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Preventive Maintenance for Bridges

Coolidge Memorial Bridge crosses the Connecticut River

Claude Napier, Division Bridge Engineer for the Federal Highway Administration, Virginia Division, provided the material in this article. It is reprinted with permission from The Road Ahead, newsletter of the Virginia Transportation Technology Transfer Center.

Congress and our adminstration are placing increasing emphasis on the importance of maintenance--particularly preventive maintenance--in extending the service life of our bridges. One of our national objectives is to preserve and enhance the infrastructure of federal aid highways (with an emphasis on the National Highway System). The goal is to improve the condition of bridges so that less than 20% of the National Highway System bridges and 25% of all other bridges are classified as deficient in 10 years. The other objective is to improve the return on investment of the highway system by reducing the life-cycle costs of new and reconstructed highways by 25% in 10 years. It will take a concerted effort on the part of the states, localities, and the FWHA to accomplish these objectives.

Preventive Maintenance

The FHWA's *Bridge Maintenance Training Manual* defines *preventive maintenance* as the performance of maintenance in order to preserve bridge components in their present condition. Ideally, preventive maintenance should be performed on bridges to keep them in good condition; consequently, preventive maintenance does not normally address structural problems. Preventive

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Communicating Change

by Rockie Blunt
President, Blunt Consulting Group

For many years I considered " communication" the most important word in the English language. That view has changed recently, though: my vote now for the most important word is "change". Why? Because change is all around us-- in our personal lives, on the job and across society as a whole--and it is happening at an ever-accelerating rate of speed. Change is essential for progress; without it individuals and organizations become stagnant, then wither away. But it also has the potential, as everyone knows, to be unsettling and intimidating.

Maybe this is where the word "communication" comes back in. When your department or organization is undergoing change, how do you send that message? It is unrealistic to think you can erase every bit of nervousness under these circumstances, but here are six tips for making people less anxious when new developments take place on the job.

Listen to employees at all levels. Listening is the "forgotten" communication skill. As a manager, your first responsibility is to your employees, and this means paying attention to what they are saying (or not saying) in difficult times. Understanding what's on their minds will help you determine what you have to say to them.

Acknowledge anxiety. Remember, change is often perceived as a threat. The smallest alteration can make individuals nervous, and you are doing them a disservice if you try to brush off their fears. Let them know that you realize how they're feeling.

Explain the need for change. It's amazing how often employees are told that changes are going to happen without telling them why. Give them some background information on the conditions that have led to the change. This point leads directly to the following one:

Outline the benefits. Once you have explained why the change is necessary, tell them how they are going to benefit. What's the up-side for them? What will they get out of the change, whether it's an external gain (a new title, added responsibilities) or internal (professional development, a great contribution to the department)?

Help people understand its impact. Going beyond the benefits, acquaint your employees with the "big picture." What ramifications will this have for them-- or their relationships with co-workers? How will everyone's routine be different now, and what will those differences mean to the organization?

Finally, and most importantly, **tell the truth.** You don't accomplish anything by sugarcoating the situation or intentially obscuring the nature or importance of the change. Your staff can deal with the change, even if it means bad news, but they can't deal with misinformation. Honesty *is* the best policy.

April 9-13, 2001

National Work Zone Awareness Week

National Work Zone Awareness Week is a national campaign to help increase public awareness of work zone safety needs from the driver as well as the highway worker perspective. The American Traffic Safety Services Association (ATSSA), in partnership with the Federal Highway Administration and the American Association of State Highway and Transportation Officials, participates in national and local activities to help educate the nation on work-zone related injuries and fatalities and the hazards and dangers that can be encountered and avoided. *For more information call (800) 272-8772, ext. 113, or go to www.atssa.com.*

May 13-19, 2001

National Transportation Week

NTW was first designated by Congress over 30 years ago to draw public attention to the importance and benefits of transportation. More than 20 national transportation organizations have worked together to share ideas and build interest in NTW. NTW provides an opportunity to share with the public the achievements in transportation and the challenges facing the industry. In addition, it brings together transportation professionals in a common purpose, especially the next generation of transportation workers -- young people. *For more information call (877) 558-6874 or go to www.ntweek.org.*

May 20-26, 2001

National Public Works Week

National Public Works Week, Sponsored by the American Public Works Association (APWA) offers public works officials the opportunity to publicize the importance of public works to their communitites. The 2001 theme is "Working In The Public Interest." Many APWA Chapters hold special events, such as an environmental campaign, exhibits, rodeos and equipment shows, an open house, employee appreciation day, or sporting events. *For more information call (816) 472-6100 or go to www.apwa.net*

September 5-6, 2001

Eastern Winter Maintenance Symposium and Equipment Expo

Worcester Centrum

The winter maintenance symposium serves as a companion to the American Public Works Association's annual Western Snow and Ice Conference. It is targeted at winter maintenance managers and other public works professionals from cities, townships, counties, and States east of the Mississippi River.

Participants can choose from breakout sessions especially designed for managers, equipment operators, and a general audience. The manager's track features sessions on such topics as privatization of winter maintenance operations and route optimization systems. Operators, meanwhile can choose from sessions on subjects ranging from the effective use of snow fences to using automated bridge deck deicing systems. The general track features discussions on anti-icing vs. deicing, fleet management, and procurement of winter equipment, among other topics. *For more information, contact Deborah Vocke at FHWA, 410-962-3744 (fax: 410-962-3655; email: deborah.vocke@fhwa.dot.gov)*

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maintenace is usually divided into two categories: (1) maintenance performed at specific intervals, and (2) maintenance performed as it is needed. Here are several examples of maintenance to be performed at specific intervals:

* Cleaning decks, seats, caps, and salt splash zones.
* Cleaning drainage systems.
* Cleaning expansion joints.
* Cleaning flanges of steel beams.
* Cleaning gusset plates of truss bridges.
* Cleaning and lubricating expansion bearing assemblies.
* Sealing concrete decks or substructure elements.

Here are some examples of preventive maintenance that are performed when bridge safety inspectors or maintenance personnel say that it is needed:

* Resealing expansion joints.
* Spot painting of steel members.
* Placing bridge overlays.
* Extending or enlarging deck drains.
* Removing debris from the channel.

Preventive maintenance must be an integral part of any bridge maintenance program. Maintenance programs need to be proactive rather than reactive. Knowledge of the best time to make use of a specific repair method is essential to economical bridge repairs. Bridge maintenance strategy needs to be developed to handle minor repairs to good bridges at an early stage and to determine the extent of repair or rehabilitation required at later years. Effective bridge maintenance programs improve safety, extend the service life of our structures, and reduce the frequency and costs of repairs.

Three Important Maintenance Activities

The three preventive maintenance activities that provide the "biggest bang for the buck" when performed in a timely manner are:

* Sealing or replacing leaking joints.
* Overlaying decks.
* Spot painting.

These treatments should be applied before the bridge elements have begun to deteriorate significantly. Sealing or replacing leaking joints can save us millions of dollars a year by minimizing the deterioration of the superstructure and substructure elements beneath the joints. Leaking joints cause the accelerated deterioration of the ends of girders, diaphragms, bearings, abutment and pier seals, abutment breast walls, and pier caps and columns. When repairing elements deteriorated because of leaking joints, the leaking joints should also be repaired.

Bridge deck overlays can significantly increase the service life of the deck by sealing the deck from aggressive solutions and thereby reducing the impact of aging and weathering. Spot painting those areas where the paint deteriorates the fastest can slow down the deterioration process and extend the service life of the paint system. In many instances, corrosion-related damage to our bridges is preventable or at least can be slowed significantly by performing preventive maintenance.

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Ordinary maintenance practices for structures and bridges

1) Remove snow that has been plowed and deposited on the shoulder of the bridge. The reasons for this are: (1) The heating and cooling characteristics of a bridge deck makes it more likely that the snow will melt and refreeze on the bridge before it does on the adjacent roadway. (2) The snow will prevent water from running off the bridge deck. (3) The snow will block the deck drains. (4) The snow will trap and hold chemicals that are harmful to the bridge deck. (5) On east-west routes, the deck area on the north side of the south parapet will not receive direct sunlight and the associated heating benefits.
2) Bridges that receive deicing chemicals and abrasives should receive a thorough cleaning after each winter season. This should include cleaning and flushing the deck.
3) Leaking deck joints should be resealed as soon as practical. This includes resealing cracks in the concrete deck or concrete backwall adjacent to the joint. The shrinkage cracks in the backwall do not affect the function of the abutment, but the cracks allow moisture to bypass the joint sealer. Also, longitudinal deck cracks near the edges of the beam flanges may allow water to by-pass the joint sealer.
4) Deck drains should be cleaned as frequently as needed. This includes cleaning the drainage slots beneath the curbs or parapets and cleaning the trough (gland) below the finger type of expansion joints.
5) Seal deck cracks. This will reduce the intrusion of water that can freeze and cause deterioration of the cement in the concrete and corrosion of the reinforcing steel, structural steel, and metal stay-in-place forms.
6) Clean all debris and vegetation from the bearing seats and cut all overgrown vegetation adjacent to, or under the structure. This should be done when problem is noted in the bridge safety inspection report or when directed by the district structure and bridge office.
7) Remove debris that has been lodged against the substructure by flooding. The debris reduces the effective waterway opening and, during flooding, significantly increases the force of the stream flow against the substructure.
8) Remove from the superstructure all dirt, bird droppings, or other debris that could trap and hold moisture. This should be done when problem is noted in the bridge safety inspection report.
9) Correct rough riding bridge decks and/or roadway approaches. Additional asphalt should not be placed on a bridge deck without the approval of the Massachusetts Bridge Engineer.
10) Place surface treatment on bare timber decks. The surface treatment provides a textured riding surface, provides protection to the timber planks, and provides a partial seal between adjacent planks.
11) At stream crossings, repair slope protection and scour erosion areas. This should be done when problem is noted in the safety inspection report.
12) Spot paint structural steel. In order for this to be effective, the surface to be painted must be properly prepared. Painting should be performed only when problem is noted in the safety inspection report.
13) Repair concrete spalls. This includes repairing potholes in the bridge decks and repairing spalled or delaminated concrete elsewhere in the superstructure or substructure.
14) Clean, lubricate, and adjust (reset) bearing assemblies. Aside from lack of edge distances on masonry plates and anchor bolts, frozen expansion bearings are the major cause of seat spalls. This work should be done when problem is noted in the safety inspection report.
15) Tighten floor fasteners on timber plank decks. This should be done when problem is noted in the safety inspection report.
16) Replace worn/deteriorated timber planks when problem is noted in the safety inspection report.
17) Remove silt/debris from the barrels of culverts when problem is noted in the safety inspection report.
18) Pave the flow lines of culverts when problem is noted in the safety inspection report.
19) Apply a preservative to the cut ends of timber members in accordance with the section of the *Road and Bridge Specifications* on timber structures.
20) Replace weight-limit posting signs, vertical-clearance posting signs, object markers (delineators) and narrow-bridge warning signs as needed.
21) Grade unpaved shoulders on the high end of the bridge. Build-up of gravel, dirt and vegetation can prevent the roadway drainage from flowing into a ditch or over the shoulder. Consequently, the approach roadway runoff on the uphill end of the bridge will be channeled onto the bridge.

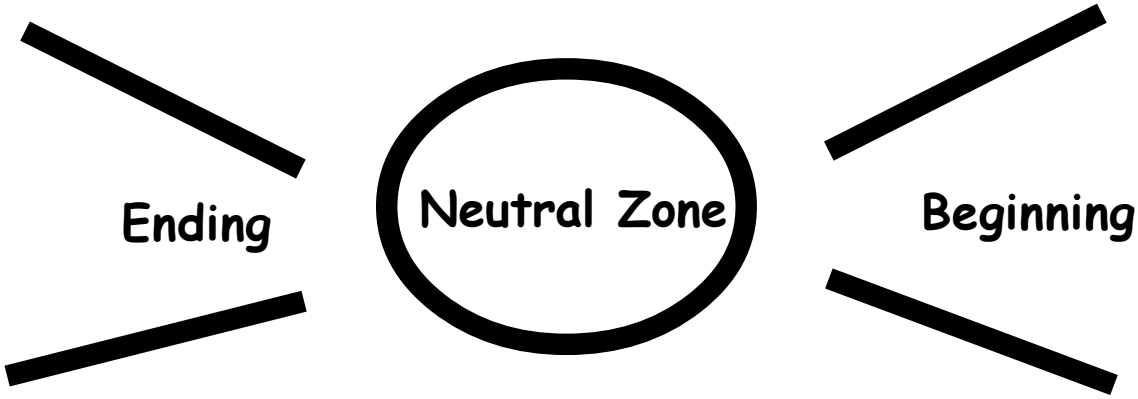
There's Been A Change. Now What?

by Rockie Blunt
President, Blunt Consulting Group

Everyone talks about change, but there's a related concept, one that's just as important, which doesn't get as much attention: the process of transitioning.

It's easy to assume that "change" and "transition" are the same thing, but they're not. A change is an alteration in the status quo: something has been added, taken away or made different. A transition, on the other hand, is the process of dealing with the change. Getting used to it. It's the reaction to the change.

Let's use the example of an employee who is promoted to supervisor. The change in job title and status is the change, but what's the transition like? As William Bridges, author of the book *Transitions* (Addison-Wesley Press), says: "every transition begins with an ending." In fact, it might be helpful to refer to the following diagram showing the three stages of the transition process:



Ending. This is, ironically, the starting point-- the employee's previous job, which is now concluding. Even though the employee is happy to have the promotion, the previous job represents familiarity, certainty and known expectations, all of which are difficult to let go of. Furthermore, depending on the nature of the department and its requirements, the employee might be expected to continue performing some of these "old" duties for a while after the promotion. In any case, the key word in this stage is *separation* from the former state.

Neutral Zone. This can be the most challenging stage of the process, the place where the real *transition* takes place. In the "neutral zone," the employee feels disoriented. Promotions are positive experiences, but they can bring with them questions, confusion and insecurities. "Can I do the job? Am I up to it? What new things am I going to have to learn? Who will I be working with? How will my former co-workers treat me now? How am I supposed to treat them?" Although these feelings are uncomfortable, they are a natural part of the process. Instead of trying to avoid them, take your time dealing with them.

Beginning. The key word here is *incorporation.* The feeling of separation comes to a close; the employee has become oriented to the supervisory role and now feels settled in the new position. The learning curve will continue, and there might be times when it is tempting to look back wistfully at the previous job, but now the person is feeling-- and acting-- like a supervisor. The transition process is complete.

HOT ICE TIPS

Interested in discussing the merits of various deicing and anti-deicing chemicals or the lastest in snow and ice control methods and materials? Looking for new information on such topics as the pros and cons of measuring pavement, temperatures with truck-mounted, infrared thermometers? You can find all of this and more on the **Snow and Ice List Serve** maintained by the University of Iowa. The List Serve currently has about 400 subscribers, many of whom work for state, city, and county agencies.

To subscribe to the List Serve, send an email to: snow-ice-request@list.uiowa.edu. In the body of the message, type "Subscribe." If you have questions or would like more information, send an email to: owner-snow-ice@list.uiowa.edu.

Massachusetts Highway Association Education Conference and Annual Meeting

May 2 & 3, 2001- Indian Meadow's Conference Facility, Westboro, MA

Massachusetts Highway Association Equipment and Trade Show

June 14, 2001- Fort Devens, Ayer, MA

For information on both events contact:
Gerard Daigle (508) 883-6624

New Publications

BIK-18 --A Comparative Analysis of Bicycle Lanes versus Wide Curb Lanes (October 1999) FHWA

BIK-19--Bicycle Lanes Versus Curb Lanes: Operational and Safety Findings and Countermeasure Recommendations (October 1999) FHWA

CDROM-28--Data Pave 2.0 Around Our World (October 1999) FHWA

COC-55--Materials and Methods for Corrosion Control of Reinforced and Prestressed Concrete Structures in New Construction (June 2000) FHWA

D&C-80--Guidelines for the Use, Design, and Construction of Bridge Approach Slabs (November 1999) VTRC

D&C-81--Older Driver Highway Design Handbook (1995) FHWA

DRA-49--Field Evaluation of the Long-term Performance of Geocomposite Sheet Drains (December 2000) US Dept. of Agriculture

DRA-50--Hydraulic and Physical Properties Affecting Ice Jams (December 1999) US Army Corps of Engineers

MAN-51--Transportation Management Center Concepts of Operation (December 1999) FHWA

PLA-50--Community Impact Assessment (September 1996) FHWA

PLA-51--Smart Moves (1996) FHWA

Stop Red Light Running

Each year, more than 1.8 million intersection crashes occur. In 1998, red light running crashes accounted for 89,000 crashes, 80,000 injuries and nearly 1,000 deaths. Public costs exceed $7 billion. The goal of the **Stop Red Light Running (SRLR) Program** is to reestablish respect for traffic signals to enhance the safety of drivers and pedestrians in communities nationwide, while reducing the number of trauma center admissions caused by this traffic problem. Information at: **http://www.fhwa.dot.gov**

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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 and Environmental 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.

LTAP Local Technical Assistance Program

To contact the Baystate Roads Program call (413) 545-2604 or FAX 413-545-6471.

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