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Are We There Yet?

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In This Issue...

SCDOT
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Perform Benefit-Cost Analysis Online with New FHWA Program

When making decisions about roadway projects, transportation agencies should consider a range of benefits and costs. Will a project's performance warrant the resources needed to build it? Which project alternative will result in the greatest net benefit and the most return on taxpayer dollars? The Federal Highway Administration's (FHWA) new online, browser-based benefit-cost analysis tool, BCA.Net, is designed to provide valuable support to the roadway decision making process.

Using BCA.Net, transportation agencies can:

- Manage economic analysis data.
- Select from an array of sample data.
- Develop alternative strategies for improving and managing highway facilities.
- Evaluate and compare the benefits and costs of alternative strategies.

BCA.Net can also help agencies determine the optimal timing for a project. The tool can be used to evaluate projects involving new lane capacity and other improvements to operational efficiency, as well as reconstruction and preservation strategies. New features to be added later this year will include enhanced traffic analysis.

BCA.Net evaluates projects based on capital and maintenance costs data, the projects' physical and performance characteristics, forecast travel demand, and the economic value of benefits to users. Required data inputs include such items as the project facility type (urban freeway, urban arterial, etc.); type of improvement being considered; project length; number of lanes; pavement condition and deterioration rate; crash rates; current and projected traffic levels; vehicle mix data; vehicle type and occupancy data; and right-of-way, construction, and operation and maintenance costs. "Most of the data should be available to the model user based on existing planning, design, and engineering studies," says Eric Gabler of FHWA's Office of Asset Management. The model provides default data for economic factors such as the value of travel time and vehicle operating costs and also calculates travel time savings based on facility characteristics and projected traffic levels. The user can override any of the default data in the model with location-specific data.

The user specifies a base strategy and alternative strategies for improvement and maintenance of the facility. BCA.Net calculates the traffic impacts and agency and highway user costs and benefits for each strategy and compares them, generating measures such as the net present value, benefit-cost ratio, and rate of return for the alternative strategies relative to the base strategy.

BCA.Net has report writing capabilities for all analysis results and their associated statistics. The tool also accommodates risk analysis. The risk analysis features of the program allow the analyst to develop probabilistic inputs and results, thus ac-

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Tech Brief: Valve Exercising

Published by the National Environmental Services Center

by Zane Satterfield, P.E., NESC Engineering Scientist

Summary

Every water system has valves—devices that regulate, stop, or start the flow of water in the distribution lines. Being able to operate these valves at a moment's notice is extremely important. In an emergency, sections of a distribution system may need to be shut down without delay. However, if a valve is not used over a period of time it can seize-up from corrosion and get stuck, making the valve inoperable. This Tech Brief examines typical valve exercising programs that can help maintain the useful life and operation of water system valves.

Where, oh where are my valves?

Most water systems would be hard pressed to say that they know where all their valves are. Others would be happy to know where half of them are. Many systems are reluctant to take on a valve exercising program because of labor costs or the fear of needing additional tools.

While not knowing the location of a system's valves makes the job more difficult, it is not a good reason for not undertaking an exercising program. Yes, it will cost money—especially if you have to replace valves that are no longer functional—but the benefits of such a program far outweigh the negative. After all, system valves are there for a reason and if they aren't working, shouldn't they be fixed or replaced?

Some of the benefits of fully operational valves include:

- Being able to isolate a water main break, meaning reduced water loss, easier repairs, and less property damage.
- Knowing where the valves are will help locate the rest of the distribution system, which is often an issue, particularly with older utilities.
- Obtaining detailed information on the valve type and size, as well as the line where it's located.
- Having confidence the valves will last much longer.
- Paying less overtime. If you can't isolate the leak or find the valves you can run into significant labor costs repairing those leaks in an emergency.
- Being able to isolate part of the system from a terrorist attack.

Software is available to help manage the valves in the distribution systems.

Getting Started

A good first step in a valve-exercising program is to prioritize the valves. The most important valves are usually those near critical customers such as hospitals. Other factors could include the amount of flow through the valve, being the oldest valve in the system, or proximity to a main intersection on a busy street. Exercise one valve at a time based on the priorities you establish.

The main components to a valve exercise program are:

1. Find and document the valve's location. Note the precise location using global positioning system (GPS) equipment, by traditional surveying, or by measurement based on two or more objects that will be there for a long time. Take a digital picture showing the valve and surrounding area. The point is: don't lose the valve once you have found it.

For more information about finding distribution lines, see the Tech Brief "Locating Distribution Lines" on the National Environmental Services Center Web site at www.nesc.wvu.edu

2. Operate the valve. Exercising the valve is operating the valve at least one full cycle until the valve operates freely with little resistance. This may take several full cycles. (A more detailed discussion on the actual exercising is found below.)

3. Keep and maintain detailed records for each valve. This includes mapping locations on as-built drawings or road maps and maintaining both electronic and hard copies. (Record keeping is discussed in more detail below.)

4. Schedule and perform needed repairs. Often, valve boxes are out of alignment, so much so that a key (a steel handle used for manual turning that come in multiple lengths) cannot get on the valve. Valves are sometimes broken during the exercising program because they have not previously been used. Fixing the broken valves in a timely manner is very important.

5. Repeat these steps on a routine basis. Experts recommend exercising a system's valves annually if possible, or at least once every two years. Some valves will need to have a different schedule than others based on their location or unusual operating conditions. It's usually a good idea to perform the exercising program during moderate weather conditions.

As mentioned at the beginning, the location of many valves is a mystery. Use a metal detector to locate valves in the distribution system.

When you find a lost valve, note it on system records and mark the location with blue paint so it is easier to spot. If the valve is in a field, a five-foot blue flag or fence post painted blue will work.

For more information about valves, see the Tech Brief titled "Valves" on the National Environmental Services Center Web site at www.nesc.wvu.edu

Essential Tools

Most water systems should already have the tools needed to do an exercising program. If not, you will need to budget to buy, lease, or rent them. The following is a list of useful tools for valve exercising:

- A utility vacuum cleaner for cleaning accumulated sediment from the gate valve box. Some models are mounted on a trailer or can be installed in the back of a pick-up truck.
- Valve keys or valve box keys for all sizes in your distribution system and extension kits if needed.
- Valve exerciser tool. There are portable, truck-mounted, or trailer-mounted exercising tools. A combination of one portable and either a truck-mounted or trailer-mounted model is desirable. These tools can be powered by electric, hydraulic, or pneumatic means. Keep in mind that for the portable valve exerciser, you have to provide the power supply (i.e., a generator for an electric tool, a hydraulic pump for hydraulic, or an air compressor for the pneumatic).
- A good metal detector to find buried valves.
- Shovels, 20- or 25-foot tape measures, and a 100-foot real tape measure, blue paint to mark the valve box lid when finished, oversized screw driver to aid in removing the lid, flashlight, system maps, street maps, journal (record) book with waterproof pen or pencil, and a digital camera to have a visual record of location.

Don't forget about safety. A flag crew may be needed to direct traffic in some locations.

Exercising Valves

The following are important details when turning the valve. These details should be used with any operation or excising of a valve:

- Don't force the valve.
- Don't be in a big hurry.
- Use the lowest torque (turning force or rational force) setting possible.
- Avoid using a cheater bar (a handle extension that allows for greater torque). A cheater bar should only be used in emergencies.
- Do not close the valve on the first cycle.
- If and when the valve is nice and free, turn it slowly to avoid water hammer. If you open or close a valve too fast the line could rupture.
- Listen closely. Sometimes you can hear the flow change when operating a valve. This will help determine if the valve is moving.
- Because debris can be stirred up during valve exercising, notify the public before starting the process. This will keep the dirty water complaint calls down.
- Consider doing your flushing program at the same time as your exercising program.
- Always count your turns down and up. They should match.

The American Water Works Association (AWWA) provides these guidelines about how to close a valve properly:

1. Begin with a steady amount of torque in the direction necessary to close the valve, moving through five to 10 rotations.
2. Reverse for two or three rotations.
3. Reverse again and rotate five to 10 more turns in the closing direction.
4. Repeat this procedure until full closure is attained.
5. Once the valve is fully closed, it should be opened a few turns so that high-velocity water flowing under the gates can move the remainder of the sediment down stream with more force and clear the bottom part of the valve body for seating.
6. Fully close the valve again.

"The reason for this cautious approach is that debris and sediment often build up on the gates, stem, and slides," the AWWA's guidance notes. "If this material is compacted while the valve is being closed, the torque required to close the valve continues to build as the material is loaded. If the procedure described above is used, the stem and other parts are 'scrubbed' by the series of back-and forth motions, and water in the system can flush the debris that has broken loose away from the stem gate and slides or guides." It is advisable to open a nearby fire hydrant to flush the debris that is being cleaned from the gate valves.

Remember that valve manufacturers have detailed operation and maintenance procedures for each of the various types of valves. Some valves have a seating where a resilient coating meets stainless steel. Other valves have actuators isolated from the water flow, meaning that some of the mechanical parts are not subject to as much corrosion and, therefore, may need less exercise. When in doubt, follow the manufacturers' guidelines.

Not as Easy as it Looks

If valves haven't been used in some time (or ever), you will encounter difficulties during the exercise program. The most common problem will be locating some of the valves and if these valves have been lost for a long time, they will need attention.

Another common problem is when the valve is already broken from previous attempts to operate it or the valve stem or operating nut breaks before any movement of the gate. These broken valves need to be repaired as soon as possible. If you see water gushing as you begin turning the key, the bonnet bolts have most likely broken. Look on the bright side, though: it's better to uncover these problems now than in the middle of the night when the valve is needed.

Some valves seem to be working fine until you get near the closed position and then the gate breaks at or near the closed position. This is most likely caused by tuberculation (build-up) in the gate valve. The worst tuberculation usually occurs at the bottom of the gate valve.

When exercising a valve, resist the urge to "crank it" hard. Dennis Blakely, an account executive with E.H. Wachs Company and an expert on valves, says, "I have seen valves that turn fairly easily all the way down to the near closed position and then require 10 times more torque to get them to open back up. This is caused by using too much torque the first time you get into the near-closed position. Control of the torque is critical in this situation."

Once you've located valves in the system, keep good records about them. Document as much information as possible, including valve size and type, function, manufacturer, type of access, normal position (open or closed), whether the valve opens right or left, date installed and maintained, and the number of turns required to open or close the valve completely. Master records should be maintained in a central location with an easily printed copy that can be taken out in the field.

Increasingly, systems are using GPS to record the location of valves. GPS can be very useful in area where a hurricane might deposit several feet of sand over a neighborhood.

If your water system has access to a survey crew, map the valves with bearing and distance using a transit. Another method is to use existing as-built drawing that your system may have to denote location.

The reality, however, is that many small water distribution systems don't have the budget for GPS or surveying and no as-built drawings exist. In this situation, use a detailed road map and a tape measure taking at least two measurements from existing objects such as telephone poles, the corner of sidewalks, or buildings to the valve (more then two measurements are better in case one of the objects disappears over time). Write the measurements on the detailed road map for future reference.

One Valve at a Time

Just getting started can be the biggest hurdle. Water systems will look at the entire system and number of valves with an overwhelming sense that this is an impossible task to accomplish. "In reality, a modest beginning can achieve immediate positive results," Blakely says. "With technological advancements in tooling and proper training, a well conceived valve exercise program will have a high percentage of positive results. With good planning and execution, a valve exercise program will realize a very low percentage of negative results.

"These facts seem to contradict the general opinion throughout the water utility industry that an exercise program will cause more work and aggravation than it is worth," he continues. "This is simply not the case. The majority of negative results are due to a lack of a valve exercise program in the past. Once problems are identified, repairs can be budgeted and scheduled."

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counting for the uncertainty associated with analysis inputs.

The program is available online at no cost and does not require the installation of software on a user's computer. Users can store up to 10 data sets on the BCA.Net server. Data may also be archived on the user's computer and restored to the BCA.Net system for use in subsequent sessions.

To begin using BCA.Net, visit https://fhwaapps.fhwa.dot.gov/bcap. Three walk-through training exercises are available under the "Help" section of the online tool. The first exercise guides users through the basic features of the tool as it performs a sample project evaluation. Two additional walk-through exercises highlight more advanced features. "The exercises not only demonstrate how to use the model, but also how to set up a project for economic analysis. We strongly recommend that users go through the exercises before getting started," says Gabler.

For more information on BCA.Net, contact Eric Gabler, FHWA, at 202.366.4036 or at eric.gabler@fhwa.dot.gov.

To learn more about using economic analysis methods in transportation decision making, visit www.fhwa.dot.gov/infrastructure/asstmgmt/invest.htm.

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Talk is Cheap, Communication Priceless
Practical Information for Engineers and Their Colleagues

by Patricia L. Lees and James E. Nichols

- Sarah said that they knew how to fix the road but didn't know how to convince the community that the fix would work.
- Bob said his unit had a 14-month backlog and that if there was a way to change what they do, he'd be the first in line.
- Paul said his 26-mile project included farms, a ski resort, a bear habitat, a nuclear waste site, and an Indian reservation, and he wondered whose advocates he should listen to first.
- Steve had 930 slides for a three-day course and knew that all of them had to be presented.

No formula or checklist is available for solving communication problems like these. People who work with engineers know that a checklist would be a good start—but talking about such problems is still necessary, whether the setting is a state department of transportation (DOT), a national agency like the Federal Highway Administration (FHWA), or a private engineering firm.

The type of training that engineers have completed, the kinds of work assignments they have had, and the assumptions they make about the world and about themselves are relevant in communication. The jokes about engineers, which circulate every few years, probably were written by engineers—they know they have issues with their social skills and that they tend to see things more as problems to solve than as relationships to cultivate.

Engineers generally are logical, methodical, and problem-solving and tend to assume that everyone else is too. Because engineers are smart, they accept new data that can help solve a puzzle. Therefore the key to converting an engineer to a successful communication style is to provide the reasons for changing, to offer examples and coaching in a nonthreatening environment, and to create and share a positive learning experience.

To improve communication with colleagues and with nonengineers, an engineer should know: the audience; something about how adults learn, as well as his or her own preferred style of learning; the specialized knowledge and skills required for effective communication; and that going outside the comfort zone may be necessary.

Engineers encounter four main trouble spots for communication:

- Making presentations,
- Designing training programs,
- Engaging public involvement, and
- Becoming managers.

Because of their respect for procedures, engineers listen, test, assess, and adjust in their communication experiences, just as in the technical aspects of their jobs. Although engineers may respond to suggestions or requirements with initial resistance, data and experimentation win out.

Making Presentations

Whenever a professional from a DOT thinks about presenting a paper, the presentations at the annual meetings of the Transportation Research Board (TRB) serve as the likely models, even when the audience is local and nontechnical. Historically, the TRB model has resembled academic presentations, with the speaker reading a formal paper aloud. The presenter may use PowerPoint for visual aids. The audience listens carefully and then joins in the question-and-answer period, as time permits—but invariably the material exceeds the time.

Most people in audiences, however, have an 8- to 12-minute attention span—and then expect a commercial break. Add the urge for multitasking, the presence of portable wireless communications devices, and a few people with attention deficit– hyperactivity disorder, and an audience's attention span can contract even more. An effective presenter therefore develops strategies to keep the audience engaged.

Today all parties to a project want to be involved, to learn about what is happening, and then contribute to the discussion. This includes the project management team with subject matter experts from many disciplines, as well as the community gathered to learn about potential projects in their neighborhood. In the past, when organizations emulated top-down, military systems, the lead engineer would be in charge, and many believed that the efficiency of that approach outweighed outside participation or shared decision making.

Times have changed—project teams include water and air specialists, archaeologists and historians, and demographers and economists. Communities want to do more than comment on proposals—they want to influence and perhaps control decisions that affect their quality of life. This represents a big change not only for veteran engineers, but also for recent graduates, who may not have experienced public involvement during their academic work. Understanding this shift of roles and the disruption it may cause is important.

Audience Characteristics

The first need is to know something about the audience—

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Winter Weather: More Dangerous Than Drunk Driving?

Laws against speeding, drunk driving, and other irresponsible behavior on the road are designed to protect motorists and pedestrians. But extreme weather is another danger travelers face, and oftentimes the risks it poses are just as high – and in some cases, higher.

To quantify the risks of driving in extreme winter weather, Tom Maze, Iowa State University professor and director of the Center for Weather Impacts on Mobility and Safety (C-WIMS), and research engineer Zachary Hans conducted a study using 10 years' worth of crash data from the Iowa Department of Transportation (www.ctre.iastate.edu/research/inprogress.cfm). Maze presented findings from the project summary.

The researchers found that in both rural and urban areas, traffic crash rates increase during inclement weather, but the severity of those crashes tends to be higher in rural areas than in urban ones. This is because during snowstorms, traffic in urban areas slows due to congestion, so crashes tend to occur at lower speeds than they do during clear conditions. But in rural areas, where the traffic is less congested, drivers can select their own speed, allowing some drivers to travel at speeds too high for the extreme conditions. This results in higher average crash severity during winter weather in rural areas.

They also found that crashes involving winger weather in both urban and rural areas tend to be more severe on higher design standard facilities, like interstates and freeways, compared with lower speed roadways. Although the reasons for this are unknown, they speculate that higher design standard facilities allow drivers more opportunity to drive at speeds unsafe for the conditions.

Severe winter storms increase the risk of being involved in a crash by as much as 25 times – much higher than the increased risks created by behaviors that state governments already have placed sanctions against, like speeding or drunk driving. "Highway agencies might wish to better manage and restrict the use of highways during times of extreme weather," Maze argued, given the higher crash risks they documented.

Another interesting question Maze posed was whether people need to "re-learn" how to drive in winter weather every year. The study showed that the first snowstorm of the year tends to have higher crash rates and higher rates of crash severity than other snowstorms during the remainder of the winter. The research also found the winter winter-involved crash rates declined over the entire season; this demonstrates that as drivers are exposed to more snowstorms, they become more expert at driving in winter weather conditions. The same trend occurred in data sets from every year the researchers studied, leading them to conclude that drivers do, in fact, seem to forget their lessons about winter driving each year after the snow melts. Maze concluded that relative winter weather crash frequency and severity is dependent on three factors: the location (urban or rural), the type of roadway, and driver experience with winter weather. Maze's findings were presented to the Iowa DOT to help officials make adjustments to snowplow routing and schedules and winter maintenance application, as well as to address the winter weather crash risks this research uncovered.

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who they are, why they are involved, and what issues they bring. The audience shares some of the characteristics of adult learners and some of the characteristics of the professionals engaged in the project. The presentation should be designed accordingly.

Malcolm Knowles, one of the pioneers in the field of adult learning, identified the following characteristics of adult learners (1):

- Adults are autonomous and self-directed. They need to be free to direct themselves. Teachers therefore must involve adult participants actively in the learning process.
- Adults have accumulated a foundation of life experiences and knowledge that may include workrelated activities, family responsibilities, and previous education. They need to connect learning to this base of knowledge and experience.
- Adults are goal-oriented. They know their goal when enrolling in a course. Therefore they appreciate an educational program that is organized and has clearly defined elements.
- Adults are relevancy-oriented. They must see a reason for learning. Learning has to be applicable to their work or to other valued responsibilities.
- Adults are practical, focusing on the aspects of a lesson most useful to their work. They may not be interested in knowledge for its own sake.
- Like all learners, adults need to be shown respect. Instructors must acknowledge the wealth of experiences that adult participants bring to the classroom.

This information may seem more relevant to training than to presentations, but in both cases, the audience is there to learn. These learning characteristics provide guidance for a presentation:

- State the purpose or the goal up front. Give the audience a reason to pay attention.
- Organize the presentation to keep the audience engaged. Telling a story helps people remember.
- Link the material to the experiences of the audience. Adults are tuned into radio station WIIFM, "What's in it for me?"
- Guide the audience to opportunities for application. End with a call to action that keeps the audience thinking about the message.

Audience Interaction

Presentations may appear to be a one-way communication but can be made interactive. The presenter can trigger more than one sense—for example, have the audience complete a diagram, draw conclusions from a chart, solve a problem as a group or by conferring with the next person, call out answers or comments, or stand up and sort themselves according to a relevant category such as urban, suburban, ultra-urban, or rural setting; or maintenance, design, or construction; or numbers of years of experience. The presenter will not lose respect or cause chaos but will provide a way for the audience members to remember and apply the information. As one engineer experienced in presentations has observed, "Corny works."

PowerPoint Strategies

Many articles and books describe how to use PowerPoint. The tips from Microsoft are a good start:

- Elements should be visible from the back of the room. Never say, "I know you can't see this"—fix it beforehand. A page from a book, or a table from a report, or a software screen rarely work as images. Parcel the information to gain a clear, uncluttered image. The rule of thumb is no more than seven lines and no more than seven words per line.
- Background and foreground colors should show up in the room—consider the room's conditions. An image that works on a computer screen may not work blown up 10 feet wide in a ballroom.
- Fancy slides are ineffective if content is missing. Animate the audience, not the slides.

A recent survey revealed audiences' annoyances with many PowerPoint presentations: the speaker read the slides aloud; the text was too small to read; the slides were hard to see because of the color choices; full sentences were displayed instead of bullet points; the text and graphics were moving around too much; and the diagrams or charts were too complex.

Additional Tips

Other tips can add impact to a presentation. For example, in preparing for a panel discussion, a panelist should talk to the other presenters to find overlaps and synergies in the presentations. The session moderator may handle this task, but if not, the speakers should take the initiative to coordinate material, find opportunities to engage the audience in dialogue, and perform more analysis and synthesis.

The question-and-answer period also requires preparation. A frequent presenter may know what questions often surface and may already have modified the presentation accordingly. A first-time presenter should prepare by considering what people may ask.

A big fear in public speaking is embarrassment, particularly at being caught without an answer. If this occurs, "I don't know" is an acceptable response; the speaker also may thank the participant for pointing out other areas for consideration.

A speaker should have what may be called a separator phrase in case a member of the audience continues arguing or wants to put the speaker on the spot. The separator phrase should get the speaker off of the defensive and back in control—for example, "It's reassuring that we don't all have to agree," or "Well, you can't tell which way the train goes by looking at the tracks."

Repeating each question before responding is always welcome to an audience because the acoustics in large rooms are usually poor. People tune out if the question-and-answer period turns into a dialogue between the speaker and one audience member.

If no questions arise, and time permits, the speaker might say, "I know it is hard to ask a question in a big room. In other conversations and presentations about this topic, people have asked…." In this way, the speaker can reveal concerns that others may have had about the topic and may prompt questions from the group.

Training Design

Consider the Learner

The biggest challenge for an engineer or other technical specialist who is involved in designing a training program is to think about the learner, not just the content. The excuse usually is that there is "so much material to cover." The trainer's job, however, is not to cover material. If the learners do not know what to do with the information, what has been gained?

The goal in designing a training program is to define what needs to be different at the end of the training: can the

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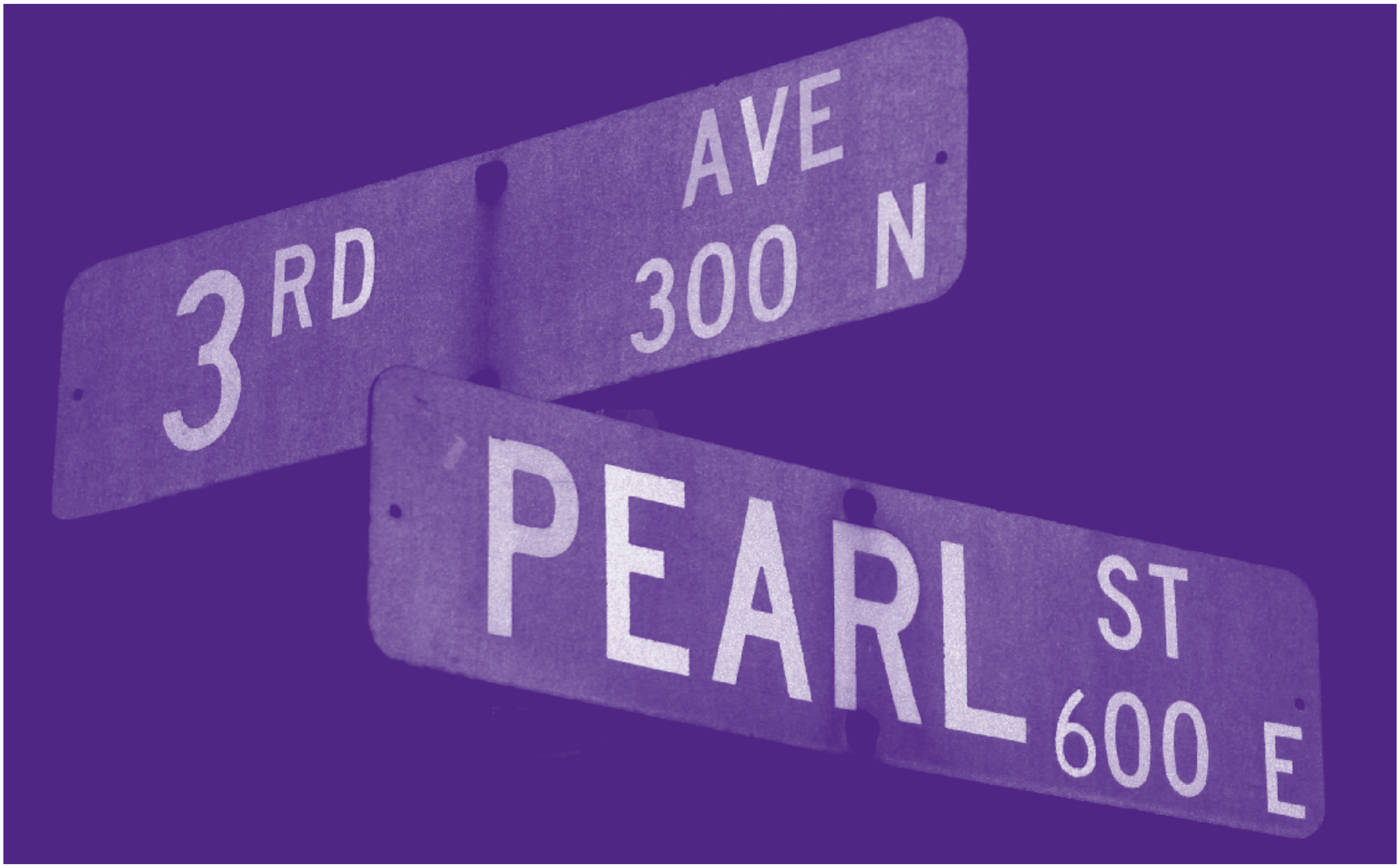
Sign Retroreflectivity Requirements Have Been Added to the MUTCD



One of the Federal Highway Administration's (FHWA's) primary missions is to improve safety on the nation's roadways. More than 42,000 people have been killed on American roads during each of the past eight years. While only one-quarter of all travel occurs at night, about half of the traffic fatalities occur during nighttime hours. To address this disparity, the FHWA has adopted new traffic sign retroreflectivity requirements that are included as Revision 2 of the 2003 MUTCD.

To comply with the new requirements, public agencies will have until January 2012 to implement and then continue to use an assessment or management method that is designed to maintain traffic sign retroreflectivity at or above the minimum levels specified. Public agencies will have until January 2015 to replace any regulatory, warning, or post-mounted guide (except street name) signs and until January 2018 to replace any street name signs and overhead guide signs that are identified by the assessment or management method as failing to meet the minimum retroreflectivity levels.

Provided that an assessment or management method is being used, an agency would be in compliance with the requirements of the new provisions even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time. Instead of using one or more of the five assessment or management methods described above, agencies are also permitted to develop and use other methods based on engineering studies.

Because of the seven to 10-year compliance period that has been adopted for replacing signs that have insufficient retroreflectivity, highway departments will be able to implement improved sign inspection and management procedures and subsequently replace the signs in a time frame that is consistent with the typical sign replacement cycle. Cost increases from upgrading materials and/or processes might be offset by the long-term savings that result from the longer life of the higher performance sheeting products.

For additional information on this rulemaking and sign retroreflectivity, please visit the FHWA retroreflectivity web site www.fhwa.dot.gov/retro.

2008 T³S Workshops Planned

The tentative list of T³S workshops that will be offered in 2008 has been established. We have several new courses that we will be presenting along with topics that have remained popular through the years.

In 2004 T³S became a co-sponsor, along with the Clemson Extension Service, the SC Department of Transportation, and the SC Department of Health and Environmental Control, offering *Certified Erosion Prevention and Sediment Control Inspector Course* numerous times throughout the year. Back by popular demand, we will again offer these courses throughout the year as well as *Certified Storm Water Plan Review*, which will be a two-day course designed for technical staff who are not licensed professional engineers.

Hot Mix Asphalt Pavement Design Selection for Low Volume Roads will be offered in February followed by *Writing Skills for Transportation Professionals* in early March.

New course offerings for 2008 include *General Construction Inspection*, *Bridge Maintenance*, and *Pipe Selection and Installation*.

In 2007 Ken Wood from FHWA presented *Basics of the MUTCD* which was a huge success. We have asked him to return in 2008 for a workshop on the new *Sign Retroreflectivity* requirements.

Back by popular demand will be the *Sixth Annual Count on Concrete Conference*. We have also had requests for *Basic Surveying* and hopefully will be able to offer it in the fall of 2008.

We will continue to send out brochures announcing the workshops, and as dates are finalized, information will be posted on our web site at www.clemson.edu/t3s that will allow you to register early for the classes that have limited space.

If you have any questions regarding any workshops we have planned, please feel free to contact me at 888-414-3069. We look forward to seeing you soon.

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trainees apply new techniques? Can they solve more complex problems? Can they prevent problems?

To develop new training, instructional design practitioners use the ADDIE model: analyze, develop, design, implement, and evaluate. No engineer would design a road without proper analysis. Without a model that structures thought, people often say, "I think I know what the problem is," and then, "I think I know what the answer is." Figure out first what the learner will do with the information—this will help in selecting outcomes, content, delivery methods, and evaluation tools.

Styles of Learning

The design of a training program for a group requires the accommodation of all learning styles. Learning is a complex process, and each person has a learning style that changes with the environment, the content, or the tasks. Most people have a dominant style that defines the best way for them to learn new information. A presentation or a training course often starts out tailored to the designer's preferred style of learning.

Consider the following statements by learners:

- I take lots of notes, and I like to doodle.
- If I had to explain a new procedure or technique, I would prefer to write it out.
- I like to talk to myself when solving a problem or writing.
- If my boss has a message for me, I am most comfortable when she talks to me in person.
- I am not good at reading or listening to directions. I would prefer to start working on the task or project at hand.
- If I had to explain a new procedure or technique, I would prefer to demonstrate it.

The first two statements indicate a visual learner; the second two characterize an auditory learner; and the third pair, a kinesthetic learner.[1]

A trainer or presenter who has not considered his or her own learning style or the range of styles in a training group may have missed opportunities to make an impact. One trainer described his classes as interactive because he told jokes and the audience laughed. Clearly he needs to change his definition of interactive and engage the individual learning styles of his class.

Public Involvement

Most public- and private-sector engineers and technical specialists react to an assignment to the public involvement part of a project with emotions similar to the fear of death or snakes. The main communication challenges, however, are fairly common. First is the general fear of public speaking—even those who are experienced speakers encounter unknowns such as the mood of the audience, the difficulty of their questions, or the presence of the media.

Anticipating an unfavorable experience, some project engineers may design the event to retain complete control. They display charts and graphs, present highly technical explanations, and draw a conclusion about the alignment or project schedule. Not surprisingly, the community stakeholders are not satisfied.

Changes in regulations, however, have assigned new value to community input and have altered the process. The community group should be viewed as trainable—they want to know what is at stake, what are the variables, and how decisions are made among competing projects. If someone asks, "How many people have to die before you fix this intersection?" the engineer should answer. The audience may be angry, but they would find out that the decision is not random. Historical relationships apply, as well as the new relationships being developed, and the project team may not know how many times in the past the community had been misled.

Princeton University professor and psychologist George Miller stated, "To understand what another person is saying, you must assume that it is true and try to imagine what it could be true of"[2]. Speakers who are focused on getting a message across may judge and interpret what other people say and as a result may respond too quickly, often without understanding the other person. Miller's Law, instead of denying a challenge and arguing a position, advocates starting from a different place in the conversation.

Engineers and other specialists need to believe that each group deserves the best presentation. Fear of confrontations, hecklers, misinterpretations, or of hearing the same questions again and again interferes with seeing a meeting as the first time for that particular audience and an opportunity for all to learn together.

Engineers into Managers

How do nonengineer managers communicate with engineers, and how do engineers learn to be managers? These questions must date back to the building of the pyramids.

For effective communication with an engineer, a manager should understand the engineer's thought process when faced with a problem. The process is usually a circular, iterative technique:

1. Identify the problem.
2. Gather information.
3. Brainstorm solutions.
4. Analyze and select a solution.

5. Test and implement the solution.
6. Communicate the solution to others.

The engineer uses Steps 1 through 5 to come up with the best solution possible. The pitfall is that Steps 1 through 5 can become a continuous loop, because the engineer may believe each time that there is a better answer and that more data are needed. Management therefore must be engaged in the first five steps to offer guidance and to set boundaries; then in the sixth step, the manager must provide a convincing argument for the solution selected.

In Step 1, the manager must establish the boundaries of the problem. The engineer may not think of the social, economic, political, or environmental dimensions of a problem—the manager must identify these. The engineer, however, may identify certain constraints to construction. Step 1 therefore is a dialogue.

Step 2 is primarily the engineer's bailiwick, gleaning information from a variety of sources and sifting through it. This makes Step 1 critical—the problem has been well defined and sources of data are broad enough to address all dimensions of the problem.

Step 3 is a joint effort, because a nonengineer manager usually can develop solutions that may not be apparent to an engineer with limited exposure to qualitative aspects of the project. Without involvement in public meetings on the project, the engineer may have little appreciation of stakeholder concerns and of options that would be viable and acceptable.

If possible, Step 4 is accomplished quantitatively by assigning numerical values to selections, but this can be deceptive and can result in erroneous choices without qualitative judgment. Management therefore should provide the qualitative input for the process.

Step 5 involves identifying suitable testing procedures to implement a solution. For example, the primary test for a selected highway project is whether it meets the needs for which it was planned—to reduce congestion, to provide greater safety, or to serve durably. Ancillary tests will be required to show the effects on stakeholders, the economic ramifications, or other aspects. Management must set up focus groups or other qualitative assessment instruments to evaluate the project.

The process is iterative. As the solution is tested, other problems are identified and the process begins again, proving the adage, "the chief cause of problems is solutions." Management needs to know when this process has reached a point of diminishing returns and the solution is acceptable.

The final step entails communicating the solution to others—perhaps the biggest challenge to management. Managers know how to identify the audience, but knowing how much detail to include in the presentation while keeping the audience engaged is an art and comes with experience. Presentations that drill down into the minutiae of Steps 1 through 5 will lose an audience, and all the hard work will be in vain if the solution is rejected because it is not understood. In contrast, an audience of engineers would want to understand the details of Steps 1 through 5, making it critical to present enough detail to impart credibility to the solution and to the team. The speaker must know the audience.

To help an engineer become a manager requires a synthesis of all the communication advice already presented. Most people also learn by watching others who are skilled at their tasks. Managers must master the technical aspects of their jobs, including the subtleties of public speaking, of supervision and training, of shared decision making, and of listening. Good communication requires paying attention to all of the clues that an audience provides.

Problem Solving

Metaphors or farming analogies may not be effective in communicating with engineers, and a designer may be hard to convince that listening to the community may generate good ideas that had not been considered—but engineers are problem solvers. Appealing to that characteristic can motivate a pavement expert to try something new and uncomfortable and discover that it works.

Many years ago at a DOT headquarters, the training room during the week was dark and crowded, with everyone focused on the front of the room. When the course ended, one of the participants was asked about the lecture delivery method and if it was effective. He said, "It's just like engineering school, so we have low expectations." The challenge is to change those expectations.

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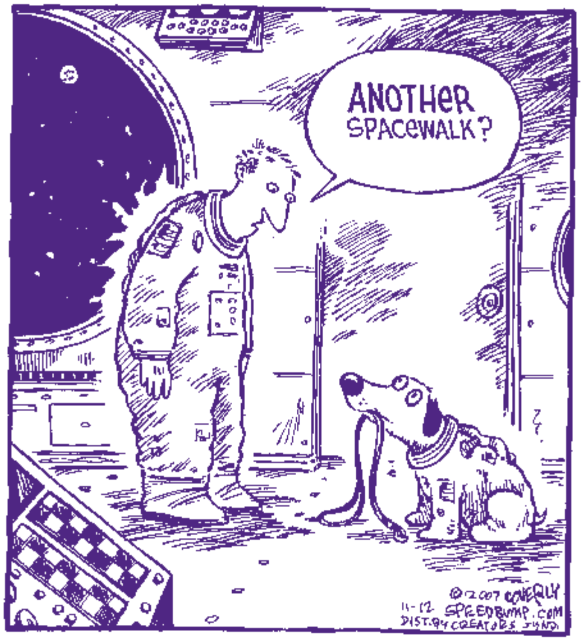
SPEED BUMP **Dave Coverly**



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