

TRB Conducts Study on Transportation Professional Needs

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It is likely that some of the nation's transportation agencies will face a shortage of trained professionals during the next decade. Many of the professionals now working in transportation agencies in federal, state, and local governments were hired shortly after World War II, when the economy was booming and many transportation activities were expanding rapidly. The past decade, by contrast, has brought budget freezes and reductions in force to many agencies, some of which did little professional hiring during this time. As a result, many agencies face a disproportionate surge in retirements during the coming decade.

Alarmed at this prospect, the U.S. Congress included a provision in the Surface Transportation Assistance Act of 1982 directing the Transportation Research Board to perform a study of the future needs for transportation professionals in governmental agencies. The study was directed to focus primarily on highway and transit agency professionals at all levels of government. The report of the study committee, chaired by Lester A. Hoel, Hamilton Professor and Chairman, Department of Civil Engineering, University of Virginia, will be released by TRB this spring.

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Information on the current age distribution of professionals, as well as on special action being taken by public agencies to meet professional needs, has been collected through a series of surveys. The American Association of State Highway and Transportation Officials, the American Public Transit Association, the Institute of Transportation Engineers, the National Association of Governors' Highway Safety Representatives, and the American Consulting Engineers Council have worked with TRB to gather current information from their membership.

HIGHWAY PROFESSIONAL NEEDS

Part of the TRB study will focus on the professional needs of specific state highway and transportation agencies. Some of the preliminary report material based on responses of state departments of transportation and highway agencies to the survey is presented here. The states were exceptionally interested and cooperative in furnishing data for this study. Virtually all the states—49 plus the District of Columbia—responded to the survey, and 40 states provided detailed information on future retirement eligibility, attrition, and hiring plans. This information was considered by the study committee in the preparation of its final report.

Although state highway and transportation agencies will be replacing an exceptionally large proportion of their professional staffs during the coming decade, the committee's analysis of this trend throughout the nation indicates that the need for new entry-level professionals does not currently appear to exceed the supply of new graduates, nor do future trends appear to create needs that cannot be met through modest realignment of recent national trends. Nevertheless, the situation within some states is far more extreme than that implied by the national average. In five states, for example, more than one-third of all professional employees will be

eligible to retire with full benefits within the next 5 years. A surge in replacement of this magnitude would create severe organizational stresses:

- Even if an agency can find adequate entry-level professionals, the loss of one-third of an agency's most senior professionals requires that professionals assume a massive increase in responsibilities at each level of the agency as the organizational hierarchy adjusts to fill the voids at the top.

- The pending surge in retirements and replacements will occur simultaneously in many states, so that a strategy of simply looking farther afield for new candidates will not be as effective as it has been in past years, when peak professional needs were confined to only a few scattered states.

- The stability of the professional work force may in many states require an adequate supply of new professionals from within the same state or region. Graduates of in-state universities may have family ties or emotional attachments to an area that overcome the inherent disadvantages of a career path that requires shifting field assignments and relocation in various regions of a state. If a state's peak demand for new professionals exceeds the capacity of its traditional nearby sources, it may encounter exceptional difficulty in trying to recruit or retain graduates from other regions.

In brief, the ability of any single state to meet its professional needs could differ sharply from the national average, and the existence of needed professional talent elsewhere is of little benefit unless it can be attracted and retained where it is needed.

To compound the problem, many states that will be facing major recruitment needs have been out of the hiring market for several years, which has left a void in word-of-mouth referrals. Several states have started using recently hired employees to do campus recruitment and encourage more students to choose professional careers in transpor-

tation. More use of female and minority recruiters would likely increase employment of female and minority professionals; the number of women choosing engineering majors in university programs has increased substantially during recent decades, and an agency that appears open and progressive will be better able to compete for this growing source of professional skill.

Many states faced with large numbers of future retirements, for example, Texas, California, and Massachusetts, have recently been stepping up the hiring of engineers. Given the relatively soft labor market for civil engineers in the past several years, some states have seen this as an opportunity to recruit and bring into the organization large numbers of new graduates. Some hiring at levels above the entry level is undoubtedly occurring, but is probably small. The normal practice in most states is to hire relatively inexperienced entry-level engineers, train them in the varied activities of the agency, and promote them after several years to fill higher staff positions. This not only provides an adequate supply of professionals versed in the methods employed by the agency, but also establishes a career path that encourages loyalty to the agency and discourages high turnover.

Nearly every state highway and transportation organization was hiring professionals in the 12-month period from July 1983 to June 1984. Nearly half (21) of the agencies reported problems with filling professional engineering positions below the management level; 12 agencies reported difficulty in hiring management-level engineers. Such hiring difficulties will be more common when retirements increase as projected and states expand recruitment.

Problems in hiring data-processing professionals are widely reported; nine states specifically noted that these professionals posed special hiring problems.

With the creative handling of professional needs, problems may be transformed into opportunities. As many state highway and transportation agencies face greater-than-usual turnover of

key professional staff in the coming decade, numerous opportunities will arise to tailor solutions to the specific circumstances of each organization. An agency that has grown too top-management-heavy during the past decade can use this opportunity to streamline itself to deal efficiently with the growing program ahead. An agency that has not fully used the professional talents of women or minorities can use this period of rapid personnel change to rectify this situation. An agency facing a lack of computer skills can use in-house training to meet its long-term needs, and in the process make the agency more effective in recruiting and retaining computer professionals. An agency that has been rigid in its certification requirements can use this opportunity to review whether planners or other professionals might be permitted to perform certain functions traditionally assigned only to engineers. Both the incentive and the ability to phase in more automated processes are enhanced by the high turnover that is anticipated for highway professionals.

Taking advantage of these opportunities, however, requires that managers anticipate future needs and plan their solutions strategically. Various measures can help states to see how their needs compare with the national picture. Such measures are briefly discussed in the following section.

VARIOUS INDEXES OF STATE NEEDS

In assessing the professional needs of each state, various elements must be considered: the specific positions being vacated, availability of suitable in-house replacements, dynamics of internal training and promotion, ability of the agency to recruit and retain, and numerous other factors related to the mission and management of the agency, including legislative regulations and public attitudes. The creativity and adaptabil-

ity of agencies and individuals are crucial in meeting staffing needs, and any realistic assessment of professional requirements within a state must be tailored to each organization. Various measures of the severity of future replacement and skill replenishment needs can help in this assessment. The study focuses on six attributes of the professional work force that are linked to the overall staff needs of future years:

1. Average age of professionals currently employed by an agency;
2. Percentage of current professional employees eligible to retire within 5 years;
3. Percentage of current professional employees eligible to retire with full benefits within 5 years;
4. Percentage of the professional work force that will actually retire within 5 years if all employees retire when they reach the agency's historic average retirement age;
5. Percentage of professional employees that an agency anticipates will leave during the next 5 years due to retirement, death, or change; and
6. Number of new professional employees that an agency anticipates hiring during the next 5 years, expressed as a percentage of the current professional work force.

In response to a survey of state departments of transportation administered by the American Association of State Highway and Transportation Officials in conjunction with this study, 40 states reported data on one or more of these indexes.¹ The six indexes, which are briefly discussed below, will be presented in detail in the final report.

Average Age

Nationwide, the average age of engineers in state highway agencies is approximately 45 years. The range in average age among agencies is fairly narrow—

from 36 years in Rhode Island to 49 years in California. The 10 states with the highest average age (among the 40 states that responded to this portion of the survey) are listed in Table 1. Two of the largest state departments of transportation, California and Texas, top this list.

There are large differences from state to state in the numbers and percentage of engineers in different age brackets. In some states relatively few engineers are more than 60 years of age, but in four states (Kansas, Massachusetts, Nebraska, and Utah), more than 10 percent of engineers exceed 60 years of age. In nearly half of the states, more than 10 percent of the engineers are between 56 and 60 years of age, although in some states, as few as 3 to 5 percent are in this age range.

TABLE 1 States With the Highest Average Age of Engineers, 1984^a

| State | Average Age |
|---------------|-------------|
| California | 48.9 |
| Texas | 48.3 |
| Oregon | 47.6 |
| Massachusetts | 47.6 |
| Nebraska | 47.6 |
| Missouri | 47.1 |
| Alabama | 46.8 |
| Idaho | 46.6 |
| South Dakota | 46.2 |
| Vermont | 46.0 |

^aBased on data from AASHTO Survey.

¹This survey was sent to the heads of all state departments of transportation or, if the state does not have a department of transportation, to the head of the state highway organization. It was requested that states take "only the highway program into account" because transit professionals were the subject of a separate survey. The data reported here may not always be strictly comparable because most, but not all, states provided responses for the department as a whole, not just its highway-related activity. The comparisons made in this article are based on responses from 40 states.

A state's retirement plan will strongly influence the effect of a work force of higher-than-average age on future professional needs. Federal Social Security benefits also strongly influence when professionals choose to retire (all but six states are covered by Social Security).

Percentage Eligible To Retire

In most states, an employee may become eligible to retire with partial benefits upon reaching a certain age, length of service, or combination of both. The most common minimum age for retirement eligibility is 55 although a number of states allow retirement as early as 50. Among the states surveyed, the average retirement age ranges from 57 to 65. The most frequent average retirement ages are 62 and 63.

Because of varied policies toward retirement as well as other factors, states sharply differ in the proportions of work force eligible to retire. For example, during the next 5 years, only about 5 percent of the professional employees in Indiana, Iowa, and New Mexico will be eligible to retire, whereas 90 percent of Florida's professionals will be eligible. Six states report that more than half of their professional employees will be eligible to retire within the next 5 years (Table 2). Comparing the data in this and the following tables it should be noted that states differ somewhat in their definitions of what constitutes an engineer.

Although being eligible to retire does not necessarily mean that an employee will retire, having a high percentage of employees eligible to retire poses a potential management liability. Even if a state historically has had a stable professional work force, this does not assure continued stability in the future. Shifts in compensation, working conditions, benefits, public image, costs of living, and competing job opportunities may cause employees to reconsider their re-

tirement decisions. This liability becomes a key concern in personnel planning when a large fraction of employees can retire with full benefits.

Percentage Eligible To Retire With Full Benefits

The number of employees eligible to retire with full benefits during the next 5 years is also strikingly large in many states, representing 30 percent or more of all professional employees in seven states (Table 3). The proportion of management engineers that can retire with full benefits is even more pronounced, because on average these professionals are older and have more years of experience. Even among employees eligible to retire with full benefits, however, the actual number of retirements will generally be smaller than the number eligible. However, this group is particularly well positioned to retire or change jobs if conditions warrant.

Percentage of Current Engineers That Would Retire Within 5 Years If All Employees Were To Retire at the Average Retirement Age

A useful index for gauging relative attrition is the proportion of employees that will retire in the next 5 years, assuming all employees retire at the agency's historic average retirement age. Computation of this index indicates future substantial turnover in some of the nation's largest state departments of transportation. California and Texas would lose about one of four engineers in the next 5 years if all employees retired immediately upon reaching the average retirement age for those agencies (Table 4), representing nearly 5 percent of all engineers employed in the nation's state highway agencies. Although such a sudden outflow is not expected (large

TABLE 2 Highest Retirement Eligibility, 1985-1989^{a, b}

| State | Percentage Eligible To Retire |
|----------------|-------------------------------|
| Florida | 90.8 |
| Pennsylvania | 77.1 |
| Kentucky | 55.7 |
| Texas | 52.6 |
| California | 52.0 |
| Massachusetts | 51.9 |
| Missouri | 49.4 |
| Hawaii | 43.8 |
| Delaware | 43.4 |
| South Carolina | 41.0 |

^aIn some states employees can retire and earn very low retirement benefits after relatively few years of service.

^bBased on data from AASHTO Survey.

proportions of state work forces are currently in excess of the average retirement age), this index is a useful indicator, particularly if a state has not recently reviewed its future staffing dynamics.

State Estimates of Attrition

States generally reported overall rates of professional attrition to be higher than

TABLE 3 Highest Retirement Eligibility With Full Benefits, 1985-1989^a

| State | Percentage Eligible To Retire With Full Benefits |
|----------------|--------------------------------------------------|
| Iowa | 41.0 |
| Texas | 40.4 |
| South Carolina | 40.2 |
| Kentucky | 39.7 |
| Florida | 34.9 |
| West Virginia | 31.4 |
| Tennessee | 30.0 |
| Missouri | 29.2 |
| Delaware | 28.9 |
| Utah | 27.4 |

^aBased on data from AASHTO Survey.

TABLE 4 Highest Index of Projected Retirement, 1985-1989^{a, b}

| State | Current Engineers Expected To Retire |
|---------------|--------------------------------------|
| California | 27.7 |
| Texas | 24.5 |
| Connecticut | 22.4 |
| Massachusetts | 21.3 |
| Hawaii | 20.2 |
| Kentucky | 19.5 |
| Wisconsin | 18.6 |
| Kansas | 18.1 |
| Iowa | 18.0 |
| Missouri | 17.4 |

^aThe index is computed from the age-distribution data furnished by the states by subtracting 5 from each state's average retirement age and estimating the percentage of employees above that computed age, assuming that employees are uniformly distributed within each age category.

^bBased on data from AASHTO Survey.

rates of retirement because of job changes and other forms of attrition in addition to retirement (Table 5). However, surprisingly, some states reported projected attrition below the level of projected retirements. This apparent discrepancy may be explained by differences in definition or interpretation, or because the simple index may not fully reflect special factors related to the distribution of future retirements known to state personnel planners. Because, in many cases, the demands of the next 5 to 10 years are unique and substantially different from historic patterns, each state should carefully review its likely future attrition patterns. Two generalizations can be formulated from state projections of attrition: (a) the anticipated attrition from many state highway agencies over the next 5 years represents a loss of a substantial portion of professional resources; and (b) individual states vary widely in the extent to which they will be affected by retirements and other forms of attrition.

State Hiring Plans

The hiring plans of many states reflect anticipated high rates of attrition. Indiana, Maine, Oregon, and South Carolina all plan to hire at least one new engineer for every three currently on the job (Table 6).

There are some distinct disparities, however, between the states ranking in the top ten on each of the indexes of need previously discussed and their plans to address these needs, as reflected in their reporting of hiring plans. For example, Texas ranks in the top ten states for each of the previous five indexes, yet does not appear among the top ten in planned hiring. Similarly, California ranks in the top ten with respect to four of the indexes, but not in terms of planned hiring. Conversely, Maine and Rhode Island do not rank in the top ten on any of the other five indexes; yet both are ranked in the top ten in terms of hiring plans. Some of the apparent discrepancies come about because of differences in definition, and, in some cases, states have already hired the replacements and are now training them.

TABLE 5 Highest Expected Attrition, 1985-1989^a

| State | % Attrition |
|----------------|-------------|
| Indiana | 43.3 |
| Oregon | 30.8 |
| South Carolina | 29.9 |
| Virginia | 27.2 |
| Missouri | 27.0 |
| Delaware | 22.9 |
| Pennsylvania | 22.3 |
| Wyoming | 20.5 |
| California | 20.0 |
| Texas | 19.3 |

^aBased on data from AASHTO Survey.

TABLE 6 Highest Planned Hiring, 1985-1989^a

| State | % of Current Number of Engineers |
|----------------|----------------------------------|
| Indiana | 43.3 |
| Maine | 40.3 |
| Oregon | 38.0 |
| South Carolina | 33.0 |
| Iowa | 32.0 |
| Missouri | 30.5 |
| Virginia | 27.2 |
| Rhode Island | 25.5 |
| Wisconsin | 24.0 |
| Massachusetts | 23.8 |

^aBased on data from AASHTO Survey.

SUMMARY

The TRB study on transportation professional needs does not attempt to gather and analyze sufficient data on each of the states to predict the future professional requirements of each. Rather, simple statistical indexes have been developed as a first step in aiding the states as they conduct their assessments. These indexes may not always coincide with state plans due to differences in definitions, varying interpretation of the survey questions, and other factors. The aim of the Study Committee in reporting various indexes, such as those described here, is to help states to make meaningful comparisons, which, in turn, could help to provide perspectives on their future needs as they review the adequacy of their human-resources plans.

The final report of the Study Committee, entitled *Special Report 207: Transportation Professionals: Future Needs and Opportunities* will be available from the Transportation Research Board this spring.