

The Post-War Highway Program

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In 1942 when we closed down our highway program, with the exception of access roads, we can truthfully say we were ringing down the curtain on the first era of road building—an era that started at the close of World War I and closed at the beginning of World War II. We are now on the eve of the new era in road building—an era that should outdimension anything that has ever taken place in the history of this country.

The first era served well in getting the country out of the mud and, in a manner, connected up the centers of population.

The new era will deal with supplying the highway facilities that will adequately meet the demands of traffic—that will relieve the points of congestion—that will reduce the cost of transportation and communication, and thus reduce the cost of production. It will be the basic factor in increasing our standard of living.

The size of the new highway program will greatly exceed that of any previous period of road building in this country. This will not be because of the enthusiasm of the road builder but because of the demands of the highway user. The ten to fifteen million new cars that will be on the highways in the next few years will require modern adequate highways. It will result from the fact that through the highway construction program we have the only practical solution of reducing our highway fatalities to a minimum.

Although a respite in the highway mortality rate was enjoyed during the war, and accidents on the highways fell off to a great degree, this problem is now being forcibly presented to us again because the number of deaths on the highway has increased rapidly since the day when gasoline became unrationed. In the month of October, 1945, according to the report of the National Safety Council, the deaths on the highways were almost equal to the all-time high peak of 1941, when approximately 40,000 people were killed. It took several years of restricted driving and rationed gasoline to lower the death rate on the highways but only a few months to return it to the old level after the restrictions were lifted. These are some of the reasons why the highway program in the new era will be gigantic and should be undertaken and pushed forward as speedily as possible.

Other reasons include the results of economic changes caused by the war. There have been many new developments. We have learned that the segment of our national economy which comprises construction is an important one. It is important in the employment of people, which is a significant requirement for a period of prosperity. We have learned that the highway program is a sizable part of the construction program. The highway facilities it provides make it possible to outrun the blockade of congestion and thus open up the free flow of motor vehicle transportation so necessary when the nation is striving to put in order its national economy so recently disrupted.

It would be prosaic to say to this audience that prosperity follows better roads. But that is a true statement, whether it is at the beginning of a highway program in a state when you are lifting the people out of the mud, or whether it is at the time when a state may be improving its existing system to provide for more modern traffic.

We are living in an age that is the beginning of a competitive efficiency period. We are living in an age of peak production. We are living in an age when the value of a minute is great and the minutes that are saved are going to mean increased production. We are living in an age of new developments—as has been evidenced by the wonders that have been achieved during the war. All our developments lead to the saving of time; therefore, to have the highways contribute to the development of our country they must be constructed so as to conserve time.

This again points to the fact that the new highway program should and can be many times greater than anything ever yet undertaken. It means that we cannot return to the prewar pattern of highway departments but we must raise our sights so as to provide for the demands of tomorrow.

HIGHWAY DEPARTMENTS UNDERSTAFFED

What has been done in the past has been well done—but what is done in the future must be better. The prosperity and living standards of all nations are in proportion to the size and usefulness of the highway system and its coordination with other forms of transportation. To increase standards, the highway system must provide facilities for the transportation and communications that go to make up that prosperity.

We are only partially prepared for this new era of road building. We are prepared to the extent that the federal legislation has been passed, and the federal money is available. Most of the states have sufficient funds to finance their first year's program. We are prepared in the fact that there are sufficient plans ready to start the program. We

are prepared in the fact that there are contractors with the "know how" and equipment. We are prepared in the fact that the manufacturers of construction equipment are producing new machinery at top speed.

We are unprepared in that only a portion of the highway departments are adequately staffed with experienced engineers—from the top to the bottom—to launch a program of the size that must be undertaken. We are unprepared in the fact that highway engineers are not paid in proportion to the importance of their jobs; and that other industries are paying salaries that attract engineers from the highway departments. This makes it almost impossible for the young engineers to look forward to a career in highway engineering. This point alone is enough to produce a bottleneck that will interfere with the satisfactory prosecution of our work.

It is, of course, quite obvious that a mere increase in salaries will not change the ability of the men immediately—but if salaries are increased it puts men in more competitive positions to hold their jobs and they will be obliged to become more expert in the performance of their duties. At the same time, the higher salaries will attract new engineers to the highway departments, and through more extensive study and application to the work the highway engineering profession will continue to have the highest calibre engineers.

Satisfactory salaries and continuity of service are the foundations upon which well trained and experienced engineers are developed. An engineer receiving an insufficient salary or worrying about where he will get his next job is working under conditions not conducive to efficient and economic engineering direction.

The engineering positions from those of the chiefs down to the lowest engineer on the job have requirements that can be described and classified. These should be set forth and then these positions should be filled by men that meet the requirements, both in training and experience. One of the great deficiencies in our highway engineering organizations today is the lack of enough men with basic engineering training. This is because men working in engineering positions in highway departments were first employed to fill minor inspection jobs; they did their work well and after a few years of faithful work were shifted to engineering positions as a reward. This practice, in the long run, though there are many exceptions, is not conducive to building the best engineering organization nor is it fair to the men who after years in this advanced position without basic engineering training find themselves in a position where further advancement is impossible. Either those men should be kept on inspection work and taught to become proficient in it and be paid salaries

commensurate with the importance of the inspection positions, or opportunity should be provided so that they can obtain a basic training in engineering.

HIGHWAY ENGINEERS' SALARIES

While we have most excellent men in the highway profession at the present time, the new program demands that the number of efficient engineers must be increased. In many instances the salaries of engineers were reduced during the depression, but in fewer instances have these salaries been reinstated. Local government units have oftentimes been too shortsighted in the standardization of their salaries for engineers and have watched only the salaried payroll instead of watching the production line. Engineers will be in charge of the expenditure of millions of dollars, and we all know that many times during a program an engineer is in the daily position of saving thousands of dollars for the department or losing or wasting many times the salaries of all the engineers put together. A quick summary of the salaries of state highway engineers will partially tell the story.

In 1929 highway engineers' salaries, in 44 states, averaged \$7,106 per year. At the present time, the average of the highway engineers' salaries in 39 states is \$7,400—an increase of five per cent over 1929. Only in five states is the maximum salary of the highway engineer above \$10,000: in six states it is between \$8,000 and \$9,000; in 12 states it is between \$7,000 and \$8,000; in eight states it is between \$6,000 and \$7,000, in five states it is between \$5,000 and \$6,000; and in four states it is below \$5,000. The bureau heads of the states average \$5,000—division and district engineers average \$4,650. These figures can only mean that the men in lesser positions get correspondingly less salary. Many highway departments claim they cannot get engineers and that is the reason they cannot accomplish their engineering work as they would like to.

The amount of the salary of highway engineers should not necessarily be compared with that of personnel in other routine positions in a state unless those other positions have the same responsibility of equal expenditures of state's money or unless the positions control and are responsible for activities that can have an equal economic appraisal. Modern highway engineering is a relatively new profession, and many ambitious engineers have been attracted to it because of their desire to be active in its development and progress, regardless of current or unsatisfactory salaries—but with a hope of future reward.

Now, however, with the stress on wages and salaries and the inflationary tendencies becoming realities outside the highway profession, the

time has come when highway engineers must be compensated in proportion to the value of the economic service which they provide. Otherwise the already depleted highway forces will suffer casualties, the engineer will seek other fields, and the highway program will be carried on by engineers of lesser training and experience—thus causing the states to spend many times the amount of money that would have been necessary to develop and extend a most efficient and highly trained highway organization.

A speedy solution would be to pay adequate salaries. Trained engineers spend at least four years in college, sometimes additional time on graduate courses—then come years of experience during which they are reading and studying to keep abreast of the latest developments in engineering. Unless they are paid satisfactorily, highway engineering will lose its engineers, who will go to other engineering fields where the pay is better or will even abandon engineering completely. At the present time even operating machines pays better money than some of the lower engineering positions.

A professor of one of our great engineering colleges told me that his best graduate engineers went into railroading because it paid better salaries. If the engineers are worth so much to the railroads, they surely are worth that much to the highway departments, which are busier in a much larger construction program.

The American Society of Civil Engineers' study on this subject reports that all chief engineers should get a minimum of \$9,600; principal assistants up to \$9,360; division engineers up to \$7,920; and the lesser jobs in proportion. Unless these salaries are maintained in the highway profession, the engineers will migrate to other fields. It is economy to pay salaries that will attract the best engineers to the highway profession.

One study recently showed that in 1929, in 44 states, only 18 per cent of the engineers received salaries of \$3,000 or more a year; six per cent received \$4,000 or more; 2.6 per cent received \$5,000 or more; and only 0.15 per cent received at least \$10,000. These figures refer to state highway departments, but the conditions are just as bad in the cities and much worse in the counties, where the nationwide average salary level is from \$2,000 to \$3,000 per year. This analysis is made on what might be termed normal conditions; but the argument is all the more important because of the increasing higher cost of living, the inflationary tendencies, and the great job ahead. Another reason for securing the best experienced and qualified engineers is because roads are going to cost more in the future than they did formerly. If they are not constructed efficiently the economic loss is greater.

THE JOB AHEAD

The size of the program that we are entering upon can best be shown by the fact that the state highway systems total about 415,000 miles, of which 332,000 miles constitute the primary roads. There are 250,000 miles of city streets. Only about 95,000 miles of these streets have been paved; some 110,000 miles have low-type surfaces; 45,000 miles have been merely graded or drained and have no surfacing. The first step in the activities of the highway program will be the heavy maintenance and reconditioning of the highways that have suffered during the war. The real highway program will commence as soon as contracts get under way.

Supplementing state highways and city streets there is a vast network of county, township, and village roads totalling 2,400,000 miles. These are the roads that serve some six million farms, producing 12 billion dollars of our national income. These are the roads that carry millions of children to schools and form the routes of the U. S. mail carrier. On these local roads there are only 45,000 miles of high-type pavement. Some 99,000 miles have low-type bituminous paving; 788,000 miles are of non-treated surface and are subject to dust and mud; 613,000 miles have been graded and drained and are without any surface; and 861,000 miles are primitive roads with no improvement whatever. Over these roads flows a large part of our farm produce—and 42 per cent of the farms are still on mud roads.

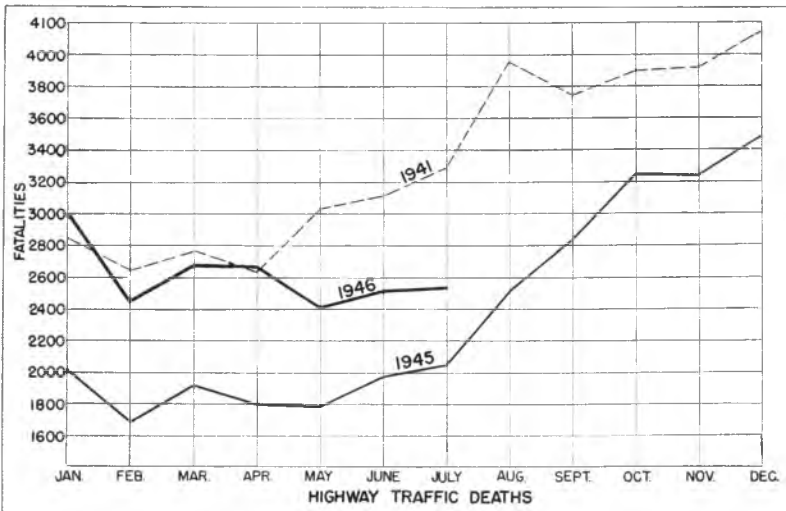
In addition to the orderly improvement of these roads there will be superimposed upon this entire program a network of approximately 40,000 miles of interstate express highways. The estimate of the cost of modernizing the entire system exclusive of the interstate highways is around 20 billion dollars. So it is easy to see the size of the highway job as well as its importance and the time it will take to complete it. This is another reason for sufficiently high salaries to attract the best engineers into the highway field, where they should have opportunities for continuous employment.

AUTOMOBILE INCREASE—FATALITIES

The number of motor vehicles on our highways reached the peak in 1941, with 34,460,000. In 1944 this was reduced to 30,100,000. There is no question that there are more cars on the road today than was estimated at the start of the war. The greatest number of cars ever scrapped in one year was 2,351,000, in 1939. The smallest number scrapped in recent years was in 1943—411,000. This means that even with a generous number being scrapped in the next five years, in

view of the demand for motor vehicles there will be close to 40 million cars by 1950. This increase is going to be a serious factor to deal with unless we immediately get the highway program started and continue it in the speediest way possible.

Automobiles have increased in proportion to population; and even though our increased population percentage for the ten years between 1930 and 1940 was only about one-half what it had been previous to that time, the Census Bureau states that now the rate of increase in population is much greater than during any previous period. This means that sometime in the near future this population is going to own



cars and if we are going to build our roads wisely we must take care of not only the immediate increase in the number of motor vehicles but must allow some leeway factor of safety for future development.

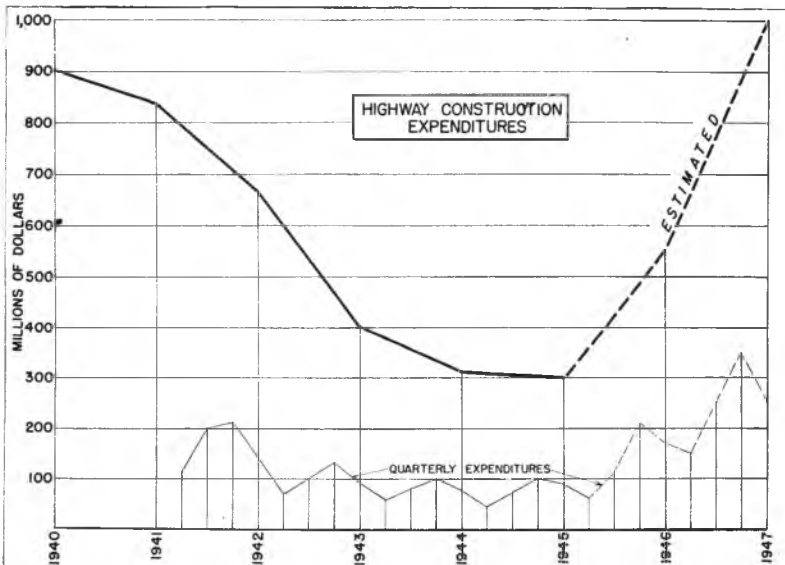
Another argument for the speedy prosecution of the highway program is the number of fatalities on the highways. The peak was reached in 1941, when approximately 40,000 were killed. During the war this death rate was reduced to 24,300 in 1944. However, when the rationing of gasoline was ended, the number of fatalities on our highways increased rapidly and at the present time is practically at the same rate as in 1941, when 34 million motor vehicles caused 40,000 deaths.

This is only a few months after the ban on speed and the rationing of gasoline has been relieved, and the number of automobiles is approximately 30 million. It is staggering to think what this will become in the next few years unless the highway program quickly removes the hazards, and safety is built into the highways.

FINANCING

The size of the highway program can be best set forth and compared by using the dollar volume of construction. During the depression of the thirties, the highway program did not suffer the same decrease as did other types of construction. The largest total highway construction program was in 1930, when at all levels of government \$1,500,000,000 of new construction was placed under contract.

During the war years our highway program included merely the construction of access and other necessary roads, principally for the war



effort. In 1945 the program amounted to only 325 million dollars. It is estimated, and hoped, that the highway program for 1946 will approximate 750 million dollars and will continually rise, until, by the year 1949, the amount of new construction placed under contract will be at least two billion dollars. From then on, in order to adequately furnish the transportation facilities for this country, the highway program for many years should range from two billion to three billion dollars per year.

Conservative people not familiar with the part that the highway program plays in our national economy, and even in our daily lives, are talking of small investments in highways and asking where the money is coming from. In the last years before the war highway users paid into the government agencies in highway-user taxes approximately

\$2,240,000,000 per year. With the additional ten or fifteen million new cars coming on our highways and with the pent-up desire of everyone to get out on the road again, the gasoline taxes collected by the state and federal governments will amply finance the cost of all new highway construction. In some states, no doubt, the direct tax will not be sufficient. In these states possibly bond issues based on highway-user income will be resorted to. As the highway investments increase, so will the tax returns from the highway user; and in this way the highway-user taxes will tend to keep pace with highway investments.

FEDERAL AID

In the 1944 Highway Act, Congress has provided \$500,000,000 a year for three years, and this must be matched—making a total of a billion a year for three years. In addition a sizeable program will be carried on by states, counties, and cities in which federal-aid will not be used—thus increasing the program.

The Federal-Aid Act of 1944 provides for annual appropriations of \$225,000,000 for rural and urban federal-aid systems or primary highways. This is larger than any former appropriation, but in addition it provides \$150,000,000 for the construction of secondary roads and \$125,000,000 for construction of federal-aid highways in urban areas. This work is being arranged for through the state highway departments, and one of the necessary factors essential for the success of the program is the sympathetic co-operation between the states and counties and the states and cities. Unless this exists, the success of the total program will be delayed. In addition to this primary, secondary, and urban program there is superimposed on the whole an interstate highway system of what might be termed “express highways.” In the urban areas these may be designed as elevated or depressed highways to carry fast-moving traffic through the cities or to points in the heart of the cities with little or no interference from local traffic.

All this provides for a balanced highway program which, if successfully accomplished, will provide highway transportation facilities far in advance of anything the country has ever known. Highways provide facilities that affect the daily lives of all the people. They reduce the cost of transportation, which means lower production costs and in turn a greater abundance or a higher standard of living.

Within the calendar year 1946 federal-aid and matching funds available amount to \$2,212,000,000—made up as follows:

Unobligated federal funds.....	\$ 106,000,000
State matching funds.....	106,000,000
Federal-aid, 1945-46	500,000,000

State matching funds.....	500,000,000
Federal-aid, 1946-47	500,000,000
State matching funds.....	500,000,000
	\$2,212,000,000

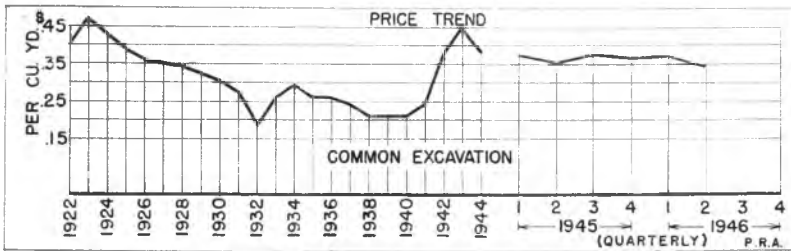
If this program is not carried out, the states will be penalized to the extent that the facilities are not provided. Between the years 1916 and 1933 federal-aid monies constituted only six per cent of the total financing of state highways. For a brief period the federal contributions were approximately 30 per cent of all funds expended in highway construction. From now on, not only will the federal portion of state investments increase to a point nearer 50 per cent of the total but it will mean greater action of the federal government as they assist in the construction of the primary, secondary, urban, and interstate highways.

THE COST OF CONSTRUCTION

There is one other point that I should like to make. I have received during the past few weeks many letters about the trend of highway contractors' bids. In some instances, and a few well justified, states have declined to award contracts. Other states, even when the bids are only slightly increased, have decided to defer the awarding of contracts until the prices become "normal." A case study of the cost analysis of highway construction definitely points to the fact that the highways of the future are going to be more expensive. Not only is this true because of the more elaborate design needed to take care of the traffic demands and to produce safer highways, but all indications point to the fact that the cost of the several unit items will undoubtedly be greater than before the war. However, with the new demands of traffic coming to our highways and the need of increased efficiency in transportation and communications, the awarding of contracts takes on a new standard of necessity. If the contractors' bids are not greatly in excess of the summation of the increased item costs that go to make up the bid, then the award should be made. The engineers' estimate should be based on current conditions and not on prices obtained in the past, especially during the depression or during the transition period when the depression was still influencing the contractors' bids.

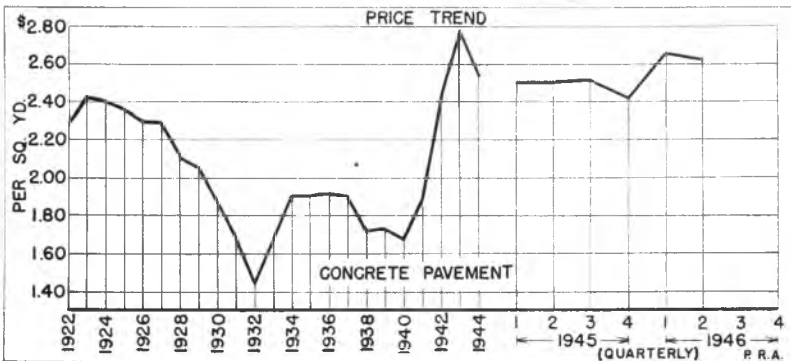
The Public Roads Administration has made an excellent study of price trends in highway construction. These studies have also been made by almost every state highway department in the country. They show that with the 1925-29 period taken as normal, the composite mile index is now only ten per cent above normal. It shows that it is now

35 per cent higher than in 1941, which was the last year when the abnormal price influence of the depression was still effective. Many of us are still thinking in terms of the prices which existed during the years of the depression. Many comparisons now being made are based on these prices. It will take another depression for these prices to exist again, and the state that waits for such prices will simply be deferring the provision of needed highway facilities. The delay will cause much greater economic loss to the people of the state—a loss which will amount to many times the difference between the depression prices and the present-day costs.



For excavation the average price for the 1925-29 period was 35 cents per cu. yd. This decreased steadily to 21 cents during the years 1938-40. In 1941 it went up to 24 cents, and in 1942—the first real war construction year—it jumped to 37 cents; in 1943 it went as high as 44 cents. It is now back to 35 cents—or exactly the same as 1927. By no possible turn of events can it at any time in the near future return to the price that existed during the depression.

In the case of concrete pavement the average bid price per sq. yd. for the 1925-29 period was \$2.29. This can be considered more or less normal. A low of \$1.44 per sq. yd. was reached in the depression. As late as in 1941, with the depression prices still influencing costs, a price



of \$1.89 was obtained. The following year, 1942, the price jumped to \$2.44 per sq. yd., and the high was reached in 1944 at \$2.54. There was a slight reduction in 1945.

In structural concrete, another major item, the 1925-29 period showed \$22.65 as a normal average. This dropped to \$15.33 during the depression and averaged \$19.00 for the years 1937 to 1941. In 1942 this jumped to \$26.00, and the peak was reached in 1944 at \$31.94. This shows a slight decrease in 1945.

We realize that with the labor difficulties at the present time and the shortage of manpower, contractors will be playing on the safe side and increasing their bids. Engineers know when this condition obtains and can act accordingly. But the engineer in considering awards should base his judgment upon current normal costs and prices and not those that obtained during the depression as has been the case in many comparisons and considerations of awards during the past month.

The last normal highway programs carried on by the states were completed in 1941. The war contracts followed, and it was after 1941 that the prices increased to about ten per cent more than the levels of the 1925-29 period.

As has been stated before, the present-day composite mile index is only ten per cent greater than that of the 1925-29 period; and even when compared with 1941, the last prewar year and the last year when deflated prices were an influence of the depression, today's price is only 30 per cent greater.

As a check on this reasoning I refer you to the State of Oregon, where a careful study was made on this trend since 1942. When they prepared their estimates for the postwar program, they took into consideration the increased prices that would obtain after the war. That these computations were accurate is shown in the first postwar contracts. The engineer's estimates averaged 5.9 per cent higher than the low bids received and were only 2.1 per cent lower than the second bids received. All contracts were awarded.

In taking into consideration the cost of postwar highway work they recognized the fact that wages had increased about 35 per cent between 1940 and 1942. Since wartime labor increased 65 per cent, it is felt that after the war wages will remain 20 per cent higher. Labor at present is uncertain in amount, quality, and cost. Its present attitude is injecting a variable in the equation, making it almost impossible to solve. An analysis of the material situation shows that materials will probably remain ten per cent higher than prewar prices for several years. Equipment and parts will be approximately 20 per cent higher in the first years after the war and will then slowly decrease. Supplies, overhead,

and general expense will probably remain 20 per cent higher in the post-war period. Profits to contractors, which were extremely low in the 1939-40 period, will be from five to 15 per cent higher than in the pre-war period. A summary of these items shows that probably the first year after the war construction costs in some cases may be as much as 30 per cent to 50 per cent higher than in the depression period, which would be from ten per cent to 20 per cent greater than in the normal 1925-29 period. We know there have been certain advances in different items of construction since this 1925-29 period, but some of these have been offset by increased efficiency in machinery and in the methods of doing work.

It seems that a state would be entirely justified in awarding contracts even when they are increased 30 to 40 per cent over the 1941 price, or if they are not more than ten to 15 per cent greater than the composite mile index obtained in the 1925-29 period. Therefore, before commissions reject bids for any highway construction, a careful analysis should be made by some such method as I have outlined. To do otherwise would be to defer our great highway program to a point where it will not provide the necessary facilities to meet the demands of transportation.

This, however, does not mean that contracts should be awarded promiscuously—even though we have millions to spend for highways, these dollars should be spent advantageously. It means that we should not delay the program while wishing for impossible prices. We should not use the depression period for our yardstick, but instead use the conditions that are current or that will result from measured factors that cause variations in costs.

The highway engineers and commissions have the greatest responsibility ever yet placed upon their shoulders. They should call for bids and then weigh the increased prices with the economic gains. The engineers are capable of making this analysis. They will know when to award, or reject, or call for new bids. If this is done, the chances are that after a few starts, possibly awkward, the highway program will settle down and produce the highway facilities to meet the demands of traffic.

This great program can be carried on only with efficient and well-trained departments. To obtain these departments, the individual positions must be made attractive. This can be done with satisfactory salaries and assurance of continuity of engineering positions.