HOST THE NATIONAL WORK ZONE MEMORIAL


Would you like the National Work Zone Memorial to visit your community in 2004? The American Traffic Safety Services Foundation invites your organization to submit an application to host the Memorial. The exhibition honors roadway workers, emergency and law enforcement personnel, pedestrians, and private vehicle occupants who have lost their lives in work zone accidents, and is a living tribute to their memory.

The exhibition brings to the attention of the motoring public and the media the fact that about 900 men, women and children are killed senselessly in work zones each year. It travels to communities cross-country year-round to raise awareness of the need to respect and stay safe in America’s roadway work zones. For photos and more information, please visit www.atssa.com and click on “Public Information.”

The Memorial is available starting in late February, 2004. Please note that it is reserved during the second week of April each year for the events in Washington, DC during National Work Zone Awareness Week.

2004 hosting applications are now available and should be submitted to ATSSF by October 31, 2003. To download an application visit http://www.atssa.com/pubinfo/downloads/atmapplication.pdf. E-mail any questions to lisak@atssa.com.

AZ LTAP has submitted an application to host the National Work Zone Memorial. We invite you to stop by and join us in paying tribute to the memory of the men, women and children who have lost their lives in work zone related accidents. The dates and location to where the memorial will be displayed will be announced in our Winter issue and or our web site.

For more information on the National Work Zone Memorial see page 9.

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Fall 2003, Vol. 3 No. 4

ISSUE FOCUS - MAKING WORK ZONES WORK BETTER

Arizona Tackles Work Zone Delays
by Alan Hansen, Assistant Planning and Research Engineer for FHWA’s Arizona Division - This original article was written in May/June 2002, the title/positions of individuals mentioned in the article may have changed since the date that it was originally written.

If you’re having trouble minimizing traffic delays during construction projects (and who isn’t), then you may discover some ideas in two innovative programs developed by the Arizona Department of Transportation (ADOT)—a motorist assist patrol and a travel-time incentive program. ADOT used the new approaches to minimize motorist delays while reconstructing a 13-mile (21-kilometer) section of State Route 68 (SR-68). The project started in July 2000 with a partnering workshop between the contractor and ADOT, and all of the pavement was in place by the end of April 2002.

Although SR-68 is a rural corridor cutting through high desert landscape and the Black Mountains, highway officials in Arizona consider the road to be a major commuter route. It serves motorists traveling between Kingman and Bullhead City on the Colorado River near the State’s western border. In addition to commuter traffic, trucks comprise 7 percent of the vehicles on SR-68, and a significant number of recreational users also travel the corridor. The construction project started at about the mid-point of SR-68 and went to Bullhead City.

ADOT’s Kingman district engineer Debra Brisk developed the motorist assist patrol and the travel-time incentive program specifically for this project. ADOT resident engineer Jennifer Livingston conducted a site visit in May 2001 when the project was approximately 35 percent complete. “The traffic management tools,” says Livingston, “truly minimized the construction impacts to the traveling public and commuters.”

Motorist Assist Patrol

The motorist assist patrol (MAP) consisted of a vehicle and driver equipped with equipment and supplies that help stranded motorists get back on the road or call for additional assistance if needed. Each MAP vehicle was outfitted with traffic control devices, water, gasoline, flares, jacks, and lighted arrow boards.

In addition to helping the motorist safely back on the road, the MAP also kept the
ARIZONA TACKLES WORK ZONE DELAYS (CONTINUED FROM COVER)

The contractor, who operated the MAP from 4 p.m. to 6 a.m. on weekdays and around-the-clock on weekends, hired a private security guard service. They operated the MAP vehicles during the hours when construction was not going on. During construction hours, the MAP was considered unnecessary since plenty of people were available to assist motorists.

Because the MAP operated at off-peak hours and the MAP drivers approached stopped vehicles and sometimes encountered people acting suspiciously, the contractor determined that trained security guards would be safer MAP drivers. The security guard training also helped the drivers know how to approach stranded motorists in a professional manner that put the motorist at ease.

Between the program’s inception in October 2000 and April 2002, the MAP vehicles assisted 963 stranded motorists. The majority of the travelers were stranded due to mechanical failure, probably caused by the high-desert temperatures and the 6-percent grade that is characteristic of much of the segment of road that was under construction. Of these motorists, 68 percent were able to get back on the road with the assistance of the MAP only. Further assistance, such as towing services, were called in the cases of the other 32 percent of the motorists needing help.

“The commitment to safety and cooperation … by the SR-68 team was impressive,” says Lieutenant Ron DeLong of the Arizona Department of Public Safety (DPS). “The Motorist Assist Patrol was very helpful to DPS and the traveling public. ADOT and the contractor also responded quickly to other travel and safety issues throughout the project.”

Travel-Time System Incentive Program

The SR-68 project also implemented a travel-time system that measured the consistency of the time it took for motorists to travel through the construction work zone. Prior to construction, the average travel time for this segment, which has a posted speed limit of 55 miles per hour (89 kilometers per hour), was 17 minutes. During construction, traffic control measures and reduced posted speed limits of 35 to 45 mph (56 to 72 km/h) increased the corridor travel time to approximately 21 minutes.

The contract included a provision that during construction, the average travel time would not exceed 27 minutes. The onus was on the contractor to measure the travel time and ensure that the average travel-time goals were met. The contract provided for a $400,000 travel-time incentive budget item that was to be reduced if the target travel-time average was exceeded. The travel times were taken 24 hours a day, 7 days a week, and were averaged over 10-minute periods. If three consecutive 10-minute periods were clocked at over 27 minutes, the contractor was charged $21.50 per minute per lane.

Any funds left in the travel-time budget are to be paid as profit to the contractor. If the contractor were unable to maintain the target travel time during construction, the entire $400,000 could be depleted, and the contractor would be responsible for paying for the additional travel-time delay. (continued on page 3)
WORK ZONE BEST PRACTICES GUIDEBOOK (CONTINUED FROM PG. 13)

Guidebook Updates
AASHTO and FHWA will work together to maintain and update the Guidebook by expanding the catalog with new approaches, technologies, and practices, as they become “state-of-the-practice” in work zone mobility and safety management. To make the Guidebook as useful and current as possible, FHWA wants to include practices that practitioners in the highway community have found to significantly reduce construction and maintenance impacts on work zone mobility and safety. FHWA encourages practitioners to identify and document such practices and nominate them for inclusion in the Guidebook. There is a best practice submission form included in the Guidebook that can be mailed or faxed to FHWA. Users can also provide feedback on practices already in the Guidebook and the usefulness of the Guidebook through a comment form in the Guidebook. Practitioners are encouraged to complete and submit the registration form in the Guidebook so they can receive information on Guidebook updates. Development of an updated version of the Guidebook is nearly complete. The updated version should be available in late 2003 or early 2004.

Receiving a Copy of the Guidebook
The Guidebook is available for viewing, searching, and download from FHWA’s work zone website. The web address is www.fhwa.dot.gov/workzones. The Guidebook was also produced in print and CD-ROM formats.

CHECK IT OUT!
“ATSSA Safety Solutions” is a three-minute video (debuted at Sept. 2002 Midyear Meeting), shows how ATSSA member products help save lives in a variety of roadway scenarios. The Illinois Road and Transportation Builders Association has uploaded the video to www.atssa.org/wzsafety/videos.asp. Windows Media or Real One video players are required to view the video on-line. After viewing the video, explore other links of this website to see outstanding examples of what this Illinois association is doing in support of National Work Zone Awareness Week.

Download ATSSA’s Roadway Safety Program <downloads/TEA-21RSSPublication1-30-02.pdf> today! (6/20/03)

Research & Technology Provisions Of Administration’s Surface Transportation Reauthorization Bill, I link to further information via the Transportation Research Board <http://gulliver.trb.org/publications/policy/admin_bill._rt.pdf> (5/22/03)

FHWA Releases 2003 Version of Highway Safety Tool for Rural Roads <http://www.fhwa.dot.gov/rural/hsdm/hsdm.htm> - The Federal Highway Administration (FHWA) announced the release of the 2003 version of the Interactive Highway Safety Model (IHSNM), a new computer software program to help improve safety by providing state and local transportation officials with better information on the effects of design decisions they make for two-lane rural roads. (5/21/03)

Work Zone Safety Standards and Practices database for records added or updated July 29-September

WHAT’S NEW
The Work Zone Safety Training Database was updated August 29, 2003.
The Work Zone Safety Contact Persons Database was updated August 29, 2003.
1994-2002 Work Zone Fatalities in Alcohol Related Crashes is now available.
The 2002 Motor Vehicle Traffic Fatal Crashes by State and Construction/Maintenance Zone is now available.
The Work Zone Safety Outreach Database was updated July 22, 2003.
The above publications are available for viewing on FHWA’s work zone website at www.fhwa.dot.gov/workzones.

ARIZONA TACKLES WORK ZONE DELAYS (CONTINUED FROM PG. 2)
As the best way to measure the travel time through the construction corridor, the contractor chose to deploy a license plate reader system developed by a British company, Computer Recognition Systems, which has its U.S. headquarters in Boston, MA. The system uses a camera and a light source to capture the license plate images of passing vehicles.

Image recognition software takes the license plate number from the picture, encrypts it, and then sends it to the central computer at the contractor’s office through a high-speed data connection. The system is optimally designed to capture license plate readings at 45 to 55 mph (72 to 89 km/h).

A second camera at the far end of the construction zone takes a second picture, encrypts that license plate number, and sends it to the central computer on a high-speed connection. The central computer then matches up the license plates that enter and exit the limits of the construction project and calculates the times for the motorists’ trips.

The contractor placed a total of four cameras on the project, one each at the entrance and exit of the construction in each direction. The cameras were mounted behind construction signs to keep them from distracting the motorists. Each of the four locations included a camera on one sign assembly and a steady burning light on a second sign, each position to capture license plate readings from passing vehicles. The lights, which operated 24 hours a day, were necessary to record and recover the license plate numbers, especially on license plates covered by motorist-installed plastic license plate covers.

The project participants considered using radar systems throughout the corridor to implement the travel-time system. Such technology would give single-point traffic speeds but would not offer direct measurement of corridor travel times.

As with many things, the terrorist attacks on September 11, 2001, affected the SR-68 project. The U.S. 93 route across the Hoover Dam, which is the other major route for vehicles traveling between Arizona cities and Las Vegas, was closed to truck traffic. All of the traffic was routed over SR-68 and through the construction project. At the time of the terrorist attacks, the contractor had been very successful in meeting the average travel-time goal, resulting in only $9,594 being drawn from the travel-time fund. The final resolution of the travel-time goals that were exceeded between September 11 and the end of the construction project is still under negotiation.

The license plate reader system was able to match around 11 percent of the license plates photographed at the start with those photographed at the finish of the corridor, a statistically adequate percentage for measuring the average travel time. The license plate reader system was fairly expensive to operate. The system requires high-speed data connections, which cost about $700 per month for a high-speed communication line capable of transmitting the travel-time information from the far end of the project versus about $200 per month for a wireless connection, which could have been used for the short distance connection on the Kingman end of the project. The monthly expense for electricity was approximately $100. Once the project is completely finished, the license plate reader system will be the property of the contractor. (continued on page 4)
The contractor placed signs on the backs of the camera and light to reduce driver distraction.

The license plate reader system has had its detractors and its share of controversy. Since the lights were on constantly, early in the project some motorists complained that the light positioned in the opposite direction to their travel distracted them. These complaints diminished after the contractor redirected the lights, and ADOT engaged in public outreach and education about the purpose of the lights.

After one of the cameras was stolen, the contractor welded the cameras to the sign structure and installed chains and padlocks. As construction proceeded and travel lanes were moved, the cameras and lights had to be adjusted continuously so that the license plates of the cars were clearly in the field of view.

Some motorists also raised privacy complaints at the start of the project; however, the central computer does not maintain any of the license plate numbers after they have been initially encrypted. The dissemination of information about the license plate reader system and the fact that it does not store license plate numbers eased the privacy concerns.

Benefits to Date  (May/June 2002)
Both of these programs make the SR-68 project a model for innovative work zone enhancements. ADOT provided comment cards to the many stranded motorists who were helped by the MAP patrols. Nearly 50 percent responded, all of whom made positive comments about their rescuers. Clearly, both programs are very popular with members of the traveling public, who find their travel delays reduced.

One resident of Bullhead City says, “I commute daily from Bullhead City to Kingman; what could have been a real nightmare during construction was no more than a slight headache. I smile every day now when I’m traveling to and from work.”

The travel-time incentive program is not as visible to the public as the MAP vehicles, but motorists still enjoy the benefits of both programs. Due to the travel-time incentive program, the contractor limited the number of flagging stations throughout the construction project and scheduled work in such a way that the adverse impact on motorists was reduced.

ADOT made extensive outreach efforts to communicate with the public regarding the project, including hiring a public relations firm and developing public service announcements, cable television announcements, radio media alerts, an information telephone number, and a Web site. These venues enabled motorists to use the corridor to express their opinions on the project. Those who responded reported that the construction work zone did not affect their travel through the corridor significantly. In addition to limiting travel delays, work zone programs such as these help improve transportation system efficiency, increase work zone safety, and provide a better working relationship between the State DOT, the contractor, and the community.

The Work Zone Operations Best Practices Guidebook and CD ROM were published by the Federal Highway Administration (FHWA) to promote the sharing of effective work zone technologies and practices among practitioners across the Nation. FHWA hopes that practitioners will find the information in the Guidebook useful for making informed decisions and taking actions that improve the operational efficiency and safety of the Nation’s highway system and our work zones. The Guidebook contains information for 262 work zone best practices that were identified through a work zone scanning tour of 26 States during 1998. Each practice is described, including the location where it was observed, reasons for its use, benefits received, and points of contact for further information.

The Guidebook was developed in partnership with the American Association of State Highway and Transportation Officials (AASHTO)’s Work Zone Best Practices Task Force to give practitioners easy access to documented best practices. FHWA’s Work Zone Mobility and Safety Product Team served as the primary developer at the federal level and the AASHTO Work Zone Task Force provided expertise from the state perspective.

Topics Covered in the Guidebook
Best practices are grouped into 11 major areas:
- Policy and Procedures;
- Public Relations, Education, and Outreach;
- Prediction Modeling and Impact Analysis;
- Planning and Programming;
- Project Development and Design;
- Contracting and Bidding Procedures;
- Specifications and Construction Materials, Methods, and Practices;
- Traveler and Traffic Information;
- Enforcement;
- ITS and Innovative Technology; and
- Evaluation and Feedback.

For each major area, the Guidebook provides an assessment of the state-of-the-art for work zone practice, lists the best practices organized into more specific subcategories, and contains a description for each practice.

To make the information easily accessible, the Guidebook contains a series of cross-references and a topical index. The cross-references enable practitioners to identify best practices based on where they were observed, project life cycle stage, type of organization, geographic or demographic characteristics, nature of activity, traffic conditions, and type of roadway.

“Best” Practices
The “best” practices listed in the Guidebook are descriptive, not prescriptive. They describe approaches and technologies that transportation agencies have used and found effective in their particular situations. Each organization must determine which of the practices and technologies are best suited for its own situation, considering all the factors that affect work zone operations. What practice or technology is “best” is a site-specific decision. The Guidebook serves as a reference catalog of useful practices and technologies for State and local transportation agencies, construction contractors, transportation planners, trainers, and other practitioners to consider in making those decisions.
Interviews with project personnel, was the positive public sentiment that resulted from the use of full road closure. Commenting on the full closure approach, Gordon Proctor, …

Work zone strategies. Work zone safety and mobility policies are necessary to support systematic consideration of work zone impacts across all stages of project development and address the safety and mobility needs of all road users, workers, and other affected parties.

FHWA provided a self-assessment tool. In 2003 each State conducted a work zone self-assessment to establish a baseline of the current state of the practice and identify future work zone quality improvement efforts.

Conduct a work zone impact analysis to determine appropriate mitigation measures. Impacts analysis is necessary to understand the type, severity and extent of the work zone impacts associated with the different project alternatives, and to incorporate appropriate mitigation measures and strategies in project design, construction, transportation management, and traffic control.

FHWA developed “QuickZone,” a work zone impact analysis tool. It estimates costs for both an average day of work and for the whole life cycle of construction and can help the project determine what times of day and what times of the year are best for a certain project.

Develop Transportation Management Plans that include traffic control, transportation operations and public information and outreach. Traffic control plans recommend strategies to safely and efficiently handle traffic flow through the actual work zone. Transportation operations plans address the safety and mobility of the transportation system by identifying strategies for the sustained operation and management of the work zone impact area. Public information and outreach communicates information about the project and expected impacts to affected road users, the general public, residences and businesses, and the appropriate public entities.

FHWA promotes using Intelligent Transportation System (ITS) technologies in and around work zones to mitigate impacts of work zones. FHWA published the ITS and Work Zone Case Study that discusses the application of ITS in work zones in four locations. Benefits and lessons learned are identified. In 2003 FHWA plans to publish an ITS in work zones implementation guide and detailed case studies.

FHWA findings show the use of full road closure during rehabilitation can reduce both work zone congestion and crashes. In these projects, the roadway is closed, traffic rerouted, and the contractor given full access to the roadway with the expectation that construction time will be dramatically reduced. In 2003 FHWA plans to publish a series of documents highlighting the use of full closure, including benefits and lessons learned from six locations.

FHWA recently published a Notice of Proposed Rulemaking proposes some changes that potentially alter the way state and local government agencies approach consideration of work zone impacts.

Some of the other Office of Operations’ initiatives underway include:

- **Work Zone Best Practices Guidebook** shares highway community success stories/lessons learned with practitioners. Best practices covered include policy/ procedures, public outreach, contracting, construction methods, enforcement, and ITS.
- The FHWA with State and local partners is sponsoring “Making Work Zones Work Better” workshops to share information on new and emerging technologies and practices focused on reducing congestion and crashes in and around work zones.

As a part of Congestion Vital Few, the FHWA is committed to reducing congestion and crashes in and around work zones. We continue to work with State and local governments, other Federal agencies, transportation officials, partner organizations, contractors, and others to make work zones work better and raise the bar for work zone safety and mobility.

For more information on FHWA Work Zone activities, please visit the FHWA Office of Operations web site at http://www.ops.fhwa.dot.gov or the Office of Transportation Operations at (202)366-1993.

### FULL ROAD CLOSURE

**A Method for Reducing Project Time and Mitigating Work Zone Congestion and Crashes**

Transportation professionals are sensitive to public dissatisfaction with work zone congestion, delay, and safety concerns and are continually developing new approaches to improve traffic operations in and around work zones. Transportation professionals also appreciate that the need for work zones is large and growing across the nation. The increasing need to repair and maintain rapidly deteriorating infrastructure and the need to supply a capacity that leads to more work zones. Transportation agencies are challenged to balance the increasing need for work zones with mobility and safety concerns expressed by the public and government agencies. Full road closure is one method that transportation agencies are giving increased consideration to during project planning and design, as a potential way to balance these conflicting needs. Simply stated, the full closure approach is designed to eliminate the exposure of motorists to work zones and workers to traffic by temporarily closing a facility for rehabilitation or maintenance. In many cases, work may be performed more quickly since the work area is effectively cleared of interference from motorists passing through a site. The public also seems receptive to the idea. A recent survey of the traveling public found that 67 percent of those responding would support a road closure for as long as one week, and nearly 40 percent would support full road closure for up to one month.

State highway agencies have used full road closure successfully on a variety of project types ranging from full depth reconstruction to bridge joint replacement with guardrail enhancements. Based on interviews with project personnel and literature reviews, six projects using a full road closure approach were examined, including benefits, considerations for success and lessons learned. Factors included duration, cost, safety, mobility, quality, and public sentiment during the application of full road closure. The goal of this examination was to provide transportation agency staff with greater awareness and a better understanding of the reasons for the use of full closure, and the benefits associated with the approach. The projects examined during the research effort had varying characteristics, and reasons for using full road closure, while achieving similar positive results. Project personnel interviewed felt that full road closure was able to improve the road rehabilitation process, creating efficiencies that reduced project duration and in some cases overall costs while improving safety. A consistent theme, heard during interviews with project personnel, was the positive public sentiment that resulted from the use of full road closure.

**Why Use Full Road Closure?**

- **Full Road Closure** has the potential to:
  - Expedite project completion
  - Reduce the impact of construction on travelers
  - Maximize workspace available to the contractor and increase productivity
  - Reduce overall congestion resulting from construction
  - Improve safety for workers and travelers
  - Reduce crashes in some cases
  - Reduce costs in some cases
  - Reduce roadblocks caused by construction
  - Provide better mobility and accessibility

**Benefits of Full Road Closure**

The six projects examined for this study all experienced numerous benefits as a result of using a full closure approach.

- All projects reported a reduction in project duration.
- Based on estimates from project personnel, two projects realized significant cost savings through the use of full closure.
- Five projects studied cited traveler and worker safety as a benefit and factor in the decision to utilize full closure.
- Three projects reported a better quality product achieved through the use of full closure.
- Two project sites reported that no complaints were received about the project, with positive comments frequently being made by the public. All projects reported that public sentiment was positive.
- Project personnel felt that worker productivity improved due to less distraction from traffic.
- All project sites noted that the impact of construction on travelers was reduced. Congestion on alternate routes during the closures was often less than predicted.

Further detail on the benefits gained by each site is included in Table 1. In addition, full closure essentially eliminates worker exposure to traffic and moves traffic away from the work zone. (continued on page 6)
**FULL ROAD CLOSURE - (CONTINUED FROM PG. 5)**

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**Reductions in project duration also reduce the time period that motorists are exposed to the congestion and safety impacts related to the road project. A measure of this benefit for the six projects is captured in Figure 1.**

**Considerations Associated with Full Road Closure**

- City/county agencies and personnel often need to be convinced of the feasibility of implementing full road closure and the potential benefits that can be realized, compared to traditional means of performing rehabilitation under traffic.
- Full closure projects are typically done on an accelerated schedule. Contractor ability to provide adequate amounts of resources (materials, equipment, crew) to maintain an accelerated pace should be assessed prior to letting a project.
- Meeting the project completion deadline is particularly important for full closure since this is often highly publicized as the date when the road will re-open. Therefore full closure projects may carry additional deadline pressure for those involved. This can accelerate decisions and limit the time for researching options when issues arise.
- Impacts to business or entertainment venues can be a factor. Many of the project sites planned closures around events and considered impacts to businesses during the planning process. This type of planning helps to ensure a successful project.
- Full closure projects are often scheduled on a 24-hour work basis, so there is potential for impacts to local residents including noise and light pollution.
- Increases to traffic densities on alternate routes must be assessed, planned for and managed. Depending on available alternate routes, there is a potential need for capacity improvements and operational enhancements that may require additional funding and coordination during planning and programming.

**Lessons Learned**

- The use of full road closure requires significant lead time for increased planning with regard to the potential effects of road closures. Project personnel need to consider all possible stakeholders to ensure that their needs are met throughout project duration.
- The availability of adequate alternate routes is the most critical factor in pursuing a full road closure approach. For the study sites, projected congestion impacts typically went unrealized, as demand during the project was less than expected as a result of information dissemination.
- A solid maintenance of traffic plan is vital to the success of the project. This includes an appropriate amount of signage in advance of the closure to inform travelers of alternate routes.
- The public outreach component was noted as the key factor in the success of full closure projects by several sites. Public relations serves to inform the public of alternate routes, reduce the overall volume of traffic, and encourage patience on the part of travelers leading to increased satisfaction with project performance.
- State agencies are typically not allowed to specify city or county roads as detours. However it was found that non-state roads handle much of the diverted traffic. Two sites related that after about two weeks traffic redistributed on its own and balanced the increased load on the network, at which time a fair assessment of overall traffic flow could be made.

(continued on page 7)

**MAKING WORK ZONE WORK BETTER - (CONTINUED FROM PG. 10)**

**Why We Are Concerned**

Unlike congestion caused by routine heavy traffic during daily peak travel periods, non-recurring events generally result in delays that travelers are not expecting. The four main causes of non-recurring congestion are: crashes, weather, work zones, and breakdowns. Work zones account for nearly 24 percent of non-recurring congestion. This is 482 million vehicle hours of delay.

Work zones continue to have adverse impacts on traveler and worker safety. Work zone fatalities reached a high of 1,079 in 2001, and over 40,000 people are injured in work zone related crashes each year.

**Construction Work is Increasing**

Increasing amounts of funding are being spent on capital improvements and maintaining existing roads. In 2000, 54 percent of highway capital outlay was spent on system preservation.

As vehicle travel continues to increase significantly faster than miles of roadway, work zones exacerbate the growing congestion problem. Between 1980 and 2000, highway lane miles increased 2.4 percent while vehicle miles of travel grew by 80 percent.

**Traffic is Increasing**

The effects of congestion are growing. Rush “hour” is no longer an hour. In 1982, rush “hour” averaged 2-3 hours, and in 1999, rush “hour” increased to 5-6 hours. The window to work without severely impacting traffic is getting smaller. The trend is more work under heavy traffic with no end in sight.

Increasing high traffic volumes on many highways make it difficult to perform work operations in or near travel lanes during much of the day because of the disruption in traffic flow and the risk this introduces for workers and the traveling public. As a result, highway work is increasingly scheduled for off-peak periods. About one-third of work zones are active primarily at night.

A review of State road closure and construction websites revealed that project characteristics set early in the planning process that are unlikely to change such as project location, purpose, and overall project duration are most likely to be posted. Information of greatest interest to the traveling public, such as number of lanes closed, times of closure, and estimated delay, is less frequently reported, between 7 and 22 percent of the time.

**Future Directions in Work Zone Mobility and Safety**

The FHWA has defined “Vital Few” priority areas for attaining near-term action. These priority areas include congestion mitigation and safety. Reducing work zone delay by aggressively anticipating and mitigating congestion caused by highway work zones is one area that can be influenced to have a positive impact on relieving traffic. Real solutions come from a fundamental change in the way projects are planned, estimated, designed, bid and, finally, constructed. A comprehensive approach to work zone management that includes policies, impacts analysis and transportation management plans supports FHWA’s vision of 21st Century Operations using 21st Century Technologies by proactively utilizing work zone impacts, serving the customer 24/7 and making use of real-time information on work zones. The FHWA is championing three major shifts in the approach to work zones built off of the 21st Century philosophy. If implemented, these changes can reduce congestion and crashes in and around work zones.
WORK ZONE MOBILITY FACTS APRIL 2003

♦ Work zone activity is significant - About 20 percent of the National Highway System (NHS) is under construction during the peak summer road work season. (A Snapshot of Work Zone Activity Reported on State Road Closure and Construction Websites, Summer 2002 - draft, December 2002, by Karl Wunderlich and Dawn Hardesty, Mitretek)

♦ Work zones cause delay - Work zones are estimated to account for nearly 24 percent of non-recurring delay. Fifty percent of all highway congestion is attributed to non-recurring conditions, such as traffic incidents, weather and special events. (Temporary Losses of Highway Capacity and Impacts on Performance, Oak Ridge National Laboratory)

♦ The total number of highway work zones in the summer is estimated to be more than 6,400 with a corresponding loss of capacity of 6,157 lane miles. Work zones in the winter are about one-half of those in the summer. (A Snapshot of Work Zone Activity Reported on State Road Closure and Construction Websites, Summer 2002 - draft, December 2002, by Karl Wunderlich and Dawn Hardesty, Mitretek)

♦ Motorists are growing more frustrated – The American public cited work zones as second only to poor traffic flow in causing dissatisfaction (2000 traveler survey). (Moving Ahead: The American Public Speaks on Roadways and Transportation in Communities, Federal Highway Administration. FHWA-OP-01-017)

♦ Vehicle miles of travel grew at a greater rate than miles of roadway - Between 1980 and 2000, vehicle miles traveled increased by 80 percent, while highway lane miles only increased 2.4 percent during the same period. (Highway Statistics, Federal Highway Administration. http://www.fhwa.dot.gov/ohim/ohimstat.htm)

♦ More work is being done on existing roads already carrying heavy traffic – The share of capital funds used for system preservation rose from 47.6 percent in 1997 to 52.0 percent in 2000. (2002 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance, U.S. DOT, FHWA-PL-03-004)

♦ Night work is increasing as agencies try to manage work zone delay - About one-third of work zones are active primarily at night, while 58 percent are active during daylight hours; and 9 percent are active for 18 or more hours per day. (A Snapshot of Summer 2001 Work Zone Activity Based on Information Reported on State Road Closure and Construction Websites, Final Report, by Karl Wunderlich and Dawn Hardesty, Mitretek. Prepared for Federal Highway Administration, U.S. Department of Transportation, February 2003.)

Work Zone Challenges

Work zones are a necessary part of meeting the need to maintain and upgrade our aging highway infrastructure. As much of our Nation’s transportation infrastructure approaches the end of its service life, preservation, rehabilitation, and maintenance will become an increasing part of our transportation improvement program. At the same time, traffic continues to grow and create more congestion. The combination of more work zones and heavier traffic volumes will result in more impacts from those work zones. The American public, during a recent national survey, cited work zones as second only to poor traffic flow in causing traveler dissatisfaction. The top improvements suggested related to roadway repairs and work zones: more durable paving materials, repairs made during non-rush hours, and reducing repair time. Further, the contracting industry is under pressure to expedite construction and minimize disruption.

FULL ROAD CLOSURE - (CONTINUED FROM PG. 6)

<table>
<thead>
<tr>
<th>Study Site</th>
<th>Reasons for Full Road Closure</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| I-44 Portland, Oregon | To expedite project completion in order to avoid the winter rainy season, allowing for the last season use of funding. | • Reduced construction duration to 2 weekends, an 85% reduction.  
• Saved approximately $100,000.  
• Achieved a smoother roadway ride through a reduction in total number of joints and cracks.  
• Likely improved safety. |
| 2 week ends, directional closures |                           |                                                                                     |
| I-45 Louisville, Kentucky | To expedite construction to reduce the impact on travelers. | • Reduced a 90 day project to 137 hours.  
• Achieved a safer working environment for the contractors and increased productivity.  
• Resulted in a higher quality end product. |
| 2 week ends, directional closures |                           |                                                                                     |
| MI-10 Detroit, Michigan | To reduce construction time in order to complete the project in construction season. | • Reduced project duration by 71%.  
• Reduced maintenance of traffic costs by 75% to 90%.  
• Created a safer working and traveling environment. |
| 2 months, bidirectional closure |                           |                                                                                     |
| US-20 Columbus, Ohio | To minimize the impact of work on travelers. | • Expected to reduce project time from 4 years to 18 months.  
• Estimated cost savings of $8 to $10 million dollars.  
• Expected to increase productivity due to increased work. |
| 3 intersections on SR 355 |                           |                                                                                     |
| Kemperick, Washington | 2 weeksends, 2 intersections on 1 weekend and 1 intersection on the second weekend |                                                                                     |
|                 | To minimize the time and disruption associated with replacing several interchanges. | • Reduced project duration by 75% on average for each interchange.  
• Eliminated the need for controlling traffic patterns resulting from maintaining traffic through the intersection.  
• Achieved positive public sentiment and support for the use of full closures. |
| 3/45 Wilmington, Delaware |                           |                                                                                     |
| 1 month directional closure | To minimize overall project completion time, reducing congestion, and improving safety. | • Reduced project duration by 75%.  
• Believed to increase the safety of both workers and travelers.  
• Improved public appreciation for DOT services. |

Table 1. Summary of Findings from Sites Included in the Study

Figure 1. Estimated Time Saved: Project Days for Full Road Closure versus Estimated Days with Traditional Maintenance of Traffic

(continued on page 8)
Conclusion

Agencies across the country are successfully using the full closure approach for performing road rehabilitation. This study examined some applications of full closure in work zones and the resulting benefits, issues, and lessons learned. The approach has enabled state agencies to significantly reduce the impacts of rehabilitation projects. Many agencies have already begun to experience these potential benefits and pass those benefits on to others.

While full road closure may not be appropriate for every work zone, there are many situations where transportation agencies can effectively use full closure. Although the need exists for more data collection to better quantify benefits, the qualitative benefits are apparent. Several sites using a full closure approach indicated that, at present, the most effective gauge of the value of a system can be found in the estimates of project personnel and positive public sentiment received from the public. Using full closure in work zones has resulted in positive public sentiment, increased productivity, reduced project duration, increased safety and/or a shortened risk period, and in some cases significant cost savings. With increased consideration and application full closure will help reduce the overall impact of work zones and rehabilitation as deteriorating roads are rehabilitated and improved to meet ongoing and future needs.

Additional Information

More information on the use of full closure in work zones may be found in a brochure and report developed by the Federal Highway Administration. The brochure, Shorter Duration, Safer Work Zones, More Satisfied Travelers: Successful Applications of Full Road Closure in Work Zones (FHWA-OP-03-086), was published in August 2003. The report is scheduled for publication in Fall 2003. Visit the FHWA work zone website at www.fhwa.dot.gov/wwzones for more information.

Acknowledgment

The authors would like to thank project personnel from study sites for their time and effort in providing information for this study. Article authored by Tracey Sriba, Federal Highway Administration, Brett Graves, Eric Perry, and Tim Luttrell, Science Applications International Corporation.

UNVEILING THE NEW WORK ZONE WEBSITE

The Office of Operations has recently made a number of improvements to its work zone program area website. Designed with the practitioner in mind, the site provides easy access to a variety of tools and information on making work zones work better and features an innovative practice each month.

A section on practitioner tools offers information on leading-edge practices and technologies that can reduce congestion and crashes in and around work zones. This section also includes information on available decision support tools that can be used to expand the analysis capabilities of highway agencies. Many of these tools are available for download through the site or can be requested using the contact information provided on the site. Furthermore, information on various outreach events, such as National Work Zone Awareness Week and the Making Work Zones Work Better Workshops, will enable practitioners to learn about work zone activities going on around the nation.

The site also provides other valuable resources, such as facts and statistics on work zone mobility and safety and access to publications and studies on current or emerging techniques and practices that can help make work zones work better. Resources also include links to the websites of other Federal agencies, State transportation departments and a variety of transportation/work zone related associations.

Please take an opportunity to view and bookmark the improved Work Zone Mobility and Safety page at www.fhwa.dot.gov/workzones. The U.S. Department of Transportation, Federal Highway Administration, Office of Operations hope you and your staff find these improvements useful.

WORK ZONE FACTS - 2003

• Over the last five years, the number of persons killed in motor vehicle crashes in work zones has risen from 693 in 1997 to 1,079 in 2001 (an average of 888 fatalities a year).
• Eighty-five percent of those killed in a work zone are drivers or occupants.
• Rear-end crashes (running into the rear of a slowing or stopping vehicle) are the most common kind of work zone crash.
• On average from 1997 to 2001, 15 percent of the fatalities resulting from crashes in work zones were non-motorists (pedestrians and bicyclists).
• More than 40,000 people are injured each year as a result of motor vehicle crashes in work zones.
• Of the 1,079 work zone fatalities in 2001, 249 occurred in crashes involving large trucks.
• In 2001, more than half of all fatal work zones crashes occurred on weekdays as on weekends.

In 2001, fatal work zones crashes occurred most often in the summer and the fall.

In 2001, the number of fatal work zone crashes occurring on rural interstates was almost 30 percent greater than the number of fatal crashes occurring on urban interstates (159 compared with 124).

In 2001, the majority of fatal work zone crashes for all vehicles occurred on roads with speed limits of 55 miles an hour or greater (57 percent and 70 percent, respectively).

Roadways Keep America Moving. Drive Safely in Work Zones!

NATIONAL WORK ZONE MEMORIAL

Respect and Remembrance

“The Reflections of Life on the Road”

Memorials have become an icon of the American culture - a touchstone that helps individuals deal with the inexpressible to hopefully stir gratitude for the good that often results from the supreme sacrifice. Whether in the elegant granite face of the Vietnam Veteran’s Memorial in Washington, D.C., or through the spontaneous decoration of a fence outside Columbine High School in Colorado, memorials have come to reflect grief, pride, and humility in the shadow of a power far greater than ourselves. Since the early days of our nation’s roadways, men, women and children have senselessly died in work zones. The number of deaths has increased significantly – from 868 in 1999 to over 1,000 in 2000. These unseen faces and lives have in many cases been forgotten - until now. Unveiled in April 2002, the National Work Zone Memorial is a living tribute to their memory, traveling to communities cross-country year-round to raise public awareness of the need to respect and stay safe in America’s roadway work zones.

Work Zone Memorial

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Drive Safely in Work Zones!
WORK ZONE MOBILITY FACTS APRIL 2003

- Work zone activity is significant - About 20 percent of the National Highway System (NHS) is under construction during the peak summer road work season. (A Snapshot of Work Zone Activity Reported on State Road Closure and Construction Websites, Summer 2002-2003, December 2002, by Karl Wunderlich and Dawn Hardesty, Mitretek)

- Work zones cause delay - Work zones are estimated to account for nearly 24 percent of non-recurring delay. Fifty percent of all highway congestion is attributed to non-recurring conditions, such as traffic incidents, weather and special events. (Temporal Losses of Highway Capacity and Impacts on Performance, Oak Ridge National Laboratory)

- The total number of highway work zones in the summer is estimated to be more than 6,400 with a corresponding loss of capacity of 6,157 lane miles. Work zones in the winter are about one-half of those in the summer. (A Snapshot of Work Zone Activity Reported on State Road Closure and Construction Websites, Summer 2002-2003, December 2002, by Karl Wunderlich and Dawn Hardesty, Mitretek)

- Motorists are growing more frustrated – The American public cited work zones as second only to poor traffic flow in causing dissatisfaction (2000 traveler survey). (Moving Ahead The American Public Speaks on Roadways and Transportation in Communities, Federal Highway Administration. FHWA-OP-01-017)

- Vehicle miles of travel grew at a greater rate than miles of roadway - Between 1980 and 2000, vehicle miles traveled increased by 80 percent, while highway lane miles only increased 2.4 percent during the same period. (Highway Statistics, Federal Highway Administration. http://www.fhwa.dot.gov/ohim/ohimstat.htm)

- More work is being done on existing roads already carrying heavy traffic – The share of capital funds used for system preservation rose from 47.6 percent in 1997 to 52.0 percent in 2000. (2002 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance, U.S. DOT, FHWA-PL-03-004)

- Night work is increasing as agencies try to manage work zone delay - About one-third of work zones are active primarily at night, while 58 percent are active during daylight hours; and 9 percent are active for 18 or more hours per day. (A Snapshot of Summer 2001 Work Zone Activity Based on Information Reported on State Road Closure and Construction Websites, Final Report, by Karl Wunderlich and Dawn Hardesty, Mitretek. Prepared for Federal Highway Administration, U.S. Department of Transportation, February 2003.)

FULL ROAD CLOSURE - (CONTINUED FROM PG. 6)

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<td>3-45 Louisville, Kentucky</td>
<td>To expedite construction to reduce the impact on travelers.</td>
<td>• Reduced a 90 day project to 17 hours. • Achieved a safer working environment for the contractors and increased productivity. • Resulted in a higher quality end product.</td>
</tr>
<tr>
<td>4-40 Detroit, Michigan</td>
<td>2 weekends, directional closures</td>
<td>To reduce construction time in order to complete the project in the construction season.</td>
</tr>
<tr>
<td>5-40 Columbus, Ohio</td>
<td>Expected duration of 18 months, bidirectional closure</td>
<td>To minimize the impact of construction on travelers.</td>
</tr>
<tr>
<td>3 intersections on SR 358, Kemertick, Washington</td>
<td>2 weekends, 2 intersections on 1 weekend and 1 intersection on the second weekend</td>
<td>To minimize the time and disruption associated with replacing several intersections.</td>
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<tr>
<td>5/45 Wilmington, Delaware</td>
<td>1 month directional closure</td>
<td>To minimize overall project completion time, reducing congestion, and increasing safety.</td>
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Table 1. Summary of Findings from Sites Included in the Study

Figure 1. Estimated Time Saved: Project Days for Full Road Closure versus Estimated Days with Traditional Maintenance of Traffic

(continued on page 8)
Reducions in project duration also reduce the time period that motorists are exposed to the congestion and safety impacts related to the road project. A measure of this benefit for the six projects is captured in Figure 1.

Considerations Associated with Full Road Closure
- City/county agencies and personnel often need to be convinced of the feasibility of implementing full road closure and the potential benefits that can be realized, compared to traditional means of performing rehabilitation under traffic.
- Full closure projects are typically done on an accelerated schedule. Contractor ability to provide adequate amounts of resources (materials, equipment, crew) to maintain an accelerated pace should be assessed prior to letting a project.
- Meeting the project completion deadline is particularly important for full closure since this is often highly publicized as the date when the road will re-open. Therefore full closure projects may carry additional deadline pressure for those involved. This can accelerate decisions and limit the time for researching options when issues arise.
- Impacts to business or entertainment venues can be a factor. Many of the project sites planned closures around events and considered impacts to businesses during the planning process. This type of planning helps to ensure a successful project.
- Full closure projects are often scheduled on a 24-hour work basis, so there is potential for impacts to local residents including noise and light pollution.
- Increases to traffic densities on alternate routes must be assessed, planned for and managed. Depending on available alternate routes, there is a potential need for capacity improvements and operational enhancements that may require additional funding and coordination during planning and programming.

Lessons Learned
- The use of full road closure requires significant lead time for increased planning with regard to the potential effects of road closures. Project personnel need to consider all possible stakeholders to ensure that their needs are met throughout project duration.
- The availability of adequate alternate routes is the most critical factor in pursuing a full road closure approach. For the study sites, projected congestion impacts typically went unrealized, as demand during the project was less than expected as a result of information dissemination.
- A solid maintenance of traffic plan is vital to the success of the project. This includes an appropriate amount of signage in advance of the closure to inform travelers of alternate routes.
- The public outreach component was noted as the key factor in the success of full road closure projects by several sites. Public relations serves to inform the public of alternate routes, reduce the overall volume of traffic, and encourage patience on the part of travelers leading to increased satisfaction with project performance.
- State agencies are typically not allowed to specify city or county roads as detours. However, it was found that non-state roads handle much of the diverted traffic. Two sites related that after about two weeks traffic redistributed on its own and balanced the increased load on the network, at which time a fair assessment of overall traffic flow could be made.

(continued on page 7)
Interviews with project personnel, was the positive public sentiment that resulted from the use of full road closure. Commenting on the full closure approach, Gordon Proctor, ... a full closure can be an effective way to complete projects faster and improve safety for highway workers and motorists.”

Work zone safety and mobility policies ...

In 2003 each FHWA State conducted a work zone self-assessment to establish a baseline of the current state of the practice and identify future work zone quality improvement efforts.

FHWA developed “QuickZone,” a work zone impact analysis tool. It estimates costs for both an average day of work and for the whole life cycle of construction and can help the user determine what times of day and what times of the year are best for a certain project.

Develop Transportation Management Plans that include traffic control, transportation operations and public information and outreach. Traffic control plans recommend strategies to safely and efficiently handle traffic flow through the actual work zone. Transportation operations plans address the safety and mobility of the transportation system by identifying strategies for the sustained operation and management of the work zone impact area. Public information and outreach communicates information about the project and expected impacts to affected road users, the general public, residences and businesses, and the appropriate public entities.

FHWA promotes using Intelligent Transportation System (ITS) technologies in and around work zones to mitigate impacts of work zones. FHWA published the ITS and Work Zone Case Study that discusses the application of ITS in work zones in four locations. Benefits and lessons learned are identified. In 2003 FHWA plans to publish an ITS in work zones implementation guide and detailed case studies.

FHWA findings show the use of full road closure during rehabilitation can reduce both work zone congestion and crashes. In these projects, the roadway is closed, traffic rerouted, and the contractor given full access to the roadway with the expectation that construction time will be dramatically reduced. In 2003 FHWA plans to publish a series of documents highlighting the use of full closure, including benefits and lessons learned from six locations.

FHWA recently published a Notice of Proposed Rulemaking proposes some changes that potentially alter the way state and local government agencies approach consideration of work zone impacts.

Some of the other Office of Operations’ initiatives underway include:

- Work Zone Best Practices Guidebook shares highway community success stories/lessons learned with practitioners. Best practices covered include policy/procedures, public outreach, contracting, construction methods, enforcement, and ITS.
- The FHWA with State and local partners is sponsoring “Making Work Zones Work Better” workshops to share information on new and emerging technologies and practices focused on reducing congestion and crashes in and around work zones.

As a part of Congestion Vital Few, the FHWA is committed to reducing congestion and crashes in and around work zones. We continue to work with State and local governments, other Federal agencies, transportation officials, partner organizations, contractors, and others to make work zones work better and raise the bar for work zone safety and mobility.

For more information on FHWA Work Zone activities, please visit the FHWA Office of Operations web site at http://www.ops.fhwa.dot.gov or the Office of Transportation Operations at (202)366-1993.

Full Road Closure

A Method for Reducing Project Time and Mitigating Work Zone Congestion and Crashes

Transportation professionals are sensitive to public dissatisfaction with work zone congestion, delay, and safety concerns and are continually developing new approaches to improve traffic operations in and around work zones. Transportation professionals also appreciate that the need for work zones is large and growing across the nation. The increasing need to repair and maintain rapidly deteriorating infrastructure and the need to supply some additional roadway capacity leads to more work zones. Transportation agencies are challenged to balance the increasing need for work zones with mobility and safety concerns expressed by the public and government agencies. Full road closure is one method that transportation agencies are giving increased consideration to during project planning and design, as a potential way to balance these conflicting needs. Simply stated, the full closure approach is designed to eliminate the exposure of motorists to work zones and workers to traffic by temporarily closing a facility for rehabilitation or maintenance. In many cases, work may be performed more quickly since the work area is effectively cleared of interference from motorists passing through a site. The public also seems receptive to the idea. A recent survey of the traveling public found that 67 percent of those responding would support a road closure for as long as one week, and nearly 40 percent would support full road closure for up to one month.

State highway agencies have used full road closure successfully on a variety of project types ranging from full depth reconstruction to bridge joint replacement with guardrail enhancements. Based on interviews with project personnel and literature reviews, six projects using a full road closure approach were examined, including benefits, considerations for success and lessons learned. Factors included duration, cost, safety, mobility, quality, and public sentiment during the application of full road closure. The goal of this examination was to provide transportation agency staff with greater awareness and a better understanding of the reasons for the use of full closure, and the benefits associated with the approach. The projects examined during the research effort had varying characteristics, and reasons for using full road closure, while achieving similar positive results. Project personnel interviewed felt that full road closure was able to improve the road rehabilitation process, creating efficiencies that reduced project duration and in some cases overall costs while improving safety. A consistent theme, heard during interviews with project personnel, was the positive sentiment that resulted from the use of full road closure. Commenting on the full closure approach, Gordon Proctor, Director, Ohio Department of Transportation said, “Under the appropriate conditions, a full closure can be an effective way to complete projects faster and improve safety for highway workers and motorists.”

Why Use Full Road Closure?

- Expedite project completion
- Reduce the impact of construction on travelers
- Maximize workspace available to the contractor and increase productivity
- Reduce overall congestion resulting from construction
- Improve safety for workers and travelers
- Reduce crashes in some cases
- Reduce costs in some cases
- Result in a smoother roadway
- Improve public sentiment

Benefits of Full Road Closure

The six projects examined for this study all experienced numerous benefits as a result of using a full closure approach.

- All projects reported a reduction in project duration.
- Based on estimates from project personnel, two projects realized significant cost savings through the use of full closure.
- Five projects studied cited traveler and worker safety as a benefit and factor in the decision to utilize full closure.
- Three projects reported a better quality product achieved through the use of full closure.
- Two project sites reported that no complaints were received about the project, with positive comments frequently being made by the public. All projects reported that public sentiment was positive.
- Project personnel felt that worker productivity improved due to less distraction from traffic.
- All project sites noted that the impact of construction on travelers was reduced. Congestion on alternate routes during the closures was often less than predicted. Further detail on the benefits gained by each site is included in Table 1. In addition, full closure essentially eliminates worker exposure to traffic and moves traffic away from the work zone.

(continued on page 6)

5 ____________________________________________ 12 12

AZ MILEPOST, FALL 2003
ARIZONA TACKLES WORK ZONE DELAYS (CONTINUED FROM PG. 3)

The contractor placed signs on the backs of the camera and light to reduce driver distraction.

The license plate reader system has had its detractors and its share of controversy. Since the lights were on constantly, early in the project some motorists complained that the light positioned in the opposite direction to their travel distracted them. These complaints diminished after the contractor redirected the lights, and ADOT engaged in public outreach and education about the purpose of the lights.

After one of the cameras was stolen, the contractor welded the cameras to the sign structure and installed chains and padlocks. As construction proceeded and travel lanes were moved, the cameras and lights had to be adjusted continuously so that the license plates of the cars were clearly in the field of view.

Some motorists also raised privacy complaints at the start of the project; however, the central computer does not maintain any of the license plate numbers after they have been initially encrypted. The dissemination of information about the license plate reader system and the fact that it does not store license plate numbers eased the privacy concerns.

Benefits to Date  (May/June 2002)

Both of these programs make the SR-68 project a model for innovative work zone enhancements. ADOT provided comment cards to the many stranded motorists who were helped by the MAP patrols. Nearly 50 percent responded, all of whom made positive comments about their rescuers. Clearly, both programs are very popular with members of the traveling public, who find their travel delays reduced.

One resident of Bullhead City says, “I commute daily from Bullhead City to Kingman; what could have been a real nightmare during construction was no more than a slight headache. I smile every day now when I’m traveling to and from work.”

The travel-time incentive program is not as visible to the public as the MAP vehicles, but motorists still enjoy the benefits of both programs. Due to the travel-time incentive program, the contractor limited the number of flagging stations throughout the construction project and scheduled work in such a way that the adverse impact on motorists was reduced.

ADOT made extensive outreach efforts to communicate with the public regarding the project, including hiring a public relations firm and developing public service announcements, cable television announcements, radio media alerts, an information telephone number, and a Web site. These venues enabled motorists who use the corridor to express their opinions on the project. Those who responded reported that the construction work zone did not affect their travel through the corridor significantly. In addition to limiting travel delays, work zone programs such as these help improve transportation system efficiency, increase work zone safety, and provide a better working relationship between the State DOT, the contractor, and the community.

WORK ZONE BEST PRACTICES GUIDEBOOK

The Work Zone Operations Best Practices Guidebook and CD ROM were published by the Federal Highway Administration (FHWA) to promote the sharing of effective work zone technologies and practices among practitioners across the Nation. FHWA hopes that practitioners will find the information in the Guidebook useful for making informed decisions and taking actions that improve the operational efficiency and safety of the Nation’s highway system and our work zones. The Guidebook contains information for 262 work zone best practices that were identified through a work zone scanning tour of 26 States during 1998. Each practice is described, including the location where it was observed, reasons for its use, benefits received, and points of contact for further information.

The Guidebook was developed in partnership with the American Association of State Highway and Transportation Officials (AASHTO)’s Work Zone Best Practices Task Force to give practitioners easy access to documented best practices. FHWA’s Work Zone Mobility and Safety Product Team served as the primary developer at the federal level and the AASHTO Work Zone Task Force provided expertise from the state perspective.

Topics Covered in the Guidebook

Best practices are grouped into 11 major areas:

- Policy and Procedures;
- Public Relations, Education, and Outreach;
- Prediction Modeling and Impact Analysis;
- Planning and Programming;
- Project Development and Design;
- Contracting and Bidding Procedures;
- Specifications and Construction Materials, Methods, and Practices;
- Traveler and Traffic Information;
- Enforcement;
- ITS and Innovative Technology; and
- Evaluation and Feedback.

For each major area, the Guidebook provides an assessment of the state-of-the-art for work zone practice, lists the best practices organized into more specific subcategories, and contains a description for each practice.

To make the information easily accessible, the Guidebook contains a series of cross-references and a topical index. The cross-references enable practitioners to identify best practices based on where they were observed, project life cycle stage, type of organization, geographic or demographic characteristics, nature of activity, traffic conditions, and type of roadway.

“Best” Practices

The “best” practices listed in the Guidebook are descriptive, not prescriptive. They describe approaches and technologies that transportation agencies have used and found effective in their particular situations. Each organization must determine which of the practices and technologies are best suited for its own situation, considering all the factors that affect work zone operations. What practice or technology is “best” is a site-specific decision. The Guidebook serves as a reference catalog of useful practices and technologies for State and local transportation agencies, construction contractors, transportation planners, trainers, and other practitioners to consider in making those decisions.
WORK ZONE BEST PRACTICES GUIDEBOOK (CONTINUED FROM PG. 13)

Guidebook Updates

AASHTO and FHWA will work together to maintain and update the Guidebook by expanding the catalog with new approaches, technologies, and practices, as they become “state-of-the-practice” in work zone mobility and safety management. To make the Guidebook as useful and current as possible, FHWA wants to include practices that in the highway community have found to significantly reduce construction and maintenance impacts on work zone mobility and safety. FHWA encourages practitioners to identify and document such practices and nominate them for inclusion in the Guidebook. There is a best practice submission form included in the Guidebook that can be mailed or faxed to FHWA. Users can also provide feedback on practices already in the Guidebook and the usefulness of the Guidebook through a comment form in the Guidebook. Practitioners are encouraged to complete and submit the registration form in the Guidebook so they can receive information on Guidebook updates. Development of an updated version of the Guidebook is nearly complete. The updated version should be available in late 2003 or early 2004.

Receiving a Copy of the Guidebook

The Guidebook is available for viewing, searching, and downloading from FHWA’s work zone website. The web address is www.fhwa.dot.gov/workzones. The Guidebook was also produced in print and CD ROM formats.

CHECK IT OUT!

“ATSSA Safety Solutions” is a three-minute video (debuted at Sept. 2002 Midyear Meeting), shows how ATSSA member products help save lives in a variety of roadway scenarios. The Illinois Road and Transportation Builders Association has uploaded the video to www.irtba.org/wzsafety/videos.asp. Windows Media or RealOne video players are required to view the video on-line. After viewing the video, explore other links of this website to see outstanding examples of what this Illinois association is doing in support of National Work Zone Awareness Week.

Download ATSSA’s Roadway Safety Program <downloads/TEA-21RSPPublication1-30-02.pdf> (6/20/03)

Research & Technology Provisions Of Administration’s Surface Transportation Reauthorization Bill, Link to further information via the Transportation Research Board <http://gulliver.trb.org/publications/policy/admin_bill_etc.pdf> (5/22/03)

FHWA Releases 2003 Version of Highway Safety Tool for Rural Roads <http://www.fhwa.dot.gov/roadsafety/highwaytool.htm> - The Federal Highway Administration (FHWA) announced the release of the 2003 version of the Interactive Highway Safety Design Model (IHSDM), a new computer software program to help improve safety by providing state and local transportation officials with better information on the effects of design decisions they make for two-lane rural roads. (5/21/03)

Work Zone Safety Standards and Practices database for records added or updated July 29-September

WHAT’S NEW

The Work Zone Safety Training Database was updated August 29, 2003.
The Work Zone Safety Contact Persons Database was updated August 29, 2003

1994-2002 Work Zone Fatalities in Alcohol Related Crashes is now available.
The 2002 Motor Vehicle Traffic Fatal Crashes by State and Construction/Maintenance Zone is now available.
The Work Zone Safety Outreach Database was updated July 22, 2003.

The above publications are available for viewing on FHWA’s work zone website at www.fhwa.dot.gov/workzones.

AZ Milepost, Fall 2003

ARIZONA TACKLES WORK ZONE DELAYS (CONTINUED FROM PG. 2)

As the best way to measure the travel time through the construction corridor, the contractor chose to deploy a license plate reader system developed by a British company, Computer Recognition Systems, which has its U.S. headquarters in Boston, MA. The system uses a camera and a light source to capture the license plate images of passing vehicles.

Image recognition software takes the license plate number from the picture, encrypts it, and then sends it to the central computer at the contractor’s office through a high-speed data connection. The system is optimally designed to capture license plate readings at 45 to 55 mph (72 to 89 km/h).

A second camera at the far end of the construction zone takes a second picture, encrypts that license plate number, and sends it to the central computer on a high-speed connection. The central computer then matches up the license plates that enter and exit the limits of the construction project and calculates the times for the motorists’ trips.

The contractor placed a total of four cameras on the project, one each at the entrance and exit of the construction in each direction. The cameras were mounted behind construction signs to keep them from distracting the motorists. Each of the four locations included a camera on one sign assembly and a steady burning light on a second sign assembly, each positioned to capture license plate readings from passing vehicles. The lights, which operated 24 hours a day, were necessary to receive the license plate numbers, especially on license plates covered by motorist-installed plastic license plate covers.

The project participants considered using radar systems throughout the corridor to implement the travel-time system. Such technology would give single-point traffic speeds but would not offer direct measurement of corridor travel times.

As with many things, the terrorist attacks on September 11, 2001, affected the SR-68 project. The US-93 route across the Hoover Dam, which is the other major route for vehicles traveling between Arizona cities and Las Vegas, was closed to truck traffic. All of the traffic was routed over SR-68 and through the construction project. At the time of the terrorist attacks, the contractor had been very successful in meeting the average travel-time goal, resulting in only $9,594 being drawn from the travel-time fund. The final resolution of the travel-time goals that were exceeded between September 11 and the end of the construction project is still under negotiation.

The license plate reader system was able to match around 11 percent of the license plates photographed at the start with those photographed at the finish of the corridor, a statistically adequate percentage for measuring the average travel time. The license plate reader system was fairly expensive to operate. The system requires high-speed data connections, which cost about $700 per month for a high-speed communication line capable of transmitting the travel-time information from the far end of the project versus about $200 per month for a wireless connection, which could have been used for the short distance connection on the Kingman end of the project. The monthly expense for electricity was approximately $100. Once the project is completely finished, the license plate reader system will be the property of the contractor. (continued on page 3)
The Arizona LTAP Center is a part of the nationwide Local Technical Assistance Program. It is financed jointly by Federal Highway Administration, Arizona Department of Transportation, and Arizona local agencies.

The Arizona Milepost may contain rewritten and reprinted material compiled from reliable sources, but it assumes no responsibility for the correctness of the information.

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ARIZONA TACKLES WORK ZONE DELAYS (CONTINUED FROM COVER)

roadway clear, identified incidents, and maintained smooth operations while the highway was under construction. The drivers of the MAP vehicles were trained as security guards, but they dressed in typical construction-type clothing, including hard hats and safety vests.

The contractor, who operated the MAP from 4 p.m. to 6 a.m. on weekdays and around-the-clock on weekends, hired a private security guard service. They operated the MAP vehicles during the hours when construction was not going on. During construction hours, the MAP was considered unnecessary since plenty of people were available to assist motorists.

Because the MAP operated at off-peak hours and the MAP drivers approached stopped vehicles and sometimes encountered people acting suspiciously, the contractor determined that trained security guards would be safer MAP drivers. The security guard training also helped the drivers know how to approach stranded motorists in a professional manner that put the motorist at ease.

Between the program’s inception in October 2000 and April 2002, the MAP vehicles assisted 963 stranded motorists. The majority of the travelers were stranded due to mechanical failure, probably caused by the high-desert temperatures and the 6-percent grade that is characteristic of much of the segment of road that was under construction. Of these motorists, 68 percent were able to get back on the road with the assistance of the MAP only. Further assistance, such as towing services, were called in the cases of the other 32 percent of the motorists needing help.

“The commitment to safety and cooperation … by the SR-68 team was impressive,” says Lieutenant Ron DeLong of the Arizona Department of Public Safety (DPS). “The Motorist Assist Patrol was very helpful to DPS and the traveling public. ADOT and the contractor also responded quickly to other travel and safety issues throughout the project.”

Travel-Time System Incentive Program

The SR-68 project also implemented a travel-time system that measured the consistency of the time it took for motorists to travel through the construction work zone. Prior to construction, the average travel time for this segment, which has a posted speed limit of 55 miles per hour (89 kilometers per hour), was 17 minutes. During construction, traffic control measures and reduced posted speed limits of 35 to 45 mph (56 to 72 km/h) increased the corridor travel time to approximately 21 minutes.

The contract included a provision that during construction, the average travel time would not exceed 27 minutes. The onus was on the contractor to measure the travel time and ensure that the average travel-time goals were met. The contract provided for a $400,000 travel-time incentive budget item that was to be reduced if the target travel-time average was exceeded. The travel times were taken 24 hours a day, 7 days a week, and were averaged over 10-minute periods. If three consecutive 10-minute periods were clocked at over 27 minutes, the contractor was charged $21.50 per minute per lane.

Any funds left in the travel-time budget are to be paid as profit to the contractor. If the contractor were unable to maintain the target travel time during construction, the entire $400,000 could be depleted, and the contractor would be responsible for paying for the additional travel-time delay. (continued on page 3)

CALENDAR OF EVENTS


October 5-8, 2003: Western Bridge Engineers’ Seminar in Reno, NV. The seminar is a biennial cooperative effort by FHWA and the State transportation departments of Alaska, California, Idaho, Nevada, Oregon, and Washington State. It allows government agencies, consultants, contractors, educators, and suppliers to exchange information on subjects of current interests in the design, construction and maintenance of bridges. For more information contact Jean Canfield, Conference Manager, at (360) 943-7732, fax (360) 357-9607 or e-mail at jeancassocc@msn.com.

October 12-14, 2003: Southeastern Local Roads Conference, Asheville, NC. For more information contact North Carolina Technology Transfer Center, telephone (919) 515-8899, e-mail bens@unity.ncsu.edu, plcoer@unity.ncsu.edu, ronnie_williams@ncsu.edu, web site http://www.ire.ncsu.edu/LTAP/

October 14-15, 2003: MINK County Engineers Meeting, St. Joseph, MO. For more information contact Missouri Local Transportation Resource Center, telephone (573) 341-7200, e-mail mltrc@umr.edu, web site http://www.web.umr.edu/mltr/index.html

October 15-17, 2003: Regional County Engineers Conference in Laughlin, NV. For more information contact AZ Association of County Engineers at info@azace.org or visit the web site at http://www.azace.org.

October 19-24, 2003: AASHTO National Transportation Management Conference in Williamsburg, VA. For more information contact AASHTO contact, Donna Tamburelli at (202) 624-5815 or donnat@aashto.org, or Eno Transportation Foundation, Inc. Contact, Regina Burge at (202) 879-4713 or regina@notrans.com.

October 22-23, 2003: Local Road Coordinator’s Conference, Rapid City, SD. For more information contact North Dakota Transportation Technology Transfer LTAP Center, telephone (701) 231-7051 (800) 726-4143, e-mail Donald.Anderson@ndsu.nodak.edu, web site http://www.ce.ndsu.nodak.edu/ndltap

November 5-7, 2003: Fleet Equipment & Shop Management for Government Agencies Workshop. For more information contact American Public Works Association at 1-800-848-APWA, e-mail education@apwa.net or web site http://www.apwa.net/Education/?mode=detail&ID=67


November 19, 2003: Click, Listen & Learn, Blueprints for Public Works Yards. For more information contact American Public Works Association at (816) 472-6100, e-mail ascherzer@apwa.net, http://www.apwa.net/education,

December 9-12, 2003: Introduction to Construction Inspection Workshop. For more information contact American Public Works Association at 1-800-848-APWA, e-mail education@apwa.net, web site http://www.apwa.net/Education/?mode=detail&ID=69

HOST THE NATIONAL WORK ZONE MEMORIAL


Would you like the National Work Zone Memorial to visit your community in 2004? The American Traffic Safety Services Foundation invites your organization to submit an application to host the Memorial. The exhibition honors roadway workers, emergency and law enforcement personnel, pedestrians, and private vehicle occupants who have lost their lives in work zone accidents, and is a living tribute to their memory.

The exhibition brings to the attention of the motoring public and the media the fact that about 900 men, women and children are killed senselessly in work zones each year. It travels to communities cross-country year-round to raise awareness of the need to respect and stay safe in America’s roadway work zones. For photos and more information, please visit www.atssa.com and click on “Public Information.”

The Memorial is available starting in late February, 2004. Please note that it is reserved during the second week of April each year for the events in Washington, DC during National Work Zone Awareness Week.

2004 hosting applications are now available and should be submitted to ATSSF by October 31, 2003. To download an application visit http://www.atssa.com/pubinfo/downloads/atmapplication.pdf. E-mail any questions to lisak@atssa.com.

AZ LTAP has submitted an application to host the National Work Zone Memorial. We invite you to stop by and join us in paying tribute to the memory of the men, women and children who have lost their lives in work zone related accidents. The dates and location to where the memorial will be displayed will be announced in our Winter issue and our web site.

For more information on the National Work Zone Memorial see page 9.

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ARIZONA MILEPOST
Your Local Technical Assistance Program

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ISSUE FOCUS - MAKING WORK ZONES WORK BETTER

Arizona Tackles Work Zone Delays

by Alan Hansen, Assistant Planning and Research Engineer for FHWA’s Arizona Division - This original article was written in May/June 2002, the title/positions of individuals mentioned in the article may have changed since the date that it was originally written.

If you’re having trouble minimizing traffic delays during construction projects (and who isn’t), then you may discover some ideas in two innovative programs developed by the Arizona Department of Transportation (ADOT) — a motorist assist patrol and a travel-time incentive program. ADOT used the new approaches to minimize motorist delays while reconstructing a 13-mile (21-kilometer) section of State Route 68 (SR-68). The project started in July 2000 with a partnering workshop between the contractor and ADOT, and all of the pavement was in place by the end of April 2002.

Although SR-68 is a rural corridor cutting through high-desert landscape and the Black Mountains, highway officials in Arizona consider the road to be a major commuter route. It serves motorists traveling between Kingman and Bullhead City on the Colorado River near the State’s western border. In addition to commuter traffic, trucks comprise 7 percent of the vehicles on SR-68, and a significant number of recreational users also travel the corridor. The construction project started at about the mid-point of SR-68 and went to Bullhead City.

ADOT’s Kingman district engineer Debra Brisk developed the motorist assist patrol and the travel-time incentive program specifically for this project. ADOT resident engineer Jennifer Livingston conducted a site visit in May 2001 when the project was approximately 35 percent complete. "The traffic management tools,” says Livingston, “truly minimized the construction impacts to the traveling public and commuters.”

Motorist Assist Patrol

The motorist assist patrol (MAP) consisted of a vehicle and driver equipped with equipment and supplies that help stranded motorists get back on the road or call for additional assistance if needed. Each MAP vehicle was outfitted with traffic control devices, water, gasoline, flares, jacks, and lighted arrow boards.

In addition to helping the motorist safely back on the road, the MAP also kept the