

“Cracks in the Pavement – Issues in today’s workforce that affect highway quality”

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Highway quality is about many interdependent skills and functions coming together in a consistent, harmonious way. "Quality doesn't happen by itself: there has to be a champion in your organization. Quality needs to be incorporated in all elements of planning, design, construction, and operations." As recently cited in 2004 by David Geiger, then Director of FHWA's Office of Asset Management ¹

Today however, that harmony is in jeopardy as transportation agencies face an unprecedented level of retirements of senior-level managers over the next decade - nearly double the rate for the nation's entire workforce. The transportation workforce requires a wider range of skills and abilities than in the past because of changing and expanding agency missions as well as new technologies; this has coincided with level or decreasing staffing in transportation agencies. Agencies are significantly under investing in training their workforces. Organizations are finding it increasingly difficult to recruit and retain professionals and technicians. Few transportation agencies are positioning their human resource activities at a strategic level so the workforce needs described by the DOT organization's strategic plan can be met.² And the situation is likely to get worse before it gets better. How bad it gets may well depend on the ability of the transportation industry to adjust its work force development and management policies and programs, and even its culture.

The purpose of this paper is to assist Chief Engineers and department leadership to better understand how highway quality will be negatively impacted by the growing gap between the workforce required to build and maintain safe and efficient roadways and the agency and contractor workforce practices being employed today. This gap can be reduced by increased attention to workforce training and development practices.

Highways are more than concrete, asphalt and steel

Safe and efficient highways are a result of sound design/engineering and effective construction practices. However, across the board, engineering firms, federal and state agencies and road building contractors are experiencing increased difficulty in maintaining an adequately knowledgeable and skilled workforce. The workforce is literally, the “glue” that holds the materials together to create the finished product. If the glue fails, the end result does as well.

Times are changing rapidly for people in the highway business and transportation organizations face an unprecedented “triple threat”. The days of life-long employment have given way to a new generation of workers. These workers are not as interested in “bread and butter” jobs but increasingly gravitate toward professions. Not only are they moving in a new direction, their attitudes toward employers and employment have radically changed from their predecessors.

These changes come at a time when large numbers of experienced highway professionals are coming up to their targeted retirement dates. An timely article “Help Wanted” illustrates the point, citing that the Federal Highway Administration (FHWA) projects that 45 percent of its work force will be eligible to retire by 2010³. The question is, who will

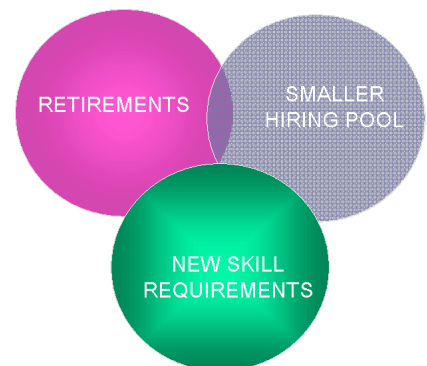


Figure 0 - The "Triple Threat "

¹ National Partnership for Highway Quality (NPHQ) Summit, November 16-17, 2004

² Transportation Research Board Report Special Report 275

³ Public Roads: July 2001

take over the tasks of these experienced workers, and equally important, how will these new workers be able to pick up the skills, perspectives, and experience of those moving into retirement?

The issue is further complicated by the decreasing level of interest in careers in highway design and construction. Younger people entering the workforce, increasingly look toward professions other than design and construction. (The number of graduate level civil engineers being produced has only increased 10% over the graduation rate of 20 years ago⁴) According to the U.S. Census Bureau, the population of those aged 25 to 34, prime workforce candidates, has decreased by 10.1 percent, a decrease of over 4 million people. The transportation marketplace must today compete for skilled talent with other agencies and private sector industry employers, local national and global. Increases in the rate of near-term government retirements and other separations have made this challenge to recover lost knowledge and skills even more daunting.

Previously, an individual's "knowledge base" was often accumulated over a lifetime of employment, with relatively few changes in employment. Today's younger workers, sensitive to the increasing demand for their skills, are more inclined and able to change jobs than their predecessors. There is also more cultural, ethnic, and skill diversity in the current labor market. Portable pension plans, recruitment bonuses, reaction to corporate headcount reductions and other features of the marketplace have encouraged even greater change.

Transportation officials recognize that there is a need to develop a workforce that thinks creatively, solves problems, builds consensus, and communicates and works effectively with diverse entities. This involves both professional and personal development.⁵, however, funding for that development is severely limited.

There is a risk associated with not having an adequate level of skilled, knowledgeable, and adaptable workers available to meet the needs of our growing society. Lack of such talent will negatively impact the ability to execute the mission of building and maintaining safe and efficient highways. Any knowledge or skill expertise shortfall that reduces the talent and capability of a transportation organization will put the quality of the resultant highway system at risk. This is reflected in a recent technical publication of the Transportation Research Board (TRB) that cites among the assessable risks to highway quality, "inexperienced workforce/inadequate staff/resource availability"⁶

When we speak of quality highways, we must consider that quality must be evident in and measured by consistent improvements in project delivery, traffic and work zone safety, maintenance, and operations of highways and streets. Highway quality is the result of a "system" of interdependent functions of planning, design, construction, system evaluation, maintenance, and rehabilitation. Quality improvements must continue to be made in planning, design, construction, environmental protection, materials inspection and testing, traffic management, traffic safety, and work zone safety for both highway workers and highway users. These improvements will require advancements in "craftsmanship skills" and repeatable quality processes.

The operational functions required to construct and maintain sustainable and safe highways are also reflected as a part of a linear delivery "system" that enables management of the highway "asset" lifecycle.

- The planning phase involves the preparation of capital expenditure programs for highways based on overall needs, demand analysis, and estimation of facility needs.

⁴ Science and Engineering Indicators 2008, National Science Foundation

⁵ FHWA Workforce Planning and Professional Development Task Force - Final Report

⁶ National Cooperative Highway Research Program report 574, "Guidance for Cost Estimation and Management for Highway Projects During Planning, Programming, and Preconstruction

- The design phase generates, analyzes, and evaluates alternative facility configurations.
- The construction phase involves quality, progress, and cost control to transform designs into long-lasting, physical realities.
- Once constructed, the functions of system evaluation and facility maintenance and rehabilitation become the main focus.

A Critical Self-Assessment Is Necessary

As we examine each of the components of quality highway construction and operation, we must ask ourselves, “Are we satisfied with the level of quality, in terms of the end result?”

- Do we have adequate data available to enable us to identify quality issues early in the “life cycle” of a highway project?
 - Bearing in mind that it is far less costly and troublesome to correct a problem at the front end of a design project than one that is in construction, do we have systems in place to facilitate problem reporting and impact analysis at each stage of highway delivery?
 - If we do not have the data we need, what is the cause? Are current entrenched (and perhaps outdated) agency beliefs restricting needed management policies and programs?
- If we have quality assessment processes in place, are these processes continually being re-evaluated and upgraded to reflect the changing methods and processes being employed today?
- Do we have a “vision” of where we want to be? Is there a logical, phased plan to get our organizations from today’s current state to our “ideal”? Is the “ideal” practical and possible given the other agency priorities and funding available?
 - Has a detailed “gap analysis” been developed? Such an analysis, of necessity, needs to encompass all of the known deficiencies and assign anticipated levels of funding required, as well as implementation difficulty, so that implementation priorities can be determined.

Do Our Processes Reflect Changing Requirements?

Highways do not last forever. Highway designers and road builders recognize that “useful life” of our highway systems finite and are largely determined by

- The standard of construction
- Traffic volumes
- Weather
- Use and abuse
- The extent of routine preventative maintenance

These measures do not remain static. For example, vehicle miles traveled (VMT) is now increasing twice as fast as the population.⁷ As these variables change, they influence the need for new methodologies and materials, which in turn affect design and construction training requirements. As highway construction and maintenance requirements change, the workforce must evolve with it, in order to maintain the highest possible level of highway quality. Are our current workforce development processes (and those of the consultants, engineers and contractors that we employ) equipped to provide the number and caliber of resources needed to adapt to a rapidly changing landscape.

Leaders in the transportation industry, observing the landscape of tomorrow, see a shrinking engineering, construction and public sector workforce, more rapid workforce attrition, aging infrastructure, funding challenges, and evolving construction methods. These interdependent factors can significantly impact the quality outcomes sought by highway owners and operators.

⁷ Barnaby, Rick, “Workforce Challenge”, Federal Highway Administration, November 2006

How Well Do We Keep Pace With The Changes That Are Happening?

Transportation officials need to conduct an ongoing review of what workforce resources are needed to build and maintain safe and efficient roadways. This necessitates a periodic evaluation to:

- identify competencies needed in the future
- analyze present workforce competencies, and how they are being utilized
- compare future needs with those present in the current workforce in order to identify competency gaps and surpluses, and
- develop a plan for closing the competency/skill gap

Yes, it is a big job! But for owners and operators of more than three million miles of roadway and over 301,000 bridges, we live in a world of big jobs. As such, there are several free or low-cost resources available. Some of the work has already been done for you. For example:

1. The Local and Tribal Technical Assistance Programs (LTAP/TTAP) operated by the Federal Highway Administration (FHWA) provides technical assistance to rural and local governments through a variety of resources including on-site training, a videotape library, workshops, newsletters and manuals, much of which is made available at no charge to local governments.
2. The members of the Transportation Curriculum Coordination Council (TCCC), provides national leadership, coordination, and inter-agency cooperation in the development of a transportation curriculum, in construction, materials, project management, and associated transportation disciplines, that is designed to improve the skills and abilities of the participants.
3. The National Highway Institute (NHI), the training and education arm of FHWA, with over 38 years of service to the transportation community. Current offerings are used to train the current and future transportation workforce, enable transfer of knowledge quickly and effectively to and among transportation professionals, and provide training that addresses the full life cycle of the highway transportation system

Transportation departments have options and choices as to how to implement a comprehensive workforce development program. Existing programs are available from these sources listed (and several others like them) and can be utilized “as is”, or they can be tailored to meet unique needs. Some organizations have chosen to create their own customized programs to their specific operations. Transportation officials should bear in mind that the more a program is customized, the time and cost needed to implement the initial program increases significantly. Subsequently, as new programs and features become available through the above sources, the more customized a workforce development solution that you have created; you may require additional integration work to incorporate the new programs/features.

Its system of highways and bridges is the United States’ most important infrastructure.

Improved highway quality is not an option; it is an imperative goal. The erosion of current levels of knowledge, experience and skill regarding those involved in designing, constructing and maintaining our critical infrastructure demands that serious attention to new approaches to recruitment, training and development and retention are needed to ensure that highway quality continues to improve in the future. Several existing resources are available to transportation organizations to facilitate getting these programs going, and implementation options are available to help address unique “local” needs.

There is one option however that is not viable because it comes at a price tag too steep for the United States and its highway users – and that is doing nothing.