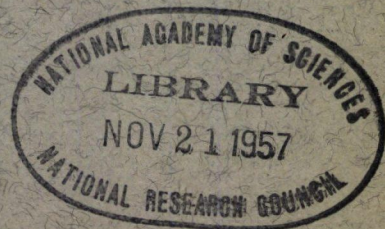


# HIGHWAY RESEARCH BOARD

BULLETIN No. 9

SALARY AND WAGE PRACTICES  
OF  
STATE HIGHWAY DEPARTMENTS

1947



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**HIGHWAY RESEARCH BOARD**

**BULLETIN NO 9**

**SALARY AND WAGE PRACTICES  
OF  
STATE HIGHWAY DEPARTMENTS**

**A STUDY BY THE  
COMMITTEE ON HIGHWAY ORGANIZATION AND ADMINISTRATION**

*Presented at the 27th Annual Meeting*

**HIGHWAY RESEARCH BOARD  
DIVISION OF ENGINEERING AND INDUSTRIAL RESEARCH  
NATIONAL RESEARCH COUNCIL**

**Washington 25, D C      December 1947**

## NATIONAL RESEARCH COUNCIL

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The Charter of the National Academy of Sciences, under a special act of the Congress approved by President Lincoln in 1863, provides that "the Academy shall, whenever called upon by any Department of the Government, investigate, examine, experiment, and report upon any subject of science or art."

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The Board provides a forum for the discussion and publication of the results obtained by individual research workers; organizes committees of experts to plan and suggest research work and to study and correlate the results; publishes and otherwise disseminates information; provides a research information service; and carries on fact finding investigations. With the cooperation of the highway departments of the states and Territories and the Public Roads Administration, the Highway Research Board conducts a Highway Research Correlation Service, to aid the many highway research agencies to correlate their work through personal visits, conferences, committee work, and dissemination of pertinent information.

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# BASIS FOR THE STUDY

The American Association of State Highway Officials first took direct action concerning the current critical salary situation when its Executive Committee meeting in Oklahoma City on February 1, 1946, authorized the appointment of a new and important Special Committee on Salaries and Wages in Highway Departments, now the Special Committee on Classification and Compensation of Highway Department Employees. This committee was charged with the responsibility of investigating highway department personnel classification procedures and compensation plans for departmental employees.

Present members of the Committee are:

D. C. Greer, Texas, *Chairman*  
Thos. E. Stanton, California  
C. E. Vogelgesang, Indiana  
Fred R. White, Iowa  
R. M. Reindollar, Maryland  
W. Vance Baise, North Carolina  
C. D. Curtiss, Public Roads  
Administration

While preliminary investigations of the Association Committee appear to indicate a wide variation in salaries for the same positions among the States, further examination disclosed a considerable difference in classification and definition of particular positions

covered by similar title designations. Furthermore, differences in organization and division of duties and responsibilities made it difficult to obtain reasonable comparisons without considerable additional study. Consequently, in an interim report of December 15, 1946, it was recommended that coordination of the work of the Highway Research Board Committee on Highway Organization and Administration and the Association Committee be effected, since the former had already begun exploratory investigations in the field. After consultation it was decided that the final recommendations of the Association Committee would depend to a large degree upon the findings of the Highway Research Board Committee.

Subsequently, representatives of both Committees met to coordinate their efforts and direct the research toward the desired ends. The discussion revealed the lack of comparable data for the States, and it was agreed that the first step should be the collection of minimum standard information from State highway departments. Since a reasonable degree of uniformity and facility was required, the Public Roads Administration field offices were used as clearing houses for collection of the data.

## SUMMARY OF FINDINGS AND CONCLUSIONS

1. Practically all highway administrators agree that their 1947 construction programs are being delayed by a shortage of engineering

personnel, occasioned to a large extent by their inability to pay salaries which are being paid elsewhere.



2. As of July 1, 1947, there were in the 48 State highway departments approximately 9,800 unfilled engineering positions, of which 4,400 required professional employees and 5,400 required subprofessional employees. These figures represent 30 and 50 percent, respectively, of present professional and subprofessional employees.

3. In spite of the relatively large number (25,000 to 30,000) of potential civil engineers now in our universities, there is considerable doubt as to whether many of them can be attracted to State highway departments, because of the low salaries and ineffective recruiting procedures.

4. Although the salary scale is important, it must be recognized that salary scale is only one phase of salary and wage administration in general, and that the existing situation has been influenced by a number of items other than pay scale.

5. Almost all highway department employees have received salary or wage increases during the past few years, but such increases have been haphazard and piecemeal, with little or no study of the real problem and situation existing. Also, since they average only 25 percent, whereas informed opinion of economists indicates that prices will ultimately settle at not less than 50 percent above 1939 averages, it seems apparent that present salaries are and will continue to be inadequate.

6. The median highway department professional salary of all States is \$3,350 per annum, and there is no difference in the median professional salary of civil service States and that of non-civil-service States. The median subprofessional salary of all States is \$2,050; in the civil service States the median subprofessional salary is

\$2,150, while in the non-civil-service States it is the same as in all States, \$2,050.

7. Although there is little difference in median salaries between civil service and non-civil-service States, a higher percentage of employees in the latter States receive lower salaries. For example, 26.9 percent of all professional employees in civil service States receive salaries of \$3,000 or less, while in non-civil-service States the corresponding percentage is 37.2. Similarly, 69.6 percent of all subprofessional employees in civil service States receive salaries of \$2,400 or less, as compared with 84.7 percent in non-civil-service States.

8. Eight and one-tenth percent of all professional salaries are \$2,400 or less, while only 0.7 percent of these salaries exceed \$7,200. In the case of subprofessional employees, the significant fact is that 13.9 percent of such employees receive salaries of \$1,500 or less per year.

9. The salaries of chief administrative officers in the several State highway departments vary from \$4,500 to \$15,000, with a median of \$7,200 for all States. Only seven chief administrative officers receive salaries of \$10,000 or more, and four receive salaries of \$5,000 or less.

10. The salaries of chief engineers in the several State highway departments vary from \$4,440 to \$14,000, with a median of \$7,200 for all States, the same as for chief administrative officers. Only four chief engineers receive salaries of \$10,000 or more, and four receive salaries of \$5,000 or less.

11. The prevailing salaries of department, bureau and division heads in the several States vary from \$3,960 to \$9,250, with a median

of \$5,460 for all States. The top salaries for these positions vary from \$4,140 to \$12,000, with a median of \$5,589, and the low salaries for the same positions vary from \$3,360 to \$7,375, with a median of \$4,500.

12. In the States east of the Mississippi River, highway department salaries are below the national average in two States out of three, but west of the Mississippi River, highway department salaries are above the national average in two States out of three.

13. Disregarding salary, the advantages of public employment about balance the disadvantages. State employment would seem to have the advantage as regards vacations, sick leave, holidays, security and continuity, while as regards hours of work and overtime, pensions, insurance benefits, extra cash awards, and prestige and opportunity for advancement, the advantage appears to be with private employment.

14. It is believed that Federal salary levels might well be adopted as minimums by all State highway departments. If they were so adopted, 75 percent of the departments would have to increase their minimum professional salaries and 80 percent their maximum professional salaries. Likewise, approximately two-thirds of the States would have to increase their minimum subprofessional salaries and all but a few their maximum subprofessional salaries.

15. Salary increases alone will not improve the quality and efficiency of highway department employees, but justified salary increases plus a proper classification plan will make it possible to reward competent employees and to replace the less efficient ones. The indi-

cated need is for highway administrators themselves to take a greater interest in personnel policy.

16. State highway departments should take more definite and systematic steps to attract new engineering graduates. Competent employees must be obtained, and measures must be enforced that will insure the maintenance of high performance standards. Recruiting and other personnel practices must be modernized if highway departments are to attract and hold the best available talent.

17. Highway departments not now operating under merit principles should avail themselves of the advantages offered by this superior personnel system. Also, in those States which now have limited coverage, the early extension of the system to include all highway department employees is urged.

18. Preoccupation with the immediate and compelling task of providing an extensive system of highways to meet public demand has caused administration to lag in comparison with progress made in technical fields such as construction and maintenance. Improvised personnel policy and bad organization are together limiting the capacity of State highway departments to develop and operate in accord with the many-times increased responsibilities of recent years.

19. A reorganization of the administrative structure of course cannot in itself insure efficiency and economy in highway operation, since reorganization plans are not self-executing. The quality of highway administration within a State will still depend largely upon the quality of the personnel who administer the highway functions. Only when employees of the highest quality are recruited to carry on

the work within a good administrative framework will the most efficient service be obtained.

20. Highway administrators should take the lead in presenting constructive plans for the better-

ment of their agencies. They should attack the problems of organization with the same vigor and scientific approach as has been applied to technical problems.

## INTRODUCTORY

In a text on road-making by W. M. Gillespie, professor of civil engineering at Union College, published in 1847, 100 years ago, when the Union consisted of only 29 States, it was stated that the principle of putting unskilled men to work at the difficult art of road making is a false one. The first step, he thought, "should be to place the repairs of the roads under the charge of a professional road-maker of science and experience." And the commissioners -- and presumably the engineers and their deputies likewise -- "should be liberally compensated for the time and attention which they give to the work ... Skill, labor, and time cannot be obtained and secured without being adequately paid for." That final admonition sounds a lot like 1947.

The seriousness of the present situation has been recognized on all sides. Practically all highway administrators agree that their 1947 construction programs are being delayed by a shortage of engineering personnel, occasioned to a large extent by their inability to pay salaries which are being paid elsewhere. Numerous recommendations have been made to the appropriate State agencies that salary schedules of highway engineers be reexamined, in order that highway departments may be able to attract and hold personnel properly qualified to perform their duties to the citizens and motorists of the several States.

The situation was summarized by Commissioner Thomas H. MacDonald in

an address given at the annual meeting of the American Association of State Highway Officials in January 1946, in the following words:

"The administration and management of highway affairs have failed to keep pace with the scientific and technical advancements that have been made in the field of construction and maintenance. The urgency of building as rapidly as possible an extensive system of highways has perhaps necessarily forced administration and management in a role of secondary importance. Now, with the greatly enlarged scope of operations, management becomes of paramount importance ...

"The State administrative organization is often poorly adapted to perform the greatly increased tasks of the immediate future. In the main, some States still have the organizational structure set up more than 25 years ago, except for additions through the natural process of accretion. The result is an obsolete type of organization, inadequate and ill-suited to proper and well-managed operations...

"Almost the whole of management may be expressed in terms of personnel. To do the job at hand, highway administration must command professional and technical competence, and it must be organized to take full advantage of the best talent available. Finding the right people for the high-level positions is important and difficult."

Salaries in many State highway departments are lamentably low, and it is no wonder that qualified young engineers are not attracted by them. The majority of the men

now working in many of these departments are old-timers, loyally carrying on at wages below what they might command elsewhere. In one State, for example, the statutory salary of the State Highway Engineer is \$5,000 per year, the same as it was 110 years ago.

During the war period, highway departments lost a great many of their best-qualified engineering personnel. Some are returning, but

many others will not return because of greater inducements elsewhere, particularly in private industry. Thus, the highway departments find themselves with a paradoxical situation, in which they cannot compete with private business for administrative and professional personnel but at the same time require the best talent for effective administration.

## PRESENT SHORTAGE OF ENGINEERING PERSONNEL IN STATE HIGHWAY DEPARTMENTS

The present situation as regards the shortage of engineering personnel in State highway departments is exemplified by advertisements which have appeared in some of the leading technical magazines. North Dakota, for example, wants 30 civil engineers of all grades, with or without experience, for highway location, design, and construction work. "Permanent positions as instrumentmen, inspectors, project engineers and resident engineers" are offered, with "opportunity for location in a western State that has excellent prospects for rapid development."

California for some months has been advertising for graduate civil engineers, preferably under 30 years of age, with or without experience, for highway and bridge location, design, and construction work. Opportunity for permanent civil service status is offered.

### GENERAL EXISTING SITUATION

According to Dean W. R. Woolrich of the University of Texas engineering school, the demand for engineers in this country is six or seven times greater than the supply

of new engineers. Many graduates are remaining in school to get additional training, thus making the shortage more acute.

In 1940 our engineer population numbered 261,000. If the ratio of engineer employment to total employment remains the same as in 1940, we shall need 337,000 engineers in 1950. And if allowance is made for the great expansion in postwar research, we shall need substantially more than 337,000.

Using these and other data, a committee of the American Society for Engineering Education under the chairmanship of Dr. Karl T. Compton, President of the Massachusetts Institute of Technology, in 1946 estimated that industry, government and education would need at least 90,000 new engineers between June 1946 and June 1950. There is no way in which such demands can be met except by training new men. Although the number of bachelor's degrees awarded by engineering institutions had reached a total of about 15,000 a year before the war, this year's total is only about 7,000. The Compton Committee, however, estimated that increased college capacities would raise the annual output

of new engineers to 35,000 in 1950, and that by 1952 the influx of additional engineers should at least make good the shortage.

#### SITUATION AS TO STUDENT ENGINEERS

In order to obtain an idea of what proportion of the students in the greatly enlarged enrollment of engineering schools at the present time have chosen civil engineering as their life work, *Engineering News-Record* recently sent out a questionnaire to a representative cross-section of engineering institutions in the United States and Canada. Figures received to date indicate that the proportion of civil engineering students in the total enrollment of engineering students is close to 11 percent in both the United States and Canada. However, a more complete survey recently made by *The Journal of Engineering Education*, covering both graduate and undergraduate enrollments in each branch of engineering in the various engineering schools throughout the United States and Canada, indicates that out of a total of 197,797 students, 28,448, or over 14 percent, are taking civil engineering.

Table 1 is an estimate by the Bureau of Labor Statistics as to the number of civil engineering students in engineering schools in the United States during the 1946-47 school year. The survival rates included in the table are those which obtained before the war; present survival rates are higher, and the number of graduates who can be expected will exceed the number indicated by the survival rates shown.

In spite of this relatively large number of potential civil engineers, there is still considerable doubt as to whether many of them can be attracted to State highway departments. According to Commissioner

Hoffman, for example, during the period from 1925 to 1940 the Department of Highways of Minnesota hired a total of 319 graduate engineers. At the present time only 63 of these engineers remain in the employ of the department. No graduate engineer has been hired, in other than a temporary capacity, for several years.

Table 1  
1946-47 CIVIL ENGINEERING STUDENTS

	Year of Graduation	Survival Rate %
10,000 Freshmen	1950	54.0
7,500 Sophomores	1949	64.7
4,000 Juniors	1948	72.0
2,400 Seniors	1947	90-95

Of 768 civil engineers graduating from Purdue between the years of 1930 to 1941, inclusive, 140 or more than 18 percent went to the Indiana State highway department. Only 15, or less than 11 percent of these men remain on State highway payrolls. These figures indicate, and the colleges and universities themselves feel, that they have done their share in pointing men toward State highway employment, and that since the States have been unable to hold them for any period of time, the fault must be theirs.

#### SITUATION IN SPECIFIC STATES

The shortage of engineering personnel is not limited to young graduates, however. In the early spring of this year, for example, the Virginia State highway department reported a need for several hundred civil engineers and engineering trainees, with positions ranging from those demanding experienced college graduates to those for men just out of high school. More than 100 openings

were available in engineering posts with salaries ranging from \$236 to \$303.20; engineering graduates with one or more years' experience or with an equivalent combination of experience and education were desired. For engineering graduates with no previous experience, or for men possessing experience equal to college study, there were more than 225 openings at salaries from \$180 to \$224.80. In the lower salary grades an estimated 200 openings were listed.

Lack of highway design engineers is the greatest obstacle in the Ohio highway department's plan to improve the State's roads, according to Director Murray D. Shaffer. He reported that designers are leaving the State civil service rolls for better pay in private industry. The present pay schedule for designers runs from \$2,400 to \$4,500, depending on previous experience. Shaffer said that most designers are trained in the State highway department after coming directly from college, but most of the present graduating class of civil engineers at Ohio State University plan to work for railroads or other industries.

In Texas, the most difficult problem of the highway department during the first postwar year was occasioned by its inability to secure and hold trained engineers and technicians. Many of the department's best technical men and executives went to other employment, and the return of former employees released from military service was disappointing. As construction began on projects for which surveys and plans were developed during the war years, engineers had to be transferred from preliminary work to supervise construction. This has delayed advancement of many projects to the construction stage.

In Kansas, it is almost impossible to employ new engineering

personnel, and there is a constant exodus of many of the best trained men of the department for higher-paid positions in private industry or with the Federal government. The activities of the State highway commission are being handicapped by a serious shortage of engineering personnel. Many engineers formerly in the employ of the commission have failed to return to the department after being in military service or being employed by war industries. Also many engineers have left the service of the department within the last year, these being lost to private industry, other State highway departments or Federal agencies. Salaries paid are not commensurate with those paid by private industry and Federal agencies.

A shortage of civil engineers in the Illinois State highway department threatens to deprive Illinois motorists of the full benefits of modern expressways that could be built, or at least designed and placed under contract, in the next few years. To get work under contract is the State's first problem, and to do it the highway department requires about three times as many civil engineers for planning and designing as are now on the payrolls, it is learned. The shortage of engineering personnel is so acute that it has resulted in the passage by the Illinois House of a resolution calling for investigation. Salaries paid by the State would be compared with those paid by other employers of engineering talent.

The reason for such shortages in practically all of the States, and particularly the manner in which the shortages have developed during the past few years, are matters of considerable interest. The failure of many States to increase the pay of engineers even enough to meet the rising cost of living has of course had a detrimental effect.

The fact that there have been practically no engineering graduates for the past five or six years and increased postwar construction programs are other factors contributing to the shortage.

South Dakota's experience is a good example of the manner in which the present shortages have developed. There 59 men from the highway department entered defense work and 113 went into military service. Of these, 20 men returned from defense plants to their former jobs in the highway department and 51 ex-service-men returned to their jobs. This net loss of 100 men has been a serious handicap to the department, and additional employees, especially engineers, are badly needed.

In January 1942, Virginia had 14,518 highway workers. In March 1945 this number had dropped to 5,703. In December 1945 the number was only 6,799, or less than half of what it had been during the first war winter. For many months the department carried more than 2,000 vacancies in salaried positions on its rolls.

On June 1, 1940, the construction department of the Kansas State highway commission had 214 full-time employees and 223 part-time employees. On June 1, 1942, this had decreased to 108 full-time and 95 part-time employees and by June 1, 1944, the personnel was further decreased to 32 full-time and 17 part-time employees. By June 1, 1946, personnel had been built up to 191 full-time employees and 135 part-time employees. However, less than one-third of the full-time employees had ever had any experience on highway construction. It is estimated that to handle properly the postwar highway program, it would be necessary to have approximately 760 employees in the department, of which one-half would be on a full-time basis and one-half on a part-time basis.

## ANALYSIS OF STATE ESTIMATES OF NEEDS

To determine what the effect of these shortages might be on the 1947 construction programs in the several States, there has been requested from each State an estimate indicating the total number of additional professional and subprofessional employees, including engineers, draftsmen, inspectors, instrumentmen, rodmen, chainmen, and similar personnel needed by the State to handle adequately its 1947 highway program. Of the 41 States which have so far made estimates, five submitted data which did not lend itself to this particular analysis, and six reported no need for additional personnel. The other 30 States report definite and immediate need for from 27 to 948 engineering employees representing from six to 127 percent of their present engineering employees. The median stated need is 39 percent of the present engineering employees.

Of the 30 States reporting in form suitable for analysis a need for engineering employees, 28 reported separately data for professional and for subprofessional needs. These 28 States reported a need for 3,064 professional and 3,813 subprofessional employees. There are presently employed 9,013 professional employees and 6,740 subprofessional employees in these States, so that estimated total requirements represent 34 percent and 57 percent, respectively, of present professional and subprofessional employees. In individual States the need for professional employees varied from zero to 112 percent of present professional employees with a median percentage of 24, while the need for subprofessional employees varied from zero to 301 percent of present subprofessional employees, with a median percentage of 48.

Applying these same data to all

States, but allowing for States not requiring additional personnel, there is a total estimated need for 4,377 professional and 5,447 sub-professional employees. There are presently employed in all States 14,160 professional employees and 10,882 subprofessional employees, so that the estimated total needs in all States represent 31 percent and 50 percent, respectively, of present professional and subprofessional employees.

It seems clear, then, that there is a definite shortage of engineering personnel in State highway departments. During the war years, of course, the supply of engineering graduates for other than military purposes was practically nil. Because of limited enrollment in technical courses during the war, the shortage will continue for several years. To complicate the

situation further, present graduates from engineering schools and experienced highway department employees are going into Federal service or into private industry at starting salaries far in excess of what the State highway departments are permitted to pay.

Besides hampering the current construction programs, the shortage of engineering personnel will have serious future effects. High wages paid elsewhere are attracting the type of person who formerly sought employment in lower grade positions with the hope of working up to better grades. Hence the highway departments' long-range programs of training young employees on the job for the higher administrative and technical positions will suffer from the present prolonged shortage of adequately educated and trained technical help.

## GENERAL APPRAISAL OF EXISTING SALARY PLANS

Most highway administrators blame the present situation (shortage, failure to attract new talent, etc.) on the salaries paid, and without doubt salaries paid have influenced the situation to a considerable extent. It must be recognized, however, that the pay or salary scale is only one phase of salary and wage administration in general, and that the existing situation has been influenced by a number of items other than pay scale.

Actually, the primary purpose of salary and wage administration is to achieve internal consistency; all other aims are secondary. This internal relationship is even more important than the problem of meeting outside salaries. It is axiomatic in any field that there are some jobs that are worth more than others and some people who are

worth more than others on the same job. To apply this principle on a fair and systematic basis is a fundamental of sound personnel practice.

### RELATIONSHIP OF CLASSIFICATION TO SALARIES

A well balanced and consistent plan to provide equal pay for work of equal difficulty has three basic features: job classification, pay scale, and administrative policy. The first of these, job classification, consists of the orderly sorting and ranking of jobs in a progressive sequence according to the comparative difficulty and responsibility of the duties involved.

Orderly classification plans are thought of as an integral part of a civil service or merit system, and it is true that classification



plans exist in all the civil service States. In fact, the head of the New York civil service system is called the "Director of Classification." Nevertheless, classification plans are in effect in practically all of the State highway departments, regardless of civil service provisions.

The prevalence of such plans does not mean, however, that all of the plans are satisfactory or even effective. In a number of non-civil service States, for example, classification plans exist without any corollary education and experience requirements for the several classes, so that in effect classification is a fiction. In some non-civil-service States, on the other hand, excellent classification plans are in effect, while in some civil service States, classification plans are not as effective as they might be.

In some classification plans there are all sorts of irregularities and unreasonably long ranges that overlap each other to a large extent. No general and consistent relationship in pay as between employments of different classes is to be found. Also, there is a marked compression resulting from pressure upward for increases for the lower-paid positions at the bottom and from the general disinclination of public authorities to recognize the importance and responsibility of positions at the top.

Examination of information available as to the duties of positions indicates conclusively that there are many cases in which positions of several different kinds and different ranks are now designated as belonging to the same class. A scale of pay appropriate to one kind and rank would not properly apply to positions of other kinds or ranks. A position of higher rank improperly placed in the class should have a higher rate. A position of lower rank found in the class may already be overpaid and

a proposed new scale, if higher than the old, certainly should not apply to it. It appears that the whole point and purpose of the classification (which is to bring like positions into the same class) has been lost.

#### *INEQUITIES OF PRESENT SALARIES*

When all positions have been grouped and classified, the next step is to establish a consistent and equitable pay scale. It is important to note that classification plans and pay scales are two different things, but that each is dependent on the other to a considerable extent. Hence, such inequities as exist in present salary schedules may be due to improper classification, to an improper salary or wage scale, or to a combination of both.

These inequities exist not only within single State highway departments, but also between States, between highway employees and other State employees, and between government and private industry. In some highway departments, for example, top officials are paid relatively high salaries while all other employees are paid relatively low salaries. In some States, inspectors and draftsmen are classified as professional employees, but in other States they are classified as sub-professional employees. In all States salaries paid appear to bear little relation to such common indices as responsibility, work load, or size of budget.

#### *LACK OF FLEXIBILITY OF SALARY SCHEDULES*

Salary schedules of practically all highway departments exhibit a decided lack of flexibility. In four States, for example, the median salary for all professional employees is identical with the median salary for all professional and

subprofessional employees combined. In another State, having a long-established civil service system and with an excellent classification plan, 360 of 380 professional employees are receiving the top salaries of their respective classifications.

This lack of flexibility is due partly to pressure upward for increases for the lower-paid positions at the bottom and the general reluctance of public authorities to recognize the importance and responsibility of positions at the top, as previously mentioned, and partly to constitutional and legislative restrictions on top salaries. There appears to be no particular relationship between top highway department salaries and the governor's salary, but in many States, the highway department salary scale is limited somewhat by the governor's salary, on the basis that top highway officials should receive a lower salary than the governor and that other highway salaries should range downward from those of the top officials.

For some highway department positions there are no really appropriate classifications. This is true particularly for positions in newly established functions, such as planning. For other titles, such as draftsmen and inspectors, there may be two or more appropriate classifications, one professional and one nonprofessional. Failure to adjust existing highway department salary plans for such discrepancies has resulted in a considerable amount of overlapping of salary schedules, and again the fundamental purpose of the classification plan has been defeated.

#### **CHARACTERISTICS OF DESIRABLE PLAN**

A desirable salary plan from an internal viewpoint, then, should:

1. Be simple in structure

2. Be internally consistent in order to avoid inherent inequalities
3. Have a sufficient number of salary grades at proper intervals in order that equal pay may be provided for equal work as soon as the need for adjustment is indicated.

It is readily apparent, however, that a compensation plan could be constructed that would provide rates of pay properly reflecting the relationships among the several classes, but that could be inappropriate because of being placed on a level too high or too low, as a whole, as compared with that of outside employment.

Perplexing problems are involved in arriving at the general pay level that should obtain in a public service. It is held by some that the level should be higher because:

1. Government should be a model employer
2. It should provide, by that means, for getting the best talent available
3. The responsibilities of government positions are more exacting
4. Higher qualifications are usually demanded
5. The opportunities for advancement are restricted, and rewards in higher positions are less attractive
6. Considerations other than those of merit and efficiency in service may restrict opportunity, threaten tenure, and otherwise work injustices that would not be tolerated in private employment.

It is held by others that the rates in public employment should be lower because:

1. Of greater steadiness in employment

2. Of greater security in tenure
3. More certain opportunity for advancement
4. Of shorter hours, more holidays, better working conditions, less exacting supervision and the like.

In general, a reasonably liberal policy can be made a paying one, if commensurately high standards of qualifications and of performance are insisted upon. Economies can be secured much more effectively by means of careful and continuing attention to keeping down the number of positions and to eliminating such direct and indirect losses and wastes as flow from incompetent and unskilled service, planning, and direction, rather than by keeping salaries as low as employees can be induced to work for. An apparent saving in the payroll secured by means of the latter policy may be counterbalanced many times over by losses in quantity or quality of service, or both, rendered by less efficient or less interested employees. Higher individual rates, securing more capable employees, and greater attention to effectiveness of organization and procedure so that more work can be done better with fewer employees at higher pay, is the way to true economy and better service in the long run.

The important thing to be kept in mind in the consideration of the compensation plan is that the State should provide itself with a systematic set of standards as to the relative value of its different kinds of employment. The matter of pay levels is one of policy, which the policy determining authorities, in the final analysis, should decide in determining what its pay policy should be.

In deciding on a desirable salary schedule for highway departments, over-all economic changes should be taken into consideration of course.

These are perhaps reflected in the cost of living index of the U. S. Bureau of Labor Statistics as well as anywhere, which index over the past few years has varied as follows:

	1935-39	100
April 1941	-	102.2
April 1942	-	115.1
April 1943	-	124.1
April 1944	-	124.6
April 1945	-	127.1
April 1946	-	131.1
April 1947	-	156.1

Although many recent salary increases have been based on cost of living index numbers, it might be noted that such numbers are results of limited samplings that serve to point out trends, and do not afford any measure of over-all changes in cost of living which can serve as a dependable base for determining pay policies or, much less, for fixing specific rates or pay scales.

#### *SALARY TRENDS IN PRIVATE INDUSTRIES AND GOVERNMENTAL AGENCIES*

In any event, it is generally supposed that increases in salaries and wages in private industry during the war years have generally equalled or exceeded increased living costs as indicated by such index numbers. In translating outside pay rates into rates applicable to State highway departments, however, the relative pay rates of different outside groups should be considered. On a country-wide basis between 1939 and 1946, it has been figured that the real wages of school teachers went down, that those of retail and store employees went up 1.4 percent, those of construction workers 15.5 percent and those of coal miners 70 percent. Whether these particular statistics are dependable or not, it is a known fact that the relationships among pay rates of various occupations at the present time are pretty well

out of balance.

In July 1945, Federal employees in classified positions received their first general increase in base annual pay since 1928. The increases ranged from 20 percent at the lower salary levels to 9 percent at the upper levels and averaged 15.9 percent for the group. In July 1946 a further 14 percent increase was made effective, so that total increases ranged from 34 percent to 23 percent and averaged 29.9 percent. Although these increases are the only ones received by Federal employees in almost 20 years, Federal salaries are in most cases substantially higher than State salaries, as is indicated by the fact that the mean entrance salary for junior highway engineers in 40 States is \$2,400, as compared with the minimum professional Federal government salary of \$2,644. Also, Federal salaries in many cases approximate the engineering salaries recommended by several State branches of the Society of Professional Engineers and by the American Society of Civil Engineers.

#### **SALARY TRENDS IN STATE AND MUNICIPAL SERVICE, INCLUDING HIGHWAY DEPARTMENTS**

Salaries paid municipal officials and employees have risen generally during the last five years from 10 percent to 40 percent, depending on the positions and the size of the city. Top city executives and department heads have seen their salaries rise slowly but steadily since 1942. Police and fire department salaries have been raised at least 15 percent since 1943.

At the start of 1947, salaries for 14 basic city jobs were highest along the Pacific Coast, next highest in the East North Central region, and lowest in the South Atlantic region, according to a regional survey undertaken early in this year by the International City Manager's

Association and the Civil Service Assembly.

Since 1943 State employees have had legislative salary increases averaging 24 percent. There have been, however, no significant salary increases for those State officials whose compensation is fixed by statute. Also, since 1939 public salaries within the State have been subject to Federal income taxes.

State highway employees have shared in these increases, of course. Since 1942, State highway department employees have received salary increases ranging from nine to 60 percent with an average of 25 percent. Several types of adjustment have been made, including flat wartime bonus payments, percentage increases either on a wartime basis or a permanent basis, increases in basic pay scales, additions to maximum pay levels, or some combination thereof.

Such increases as have been made, however, have been haphazard and piecemeal, with little or no study of the real problem and situation existing. Their inadequacy is demonstrated by the fact that highway departments are unable to hire the employees which they so badly need. Also, since increases average only 25 percent whereas informed opinion of economists indicates that prices will ultimately settle at not less than 50 percent above 1939 averages, it seems apparent that present salaries will continue to be inadequate.

Finally, then, although practically all highway departments have granted salary and wage increases during the past few years, such increases as have been made have in general failed to alleviate the existing situation because:

1. They have affected low salaries mostly
2. They have been haphazard and inadequate
3. They have failed to raise

salaries to proper levels as is evidenced by the thousands

of vacant positions in practically all highway departments.

## ANALYSIS OF STATE HIGHWAY DEPARTMENT SALARY DATA

Forty States submitted salary data suitable for analysis; of the 40, 17 have civil service systems and 23 do not. The relative percentages of professional and subprofessional employees in individual highway departments vary considerably from State to State, and since these variations would affect comparisons of salary data for professional and subprofessional employees combined, professional and subprofessional salary data have been analyzed separately.

### OVER-ALL SALARIES

The median professional salary in all States analyzed is \$3,350, and there is no difference in the median professional salary between civil service States and non-civil-service States. The median subprofessional salary in all States is \$2,050; in the civil service States the median subprofessional salary is \$2,150, while in the non-civil-service States it is the same as in all States, \$2,050.

Median professional salaries in individual States vary from \$2,520 to \$4,800, and median subprofessional salaries vary from \$1,380 to \$2,940. In civil service States median professional salaries vary from \$2,636 to \$3,900, so that the extreme variations of \$2,520 and \$4,800 are in non-civil-service States. Median subprofessional salaries in civil service States vary from \$1,380 to \$2,760, while in non-civil-service States they vary from \$1,440 to \$2,940.

Table 2 shows the percentage of professional and subprofessional salaries which are included in each

of several salary groups for the 40 States analyzed. It is significant that 8.1 percent of all professional salaries are \$2,400 or less, while only 0.7 percent of these salaries exceed \$7,200. In the case of subprofessional salaries, it is significant that there do exist salaries of \$1,200 and less, although the percentage of such salaries is very small.

### SALARIES OF CHIEF ADMINISTRATIVE OFFICERS

The salaries of chief administrative officers in the several States vary from \$4,500 to \$15,000, with a median of \$7,200 for all States. Only seven chief administrative officers receive salaries of \$10,000 or more, and four receive salaries of \$5,000 or less. It is interesting to note that the four States which pay their chief administrative officers the highest salaries in the country all pay median professional salaries below the average for the country as a whole, and in three of these four States the median professional salaries are included in the lowest quarter of all such salaries. Of the four States which pay their administrative officer \$5,000 or less, three pay median professional salaries equal to that for the country as a whole.

### SALARIES OF CHIEF ENGINEERS

The salaries of chief engineers in the several States vary from \$4,440 to \$14,000, with a median of \$7,200 for all States. Only four chief engineers receive salaries of \$10,000 or more, and four receive salaries of \$5,000 or less. Of the four States which pay their chief

engineers \$10,000 or more, two pay top median professional salaries, while the other two are included in that group of four States which pay top salaries to their chief administrative officers but pay low median professional salaries.

that no other highway department salary should exceed that of the chief administrative officer. In some States, of course, the chief engineer in effect functions as the chief administrative officer also, and in such cases his salary might justi-

TABLE 2 -- HIGHWAY DEPARTMENT SALARIES IN THE UNITED STATES

Cumulative Percentage Distribution

*Professional Salaries*

Annual Salaries	All States	Civil Service States	Non-Civil-Service States
\$			
2,400 or less	8.1	7.4	8.7
3,000 or less	32.3	26.9	37.2
3,600 or less	62.3	59.1	65.3
4,200 or less	81.0	78.4	83.4
4,800 or less	92.2	90.4	94.0
6,000 or less	98.1	97.3	98.9
7,200 or less	99.3	98.9	99.7

*Subprofessional Salaries*

1,200 or less	0.3	0.0	0.6
1,500 or less	13.9	11.2	16.2
1,800 or less	30.1	25.6	33.9
2,100 or less	52.3	48.4	55.6
2,400 or less	77.8	69.6	84.7
2,700 or less	88.7	84.6	92.2
3,000 or less	96.8	98.3	95.5

It should be noted that there exists a close correlation between the salaries paid to chief administrative officers and those paid to chief engineers, the median salary of each group being \$7,200, as has already been pointed out. The salary of the chief engineer exceeds that of the chief administrative officer in only two States, but in all States the difference in salary between the two is small. This situation results from legal and statutory limitations in some instances, but in most cases is simply an application of the basic idea

fiably exceed that of the nominal chief administrative officer.

**SALARIES OF DEPARTMENT HEADS**

The prevailing salaries of department, bureau, and division heads in the several States vary from \$3,960 to \$9,250, with a median of \$5,460 for all States. The top salaries for these positions vary from \$4,140 to \$12,000, with a median of \$5,589, and the low salaries for the same positions vary from \$3,360 to \$7,375, with a median of \$4,500. The difference

between prevailing and top salaries is small, and is another indication that salaries are concentrated at the top of classification grades.

Among department, bureau, and division heads those in charge of construction, maintenance, and bridges generally receive the higher salaries. Those in charge of planning, county aid, tests and materials, and right-of-way ordinarily receive the lower salaries. In some States the construction head receives a higher salary than any of the other heads, and in most States the salary of the construction head equals or exceeds that of the maintenance head. In some few States, however, the maintenance head receives a higher salary than does the construction head. All of these things indicate that existing salary differences among department, bureau, and division heads may be based on personal factors or prejudice rather than on responsibility, work load, participation in policy determination, etc., and that in many cases salary classifications have been made to fit the individual rather than the job.

### **GEOGRAPHICAL DIFFERENCES**

In some cases there are marked geographical differentials in salary among the highway departments of several States. In the Midwest and Northwest, for example, highway department salaries almost without exception are well above the United States average, while in the Southeast and along the Atlantic coast salaries are well below the national average. In the States east of the Mississippi River, the highway department salaries are below the national average in two States out of three, but west of the Mississippi River, highway department salaries are above the national average in two States out of three.

Whether such geographical differentials in pay are justified, on

the basis of cost of living, standard of living, or some other basis, is a matter of opinion. The State of California, with perhaps greater variations in climatic, social, and economic conditions than any other State, years ago, as a result of careful studies, adopted and has since applied the policy of like pay for like work uniformly throughout the State. The Government of the United States has long followed a similar policy as to all areas in the continental United States, which policy was adopted after careful study of all aspects of the problem.

Another matter to be considered in connection with geographical differentials in pay is the proportion of total State employees in highway work and the relative earnings of highway employees as compared with other State employees. No current information is available, but a study<sup>1</sup> published by the U. S. Bureau of the Census in 1942 stated that in the southern States, for example, the proportion of employees engaged in highway work to all State employees is consistently higher than the proportion of highway payrolls to total payrolls, indicating that average earnings of highway employees in the southern States are lower than the average for other functions. In the west the proportion of payrolls devoted to highways is consistently higher than the proportion of highway employees to all employees, indicating that highway employees in the western States are somewhat better paid than other State employees.

### **COMPARISONS WITH FEDERAL SALARIES**

Federal civil service professional employees receive salaries ranging from a minimum of \$2,644.80 to a maximum of above \$10,000 per year; this maximum exceeds \$9,975 in only

<sup>1</sup>Public Employment in the United States, U. S. Bureau of Census, January 1942.

a very few instances, however. State highway department professional salaries range from \$1,800 to \$15,000 in individual States with the median low salary in all States being \$2,400 and the median high salary for all States being \$7,500. Of the 40 States analyzed, 29 have low professional salaries below the Federal low, and only nine have high salaries above \$9,975.

It has already been stated that Federal salaries were raised an average of 30 percent in 1945 and 1946, and that this was the first increase in such salaries since 1928. Nevertheless, approximately 15 percent of all professional salaries in State highway departments are below the minimum Federal professional salary. Actually the figure is higher than this, because in a number of States a graduate engineer does not receive a professional classification until he has worked in a subprofessional capacity for either one or two years. In the Federal service graduate engineers immediately receive the lowest professional classification. Also, the Federal service is usually conceded to offer more security than the State service. In spite of these advantages over State employment, however, the Federal government is experiencing considerable difficulty in hiring young graduate engineers at its minimum entrance salary.

#### **COMPARISONS WITH OTHER GOVERNMENTAL SALARIES**

Municipalities and counties, too, are having difficulty in hiring engineering employees, in spite of the fact that in many instances they pay salaries which exceed those paid by State highway departments. Table 3 shows salary scales for two representative engineering classifications in several types of governmental units. The State salaries are low in every instance.

Tables 4, 5, and 6 show salaries of directors of public works, city engineers, and superintendents of streets, respectively, in cities of over 50,000 population as of January 1, 1947. In each case the median salary in cities of 500,000 and over exceeds the \$7,200 median salary of chief administrative officers and chief engineers in State highway departments.

#### **COMPARISONS WITH PRIVATE INDUSTRY SALARIES**

Data on engineering salaries in private industry are not generally available, and such data as are available concern recent engineering graduates. It is generally conceded that government cannot expect to pay the high salaries paid by private industry for important executive and supervisory positions, but it is also generally conceded that government salaries should more nearly approach those salaries than they do now. Also, it has been true in the past that for classes of positions of the lower grades, State pay levels in general were as high as, and in most cases higher than the corresponding pay levels outside the State service. In general, for classes of positions in the higher grades, State pay levels were definitely lower than pay levels outside the State service.

The Engineers Joint Council Committee on the Economic Status of the Engineer has recently issued a report on private employer practice regarding engineering graduates. No company reports a starting monthly salary of less than \$150, and only four less than \$175. Five companies report starting salaries above \$250. The median is approximately \$207 per month. The Compton Committee summarized similar data contributed by 125 companies in April 1946. The average starting monthly salary of graduate engineers was \$210, with variations from



**TABLE 3 -- REPRESENTATIVE GOVERNMENTAL ENGINEERING SALARIES  
IN EFFECT IN JANUARY 1947**

*Median Pay Scale for Junior Draftsmen*

Unit	Starting Rate \$	Top Rate \$
26 cities above 100,000	195.50	227.63
7 cities below 100,000	194.00	226.50
4 counties	259.25	301.75
10 States	150.84	199.75

*Median Pay Scale for Junior Civil Engineer*

Unit	Starting Rate	Top Rate
23 cities above 100,000	237.00	270.00
8 cities below 100,000	212.50	265.00
4 counties	288.66	330.41
10 States	200.00	247.00

Source: Pay Rates in the Public Service (A Survey of Pay Rates in Effect in January 1947) by Civil Service Assembly of U. S. and Canada.

\$125 to \$320.

The starting salaries just mentioned compare favorably with the median low professional salary of \$2,400 for highway departments, except for the fact that highway department graduate engineers in many cases do not receive professional classifications until they have served in a subprofessional capacity for one or two years, as has already been mentioned. The

State of New York, with a low professional salary of \$3,000, has found that salaries presently paid are comparable with and in proper relationship to salaries paid in private industry<sup>2</sup>, but New York State salaries are definitely within the top 10 percent of all State

<sup>2</sup>Survey Report of the Salary Standardization Board. State of New York, Department of Civil Service, January 1947.

**TABLE 4 -- SALARIES OF DIRECTORS OF PUBLIC WORKS IN CITIES OVER  
50,000 POPULATION AS OF JANUARY 1, 1947**

Population Class	No. of Cities Reporting	Salaries			
		Average \$	Lowest \$	Median \$	Highest \$
500,000 and over	12	10,148	6,540	10,000	12,840
250,000-500,000	15	6,508	4,000	6,000	10,000
100,000-250,000	24	5,167	3,600	4,900	7,500
50,000-100,000	46	5,085	1,800	4,900	9,000

Source: International City Managers' Association and The American Municipal Association.

**TABLE 5 -- SALARIES OF CITY ENGINEERS IN CITIES OF OVER 50,000 POPULATION AS OF JANUARY 1, 1947**

Population Class	No of Cities Reporting	Salaries			
		Average \$	Lowest \$	Median \$	Highest \$
500,000 and over	7	9,097	6,350	10,000	10,800
250,000-500,000	20	6,830	4,000	6,980	10,000
100,000-250,000	39	5,557	3,168	5,500	10,000
50,000-100,000	77	4,912	3,000	4,800	8,300

Source International City Managers' Association and The American Municipal Association

**TABLE 6 -- SALARIES OF SUPERINTENDENTS OF STREETS IN CITIES OVER 50,000 POPULATION AS OF JANUARY 1, 1947**

Population Class	No of Cities Reporting	Salaries			
		Average \$	Lowest \$	Median \$	Highest \$
500,000 and over	8	8,379	5,520	8,260	12,840
250,000-500,000	14	5,102	3,900	4,830	7,000
100,000-250,000	29	4,170	2,800	3,990	5,824
50,000-100,000	61	3,735	2,160	3,640	5,700

Source International City Managers' Association and the American Municipal Association

salaries The heads of railroad engineering departments in the Chicago region have been offering young engineering graduates \$260 to

\$275 a month to start, and in this way have been able to get some of the top men graduated from nearby colleges

## SUPPLEMENTAL ITEMS THAT AFFECT COMPARISONS

The statement is often made that comparisons between State salary rates and outside rates are not very significant or certainly not conclusive because the demands on State workers as to hours and effort are less and the advantages and benefits given them are greater. Reference is made to such things as short hours, sick leave, holidays, vacation allowances, pensions,

security of tenure, satisfaction of working for the government, and the like. At one time there was much to support this view. But there is not the same foundation for it today.

Many of the advantages of employment in the State service that formerly existed have either disappeared, or have been minimized by the changes in industry's personnel

practices in recent years. Working hours on the "outside" have become fewer, special benefits more numerous, tenure during good service in white collar jobs relatively secure, and opportunities for promotion to well paid administrative positions more attractive.

Furthermore, most items of benefit to employees, in addition to direct pay, do not represent equal values to all employees that receive them. Security may be of major importance to the head of a family, but of little significance to a young beginner, without family ties, who may regard his, or her, job as merely a "stop gap" until a better position can be secured outside. And during a period when the cost of living is rising, shorter hours of work, longer vacations, more holidays, and many other advantages, become less important to the average employee than the amounts of take-home pay. Few employees will take positions offering longer vacations or extra holidays if it means accepting lower pay.

#### **ANNUAL AND SICK LEAVE**

Of 28 States reporting leave provisions, 21, or 75 percent, allow 12 days or two weeks of annual leave, and the others allow either 15 days or three weeks. Eleven of the 28 States do not permit accumulation of annual leave, eight States permit accumulation equal to twice the annual allowance, and the other nine States permit accumulation in varying amounts. Only one of these States permits accumulation without limit, however, and only one other permits accumulation of as much as 60 days. Two weeks of vacation with no accumulation is the general rule in private industry.

As regards sick leave, 14 of the 28 reporting States allow 12 days per year, four allow 15 days per year and three allow three weeks. Of the other seven States, two

allow 18 days of sick leave annually, one allows 24 days, one allows 30 days, one allows sick leave at the discretion of the commissioner, one definitely allows no sick leave, and one is indefinite. Only four of the 28 States do not permit accumulation of sick leave, while six States permit accumulation to 60 days, seven States to 90 days, three States to 100 days, one State to 150 days, one State permits accumulation without limit, and the other six States permit accumulation in varying amounts. Sick leave provisions in private industry call for one week of such leave annually, two weeks annually, or a discretionary amount, in about equal proportion.

#### **RETIREMENT SYSTEMS**

Of 40 States reporting, 32, or 80 percent, have retirement systems applicable to highway department employees. The comprehensiveness of these systems varies widely. All private industry comes under the social security act, of course, and in addition a number of such concerns maintain private retirement plans.

#### **CONTINUITY OF WORK**

On certain types of work State highway employment does have a marked and important advantage over private employment that should be reflected in wage differentials. Those types are the ones that involve skilled or common labor paid by the hour or day but providing unbroken employment in the State service whereas in the outside world the employment is normally interrupted and temporarily discontinued when weather, lack of material, lack of orders, or some other condition leads the employer to discontinue it for a shorter or longer time.

## SECURITY OF TENURE

As to security of tenure, many State highway departments, particularly those in civil service States, provide a maximum of security which may be of especial importance in periods of depression. It has previously been indicated that almost half of the States have civil service or merit systems, but even in these States in some classes of work, reductions of force, layoffs, and other separations occur, sometimes in large numbers due to variations in work loads and to other causes.

Security which adheres to public positions in many jurisdictions has often been advanced as an adequate substitute for pay to encourage entrance to and continuance in the public service. It is undoubtedly true that the prospect of indefinite tenure is an important consideration to many applicants for public positions. But security is a characteristic of the lesser rather than the principal posts, and in any event this consideration will affect only slightly the man of superior ability and qualifications. All too often security has a deadening reaction on the general tone of the public service in that it tends to solidify mediocrity and to stifle ambition.

## PRESTIGE AND OPPORTUNITY FOR ADVANCEMENT

The prestige value of State employment varies with the individual. It is probable that the average person finds little to choose between State employment and private employment, some preferring one and some the other. Nevertheless, the prestige value of public employment today is generally low as compared with that of private employment. Opportunities for maximum earnings are limited in State employment, and there is generally less opportunity for rapid advancement.

In fixing the basic compensation of public employees, then, the advantages of public employment about balance the disadvantages, and therefore are not important factors. State employment would seem to have the advantage as regards vacations, sick leave, holidays, security and continuity, while as regards hours of work and overtime, pensions, insurance benefits, extra cash awards, prestige, and opportunity for advancement, the advantage appears to be with private employment. Moreover, it has become obvious that even if State work were pleasanter but less well paid, the most desirable type of worker, the one with energy and ambition, would still rather take the outside job and do better financially for himself and his family.

## SUGGESTED SALARY INCREASES

No formula has ever been agreed upon for determining, with any degree of exactness, what the pay of any worker, or of workers in any establishment, or of workers in general, ought to be, either in actual money amounts, or in relation to the pay of other workers in the service of the same or other employers. Different possible bases for such determination most commonly

advanced in discussions of the problem are:

1. Supply and demand
2. Cost of living
3. Living standards
4. Ability of employers to pay
5. Market value
6. Policies of employer.

No doubt all of these enter, in some degree and in varying combina-

tions, into the fixing by most employers, public and private, of the rates to be paid their employees. Their advantages and short-comings when considered individually, and their interrelationships with each other, will not be discussed here but should be considered when determining appropriate pay levels.

The factors which control the general level of the whole pay plan can be stated in a somewhat different form. Such factors include the present pay scales for classes of positions and the immediate and ultimate cost of adopting the plan; the availability of a desired standard of personnel for recruitment at the proposed pay levels; the relation of the pay plan to the costs and standards of living in the community; and the relation of the proposed pay scales for comparable positions in private employment in the vicinity and in other public employment either in the vicinity, in neighboring communities, or in communities which are used generally as a basis for comparison by special interest groups (business, union, or employee).

#### **BASES FOR ADJUSTMENT**

Because of the varying combinations and effect of these factors in different States, it is probably not feasible to recommend one salary schedule applicable to all State highway departments, and no such recommendation will be attempted in this report. It is clear, however, that the general level of highway department salaries should be upped. As has already been pointed out, there are now some 9,800 vacancies existing in the several departments for professional and subprofessional employees, which fact justifies an increase from the viewpoint of supply and demand. As regards cost of living, although highway department salaries along with other State salaries

have been upped an average of 25 percent during the past few years, the cost of living probably can be expected to remain at 50 percent above the prewar level, so that an increase on that basis is definitely justified.

From the viewpoint of policy, an increase is even more justified. It has already been pointed out that the advantages of public employment about balance the disadvantages and therefore are not important factors in fixing the basic compensation of public employees; if there is any advantage, it is probably in favor of private industry with its more rapid advancement and higher ceiling. Also, the idea that State officials cannot receive more salary than the governor has fixed arbitrary and unreasonable ceilings upon the compensation of all public employees. These unreasonable views prevail at a time when the public business is steadily becoming larger and more complex, and so demanding the best qualified and most competent employees.

#### **RECOMMENDED SCALE**

It is believed that Federal salary levels might well be adopted as minimums in all State highway departments. These salary levels have been increased an average of only 30 percent during the past few years, and so are well behind the increased cost of living. Nevertheless, if adopted as minimums by all State highway departments, 75 percent of all departments would have to increase their low professional salaries and 80 percent of them would have to increase their top professional salaries. In the case of subprofessional salaries, approximately two-thirds of the departments would have to increase their low subprofessional salaries and all but a few would have to increase their top subprofessional salaries.

Present Federal salary levels

and grades for engineering employees are as follows:

*Professional*

P-1	\$2,644.80 to \$3,397.20
2	3,397.20 to 4,149.60
3	4,149.60 to 4,902.00
4	4,902.00 to 5,905.20
5	5,905.20 to 6,862.80
6	7,102.20 to 8,059.80
7	8,179.50 to 9,376.50
8	9,975.00 to 10,000.00
9	Above \$10,000.00

*Subprofessional*

SP-1	\$1,690.00 to \$2,093.04
2	1,822.00 to 2,243.52
3	1,954.00 to 2,394.00
4	2,168.28 to 2,619.72
5	2,394.00 to 2,845.44
6	2,644.80 to 3,397.20
7	3,021.00 to 3,773.40
8	3,397.20 to 4,149.60

It might be noted that Federal subprofessional salary grades overlap the professional grades to a considerable extent, and that all salaries in the three top subprofessional grades equal or exceed the minimum professional grades. Similarly in a majority of State highway departments there is some overlapping of professional and subprofessional salaries.

The requirements for appointment to the several grades of Federal engineering positions, both professional and subprofessional, are given in Appendix B. The duties of the different positions are also indicated. Data for the P-9 professional grade and the SP-1 subprofessional grade are not included because current standards for those grades are not available.

In adapting Federal or other salary levels to a State highway department, the number of grades set up will depend on the size of the organization, type and distribution of responsibility, etc. The number of grades set up will also be influenced by the spread or range which is desired between the

high and low salaries. The minimum present range between high and low professional salaries in any State highway department is only \$2,100, while the maximum such range is \$13,200. In the case of subprofessional salaries, the minimum and maximum ranges are \$400 and \$3,000, respectively, except that in one State there is no range at all, all 570 subprofessional employees receiving the same salary, which is the maximum permitted. Probably a range somewhere between these extremes is desirable.

Salary increases alone will not improve the quality and efficiency of highway department employees, but justified salary increases plus a proper classification plan will make it possible to reward competent employees and to replace the less efficient ones. Any program of salary increases should be accompanied by a thorough overhauling of the classification system, with particular emphasis on the requirements for the several different grades. Inevitably some of the employees will be regrouped and some will be downgraded, just as some will be upgraded. With the proper effort, however, the already mentioned ideal of "like pay for like work" can grow into the greater ideal of "right pay for right work."

*COST OF INCREASES TO THE STATE*

The cost to the State of a revised highway department pay scale is uncertain and difficult to estimate, and will of course vary from State to State. It is important to remember, however, that the total cost of personnel adds up to more than just a total of salaries and wages paid, particularly if employees are inefficient or poorly qualified. Money may be spent for mediocre work and poor results, unnecessary facilities may be built, or necessary ones may not be carefully planned, economically con-

structed, or effectively utilized. Perhaps if the deleterious effects of an inflexible and inadequate pay policy were more clearly realized no spur to further action would be needed.

In any event, the direct costs of a salary increase for highway employees will vary widely from State to State, depending on the amount of the increase, which will be influenced to some degree at least by present salary levels, the amount of reclassification, etc. In some States the new payroll costs will not be very much different from the present payroll costs, because many positions are now in higher classes than those in which they properly belong. Also, in some States, only the higher-level positions, which account for only a relatively small percentage of total payroll costs, are underpaid. In many States, however, increases will be required throughout the department, and direct costs will increase in proportion.

With respect to the whole problem of salary and wage increases, then, immediately desirable steps might be stated in this way:

1. Bring the entire range of salaries and wages up to more adequate amounts in States where the level of pay of highway employees is chronically low

2. Remedy situations where salaries paid for particular jobs whose duties have become fairly well established over a period of time are obviously out of line

3. Remedy situations where men performing important duties in connection with some of the newer activities of State highway departments are at a disadvantage as a result of rank in an obsolete form of structural organization.

In view of the varying pattern of salary trends in all jurisdictions, it seems apparent that there is no simple solution for adjusting State highway department salaries. Sufficient data and suggestions have been given so that the deficiencies of any particular State should be clear, both as to salary levels and also as to salary administration in general. The method to be adopted for correction must be flexible enough and comprehensive enough to be adaptable to changing conditions. It is recommended that the proper method for eliminating injustices and inequities as to salaries, especially in such uncertain times as are now being experienced, would be to re-examine salaries at regular intervals.

## GENERAL RECOMMENDATIONS AS TO PERSONNEL POLICY

It was pointed out in the introduction to this study that during the war period highway departments lost heavily of their best men and that many of these are not returning, finding greater inducements elsewhere, particularly in private industry. Also, since the beginning of the war production period, highway employee wages have been up for discussion almost constantly,

and many adjustments have been made. Finally, a need for further salary increases was shown.

In most instances, however, salary adjustments alone represent a temporary palliative. What seems needed and appears to be the only reasonable solution is a more or less general overhauling of the wage policies and standards. It has been shown that there are wide

differences in salaries paid for positions with substantially the same duties and responsibilities. It is also true that in the great majority of cases position titles carry no common definite meaning. Because of the lack of specific and reasonably objective information as to duties of positions and meaning of titles, the task of both the budget authority and the legislature is in many instances made more difficult by the necessity for considering detailed appropriations for individual salaries.

Correction of present conditions will necessitate:

1. The formulation and adoption of a sound classification plan by which all positions are grouped on the basis of character, difficulty, and responsibility involved
2. The formulation and adoption of a compensation plan based on the premise of like pay for like work with minimum and maximum salary rates for each class, together with intermediate steps
3. Establishment of effective recruiting procedures based upon competitive examinations
4. A stated policy of fostering a career service through promotions, transfers, in-service training and other programs.

#### **POSITION CLASSIFICATION AND PAY PLANS**

The basic features of a good job classification plan are relatively few and simple. The initial step is the preparation of a description of each position, setting forth the assigned duties, responsibilities, and authority. Positions are then grouped into classes according to the similarity of assigned duties and responsibilities, and the required education, specialized knowledge, experience, abilities, and personal characteristics.

Following this general allocation of the various positions to their appropriate classes, it is necessary to undertake a careful comparative evaluation so that all classes of jobs may be ranked progressively within and among the different groups. This can be done accurately by allowing a specified number of points for each significant job factor. Such an overall inventory is frequently an eye opener to the chief administrative officers. It will show up most flaws in work organization, indicate the possibilities of more efficient use of present personnel, and provide a reliable guide to future hiring.

A basic test as to whether two positions are of the same class is that of determining whether they could fairly be filled from the same employment list. A qualified eligible obtained from the tests for any class must be qualified for any position allocated to the class. This principle applies just as forcefully to promotion tests as to original entrance tests. Hence any junior engineering aide who qualifies for promotion to senior engineering aide is entitled to consideration, in his due order, for any position of senior engineering aide that may be vacant anywhere in the department. If there is any position allocated to the class of senior engineering aide for which experience in any position as a junior engineering aide does not tend to qualify the employee, then the classification is wrong.

When all positions have been grouped and classified, the next step is to establish a consistent and equitable pay scale. Rates of pay are of such fundamental importance that it is necessary to see that they are properly related to general wage scales within the community and the region, as well as to prevailing salaries for similar work in competing organizations. The mechanics of setting up a



salary and wage scale consist of establishing a salary range for each class of positions. A spread of 25 to 35 percent between minimum and maximum rates has been found advisable. In addition, each range should include several intermediate steps -- preferably three, five, or seven, with a difference of four to eight percent between each step.

One principle which should govern the fixing of particular scales for individual classes of positions is that the pay should be related to the position and not to the individual or group of individuals who happen to be filling the position at the time. A relatively liberal policy of pay levels directed toward striking a mean between the highest and lowest that could be justified but tending somewhat toward the high side is probably the best. Such a policy can be made to pay substantial dividends in more effective and economical service.

#### **RECRUITMENT, SELECTION AND PLACEMENT**

Policies other than those involving pay levels alone, and effective procedures for realizing upon them, must be maintained, however, if real advantages are to be secured from relatively higher levels of pay. More is necessary than just the filling of positions and the paying of relatively liberal rates. Competent employees must be sought, and measures must be enforced that will insure the maintenance of high performance standards.

Nevertheless, in spite of the large number of positions to be filled, few States have taken any recent positive steps to modernize their recruiting and other personnel practices so as to attract to the public service a fair share of the best talent among returning war veterans and displaced war workers. Also, although the long-term picture of the past ten years shows a steady growth of the merit concept

and modern personnel methods, most States are still far short of any acceptable goal, and there is very little evidence of any recent progress in this direction, except possibly in connection with retirement systems.

The chief feature of the merit concept provides that government personnel shall be selected, retained, and promoted on the basis of their capacity and demonstrated ability to advance the purposes of the government. Such a principle has no reference to the political beliefs of the public servant but merely to his physical, mental, and moral characteristics. Until recent years the personnel movement has crystallized around tenure as the essence of the merit concept, but it is not difficult to perceive that tenure without wise selection will accomplish little more than to "freeze" in office an incompetent public servant. The present emphasis of the personnel movement is on the development of methods of selection which will insure the appointment of personnel to whom tenure can safely be given. The development of these methods will require in many jurisdictions a complete reappraisal of traditional techniques and a willingness to scrap them in favor of new ones where it is necessary. More than that, it will require new concepts of the relation of the recruitment process to the classification plan and through the latter to the educational system.

The effect upon the vitality of the State highway departments of a constant draining off of the more aggressive, more ambitious employees is regrettably apparent. Many such departments, along with other State and Federal agencies, appear to pass through a "life cycle." When first established, or when subsequently overhauled (in some time of emergency), they attract many young, vigorous, and able men, who, while

the departments are young, lend momentum and imagination to their policies, and progress while the department grows. Then, as the program becomes established and growth slows down, these men find themselves in rather stationary niches. Offers from private industry which were refused during the more exciting phases of development are now accepted. The department, which had been characterized by their imagination, drive, and enthusiasm, adapts itself to those who remain. Its program is less imaginative; its processes less and less flexible; its innovations and advances fewer.

State highway departments should take more definite and systematic steps to attract new engineering graduates. In recent years there has been a steady decline in the percentage of engineering school graduates coming to State highway departments, until at the present time it practically has reached zero. Also, of the engineering graduates who did go with State highway departments, only a very few have remained. The universities feel that they have done their part in pointing graduate engineers to highway department employment, and that responsibility for failure to attract and hold them rests with the States. The American Society for Engineering Education has suggested the following action program<sup>3</sup> to remedy the situation:

1. "Send a personnel representative to the colleges which serve you and have the same man or men continue to make these visits periodically. Offer summer vacation employment as well as permanent positions.

2. "Make transportation (highway

<sup>3</sup>American Society for Engineering Education, Civil Engineering Division, Committee IV, Transportation, Harry Rubey, Chairman, May 1, 1947.

engineering in our case), which has lost its glamour, attractive as a career.

3. "Offer adequate salaries on today's scale."

Unless these things are done highway departments will continue to secure an inadequate number of graduates and mainly those that have been rejected by the industries which follow the foregoing policies. Writing to colleges is helpful but not fully satisfactory. The cooperation of the colleges can still be assured, but student and faculty interest in highway engineering has waned rapidly, may soon disappear, and may be difficult to revive.

A hopeful reversal of the trend toward a waning student and faculty interest in highway engineering has recently occurred in California. There the State legislature has established at the University of California an Institute of Transportation and Traffic Engineering to cooperate in research with the California State Division of Highways and with other agencies charged with responsibility for the design, construction, maintenance, and operation of highways, airports, and other related facilities for public transportation. This development appears to be a progressive step in acquiring an adequate supply of trained technicians, and might well be followed in other States.

#### **CIVIL SERVICE AND THE PERSONNEL POLICY**

It has been discovered after study of various personnel systems that a considerable number of States with civil service or merit systems offer well-designed systems of personnel administration properly administered. Since the mere existence of a formal merit system cannot of itself result in good personnel administration, it must be the principles inherent in such

a system which are significant in connection with personnel policy. What, then, are these principles which, whether formalized or not, are the fundamentals of a sound personnel policy?

First, recognition must be given to the fact that State government is a complex organization which requires a high order of ability to operate effectively. Once this essential is recognized, the others follow naturally. They include the following:

1. An effective recruiting procedure
2. A logical classification plan, with corollary education and experience requirements for each class
3. A salary and wage scale based on the principle of "like pay for like work"
4. Continuity of work, and security of tenure for satisfactory employees
5. Selection, retention, and promotion on the basis of capacity and demonstrated ability
6. Definite and equitable leave provisions, and
7. The fostering of a career service through promotions, transfers, in-service training, and other programs.

The application of these principles has proved to be extremely effective. There have been criticisms, of course, but in almost every case they have been directed not at the principle or the policy, but rather at inflexibilities in the application and administration thereof. On the whole, the experience has been so beneficial and the advantages so obvious that today no objective and serious-minded State official or group would suggest abandonment in favor of the catch-as-catch-can policies of the

past.

Some officials, although granting the value of a promotion plan for most employees, argue that certain positions should be exempt from the provisions of the plan. In some States, for example, the administrative heads of major departments are likely to be brought in from the outside on the ground that their positions involve the determination of political policies and thus should be responsive to the political administration in power. But political policies are in fact rarely involved in administrative work.

If it be conceded, however, that the head of a department in either a public or commercial service is a policy-making officer, his chief assistants are surely not of the same status. These are commonly accepted not only from the promotion procedure but also from the operation of the general personnel system on the ground that the head of a department should not be limited in the choice of his principle assistants. In a public service, however, very seldom do the department heads have real freedom in such selection since there are too many kinds of political and personal pressure brought to bear. Almost any large public service affords illustrations of the fact that such a theoretical free hand in selection seldom provides anything like the best-qualified talent available. Similar considerations often apply in private employment where the demands of influential stockholders or customers are difficult to ignore. A central personnel agency is normally in a better position to resist ulterior influences than any individual appointing officer.

All the arguments for filling positions on merit, preferably by the promotion of capable employees who have gained experience in the service, apply with greater force

in the higher than in the lower ranks. If department heads in a large service are to be changed whenever the administration or management changes, it is all the more important that their chief assistants should hold their positions in order to make available for the new department heads the knowledge, skill, and experience which they have accumulated and thus make it possible to carry on effectively the operating machinery and preserve the traditions from administration to administration.

The increasing application of the merit concept in the States must be evidence of a growing appreciation of the importance of good personnel programs, but in view of the fact that highly effective examples of personnel administration have been afforded for some time by the more progressive States; it is surprising that the extension of the concept has been so slow. The States have not wanted for models among their own numbers, but apparently the willingness to profit from the experience of others and to apply demonstrated improvements to their own particular circumstances has been sadly lacking.

It would appear desirable that highway departments not now operating under merit principles avail themselves of the advantages offered by this superior personnel system. Also, the early extension of the system to include all highway department employees in those States which have limited coverage is urged. While highway departments are often not the sole determinants in the adoption of State-wide merit systems, they have not always provided the active support which might be expected of one of the largest agencies of State government. In fact, State highway departments in some instances have opposed such action.

The existence of a formal merit or civil service system in a State

highway department is by no means a guarantee of excellence in personnel practices; neither is the absence of a civil service system necessarily an indication of poor personnel practices. So much depends upon the quality of administration that no hard-and-fast measurement of personnel practices can be made by the presence or absence of civil service alone. It is certain that personnel administration in many of the departments that are not under civil service is on a high level. Some of these departments have classified their employees, and conscientiously attempt to make promotions on the basis of merit; the records of many of them indicate firmly established tenure.

Conversely, in some departments having merit systems, there is need to make employee hiring, firing, and classification fairer, more efficient, and divorced from politics. It is often easy to escape merit-system restrictions by designating certain employees as "temporary" and keeping them on the payroll indefinitely or reappointing them continually. Also, deserved promotions are in many cases withheld because they would necessitate at the same time the promotion of undeserving employees with seniority and perhaps influential political friends. Indeed, in some States with a merit system it is impossible for even the better qualified employees to get a job without proper political sponsorship.

Nevertheless few will argue that the application of merit system principles is not a step toward better personnel practices, or that it does not make better personnel practices easier to achieve than where such principles are absent. A personnel policy based on these principles exists not only for employees but to assure the public of an efficient administration. Honesty, ability, energy, courtesy, and courage, rather than political

influence, should be the determining factors for original employment, tenure of office, and promotion. It is desirable to extend the principles of the merit concept to all State highway organizations.

### **OBJECTIVES OF THE PERSONNEL POLICY**

What does an employee have a right to expect in his relations with the highway organization of which he is a member? Security in his position. Remuneration in accordance with the class of work done. Opportunity to advance in position and pay, in accordance with ability. A chance to gain in knowledge and ability, and accordingly, to improve the work of his department. A level of income sufficient to make him happy in his choice of a career in the public service, as against other work opportunities. The public, as his employer, has a stake in assuring him on all these counts.

When jobs change abruptly, regardless of what new talent is recruited, valuable experience is thrown away. Where the future is uncertain, capable men are dissuaded from going to work for the department. Where equal performance does not bring equal reward, the morale of an organization is poor. Where pay is stingy, trained men are lost as soon as better opportunities beckon, as some highway departments have found out during the past few years.

Everybody knows these things. The job is to get the principles translated - in one way or another - into universal practice. The indicated need is for the highway administrators themselves to take a greater interest in personnel policy. They can do something about it if they will recognize that a problem exists, and if they will take time enough to understand a few basic principles.

## **ORGANIZATION AND THE SALARY PROBLEM**

It has been noted that improvised personnel policies and bad organization together are limiting the capacity of many State highway departments to develop and operate in accordance with their new responsibilities. Adequate staffing with competent personnel is an immediately serious problem because the lack of manpower is already jeopardizing the highway programs. Proper organization is just as serious a problem, although the effects and results of bad organization are less apparent than are those of poor personnel policy.

Organization means different things to different people. Some think of organization in terms of personalities, for example, while others think of it merely as a chart or piece of paper. For our purposes organization means a subdivision of total responsibility

into logical and separable component responsibilities, and the integration and relation of these component responsibilities in such a manner as will most effectively facilitate coordination and control. To a considerable extent the difficulties experienced in the administration of highway operations result from the fact that the component responsibilities are illogical and ill-defined, products of evolution rather than of considered design.

### **DEVELOPMENT OF HIGHWAY DEPARTMENT ORGANIZATION**

Most State highway organizations have, like Topsy, "just growed." Additions and changes in the general plan have been made only to meet specific needs on the basis of expediency and with little regard for over-all design or rationality. In

fact, highway administrative structures in many cases have not been developed sufficiently to permit a broader activity than that of meeting successive emergencies.

In reviewing the history of a number of highway departments, it is surprising how little their forms of organization have changed over the years. Generally, except for increases in activity, personnel increases and changes, additional legislation, and additional responsibilities, the departments changed little until some major reorganization was effected, such as a general reorganization of State government. In many cases no basic organizational changes were made, but during the intervening years the volume of work increased many times, the number of employees increased, new and varied technical problems were encountered, and pertinent legislation was radically changed. Likewise, the number of miles of roads administered and the annual expenditures increased tremendously.

Changes of organization have obviously not kept pace with these developments, and gradually by the process of accretion State highway departments have tended to grow into sprawling, uncoordinated administrative mechanisms. Highway administrators perhaps have had little opportunity to examine seriously their respective organizations with a view to effecting desirable integration, and such feeble attempts as may have been made on occasion have collapsed after running head-on into the practical difficulties usually experienced in bringing together a group of related activities.

#### **APPRAISAL OF EXISTING ORGANIZATIONS**

Granting that a raise in salary for top highway administrators is long past due, the opposition still might very properly ask, "What have highway administrators done about better management?" The lull in

activity during the war years offered a wonderful opportunity for administrators to bring about administrative reorganization where needed, but only a few States seized the opportunity. Consequently, many States are faced with the necessity of handling greatly increased activities and responsibilities with a poorly adapted administrative organization. It is true that some departments have partially solved the problem through administrative reorganizations which permit some improvement in highway administration, but by and large highway departments are still struggling with antiquated administrative machinery to meet the many-times increased responsibilities of recent years.

Considerable organizational confusion results from failure to recognize the important distinction between primary (operating) and secondary (staff) responsibilities. Wherever the administrative burden exceeds the personnel capacity of the chief administrator, he needs a staff. Through this means, he can secure the necessary assistance, specialized knowledge and concentration of attention upon the different aspects of his responsibilities to permit his doing a fully effective management job. The staff is basically an elaboration of his office, not another level of management.

Also, even in the better managed departments, there is a lack of awareness of the need for giving constant study to the organizational structure. It would appear that those in control of affairs adhere to the viewpoint that, a plan of organization having been established at some time in the past, there is no virtue in regularly examining the operation of the plan and in making adjustments to the dynamics of changing conditions. This viewpoint is contrary to the fundamental principle that organization is a continuing process which, if it is

to be successful, must accompany the evolution of institutional growth.

Finally, too many employees have been reporting directly to the chief administrative official, and proper delegation of authority has not been attempted. As a consequence, top officials have had to decide matters of comparatively minor importance rather than devote themselves to important matters of policy and administration. A brief review of the various activities supervised by the chief administrative official indicates that the number of individuals reporting directly to him varies in the several States from two to 22, the average number being eight. The number of individuals reporting to the chief engineer varies from three to 41, the average being 13.

#### **SUGGESTIONS FOR BETTER ORGANIZATION**

Every effort should be made to keep the division of responsibility at a minimum in order to facilitate administration and to avoid delay and multiple handling. The number of divisions required is of course dependent upon the number of primary functions requiring executive coordination, and upon the number of these which can be grouped for such coordination at a higher level. Ordinarily, when the number of functions allocated to one executive exceeds five to seven or eight, depending upon their character, the executive is likely to be overburdened. On the other hand, if a major unit or function is split into less than three or four subordinate functions, the additional subdivision is often not justified.

An effective approach for reorganization is through the development of an ultimate comprehensive plan for the entire department, to serve as a check on the adequacy of the existing plan, as a guide in making immediate improvements which can be effected without disarrang-

ing present operations, and as a goal toward which to work in making needed changes of a more delicate or far-reaching character. Such a plan should be laid out with complete objectivity, and existing arrangements and precedents should be forgotten. Attention should be concentrated on things as they should be rather than as they are.

It is important that the job should be approached from an overall viewpoint, primarily because of the close interdependence and relationship which should exist among the parts of an organization. It is impossible to design properly a part unless we know what it is to be a part of. Hence, although individual bureaus or subdivisions thereof can and should be reorganized as it becomes opportune to make the necessary changes, such reorganizations should be part of a comprehensive reorganization plan for the entire department.

It is also important that the comprehensive plan be considered as a long-range guide and objective rather than as a proposal for immediate wholesale reorganization. Many of the features of such a plan are immediately applicable with benefit to all concerned, but others may involve important changes in jurisdiction and should perhaps be delayed until the circumstances are right, as, for example, when the key positions involved are vacant through retirement, promotion, or transfer. If the plan is presented as an immediate objective, resistance and objection may be encountered, but if approached on a long-term basis, it is generally possible to effect the various changes as logical evolutionary developments, without dislocation or damage to the individuals concerned.

It is important, too, that experience in management and organization be emphasized in the selection of the chief administrative officer. Otherwise, the administration of the

department suffers while administrative experience is being obtained. Adequate administrative ability and experience, on the other hand, permit immediate attention to problems of departmental organization and work control, to a proper balancing of functions, and to the maintenance of good relations with other agencies, with the legislature, and with the public.

Insistent demands are being made everywhere for more efficiency and economy in government. Progressive highway administrators should meet this challenge and take the lead in presenting constructive plans for the betterment of their agencies. For years highway officials have been providing physical facilities on the basis of the "greatest possible service at the least possible cost." The same principle can be applied to management. Highway administrators should attack the problems of organization with the same vigor and scientific approach as has been applied to technical problems.

### **BENEFITS OF GOOD ORGANIZATION**

The benefits of a good organization plan are many. Through such a plan the whole process of administration is made easier and more effective. Top executives are freed of burdensome detail and are able to concentrate their attention on major policy problems and broad directional planning.

A properly designed organizational structure, with a logical grouping of functions and a minimum amount of subdivision, permits an effective management job with a minimum administrative staff. The corollary orientation of supervisory personnel as to their management obligations tends to insure the performance of necessary functions

with a minimum total force, working at full efficiency. Clear-cut assignments and consistent treatment of like responsibilities throughout the department, as provided in a good plan, make possible rational and equitable salary administration.

By assuring that each member of the department has a definite assignment for which he is squarely responsible, a good plan helps to utilize the full energies and capabilities of each individual employee. Responsibility is an immensely stimulating force; it calls forth the best efforts of able people, and gives full play to their initiative, enterprise, resourcefulness, and ingenuity. It lends interest and zest to the job, and gives rise to a proprietary spirit as distinct from a sense of "just working there." It makes people forget to watch the clock and concentrate their full energies on getting the job done.

Finally, responsibility is a most potent factor in developing able people to their full potentialities - as supervisors, executives, and staff assistants. Given real responsibility, even reasonably well qualified men usually rise to the occasion, grow up to the job. Where responsibility is closely held and highly centralized, there is normally a scarcity of employees qualified to take major responsibility when the need arises. Where responsibilities are clearly defined and properly delegated, however, there are usually many qualified candidates for promotion and advancement to fill key posts as they become vacant. Thus responsibility is a major factor in attracting able men and in keeping them interested and satisfied with their assignments.



## ACKNOWLEDGEMENTS

The factual data in the report were obtained from the individual State highway departments by means of a questionnaire, a copy of which is included herein as Appendix A. Forty-three States responded to the questionnaire in time to permit tabulation and analysis of their data for inclusion in this report.

The Committee wishes to express its appreciation to all State highway departments for their sympathetic understanding and patience with a task of considerable magnitude. The Committee is also grateful to the Division and District offices of the Public Roads Administration who transmitted the questionnaires to each highway department, helped with their interpretation, returned the completed data to the Committee, and in some cases took an active part in assembling and compiling the desired information.

Finally, grateful appreciation is extended to the staff of the Administrative Research Section, Division of Financial and Administrative Research, Public Roads Administration. The report was prepared by Mr. Ralph S. Lewis, Head of the Section's Organization and Management Unit, with the assistance of Mr. Elmer H. Rehberger and Mrs. Constance Bartlett.

# APPENDIX A

## MEMORANDUM REQUESTING DATA ON STATE HIGHWAY DEPARTMENT ORGANIZATION

PUBLIC ROADS ADMINISTRATION  
FEDERAL WORKS AGENCY  
Washington

March 24, 1947

**TO:** Division Engineers

**FROM:** H. S. Fairbank, Deputy Commissioner

**SUBJECT:** State highway department organization

The American Association of State Highway Officials Committee on Salaries and Wages in Highway Departments in an interim report to the Executive Committee on December 16, 1946, at the meeting in Los Angeles, indicated that its final recommendations will depend upon findings of the Highway Research Board Committee on Organization and Administration in a research undertaken by that Committee. The Research Board Committee has determined the need for certain minimum organization and personnel data upon which necessary comparisons between the States can be based, and has asked the cooperation of the Public Roads Administration field offices in obtaining the necessary information from each State.

For a number of years information concerning State highway organizations, particularly organization charts and personnel statements, has been submitted on a more or less informal basis. Because of the increasing interest and concern with matters of highway organization, and in view of the requirements of the above Committees, it is necessary that adequate data be obtained in respect to each State. In order to standardize the reporting of the salary and personnel data, sample schedules have been prepared and are attached for your guidance. The minimum requirements with respect to related administration and organization matters are also outlined below.

A sufficient number of copies of this memorandum are enclosed to provide for distribution to each District office and each State highway department. Additional copies may be obtained upon request.

It is expected that the Division and District offices will take an active part in assembling and compiling the desired information. The work should be done, however, in cooperation with each State highway department; and care should be taken that the material in its final form is approved by a responsible official of the department.

*State Highway Organization Data.* Reference is made to Item 1, Page 7, of the Memorandum to District Engineers, dated September 20, 1939, and the Memorandum to each Division Engineer, dated December 2, 1944 (to Division 8 November 23) regarding the organization chart and personnel statement.

Insofar as practicable, it is desired that the personnel data be presented as follows:

1. For the executive and administrative officers and the heads of departments, divisions, bureaus, etc., report the position and salary data by position title, classification title, salary ranges either on monthly or yearly basis, and present rate of pay, as illustrated on Sample Schedule 1, attached.

2. For all employees, including those shown on Schedule 1, array the position, salary data, and number of employees within each department, division, or bureau, etc., by position title, classification title, number of employees, and the present rate of pay, as illustrated on Sample Schedule 2. In connection with the present rate of pay, the salaries of all employees having "Engineer" ratings should be listed. Where a number of such employees are grouped under a single position title, the list should give the number of individuals employed at each salary within the range of salaries covered by the position title. For all other employees grouped under a single position title, the average salary of the group will be sufficient.

3. Submit a schedule of the existing position classifications, with corresponding salary ranges by either monthly or yearly rates of pay, as illustrated on Sample Schedule 3. In those States where a merit or civil service system has been established, a copy of the existing schedule of position classifications and salary ranges will be sufficient for the purpose. For sub-professional and professional positions only, the education and experience requirements for each position classification should be included.

Organization charts of the State highway departments were last requested late in 1944, but were not received for all States. If no chart was submitted at that time, or if there has been a subsequent change in the organization, it is desired that a current organization chart be submitted. If a chart was previously submitted and there has been no change in the State organization since that time, it will not be necessary to submit another copy. In such case, however, it should be stated that no organization changes have taken place in the interim.

*Civil Service, Merit, Pension, and Retirement Systems.* For those States that have a civil service or merit system submit one copy each of the laws and regulations governing this system. This material should be accompanied by a brief discussion interpreting the principal features of the laws and regulations as they apply to employees of the State highway department. Particular attention should be paid to annual and sick leave; the amounts of each, if any; whether either or both are cumulative; and the scope of application to different classes of employees. Other employee benefits provided by the civil service or merit system should be noted and described.

Submit also one copy each of the laws and regulations governing the pension or retirement system, if any, for State employees. This submittal should also be accompanied by a discussion and interpretation of the system as it applies to employees of the State highway department, with particular reference to the following features: the amounts of retirement pay received by employees retiring at different salary levels; amounts of required contributions to the retirement fund by the employee and the State, respectively; the age and number of years' service an employee must have before retirement and a pension are granted; sick benefits, hospitalization, and medical care, if any, provided under the law; and any other important benefits granted to the employee.

The descriptive statements accompanying

these two submittals need not repeat in detail information that is set forth plainly in the laws and regulations. They should serve rather to clarify and interpret the published material and to emphasize the more important provisions of the civil service and retirement systems.

**Functional Statements.** For each State highway department a statement of the functions and responsibilities of the department should be prepared in the following detail:

1. A statement of the function and responsibilities of each main department, bureau, or division, and of the major subdivisions thereof.
2. A statement of the functions and responsibilities of all staff or auxiliary units other than the main departments, bureaus, or divisions.
3. A statement of the functions and responsibilities of the major field offices (divisions or districts as the case may be), and the principal subdivisions thereof, including a description of the working

relationships between the central office staff and the field divisions.

The functional statement, which should be confined to essentials and made as brief as the required detail permits, is intended to supplement the organization chart by showing the relationships between operating departments and staff unit, and between the central office and the field. It should also indicate clearly the existing lines of authority within the department

**Estimate of Personnel Requirements.** Also desired is an estimate from each State indicating the total number of additional professional and sub-professional employees, including engineers, draftsmen, inspectors, instrumentmen, rodmen, chainmen, and similar personnel needed by the State to handle adequately its 1947 highway program. These estimates will be used in connection with a study of the current critical shortage of competent technical personnel, and should indicate for each category the employees needed by each department, division, or bureau, as of March 1947.

**Attachments**

## State of \_\_\_\_\_

**SCHEDULE 1 Position and Salary Data for Executive and Administrative Officers  
and Heads of Departments, Divisions, or Bureaus, Etc**

Position Title	Classification Title	Salary Range Present Salary	
		Mo or Yr \$	Mo or Yr
Commissioner, Director	Executive, Engineer IX		
Superintendent, Secretary, etc	Administrator, etc	12,000	
State Highway Engineer	Engineer VIII	9,600 and up	
Ass't State Highway Engineer	Engineer VII	7,800 - 9,600	
Bridge Engineer	Engineer VII	7,800 - 9,600	
Construction Engineer	Engineer VII	7,800 - 9,600	
Design Engineer	Engineer VII	7,800 - 9,600	
Maintenance Engineer	Engineer VII	7,800 - 9,600	
Location Engineer	Engineer VII	7,800 - 9,600	
Division or District Engineer	Engineer VII	7,800 - 9,600	
Materials, Testing, or Research Engineer	Engineer VI	6,300 - 7,800	
Office Engineer	Engineer VI	6,300 - 7,800	
ROW Engineer	Engineer VI	6,300 - 7,800	
Highway Planning Survey Engineer, etc	Engineer VI	6,300 - 7,800	
Equipment Engineer	Engineer V	5,040 - 6,300	
Chief Accountant	Accountant V		
Assistant Attorney General			
Purchasing Agent	Administrative Ass't II	4,200 - 5,100	
Personnel Director, etc	Administrative Ass't II	4,200 - 5,100	

## State of \_\_\_\_\_

**SCHEDULE 2. Position, Salary Data, and Number of Employees Within  
Each Department, Division or Bureau, Etc.**

Position Title	Classification Title	No. of Employees	Present Salary <sup>a</sup> Mo. or Yr.
<i>Commissioner's, Director's, Superintendent's or Secretary's Office</i>			
Commission	Members		
Secretary to the Commission	Administrative Ass't	III	
Stenographer	Stenographer	III	
<i>Chief Engineer's Office</i>			
State Highway Engineer	Engineer	VIII	
Ass't to State Highway Engineer	Engineer	V	
Secretary	Stenographer	II	
Clerk-typist	Clerk-typist	II	
<i>Bridge Department, Division or Bureau, Etc.</i>			
Bridge Engineer	Engineer	VII	
Ass't Bridge Engineer	Engineer	VI	
Bridge Construction Engineer	Engineer	V	
Bridge Office Engineer	Engineer	V	
Bridge Maintenance Engineer	Engineer	V	
Bridge Office Engineer	Engineer	V	
Bridge Design Engineer	Engineer	IV	
Bridge Design Engineer	Engineer	III	
Bridge Design Engineer	Engineer	II	
Bridge Design Engineer	Engineer	I	
Draftsman	Engineer Aide	C	
Draftsman	Engineer Aide	B	
Draftsman	Engineer Aide	A	
Stenographer	Stenographer	II	
Clerk-typist	Clerk-typist	II	
Clerk-typist	Clerk-typist	I	
<i>Division or District Office</i>			
Division or District Engineer	Engineer	VII	
Ass't Division or District Engineer	Engineer	VI	
Division or District Maintenance Engineer	Engineer	V	
Division or District Construction Engineer	Engineer	V	
Division of District Bridge Engineer	Engineer	V	

## SCHEDULE 2. (continued)

Position Title	Classification Title	No. of Employees	Present Salary <sup>a</sup> Mo. or Yr.
<i>Division or District Office (cont'd)</i>			
Division or District Office Engineer	Engineer	V	
Resident or Locating Engineer	Engineer	IV	
Resident or Locating Engineer	Engineer	III	
Resident or Locating Engineer	Engineer	II	
Resident or Locating Engineer	Engineer	I	
Inspector	Aide C or Engineer	I	
Instrumentman	Aide	C	
Instrumentman	Aide	B	
Levelman	Aide	C	
Levelman	Aide	B	
Chainman	Aide	B	
Chainman, etc.	Aide	A	
<i>Accounting Department, Division, or Bureau, Etc.</i>			
Accountant (Chief)	Accountant	V	
Accountant	Accountant	IV	
Accountant	Accountant	III	
Account Clerks	Clerk	III	
	Clerk	II	
	Clerk	I	
Clerks	Clerk	III	
Clerks	Clerk	II	
Bookkeeping Machine Operator, etc.	Machine Operator	III	
	Machine Operator	II	

<sup>a</sup>For "Engineer" grades, list individual salaries, whether positions are grouped or not; for all other grades, where positions are grouped, average salary of the group will be sufficient.

## State of \_\_\_\_\_

## SCHEDULE 3. Position Classification and Salary Ranges

<i>Sub-Professional or Technical Grades:</i>	Salary Ranges
	Monthly or Yearly \$
Engineering Aide A (Junior)	1,740 - 2,100
Engineering Aide B (Senior)	2,100 - 2,640
Engineering Aide C (Principal)	2,640 - 3,240
etc.	
<i>Professional Grades:</i>	
Engineer I (Junior)	2,100 - 2,640
Engineer II (Assistant)	2,640 - 3,240
Engineer III (Associate)	3,240 - 4,080
Engineer IV (Highway)	4,080 - 5,040
Engineer V (Senior)	5,040 - 6,300
Engineer VI (Principal)	6,300 - 7,800
Engineer VII (Ass't or Deputy Chief)	7,800 - 9,600
Engineer VIII (Chief)	9,600 and up
etc.	
<i>Clerical and Administrative Grades:</i>	
Clerk I (Junior)	1,200 - 1,700
Clerk II (Senior)	1,500 - 2,000
Clerk III (Principal)	1,800 - 2,300
etc.	
Clerk-typist I (Junior)	1,200 - 1,700
Clerk-typist II (Senior)	1,500 - 2,000
Clerk-typist III (Principal)	1,800 - 2,300
etc.	
Stenographer I (Junior)	1,200 - 1,700
Stenographer II (Senior)	1,500 - 2,000
Stenographer III (Principal)	1,800 - 2,300
etc.	
Accountant I (Junior)	2,100 - 3,000
Accountant II (Senior)	2,700 - 3,600
Accountant III (Principal)	3,300 - 4,500
Accountant IV (Chief)	4,500 - 6,000
etc.	
Administrative Assistant I (Junior)	3,300 - 4,200
Administrative Assistant II (Senior)	4,200 - 5,100
Administrative Assistant III (Principal)	5,100 - 6,000
etc.	



# APPENDIX B

## UNITED STATES CIVIL SERVICE COMMISSION

### SPECIFICATIONS FOR ENGINEERING POSITIONS

ENGINEER, P-1,	\$2644 80	a year
ENGINEER, P-2,	\$3397.20	a year
ENGINEER, P-3,	\$4149.60	a year
ENGINEER, P-4,	\$4902 00	a year
ENGINEER, P-5,	\$5905.20	a year
ENGINEER, P-6,	\$7102.20	a year
ENGINEER, P-7,	\$8179.50	a year
ENGINEER, P-8,	\$9975.00	a year

#### ALL BRANCHES OF ENGINEERING

##### DUTIES

To perform professional work in one of the branches of engineering, involving technical operations and the application of engineering and other scientific knowledge to the solution of engineering problems. The satisfactory performance of the duties of these positions requires a thorough understanding of the physical sciences upon which engineering is based, a good working knowledge of engineering concepts, terminology, units of measurement, techniques, and practices, and the ability to apply this knowledge.

The duties embrace such functions as

1 The design, development, or preparation of specifications for structures, machines, equipment, ships, public works, power plants, and communication or transportation facilities, involving applications of theoretical and applied mechanics and a knowledge of the strength and properties of materials

2 Original research in one or more branches of engineering developing engineering applications of physical and other scientific principles

3 Engineering phases of mapping activities such as land and hydrographic surveys and the application of engineering techniques to map production

4 Evaluation, investigation or survey of engineering projects, structures,

devices, or services

The difficulty of the work performed, the responsibility assumed, and the extent of supervision exercised will vary with the grade of the position, increasing progressively in the higher grades

##### REQUIREMENTS

Engineer, P-1 Applicants must meet the requirements specified under either A or B below or they must have had any time-equivalent combination of A and B

(A) They must have completed successfully a standard professional engineering curriculum leading to a bachelor's degree in a college or university of recognized standing, or

(B) They must show that they have had at least four years of successful and progressive technical engineering experience of such a nature as to enable them to perform successfully at the professional level. This experience must have demonstrated that the applicant has acquired a thorough knowledge of the fundamental physical and mathematical sciences underlying professional engineering and a good understanding, both theoretical and practical, of the engineering sciences and techniques and their application to the specialized branch of engineering for which application is made. The experience must show that the applicant possesses an under-

standing of this field of engineering equivalent to that which would have been acquired through successful completion of a standard engineering curriculum in a college or university of recognized standing.

**Engineer, P-2 to P-8, inclusive:** In addition to meeting the minimum requirements specified for Engineer, P-1, above, applicants for these higher grades must show additional experience as follows:

**Engineer, P-2:** One year of professional engineering experience in one of the branches of engineering.

**Engineer, P-3:** Two years of progressive professional engineering experience, including at least one year of moderately difficult and important work in one of the branches of engineering equivalent in grade level to that required of P-2 engineers. The experience must have demonstrated the applicant's ability to perform difficult engineering work under only general supervision.

**Engineer, P-4:** Three years of progressive professional engineering experience, including at least one year of difficult and important work in one of the branches of engineering equivalent in grade level to that required of P-3 engineers. The experience must have demonstrated a good knowledge of engineering principles and the ability to perform engineering work of greater than ordinary difficulty under only very general supervision.

**Engineer, P-5:** Four years of progressive professional engineering experience, including at least one year of important and responsible work in one of the branches of engineering equivalent in grade level to that required of P-4 engineers. The experience must have demonstrated a thorough knowledge of engineering principles and their application and either (a) the ability to direct and coordinate engineering activities of importance, or (b) a high degree of technical competence in the original successful solution of unusually complex and difficult engineering problems in connection with important technical engineering research, design, devel-

opment, or comparable functions.

**Engineer, P-6:** Four years of broad and progressive professional engineering experience, including at least one year of very important and responsible work in one of the branches of engineering equivalent in grade level to that required of P-5 engineers. The experience must have demonstrated a thorough and wide knowledge of engineering principles and their application and either (a) ability of higher order in the organization, direction, and coordination of engineering activities of importance, or (b) outstanding technical competence in the original successful solution of very complex and difficult problems in connection with highly technical and important engineering research, design, development, or comparable functions.

**Engineer, P-7:** Four years of broad and progressive professional engineering experience, including at least one year of highly important and thoroughly responsible work in one of the branches of engineering equivalent in grade level to that required of P-6 engineers. The experience must have demonstrated a comprehensive knowledge of engineering principles and their application, ability of a high order in the organization, direction, and coordination of engineering activities of major importance, and administrative leadership.

**Engineer, P-8:** Four years of broad and progressive professional engineering experience, including at least one year of extremely important, and completely responsible experience in one of the branches of engineering equivalent in grade level to that required of P-7 engineers. This experience must have demonstrated a comprehensive knowledge of engineering principles and their application, ability of the highest order in the organization, direction, and coordination of engineering activities of major importance and magnitude, and administrative leadership of outstanding character. For eligibility in this grade the applicant's attainments as an engineer must have been such as to have given him wide recognition by the engineering profession.

For any grade of position the required amount of experience will not in itself be accepted as proof of qualification for a position. The applicant's record of experience or training must show that he has the ability to perform *completely* the duties of the position.

*Substitution of Graduate Study for Experience.* Graduate study in engineering successfully completed at a college or university of recognized standing may be substituted for experience up to a maximum of two years of experience. Completion of all scholastic requirements for the master's degree will be accepted for eligibility in the P-2 grade. A Doctor's degree in engineering will meet the requirements for eligibility in the P-3 grade and will be accepted for two years of the general experience requirement for grades P-4 and above. Graduate study may not be substituted for the one year of specialized higher level experience required for the P-4 and higher grades.

#### BASIS OF RATINGS

**Engineer, P-1:** A written test will be given, the purpose of which is to measure the applicant's knowledge of Engineering Fundamentals. It will consist of questions in higher mathematics, physics, chemistry, engineering mechanics, engineering materials, and other engineering subjects common to the various branches of professional engineering. The test will require about five hours. A slide rule may be used.

Competitors will be assigned to the appropriate optional branch or branches of engineering on the basis of their education and experience.

**Engineer, P-2 to P-8:** Competitors will be rated on the extent and quality of their experience and education relating to the duties of the positions, such ratings being based upon competitor's statements in their applications and upon corroborative evidence. They will be assigned to the appropriate optional branch or branches of engineering on the basis of their experience or graduate study.

ENGINEERING AID, SP-2,	\$1822.00	a year
ENGINEERING AID, SP-3,	\$1954.00	a year
ENGINEERING AID, SP-4,	\$2168.28	a year
ENGINEERING AID, SP-5,	\$2394.00	a year
ENGINEERING AID, SP-6,	\$2644.80	a year
ENGINEERING AID, SP-7,	\$3021.00	a year
ENGINEERING AID, SP-8,	\$3397.20	a year

#### ALL BRANCHES OF ENGINEERING

##### DUTIES

To perform sub-professional engineering work in one of the branches of engineering such as civil, electrical, mechanical, etc. Depending upon the branch of engineering and the nature of the specific position, to perform such functions as testing of engineering materials, assisting in land surveys in the field, conducting or assisting in performance of efficiency tests of machinery and equipment; making less difficult engineering calculations; preparing technical material for engineering reports, specifications, and esti-

mates; and performing related work as assigned.

In the lower-grade positions employees work under close supervision. The duties increase in difficulty and responsibility with each successive grade. Employees in the higher grades usually work under the supervision of an employee of professional grade and may be required to perform original work of a less technical nature. The higher-grade employees may also supervise a group of lower-grade aids.

## REQUIREMENTS

**Experience:** Except for the substitution of education provided for below, applicant must show experience as follows:

Grade and Salary	Total	
	Engineering Experience Required	Specialized Experience Required
SP-2 \$1822.00	3 months	none
SP-3 \$1954.00	1 year	3 months
SP-4 \$2168.28	2 years	6 months
SP-5 \$2394.00	3 years	9 months
SP-6 \$2644.80	4 years	9 months
SP-7 \$3021.00	4½ years	12 months
SP-8 \$3397.20	5 years	12 months

The required specialized experience must have been in the specialized branch of engineering in which eligibility is assigned and must also have been of a level of difficulty and responsibility not lower than that of the grade next below the grade in which the applicant is accorded eligibility. The required amount of experience will not in itself be accepted as proof of qualifications. The applicant's record of experience or training must show that he has the ability to perform completely the duties of the position.

**Substitution of Education for Experience:** Pertinent undergraduate or graduate study in engineering completed in a college or university of recognized standing may be substituted year for year for the appropriate required experience. Pertinent study completed in other institutions above high school level will receive appropriate credit in accordance with the courses shown. Applicants desiring credit for such study should furnish a list of the courses completed together with the number of semester hours credit received for each course.

Pertinent training acquired while serving in the armed forces of the United States will be accepted on the same basis as civilian training and will be evaluated according to the actual time spent in training and the courses completed. Appli-

cants desiring credit for such training should describe fully in their applications the contents of each course and give the duration in weeks and the number of class hours per week spent in the course. Also if studies taken in the armed forces have been appraised for college credit by any institution of recognized standing, the number of college credits awarded in each subject should be stated together with the name of institution awarding the credit.

## BASIS OF RATINGS

Competitors will be rated on the subjects listed below which will have the relative weights indicated.

Subjects	Weights	
	SP-2 to SP-6	SP-7 and SP-8
1. Written test	100	50
2. Experience and Education	—	<u>50</u>
Total	100	100

**Subject 1 - Written Test:** All competitors will be given a written test occupying about four hours. This test will include questions on the following subjects: arithmetic computations and problems, elementary principles and concepts in the field of physics, chemistry and allied physical sciences, chart reading, gage and scale reading, and meaning of words. The test will include questions to test ability to see accurately the relationships in geometric figures. The same written test will be given for all grades, but higher performance may be required for the higher grades.

**Subject 2 - Experience and Education:** In Subject 2, competitors for grades SP-7 and SP-8 will be rated on the extent and quality of their experience and education relating to the duties of the position. The ratings will be based on competitors' statements in their applications and upon corroborative evidence. The ratings in this subject will be combined with those on the written test as indicated above.