying local conditions which will make modifications of the present standard pavement types advisable. As used in this connection, the ultimate type refers to brick, Portland cement concrete, bituminous concrete and sheet asphalt wearing surfaces supported by adequate foundations. Speaking generally, and with a full knowledge of the fact that there are isolated exceptions to this general rule, the macadam types are now, because of the large expense in maintaining them, proving less satisfactory than such types, and there is sound engineering judgment in not advocating the construction of these pavements. At the present time there is the added incentive toward such construction that the transportation, materials and labor used should produce the most permanent results possible. As far as transportation is concerned, one way has been pointed out which makes use of existing equipment during the period of the year when it now stands idle. Also, if the increasing funds for highway improvements are more generally spent on the higher types of construction, it will relieve the producers of ordinary road materials of a heavy burden, and will enable them to develop their facilities for production fast enough to keep pace with the demand for their product. This relief will be enlarged if specifications are standardized which make possible the production of a lesser number of grades or sizes of the same material, and utilize ^{all} of the output practicable.

The more general adoption of the higher types of pavements will have an even greater effect on the labor supply. The construction of hard-surface pavements is increasingly a matter of machinery and equipment rather than of labor. To what extent this use of equipment can be carried, perhaps, best illustrated by a concrete paving job on which less than 20 men were used in the whole process of unloading cars, carrying materials to the mixer, mixing and placing the concrete, finishing and watering it and in settling forms. Moreover, the men who were employed did not, in general, rate as unskilled labor. Indeed, most of them were highly skilled laborers and skilled mechanics. This job was a perfectly ordinary job, the rate of progress satisfactory and the work excellently done.

A project of this nature, beside making a relatively small demand for labor, has to its credit the fact that it has practically no effect on the local labor conditions. It does not use enough men to seriously affect a local labor situation, even if all of the crew had to be locally obtained. However, such a project as this one uses almost no local labor, because practically all of the members of the crew are highway skilled, and so must be obtained from the larger labor centers, where such men flock for re-employment as their jobs run out.

A further advantage on projects of this kind arises from the fact that the turnover is low. But even if it is higher than normal, as it has been during the past few years, the turnover merely involves a change in already skilled laborers. It does not, as in the lower types of pavement, involve the necessity of developing men who are wholly unfamiliar with this type of work.

Finally, as where the lower types of highway are involved, the present shortage of contractors can to an extent be relieved by seeking

bids from responsible contractors who are familiar with related work. There are, for instance, a large number of contractors who are familiar with city paving who would make splendid highway contractors, and if this field should not provide all that are needed, there are numerous building contractors whose familiarity with the handling of concrete and with the development of construction organization should make them very satisfactory contractors on highway work.

These men are, generally speaking, well equipped, financially responsible and thoroughly competent. To induce them to enter this field it will, however, be necessary to plan projects of a size sufficient to attract their attention and to eliminate all doubt from the specifications. Once these results are obtained, there should be no lack of competitive bidding, and the unreasonable increases in bid prices which are now threatened by reason of the fact that properly equipped highway contractors are fully employed should be avoided.

Summarizing the general highway situation, it would appear that (1) there is an insistant demand for better highways, which has resulted in the appropriation of enormous sums for highway construction; (2) that this demand should be met by the prompt construction of serviceable highways as rapidly as possible, but that (3) there are difficulties to be met in transportation, labor, materials and construction organizations which must be solved or the construction program will defeat itself by developing unreasonable prices, and, finally, (4) that the solution of the problem lies in the selection of types of construction which will throw the least possible strain on the weak points. If this is done, it is confidently believed that even higher rates of highway construction can be attempted with safety and with every assurance of success.

Wise economics can and will be made along the lines pointed out in this discussion in the utilization of rail equipment, the substitution of mechanical equipment for hand labor, the standardization of materials as well as in the design of pavements which will utilize every favorable local condition. But poor or inadequate construction must not be allowed to masquerade behind the shield of economy. So far as participation in the Federal-aid program is concerned, this Bureau will not become a party either to high cost economy of this character or in programs of construction so in excess of possible production that high prices rather than road production are secured.