Recruitment, Training and Retention of Highway Engineers

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The Kentucky Department of Highways, like most of the other state highway departments of the country, has been faced with a very serious shortage of engineering personnel for the past several years. This situation has been particularly acute since the beginning of the Korean war. It is my purpose to tell you as concisely as I can in the time allotted just what steps our Department has taken to try to help relieve this shortage and what the results of those measures have been so far.

TRAINING EMPLOYEES

We approached this problem from a twofold standpoint: first, from the point of view of doing everything we could to interest and help the engineers already with our organization; and second, to recruit and train as many new engineers as possible, particularly those with engineering college training. In considering what could be done on the first phase of this matter, we knew that a large percentage of our very capable old-time engineers, particularly in our field forces, were not college trained people, and many of them were not registered as professional engineers with our State Board of Engineering Registration, and thus were being held back from possible promotion to our Assistant District Engineer grade or equivalent. Professional registration is required by our department for that and all higher engineering grades.

We decided to set up some short courses which would give all of our engineering personnel then employed the opportunity if they wished to do so to pursue certain courses of study which would result in giving them at least a working knowledge of some of the engineering fundamentals that the college trained engineers get in their regular detailed courses. We felt this probably would make our men more interested in their work and of more value to us in their positions.
Also, we thought it would help some of them to pass examinations for registration as professional engineers.

With the very fine cooperation of the University of Kentucky through Dean D. V. Terrell of the College of Engineering and under the direct administration of the University Extension Division, extension courses were worked out in the following subjects: Fundamentals of College Mathematics, Problems in Engineering Physics, Strength of Materials and Stresses, Elements of Steel Design, and Elements of Reinforced Concrete Design. Instruction centers were set up in each of our engineering districts and at the central office at Frankfort.

Instructors were employed (many of whom were graduate engineers already working with our department), and arrangements were made for the engineering groups to meet for two hours, once each week, for a period of twelve weeks for each of these five courses. The State Highway Department paid all of the expenses connected with these courses, furnished state transportation for the men to and from their work, and allowed them enough time to get there for the early night sessions if their place of work assignment was a considerable distance away. Thus the men were not out any expense themselves other than to purchase their own textbooks. It was felt that they would want to buy their own books in order to be able to keep them as their personal property for reference and use after the courses were completed.

Approximately 300 engineers throughout the state signed up for these courses. The courses were carried on through three winters. During the spring, summer and fall our field forces were too busy to take time off for this training. There was a gradual dropping out of some of the men for various reasons, but at the end of the three year period approximately 100 of the engineers had finished the entire five courses. Mainly as a result of these courses, we were able to keep these men in our employ during the time of this study, and most of them have remained with us since.

Quite a few of them have applied for, and passed the necessary examinations to be registered as professional engineers with our State Board since the courses were completed about two years ago. I believe this practical training program for our old-time engineers has had another beneficial effect in that it has probably made some of these men less antagonistic, or to put it positively, has made them more sympathetic and friendly to the young college men coming into our organization and working under the supervision of these old-time engineers.
RECRUITING AND TRAINING NEW EMPLOYEES

Our other approach to this problem has been one of recruiting and training young men of college age. This was motivated by the fact that we felt strongly in our department that it would be advantageous from several standpoints not only to get the best possible available talent to study highway engineering at our state university but also for them to pursue a cooperative type course that would give them alternate periods of both school work and varied assignments in all kinds of work with our Department. We felt, too, that undoubtedly there were a good many boys coming out of high school who would make excellent engineers if they had the opportunity to pursue a college engineering course but who probably would not because of lack of funds unless they were given at least some initial help in getting started with their school work. Accordingly, we devised a plan which, after getting the legal approval of our State Attorney General, was put into operation and has been continuing for the past six years.

Under this plan the University of Kentucky Scholarship Committee holds examinations at various points in the State each spring where all the interested high school students can attempt to qualify for highway engineering scholarships. Based on these examinations in Mathematics, Science, English and general ability, the university officials, without any regard whatever to politics or outside influence, select the top rated young men for the highway scholarships. At the present time one person is selected from each of our eleven highway districts and the next three highest graded applicants from the state at large, making a total of fourteen. Four other young men are selected on the same basis each year, two of whom are furnished scholarships by highway contractors and two by associated highway industries, of which the Kentucky Highway Contractors Association is one.

Under our specified plan of operation, these young men are required, before being given a scholarship, to sign a written agreement along with their parents or guardian stating that they will stay with this program through their school training period and for at least one year following their graduation. The Highway Department guarantees to furnish them with employment at regular salary rates during their work periods as long as their work is satisfactory both in school and on the job. The boys selected each spring are given work as axemen with our department the first summer, then enter the university in the fall and are rated during the nine months of
their freshman year in the Engineering College as “Student Engineering Employees” and are paid $60 per month by our department during their first school year. During that time they are not required to put in any specified hours other than weekly meetings with our scholarship advisor at our Highway Research Laboratory on the campus and occasional inspection trips to interesting highway projects in the vicinity of the university.

Following completion of the freshman year’s work, they are supposed to work with us for about eight months, then return to school for one semester and continue with this alternating program for the next four years. During this time they get varied assignments with our department with advances in ratings and salary as merited.

In effect this results in a six-year cooperative program in which they would each spend about 36 months in school and another 36 months on our practical work. At the end of that time they get their B.S. degree in Civil Engineering, if qualified, and are eligible for a good position with our Department in whatever phase of the work they wish to pursue and on which we could best use them.

RESULTS

Unfortunately, the military requirements during the past three years, have been such that most of our scholarship boys have had to continue in school except for their summer vacations. However, subject only to that change, we have continued with the scholarship program and our first group of scholarship boys will graduate this year. It is probable that most of them will have to go into military service and therefore will not be available for employment for at least another two years. Even though this program has not paid off in actual dividends yet, except for summer work of these employees and some eight months of work periods prior to the Korean War, we believe that the long-range benefits undoubtedly will be very good for the department.

It is worth mentioning also in this connection that the public relation to this plan, including its basis of non-political selection of students for this program has been most satisfactory. The program will result in not only developing greater respect for the department in the mind of the public as an incidental benefit, but, more importantly, will undoubtedly give us the services in the years ahead of many fine young highway engineers, a good many of whom probably would not have been able to get a college education but for the help received through this program.
GRADUATE TRAINING PROGRAM

The other phase of our training program for young engineers has been a more recent development—in fact, just started last year. This, again, has been a cooperative project with the University of Kentucky. I think it is probably unique in its method of operation. The plan was developed primarily with the objective of trying to get more talented young engineering graduates into the Highway Department's services and to retain them there at least long enough to get some of them acquainted with and liking our work enough to want to stay with it.

Under this plan, which we call our "Graduate Training Program," the university selects from the applicants each year not more than five of the highest rated young men who hold a Bachelor of Science in Civil Engineering or a Highway Engineering degree obtained within a three year period prior to their selection. The selectees are required to have resided in Kentucky for a period of at least ten years.

Under the plan the department agrees to employ them on our regular work with varied assignments, if they want a variety of work and we can arrange it for them, and at regular salary for a period of three years. During that three year period they work full-time wherever we want to use them for the first and third years. During the middle year of the period, or to be more exact, during two college semesters in the middle year, the boys attend University of Kentucky where they take their school work for a Master's degree in Civil Engineering. While they are in attendance at the University they are required to do from ten to twelve hours per week of practical work for the department in addition to their school work.

The unusual benefit to them from this plan is that during their nine months in school we pay them their full salary, in fact the same amount they would be getting if they were continuing on actual-full-time work assignment in our department. In order to be sure that none of the boys get their degree at the end of the second year and then leave our services, we have an agreement with the University whereby the degrees are not given until the end of the third year. Also in the written agreement which the young men sign with us it is stipulated that if they drop the plan before its completion, they are required to pay back to our department any amount which we have paid them in salary over and above what they have actually earned by their practical work for us during the nine months in which they are taking their school work for a Master's degree.
So far this plan has shown some good results. Through it we have been able to pull back to Kentucky three very highly rated young engineers who had been working in other states since graduation. It has resulted in the retention of two of our young resident engineers who were eligible for the plan and are taking part in it.

The appointments are made by the University Scholarship Committee and are awarded entirely on the basis of the applicants' school work, practical work since graduation and other factors of personality and character, with no reference whatever to politics or pressure from any source.

Inasmuch as this plan has been in operation only one year, it is too early to tell how it is going to work out over a more extended period of time or whether we will deem it of enough value to continue it as a permanent part of our recruitment program in the future.

PART-TIME EMPLOYMENT

In addition to these programs for college training, we employ as many young civil engineering students as possible during their summer vacations and even during their Christmas holiday period, even though they are not in our scholarship groups. We maintain branch offices either at the University or nearby in downtown Lexington at which we give part-time employment regularly to Civil Engineering students doing drafting and design work for our Planning Division, Location Section, Bridge Office and Highway Research Laboratory. It is our idea that all of this part-time work is helpful in that probably some of these civil engineering students will join our staff after they graduate who are not in our scholarship training programs and might not otherwise come with us.

We have never set up a graduate training program of the kind operating in several other states because we felt that the best time to give the young men diversified training was during their college years. Such a cooperative plan would help them, both in their school work and their practical work with us. By such a plan, we could start them out logically at the very bottom of the scale in our highway work (as axeman). This lets them learn each job all the way up, rather than having to start them at a higher rating, as we would have to do if they were engineering graduates when we hired them. We do, however, offer our young graduates an opportunity to transfer from time to time to various types of work whenever they want to, provided we can work it out. In fact we have a policy in the department to do as much transferring for the good of the department
as possible in order to develop more of our highway engineers with varied experience. We believe the college-cooperative program, which our undergraduate scholarship students follow, provides the best means of training young men for careers in highway engineering work.

It is my opinion that our training programs have been quite helpful to our department and will be more so in the future. However, if our highway departments are to be able to recruit and hold top-notch highway engineers through boom times, as well as depressions, we must find ways and means of making our state highway engineering service as attractive, or even a little more attractive as a career than young men can find anywhere else. That means adequate salaries, retirement benefits, employment security, good working conditions, and all the other things that go to make for satisfactory lifetime careers in engineering work. If it is not practical or possible for at least some highway departments to provide as much security of employment to technical men as these men feel they could get in other fields of activity, then the incentive for them to enter highway work will depend on other advantages such as higher salaries or better retirement plans than other fields of activity offer. So far, of course, the reverse has been pretty much true. In most cases, the state highway salaries for engineers have been lower than in other fields of work, particularly during times of business prosperity. With the possible decrease in defense factory construction there may be some easing up of the acute engineering shortage within the next year. But irrespective of that, our problem is to provide sufficient incentives so that we not only will be able to recruit and hold engineers during depression periods but also will be able to keep the services of an expert and adequate technical staff during boom times like the present.