Inspection and Control—Purposes, People and Problems

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INTRODUCTION

At a time when science and technology are moving at the fastest pace in recorded history, we in America are finding that we are faced with a shortage of one of the most important commodities for future progress—technician manpower.

The two decades since World War II have shown us that science and technology are moving faster and are demanding more skilled personnel than the educational establishment can produce. For the first ten years after World War II, this growing deficiency in technicians, those highly skilled sub-professional persons who assist engineers and scientists, apparently went unnoticed by our society. The emphasis during the war years and immediately thereafter was on professional engineers and this was the area of education stressed, by and large, by the majority of the colleges and universities in the United States. It took a dramatic launching into space by a foreign power of a grapefruit-sized satellite to jar America awake and turn our thoughts to where they should have been in 1945 and the years immediately following.

The launching of Sputnik I by the Soviet Union in 1957 has since been looked upon as the prod that first awakened the United States from it’s apathy, and later motivated us into doing something about the great technician void in our labor force.

By 1975 more than one and one-half million technicians will be required in this country. This is 77 percent more than the 1963 employment level. Based on normal attrition, the yearly need will be about 86,000 new technicians.

THE NEED FOR TECHNICIANS

All areas of science, research and industry are in dire need of technicians, but one of the gravest needs for these skilled personnel today is the highway industry.
The Highway Need

The toll highway systems and the federal highway programs which accelerated highway construction in this country to a fevered pitch soon revealed to us that there was a serious shortage of technically trained personnel to carry on the work needed in the planning, design and actual construction of highways. Highway departments have found it almost impossible to employ personnel who had received any formalized training in civil technology. And qualified personnel will be even harder to recruit as time goes on.

Reasons for Increased Need

Consider some of the reasons for the increased need for highway and civil technicians in the highway industry today. It has been conservatively estimated that the population of the United States will increase to 300,000,000 by the year 2000. Other experts assert that a population of 350,000,000 by the year 2000 is more realistic.

In the United States, it is predicted that with even the minimal increase of 100,000,000 people, most of whom will be urban dwellers, that 750,000 miles of new streets and expressways, 480,000 additional high school and junior college classrooms, 30 million more dwelling units, and tremendous expansion in water systems, and new industrial and commercial structures will be needed.

In addition to these rather impressive statistics, it must be realized too that there is an increasing shortage of graduate engineers and, at the same time, the general nature of an engineer's work is changing. Three and four decades ago, engineers performed many of the routine and perfunctory materials and quality control tests that were required in most types of highway construction. In addition, much of the detailing and other design and survey work was handled by the junior engineers. This was at a time when construction activity was at a more leisurely pace and deadlines were not as critical as they are today.

Today most graduate engineers no longer have time for the many duties they once performed as junior engineers and are assigning these important, yet routine tasks to the technicians. This leaves the engineer for more time for creative designing and overall supervision of projects.

WHERE WILL TECHNICIANS COME FROM

A logical question at this point is, if we need more technicians and our existing educational establishment is unable to produce them, from where are they going to come?
Congress Acts on Technician Shortage

Fortunately the federal government became aware of the acute technician shortage as early as the mid 1950's. Shortly after the launching of Sputnik I, Congress, in 1958, included a section in its now historic National Defense Education Act to provide aid to the technical and vocational areas of education. Under provisions of this section, which became known as Title VIII, the Office of Education, Department of Health Education and Welfare, administering funds to the states to be matched by the states dollar for dollar to train skilled technicians which were "necessary for national defense". These funds were authorized to be spent for the purchase of laboratory equipment, for teachers salaries, and for providing materials and other services for programs and technical education. More legislation followed in 1963 in the form of the Vocational Education Act passed by Congress which made permanent the provisions of Title VIII of the National Defense Education Act for training highly skilled technicians.

New Technical Training Schools

Since these acts have been in force, hundreds of new technical training schools have been constructed and put into operation and tens of thousands technicians trained.

State Highway Departments Train Technicians

State highway departments traditionally have had some sort of in-service training programs through the years. In most cases, these were directed at incoming civil engineering graduates for the purpose of indoctrinating them in design, construction and administrative policies of the department. Many states, however, have organized in-service training programs for technicians. In many states, the in-service programs provide the only training that high school graduates wanting to become technicians receive. In other states, these programs supplement training that is received by the trainees at schools outside the state highway department.

HIGHWAY TRAINING PROGRAMS

In a comprehensive survey which our firm, Soiltest, Inc., conducted a year ago with regard to technician training, we found that the highway departments had several different types of training programs under way. The training activities can be classified into 4 different groupings:

1. Basic training for new men;
2. Continuing education and up-grading of existing personnel;
3. Correspondence courses;
4. College or technical school work.

**Training by Job Rotation**

All of the highway departments concentrate heavily on training new personnel. Since it is desirable to have well qualified technicians, that is men qualified to perform more than one individual testing or inspection task, many of the departments use a rotational system for their technicians to get them acquainted with as many programs as possible.

**The "Buddy System"**

To give the new personnel the benefit of experience of qualified men, who have been with the highway department for many years, many of the states use a “buddy system” for the on-the-job training. Field trips are also used to expose trainees to various field problems in construction techniques. Many highway departments run a special school for one week or longer each for material inspectors. They are in-service training programs that are normally carried out whether or not the departments have other formal educational programs.

**Continuing Education Programs**

Our survey also indicated that most highway departments have continuing educational programs for upgrading technicians and for keeping them abreast of the new techniques, developments and specifications in the field.

**Reclassification Periods for Technicians**

Some highway departments are considering establishing a reclassification period for technicians and inspectors every several years. In Hawaii for example, inspectors and engineering aids are given extensive training in the laboratory and are issued certificates which are good for one year. Recertification is made every year by checking the performance of the tests conducted in the field by the technicians. The states which have certification programs, such as Hawaii and others, and continuing training programs have found that this type of training raises the proficiency and also improves morale. Two years ago, in the slack construction season, 600 personnel of the Kansas Highway Department enrolled in highway mathematics courses. This is a continuing education program for highway technicians in cooperation with the state vocational educational department.
Minnesota's Program

Minnesota has a program with course material prepared by the highway department and county engineering association. In 1964-65, 196 highway technicians were trained.

Georgia's Program

A special extension program in the State of Georgia, operated by the Department of Education for the Highway Department, will expose more than 700 highway personnel to a higher level of education in their field of work. The program takes three years to complete at the rate of eight hours of special instruction per week. Graduates are certified as civil technologists by the state merit system.

Highway Contractors and Technicians

Although most states are doing all they can with regard to in-service and cooperative education programs, it is doubtful that the highway departments can carry on the training necessary to develop all the technicians that are required. In addition, many contractors now use technicians for their own testing procedures on both private and governmental work.

INCREASE THE NUMBER OF TECHNICIANS

The big question is, how can highway departments, contractors and others concerned with the road industry find all the technicians necessary to accomplish future work?

Promotion

First of all, a job has to be done in acquainting young people with the opportunities that exist in the highway and civil engineering fields. To develop an interest in technical work, they must become familiar with the aspects of the work. In many minds, an aged image of the highway inspector exists; few people are familiar with the interesting and challenging aspects of highway and civil engineering work.

Use of Existing Technical Schools

To operate, schools need students. And highway departments need technicians. By a cooperative program in the planning and training of men to be highway technicians, both the vocational schools and the highway industry can benefit. By formalizing a training program in cooperation with existing technical schools, the technician manpower needs of the highway industry can be met in the future.
Promotion in the High School

If more high school graduates are to be attracted to careers as technicians, the highway industry needs to do a much better job than it has done to date. It has to get "word" to these young students on what is involved in highway work and what tasks the technician performs in the design and construction of highways.

High school counselling is of great importance. Presently, this is of considerable importance since fewer high school graduates are electing to study engineering; and demand by employers goes for manpower in the technical fields.

The lack of adequate information generally gets the blame for insufficient preparation of students in these areas. Commenting on the counselling programs, a University of Michigan professor stated, "We need persons who are thoroughly familiar with today's rapidly changing technologies. By making occupational information available to students early in their school careers, they would gradually be able to relate their ideas to their own specific abilities and interests prior to the time of making curriculum decisions."

Promotion by Various Organizations

Some engineering societies are cooperating with guidance and personnel organizations in trying to develop the type of information required. Public relations programs, manuals and books are available through some of the professional organizations.

COOPERATION BETWEEN HIGHWAYS AND SCHOOLS

A good working association between highway departments and state education departments and with technical schools and colleges in the state is important. In our survey, we contacted technical schools and colleges to obtain information regarding their relationships with the highway departments in the training of highway and civil engineering technicians. A junior college in Florida reported that it was receiving considerable help from the state highway department and that their district engineer was a member of the college advisory board. They have very close contact with the highway department, but they would desire closer contact with industry. The highway department makes its needs for skilled persons known to the college. The present demand for graduates in the technical field exceeds supply and this particular Florida junior college estimates that the need for the next ten years in the state will exceed 300 new technicians per year.

A community college in Honolulu reports that their advisory com-
mittee in technical education is made up of both highway engineers and engineers in private practice. An area vocational technical school in Georgia has a field engineer from the highway department heading its advisory board. The Georgia State Highway Department has developed and outlined a civil technology program. There is very close cooperation between the school and the highway department.

Better Communication Between Highways and Schools

On the other hand communication between the state highway department and the educational establishment in the state, has been poor. A community college in New England indicates that the support from the highway department is "inadequate" but they do get support from the cement and asphalt associations. In this state, therefore, the needs of the highway department are totally unknown, but industry has given indication of it's requirements.

The key word here is communication. To solve the acute technician shortage, the state highway departments must establish a strong line of communication with the educational establishment so that the department's needs can be made known and fulfilled.

IMPEDIMENTS TO TECHNICIAN RECRUITING

Two key impediments in attracting sufficient numbers of technician recruits were cited over and over again in our survey. Those two impediments were salary level and recognition. Many highway departments make mention that the salary schedule presently offered for technicians in their state is inadequate to attract sufficient recruits. Several departments stated that in many instances, the salary schedules were not developed in contemplation that well-trained and experienced personnel would be available. With the up-grading of technical education programs in many states, it is found that qualified and well trained technicians can command higher salaries from industry than they can from highway departments. Many of these departments mentioned that they are actively promoting a revision in the highway technician's salary scale.

Term Technician Poorly Defined

Definition of terms poses a problem too. Although the term "technician" has received considerable attention during recent years, and leaders in both industry and education have often attempted to define it, the information gathered suffers from a diversity of meaning and application. This is both an academic problem and a job classification problem. It is a problem nevertheless which seriously affects the feel-
ings, prejudices and values of the coming generation. They are the people now making decisions regarding their future vocations. If the term technician continues to suffer from inadequate definition and representation, our youth will certainly show little appreciation of it.

**Lack of Recognition for Technicians**

And one final comment—this about *recognition*. To develop the interest of young men in careers as highway technicians, there must be a better recognition of the engineering technician in the industry. Certainly this type of recognition has already taken place in other professions such as medical, dental and mining where technicians are accepted as a standard and respected part of the staff operations.

**Lack of Certification Programs**

A certification program would significantly improve the status of the technician and several programs, both national and local, are under way at the present time aimed at this end.

**Summary of Impediments**

In short, there appear to be three significant factors impeding the development of more technicians for the highway industry in our country today. They are a general lack of communication between the highway industry which needs skilled technicians and education, which is expected to train the technicians. The Soiltest survey indicates that 33 state highway departments out of 50 are not communicating with their state education department and vice versa on a regular basis to exchange information about training requirements and programs.

Recognition and status, or the lack of enough recognition and status, is also a factor affecting the number of young people considering careers as highway technicians. And lastly, compensation—or the lack of compensation—is still another factor. The Soiltest survey indicates that out of 50 state highway departments, seven indicated that salary was definitely a factor in not being able to procure enough technicians to meet their needs and ten other states cited reasons that could very well have implied salary factors.

**GENERAL SUMMARY**

The recruiting and training of highway technicians is now a problem and there is every indication that it will continue to be a problem in the years ahead. However, it is not an insoluble problem. Highway departments, through an intelligently planned program, can meet the
challenge head on by establishing open lines of communication with the educational establishment in their state, by organizing comprehensive in-service training programs at all levels, by instituting cooperative programs with state universities and colleges to upgrade the performance level of present technicians, by working with professional organizations and other groups to publicize the glamour, importance and dignity of the technicians role in society, and lastly, by approaching realistically a compensation problem that exists in today's highly competitive labor market-place.