Shrinking Dollars for Road Repair Require Better Quality Control

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Transportation officials currently find themselves on the horns of a dilemma. They are required to provide efficient facilities for current and projected increases in use, but are also asked to do so with fewer dollars. The long-range solution may involve adjustments in both user expectations and revenue structures, but immediate action to bridge the gap between needs and revenues can be taken within the constraints imposed. The quality of construction can be improved without significantly increasing the costs. By taking a fresh look at quality control, it may be possible to get a "bigger bang from bucks" currently available.

QUALITY CONTROL SURVEY

In response to increased concern over the rate of deterioration of the nation's highway facilities, the Federal Highway Administration (FHWA) conducted a Highway Condition and Quality of Highway Construction Survey in 1976. In summarizing the findings of that survey, Doyt Y. Bolling noted that a considerable gap exists in highway work between the quality of work specified and the quality of work received. This conclusion was substantiated by extensive field surveys and reports from throughout the United States.

In 1979 a follow-up survey was conducted by FHWA to provide information on the condition of recently completed highways and to determine the relationship, if any, between the quality of construction (as evaluated in the 1976 study) and observable pavement distress. A total of 311 projects were reviewed to determine their general condition after 3

Feature

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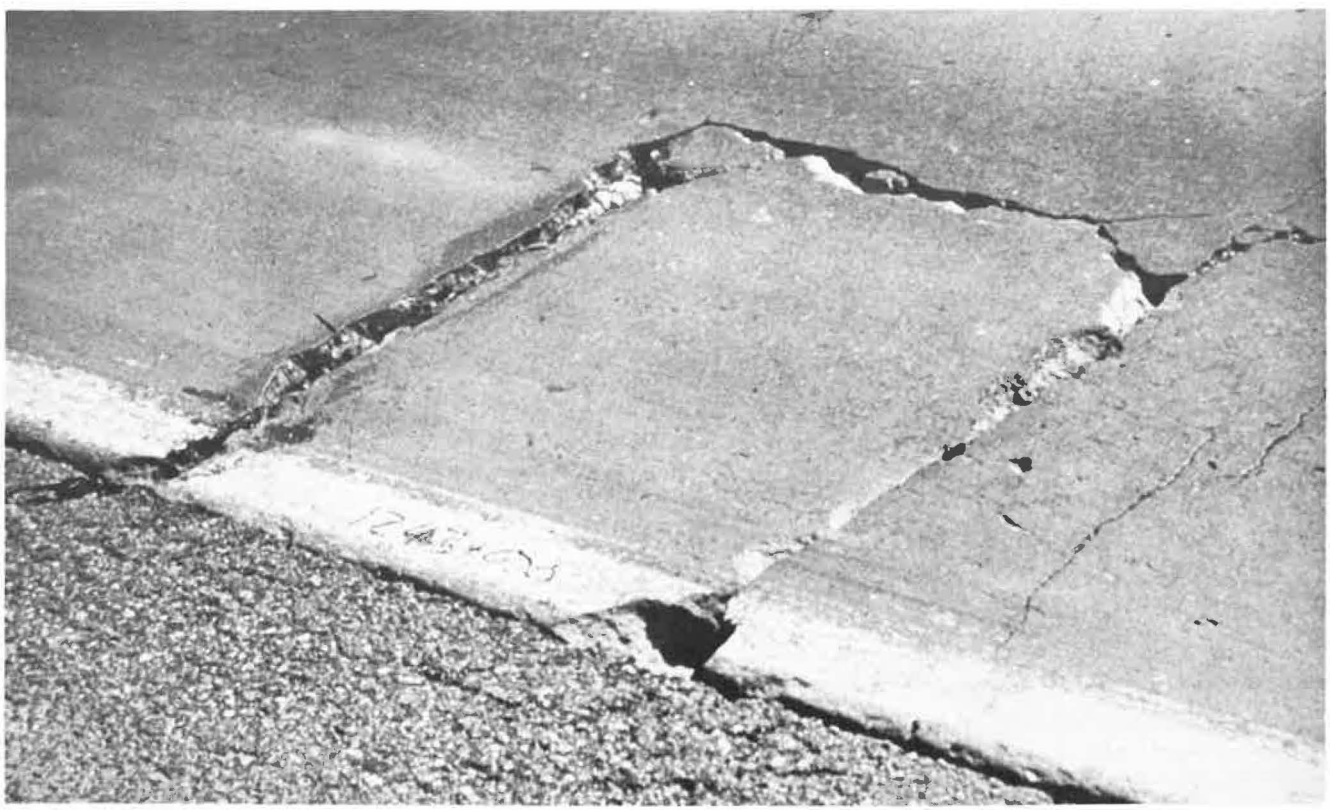

In a time of budgetary constraint for transportation departments across the country, how best to maintain systems at the least cost is a crucial question. Costs of maintenance and repair of pavement distress, for example, are skyrocketing. Also of concern is the possible relationship between quality control and repair cost.

Getting the most for a state's construction dollar depends not only on the quality of the construction materials but also on skilled personnel and the proper preparation of specifications. Other factors are controls that are uniformly and consistently applied.

years of service. In addition, information on the quality of construction being attained was collected on 403 active projects.

Even though the projects were all only 3 years old, observable pavement distress was noted in 73 percent of them. Although no specific relationships between the quality of construction and observed distress could be established for particular projects, it is significant to note that, on projects only 3 years old, it was possible to develop "trend lines" showing a positive relationship between quality of construction and three categories of distress—longitudinal cracking, transverse cracking, and rutting.

Of even more concern is the finding that quality control problems were found in each of the principal quality control factors evaluated for flexible pavements. It was also concluded that the severity of quality control problems increased between the 1976 and the 1979 surveys. Taken together the two surveys indicate that more effort has to be put forth toward improving quality control processes.

BETTER QUALITY CONTROL NEEDED

Recognizing the need to improve their quality control, many states have taken what they felt to be very positive steps toward this objective. Some have increased their inspection efforts and frequency of testing. Most states have increased the amount of training given their inspectors. Some have opted for the quality assurance "Q.A." route, a statistical testing procedure with end result requirements. However, the results of the 1979 FHWA survey and the continuing number of premature defects appearing on recently completed highways indicate that further improvements are necessary.

Perhaps we need to work smarter. We need to optimize our efforts—and even our control philosophies. Increasing the number of inspectors is probably not the answer. Two federal surveys found no relationship between the level of staffing and the quality of work produced.

If we are going to work smarter, not harder, we need to identify those materials and those operations that are most critical. We must determine if each specification is needed. Sometimes the "spec" is required because "we've always done it that way." Does compliance or noncompliance with a specification requirement correlate with performance of the work? Do the specifications leave room for improved and innovative procedures or materials?

Most conflicts for alleged failure to deliver what was contracted for arise from failure of some specification to be communicable. Adjectives such as equal or better, reasonably close, conformity, consistent with good construction practices, differing materially, equitable adjustment, etc., have no meaning in commerce nor in regulation. What must be specified is what departures from standards are permissible, and how shall departures be measured? What departure is

Quality control during all phases of highway repair work is related to a number of factors—pride of workmanship at all levels, frequency of testing, and inspection.

economical? The answers can be stated in statistical terms, tests, and statistical interpretation of tests. Good statistical language reduces the possibility for misunderstanding the meaning of a specification.

For those items determined to be necessary, are the requirements reasonable? Are the tolerances properly set? Are they adequate, yet achievable?

HOW MUCH TESTING IS ENOUGH?

Frequency of testing is a major consideration. There are some questions that may put testing in perspective. Is the cost of the test worth the information provided? Are test requirements flexible enough to allow judgment under varying conditions? What are the consequences of failure? What is the probability of failure? Is the risk of not detecting unsuitable work acceptable to the transportation agency? Is the risk of rejecting suitable work acceptable to the contractor and therefore economical to the agency? Is the productivity of field engineers acceptable? Has a preoccupation with the need for more and more documentation diminished the value of engineering talent? Can the required number and distribution of reports be reduced and still provide adequate or perhaps better contract administration?

To apply good inspection and construction supervision in the field the decisions must frequently be made on a case-by-case basis. No single standard always applies. Better qualified engineering technician-inspectors, cross-trained to understand the needs and criticality of several categories of work, are required. Most people working in quality control would welcome a chance to acquire more knowledge of statistical evaluation as well as supervision to improve their skills. Competency tends to counteract a national disease—lack of pride in workmanship. The American Association of State Highway and Transportation Officials (AASHTO)-endorsed program for certification of transportation engineering technicians administered by the National Institute for Certification in Engineering Technologies (NICET) could be very helpful in identifying qualified inspectors. People trained to recognize potential problems are required. But their training should not stop after competence has been achieved in the technical aspects of the job. Too often, the agency and the contractor interact on an adversarial basis. The truly qualified inspector will also be trained in management techniques that elicit trust and motivate the contractor to provide the product quality specified.

Management can help by providing the organization and competent staff to carry on and develop quality control on an economic scale. No quality control program, however designed, will work effectively in the absence of direction from the top. Management must insist that controls are uniformly and consistently applied. Is it costly? Proper organization and competence do not necessarily increase budgets for quality control. Management is already paying for proper organization, but often it is not getting its money's worth. Pounds of meaningless figures spit out of computer memory do not ensure quality control, in fact are probably very costly and have little benefit. Good management principles, such as measuring the results and holding subordinates and contractors responsible for good performance, are a necessary ingredient of an effective quality control program. Management ultimately bears the responsibility for poor design, high costs, and poor quality.

Evaluating the cost effectiveness of construction tasks, working with the contractors to achieve the most cost-effective construction, and maintaining a level of quality that provides the desired level of service at the least maintenance cost are a must.

Good engineering principles and fiscal reality demand that the first priority be the life-cycle cost effectiveness of the nation's highway facilities. This can be achieved if managers are responsible, people are properly trained, and a workable and reasonable quality assurance program exists and is enforced.