

Problems of the Professional Highway Engineer

HAL H. HALE, Executive Secretary
American Association of State Highway Officials
Washington, D. C.

The American engineer is a peculiar breed of cat. Taken singly, he is as rugged, productive, and unpredictable an individual as to satisfy the most ardent of rugged individualists. Collectively, his actions can be predicted with the regularity attributed to the U. S. Weather Bureau, whose forecasts are considered to be accurate something like 85% of the time. It is the 15% failure in predicting the weather and the American engineer which we remember and explain as the exception to the rule that makes each of the endeavors interesting and uncertain.

Our engineer will lie on his belly in the wet bottom of a bridge footing excavation and fight all night (without extra pay) beside the foreman and timber crew to prevent the walls caving in; and yet, on the evening of the monthly meeting of his professional engineering society (if he belongs to one), he will be too "tired" or too "busy" to take an hour to attend the meeting and discuss problems and actions for improving the welfare of the profession as a whole. He will stand up and meekly apologize for the fact that he is an engineer in the public service and, as such, subject to the political whims and fancies of our system of government. However, on election day, in all-too-many instances, it will be found that he has not taken the time to register or otherwise qualify himself to vote in the selection of the public officials under whose over-all authority he is employed.

Do not let this occasional lassitude lead you to the conclusion that our engineer is not conscious of his public responsibilities or appreciative of his duties. There is perhaps no other group of citizens in this country as sincerely conscious of their public responsibilities. No group is better informed on local, national, and international events. The engineer is an avid reader of his newspaper and public information services. He keeps pretty well posted on world affairs and perhaps worries about them as much as or more than the average citizen. When he learns that, in the national budget submitted recently totaling better than 41 billion dollars, more than half of the amount must go to the maintenance of a war machine to defend his country if the need arises in this perilous

world situation and to attempt assistance to other governments throughout the world, and when he considers what could be accomplished with such moneys in our own country, he is not in the least patient with some individuals whose lust for power and world domination make these mammoth sums necessary.

Our engineer will apologize for the fact that he is in the public service and thus subject to the charge by those who would like to have his job that he is "living off the taxpayer," but he will seldom make the effort to explain that the great bulk of engineers derive their livelihood directly or indirectly from the expenditure of public funds. Whether he be the engineer in charge of the operation of the local water plant or the consulting engineer who designed the plant originally, neither would earn a dime if funds had not been provided by the public for the building of the water plant in the first place.

He will stand up and wail to the high heavens about the economic position of his brother professionals in the medical and legal fields whose incomes are always assumed to be astronomical (and many times are). Yet he has never been willing to collectively take the step that would put him in position to improve his financial status by requiring legally that, irrespective of the job he does, if he calls himself an engineer, he must have a college degree in engineering and must be registered under appropriate state laws to practice his profession. Most engineering registration laws contain so many exceptions and grandfather clauses that they tend to provoke comparison with the rabbit family—in which instance it is difficult to determine just how many grandfathers may be involved.

While making an engineering degree and registration mandatory are not, by any stretch of the imagination, a solution to the professional and financial dilemma of the engineer, today they certainly are essential foundation stones for building a better order in the profession. By some peculiar quirk of reasoning, the civil engineer is more vulnerable in his professional position than are other branches of engineering for the reason that he is always looked upon as a tax spender simply because, by their very nature, his activities lie so heavily in the area of publicly financed facilities. This type of philosophy has been, to a great degree, responsible for the inability of the founder societies to function collectively in a more efficient manner.

The American engineer, if he chose to do so, and acting collectively, could bring the economic wheels of this country to a grinding, screeching stop so completely that a nationwide rail or coal strike would appear insignificant by comparison. Fortunately and commendably, his sense of responsibility to the public, to his country, and to his job, have precluded any such action on his part.

NEED FOR ENGINEERS

Under conditions obtaining today, the civil engineer finds himself in what the trade describes as a "sellers' market," and in these circumstances he has been able to improve his salary status in some degree, even in the public service. Yet under these favorable conditions his salary, in general, is lower than in many other professions requiring comparable educational background.

In 1946 a committee of the American Society for Engineering Education, under the chairmanship of Dr. Karl T. Compton, reported that industry, the public service, and education would need at least 90,000 new engineers between 1946 and 1950. About that time, W. R. Woolrich, Dean of the University of Texas Engineering School, estimated that the demand for engineers in this country exceeded the supply by six or seven times. In late 1947 a committee of the Highway Research Board of the National Academy of Sciences, collaborating with a committee of the American Association of State Highway Officials, reported that our 48 state highway departments were then in need of some 14,000 men in the professional and subprofessional categories. Also, about that time the median salary of the chief engineers of the 48 state highway departments was \$7,200 per year, with only four receiving salaries above \$10,000 per year. The highest was \$15,000 per year, and the lowest \$4,440. In that year the chief engineer receiving the \$4,440 salary was responsible for federal-aid state project funds alone approximating \$9,200,000. That figure does not include any amount for his regular state projects, maintenance operations, or other funds under his jurisdiction. It includes only projects involving federal aid. All for \$4,440 per year! In one of the so-called top-salary states, where the chief engineer's salary was a little above \$12,000 per year, he was responsible for federal-aid state projects totaling \$44,600,000. His total monetary responsibility was more than double that amount.

Obviously, in the position which I hold, my primary concern has to do with engineers in the highway field. Now, what about those 90,000 engineers that Dr. Compton mentioned as being needed between 1946 and 1950? Where does the highway department stand in the picture? In the spring of 1948, the American Association of State Highway Officials surveyed 127 engineering schools (120 replied) and asked four questions:

1. How many full-time engineering students do you have enrolled?

Answer—179,273.

2. How many will you graduate in June, 1949?
Answer—21,307
3. How many will be civil engineers?
Answer—3,358
4. How many civil engineers have expressed interest in engineering in the public service?
Answer—589 (580 of whom said, "only if salaries are competitive," which eliminated 575 of those.)

Even if the highway departments got every civil engineering graduate in 1946-7-8-9, they could not meet their present deficiencies. Of course, they did not, and will not, get them. If they employed everyone who expressed interest in highway work, they would only get one-seventh of the number needed today.

In 1948, our member departments awarded approximately one billion, one hundred fifty millions of dollars worth of road work for the improvement of 40,000 miles of roads (at 1940 prices this amount would have improved better than 80,000 miles of roads). This is a considerable betterment of the 1947 total of eight hundred, thirty-two million dollars, but to meet our presently existing highway deficits, the figure should be around three billion per year for a good many years to come. We are going to build those needed roads, or a very large percentage of them, simply because the economics of our country require them. That economy cannot survive without them. Of course, we could go back to primitive transportation methods, turn to the *cargadores* and the *buey carreta* of the tropics, but with that reversion we could also accept all those other things that go with them. Any thought of such a backward trend in this atomic age is sheer madness; therefore, we will build more, and better, and safer roads for our great automotive transportation system because we have no other choice.

A FUTURE FOR PROFESSIONAL HIGHWAY ENGINEERS

Is there a future for the professional highway engineer? The answer is yes! Positively, unequivocally, yes! We hear much today about old-age benefits, national health insurance, cradle-to-grave security, and so on and so on. Remember, our young engineers being graduated today and tomorrow have never lived in an age when they heard much of any other type of philosophy; but, if they have in them the same character and determination as had their progenitors, they will not overweight these factors and depend on them alone for getting a job, holding

a job, and forging ahead in that job. Security is a satisfying thing, but its comforts should not be allowed to conceal its possible consequences. There is a lot of personal satisfaction in getting ahead under your own steam, even if it does get low occasionally.

The question is often raised, "Is there any 'security' for the highway engineer?" When we see some of the changes that frequently occur in highway departments, we may be inclined to answer with a flat "no." Yet there is continuity of employment for the highway engineer. In September of 1948, at the annual meeting of the American Association of State Highway Officials in Salt Lake City, the fourth annual presentation of the Association's Twenty-five-Year Awards of Merit was made. These awards are made each year to the employees in our fifty-two member departments who have worked in one or more of the departments a cumulative total of twenty-five years. Recipients must hold positions of responsibility in the member departments: that is, they must have responsibility equivalent to or greater than that usually vested in the district engineer of a state highway department. At the Salt Lake City meeting, we presented the 1,132nd Twenty-five-Year Award. This is indicative that there is such a thing as continuity of employment for the highway engineer far beyond that generally credited to such work.

Certainly there are hazards in such employment, and it would be absurd to intimate otherwise. There are firings, changes, and reorganizations going on all the time; yet observe that those 1,132 Twenty-five-Year Award winners have served a total of not less than 28,300 years in the highway field.

Let those who dwell with the illusion that employment of engineers in private enterprise is not fraught with many of the same hazards as beset the public service turn quickly and quietly to the records of the depression period of the thirties and review the employment rolls of the CWA, the WPA, the ERA, and all the other A's and see how many engineers' names were, from unfortunate force of circumstance, listed thereon after release or dismissal from private employment. Many engineers in the public service during that unhappy period suffered drastic reduction in income and other hardships, and many were laid off; but I do not believe that you will find the mass firings and layoffs that struck down so many good engineers in the so-called "private employment field." Many fine engineers are working in highway departments today who came there when business slumped and profits dropped off "over at the plant." So, let us view "employment hazards" as pretty much common to all employment—private or public, capital or labor, christian or heathen—under our system of government.

From time to time voices are raised in the consulting engineering field belaboring the state highway engineer for the fact that such a great percentage of his work is done by engineers in the public service. In my opinion, this situation cannot and should not be otherwise. Every state highway department frequently finds it necessary to secure consulting engineering services in specialized fields pertaining to highways. This is as it should be. There are fundamental and basic reasons, in my opinion, why the engineer concerned with our highway problem should be in the public service. Last year, the 48 state highway departments let better than a billion dollars to contract work. These are tax moneys obtained through procedures established by the state legislatures. The engineer responsible for the administration of these funds must, of necessity, have close contacts with the state legislature, the city and county governments of his state, and the federal government through the Public Roads Administration, and with the public that supplies the tax funds with which the facilities are ultimately built.

There is a continuing and important relationship existing between the engineer of design and construction and the engineer of maintenance, for the subsequent maintenance charges will obviously depend on the ability with which the design and construction are carried out. Therefore the maintenance engineer must maintain close liaison with the engineer who designs, always surrounded by an awareness that both are dealing with a critical and exacting employer—the public. He must answer to the public in one way or another for everything he does. His position in relation to the public may be compared with a military force established for the purpose of protecting the country. In the centuries past, many of the so-called armies were mercenaries, employed by a government from any conceivable source, without allegiance to the cause or citizenship of any kind in the country by which they were employed. Eventually, military men found that wars could not be fought to successful conclusion under such arrangements. Your highway engineer is also engaged in war—a war to provide facilities for our great American system of transport. In my opinion, that war can best be won if the highway engineer is in the public service.

Emerson once said that “an institution is but the lengthened shadow of a man.” Our present American highway system is the lasting shadow of our highway engineers of yesterday and today. Andrew Jackson once said that “one man with courage is a majority.” Our highway system of tomorrow will be built by our professional highway engineers of today and those to come tomorrow. They are, and will be, men with the courage that Jackson said made majorities.

Yes, there is a worthwhile future for the highway engineer, a future with enough unsolved problems and headaches to keep the job interesting and exciting to the man who has what we politely refer to as "intestinal fortitude," but which in the less flowery language of the project engineer is described as "guts."

To the mountains of my home state, there once came a stranger who, when he saw the hillsman cultivating with crude tools small rocky slopes, so steep and barren as to be precipitous, said, "In heaven's name, what can you possibly grow here?" The mountaineer replied with one word, "men." And so, when you turn to view the sometimes rocky and barren fields of the highway engineer and say, "Who are these who labor here, and for what do they labor?" Our answer is, "The professional highway engineers who build the roads on which the economy and safety of our nation depend."