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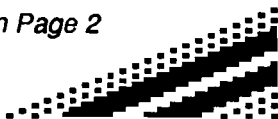


Continuous Quality Improvement: Doing More with Fewer Resources or Chris goes to Washington

In January, I attended the National Conference of the Transportation Research Board (TRB) in Washington, DC. I went expecting to see a lot of the city (I love the National Zoo), meet some new people, and attend a number of meetings. My expectation was that the meetings would discuss obscure things, such as the effect ISTEA has had on the tensile stresses and chloride infiltration of highway bridges in Fairbanks, Alaska.

Fortunately and unfortunately, things didn't work out as I had planned. Unfortunately, I didn't get to see any of the city, but fortunately, the meetings were not obscure. In fact, they were both practical and informative. We did have one person fall asleep in a meeting, but it was hard to blame him because the lights were turned off for a slide show. If only he hadn't snored.

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WHY PAVEMENT TESTING?

**"TESTING HAS BEEN VERY
SUCCESSFUL IN MY TOWN"**
...according to R. Patrick Ellis, Superintendent of Public Works in Sandwich, MA.

The purpose of pavement testing and inspection is to ensure that roadways built in your community conform to the standards and specifications described in your bid documents. In order to assure quality, you need the right materials, in sufficient

quantity, mixed under suitable conditions, and placed by a trained crew using proper equipment. Pavement testing allows a municipality to measure a contractor's compliance with job specifications, so "you get what you pay for."

Most communities find that the complexity of pavement tests and the cost of acquiring elaborate test machines preclude them from con-

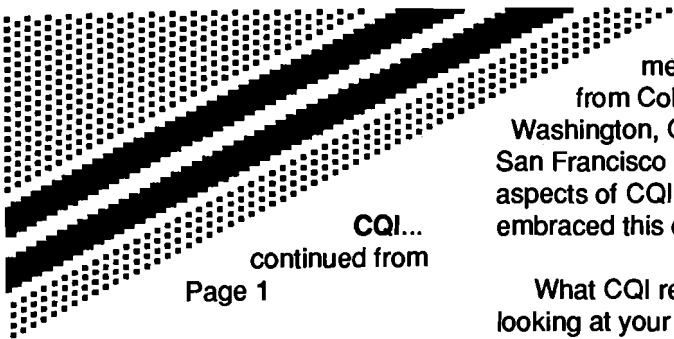
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R. Patrick Ellis (left), Superintendent of Public Works, Town of Sandwich, and Richard Tracy, Highway Superintendent, Town of Westhampton



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What surprised me most about the meetings was how many of them focused on management techniques. I think the reason for this was that as municipal and state programs continue to grow, and budgets continue to shrink, engineers are looking for ways to maintain their current level of performance.

The management solution engineers are finding is called Total Quality Management (TQM). Actually, in the meetings I attended, it was called Continuous Quality Improvement (CQI). That's the cultural difference between the private sector and the public sector. The private sector wants perfection from its workers, hence the word "total", whereas the public sector realizes that no one can achieve "total" quality, so it settles on "continuous improvement." It's hard to say which approach is better. I like the concept of continuous improvement myself, it's more realistic.

At the TRB conference, people from the Federal Highway Administra-

tion and the Departments of Transportation from Colorado, Wisconsin, Washington, Oregon, Virginia and San Francisco spoke on different aspects of CQI. All of them have embraced this concept.

What CQI requires is a new way of looking at your organization. You have to stop looking at results, and start looking at the process which creates those results. Determine the steps used to perform a task, and then work with the people who perform these steps to improve the process and thus create higher results. You have to listen to your employees; since they are the ones that have to do the work, they often know the most about the process. They don't speak up for fear of rocking the boat, or maybe because no one ever asked what they thought.

The following are some of the important features and considerations of a CQI plan.

The Customer:



CQI tells us to focus on the customer. After all, we do this work for the customer. Listen to your customers and work toward pleasing them. As a first step, identify who your customers are. Next, ask them what they want from you. One DOT, which spoke at the conference, has its crews

hand out survey cards to citizens the crew encounters during the course of the day. From the returned cards the DOT finds out on a continuous basis how they are perceived by their customers.

Vision:



If top management doesn't champion CQI then it will fail. This effort must be part of upper management vision.

An example of management vision which supports a CQI program is "to attract and retain the best and brightest."

Organization:



You may have to change your organizational structure for all of this to work. The vertical hierarchy, where information flows only up and down through channels, will not allow the communication or feedback needed for CQI. Your vertical hierarchy should be replaced with a flatter horizontal structure, which allows communication to flow directly to many different levels.

New programs:



You may need to add a pavement management system, a sign management system, or even a geographic information system. All of these are management tools that will complement your CQI.

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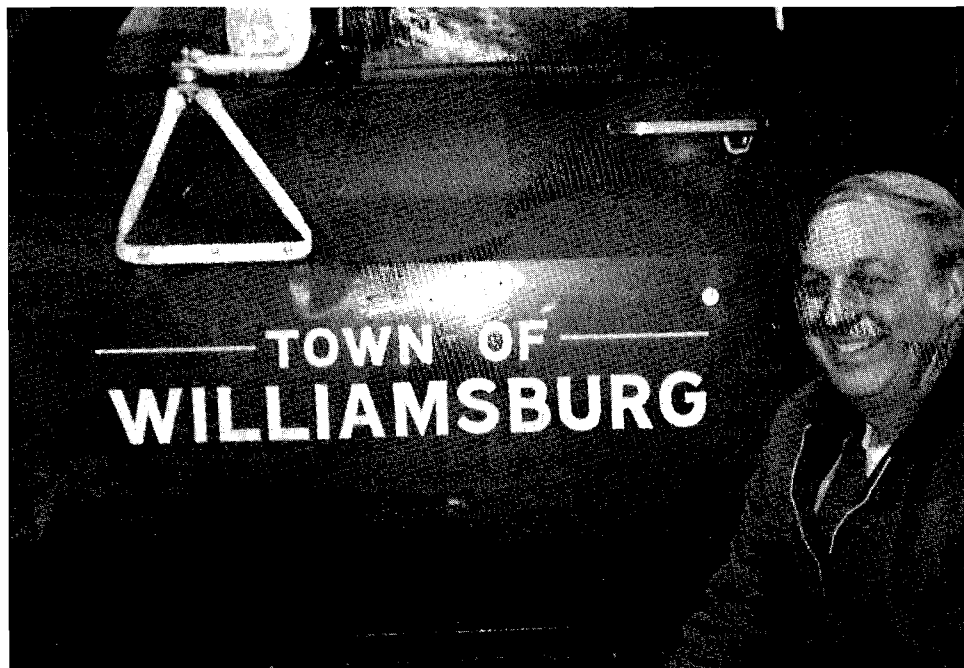


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ducting tests using in-house resources. Fortunately, a number of local private laboratories are qualified to offer pavement testing expertise to municipalities. They can assist in monitoring many aspects of active construction projects, such as sampling mix materials, testing the samples, overseeing and testing different phases of the construction process, and determining the acceptability of the end result. You may have heard of some of the methods and tools they employ: the nuclear density gauge, test cores and pits, the Marshall Mix test, Abson distillation using vacuum extraction, penetration and ductility tests, and the thin film oven test.

This article is too short to go into detail about the many tests and methods employed in the lab and out in the field. However, much has been written about pavement and plant testing, the types and applications of the various procedures, and about the many stages in the paving process where something can go wrong. One excellent reference that the Baystate Roads Program has in their library is entitled "Principles of Construction of Quality Hot-Mix Asphalt Pavements," an Asphalt Institute (AI) publication. You may borrow this report from Baystate Roads, or obtain a report copy directly from the Asphalt Institute (call Baystate Roads for details).

According to the AI manual, "The physical properties of asphalt that are of most interest to highway design, construction, and maintenance personnel are: durability, adhesion, temperature susceptibility, and aging and hardening." For aggregate, the properties to test include: "...maximum particle size and gradation, cleanliness, toughness, particle shape, surface texture, absorptive capacity, and affinity for asphalt." Simple and elaborate tests have been developed for both field and laboratory applications to evaluate the asphalt and aggregate samples. The samples are



Roger Bisbee, Highway Superintendent, Town of Williamsburg

checked for selected properties against a set of industry generated standards called ASTM or AASHTO test methods. The test results are then used to make conclusions about the quality of the construction materials and methods.

The plant inspector does extraction tests on the mix, and monitors the plant production for mixture temperature and for uniformity, quality, and consistency of the bituminous cement material. This testing/inspection may also include daily production rates, aggregate sampling from either cold or hot feed bins, asphalt cement sampling, extraction/gradation testing, and Marshall design conformance. Extraction tests separate the asphalt from the hot mix matrix, and then provide percent asphalt cement and gradation percent of the aggregate.

The balance of this article describes pavement testing experiences through the eyes of the highway superintendents in the towns of Westhampton, Williamsburg, and Sandwich, MA. According to Patrick Ellis, "It is a small price to pay when you consider what it gets you. We do it (pavement testing) for all types of

pavement projects, whether it's state-aid or not." He went on to explain that he hires an inspector to stay in the hot-mix plant during the entire duration of paving.

Pat feels that the extraction gradation tests are very important, because plant hot-mix performance is based on the actual mix component portion of a mix. Skimping on the asphalt content will considerably decrease the service life of the hot mix pavement, which will directly effect pavement management, "...and that's something you want to know. When you specify a certain mix, that's what you should get."

In Williamsburg, Roger Bisbee, Highway Superintendent, feels that "some of the paving jobs we've done have been kind of shaky before - some projects we did years ago. They started to show some deterioration before the rest of the road, which indicates to me that it's very important to do more than put stuff on the ground and roll it." He went on to explain, "Quite honestly, what they want is to get out as much mix as they can in a day, and it all looks the same for the first couple of years anyway. I

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really think that if you're going to spend that much money on something that ought to last for 12-15 years, than for just a little bit more money, you can make sure that you'll get all the life you can out of it."

Dick Tracy, Highway Superintendent for Westhampton, MA, had a similar experience. He said, "That's a road that I thought . . . great, we have 15 years of free time." He was trying to understand why the 4.5 mile, Federal Secondary "well built road" that he inherited from the state was not holding up "nearly as well as I thought it should...and pretty well not as long as the experts tell me it should." The recurrent theme with all three men was their desire to protect the tremendous long term investment their community had made in its roadway infrastructure.

Pat figures that "it generally ends up costing us, for every \$30,000 of mix that we put down, ...a little under \$1000 in plant inspection." Dick added that "a couple of year's back, our state district offices used to be at the plants and do all this kind of

testing, and they are no longer there...and so, if we want it done, we don't have anyone out there to watch out for us and we've got to take it up and do it ourselves."

Both Pat and Dick felt the state specifications used for most mix

"The recurrent theme with all three men was their desire to protect the tremendous long term investment their community had made in its roadway infrastructure"

designs should be tightened up. Pat explained that the current state specification parameters "are so broad, even on percent asphalt. That's why we get so alarmed when there is a problem with the testing, because we assume that if we've given [the hot mix producer] a range that [they] can fall into which is rather

broad. When [they] fall out of that range, that should really raise the red flag. Sometimes the mistakes are just human error". The mistakes can also be inherent plant maladies. There is a real need to insure that the mixture is properly designed and monitored in compliance with the state specification limits for the intended municipal application.

Most hot-mix plants do a professional, excellent job of hot-mix construction, but the bottom line is that municipalities are still responsible for the end product. Communities need cost-effective methods to ensure a quality product from all phases of road construction. The three innovative highway officials quoted in this article have expressed their belief that pavement testing and inspection provides that quality oversight. Many thanks to Roger, Dick, and Pat for their perceptive comments.

This article was written by Meryl Ann Mandell, MSCE.

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CALENDAR

April 27 & 28, May 4 & 5, 1993

Trenching and Microtunnelling
Hyannis, Amherst, Dedham,
and Southborough, respectively
Contact: Chris Ahmadjian or
Carol McCumber
Baystate Roads Program
(800) 374-ROAD (7623)

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May 25, June 1, 2, & 3, 1993

Hot Mix Asphalt:
From the Plant to Your Road
Amherst, Southborough,
Dedham, and Hyannis,
respectively
Contact: Chris Ahmadjian or
Carol McCumber
Baystate Roads Program
(800) 374-ROAD (7623)

December 5-7, 1993

Seventh Annual 4R Conference
and Road Show (Rehabilitation,
Resurfacing, Reconstruction,
Restoration)
Philadelphia, PA
Contact: Gillette Exposition
Group
(708) 298-6649

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Training:



Training is a vital component of CQI. A strong training program continuously renews and improves worker abilities. It also shows your workers that the department believes in them and their ability to advance.

Feedback:



Listen to everyone in the organization. The best improvement ideas can come from anywhere. This feedback will also tell you if your CQI is working.

Acceptance:



When the State of Colorado implemented its CQI, it found that:

20% of its employees were thrilled.
60% followed management's lead.
20% refused to change and resisted all CQI efforts.

Immediate implementation of CQI training stopped the 20% that will never change from influencing the rest of the employees. This training program was the only thing which outran the rumor mill. The 20% that wouldn't change had to be worked around until they messed up and were let go, or until they left by attrition.

Time:



Learning and experience curves will have to be traveled. During that time, more work, not less, will be required from everyone, especially managers. Remember, quality is free, but only after you travel the learning and experience curves.

Rewards:



- ◆ Higher efficiency and productivity.
- ◆ Empowered personnel who have more confidence and pride in their work.

DICK GRANT GIVES MINIWORKSHOPS

In December, Dick Grant and I traveled to the town of Milton to speak at their DPW foreman's meeting. The topic was Public Relations. Let me clarify my first sentence, Dick did 99% of the speaking. That was probably for the best, because his talk went very well. We learned a lot about Milton and hope they gained some insight into public relations.

In January and February, Dick gave miniworkshops in the towns of Lee, Harwich, and Newbury. These workshops lasted two to three hours, and covered snowplowing techniques and storm preparation. In addition, there was some discussion on public relations.

For those of you who do not know Dick, he is an engineering consultant for the Baystate Roads Program, and a retired superintendent of the Worcester Department of Public Works.

Dick started his career with the

Worcester DPW immediately after returning home from World War II. His started as a laborer. In the years that followed, Dick moved quickly up the ladder until he reached the top and became superintendent. Once at the top, Dick transformed his department from a stagnant bureaucracy, into an efficient organization, which is respected by the citizens of Worcester to this day.

If you would like to have a miniworkshop in your town, call us at:

(800) 374-ROAD

The service is free and the subject is up to you. All we ask is that you provide the room and the audience. There is no minimum size requirement for either the room or the audience.

I hope that we visit you soon and if you have questions or need more information, call me. -- Chris

- ◆ Improved public perception and respect.
- ◆ Better performance measurement.
- ◆ More ammunition and justification of needs at budget time.

The two most important things to remember about CQI are that there is no generic plan that works for everyone, and that this is not something which can be implemented as a quick fix. Results may not be seen for one year or several years; however, the final rewards do outweigh the initial increases in work load.

If you would like to discuss CQI's or want some written information, call me at (800) 374-ROAD (7623). I'd like to hear what you think. -- Chris Ahmadjian

NEW! BAYSTATE ROADS PROGRAM

TOLL-FREE NUMBER!

JUST CALL

**1-800-374-
ROAD (7623)**



"I GOT THEM POTHOLE BLUES"



Early England's roads were dirt over clay. Wheels gouged ruts into them. Pottery-makers, needing cheap clay to make pots, dug for it in spots where the ruts were deep. Teamsters of the day named those spots for us: "potholes."

- Syndicated columnist L.M. Boyd

One pass of an 18,000-pound single axle load on a truck has the same effect on an asphalt pavement structure as **9,600+ automobile passes.**

Think about that.





NEW LISTINGS

Instrumentation for Flexible Pavements - Field Performance of Selected Sensors, Volume 1, June 1992, U.S. DOT/FHWA. This report presents the results of a research study on methods for measuring strain and stress in bituminous pavements subjected to dynamic vehicle loading. The research program was divided into two phases. In the first phase, an extensive literature search was conducted to identify the existing pavement instrumentation and to select the most promising types of gauges for a field testing program. In the second phase, new concepts in pavement instrumentation were investigated.

Americans With Disabilities Act - Accessibility Guidelines for Buildings and Facilities, Transportation Facilities, and Transportation Vehicles. August 1992, U.S. Architectural and Transportation Barriers Compliance Board. The Americans with Disabilities Act (ADA) of 1990 provides comprehensive civil rights protections to persons with disabilities in the areas of employment, public accommodations, transportation, state and local government services, and telecommunications. This publication sets specific guidelines for compliance with the ADA in the areas mentioned above.

And other available publications:


The Engineer's Pothole Repair Guide, U.S. Army Corps of Engineers, March 1984
Comparison of Three Compactors Used in Pothole Repair, U.S. Army Corps of Engineers, November 1984
Pothole Primer - A public administrator's guide to understanding and managing the pothole problem, U.S. Army Corps of Engineers, Revised 1989
Rating Unsurfaced Roads - A field manual for measuring maintenance problems, U.S. Army Corps of Engineers, Revised September 1988

All of the above publications are available free of charge. To receive a copy, simply write, call or fax us with your request: Baystate Roads Program, 214 Marston Hall, Department of Civil Engineering, University of Massachusetts, Amherst, MA 01003.

Phone: (800) 374 ROAD (in state) or (413) 545-2604; Fax: (413) 545-2840

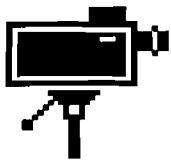
DID YOU KNOW...

pc-trans Magazine is changing to a free subscription. "What's the catch?" There is none. PC-TRANS simply realizes that there are a lot of transportation people who could benefit by the information in *pc-trans*. *pc-trans* offers technical support and information for transportation professionals at all levels of micro-computing: beginning, intermediate and advanced. Also, because PC-TRANS is an FHWA-designated software distribution center, people can get new transportation software as it becomes available. To order, call Meredith at (913) 864-5655, or write University of Kansas Transportation Center, 2011 Learned Hall, Lawrence, KS 66045.



Check out these videos for spring viewing!

- MO-119** *Potholes - Causes, Cures and Prevention*
- MO-109** *Pothole Repair*
- MO-110** *Guidelines for Spring Highway Use*
- ST-113** *Traffic Control for Short Term Work Zones*



VIDEOTAPE LENDING LIBRARY: NEW ACQUISITIONS

**Advance Warning (Flashing) Arrow Panels;
Barrier Delineation in Work Zones: The Well-
Defined Path ST-140**
(25 minutes; 24:20 minutes)

The first part of this videotape covers mode selections, design standards, application and placement, and cost and maintenance of arrow panels.

The next part of this tape discusses the Concrete Safety Shaped Barrier (CSSB). It reviews the function of CSSB's, the problem of visibility, current standards, two typical placement situations, delineation techniques, end treatments, and more.

Full Depth Reclamation MO-185
(12 minutes)

This tape provides a brief description of how to reclaim a road, and addresses types of roads/pavement conditions which may be candidates for reclamation.

**Modern Timber Bridges: A New Return for
Old New England DC-137 (10 minutes)**

This videotape highlights a bridge replacement project in Foster, Rhode Island. A modern timber bridge is constructed in place of a deteriorating existing bridge. The advantages of modern timber bridge construction are emphasized.

To borrow a copy of a videotape, simply write, call or fax us with your request.

The Baystate Roads Program, which publishes *Mass Interchange* each quarter, is a Technology Transfer (T2) Center created under the Federal Highway Administration's (FHWA) Local Technical Assistance Program (LTAP). FHWA is joined by the Massachusetts Highway Department, the Department of Civil Engineering at the University of Massachusetts/Amherst, and local public works departments in an effort to share and apply the best in transportation technologies.

In addition to publishing *Mass Interchange*, the Baystate Roads Program facilitates information exchange by conducting workshops, providing reports and publications and videotapes on request, and offering one-to-one technical assistance on specific roadway issues. Because the program relies on input from many sources, inquiries, articles, and ideas are encouraged.

To contact the Baystate Roads Program, call (800) 374-ROAD (in state) or (413) 545-2604.

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MASS INTERCHANGE

SPRING 1993

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