



COLORADO
Department of Transportation



CDOT Work Zone Safety and Mobility Rule *Procedures Document*

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Marcee Allen (FHWA Region 8)
Kevin Ashoury (CDOT Maintenance)
Larry Brinck (CDOT (Project Development)
Mindy Crane (CDOT Public Information)
Ken DePinto (CDOT ITS)
Toni Gatzen (CDOT Public Information)
Larry Haas (CDOT Region 4)
Jake Kononov (CDOT Research)
San Lee (CDOT Safety & Traffic Engineering)
Ken Nakao (CDOT Safety & Traffic Engineering)
KC Matthews (CDOT Safety & Traffic Engineering)
Keith Powers (CDOT Region 5)
Kevin Radel (CDOT Region 1)
Ronnie Roybal (CDOT Safety & Traffic Engineering)
Nancy Shanks (CDOT Public Information)
Roy Smith (CDOT Region 6 Maintenance)
Gabriela Vidal (CDOT Safety & Traffic Engineering)
Roland Wagner (CDOT Region 3)

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by HQ Traffic and Safety Engineering

2829 West Howard Place, 4th Floor

Denver, CO 80204

Telephone: (303) 757-9662

Fax: (303) 757-9219



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INTRODUCTION

A Transportation Management Plan (TMP) lays out a set of coordinated strategies and describes how these strategies will be used to manage the work zone impacts of a project. The key to a successful TMP is early development in the project's life-cycle and the use of a multidisciplinary approach. More details about the TMP can be found in Section 630.10 of the CDOT Standard Specifications for Road and Bridge Construction.

TMP development occurs during the preliminary engineering and design phases of a project. During project development (i.e., preliminary engineering), the potential work zone impacts of a project should be assessed and work zone transportation management strategies and associated costs identified. The level of detail of this assessment may increase as more project specific information becomes available. The TMP development process is intended to work in an iterative manner that helps identify the work zone impacts of a project, given a certain combination of construction phasing and impacts management strategies.

The scope, content, and degree of detail of a TMP may vary based on the expected work zone impacts of the project. Additional information and examples of TMPs can be found in the FHWA TMP development resource website at the following URL:

http://www.ops.fhwa.dot.gov/wz/resources/final_rule/tmp_examples/sample_tmpls.htm.

Overview of TMP Development

TMP development occurs during the preliminary engineering and design phases of a project. During project development (i.e., preliminary engineering), the potential work zone impacts of a project should be assessed and work zone transportation management strategies and associated costs identified. The level of detail of this assessment may increase as more project specific information becomes available. The TMP development process is intended to work in an iterative manner that helps identify the work zone impacts of a project, given a certain combination of construction phasing and impacts management strategies.

Scope, Content, and Degree of Detail

The TMP consists of strategies to manage the work zone impacts of a project. Its scope, content, and degree of detail may vary based on the expected work zone impacts of the project. All projects must comply with the Region's Lane Closure Policy. The Region Traffic Engineer must approve all work that does not comply with the Region's Lane Closure Policy.

Significant Project

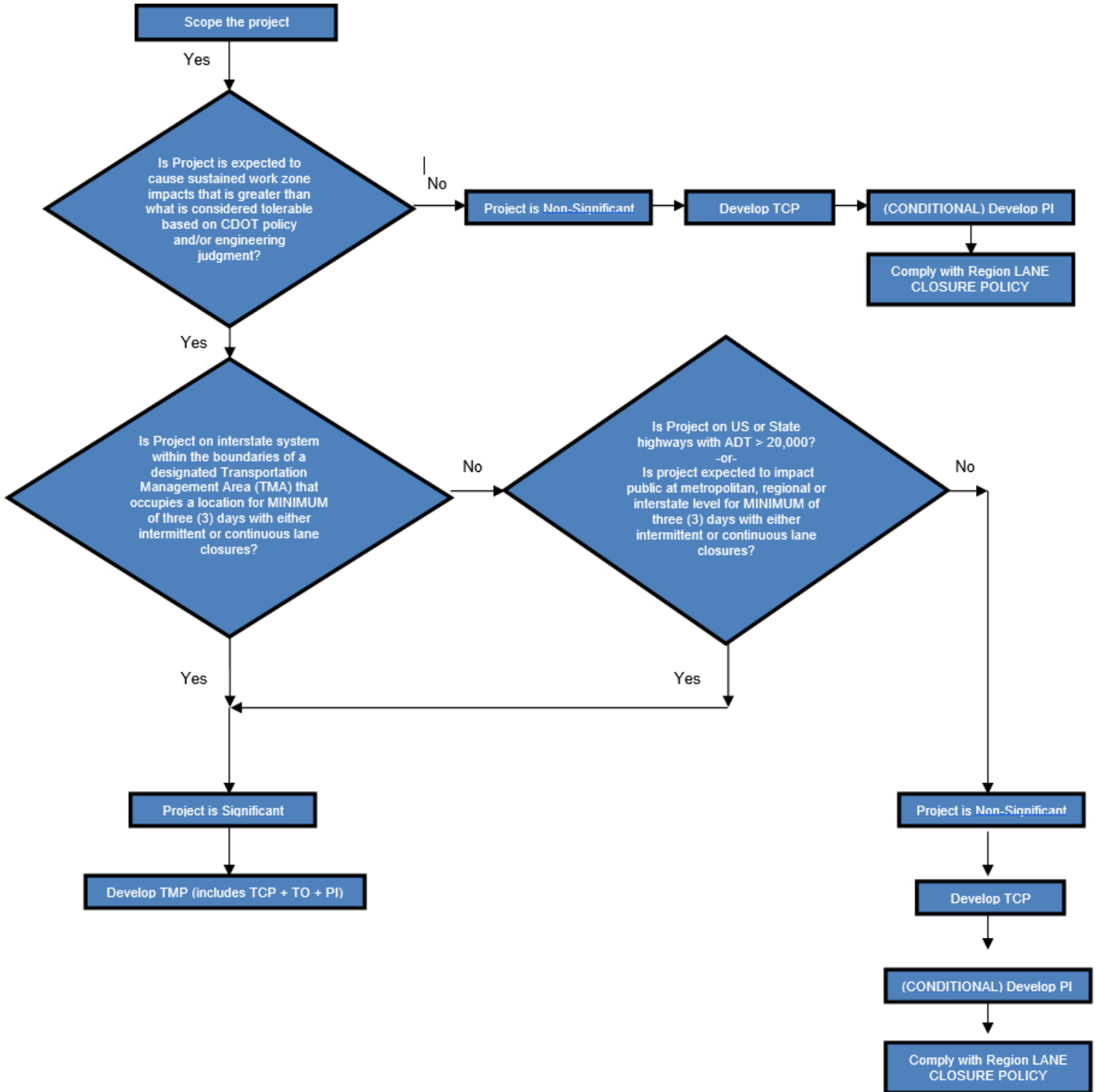
A significant project is defined as one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts at a location for three or more consecutive days with either intermittent or continuous lane closures. A significant project impacts the traveling public at the metropolitan, regional or the Interstate level and has a moderate to very high level of public interest. It will directly impact a moderate to very large number of travelers and will have moderate to very high user cost impacts.

For significant projects, the TMP consists of three components: a Traffic Control Plan (TCP), Transportation Operations (TO), and Public Information (PI). For individual projects or classes of projects that are not classified as significant, the TMP, at a minimum, will consist of a TCP. The TO and PI components are optional but should always be considered.

	TCP	PI	TO
Significant Projects	Required	Required (The Project must obtain written approval from the FHWA to be exempt from this requirement)	Required Comply with the requirements of the project regions <u>Lane Closure Policy</u> (The Project must obtain written approval from the FHWA to be exempt from this requirement)
Non-Significant Projects	Required	If <u>ANY</u> of the following characteristics applies, a PI is <u>REQUIRED</u> : <input type="checkbox"/> High level of Public Interest <input type="checkbox"/> Significant impact on public/private access (e.g. businesses, communities, park & ride lots, schools, fire stations, etc.) <input type="checkbox"/> Project timing (e.g. special events, etc.) that will result in an increase in traffic volumes. If <u>NONE</u> of the above apply, PI is Optional	Must comply with the requirements of the project region's <u>Lane Closure Policy</u> *

*A full TO analysis is required if the Region does not have a lane closure policy.

Determination of Significant Projects Flow Chart



Traffic Control Plan (TCP)

Construction phasing greatly affects the safety and mobility of work zone users. It is important that designers and construction engineers who develop the construction phasing plans consult and appropriately involve safety experts, traffic engineers and other technical specialists in the project development process. Construction phasing and traffic control plans (TCPs) must be developed concurrently. A review should be conducted to verify the feasibility of the TCP and phasing. Transportation Operations (TO) and Public Information (PI) components should be considered at the same time as construction phasing and TCP development to generate a well-thought-out TMP. The best TMP development process involves developing and evaluating the best combination of project design, TCP, TO strategies, PI strategies, and construction phasing.

The TCP describes measures to be used for guiding road users through a work zone or an incident area. The TCP plays a vital role in providing continuity of reasonably safe and efficient road user flow and highway worker safety when a work zone, incident, or other event temporarily disrupts normal road user flow. The TCP shall be consistent with the provisions of Sec 630.10 of the CDOT Standard Specifications for Road and Bridge Construction, CDOT M&S Standard Plans, Manual on Uniform Traffic Control Devices (MUTCD), and any applicable incident management plans. The scope of the TCP is determined by the project characteristics, and the traffic safety and control requirements identified for the project. The TCP shall include specific elements from CDOT Standard Specifications for Road and Bridge Construction, CDOT M&S Standard Plans, MUTCD, or be designed specifically for the project in the form of Method of Handling Traffic (MHT) plans.

Transportation Operations (TO) Component

The TO component of the TMP consists of compliance with the Region's Lane Closure Policy. (The Region Traffic Engineer must approve all work that does not comply with the Region's Lane Closure Policy.) In addition, TO strategies should be identified that will be used to mitigate impacts of the work zone on the operation and management of the transportation system within the work zone impact area. Typical TO strategies may include, but are not limited to, travel demand management, corridor/network management, work zone safety management, traffic incident management and speed enforcement (pp. 34 – 41). The scope of the TO component should be determined by the project characteristics, and the identified transportation operations and safety strategies (Also see Sect 630.10(b) of the CDOT Standard Specification for Road and Bridge Construction).

Public Information (PI) Component

The PI component of the TMP includes communications strategies that inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions on the project (pp. 42 – 44). This may include motorist information strategies. The scope of the PI component should be determined by the project characteristics and the identified public information and outreach strategies. Public information should be provided through methods best suited for the project and may include, but not be limited to, information on the project characteristics, expected impacts, closure details, and commuter alternatives.

A significant project procedures guideline and checklist is shown in the next two pages.

Significant Project Procedures

Project #: _____ Location: _____

A Significant Project is any project which meets ALL of the following:

- A project that alone, or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts that is greater than what is considered tolerable based on CDOT policy and/or engineering judgment.
- On an interstate system within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for a MINIMUM of three (3) days with either intermittent or continuous lane closures.

Or a Significant Project is any project which meets ANY of the following:

- Construction is on US or State highways with an Average Daily Traffic (ADT) count of OVER 20,000.
- A project that is anticipated to impact the traveling public at the metropolitan, regional or the interstate level for a MINIMUM of three (3) days with either intermittent or continuous lane closures.

Projects meeting the definition of a Significant Project require a Transportation Management Plan (TMP), consisting of a temporary Traffic Control Plan (TCP), Transportation Operations (TO) strategies, and Public Information (PI) strategies. Check one:

- Project meets the criteria for a Significant Project
- Project DOES NOT meet the criteria for a Significant Project [TMP includes TCP, Conditional PI (see CDOT Work Zone Safety and Mobility Rule Procedures Document) strategies, and TO strategies]

Traffic Control Plan strategies included in this plan set (see pages 17-22). Check all that apply:

- | | |
|---|--|
| <input type="checkbox"/> Construction phasing/staging | <input type="checkbox"/> Full road closures |
| <input type="checkbox"/> Lane shifts or closures | <input type="checkbox"/> One-lane two-way operation |
| <input type="checkbox"/> Two-way traffic on one side of divided highway | <input type="checkbox"/> Reversible lanes |
| <input type="checkbox"/> Ramp closures/relocations | <input type="checkbox"/> Night/weekend work |
| <input type="checkbox"/> Work hour restriction | <input type="checkbox"/> Business access improvements/coordination |
| <input type="checkbox"/> Off-site detours/alternative routes | <input type="checkbox"/> Accelerated construction procedures |
| <input type="checkbox"/> Innovative construction techniques (precast or rapid cure materials) | |
| <input type="checkbox"/> Other (please specify): _____ | |

Transportation Operations strategies included in this plan set (see pages 23-29). Check all that apply:

- | | |
|--|---|
| <input type="checkbox"/> Signal timing/coordination improvements | <input type="checkbox"/> Temporary signals (fixed or portable) |
| <input type="checkbox"/> Street/Intersection improvements | <input type="checkbox"/> Bus turnouts |
| <input type="checkbox"/> Turn/parking restrictions | <input type="checkbox"/> Truck/Heavy vehicle restrictions |
| <input type="checkbox"/> Truck lanes | <input type="checkbox"/> Reversible lanes |
| <input type="checkbox"/> Ramp closures | <input type="checkbox"/> Railroad crossing controls |
| <input type="checkbox"/> Coordination with adjacent construction | <input type="checkbox"/> Construction speed zone |
| <input type="checkbox"/> Temporary or moveable traffic barriers | <input type="checkbox"/> Shadow vehicles with truck-mounted attenuators |
| <input type="checkbox"/> Crash cushions | <input type="checkbox"/> Temporary rumble strips |
| <input type="checkbox"/> Intrusion alarms | <input type="checkbox"/> Warning lights |
| <input type="checkbox"/> Review by Region Safety Team | <input type="checkbox"/> ITS for traffic monitoring/management |
| <input type="checkbox"/> Safety award incentives | <input type="checkbox"/> Surveillance for incidents (video, loop detectors) |
| <input type="checkbox"/> Transportation Management Center (TMC) | <input type="checkbox"/> Incident/Emergency response plan |
| <input type="checkbox"/> Tow/Service patrol | <input type="checkbox"/> Local detour routes |
| <input type="checkbox"/> Police presence/enforcement | <input type="checkbox"/> Traffic Fines Double |
| <input type="checkbox"/> Speed trailers or fixed radar units | |
| <input type="checkbox"/> Other (please specify): _____ | |

Public Information strategies included in this plan (see pages 30-32). Check all that apply:

- | | |
|---|---|
| <input type="checkbox"/> Coordinate with Region PI officer | <input type="checkbox"/> Brochures/Mailers |
| <input type="checkbox"/> Press releases/media alerts | <input type="checkbox"/> Paid advertisements |
| <input type="checkbox"/> Public Information Centers | <input type="checkbox"/> Telephone hotline |
| <input type="checkbox"/> Planned lane closure website | <input type="checkbox"/> Public meetings/hearings |
| <input type="checkbox"/> Coordination with schools, businesses | <input type="checkbox"/> Coordination with emergency services |
| <input type="checkbox"/> Work zone education/safety campaigns | <input type="checkbox"/> Rideshare promotions |
| <input type="checkbox"/> Traffic radio | <input type="checkbox"/> Changeable/Dynamic message sign |
| <input type="checkbox"/> Highway Advisory Radio (HAR) | <input type="checkbox"/> Contracted PI services |
| <input type="checkbox"/> Transportation Management Center (TMC) | <input type="checkbox"/> Temporary motorist information signs |
| <input type="checkbox"/> Other (please specify): _____ | |

DEVELOPMENT AND IMPLEMENTATION OF THE TMP

Detailed information of the TMP can be found in Section 630.10 of the CDOT Standard Specifications for Road and Bridge Construction book, and the FHWA TMP development resource website at the following URL: http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm. The project designer should compile available project materials, such as the project definition (project scope, roadway/traffic characteristics, other factors such as public outreach/community information, etc.), construction phasing approaches/plans, preliminary work zone management strategies, and preliminary cost estimates for TMP development and implementation. Information for other projects within the corridor should also be compiled to assess the combined/cumulative impact of the projects.

TMP Development During Preliminary Engineering and Design

The designer works with traffic engineering/operations personnel and other relevant technical specialists in preparing the project design. As more information and data become available, preliminary work zone strategies, and their costs should be reassessed and refined. The following points should be considered in the development of TMPs:

1. The first step in developing a TMP is to identify the stakeholders that should be involved. CDOT stakeholders may include staff from design, traffic/operation, safety, construction, planning, and maintenance as well as other technical specialists. Other stakeholders may include other local traffic agencies, railroad agencies/operators, freight companies, utility providers, law enforcement, emergency services, courtesy patrols, businesses, schools, and/or community groups, and transit providers.
2. Congestion Mitigation strategies should be identified based on the project constraints, costs, and construction phasing plan. The stakeholders' role is to provide input for the document. CDOT has lane closure policies that must be followed. The use of simulation and analysis tools are used to predict delays, queues, and impacts of detours.
3. The PS&Es shall include all required TMP components, or the provisions, for a consultant developed TMP. For example, all projects are required to have a TCP. Projects requiring a TO component must specify the TO strategies to be utilized on the project in the general notes and include all contract language, plan sheets, and specifications required to implement the selected strategies. Projects requiring a PI component must utilize the Public Information Services specification. The TMP components needed for projects are based on whether the project is significant or non-significant (see pp. 1 - 3). TMPs must be approved by the CDOT project engineer prior to implementation. Once approved, the TMP and the phasing plans are finalized. The PS&Es shall include appropriate pay item provisions for implementing the TMP. For method-based specifications, individual pay items, lump sum payment, or a combination of the two may be used. For performance-based specifications (incentive/disincentive), applicable performance criteria and standards shall be used (e.g., safety performance criteria such as number of crashes within the work zone; mobility performance criteria such as travel time through the work zone, delay, queue length, and traffic volume; incident response and clearance criteria; and work duration criteria).

TMP Implementation and Monitoring During Construction

1. CDOT and the contractor shall each designate a trained person at the project level who has the primary responsibility and sufficient authority for implementing the TMP and other safety and mobility aspects of the project.

The designated person:

- makes routine inspections to determine that the Transportation Management Plan (TMP) is properly implemented and functioning in compliance with the plans, specifications, the MUTCD, and the Colorado Supplement to the MUTCD,
 - ensures that traffic control device inspections are conducted every calendar day per CDOT Standard Specification 630.11(6),
 - has authority to halt work until applicable or remedial safety measures are taken,
 - reports needed changes to the Project or Resident Engineer,
 - documents any major changes to the TMP,
 - assists Department staff with work zone crash reviews, and
 - coordinates with and assists the Public Information Office with any information needed for implementation of PI strategies for which the Contractor is not responsible.
2. The consultant and/or project designer may re-evaluate or modify components of the TMP due to alternate construction phasing or other recommended work zone management strategies. All TMP modifications must be approved by the CDOT project engineer prior to implementation.
 3. Some of the components may need to be implemented prior to construction (e.g., public relations campaign, improvements to detour routes). During construction, implementation of the TMP and the performance of the work zone must be continuously monitored (per section 630.10 of the CDOT Standard Specifications for Road and Bridge Construction book) to verify that the predicted impacts closely resemble the conditions in the field. Example performance measures are volume, travel time, queue length, delay, number of incidents, incident response and clearance times, contractor incidents, community complaints, user costs, and cumulative impacts from adjacent construction activities. Delays or queue lengths shall be measured on a weekly basis using the CDOT WorkZone User Cost program (found at the following URL: <http://www.coloradodot.info/business/engineeringapplications/download-area.html>), and the Work Zone Safety and Mobility Traffic Queuing Form (see p. 46) to ensure that they are within the acceptable limits set by the Region's Lane Closure Policy. Performance measures shall be based on current CDOT policies, standards, specifications and procedures and shall be included in the contract. If performance requirements are not met, CDOT and/or a consultant shall revisit the TMP and consider alternate management strategies and/or phasing approaches that meet the approval of the CDOT project engineer. Adjustments shall be made to the TMP as necessary and documented (see pp. 21 – 26).

Post-Construction Performance Evaluation

Prior to project acceptance, the contractor shall submit a report that contains an evaluation of the TMP. The post-project evaluation report shall contain successes and failures, changes made to the TMP and the results of those changes, public input, actual versus predicted measures, cost for implementation of the strategies, and suggested improvements (per CDOT Standard Specification 630.11).

QUALITY ASSURANCE REVIEWS FOR WORK ZONE TRAFFIC CONTROL (TRAFFIC CONTROL REVIEWS)

Introduction

CDOT places a high priority on the safety of workers and the traveling public in the management of its construction and maintenance programs. Minimizing traffic congestion and adverse impacts on the local community are also important considerations. To support these objectives, work zone traffic control is an integral element in the management of Department programs. Work zone management in turn is comprised of several distinct elements. These include:

- establishment of overall goals and objectives,
- development of standards and specifications,
- provisions for project-specific traffic control plans,
- providing staff training and development,
- Contractor/industry outreach,
- maintaining an accident reporting and analysis system, and
- maintaining an ongoing traffic control quality assurance program.

CDOT annually reviews randomly selected projects for the purpose of assessing the effectiveness of its procedures.

The CDOT Quality Assurance program will be utilized for all temporary traffic control on CDOT roadways and projects—construction, maintenance, and permits. The statewide work zone review program, also known as the Traffic Control Review (TCR) program, was initiated in July 2004 in response to management concerns for the quality of temporary traffic control, and to comply with FHWA requirements.

The purpose of the program is to gather information to evaluate the overall quality and effectiveness of work zone traffic control throughout the Department, to identify areas where improvement is needed, and to facilitate open discussion of traffic control issues. Regions are expected to use the review results to address and correct both project-specific and Region-wide issues.

The responsibility for administration of these requirements will rest with the Contracts and Market Analysis and the Safety and Traffic Engineering Branch.

Traffic Control Review Procedures

1. The TCRs will be performed every year. Region staff are encouraged to perform TCRs on their projects in addition to the process identified in this document. The TCR program does not change the requirement for Resident Engineers (RE) to perform TCRs on projects as defined in the Construction Manual.
2. A TCR may have two components. The field review component consists of performing a review of the existing traffic control on the roadway the day of the review. The office review component consists of reviewing the traffic control documentation for the project. Both these components will be documented using the TCR Form. All engineering projects shall have a field review. One Engineering project per region shall have an office review. Maintenance

projects will have a field reviews as well as a review of any documentation available from the TCS.

3. The TCR Team will consist of a representative from the Region Traffic Program, FHWA, and an Area Engineer (AE). Optional personnel include a representative from the Region Safety Office, Region Maintenance, and headquarters Risk Management.
4. To ensure consistency between the TCR Teams and prior to performing any TCR, the AEs will perform a practice field review on an active construction project.
5. TCRs will be performed on six (6) Engineering projects in Region 1 and on four (4) Engineering projects in the other regions. The AEs will randomly determine potential Engineering projects. If feasible, one (1) Engineering TCR per region should be performed at night. TCRs will be performed on two (2) Maintenance projects per region. Maintenance projects will be identified by the team Maintenance representative or other means necessary.
6. There are three (3) types of notice for the TCRs: “Notified”, “No Notice,” and Maintenance. Below describes the procedures for the three types:
 - a. Notified: Half of the scheduled Engineering TCRs will be “Notified”. The primary purpose of these TCRs is to educate staff and directly improve traffic control. These TCRs will have a score and will not be reported to FHWA. At a minimum, the results of the review will be used to generate discussion and ensure a complete review. The AEs will contact the Program Engineers to develop the list of potential projects. The AEs will notify the Program Engineer and RE of the impending review a minimum of two (2) weeks prior to the review. The AE will coordinate with the Project Engineer two (2) working days in advance of the scheduled review.
 - b. No Notice: Half of the Engineering projects will be “No Notice” TCRs. The primary purpose these TCRs is to measure the quality of the traffic control for reporting purposes. A score on the No Notice TCR is required and included in the report to FHWA. The AEs will make every attempt to make these TCRs educational and interactive with project staff while maintaining the integrity of the scoring. If project staff are not able to join the team during the review or immediately after, the Program Engineer or project staff may request the AEs conduct a project specific post review meeting to discuss the TCR findings.
 - c. Maintenance: Considering Maintenance work plans change frequently, the TCR may be Notified or No Notice reviews. If Maintenance staff are not available during or immediately after the TCR, a project specific post review meeting may be held at the request of the Maintenance Superintendent or project staff.
7. Upon completion of all the TCRs, a statewide post-review meeting will be held and attended by the AEs, FHWA, Division of Maintenance (DMO), and the Traffic and Safety Branch. The purpose of the meeting is to determine if there are any actionable items and if so to determine how to move them forward. The actionable items may be regarding the findings related to the traffic control on the projects or regarding the TCR process. AEs will take meeting minutes for purposes of reporting as described below.

REPORTING

Contracts and Market Analysis will report results every year as follows:

1. Each Region’s RTD, Program Engineers, and Region Traffic Engineer will receive the Region’s final report with project scores and a statewide average score. The statewide

average score for the construction projects will be based on the projects with “NO NOTICE” reviews. A separate section will be written with the “NOTIFIED” projects information. The report will also include a description of any specific region and statewide issues.

2. Each RE will receive the scores for the projects and the statewide average score. This report will also include a description of specific region and statewide issues.
3. Each Project Engineer will receive the project’s score and the statewide average score. Their report will also include a description of specific region and statewide issues.
4. The WZSMR team will receive all TCR results, the post-review meeting minutes, and a list of actionable items.
5. The Maintenance Resident Engineer will receive all the Maintenance project’s TCR results, the average Engineering score, and the statewide Maintenance projects average.

TMP CONTENT

TMP consists of three components: a TCP, TO, and PI. For individual projects or classes of projects that are not classified as significant, the TMP, at a minimum, will consist of a TCP. The TO and PI components should be considered. This section is intended to serve as overall guidance that sets forth some basic principles and issues to consider in developing TMPs. The following is a list of the TMP development items that should be considered. Each item is described in more detail in the sections that follow.

1. Project Description
2. Project TMP Roles and Responsibilities
3. Existing and Future Conditions
4. Work Zone Impacts Assessment
5. Work Zone Impacts Management Strategies
6. TMP Monitoring Requirements
7. Traffic Incident Management Plans (TIMP)
8. Key Findings
9. Appendices

Project Description

The project description presents the scope and definition of the project. It may include:

- Project type
- Project area/corridor/limits
- Project goals and constraints
- Proposed construction phasing
- General schedule and timeline
- Related and/or adjacent projects

Project TMP Roles and Responsibilities

The roles and responsibilities for the development, implementation, monitoring, and evaluation of the TMP should be documented. These may include, but are not limited to:

- Design Engineer
- Project Engineer
- Resident Engineer
- Program Engineer
- Maintenance Superintendents
- Maintenance Supervisors
- Stakeholders
- Contractors
- Public Information Manager
- CDOT Office of Public Relations
- Incident Management Coordinator

- Emergency Contacts

Existing and Future Conditions

This includes information on existing and anticipated future conditions in the study area including traffic, safety, and business/community access. Examples are:

- Data collection and modeling approach
- Existing roadway characteristics (history, roadway classification, number of lanes, geometrics, urban/suburban/rural)
- Existing and historical traffic data (volumes, speed, capacity, volume/capacity, percent trucks, queue length, peak traffic hours)
- Existing traffic operations including signal timing, delay, and traffic control types
- Crash data
- Incident data
- Local community and business concerns/issues
- Traffic growth rates (for future construction dates)
- Traffic predictions during construction (volume, delay, queue)

Work Zone Impacts Assessment

Depending upon the project type, the TMP may include a qualitative and/or quantitative analysis of work zone impacts, impacts assessment of alternative strategies (in conjunction with each other), and the impacts of the chosen management strategies. Examples are:

- Region lane closure policies
- Qualitative summary of anticipated work zone impacts
- Impacts assessment of alternative project design and management strategies (in conjunction with each other)
- Construction approach/phasing strategies
- Work zone impacts management strategies
 - Traffic analysis results (if applicable)
 - Traffic analysis strategies
 - Analysis tool selection methodology and justification
 - Analysis results
- Constructability issues
- Selected alternative

Work Zone Impacts Management Strategies

The objectives of work zone impact management strategies are to minimize traffic delays, maintain or improve motorist and worker safety, and maintain access for businesses and residents. For the TMP, work zone impact management strategies should be identified for both the mainline and detour routes for the construction phasing approach(es). Where appropriate, the management strategies should be documented on plan sheets and the “Significant Projects Procedures” checklist, found on pp. 5 – 6. A list of work zone strategies for the temporary traffic

control, traffic operations, and public information components are discussed in more detail in Section 5.

TMP Monitoring

Monitoring Requirements

This should include or refer to any CDOT policies, standards, requirements, and procedures for TMP implementation. The monitoring should consider both the performance of individual TMP strategies and overall performance of the work zone and work zone impact area during construction. The following items, as appropriate, shall be included in the formal project documentation:

- Verification of work zone setup (via MHTs and Daily TCS Diaries)
- Identification of the process for monitoring TMP performance (e.g., volume counts, queue length, accidents, complaints, surveys)
- Tracking TMP implementation costs and comparing them to the budgeted costs via Change Modification Orders (CMO's) and/or SiteManager
- Approach for and performance of corrective actions when TMP performance requirements are not met (e.g. when maximum queue lengths or delays specified in the Region's lane closure policy are exceeded)
- When alternative TMPs or changes to the TMP are submitted via revised MHTs, CMOs, or revised Phasing plans
- Identification of the person responsible for monitoring each component of the TMP before or during the pre-construction meeting (typically the CDOT Project Engineer/Manager and the Region's Public Information representative)

Evaluation Report Requirements:

The TMP should include a reference to the development of an evaluation report upon completion of construction to document lessons learned and provide recommendations on how to improve the TMP process and/or modify guidelines. The report should include the following:

- An overall statement reflecting the usefulness of the TMP
- Changes necessary to correct oversights in the TMP
- Changes made to the original plan and their level of success
- Public reaction to the TMP
- The maximum and average delay time encountered (e.g., average queues, slowdowns) during peak and off-peak periods, and delay history over the duration of the project
- Identification of the peak traffic periods
- Frequency of legitimate complaints and the nature of the complaints
- Types and numbers of crashes that occurred during construction
- Types and numbers of safety service patrols incidents
- Level of success and performance log for each strategy of the TMP implemented
- Suggested improvements or changes for similar future projects

Performance Monitoring

The TMP should include the following components to ensure that the following TMP components are addressed and included in all future significant project TMPs:

- Project contract documents should specify the contractor TMP implementation responsibilities and compliance documenting should be in the project files.
- A determination should be made for each significant project how closely the predicted impacts resemble actual conditions in the field, and whether or not the implemented TMP strategies are effective and are in compliance with the Region Lane Closure Strategies.
- CDOT should ensure that a monitoring plan will be a component of the Transportation Management Plans for all significant projects in the State.
- The monitoring should initially occur during peak and off-peak periods and on a weekly basis, with the frequency reduced if when conditions stabilize.
- Delay and queue data should be collected for periodic analysis. A copy of the Work Zone Safety and Mobility Traffic Queuing Form is found on p. 46. Results of the analysis should show whether the TMP meets or exceeds the Department's goal of threshold of having less than the traffic delay minutes recommended in the Region Lane Closure Strategies.
- Work zone delay and queue measurements should be conducted using acceptable methods that include field observations and work zone drive-throughs, such as Section 630.10(a)(3), the Region Lane Closure Policy.
- Construction staff should be required to document all monitoring activities in a manner prescribed by HQ Safety and Traffic Engineering Branch.
- The monitoring plan should include a crash analysis of before and after a project is done and makes comparisons with another similar work zone.
- A project safety assessment should be reviewed and all potential locations for monitoring safety identified for any increase in crashes during construction.

TMP Performance Evaluation

The TMP procedures should include TMP evaluation guidelines for all significant projects. The following items, as appropriate, shall be included in the formal project documentation:

- CDOT should compile Statewide TMP performance results, analyze it and determine which TMP strategies are performing at an acceptable level. Acceptable levels should be as determined by the Safety and Traffic Engineering Branch.
- Performance evaluations should include field observations and measurements, effectiveness of TMP management strategies, innovative approaches/techniques/technologies used and lessons learned, and recommendations for policy or procedural change.

Debriefing Process

The TMP should include a post-construction review initiated between the Region Traffic Engineer and the Project Engineer, either during or after construction. The review should provide comments on what parts of the TMP process were, and were not, successful, and/or modify guidelines/specs for future projects. The following items should be included in the post-construction review:

- Initiating annual WZ data sharing to assess uniformity and compliance with policies and procedures, assesses which strategies are working and which are not.
- Collecting TMP best practices per project throughout the State and share these practices to the traffic designers for use on future projects.
- A formal TMP performance report documenting successes and failures will be prepared by the project engineer for each level III project.
- Recommendation of statewide review teams selecting practices and reports findings on TMP practices annually at conferences and training sessions.
- Collection of best practices throughout the State regarding TMP strategies and share the results at annual statewide conferences and training opportunities.

Traffic Incident Management Plan

Contingency plans are required for all planned work and should comply with Guidelines for Developing Traffic Incident Management Plans for Work Zones (http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-booklets-guidelines/Incident_Management_Guidelines_20080922.pdf/view).

The plan specifies activities that should be undertaken to minimize traffic impacts when unexpected events occur in the work zone (e.g., accidents, unforeseen traffic demand, inclement weather). This plan, developed by CDOT or a consultant, addresses specific actions to restore or minimize the effects of unexpected congestion or delays that exceed the original estimates or acceptable levels.

Key Findings

This section highlights some of the key findings for the selected alternative and discusses feasibility, anticipated traffic, or safety concerns (e.g., specific roadways with long estimated queues, accessibility issues, ability of the detour routes to handle diverted traffic) and any special provisions or issues.

Appendices

Appendices include information that may be relevant or of interest to the implementer of the TMP, TMP manager, CDOT, or other stakeholders. This could include, but should not be limited to, observed, historical, and/or estimated traffic volumes, speeds, travel times, level of service, delay, and accidents; maps; phasing plans; lane closure charts; and detailed analysis methodology, assumptions, parameters used; etc.

LIST OF WORK ZONE STRATEGIES

Temporary Traffic Control Plan (TCP) Strategies

Business access improvements. Some projects will have a direct impact on businesses, particularly accessibility. Accessibility improvements for businesses may include signage or information to direct motorists to the business(es) and/or relocation of access locations.

Changeable/dynamic/variable message signs (CMS/DMS/VMS). CMS/DMS/VMS are message boards placed along roadways (typically freeways) that notify travelers of incidents, travel time information, construction/road closures, and other potential hazards in or around the work zone. Careful placement of the roadway equipment provides the information at points where drivers have recourse and can adjust their routes to account for the information. These message signs should be used when the condition of the work zone is changing and where a static sign is not sufficient to provide the information to motorists.

Clear Zone. Establish clear zone in the work zone to ensure the Contractor's operations provide a clear area. The clear zone addresses items such as storage of equipment and employee's private vehicles, storage or stockpiling of project materials. The clear zone applies during working and non-working hours. It is not intended resolve preexisting deficiencies in the design clear zone or establish clear zone values at the completion of the project. Work zone clear zone values may be less than the design clear zone values due to the temporary nature of the construction site and limitation on horizontal clearance.

Construction phasing. The impacts of a work zone on traffic may be limited by the project phases, thus completing portions of a construction project one part at a time.

Flagging practice. This strategy involves safe flagging practice when flaggers are involved in work zone.

Freeway-to-freeway ramp closures. This strategy involves closing one or more freeway-to-freeway interchange connectors over a period of time. It may be necessary to close interchange connectors depending on the design characteristics and right-of-way availability. This type of closure will significantly impact the capacity of the facility, particularly on roadways with high volumes and/or congestion. Construction duration for this strategy can be reduced in conjunction with a design-build contracting approach. Provisions must be made for detouring traffic.

Full roadway closure. This strategy involves the complete closure of the roadway during the construction. It necessitates being able to detour traffic adequately onto existing routes. The advantage of this strategy is that it provides for faster construction by allowing the contractor full access to the work area and eliminates exposure of motorists to work zones and workers to traffic. It increases construction efficiencies, eliminates traffic control devices, and reduces overall project duration.

Full closure strategies (off-peak, night, intermittent). These strategies involve complete closure of the roadway for various time periods. Off-peak and night closures require detour routes and other strategies to manage the work zone traffic. For intermittent closures, traffic is stopped for short period(s) (one or both directions). Intermittent closures should be used only on roadways with low volumes or during periods of lower volumes (mid-day, night, weekends, etc.).

Lane closure. This type of work zone closes one or more existing traffic lanes. This strategy should be analyzed to determine if significant impacts would result from the loss of capacity. See your Region's Lane Closure Strategy document for more information.

Lane shift to shoulder/median/one side of divided facility. This strategy involves traffic being diverted onto the shoulder, a portion of the shoulder, or one side of a divided highway for use as a traffic lane. If the construction period is of long duration, a pavement engineer should determine if the pavement is adequate to support the traffic (consider the percentage of heavy vehicles for this corridor).

Off-site detours. This strategy involves re-routing traffic to other roadways and should be considered with total closure of the roadway or where capacity is significantly reduced (one or both directions). Attempts should be made to synchronize the detour route with the beginning and end of construction. Facilities with large volumes should be detoured to other major routes (if feasible), whereas local route detours can generally be used for four-lane facilities. In either case, improvements may be necessary to accommodate the diverted traffic on the detour routes. Some of the factors that should be considered include available capacity, geometrics, detour route speeds, pedestrian concerns, rail crossings, and oversize/overweight/over height vehicle concerns. Some of the improvements that may be needed for detour routes include:

Capacity/geometric improvements. Improvements to the detour route may be necessary to accommodate the diverted traffic from the roadway impacted by the work zone. These may include improvements to the mainline and/or intersections, including roadway and/or shoulder widening, and additional through and/or turn lanes.

One-lane, two-way operation. One lane, two-way traffic control involves using one lane for both directions of traffic. It is usually implemented for short-term projects on bridges or in rural areas over a short distance. This may include the use of flaggers or temporary/portable traffic signals to control traffic and minimize delay and safety concerns.

Parking restrictions. This strategy involves eliminating parking on the facility or instituting parking restrictions by time of day and/or day of week. The objectives can be either to use the parking area as an additional lane, increase capacity, or reduce traffic conflicts. Availability of parking for local businesses will need to be addressed, as well as the need to improve intersection geometrics to accommodate an additional lane.

Pedestrian/bicycle access improvements. This strategy involves improvements for pedestrians and/or bicyclists where the work zone impacts their accessibility. They may include physical separation of pedestrians and vehicles, temporary or permanent sidewalks or bike lanes, protection from drop-off locations, crosswalks, temporary or permanent lighting, and/or signal adjustments. Pedestrians/bicyclists should be directed to a safe location if walkways and paths cannot be provided. Special pedestrian/bicyclist considerations may be needed in locations where sidewalks traverse the work zone, where a school route traverses the work zone, where there is significant pedestrian/bicyclist activity, or where existing land use generates such activity (e.g., parks, schools, shopping).

Ramp closures/relocation. Ramp closure involves closing one or more ramps in or around the work zone (for specific time periods, days of week, or all day). It may be necessary for construction purposes or to improve traffic flow on the mainline. Ramp relocation may be used to maintain accessibility to the freeway and/or local businesses or community. Consideration should be given to additional signage and public information campaigns to forewarn motorists, the potential impact to business and community access, and detour route and information. For safety reasons, adjacent ramps should not be closed at the same time unless absolutely necessary.

Reduced lane width (constriction). This involves reducing the width of one or more lanes to maintain the existing number of lanes on the facility. The width reduction may be less if the

shoulder is available for use (width and structural adequacy). However, reduced lane widths reduce the facility's capacity and may require lane marking changes.

Reduced shoulder width. This involves reducing the width of the inside and/or outside shoulder for construction purposes.

Reversible lanes. This strategy involves sharing lane(s) of travel to accommodate peak period traffic flow. It is also known as variable lanes or contra-flow lanes. The direction of travel varies by time of day, or maybe day of week. Some sort of barrier (e.g., movable barrier system) should be used to maintain safety and direct traffic flow. However, the cost of this type of barrier system often limits the use of this strategy.

Shoulder closure. Shoulder closure prevents vehicles from using a shoulder or any portion of the shoulder for its intended legal use. This strategy should be avoided in areas with high incident rates. It may also require provisions for towing disabled vehicles and construction of shoulder pull-outs.

Signal timing/coordination. This involves retiming or coordinating (interconnecting) traffic signals to increase the capacity of the roadway and improve traffic flow.

Signage. Signage should accurately describe the situation in and around the work zone. The content of the signs should reflect what action should be taken by motorists and provide relevant and current information. Advance warning signs need to be spaced accurately to allow for motorists' action. Also, make sure to inspect/review signage frequently for compliance to state and federal regulations.

Construction signs. Advance signing should be used to notify the motoring public of the work zone and/or offer options for alternative routes. Signs should include dates and/or locations of construction and/or closures.

Detour signs. Detour signs should clearly direct motorists onto detour routes, through the detour, and back to the route from which they were detoured. Advance notice is required so that the motorists have time to choose an alternate route.

Traffic control officers. This involves the use of traffic control officers to direct traffic. It is most often used at heavily congested intersections or during special events, typically for a short duration.

Fines Double signs. These signs alert motorists to slow down in work zones or pay double the traffic fines for speeding in work zones.

Flaggers. Flaggers are persons who control traffic and assign right of way at approaches to work zones. They slow traffic to ensure the safety of the construction workers and motorists. Flaggers should be used only after all other suitable methods of traffic control are considered and should be limited to rural, low-volume roadways. Flaggers should be clearly visible to approaching traffic and located far enough upstream so that motorists will have time to respond.

Flashing arrow signs. These signs consist of a message board with a flashing arrow and are intended to aid motorists in navigating and merging through and around the work zone. They are particularly effective in alerting motorists of lane closures and/or the need to change lanes. They are intended to supplement conventional traffic control devices.

Signing and striping enhancements. Signs and/or striping enhancements are provided to guide motorists through the detour route.

Temporary structures/lanes/shoulders (temporary diversion or runaround). This work zone type involves the use of a temporary roadway for diverting traffic so the structure, roadway, or shoulders can be closed for the project. This type of work zone typically involves significant work preparing the temporary roadway prior to actual construction of the roadway and may involve additional right-of-way or easements. It is recommended that the temporary facility be designed such that capacity and safety impacts are the same as or better than the existing facility.

Traffic screens. Also known as glare or gawk screens, traffic screens consist of vertical panels that are attached on top of concrete barriers to minimize glare from opposing traffic and prevent motorists from viewing the construction activity. This is intended to be used to minimize rubbernecking delays and increase the safety of motorists and highway construction workers.

Two-way traffic operations on one side of divided facility (crossover). Also known as reconstruction by halves, this involves the reconstruction of all lanes in one direction while the opposing lanes share the roadway with traffic in the opposite direction. Shoulders and/or lane constrictions may be used to maintain the number of lanes in each direction. This strategy provides an effective work area, and workers are generally separated from the traffic stream; however, there is the need for crossovers and positive separation. This strategy should be considered when it can reduce the construction period, safety concerns can be addressed, and there is adequate geometry to allow for crossovers. Standards should be developed and used for this strategy (e.g., crossover lengths, pavement, speeds, and positive separation devices).

Work hour restrictions (peak hours, holidays, special events). This involves restricting work hours such that work does not occur during periods of peak travel demand and congestion. Work zone phasing will need to be considered to accommodate periods where longer construction duration is necessary.

Night work. Work is performed at night (end of evening peak period to beginning or morning peak period) to minimize the work zone impacts on motorists. Night work may occur during specific phases of the project or for the entire project duration. Night work has increased because of the need to maintain roads operating at or near capacity during the day. Safety issues may be of concern for night work as motorists' driving skills are typically impaired (e.g., lighting distractions, reduced perception, excessive travel speeds through the work zone). In addition, it is more difficult for contractors to get resources and labor for night work.

Weekend work. Construction work (all or phases) is restricted to weekends, i.e., the period from the end of the Friday afternoon peak period to the beginning of the Monday morning peak period.

Construction Management Techniques

A+B bidding. A+B bidding can be used to encourage contractors to minimize construction impacts by reducing the exposure time. This method is used to determine the winning bid, not actual payments to the contractor. Part A refers to the contractor's estimated cost of the work, and Part B refers to the total dollar amount based on a set user or agency cost per day times the number of days proposed by the contractor to complete the work.

Design-build. This strategy involves the use of one contractor to design and build the project. This decreases the project duration by allowing construction to begin prior to design completion. The results are reduced administrative costs; a single point of contact for design and construction issues; and flexibility for innovative designs, materials, and construction techniques.

Disincentives for lane closures. Under this strategy the contractor is assessed a specified amount for each quarter hour or other time period increment that he or she has not opened a lane or roadway to traffic during peak period rush hours. The penalty is usually very high and is generally based on road user costs. It is effective in ensuring that his or her work operations are complete prior to rush hour.

Incentive/disincentive clauses. This strategy involves the use of incentives and/or disincentives in the construction contract to minimize construction duration (e.g., additional funds may be paid to the contractor if the project is completed early or the contractor may be penalized if late). Incentive/disincentive provisions should be considered for projects that: have high traffic volumes; significantly impact traffic flow, businesses, and/or the community; replace a facility out of service (e.g., bridge or roadway damaged by a disaster); or have detours that are significant in length.

Innovative construction techniques (e.g., precast members, rapid cure materials). These strategies involve the use of special materials such as quick curing concrete or precast items (e.g., culverts) to minimize the duration of the work zone or where traffic restrictions need to be minimized (e.g., roadways with high volumes).

Lane rental. Lane rental involves a charge that is assessed to the contractor when a portion of the roadway is obstructed. The charge can vary according to time of day, day of week, number of lanes impacted, and duration. Contractors include in their bid an estimate to accommodate the number of hours they expect to keep a particular number of lane-miles closed. The contractor can make or lose money depending on how the actual number of lane miles involved compares to the bid.

No excuse bonus clauses. This strategy provides for a clause in the contract that awards the contractor a cash bonus for finishing the project or a significant item in the contract by a specified date. No excuses or outside impacts by weather, utilities, right of way, other contractors, unknown conditions, etc., are allowed that would change the set date. This strategy is particularly effective on projects that have utilities or right-of-way problems not cleared by the time work begins.

Milestones. This strategy sets milestones for different phases of a project to be complete to provide for earlier opening of a section of roadway or a bridge to traffic. Usually, incentive/disincentive or bonus clauses are added to give more emphasis to the milestone.

Other Strategies

Bicycle/pedestrian traffic controls. These may include physical separation of pedestrians and vehicles, temporary or permanent sidewalks or bike lanes, protection from drop-off locations, temporary or permanent lighting, and/or signal adjustments. Pedestrians/bicyclists should be directed to a safe location if walkways and paths cannot be provided. Special pedestrian/bicyclist considerations may be needed in locations where sidewalks traverse the work zone, where a school route traverses the work zone, where there is significant pedestrian/bicyclist activity, or where existing land use generates such activity (e.g., parks, schools, shopping). Also, if conditions exist, use pilot vehicles to direct bicyclists through safe routes in work zones.

Severe weather conditions. Severe weather information systems can be used to alert motorists of potential weather conditions to improve safety conditions through the work zone. However, because of increased difficulty in vehicle control and distraction and/or anxiety for road users during severe inclement weather, work on the project should be postponed, if possible, until the

weather conditions improve. Planned work zone management strategies for the project should continue if inaction would be worse than allowing the work zone to be unattended.

TRANSPORTATION OPERATIONS (TO) STRATEGIES

Travel Demand Management

Automated Flagger Assistance Devices (AFADs). AFADs are portable traffic control systems that assist a flagger operation for short-term lane closures, on two-lane highways. For a typical flagging operation with AFADs, one or both flaggers can be positioned a short distance away from the roadway and moving traffic. A flagger(s) can operate an AFAD(s) by using a radio control unit or an attached cable. This strategy should be considered in areas with high crash rates and on short-term lane closures where flaggers are needed.

HOV lanes. High-occupancy vehicle (HOV) lanes, also known as carpool lanes, require two or more persons per vehicle for use (exceptions may include motorcycles and/or low-emission vehicles). HOV lanes can provide better efficiency for the roadway by moving more people per lane than does a general purpose lane. However, there needs to be a large amount of similar origins and destinations, and/or incentives (park-and-ride lots, preferential parking, time savings, ridesharing match program, etc.), for this strategy to work. HOV lanes could involve using a shoulder, using the median, or dedicating a travel lane for this purpose (likely to be controversial) and can be used during peak periods or for 24 hours/day.

Late Merge (Utilizing multiple lanes to the merge point). Where appropriate, signs may be placed through the work zone to encourage motorists to use all available lanes to the physical merge point. By utilizing all lanes and taking turns to merge, more traffic can move through the work zone; thus, reducing the queue length.

Park and ride promotion. This strategy involves the creation, expansion, and/or promotion (advertising) of park and ride lots to encourage ridesharing or transit use and reduce the number of vehicles traveling through the work zone.

Parking supply management. This strategy involves managing the parking supply typically through cost strategies to reduce the traffic demand. This strategy is difficult to implement unless parking at the origin/designation is controlled by CDOT and/or parking is limited.

Pedestrian/bicycle access improvements. This strategy involves improvements for pedestrians and/or bicyclists where the work zone impacts their accessibility. These may include physical separation of pedestrians and vehicles, temporary or permanent sidewalks or bike lanes, protection from drop-off locations, temporary or permanent lighting, and/or signal adjustments. Pedestrians/bicyclists should be directed to a safe location if walkways and paths cannot be provided. Special pedestrian/bicyclist considerations may be needed in locations where sidewalks traverse the work zone, where a school route traverses the work zone, where there is significant pedestrian/bicyclist activity, or where existing land use generates such activity (e.g., parks, schools, shopping).

Reduced fares. Payments are made to a transit provider to subsidize fare costs to encourage increased ridership during the period of construction to reduce vehicles through the project.

Ridesharing/carpooling incentives. This strategy involves the use of rideshare/carpool incentives to reduce the number of vehicles going through a work zone. This could include preferential parking for carpools, the addition of mainline HOV lanes or bypass lanes on ramps, provision of vanpool vehicles, etc. These incentives should be used only in areas where a benefit such as reduced travel time or reduced user costs may be expected.

Shuttle services. Shuttles and charter buses may be considered if a large number of users along the corridor are anticipated to use this service. Users would need to realize a benefit in travel time, parking costs, etc., in order for this strategy to be effective.

Telecommuting. Telecommuting involves employees working at home, or at a telecommuting center near their home, full time or part time. Motorists who normally travel through the work zone would be encouraged to telecommute during the duration of the project to reduce the demand.

Toll/congestion pricing. Tolls are fees paid by motorists to drive in a particular area. Congestion pricing, or value pricing, involves the use of higher tolls under congested conditions and lower tolls at less congested times and is intended to reduce peak-period vehicle trips. This could be implemented in several ways: construct a new toll road to provide an alternative route or toll the roadway through the work zone to reduce the demand for the roadway; enforce during peak periods, weekdays only, or all day; collect tolls automatically or manually; or collect fixed or varied tolls (on a set schedule or based on changes in the level of congestion).

Transit incentives. Transit incentives include employer transit subsidies and guaranteed ride home programs. These strategies work best when there are adequate transit routes and frequencies that serve major origins and destinations of motorists through the work zone.

Transit service improvements. Where appropriate, transit service improvements may include the modification of transit schedules and/or routes, increases in frequency, or the establishment of transit service in the corridor. This strategy should be considered only in areas where transit use is likely.

Variable work hours. This strategy involves encouraging motorists who typically travel through the work zone during periods of high demand to work variable hours (off-peak) to reduce the demand for travel during peak periods.

Corridor/Network Management

Advance/delay planned projects. This strategy advances or delays projects in the nearby network that are scheduled for construction during the same time that the project will be underway. Advancing the work so that it is complete prior to the beginning of project construction will provide more network capacity or better traffic operations. Delaying the work will prevent traffic impacts on both projects at the same time.

Bus turnouts. This involves the construction of bus stop areas that are recessed from the traveled roadway. This strategy should be considered on detour routes or on highway facilities with a high occurrence of bus traffic and stops. This strategy improves traffic flow and delays by minimizing the occurrence of buses blocking the roadway. Bus turnouts should be designed for clear rear vision for safe re-entry into traffic.

Coordination with adjacent construction site(s). This involves combining or coordinating projects (scheduling) within a specific corridor to minimize the impacts to the motoring public and potentially result in cost savings to the state.

Dynamic lane closure system. This system would involve advance warning signs for the lane closure, use of variable-length barriers making up a tapered lane closure system; and a control cabinet to operate the system (e.g., supervisory control PC, radio unit). The objective is to enhance mobility and the safety of highway workers.

Parking restrictions. This strategy eliminates parking on the facility or calls for parking restrictions by time of day and/or day of week. The objectives of restricting parking can be either to use the parking area as an additional lane, increase capacity, or reduce traffic conflicts. Availability of parking for the local businesses will need to be addressed, as will the need to improve intersection geometrics to accommodate an additional lane.

Railroad crossings controls. If a rail crossing is located within the work zone and/or on the detour or diversion routes, improvements may need to be considered for safety purposes. These could include advanced warning signs, railroad crossing signs, pavement markings, flashing lights, and gate arms. The type of control would depend on the level of traffic and what rail crossing controls exist.

Ramp metering. Ramp meters are traffic signals located on the freeway on-ramp or on freeway-to-freeway connectors that control the entry of vehicles onto the freeway to maintain safe and smooth freeway operations. Ramp metering can include pre-set timing, traffic-actuated (metering changes based on mainline traffic) metering, or centrally controlled metering and may be used during peak periods or all day. If ramp metering is considered, potential impacts due to ramp queues on local streets should be evaluated.

Reversible lanes. This strategy involves sharing lane(s) of travel to accommodate peak period traffic flow. It is also known as variable lanes or contra-flow lanes. The direction of travel varies by time of day, or maybe day of week. Some sort of barrier (e.g., movable barrier system) should be used to maintain safety and direct traffic flow. However, the cost of the barrier system often limits the use of this strategy.

Separate truck lanes. This strategy involves the construction of new/separate truck lanes, use of one of the existing lanes for only trucks, or conversion of a shoulder or median for truck only use. This should be considered only in areas with a high percentage of trucks, for projects of long duration, and where there is a capacity (e.g., reduced lane widths) and/or safety concern in the work zone with truck movements. Appropriate design and geometric concerns related to trucks would need to be addressed if these were implemented.

Signal timing/coordination improvements. This involves retiming traffic signals to increase the capacity of the roadway(s) and improve traffic flow.

Speed limit reduction/variable speed limits. A reduced speed limit may be needed when the work zone may become a traffic hazard or to help protect construction workers. Speed limit changes may be implemented before traffic is detoured, through the work zone, or adjacent to unprotected construction workers. Unfortunately, adherence to speed limit reductions is often poor. To encourage adherence, additional enforcement and/or increased fines (with signage to reflect the increase) may be necessary.

Street/intersection improvements. Improvements on streets and intersections for the roadway and/or alternate routes may be necessary to handle the traffic through the work zone area. These may include improvements to the mainline and/or intersections such as roadway and/or shoulder widening and additional through and/or turn lanes.

Temporary signals. This involves the installation of temporary traffic signals to improve traffic flow through and near the work zone and/or address safety concerns.

Temporarily suspend ramp metering. This strategy involves turning off existing ramp meters during specific time periods or for the duration of the project. This strategy may be considered where it is necessary to get traffic onto the freeway quickly (e.g., at the end of a detour route).

Truck/heavy vehicle restrictions. Trucks may be prohibited from using the facility completely by time of day or day of week. Implementing truck restrictions can increase the capacity of the roadway, particularly for facilities with a high percentage of trucks. Availability and sustainability of alternate routes for the trucks must be considered, as well as any state and/or local ordinances that govern truck traffic access.

Turn restrictions. This strategy restricts turning movements for driveways and/or intersections and can be implemented during peak periods or all day. Turn restrictions are typically used to increase roadway capacity and reduce potential safety issues.

Work Zone Safety Management

Changeable/dynamic/variable message signs (CMS/DMS/VMS). CMS/DMS/VMS are message boards placed along roadways (typically freeways) that notify travelers of incidents, travel time information, construction/road closures, and other potential hazards in or around the work zone. Careful placement of the roadway equipment provides the information at points where drivers have recourse and can adjust their routes to account for the information. These message signs should be used when the condition of the work zone is changing and a static sign is not sufficient to provide the information to motorists.

Construction safety inspectors. This strategy involves having one or more construction safety inspectors on-site.

Crash-cushion (fixed and mobile). Also known as an impact attenuator, a crash cushion is a fixed or mobile device placed at a specific location to prevent an errant vehicle from entering a work zone or crashing into a hazard by gradually decelerating the vehicle to stop or by directing the vehicle away from the hazard.

Intrusion alarms. This strategy involves the use of a technology that detects vehicles entering the area between the motorists and the construction workers. When an intrusion is detected, workers in the area are warned via a loud siren.

Movable traffic barrier systems. This involves a mechanical system to move temporary barriers (e.g., portable concrete barriers) quickly within the work zone. Barrier systems are typically used for reversible lanes and for providing additional space for the contractor to work during off-peak hours.

Project task force/committee. A project task force/committee would be created to address the issue of safety within and near the work zone. The goal would be to identify and recommend actions to improve worker safety without sacrificing motorist safety and mobility.

Radar speed monitoring/display units. This is a portable system that can be mounted on a sign or located on a portable trailer that uses radar to measure vehicle speed and that informs motorists of their speed. A sign with the speed limit for the roadway should be at or near the panel sign to inform motorists of the speed limit. The objective of this system is to enhance safety by reducing vehicle speeds and speed variations.

Road safety audits. Road safety audits involve analysis of the future or existing roadway by an independent expert on safety issues. It is a proactive way to reduce crashes and identify potential safety hazards. Audits may be performed during any stage of a road project, including planning, preliminary design, detailed design, traffic control planning, construction, pre-opening, and on existing roads.

Safety awards/incentives. This strategy involves the use of awards or incentives for innovations that reduce the safety impacts associated with the work zone.

Team meetings. This involves conducting project team pre-shift meetings on a regular basis to discuss TMP strategies, implementation, and monitoring, particularly related to safety concerns.

Temporary rumble strips. Rumble strips are temporary grooves or raised strips placed across a travel lane to alert motorists of the change in roadway conditions or a hazardous curve, slowing condition, or other hazard ahead.

Temporary traffic signals. This involves the installation of temporary traffic signals to improve traffic flow through and near the work zone and/or address safety concerns.

Temporary traffic barrier. A temporary traffic barrier is some sort of a barrier system to separate traffic flow physically from construction workers during the duration of the project. It could range from a narrow bituminous island with delineator tubes to concrete barriers (moderate to long duration). The objective is to provide a physical separation for safety purposes.

TMP monitor/inspection team. This would require the establishment of a team (or person) to monitor and inspect implementation and monitoring of the work zone transportation management strategies. Warning lights. Warning lights include flashing warning lights on barricades or signs to delineate a barrier or warn motorists of the work zone or other conditions ahead.

Windshield surveys. This involves having a person drive (or walk) through the work zone and conduct an assessment of traffic flow and safety.

Traffic Incident Management and Speed Enforcement

Accident staging/investigation areas. Areas located off the roadway where enforcement officials can complete their accident reports without blocking traffic.

Automated enforcement. Automated enforcement involves the use of various technologies such as radar, cameras, video, and sensors to detect and record vehicle speed or traffic signal violations. When a vehicle speed exceeds a specified threshold or a red signal violation occurs, the vehicle's license plate and/or driver are photographed. The citation with the photo(s) is then mailed to the registered owner of the vehicle.

CB Wizard Warning System. The CB Wizard Warning Device is designed to send prerecorded messages across two selected CB channels and is geared toward truck drivers. The CB Wizard Warning Device automatically kicks into a channel when there is a break in the action.

Call boxes. Temporary or permanent call boxes may be installed through the work zone to provide motorists with a means to contact incident response personnel. This expedites the process by which accidents and breakdowns can be removed.

Changeable/dynamic/variable message signs (CMS/DMS/VMS). CMS/DMS/VMS are message boards placed along roadways (typically freeways) that notify travelers of incidents, travel time information, construction/road closures, and other potential hazards in or around the work zone. Careful placement of the roadway equipment provides the information at points where drivers have recourse and can adjust their routes to account for the information. These message signs should be used when the condition of the work zone is changing and a static sign is not sufficient to provide the information to motorists.

Contract support. This strategy involves additional contract support than what is available by the contractor to support incident management. This could be with law enforcement, 911 dispatch, TMC support, towing and recovery providers, emergency medical services, or others.

Cooperative police enforcement. Cooperative enforcement is similar to paid police enforcement except it is implemented through a cooperative agreement with the DOT.

Dedicated (paid) police enforcement. This strategy involves the use of paid police patrols in the work zone. Enforcement in the work zone can be used to deter speeding, provide for removal of vehicles involved in incidents or breakdowns, assist in traffic control, enforce other traffic laws, and prevent intrusions.

Distance/milepost markers. Distance/milepost markers consist of a mounted sign located in the median or shoulder that lists location information (milepost, route, county, etc.). This strategy is effective in responding to incidents or breakdowns as motorists can quickly and correctly inform emergency or response personnel of their location. To be effective, these markers should be placed no further than 1/10 mile apart.

Enforcing penalties. This strategy involves the use of enhanced fines for speeding or other violations in traffic work zones (e.g., fines may be increased to up to \$500 in Colorado work zones). The intent is to deter speed violation and improve safety through the work zone.

Fender bender signing. This strategy places static signing at various locations along the road indicating to the public that in minor accidents they should move their vehicles out of the roadway and onto the shoulders until enforcement officials arrive so as not to obstruct traffic lanes.

HAZMAT trailers. These provide for having readily available materials to clean up hazardous spills in the close proximity of the project. They speed up reopening the roadway to traffic.

Helicopter. This strategy involves the use of aerial surveillance to identify and verify incidents. This is rarely used unless it is available at no or a low cost (e.g., share expenses with a radio station traffic reporter).

Highway advisory radio (HAR) (fixed and mobile). Longer, more accurate messages than what are available using signage may be necessary for the work zone. HAR involves the dissemination of traffic control information to motorists while en route over wide-area wireless communications directly to the vehicle's radio. Signage will need to be used to inform travelers of the number to obtain the information.

Incident/emergency management coordinator. A person would be dedicated to overall incident and emergency management for the project. Some of the responsibilities might include developing incident and/or emergency response plans, overseeing implementation and monitoring of the work zone transportation management strategies, and managing incidents or emergencies. This strategy should be considered for large projects of long duration.

Incident/emergency response plan. This strategy involves the development of an incident response plan. This plan should include, but not be limited to, roles and responsibilities, response agencies, processes/procedures, actions to take for various incident types and levels, contact information, alternate routes, personnel and equipment information, and staging area locations.

ITS for traffic monitoring/management. ITS can be used in work zones to identify areas where traffic flow is impeded so that traveler information can be provided and/or adjustments to the work zone can be made. A work zone ITS deployment uses sensors to detect traffic conditions and can automatically feed this information to motorist information outlets such as CMS and

websites, or to a TMC. Monitoring traffic cameras can help detect places where drivers are having difficulty negotiating a work zone and then the layout can be adjusted.

Local detour routes. Identification and approval/authorization of local detour routes in the case of incidents is an important strategy to consider, particularly for high-volume and incident-prone facilities. This would involve identifying possible local detour routes throughout the work zone and obtaining approval or authorization from the local agency for the use of the roadway(s) as a detour route(s) in the event of an incident.

Media briefings. This strategy involves working with the media to provide information for procedures to be used during an actual incident as well as proactive information to help inform the public.

Mile-post markers. Mile-post markers consist of a sign located in the median or shoulder, which lists location information (direction, route, mile, and tenths of a mile). Some areas may refer to these as location reference markers, since they can be used to mark direction; route, bridge or overpass names; intersection names; etc. in addition to mileage information.

Photogrammetry. Photogrammetry involves the use of photos taken in the field and computer software for documenting and measuring incident-related data (e.g., skid marks, vehicle location, etc.) which may reduce incident clearance times.

Safety service patrols. These are specific motorist service patrols to assist motorists who are disabled in order to get them on their way to reopen the roadway or shoulder traffic.

Smart work zone technologies. These are work zone devices and/or systems that use automatic sensors to measure traveler travel time or delay and display this information via PCMA's, HARs, the Internet, and other means in "real-time" conditions.

Surveillance (CCTV, loop detectors, lasers, probe vehicles). This strategy involves the use of surveillance, also known as monitoring or detector stations, to detect, verify, and respond to incidents in the work zone.

Total station units. This involves the use of survey equipment for documenting/mapping major incidents to reduce the clearance time.

Tow. This strategy involves the use of on-site (or near site) tow trucks to reduce the time an incident (breakdown or accident) affects the work zone. This strategy should be considered in areas where a breakdown or accident will significantly impact traffic flow or safety. Parking areas and turnaround locations for the tow trucks should be provided.

Transportation management center (TMC). This strategy involves the use of and coordination with an existing TMC to aid in incident management. If the project is large and of long duration and a TMC does not exist, a TMC may be constructed and operated to help maintain traffic flow and manage incidents. Information, such as traffic data and incident information, can be communicated and shared.

PUBLIC INFORMATION (PI) STRATEGIES

The inclusion of a public information and/or relations campaign can be very effective in keeping the public informed of the project and its potential work zone impacts. The public (particularly the impacted communities and businesses) should be included in the TMP process early and should be informed in a timely manner of potential work zone impacts and issues. Coordination with the agency's public affairs office will be necessary, particularly for significant projects.

Public Awareness

Brochures and mailers. Brochures and mailers are printed material containing project-related information such as advanced notice of the project's start date, schedules, pictures/graphics of the project, a description of the need for the project, alternative routes, etc. These may be passed out to motorists at key locations (e.g., large employers in the project area, rest stops, automobile associations, travel information centers) or mailed to affected businesses or communities.

Community task forces. This strategy involves the development of community task force(s), which includes various stakeholders from the community that may be impacted by the work zone (businesses, neighborhood groups, interested individuals, public officials, or other representatives). The task force(s) could be developed as early as the planning stage of the project or during construction. The objective is for the group(s) to provide input and review/comment on the construction and management strategies and implementation to minimize the impacts of the project on the community. The contractor and agency would be responsible for meeting with the task force(s) to obtain their input and recommendations.

Coordination with local/cable TV newsrooms, schools and school districts, local major employers/businesses, and local emergency services (fire, police, and ambulance). This strategy involves coordinating with various community and business groups that are likely to be impacted by the work zone. Mechanisms (fax, e-mail, phone message, mailings) can be established to communicate project-related information including start dates, significant changes in the project, project schedule, and occurrences of incidents within the work zone.

Paid advertisements (newspaper, radio, television). Paid advertisements announce the coming of a major project and can involve newspaper, radio, television, billboards, etc. Planning is necessary prior to construction of the project for scheduling and developing such advertisements. Paid advertisements can also be used for progress updates or to provide information regarding major changes to the work zone configuration and management.

Planned lane closure website. This strategy is typically not for one specific project but rather is usually implemented for an entire state, district, or geographic region. It includes a web page that provides planned lane closures of freeways for public information. It should include the routes involved as well as the start and end dates of the lane closure information, both in text and graphical form.

Press releases/alerts. These involve the provision of project-related information to the news media, affected businesses, and other affected or interested parties. They can include print and/or electronic media and are almost always used to announce the start of a project and, for medium to large projects, to provide updates and report progress.

Project website. This traveler information system provides traffic or travel information for the work zone via the web/Internet. It can include static information and/or real-time interactive request/response information.

Public information center. This is a facility that may be located near the project site that may contain scale model displays, maps, brochures, videos, etc., about the project.

Public meetings/hearings. This strategy involves using project or public relations staff to present project-related information to the public, community, and/or businesses.

Rideshare promotions. These include creating or marketing an existing rideshare program through signage, advertisements, brochures, and events. The purpose is to encourage ridesharing to reduce the number of vehicles traveling through the work zone.

Telephone hotline. This traveler information system provides traffic or travel information for the work zone via telephone. It can include static broadcast information and/or real-time interactive request/response information.

Visual information (videos, slides, presentations) for meetings or for web-based dissemination. This involves the use of videos, slides, and presentations to supplement public meetings, public information center displays, or press releases.

Motorist Information Strategies

Commercial traffic radio. The dissemination of project-related information via the radio.

Freight-travel based information. This strategy should be considered only when there is a moderate to high percentage of freight movement through the work zone area. This involves working with the freight community (trucking companies, truck drivers, etc.) to identify information they would like to be informed of in the work zone area (e.g., truck restrictions, occurrences of incidents, planned closures) and provides a mechanism for the information to be disseminated to freight stakeholders.

Ground-mounted signs. These are signs mounted in the ground with information to guide motorists through the work zone and warn of potential hazards.

Highway advisory radio (HAR) (fixed and mobile). Longer, more accurate messages than what are available using signage may be necessary for the work zone. HAR involves the dissemination of traffic control information to motorists while en route over wide-area wireless communications directly to the in-vehicle radios. Signage is needed to inform travelers of the telephone number and/or the radio channel where the information may be obtained.

Highway information network (web-based). A highway information network is a website where multiple stakeholder groups can place information related to the roadway. The website is shared among the various stakeholder groups, each with their own data storage areas (including control of functionality, security, data quality, etc.).

Portable and stationary changeable/dynamic/variable message signs (CMS/DMS/VMS). CMS/DMS/VMS are message boards placed along roadways (typically freeways) that notify travelers of incidents, travel time information, construction/road closures, and other potential hazards in or around the work zone. Careful placement of the portable roadway equipment provides the information at points where drivers have recourse and can adjust their routes to account for the information. These message signs should be used when the condition of the work zone is changing and a static sign is not sufficient to provide the information to motorists.

Radar speed message sign. A portable system mounted on a sign or located on a portable trailer that uses radar to measure vehicle speed and informs motorists of their speed. A sign with the speed limit for the roadway should be at or near the panel sign to inform motorists of the speed

limit. The objective of this system is to enhance safety by reducing vehicle speeds and speed variations.

Temporary Information signs. This type of sign features the name of the contractor, contact phone numbers, and these signs are usually at the beginning (CDOT sign code G20-11) and end (CDOT sign code G20-10) of the work zone.

Traveler information systems (wireless, handhelds). For this strategy, motorists can be provided with information related to the work zone, static and/or real time, via wireless or handheld devices. These can be in the form of cell phones, pagers, in-vehicle systems, or e-mail notifications. Depending on the size, nature, and duration of the project, hand-held-type devices could be purchased or made available to motorists who regularly travel through the work zone to warn them of potential delays on a real-time basis.

TRAINING

Work Zone Safety and Mobility training courses are listed below:

A	Traffic Control Technician (ATSSA) (prerequisite for the ATSSA 2-day Traffic Control Supervisor course)
B	Traffic Control Supervisor (CCA or ATSSA)
C	Traffic Control Supervisor refresher course (CCA or ATSSA) ¹
D	Advanced Work Zone Management and Design (NHI course #3800072)
E	Safe and Effective Use of Law Enforcement Personnel in Work Zones (ATSSA or FHWA) ²
F	Flagger Certification (½-day LTAP, or 2-day ATSSA)
G	Internal CDOT Flagging Certification (Regional Training)
H	National Traffic Incident Management Responder Training

¹ Upon completion of the 2-day Traffic Control Supervisor course, a refresher course must be taken every three years.

² Upon completion of the ½-day Safe and Effective Use of Law Enforcement Personnel in Work Zones classroom training, the 2-hour interactive web-based FHWA course must be taken every three years as a refresher course.

The following outlines the minimum Work Zone Safety and Mobility requirements for the listed positions:

Functional Class	Job Title	Required Training
CDOT Personnel	Project Managers	B or C
	Project Engineers	B or C
	Designers	B or C, D ³
	Maintenance	B or C, D ³ , G, H
Project Designers	Designers	B or C, D ⁴
Project Builders (General Contractors and Subcontractors)	Project Superintendents	B or C
	Traffic Control Supervisors	B or C, F
	Flaggers	F
Law Enforcement	Local Police Departments	E ⁵
	County Sheriff Departments	E ⁵
	State Patrol	E ⁵

³ Applies to design and maintenance personnel who design Traffic Control Plans.

⁴ Applies to designers who design Traffic Control Plans.

⁵ Applies to law enforcement personnel who provide uniformed traffic control on federal-aid projects.

A. Traffic Control Technician (TCT)

COST: \$180 per Participant (ATSSA Member); \$205 per Participant (Non ATTSA Member)

CLASS SIZE: Minimum 20, Maximum 40

CEUs: 0.75

TRAINING LEVEL: Basic

LANGUAGE: English and Spanish

DESCRIPTION: This one-day, 8-hours training course provides participants with basic knowledge of temporary traffic control that allows them to assist in installing traffic control devices, monitoring their performance, and recognizing deficiencies during the course of a project. The course is an introduction to temporary traffic control in work zones for individuals who work in the field installing and removing traffic control devices. The course provides concepts, techniques, and practice exercises in the installation and maintenance of traffic control devices.

PREREQUISITES: Previous experience in temporary traffic is not required for this course.

TARGET AUDIENCE: Individuals who perform duties in or around temporary traffic control work zones.

OUTCOMES: Upon completion of the course, participants will be able to:

- Demonstrate knowledge of the latest concepts as related to Parts 1, 5, and 6 of the MUTCD.
- Demonstrate knowledge of key concepts in the AASHTO Design Guide and other standards as related to such items as worker and flagger apparel (such as ANSI and similar standard guides).
- Evaluate work zone temporary traffic control designs for nighttime and daytime issues.
- Analyze and evaluate operational, safety and mobility impacts of work zones, including scheduling, scope, phases and alternate routes.

CONTINUING TRAINING REQUIREMENTS: Certification is valid for 4 years. At the end of 4 years, the student must take a recertification exam to be recertified.

SPECIFICATION REQUIREMENTS: No requirements at this time.

If you have questions about this ATSSA training course, please contact ATSSA at:
training@atssa.com or (800) 272-8772.

B. Traffic Control Supervisor (TCS)

COST: \$355 per Participant (ATSSA Member); \$405 per Participant (Non ATTSA Member)

CLASS SIZE: Minimum 20, Maximum 40

CEUs: 1.50

TRAINING LEVEL: Intermediate

LANGUAGE: English

DESCRIPTION: This two-day, 16-hours training course is designed to train those who will be actively involved in designing or setting up and maintaining temporary traffic control in a work zone. It moves from the concepts and techniques taught in the TCT course to the implementation of traffic control plans and techniques for installation and removal. Students are taught how to read and interpret plans and specifications and implement them in the field.

Each participant receives a copy of the "Advanced Work Zone Management and Design" reference manual and a participant workbook that contains all lesson materials.

PREREQUISITES: Passing the Traffic Control Technician (TCT) course is a prerequisite to register for this course.

TARGET AUDIENCE: Supervisory personnel that are responsible for the installation, maintenance, or removal of traffic control devices.

OUTCOMES: Upon completion of the course, participants will be able to:

- Demonstrate knowledge of the latest concepts as related to Parts 1, 5, and 6 of the MUTCD.
- Demonstrate knowledge of key concepts in the AASHTO Design Guide and other standards as related to such items as worker and flagger apparel (such as ANSI and similar standard guides).
- Evaluate work zone temporary traffic control designs for nighttime and daytime issues.
- Designing temporary traffic control setups and also recognizing, analyzing and correcting deficiencies.
- Obtaining skills necessary to become an effective supervisor, capable of leading a team in the field.

CONTINUING TRAINING REQUIREMENTS: Certification is valid for 4 years. At the end of 4 years, the student must take a recertification exam to be recertified.

SPECIFICATION REQUIREMENTS: No requirements at this time.

If you have questions about this ATSSA training course, please contact ATSSA at: training@atssa.com or (800) 272-8772.

C. Traffic Control Supervisor Training

COST: \$250 per Participant (2017 Price)

CLASS SIZE: Minimum 1, Maximum 5

TRAINING LEVEL: Basic

DESCRIPTION: This course is designed to give participants state-of-the-art knowledge of the entire process of planning, designing, installing, maintaining and monitoring traffic control for work zones. This training is offered to anyone responsible for any phase of construction and maintenance operations. These principles, applied to maintenance and construction operations can save your organization many times the cost of the course by helping avoid tort claims and liability judgments. This short course is a basic requirement essential to all persons involved in street and highway work. Several workshops included in this course use teambuilding and presentation of solutions to provide hands-on experience with implementing and modifying temporary traffic control plans for various real life situations.

TARGET AUDIENCE

In order to achieve the goal of improving training in Work Zone Safety, the Safety and Traffic Engineering Branch is utilizing Technical Training funding to provide the initial certification for the following CDOT individuals: Construction Project Personnel - CEPMs, Project Engineers, EPSTs; Maintenance Personnel –TMs. CDOT new hires need to complete the two (2) day training through the Colorado Contractor's Association (CCA), within 12 calendar months of their hire date, and re-certify accordingly there-after.

Contractor Personnel – The TCS training requirements for Contractor Personnel are included in the contract documents. The contractor will need to arrange for the training of their personnel using the approved vendor.

Consultant Personnel – Consultant personnel performing oversight duties on CDOT construction projects must meet the same requirements as CDOT personnel.

OUTCOMES: Upon completion of this course, participants will be able to:

- Read and interpret traffic control plans for implementation in the field.
- Recognize, analyze, correct, and document deficiencies.
- Be an effective Supervisor who can effectively oversee personnel in the field.
- Demonstrate a comprehensive knowledge of work zone standards guidelines, installation, removal procedures, inspection, documentation and supervisory skills.

CONTINUING TRAINING REQUIREMENTS: Recertification through CCA shall be limited to CEPMs, Project Engineers, EPSTs; and Maintenance Personnel; and should occur no later than one day prior to the current expiration, which is three years from date of prior certification. If re-certification is not met, prior to certification expiring, the two day class shall be required.

SPECIFICATION REQUIREMENTS:

The specifications covering these requirements for Contractor personnel on CDOT projects are contained in the most current version of CDOT's Standard Specifications for Road and Bridge Construction and CDOT Standard Special Provisions.

For the most current information regarding versions of these specifications please refer to: <https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs>. For questions regarding these specifications, contact the Safety and Traffic Engineering Branch at 303-757-9662.

Training contacts and procedures are handled through CDOT public announcements, the internal web, and my learning.

If you have questions about this CDOT training, please contact CDOT Safety and Traffic Engineering Branch (Engineering Personnel) at (303) 757-9662.

D. Advance Work Zone Management and Design Training

COURSE NUMBER: FHWA-NHI-133115

http://www.nhi.fhwa.dot.gov/training/course_search.aspx?tab=0&key=133115&sf=0&course_n=133115

COST: \$825 per Participant (2017 Price)

CLASS SIZE: Minimum 20, Maximum 30

CEU: 1.8 Units

TRAINING LEVEL: Accomplished

DESCRIPTION: This three-day training course provides participants with advanced levels of knowledge and competencies with technical and non-technical aspects of work zone traffic control, including “best practices” in work zone planning, design, project management, and contract issues. The course designed to provide maximum flexibility by including core, recommended, and optional lessons. The default course consists of the core and recommended lessons. Each participant receives a copy of the "Advanced Work Zone Management and Design" reference manual and a participant workbook that contains all lesson materials.

TARGET AUDIENCE: This course is intended for those who understand the principles of engineering judgment and studies, have considerable management or design experience in work zone traffic control, and have an understanding of the Manual on Uniform Traffic Control. This includes: state and local design engineers, traffic and safety engineers, senior work zone traffic engineers, transportation planners, employees of metropolitan planning organizations and board members, regional planners, regional construction engineers (with work zone experience), and senior engineering technicians.

CDOT Designers – All CDOT Designers who design traffic control plans for federal-aid projects must obtain a Certificate of Completion for the course. Personnel will need to arrange for their own training through CDOT’s Office of Organizational Learning & Development.

Consultant Designers – All Consultant Designers who design traffic control plans for federal-aid projects must obtain a Certificate of Completion for the course. Consultant personnel will need to arrange for their own training through CDOT’s Office of Organizational Learning & Development or directly with NHI.

OUTCOMES: Upon completion of the course, participants will be able to:

- Apply the latest safety and mobility design concepts as it relates to temporary traffic control (TTC) plans for work zones.
- Identify the latest MUTCD principles as it relates to TTC plans for planning, design, project management, and describe the various contracting issues that may need to be resolved.
- Demonstrate knowledge of the latest concepts as related to Parts 1, 5 and 6 of the MUTCD.
- Demonstrate knowledge of key concepts in the AASHTO Design Guide and other standards as related to such items as worker and flagger apparel (such as ANSI and similar standard guides).
- Evaluate work zone temporary traffic control designs for nighttime and daytime issues.

- Analyze and evaluate operational, safety and mobility impacts of work zones, including scheduling, scope, phases and alternate routes.
- Consider the application of ITS technologies and where applicable apply ITS technologies to work zone planning, design and execution.
- Consider alternative innovations, best practices and recent research findings in work zone planning, design and execution.
- Develop temporary transportation management plans for safety and mobility.
- List elements necessary for successful contracts and identify strategies for resolving contract issues, including best practices in work zone contracting, also identify tools to resolve conflicts with contracting issues.
- Identify and resolve community issues, including impacts of work zones on affected residential and business areas. Apply public participation, outreach, and work zone strategies to minimize or mitigate community impacts with respect to work zones.
- Identify and analyze specific (key) issues and concerns that affect work zone design and demonstrate ability to explain safety and mobility issues, impacts and alternatives to peers, public and/or decision makers.
- Summarize work zone safety and mobility impacts and alternatives

CONTINUING TRAINING REQUIREMENTS: No requirements at this time.

SPECIFICATION REQUIREMENTS: No requirements at this time.

If you have questions about this NHI training, please contact NHI at:
nhicustomerservice@dot.gov or (877) 558-6873.

E. Safe and Effective Use of Law Enforcement Personnel in Work Zones

COURSE NUMBER: FHWA-NHI-133119

COST: Free

CLASS SIZE: Varies with course delivery type (In-class vs. Online)

TRAINING LEVEL: Basic

DESCRIPTION: This course has two delivery methods: a ½ day classroom training and a 2-hour interactive web-based training (WBT.) It provides law enforcement agencies with the practices and procedures to improve traffic safety in work zones. The initial training for each participant must be taken in a classroom setting, and WBT course may be used to satisfy the ongoing training requirements.

Work zone law enforcement is highly effective in reducing speeding, speed variability, and undesirable driving behaviors such as tailgating and unsafe lane changes, which improves both traffic and worker safety. The presence of work zone enforcement is also believed to raise driver awareness and overall alertness, further improving work zone safety.

The purpose of this course is to provide basic knowledge to help save lives, avoid work zone crashes, and improve safety when working in a work zone. This course will provide tips for safe practices for law enforcement officers (LEO's) in work zones as well as providing for a safer work zone environment. This training will also educate participants on the standards and guidelines related to temporary traffic control in work zones; the role of LEO's in work zones; the components of a typical work zone; and the proper practices and procedures related to the use of law enforcement officers in work zones.

TARGET AUDIENCE: This course is intended for state troopers, state, county, municipal officers, and highway patrol officers who will participate in work zone activities.

OUTCOMES: Upon completion of the course, participants will:

- Understand the existing national standards and guidelines for uniform treatment of temporary traffic control in work zones.
- Describe the role and responsibilities of LEO's in Work Zones.
- Understand the terminology and proper communication channels associated with executing their role in work zones.
- Explain proper practices and procedures related to the use of LEO's in work zones.
- Recognize the component parts of work zones and typical types and configurations, including: long-term & short term construction, maintenance, mobile operations and any other type of project approved by the DOT or Local Agency.
- Explain safe operating practices of LEO's working in a Temporary Traffic Control (TTC) zone.

CONTINUING TRAINING REQUIREMENTS: Every three years a no cost online class may be taken in lieu of a classroom refresher course. The online class can be found at: FHWA-NHI-133119 <https://www.nhi.fhwa.dot.gov/home.aspx>.

NHI certificates must be sent to CDOT in order to receive a new certification card.

Note: Students must take the course within six months of their initial enrollment with NHI.

SPECIFICATION REQUIREMENTS:

The specifications covering these requirements for LEO's on CDOT projects are contained in the most current version of CDOT's Standard Specifications for Road and Bridge Construction and CDOT Standard Special Provisions.

For the most current information regarding versions of these specifications please refer to: <https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs>.

For questions regarding these specifications, contact the Safety and Traffic Engineering Branch at 303-757-9662.

If you have questions about this NHI training, please contact NHI at: nhicustomerservice@dot.gov or (877) 558-6873.

F. Flagger Certification Training (State Certified Instructor Led Training)

COST: Dependent on the Instructor teaching the class.

CLASS SIZE: Dependent on the Instructor teaching the class.

CEUs: 0.0

TRAINING LEVEL: Basic

LANGUAGE: English and Spanish (Dependent on the instructor)

DESCRIPTION: Being a flagger is the most important job on the work site. Careless use of the sign or distraction from duty could cause serious injury to workers or the motoring public. Performing flagger duties diligently can prevent traffic incidents in the work area.

This is a basic training in the area of flagger training. It has been designed for someone learning the first steps in performing flagger duties. This training would be useful as a refresher course for all employees involved with work zone traffic control where flaggers are utilized.

This training delves into the individual state flagger training or certification requirements. For more information on setting up a State Certified instructor led training course, please contact the State's list of flagger instructors on the ATSSA Training website to set up a time and location for training.

<http://www.atssa.com/TrainingCertification/FlaggerInformation/FlaggerInstructorList.aspx?STATECD=CO>

PREREQUISITES: Passing the Traffic Control Technician (TCT) course is a prerequisite to register for this course.

TARGET AUDIENCE: This training is intended for individuals that will be performing or are engaging in flagger duties on construction/maintenance projects. The course will assist them in better understanding the importance and duties involved with flagging on a project. It would be beneficial to the entry level employee as well as the experienced flagger.

OUTCOMES: Upon completion of the course, participants will be able to:

- Identify the responsibilities of a flagger.
- Describe the proper ways to place signs.
- Describe the proper position for flagging.
- Define the flagging procedures for stop, slow, and proceed.
- Identify the correct procedures for various flagging situations.
- Describe the proper conduct in flagging.

SPECIFICATION REQUIREMENTS: No requirements at this time.

If you have questions about this ATSSA training course, please contact ATSSA at:
training@atssa.com or (800) 272-8772.

G. Internal CDOT Flagging Certification (Regional Training)

COST: None

CLASS SIZE: Minimum 1, Maximum 1

CEUs: 0.0

TRAINING LEVEL: Basic

LANGUAGE: English

DESCRIPTION: An online flagging certification course, internal to CDOT, which can be utilized by ALL CDOT employees requiring a flagger's card/certification. The course is delivered via Google Forms and is tracked by the form and accompanying Google Sheet.

PREREQUISITES: None

TARGET AUDIENCE: The bulk of the audience is Transportation Maintenance Workers, from TM-I through TM-III, and LTC Ops. Also included in this audience is employees within Traffic Maintenance (ET-I through ET-III, TM-I through TM-III, and LTC Ops). The remainder may include engineers at any level that require a flagging card, and any other employees whose job duties may include flagging.

The program is delivered via an area admin (usually an Admin Asst. III or above) in an LTC Ops area. The employee or the supervisor delivers it via e-mail upon request or requirement. New employees will click on a link in the Google Form for NEW EMPLOYEES. They will be required to view approximately 17 extra slides in the delivery of the flagging program. Returning employees may click the link to bypass these slides. The tests consists of 50 questions, 25 multiple choice, and 25 True/False. The questions and answers randomize each time the test is taken to avoid cheating and duplication. The employee must also be signed in through their state email account. Upon submission of the test, the admin is notified by the form/sheet and will verify that the test applicant has successfully completed the course (80% or better for a passing grade and issuance of card). Program oversight is the area admins and their designees, and Chris Ukowich as the over seer of this internal program. Cards are issued every two (2) years.

OUTCOMES: Upon completion of the course, participants will be able to:

- Identify the responsibilities of a flagger.
- Describe the proper ways to place signs.
- Describe the proper position for flagging.
- Define the flagging procedures for stop, slow, and proceed.
- Identify the correct procedures for various flagging situations.
- Describe the proper conduct in flagging.

CONTINUING TRAINING REQUIREMENTS: Certification is valid for 2 years. At the end of 2 years, the student must take a recertification exam to be re-certified.

If you have questions about this training course, please contact Chris Ukowich at:
Christopher.ukowich@state.co.us or (970) 350-2196.

H. National Traffic Incident Management Responder Training (Web-Based)

COURSE NUMBER: FHWA-NHI-133126

COST: \$0

CLASS SIZE: Minimum 1, Maximum 1

CEUs: 0.4

TRAINING LEVEL: Basic

LANGUAGE: English

DESCRIPTION: Three injury crashes occur every minute in the United States, putting nearly 39,000 incident responders potentially in harm's way every day. Congestion from these incidents often generates secondary crashes, further increasing traveler delay and frustration. The longer incident responders remain at the scene, the greater the risk they, and the traveling public, face. A cadre of well-trained responders helps improve traffic incident response. Better incident response improves the safety of responders and drivers, reduces crashes that occur because of incident-related congestion, decreases traffic delays caused by incidents, and can cut incident response time.

The National Traffic Incident Management Responder Training was created by responders for responders. This course provides first responders a shared understanding of the requirements for safe, quick clearance of traffic incident scenes; prompt, reliable and open communication; and motorist and responder safeguards. First responders learn how to operate more efficiently and collectively.

This training covers many TIM recommended procedures and techniques, including: TIM Fundamentals and Terminology, Notification and Scene Size-Up, Safe Vehicle Positioning, Scene Safety, Command Responsibilities, Traffic Management, Special Circumstances, Clearance and Termination, and Telecommunicators

PREREQUISITES: It is recommended that you take the following courses offered by FEMA:

- IS 700 – National Management System (NIMS), An Introduction.
- ICS 100 – Introduction to Incident Command System (ICS).
- ICS 200 – ICS for Single Resources and Initial Action Incidents.

TARGET AUDIENCE: The target audience for the training are individuals from all TIM responder disciplines, including: Law Enforcement, Fire/Rescue, Emergency Medical Service, Towing and Recovery, Emergency Management, Communications, Highway/Transportation and Dispatch within States, regions, and localities.

OUTCOMES: Upon completion of the course, participants will be able to:

- Use a common set of practices and advance standards across all responder disciplines.
- The National Traffic Incident Management Training Program equips responders with a common set of core competencies and assists them in achieving the TIM National Unified

Goal of strengthening TIM programs in the areas of: Responder safety; Safe, quick clearance; and Prompt, reliable, and interoperable communications.

CONTINUING TRAINING REQUIREMENTS: No requirements at this time.

SPECIFICATION REQUIREMENTS: No requirements at this time.

If you have questions about this NHI training, please contact NHI at:
nhicustomerservice@dot.gov or (877) 558-6873.



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