STATUS AND RELATIVE PROGRESS OF THE FEDERAL-AID HIGHWAY PROGRAM

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Since 1940, - one year less than a full decade, - our highways have been confronted with all the vicissitudes that conceivably could fall to their lot. A review of the pertinent facts confirms the magnificent record of performance of the State highway departments. There is no denial of the accomplishments under difficulties of the local highway officials, urban and rural, but the problem of keeping the highways in service under the rapidly growing number and the over-weight concentration of motor vehicles has been most acute on the State and interstate routes. That the major highway network has been kept in operation under the adverse conditions is proof positive of the effective organization of the highway departments, and particularly of their maintenance abilities. Perhaps the job of keeping these major highways operating is now being too well done. During the war period it was the only possible course. Now the highway officials know the extent to which a very large proportion of the most important routes are kept in service only on borrowed time, and that the cost is eating extravagantly into construction funds seriously needed to rebuild them into safe, efficient facilities.

In this period - 1940 to 1949 - the over-all increases and changes in the factors that reflect both the quantity and character of the services

demanded from our highways are not only very large; they are also growing more adverse in their relative proportions.

The number of registered motor vehicles increased from 32,452,861 in 1940 to 41,151,326 in 1948, - about 27 per cent as a total.

The number of busses increased from 62,582 in 1940 to 135,430 in 1948, - about 116 per cent.

The number of trucks, including tractor trucks, increased from 4,590,366 in 1940 to 7,227,380, - about 57 per cent.

The preliminary estimates for 1949 indicate a further increase of about 6.6 per cent in motor vehicles over 1948, - a total of 43 million plus.

The estimated vehicle-miles of service provided by our highways in 1940 was 302,143 millions, and in 1948 - 397,589 millions, - an increase of above 30 per cent.

Thousands of miles of highways have deteriorated beyond a reasonable condition for use, and thousands of miles more reach this condition annually. Based on experience records in 35 States it is estimated that in the neighborhood of 40,000 miles of the Federal-aid systems alone should be replaced each year.

The structural deterioration is being hastened and in addition an ever-increasing mileage is rapidly becoming deficient in width, sight

distance, strength and other features because of the enormous increase in volume and weight of traffic. For trucks only, the vehicle-miles traveled in 1948 on the same roads was 9 per cent greater than in 1941 and 24 per cent greater than in 1936. The ton-miles of truck loads carried in 1948 was 42 per cent higher than in 1941 and 197 per cent higher than in 1936. The average load carried by trucks in 1948 was 38 per cent higher than in 1941 and 73 per cent higher than in 1936. The frequency of heavy axle loadings has also increased tremendously. Axle loads of 18,000 pounds were found on an average of 13 out of every 1,000 vehicles on the highways in 1936 and on 93 out of every 1,000 vehicles in 1948, a 615 per cent increase. Axle loads of 22,000 pounds or more were found on an average of 2 vehicles per thousand in 1936 and 20 per thousand in 1948, a tenfold increase.

Progress of the Federal-Aid Construction Program.

Against these service requirements and indicated potentials must be measured the progress in highway improvement. Taken by itself the Federal-aid operations of the latest fiscal year are encouraging, but relative to needs the whole program of construction and maintenance is inadequate and unbalanced.

The total of almost 21,000 miles completed last year represents an increase of about 3,000 miles over the mileage completed during the prior fiscal year. About 18,000 miles were completed during the fiscal year 1948, 8,000 miles during 1947, and 3,000 miles during 1946.

The 21,000 miles of Federal-aid highways opened to traffic during the fiscal year ended last June 30 included the construction or major reconstruction of almost 3,000 bridges over streams, railway-highway or highway-grade separations and combinations. A total of 149 railway-highway grade crossings were eliminated during the year, and protective devices were installed at an additional 466 grade crossings.

The improvements are classified as follows: about 1,900 miles of bituminous, portland cement concrete or other high type surfaces; 8,400 miles of intermediate bituminous types - surface treatments or mixed bituminous surfaces; 7,400 miles of non-dustless type - selected soil, gravel or stone; and about 1,900 miles of grading and drainage, in preparation for future surfacing.

The influence of the secondary road program is reflected in the types of improvements. The relatively large proportion of intermediate and low types reflects the pressures for the rehabilitation of long mileages.

During the four years since the end of the war, there has been completed and opened to traffic a total of nearly 50,000 miles of Federal-aid highways. Another 19,000 miles are under construction or covered by approved plans, and an additional 15,000 miles are programed for construction. These figures constitute an enviable record, particularly in view of the many difficulties that have confronted the highway construction industry in this postwar period.

The total cost of projects completed during the past year was almost $750,000,000, of which about $390,000,000 were Federal funds. In dollar volume the work completed last year set a new record high for the 33-year history of Federal aid.

Construction Put in Place.

The record for construction put in place during the past year, including work done on projects not yet completed, is even more encouraging.

The value of work done during the year is estimated at $826,000,000, of which about $421,000,000 are Federal funds. These totals represent an increase of nearly 25 per cent over the value of work done during the prior year. Thus, in the construction phase of the program, we are approaching the $450,000,000 annual rate of Federal fund authorizations provided by the Federal-Aid Highway Act of 1948 for the fiscal years 1950 and 1951.

For the present calendar year the value of construction to be put in place is estimated at about $850 million dollars total cost. Even when adjustments are made for the lesser purchasing power of the dollar today as compared to the 1930's, this figure represents a volume of Federal-aid work to be done this year that is greater than that of any prior year.

Although the construction phase of the program is approaching the annual rate of Federal fund authorizations on a country-wide basis,

there is still a relatively large number of States that are far from reaching this objective. Last year the value of work done in 24 of the States was approximately equal to or more than the State's proportionate share of a $450,000,000 Federal authorization. In eight States the work done corresponded to an authorization rate between about $400 million and $450 million dollars. In 19 States the corresponding rate was less than $400,000,000 and it is in this latter group particularly that special attention needs to be given to further advancement of the program to a rate consistent with Federal authorizations, as soon as it is possible to do so. (The above counts include the District of Columbia, Hawaii and Puerto Rico.)

Comparison of the Calendar Years 1948 and 1949.

Contracts awarded on Federal-aid projects during the first eight months of the calendar year 1948 totaled about $497 million. During the corresponding period this year the total was approximately $448,000,000, representing a decrease from last year of almost $49 million or about 10 per cent. Awards during August of this year were almost 22 per cent less than during August a year ago.

In advancing projects through plans approved stage, the net total this past year amounted to about $358,000,000, measured in Federal funds. During the previous year the corresponding total was $452,000,000. Thus the total this year, again expressed in Federal funds, was $94,000,000

or about 20 per cent less than during the year prior, and amounted to only about 82 per cent of an apportionment of $450,000,000.

The same trend is indicated in programing activities. Projects programed this past year amounted to $810,000,000 in total cost and $403,000,000 in Federal funds, representing a decrease of 21 per cent from the previous year.

Federal-aid funds authorized for the fiscal year 1951 were apportioned recently and made available to the States effective October 1, 1949 to assist those States whose program is advanced well beyond the average.

In addition to the 1951 funds, there was an unprogramed balance of more than $200,000,000 in postwar funds available on September 1, 1949. Also, programed projects financed from postwar funds for which contracts were not awarded on September 1 amounted approximately to a $450,000,000 apportionment.

Primary Roads.

Of the three classes of highways provided for by the postwar legislation, the program financed from primary funds is furthest advanced. Nearly 15,000 miles have been completed and opened to traffic, and about 2,450 bridges have been built. The value of construction put in place, expressed in Federal funds, is equal to the full amount of the apportionments for the first two postwar fiscal years plus about

one-third of the apportionment for the third year. About 93 per cent of the total postwar primary funds available prior to the recent apportionment of 1951 funds has been programed.

Secondary Roads.

The program financed from secondary funds is nearly as far along. The nearly 30,000 miles completed is about double that for the primary program, and over 3,300 new bridges are now in use on secondary roads. The Federal fund value of construction put in place is somewhat greater than the apportionments for the first two postwar fiscal years.

Urban Highways.

The urban program has not kept pace with the primary and secondary programs. Projects completed to date account for less than the first postwar fiscal year apportionment of urban funds. Although 80 per cent of the urban funds apportioned for the fiscal years 1946, 1947, 1948 and 1950 have been programed, less than 60 per cent have been covered by approved plans.

Interstate System Improvements.

Interstate system improvements to July first of this year accounted for about 30 per cent of the total amounts programed for these two classes of funds combined. About 23 per cent of the primary funds and nearly 46 per cent of the urban funds are for interstate system improvements.

The Federal funds programed for interstate system improvements amounted to about $345,000,000 for 3,700 miles of construction, for which the estimated total cost was $690,000,000. The rate at which interstate system improvements have been programed during the postwar period thus amounts to about 1,000 miles annually.

By way of comparison with this actual progress, the report "Highway Needs of the National Defense" indicates that a capital investment averaging probably more than $500,000,000 annually will be required for the next 20 years if the system is to be brought to a state of adequacy during this longest reasonable period.

Joint Economic Committee Survey.

The Joint Economic Committee of the Congress in July of this year requested the Governor and highway officials of each State to submit to the Committee a report of highway deficiencies in their State. A report prepared under direction of the Committee indicates that 44 States estimate their highway deficiencies to be in excess of $29 billion dollars.

Certainly the backlog of needed road construction is tremendous. It follows that the Federal-aid program should now proceed at the maximum rate possible.

Some of the Conditions Affecting Highway Improvement Progress.

The estimated dollar value of Federal-aid construction work actually put in place in the calendar year 1948 is $768,400,000, which is 8.3 times

the corresponding figure of $92,900,000 for 1945. Adjusting both amounts by means of our composite mile price index to eliminate the effect of inflation, we find that the physical volume of work performed in 1948 is 5.8 times as great as in 1945. This extraordinary progress was achieved despite the tremendous obstacles to be overcome.

In the last quarter of 1948 bid prices were 48 per cent above the average for the calendar year 1945 and 123-1/2 per cent above the average for the calendar year 1940. The extremely high prices were the result of numerous unfavorable conditions.

Most of the materials and equipment items essential to highway construction were in critically short supply and many months were required to effect delivery. Costs rose accordingly as exemplified by the following figures:*

Item	1940 Price $	1948 Price $	Percent Increase
2"x4" Fir lumber per M.b.m.	34.88	97.28	179
2"x4" Pine lumber per M.b.m.	31.15	88.41	184
Reinforcing steel per cwt.	2.43	4.58	88
Structural steel per cwt.	3.44	4.90	42
Cement per bbl.	2.51	3.82	52
Paving asphalt in cars, per ton	15.12	24.17	60
Gravel per ton	1.47	2.15	46
Sand per ton	1.17	1.96	68
Gasoline per gallon	0.184	0.265	41
1½- to 2-ton dump trucks	852.00	1,447.00	70
Tractor (100 H.P. and over)	7,300.00	12,650.00	74

* Based on Engineering-News-Record data and reports available in Public Roads.

Even when materials and equipment could be obtained delivery was frequently delayed from several months to a year or more.

Labor shortages were encountered generally throughout the country, particularly in the skilled classifications. Often such labor as was available was inexperienced, with consequent low productivity. Average hourly wage rates had increased from $0.64 in 1940 to $1.40 in 1948, or 119 per cent.

In 1947 it appeared that it might not be possible to increase the size of the construction program because of lack of capacity of the contracting industry to handle additional work. This was based on reports from all parts of the country that contractors were overloaded with work and were unable to maintain satisfactory progress on their contracts, and on the fact that an average of only 3.8 bids were being received per project advertised, with no bids at all received on many projects.

Uncertainties regarding future economic conditions, cost trends and availability of materials, labor and equipment caused contractors to protect themselves by including in their bids a considerable allowance for contigencies.

In addition to all these difficulties many States found themselves lacking sufficient competent engineers to make surveys, prepare plans and supervise the construction. A few States were handicapped to some extent because of financial difficulties but most of them had ample funds available as a result of large surpluses accumulated during the war years.

As we entered the 1949 construction season the situation had changed greatly. Materials and equipment were in general readily available in adequate quantities although spot shortages of steel and cement are still being reported occasionally. The labor supply was much improved in both quality and quantity. Workmen more experienced, more energetic and more dependable could be obtained. Instead of being troubled with a shortage of labor we are now being asked to expedite highway construction work in certain areas where unemployment threatens to become a serious problem.

Economic conditions have been stabilized to the extent that contractors need no longer cushion their bids because of the uncertainties with which they were formerly plagued regarding the future costs and working conditions. The contractors have become better organized and equipped. Since the beginning of 1948 Federal-aid contracts have been awarded to 841 contractors who had not had any such contracts during the postwar period. In addition to these 841 new contractors entering the highway field, several hundred other new ones have bid on one or more contracts without being successful in obtaining a contract. As a result there has been a marked increase in competition. Instead of the 1947 average of 3.8 bids per project the average for the first six months of 1949 was 5.9 bids per project which is an increase of 55 per cent. Rarely do we now hear of an overloaded contractor and it seems obvious that the contracting industry now has more than sufficient capacity to handle the contemplated programs.

As a consequence of these improved conditions bid prices decreased steadily during the first six months of this year. By the end of the second quarter of 1949 the composite mile price index of the Bureau of Public Roads showed a drop of six per cent from the peak in the fourth quarter of 1948 when it was 123-1/2 per cent above the 1940 figure.

In about a third of the States the slow progress is due wholly or partly to a continuing shortage of engineers. Intensive recruiting and training programs coupled with recently authorized salary increases and other benefits have brought about some improvement in the situation in many States. However, most of the additional engineers being attracted to the highway departments are recent college graduates with little or no practical experience. It takes considerable time for these men to develop into fully qualified design and construction engineers. As a result there is still a definite shortage of higher grade engineers, especially those with ability to handle structural designs and the complicated problems involved in urban projects. The engineering situation is gradually improving and lack of engineers should soon cease to be a major impediment to construction progress except in those States which do not increase the salary scale and other employee benefits sufficiently to attract and hold the quality and number of men they need.

The Question of Highway Funds.

An important deterrent to progress this year has undoubtedly been the inability of some of the States to provide matching funds for the available

Federal funds. The surpluses accumulated during the war years were exhausted and current revenues were not sufficient to meet the demands. In a number of States where State funds are ample the counties and cities are required by law or policy to supply the matching money or to provide the rights-of-way for secondary and urban projects, respectively, and frequently there is serious delay.

Although highway construction costs increased 123-1/2 per cent from 1940 to 1948 and the Federal-aid highway funds available annually now are more than twice what they were in the prewar years, the increase in State and local revenues available for highway purposes has not kept pace over the nation as a whole and in some States has been considerably less. The total State funds available to the 48 States and the District of Columbia for State highway purposes were $862,839,000 in 1940 and $1,599,359,000 in 1948, an increase of only 85 per cent. The corresponding amounts available for local roads and streets were $331,516,000 in 1940 and $621,527,000 in 1948, an increase of 87 per cent. In each year a substantial portion of the State funds was required for service of State obligations, for State highway police and for administration, maintenance and non-Federal-aid construction in which Federal funds did not participate.

The figures given for revenues and expenditures are for the nation as a whole. In individual States the situation varies over a wide

range. In five States the current revenues available for administration, construction and maintenance were from two to three times as great in 1948 as in 1940, in two States they were nearly four times as great. On the other hand, in two States the current revenues for the same purposes were actually less in 1948 than in 1940, in one State 14 per cent less and in the other five per cent less. Fortunately the recent Legislatures in both of these States took action to remedy the situation so that adequate matching funds are now available. In some of the other States, however, where similar action was needed none was taken, and the highway departments are still faced with the problem of trying to finance highway improvements at postwar prices with little more than prewar incomes. In three States where the Legislatures enacted tax increases to provide additional highway funds attempts have been made to repeal the legislation by referendum vote.

The Tyranny of Rising Maintenance Costs.

Because of the cessation in highway construction during the war years and the increase in both volume and weight of traffic since then, the Federal-aid highway system has been wearing out or becoming obsolete at a much faster rate than reconstruction has been performed and permanent improvements made. This has resulted in extremely heavy maintenance costs and has necessitated recourse to low type reconstruction and improvements as temporary expedients to keep traffic moving.

As Federal funds cannot be used for maintenance, the abnormally large expenditures have caused further disparity between the Federal-aid funds available and the State matching funds available for new construction and reconstruction on fully adequate standards. The temporary expedients used have merely postponed, rather than eliminated, the day when highway income and highway construction costs must be brought into closer agreement if serious breakdowns in our major highway systems are to be avoided.

It is a good example of living in a 'fool's paradise' to substitute costly maintenance for needed capital improvements. There is no escape from the payment for our highways whether or not we have them.

To illustrate, in a State with limited gas tax revenue, where every Federal-aid matching dollar is needed, State highway maintenance expenditures rose from 2.1 to 4.8 million dollars per year - from $387 to $795 per mile. While the cause must be assigned partly to a rise in price level, examination of the highway systems discloses the existence of sections with 3/4-inch bituminous mats on a weak base costing from $1,183 to $1,641 per mile for surface maintenance. Highway users were frequently required to ride over these rough surfaces and spring load limits prohibited the realization of full benefits from the motor vehicle investment.

Reports from a second State indicate that it is becoming increasingly difficult for the maintenance forces to do other repair than the roadway surfacing. Forty-nine per cent of 1935 maintenance expenditures was for the surface; in 1940 it was 58 per cent; and in 1948 it was 73 per cent. This mounting work increases pressure for inroads into funds that would be available for matching the State's share of Federal-aid construction costs.

A third State reported that out of 2,812 miles of bituminous roads, 65 per cent are inadequate for maintenance and out of 1,430 miles of rigid pavements, 40 per cent are inadequate for maintenance. The roads require strengthening of base, resurfacing and improvement of structures. The maintenance budget in this State was further stressed by the Western snow disaster. The 11-year average snow removal cost was increased 300 per cent.

A fourth more populated State reports maintenance forces struggling with repairs on a State highway system that has a narrow right-of-way and drainage problems on 3,100 miles of road. There are 1,165 miles of rural and 138 miles of urban pavement that are in need of widening, and 1,378 miles in need of additional shoulder width; 1,089 bridges (including grade separation) should be replaced, and 266 should be widened. It is anticipated that 10,895 miles of rural highways and 712 miles of urban highways in this State will need resurfacing in the

next 11 years. This same State in 1943 observed that out of 2,953 miles of concrete pavements 243 miles, or eight per cent, developed symptoms of pumping. By 1948 road pumping spread to 1,590 miles or 40 per cent of the concrete roads on the State system.

In summary, we might be tempted to become complacent because of the very considerable dimensions of the current construction program. But an honest evaluation of the rate of highway improvement compared with the necessities can leave only one conclusion - that we are seriously losing in the battle with traffic.

The only possible attack upon our current highway problems that has any hope of bringing relief must be the application of the successful, and the discard of the unsuccessful policies out of our usable past.

Among the problems which are demanding priority of consideration is the inadequacy of current revenues. We cannot provide for the traffic in expanded quantities and increasing weights in the postwar period with prewar revenues. We cannot solve our most serious traffic problems by toll roads. The very fact that the worst congestion occurs within the metropolitan areas rules out the toll road because of its operating characteristics. Further, the financing of roads with revenue bonds is an expensive expedient. Toll roads financed with revenue bonds should not be confused with roads supported by faith and credit of the public. The difference in cost between revenue bonds and faith and credit bonds will

be sufficient to amortize the cost of the road in a 30- to 40-year period. There is too much confusion of terms. Roads financed with bonds do not need to be revenue bond toll roads. Any road that should be built with bond proceeds because of traffic volume pressures for better facilities will be self-supporting if the road user tax earned by the road when built is dedicated to bond retirement, and the bonds are issued at the low interest the States can now command. We know from our records that we obtained the most rapid extension of the first systems of modern roads now in service in many States by bond issues which have been comfortably carried by a fraction of the expanding revenues, and there is no valid reason now why this process cannot be repeated where necessary.

Again out of our usable past we know that it is the pattern of administration and organization at State and national levels that has produced the roads we now use and kept them in operation under adverse conditions. In a troubled world we need internal peace, and we cannot achieve this in our over-all road program until the pattern of operations adjusted to the needs, that has been developed and proven satisfactory for State operations, is extended to the local roads. This problem will remain with us and will grow more acute until roads are provided adequate for the operation of motor vehicles to serve the rural districts.

Finally, the most important problem of all at State, Federal or local level, is a larger force of trained engineers and technicians who

know they have a stable career in the highway improvement field. More adequate salaries, opportunities for advancement through in-training courses, retirement plans, are among the necessities to attract men to highway work.

The group here represented is responsible for a major element in our nation's economy. Highway problems are not static, and a successful attack upon them must be dynamic.