Work Zone Operations Best Practices Guidebook (Third Edition)

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Federal Highway Administration

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Project Leader - Tracy Scriba, FHWA

16. Abstract

This Work Zone Best Practices Guidebook provides an easily accessible compilation of work zone operations practices used and recommended by various States and localities around the country. The Guidebook is a reference document that can be updated with new approaches, technologies, and practices for effectively managing work zones and reducing the impacts of work zones on mobility and safety as they are identified. The best practices are descriptive, not prescriptive. They describe approaches that have been successfully used by transportation agencies, along with contact information to find out more from the agency using the practice. Each organization must determine which of these practices are best suited for its particular situation, considering all the site-specific factors that affect work zone operations.

The best practices are grouped into 11 major categories to help practitioners easily find practices that deal with a particular topic. Practices can also be found via six cross-references that enable users to find best practices in several different ways, and a subject index that offers 49 topics and subtopics for more specific searches.

The Guidebook is available in two formats: a print version, which can be ordered by mail or downloaded as a PDF and printed, and a web-based, searchable version.

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Foreword and Acknowledgments

This Guidebook is the third release of a resource designed to give State and local transportation agencies, construction contractors, transportation planners, trainers, researchers and others with interest in work zone operations access to information and points of contact about current best practices for improving work zone mobility and safety. The Guidebook is available in two formats: a print version, which can be ordered by mail or downloaded as a PDF and printed, and a web-based, searchable version. The PDF and web-based versions of the Guidebook are available via the Federal Highway Administration Office of Operations work zone website: http://www.fhwa.dot.gov/workzones. Printed copies of the Guidebook can be obtained by sending an email with the name of the publication you are requesting, number of copies needed, and shipping directions, to workzonefeedback@dot.gov.

In addition to the collection of work zone best practices and associated cross-references, the Guidebook includes three forms designed to make the Guidebook more useful to current and future users. These are 1) a registration form, 2) a best practices submission form, and 3) a best practices review and comment form. Please complete the registration form so that you can be included in distributions of future editions of this document and notified when updated information is available.

The Guidebook's origins date back to the June 1999 American Association of State Highway and Transportation Officials (AASHTO) Meeting of the Subcommittee on Traffic Engineering (SCOTE). At that meeting, the Director or FHWA's Office of Transportation Operations and the Chairman of the AASHTO SCOTE Best Practices in Work Zones Task Force agreed to collaborate on the development, publication, and distribution of a Work Zones Best Practices Guidebook that would give practitioners easy access to these best practices. Since then, AASHTO and FHWA have continued to work together in the development of the Guidebook. AASHTO provides subject matter expertise and access to practitioners, while FHWA provides national coordination, research, and publication support.

The AASHTO Work Zone Task Force has continued to collaborate with FHWA on the Guidebook. In preparation for this version of the Guidebook, the Task Force provided a review of new practices being considered for addition to the Guidebook and provided recommendations for deleting, revising, and combining existing best practices. In addition, State points of contact reviewed their practices and provided recommended updates and additions, as well as deletions of practices no longer in use. FHWA also reviewed all practices, and combined some similar practices to avoid repetition. As a result of these efforts, the Guidebook has been significantly updated:

- 23 new practices were added to the Guidebook in this version.
- 66 out-of-date practices were deleted.
- 3 practices were combined with others for clarity
- Nearly all of the 172 practices were updated.

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Work Zone Best Practices Guidebook Registration

Please take a few moments to complete the following registration form. By submitting the form you will be notified when addendums are available on the web site, and included in any distributions of future printed editions of the Guidebook. An online version of the form is available on the FHWA work zone website at http://www.ops.fhwa.dot.gov/wz/practices/best/bestpractices.htm. You may also submit a hard copy version of the form to the following address: FHWA Work Zone Program, 1200 New Jersey Avenue SE (HOTO-1), Washington, DC 20590.

Name:	
Title/Position:	
Organization/Agency:	
Address (include country if other than USA):	
Phone: ( )	Fax: ( )
Email Address:	
Primary Responsibility (especially note responsibilities related to work zone operations):	
Do you want to be notified of additions/changes to the Guidebook? ❑ yes ❑ no	
Would you like to receive a paper copy or CD copy of the Guidebook when available? ❑ yes ❑ no	
Suggestions for improving the Guidebook:	
Based on your initial impressions, do you feel that this Guidebook will be useful to you in identifying practices that will improve work zone operations? Assign 1 to 4 stars. (Not useful) ✵ ✵✵ ✵✵✵ ✵✵✵✵ (Very Useful)	

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Work Zone Best Practice Submission Form

Is your organization using innovative approaches that result in reduced congestion and crashes in work zones? Use the form below to describe what you do to improve work zone operations, whether in policy, planning, public outreach, or during construction and maintenance activities. An online version of the form is available on the FHWA work zone website at http://www.ops.fhwa.dot.gov/wz/practices/best/bestpractices.htm. You may also submit a hard copy version of the form to the following address: FHWA Work Zone Program, 1200 New Jersey Avenue SE (HOTO-1), Washington, DC 20590.

State(s) where the practice in employed:
Title of the best practice/policy:
Description of the best practice/policy:
Reason(s) for adopting the best practice/policy:
Biggest benefit(s) being realized from this best practice/policy:
Location and type(s) of projects where this practice/policy is most applicable/effective:
Contact(s) (include name, title, office/agency, phone/fax, and email address):
Select the one most applicable category from the following list: ❑ Policy and Procedures ❑ Public Relations, Education, and Outreach (Program Level) ❑ Modeling and Impact Analysis ❑ Planning and Programming ❑ Project Development and Design ❑ Contracting and Bidding Procedures ❑ Construction/Maintenance Materials, Methods, Practices, and Specifications ❑ Traveler and Traffic Information (Project Related) ❑ Enforcement ❑ ITS and Innovative Technology ❑ Evaluation and Feedback

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Work Zone Best Practices Comment Form

As you use this Guidebook to identify, select, and, as appropriate, employ best practices described here, please provide comments on best practices you find particularly helpful or where you have built upon a best practice contained in the Guidebook to achieve better results.

An online version of the form is available on the FHWA work zone website at http://www.ops.fhwa.dot.gov/wz/practices/best/bestpractices.htm. You may also submit a hard copy version of the form to the following address: FHWA Work Zone Program, 1200 New Jersey Avenue SE (HOTO-1), Washington, DC 20590.

Best Practices Reference No. (from Guidebook):	
Best Practice/Policy Title (from Guidebook):	
Your Name:	Title/Position:
Your Organization/Agency:	
Phone: ( )	Fax: ( )
Email Address:	
Comment(s) on the best practice (e.g. how and where applied, results obtained, modification/ improvements made, “lessons learned”):	
Did you contact anyone to learn more about the best practice: ❑ yes ❑ no Was the contact information provided in the Guidebook correct: ❑ yes ❑ no If the contact information was incorrect, please provide the correct contact information (if known):	
How would you rate the Guidebook or the specific best practice overall in terms of how well you were able to implement it in your organization and the results achieved? Assign 1 to 4 stars. (Low) ✵ ✵✵ ✵✵✵ ✵✵✵✵ (High)	

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Overview of the Guidebook

This Work Zone Best Practices Guidebook provides an easily accessible compilation of work zone operations best practices and policies used by various States and localities around the country. The Guidebook is a reference document that can be updated with new approaches, technologies, and practices for effectively managing work zones and reducing the impacts of work zones on mobility and safety. The best practices are *descriptive,* not *prescriptive.* That is, they describe approaches that have been successfully used by transportation agencies, along with contact information to find out more from the agency using the practice. *Each organization must determine which of these practices are best suited for its particular situation, considering all the site-specific factors that affect work zone operations.*

The best practices are grouped into 11 major categories to help practitioners easily find practices that deal with a particular topic. Each of the 11 major categories has its own section in the Guidebook. Each section has a description of the category and a brief summary of the types of activities found in that category, followed by each of the work zone best practice entries in the section. The entry for each practice includes:

- Category/Subcategory Name and Reference Number for the Best Practice
- Best Practice Title
- Description of the Best Practice
- Reason(s) the Agency Used the Best Practice
- Primary Benefit(s) Being Realized from this Best Practice
- Most Applicable Location(s) and Type(s) of Projects Where this Practice Is Most Effective
- Contact(s).

In addition to the category and subcategory designations, practices can be found via cross-references, a subject index, and an online keyword search. The six cross-references allow practitioners to identify best practices based on where they were observed, when in the project life cycle stage they are used, the nature of the work zone activity, traffic conditions in the work zone, geographic or demographic characteristics, and the type of roadway involved. The Guidebook also contains a subject index that has 49 topics and subtopics for more specific searches. The online version at http://www.ops.fhwa.dot.gov/wz/practices/best/bestpractices.htm also enables users to find practices by searching on a keyword/term of interest.

Figure 1 provides an illustration of how the Guidebook is organized.

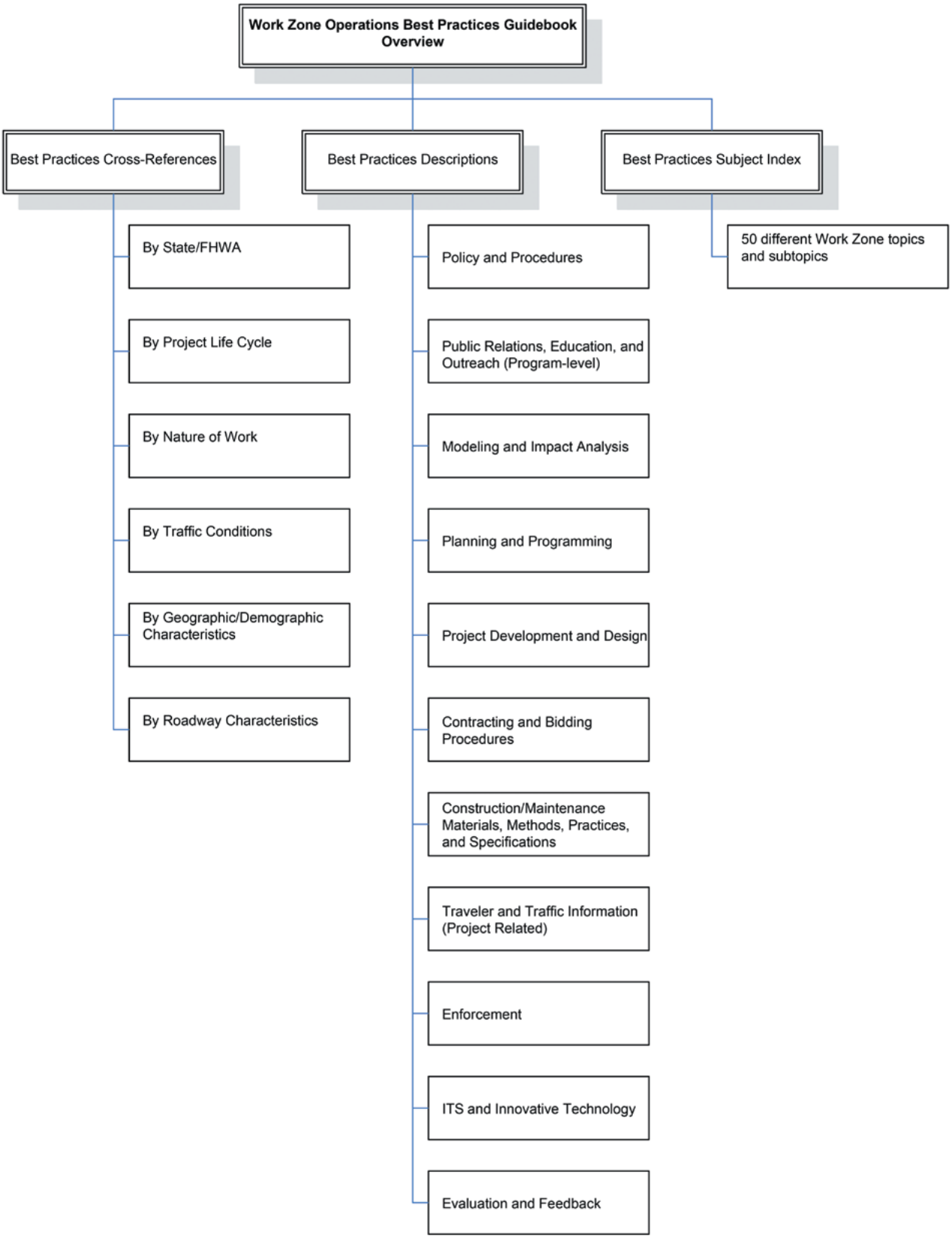

Figure 1. Guidebook Organization

Best Practices by State and Federal Highway Administration

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Best Practices Category A - Policy and Procedures

Best practices in this section encourage customer driven comprehensive work zone transportation management policies that focus on reducing the exposure of and impacts to the road user and worker. High-quality design, construction, and maintenance operations policies and practices are included that minimize disruption to the highway user and maintain a safe, efficient roadway environment for the traveling public and highway workers.

Examples of practices include:

- Road, ramp, and lane closure policies that reduce the period of time that work zones are present on the roadway.
- Committees and task forces that collaborate to minimize project impacts.
- Organizational strategies, structures, and policies to examine work zone issues and impacts.
- Performance goals and measures for work zones, such as maximum delay and/or queue lengths.
- Technical guidance that provides specifications, geometric standards, and life-cycle costing analysis to ensure quality work, materials, and design.
- Traffic management principles that focus on reducing the exposure of road-users and workers.

The following best practice entries relate to work zone policy and procedures:

Subcategory	Ref. #	POLICY AND PROCEDURES Best Practices
A1 Lane/Ramp/ Road Closure Policy	A1-1	Road Closure Program
	A1-2	Street Restriction Program
	A1-3	Maintain Existing Number of Travel Lanes
	A1-4	Limited Length of Lane Closure
	A1-5	Ramp Closures During Reconstruction
	A1-6	Total Closures to Accelerate Work and Minimize Delay
	A1-7	Lane Closure Policy/Map
	A1-8	Lane Closure Coordinator
	A1-9	Narrowing Lanes and/or Reinforcing Shoulders to Maintain Existing Number of Lanes

Subcategory	Ref. #	POLICY AND PROCEDURES Best Practices
A2 Collaboration	A2-1	Mayor's Transportation Management Task Force
	A2-2	Public-Private Partnership Incentives for Early Completion
	A2-3	"Design for Safety" Partnership
	A2-4	Consolidated Traffic Control Logbook
A3 Organizational Strategy	A3-1	Full-Time Work Zone Traffic Control Engineer
A4 Performance Goals and Measures	A4-1	Work Zone Performance Goal – Maximum Delay Specification
	A4-2	Work Zones Designed at the Posted Speed
A5 Technical Guidance	A5-1	Guide to Establishing Speed Limits in Highway Work Zones
	A5-2	Work Zone Speed Limit Reduction and Speeding Fine Program
	A5-3	Long Life Pavement Rehabilitation Program for Urban Freeways
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	A5-5	Additional Shoulder Thickness
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BEST PRACTICE:

Road Closure Program

DESCRIPTION:

Each project is analyzed and a determination is made, prior to construction, concerning road closures that will be permitted during construction. The county has used this process for over 12 years. The county performs a benefit/cost (B/C) study utilizing the traffic volumes, duration of the project, and length of detour that will be required. If the B/C study indicates it is advantageous to close the roadway during construction it will be noted in the contract special provisions. Occasionally, on projects where closure is not so noted in the contract, the contractor may propose a schedule for a lesser duration of road closure that will result in an acceptable B/C rate and the contractor will be permitted to close the roadway. Local traffic access for affected residents and businesses is still maintained during road closures.

REASON(S) FOR ADOPTING:

The county is aware of the cost of the project to both the county as well as the traveling public. Road closures are expected to permit the construction to be completed quicker, at lower cost, and with greater safety to both the contract workers and the motorist.

PRIMARY BENEFIT(S):

Lower cost, safer project, and construction completed earlier.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any county road, urban and rural.

STATE(S) WHERE USED:

Arizona

SOURCE/CONTACT(S):

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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-2

BEST PRACTICE:
Street Restriction Program

DESCRIPTION:
The Right-of-Way Management Program has been in place for about six years. Individuals, agencies or companies requesting to use the right-of-way are required to secure a Temporary Restrictions and Closure (TRACS) permit, which will allow staff to coordinate multiple projects in an area to reduce space conflicts and authorize them to perform their work. The program is used for all projects and special events on major and collector streets. The four major components of the program are:

- ***Certification*** – agencies wanting to place/remove temporary traffic control (TTC) are required to go through an annual training program;
- ***Impound Authority*** – the City can remove and store TTC devices in emergency situations or as a last resort if the owner will not pick them up;
- ***Civil Sanctions*** – fines for TTC violations; and
- ***Parking Meter Fees*** – fees for taking parking meters out of service.

REASON(S) FOR ADOPTING:
As traffic levels and the number of construction/maintenance activities increased, City staff and citizens noticed an overall degradation in work practices within the public right-of-way. The program was designed to enhance traffic safety and mobility by minimizing unauthorized and improper street and sidewalk restrictions. The goal is to improve awareness and knowledge of effective temporary traffic control practices, gain high levels of compliance with related requirements, and reduce the impact on the traveling public without delaying projects.

PRIMARY BENEFIT(S):
An increase in safety for workers, pedestrians, bicyclists, and the motoring public. Less conflict between traffic and construction work results in projects being completed quicker and more efficiently.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All streets and highways.

STATE(S) WHERE USED:
Arizona

SOURCE/CONTACT(S):

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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-3

BEST PRACTICE:

Maintain Existing Number of Travel Lanes

DESCRIPTION:

For widening or major reconstruction on limited access facilities, the Florida Department of Transportation policy is that the work zone design plans maintain the existing number of lanes for the various work phases. In all cases, traffic volumes will be analyzed to determine if any lane closures can be permitted for short durations. This policy has been in effect since December 1995.

REASON(S) FOR ADOPTING:

Public criticism of unnecessary lane closures on existing facilities. This awareness was heightened due to several hurricane evacuations where less than all lanes were available.

PRIMARY BENEFIT(S):

Reduced driver delay and frustration and improved public relations.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Type of facility: High-volume/high-speed, urban or rural freeways and other multi-lane access controlled roadways. All types of work.

STATE(S) WHERE USED:

Florida

SOURCE/CONTACT(S):

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Stefanie D. Maxwell, P.E., Specialty Engineer
Florida DOT Construction
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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-4

BEST PRACTICE:
Limited Length of Lane Closure

DESCRIPTION:
Work zone lane closures are limited to two miles within a project. Lane closure length is based on traffic volumes, percent grade, and directional travel demand. The restriction based on roadway grade is applied in the mountainous region of western North Carolina. Directional restrictions are applied in urban areas where rush hour traffic predominates. Lane closure restrictions have been used by the North Carolina Department of Transportation since the early 1990s and have been increasingly used in recent years.

REASON(S) FOR ADOPTING:
Managing the capacity reduction by setting limits on lane closures reduces traffic queuing and the possibility of vehicles becoming involved in a collision.

PRIMARY BENEFIT(S):
Congestion is managed and safety of motorists is improved.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This policy applies to high-volume/high-speed divided facilities with major construction projects.

STATE(S) WHERE USED:
North Carolina

SOURCE/CONTACT(S):
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North Carolina DOT
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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-5

BEST PRACTICE:

Ramp Closures During Reconstruction

DESCRIPTION:

The Oklahoma Department of Transportation (ODOT) considers implementing ramp closures on all projects during reconstruction efforts on Interstates and freeways. ODOT conducts a public hearing for the surrounding neighborhoods to notify the public of the upcoming closures and to address the concerns expressed by the public. Typically, this is done just prior to closing the ramps.

In the future, ODOT plans to conduct the public hearings during the planning and design phases to ensure that all local concerns are addressed and that no local economic hardship will result from the ramp closures. ODOT plans to distribute questionnaires after completion of the construction project to determine how the local population was affected and what improvements can be made to the ramp closure process.

REASON(S) FOR ADOPTING:

This policy was initiated to facilitate reconstruction and improve public relations when existing ramps must be closed for rehabilitation projects.

PRIMARY BENEFIT(S):

The primary benefits are facilitating and accelerating reconstruction. These in turn reduce motorist delay and improve safety. The secondary benefits derived from this practice are increased public awareness of construction projects and work zones, less confusion of local citizens seeking alternate routes, and occasionally, new ideas on different approaches to closing the ramps.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This practice mainly affects high-speed/high-volume, access-controlled Interstates, and freeways during rehabilitation and reconstruction.

STATE(S) WHERE USED:

Oklahoma

SOURCE/CONTACT(S):

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Oklahoma DOT
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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-6

BEST PRACTICE:

Total Closures to Accelerate Work and Minimize Delay

DESCRIPTION:

Total closures of a section of road are used for a period of time to efficiently complete construction and minimize overall impacts to travelers.

Full road closure is designed to eliminate the exposure of motorists to work zones and workers to traffic by temporarily closing a facility for rehabilitation or maintenance. During full road closure, traffic is detoured, allowing workers full access to roadway facilities. A full closure approach may be used for an extended period of time, on weekends or nights, or directionally on a segment of roadway.

REASON(S) FOR ADOPTING:

The main reason to adopt the practice is to accelerate the completion of construction projects and to minimize delays.

PRIMARY BENEFIT(S):

The contractor can work without worrying about traffic in the work zone. The total time to construct a project and the cost of the project are reduced. Use of full road closure can also result in positive public sentiment, increased productivity, and increased safety.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All locations where alternate routes are available and/or access can be restricted for a period of time, and reducing project duration is important.

STATE(S) WHERE USED:

Ohio

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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-7

BEST PRACTICE:

Lane Closure Policy/Map

DESCRIPTION:

Lane closure policies and maps are used by agencies across the country to better schedule work zone activities and limit impacts to traffic by designating when and how lanes can be closed for work on some or all roadways based on analysis of roadway conditions.

Using the *Highway Capacity Manual* formulas, the Ohio Department of Transportation (ODOT) analyzed freeways using hourly traffic counts and queue analysis methodologies. From this analysis, ODOT created a map showing the times of permitted lane closures that will generally not cause backups, broken down by hour of the day, and weekday or weekend for corridors across the State. As part of its lane closure policy, ODOT requires contractors, utility workers, and Department maintenance staff to maintain sufficient capacity to manage queuing/delay throughout the day on Interstates by closing or opening lanes on an hour-by-hour basis. ODOT also provides work zone engineers (both internal and external) with a web tool for looking up permitted lane closure times, available at: http://plcm.dot.state.oh.us/. This website also highlights the method that the State uses to calculate permitted lane closure times and how data is collected to support these calculations. Exceptions to this policy, except for during emergencies, require further analysis and approval from a central committee.

Colorado DOT (CDOT) divided the State into six regions that each developed unique regional lane closure policies. CDOT publishes lane closure maps and spreadsheets for work zone engineers and contractors. Allowable lane closures vary by region but are calculated based on queue analysis and wait time limits. CDOT's regional lane closure policies have enabled the DOT to plan more effective lane closures based on the specific needs of a region.

California DOT (Caltrans) has developed a lane closure approval process and a web-based Lane Closure System (LCS) to coordinate lane closures. The LCS allows Caltrans to review the details of a lane closure request, check for potential conflicts, approve or mitigate requests, ensure that the closure is consistent with any corridor transportation management plans, and monitor closure progress. Requests are submitted by resident engineers (REs) a week in advance of the planned lane closure. After they are approved, the RE must notify the appropriate traffic management center on the day the closure starts and again when it ends. The LCS feeds data into California's freeway Performance Measurement System (PeMS), a real-time data management system that provides the status of all lane closures.

Indiana DOT (INDOT) lane closure policy includes a color-coded statewide lane closure map that indicates lane closure restrictions and more detailed maps for each of the four major urban areas. An example of a restriction would be an area that can only have lane closures at night. For sections that are too small to see on the maps, tables offer more specific locations.

REASON(S) FOR ADOPTING:
A growing number of lane closures by contractors and State agencies were causing major queuing.

PRIMARY BENEFIT(S):
Reduced work zone delays for motorists and increased customer satisfaction.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All freeways. All types of work.

STATE(S) WHERE USED:
California, Colorado, Indiana, Ohio

SOURCE/CONTACT(S):
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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-8

BEST PRACTICE:

Lane Closure Coordinator

DESCRIPTION:

The lane closure coordinator serves as a single point of contact for compilation and distribution of information related to planned lanes closures each week. This practice began in 1997 in the Northern Virginia District of the Virginia Department of Transportation (VDOT).

REASON(S) FOR ADOPTING:

Lane closure coordinators can be used to avoid concurrent lane closures during maintenance, construction, or utility work on nearby sections of roadway and to avoid conflicts in operations.

PRIMARY BENEFIT(S):

Through the activities of lane closure coordinators, work zone activities can reduce traffic delay and congestion due to multiple operations in nearby areas.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of work and all locations.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Policy and Procedures → Lane/Ramp/Road Closure Policy	A1-9

BEST PRACTICE:

Narrowing Lanes and/or Reinforcing Shoulders to Maintain the Existing Number of Travel Lanes

DESCRIPTION:

The travel lanes are narrowed and shoulder lanes are reinforced (if not built strong enough initially to support traffic) in order to maintain the same number of travel lanes during a work zone. Typically at least one lane is wider than the others and trucks are restricted to the wider lane(s).

REASON(S) FOR ADOPTING:

To maintain the overall number of travel lanes in a work zone to the number available for travel without a work zone. To better accommodate future maintenance needs by building or rebuilding shoulders to a higher strength.

PRIMARY BENEFIT(S):

Maintaining the same number of lanes helps minimize congestion. Reduced lane widths can have the effect of slowing motorists, increasing the rate of attention thereby improving safety.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All highways.

STATE(S) WHERE USED:

FHWA

SOURCE/CONTACT(S):

Methods and Procedures to Reduce Motorist Delay in European Work Zones
FHWA-PL-01-001 www.international.fhwa.dot.gov October, 2000

Policy and Procedures → Collaboration	A2-1

BEST PRACTICE:

Mayor's Transportation Management Task Force

DESCRIPTION:

The transportation management task force is a multi-agency task force that meets once a week to review city-wide construction and maintenance activities and special events that have the potential to significantly impact traffic throughout the City of Chicago. The task force compiles a list of projects and groups the items according to geographic location. The list goes beyond roadway projects to include sewer, utility, maintenance, building construction, and other kinds of construction that impact traffic flow. The task force also takes into account upcoming special events. The projects considered by the task force to have the greatest impact to traffic are included in a "Mayor's Weekly Traffic Bulletin," with new or priority projects/events highlighted at the top. The locations throughout the City are broken down in the bulletin by downtown, expressways/major arterials such as the Eisenhower or Chicago Skyway, the Central Area of Chicago, Chicago's North/Northwest areas, the West/Southwest areas and by the South/Southeast areas. The bulletins also indicate basic information relative to the type of work, such as resurfacing, reconstruction, restoration/rehabilitation, utility, etc. All Aldermanic Offices and a multitude of other agencies, such as police and community organizations, regularly receive the weekly "Mayor's Bulletin" and task force meeting minutes. The task force and bulletin have been in-place since 1982.

REASON(S) FOR ADOPTING:

Initially started in response to office building construction and infrastructure projects that were occurring simultaneously throughout the Central Business District, the city surveyed all such activities which might adversely impact traffic flow and began coordinating efforts to help motorists drive through construction work zones of all kinds.

PRIMARY BENEFIT(S):

By meeting and formulating coordinated traffic flow mitigation efforts, the task force can provide the motoring public advance notice of construction projects and events for the weekend and following week. This enables the public to plan ahead and even avoid, all together, areas where construction activities are going to occur.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Types of facilities include all of Chicago's freeways, streets, 2-lane/2-way highways, bridges, and even major building construction sites.

STATE(S) WHERE USED:
Illinois

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Policy and Procedures → Collaboration	A2-2

BEST PRACTICE:

Public-Private Partnership Incentives for Early Completion

DESCRIPTION:

The Oklahoma Department of Transportation (ODOT) created a public-private partnership to facilitate early completion of a project. A food chain offered ODOT $300,000 if the project was completed prior to the grand opening of the new store. ODOT chose to offer the $300,000 to the contractor as an incentive for early completion of the project.

REASON(S) FOR ADOPTING:

This practice was originally begun when a large food chain was building a new store near an existing Interstate interchange that was being rehabilitated and expanded. This practice was received so well by the State government and public that ODOT decided to seek similar public-private partnerships in the future.

PRIMARY BENEFIT(S):

Besides reducing user delay, this practice encourages similar public-private partnerships, with the private sector realizing that they receive economic benefits from improved transportation facilities and that they can facilitate similar partnering arrangements at relatively minor expense to themselves and ODOT can offer these types of incentives with no additional risk or expenditure to themselves.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This type of public-private partnership will be used on a case-by-case basis.

STATE(S) WHERE USED:

Oklahoma

SOURCE/CONTACT(S):

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Policy and Procedures → Collaboration	A2-3

BEST PRACTICE:
"Design for Safety" Partnership

DESCRIPTION:
The California Department of Transportation (Caltrans) Director formed a cross-functional task force consisting of design, construction, and maintenance. This one-time effort was intended to identify 20 or so safety related items for opportunities to develop worker safety practices for designers to consider when designing projects. An example of an item is the design of project access for maintenance workers from off the Right-of-Way (ROW). Some practical considerations were to purchase additional ROW, or to round slopes to provide easier access.

REASON(S) FOR ADOPTING:
The Caltrans Director wanted to look at cross-functional safety improvements. This effort is currently going through revitalization and the information developed as best practices are being incorporated into the Caltrans Project Engineer Academy curriculum.

PRIMARY BENEFIT(S):
Caltrans now has maintenance forces come into the Project Engineer Academy to discuss designing for worker safety. Designers have at their disposal a number of best practices to consider in design.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Reconstruction of freeways.

STATE(S) WHERE USED:
California

SOURCE/CONTACT(S):
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Caltrans
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Policy and Procedures → Collaboration	A2-4

BEST PRACTICE:

Consolidated Traffic Control Logbook

DESCRIPTION:

The traffic control logbook is used by contractors and New Mexico Department of Transportation (DOT) employees as an all encompassing traffic control diary and accident record. A consistent format and checklists are provided to ensure similar record keeping on all projects. Contractor and DOT diaries are compared on a daily basis to determined if entries are compatible. Signature blocks are provided so that each agency can concur with the acceptable entries.

REASON(S) FOR ADOPTING:

To provide for uniformity in record keeping.

PRIMARY BENEFIT(S):

The logbook results in greater uniformity across traffic control and accident record-keeping. Since the checklists provide prompts, the record keeping process is simplified and more complete.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All work zones.

STATE(S) WHERE USED:

New Mexico

SOURCE/CONTACT(S):

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Policy and Procedures → Organizational Strategy	A3-1

BEST PRACTICE:

Full-Time Work Zone Traffic Control Engineer

DESCRIPTION:

The Work Zone Traffic Control Engineer is charged with making sure motorists have a safe and efficient means of travel through work zones. In Ohio, the work zone traffic control engineer monitors the State's work zones to reduce delays and work zone crashes, and to improve communication with motorists. The Ohio Department of Transportation (ODOT) District 12 (Cleveland area) and Columbus and Cincinnati areas use this type of position.

REASON(S) FOR ADOPTING:

A full-time work zone traffic control engineer can be used to help identify strategies to mitigate increasing delays caused by construction projects, and to reduce liability from lawsuits in work zones.

PRIMARY BENEFIT(S):

Having a work zone traffic control engineer helps ensure that a staff person is dedicated to monitoring and addressing traffic flow and capacity issues in work zones and does not have to worry about other concerns normally associated with project inspection. The activities completed by the work zone traffic control engineer can help reduce delays in work zones and improve communication with motorists by using highway advisory radio and portable changeable message signs.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All locations and all types of work.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Reynaldo Stargell
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Policy and Procedures → Performance Goals and Measures	A4-1

BEST PRACTICE:

Work Zone Performance Goal – Maximum Delay Specification

DESCRIPTION:

A number of States have adopted work zone mobility performance goals such as maximum delay specifications. For example, the Wyoming and Oregon Departments of Transportation (DOT) have 20-minute maximum delay rules in effect for work zones. Massachusetts DOT has had a 12-minute work zone delay rule in effect for over 15 years. Analyses are performed, during design, based on expected traffic volume and capacity reductions due to work zone operations to estimate anticipated delay. If the expected delay approaches or exceeds the performance threshold, alternative construction strategies, work hours, or other transportation management strategies are considered.

REASON(S) FOR ADOPTING:

This specification was adopted to minimize delay to motorists. A design practice was needed to give insight into the reduction of congestion through work zones. It helps in preparing and understanding such issues as stage construction and allowable work hours.

PRIMARY BENEFIT(S):

This type of approach can be beneficial for both the motorist and the contractor. It allows the contractor to perform work that delays the public, but limits this delay to a specified amount that is considered tolerable. Allowing some delay can make the contractor's approach to their work somewhat easier than if no delay were allowed. It allows motorists to continue to use existing routes without unreasonable delays or detours.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Major construction activities. It is especially applicable to environmentally sensitive or remote rural locations in which major construction activities are performed under traffic because no reasonable detours exist.

STATE(S) WHERE USED:

Massachusetts, Oregon, Wyoming

SOURCE/CONTACT(S):

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Policy and Procedures → Performance Goals and Measures	A4-2

BEST PRACTICE:

Work Zones Designed at the Posted Speed

DESCRIPTION:

In instances where traffic realignment is required through the work zone, the realignment (e.g., reversing curves and super elevations) is designed for the posted speed rather than the reduced work zone speed.

REASON(S) FOR ADOPTING:

Simply posting signs with a lower speed through a work zone, without any enforcement, often does not result in reduced speeds.

PRIMARY BENEFIT(S):

The biggest benefit is that safety is enhanced through the project.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any type of work requiring the realignment of traffic. This practice is considered for every project. It is most effective for high-volume/high-speed locations.

STATE(S) WHERE USED:

Oregon

SOURCE/CONTACT(S):

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FHWA Oregon Division Office
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Policy and Procedures → Technical Guidance	A5-1

BEST PRACTICE:

Guide to Establishing Speed Limits in Highway Work Zones

DESCRIPTION:
The Minnesota Department of Transportation (MnDOT) developed a document entitled, "A Guide to Establishing Speed Limits in Highway Work Zones" that outlines guidelines, proper layouts, and procedures for implementing work zone speed limits. MnDOT uses this document in the teaching of its Traffic Control Overview and Supervisor classes. The document is available at: http://www.dot.state.mn.us/speed/pdf/WZSpeedLimitGuideline.pdf.

REASON(S) FOR ADOPTING:
MnDOT developed this document to provide uniform guidelines for the proper application of speed limits in highway work zones. Work zone safety is enhanced with proper use of speed limits throughout the length of a work zone. Proper practice also aids in speed limit enforcement efforts.

PRIMARY BENEFIT(S):
Work zone speed limits in Minnesota are implemented and signed more uniformly. This practice is considered effective in making work zones safer for highway workers and the traveling public.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
The use of this guide is applicable to all highway work zones.

STATE(S) WHERE USED:
Minnesota

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Craig Mittelstadt, Construction and Innovative Contracting
Minnesota DOT
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Policy and Procedures → Technical Guidance	A5-2

BEST PRACTICE:

Work Zone Speed Limit Reduction and Speeding Fine Program

DESCRIPTION:

North Carolina Department of Transportation (NCDOT) has a criteria-based program to determine when to use speed limit reductions and increased speeding fine penalties in work zones. NCDOT uses two different methods and criteria for establishing work zone speed limit reductions. The first, and most often implemented, is a temporary speed limit reduction that uses portable devices (portable changeable message signs or portable signs) to reduce the speed limit. This application is used for short-term applications of up to 30 days. For more long-term needs, the work zone speed limit is reduced using standard speed limit signs. This second approach is normally used in work zones where significant changes to lane geometry have occurred, lane widths are significantly reduced, and/or where the shoulders have been essentially eliminated. The temporary speed limit reductions are typically used to improve worker safety during lane closure activities. The long term speed limit reductions are typically targeted to improve motorist safety due to work zone conditions. The $250 speeding fine signs are used for both applications. Speed limit reductions and the $250 speeding fine have to be approved by the State Traffic Engineer before being implemented.

REASON(S) FOR ADOPTING:

NCDOT needed to differentiate between “activities” that warranted temporary speed limit reductions and “projects” that needed long-term speed limit reductions. By having separate methods, NCDOT was able to remove ineffective and often ignored speed limit signs in the work zone.

PRIMARY BENEFIT(S):

The greatest benefit is driver compliance with work zone speed limits. This leads to smoother traffic flow and less speed variance within the work zone which in turn leads to fewer crashes.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Temporary speed limit reductions are targeted mainly for lane closure activities on freeways and Interstates with speed limits of 60 MPH and greater. The long term speed limit reductions are used on freeways and Interstates with speed limits of 60 MPH or greater that have significant lane geometry alternations and/or shoulder restrictions throughout the length of the project.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Ron Hancock, P.E., State Construction Engineer
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Policy and Procedures → Technical Guidance	A5-3

BEST PRACTICE:

Long Life Pavement Rehabilitation Program for Urban Freeways

DESCRIPTION:

The Long Life Pavement Rehabilitation Program (LLPRP) for Urban Freeways began in April of 1997. It grew out of the California Department of Transportation (Caltrans) Headquarters, Office of Maintenance, specifically Pavement Managers, as they developed proposals for multi-year funding of 4R work on the State system. All pavement rehabilitated under the LLPRP will have 30–40 year design life. Thus the program will pay dividends to the highway users and Caltrans in reducing the frequency of maintenance and rehabilitation treatments, thereby reducing the number of work zones, number of maintenance activities, and therefore worker exposure.

REASON(S) FOR ADOPTING:

The driving force behind long life pavement rehabilitation strategies is user costs. The most significant factor in driving up user costs are delays due to congestion, something freeway users clearly do not want. An extra benefit of this strategy is to reduce the number and duration of lane closures during pavement reconstruction, rehabilitation, or maintenance.

PRIMARY BENEFIT(S):

Long life pavement rehabilitation strategies are developed to meet highway users' demands (i.e., safe, smooth freeways, with minimal disruptions to traffic and minimum delays for road work). Since construction windows are confined to off-peak hours, the disruption to traffic is minimized. Innovative materials, such as FSHC with higher compressive and flexural strengths, have been developed to maximize productivity within the narrow work windows.

LLPRP treatment is intended to reduce the frequency of highway work. The extra dollars paid up front for the longer design life will pay dividends by extending the time between required periodic maintenance and rehabilitation, and reduce the related traffic delays, additional operating costs, and pollution. Reducing the frequency of highway work will enhance the safety of users and highway workers.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Urban high-volume freeway rehabilitation.

STATE(S) WHERE USED:

California

SOURCE/CONTACT(S):

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Policy and Procedures → Technical Guidance	A5-4

BEST PRACTICE:

Minimum Geometric Standards for Work Zones

DESCRIPTION:

It is Oregon's policy that work zone lane and shoulder widths will meet the minimum geometric standards specified in the Oregon Department of Transportation (ODOT) Highway Design Manual. Internal policy also calls for 300 ft. minimum acceleration lanes.

REASON(S) FOR ADOPTING:

Wider lanes and shoulders increase work zone safety by reducing the potential for sideswipe accidents and truck off-tracking. The safety of construction personnel is also improved because they are farther away from moving traffic.

PRIMARY BENEFIT(S):

Safety is enhanced through the project by reducing the number of potential conflicts often associated with narrow lanes and shoulders.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any type of work. This practice is considered for every project. It is most effective for high-volume/high-speed locations.

STATE(S) WHERE USED:

Oregon

SOURCE/CONTACT(S):

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Policy and Procedures → Technical Guidance	A5-5

BEST PRACTICE:

Additional Shoulder Thickness

DESCRIPTION:

All new construction or reconstruction projects on truck routes on the State system that involve the construction of new shoulders shall meet thickness requirements that are included in Illinois Department of Transportation's standard specifications:

- 2-lane major principal arterials – These highways should normally have 8' to 10' paved shoulders. If the 20-year projected traffic exceeds 2,000 multiple unit trucks (MU) per day or 10,000 Average Daily Traffic (ADT) the shoulders shall be constructed to the same thickness as the pavement. The 2,000 MU threshold is based on the traffic that would require a shoulder thickness greater than 200 mm to handle the occasional load.

- 4-lane highways – When the 20 year projected traffic exceeds 3,000 MU's per day or 25,000 ADT, shoulders shall be built to the same thickness as the adjoining pavement. If the expected Vehicles Per Hour (VPH) exceeds 1,700 the shoulder shall match the thickness of the pavement. When anticipated that the shoulder will be used for an extended period of time (greater than 3 years) during the design life of the pavement, the shoulder shall be designed to pavement standards, utilizing the same pavement design, details, and materials as the mainline pavement.

REASON(S) FOR ADOPTING:

Additional shoulder thickness is intended to allow the shoulders to be used, if necessary, to carry traffic during construction improvements and incident management.

PRIMARY BENEFIT(S):

The shoulder is used during construction projects and incidents. Traffic can be shifted to maintain the number of lanes and minimize the effects of work zone activity.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

2-lane major principal arterials, 4-lane highways, Interstates, and expressways that are truck routes.

RELATED BEST PRACTICES:

Reinforcing Shoulders (Practice G1-3)

STATE(S) WHERE USED:
Illinois

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Policy and Procedures → Traffic Management Planning	A6-1

BEST PRACTICE:

Travel Time Systems in Work Zones

DESCRIPTION:

The Transportation Systems Management (TSM) unit at the New Jersey Department of Transportation (NJDOT) realized the need to provide travel time systems in certain work zones, especially in areas where an increase or fluctuation in travel times is expected. NJDOT developed criteria/warrants which, if fulfilled, would necessitate installing a temporary travel time system within a work zone. Dynamic message signs (DMS) and transmit readers would be installed to operate the travel time system.

REASON(S) FOR ADOPTING:

There is unreliability of travel times associated with certain construction projects and commuters are either delayed or unsure of the time they need to give themselves to compensate for traveling through a specific work zone. In the past, there were significant delays which were unpredictable and caused major concern to both the Department and the motorist.

PRIMARY BENEFIT(S):

The installation of travel time systems within work zones will benefit motorists and is also viewed as a good public relations effort. Motorists will know how long it will take them to get through the work zone and as a result, they can make informed decisions about their travel plans such as taking an alternate route if significant delays are expected. This helps to reduce stress and frustration for drivers and is beneficial to their quality of life. In addition, the travel time systems help the Department to manage traffic better in construction work zones and the surrounding highway.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Construction projects where an increase or fluctuation in travel times is expected and where heavy delays are expected due to traffic volume. In addition, the travel time systems would benefit projects that have complex staging associated with them.

STATE(S) WHERE USED:

New Jersey

SOURCE/CONTACT(S):

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New Jersey DOT
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Policy and Procedures → Traffic Management Planning	A6-2

BEST PRACTICE:

Work Zone Traffic Incident Management Plans

DESCRIPTION:

A traffic incident management (TIM) plan can help reduce the effects that a work zone has on traffic conditions by planning in advance for how incidents in work zones will be identified and cleared. Colorado and Wisconsin have requirements for traffic incident management (TIM) plans as part of each work zone.

The Colorado Department of Transportation (CDOT) developed guidelines for developing TIM plans for work zones. The guidelines include references to existing TIM plans in the State, considerations for developing work zone TIM plans, how to plan TIM response in work zones, key components of a work zone TIM plan, and implementation and management considerations for work zone TIM plans. Colorado has 12 ongoing TIM programs/plans (TIMP) for its Interstates and State highways. In the areas covered by these existing plans, the construction contractor is required to coordinate with CDOT and the appropriate response agencies to modify the TIMP to accommodate the project. If the project lies outside of any existing TIMP, the contractor may be required, via a project special provision, to lead the development of a TIMP appropriate to the project duration and the level of impact the project will have on the highway and its users. CDOT's guidelines can be found at http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-booklets-guidelines/Incident_Management_Guidelines_20080922.pdf/view, and its project special provision worksheet at http://www.coloradodot.info/business/designsupport/construction-specifications/2005-construction-specs/work-sheets/630timp.doc/view.

The Wisconsin Department of Transportation (WisDOT) has guidelines for Incident Management Plan (IMP) development. The IMP is a portion of WisDOT's larger transportation management plan (TMP) development process. A draft of the IMP is completed early in the design process and finalized prior to construction. Wisconsin's IMP typically identifies emergency contacts, expected work zone queues, alternate routes, equipment location, and traveler information. The generic steps towards developing Wisconsin's IMP include organizing stakeholder groups, evaluating mitigation strategies, recommending actions, and formalizing these discussions. WisDOT is developing guidelines for insertion in its Facilities Development Manual 11-50-10.

REASON(S) FOR ADOPTING:

TIM plans can help manage congestion and incidents during work zone projects.

PRIMARY BENEFIT(S):
TIM plans help ensure that all incidents are cleared quickly and efficiently, reducing congestion impacts on the work zone and drivers and decreasing the likelihood of secondary crashes.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All work zones.

STATE(S) WHERE USED:
Colorado, Wisconsin

SOURCE/CONTACT(S):
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Policy and Procedures → Traffic Management Planning	A6-3

BEST PRACTICE:

"Compendium of Options" (Construction Traffic Maintenance Strategies)

DESCRIPTION:

The "Compendium of Options," created by the Ohio Department of Transportation (ODOT) is a listing of strategies and options that should be considered by designers for maximizing capacity while maintaining traffic flow through work zones. It is broken down into 6 areas: 1) construction/traffic maintenance strategies, 2) options outside the work zone, 3) options inside the work zone, 4) time limitations with liquidated damages, 5) contracting procedures, and 6) administrative options. This guidance has been in use since 1996.

REASON(S) FOR ADOPTING:

ODOT's goal is to reduce delay and improve safety for both workers and motorists through work zones. The "Compendium of Options" was one of ODOTs first efforts to identify and disseminate best practices throughout its districts and continues to be a useful resource for designers.

PRIMARY BENEFIT(S):

Improved capacity and safety through work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of work.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Policy and Procedures → Traffic Management Planning	A6-4

BEST PRACTICE:

Policy/Standards for Slow Moving or Mobile Maintenance Operations

DESCRIPTION:

The North Carolina Department of Transportation (NCDOT) developed definitions and separate standard drawings for traffic control set-up for moving and mobile operations. NCDOT's Maintenance & Utility Traffic Control Guidelines define moving operations as faster than 3 mph (e.g., striping), and mobile operations as work that moves intermittently or is stopped for up to 15 minutes (e.g., pothole patching). According to the policy, the designer first must determine if the operation is moving or mobile, and then must get approval from a Qualified Work Zone Supervisor before using any of the drawings provided in the MUTG. NCDOT's Guidelines can be found at: https://connect.ncdot.gov/projects/wztc/Documents/NCDOT_Maint_Utility_TC_Guidelines.pdf.

The Indiana Department of Transportation (INDOT) publishes a Work Zone Traffic Control Handbook, http://www.in.gov/indot/files/WorkZoneTCH.pdf, which includes a significant section on mobile operations (starting on page 76). The section describes scenarios for both two-lane and multi-lane roadways, including when to use flaggers, shadow vehicles, changeable message signs, and stationary signage.

REASON(S) FOR ADOPTING:

After discovering that an increase in volume and speed along high-speed/high volume highways led to an increase in collisions between motorists and maintenance vehicles, the new standards were introduced. Having policies can lead to better coordinated efforts for this type of operation and a decrease in collisions between motorists and workers.

PRIMARY BENEFIT(S):

North Carolina has experienced a significant reduction in serious collisions between motorists and maintenance vehicles since the introduction of its policy and standard drawings for moving operations. In Indiana, having the mobile operations section in its handbook has led to improved coordination and implementation of mobile operations activities across the State.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This procedure applies to all routes where a slow moving or mobile maintenance operation occurs.

STATE(S) WHERE USED:
Indiana, North Carolina

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Policy and Procedures → Traffic Management Planning	A6-5

BEST PRACTICE:

Traffic Management in Work Zones

DESCRIPTION:

The Ohio Department of Transportation (ODOT) has developed a policy to move traffic through all work zones on interstates and other freeways by the elimination or reduction of delays. The policy moves the determination and analysis of options for maintenance of traffic to the beginning of the project development process, and contains queue thresholds and time limits to aid designers in choosing the proper strategies.

For example, projects on interstate highways must maintain two open lanes in each direction at all times, queues must not exceed 1.5 miles at anytime, or 0.75 mile for more than 2 hours. If analysis modeling during project development shows that thresholds will be exceeded, other strategies for traffic management and project phasing must be used or a waiver must be requested.

REASON(S) FOR ADOPTING:

ODOT's goal is to minimize the impacts on the traveling public resulting from the implementation of the work zone.

PRIMARY BENEFIT(S):

Reduced travel delay associated with work zones, along with reduced work zone related crashes.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Interstates and other freeways.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Policy and Procedures → Traffic Management Planning	A6-6

BEST PRACTICE:

Temporary Pedestrian Access Routes (TPAR)

DESCRIPTION:

The Minnesota Department of Transportation (MnDOT) has adopted *Public Rights-of-Way Accessibility Guidance of 2005 (PROWAG)* as its standard for implementing the Americans with Disabilities Act (ADA) on the State Highway system, including during maintenance and construction activities. MnDOT also gathered input from pedestrians with disabilities regarding devices to be used to redirect pedestrians through/around work zone areas. From these sources and the Federal Manual on Uniform Traffic Control Devices (MUTCD), MnDOT developed standards and guidelines to implement Temporary Pedestrian Access Routes (TPAR) through areas impacted by maintenance and construction. Standard layouts have been designed and are available in the *Temporary Traffic Control Zone Layouts Field Manual (February 2011)*, which is part of Minnesota's MUTCD. Also available in the document are diagrams with appropriate dimensions and parameters for TPAR routes and devices. More information is available at http://www.dot.state.mn.us/trafficeng/workzone/tpar.html.

REASON(S) FOR ADOPTING:

To meet standards set in the Federal MUTCD for making pedestrian routes through/around work zones accessible.

PRIMARY BENEFIT(S):

Ensuring that pedestrians (including those with disabilities) are accommodated when pedestrian routes are impacted by construction and maintenance activities.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any work zone that impacts an accessible route for pedestrians.

STATE(S) WHERE USED:

Minnesota

SOURCE/CONTACT(S):

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Policy and Procedures → Traffic Management Planning	A6-7

BEST PRACTICE:

Commuter Incentives to Minimize Congestion in Work Zones

DESCRIPTION:

Techniques such as incident management and aggressive lane rental specification are used to preserve existing freeway capacity on Oregon Department of Transportation (ODOT) construction projects. To minimize congestion in areas where existing capacity cannot be maintained, ODOT implements one or more strategies in coordination with local partners to reduce the number trips made in a corridor during peak commute periods. Commuter incentives and other demand reduction measures may include:

- Providing transit incentives such as free Amtrak commuter rail service;
- Providing carpool incentives such as free carpool parking;
- Implementing guaranteed ride home program;
- Temporarily converting general purpose travel lanes to HOV lanes;
- Increasing transit service coverage and frequency;
- Constructing additional or expanding existing park and ride lots so transit connections are more convenient; and
- Marketing and promoting telecommuting, job-sharing, and employee flextime programs with employers in the affected area.

REASON(S) FOR ADOPTING:

In anticipation of traffic congestion resulting from construction-related reduced freeway capacity commuter incentive programs can help maintain acceptable levels of service through a work zone.

PRIMARY BENEFIT(S):

Benefits include reducing traffic congestion in the work zone; decreasing traffic diversion onto neighborhood streets; attracting drivers away from single-occupant vehicles to other modes during construction (with the additional benefit of retaining some ridership and use of carpools beyond project completion); and improving air quality due to fewer vehicles in the traffic stream.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Projects in urban areas with established transit systems or carpooling programs, and projects on facilities with HOV lanes or general-purpose lanes that could be converted to HOV.

STATE(S) WHERE USED:

Oregon

SOURCE/CONTACT(S):

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Best Practices Category B - Public Relations, Education, and Outreach (Program Level)

Highway agencies perform public relations, education, and outreach activities to notify, inform, and educate the general public and others about work zones. Best practices in this section focus on program level outreach efforts. Program level public information and outreach are used to raise general awareness about motorist and worker safety and mobility issues and the need to be vigilant while driving in work zones, and are not geared toward a specific project. These practices help keep road users, the general public, elected officials, and others informed, involved, and sensitive to the highway worker and work zone safety needs. Strategies that are used on individual projects to communicate with road users, the general public, area residences and businesses, and public entities about a specific road construction project are discussed in Category H.

Examples of practices include:

- Public relations campaigns and materials for the general public and elected officials.
- Public relations campaigns directed to trucking groups and commercial drivers.
- Strategies for developing partnerships with the media.
- Reference and training materials for contractors and State and local transportation agency employees.

The following best practice entries relate to public relations, education, and outreach:

Subcategory	Ref. #	PUBLIC RELATIONS AND OUTREACH Best Practices
B1 Drivers	B1-1	Motor Carrier Initiative to Prevent Work Zone Crashes
	B1-2	Multi-Faceted Approaches to Providing Construction Information to Truckers
	B1-3	Partnership with Motor Truck Association
B2 General Public	B2-1	Using a Mascot to Raise Public Awareness
	B2-2	Work Zone Awareness Week
	B2-3	Outreach Program for Construction and Maintenance Work Zones
	B2-4	Regional Coalition for Disseminating Road Construction Information

Subcategory	Ref. #	PUBLIC RELATIONS AND OUTREACH Best Practices
B2 General Public	B2-5	Public Outreach to Increase Use of Transportation Management Plan (TMP) Strategies
	B2-6	Traffic Safety Information Center
B3 Media	B3-1	Develop Media Partnerships
B4 State/ Contractors/ Workers	B4-1	Circuit Rider Program
	B4-2	Work Zone Safety Round Tables
	B4-3	"What's Wrong With This Work Zone" – Training Video
	B4-4	Work Zone Traffic Control Training Requirements
	B4-5	Regional Work Zone Workshops
	B4-6	"Build a Better Mousetrap" Competition

Public Relations, Education, and Outreach → Drivers	B1-1

BEST PRACTICE:

Motor Carrier Initiative to Prevent Work Zone Crashes

DESCRIPTION:

Some public campaigns and outreach efforts are focused on motor carriers to help prevent work zone crashes. This is accomplished through the following methods: 1) Meetings to discuss and identify where work zones are located, 2) Distribution of educational materials during compliance reviews and public meetings, and 3) Mass mailings of educational materials to area motor carriers identifying work zone hazards and how to minimize the chances of having crashes.

REASON(S) FOR ADOPTING:

The reason for implementing the policy was to maintain a level of zero work zone fatalities and curb any potential increase of crashes by our proactive outreach efforts.

PRIMARY BENEFIT(S):

The effort is expected to result in a decrease in overall work zone crashes.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All projects, but particularly those where high motor carrier user volume could occur.

STATE(S) WHERE USED:

Utah

SOURCE/CONTACT(S):

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Public Relations, Education, and Outreach → Drivers	B1-2

BEST PRACTICE:

Multi-Faceted Approaches to Providing Construction Information to Truckers

DESCRIPTION:

The North Carolina Department of Transportation (NCDOT) uses a number of different mechanisms to communicate work zone information to truckers traveling through North Carolina. These methods include reaching truckers en-route by putting construction information in locations where truck drivers typically frequent like truck stops and rest areas and using CB and FM radio to inform truckers when they are approaching construction along their routes. NCDOT also provides pre-trip information via print and web materials it has developed for truckers, and partners with trucking associations in the region to distribute the materials. The American Automobile Association (AAA) has also partnered with NCDOT to help get work zone information out to truckers. NCDOT recently developed videos aimed at truck drivers to educate them about the dangers of driving unsafely in work zones and steps that they can take to protect themselves and others when driving through North Carolina work zones.

REASON(S) FOR ADOPTING:

Providing information to truck drivers through many different outlets that are likely to reach truckers increases the chance that a truck driver will see the information about an approaching work zone and adjust their behaviors and, if necessary, use an alternate route.

PRIMARY BENEFIT(S):

Truck drivers have more information at their fingertips about work zones and are able to make decisions about their routes in advance of a work zone. NCDOT also maintains contact with regional trucking associations and companies, developing relationships with these groups for future projects.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Long-term projects where truckers would likely be impacted by the work zone over the course of the project's duration.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Public Relations, Education, and Outreach → Drivers	B1-3

BEST PRACTICE:

Partnership with Motor Truck Association

DESCRIPTION:

Involvement of representatives from State Motor Truck Association in the identification, development, and implementation of actions to reduce crashes associated with work zones. Practice was initiated in 1995.

REASON(S) FOR ADOPTING:

Practice was initiated due to a high number of fatal crashes involving commercial vehicles in or near work zones. The Motor Truck Association was contacted to provide a trucking industry perspective on how to address the problem, and to serve as a direct conduit to provide information to industry.

PRIMARY BENEFIT(S):

Provides State agency personnel with a better perspective on how proposed actions will impact commercial vehicles. Partnership creates a direct conduit to industry on problems and potential solutions.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Freeways, all types of work.

STATE(S) WHERE USED:

Pennsylvania

SOURCE/CONTACT(S):

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Public Relations, Education, and Outreach →General Public	B2-1

BEST PRACTICE:

Using a Mascot to Raise Public Awareness

DESCRIPTION:

State DOTs use many educational tools to inform drivers about work zones in their States. One way to do this is through the use of mascots. Through appearances in reading materials (e.g. comic books, newspaper articles, coloring books), advertisements (print, video), or in-person appearances at public events, mascots can be used to inform drivers about specific projects, educate children and adults about work zones in general, and bring awareness about specific initiatives. Washington State used Burl the Squirrel to educate children and inform drivers about the goals, objectives, and construction plans along the I-90 corridor in northwest Washington State. North Carolina uses Buddy Barrel and Connie Cone as Work Zone Safety Program mascots who attend public functions and appear in coloring books and other materials to promote work zone awareness.

REASON(S) FOR ADOPTING:

Designing a mascot for a State DOT to use for general work zone awareness or during specific work zone projects helps the DOT reach a greater audience, including children who might show their promotional materials to their parents who drive through work zones. The use of a mascot can make the messages more likely to be remembered.

PRIMARY BENEFIT(S):

Easily recognizable branding enhances public education and receptiveness and improves awareness of work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

In any State looking to increase public awareness about work zones. When used for a specific project, mascots can be particularly beneficial on long term projects where public relations information needs to be relayed to the public frequently.

STATE(S) WHERE USED:

North Carolina, Washington

SOURCE/CONTACT(S):

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Washington State DOT
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Public Relations, Education, and Outreach →General Public	B2-2

BEST PRACTICE:
Work Zone Awareness Week

DESCRIPTION:
In 1998, the Virginia Department of Transportation (VDOT) conducted the first statewide work zone safety awareness campaign for both VDOT employees and the general public in the spring. Press conferences with the Virginia State Police were held across the state emphasizing the dangers of working in and driving through work zones. The State Police increased their presence in work zones during the week, and VDOT employees drove with their headlights on, wore orange ribbons, and displayed ***"GIVE 'EM A BRAKE"*** bumper stickers on their vehicles. VDOT conducted daily activities focusing on work zone safety, and they distributed give-a-ways such as key chains, penlights, and rain ponchos to employees.

REASON(S) FOR ADOPTING:
To increase the awareness of VDOT employees and the general public to safety concerns related to working in and driving through work zones.

PRIMARY BENEFIT(S):
Reminds employees to pay closer attention when performing work zone activities, encourages motorists to drive with caution and obey the posted speed limits when traveling through work zones, and communicates VDOT's commitment to putting "Safety in Everything We Do."

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All roads. All locations.

STATE(S) WHERE USED:
Virginia

SOURCE/CONTACT(S):
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Public Relations, Education, and Outreach →General Public	B2-3

BEST PRACTICE:

Outreach Program for Construction and Maintenance Work Zones

DESCRIPTION:

Effective outreach can help inform motorists of upcoming construction efforts, educate motorists about detour routes, and reduce delays as motorists plan in advance to detour around work zones along their route. Information provided through the media is one way to reach a large audience about road work. Outreach delivered via radio can be especially useful for reaching motorists already on the road.

The Arkansas State Highway and Transportation Department (AHTD) uses the media to educate and inform motorists and the general public about upcoming work zone activity. A recent survey informed the agency that most motorists are often already traveling when they learn of a work zone they are approaching, so AHTD developed targeted radio outreach for key Interstate corridors to alert motorists to work zones. These radio spots are designed to be short, informative, and entertaining to encourage motorists to pay attention to the information being presented. AHTD also installed signs announcing the radio station playing the spots to inform out-of-State motorists of the information. In addition to the use of radio spots, AHTD uses videos posted on their website as well as their Twitter account to communicate information on construction and maintenance work zones as a part of their comprehensive media outreach program. As needed, press conferences are held and interviews are done with local media outlets about specific projects.

REASON(S) FOR ADOPTING:

To educate motorists and other travelers about work zones throughout a region and potential impacts these work zones might have on their travel.

PRIMARY BENEFIT(S):

Educating the public about upcoming construction projects can improve safety and mobility in and around work zones. Effective public outreach results in informed citizens who can make better decisions about travel routes during construction activities.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any area where en-route traveler information about work zones could help reduce congestion levels, such as areas with available diversion routes.

STATE(S) WHERE USED:

Arkansas

SOURCE/CONTACT(S):

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Public Relations, Education, and Outreach →General Public	B2-4

BEST PRACTICE:

Regional Coalition for Disseminating Road Construction Information

DESCRIPTION:

TRANSCOM formed as a regional transportation coalition to help agencies coordinate road projects and serve as a clearinghouse for transportation incident and construction information in New York, New Jersey, and Connecticut. TRANSCOM transmits information to hundreds of transportation agencies, media outlets, and major employers throughout the day, informing them of incidents and delays.

REASON(S) FOR ADOPTING:

Fourteen major transportation agencies and the Federal Highway Administration (FHWA) saw the need for some type of regional clearinghouse for this type of information that would transcend the normal transportation agency's boundaries and would include all transportation modes in the greater New York City area.

PRIMARY BENEFIT(S):

Transportation providers are able to provide better service to their customers in responding to incidents and enabling users to avoid road construction and incidents by detour routing, delaying trips, etc. The users benefit by spending less time unnecessarily sitting in congestion due to road construction and transportation incidents.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any region that has major road, bridge, tunnel, and transit facilities.

STATE(S) WHERE USED:

Connecticut, New Jersey, New York

SOURCE/CONTACT(S):

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John Bassett
New York State DOT
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Public Relations, Education, and Outreach →General Public	B2-5

BEST PRACTICE:

Public Outreach to Increase Use of Transportation Management Plan (TMP) Strategies

DESCRIPTION:

For projects that are expected to cause high levels of traffic congestion, a comprehensive transportation management plan (TMP) that includes a range of public outreach and demand management strategies can help maintain adequate mobility. In Oregon and Washington, a multi-jurisdictional, bi-state Traffic Management Team worked together to develop a TMP to lessen the traffic impacts anticipated with the closure of the northbound I-5 Interstate Bridge crossing the Columbia River. The TMP included a public outreach effort to advise commuters in Portland, Oregon, and Vancouver, Washington, of travel alternatives that would help relieve severe traffic congestion. A common theme in the outreach effort was that commuters need to share responsibility by taking initiative to change their commute habits during the closure.

The Team recognized that employers would be key in allowing commuters to use alternate commute options and to share information about these options. An employer outreach program was established targeting all employers with 50 or more employees crossing the Columbia River. Phone contacts were made, followed by mailing information packets. ODOT later conducted company presentations to provide an overview of the project and explain commute alternatives to employees.

The Team also recognized that a news media partnership would be necessary to communicate traffic management strategies to the public. A series of press releases were issued through the summer to provide periodic updates on the project with a final advertising campaign three weeks prior to the closure. This advertising campaign promoted commuter options by distributing maps and brochures from displays in retail centers and placement of advertisements in print and radio mediums.

REASON(S) FOR ADOPTING:

The TMP developed for this project contained 13 strategies, one of which was a public outreach program targeted to commuters and employers. It was recognized that public participation would be integral in achieving the goal of a26 percent reduction in trips.

PRIMARY BENEFIT(S):

Benefits included a high level of community awareness of the project and a trip reduction of 19 percent. Other benefits were an increased level of awareness

of transit alternatives in the corridor and a renewed interest in HOV lanes in the metropolitan area. Future projects on the Interstate Bridge can use the TMP for this project as a "roadmap" for how to stage similar projects without gridlock.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Use of public outreach efforts to inform the public is most effective in urban areas with good radio/newspaper/television broadcast coverage, and several large employers.

STATE(S) WHERE USED:
Oregon

SOURCE/CONTACT(S):
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FHWA Oregon Division Office
Phone: (503) 587-4727
Email: jeffrey.graham@dot.gov

Public Relations, Education, and Outreach →General Public	B2-6

BEST PRACTICE:
Traffic Safety Information Center

DESCRIPTION:
The Oregon Department of Transportation, the Oregon State Police, and FHWA established a traffic safety information center to work together to reduce injuries and fatalities. A trailer was set up at the Baldock rest area and is used by the agencies to provide educational materials to motorists, including information related to work zone safety.

REASON(S) FOR ADOPTING:
This safety center was established as a means for the agencies to jointly work together in sending out safety information.

PRIMARY BENEFIT(S):
The biggest benefits are the pooled resources and the large number of contacts the group can make. The public can go to one location and get information on the *Give 'em a Brake*, *No-Zone*, and drunk driving campaigns, in addition to many other topics covered by the agencies.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Freeway rest areas/welcome stations.

STATE(S) WHERE USED:
Oregon

SOURCE/CONTACT(S):
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FHWA Oregon Division Office
Phone: (503) 587-4721
Email: nick.fortey@dot.gov

Public Relations, Education, and Outreach →Media	B3-1

BEST PRACTICE:
Develop Media Partnerships

DESCRIPTION:
Establish regular contact with State and/or local media (radio, TV, and cable) to provide an on-going dialogue on work zone safety issues. This practice has been used since 1994 when 20 people were killed in Oregon roadway work zones.

REASON(S) FOR ADOPTING:
The media become confident in the value of the information to their customers. The likelihood of coverage of work zone safety in the media is increased. There is a known contact at the State DOT.

PRIMARY BENEFIT(S):
Increased likelihood of coverage of work zone safety in the media, better informed motorist, and a likely reduction in work zone worker deaths.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All projects.

STATE(S) WHERE USED:
Oregon

SOURCE/CONTACT(S):
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Oregon DOT
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-1

BEST PRACTICE:
Circuit Rider Program

DESCRIPTION:
The Minnesota Department of Transportation (MnDOT) and the Iowa Department of Transportation operate a Circuit Rider Program which is a mobile outreach effort providing face-to-face transfer of the latest technologies and information on a variety of traffic operations and safety topics, including traffic control and work zone safety.

REASON(S) FOR ADOPTING:
The Circuit Rider Program was instituted to bring new technologies to field personnel and to gather information on new methods and technologies used at a particular field site to share with others throughout the State.

PRIMARY BENEFIT(S):
The Circuit Rider Program has proven to be a very effective technology transfer mechanism. It is an excellent way to give field personnel hands on experience with both common and "state-of-the-art" permanent and temporary traffic control methods and devices.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
The Circuit Rider Program is used throughout the States of Minnesota and Iowa.

STATE(S) WHERE USED:
Iowa, Minnesota

SOURCE/CONTACT(S):
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-2

BEST PRACTICE:

Work Zone Safety Round Tables

DESCRIPTION:

Once each year, work zone safety representatives from Virginia Department of Transportation's (VDOT) nine districts participate in a 2-day meeting with work zone safety personnel from the Department's Central Office to review and discuss VDOT's work zone safety program. The format allows each district to discuss and share general or specific work zone problems and concerns, as well as best practices and solutions to problems encountered in their district. The meetings have been conducted since the spring of 1990.

REASON(S) FOR ADOPTING:

To share information and successful practices statewide; to develop consistent work zone safety practices statewide; to interpret and discuss Federal and State work zone safety requirements, standards and guidelines; and to review and discuss the state of the practice in work zone traffic control devices.

PRIMARY BENEFIT(S):

Greater Statewide consistency in the work zone safety program. Increased participation and input in the development and implementation of work zone safety standards and guidelines. Greater focus and compliance to the work zone safety program. Improved communication and cooperation between district and Central Office work zone safety personnel.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All roads statewide.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Virginia DOT
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-3

BEST PRACTICE:

"What's Wrong with This Work Zone" – Training Video

DESCRIPTION:

In the spring of 1998, the Virginia Department of Transportation (VDOT) developed and distributed a work zone training video that displays two improperly setup work zones: a lane closure operation on a four-lane roadway, and a flagging operation on a two-lane roadway. VDOT and contractor field personnel who view the video are taken through the work zones from a motorist's perspective, and asked to find the deficiencies in each. The video then shows and discusses each deficiency. The corrections are made and the work zones are viewed again to show the improvement over the improperly setup work zones. A lane closure on a freeway was added in 2002, and the flagging operation video was updated in 2008.

REASON(S) FOR ADOPTING:

To provide a training tool to increase the awareness of common work zone installation deficiencies found on Virginia roadways, and show the important differences between incorrectly and correctly installed work zone traffic control.

PRIMARY BENEFIT(S):

Increasing VDOT and contractor field personnel awareness of the importance of following established work zone traffic control standards and guidelines.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of projects.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Virginia DOT
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-4

BEST PRACTICE:

Work Zone Traffic Control Training Requirements

DESCRIPTION:

In 2007, the Virginia Department of Transportation (VDOT), implemented three work zone traffic control (WZTC) training courses, a one-day Basic WZTC course for installers of temporary traffic control, a two-day Intermediate WZTC course for inspectors and contractor superintendents, and a two-day Advanced WZTC course for designers of traffic control plans. Training requirements mandate at least one Basic trained person on each work crew that installs, makes adjustments to or removes work zone traffic control, supervised by a person who has completed the Intermediate WZTC course. Each design team must have at least one member who has completed the Advanced WZTC course. As of 2012, over 24,000 people have attended one of the three courses since implementation.

REASON(S) FOR ADOPTING:

To provide the necessary training to VDOT, contracting, and design personnel; review changes and new requirements; and improve communication between the Department and the contracting/design industry.

PRIMARY BENEFIT(S):

Better trained personnel, increased awareness to and focus on work zone safety requirements; improved communication between the Department and the contracting/design industry; and better designed, installed, and maintained work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All roadways statewide.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Virginia DOT
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-5

BEST PRACTICE:

Regional Work Zone Workshops

DESCRIPTION:

The Midwest Work Zone Roundtable has been meeting since the early 1990s to discuss best practices and common issues, standards and specifications, policies, and procedures related to work zone traffic management and temporary traffic control. Representatives from Midwest States that participate include Ohio, Wisconsin, Illinois, Nebraska, Kansas, Missouri, Indiana, Iowa, Michigan, and Minnesota. The Roundtable holds an informal meeting, typically each year, allowing participants to seek and receive feedback from peers on work zone-related issues and ideas. Participants include traffic control specialists, typically one to three representatives from each State who are responsible for work zone training, process reviews, and specifications development, as well as members of the corresponding FHWA Divisions. Participants point to growing participation and more uniform work zone set-up, practices, and guidance among participating States as evidence of the group's success.

REASON(S) FOR ADOPTING:

The roundtable was established so that the State personnel involved in the administration of the work zone programs could get together and share practices and discuss common concerns.

PRIMARY BENEFIT(S):

More uniform work zone set-up, practices, and guidance among participating States as evidence of the group's success.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All facilities. All types of work.

STATE(S) WHERE USED:

States in the Midwest

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FHWA Resource Center
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Public Relations, Education, and Outreach →State/Contractors/Workers	B4-6

BEST PRACTICE:
"Build a Better Mousetrap" Competition

DESCRIPTION:
The National Local Technical Assistance Program (LTAP)/Tribal Technical Assistance Program (TTAP) conducts the "Build a Better Mousetrap" Competition to collect and disseminate real world examples of best practices and tips from the field and assist in the transfer of technology. State LTAP/TTAP Centers that want to hold a competition can elicit entries from highway agencies on innovative practices they are employing to increase safety, reduce cost, or improve efficiency. Submissions include work zone-related activities. LTAP/TTAP Centers can enter their winner into the national competition, and the winner of the national competition is announced at the LTAP/TTAP National Conference. All entries submitted at a Center and at the national level are included in the annual electronic booklet. More information on the "Build a Better Mousetrap" Competition can be found at http://ltap.org/resources/mousetrap.php.

REASON(S) FOR ADOPTING:
Most local and Tribal agencies are very short on resources. They continually develop new concepts and techniques to accomplish their objectives, but they are not shared with other jurisdictions that might well benefit from the same idea.

PRIMARY BENEFIT(S):
Publishing novel concepts, as well as recognition of the best ideas, transfers technology and creates energy for trying new and better ways of conducting business.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Type of Facility: Local roads.
Location: Primarily rural, some urban.
Volume/Speed: Primarily low-volume, low-speed, but includes others.
Type of Work: Primarily maintenance.

STATE(S) WHERE USED:
All States that choose to participate

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Best Practices Category C - Modeling and Impact Analysis

Modeling and impact analysis includes mathematical equations, software, and analysis used to estimate the impact of work zones prior to and during implementation. Best practices in this section encourage the use of user-friendly analysis tools that are readily adapted to the local construction site and situation. These tools enable analysis and estimation of work zone impacts, including travel times, queue length, travel speed, total delay, and crash rates. These tools provide feedback to the design and construction team on how the work zone will affect traffic, and help them determine how much mitigation is needed to keep impacts tolerable.

Examples of practices include:

- Lane closure analysis used during project planning.
- User-friendly project specific computer software that can predict capacity breakdown on freeways before it occurs.
- Impact reports used to identify/understand actual construction impacts on traffic.

The following best practices relate to modeling and impact analysis:

Subcategory	Ref. #	MODELING AND IMPACT ANALYSIS Best Practices
C1 Lane Closure and Capacity Analysis	C1-1	Lane Closure Analysis
	C1-2	Using Software to Predict Congestion and Associated User Costs
	C1-3	Traffic Impact Analysis
	C1-4	QuickZone Impact Analysis Spreadsheet Tool
C2 Impact Identification and Mitigation	C2-1	Traffic Impact Report
	C2-2	Road Construction Safety Audit

Modeling and Impact Analysis → Lane Closure and Capacity Analysis	C1-1

BEST PRACTICE:

Lane Closure Analysis

DESCRIPTION OF BEST PRACTICE:
Lane closure analysis is a planning tool used by designers to assess the traffic impacts of lane closures for open roads and roads with signalized intersections. The results of the analysis will guide the scheduling of work requiring lane closures, if a lane closure should or should not be allowed, and the time of day or night a lane closure could occur without excessive travel delay.

REASON(S) FOR ADOPTING:
To minimize mobility impacts on the traveling public due to work zone lane closures.

PRIMARY BENEFIT(S):
Reduction of delays and work zone crashes that can occur during congested conditions.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All types of facilities. All types of work.

STATE(S) WHERE USED:
Florida

SOURCE/CONTACT(S):
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Modeling and Impact Analysis → Lane Closure and Capacity Analysis	C1-2

BEST PRACTICE:

Using Software to Predict Congestion and Associated User Costs

DESCRIPTION:

Software, including QueWZ98, is used to predict queue and user cost from a lane closure on an Interstate highway. This information is then used to determine the advisability of allowing lane closures on Interstate highways outside of certain predetermined times; as criteria to determine the best alternative for maintaining traffic; and to predict the number of vehicles diverting onto alternate routes so signals can be optimized along those routes. The QueWZ98 software has been calibrated by Indiana DOT and found to be reasonably accurate. Other software, which is Microsoft Windows OS based, is being calibrated at this time.

REASON(S) FOR ADOPTING:

QueWZ98 and other programs have the ability to predict the queue that will develop from the closure of a lane or lanes. This is used to determine if waivers to the Interstate Lane Closure Policy (which was developed to limit the congestion caused on Indiana Interstate Highways from temporary operations other than incident management) are warranted.

PRIMARY BENEFIT(S):

The biggest benefits being realized are reduced delays for motorists, better planning for maintaining mobility, and an associated increase in traffic safety and road user satisfaction.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

These programs are primarily applicable to freeways for any type of project.

STATE(S) WHERE USED:

Indiana

SOURCE/CONTACT(S):

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Indiana DOT
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Modeling and Impact Analysis → Lane Closure and Capacity Analysis	C1-3

BEST PRACTICE:
Traffic Impact Analysis

DESCRIPTION:
Prior to designing a project, detailed traffic capacity analysis is completed to determine how many lanes must be maintained and when to provide enough capacity for adequate traffic flow. The capacity analysis is completed for a typical weekday, Friday, Saturday, and Sunday for each month of the year.

REASON(S) FOR ADOPTING:
This practice was adopted to limit any possible delays in the work area.

PRIMARY BENEFIT(S):
This practice has improved customer service and safety.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This practice has been used on high-speed/high-volume facilities.

STATE(S) WHERE USED:
Pennsylvania

SOURCE/CONTACT(S):
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Modeling and Impact Analysis → Lane Closure and Capacity Analysis	C1-4

BEST PRACTICE:

QuickZone Impact Analysis Spreadsheet Tool

DESCRIPTION:

QuickZone is a work zone delay impact analysis spreadsheet tool developed by FHWA. QuickZone is an open-source, Excel-based application able to quantify corridor delay resulting from the reduced capacity in work zones; identify impacts of alternative construction phasing; assess the impacts of delay mitigation strategies; and support the calculation of work zone completion incentives/disincentives.

During the roll-out of this spreadsheet, FHWA partnered with States and local transportation agencies to facilitate the initial set-up of the spreadsheet for the agency's needs. One of the QuickZone partners, the Maryland State Highway Administration (MDSHA) was interested in building upon the existing code available in QuickZone, particularly when assessing the impacts of alternative construction phasing. MDSHA customized the software with a State-specific capacity estimation model and uses it to prepare for work zone activities across the State. A number of other States use QuickZone as one of their tools for work zone traffic analysis.

REASON(S) FOR ADOPTING:

To assess the impacts of alternative construction and maintenance of traffic approaches.

PRIMARY BENEFIT(S):

Allows users to calculate the cost of traveler delay on a corridor level.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any State or locality interested in quantifying delay resulting from work zones.

STATE(S) WHERE USED:

Maryland

SOURCE/CONTACT(S):

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Maryland State Highway Administration
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Modeling and Impact Analysis → Impact Identification and Mitigation	C2-1

BEST PRACTICE:
Traffic Impact Report (TIR)

DESCRIPTION:
On the majority of projects, the Traffic Impact Report (TIR) is used to identify construction impacts on traffic. It contains recommendations for traffic mitigation to be used by the designer of the traffic control plan (TCP). The decision to develop a TIR is a mutually reached decision of the Project Manager, Design Coordinator, and the Regional Traffic Operations Manager (within Transportation Systems Management) This practice was initiated in 1994, and is now part of the New Jersey Roadway Design Manual. The New Jersey Department of Transportation Engineering web page contains policy, procedures, manuals & guidelines, CADD drawings, and specifications involved in design (http://www.state.nj.us/transportation/eng/).

REASON(S) FOR ADOPTING:
To help with coordinating the required mitigation and timing of the project with other construction projects, both local government and private. Concurrent projects in close proximity had caused conflicting detours and overlapping traffic impacts.

PRIMARY BENEFIT(S):
The designer has the benefit of the TIR which recommends mitigation such as night work, restricted hours, number of lanes available for traffic, staging requirements, public information program, and transportation strategies (park and ride, shuttle buses, etc.). The designer uses the TIR in the preparation of the TCPs and staging plans. This approach has proven to result in a better overall TCP and reduction of the inconvenience of the motorist.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This practice is applicable to all facility types where significant impacts to traffic are expected due to construction activities.

STATE(S) WHERE USED:
New Jersey

SOURCE/CONTACT(S):
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New Jersey DOT
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Modeling and Impact Analysis → Impact Identification and Mitigation	C2-2

BEST PRACTICE:

Road Construction Safety Audit

DESCRIPTION:

A road construction safety audit (RCSA) process was developed for Wyoming Department of Transportation (WYDOT) to use in evaluating alternatives for rural Interstate reconstruction projects. The audit evaluates the traffic control plan, devices used, and potential strategies before an Interstate work zone is established on the roadway. The objective of the RCSA is to ensure that safety considerations have not been overlooked, and alternative devices and strategies have been considered.

REASON(S) FOR ADOPTING:

A formal process to select reconstruction alternatives based on a safety perspective did not exist in Wyoming.

PRIMARY BENEFIT(S):

With this procedure, WYDOT engineers are able to systematically compare and evaluate benefits, costs, and trade-offs of the various work zone and traffic redirection alternatives.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Reconstruction on rural freeways.

STATE(S) WHERE USED:

Wyoming

SOURCE/CONTACT(S):

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Best Practices Category D - Planning and Programming

Planning and programming involves defining issues and opportunities, evaluating alternative solutions, gathering public input, and deciding when projects should be funded or programmed within existing budgetary constraints. These best practices emphasize a corridor approach to evaluating, planning, and programming for the sake of minimizing work zone impacts on road users. State DOTs are encouraged to give full consideration to long-range corridor needs, traffic demands, road user costs, potential business community impacts, and overall evaluation of total costs for the life of the improvement. They should consider modeling software, high-performance materials, and innovative delivery methods to complete projects with minimal disruption to the traveling public.

Examples of practices include:

- Corridor planning strategies to minimize traffic delays across the transportation network, reduce the exposure of motorists and workers, and provide for the safe, efficient travel needs of road users now and in the future.
- Organizational coordination of projects to minimize motorist delay.
- Traffic management planning to maintain acceptable levels of traffic flow during periods of construction activities.

The following best practice entries relate to work zone planning and programming:

Subcategory	Ref. #	PLANNING AND PROGRAMMING Best Practices
D1 Corridor Planning	D1-1	Multi-Level Transportation Management Plans (TMPs)
	D1-2	Corridor Planning to Minimize Delays and Enhance Safety in Work Zones
	D1-3	Corridor Planning
	D1-4	Partnering with the Local Community on Project Planning
	D1-5	Corridor Modeling for Construction Closure and Restriction Alternatives
D2 Organizational Strategy	D2-1	High Impact Project Task Forces
	D2-2	Coordination of State DOT, Local Government, and Utility Construction and Maintenance Work to Minimize Motorist Delays
	D2-3	Partnering to Improve Work Zone Design and Traffic Control
	D2-4	Use of a Computerized Planning System for Road Work and Lane Closures

Subcategory	Ref. #	PLANNING AND PROGRAMMING Best Practices
D3 Traffic Management Planning	D3-1	Transportation Management Plan
	D3-2	Transportation Management Plan Development Tools
	D3-3	Widening Bridges to Accommodate Future Construction
	D3-4	Multi-Disciplinary Teams to Develop Transportation Management Plans (TMPs)

Planning and Programming → Corridor Planning	D1-1

BEST PRACTICE:

Multi-Level Transportation Management Plans (TMPs)

DESCRIPTION:

The goal of a Transportation Management Plan (TMP) is to proactively manage the traffic-related impacts of a construction project. TMPs manage impacts through the application of traditional and innovative traffic mitigation strategies. A project-level TMP is required for every Federal-aid highway project by the 2004 Work Zone Safety and Mobility Rule (http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm). A multi-level TMP coordinates these efforts for several work zones across a city, region, or State. A multi-level TMP is particularly useful when several road projects may be occurring at the same time and have a compounding effect on traffic and mobility in a region. Multi-level TMPs build off of one another, with the higher level TMP setting policies for the lower-level TMPs.

The Oregon Department of Transportation (ODOT) developed a multi-level TMP approach to address safety and mobility at a regional and statewide level, recognizing that motorists may encounter multiple work zones on a trip and the combined impacts of those work zones may add up. This approach improved ODOT's ability to identify potential mobility or safety issues earlier, and provide proactive, coordinated solutions. Oregon uses three levels of TMPs: program-level, corridor-level, and project-level. Oregon's program-level TMP serves as the framework for corridor-level TMPs, providing overarching safety and mobility policies for the State. Oregon's corridor-level TMPs identify corridor management, construction staging, and mobility strategies for six high-volume freight and passenger travel routes. Lastly, Oregon's project-level TMPs describe traffic control, congestion mitigation, and public information/outreach strategies for individual projects.

A similar approach is being used for the Virginia Megaprojects program. The program is a Virginia Department of Transportation (VDOT) initiative to develop, facilitate, and use coordinated transportation management strategies for several major regional mobility projects in Northern Virginia, just outside the Nation's Capital. Projects include construction of high occupancy toll (HOT) lanes along I-495, widening of I-95 and I-66, expansion of the Metrorail system from downtown Washington, DC to Dulles airport in suburban Virginia, and other spot improvements across the region. Each specific project proposed under the Megaprojects banner developed its own independent TMP. VDOT also developed a regional TMP to analyze the overarching impacts of these individual project TMPs on mobility throughout the Washington, DC metro area. In creating the regional TMP, VDOT identified the combined impacts of the projects and potential areas of conflicts or excessive impacts, and met with stakeholders to

resolve those issues. Methods were proposed to alleviate concerns through shared mitigation strategies. The regional TMP provided VDOT with a framework to monitor conditions and quickly implement or modify impact management strategies as needed.

REASON(S) FOR ADOPTING:
When developing complex large-scale projects, a multi-level TMP can provide a comprehensive analysis of the cross-cutting impacts that a series of simultaneous projects will have on one another and coordinate the efforts to manage the impacts. It can also identify the smaller-scale impacts that each project will likely have on mobility and safety in the surrounding community.

PRIMARY BENEFIT(S):
Reduced overall impacts from better coordinated projects that consider the safety and mobility impacts each project will have on others in the region and the combined impacts that projects will have on motorists, businesses, and other stakeholders. Potentially increased efficiencies and reduced costs for traffic management strategies since some strategies (e.g., a motorist assist program, CCTV, variable message signs) may be suitable for sharing across projects.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Regions where multiple projects will be occurring simultaneously that could affect mobility through the region. Multi-level TMPs are also applicable for large scale rehabilitation and construction projects that impact entire corridors, regions, or States.

RELATED BEST PRACTICE(S):
Transportation Management Plan (Practice D3-1)
Transportation Management Plan Development Tools (Practice D3-2)
Multi-Disciplinary Teams to Develop Transportation Management Plans (Practice D3-4)
Comprehensive Traffic Management Plan (Practice E3-2)
Using a Transportation Management Plan Peer Review Process (Practice E3-4)

STATE(S) WHERE USED:
Oregon, Virginia

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Planning and Programming → Corridor Planning	D1-2

BEST PRACTICE:

Corridor Planning to Minimize Delays and Enhance Safety in Work Zones

DESCRIPTION:

The Indiana Department of Transportation (INDOT) collects data on current traffic and determines the amount of traffic the road can carry while being reconstructed. They conduct an analysis on the likely routes to be used in the corridor by traffic that cannot be accommodated on roads under construction. Improvements are made on alternate routes as needed to have sufficient capacity.

REASON(S) FOR ADOPTING:

This practice of reviewing an entire corridor and upgrading its traffic carrying capacity, prior to beginning the heaviest construction, was implemented to improve safety and mobility.

PRIMARY BENEFIT(S):

Safety on the construction project is increased and motorist delay is decreased substantially. It has also helped to reduce the number of complaints received by INDOT about construction zone delays.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Normally applied to freeway and other high-volume arterials.

STATE(S) WHERE USED:

Indiana

SOURCE/CONTACT(S):

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Indiana DOT
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Planning and Programming → Corridor Planning	D1-3

BEST PRACTICE:
Corridor Planning

DESCRIPTION:
The Michigan Department of Transportation (MDOT) is attempting to identify all needed construction work in a corridor and then let a contract to deal with it all, especially in the Detroit area. The principle they are applying is "get in, get out, and stay out". A typical example of this new approach was bridgework performed on I-94 where all crossroad bridges were packaged into the contract.

Also, MDOT has applied the corridor approach to short term roadwork from a variety of sources. A typical implementation is for MDOT to allow a total weekend closure within a long-term contract project, and invite road maintenance, utility, and survey forces to also work on their road interests during that time period.

REASON(S) FOR ADOPTING:
MDOT was looking for ways to reduce the seemingly constant road closures on freeway corridors. In the past it was not uncommon for the State to be working on a given stretch of highway, year after year, doing different elements of work.

PRIMARY BENEFIT(S):
Traffic inconvenience is minimized by this approach. It is also expected that MDOT credibility with the public is enhanced.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This concept is being used primarily on high-volume urban freeway projects where traffic distribution is a major issue.

STATE(S) WHERE USED:
Michigan

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Planning and Programming → Corridor Planning	D1-4

BEST PRACTICE:

Partnering with the Local Community on Project Planning

DESCRIPTION:

When developing a project plan for a roadway construction project, it is important to consider the impacts that the work zone will have on the surrounding community. By partnering with the local community early in the planning process, potential impacts can be discussed and plans for traffic mitigation can be developed with the support of the community. Wisconsin DOT (WisDOT) did extensive partnering for the Marquette Interchange Project, a major four-year reconstruction project in downtown Milwaukee that greatly affected the surrounding area – the students and faculty of Marquette University in particular. The Interchange links Interstate 94, Interstate 43, and Interstate 794 and the project involved major work to modernize the four-level interchange to a five-level interchange. Through frequent meetings and an interactive website devoted to the project, WisDOT communicated with the university and local community throughout the entire process, developing a construction plan that met both the needs of the university community and the work zone project.

One of the outcomes of bringing the local community into the planning process was the development of several communication strategies to ensure that construction information was disseminated to the community in a timely manner. Communications strategies included the development of an interactive website with mapping, traffic bug alerts, closure schedules, and real-time traffic flow, and printed materials (brochures, get-around guides). These products provided the local community and visitors with reliable information to help them make the decision to either avoid the construction or allow extra time for travel.

REASON(S) FOR ADOPTING:

By coordinating with the local community early and often throughout the project planning and implementation process, potential impacts to the surrounding community can be discussed, traffic mitigation strategies can be developed, and design decisions can be made with the input and support of those who will be impacted by the construction.

PRIMARY BENEFIT(S):

The impacts of the construction on the public were mitigated as much as possible. Surveys were conducted throughout the project proving that the information provided to the public was more than adequate and very helpful in coping with the disruption of the work zone.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Work zones that will cause great disruption and impact the surrounding area.

STATE(S) WHERE USED:
Wisconsin

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Planning and Programming → Corridor Planning	D1-5

BEST PRACTICE:

Corridor Modeling for Construction Closure and Restriction Alternatives

DESCRIPTION:

The Utah Department of Transportation (UDOT) used the local metropolitan planning organization (MPO) database and travel demand forecasting model to compare alternatives for a major Interstate reconstruction effort through a major population center. The model was already used for transportation planning using traffic assignment capabilities and allowed planners to evaluate closure scenarios and model the changes in volume on alternate routes. The analysis was used to fund capacity changes on alternate routes and to help determine the optimum construction strategies and sequencing.

REASON(S) FOR ADOPTING:

The analysis was performed as part of a comprehensive construction and procurement plan because of the magnitude of impact from significant Interstate reconstruction through a major population center. The scope of work necessitated increased analysis not typical for construction projects.

PRIMARY BENEFIT(S):

Detailed analysis data provides a basis for decision-making. The planner is better able to evaluate impacts on a corridor level, not just on one route.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Not typical for routine projects. The model is highly complex and data intensive. The model is mostly used in planning long-term improvements and is most appropriate for projects of regional impact with sufficient time to undertake long-term analysis.

STATE(S) WHERE USED:

Utah

SOURCE/CONTACT(S):

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Planning and Programming → Organizational Strategy	D2-1

BEST PRACTICE:

High Impact Project Task Forces

DESCRIPTION:

A "High Impact Project Task Force" is a task force formed during the project development phase. At the Missouri Department of Transportation (MoDOT), the members of the task force are from various disciplines, and they are charged to examine and review all aspects of the project which may impact the traveling public (motorists). This practice has been used for more than 10 years and has been integrated with MoDOT's project managers.

The members of the task force employ various methods for examining the impacts, such as value engineering targeted to reduce contract time and motorist impacts; input from the public and road user groups; and input from local businesses, communities and elected officials on traffic management plans.

REASON(S) FOR ADOPTING:

Examples of success include the formation of a multi-agency partnership to reduce traffic on an I-70 bridge rehabilitation in St. Louis. Public and private agencies worked together to promote and implement traffic demand management strategies.

Another major bridge rehabilitation project required revised traffic routing. Impacted businesses and the public provided input on the traffic management plan that revealed an operational problem. A solution was identified and included in the construction project proposal.

PRIMARY BENEFIT(S):

Formation of the high impact project task force has resulted in reduced construction time, less impact to the traveling public through recommended revisions to traffic management plans, better understanding and buy in of the traffic management plan by the users, and the use of new techniques to monitor traffic through construction.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Freeways, major bridges, expressways, complex interchanges in urban or rural areas where high volumes of vehicles are using the roadway system.

STATE(S) WHERE USED:

Missouri

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Planning and Programming → Organizational Strategy	D2-2

BEST PRACTICE:

Coordination of State DOT, Local Government, and Utility Construction and Maintenance Work to Minimize Motorist Delays

DESCRIPTION:

The Oklahoma Department of Transportation (DOT) coordinates its projects and activities with the road work of local governments, utility contractors, and maintenance forces, during the project planning phase, to minimize motorist delays. The effort began in 1998.

REASON(S) FOR ADOPTING:

Oklahoma DOT found that many adjacent and alternate routes were being rehabilitated at the same time causing motorist delays. In addition, many instances were found where an overlay/rehabilitation job was completed, then shortly thereafter, a new utility crossing was installed effectively ruining the recent improvements.

PRIMARY BENEFIT(S):

The primary benefit is the reduction of motorist delay. The secondary benefits included providing an open forum to discuss formal agreements to detour traffic from the State routes to local routes or vice versa; discussing funding arrangements to improve a local highway facility to act as an alternate route for detouring traffic through and around a State highway project; and managing traffic through partnerships and networking. Although it was recognized early that not all projects could be effectively coordinated because of funding limitations or politics, the majority of projects could be coordinated to provide the least amount of delay to the motoring public.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Currently, all types of urban projects are being considered for coordination. Major arterials are the focus at this time with the expectation that eventually residential streets will be considered once the methods of coordination are improved.

STATE(S) WHERE USED:

Oklahoma

SOURCE/CONTACT(S):

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Planning and Programming → Organizational Strategy	D2-3

BEST PRACTICE:

Partnering to Improve Work Zone Design and Traffic Control

DESCRIPTION:

The Kansas Department of Transportation (KDOT) partners with traffic control contractors, the American Traffic Safety Services Association (ATSSA), vendors, and FHWA to improve work zone design and traffic control. KDOT and FHWA meet quarterly with the ATSSA local chapter to discuss the functionality of existing work zone traffic control practices. The traffic control contractors and vendors will travel around the State to meet with KDOT field personnel and/or contractors to determine what is and is not working in work zones.

REASON FOR ADOPTING:

KDOT is interested in developing efficient and practical work zones, creating safer conditions for the driving public. This effort also helped KDOT to establish contacts with all parties involved in work zones.

PRIMARY BENEFIT(S):

Partnering has enhanced communication between KDOT and contractors. Work zone issues are looked at from two perspectives and policy is developed that all stakeholders can agree on. Headquarters personnel are able to determine first-hand what does and does not work in the field, improving work zone design in the future. This has been very successful in achieving uniform work zone practices throughout the State and eliminating awkward or outdated practices or procedures.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Partnering has been beneficial to all work zones through out the State.

STATE(S) WHERE USED:

Kansas

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Planning and Programming → Organizational Strategy	D2-4

BEST PRACTICE:

Use of a Computerized Planning System for Road Work and Lane Closures

DESCRIPTION:

The national computerized planning system, called the MELDWERK system or "report works," contains information on more than 2,000 road projects planned for each month across the country. Daily maintenance projects are included in the system. The system is used by more than 40 local road authority planners and 30 consulting companies, as well as traffic operators and highway agencies. This practice provides a uniform way to collect traffic information, assists in traffic management, and helps determine signage and optimal alternate routes. The system enables localities to coordinate their projects so that adjacent routes are not under construction simultaneously.

REASON(S) FOR ADOPTING:

To ensure that all road maintenance and construction projects are coordinated among the various highway and public works agencies in the country.

PRIMARY BENEFIT(S):

Avoiding simultaneous construction on adjacent routes as much as possible, thereby enhancing systemwide mobility.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All work zones nationwide.

STATE(S) WHERE USED:

FHWA

SOURCE / CONTACT(S):

Methods and Procedures to Reduce Motorist Delay in European Work Zones
FHWA-PL-01-001 www.international.fhwa.dot.gov October, 2000

Planning and Programming → Traffic Management Planning	D3-1

BEST PRACTICE:

Transportation Management Plan

DESCRIPTION:

A transportation management plan (TMP) is an overall strategy for accommodating traffic during construction on a project or corridor. Through the development of TMPs, transportation agencies are able to plan for and implement strategies to improve safety and mobility while still completing the necessary work on the roadway. In 2007, FHWA issued the Work Zone Safety and Mobility Rule requiring that TMPs be developed for all federal-aid projects. This requirement was modeled after the TMPs in use by the California Department of Transportation (Caltrans).

A Caltrans TMP is a cohesive set of operational and demand management strategies designed to maintain acceptable levels of traffic flow during periods of construction activities. The Caltrans TMP development process focuses on how the interactions among the planning, design, construction, and funding phases of the transportation project should be considered and addressed as a system rather than individually by separate stakeholders. Caltrans' goal is to keep work-zone induced motorist delay to less than 30 minutes above normal recurring delay. They use TMPs to achieve this goal.

Caltrans classifies TMPs into three categories: a blanket TMP, a minor TMP, or a major TMP, based on the types of conditions. Blanket TMPs are used for low-volume areas where there are minimal expected delays, off-peak work, and moving lane closures. Minor TMPs are used where some impacts are expected, lane closures are required, and mitigation strategies are needed to maintain safety and mobility for motorists and construction workers in the work zone. For a major TMP, which is developed for projects where significant impacts are expected, many stakeholder groups are involved, the duration of the project is typically long, and there are multiple TMP strategies to manage impacts.

For each of these TMP categories, Caltrans guidance identifies strategies that are generally appropriate. Practitioners use this guidance when developing TMPs for their projects. The TMPs are then implemented in the field with each project to improve safety and mobility through the State's work zones. The implementation of TMPs in California has helped to significantly reduce delays in work zones.

REASON(S) FOR ADOPTING:

Since 2007, TMPs are required for all federal-aid projects as a part of the Work Zone Safety and Mobility Rule. Many States have seen the benefits of TMPs and develop them for all projects.

PRIMARY BENEFIT(S):
Congestion through the construction zone is minimized; construction zones are safer and construction duration and costs are reduced.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All projects.

RELATED BEST PRACTICE(S):
Multi-level Transportation Management Plans (Practice D1-1)
Transportation Management Plan Development Tools (Practice D3-2)
Multi-Disciplinary Teams to Develop Transportation Management Plans (Practice D3-4)
Comprehensive Traffic Management Plan (Practice E3-2)
Using a Transportation Management Plan Peer Review Process (Practice E3-4)

STATE(S) WHERE USED:
California

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Planning and Programming → Traffic Management Planning	D3-2

BEST PRACTICE:

Transportation Management Plan Development Tools

DESCRIPTION:

A transportation management plan (TMP) is an overall strategy for accommodating traffic during construction on a project or corridor. Through the development of TMPs, State agencies are able to plan for and implement strategies to improve safety and mobility while still completing the necessary work on the roadway.

Several States across the country have produced tools to help them develop effective TMPs. Tool efforts include developing templates so that TMPs follow a consistent format and thought process, and sample TMPs to illustrate what the State is looking for in its TMPs. The Rhode Island Department of Transportation (RIDOT) identified four levels of work zone impacts for project classification, and then developed a set of four TMP templates in Microsoft Excel (one for each impact level) for staff to use when developing TMPs. The Virginia Department of Transportation (VDOT) developed a series of sample TMPs that designers can use when starting their own TMPs for upcoming road construction projects.

Several States, including Illinois, Indiana, Kansas, and Maryland, have developed TMP checklists to aid designers and ensure consideration of all necessary factors in developing TMPs. Maryland has a work zone design checklist for identifying traffic control options, work zone impacts, and impacts management strategies. The Illinois TMP checklist shows possible components to include in TMPs and is intended to assist preparers and reviewers of TMPs.

FHWA developed TMP templates and samples to illustrate what TMPs could look like for low to moderate impact projects and moderate to high impact projects. Agencies can use these templates and samples as a reference or starting point for their own efforts. The templates are available in Microsoft Word format and are easily adaptable for customization by agencies.

These and other TMP development tools are available at http://www.ops.fhwa.dot.gov/wz/resources/final_rule/tmp_examples.htm.

REASON(S) FOR ADOPTING:

To assist planners, traffic engineers, and designers in developing and implementing TMPs effectively and consistently across a State.

PRIMARY BENEFIT(S):

Increased safety and reduced delay/congestion through better planning for and implementation of innovative strategies to reduce traffic, inform motorists, and

stage construction.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All projects.

RELATED BEST PRACTICE(S):
Multi-level Transportation Management Plans (Practice D1-1)
Transportation Management Plan (Practice D3-1)
Multi-Disciplinary Teams to Develop Transportation Management Plans (Practice D3-4)
Comprehensive Traffic Management Plan (Practice E3-2)
Using a Transportation Management Plan Peer Review Process (Practice E3-4)

STATE(S) WHERE USED:
Illinois, Indiana, Kansas, Maryland, Rhode Island, Virginia

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Planning and Programming → Traffic Management Planning	D3-3

BEST PRACTICE:

Widening Bridges to Accommodate Future Construction

DESCRIPTION:

The Wisconsin Department of Transportation (WisDOT) has begun to widen some bridges to 56 feet during rehabilitation in order to accommodate four lanes of traffic during future reconstruction. According to the procedure set forth in the Facilities Development Manual the widening decision depends on several factors:

- Projected traffic volumes for the year when the adjoining highway will be reconstructed or rehabilitated (not when the bridge will be overlaid or re-decked);
- The proposed project improvement type for the adjoining highway;
- The hours during which highway reconstruction will cause lane restrictions.

Bridge widening is warranted if:

- Projected Annual Average Daily Traffic (AADT) is between 20,000 and 25,000 with high seasonal peaking characteristics present.
- Projected AADT is less than 20,000 and high summer weekend traffic is present.
- Reconstruction of the adjoining highway is anticipated within 20 years.

REASON(S) FOR ADOPTING:

To allow additional capacity as needed during future rehabilitation activities.

PRIMARY BENEFIT(S):

This practice enables four lanes to be maintained during roadway rehabilitation. As lanes are closed traffic is shifted to the shoulder as needed.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Four lane divided corridors.

STATE(S) WHERE USED:

Wisconsin

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Planning and Programming → Traffic Management Planning	D3-4

BEST PRACTICE:

Multi-Disciplinary Teams to Develop Transportation Management Plans (TMPs)

DESCRIPTION:

The development of transportation management plans (TMPs) by multi-disciplinary teams began in June 1997, after the issuance of the Indiana Department of Transportation's (INDOT) new Design Manual. The manual includes an entire chapter devoted to the subject of TMPs, and describes the make-up and responsibilities of TMP teams. These teams bring together staff with a variety of expertise to discuss possible alternatives for traffic management and to consider issues such as constructability as part of TMP development and review. The composition of the TMP team is based on the purpose, goals, and constraints of the TMP and varies from project to project. The team's responsibilities vary to some degree based on the expected traffic impacts of a project, and include tasks such as collecting data, performing impacts analysis, reviewing construction phasing and scheduling, and selecting traffic control alternatives and other TMP strategies.

REASON(S) FOR ADOPTING:

To ensure that a reasonable transportation management strategy has been incorporated into the project plans.

PRIMARY BENEFIT(S):

The biggest benefit gained is that it provides a team approach with a variety of disciplines. This approach looks outside the box for potential solutions. Evaluation of TMPs by the team reduces the chance of errors being repeated.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Applicable to major projects with high volumes of traffic, mainly in urban and suburban areas.

RELATED BEST PRACTICE(S):

Multi-level Transportation Management Plans (Practice D1-1)
Transportation Management Plan (Practice D3-1)
Transportation Management Plan Development Tools (Practice D3-2)
Comprehensive Traffic Management Plan (Practice E3-2)
Using a Transportation Management Plan Peer Review Process (Practice E3-4)

STATE(S) WHERE USED:

Indiana

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Best Practices Category E - Project Development and Design

Project development and design entails developing alternatives and selecting the preferred design that minimizes present and future negative impacts experienced by road users and workers. Best practices in this area encourage assessing motorist delay, road user and worker safety, and impacts to adjacent communities on all major urban and other high-volume corridors.

Examples of practices include:

- Constructability review processes and strategies to ensure efficient projects.
- Tools and practices, such as value engineering and the use of CPM scheduling, implemented during project development and design to assess project impact, shorten construction time when possible, and minimize road user costs.
- Project-specific transportation management plans and strategies that provide for traffic flow and access to motorists and other road users, and enable adequate and safe access/egress for workers.
- Technical committees and community groups to review project plans and provide input during project development and design and recommend mitigation strategies.

The following best practice entries relate to project development and design:

Subcategory	Ref. #	PROJECT DEVELOPMENT AND DESIGN Best Practices
E1 Constructability Review Process	E1-1	Constructability Reviews to Minimize Construction Contract Time and User Delays
	E1-2	Constructability Practices for Reducing the Impact to Motorists and Businesses
	E1-3	Formal Constructability Review Process
	E1-4	Constructability Reviews by Construction Industry Representatives During Project Design
	E1-5	Contractor Participation in Constructability Reviews
	E1-6	Constructability Reviews on High Visibility Projects in Design Phase
	E1-7	North Carolina Contractor's Association Participation in Constructability Reviews
	E1-8	Employ a Contractor to Assist Designers and to Perform Constructability Reviews

Subcategory	Ref. #	PROJECT DEVELOPMENT AND DESIGN Best Practices
E2 Design and Scheduling Decisions	E2-1	Value Engineering Performed on All Projects Over $5 Million
	E2-2	Comparison of the Estimated Construction Time Required to Maintain Traffic Versus Diverting Traffic
	E2-3	Value Engineering Studies Conducted on Major Projects
	E2-4	Evaluating Staging Approaches to Assess Tradeoffs between Traffic Flow and Construction Efficiency
	E2-5	Critical Path Method (CPM) Scheduling to Set Contract Time
	E2-6	Consideration of Nighttime Construction during Project Development
	E2-7	Life−Cycle Costing to Select Longer Lasting Materials and Products
E3 Project Specific Traffic Management Planning	E3-1	Construction Work Zone Traffic Control Strategy
	E3-2	Comprehensive Traffic Management Plan
	E3-3	Access/Egress Practices in Work Zones
	E3-4	Using a Transportation Management Plan (TMP) Peer Review Process
E4 Community Involvement and Coordination	E4-1	Traffic System Management Committees
	E4-2	Involvement of Affected Communities and Businesses in the Project Development Process
	E4-3	Using Video to Enhance Public Involvement
	E4-4	Community Advisory Councils

Project Development and Design → Constructability Review Process	E1-1

BEST PRACTICE:

Constructability Reviews to Minimize Construction Contract Time and User Delays

DESCRIPTION:
On major projects the Virginia Department of Transportation (VDOT) uses an independent consultant, and in some instances contractor(s), to review the plans for a project to develop the best sequencing of work and to establish an optimum construction period to minimize exposure and impact on traffic.

REASON(S) FOR ADOPTING:
Constructability reviews can be used to shorten construction time and minimize traffic delays.

PRIMARY BENEFIT(S):
VDOT has found that projects vetted through this process typically result in less user delay and public compliant.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All major facilities and all types of work.

STATE(S) WHERE USED:
Virginia

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Project Development and Design → Constructability Review Process	E1-2

BEST PRACTICE:

Constructability Practices for Reducing the Impact to Motorists and Businesses

DESCRIPTION:

In 1996, as part of their statewide Quality Control/Enhancement Plans, the Florida Department of Transportation (FDOT) instituted constructability reviews into the project development process. In general, this involves active participation by FDOT Construction personnel early in the design stages of a project, possibly even during planning for large or complex groups of projects. Constructability reviews early in the process ensures the scope of the project addresses construction issues, preventing conflicts and reducing contract time.

REASON(S) FOR ADOPTING:

By implementing constructability practices, FDOT hopes to better anticipate field oriented issues and conflicts which have typically plagued projects (e.g., utility conflicts, maintenance of traffic which cannot be implemented, etc.) and to encourage use of new construction methods (administrative and technical) which increase the quality and reduce time on the job.

PRIMARY BENEFIT(S):

Reducing the time the public is exposed to construction conditions, and reducing costly construction supplemental agreements and claims.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Applicable for all construction projects, but especially those with more complex maintenance of traffic or which have a high impact to adjacent property owners.

STATE(S) WHERE USED:

Florida

SOURCE/CONTACT(S):

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Project Development and Design → Constructability Review Process	E1-3

BEST PRACTICE:

Formal Constructability Review Process

DESCRIPTION:

The constructability review process (CRP) is an iterative, multi-disciplinary review of the Plans, Specifications, and Estimates documents (PS&Es) at various defined stages of the project development process. This review will include all functional areas including, but not limited to: traffic, design, construction, and maintenance. The CRP has been implemented on all projects greater than $25 million since July 1997 and implemented for all major projects (>$750,000) since July 1998.

REASON(S) FOR ADOPTING:

To improve overall constructability in an effort to reduce contract time extensions and delay claims and the overall cost/duration of construction.

PRIMARY BENEFIT(S):

The CRP would address many of the root causes leading to constructability problems, contract change orders, and delay claims. Constructing a project right the first time would not only minimize contract time, but also reduce or eliminate some future maintenance problems. All of this adds up to less inconvenience to the traveling public and a better perception by the public of the State Department of Transportation.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types. All locations.

STATE(S) WHERE USED:

California

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Project Development and Design → Constructability Review Process	E1-4

BEST PRACTICE:

Constructability Reviews by Construction Industry Representatives During Project Design

DESCRIPTION:

Working with the Colorado Contractor's Association, a construction contractor is selected to review and critique plans under development at about 30 percent complete stage. The constructability review should occur shortly after the Field Inspection Review stage of design.

REASON(S) FOR ADOPTING:

A constructability review should be conducted by the Region to define risks and potential costs associated with the project, and to eliminate problems with plans that could have been identified by those more familiar with construction or work phasing. Review by contractors allows correction prior to advertisement and start of construction.

PRIMARY BENEFIT(S):

Fewer costly changes during construction. Some savings in delay and congestion due to revisions to work sequencing or traffic control that affects users.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Constructability reviews are recommended for all "Signature Projects." A Signature Project is one that has a complex feature that is unique or different from most Colorado Department of Transportation (CDOT) projects. The complex feature requires extra consideration by CDOT when estimating the project and by bidders when bidding the project. Aspects to consider in determining the designation include, design features, constructability, and innovative delivery methods. The size of a project should not be a factor in its designation as a signature project.

STATE(S) WHERE USED:

Colorado

SOURCE/CONTACT(S):

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Project Development and Design → Constructability Review Process	E1-5

BEST PRACTICE:

Contractor Participation in Constructability Reviews

DESCRIPTION:

This practice allows all of the contractors to review the plans in advance of advertisement to ensure that the best, most economical, and quickest design and construction methods are incorporated prior to advertisement. This practice was begun in 1997 and is commonly used on projects.

REASON(S) FOR ADOPTING:

The constructability reviews were begun largely because there was an untapped wealth of experience of contractors who know how to construct projects in the most economical and expedient manner.

PRIMARY BENEFIT(S):

Besides incorporating better, more economical, and expeditious methods of construction, having the contractors review the plans early provides a way to detect errors overlooked in the design phase and allows the contractors additional time to become more familiar with the project, and therefore enables them to submit more accurate bids.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This is done on projects over $5 million.

STATE(S) WHERE USED:

Oklahoma

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Project Development and Design → Constructability Review Process	E1-6

BEST PRACTICE:

Constructability Reviews on High Visibility Projects in Design Phase

DESCRIPTION:

Constructability reviews fall under the transportation management plans process, which is included in the Indiana Department of Transportation (INDOT) Design Manual. Constructability reviews include reviewing construction phasing and scheduling, reviewing design alternates, reviewing traffic control alternates, reviewing the adequacy of alternate routes, coordinating the design with other plans in the region, and coordinating funding and timing with other projects within the corridor.

REASON(S) FOR ADOPTING:

INDOT realized that major projects on high-volume routes could impact an entire corridor and many other facilities such as hospitals, schools, recreational facilities, and shopping centers. INDOT formally began the practice of traffic management plans in 1997 to lessen impacts on all facilities. Constructability reviews help ensure that the best traffic management plans are developed.

PRIMARY BENEFIT(S):

Increased safety and reduced delay and congestion. Fewer complaints from affected facilities such as shopping centers and motorists.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This type of practice is most applicable on any type of facility of high visibility (primarily urban freeways).

STATE(S) WHERE USED:

Indiana

SOURCE/CONTACT(S):

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Project Development and Design → Constructability Review Process	E1-7

BEST PRACTICE:

North Carolina Contractor's Association Participation in Constructability Reviews

DESCRIPTION:

The North Carolina Contractor's Association is actively involved in constructability reviews early in the design process. The reviews have been conducted since 1996.

REASON(S) FOR ADOPTING:

The process has been developed to provide a more constructible design by using contractor input early in the design process.

PRIMARY BENEFIT(S):

The greatest benefit to date is reduction in contract time—sometimes dramatic decreases due in particular to improved project designs. The contractor input has resulted in reductions in contract costs and user costs and better traffic management strategies.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Projects selected for review are typically Significant Projects which are usually on high speed, high-volume freeways. These projects typically involve major rehabilitation and/or construction and sometimes have special environmental mitigation concerns. However, other types of projects where "specialized" construction equipment and professional expertise is required are excellent candidates as well.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Project Development and Design → Constructability Review Process	E1-8

BEST PRACTICE:

Employ a Contractor to Assist Designers and to Perform Constructability Reviews

DESCRIPTION:

An engineer with over 35 years of experience in construction, retired from a local contracting company with extensive bridge building experience in the region, is available on a part-time basis (approx. 20 hours per week) to review plans; discuss economical design and detailing; recommend methods of repairs, construction staging, scheduling, and traffic control phasing; estimate costs; provide time schedules; and assist in resolving field problems.

REASON(S) FOR ADOPTING:

To provide the Maryland State Highway Administration (SHA) Office of Bridge Development the benefit of an individual experienced in the construction industry, in general, and bridge construction, in particular. Frequently, designers, especially young engineers, do not have the benefit of actual construction experience and may not be aware of the implications of their design decisions on the contractors who have to build them. Prior to the employment of this retired contractor, SHA design engineers had to rely on their own, sometimes limited experience or had to seek advice from active contractors willing to assist. This practice was not always in the best interest of the State.

PRIMARY BENEFIT(S):

The benefits being realized include: avoidance of design details which are difficult and expensive to build; development of economical methods to build, rehabilitate or repair structures; valuable assistance in the more efficient and economical resolution of field problems; reduction in the number of field problems and construction claims; insight into the contractor's point of view regarding methods and sequences of construction; and the development of the importance of the concept of design constructability in the minds of bridge design engineers. An added benefit is the reduction of inconvenience to the traveling public.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This practice can be used on all structure projects, regardless of size or location.

STATE(S) WHERE USED:

Maryland

SOURCE/CONTACT(S):

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Maryland State Highway Administration
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Project Development and Design → Design and Scheduling Decisions	E2-1

BEST PRACTICE:

Value Engineering Performed on All Projects Over $5 Million

DESCRIPTION:

Value Engineering (VE) is a systematic approach to obtaining optimum value for every dollar spent on transportation projects. A VE review is conducted by a multi-discipline team of experienced engineers and technicians during the design and development phase of a project. The VE team can provide recommendations on all aspects of the project, including temporary traffic management issues. The Virginia Department of Transportation (VDOT) began performing VE studies in the mid-1970s.

REASON(S) FOR ADOPTING:

By identifying the most cost-effective use of funds, the program assists management in providing the best transportation system possible and reducing disruption to motorists during construction and maintenance activities. In 1990, the Virginia General Assembly legislated that a VE study be performed on all construction and maintenance projects exceeding $5 million.

PRIMARY BENEFIT(S):

VE can reduce construction time, project cost, and road user cost without sacrificing quality or operation and maintenance capabilities. VE team members gain increased familiarity with other disciplines by participating in VE studies.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All projects except repetitive routine maintenance.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Project Development and Design → Design and Scheduling Decisions	E2-2

BEST PRACTICE:

Comparison of the Estimated Construction Time Required to Maintain Traffic Versus Diverting Traffic

DESCRIPTION:

The Indiana Department of Transportation (INDOT) Design Manual calls for analyses to compare the benefits and costs, such as user costs, of traffic management options to determine the most appropriate option. This practice is covered under the transportation management plans component of the INDOT Design Manual. It is considered specifically when reviewing traffic control alternatives. The alternatives to analyze include on-site options (e.g., lane closures, use of shoulders) as well as detours. For on-site options, considerations include factors such as right-of-way costs, user delay costs, and accident potential. Analysis for detours includes factors such as additional travel time, the cost to travel the extra distance, the cost for any improvements needed to the detour route, and the effect of the detour on the community and local businesses. The manual provides guidance on identification of options and how to perform the calculations.

REASON(S) FOR ADOPTING:

To support the selection of effective traffic control alternatives.

PRIMARY BENEFIT(S):

The biggest benefit realized is easier construction for the contractor and increased safety of the traveling public, and it is usually cost effective.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This type of practice may be cost effective on various types of facilities. Each project is site specific.

STATE(S) WHERE USED:

Indiana

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Project Development and Design → Design and Scheduling Decisions	E2-3

BEST PRACTICE:

Value Engineering Studies Conducted on Major Projects

DESCRIPTION:

The Texas Department of Transportation (TxDOT) began conducting voluntary value engineering (VE) studies in 1991. One of the elements of the design process is to focus on traffic management as it relates to constructability and travel flow through work zones. VE studies are performed in the early phases of design.

REASON(S) FOR ADOPTING:

The VE study provides benefits to project development and the potential constructability of a project. The VE study is also used to analyze processes, such as the utility accommodation and local agency projects.

PRIMARY BENEFIT(S):

Improved early communications between design, construction, and maintenance personnel.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The VE is conducted on major projects or processes.

STATE(S) WHERE USED:

Texas

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Project Development and Design → Design and Scheduling Decisions	E2-4

BEST PRACTICE:

Evaluating Staging Approaches to Assess Tradeoffs between Traffic Flow and Construction Efficiency

DESCRIPTION:

Impacts to traffic from construction are closely monitored by the local press, business oversight groups, and concerned citizens. Alternate staging approaches are evaluated to assess tradeoffs between traffic flow and construction efficiency. At times either during the design process or prior to construction an alternative staging plan is developed or presented. This alternative plan usually gives the contractor more of a working area (e.g., a full closure approach and traffic diversion) and, hopefully, a shorter construction period. Queue analysis is performed on the alternatives to determine how the different staging will affect traffic flow. The difference in delay cost with the additional closures is then compared to the potential savings based on the construction duration and quality of the product.

REASON(S) FOR ADOPTING:

To identify the staging alternative that balances vehicular and pedestrian mobility and minimizes construction cost and schedule.

PRIMARY BENEFIT(S):

The project obtains a high-degree of trust and confidence from external agencies and organizations that allows construction to proceed as desired.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types/all locations.

STATE(S) WHERE USED:

Massachusetts

SOURCE/CONTACT(S):

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Project Development and Design → Design and Scheduling Decisions	E2-5

BEST PRACTICE:

Critical Path Method (CPM) Scheduling to Set Contract Time

DESCRIPTION:

The Oklahoma Department of Transportation (ODOT) sets a maximum allowable contract time using the Critical Path Method (CPM) scheduling method, reducing the maximum allowable amount of time that contractors can bid on A+B contracts. In A+B bidding, the A portion is construction cost, and the B portion is the number of days multiplied by a DOT-established dollar value for each day. The A and B portions are added together to get the total bid cost for the project. Contractors that can get the project done in fewer days will reduce the B portion of their bid, which may result in a lower overall bid cost. Setting the maximum allowable contract time by use of the more accurate CPM scheduling method reduced the maximum allowable amount of time the contractor can bid, and thereby encourages the contractors to be more aggressive in bidding the time part of the contract.

REASON(S) FOR ADOPTING:

When ODOT began A+B bidding projects, the contractors who were unfamiliar with the processes tended to bid the schedule (B portion) very conservatively.

PRIMARY BENEFIT(S):

Accelerated contract completion and reduced motorist delays.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Projects where the potential exists for significant motorist delays, and when projects need to be completed by a certain time (e.g., before a planned special event).

STATE(S) WHERE USED:

Oklahoma

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Project Development and Design → Design and Scheduling Decisions	E2-6

BEST PRACTICE:

Consideration of Nighttime Construction during Project Development

DESCRIPTION:

As a result of legislation signed by the Governor in the mid-1990s, the New York State Department of Transportation (NYSDOT) is required to evaluate the feasibility of nighttime construction on many projects in the urbanized areas of downstate New York. The NYSDOT has taken the legislation one step further and institutionalized nighttime construction as a traffic management strategy consideration during project development on all urbanized, high-volume arterials when volume projections indicate that an adequate Level of Service cannot be maintained during daytime construction. Other departmental guidance and requirements for nighttime construction are included in the Department's Highway Design Manual and Standard Specifications.

REASON(S) FOR ADOPTING:

To increase safety by promoting smoother traffic flow through the work zone. To reduce construction related congestion and impacts on local businesses.

PRIMARY BENEFIT(S):

Increased safety and reduced congestion near work zones.

RELATED BEST PRACTICE(S):

Nighttime Lighting Specification (Practice G5-4)

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of work on high-volume facilities at night, typically in urban areas

STATE(S) WHERE USED:

New York

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Project Development and Design → Design and Scheduling Decisions	E2-7

BEST PRACTICE:

Life-Cycle Costing to Select Longer Lasting Materials and Products

DESCRIPTION:
When selecting the type of pavement to be used, a life cycle cost analysis is performed to determine what type of pavement would be the best choice.

REASON(S) FOR ADOPTING:
In the past, pavements were selected for a variety of reasons: supply, personal choice, maintenance, etc. These reasons were never quantified; instead they were generally subjective. In many instances the decisions were correct, but sometimes they were not and did not result in a long pavement life.

PRIMARY BENEFIT(S):
A life cycle cost analysis provides quantitative information about which pavement type you should use on a project. Longer lasting pavement will drastically reduce the frequency of work zone activity in the future.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All types of projects. All locations.

STATE(S) WHERE USED:
Ohio

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Project Development and Design → Project Specific Traffic Management Planning	E3-1

BEST PRACTICE:

Construction Work Zone Traffic Control Strategy

DESCRIPTION:

Early in project development of a high impact construction project, the work zone traffic control strategy is identified as part of the transportation management plan. The traffic control strategy is discussed during a project design conference that is attended by traffic engineers, law enforcement officials, and construction engineers.

The purpose of the meeting is to share project staging concepts with the group to look for potential problems with the staging that likely will constrain the number of lanes that can be closed, and the hours of the day/ days of the week that work can occur. Also discussed is the level of service to be provided to motorists during construction, and the need for night operations. A checklist has been developed to alert people to the various strategies available.

REASON(S) FOR ADOPTING:

To ensure that traffic control strategies are considered in design and later in developing the traffic control plan for the Plans, Specifications, and Estimates documents (PS&Es).

PRIMARY BENEFIT(S):

Provides for the safety needs of the project and minimizes travel time delays. Conducting these reviews early in the project design phase means that funds can be allocated to cover the costs.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any project.

STATE(S) WHERE USED:

Washington

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Project Development and Design → Project Specific Traffic Management Planning	E3-2

BEST PRACTICE:

Comprehensive Traffic Management Plan

DESCRIPTION:

Mississippi Department of Transportation (MDOT) implemented a comprehensive traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction on the high-volume I-55/I-20 Interchange. A team composed of MDOT, FHWA, contractors, and local authorities covering police, fire, emergency medical, and road services were responsible for the plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This team approach was used to reduce traffic delay and decrease the emergency response time. Practices adopted included contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing. Some of these practices have been incorporated by MDOT for use on other projects.

REASON(S) FOR ADOPTING:

The I-55/I-20 interchange handles over 100,000 vehicles a day and is the major East-West and North-South route through the State and the City of Jackson. The innovative practices for reducing delays and improving emergency response time were considered vital for increasing safety.

PRIMARY BENEFIT(S):

There were significant reductions in traffic delays for the traveling public and emergency response time was decreased. The use of radio, TV, and facsimiles to inform the traveling public of upcoming road closures and delays greatly enhanced the public perception of the construction project and MDOT as a whole. By keeping the public involved and informed of the status of construction activities, a good working relationship developed between the Department, contractors, and the public. The public was much more willing to tolerate delays and soon began to find alternate routes without complaining. Safety was also seen to increase.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This practice is applicable where the traffic demand and public perception would warrant its use. Any type of construction activity on a high-speed roadway or major roadway with high volumes of traffic could implement this practice.

RELATED BEST PRACTICE(S):
Multi-level Transportation Management Plans (Practice D1-1)
Transportation Management Plan (Practice D3-1)
Transportation Management Plan Development Tools (Practice D3-2)
Multi-Disciplinary Teams to Develop Transportation Management Plans (Practice D3-4)
Using a Transportation Management Plan Peer Review Process (Practice E3-4)

STATE(S) WHERE USED:
Mississippi

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Project Development and Design → Project Specific Traffic Management Planning	E3-3

BEST PRACTICE:

Access/Egress Practices in Work Zones

DESCRIPTION:

In a work zone, construction vehicles are entering, leaving, and sometimes crossing open travel lanes to deliver materials and equipment to job sites or perform other work-related activities. These actions bring sometimes slow-moving work vehicles into faster-moving traffic driving past a work zone, presenting a potential risk of collision between construction vehicles and motorists. To address these issues, States have developed construction vehicle access/egress policies and practices to promote safety for workers and motorists in work zones. Policies typically address how job sites will provide a safe means for work vehicles and equipment to enter and exit travel lanes and for delivery of construction materials to the work space. Practices for safe access/egress range from coordination meetings to design specifications for acceleration/deceleration lanes to the use of technology.

Many States have policies or guidelines that specify how access/egress should be addressed on projects. The Virginia Department of Transportation (VDOT) *Work Area Protection Manual* includes a section describing techniques that should be used in the field to promote safe access/egress in work zones, including the use of flashing lights on construction vehicles at night to increase their visibility to motorists. VDOT's Transportation Management Plan Requirements include a list of considerations for acceleration/deceleration lanes in work zones and state that access/egress points shall be considered and discussed in each project's Temporary Traffic Control Plan. Section 11 of Texas DOT's *Work Zone Safety and Mobility Guidelines* includes a list of strategies that work zone practitioners should consider when implementing work zone access/egress points. Maryland State Highway Administration's access/egress guidelines are included in its *Book of Standards* and *Standard Specifications*. These documents provide general information on where signage should be placed to alert motorists of construction vehicles entering the roadway, require that construction vehicle access/egress be in the same direction as the flow of traffic, and list additional strategies that practitioners could employ if necessary in specific work zones of concern.

In Virginia and several other States, project teams meet with the construction contractor's vehicle operators prior to construction to educate them on the correct areas and methods for entering and leaving the job site. Follow-up meetings are held as needed to reinforce key concepts, discuss issues, and inform drivers of modifications to the access/egress locations due to construction phasing or other changes.

While it is always preferable to provide adequate acceleration/deceleration space for work vehicles to enter/exit travel lanes smoothly, sometimes project site space limitations make this infeasible. For work zones that have limited visibility or limited acceleration/deceleration lanes, the Minnesota DOT (MnDOT) uses vehicle detection technology to identify when construction vehicles are beginning merge, deceleration, or crossing activities and then alerts motorists. The identification of a construction vehicle triggers a message on a changeable message sign (CMS) to inform motorists in the travel lane that a slow vehicle is about to enter, leave, or cross the road, enabling the motorist to make an informed decision to either slow down or move over to avoid the vehicle. MnDOT's Intelligent Work Zone Toolbox (http://www.dot.state.mn.us/trafficeng/workzone/iwz/MN-IWZToolbox.pdf) identifies when this type of motorist information system is appropriate, and specifies how to configure the signage for maximum visibility and comprehension.

Maryland and Texas use CMSs with general work zone guidance information, additional signing for motorists approaching access/egress points, and flaggers to assist with construction vehicles entering and exiting the roadway.

REASON(S) FOR ADOPTING:
Work zones are often areas of constrained access and capacity that have construction vehicles entering, leaving, and crossing active travel lanes, which presents potential safety and mobility concerns. Access/egress policies and practices help agencies and contractors better provide for safe and effective work zone entry/exit during design and construction.

PRIMARY BENEFIT(S):
Providing adequate access and egress points in a work zone enables work vehicles to safely enter and exit the travel lanes of a road. Providing design features such as an acceleration/deceleration lane allows work vehicles to adjust their speed outside the travel lanes, and alerting motorists to work vehicle movements, both can reduce the risk of crashes and congestion when work vehicles merge into traffic.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All work zones need good access and egress to protect the safety of the workers and motorists. Work zones where construction vehicles have limited visibility or lack adequate acceleration/deceleration lanes may need special attention.

STATE(S) WHERE USED:
Colorado, Maryland, Minnesota, Texas, Virginia

SOURCE/CONTACT(S)

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Planning and Programming → Traffic Management Planning	E3-4

BEST PRACTICE:

Using a Transportation Management Plan (TMP) Peer Review Process

DESCRIPTION:

Peer reviews of transportation management plans (TMPs) can be used to take a close look at TMPs before finalization and implementation to improve consistency, provide feedback and comments for improvement of the plans, and serve as an on-going, hands-on training opportunity for staff. The Michigan Department of Transportation (MDOT) uses a peer-review process to review TMPs for all projects that meet its definition of significant projects. Projects are submitted to the peer review team after plan review (at 35 percent design stage) and before the errors and omissions check (near-final design). At this point the TMP is mostly complete but there is still some flexibility in design and budget.

Review teams consist of engineers from across MDOT; a team typically includes personnel from regions outside of where the road project will occur to provide an independent, third party review. Designated staff are responsible for participating in some TMP reviews each year. MDOT peer review teams use a checklist to evaluate each TMP, and give the TMP a rating: green (go ahead with the project), yellow (some minor issues should be addressed prior to implementation), or red (larger issues must be addressed before moving forward with the TMP or the TMP is incomplete). The checklist tracks with a template that MDOT developed to guide TMP development (http://ops.fhwa.dot.gov/wz/resources/final_rule/mdot_tmp_template/mdot_tmp_template.htm).

Once the review is complete, the peer review team meets to discuss the TMP and offer feedback to the TMP development team for consideration. If a TMP is rated yellow, then rework is completed and a document change log is submitted to the review team with the revised TMP. If a TMP is rated red, it must be reworked and resubmitted for review.

REASON(S) FOR ADOPTING:

Peer review of TMPs helps to catch potential issues in a TMP early and this process enables a comprehensive review of all TMPs prior to implementation.

PRIMARY BENEFIT(S):

More effective TMPs. Also, the peer review process serves as a mechanism for regions to work together and share best practices, successes, and challenges with TMP strategies amongst all of a State's work zone engineers.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
TMP peer reviews have been beneficial to the TMPs on all significant projects throughout the State – especially those with complex traffic control issues.

RELATED BEST PRACTICE(S):
Multi-level Transportation Management Plans (Practice D1-1)
Transportation Management Plan (Practice D3-1)
Transportation Management Plan Development Tools (Practice D3-2)
Multi-Disciplinary Teams to Develop Transportation Management Plans (Practice D3-4)
Comprehensive Traffic Management Plan (Practice E3-2)

STATE(S) WHERE USED:
Michigan

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Project Development and Design → Community Involvement and Coordination	E4-1

BEST PRACTICE:

Traffic System Management Committees

DESCRIPTION:

Traffic System Management Committees emphasize a working team environment and have been used on major projects for more than 12 years. These groups meet on a monthly basis to discuss work zone issues as well as those problems affecting the local community and especially nearby residents. The workgroup makeup generally includes construction and contractor personnel, police agencies, fire departments, local city engineering, traffic engineering departments, and design consultants. Frequently local businesses, schools, shopping centers, and neighborhood associations are invited to the workgroup meetings.

REASON(S) FOR ADOPTING:

These meetings increase awareness of the current construction efforts being focused on for the coming month as well as resolving any neighborhood traffic, safety, noise, or other concerns. Problem areas are discussed and solutions determined where possible. Newsletters that are being proposed for release to the neighborhood are reviewed and modified if necessary. Traffic management studies have been initiated through this group.

PRIMARY BENEFIT(S):

The Traffic System Management Committees promote: contractor coordination, project administration, and open communication. Local agencies, businesses, and neighborhoods know where they can go to get reliable answers to their questions. State and contractor personnel are able to better understand community needs and resolve conflicts more easily.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Type of facility: Generally freeways or large dollar projects.
Location: Generally urban projects.
Volume/Speed: High−volume/high−speed.
Type of work: New construction or major reconstruction.

STATE(S) WHERE USED:

Arizona

SOURCE/CONTACT(S):

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Project Development and Design → Community Involvement and Coordination	E4-2

BEST PRACTICE:

Involvement of Affected Communities and Businesses in the Project Development Process

DESCRIPTION:

This practice is used on an individual project basis and has been in effect for several years. Maricopa County Department of Transportation's (MCDOT) public involvement process is housed within the MCDOT RightRoads Program for public outreach and managed in-house by the MCDOT Community Relations team since the program's inception in 2000. Public input meetings are conducted at critical milestones during the project development process with all identified project stakeholders including the local neighborhood and business groups to obtain their input into the planning, design and construction of projects. In some of these meetings workgroups are organized to discuss specific issues and develop recommendations that are and evaluated by the project team. These meetings give local citizens a feeling of ownership in the project, help to establish the project nee, and aid in the development of a safe and efficient roadway for the long term.

REASON(S) FOR ADOPTING:

Consensus-building and early issue identification: the purpose of these meetings was to get the communities' feel for the project and better understand their needs. Information is obtained early and eliminates surprises that may otherwise not be brought out until the end of the design process or even during construction. Improved community relations are also one of the reasons for adopting the process. The participation of stakeholder public and multi-agency involvement aids in the development of a consistent roadway and the resolution of conflicting agency requirements; facilitates ultimate regional traffic flow; and preserves the interests and rights of area residents and adjacent development. Gaining consensus among the agencies and impacted public stakeholders is critical to the success of public works projects.

PRIMARY BENEFIT(S):

A better overall public works project: Consensus –building: Some citizens find it easier to bring out and discuss their opposition and at the same time come to an understanding as to the desires of their neighbors within the open house public meeting format. In a sense, they are brought on board as decision makers. It makes the county's job easier and facilitates conflict resolution. Early issue identification and analysis of political sensitivities can prevent untimely design modifications, minimize future change orders and costly schedule delays.

The greater and longer lasting benefit is that of public trust-building. This includes the fostering of a real and earned public perception of government professionalism, stewardship, integrity and transparency; a confident foundation for good continued citizen relations; and the laying of firm groundwork for a positive public outlook on future MCDOT undertakings.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All major new and reconstruction roadway projects.

STATE(S) WHERE USED:
Arizona

SOURCE/CONTACT(S):
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Project Development and Design → Community Involvement and Coordination	E4-3

BEST PRACTICE:

Using Video to Enhance Public Involvement

DESCRIPTION:

The Illinois Department of Transportation, District 4, has used videos on several projects to give interested stakeholders insight into project specifics. Video is used to illustrate various project alternatives and their impacts to the public. The videos are used at public meetings and presentations to increase public understanding and help get buy in. One example is the video created for the rehabilitation of the Havana Bridge over the Illinois River. The video was used to demonstrate alternatives to the public and alleviate public resistance to a bridge closure. The bridge was closed for the rehabilitation and a ferryboat system and a park and ride facility were used.

REASON(S) FOR ADOPTING:

The people of Havana stated early in the preliminary engineering stage that closure of the bridge was unacceptable due to the perceived impacts to the area. It was determined that the rehabilitation work would require closure of the bridge at least during the floor beam replacement. Three alternatives were developed, each requiring a different degree of closure. To convey this information to the public, a video was developed that described the different alternatives and their impacts.

PRIMARY BENEFIT(S):

Benefits of the use of video include educating the public on alternative methods of construction. Public sentiment in Havana went from, “You can’t do that!” to “Close the bridge and get it fixed as quickly as possible!” Much of this change in sentiment is attributed to the video.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Video is an efficient medium for conveying information on complicated projects, particularly during enhanced public involvement on complex urban projects and other projects that involve major impacts to the traveling public.

STATE(S) WHERE USED:

Illinois

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Project Development and Design → Community Involvement and Coordination	E4-4

BEST PRACTICE:
Community Advisory Councils

DESCRIPTION:
The City of Columbus, Ohio coordinates community advisory councils, comprised of businesses, neighborhood associations, representatives of the Paving the Way traffic management program, and other interested parties. These councils provide a forum for complaints and issues to be discussed and aid in developing the communication plan for upcoming projects in the City.

REASON(S) FOR ADOPTING:
The size of the projects and the number of individuals that would be impacted by the projects were such that it was believed that they needed a voice in the design and construction process. With projects of large magnitude, public relation problems could be minimized with the establishment of the councils.

PRIMARY BENEFIT(S):
Community advisory councils assist with gaining buy-in of the affected community to upcoming projects. Councils also give individuals a forum to voice complaints.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All public roads.

RELATED BEST PRACTICE(S):
Single Source for Construction Project Information in a Metro Area (Practice H3-5)

STATE(S) WHERE USED:
Ohio

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Best Practices Category F - Contracting and Bidding Procedures

Contracting and bidding includes developing effective contracts and obtaining appropriate financial bids for reconstruction efforts. Best practices in this section emphasize the application of contracting and bidding procedures to reward contractors for quality work, innovation, accelerated early completions, minimizing road user delays, and enhancing the safety of road users and workers.

Examples of practices include:

- Time-based bidding and flexible Notice to Proceed dates on projects that may adversely affect the existing level of service.
- Pre-qualification procedures used to assess contractor capacity and capability to perform the work, especially on high-risk, high-visibility, and/or complex projects.

The following best practice entries relate to work zone contracting and bidding procedures:

Subcategory	Ref. #	CONTRACTING AND BIDDING PROCEDURES Best Practices
F1 Contracting Techniques	F1-1	Alternative Contracting Practices
	F1-2	A+B Bidding with Incentive/Disincentive Clauses
	F1-3	A+B and Incentive/Disincentive Clauses
	F1-4	Lane Rental
F2 Contractor Qualifications	F2-1	Pre-Qualifying Contractors
F3 Flexible Timing	F3-1	Flexible Start Times
	F3-2	Narrow Window for On-Site Construction

Contracting and Bidding Procedures → Contracting Techniques	F1-1

BEST PRACTICE:
Alternative Contracting Practices

DESCRIPTION:
In 1996, the Florida Legislature authorized the Florida Department of Transportation (FDOT) to use alternative contracting techniques on construction projects. Alternative contracting techniques include A+B, Lane Rental, Design/Build, Public Private Partnerships (PPP), Witness and Hold, Streamline Contracting, Warranty Clauses, No Excuse Bonus, Lump Sum, Liquidated Savings, and Incentive/Disincentive. More than one alternative contracting technique may be used on the same project (e.g., Lane Rental combined with No Excuse Bonus). The Legislature limits the use of some innovative contracting techniques (Low Bid Design-Build, Construction Manager at Risk, and Bid Averaging) to $120 million (F.S. 337.025) annually, excluding Turnpike and ARRA projects.

REASON(S) FOR ADOPTING:
To accelerate contract completion and to control cost overruns on construction projects.

PRIMARY BENEFIT(S):
Early project completion results in reduced disruption and inconvenience to motorists and nearby businesses and homeowners.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Alternative contracting practices are used on many different types of projects. FDOT evaluates which method may be most suitable for a particular project. Incentive/Disincentive is used on all critical projects on the Florida Turnpike.

STATE(S) WHERE USED:
Florida

SOURCE/CONTACT(S):
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Contracting and Bidding Procedures → Contracting Techniques	F1-2

BEST PRACTICE:

A+B Bidding with Incentive/Disincentive Clauses

DESCRIPTION:

A+B bidding is cost plus time bidding. A is the traditional bid amount for contract items and work to be done under the contract. B is the amount of time bid to complete the work. Time is typically bid in number of days/periods required to complete the contract or identified parts of the contract (phases), as estimated by the bidder. The value of each time unit is established by the owner and is based on user costs or other established monetary value of early completion. Therefore, B equals number of time units bid multiplied by the owner agency's established costs per time unit. The low bid is determined by the sum of the A and B values.

Many A+B contracts also include an incentive/disincentive (I/D) provision to discourage the contractor from overrunning the time bid for completing the work, and to reward the contractor if work is completed earlier than the time bid. The DOT's estimate of days or hours of lane/road closure time is critical in this practice. This baseline estimate helps an agency determine how much accelerations benefit a bid is providing to justify paying an incentive. This practice may add to project cost, thus the decision to use the I/D clause should be project specific.

This approach is best considered during the planning stage of the project so an appropriate traffic management strategy can be matched to this contract strategy. Several States have used A+B bidding, including:

- Indiana has used A+B bidding since 1996.
- Missouri has used A+B with I/D clauses extensively since 1988.
- North Carolina has used this process since 1989 and has criteria that must be met before a project is considered for A+B bidding.
- Oklahoma looks at each project on an individual basis and uses the best method of contract bidding.

REASON(S) FOR ADOPTING:

This method is used to minimize the time required to complete work thereby reducing the amount of traffic inconvenience. This practice also encourages contractor innovation related to efficient construction methods.

PRIMARY BENEFIT(S):

The A+B and I/D processes have been shown to decrease construction time, keeping user costs to a minimum.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Used most often on high traffic volume urban rehabilitation projects. Can be applied to all types of facilities and all types of work where the need is to "accelerate" the completion of the project.

RELATED BEST PRACTICE(S):
A+B and Incentive/Disincentive Clauses (Practice F1-3)

STATE(S) WHERE USED:
Indiana, Missouri, North Carolina, Oklahoma

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Contracting and Bidding Procedures → Contracting Techniques	F1-3

BEST PRACTICE:

A+B and Incentive/Disincentive Clauses

DESCRIPTION OF THE BEST PRACTICE/POLICY:

- A+B bidding – The contractor is asked to factor in the estimated time for the job, along with the cost of the work.
- I/D – The contractor is assigned a cost value for time that rewards or costs him money during execution of the contract depending on how efficient the contractor's operations are.
- Disincentive only – In some cases the Michigan Department of Transportation (MDOT) will assign a disincentive cost to lane closures, and assess the contractor in 15-minute intervals. This type of contract provision is used to assure that certain lanes will be opened by the contractor to accommodate rush hour or weekend directional traffic patterns. On this type of clause, there is no incentive money awarded for opening a lane ahead of the rush hour; this is a disincentive only.

REASON(S) FOR ADOPTING:

MDOT wanted to minimize the time required to complete work thereby reducing the amount of traffic inconvenience. By utilizing the A+B technique along with an I/D clause, MDOT has been able to tap contractor ingenuity as to how to get the work done in the least time possible.

PRIMARY BENEFIT(S):

- A+B bidding – Reduced overall contract time, with resultant reduced motorist delay.
- I/D and Disincentive only – Reduced delay during critical high-traffic periods.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

These particular techniques have been reserved for those projects in which the construction has a major impact on traffic. Generally these projects have been on major urban freeways.

RELATED BEST PRACTICE(S):

A+B Bidding with Incentive/Disincentive Clauses (Practice F1-2)

STATE(S) WHERE USED:

Michigan

SOURCE/CONTACT(S):

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Contracting and Bidding Procedures → Contracting Techniques	F1-4

BEST PRACTICE:
Lane Rental

DESCRIPTION:
Lane rental is a process whereby the roadway user cost, generated by user delays due to lane closures, is transferred to the contractor performing work. The contractor is required to pay the Oklahoma Department of Transportation (ODOT) in order to close a lane. The lane rental costs for peak volume hours are relatively high (up to $60,000 per hour per lane), are reduced for non-peak daylight hours, and are generally free for nighttime construction operations.

REASON(S) FOR ADOPTING:
This practice was started to minimize motorist delay by encouraging the contractor to work during non-peak hours. It provides a fair and equitable means to allow the construction contractor to choose its own methods of construction.

PRIMARY BENEFIT(S):
Reduced motorist delay and accelerated construction times on the work requiring a lane closure. Because the rentals charges are based on conservative, real numbers—changes in highway capacity, minimum wages, average gasoline prices in the area, etc.—the charges reflect the actual, measurable costs experienced by the motoring public and make the contractor aware of and responsible for the costs.

One of the problems associated with bidding a project with lane rentals is that it is generally perceived to be a large risk to the smaller contractors and therefore may limit competition.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This technique is used mainly on the high-volume/high-speed Interstates and highways for rehabilitation and reconstruction projects.

STATE(S) WHERE USED:
Oklahoma

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Oklahoma DOT
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Contracting and Bidding Procedures → Contractor Qualifications	F2-1

BEST PRACTICE:

Pre-Qualifying Contractors

DESCRIPTION:

The Ohio Department of Transportation (ODOT) pre-qualifies contractors two different ways: 1) By type of work to be accomplished in the contract (e.g., can the contractor build this type of bridge), and 2) the contractor's ability to manage a certain dollar value of projects (e.g., can the contractor manage four projects worth $250 million). When contractors bid beyond their capacity/capability, there is a greater risk of projects falling behind schedule or being unable to complete the work successfully.

REASON(S) FOR ADOPTING:

Previously, contractors were being awarded projects that they could not finish because they were not professionally qualified or able to manage projects of that size. This leads to continued disruptions of traffic because a new contractor must be hired or the work is inferior and will not last as long.

PRIMARY BENEFIT(S):

When a contractor is awarded a project, there is no question as to his ability to complete the project. Projects are not delayed due to the inability of a contractor to complete a project.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of work.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Contracting and Bidding Procedures → Flexible Timing	F3-1

BEST PRACTICE:

Flexible Start Times

DESCRIPTION:

In 1987, after endorsement by the Florida Legislature, the Florida Department of Transportation began using flexible start times on construction projects. Normally, after award of a project, the "Notice to Proceed" is issued and the contractor is to begin work within 15 days. However, with flexible starting provisions, the contractor is allowed to extend this period of time (usually up to 100 days) to start construction.

REASON(S) FOR ADOPTING:

To reduce the time period the public is exposed to construction conditions, and to increase the frequency of completing contracts within the authorized contract time.

PRIMARY BENEFIT(S):

Flexible start time encourages competition in the bidding process and enables a contractor to have more flexibility in scheduling use of equipment and manpower. By having additional flexibility in scheduling resources, the contractor should have less scheduling problems that may cause delay to completion of a contract. Therefore, contracts using flexible start time are expected to finish on time.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This provision is being used on State funded projects and projects not on the National Highway System. In addition, it is primarily used on smaller, less complex projects such as resurfacing contracts.

STATE(S) WHERE USED:

Florida

SOURCE/CONTACT(S):

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Contracting and Bidding Procedures → Flexible Timing	F3-2

BEST PRACTICE:
Narrow Window for On-Site Construction

DESCRIPTION:
On selected projects, the Oregon Department of Transportation specifies a restricted time frame for on-site construction within the allowable contract time. For example, on-site work on an overlay project might be limited to 30 consecutive calendar days although the contractor may have 100 calendar days to complete the entire project.

REASON(S) FOR ADOPTING:
This practice was adopted to minimize the length of time traffic is disrupted and to present a more positive image to the public.

PRIMARY BENEFIT(S):
Projects are completed in a more timely manner with minimal disruption.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This policy is most applicable to overlay projects on 2-lane rural highways, but can be applied to other work.

STATE(S) WHERE USED:
Oregon

SOURCE/CONTACT(S):
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Best Practices Category G - Construction/Maintenance Materials, Methods, Practices, and Specifications

Construction/maintenance materials, methods, practices, and specifications includes practices related to construction techniques, innovative materials, and specifications established to improve quality and product life spans. These best practices encourage maintaining level of service and safety in the work zone.

Examples of practices include:

- Use of construction methods, such as full road closure and accelerated bridge construction, to improve product quality and durability, significantly reduce the time to construct/re-construct bridges, minimize motorist delays, and improve safety.
- A contractor-assigned on-site Traffic Control Coordinator to implement and maintain all traffic operations for a project on behalf of the contractor.
- Performance-based specifications instead of prescriptive-type specifications.
- Pocket-sized guidelines for field personnel responsible for the installation, inspection, and removal of temporary traffic control measures.
- Requirements for adequate lighting for all nighttime operations, lane shifts, lane drops, and temporary gores.

The following best practice entries relate to specifications and construction materials, methods, and practices:

Subcategory	Ref. #	CONSTRUCTION/MAINTENANCE MATERIALS, METHODS, PRACTICES, AND SPECIFICATIONS Best Practices
G1 Construction Methods	G1-1	Portable Concrete Barrier (K-rail) Connection
	G1-2	Removal of Traffic Control Pattern if Not Working Multiple Shifts
	G1-3	Reinforcing Shoulders
	G1-4	Restricting the Length of Active Work Zones
	G1-5	Rubblization
	G1-6	Accelerated Bridge Construction
	G1-7	Total Road Closure
	G1-8	Construction Practices to Minimize Motorist Delay and Inconvenience
	G1-9	Weekend Closure for Resurfacing to Accelerate Construction

Subcategory	Ref. #	CONSTRUCTION/MAINTENANCE MATERIALS, METHODS, PRACTICES, AND SPECIFICATIONS Best Practices
G2 Incident Management	G2-1	Incident Management in Work Zones
	G2-2	Use of Pull-Off Areas in Work Zones
	G2-3	Hoosier Helper
G3 Oversight/ Coordination	G3-1	Requiring a Traffic Control Supervisor
	G3-2	“Safety Program” Specification
	G3-3	Traffic Control Coordinator
	G3-4	Project Coordination Teams
G4 Traffic Control	G4-1	Delay Damage Specification for Failure to Remove Lane Closures
	G4-2	Quick Change Moveable Barrier™
	G4-3	Coordination of Detours for Over-Sized Vehicles During Construction
	G4-4	Performance-Based Lane Closures
	G4-5	Standard Specification that Requires the Contractor to Correct Deficient Traffic Control
	G4-6	Reduced Speed When Flashing
	G4-7	Closure of Entrance Ramps During Construction
	G4-8	Drone Radar on Changeable Message Signs
	G4-9	Zipper Merge
	G4-10	Halogen Stop/Slow Paddle
	G4-11	Pocket-sized “Guidelines For Temporary Traffic Control”
	G4-12	Traffic Pacing Design
	G4-13	Water Filled Barrier in Work Zones
	G4-14	Use of 42” Flexible Cones (a.k.a. “Grabber Cones”)
G5 Worker Safety/ Productivity	G5-1	Flagger Certification Program
	G5-2	Work Zone Safety Checklist Form
	G5-3	High Visibility Reflective Apparel
	G5-4	Nighttime Lighting Specification
	G5-5	Improved Warning Lights on Vehicles

Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-1

BEST PRACTICE:

Portable Concrete Barrier (K-rail) Connection

DESCRIPTION:

A connection is made from the existing concrete barrier or metal beam guard rail to temporary, portable concrete barrier used during construction (K-rail). Typically, a protected work zone includes K-rail butted up against existing concrete barrier or metal beam guard rail and flared out to the required width of the work zone. The transition from existing barrier to the K-rail is not a smooth one, and typically leaves the "blunt-end" of the first K-rail section exposed. The traditional solution is to shield the blunt-end with a sand-barrel array.

REASON(S) FOR ADOPTING:

The standard sand-barrel array used on high-speed facilities includes two rows, leaving very little horizontal clearance. The K-rail connection eliminates the need to shield the blunt-end of a sand-barrel array.

PRIMARY BENEFIT(S):

The result is greater horizontal clear distance between traffic and the highway safety feature, as well as improved sight distance. Also, the maintenance/replacement of damaged sand barrels no longer exists, reducing worker exposure and saving time and money.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Reconstruction, restoration/rehabilitation of rural freeways.

STATE(S) WHERE USED:

California

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-2

BEST PRACTICE:

Removal of Traffic Control Pattern if Not Working Multiple Shifts

DESCRIPTION:
This practice requires the contractor to remove a lane closure if not working multiple shifts. This practice is used on milling and paving projects.

REASON(S) FOR ADOPTING:
This practice is used to encourage the contractor to work multiple shifts and improves driver expectations by only having lane closures during work periods.

PRIMARY BENEFIT(S):
Improved customer service, safety, and driver expectation.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This is used on mill and pave projects on high-speed/high-volume roads.

STATE(S) WHERE USED:
Pennsylvania

SOURCE/CONTACT(S):
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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-3

BEST PRACTICE:
Reinforcing Shoulders

DESCRIPTION:
Prior to beginning major projects, the mainline shoulders should be of sufficient structural integrity to withstand all anticipated construction operations. This may require reinforcing the shoulders prior to beginning regular construction operations. This practice is especially vital if the shoulder is expected to be used as a travel lane during construction operations.

REASON FOR ADOPTING:
There was approximately $225,000 spent on mainline shoulder repairs on the Illinois Department of Transportation I-57 project. This came to around $200,000 over plan quantity. There appeared to be two main sources of the cost overrun: First, whenever the flagger stood next to the paving machine and consequently pushed traffic over onto the shoulder, there was a shoulder repair to complete at that location. A second cause was damage that occurred during full-depth patching operations due to work being performed on the roadway centerline. The contractor was informed that traffic was to be unhindered; however, the contractor's flagman continually directed traffic onto the shoulder.

PRIMARY BENEFIT(S):
Having the shoulder available to carry shifted traffic provides an additional travel lane. The additional lane may enable more efficient construction operations and allow the DOT to maintain additional travel lanes, helping minimize work zone congestion. When shoulders are reinforced in anticipation of construction operations, they can also be used in the future to reduce the effects of incidents.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
2-lane major principal arterials, 4-lane highways, Interstates, and expressways.

RELATED BEST PRACTICE(S):
Additional Shoulder Thickness (Practice A5-5)
Reinforcing Shoulders (Practice G1-3)

STATE(S) WHERE USED:
Illinois

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-4

BEST PRACTICE:

Restricting the Length of Active Work Zones

DESCRIPTION:

The Mississippi Department of Transportation (MDOT) has developed a policy that restricts the length of active work zones within a project. This policy limits the length of lane closures on a project to one mile. The maximum is sometimes increased on a project by project basis. This policy does not allow the contractor to be working on the entire section of the project with little or no progress being made. The contractor is allowed to have more than one operation working at one time, but the distance between operations must meet the active work zone length as stated above.

REASON(S) FOR ADOPTING:

MDOT adopted this policy to prohibit lengthy lane closures on construction projects. With restricted lengths of lane closures on construction projects, the delay to the traveling public is reduced.

PRIMARY BENEFIT(S):

The primary benefit is travel delays are reduced because the length of lane closure is reduced.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This policy is applicable to all types of facilities and all types of projects, but is typically applied to those on major arteries. There have been a few exceptions granted to extend the length to three miles on a few projects throughout the State, based on engineering judgment.

STATE(S) WHERE USED:

Mississippi

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-5

BEST PRACTICE:

Rubblization

DESCRIPTION:

Rubblization is a technique in which existing Portland cement concrete pavement (PCCP) is broken into coarse granular material and rolled in place to provide a sub-base, generally for an asphalt overlay. Rubblization techniques eliminate the need to perform a pre-overlay repair of concrete pavement that has extensive cracking and/or materials-related deterioration.

Many States, including Illinois, Iowa, Maine, and Michigan, have successfully used rubblization to improve their repair operations of PCCP roadways that have significant cracking or damage, thus mitigating the risk of reflective cracking on asphalt overlays on their roadways. In Maine, rubblization has been recognized as a "green" alternative for roadway repairs. The use of rubblization on I-295 allowed the Maine DOT to address the alkali-silica reaction that was taking place in the existing concrete pavement without removing the material. Since the rubblized materials were used in place and along adjacent shoulders, the process reduced waste material and was considered a "green" practice.

REASON FOR ADOPTING:

As deterioration of PCCP occurs, rubblization provides agencies a cost-effective, environmentally-friendly method to rehabilitate a pavement without wasting the pavement asset.. Agencies that have used rubblization have found that construction time and cost savings could be realized while providing a high quality base product and lessening the time and expense of transporting waste materials from the construction site.

PRIMARY BENEFIT(S):

Environmentally-friendly: Use of the rubblized concrete decreases the amount of construction materials going to landfills.

Higher quality product at lower costs: The rubblized material acts as an interlocked unbound layer comparable to a high-quality aggregate base, and has costs that are estimated at one-third compared to removal and replacement of the PCCP with a different base material.

Construction time savings: Rubblizing and overlaying takes about one-third as much time as removing old concrete and reconstructing pavement.

Addresses recurring pavement flaws: Rubblizing the underlying concrete layer before overlaying with asphalt provides a sound base level that minimizes reflective cracking.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
The use of rubblization techniques are most suited to locations where existing PCCP pavement has extensive reflective cracking or deterioration and an overlay will be used to provide structure and smoothness. Rubblization is particularly useful where environmental concerns would stem from hauling existing materials from the construction site and introducing new materials to the location. Rubblization may not be suitable in locations where there is a high water table or weak subgrade. Some States provide drainage a year prior to rubblization in order to help dry out the base and subgrade.

STATE(S) WHERE USED:
Illinois, Iowa, Maine, Michigan

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-6

BEST PRACTICE:

Accelerated Bridge Construction

DESCRIPTION:

Accelerated bridge construction (ABC) involves using various methods during project, planning, design, contracting, and construction to significantly reduce the time to construct/re-construct a bridge, as compared to traditional cast-in-place methods, while maintaining quality. Methods include:

- Working with stakeholders to innovate during planning;
- Accelerating certain activities, such as right-of-way acquisition, utility relocation, or materials procurement, so that they occur before project advertisement;
- Using pre-fabricated elements, such as deck segments, that are built off-site and can be quickly put in place once on-site;
- Moving into place entire structures already built off-site using self-propelled modular transporters (SPMTs); and/or
- Using accelerated scheduling to reduce project delivery times.

ABC may involve using one of these methods on a project, or several of them in combination.

Utah Department of Transportation (UDOT) began using ABC elements in 1997 and has now employed ABC methods and elements in over 200 settings. In Utah, ABC is considered for inclusion on all projects involving structures. For its Riverdale Road over I-84 bridge in 2008, UDOT used ABC to reduce the construction impact to the area. The bridge was constructed in phases using almost all pre-fabricated elements, reducing road closures and detours by several months, which equated to a road user cost savings of over $2 million. On I-80 at Mountain Dell and Lambs Canyon near Salt Lake City, UDOT replaced 4 bridge superstructures in 37 hours over two weekends by building the bridges in the median adjacent to the existing structures over four months and transporting them into place using SPMTs. By coordinating with local media for construction updates, meeting with the local community throughout the construction process, and posting information in common areas for travelers, UDOT was able to mitigate construction impacts and meet safety and mobility needs. Using off-site construction and SPMTs, UDOT estimated that motorist delay was decreased by 180,000 hours, which equated to a savings of over $2.5 million.

Many other states are using ABC techniques to shorten their project delivery times, including Virginia and Florida. Virginia DOT replaced the George P.

Coleman Bridge along Highway 17, near Yorktown, VA, in nine days by using a barge to float in the four-lane prefabricated replacement bridge (consisting of 2,540 feet of truss and swing spans). In 2006, Florida DOT was the first to use SPMTs in the United States to replace a bridge across an Interstate. The old Graves Avenue Bridge was moved from its current position across I-4 to the side of the road for demolition in 22 minutes. Then SPMTs were used to move the new spans from their fabrication site along I-4 to the bridge location, limiting the impact on motorists to only 2 weekend nights of detours/closures along the corridor.

REASON(S) FOR ADOPTING:
Building bridges over existing roads can create long term work zones, which can be disruptive to traffic and can pose safety concerns for drivers and construction workers. Accelerated bridge construction limits construction time over the existing road, often reducing this time from months to days, thus minimizing safety and mobility impacts.

PRIMARY BENEFIT(S):
Accelerated bridge construction reduces exposure to work zones, increasing work zone safety for drivers and construction workers. It limits user delays and minimizes traffic disruption during bridge construction. Because the bridges are constructed in a controlled environment, the quality is generally improved and the cure times are reduced. The construction cost for ABC can be more expensive than traditional construction methods (at least in the beginning as crews and owner-agencies are learning the methods and acquiring equipment), but can reduce total project costs due to lower project traffic control costs and lower fuel use and travel time for people driving (user costs), and create a positive public image for the DOT.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Bridges being built or reconstructed over existing highways.

STATE(S) WHERE USED:
Florida, Utah, Virginia

SOURCE/CONTACT(S):
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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-7

BEST PRACTICE:

Total Road Closure

DESCRIPTION:
The highway is closed to allow unrestricted contractor access to the roadway.

REASON(S) FOR ADOPTING:
This practice, when combined with incentive/disincentives, significantly reduces the time to complete work.

PRIMARY BENEFIT(S):
Significant reductions in project construction time, which results in less delay to motorists. Also, as a result of shorter construction time, less total traffic is exposed to work zone hazards and the challenges of changing work zone traffic control.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
The Michigan Department of Transportation has applied total closures to urban or suburban freeways, in areas where local street system or other freeway segments exist to handle the diverted traffic.

STATE(S) WHERE USED:
Michigan

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-8

BEST PRACTICE:

Construction Practices to Minimize Motorist Delay and Inconvenience

DESCRIPTION:

Many techniques have been used to minimize motorists' delay in and near work zones, such as the use of pre-fabricated elements or full closures of roadways to reduce total construction time.

The Illinois Department of Transportation (IDOT) completed a resurfacing and bridge seismic retrofit/overlay project on I-57 during the summer of 1999 that incorporated several innovations for minimizing delays and inconveniences to motorists. Many innovations were later adopted into IDOT's Bureau of Design and Environment (BDE) Procedure Memorandum. Innovations used on this I-57 project included:

- Consolidating several projects into one combined project.
- Moving lane closures and tapers to the mid–day production point.
- Using fast setting mixes for bridge work and pavement patching.
- Contractor accomplishing multiple tasks during lane closures and sponsoring of a road report to increase knowledge of the project.
- Using lane rental and incentive/disincentive contracting.

In recent years, accelerated bridge construction (ABC) techniques have been used to reduce construction time, improve safety conditions for construction workers, and increase public support. With ABC, a bridge can be removed and replaced in a matter of days rather than months or even years. Many States, including Utah, Florida, Virginia, and Washington have implemented ABC techniques on critical bridge infrastructure projects.

For example, the Utah Department of Transportation (UDOT) replaced four bridges in a period of 37 hours over a two-weekend period by constructing the bridges "off-site" in the median and then transporting them into place over a typically congested freeway that was closed during the weekend construction periods. The Florida Department of Transportation (FDOT) used self-propelled modular transporters to move a bridge into place over I-4 in a matter of 22 minutes in 2006. Virginia and Washington have used pre-fabricated elements constructed off-site to help replace older bridges quickly and safety.

REASON FOR ADOPTING:
Innovative construction processes can be used to support the timely completion of projects and meet the needs of customers by minimizing disruptions to the traveling public.

PRIMARY BENEFIT(S):
Typically, innovative construction practices can result in decreased construction time for projects, reduced delays for motorists, and less negative feedback from the public with regard to the construction and its perceived inconveniences.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All construction and reconstruction projects, with a particular emphasis on projects occurring on high-volume roadways or on roads with no available diversion routes.

STATE(S) WHERE USED:
Florida, Illinois, Utah, Virginia, Washington

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Construction Methods	G1-9

BEST PRACTICE:

Weekend Closure for Resurfacing to Accelerate Construction

DESCRIPTION:

The I-405 project was Washington State's first experience with closing a north/south Interstate facility over an entire weekend to accommodate resurfacing operations. In the past, various closure operations had been used on the east/west I-90 corridor in the vicinity of Seattle. The more common practice has been to require nighttime paving operations, allowing the contractor to close only partial widths of the Interstate facility. Weekend closures usually require natural detour routes and are a more common practice on minor roadways where these detours can be accommodated.

Weekend closures are encouraged and considered on a project-by-project basis as a good alternative to a lengthy series of daily closures. Depending on the evaluation of alternative routes and the planned work operation. Washington has tried varieties of this type closure for other routes and work operations. With the evolution of public awareness, freeway cameras, websites, and media outlets, high impact, short term closures are being readily accepted. This approach does not work for all routes but based on Washington State's success, the agency considers full closures when evaluating future similar projects.

REASON(S) FOR ADOPTING:

Due to the tremendous daily volumes for this route, no daytime lane closures can be attempted and all work operations requiring lane closures on urban freeways and often urban non-interstate routes have gone to all night work. In an effort to deal with noise ordinances and best mitigate the noise impacts, weekend closures have been used to shorten the exposure period. Secondary reasons include: minimizing the disruption to daily commuters; increasing the quality and safety of the paving operation due to the absence of traffic through the work zone; and providing the opportunity to research and measure the various impacts on commuters, trucking, and businesses, as well as safety characteristics and quality of the finished product.

PRIMARY BENEFIT(S):

Weekday traffic disruption is minimized for the largest portion of the project since the work is concentrated to specific hours. The public tolerates weekend traffic disruption, as it is known to be of short duration and they can plan accordingly provided they are given early notice and alternate routes are available. Positive public relations are a win-win solution and key to the success. Safety to the motoring public and work crews are greatly improved. Positive feedback from the public. Unimpeded access of equipment and materials to the job site.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Resurfacing of an urban Interstate. Demolition of bridge structures.

STATE(S) WHERE USED:
Washington

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Incident Management	G2-1

BEST PRACTICE:

Incident Management in Work Zones

DESCRIPTION:

This practice consists of providing services to respond to incidents in work zones, keeping the area free of disabled vehicles. Incidents are identified through various sources, including traffic patrols, maintenance patrols, State Police, CB radios, cell phones, and traffic flow irregularities identified at a Traffic Management Center.

Services can include the following: general assistance, towing and towing arrangements, emergency fuel, tire changing, placement of cones and flares, and updated motorist information systems such as advisory signs and local media contacts. Some States employ an on-site traffic control supervisor for large projects who can quickly identify and respond to incidents. The contractor may be required to establish emergency detour routes for use in the event that an incident in the work zone closes the roadway.

- Pennsylvania requires an Incident Management Plan for long-term construction projects; freeway projects normally require a preconstruction meeting with emergency responders.
- Mississippi includes provisions in contracts requiring contractors to provide incident management.
- Illinois identifies incidents in work zones through multiple methods and deploys Minutemen vehicles to assist stranded motorists by getting them moving or removing the vehicles from the roadway.
- Iowa contracts services to provide 24-hour-per-day monitoring of traffic control devices and incident response.
- Oregon employees a full-time traffic control supervisor whose duties include patrolling the project at least once every 4 hours to maintain work zone traffic control devices and to be on call 24 hours-per- a day.

REASON(S) FOR ADOPTING:

Traffic incidents, even those located off of the travel lanes, can have a significant negative impact on traffic flow in a work zone. Rapid response to incidents is essential to minimize their impact on traffic safety and mobility. During peak traffic volume periods, incident response delays of minutes can impact congestion for hours. Contractors can be a key part of a maintaining traffic flow, and are becoming more willing to be responsible for improving traffic control and emergency vehicle access, as part of a successful Incident Management team.

PRIMARY BENEFIT(S):
Benefits include reducing delay, enhancing safety, improving public image, and encouraging contractor responsiveness to address incidents in work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All freeways. All types of work.

STATE(S) WHERE USED:
California, Illinois, Iowa, Mississippi, Oregon, Pennsylvania

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Incident Management	G2-2

BEST PRACTICE:

Use of Temporary Pull-Off Areas in Work Zones

DESCRIPTION:

Pull-off areas may be included in work zones along limited access roadways where one or both shoulders are limited due to construction activities. The pull-off areas may serve one or more functions: 1. Vehicle refuge – for motorists who experience vehicle malfunctions; 2. Enforcement – for law enforcement personnel to pull over drivers and issue citations; and 3. Crash clearing and/or investigation – if a crash does occur within the work zone, these areas can be used to clear vehicles, minimizing the impact on traffic congestion. They also provide emergency response vehicles more space to aid victims after a crash, reducing the need to take an additional traffic lane.

Maryland has developed a detailed pull-off area policy for work zones, which describes specific guidelines on when and where to use this strategy. The policy identifies maximum acceptable pull-off area spacing distances, recommended pull-off area layouts and corresponding signage placement, and assumptions that were used to develop the pull-off area spacing calculations.

New York State DOT has a policy that recommends the use of pull-off areas when doing roadway construction that requires a two-lane, two-way crossover operation. In this scenario, pull-off lanes are placed in the median or the shoulder of the opposing lane, spaced approximately 1 mile apart if the cross-over work zone is longer than 1.8 miles. New York's policy also recommends signage placement, starting 350 meters before the emergency pull-off area to assist motorists in finding these shelters. The entire pull-off area is paved, matching the cross slope of the shoulder.

Wisconsin DOT has developed a standard drawing to install temporary pull-off areas in divided highway work zones where there are cross-overs and head-to-head traffic flow. In this situation the 6-ft. inside shoulder becomes an outside shoulder for the motorists who have crossed over, and is not enough space to accommodate a disabled vehicle or law enforcement activities. WisDOT adds 6 feet of gravel or other suitable aggregate into the median beside the existing 6-ft. shoulder to provide a 12-ft. wide pull-off area. Using gravel/aggregate allows for inexpensive installation and relatively easy removal after the work is complete. WisDOT recommends installing temporary pull-offs using this layout every half-mile through the work zone. Temporary pull-offs must be removed before the road is returned to one-way traffic.

REASON(S) FOR ADOPTING:
Work zones are often areas of constrained capacity and access. Minimizing and avoiding conditions that further constrain capacity help provide smoother traffic flow. Pull-off areas can reduce instances of disabled motorists and crashes blocking travel lanes in work zones.

PRIMARY BENEFIT(S):
Temporary pull-off areas in work zones improve safety by providing an area of refuge for motorists and crash response activities, and a place where law enforcement can safely issue citations. Congestion and queues in work zones are reduced by enabling these activities to occur outside of the travel lanes.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Any work zone on a limited access roadway that closes the shoulder area, eliminating refuge areas for motorists and law enforcement.

STATE(S) WHERE USED:
Maryland, New York, Wisconsin

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Incident Management	G2-3

BEST PRACTICE:

Hoosier Helper

DESCRIPTION:

Hoosier Helper is a program consisting of incident response vehicles to assist stranded motorists and remove disabled vehicles. These services can be especially helpful in work zones, since capacity is often restricted and disabled vehicles even on the shoulder can further reduce capacity. Hoosier Helpers are able to advise motorists of crash-related congestion by sending messages to highway advisory radio, variable message signs, and pagers from the scene of the crash.

REASON(S) FOR ADOPTING:

The primary reason for adopting the Hoosier Helper program was to quickly remove disabled vehicles from the freeway and reduce congestion.

PRIMARY BENEFIT(S):

The biggest benefit is to restore capacity.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The Hoosier Helper program is most applicable on high-volume freeways in both urban and rural environments and can be used in congested work zones.

STATE(S) WHERE USED:

Indiana

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Oversight/Coordination	G3-1

BEST PRACTICE:

Requiring a Traffic Control Supervisor

DESCRIPTION:
Contractors on large freeway projects must have a certified worksite traffic control supervisor on the job when lanes are closed or other work zone-related activities are being performed. The work zone traffic supervisor must document daily operations and perform weekend inspections of the work zone.

REASON(S) FOR ADOPTING:
Poor quality of traffic control and operations was evident in work zones. Contractor personnel were not adequately trained on the basics of the Manual on Uniform Traffic Control Devices (MUTCD).

PRIMARY BENEFIT(S):
Improved quality of work zone operations.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Large freeways projects.

STATE(S) WHERE USED:
Ohio

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Oversight/Coordination	G3-2

BEST PRACTICE:
"Safety Program" Specification

DESCRIPTION:
The "Safety Program" specification has been developed by the New Jersey Department of Transportation and accepted by the construction industry. It requires a contractor to have a written safety program prior to starting work on a project. Elements of the program include safety responsibilities, emergency plans, training, implementation, and discipline procedures. The specification must be written by a qualified safety professional and is not a contract pay item. The contractor is wholly responsible for the program.

REASON(S) FOR ADOPTING:
The purpose of the program is to increase the level of safety in work zones.

PRIMARY BENEFIT(S):
Expected benefits include reduction in injuries and deaths in work zones, reduced insurance rates for contractors, reduction of project costs, and the enhancement of work zone safety awareness on a statewide basis.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This specification is applicable to all construction projects throughout the State.

STATE(S) WHERE USED:
New Jersey

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Oversight/Coordination	G3-3

BEST PRACTICE:

Traffic Control Coordinator (TCC)

DESCRIPTION:

Before the start of construction operations, the contractor is required to assign an employee as the on-site Traffic Control Coordinator (TCC). The TCC is a full time position and the employee designated as the TCC must be available on a 24-hour a day, 7 day a week basis. The TCC has the responsibility for and authority to implement and maintain all traffic operations for the project on behalf of the contractor. The TCC must be certified as having successfully completed the Rutgers CAIT Traffic Control Coordinator program and successfully complete an approved traffic control refresher course every 2 years.

REASON(S) FOR ADOPTING:

The purpose of the TCC is to provide a single contact person to correct or change the traffic control set up. The person would be trained in the activity as approved by the New Jersey Department of Transportation.

PRIMARY BENEFIT:

The TCC training is for the most part specific to working in New Jersey. The instruction is provided by subject matter experts from Rutgers, New Jersey DOT, New Jersey Authorities (toll roads), New Jersey State Police Construction Unit, New Jersey Municipal Police, New Jersey Attorney, and USDOL (OSHA).

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The training is applicable to all types of highways and can be used by counties, municipalities, and utility companies.

STATE(S) WHERE USED:

New Jersey

SOURCE CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Oversight/Coordination	G3-4

BEST PRACTICE:

Project Coordination Teams

DESCRIPTION:

Since 1991 representatives from emergency response agencies have met periodically to improve the response and clearance of incidents on North Carolina highways. This practice has evolved to address a broader set of work zone safety and mobility issues and has a direct influence on North Carolina's significant projects. These project coordination teams are now meeting frequently (sometimes monthly) during the life of the project to discuss work zone safety and mobility. These teams are made up of the State Highway Patrol, the Contractor, Division Incident Management Engineers, Work Zone Traffic Control Engineers, Construction and Traffic Engineers. Issues are discussed in a timely manner and solutions are discussed and implemented with the support of the entire team.

REASON(S) FOR ADOPTING:

This practice was adopted to improve coordination, communication, and cooperation in support of work zone mobility and safety during construction on the state's significant projects.

PRIMARY BENEFIT(S):

Discussions about work zone crash data at team meetings that include law enforcement personnel familiar with the locations helps identify problematic work zone crash sites and proactively address problem areas. In addition, through pre-planning and preparation for incidents that happens at these meetings, emergency response agencies are able to more quickly access the scene and care for the injured. The quick response and clearance of incidents by predetermined alternate route detours helps maintain traffic flow.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This program applies to high-volume/high-speed freeways and bridges in rural and urban settings.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-1

BEST PRACTICE:

Delay Damage Specification for Failure to Remove Lane Closures

DESCRIPTION:

The contractor provides to the California Department of Transportation (Caltrans), prior to establishing a lane closure, a contingency plan in the event of an equipment breakdown or materials failure that delays opening the lane or lanes within the time limits specified. A specified dollar amount based on delay damages is set for each 10 minutes past the time specified to reopen a closure. This damage is charged to the contractor if all lanes are not available for use by public traffic at the specified time. This practice has been in operation since the middle of 1995.

REASON(S) FOR ADOPTING:

Concerns for delay to the traveling public on all major commuter routes.

PRIMARY BENEFIT(S):

Encourage compliance by Contractor to pick up lane closures at required times to eliminated or reduced delay to the traveling public. Also, the requirement of the contractor to submit a plan for the work that has contingencies for equipment and material failures, which was not required prior to this specification.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All mainline segment and connector closures with delay damages exceeding $6,000 per hour.

STATE(S) WHERE USED:

California

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-2

BEST PRACTICE:

Quick Change Moveable Barrier™

DESCRIPTION:

A concrete barrier wall used to separate opposing traffic is shifted laterally 12 ft, twice daily, to reverse the direction of travel on that 12 ft lane. A transport vehicle moves 6,000 ft of barrier in 25 minutes. The barrier system enables the agency to open and close lanes or reverse the direction of travel in a lane to accommodate peak traffic volumes and protect workers.

Successful completion of an aggressive project, the Super70 project, to completely rebuild Interstate 70 near Indianapolis in one construction season required directional closure of the roadway. Indiana Department of Transportation (INDOT) opened three inbound lanes during the morning rush hour and two outbound lanes. In the evening rush, the flow was reversed, with three outbound lanes and two inbound. INDOT used movable barrier wall to accomplish the daily lane shifts.

REASON(S) FOR ADOPTING:

Bridge rehabilitation closed a 2-lane bridge. The adjacent bridge was reconfigured to 3 lanes, carrying 2-way traffic. The movable barrier allows reversing the center lane so that 2 lanes are provided for peak rush hour traffic.

PRIMARY BENEFIT(S):

Reduced traffic delay, improved traffic flow.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Areas where the peak traffic tends to be high in one direction in the morning and another later in the day.

STATE(S) WHERE USED:

Indiana

SOURCE / CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-3

BEST PRACTICE:

Coordination of Detours for Over-Sized Vehicles During Construction

DESCRIPTION:

The North Carolina Department of Transportation (NCDOT) Work Zone Traffic Control Section works with the NCDOT Permits Unit to inform and direct over-sized, over-weight, and over-height vehicles around restricted work zones. The criteria for detouring traffic is provided to the NCDOT Division Office for careful prescription of signing, number of lanes provided, maximum length, etc. The coordination procedures have been in existence since 1995.

REASON(S) FOR ADOPTING:

The NCDOT is responsible for providing appropriate detours that will accommodate overwidth/overheight commercial truck traffic around work zones that have height, width, or weight restrictions.

PRIMARY BENEFIT(S):

The coordinated effort between NCDOT, commercial freight r agencies, and local municipalities to ensures safe, efficient, and necessary detours for commercial traffic in or around work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This procedure applies to all work zones and all roadways.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-4

BEST PRACTICE:

Performance-Based Lane Closures

DESCRIPTION:

The Illinois Tollway implemented performance-based lane closures to minimize the impact on traffic during either maintenance or construction on its 286-mile toll road system. The Tollway's policy is to not permanently reduce capacity when major work is performed on segments of its system. Short term closures are approved based on the Tollway's Performance-based Lane Closure Program to minimize the impact of such closures. The Performance-Based Lane Closure Guide uses recent traffic data to provide insights to the hours of the day and days of the week when traffic impacts of a lane closure are expected to be minimized. This allows the Tollway to effectively evaluate requests for planned short-term lane closures. Working in concert with the Tollway's manual on establishing lane closures, the Guide has proven to be much more effective than the previous 9 a.m. to 3 p.m. policy. The Tollway has reduced hours in some locations while allowing extended hours in others. This has given the Tollway the ability to provide a more efficient and safer driving environment for its patrons, while giving contractors and maintenance crews the maximum allowable time to complete their work.

The Tollway places a high premium on communication of road conditions and lane status to the media and its customers. The Tollway uses ITS (cameras, sensors) to monitor work zone traffic flow and behavior from its Traffic Operations Center (TOC), and is able to provide motorists travel time and incident information through a network of dynamic message signs and a large number of portable changeable message signs that are provided under construction contracts but are messaged direct from the TOC. The Tollway also issues e-mail alerts to the media and commercial trucking industry when incidents impact system performance.

REASON(S) FOR ADOPTING:

Traditionally, the Illinois Tollway had restricted lane closures for construction and maintenance activity to off-peak mid-day, weekend, and nighttime hours to minimize the impact the closures would have on the road system. In recent years, there have been some lane closures within these allowable periods that still resulted in significant backups. In anticipation of the demand for increased closures as the Tollway implemented the Congestion-Relief Program and to reduce motorist delays, the Lane Closure Guide was developed to try to achieve the goal of "no lane closure delays" during this program.

PRIMARY BENEFIT(S):
While some delays seem to be inevitable during a major construction project, since implementation of the Lane Closure Guide delays due to lane closures have been significantly reduced. The Lane Closure Guide has enabled the Tollway to identify windows of closures that previously would have been prohibited, thereby enabling its contractors to accelerate work schedules while also reducing "traditional" delays experienced by motorists. This has not only included increased hours in the reverse commute direction, but earlier starts for night-time closures and occasionally an extra hour (which is often critical) in the peak direction. These extra hours have allowed the Tollway to get a significant amount of required work accomplished with a minimal impact to the motorist. The Guide also indicated some sections where no work is allowed on Fridays anymore, or on some critical sections where all work now has to be done at night or on weekends. Tollway staff and contractors have embraced the more flexible work hours and have used them as much as possible.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This Guide is used any time a work zone contains a lane closure.

STATE(S) WHERE USED:
Illinois

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-5

BEST PRACTICE:

Standard Specification that Requires the Contractor to Correct Deficient Traffic Control

DESCRIPTION:

The contractor is required to respond within 30 minutes to any request from the agency engineer for re-aligning, replacing, or moving traffic control devices or moveable concrete barrier, or otherwise re-establishing compliance with the Maintenance of Traffic Specifications. The contractor will be subject to a monetary reduction for each incident per day when the agency engineer determines that the contractor is not in full compliance with the specifications. The penalty is $500 on the Illinois Tollway and $2,500 on Illinois Department of Transportation projects..

REASON(S) FOR ADOPTING:

It is imperative to have proper traffic control to maintain traffic flow and safety to the public. This specification includes a time frame for the contractor to respond to the agency engineer's request to correct deficient traffic control, and the penalty gives the engineer an instrument to further enforce the specification.

PRIMARY BENEFIT(S):

Traffic control is better maintained even without the engineer requesting the contractor to correct any deficiencies. Ultimately, this specification helps provide a safer work zone for the public with both the engineer and the contractor attentive to traffic control deficiencies.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This practice is a standard specification and is incorporated into every State and Tollway project.

STATE(S) WHERE USED:

Illinois

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-6

BEST PRACTICE:

Reduced Speed When Flashing

DESCRIPTION:

Used since 1989-90, this practice allows for normal speed driving in portions of a work zone where actual construction work is not in progress. A reduced speed limit (at least 10 mph below the posted limit) when flashing sign is only activated when in the vicinity of actual construction activity. Other areas within the contract limits are permitted to travel at a greater speed.

REASON(S) FOR ADOPTING:

This practice was initially developed for lengthy Interstate projects. Previously the only practical way to obtain a reduced speed through the construction zone was to post the entire length. However, the Indiana Department of Transportation received several complaints about reduced speed for a 10 mile section of road, when actual visible construction was only occurring in a 2 mile section. Motorists tended to disregard the speed restriction when they did not see workers present.

PRIMARY BENEFIT(S):

Vehicular traffic does slow down in work areas where construction workers and activities are present, which provides for increased worker and motorist safety. In areas where activities are not taking place, motorists can travel at a higher rate of speed thus improving efficiency and mobility.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of facilities with speed limits greater than 45 mph. All types of work.

STATE(S) WHERE USED:

Indiana

SOURCE/CONTACT(S):

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Indiana DOT
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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-7

BEST PRACTICE:

Closure of Entrance Ramps During Construction

DESCRIPTION:

The best practice is the closure of entrance ramps during construction. One or more ramps are closed within a work zone, and possibly preceding a work zone if it is deemed necessary. Entering traffic from ramps adds demand to the facility and creates turbulence due to merging movements. This can increase congestion, particularly in work zones with reduced capacity. By limiting the frequency of entrance ramps for certain work zones, the Ohio Department of Transportation (ODOT) and its contractors can improve mobility and safety through a corridor.

REASON(S) FOR ADOPTING:

The primary reason for closing entrance ramps is to reduce accidents in the construction work zone. Closing ramps can address the issues of a reduced weaving area and increased congestion.

PRIMARY BENEFIT(S):

A reduction in the number of crashes and less congestion in the work zone.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All high-volume freeway projects.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-8

BEST PRACTICE:

Drone Radar on Changeable Message Signs

DESCRIPTION:

The Ohio Department of Transportation uses drone radar on portable changeable message signs (PCMS) on some freeway construction projects to alert drivers that they are approaching a work zone. These drone radar PCMS are placed in advance of work zones and are intended to alert drivers that something is unusual on or near the road ahead. These alerts especially target long-haul commercial motor vehicle drivers unfamiliar with the roads in the State.

REASON(S) FOR ADOPTING:

Drone radar PCMS helps to provide a safer work zone for motorists and workers by giving drivers additional advance warning.

PRIMARY BENEFIT(S):

Drivers entering the work zone are more alert, especially at night.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All locations and all types of work.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-9

BEST PRACTICE:

Zipper Merge

DESCRIPTION:

When a lane is closed in a construction zone, a zipper merge occurs when motorists use both lanes of traffic until reaching the defined merge area, and then alternate in "zipper" fashion into the open lane. The Minnesota Department of Transportation (MnDOT) has implemented the use of the zipper merge in congested lane reductions caused by maintenance and construction activities. Standard layouts have been designed and are available in the document *Temporary Traffic Control Zone Layouts Field Manual (February, 2011)*, which is part of Minnesota's Manual on Uniform Traffic Control Devices (MUTCD). Both passive (static signs) and active (intelligent work zone) systems are used to implement the zipper merge. MnDOT implemented an educational campaign through the Minnesota Drivers Manual and an advertising effort.

More information is available at http://www.dot.state.mn.us/zippermerge/ and http://www.dot.state.mn.us/trafficeng/workzone/wzreports.html - see Dynamic Late Merge System.

REASON(S) FOR ADOPTING:

To improve safety in congested areas where lane closures are caused by maintenance and construction activities.

PRIMARY BENEFIT(S):

More even lane use approaching a lane reduction. Reduced speed differential between lanes. More predictable driver behavior. Reduced length of queue (up to 40%).

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Lane reductions with flow ≥ 1500-1800 vehicles per hour.

STATE(S) WHERE USED:

Minnesota

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-10

BEST PRACTICE:

Halogen Stop/Slow Paddle

DESCRIPTION:

The halogen stop/slow paddle is used to control traffic through work zones. It is equipped with halogen lights, which can be illuminated by the operator of the sign. The halogen paddle is visible from distances beyond 285 feet, and it is especially useful during daytime operations. The Michigan Department of Transportation has tested and began supplying them to road crews.

REASON FOR ADOPTING:

Paddles were adopted to improve the visibility and safety of road crews in overcast, dusk, and dawn daytime operations.

PRIMARY BENEFIT(S):

Protection for road crews, improved visibility, and safety.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any work zone situation requiring a flagger particularly where visibility may be challenging.

STATE(S) WHERE USED:

Michigan

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-11

BEST PRACTICE:

Pocket-sized "Guidelines for Temporary Traffic Control"

DESCRIPTION:

In 2011, the Virginia Department of Transportation (VDOT) produced a color, laminated, pocket-sized version of their Guidelines for Temporary Traffic Control for field personnel responsible for the installation, inspection, and removal of temporary traffic control measures. The guide, last updated in 2011, contains standards for temporary traffic control device installation and 25 of the most-used typical traffic control layouts for maintenance/utility/permit operations. Over 60,000 copies have been distributed.

Wisconsin has distributed over 25,000 copies of a work zone safety pocket size handbook guideline for construction, maintenance, and utility operations. The handbook presents information and guidelines for temporary traffic control, including approximately 30 typical traffic control application drawings. The handbook and a one-day basic work zone traffic control training course were developed with the University of Madison-Wisconsin.

REASON(S) FOR ADOPTING:

To make work zone safety information more readily available in an easy-to-read and understandable format for field personnel.

PRIMARY BENEFIT(S):

Provides more workers and supervisors with ready access to the standards and guidelines for traffic control in work zones. Improves the installation of traffic control devices and the flow of traffic through work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Primarily for rural and urban primary and secondary roadways and streets. The guide can also be used for many freeway and limited access highway applications.

STATE(S) WHERE USED:

Virginia, Wisconsin

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-12

BEST PRACTICE:

Traffic Pacing Design

DESCRIPTION:

This method is used when roadway construction activities (e.g., placing bridge beams, overhead sign structures, etc.) are taking place in or above all lanes of the roadway, thus requiring traffic to be temporarily slowed rather than completely stopped. Traffic is paced at a safe speed (desirably not less than 20 mph on the Interstate) to provide a gap in traffic and allow the work activities to be performed. The pacing of traffic is controlled by pilot vehicles (i.e., law enforcement vehicles with blue lights flashing) driven by uniformed law enforcement personnel. Any on-ramps between the beginning point of the pacing area and the work area are blocked until the pilot vehicle has passed. The traffic control supervisor is stationed at the work area continuously throughout the pacing operation to ensure radio communication between all the police vehicles involved in the pacing operation and the contractor/ project administrator. Advance signing warning motorists of the traffic pacing area is also provided.

REASON(S) FOR ADOPTING:

To increase safety and reduce the number of crashes caused by roadway construction activities by allowing traffic to continue moving at a reduced speed rather than coming to a complete stop. This method is much less expensive and more convenient than building detours.

PRIMARY BENEFIT(S):

Increased safety by reducing the risk of crashes due to stationary vehicles on the roadway and reduced project costs.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

High-volume/high-speed urban and rural freeways and other multi-lane access controlled facilities. Type of work: Overhead work (e.g., bridges and overhead signs, etc.) requiring total roadway closure.

STATE(S) WHERE USED:

Florida

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-13

BEST PRACTICE:

Water Filled Barrier in Work Zones

DESCRIPTION:

The North Carolina Department of Transportation (NCDOT) has used water filled barrier as a substiture for temporary precast concrete barrier on projects to protect travelers from construction areas as well as drop-off conditions and additional protection for the construction workers. NCDOT typically uses water filled barriers on projects with traffic speeds less than 45 mph; however occasionally water filled barriers are used in work zones with traffic speeds up to 60 mph

REASON(S) FOR ADOPTING:

To protect travelers and workers while more easily enabling access to homes and businesses.

PRIMARY BENEFIT(S):

Increased safety for travelers and construction workers.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Urban and suburban work zones. These are effective in areas where the barrier has to be opened to allow access to homes and businesses.

STATE(S) WHERE USED:

North Carolina

SOURCE / CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Traffic Control	G4-14

BEST PRACTICE:

Use of 42" Flexible Cones (a.k.a. "Grabber Cones")

DESCRIPTION:

The Ohio Department of Transportation (ODOT) evaluated the use of weighted channelizers (flexible/"grabber" cones) beginning in 1997 and approved them for use in July 2001. These cones are generally used in the "activity" area of the work zone. The weighted channelizers can be spaced more closely together and present the driver with more of a visual barrier than when drums are used. Per ODOT policy, the maximum spacing between cones is 40 feet. The weighted channelizer should not be used in the transition/taper area during night operations on highways. On low speed facilities the weighted channelizer can be used day or night, on any section of the work zone.

REASON(S) FOR ADOPTING:

ODOT desired a device to use for short-term night time setups that could be installed/torn down quickly, and could reduce the chance of driver confusion.

PRIMARY BENEFIT(S):

Weighted channelizers provide easier installation/teardown, which results in less exposure for the work crew during these periods. These devices are easier to transport and take up less storage space than drums. The cones also reduce the chance of driver confusion.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Temporary work zone activities on low and high speed facilities.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Worker Safety/Productivity	G5-1

BEST PRACTICE:

Flagger Certification Program

DESCRIPTION:

In 1990, the Virginia Department of Transportation (VDOT) began requiring certified flaggers in work zones. Each flagger applicant must watch a VDOT-produced basic flagging informational video and take and pass a written test based on the video and other training material. The successful candidate then receives a flagger certification card that must carry the card while performing flagging duties. The flagger must be re-certified every 2 years.

REASON(S) FOR ADOPTING:

Flagger certification improves basic flagging techniques of flag persons by training them in the required standards, guidelines, and best practices.

PRIMARY BENEFIT(S):

Improved flagging operations.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All roadways statewide.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Worker Safety/Productivity	G5-2

BEST PRACTICE:

Work Zone Safety Checklist Form

DESCRIPTION:

In 1997, the Virginia Department of Transportation (VDOT) developed and implemented a two page work zone safety checklist form for reviewing and documenting the status/condition of work zones for construction/ maintenance/ utility/ permit operations. The form must be completed weekly by construction inspectors, with every other review performed at night. VDOT provides the completed form to the contractor for correcting work zone deficiencies, and a copy is filed with the project records.

REASON(S) FOR ADOPTING:

To standardize work zone safety reviews conducted Statewide, to provide contractors, in writing, a list of work zone deficiencies, and to improve the appearance and function of work zone traffic control.

PRIMARY BENEFIT(S):

Consistent reviews of work zones by construction inspectors and district work zone safety personnel, improved documentation of work zone conditions, and improved response time to work zone deficiencies by contractors.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All roadways statewide.

STATE(S) WHERE USED:

Virginia

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Worker Safety / Productivity	G5-3

BEST PRACTICE:

High Visibility Reflective Apparel

DESCRIPTION:

The Iowa Department of Transportation has been using highly visible reflectorized gear for some time. The Minnesota Department of Transportation requires that full-length, high-visibility reflective clothing (tops and bottoms) be worn by all workers during night work.

REASON(S) FOR ADOPTING:

To improve safety in work zones by making workers more visible in various lighting and working conditions.

PRIMARY BENEFIT(S):

Requiring full-length, high-visibility clothing improves worker safety. Motorists can see that the reflecting object is a human and they generally tend to be more cautious and slow down.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any work area.

STATE(S) WHERE USED:

Iowa, Minnesota

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Worker Safety / Productivity	G5-4

BEST PRACTICE:

Nighttime Lighting Specification

DESCRIPTION:

To mitigate the impact of construction activities to the traveling public and to maximize the duration of construction operations for contractors, many States are conducting work at night on major roadways. To improve safety for both workers and travelers nighttime lighting specifications are typically necessary.

- In New Jersey a multi-discipline task force evaluated the existing specification in an effort to determine the required levels of illumination to enhance work zone safety and provide quality workmanship for specific work elements. A final specification was developed and incorporated into the New Jersey Department of Transportation standard specifications.
- Washington frequently specifies the use of temporary high mast illumination which consists of 100-foot timbers placed in non-conflict areas to provide a consistent, high level of lighting for long term construction projects. Washington also requires portable lighting at all flagging locations with a height of 15-25ft to highlight the presence of the flagger but also to minimize glare to drivers.

REASON(S) FOR ADOPTING:

To ensure adequate levels of illumination for work done at night.

PRIMARY BENEFIT(S):

Enhancement of work zone safety for travelers and workers during night work, and increased quality level of workmanship.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The night lighting specification is applicable to all projects that specify or allow night work, typically high volume areas.

RELATED BEST PRACTICES:

Nighttime Construction Operations (Practice G1-5)

STATE(S) WHERE USED:

New Jersey, Washington

SOURCE/CONTACT(S):

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Construction/Maintenance Materials, Methods, Practices, and Specifications → Worker Safety / Productivity	G5-5

BEST PRACTICE:

Improved Warning Lights on Vehicles

DESCRIPTION:

The Missouri Department of Transportation (MoDOT) outfits trucks with a visible strobe type warning lightthat uses a 180-watt output controller to increase the power and visibility of the lights on MoDOT vehicles, compared to previously-used 50-watt bulbs. The strobe light system regulates each output at a constant rate, and it is able to power up to eight outputs with equal intensity. Through field tests travelers indicated that the light was more visible with better recognition, even up to 1 mile away.

REASON(S) FOR ADOPTING:

To increase safety of employees by increasing the visibility of MoDOT vehicles.

PRIMARY BENEFIT(S):

Benefits anticipated are achieving better motorist recognition and better operator visibility. Work zone crashes should be reduced and productivity should be improved.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any State vehicle.

STATE(S) WHERE USED:

Missouri

SOURCE/CONTACT(S):

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Best Practices Category H - Traveler and Traffic Information (Project Related)

Traveler and traffic information includes methods, technologies, and equipment to identify work zone traffic conditions and inform the traveling public. These practices emphasize strategies to provide detailed project information to the public, including about the type of work being completed, planned duration, expected delay, and strategies to avoid delay. These best practices emphasize the provision of accurate, up-to-date work zone information to road users in a sufficient time to help them make informed travel decisions.

Examples of practices include:

- Hiring public relations firms to communicate project information regarding high-volume reconstruction projects.
- Including a bid item in construction contracts that identifies public relations support and activities to be performed.
- Monitoring work zone traffic conditions through fixed and portable traffic management systems.
- Real-time work zone traffic conditions that are accessible on the Internet and disseminated through social media.
- Changeable message signs, traffic advisory radio, and early warning systems to warn motorists approaching congested work zones.

The following best practice entries relate to work zone traveler and traffic information:

Subcategory	Ref. #	TRAVELER AND TRAFFIC INFORMATION Best Practices
H1 Project Public Outreach Techniques	H1-1	Project Public Information/Public Relations Program
	H1-2	Public Outreach for Travel Demand Management
	H1-3	Public Relation Campaigns and the Use of Public Relation Firms
	H1-4	Targeting Public Outreach to Key Stakeholders
	H1-5	Signing for Businesses Affected by Construction
H2 Traffic Information Management	H2-1	Bid Item in the Construction Contract for Public Relations
	H2-2	District Work Zone Traffic Management Coordinator
	H2-3	Construction Database and Website
	H2-4	Contractor Involvement in Disseminating Project and Lane Closure Information

Subcategory	Ref. #	TRAVELER AND TRAFFIC INFORMATION Best Practices
H3 Traveler Information Delivery	H3-1	New Technologies to Communicate Project Information
	H3-2	Using a Communications Center to Provide Real-Time Traffic Information to the Public
	H3-3	Dissemination of Work Zone Project Information
	H3-4	Use of Traffic Management Centers to Advise Motorists of Work Zone Delays
	H3-5	Single Source for Construction Project Information in a Metro Area
	H3-6	Website for Traffic Information, Advisories, and Alerts
	H3-7	Media Campaign for Major Projects – Real-Time Traffic Information to Public
	H3-8	Disseminating Information on Current Work Zones to Motor Carriers
	H3-9	Highway Condition Reporting System
	H3-10	“Wizard” CB Radio Transmissions Providing Work Zone Safety Messages to Truckers

Traveler and Traffic Information → Project Public Outreach Techniques	H1-1

BEST PRACTICE:

Project Public Information/Public Relations Program

DESCRIPTION:

This program is directed at the project level and involves making the status of local construction projects known to the community and local businesses through the issuance of electronic newsletters or construction alerts. In addition, pre-construction public information meetings and monthly traffic management meetings may be held. The newsletters are sent to the media, businesses, residents, and others who request to be included or opt in to the electronic mailing list for project materials. The newsletters normally give the project status, lane restrictions, ramp closures, recommended detour routes, access to area businesses, and any other work zone traffic restrictions in effect.

REASON(S) FOR ADOPTING:

A need exists to provide current information to a wide range of people. In addition to providing roadway closure information, the newsletters include a list of several places people can call for additional information. The names and phone numbers are listed of the resident engineer, community relations contact, and Arizona Department of Transportation (ADOT) district office.

PRIMARY BENEFIT(S):

Local citizens are kept informed and made aware of where they can call for additional information. This promotes direct communication between ADOT and residents. Motorists can plan trips to avoid the work areas affected and reduce congestion. Businesses can plan for deliveries and incorporate work zone information into their communication with customers. The high quality of the newsletters gives them “reach” when copies are shared among friends.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Generally freeways or very large projects in urban areas, although some rural uses have been tried.

STATE(S) WHERE USED:

Arizona

SOURCE/CONTACT(S):

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Traveler and Traffic Information → Project Public Outreach Techniques	H1-2

BEST PRACTICE:

Public Outreach for Travel Demand Management

DESCRIPTION:

Travel Demand Management (TDM) is a general term for various strategies that increase transportation system efficiency by reducing total demand or shifting a portion of demand to other times, routes, or modes of travel. TDM can be used in work zones to help reduce traffic flow through a work zone, particularly when capacity is constrained due to narrowed or closed lanes or construction activity. Although most individual TDM strategies only affect a small portion of total travel, the cumulative impacts of a comprehensive TDM program can be significant.

When a gas explosion destroyed two portions of the MacArthur Maze and quick reconstruction was needed, the California Department of Transportation (Caltrans) launched an aggressive public relations campaign using a website and local media personnel to inform drivers about alternate routes, public transportation alternatives, and reconstruction updates. Traffic in the area was reduced significantly, helping enable reconstruction in 26 days rather than a few months.

The Washington State Department of Transportation (WSDOT) developed a comprehensive public outreach campaign to prepare local businesses, community groups, and the general public for a major roadway rehabilitation project along Interstate-5 through downtown Seattle that reduced the number of open lanes to two. WSDOT developed a public outreach plan which encouraged motorists to shift their routes from the work zone corridor to other routes or modes of transportation which resulted in more than a 50 percent reduction of traffic through the work zone area. WSDOT used a website with a Construction Coordination Map showing affected streets and sidewalks, alternate routes, and real-time congestion information to help motorists safely navigate through the work zone.

In advance of closing the Fort Pitt Bridge-Tunnel in Pittsburgh for reconstruction, the Pennsylvania Department of Transportation (PennDOT) made improvements and modifications to detour roadways to ensure those roadways would be able to handle significant detoured traffic. By preparing detour routes in advance, PennDOT was able to divert traffic without confusing drivers and ensure that the detour routes could sustain the additional traffic. PennDOT also reversed the flow of lanes on the detour routes to ensure that traffic flowed smoothly into the city, and opened up a barrier to allow traffic from one of the detour routes to re-enter

in a free-flow lane without having to merge into a single lane – an approach that proved extremely beneficial to motorists.

REASON(S) FOR ADOPTING:
TDM strategies help to improve overall traffic flow through the dispersion of traffic or by increased use of different transit modes when capacity is constrained due to construction. Safety of the traveling public and time saving is also realized.

PRIMARY BENEFIT(S):
Traffic delays due to work zones can be decreased due to use of TDM strategies.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Long-term projects where capacity is constrained and there is a potential for delays. TDM strategies are also helpful when there is a full road closure or where regular traffic flows through the work zone may slow construction efforts.

STATE(S) WHERE USED:
California, Pennsylvania, Washington

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Traveler and Traffic Information → Project Public Outreach Techniques	H1-3

BEST PRACTICE:

Public Relation Campaigns and the Use of Public Relation Firms

DESCRIPTION:

The Illinois Department of Transportation (IDOT) hires public relations firms to communicate project information to the traveling public regarding high-volume urban freeway reconstruction projects. The services include, but are not limited to, advance information campaigns to encourage the use of alternate routes, assistance with press releases and conferences, presentations to neighborhoods and other groups, and preparation of newspaper and radio advertisements. Public relations firms are required to submit a proposal and make a presentation on their proposal as part of the selection process.

REASON(S) FOR ADOPTING:

IDOT recognizes the need to use specialists in the area of public relations. In the past, efforts were conducted by IDOT personnel whom were not trained, nor did they have the background, in communicating effectively with the public.

PRIMARY BENEFIT(S):

The presentation of information to motorists in an easily understood and interesting format increases the effectiveness of alerting commuters to traffic impacts. Public relations firms have the resources to develop professional publications (e.g., brochures, maps, fliers). The distribution of publications, in conjunction with professionally produced presentations and multi-media advertisements, effectively communicates information regarding projects. In addition, another advantage that public relation firms have over transportation agencies is their established contacts with news media personnel.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Although geared towards high-volume urban rehabilitation projects, the concept has application to any project, especially those with high user impacts.

STATE(S) WHERE USED:

Illinois

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Traveler and Traffic Information → Project Public Outreach Techniques	H1-4

BEST PRACTICE:

Targeting Public Outreach to Key Stakeholders

DESCRIPTION:

Targeting specific public outreach efforts to populations most likely to affected by a construction project can help ensure that those who need the information will receive it. Using radio or other media to reach targeted drivers when construction occurs on heavily traveled routes that lead to sports or entertainment facilities can help divert motorists from high traffic construction projects to other routes or modes of travel. Key stakeholders can be of great assistance in getting information to the target audience in ways that are most convenient for the motorists. In 2005, the Michigan Department of Transportation partnered with the Detroit Tigers Radio Network and its 30 affiliated stations for the "Line Drive Home" campaign to get construction and traffic information out to the public. The purpose of the campaign was to shift traffic to alternate routes, helping motorists avoid major construction zones on I-75 and US-23, roads that lead some of the traffic to the stadium.

REASON(S) FOR ADOPTING:

Because of the excitement of Major League Baseball games in Detroit, a baseball theme was chosen as the best way to spread the construction information, and the campaign was advertised over the Detroit Tiger Radio Network and through brochures. The printed materials were augmented with a dedicated page on the MDOT Web site that attracted more than 82,000 individual hits. The "Line Drive Home" campaign was very successful in Michigan, decreasing traffic around the construction zones by 20 percent.

PRIMARY BENEFIT(S):

Motorists most likely to be impacted by construction receive timely traffic information, and work zone traffic and delays can be greatly lessened.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Work zones that will cause delays on high traffic roads nearby sports or entertainment facilities.

STATE(S) WHERE USED:

Michigan

SOURCE/CONTACT(S):

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Traveler and Traffic Information → Project Public Outreach Techniques	H1-5

BEST PRACTICE:

Signing for Businesses Affected by Construction

DESCRIPTION:

The city of Phoenix has recognized that construction, reconstruction, or resurfacing of their city has a negative effect on local business. In order to aid the business customer in finding access into local businesses, the city has elected to install small signs delineating the access route.

REASON(S) FOR ADOPTING:

The city of Phoenix recognizes that businesses pay a large percentage of the revenue that the city receives. It is the city's intent to keep them in operation and not unduly affect their business during construction. Fewer complaints are received as the business community sees that the city is trying to mitigate the effects on them due to construction.

PRIMARY BENEFIT(S):

Friendlier communication with business owners, with fewer complaints. Businesses are better able to survive the construction project.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All streets and highways.

STATE(S) WHERE USED:

Arizona

SOURCE/CONTACT(S):

Thomas Godbee, Deputy Street Transportation Director
City of Phoenix
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Traveler and Traffic Information → Traffic Information Management	H2-1

BEST PRACTICE:

Bid Item in the Construction Contract for Public Relations

DESCRIPTION:

Maricopa County Department of Transportation (MCDOT) includes a bid item in nearly all of its construction contracts to support the public relations efforts led by MCDOT's in-house Community Relations team under the umbrella of its RightRoads Program for public outreach. The contract will typically identify the type of program support and activities the contractor will be required to perform such as participating in public meetings; providing informational signage; gathering information for and distributing public notices/newsletters; documenting existing property conditions prior to starting construction; and assisting in responding to questions or complaints concerning construction operations.

MCDOT construction newsletters and informational roadside signage give 24-hour construction hotline number and project website where the public can obtain timely and accurate project information. Newsletters typically include information such as construction progress, hours of construction, upcoming activities that will create high noise levels, interruption of utilities, traffic restrictions or street closures, detour locations, disruption of bus routes, and planned haul/material delivery routes.

REASON(S) FOR ADOPTING:

MCDOT is aware that roadway construction is a disruption to residents, businesses and motorists, and that these stakeholders need and deserve open, ongoing communication and information about public projects. MCDOT's program and the support provided through this bid item ensures proactive planning and well-organized execution of a cooperative and project-specific public information and outreach plan.

PRIMARY BENEFIT(S):

This program has vastly reduced the number of complaints that are received regarding construction impacts and community inconvenience. With knowledge of the construction project, motorists will alter their trips to other routes, thereby reducing congestion and enhancing both motorist and worker safety. Sometimes information is provided by citizens that the County was unaware of and can be taken into consideration and adjustments can be made when necessary. A long-term benefit is the building of public trust that comes from the two-way dialog among affected residents, businesses, the traveling public, partnering jurisdictions, and MCDOT.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All types of projects that impact the public.

STATE(S) WHERE USED:
Arizona

SOURCE/CONTACT(S):
Roberta Crowe
Maricopa County DOT
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Traveler and Traffic Information → Traffic Information Management	H2-2

BEST PRACTICE:

District Work Zone Traffic Management Coordinator

DESCRIPTION:
A single person in each of the 12 Caltrans Districts has authority to halt lane closures, temporary signals, etc.

REASON(S) FOR ADOPTING:
The cumulative effect of projects in close proximity can sometimes lead to poor, inefficient operations. Also, travel volumes tend to be dynamic in nature and fluctuate due to incidents or recreational/holiday demand.

PRIMARY BENEFIT(S):
The Coordinator is able to see the "bigger picture" and make decisions that provide relief to an area affected by construction. The Coordinator stays abreast of the regional traffic situation whereas the Resident Engineer tends to focus only on the happenings within the project limits of his/her contract.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All locations. All types of work.

STATE(S) WHERE USED:
California

SOURCE/CONTACT(S):
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Caltrans
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Caltrans
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Traveler and Traffic Information → Traffic Information Management	H2-3

BEST PRACTICE:

Construction Database and Website

DESCRIPTION:

Houston TranStar is a multi-modal transportation and emergency management center serving Houston, Texas and the surrounding region. TranStar was developed with the cooperation of four transportation agencies: Texas Department of Transportation (TXDOT), Metro Transit Authority, Harris County, and the City of Houston. The function of the center is to plan, design, operate, and maintain 15,000 miles of roads in the Greater Houston area. TranStar includes a web-based construction management system, called *Roadworks*, that allows engineers and planners in different agencies to share project information and allows the public to determine the status of current and planned road construction projects in the Greater Houston area. Information posted on the website includes:

- Key project information (project name, number, description, point of contact, start/finish dates, location)
- Interactive maps
- Access to construction data
- Real-time traffic information, including incidents
- Motorist assistance information
- TXDOT lane closures

REASON(S) FOR ADOPTING:

During a period of economic prosperity in Houston during the early 1990s, many construction projects were implemented simultaneously. Motorists and transportation agencies became concerned that mobility was being restricted and resources could be better used through coordinated efforts.

PRIMARY BENEFIT(S):

Using *Roadworks,* agencies are able to coordinate activities, minimize the impacts of construction to road users, and maximize available resources. The general public is able to use the website to gain information on project status.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All streets and highways.

STATE(S) WHERE USED:

Texas

SOURCE/CONTACT(S):

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Traveler and Traffic Information → Traffic Information Management	H2-4

BEST PRACTICE:

Contractor Involvement in Disseminating Project and Lane Closure Information

DESCRIPTION:

Contractors help keep the public informed of lane closures and the status of construction for road projects in the City of Columbus, Ohio. A plan note in the contract requires the contractor to provide notice a specified number of days in advance of any planned lane closures. Project meetings are also attended by staff from the "Paving the Way" traffic management program to coordinate public outreach efforts.

REASON(S) FOR ADOPTING:

The City of Columbus adopted this policy give advance notice and to keep the public notified of lane closures and the status of construction.

PRIMARY BENEFIT(S):

The public is better informed of lane closures and "Paving the Way" has advance notice to properly prepare notification of closures.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of work.

RELATED BEST PRACTICE(S):

Single Source for Construction Project Information in a Metro Area (Practice H3-5)

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

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City of Columbus
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Traveler and Traffic Information → Traveler Information Delivery	H3-1

BEST PRACTICE:

New Technologies to Communicate Project Information

DESCRIPTION:

New communication technologies, such as Facebook and Twitter, are providing new ways for DOTs to dispense work zone construction updates to drivers in affected areas. State and local DOTs can use these technologies to enhance their efforts to educate the public about what to expect for upcoming and current work zones in the area and available alternate routes to use during these projects. One of the first states to use these technologies was Arizona, which uses Facebook, a social networking website, and Twitter, a "micro-blogging" website, to relay travel delays, construction impacts, holiday travel information, and completed major milestones to thousands of people at the click of a mouse. Users sign-up to receive updates, and then these tools send the updates to either a person's cell phone or personal profile on the websites, enabling users to plan their trips before getting out on the road by providing up-to-date information on construction projects that might affect their trip. The information is intended for pre-trip planning purposes. Arizona DOT (ADOT) uses these tools as part of an integrated communications approach, with its phone and online 511 systems providing the foundation. While its 511 systems are the most up-to-date, complete sources of information, ADOT recognized that adding social media tools like Twitter enables ADOT to reach a broader audience that may not use tools like 511 that require the user to seek out the information. Once a user signs up on Twitter or Facebook, real-time information is automatically delivered directly to the user whenever ADOT identifies the need for an update.

Other States that are using social media to reach out to motorists include Rhode Island, Iowa, and Missouri. In addition to Facebook and Twitter, Rhode Island and Iowa also use RSS (really simple syndication) feeds to reach a larger audience of motorists. RSS feeds automatically deliver updated traffic and news blurbs to an email account or a bookmarked page in a person's web browser. Missouri provides project updates to travelers via their blog, podcasts, and videos posted on YouTube, in addition to providing information on Facebook and Twitter.

REASON(S) FOR ADOPTING:

Using these tools is another way to inform drivers of work zones and the impacts that the construction projects will have on their routes. Many people are using these tools in their daily lives, so they are an easy, inexpensive, and convenient way to reach more people in the affected area.

PRIMARY BENEFIT(S):
The public is more informed about work zone impacts that might affect their travel plans. Since users have to sign-up to receive updates, the information is targeted to those most interested and where it can have the most benefit. ADOT has seen an improvement in public perception when it can use the social media tools to push real-time information (like for a major closure or incident) to users, document how many messages were sent and how many users they reached, and then communicate the reach of their information to the media, agency leadership, and elected officials. ADOT also sees public safety benefits in using these tools to quickly push to users information about weather events, closures or major road restrictions.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Long-term work zones where construction impacts on drivers will be changing throughout the course of the project. These tools can also be beneficial on short-term projects, since these projects sometimes catch drivers by surprise and thus may create the most safety and acceptance issues.

STATE(S) WHERE USED:
Arizona, Iowa, Missouri, Rhode Island

SOURCE/CONTACT(S):
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Traveler and Traffic Information → Traveler Information Delivery	H3-2

BEST PRACTICE:

Using a Communications Center to Provide Real-Time Traffic Information to the Public

DESCRIPTION:

The Illinois Department of Transportation (IDOT) Communications Center for the Chicago metropolitan area collects and distributes real-time traffic information for a portion of their Interstate routes. The traffic information is generated by their traffic management center. In addition, construction and maintenance work zone lane closure information is updated on at least a daily basis. The real-time information is broadcast on highway advisory radio and is continuously sent to the media and traffic information service providers via automatic direct feed. The information is also available by toll-free phone and over the Internet.

REASON(S) FOR ADOPTING:

While free-flow traffic cannot always be attained, the traveling public does want to minimize their travel time. By obtaining accurate real-time traffic information, motorists can make informed route decisions and help to balance the demand on the system.

PRIMARY BENEFIT(S):

Informed motorists can select the route(s) that will provide the best travel time. Because the information is real-time, motorists can adjust their routes even while en route, to avoid traffic-delaying incidents. In addition to providing improved travel times, such route adjustments help to alleviate demand and assist in traffic flow recovery from incident-related congestion.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Most applicable on a systematic basis to larger urban areas that have several route choices. However, to a lesser degree, the concept may have application in other areas or for a specific project.

STATE(S) WHERE USED:

Illinois

SOURCE/CONTACT(S):

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E-mail: Anthony.Bridson@illinois.gov

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Traveler and Traffic Information → Traveler Information Delivery	H3-3

BEST PRACTICE:

Dissemination of Work Zone Project Information

DESCRIPTION:

The Arizona Department of Transportation (ADOT) has an extensive plan for public outreach during construction projects in the State. ADOT's Communications and Community Partnerships Division is involved throughout the design, construction, and maintenance process. ADOT has a hot-line for drivers to report problems on the road for higher interest projects. Also, ADOT is using Arizona 511 traveler information phone numbers, electronic signage, and websites to get information out to motorists. For their recent large-scale construction project on I-10, ADOT had a fully-staffed call center during the day, seven days a week, to answer motorists' questions about the project. In the evening, an automated message described traffic delays, construction plans, etc.

The public information office in each of the eight district offices within the Florida Department of Transportation (FDOT) provides information on the location and duration of construction work zones to the public and the news media. For larger projects, the civil engineering inspection staff includes a project level public information position. On some major projects a toll-free hotline has been established for project information. FDOT also uses websites and social media to disseminate critical project information.

The Illinois Department of Transportation (IDOT) is proactive in notifying the motoring public of upcoming and ongoing construction projects. This is an effort to increase safety for workers and motorists in work zones and to ensure that motorists, local and state law enforcement and government officials, and the general public are made aware of road projects in a timely manner. IDOT uses a variety of platforms to disseminate this information: news releases, social media (Facebook, Twitter, YouTube) and public meetings to get this information to the public. In recent years, the use of social media has allowed the Department to get information out to a larger number of people. Through public service announcements for Work Zone Awareness Week, videos on current projects, and daily content posted on social media websites, IDOT is keeping motorists informed.

REASON(S) FOR ADOPTING:

To raise public awareness of work zones and inform the motoring public about the location, duration, and impacts of road projects.

PRIMARY BENEFIT(S):
Effective public information and outreach can result in better public relations and fewer traffic impacts due to motorists' ability to better avoid construction delays. The public appreciates being informed and knowing who to contact with concerns. Social media enables faster dissemination of information to a larger audience. These efforts improve image of DOTs.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This practice is applicable to all types of construction projects where the public will be impacted by construction activities.

STATE(S) WHERE USED:
Arizona, Florida, Illinois

SOURCE/CONTACT(S):
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Florida DOT
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Brian Williamsen, Community Relations Manager
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Traveler and Traffic Information → Traveler Information Delivery	H3-4

BEST PRACTICE:

Use of Traffic Management Centers to Advise Motorists of Work Zone Delays

DESCRIPTION:

Approximately 25 years ago, the New York State Department of Transportation (NYSDOT) and FHWA created a traffic management system and center on Long Island. It covered most of the Long Island Expressway (I-495), Northern State Parkway, and State Route 25. Loop detectors, ramp meters, a computerized signal system, cameras, and variable message signs were placed throughout this 35 mile corridor to provide traffic information such as work zone delays, with an ability to manage congestion and provide motorist information on incidents. Since then, Traffic Management Centers have been established in most urban areas of New York State.

REASON(S) FOR ADOPTING:

NYSDOT and FHWA realized that traffic was increasing but fiscal constraints and environmental and right of way impacts can preclude traditional methods of building a way out of congestion. Therefore, it was decided to try and manage the facilities to minimize the delays due to congestion and to provide detour alternatives in case of major incidents.

PRIMARY BENEFIT(S):

NYSDOT was able to gain greater information on real-time traffic flow and to react quicker to incidents impacting traffic flow. Motorists benefited by spending less time in congestion unnecessarily.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Urban and suburban freeway, parkway, and arterial roadways.

STATE(S) WHERE USED:

New York

SOURCE/CONTACT(S):

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FHWA New York Division Office
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John Bassett
New York State DOT
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Traveler and Traffic Information → Traveler Information Delivery	H3-5

BEST PRACTICE:

Single Source for Construction Project Information in a Metro Area

DESCRIPTION:

"Paving the Way" is a comprehensive traffic management program that provides public information and commuter-assistance services to Columbus area motorists. "Paving the Way" maintains a web site, produces a 10-minute television segment responding to emails during the busy construction season, and provides an automated email system informing over 3,000 subscribers of upcoming projects. It is a cooperative partnership between the Federal Highway Administration, the Ohio Department of Transportation, and the City of Columbus.

REASON(S) FOR ADOPTING:

To provide one source for all information pertaining to highway construction projects in the Columbus metropolitan area and to coordinate traffic control between projects.

PRIMARY BENEFIT(S):

"Paving the Way" keeps motorists informed on work zone traffic control with one point of contact for information. The organization conducts safety campaigns and monitors projects to improve traffic control.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All public roads.

STATE(S) WHERE USED:

Ohio

SOURCE/CONTACT(S):

J.P. Blackwood
City of Columbus
Phone: (614) 645-6016
Email: jpblackwood@columbus.gov

Traveler and Traffic Information → Traveler Information Delivery	H3-6

BEST PRACTICE:

Website for Traffic Information, Advisories, and Alerts

DESCRIPTION:

Websites have become an important source of highway construction project information to travelers and others. Some websites are project specific, while others are statewide or regional.

The Iowa Department of Transportation (IDOT) maintains a website dedicated to work zone activities. The website features updates on current and planned road construction projects, real-time traffic reports, construction expenditure information, and work zone safety tips. The website can be viewed at http://www.dot.state.ia.us/roadcons.htm.

The Maryland CHART program is a multi-jurisdictional and multi-disciplinary program that provides real-time traffic information, incident response, lane closure information (including for work zones), and general traveler information via a website at www.chart.state.md.us. A statewide operations center serves as the "hub" of the CHART system with satellite traffic operations centers across the State to handle peak-period traffic.

The Oregon Department of Transportation (ODOT) maintains the TripCheck website (http://www.tripcheck.com), a one-stop website for motorists to learn about road conditions in and around the State. The website is updated in near real-time and shows on-going construction activities, weather conditions, and maps of trucking centers and travel centers across the state.

REASON(S) FOR ADOPTING:

Providing easy, quick, comprehensive communication for concerned audiences underscores the agency's commitment to informing the public about road project(s) and gives travelers the ability to pre-plan their trips including when to leave, what routes to take, and what mode of transportation to use.

PRIMARY BENEFIT(S):

Web technology provides the ability to distribute traffic information to concerned audiences directly in real time and enables an agency to reach a large number of people in a short time at a manageable cost. Providing real-time traffic and lane closure information can enable drivers to choose alternate routes and transportation modes, thereby reducing travel times and delays due to incidents. Congestion is reduced and travel speeds increase.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This practice is applicable to all types of construction projects where the public will be impacted by construction activities.

STATE(S) WHERE USED:
Iowa, Maryland, Oregon

SOURCE/CONTACT(S):
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Iowa DOT
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Clarence Haskett
Maryland State Highway Administration
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Scott McCanna
Oregon DOT
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Traveler and Traffic Information → Traveler Information Delivery	H3-7

BEST PRACTICE:

Media Campaign for Major Projects – Real-Time Traffic Information to Public

DESCRIPTION:
The use of an extensive public information campaign for major Interstate reconstruction projects typically begins before construction starts. The campaign can include the use of a phone "hotline," a project website, faxes, mailings, and public meetings where information on the project and current or planned lane closures is provided. Periodic brochures describing activities and the progress of the reconstruction may be mailed to residents in the corridor.

REASON(S) FOR ADOPTING:
The goal of the campaign is to provide as much information as possible to the traveling public so that they can make informed decisions on which route and/or mode to use.

PRIMARY BENEFIT(S):
Reduction of accidents and congestion in the work zone. Travel behavior modification (i.e., using alternate routes, postponing, or rescheduling trips, etc.).

MOST APPLICABLE LOCATION(S)/PROJECT(S):
High-volume urban arterials or freeways.

STATE(S) WHERE USED:
Utah

SOURCE/CONTACT(S):
Mindy Nelson, Public Information Officer
Utah DOT
Phone: (801) 234-2210
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Traveler and Traffic Information → Traveler Information Delivery	H3-8

BEST PRACTICE:

Disseminating Information on Current Work Zones to Motor Carriers

DESCRIPTION:

This is an outreach effort to help prevent work zone crashes. It is accomplished through the distribution of a weekly newsletter through the trucking associations, which discusses and identifies where work zones are located, hazards, and how to minimize the chances of having crashes. The creation and distribution of the news document is performed by the Utah Trucking Association.

REASON(S) FOR ADOPTING:

The reason for implementing the practice was to maintain a level of zero work zone fatalities and curb any potential increase of crashes through increased proactive outreach efforts.

PRIMARY BENEFIT(S):

It is expected to result in a decrease in overall work zone crashes, and to allow motor carriers to act proactively to help reduce delays in transportation.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All projects, but particularly those where there is likely to be a high volume of motor carriers.

STATE(S) WHERE USED:

Utah

SOURCE/CONTACT(S):

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FHWA Utah Division Office
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Traveler and Traffic Information → Traveler Information Delivery	H3-9

BEST PRACTICE:

Highway Condition Reporting System

DESCRIPTION:

The Highway Condition Reporting System (HCRS) allows the construction and maintenance offices throughout the State to input information relative to roadway closures or restrictions whether they are from highway work, weather, or roadway incidents/accidents. This information may be retrieved either through the Internet or by phone. Requests to activate the variable message signs are also included as a part of this system. The system went online in January 1998 and usage has grown to over one million web page hits per day. Arizona also has AZ511.org which is used extensively and linked to HCRS.

REASON(S) FOR ADOPTING:

The previous system used by Arizona Department of Transportation was not usable by the general public. This system was designed to make work zone activities and road closure information more easily available to everyone.

PRIMARY BENEFIT(S):

The system provides high quality, real-time information to motorists and highway officials in an easily accessible manner.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Type of facility: All State highways.
Location: Statewide.
Volume/Speed: All volumes/speeds.
Type of work: Any activity affecting traffic.

STATE(S) WHERE USED:

Arizona

SOURCE/CONTACT(S):

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Arizona DOT
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Traveler and Traffic Information → Traveler Information Delivery	H3-10

BEST PRACTICE:

"Wizard" CB Radio Transmissions Providing Work Zone Safety Messages to Truckers

DESCRIPTION:

The Wizard Work Zone Alert Radio is a portable system, which broadcasts traffic safety and work zone information on citizens band radio channels, primarily aimed at long-haul truckers. The system can record and store up to three different messages and transmit over two different CB channels. Messages are seven to ten seconds, and can be pre-recorded or recorded on site. The user has the option of transmitting a message every 30, 60, or 90 seconds. The Wizard monitors CB transmissions on one or more pre-selected frequencies. When it detects a lull, the Wizard will broadcast a safety message. The Wizard uses a standard CB antenna and a 12-volt power source, and can broadcast over approximately four miles. The system was approved for use in Pennsylvania in 1998, and was tested in several States under the Midwest States Smart Work Zone Initiative with favorable results.

REASON(S) FOR ADOPTING:

The Department was looking for a unique way of targeting long-haul truckers with safety information as they approached work areas.

PRIMARY BENEFIT(S):

Truck drivers are alerted to the work zone and any new traffic patterns.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of facilities. All types of work.

STATE(S) WHERE USED:

Pennsylvania

SOURCE/CONTACT(S):

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FHWA Pennsylvania Division Office
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Best Practices Category I - Enforcement

Enforcement includes activities undertaken by law enforcement officers to enforce laws and encourage safe conditions in work zones. These best practices involve using work zone trained and qualified uniformed police officers who are readily available for construction and maintenance operations.

Examples of practices include:

- Training for uniformed police officers in work zone traffic control, including work zone data on crash report forms, the Manual on Uniform Traffic Control Devices (MUTCD), and incident management.
- Full-time dedicated uniformed police officers to enforce work zone activities.
- Off-duty law enforcement officers to monitor and provide surveillance at problematic work zones.
- State-of-the-art equipment to alert drivers to slow down when approaching work zones.

The following best practice entries relate to work zone law enforcement:

Subcategory	Ref. #	ENFORCEMENT Best Practices
I1 Organizational Strategy	I1-1	Interagency Agreement for Police Presence in Work Zones
	I1-2	Police Officer Training Program for Work Zone Duty
	I1-3	Full-Time State Police Positions Assigned to Safety and Construction Issues
	I1-4	Helping All Work Zones Keep Safe (HAWKS) Program
I2 Speed Management	I2-1	Active Law Enforcement to Manage Speed in Work Zones
	I2-2	Drone Radar in Work Zones

Enforcement → Organizational Strategy	I1-1

BEST PRACTICE:

Interagency Agreement for Police Presence in Work Zones

DESCRIPTION:

The California Highway Patrol (CHP) has contracted with the California Department of Transportation (Caltrans) to provide services on an as-needed basis. The CHP, where appropriate, provides awareness of work zone areas and enforcement of the speed limit. The interagency agreement shares the responsibility between Caltrans and CHP for enhancing highway worker and motorist safety in and around highway work zones. Caltrans and CHP personnel work closely together to determine actions necessary to address highway worker and motorist safety, traffic control procedures, and anticipated traffic delays. Issues of collaboration can include methods of job site communication, traffic handling, acceptable traffic delays, contingency plans to address traffic mobility, and emergency vehicle routes. There are two parallel programs, the Construction Zone Enhanced Enforcement Program (COZEEP) and the Maintenance Zone Enhanced Enforcement Program (MAZEEP).

REASON(S) FOR ADOPTING:

Speed reduction and awareness of work zones was not being adequately accomplished through the use of signing, and channelizing devices, etc.

PRIMARY BENEFIT(S):

Reduction in highway and worker related accidents, creating an overall safer work zone.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types. All locations.

STATE(S) WHERE USED:

California

SOURCE/CONTACT(S):

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Theresa Drum – MAZEEP
Caltrans
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Enforcement → Organizational Strategy	I1-2

BEST PRACTICE:
Police Officer Training Program for Work Zone Duty

DESCRIPTION:
Transportation agencies may use police officers in a work zone to enhance motorist awareness through the visible presence of officers, manage speeds through active enforcement, and/or provide incident management services, when there are certain concerns present in that work zone. In some cases, DOTs have also used police officers to provide an extra layer of review of proper traffic control. To safely perform their duties in work zones, police officers need to be properly trained. Louisiana DOTD offers a work zone training program for law enforcement personnel that covers enforcement and incident management in work zones. This training program is 1.5 hours long and covers the following topics: why work zone training for law enforcement is important, the different parts of a work zone, the role that law enforcement plays in managing a work zone, video examples of law enforcement managing work zones, how to handle incidents in work zones, and proper stopping locations in work zones. This training is offered to State Police and local law enforcement agencies. Louisiana DOTD's work zone policy requires that police officers working on project sites be certified through this training program. Police officers must provide a course completion certificate to the hiring contractor.

Several other States, including Oregon, New Jersey, and Maryland, have also developed specific work zone law enforcement training programs. Oregon provides training to law enforcement personnel through a workshop, held annually at a law enforcement conference in the State. Oregon's training covers behavioral and traffic control engineering information related to law enforcement in work zones. Incident response is covered as part of the mandatory Oregon law enforcement curriculum. In New Jersey, training is provided to law enforcement personnel through both police-specific programs and general work zone training programs that may be attended by law enforcement. The New Jersey Police Work Zone Safety Program is specifically provided for law enforcement personnel and is given as a 4-day train-the-trainer program by the New Jersey local technical assistance program (LTAP). The NJLTAP also provides a 1-day program specifically for Police, accepted by the NJDOT, that provides training for locations that do not have an officer trained through the train-the-trainer program. This shorter course is intended to fill a need by enabling more law enforcement personnel to receive training for work zone duty.

REASON(S) FOR ADOPTING:
Requiring work zone training for law enforcement personnel ensures that personnel involved in work zone management, speed enforcement, and incident

management are trained to follow the same protocol, decreasing the risk of an accident involving law enforcement personnel in work zones.

PRIMARY BENEFIT(S):
Law enforcement personnel will be better trained to safely handle the unique conditions and situations presented in a work zone.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All states where law enforcement personnel will be expected to provide enforcement and presence duty in work zones and assistance in managing incidents in work zones.

STATE(S) WHERE USED:
Louisiana, Maryland, New Jersey, Oregon

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Enforcement → Organizational Strategy	I1-3

BEST PRACTICE:

Full-Time State Police Positions Assigned to Safety and Construction Issues

DESCRIPTION:

In Maryland, a State Police Liaison Officer is available to provide valuable input on a number of highway safety related issues including work zones. The State Police and the Maryland State Highway Administration (MDSHA) understand each other's roles and work together as a team to solve mutual safety problems. The Liaison Officer has been working on location with MDSHA for over 10 years.

The New Jersey Department of Transportation (NJDOT) and the New Jersey State Police (NJSP) developed a unique construction unit consisting of NJSP Troopers to assist NJDOT Resident Engineers in monitoring and enforcement of the approved traffic control plans (TCPs). The unit was activated in 1994 to increase the performance level of law enforcement services relating to work zone safety and to establish consistency in enforcement of TCPs on a statewide basis. Troopers assigned to the NJSP Construction Unit receive specific work zone safety training.

REASON(S) FOR ADOPTING:

MDSHA and the Maryland State Police realized that Maryland's highway system would operate more efficiently and safely if both agencies worked as a team. A number of highway safety issues: 1) work zone traffic control safety concerns, 2) freeway traffic incident management, 3) special events, and 4) seasonal traffic management responsibilities, led to the adoption of this policy.

The NJDOT and NJSP realized the need to increase the level of performance of law enforcement personnel in work zones and provide enforcement consistency on a statewide basis.

PRIMARY BENEFIT(S):

The primary benefits being realized from this best practice include: 1) improved highway safety, 2) immediate action on highway safety issues, 3) improved operations between State Police and MDSHA/DOT personnel, 4) uniformity in the implementation of TCPs, and 5) increased level of safety for workers and travelers.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of facilities. All types of work.

STATE(S) WHERE USED:
Maryland, New Jersey

SOURCE/CONTACT(S):
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Enforcement → Organizational Strategy	I1-4

BEST PRACTICE:

Helping All Work Zones Keep Safe (HAWKS) Program

DESCRIPTION:

This is a program between North Carolina Department of Transportation (NCDOT) and the North Carolina State Highway Patrol to monitor work zones where crashes and/or speeding is a problem. The program funds off-duty highway patrolmen to monitor and provide surveillance to problematic work zones. Work zones are selected based on a scoring system that uses data on crash rate, average speed, congestion, and the type of roadway to determine priority locations. This program is supported by Federal funding and uses an 80/20 reimbursement ratio to fund these activities.

REASON(S) FOR ADOPTING:

Previous law enforcement efforts in work zones were not organized and prioritized. The HAWKS program allows the DOT to select and coordinate the work zones where enforcement and surveillance activities are needed. In addition, this program is more cost effective than previous efforts in that NCDOT can select specific focus areas for enforcement.

PRIMARY BENEFIT(S):

The greatest benefit is the reduction of work zone crashes and fatalities. Also, whenever crashes occur in these work zones, the presence of law enforcement dramatically reduces clearance times and the return of normal traffic flow through the zone.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Projects selected for review are typically significant projects which are usually on high-speed/volume freeways. However, the HAWKS has been proven effective for all types of roadways with speed limits of 55 MPH and greater.

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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Enforcement → Speed Management	I2-1

BEST PRACTICE:

Active Law Enforcement to Manage Speed in Work Zones

DESCRIPTION:

The predominate use of on-duty Florida Highway Patrol (FHP) officers for active patrolling of projects for speed control/traffic enforcement began in 1995. Prior to that, the use of off-duty officers was the normal practice. FDOT reimburses the FHP out of project funds per the FDOT/FHP agreement. Conditions to consider in deciding on the use of Speed and Law Enforcement Officers may include, but not be limited to:

- A work zone requiring reduced speeds
- Work zones where barrier wall is used adjacent to through traffic
- Night time work zones
- Areas with intense commuter use where peak hour traffic will require speed enforcement
- A work zone in which workers are exposed to nearby high speed traffic
- Work zones similar to the ***Design Standards***, ***Index 608*** *(Two-Lane Two-Way Temporary Diversion Connection),* ***613*** *(Multilane Work within the Travel Way, Median, or Outside Lane),* ***614*** *(Multilane Work with the Travel Way, Center Lane),* ***and 651****(Multilane Divided, Maintenance and Construction).*

The FDOT contract with the Department of Highway Safety and Motor Vehicles, as well as Hireback Reports, can be found at the following link:
http://www.dot.state.fl.us/construction/Engineers/MOT/FHP_Contract.shtm

REASON(S) FOR ADOPTING:

The use of off-duty officers was not achieving the desired results of lowering speeds on major freeway projects. Off-duty officers on contractor's payroll had to obtain "on-duty" status to issue citations, thus rarely wrote citations for speeding.

PRIMARY BENEFIT(S):

The on-duty FHP officers are providing active patrolling with an emphasis on speed enforcement. Officers, when paid directly by the State, give more control of the officer's assignments to the project's personnel and are coordinated in advance with the FHP.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Urban or rural freeways and limited access roadways. All types of work.

STATE(S) WHERE USED:
Florida

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Enforcement → Speed Management	I2-2

BEST PRACTICE:

Drone Radar in Work Zones

DESCRIPTION:

Drone radar units are small, electronic devices that emit radio signals. The signals will then activate all radar detectors within range. Motorists that have a radar detector in their vehicles may perceive the signals from the drone as an indication of the presence of police enforcement, and as a result reduce their speed because they perceive there is a risk of a speeding citation. A drone radar unit is attached to equipment typically seen in a work zone, such as an arrow panel or signpost.

REASON(S) FOR ADOPTING:

The idea is to alert vehicles to slow down to a reasonable speed through work zones. The advance notice would also alert sleepy, fatigued, and inattentive drivers.

PRIMARY BENEFIT(S):

Speed reductions and safer work areas.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All types of high-speed facilities, locations, and work.

STATE(S) WHERE USED:

Massachusetts

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Best Practices Category J - ITS and Innovative Technology

These best practices use intelligent transportation systems (ITS) to automatically collect and analyze before, during, and after-work traffic flows in the work zone; provide accurate real-time information automatically to motorists and to the construction team; enforce speed; and provide the information needed for road users to safely navigate the work zone.

Examples of practices include:

- Mobile surveillance trailers to collect traffic data for locations that do not have permanent surveillance infrastructure.
- Portable ITS technologies that can provide real-time roadside travel and traffic management information and can capture work zone speed and volume data.
- Effective tools and techniques for safely and efficiently merging traffic approaching a work zone with lane closures.
- Automated equipment to perform high-exposure, short-term maintenance operations.

The following best practice entries relate to ITS and innovative technology practices:

Subcategory	Ref. #	ITS AND INNOVATIVE TECHNOLOGY Best Practices
J1 Traffic Monitoring and Management	J1-1	Queue Length Detector
	J1-2	Mobile Surveillance/Ramp Metering
	J1-3	Portable ITS Technology for Work Zone Traffic Management
	J1-4	Dynamic Lane Merge
J2 Traveler Information Delivery	J2-1	Indiana Expert System for Advanced Traveler Information
	J2-2	Providing Real-Time Traffic Information via Changeable Message Signs
	J2-3	Work Zone ITS for Traveler Information
J3 Other Technology Tools	J3-1	Automated Machine for Cone Placement and Retrieval
	J3-2	Toolbox for Work Zone ITS

ITS and Innovative Technology → Traffic Monitoring and Management	J1-1

BEST PRACTICE:

Queue Length Detector

DESCRIPTION:

This detector uses infrared beams projected across the traffic lanes to monitor how long it takes vehicles to cross through the beam. If the length of time exceeds a certain preset amount, then traffic has stopped or slowed. When this happens an alert is automatically sent to workers to try to remedy the problem, and take action to increase traffic flow.

REASON(S) FOR ADOPTING:

To detect traffic queues, minimize delays caused by road work, and reduce the number of rear-end collisions.

PRIMARY BENEFIT(S):

Increased safety, fewer rear-end collisions, less delay.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any work zone where queues may form.

STATE(S) WHERE USED:

Missouri

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ITS and Innovative Technology → Traffic Monitoring and Management	J1-2

BEST PRACTICE:
Mobile Surveillance/Ramp Metering

DESCRIPTION:
This practice features self-powered mobile surveillance trailers with various off-the-shelf technologies such as wireless communication infrastructure operating in several unlicensed frequencies (spread spectrum), and video image processing. This technology is able to provide images and traffic data (speed, volume, occupancy) to the traffic management center (TMC) from locations that do not have permanent surveillance infrastructure (e.g., sensors, loops, CCTV) or have had it interrupted during road work. The trailers can be used to control ramp meters that have had their normal capabilities disabled and can keep them in communication with the TMC.

REASON(S) FOR ADOPTING:
The reason for exploring this method of traffic surveillance is in some instances during construction, surveillance for essential links in the freeway system or in the city street network may be disrupted. If no existing surveillance infrastructure existed before construction began and considerable traffic disruption is expected, this method would allow for collection of information that can be used to detour or inform the traveling public by activating variable message signs. During an event management scenario (Super Bowl, large conventions, or the State Fair), the trailers can be helpful in managing traffic.

PRIMARY BENEFIT(S):
This practice will allow the collection of traffic data (speed, volume, occupancy) and the transmittal of video images while the existing surveillance infrastructure is inoperable (due to construction, maintenance, etc.) or if there is no existing infrastructure. Freeway ramp meters will be running in normal mode and will remain in communication with the TMC although their sensors and loops may not be operating.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
This method of collecting data can be used on freeways and city streets, in urban areas and rural areas, in a variety of construction activity.

STATE(S) WHERE USED:
California

SOURCE/CONTACT(S):

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ITS and Innovative Technology → Traffic Monitoring and Management	J1-3

BEST PRACTICE:

Portable ITS Technology for Work Zone Traffic Management

DESCRIPTION:

Portable ITS technologies such as variable message signs (VMS), highway advisory radio (HAR), and queue length detectors have been used by Missouri Department of Transportation on various construction projects to detect traffic conditions and provide messages to motorists. The detectors collect data such as lane-occupancy and traffic speed and send them to a computer. The computer processes the data and determines appropriate messages to display to motorists on VMS. For example, if the traffic data show that a slowdown is occurring and backups are forming, the system can be programmed to automatically display a warning message on the VMS. The ITS technologies of VMS and HAR provide continuous and updated information to the traveling public as they approach or travel through construction zones.

The Indiana Department of Transportation (INDOT) has used a variety of technologies including highway advisory radio (HAR), variable message signs (VMS), Indiana lane merge (dynamic merge), and closed circuit TV. The HAR is incorporated into the construction project and remains operational after construction to become a part of the State system.

REASON(S) FOR ADOPTING:

The ITS technologies provide additional data on the traffic situation, allowing more effective management of the traffic through construction zones. The information can be used to keep motorists advised of real-time conditions, to smooth traffic flow, and to give drivers earlier notice when incidents occur and advance warning to avoid rear-end crashes. The information also helps motorists to consider other travel options.

PRIMARY BENEFIT(S):

Benefits are improved traffic management through construction zones, reduced congestion, and reduction in frustration of the traveling public and rear-end crashes when delays are experienced. Driver behavior is improved as a result of making traveler information available. Also, it improves emergency response time to incidents.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The “smart work zone” is most applicable on freeway facilities, both urban and rural. It is especially useful where high volume is experienced. It can also be helpful in recreational and tourist locations with seasonal traffic.

RELATED BEST PRACTICE(S):
Dynamic Lane Merge (Practice J1-4)
Providing Real-Time Traffic Information via Changeable Message Signs (Practice J2-2)
Work Zone ITS for Traveler Information (Practice J2-3)

STATE(S) WHERE USED:
Indiana, Missouri

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ITS and Innovative Technology → Traffic Monitoring and Management	J1-4

BEST PRACTICE:
Dynamic Lane Merge

DESCRIPTION:
At work zone lane closures, conventional merging practices can sometimes lead to long queues, undesired speed differentials between lanes, aggressive driving, and an increased potential for traffic crashes. A dynamic lane merge system that varies merging behavior based on traffic conditions can help smooth traffic flow approaching a merge point. A dynamic lane merge implementation involves the deployment of both static and changeable message signs, in conjunction with ITS technologies, to encourage drivers to either merge early or late (depending on traffic volume) as they approach a lane closure. Dynamic lane merges can have a positive effect on aggressive driving, queue lengths, throughput, crashes, travel time, and speed differentials between lanes, resulting in improved safety and mobility.

One example of a dynamic lane merge implementation is the Indiana lane merge system (ILMS). ILMS involves a dynamic no passing zone placed prior to the taper of a work zone. Work zone engineers place an initial sign, equipped with constantly activated flashing strobes, followed by additional signage that is automatically activated upstream of the work zone when capacity is high in order to alert drivers of the no-passing zone. The Indiana Department of Transportation (INDOT) completed a comprehensive study of the expected impacts of ILMS and how it could positively affect work zone safety and mobility in the future as a part of ILMS implementation activities.

REASON(S) FOR ADOPTING:
The Indiana lane merge concept was developed to reduce aggressive merging near the taper and encourage motorists to switch lanes well upstream of the discontinuous lane taper.

PRIMARY BENEFIT(S):
Benefits realized from this lane concept are improved safety as a result of fewer crashes, and improved traffic smoothness and mobility. The study of the ILMS showed that as the number of vehicles on the roadway increased, ILMS's dynamic no-passing zone algorithms improved safety and decreased congestion. As the congestion decreased, ILMS had less of a positive effect on congestion and safety.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Freeways in urban and rural environments where congestion is expected due to lane closures.

STATE(S) WHERE USED:
Indiana

SOURCE/CONTACT(S):
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ITS and Innovative Technology → Traveler Information Delivery	J2-1

BEST PRACTICE:

Indiana Expert System for Advanced Traveler Information

DESCRIPTION:

The Indiana Expert System is an advanced traveler information system (ATIS) that has been used in work zones to provide traveler information. The expert system enables the traffic management center (TMC) staff to program messages to travelers from the TMC, remote locations, or from their vehicles at the site of an incident. The Indiana Expert System can send these messages to highway advisory radio (HAR), variable message signs (VMS), pagers, etc. simultaneously.

REASON(S) FOR ADOPTING:

The Indiana Expert System was adopted to reduce the time required to deliver real-time messages to the public, minimize the number of people involved in the process, and inform travelers of traffic conditions so they can make informed decisions.

PRIMARY BENEFIT(S):

The biggest benefit realized is improved traveler information, including work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

The Indiana Expert System is most applicable to urban and rural freeways.

STATE(S) WHERE USED:

Indiana

SOURCE/CONTACT(S):

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ITS and Innovative Technology → Traveler Information Delivery	J2-2

BEST PRACTICE:

Providing Real-Time Traffic Information via Changeable Message Signs

DESCRIPTION:

Portable traffic monitoring and messaging systems are designed to keep drivers informed of current traffic conditions on the road ahead. These traffic-responsive systems are used in work zones to continuously monitor real-time traffic conditions and automatically respond with appropriate and dynamic messaging, such as travel time information; delay time information; alternate route information; stopped traffic warnings; dynamic speed displays; and lane merge and other motorist instructions. These messages are usually displayed to motorists using changeable message signs. The systems detect traffic volumes and/or speeds at various locations using sensors and send the data to a computer that can use the data to determine the most appropriate message to display. Traffic information systems can run 24 hours a day, 7 days a week, keeping motorists informed of traffic conditions, the need to be cautious, or take an alternative route, during work zone projects.

REASON(S) FOR ADOPTING:

Traffic conditions can change frequently in work zones. Real-time systems better enable monitoring of current conditions and providing up-to-date messages to motorists.

PRIMARY BENEFIT(S):

Reduced crashes, providing travelers with information on which to make alternate route decisions, and reduced motorist frustration and user costs.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Any work zone exposed to traffic. May be most useful in areas with high traffic volumes and highways with limited sight distance.

RELATED BEST PRACTICE(S):

Portable ITS Technology for Work Zone Traffic Management (Practice J1-3)
Work Zone ITS for Traveler Information (Practice J2-3)

STATE(S) WHERE USED:

Illinois

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ITS and Innovative Technology → Traveler Information Delivery	J2-3

BEST PRACTICE:

Work Zone ITS for Traveler Information

DESCRIPTION:

Work Zone intelligent transportation system (ITS) technologies are sometimes implemented in work zones where permanent systems are not located to provide real time work zone information. These portable work zone systems are easily deployed and can provide "real time" road side travel information, information for traffic management (i.e., dynamic lane and detour routing) as well as capturing work zone speed and volume data for performance driven mobility metrics. These systems can be stand alone or incorporated into a traffic management center.

REASON FOR ADOPTING:

To provide the motoring public with "real time" work zone information to improve both mobility and safety of motorists and construction workers.

PRIMARY BENEFIT(S):

- Reduction of congestion associated with lane closures.
- Reduction/elimination of rear-end crashes and fatal crashes due to excessive queuing.
- More reliable and accurate en-route travel information.
- Reduction of "road rage" for smoother, safer traffic flow through work zones.
- Improved communication with the motoring public resulting in a more positive image of NCDOT.
- Real time, credible information resulting in better compliance with suggested traveler actions.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Each project needs to be evaluated before any system is selected and deployed. The work zone traffic problems need to be identified and understood prior to implementing any system.

RELATED BEST PRACTICE(S):

Portable ITS Technology for Work Zone Traffic Management (Practice J1-3)
Providing Real-Time Traffic Information via Changeable Message Signs (Practice J2-2)

STATE(S) WHERE USED:

North Carolina

SOURCE/CONTACT(S):

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ITS and Innovative Technology → Other Technology Tools	J3-1

BEST PRACTICE:

Automated Machine for Cone Placement and Retrieval

DESCRIPTION:

The California Department of Transportation (Caltrans) developed and tested a machine that will mechanically place and retrieve cones, thus reducing maintenance personnel exposure to the hazards of traffic and physical exertion involved in handling the cones. The Automated Cone Machine uses robotics, automation, and advanced computer control to place and retrieve cones around highway work zones. The development of the machine was conducted by the Advanced Highway Maintenance and Construction Technology Center (AHMCT) (http://ahmct.ucdavis.edu/), which is jointly managed by the University of California, Davis and Caltrans.

REASON(S) FOR ADOPTING:

Deployment of cones is currently achieved by a person riding on the exterior of a modified vehicle. This process requires a considerable amount of manual effort and personnel are exposed to the hazards of traffic in addition to the physical exertion involved in handling the cones.

PRIMARY BENEFIT(S):

Benefits are expected in improved safety and operational efficiency. The advanced cone machine removes the need for a worker riding in the rear area of the truck.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Roadway maintenance on all freeways and for any work zones requiring placement and collection of traffic cones.

STATE(S) WHERE USED:

California

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ITS and Innovative Technology → Other Technology Tools	J3-2

BEST PRACTICE:
Toolbox for Work Zone ITS

DESCRIPTION:
The Minnesota Department of Transportation (MnDOT) has developed an Intelligent Work Zone (IWZ) Toolbox as a guideline for selecting an appropriate IWZ System to address existing work zone traffic issues and to mitigate anticipated issues on scheduled projects. The Toolbox describes 14 types of IWZ systems, each of which is a collection of standard system components which have been combined to produce a real-time system that can be applied to solve a work zone issue. The various components address collecting, storing, managing, analyzing, and transmitting data to the motorist. The Toolbox groups the systems into three categories, traffic responsive systems, vehicle responsive systems, and environmentally responsive systems, and contains discussion on possible benefits, considerations for when to use a system, and a possible layout of components for each of the 14 systems. The system descriptions in the Toolbox are intended as brainstorming material to aid in the development of practical solutions to a project's unique problems.

REASON(S) FOR ADOPTING:
The IWZ Toolbox helps MnDOT effectively use IWZ Systems to address existing work zone traffic issues and to help mitigate anticipated issues on scheduled projects. MnDOT has found that under certain conditions IWZ systems can be more effective and safer than using static signs and flaggers in terms of gaining motorist's attention, providing motorists with accurate, real-time information, and increasing appropriate vehicle speeds and lane usage through the work zone.

PRIMARY BENEFIT(S):
The Toolbox helps project designers and engineers determine which work zones would benefit from applying an IWZ System and which system might be suitable to address both existing work zone traffic issues and expected issues on upcoming projects.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All work zones. While ITS may not be used on all work zones, the Toolbox can help engineers make the best decisions on which work zones to use it on.

STATE(S) WHERE USED:
Minnesota

SOURCE/CONTACT(S):

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Best Practices Category K - Evaluation and Feedback

These best practices emphasize methods to collect and evaluate work zone data and feedback from road users and others. Performance measures for work zones (e.g., minutes of delay, queue length, number of crashes) can be used to evaluate how well agencies are meeting performance goals for mobility and safety in work zones. Best practices include those that emphasize the electronic collection of work zone crash data, since this enables an agency to use automated processes to analyze the data for trends and to produce reports that can be periodically furnished to appropriate DOT offices (including, but not limited to, design and construction project personnel).

Through mechanisms such as surveys, meetings, and project hotlines, motorists provide perspectives on how well their demands for mobility and safety in work zones are being met.

Examples of practices include:

- Uniform work zone definitions and work zone data for reporting work zone crashes.
- An electronic crash data collection system developed to automatically transmit raw work zone crash data to the highway agency.
- Performance measures for work zone mobility and delay that can be applied to a specific project, statewide, and nationally.
- Project customer surveys to evaluate work zone acceptability.
- A committee to review and develop recommendations to improve maintenance of traffic through work zones.

The following best practice entries relate to evaluation and feedback:

Subcategory	Ref. #	EVALUATION AND FEEDBACK Best Practices
K1 Data Collection/ Analysis	K1-1	Work Zone Crash Data Analysis
	K1-2	Analysis of Work Zone Crash Data
	K1-3	Analysis of Work Zone Crash Trends
K2 Driver Surveys	K2-1	Work Zone Report Card
	K2-2	Project Specific Customer Surveys on Major Interstate Reconstruction Projects
K3 Project Review and Use of Findings	K3-1	Work Zone Review Team
	K3-2	Statewide Work Zone Inspection Program
	K3-3	Maintenance of Traffic (MOT) Committee
	K3-4	Work Zone Safety Task Force
	K3-5	Work Zone Safety Award Program

Evaluation and Feedback→ Data Collection/Analysis	K1-1

BEST PRACTICE:

Work Zone Crash Data Analysis

DESCRIPTION:

In coordination with other sections within the Wyoming Department of Transportation (WYDOT), the Wyoming State Traffic Engineer monitors construction related accidents, analyzes the data, and submits an annual report to the State Construction Engineer. Data collected includes the number of crashes that occur in the following situations:

- Detour or lane transition;
- While flagging is present;
- Involving a traffic control device;
- Involving contractor equipment;
- Resulting in injuries:
- Resulting in fatalities;
- In an urban area;
- In a rural area;
- During the day; and
- During the night.

REASON(S) FOR ADOPTING:

The intent of this analysis is to correct problems with accident locations as they develop and to determine accident trends and the relationship between various methods of traffic control and crashes.

PRIMARY BENEFIT(S):

Safety issues can be addressed on current work zones, and corrective actions (such as revising traffic control standards) for future work zones can be taken to address recurring observations. These actions could involve situations in planning, pre-construction, construction, and maintenance.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

This practice/policy is applicable for all work zones.

RELATED BEST PRACTICE(S):

Analysis of Work Zone Crash Data (K1-2)
Analysis of Work Zone Crash Trends (K1-3)

STATE(S) WHERE USED:

Wyoming

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Evaluation and Feedback→ Data Collection/Analysis	K1-2

BEST PRACTICE:

Analysis of Work Zone Crash Data

DESCRIPTION:

Agencies compile and analyze work zone crash data through ongoing efforts and special studies to help identify areas of concern in work zones. This analysis can identify issues and take corrective actions on individual projects. Such efforts can also identify larger trends and be used to update policies/standards.

The New York State Department of Transportation (NYSDOT) compiles data related to work zone fatalities and injury crashes based on type, area within the work zone, driver characteristics, and type of collision. This information is used to identify trends in driver behavior and potential work zone emphasis areas to improve work zone safety. The information is collected at the NYSDOT Regional level and analyzed by the main office. The information is categorized in many ways including the following:

- Accident Category (fatal, hospital, minor, unknown)
- Accident Type (e.g., rear end, worker hit by vehicle, etc.)
- Work Zone Situation (e.g., alternating 1-way traffic, lane shift, etc.)
- Project Related Traffic Accidents at Flagger-Controlled Locations (e.g., head-on, sideswipe, etc.)
- Project Related Traffic Accidents based on
    - Project Type (e.g., bridge, pavement, maintenance, etc.)
    - Facility Type (e.g., principal arterial interstate, minor collector, etc.)
    - Driver Characteristics (e.g., age, sex, and locality)
    - Time of Day
- Accidents Involving
    - DOT Employees (e.g., trip or fall, vehicle struck worker, fall from elevated structure, work zone intrusion)
    - Consultant Employees
    - Contractor Employees

Many other States also collect work zone safety-related information to improve mobility and safety for current projects and future efforts.

- The Kansas Department of Transportation (KDOT) collects and analyzes information on crashes in construction zones and then informs law enforcement and construction managers about the crash frequency. As a part of this effort, KDOT staff members provide recommendations for work zone safety improvements to officials for consideration during projects and after projects for future efforts.

- The Montana Department of Transportation (MDT) collects and analyzes data on construction crashes and evaluates whether changes need to be made at an individual work zone, or to its policies.

REASON(S) FOR ADOPTING:
This practice was adopted to identify trends and better develop countermeasures to reduce the deaths and injuries associated with crashes in or near work zones.

PRIMARY BENEFIT(S):
Reduced fatalities and injuries are a result of the countermeasures, as well as increased knowledge and situational awareness regarding crashes in work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All locations and projects.

RELATED BEST PRACTICE(S):
Work Zone Crash Data Analysis (K1-1)
Analysis of Work Zone Crash Trends (K1-3)

STATE(S) WHERE USED:
Kansas, Montana, New York

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Evaluation and Feedback→ Data Collection/Analysis	K1-3

BEST PRACTICE:

Analysis of Work Zone Crash Trends

DESCRIPTION:

The Ohio Department of Transportation (ODOT) uses a real-time crash analysis tool to track work zone crashes on a subset of pre-selected work zones. ODOT collects data on crashes in these work zones and compares the data to historical data to identify changes in trends. The data are captured in near real-time by electronic queries and bi-weekly visits to law enforcement agencies. ODOT uses this data to monitor crash frequencies at the selected work zones to ensure they stay at or below the crash frequency at the same location prior to the establishment of the work zone.

To analyze the crash data, ODOT constructed a system to routinely run queries on the crash data to draw attention to high crash areas. After initial system programming and set-up, the analysis, graphs, and summary data are produced instantly by the push of a button. This analysis enables ODOT to identify crash trends at their work zones. If ODOT finds that the crash frequency is greater during a work zone than it was at the same location prior to the start of construction, or if ODOT observes a developing trend, changes can be made to the work zone in an attempt to prevent potential crashes. Work zone segments with increased crash frequency are visited and potential fixes are proposed by ODOT staff. This analysis allows traffic engineers to find problems in active work zones, investigate the issues, and apply necessary corrective strategies while the work zones are still active. When similar issues occur in multiple locations, ODOT considers changes to its design procedures and standards to prevent the issues from arising on future projects.

REASON(S) FOR ADOPTING:

This practice was adopted to identify trends and better develop countermeasures to reduce the deaths and injuries associated with crashes in or near work zones.

PRIMARY BENEFIT(S):

Reduced fatalities and injuries are a result of the countermeasures, as well as increased knowledge and situational awareness regarding crashes in work zones.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All locations and projects.

RELATED BEST PRACTICE(S):
Work Zone Crash Data Analysis (K1-1)
Analysis of Work Zone Crash Data (K1-2)

STATE(S) WHERE USED:
Ohio

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Evaluation and Feedback → Driver Surveys	K2-1

BEST PRACTICE:
Work Zone Report Card

DESCRIPTION:
Motorist feedback is one of many ways that State DOTs are gathering information to assess their efforts to provide safety and mobility in work zones. The Missouri Department of Transportation (MoDOT) created an online survey tool to enable the public to provide feedback on work zones on state highways. Drivers are asked to comment on the effectiveness of work zone warning signs, cones and barrels, speed limits, and flagger directions. The survey also asks for comments on whether travel through the work zone was timely (i.e., if there were delays) and safe, as well as the weather conditions while driving through the work zone and the type of vehicle used. MoDOT uses this information to help identify issues and make adjustments in the field to current work zones and, along with its own inspections, to assess three measures on visual guidance, traffic flow, and safety in Missouri work zones.

The survey program began in January 2009, and MoDOT collected 2100 surveys in the first year. Survey responses were from both the general public and non-technical MoDOT staff. MoDOT promotes the survey through messages on changeable message signs and boards, announcements on the MoDOT website, and information cards placed in Missouri Welcome Centers. In the first year of the program, 89% of the respondents felt that MoDOT's work zones were meeting their expectations. The survey is available at http://www.modot.org/workzones/Comments.htm.

REASON(S) FOR ADOPTING:
The report cards provide another way to identify any problem areas in work zones where adjustments and improvements may be needed. These areas can then be investigated and addressed as needed to improve safety and mobility for motorists and workers.

PRIMARY BENEFIT(S):
The quick online survey has made it easy for the public to provide feedback on work zones. The public feedback helps MoDOT evaluate public satisfaction with their work zone efforts. The first-hand information from the public can also help increase work zone safety and efficiency. The public serves as another set of eyes in the field who experience the work zone, sometimes on a daily basis, and their feedback can help MoDOT quickly identify issues.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All work zones.

STATE(S) WHERE USED:
Missouri

SOURCE/CONTACT(S):
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Evaluation and Feedback → Driver Surveys	K2-2

BEST PRACTICE:

Project Specific Customer Surveys on Major Interstate Reconstruction Projects

DESCRIPTION:

This practice has been implemented as a part of major Interstate reconstruction contracts. The surveys are used to evaluate the effectiveness of efforts to minimize delays and enhance the safety of work zones. This practice begins shortly after construction and basically consists of mail-out surveys and central location surveys to acquire input from the traveling public on the effectiveness of the maintenance of traffic measures used on the project. Changes are made if problem areas are identified by the surveys.

REASON(S) FOR ADOPTING:

The main reason for adopting this practice was the sheer size of some reconstruction projects and the fact that they would undoubtedly impact most of the traveling public in a major population center at one time or another. This practice was an effort to collect information on public opinion and reaction to the project maintenance of traffic measures, and to use it to identify problem areas, making improvements where needed.

PRIMARY BENEFIT(S):

Gaining extensive public input into the traffic control measures, and identifying modifications based on input received.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

Large urban projects.

STATE(S) WHERE USED:

Utah

SOURCE/CONTACT(S)

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Evaluation and Feedback → Project Review and Use of Findings	K3-1

BEST PRACTICE:
Work Zone Review Team

DESCRIPTION:
A team composed of FHWA and Kansas Department of Transportation traffic engineers, designers, and construction personnel periodically performs an onsite scan of project work zones throughout the State. As they scan the work zones, participants list positive and negative aspects of the operation. The information is shared with the appropriate construction office and further action is taken if necessary.

REASON FOR ADOPTING:
This enables the State to standardize work zone procedures as well as educate field personnel on acceptable work zone management.

PRIMARY BENEFIT(S):
Work zones throughout the State are standardized, and personnel are more aware of best possible practices and procedures. This helps limit dangerous liability and enables headquarters personnel to determine first-hand what does and does not work in the field, improving work zone design in the future.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Any work zone statewide.

STATE(S) WHERE USED:
Kansas

SOURCE/CONTACT(S):
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Evaluation and Feedback → Project Review and Use of Findings	K3-2

BEST PRACTICE:

Statewide Work Zone Inspection Program

DESCRIPTION:

The New York State Department of Transportation (NYSDOT) is committed to an aggressive work zone safety inspection program which monitors worker and traveler safety performance indicators. Each year a statewide survey of work zone traffic control is conducted by inspecting a representative sample of construction, maintenance and permit projects. The purpose of the Statewide Work Zone Inspection Program is to gather information which enables NYSDOT to evaluate the overall adequacy of work zone traffic control on department projects and identify areas where improvements are needed.

The evaluation includes design, implementation, and maintenance of work zone traffic control and assesses compliance with department standards, practices, and policies. The inspections are done by a team of Central Office and Regional Office staff from the various program areas responsible for work zone safety. The inspections rate individual work zone safety and traffic control elements in each work zone based on a 0 through 5 point rating system. A checklist is used for each project to ensure that critical elements are reviewed and documented. Overall performance is evaluated by determining the percentage of individual work zone traffic control elements that receive a 4 or better rating. Training and revisions to specifications, standards and policies, or other initiatives are developed each year based on deficiencies that are observed during the field reviews.

REASON(S) FOR ADOPTING:

The safety program ensures the continual improvement of work zone traffic control on New York State Highways through a process of evaluating uniformity and compliance with state standards.

PRIMARY BENEFIT(S):

- Effective traffic control through maintenance and construction work zones.
- Steady improvement of traffic control, as indicated by survey results.
- Promotion of the open exchange of ideas between Regional and Central Office personnel.
- Identification of improvement opportunities.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All work zones on New York State highways, with an emphasis on construction and maintenance work zones.

STATE(S) WHERE USED:
New York

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Evaluation and Feedback → Project Review and Use of Findings	K3-3

BEST PRACTICE:
Maintenance of Traffic (MOT) Committee

DESCRIPTION:
The MOT Committee consists of a multi-discipline team made up of representatives from construction, design, maintenance, traffic engineering, safety, product evaluation, utilities, and FHWA, and sometimes members from private organizations such as Builders Associations and ATSSA. The MOT Committee reviews, investigates, and develops recommendations (for senior management) to improve the MOT for all work zone traffic control. Issues such as pavement edge drop-off protection, MOT cost overruns, revision of specifications, and safety training are topics generally considered.

REASON(S) FOR ADOPTING:
This group provides a means for those most involved in traffic control to meet and discuss common problems and to resolve conflicts. Problem situations are discussed among those who are most qualified to suggest and make decisions.

PRIMARY BENEFIT(S):
The biggest benefits realized from this best practice are: 1) gaining input from the various offices/associations, 2) development of better policies and/or directives, 3) better information exchange and the reduction of potential problems, and 4) development of a good working relationship with other offices.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
All types of facilities. All types of work.

STATE(S) WHERE USED:
Florida, Maryland

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Evaluation and Feedback → Project Review and Use of Findings	K3-4

BEST PRACTICE:
Work Zone Safety Task Force

DESCRIPTION:
This Task Force is comprised of Washington State Department of Transportation (WSDOT) Headquarters and regional representatives from design, construction, maintenance, traffic, and employee safety, along with representatives from Washington State Patrol, the construction industry, local professionals, and technical engineers. The Task Force initially identified 28 recommendations with the purpose of reducing work zone impacts, including increasing safety training, better reflective gear for workers, intensified public education and outreach through the *Give 'em a Brake* campaign, and partnering with Washington State Patrol whose presence in work zones has greatly increased safety. The Task Force continues to meet quarterly to monitor progress with the implementation of the recommendations and to develop new initiatives.

REASON(S) FOR ADOPTING:
The Task Force was initiated in response to the increase in work zone accidents and near miss traffic incidents.

PRIMARY BENEFIT(S):
The Task Force brings attention and focus to work zone safety with high level support. Issues are addressed by a multi-discipline team. Numerous actions to improve work zone safety have been implemented as a result of the Task Force.

MOST APPLICABLE LOCATION(S)/PROJECT(S):
Statewide.

STATE(S) WHERE USED:
Washington

SOURCE/CONTACT(S):
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Evaluation and Feedback → Project Review and Use of Findings	K3-5

BEST PRACTICE:

Work Zone Safety Award Program

DESCRIPTION:

The Minnesota Department of Transportation (MnDOT) has had a Work Zone Safety Awards Program in place since 1988. Originally the program was designed to recognize contractors and public agency construction personnel who have put forward outstanding work zone safety efforts on construction projects. Since 1994 MnDOT has maintained a Work Zone Safety Awards Program for county maintenance employees as well. The program recognizes counties that put forward outstanding work zone safety efforts on county maintenance projects.

REASON(S) FOR ADOPTING:

The program was implemented to increase work zone safety awareness among counties, maintenance workers, contractors, and MnDOT construction personnel by rewarding those who demonstrate outstanding efforts in work zone safety.

PRIMARY BENEFIT(S):

The award program has had a very positive impact on improving the work zone safety consciousness of county maintenance and front-line workers in Minnesota.

MOST APPLICABLE LOCATION(S)/PROJECT(S):

All counties, contractors, and public agency personnel in Minnesota are eligible to win this award.

STATE(S) WHERE USED:

Minnesota

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Subject Index

The topics listed below are drawn from the best practices contained in the Guidebook. The subtopics provide more specific ways for identifying specific best practices that relate to areas of interest. The numbers given for each topic or subtopic are the best practice reference numbers (not page numbers).

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