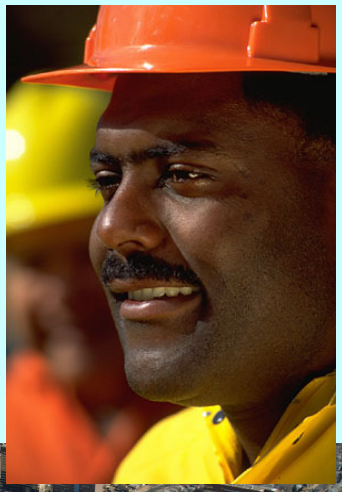
Colorado

Work Zone Best Practices Safety Guide



Colorado
Work Zone Best Practices Safety Guide

UPDATED 2/1/2008

Message from the Colorado Department of Transportation's Executive Director

The Colorado Department of Transportation (CDOT) places a high priority on the safety of highway workers and the traveling public in construction and maintenance cone zones. To ensure ongoing improvements in highway safety, CDOT works with our highway safety partners in order to implement new work zone strategies.

To accomplish our goal of continuously improving safety in all Colorado work zones, we must educate motorists about the dangers in work zones and train highway workers how to eliminate or reduce the risk of those dangers.

In support of this goal, CDOT has partnered with local businesses, law enforcement agencies, safety advocates and federal officials for several years. In March 2004, this safety coalition produced a comprehensive publication for work zone safety entitled "Colorado Work Zone Best Practices Safety Guide."

This guide provides our employees and contracting partners with the information and tools needed to create a safer work zone environment. The guide also focuses on reducing vehicle intrusion into work zones; reducing work zone accidents, injuries and deaths; ensuring contractor compliance; educating the public; and reducing construction impacts to traveler mobility and safety.

Following three years of field testing the practices and procedures contained in the guide, we have developed an updated version that follows industry best practices and meets the needs of today's work zone safety issues. As a result, we are pleased to announce the release of the updated 2007 version of the "Colorado Work Zone Best Practices Safety Guide."

While CDOT and its partners have developed this guide, it is important for our employees and contractors to implement the tools and strategies outlined in order to improve highway safety.

CDOT is committed to being a leader in the nation for developing innovative and effective safety programs and will continue to work with all of our partners to reduce death and injuries in Colorado work zones.

Russell George

Russell George

Colorado Work Zone Best Practices Safety Guide

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Program Credits

Work Zone Safety Task Force Contributors

Stakeholders
Aggregate Industries
American Civil Constructors
Asphalt Specialties
Colorado Strijpe Wright/American Barricade Rental
KECI
Kiewit Western Co.
Kolbe Striping
Lafarge North America
Rule Engineering, LLC.
Safety and Construction Supply

Insurance/Risk Management
HRH of Colorado
Lockton Companies of Colorado
St. Paul Marine and Fire Insurance Company
Travelers Insurance

Law Enforcement
Colorado State Patrol
Denver Police Department
Jefferson County Sheriff

Stakeholder Associations/Trade Groups
Colorado Asphalt Paving Association (CAPA)
Colorado Contractors Association (CCA)
Colorado Rock Products Association (CPRA)

Colorado Agencies
Colorado Department of Transportation (CDOT)

Federal Agencies
Federal Highway Administration (FHWA)
Occupational Safety and Health Administration (OSHA), Englewood Area Office
Occupational Safety and Health Administration (OSHA), Denver Area Office

Introduction

Each year, Colorado workers are injured or killed while working to construct, improve, or maintain our state roadways. This program is intended to give contractors the information and tools they need to enhance compliance and to help them perform their work in a safer manner while working on or near our public roadways.

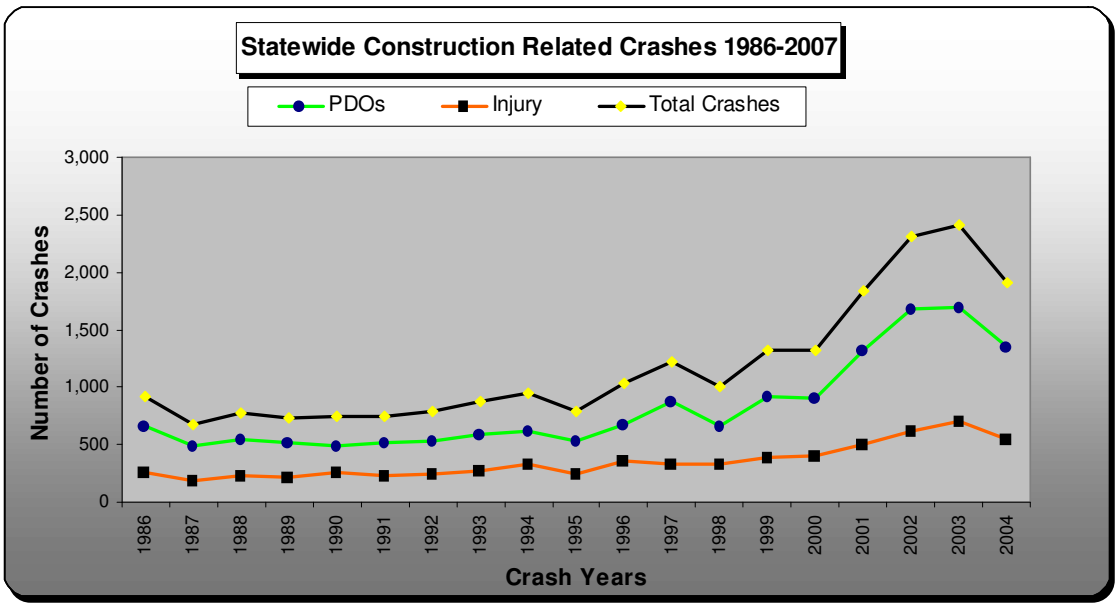
The Need for Work Zone Safety

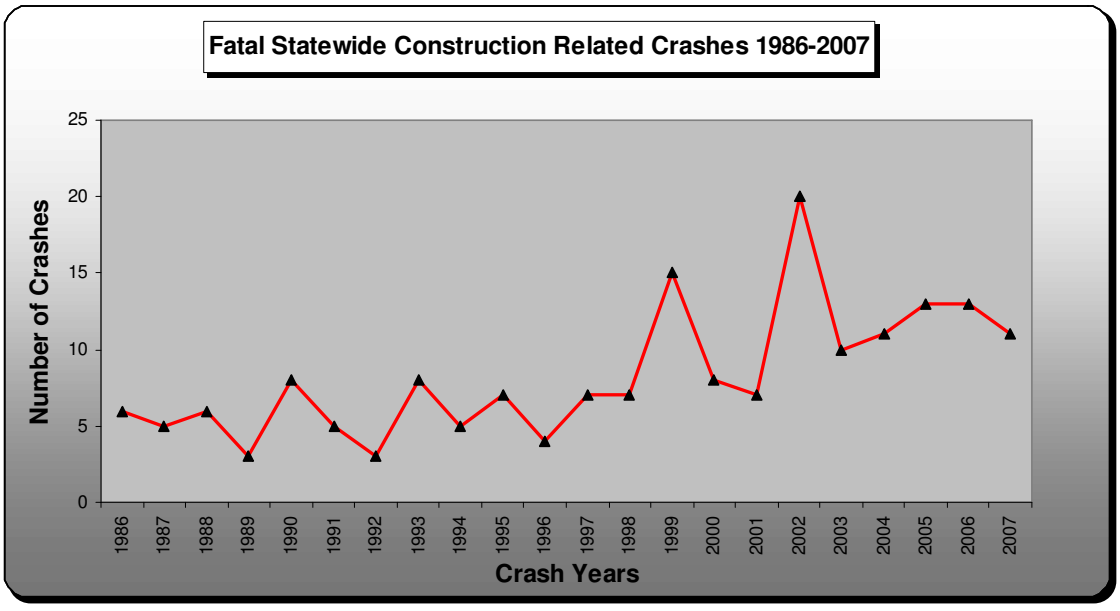
Information provided by St. Paul Fire and Marine Insurance Company

On the roads, driving speeds and congestion are increasing. The average driver's age is rising and there appears to be an increase in younger and more unskilled driving accidents and fatalities. There are more distractions, both inside and outside the vehicle. Drivers are less patient, less tolerant, and more aggressive. All of this is occurring while nighttime work is rising, and minimizing inconvenience to the public becomes a standard requirement. Statistics can be helpful to identify these types of trends, measure improvement, and quantify costs.

- In the U.S., vehicle-pedestrian/worker accidents cause nearly 5,000 fatalities and 40,000 injuries every year.
- 800 to 1,000 fatalities occur in work zones every year – more than 100 of these involve workers.
- Transportation incidents cause more than 40 percent of all work-place fatalities; 6 percent involve workers struck by vehicles.
- According to the U.S. Labor Department, "struck-by" is among the four leading causes of fatalities in the construction industry. Construction vehicles or other heavy equipment cause 50 percent of worker-vehicle struck-bys.
- 25 percent of vehicle worker fatalities occur between 6 p.m. and 6 a.m. when less than 10 percent of the work force is out. Work zone crews out between 6 p.m. and 6 a.m. are 300 percent more likely to be struck by vehicles than crews out during the day.
- One of five worker deaths is caused by a highway collision.

- Four out of five traffic-endangered workers do not have adequate, high-visibility protection.
- A 60-year-old driver requires eight times more light to see at the same level as a 20-year-old driver.
- Annual estimates for visibility-related, road construction injuries are nearly $90 million.
- An estimated $450-$800 million is paid annually in highway-related tort settlements.





1 Program Elements

Scope

This document does not constitute a standard, specification, or regulation and use of the document is at the sole discretion of the individual. The information presented here was developed from existing regulatory requirements, other state programs, and industry best practices. This document is intended to assist users in the implementation of regulatory requirements and performance standards.

It is expected that this program will grow and improve with time by monitoring national practices and making necessary adjustments.

DISCLAIMER: Compliance with this document by itself does not guarantee compliance with Federal, State, or local regulations.

General

Commitment

The construction industry and public agencies in Colorado are dedicated to making roadway work zones as safe as possible. Regulations, enforcement, and encouraging best practices will help meet this goal. All parties should make every effort to both comply with, and assist in, this effort.

Goals

- Reduce or eliminate accidental vehicle intrusion into roadway work zones,
- Reduce or eliminate worker and public accidents, injuries, and deaths,
- Ensure contractor compliance,
- Educate the public,
- Reduce construction impacts on mobility and safety.
- Pursue legislative enhancements.

Ownership

Organization

The Colorado Work Zone Safety Committee was chartered in June 2003 and is comprised of State, regulatory, industry, insurance, and other parties interested in developing the program.

Roles and Responsibilities:

Project Owners / Colorado Department of Transportation (CDOT)

Project owners / Colorado Department of Transportation will provide the necessary design and regulatory requirements in contract documents provided to contractors to help make roadway work as safe as possible.

Contractors

As a minimum, contractors shall comply with contractual and regulatory requirements.

Law Enforcement

Owners and contractors should work closely, continually communicate, and closely coordinate issues with law enforcement to maximize the benefits from the law enforcement resource.

Legislative

State and local governments can assist work zone safety by enacting legislation to increase accountability for the traveling public.

Regulations [Incorporated by Reference]

Colorado Department of Transportation

- Construction Specifications
  http://www.dot.state.co.us/DesignSupport/Construction/2005SpecsBook/2005index.htm

Manual of Uniform Traffic Control Devices

- Colorado Supplement of the MUTCD
  http://www.dot.state.co.us/Traffic_Manuals_Guidelines/MUTCD_2003/MUTCD_2003_Colorado_Supplement.pdf
- Material & Specifications Standard Plans
  http://www.dot.state.co.us/DesignSupport/
- Manual on Uniform Traffic Control Devices (MUTCD). U.S. DOT, FHWA
  http://mutcd.fhwa.dot.gov/

Occupational Safety and Health Administration

- Miscellaneous requirements
  http://www.osha.gov/

Training

Training is an important part of any program. Each discipline involved in project design and construction must have knowledge required to be an effective contributor to the construction goals. Knowledge requirements extend from on-the-job training to formal education and may require licensing or certification. Tasks or jobs, which would include flaggers and Traffic Control Supervisors (TCS), are subject to certification by testing. SEE ADDENDUM A.

Risk Management

Overview

A well-conceived and managed Risk Management program is a necessary step toward protecting worker and public safety. Such programs will initiate a plan of action concerning loss prevention and control. The information presented here is intended as a management guide only. It is not legal advice nor

should it be construed to be a determination of insurance or bonding coverage. Risk Management is most simply defined as the protection of a company's assets and earning or operating capacity. This protection takes on many different forms and uses a number of techniques to accomplish its goal. A significant step in this process is adequate insurance and bonds, because contractors are not usually allowed to bid on work without at least minimum coverage in place. Two additional significant steps are loss prevention and loss control efforts. While the following touches briefly on these three topics, it is only meant as an overview. Contractors need to consult a licensed insurance broker and reputable insurance carriers for specific and detailed programs to meet appropriate risk management goals. A truly comprehensive risk management program considers far more comprehensive protection techniques than these three basic areas.

Insurance and Bonds

Every bid a contractor submits will require proof of adequate insurance coverage in at least three areas. This includes workers' compensation, general liability, and auto liability. Other coverage often seen or required includes builders' risk, professional liability (errors and omissions), and railroad protective. The contract will stipulate the specific coverage and limits required. Contractors need to consult a licensed insurance broker and reputable insurance carriers for specific and detailed information regarding meeting the contract requirements.

Surety bonds are also required for most work. Bond types required are usually performance, payment, and bid bonds. Again, the contract will stipulate the specific bonds and dollar amount required for each. Contractors need to consult a licensed insurance broker and reputable surety company for specific and detailed information regarding the contract requirements or otherwise obtaining adequate coverage.

Loss Prevention/Loss Control

Loss Prevention is best defined as any activity that actually contributes to the prevention of losses on a project. This includes bodily injury to employees or the public and property damage to the contractor's property or that of the public. The primary purpose of this work zone safety document is to guide the contractor through the steps necessary to prevent injury or damage within work zones. Loss Prevention is best approached by developing a comprehensive Risk Management Plan. A comprehensive plan should include the following:

- Written Risk Management Policy,
- Safety committee or coordinator,
- Safety and Loss Prevention rules,
- Safety and Loss Prevention training.

Loss Control is best defined as any activity that is performed to limit the extent of a loss, after that loss has occurred. As in Loss Prevention, this includes bodily injury and property damage to both the contractor's employee, property, or that of the public. While a contractor's loss control efforts should be part of an overall risk management program, the primary focus should be that of its employees. Continuing the outlined essentials above, this plan should also include the following:

- Designation of a Medical Provider for treatment of work-related injuries.
- Policies and Procedures on Claims Management, including:

- Involvement in medical case management, including a modified duty program to return employees to work while recovering,
- Coordination with injured worker, insurance adjuster and designated medical provider to assure prompt and equitable outcome of case,
- Involvement with insurance company adjuster regarding bodily injuries and/or property damage to the general public.

The six Risk Management program essentials outlined in Loss Prevention and Loss Control above are the main tenets of the State's Premium Cost Containment Program. The certification achieved by implementing this program can provide the contractor a direct reduction on their workers' compensation insurance premium.

This program and a number of documents related to employer certification requirements can be located at:

Division of Workers' Compensation Customer Service Unit
633 17th Street, Suite 400, Denver, CO 80202-3660
Denver 303.318.8700
Toll-free 1.888.390.7936
http://www.coworkforce.com/DWC

Colorado Workers' Compensation Premium Cost Containment Program

The following is an excerpt from Essentials of Colorado Workers' Compensation Premium Cost Containment Program.

"Because of alarming increases in the number of injuries and resulting costs of workers' compensation to Colorado Employers, the state legislature enacted the Premium Cost Containment Program in 1989. Under this program, employers who implement and maintain a standardized loss prevention/loss control program, and achieve certification status, are eligible for a reduction on their workers' compensation insurance premiums. By preventing injuries and lowering costs of claims, these employers also contribute to the stabilization and possible reduction of the standard rates set for their respective industries."

2 Project Development and Design

Public Information

Project/Work Zone Communications

Transportation is big news in Colorado. It is rare that it escapes daily media coverage. The perception of a project's success often depends on communications. Well managed communications programs help ensure that key messages are properly developed, transmitted, and received, resulting in efforts that effectively convey information. But those efforts go beyond communications with drivers. It may include others directly affected by a project: residents, business owners, public safety personnel, and even elected officials.

Before work commences on a project, a customized communications plan and coordinating budget should be considered. Depending on the size and scope of the project, the plan may be prepared by Colorado Department Of Transportation or its consultant or contractor. In either case, it should be given adequate thought and planning.

Colorado Department Of Transportation's public relations director and regional public relations managers each maintain responsibility for at least one of Colorado Department Of Transportation's six transportation regions. Initial project information can be gathered at pre-construction project meetings and via phone and/or email communications from resident, project, or program engineers.

Through Colorado Department Of Transportation's Construction Public Notification Policy, a short description of each construction project is published monthly via Transportation News and Colorado Department Of Transportation's web site in advance of construction. Additionally, a press release is written for projects requiring minimal communications. The release generally includes the following:

- Project location (highway number, mile or geographic point),
- Scope of construction,
- Time/days of operation,
- Anticipated delays,
- Work zone speed limits,
- Truck restrictions – if any,

- Project end date,
- Project cost,
- Project's prime contractor,
- Colorado Department Of Transportation contact name and phone number.

Upon completion, the release is distributed via fax and e-mail to local media outlets. In addition, the information is usually distributed to the primary local and county government offices, chambers of commerce, visitor's centers, truck stops, and to any other locations where the information would be available to area travelers. The information also is placed on the public information page on the Colorado Department Of Transportation's website.

If necessary, a letter or flyer is also written and distributed to local businesses and residents who may be impacted by construction. In addition to a release, occasional "updates" can be distributed during a project's duration if a specific operation is expected to impact traffic beyond the normal scope of work.

Continuous project updates also are distributed statewide each Friday via a Highway Lane Closure Report. Each report covers one geographic region: Denver area, Southeast Colorado, Northeast Colorado, Western Colorado (west of Denver), and State Highway 82. Colorado Department Of Transportation's Traffic Management Center is responsible for distributing this information to visitor centers, major truck stops and ports-of-entry. Public Relations distributes to media outlets, traffic reporting agencies and to various Colorado Department Of Transportation offices throughout the state. The information is also placed on Colorado Department Of Transportation's primary and other various project websites.

Colorado Department Of Transportation's Public Relations Office (PRO) director and managers should do the following as a project contact:

- Be listed as contact with number on any correspondence relating to the project,
- Remain subject-to-call at all times and carry a cell phone and/or pager,
- Work with project contractor PR designee to provide accurate information on a regular basis to private individuals, news media, businesses, local organizations and any other entity the project engineer deems necessary that are interested in the project,
- If necessary, able and ready to make presentations about the project to neighborhood groups or businesses.

Strategies to enhance communications could include:

- Neighborhood and/or business owner meetings on regular or semi-regular basis,
- Advertisements in local newspapers,
- Project-specific brochures, newsletters or flyers distributed via direct or email to area businesses and residences,
- Set-up project information phone line (monitored for call-backs/comments or answered directly), or this may be done by project contractor PR designee,
- Regular evaluation to monitor progress and measure results to further enhance communication efforts,
- Project tours for elected officials and/or media.

When the public is informed about what to expect within a project work zone,

it allows them to make better decisions about when to travel, or to take alternate routes. Additionally, consistent communications regarding work zone safety and incidents makes the public more aware of the potential safety issues.

One of the focus areas the PRO works to promote has to do with work zone safety. Listed here are some of the ways we publicize the issue:

Traffic Watchers: The PRO hosts a media luncheon twice a year to provide construction updates and discuss maintenance projects and snow removal plans. The luncheon is held each spring and fall. The luncheon is well attended and includes participation from all major network Denver television stations, Hispanic television stations, the Denver Post, Rocky Mountain News, weekly newspapers from all over the metro area, and representatives from both traffic reporting agencies.

National Work Zone Safety Awareness Week: Colorado Department Of Transportation, in partnership with the Colorado State Patrol and Colorado Contractors Association, holds an event/news conference each April to draw attention to this week.

Work Zone Safety Enforcement and Education Program: Over the summer months, the PRO, in partnership with Colorado Department Of Transportation's Safety Office, dedicates a specific amount of funding to go to overtime enforcement in select work zones. These projects are selected with input from the regions. The PRO issues news releases to local media regarding the program and also follows up with data collected at the end of the enforcement period.

Colorado Department Of Transportation's Public Relations Office phone number is (303) 757-9228. Contact the office for the appropriate regional public relations manager.

Traffic Law Enforcement

Law Enforcement Recommendations

Clear Expectations and Goals

Determine goals and level of police enforcement desired for the project. This may range from static presence in a marked unit provided by the contractor or agency (depending on agency protocols), SMART trailer, roving patrol, and active enforcement. Specify the desired goals and activities in any contract made with police regarding use of extra duty officers, and use officers from the appropriate jurisdiction (contractors use whoever is available as extra duty help, not necessarily the jurisdiction where the project takes place). Tailor police presence and enforcement to the project based on available resources and work times, size, location, and dura-

tion of the road project. Create model incident response guidelines for safe responses to incidents in the work zones (small and large scale accidents, hazmat incidents, etc.).

Other Pertinent Considerations

Explore availability of grants to fund a public awareness media campaign on cone zone safety. Future considerations are to lobby for statutory assistance by creating penalty aggravators for careless driving offenses, vehicular assault, and vehicular homicide in a construction zone, similar to the fines doubled in work zones.

Incident Management

Emergency Services Coordination

In some cases, especially on larger projects, there will be conflicts of jurisdictions. It is important to establish EXACTLY who will be responding to what type of incident.

Pre-planning

No two work zones are alike. It's important to know who and HOW emergency services will be responding to issues such as vehicle accidents, fire, medical and any other emergency. Identify these providers, let them know of your plans, and incorporate their input into the work zone planning. For longer duration or more complicated work zones, invite responders to your site for their considerations.

Access is a key element. If your work involves bridges, excavations, concrete barriers, etc., it is important to consider how emergency services will be accessing the area, and properly communicate changes to affected parties.

The Colorado Department of Transportation has prepared an incident management guide, "Guidelines for Developing Traffic Incident Management Plans for Work Zones", available online at http://www.dot.state.co.us/Traffic_Manuals_Guidelines/.

Incident in progress

Expect that the public will attempt to follow the path of least resistance, which could mean that they will enter protected work zones to get around accidents. Secondary accidents can also be a result of initial accidents. Be alert for vehicles crashing into crashed vehicles.

Post-incident

Lessons learned are an important aspect of any effective safety effort. After any incident, review conditions and set-ups and look for opportunities for improvement. Ensure implementation project-wide.

Contracting

Design

Colorado Department of Transportation has implemented a number of innovative strategies supporting work zone safety. These include but are not limited to:

- Payment of traffic control devices as separate bid items to ensure that funding supports our goals,
- Greater emphasis on planning and implementation of work zone traffic control by the inclusion of work zone traffic control plans in bid packages,
- Requirement of training of flaggers and traffic control supervisors working on state construction projects,
- Payment of traffic control management by contractor to force availability of qualified personnel,
- Use of latest technology and products when justified,
- Funding of public relations efforts related to work zone safety,
- Support for legislation related to work zone safety, such as double fines in work zones.

Not every strategy is appropriate for every project. An assessment of risk should dictate which specific response strategies work best in each situation. Traffic modeling computer programs are available and can be used to forecast operation/safety problems associated with lane reductions, curtailing the need for trial and error implementation of lane restrictions for construction. The Colorado Department of Transportation provides a Traffic Control Plan (TCP) for the work zone. The TCP is defined as those parts of the contract documents that contain the requirements for the maintenance of traffic during construction of the project. See further considerations under “Standard Forms” on page 21.

Specifications

The Colorado Department of Transportation provides specifications in each contract that state the directions, provisions, and requirements pertaining to the performance of the work. See page 29 for links to construction specifications.

Pre-Bid

Contractor reviews plans, specifications, TCP, etc. Design criteria and considerations, including any consideration for payment of uniform traffic control (UTC), are included in the traffic control plan, in general notes, or communicated at the job showing.

Bid

The bidder submits his proposal. After communicating construction access

and UTC budget to subcontractors, communicate quite clearly what is NOT going to be paid for by Colorado Department of Transportation.

Pre-Construction

Contractor develops and submits to Colorado Department of Transportation for approval the method for handling traffic (MHT) for each different phase of construction.

The MHT shows the contractor's proposed construction phasing and proposed traffic control devices consistent with the TCP. The contractor furnishes certifications for traffic personnel as required in the contract.

Construction

The Traffic Control Supervisors and Colorado Department of Transportation project administrators inspect the job site to assure the MHT is followed for each phase of construction. If field changes are made to the Traffic Control set-up, immediately update the MHT to accurately reflect those changes. All changes to any MHT must be approved through the normal chain of approval.

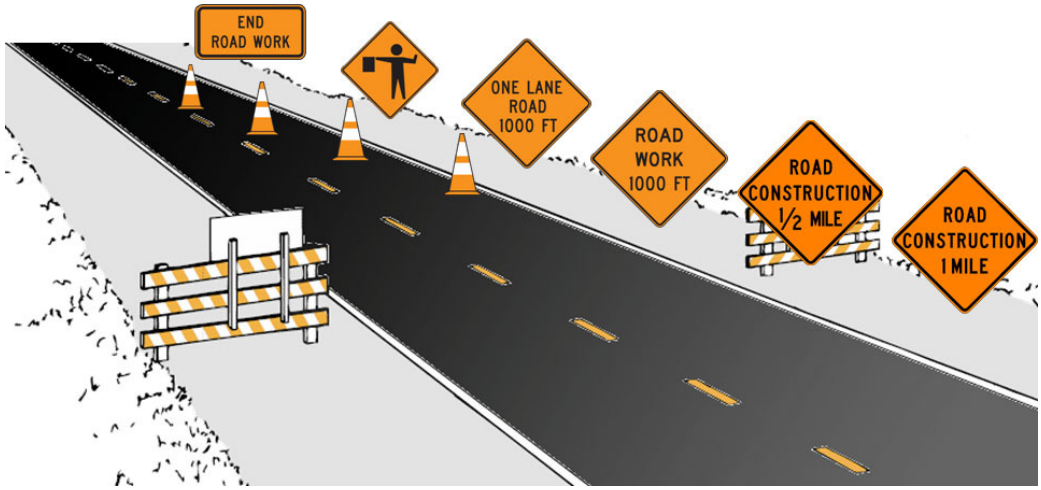
During project execution the contract management team must analyze and respond to new sources of risk introduced by changed conditions or changes in the scope of work. Effective control of risk is only accomplished through continual review of conditions, planning, and re-planning. When appropriate, multidisciplinary work zone and design review teams can be established to consider programs and processes.

More Design Considerations:

- Consider special events or high traffic volumes during "rush hour." Where available, follow established lane closure policy guidance.
- Involve Colorado Department of Transportation resident and project engineers who have input on design; preferably those individuals responsible for construction of the project.
- On large and/or complex projects, seek contractor input to phasing prior to final design, if possible.
- Address height and clearance verification issues in the design phase rather than the construction phase. Potential conflicts can be better addressed at this stage rather than causing costly delays and further public inconvenience.
- On interstate projects, make a budget allotment for Uniform Traffic Control (UTC) available to the project engineer and note in Project Special Provisions, when appropriate, based on a risk analysis. Development of project TCPs should include evaluation for the need for UTC. This would prevent discounting this service due to cost.
- Provide and communicate budget to project engineers for special construction accesses, if allowed. For example, the use of median turnarounds on rural interstate jobs or stockpile areas adjacent to live traffic. Unless plans specifically allow construction access, and the traffic control

associated with this activity are included in the plans, it will not be allowed. Safety issues for construction access, particularly access to controlled access highways, should be evaluated carefully. Normally access off the project site will not be allowed and access within project limits will need careful planning and implementation. This is a potential opportunity for contractors to attempt to save money by not providing adequate signage or other traffic control devices.

- Consider more advanced work zone signage for congested areas. Traffic backups may start well ahead of advance warning signs.



- Allow for more than one TCS on a job. TCS or TCM days are paid on a 24-hour basis for one person. Subcontractors quote one TCS for either a 10 or 12-hour period and it is up to the prime contractor to add money for overtime or additional traffic control supervisors. Keep in mind TCS, flagging, and TCM bid items are contractor provided services and not persons. In most cases, providing this service will require more than one person to complete an 8-hour-day paid service.
- When practical, consider more prevalent use of temporary, full closures on ramps and connecting roads rather than partial closures that put live traffic adjacent to operations.
- Crossing a live lane of traffic to obtain materials or equipment is a worker hazard that can be avoided with proper planning. Contractors should plan on having material and equipment storage immediately adjacent to the work zone or instruct workers they are not to enter a live lane without assistance from the project traffic control personnel.

3 Implementation and Best Practices

Introduction

Compliance with the most current edition of the Manual on Uniform Traffic Control Devices (MUTCD) is required on all construction projects where work is being conducted in the public right-of-way.

Hazard Analysis

Pedestrian Access

For pedestrian considerations, reference Part 6 Temporary Traffic Control of the MUTCD. Typical applications, TA-28 and TA-29, are examples for pedestrian considerations and Chapter 6D discusses pedestrian and worker safety. Another consideration is Americans With Disabilities Act (ADA) requirements (four foot wide walkways, guarded hazards, changes in elevation shall not exceed 1:12 ratio, etc.).

Limited Sight Distance

When sight distance is an issue, it may be necessary to extend tapers and buffer spaces. Personnel should be properly trained in the design and operation of work zone traffic control before making these adjustments. Sight distance can be affected by many factors: horizontal and vertical curves, topography, landscaping, advertising signs, buildings, and temporary obstructions such as construction equipment. If field changes are made to the Traffic Control set-up, immediately update the MHT to accurately reflect those changes. The following table from the MUTCD may be used as a reference regarding sight distances.

Table 6E-1. Stopping Sight Distance as a Function of Speed

Speed* (km/h)	Distance (m)
30	35
40	50
50	65
60	85
70	105
80	130
90	160
100	185
110	220
120	250

Speed* (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Utilities

Utilities of high hazard (i.e., high pressure gas, high voltage) and high value (i.e., fiber optic, telephone) will be commonly located above, below, and near roadway rights-of-way and bridge structures. Planning for, locating, and/or protecting these utilities shall be of utmost concern.

Utility-related work zone safety issues may arise from: (a) utility adjustment and installation work that is performed concurrently with highway construction; and (b) highway construction work that is performed in close proximity to existing utility facilities.

Contractors and subcontractors should become familiar with planned utility adjustments and coordination requirements as shown in the Utilities Special Provision and on plan sheets and detail drawings. Project traffic control, signage, and work zone delineation must account for possible concurrent highway and utility construction work. Utility construction may also require measures for the protection of open excavations, and the safe parking or storage of equipment, vehicles, and materials. The project manager must ensure that highway contractors and utility owners understand their respective duties and properly coordinate all necessary safety measures, whether furnished by the utility or by the contractor on the utility's behalf.

Utilities may also perform, under permit, unplanned work that is otherwise unrelated to the highway project. In such cases the utility will generally be responsible for its own safety measures; however, provisions for such work must still be properly integrated into the project safety plan.

The contractor must also ensure that its construction activities include proper safeguards against interference with or accidental damage to existing utility facilities. The project plans may include test hole or other information that may help identify areas of potential conflict. The contract may include "potholing" bid items for onsite subsurface utility investigations. The contractor must also comply with the notification and safety protective provisions of CRS Title 9, Article 1.5, "Excavation Requirements," before excavating in the area of underground facilities; and of CRS Title 9, Article 2.5, "High Voltage Power Lines – Safety Requirements," before working in proximity to high voltage overhead lines.

Project Specific

Other impacts to projects are special events such as rodeos, fairs, games, etc. Inclement weather, sun glare, etc. can also have an adverse affect on the traffic operations within a work zone. Examples of impacts may be as specific as "rural school bus pick –up / drop-off location" or as general as "no project on XY lane during the period of one day before and two days after Frontier Days." Ultimately the traveling public is our customer whether we work for the owner or contractor. Every effort should be made to provide the customer as safe and efficient a construction work zone as practical. Repeated failure to do so will only serve to make demands on the industry more stringent for limiting work zone activities.

Pre-Job Planning

Project Traffic Safety

Traffic control plans are required by the MUTCD and must consider safety

as an integral part of each project considering motorist, pedestrian, cyclist and worker safety.

Traffic Law Enforcement

Planning Considerations

"Contact local law enforcement" must be added to the planning checklist. Invite representatives of the appropriate law enforcement jurisdictions to road construction planning meetings. This will serve notice to the agencies that a project will be taking place in their area. Designers can then solicit law enforcement assistance and learn what resources the agency can provide (traffic unit saturation patrols, extra patrols, extra duty officers, SMART trailer, etc.). Some large and complex projects may pass through more than one public jurisdiction and/or private entity, and it is important that planning and communications involve all stakeholders. Designers can then create realistic expectations of police, for example, making traffic stops in the work zone creates another safety hazard; watching for violators in the zone and stopping them after they exit the zone is more realistic. Larger agencies have more resources available than smaller agencies. Realistic expectations can be set based on what that agency can offer.

Security

Law enforcement can play a role in work zone security, helping to assure that traffic control devices are not stolen or vandalized as well as preventing theft of other critical equipment from the work zone areas.

Traffic Control Equipment and Devices

All traffic control equipment and devices must conform to the requirements of the MUTCD, which also requires conformity to the NCHRP 350.

Signs

All signs in work zones must comply with the MUTCD, and Federal and State Highway sign standards.

Sign Covers

When signs are not in use, it is required that they be taken down or fully covered. Sign covers are detailed in the CDOT Specifications manual. Sign covers may be made of durable plastic, wood, metal, or polypropylene. Signs which are taken down or faced away from traffic, must be stored outside of the clear zone.

Channelizing Devices

Channelizing devices include tubes, cones, drums, vertical panels, barricades and barriers. Uses and prohibitions of channelizing devices are covered in the appropriate section of the MUTCD.

Cone Setting Vehicle Safety Devices

Fall protection shall be provided for workers on cone-setting vehicles. OSHA can cite failure to provide fall protection under the General Duty Clause [29CFR 1910.5(a)(1)]. Types of fall protection include: positioning devices, rails, or seat belts for specially constructed seats near the road surface and adjacent to the cargo platform. Truck mounted attenuators on shadow vehicles also offer worker protection and should be used whenever possible during work zone setup and removal.

Device Maintenance

A minimum of one cleaning cycle should be made every two weeks or more as necessary. The MUTCD and NCHRP Report 350 require that devices be maintained to manufacturer's specifications.

Variable Message Signs (VMS Boards)

All variable message signs in work zones, both temporary and fixed, must comply with the MUTCD, and Federal and State Highway sign standards. Contact Colorado Department of Transportation, Traffic Operations Center for use of fixed signs.

External Traffic Control Plan (TCP)

Work Zone Implementation

Work Zone Layouts – Typical applications are found in the MUTCD and the State standards. They may be modified and upgraded to improve the traffic flow or provide an additional margin of safety to fit a particular site. Examples of improvements include: longer advance warning with additional signs, longer tapers, buffer spaces, flashing beacons, closer spacing of devices, etc.

Work Zone Set-Up – Ideally, work zones are installed from upstream to downstream. The advance warning signs are installed first.

Work Zone Repositioning – If incidents occur frequently or if traffic operations are poor within the work zone, modifications may be necessary to improve the setup. When modifications occur, proper advance warning should be provided to motorists to minimize impacts to traffic operations and provide a safe work environment for construction workers.

Work Zone Removal – Ideally, the work zone is removed in the opposite direction of set-up; downstream to upstream leaving the first warning sign the motorist sees as the last item of protection picked up by workers.

Work Zone Flagging Operations – The MUTCD (chapter 6E Flagger Control) covers flagging operations in basic terms of clothing (performance standard of "visibility at 1000 feet and clearly identifies the wearer as a person") as well as equipment specifications and techniques. CDOT has a training and certification process that all flaggers must pass before being allowed on Colorado projects.

Work Zone Nighttime Operations – ***Nighttime operations are considered to be operations conducted between sunset and sunrise. Consideration should be given to having night work illumination equipment in place one half hour prior to sunset and left in place until one half hour after sunrise.*** More and more projects are required to be completed at night for traffic volume considerations. Several issues arise in set-up of TCP's for night operations. When additional lighting is required on the job site at night, placement is critical. Light plants may cause driver blindness if positioned improperly. Flaggers are required to have their workstation illuminated. However, this can be a problem with mobile operations. Use best practices to find the optimal combination of retro-reflective clothing and traffic control devices to make a flagger visible to motorists.

Work Zone Inclement Weather Operations —

It's important to consider inclement weather in your work zone planning and implementation. Inclement weather can interrupt traffic control devices unexpectedly, require longer stopping distances, impede visibility, and make work zone access points more dangerous. Extra care and consideration should be taken.

Internal Traffic Control Plan (ITCP)

Work Zone Implementation

Work Zone Layouts – A critical ITCP factor is planning for haul road machinery movement patterns as the project progresses. Training workers on the hazards presented by changing patterns and performing a team based Job Hazard Analysis will minimize the worker/machine conflicts. A formal Job Hazard Analysis is a procedure designed to study the job for any potential hazards caused by the machinery, the surroundings, or the worker, with adequate controls for those hazards identified. Strict adherence to basic rules of the site must be required; i.e., no loitering next to equipment, no crossing haul roads or live lanes, requiring all persons on site to have appropriate gear (hardhats, high visibility clothing in good condition, safety glasses, and appropriate boots), and requiring each operator to complete a walk around the equipment before moving after being parked, even for a short interval.

Work Zone Set-Up – Speed and visibility are key concerns in the work zone. Construction equipment interacting with vehicles and ground workers should be planned and considered carefully. Workers on foot (WOFs) should be separated from equipment as much as possible.

Work Zone Repositioning – Work zones are dynamic by nature and constant monitoring and improvements should be made as construction activities change and/or are completed.

Work Zone Removal – If motorists are expected to follow and obey all signs and directions there must be a perceived respect. It's as important to remove/cover signs when not appropriate as it is to place them.

Work Zone Flagging Operations – This is a viable option when high or otherwise hazardous work zone traffic warrants it, especially when there is a large amount of heavy equipment traffic.

Work Zone Nighttime Operations – Visibility is the concern here. Assure that areas have adequate lighting and ground personnel have necessary reflective clothing on.

Worker and Traffic Protection

Work Zone Training

Basic training for all employees on a construction site must include identification of the hazards they face on the job and what prevention techniques, personal protective equipment, or best practices they should use to prevent injury. This level of training is required under the OSHA regulation 1926.21. [SEE ADDENDUM A]

Personal Protective Equipment (PPE)

(St. Paul Fire and Marine Insurance Company Guidance)

Work Zone Worker Personal Protective Equipment

People tend to see what they're looking for. So, to make people stand out, contractors need to make them conspicuous. Roadway workers should command "visual attention" if within viewing range – without requiring an active or timely search. To that end, here are some basics:

- Reflectivity/Retroreflectivity is defined as the ability to return or reflect a high degree of light back to the direction from which it came. This principle works to give workers a significant or conspicuous 'signature' in night conditions.
- Color and patterns generate conspicuity in daylight and over-cast/low-light conditions. Fluorescent colored materials like yellow-green and red-orange generate significant contrast with most backgrounds.
- Design should include 360 degrees (if possible) of retroreflective and fluorescent materials since workers may be exposed from any viewable angle to endangering traffic or equipment. This same design considera-

tion should be used for the head, arms, legs and feet depending on potential hazards and risk.

- Lights, blinking and otherwise, worn by personnel are also available for head, torso, and other areas in cases of high exposure, hazards or risk.
- Eye Protection shall be required to protect eyes from materials falling off of vehicles and/or debris being kicked up by traffic.

Requirements of the Occupational Safety and Health Administration (OSHA) stress the importance of effective personal protective equipment in the workplace/work zone. The basic elements are:

- Provide an in-depth evaluation of the exposure, hazards, and equipment needed.
- Using Personal Protective Equipment requires hazard awareness and training on the part of the user. Training should include protective limitations, proper use, and maintenance.
- Personal Protective Equipment must be properly fitted and maintained in a clean and serviceable condition by the wearer.
- Selection of proper Personal Protective Equipment is key. The Personal Protective Equipment should not be altered or removed even though an employee finds it uncomfortable. Weather conditions should be considered as well.
- The contractor should continually monitor, evaluate, and determine effectiveness, making changes to the plan and equipment as needed.

4 Monitoring Compliance

"It's not what you expect, it's what you inspect!"

Roles and Responsibilities

Owner — The project owner/the Colorado Department of Transportation should routinely inspect its contractor for compliance with contract requirements.

Contractor — It's a good practice to routinely (first thing every morning) inspect and record how traffic is reacting to traffic control devices and what the equipment condition and configurations are. Night inspections should be made on a weekly basis.

Inspections

It is recommended that in addition to required traffic control plans and logs that the conditions be recorded on video or other method on a daily basis to help protect the contractor in any possible litigation situations.

Standard Forms

Sample Work Zone Inspection Forms

The inspection forms provided at the end of this section are based on generally accepted concepts for work zone safety and compliance with the MUTCD. Individual highway agencies may impose additional requirements. In addition, specific work zone conditions may also raise other concerns. The items on these forms are provided as examples. ***Prior to their use, they should be checked for compliance with highway agency requirements and actual conditions on the project site.***

These inspection items may need to be revised and additional items added to properly address all safety concerns in a specific work zone. Once any revisions necessary to comply with agency requirements and project conditions are made, these forms can be used by a contractor for work zone quality control inspections to document the condition of the work zone and identify and track issues that need to be addressed, and to document daily work zone operations.

Three forms are provided. The first is intended for overall review of an entire project for quality assurance purposes. The second form is a Foreman's Daily Work Zone Report, which is intended for use by each work zone foreman or supervisor to document daily operations within a project. For small projects, one Foreman's report will cover the entire project. For large projects, multiple reports may be necessary. The third form is the inspection form used by the joint CDOT/FHWA inspection teams during their annual Traffic Control Reviews.

In addition to documenting work zone conditions using inspection forms, a discussion of videotaping work zones to document their condition is provided below.

Videotaping Work Zone Setups - A very useful tool to document the specific details of work zone setups is recording the project on videotape. This provides a record of the traffic control setup that may later be used for accident investigations, liability defense, and payment disputes. To be useful, it is important for the video to include a time and date log to indicate when it was made. Equally important, all videos need to be logged and identified so they are accessible when needed.

The quality of the video must be adequate to clearly show the condition and placement of traffic control devices and the actual legends included on signs. Amateur video recorded on inexpensive equipment often does not provide adequate image quality to determine specific details of the traffic control setup. Using good equipment, a clear daytime image of the traffic control setup can be recorded from a vehicle driving through the project. ***However, a driver should not attempt to operate the recorder while driving!*** Obtaining good video quality at night is difficult unless done by a professional using very good equipment. Amateur video recorded at night may appear to show reduced visibility for traffic control devices, even when they are highly reflective. If the decision is made to videotape a project at night, it is important to obtain a representative image that does not portray the devices as less visible than they actually are.

To maximize their value, videos should be made as soon as the initial traffic control setup is completed, and after the completion of any major changes in the project. It may also be helpful to record the project prior to any extended periods of inactivity, and prior to any major holidays when extraordinary traffic conditions may occur. Videotaping should also be considered to document traffic controls present at the time of an accident. If recorded as soon as possible after an accident, this record may be helpful to establish that appropriate traffic controls were in place at the time of the accident, especially when supplemented by a written record documenting that the video shows the condition of the project at the time of the accident.

Finally, video may be especially valuable to document the impacts of traffic control operations within or adjacent to the project, that are the responsibility of others. Operations by utilities or by other contractors working within or adjacent to the project limits may impact traffic control in an adverse manner, and not be under the control of the contractor responsible for the project. In these situations, videotaping may be extremely important to provide a record of the traffic control operations related to the project, as well as those under the responsibility of others. This record may be essential if it becomes necessary to defend a claim arising from traffic controls under the control of someone else.

Sample Work Zone Form #1
Sample Work Zone Inspection Quality Assurance Form

Project: _____ Contractor: _____

Date: _____ Inspected by: _____

Reviewed by: _____

Follow-up Items Assigned: _____

_____

Follow-Up Inspection Completed by: _____ Date _____

Yes	No	N/A	**TRAFFIC SIGNS**
			Sign faces clean
			Sign faces in good condition—no abrasion/wear/tears
			Sign faces smooth/flush—no bowing or wrinkling
			Legends clear, uniform - no mismatched overlays
			No mesh or transparent sign panels
			Reflective sheeting for night use
			Appropriate size for location and conditions
			Proper color (orange for warning, white or red for regulatory, others per MUTCD)
			Sign shape per MUTCD
			Sign height minimums per MUTCD or Agency requirements
			Signs displayed perpendicular to traffic
			Unneeded signs covered or removed when operation/hazard no longer exists
			Covered signs by 100% opaque material if not in service
			Removed signs in safe location, hidden from traffic
			Approved sign supports, no heavy posts or diagonal braces facing traffic
			Signs clearly visible to traffic—not hidden by foliage, other signs, or features
			Adequate spacing between signs—100 ft minimum (urban low speed), more at high speeds or complex signs
			Only one sign per post or support (supplemental panels are permissible)
			Only one countdown series per location—no conflicts/overlaps
			Advance warning provided for all operations/hazards

Yes	No	N/A	CHANNELIZING DEVICES/LANE CLOSURES
			Devices clean and in good condition
			Reflectorized per MUTCD for night use
			Ballast contained and at ground level
			Proper device type and size per MUTCD
			No wooden barricades or steel drums
			Devices not blocking sight distances
			Type III's used for road/bridge closures
			Device spacing meets guideline in tapers and tangents
			Closer spacing at intersections, driveways, curves, etc.
			Devices at outer limit of traffic space, not beyond
			Transverse devices at intervals in closed lanes
			Devices used to mark point hazards
			Flashing warning lights at point hazards/closures
			Steady-burn lights used for delineation
			Good sight distance to lane closure tapers
			Taper locations avoid other conflicts—ramps, etc.
			Taper lengths per MUTCD
			Minimum 2L separation between tapers (tangents)
			Arrow panel at start of lane closure
			One arrow panel per lane closed
			Advance warning signs for closure or shift
			Device position maintains uniform lane width
			Direction of chevrons correct
Yes	No	N/A	**POSITIVE GUIDANCE/PAVEMENT MARKINGS/DELINEATION**
			Effective pavement markings—centerline, lane lines, edge lines
			Good reflectivity for nigh visibility
			Interim markings in place on new pavement
			Supplemental NO PASSING signs if needed
			Roadside delineators/channelizing devices at hazardous features, difficult roadway alignment
			Obsolete markings completely removed/masked
			No misleading removal scars
			Clear path guidance throughout project effective for all driving conditions (darkness, rain)
			Provide clear guidance and travel way for pedestrian and bicycles, if present/expected

Yes	No	N/A	TEMPORARY BARRIERS/ROADSIDE SAFETY
			Roadside hazards eliminated or protected within the clear zone
			Materials and equipment stored beyond the clear zone, especially during non-working hours
			Workers' vehicles parked in safe location beyond the clear zone
			Channelizing devices/delineators used to mark roadside hazards if no removed/protected
			Temporary barrier-portable concrete barrier, used to protect hazards, where warranted
			Safety fencing/barricades to protect pedestrian hazards
			Portable concrete barrier installed per standards
			Joint connections provided, pavement connections if needed
			Channelizing devices and buffer space prior to barrier
			Standard connections between different barrier types
			Delineators or steady-burn lights on barrier close to travel path on curves
			Safety treatment for all barrier ends—turndown or crash cushion, if exposed to vehicle impact
Yes	No	N/A	**WORKER AND VEHICLE PROTECTION**
			Safe access for workers and vehicles
			High visibility apparel for all workers in accordance with ANSI/ISEA 107-2004
			Hardhats for all workers
			Vests and hardhats reflectorized for night time and other low visibility conditions
			Revolving amber lights on vehicles/equipment
			Reflective tape on vehicles/equipment
			Escort vehicle for slow-moving equipment in the active traffic space
			Warning signs for worker and vehicle/equipment entrances
Yes	No	N/A	**BRIDGE AND ROAD CLOSURES**
			Type III barricades to form closure
			Flashing warning lights on barricades
			Regulatory ROAD/BRIDGE CLOSED sign above barricade
			Advance warning signs for closure/detour
			Detour route guidance provided, if needed
			Safety fencing provided to secure site

Yes	No	N/A	FLAGGING PROCEDURE
			STOP/SLOW paddle used as primary device
			Paddles are 8-sided, 18 in. minimum (24 in. for high speeds)
			Minimum 5 ft. staff length, 6 ft. preferred
			Flags OK for emergencies
			Flags, if used, are 24 in., red color, solid material
			Flagger procedure per MUTCD, strictly followed
			All flaggers are trained and certified
			Flaggers wear good quality vest and hard hat, reflectorized at night—per ANSI/ISEA 107-2004
			Flagger station isolated from operations and other workers
			Food sight distance to flagger station
			Flagger has adequate escape route
			Flagger positioned on shoulder or within lane closure as traffic approaches
			Flagger maintains eye contact until vehicle is stopped
			Periodic relief provided to all flaggers
			Flagger sign in advance of full-time flaggers
			Flagger sign removed promptly when no longer needed
			Distance from sign to flagger kept current as operation moves
			Other warning signs provided per MUTCD
			Supplemental signs/devices to slow traffic on high speed roads prior to flagger
			Flagger station illuminated at night (street lights are insufficient for proper illumination)
Yes	No	N/A	**ROADWAY SURFACE CONDITIONS**
			Bumps/holes, rough pavement repaired or marked promptly
			Advance warning signs for bumps, rough/unpaved surfaces
			Warning signs for milled/grooved pavement
			Restore pavement markings on milled pavement
			Accumulation of pavement debris is prevented by cleaning/sweeping
			Control dust on unpaved surfaces using water/chemicals
			Maintain smooth surface on unpaved roadway by frequent grading/compaction
			Pavement edge drop-off minimized, marked if present
			Sidewalks and walkways free of obstruction, smooth compact surfaces

The location of specific concerns or deficiencies should be noted to permit needed adjustments and follow-up to be completed.

Sample Work Zone Form #2

FOREMAN'S DAILY WORK ZONE REPORT

Contractor: _____ Project: _____

Date: _____ Foreman: _____

Provide Description and Location of Operations:_____

_____

_____

List TA's or MHT's used for Setups: _____

Describe any modification to TA/MHT and reasons made:

List times for all setup, removals, major changes:

List Work Zone inspections made, areas/operations covered/times completed:

List crew and equipment assigned to Work Zone operations:

Describe any incidents or accidents:

Reviewed by: _____ Date: _____

Traffic Control Review Form

Project: _____ **Date:** _____
Subaccount: _____ **Time:** _____
Location: _____

Project Engineer: _____ **Prime Contractor:** _____
Resident Engineer: _____ **Traffic Control Contractor:** _____
Reviewer: _____ **Traffic Control Supervisor:** _____

Use Yes, No, NA (Not applicable), or NC (Not Checked)

[NOTE: References are to CDOT's 2005 Standard Specifications, standard special provisions (SSP), Construction Bulletins (CB), M&S standards (M- or S-xxx-x), Construction Manual (CM), Manual on Uniform Traffic Control Devices (MUTCD), or 2002 Roadside Design Guide (RDG)]

	I. TRAFFIC CONTROL MANAGEMENT (Weight = 1)	Yes/No/NA		
A.	TCS's Traffic control daily diaries on file (630.10(5))			
B.	Diaries reviewed by CDOT (CM 630.3.2)			
C.	Discrepancies...noted in diary, CDOT Form 7 & corrected (630.10(5)(viii))			
D.	Night inspections conducted weekly, documented (630.10(6))			
E.	MUTCD (Current) in CDOT field office (CM 630.3.1 #1)			
F.	Resident Engineer Traffic Control Review done (CM 630.3.1 #7, CM 630.2.2 #1)			
G.	Public Info. Spec implemented as required, including up-to-date phone message, daily phone call log, fliers, etc. (Project Special Provision 626)			

	II. METHOD OF HANDLING TRAFFIC (MHT) (Weight =2)	Yes/No/NA		
A.	MHT on file in project records, for each work zone operation (630.09)			
B.	All CDOT Personnel and superintendents have received WZTC training (SSP 630)			
C.	MHT in compliance with TCP (630.09)			
D.	CMO prepared for major change of TCP (630.09)			
E.	MHT reviewed and initialed by Prime contractor (CM 630.2.4 #1)			
F.	MHT approved and initialed by proper CDOT person (630.09)			
G.	MHT sufficiently detailed per 630.09.			
	1. Detailed diagram (630.09(1))			
	2. Tabulation of devices for each phase (630.09(2))			
	3. MUTCD, Plans, Specs & other sources referenced (630.09(3))			
	4. Estab. access mtce. plan, turn around locs., equip. storage, etc. (630.09(4))			
	5. Pedestrian (ADA), bicycle & non vehicular access addressed (630.09(5))			
	6. Plan for emergency vehicle access (630.09(6))			
H.	Vert. and horiz. clearances (630.09(7)&(8), CM 630.2.4, #7a & 7b, CB 2006-1)			

	III. WORKSITE TRAFFIC CONTROL SUPERVISOR (TCS) (Weight =1)	Yes/No/NA		
A.	Current ATSSA or CCA Certification on file in project records (630.10)			
B.	TCS has current flagger card (630.10)			
C.	TCS available on project (630.10, last paragraph)			
D.	TCS has current MUTCD (630.10(8))			
E.	TCS has current TCP, MHT, M&S-Standards and revisions (630.10(8))			
F.	TCS appropriately dressed (fluorescent orange-red or yellow-green hardhat, vest, reflectorization at night, sturdy boots) (630.13) (appropriate PPE)			

IV.	**FLAGGERS (Weight = 1) (see MUTCD Chapter 6E)**	Yes/No/NA		
A.	Current flagger card (630.13(a))			
B.	Appropriately dressed (fluorescent orange-red or yellow-green hardhat, vest, reflectorization at night, sturdy boots). (630.13) (appropriate PPE)			
C.	Proper flagging methods used (630.13, MUTCD 6E.04)			
D.	Flagger location (630.13, MUTCD 6E.05):			
	1. Visible to traffic.			
	2. Proper distance in advance of work.			
	3. Station illuminated at night (630.13)			
E.	"STOP/SLOW" Paddle (630.13, MUTCD 6E.03):			
	1. Correct size and shape.			
	2. Satisfactory condition.			
	3. Correct sheeting (Type III or fluorescent).			

V.	**CONSTRUCTION/MAINTENANCE SIGNING (Weight = 3)**	Yes/No/NA		
A.	Placement (spacing/mounting height/angle/offset/sight distance) conforms to approved MHT/MUTCD/S-Stds.	YES		
B.	Conforms to MUTCD/S-Standards/TC plans (size, layout, color).			
C.	Satisfactory condition (clean, readable, no wear/tear/wrinkling/bowing).			
D.	Temporary signs			
	1. 1' minimum above pavement elevation (S-630-1, Sht 11, note 12)			
	2. Stored out of clear zone (630.12, SSP 630)			
E.	Satisfactory breakaway posts or NCHRP 350 compliant (630.02, 614.02, 630.08, SSP 630, CB 2005-10)			
F.	Correct signing for situation			
G.	Conflicting signs properly treated (masked, turned, removed) (630.11, 630.12)			
H.	Appropriate fluorescent & reflective sheeting on all signs. (630.02, SSP 614/630)			
I.	Flashing beacons installed/working properly (S-614-14)			
J.	VMS message/placement (MUTCD 6F.55, MUTCD 1A.14)			

VI.	**TRAFFIC CONTROL DEVICES (Weight =3)**	Yes/No/NA		
A.	Arrow panel (MUTCD 6F.56, 630.03)			
	1. Correct size, number of lights etc.			
	2. Correct mounting height.			
	3. Correct placement.			
	4. All lights working.			
	5. Correct operating mode.			
	6. Auto dimmer for night use operational.			
B.	Channelizing devices (barricades, cones, drums, etc.) (630.05, 630.06, MUTCD 6F.58 to 6F.63):			
	1. Correct dimensions.			
	2. Clean, adequately maintained, and functional (upright, etc.)			
	3. Correct taper length			
	4. Correct spacing between devices.			
	5. Warning lights working.			
C.	Concrete barrier (temporary):			
	1. Correctly pinned. (630.07, M-606-14, RDG 9.2.1.1)			
	2. Proper reflector spacing. (S-630-2 Note 9, max 50 feet)			
	3. Proper reflector color (S-612-1)			
	4. End treatment installed, or “Clear zone” established. (S-630-2, Note 9)			

	5. Correct Taper (RDG 9.2.1.1.1, 4:1 to 8:1, S-630-1, Sht 11, Note 16)			

VI I.	PAVEMENT MARKINGS (Weight =2)	Yes/No/NA		
A.	Pavement marking plan on file. (627.03)			
B.	Conflicting markings properly removed. (627.03(d), 202.05, MUTCD 6F.71)			
C.	Pavement markings placed correctly (full compliance, width, length, location, waviness) (627.03) (per plans, specs, and MUTCD)			
	1. No passing zones in full compliance. (627.03)			
D.	Satisfactory condition (not overly faded, damaged or obscured)			
	Section Score (Sum X Wt)			

VI II.	MISCELLANEOUS ITEMS (Weight = 3)	Yes/No/NA		
A.	"Clear Zone" free of obstructions. (per plans or RDG 9.1.1)			
	1. Construction materials/equipment out of clear zone or protected			
	2. Hazards in clear zone (other than barrier) delineated or protected			
	3. Pavement edge drop-offs minimized, marked if present (MUTCD 6F.42)			
B.	Impact attenuators:			
	1. Installed per specifications (proper array and pad).			
	2. Lids in place, dry sand, good condition.			
	3. Other attenuator types installed properly and maintained			
C.	Pilot car operation correct. (630.13)			
D.	Compliance with Project Special Provisions (working hours, etc.).			
E.	Traffic Signal operations/installation (630.04, 614)			
	1. Timing adequate			
	2. Vertical clearance adequate/Proper location of heads			

IX .	TRAFFIC IMPACTS (Weight = 2)	Yes/No/NA		
A.	Adequate driver guidance (Drivers understand where to go)			
B.	Traffic delays being mitigated (Alt Rte, delays advertised etc.)			
C.	Accidents documented (630.10(5)(viii))			
D.	Work Zone speed limit			
	1. Form 568 on file (CM, Appendix B)			
	2. Speed reduction appropriate for operation (not too slow/not too fast)			
	3. "Fines Doubled" and return to speed limit properly placed (S-630-1, Sht 10)			

X.	WORK ZONE AREA AND WORKER SAFETY (Weight = 2)	Yes/No/NA		
A.	Safe entrance/exit to work zone for equipment and workers (630.09(4))			
B.	Work zone buffer adequate (MUTCD 6C.06)			

(See next page for comments)

COMMENTS:
Section I General Comments:

A:
B:
C:

D:
E:
F:
G:
Section II General Comments:

A:
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Section III General Comments:

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Section IV General Comments:

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Section VIII General Comments:

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Section IX General Comments:

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D:
Section X General Comments:

A:
B:
Overall Comments:

4 Technical Resources / Bibliography

Federal

MUTCD

http://mutcd.fhwa.dot.gov/

NCHRP Report 350 (Crashworthy hardware)
http://safety.fhwa.dot.gov/fourthlevel/pro_res_road_nchrp350.htm

OSHA

http://www.osha.gov

WORK ZONE WEBSITES

National Work Zone Safety Information Clearinghouse:
http://wzsafety.tamu.edu/

Federal Highway Administration Work Zone website:
http://ops.fhwa.dot.gov/wz/index.asp

National Institute for Occupational Safety & Health (NIOSH):
http://www.cdc.gov/niosh/injury/traumazone.html

Work Zone Operations — Best Practices Guidebook, April 2000
http://www.ops.fhwa.dot.gov/wz/practices/best/bestpractices.htm

CD-Rom, FHWA-OP-00-010

State

CDOT Construction Links

http://www.dot.state.co.us/DesignSupport/Construction/2005SpecsBook/2005index.htm

http://www.dot.state.co.us/Traffic_Manuals_Guidelines/Traffic_Guidelines_and_Information.asp

Colorado Supplement of the MUTCD:
http://www.dot.state.co.us/Traffic_Manuals_Guidelines/MUTCD_2003/
MUTCD_2003_Colorado_Supplement.pdf

Public Relations/Project Information Page
http://www.dot.state.co.us/Communications/News/index.htm#

Suggested Training Matrix

FUNCTIONAL GROUP	JOB TITLE	SUGGESTED TRAINING TOPICS
Project Owners (City, County, CDOT)	Policy Makers	8
	Managers	2,3,7,8
	Engineers/Designers	1,2,5,7,8
	Field Oversight	1-8
	Safety	1-8
	Maintenance	1-8
Project Builders (General Contractors and Subcontractors)	Managers	2,8
	Estimators	5,8
	Engineers/	5,8
	Designers	1-8
	Safety	1-8
	Field Supervision	1-8
	Workers/Operators	1-8
	Flaggers	1-8
Specialty Contractors (Subcontractors)	Stripers	1-8
	Traffic Control	1-8
	Maintenance	1-8
Law Enforcement	Local Police Departments	1,4,5,6,8
	County Sheriff Departments	1,4,5,6,8
	State Patrol	1,4,5,6,8
	OSHA	1,2,4,5,8
All Work Zone Visitors		1,2,4

Training Topics Menu	
Hazards	1
Established Program	2
Accountability	3
Personal Protective Equipment	4
MUTCD Knowledge	5
MUTCD Skills	6
Field Corrective Actions	7
Laws & regulations	8

Available Training Courses	Potential Providers	Hours Needed
Traffic Control Technician	Zerah, Inc: ATSSA	8
Traffic Control Supervisor	CCA; ATSSA	16
State Flagger Training	CDOT	4
Traffic Incident Management Plan	CDOT	8

Notes

FOR MORE INFORMATION OR STAFF ASSISTANCE, PLEASE CONTACT:

Gabriela Vidal, Branch Manager
Colorado Department of Transportation
Safety and Traffic Engineering Branch
4201 E. Arkansas Avenue
Denver, Colorado 80222
Voice: (303) 757-9879
Fax: (303) 757-9219

Email: Gabriela.Vidal@dot.state.co.us

A copy of this guide is available at:
http://www.dot.state.co.us/Traffic_Manuals_Guidelines/