

Federal Aid Facts and Figures

By

Thos. H. MacDonald, Chief Bureau of Public Roads.

Picture a pile of gravel and stone twice as high as the Wash-
ington monument and of equal length and breadth, and you will have
a fairly accurate notion of the quantity of material required for the
Federal-aid roads under construction and completed at the close of
last year. Think of a million freight cars in a train 7,500 miles
long, and you will understand the transportation problem involved
in supplying these Federal-aid roads.

The Federal-aid program has advanced with a rapidity little short
of startling to those unfamiliar with the steady progress that was
being made in the earlier years of the work when the projects which
are now being reported as completed were being advanced through the
preliminary stages of surveying and planning. For four years after
the beginning of the work in 1916 the results were not impressive
in point of roads actually completed. It is not worth while to dwell
upon the reasons for such a condition. They should be obvious to all
who have been in contact with the economic situation during these
troubled years, and especially to contractors who know too well the
great amount of work that must be done in any constructive enterprise
before it makes a showing.

In July 1920, four years after the passage of the Federal Aid
Road Act there had been entirely completed 1,677 miles of road and
projects aggregating 14,940 miles were 30 per cent and complete making

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an equivalent completed length of approximately 6,000 miles. A year later and five years after the passage of the act the mileage entirely completed was 7,469 and the 17,978 miles under construction were 50 per cent complete so that the equivalent completed length was over 16,000 miles, a gain of 10,000 miles during the year.

In the eight months intervening between last July and the first of March the mileage of projects entirely completed has almost doubled. From 7,469 miles it has increased to 14,639 miles; and to this must be added the equivalent completed mileage in the projects which are now under construction. There are 14,375 miles in these projects under construction and they are reported as 66 per cent complete, so that the equivalent completed mileage is over 24,000 miles. The striking fact is that the mileage of projects entirely completed in the last eight months is about equal to the record of the best previous year and over 1000 miles greater than the total equivalent mileage completed during the first four years of work.

The chart reproduced on page _____ tells the whole story of this progress and those who will study it will find the reason for the great increase in the rate of completion which is now being recorded. Measure the distance in months on any horizontal line between the stepped line which represents the rate at which Federal funds have been made available and the line which represents the completion of projects and you will have the time required to absorb the money that is appropriated in work actually performed. The average time is between two and two and one-half years. The roads completed at this time will just about use up the money appropriated up to June 30, 1920.

The roads completed at that time were paid for very largely by the money appropriated two years previously with some addition from the appropriation of February 26, 1919. The sudden increase in the rate of appropriation which occurred in 1919 was not reflected in an increased rate of completion until 1921, and the great rate of completion now being recorded corresponds to the large increase in the appropriation which became available in 1919.

There is one other very important fact that this chart illustrates, a fact that is not clearly understood by many people. I refer to the effect of a delay in the appropriation of funds. If you will follow the line which represents the Federal-aid funds obligated, which really represents the initiation of projects you will see that it has progressed at a very uniform rate from early in 1919 to last June. Skirting the reentrant corners of the appropriation curve it shows that the funds made available each year have been almost completely obligated within the year by the initiation of projects. Last year the rate of progress was predicated upon the assumption that a new appropriation would become available with the beginning of the Federal fiscal year in July and the curve of Federal-aid obligated, as you will see was headed toward the point at which, on July 1, 1921, it was expected that the appropriation would be increased. Instead the new appropriation was not made until almost six months later and the effect upon the initiation of projects is graphically shown by the flattening of the curve, which is now turning upward again. The time lost in initiation of projects will undoubtedly be felt two years hence in a slackening of the rate of completion of projects.

There is now an unobligated balance of the funds that have been appropriated, amounting to nearly \$78,000,000. Upon the most optimistic estimate the roads which are to be paid for by the money already appropriated cannot be completed before the close of the year 1923, and for this reason it is difficult for many people to understand why there should be a further appropriation, before that time. I believe that the chart explains the reason very clearly. As you will see we are now on the up trend in the initiation of projects, after a period of stagnation resulting from the delay in appropriating last year. At the estimated rate the funds now available will be obligated in approved projects before the end of this year. Unless there is a new appropriation before that time there will be a repetition of what has just happened -- another period of stagnation, which will be reflected all the way through the progress of the work to the completion of the delayed projects two years later.

There should be another appropriation this year and it should become available on July 1. How great that appropriation should be is entirely dependent upon the length of time our people are willing to wait for the completion of the connected system of Federal highways which is demanded by the Federal Highway Act approved by President Harding last November. The act calls for a system of interstate and intercounty roads amounting to 7 per cent of the entire mileage of roads in the country. As there are approximately 2,500,000 miles altogether the Federal system will include approximately 180,000 miles. The selection of the roads which are to be included in the system is not yet completed, and it is not known definitely what part

of the roads at present improved will be included. It is reasonable to assume however, that about 60,000 miles already completed will form links in the system, leaving about 120,000 miles to be built. At the rate of \$20,000 a mile the cost will be \$2,400,000,000. This cost will be paid from State and Federal funds, according to past experience in the proportion of 43 per cent Federal money to 57 per cent State money. The last Federal appropriation was \$75,000,000. When matched by State funds, the combined amount will be about \$175,000,000. If this rate is maintained annually until the completion of the system it will require about 14 years. On the basis of a Federal appropriation of \$100,000,000 the system can be built in about 10 years, and at the rate predicated by a Federal appropriation of \$50,000,000 it will be 20 years before we shall have a connected system of roads such as is laid down in the Federal Highway Act. The question is how long can our people wait.

Consider the service value of such a system and reflect that the cost of building it in 10 years can be met by collecting from each man, woman and child in the country two-thirds of a cent each day, and it will be clear to you that the cost of the most ambitious program suggested is no great drain upon the resources of the country. The citizens of Baltimore, Maryland, are taxed for the maintenance of the city government and for civic improvements at the rate of \$2.98 for each hundred dollars of property valuation. That means that the man in Baltimore who owns property valued for purposes of taxation at \$100 will pay more into the city treasury in a year than his average annual share of the cost of building the Federal highway system in 10 years.

In the record of a construction enterprise as great as this Federal aid work there should be many things of especial interest to contractors -- and there are. There is for example a wealth of information on the costs of various operations involved in road building. I have selected the single operation of earth excavation and have had the costs of this one item of the completed projects compiled and reduced to tabular form for easy comparison and review. One fact stands out most prominently in the table, which is reproduced on page _____, and that is that the man who attempts to forecast the cost of excavation from a knowledge of previous costs is a most intrepid individual. Viewed in the aggregate for the United States as a whole it is possible to trace a decided trend upward from 35 cents in 1917 to a peak price of 60 cents in 1920, dropping then to 44 cents in 1921. But compare the costs recorded by years for each of the nine geographic divisions and you will find the appearance of utter confusion. In their ups and downs from section to section and quarter to quarter the prices appear to obey no law whatever. While the middle Atlantic States were paying \$1.34 a cubic yard in 1917, the States of Oklahoma, Texas, Arkansas and Louisiana were paying an average of 23 cents. When, in 1918, the price in the latter group of States jumped to 49 cents a cubic yard the middle Atlantic States' price remained practically constant, increasing only to \$1.35. In 1919, the seaboard States experienced a slight reduction to \$1.32 but the bottom dropped out of the price ^{the} in/other group and an average level of 34 cents was established; meanwhile the price in every other geographic division with the single exception of the south Atlantic States was on the increase. There are reasons for these apparant

discrepancies and it is these reasons which the successful contractor seeks to grasp before he submits his bid. In retrospect it is not difficult to discern a few of them which account for some of the differences to be noted in the table. No doubt one reason for the uniformly higher costs in the middle Atlantic and the New England States is that in these sections grading is very largely a matter of trimming. Heavy cuts and fills, which in other sections help to reduce the unit cost of grading, are rare in these States where the grades have previously been established to a very large extent and the work done involves the careful preparation of a subgrade for surfaces of high type. The varying ratio of supply to demand in the labor market is another of the reasons. New York, New Jersey and Pennsylvania were the first of our States to experience the competition of the war industries. In 1917 their price levels, following the increase in wages, had practically reached the peak, which was not attained in other sections until a year or more later.

The two other tables reproduced on pages _____, and _____ give detailed information with regard to the whole cost of the Federal aid projects for which the final payment has been made, and for the same projects an analysis of the character area and cost of their pavements. In each table the data are given by geographical sections.

The summary table giving the subdivisions of the cost of the projects shows that for the entire United States the cost of grading represents 21 per cent of the total cost; paving 61 per cent; shoulders 1 per cent; structures 14 per cent; and engineering 3 per cent. The percentages for the various sections differ considerably from the average. In the middle Atlantic, New England and some of the central

States a greater proportion of the cost goes to pavements. In the southern and mountain areas greater percentages go into grading and structures. The analysis of pavements reveals the fact that the country may be roughly divided into zones in each of which some particular type or types of pavement predominate. The southern States are shown as the zone of sand-clay roads; gravel roads are built extensively in every section except the Atlantic Coast States south of New England, which is preeminently the area of bituminous macadam. Bituminous concrete is used principally along the north Atlantic Coast, the Pacific Coast, and the southwest; concrete, plain or reinforced is used extensively in nearly all sections; and brick is used principally in the middle and south Atlantic and east and west north central States.