

Observed Manpower Requirements

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● THIS report deals with highway manpower requirements in two general ways; first, from the point of view of general national conditions, and second, from specific situations as witnessed in several states.

When we deal with the subject of manpower requirements, we all realize that we are working on a subject that has many facets and influences. It is not a subject that can be treated by application of engineering formula.

Economic influences, such as the lack of adequate long term highway programs or the general level of employment, have an important bearing. Changing situations in total scientific developments create imbalances in attractiveness of fields of endeavor. Currently the trend is toward atomic energy and electronics. Finally, government employment policies and management practices in many instances aggravate a situation that is already bad.

Throughout the nation we have a real problem in meeting the needs for engineering personnel, both professional and subprofessional. The situation may get worse before it can get better. It is now acute enough that we must take positive steps to solve the problem.

The shortage of highway engineers starts in college. Total enrollment in colleges continues to increase but the percentage of students taking engineering remains at 7½ percent, about the same as for the past five years. Out of an annual total of about 22,000 engineering graduates, about 4,000 are civil engineers. At the present rates of employment, only about 14 or 15 percent of the civils are going into highway engineering. And, to carry it a step farther, less than three percent of our total engineering graduates in all branches enter highway work.

It is difficult to accurately forecast the number needed. We do know that states generally have, up to now, been able to recruit less than one-third the number of graduates they were seeking. If the backlog of need for engineers could be met it would require induction of about 2,000 engineers annually in the highway field for the next few years.

This requirement calls for action on two fronts. First, more engineers must be attracted to the civil engineering branch in relation to other engineering fields. Second, highways must be made competitively attractive with other areas of employment for civil graduates.

Highway departments up to now have been able to subsist to a large degree because the first crop of engineers recruited in the road program of the 1920's are still in service. However, the age situation is becoming more critical and new blood must be injected at a faster rate. A few examples taken from recent studies serve to make the point.

In one state 15 of the 24 men in the top three grades were over 60 years old. In the same state, out of a total of 238 engineers in grade II, only 13 were under 40 years old. No one in grade III or higher was under 40 years old.

In another state over one-third of the personnel employed in engineering work are over 60 years of age and only 12 graduate engineers out of a total of 89 qualified engineers are under 45 years of age.

Another state has a total of 619 engineers with one-third over 50 years old. In the same state 182 employees are classified as junior engineers or instrumentmen. The average age of the 182 men is 40 and only 13 of them are college trained.

In another case, one-third of the entire engineering staff will be retired in 15 years and another one-fifth will follow in the next five years.

In one of the smaller states with only 71 engineers, 17 are now eligible for retirement and only six men are under the age of 40.

Those individual cases do not necessarily represent a national average condition, but they do illustrate the fact that many states thus far have fallen far short of laying the groundwork which will build strong engineering forces for the future.

On the other hand, we can point to a few states that have recognized the problem and

have adopted aggressive courses of action which are producing results.

Now let us turn to a discussion of the things that can and must be done to meet the problem.

To get more engineers into the colleges and in turn to get more of them into highways, we must have a sound sales argument.

First, engineers must be convinced that there is a rewarding future in highways. That means that for one thing the highway program at all levels of government must be adequate and firmly committed as a continuing program. Opportunity for an engineering career cannot be easily sold when it is of a fluctuating or unstable character.

Second, it must be demonstrated that the rewards are substantial. By that we mean that salaries and other benefits are competitive with other fields and that meritorious effort will bring recognition and advancement.

With regard to the influence of a stable long range program, it can be concluded that the current national interest in highways will bring forth a stepped-up program. Such a program on a nation-wide basis should serve well to convince students that there is a big job to be done in highway development. It should lead to a greater proportion of students choosing civil engineering. It should also provide the incentive for the highway agencies to reorganize their personnel policies and practices in such a manner as is required to be competitive for engineering talent.

It is significant to note that those states which have been most aggressive in the post-war years in the adoption of long range plans with accelerated financing have been most successful in meeting the personnel problems.

The salaries of civil engineers on a national basis for the first ten years of service are generally competitive with other branches of engineering. However, as engineers progress beyond the ten year period of service, median salaries of civils are falling below other major branches. Highway salaries generally are below that of civil engineers in non-governmental employment but it is most noticeable in the upper grades. The situation varies greatly between agencies of government and regions of the nation.

If highway agencies are to be made fully salable to young engineers, it will be necessary not only to make beginning salaries attractive, but rates must be materially increased in the higher positions. The young engineer of today is being solicited by many agencies. He cannot afford to choose one that does not give a reasonable opportunity for an ultimate economic status equivalent to his fellow engineers in other fields.

The salary studies made by several engineering societies provide the basis for the above observations.

Attraction of engineers to highways will require more than adequate salaries and a challenging long term program. One requirement is the production of evidence that careers are not subject to the whims of political manipulation of management. This can be brought about, as far as most personnel are concerned, by good systems of civil service or merit rating. Such systems are not without their disadvantages but by and large they serve to attract men to careers in government. Such systems must be administered with sympathetic understanding of the management needs of the highway agencies. By that I mean they must be flexible enough to permit active recruitment on a competitive basis. It must be recognized that engineering is a technical profession requiring education and demonstrated qualification. It cannot be put in the same category as non-technical government service where comparable pre-qualification is not required.

At the end of the line, men today, as in nearly all walks of life, hope to look forward to a retirement that is commensurate with the cost of living. Many highway department retirement plans are now inadequate to meet those objectives.

Another need in order to compete for talent and simultaneously provide the best results from talent obtained is that of in-service training. This activity should be designed to fully acquaint the new employee with all the varied functions that are required in highway engineering and operation. It provides a period when the new employee may convert his academic training into practical application in a highway career. It gives the employee a chance to demonstrate the area of greatest interest to him and the area of greatest capability to the employer. Both employer and employee benefit from the process. The value of the process has been fully demonstrated in too few departments.

Perhaps another area should not be overlooked in creating an atmosphere of salability

with respect to highway engineering. Highway engineering today is a real challenge. It is tremendously diversified in its requirements. Traffic movement is one of the more complex domestic problems. If we are to plan, build and operate highways for the future, we must have men with a great variety of skills, imagination and courage.

We must have men with foresight for planning and design. We must devise new ways of performing routine engineering calculations. We must devise new and better ways of operating and maintaining facilities. We must find better ways of getting the most from the men we have and those we will get in the future. We need to apply as much science to personnel engineering as we do to the basic sciences of engineering. When we do, we will then begin to meet our manpower requirements. Then I think we will be able to approach the young engineer with an argument that will be convincing and salable.