

Guidelines for Developing Traffic Incident Management Plans for Work Zones



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Safety and Traffic Engineering Branch

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I. Introduction

Goals of Traffic Incident Management for Work Zones

The Colorado Department of Transportation is committed to providing a safe and reliable transportation system. “According the Federal Highway Administration (FHWA), nearly 800 fatalities and 37,000 serious injuries occur annually from vehicle accidents in work zones...The number of persons killed in motor vehicle crashes in work zones ... [went] from 789 in 1995 to 868 in 1999, with an average of 768 fatalities a year.” (Iowa Safety Management System, Toolbox of Highway Safety Strategies, Chapter 19, 2001) In addition, traffic incidents, non-recurring events that cause a reduction in highway capacity, account for between 50 and 60 percent of total congestion delay. In small urban or rural areas it can account for significantly higher percentages. (FHWA, Freeway Management Operations Handbook, Chapter 10, Draft 2003) These incidents pose a risk of secondary incidents and cause problems including traveler delay, increased fuel consumption, reduced air quality, and, when combined with work zones, delays and costs to the construction project.

Traffic incident management provides a coordinated approach to managing incidents that occur on the highway. It is “the systematic, planned, and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders. Effectively using these resources can also increase the operating efficiency, safety, and mobility of the highway. This results from reducing the time to detect and verify an incident occurrence; implementing the appropriate response; safely clearing the incident; and managing the affected flow until full capacity is restored.” (FHWA, Freeway Management Operations Handbook, Chapter 10, Draft 2003)

Best Practices

CDOT’s initiative to provide guidelines for traffic incident management in work zones builds on successful practices already in place in Colorado and other states. Although a number of other states have adopted guidelines and requirements to address incident management in work zones, CDOT’s effort goes beyond these current practices. Several practices from other states are outlined below:

State	Description	Benefit
California	Designated towing-service responsible for keeping work zone free of disabled vehicles.	Quick response results in significant decrease in queue lengths and motorist delays.
Iowa	Contractor provides 24-hour per day monitoring of traffic control devices and incident response and assists stranded motorists.	Improves traffic safety and traffic flow through major reconstruction projects and provides prompt notification of incidents.

State	Description	Benefit
Mississippi	I-55/I-20 reconstruction project provision outlined the responsibilities of the contractor as part of the Incident Management Team, responsible for reducing traffic delay and providing emergency vehicle access to the site.	The contractor became a partner involved in making decisions with the Incident Management Team and was more willing to be responsible for improving traffic control and emergency vehicle access on the project.
North Carolina	Since 1991, representatives from emergency response agencies have met in Incident Management Inter-Agency Teams. During team meetings, NCDOT resident engineers inform agencies about construction projects.	Pre-planning and preparation allow emergency response agencies to access the scene more quickly. Quick response and clearance by predetermined alternate routes help maintain traffic flow.
Oregon	The Westside Corridor Work Zone Incident Management program included safe pullouts for disabled vehicles, tow truck and operator during peak hours, regular patrol by supervisor, supervisor truck with emergency equipment, routine service patrols, call-in number for motorists to report incidents, and motorist information provided through VMS and news outlets.	Benefits included reduced delay and enhanced safety in the work zone because incidents are responded to and cleared faster. The program fostered good will with the public
Pennsylvania	Incident management plans are required on long-term construction projects. The policy has been in use since 1994 and requires a pre-construction meeting with emergency responders	The meetings eliminate guesswork during actual emergencies and provide effective response and reduced delay.
Utah	Service patrols were provided on the I-15 project on I-15 and the alternate route I-215. The service patrols consisted of vehicles equipped to handle minor vehicle problems.	The intended benefit was to reduce congestion and provide good public relations with the community.
Utah	Utah has initiated a cooperative effort of emergency response agencies, trucking companies and the media to develop emergency response plans submitted and incorporated within traffic control plans.	The practice allows emergency response agencies and the private sector to have input into the overall traffic control plan, improving and coordinating emergency response to the work zone.

(Source: FHWA, Work Zone Operations Best Practices Guidebook, 2000)

Examples of formalized traffic incident management programs developed for long-term reconstruction efforts include the Big I Project in Albuquerque, New Mexico and the T-REX project in Denver. Both projects provided a program that integrated transportation and public safety agencies in planning and responding to incidents in the work zone. They also provided coordination through a dedicated traffic operations center that monitored and coordinated response to incidents. The T-REX program is outlined in more detail below.

Overview of Existing CDOT Traffic Incident Management Programs

The Colorado Department of Transportation (CDOT) has led the development of a number of traffic incident management plans and programs throughout the state. These programs address procedural and coordination aspects of managing unplanned events on the highway that impact the flow of traffic. These incidents range from environmental events to stalled vehicles to multi-vehicle crashes to hazardous materials incidents that may impact the shoulder or close the entire highway.

Currently, there are nine active traffic incident management programs for Colorado Interstates and State Highways. Below is a brief description of these programs. Additional information for each program is available in the program response manual and the final report.

North I-25 – Weld/Larimer Counties

The North I-25 Weld/Larimer Counties Incident Management Plan developed by CDOT Region 4 in 1996 was the first of its kind in the state of Colorado. The limits of this plan are I-25 from SH 7 (MP 229) to Exit 293.

US 36 – I-25 to Boulder

The US 36 Incident Management Plan covers the Boulder Turnpike from I-25 to Boulder. This plan was developed in 2001.

T-REX – I-25 Broadway to Lincoln Avenue, I-225 Parkway to I-25

The T-REX Traffic Incident Management Program incorporated and updated the I-25 DTC Incident Management Plan developed in 1998 and added additional sections of I-25 and I-225. The limits of the T-REX program, developed in 2001, are I-25 from Broadway to Lincoln Avenue and I-225 from Parker Road to I-25.

South I-25 – Douglas County

The South I-25 Corridor Incident Management Program, developed in 2001, covers the 30 miles of I-25 in Douglas County (MP 193 to MP 163) and abuts the portion of I-25 covered in the T-REX Traffic Incident Management Program

DIA – I-225/I-70 Interchange

The DIA Incident Management Plan was developed in 1997 and is currently in draft status. It addresses incidents in the vicinity of the I-225/I-70 interchange to minimize delays to DIA.

6th Avenue – Kalamath to I-70

The US 6 – Kalamath to I-70 Incident Management Program was developed in 2001 and covers 6th Avenue from Kalamath east of I-25 to I-70 in Jefferson County.

I-70 Mountain Corridor – Morrison to Utah

The I-70 Mountain Corridor Incident Management Program covers 259 miles of I-70 through the mountains from the Utah state line to the Morrison exit. The program coordinates across two CDOT regions, Region 1 and Region 3, and between three traffic operations centers, Hanging Lake Tunnel, Eisenhower Tunnel and the Colorado Transportation Management Center in Lakewood. This plan was developed in 2000.

I-25 through Colorado Springs

The I-25 Colorado Springs Incident Management Program was developed in 1998 and covers I-25 from Old Highway 85/87 (Exit 128) to Fontanero Street (Exit 144).

I-25 through Pueblo

The I-25 Corridor Incident Management Plan for the Pueblo Area was developed in 1997 and includes I-25 from Stem Beach (Exit 91) to Bragdon (Exit 108).

These programs were developed with representation from affected response agencies in the corridor, including CDOT, local transportation agencies, fire/rescue, law enforcement, emergency medical services, towing services, and other agencies in the corridor. The process included the review and incorporation of existing protocols and agreements. The programs outline procedures for informing system users and the media and provide guidance for program implementation and management.

Each of the programs includes an Incident Response Manual that contains:

- Incident levels and associated actions
- Lists of response agencies
- Roles and responsibilities of response agencies
- Contact information and procedures
- Scene management guidelines
- Predetermined alternate routes
- Resource information

The manuals provide a quick, in-the-field reference to response personnel to ensure effective, consistent response to incidents in that corridor.

II. Considerations for Developing Traffic Incident Management Programs for Work Zones

It is the intent of the Colorado Department of Transportation to ensure work zones are safe and minimize the impact and delay to motorists. Planning for traffic incidents that occur within work zones is a critical component of reducing delay and increasing the safety and reliability of the highway system. Traffic incident management plans should be developed in a collaborative effort with the emergency response and public safety community and incorporated in the overall work zone management plan. The level of complexity of these plans should reflect the duration and complexity of the construction project and its impacts on the system. Long-term, complex reconstruction projects, such as T-REX, necessitate comprehensive programs with significant investment in equipment and procedures to support the project. Short-term projects in low volume, rural areas may simply require an initial meeting and ongoing coordination with appropriate response agencies. Each construction project presents unique problems for emergency responders and the management of incidents that occur in the work zone. The intent of these guidelines is to guide and assist the development of programs that meet the needs of the contractor, CDOT, emergency responders, and the motoring public.

Incorporating and Adapting Existing Programs

The first step in developing a program for a CDOT construction project is to review the list of existing programs above to determine if the project is within a corridor with an active traffic incident management program. If it is, the contractor will need to coordinate with CDOT and the appropriate response agencies to identify any changes or additions necessary to accommodate the project. In this case, the contractor will become an active partner in the existing program and will not need to develop a new program for use on the project.

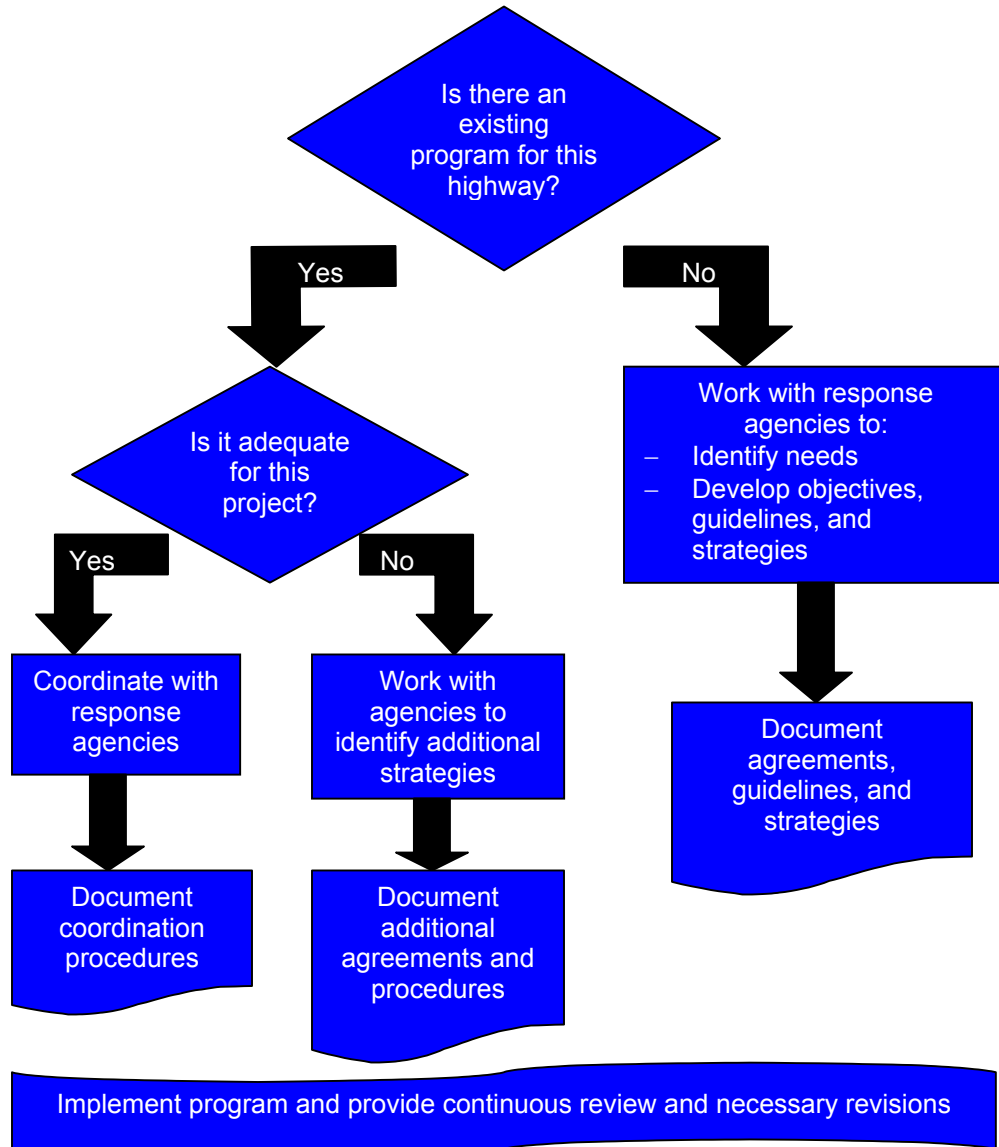
If the proposed project lies outside of any existing programs, the contractor will take the lead in developing a program appropriate to the project duration and the level of impact the project will have on the highway and its users.

Identifying Appropriate Program Detail

The intent of this document is to guide the development of a traffic incident management plan that is appropriate to the project and enhances incident detection, response, and clearance. Each project should identify the level of detail and the strategies necessary to ensure a safe work zone that minimizes the impacts of traffic incidents on the workers, responders, and traveling public. The process of determining the level of detail required for the program should include the CDOT Project Manager in partnership with the response agencies in the project area. The flowchart below provides some key questions to help determine the program needs.

Important considerations should include:

- Will this project impact emergency response in this segment of highway
- Are there access issues for responding to incidents within the work zone
- If an incident closes the highway in one or more directions, how will traffic be re-routed
- Are there strategies to minimize project impacts on response agencies
- Are there strategies to minimize incident impacts on the public
- Are there procedures that would enhance incident clearance and safety
- What equipment would improve emergency response and management during construction, is it available, and where is it located
- How will project personnel coordinate and assist emergency responders



As shown in the figure above, if a project lies in an area that is currently covered by a traffic incident management program, the first step in the process is to review the program to see how it applies to the proposed project. The contractor should anticipate meeting with the response agencies (e.g. fire, law enforcement, traffic engineering, etc.) to determine if the program is adequate for the needs of the project. If it is adequate and no changes are required, the contractor should work with the response agencies to determine and document their role in the program and how they will support the program.

If it is determined that additional procedures and strategies are needed to ensure that stakeholders' needs are met during construction, these should be identified, documented, and implemented by the contractor. These might include:

- Contact lists for construction and utility personnel
- Procedures for communicating with the contractor during an incident
- Procedures for updating response agencies on traffic control changes
- Emergency access requirements
- Variable message signs or other traveler information strategies
- Detour routes to be used in the event of a long-term incident

On more complex projects where there is no traffic incident management in place, the contractor should anticipate identifying and meeting with response agencies in the area to identify concerns and consider a full range of strategies to address these concerns. On projects with multiple phases, it may be necessary to develop a plan for each phase of the project. The procedures and recommended strategies should be documented by the contractor and distributed to all response agencies and construction personnel. Strategies that require implementation (e.g. signing, ITS devices, traffic management center, courtesy patrol) should be implemented by the contractor at the start of the project. Training and follow-up sessions will be necessary to ensure that all agencies and construction personnel are familiar with the procedures in the plan. These should also be reviewed, revised and updated as necessary throughout the life of the project.

Some of the tools that might be included in the documentation include:

- Incident levels and associated actions
- Lists of response agencies
- Roles and responsibilities of response agencies
- Contact information and procedures
- Scene management guidelines
- Predetermined alternate routes
- Resource information

On any project, the minimum requirement should be to identify whether there is an existing program and determine the role of the contractor in implementing the program. The contractor should also contact appropriate response agencies in the corridor to discuss their concerns with the proposed work zone and agree to procedures and strategies that will support traffic incident management. This communication and coordination is essential for any work zone. On more complex projects, this coordination will become more formalized and require the

involvement of more stakeholders. It will necessitate a greater commitment of time and resources on the part of the contractor.

Planning and Coordinating with Response Agencies

Interagency coordination provides the foundation for successful traffic incident management. On construction projects, it is essential that the contractor's key personnel become familiar with the agencies that respond to highway incidents in the project area. This includes identifying the agencies and meeting with representatives to discuss current procedures and protocols as well as concerns the agency may have with potential impacts of the project on their operations and any issues with response in and around the project area. On more complex projects, this may entail developing project-specific procedures and agreements.

Agency Identification

When identifying the agencies in the project area, the contractor should consider the following types of agencies to develop a list specific to the project:

Transportation Agencies

On CDOT projects, CDOT personnel with a specific interest in traffic incident management on the project may include the Region Traffic Engineer, Maintenance Supervisor, special response teams or equipment for the project area (e.g. Hanging Lake Tunnel personnel in Glenwood Canyon), and the traffic management centers (CTMC, Hanging Lake, and Eisenhower Tunnel). At the local level, cities and counties in the project area have transportation or road maintenance and operations personnel who would be impacted by detours and who could provide resources in the event of an incident.

Law Enforcement

Colorado State Patrol (CSP) generally has jurisdiction on state highways in Colorado and is often the first responding unit to incidents on these facilities. Local law enforcement, police and sheriff, also respond to traffic incidents on state highways and in some locations may have primary jurisdiction. It is important to coordinate with law enforcement at all three levels to determine their needs in managing traffic incidents in the project area.

Fire/Rescue

Fire/rescue response is generally provided by local fire departments along the corridor. These departments may have volunteer or career responders, or a combination. It is important to work with these agencies to determine their needs and understand their current practices and protocols. On large projects, the project area may overlap more than one fire district, requiring the coordination between each one and the contractor. In most areas of the state, agreements between neighboring districts are in place that will support coordination on these projects.

911 Dispatch

Public safety answering points (PSAP) receive 911 calls and dispatch appropriate response agencies. 911 calls from cell phones on Colorado highways usually go to county or city dispatch centers, which then dispatch emergency responders appropriate to the nature of the call. Special cell phone

numbers may be routed to other dispatch centers. For example, *CSP and *DUI cell phone calls are received by CSP dispatch centers, as are call made from existing emergency call boxes along state highways. Coordination between these centers and the response agencies is a critical part of effective response. The contractor needs to identify the dispatch centers for the project and ensure that their information and procedural needs are met in managing traffic incidents in the work zone.

Towing and Recovery

Towing and recovery services are generally privately provided. Towing services are often maintained on a pre-qualified list by CSP for response on state highways. In some cases, contractors provide on-call or on-site towing capability as part of the construction contract. If private towing services will be used in a work zone traffic incident management plan, representatives of the providers should be involved in developing any guidelines or procedures for the project area.

Emergency Medical Services

Emergency medical services (EMS) are generally provided by fire departments or ambulance services in the project area. Their role is to help stabilize and transport victims of any incidents in the project area. They are part of the overall response effort and should be involved in developing guidelines and procedures.

Hazardous Materials

Hazardous materials incidents fall under the jurisdiction of the Designated Emergency Response Authority (DERA) for the area. This is the agency with legal authority to respond to and manage hazardous materials incidents. In many urban areas, the DERA is the fire department. In more rural areas or locations without local expertise in hazardous materials, the DERA on state highways is often CSP. It is important to identify who the DERA is for the project area and involve them in identifying any special needs in the project area and in developing guidelines and procedures.

Media

The media can be an essential resource in informing the motoring public of incidents that affect their travel. Broadcast media, such as radio and television, can provide real-time information to drivers in their car, or before they even get in their car, allowing them to make informed decisions about their travel based on current conditions. Print media, such as local newspapers, can help distribute project information in advance in terms of traffic incident procedures and sources of information during an incident. Other media services, such as internet and paging services, can also provide time-sensitive information to their subscribers. Local media services should be identified and coordinated with to provide effective traffic incident management in project work zones.

Other Response Agencies

A number of other response agencies may exist in a project area and could have an impact on how traffic incidents are managed in work zones. Some local governments or quasi-governmental agencies provide specialized rescue services, such as extrication of patients from badly damaged vehicles or high-angle rescues in mountainous areas. Special dive teams may be needed for

incidents that involve patients in rivers that run parallel to a number of highways in Colorado. The Red Cross and Salvation Army provide support services to responders and victims during long-term or catastrophic incidents. In many counties, victims of fatal crashes cannot be moved until the Coroner is on-scene to pronounce the death. These procedural issues should be identified in the planning process and appropriate representatives should be included in plan development.

Planning Approach

Effective traffic incident management requires a comprehensive, integrated planning process that involves all potentially affected stakeholders. Stakeholders include traffic engineers, highway maintenance personnel, law enforcement officers, fire and emergency medical responders, towing and recovery operators, and a range of other professions who play a role in incidents and emergencies on the roadway. They consist of federal, state, and local agencies, as well as private sector, volunteer, and contract agencies. To effectively manage incidents to reduce the impact on the system and improve safety, representatives from all of these agencies must work together to define common goals, roles and responsibilities, and strategies for improving institutional, technical and operational aspects of traffic incident management.

There are two approaches to developing and implementing effective traffic incident management. The first is to identify incident management as a planning priority and develop programs and plans for the existing system. The second is to incorporate incident management as a key component of any construction or reconstruction project. The inclusion of a comprehensive traffic incident management program in construction projects supports safety goals for the long term while mitigating traffic congestion during construction. Traffic incident management provides a wide range of opportunities for traffic and safety management and requires a comprehensive approach to planning.

Coordination with Other Projects

Some projects may occur on a highway where other construction activities are underway in close proximity, either on the same highway or on intersecting streets or highways. It is important to coordinate between these projects to minimize the impact and to simplify the planning process. Projects that occur in the same area often impact the same emergency response agencies and efforts must be made to support procedures developed for other programs and projects. Different procedures for different projects in the same area create confusion and a high potential for program failure. Another important consideration when there are multiple projects in the same area is the limitation they may place on detour routes. Routes that include highways that are under construction may create significant congestion and safety concerns on the alternate route.

ITS Considerations

Many CDOT reconstruction projects include intelligent transportation system (ITS) devices such as variable message signs (VMS), traffic monitoring video devices, and ramp metering. These devices provide opportunities for traffic incident management and the phasing of their construction and activation may

support incident management during construction. For example, if the project includes a permanent variable message sign and it is possible to construct it and bring it on-line early in the project, it can be used to inform drivers during incidents or delays in the work zone.

In addition to permanent installations, there are a number of strategies that use ITS devices in temporary or portable applications. These include trailers that combine surveillance capabilities with VMS displays, or VMS boards mounted on the back of a truck that can be located quickly to support incident management. These are fairly inexpensive strategies that provide significant benefit in terms of safety and congestion management.

III. The Planning Process

Traffic incident management programs address several key components or phases of traffic incident management, including:

- Incident Detection and Verification
- Incident Response
- Incident Site Management
- Incident Clearance
- Motorist Information Dissemination

Many of the goals and strategies for traffic incident management target specific phases. Incident detection and verification begins as soon as an incident is discovered and reported. Verification may occur with the arrival of the first responding unit or by use of video surveillance equipment. The important aspect of verification is that it helps substantiate the incident and begin defining the resources needed and the level of impact to the highway.

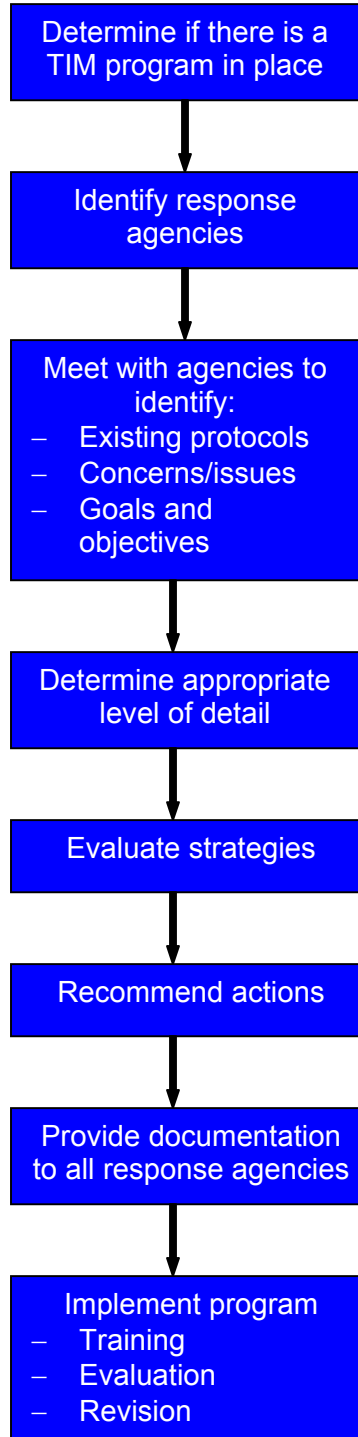
Incident response encompasses all responding agencies. It is the process of providing resources necessary to address life-safety issues as well as manage the traffic and subsequent clearance. A well-planned and managed response minimizes the number of units and ensures the appropriate resources are allocated efficiently and effectively.

Effective site management ensures a scene that is safe for responders, victims, and other motorists. It is well coordinated and orchestrated to minimize impacts to response agencies and the public. Incident clearance is the process of clearing the incident from the roadway and returning the traffic to normal conditions. In the event of a long-term incident with significant impact on the capacity of the highway, this may include rerouting traffic around the scene until capacity is restored and incident-related congestion reduced.

A very powerful component of traffic incident management is traveler information. Motorists who are informed of an incident and can use that information to make changes to their travel plans are less frustrated and less likely to become caught in the resulting delay. This is important from a customer service perspective as well as from a scene safety perspective. Reducing the number of frustrated drivers caught in the congestion reduces the potential for secondary crashes and the exposure of on-scene workers and responders.

Process Overview

The following flowchart illustrates the common steps in developing a traffic incident management (TIM) program:



Planning Overview

Traffic incident management planning follows the standard steps for effective planning. (Source: Corbin and Noyes, "Traffic Incident Management Planning: The Case for Mainstreaming," *ITE Journal*, 2003)

Traffic Incident Management Planning Steps

- Goals
- Objectives
- Performance Measures
- Strategies
- Alternative Tactics
- Implementation
- Evaluation

Goals

Goals are the desired effects of the effort. A common goal of traffic incident management is to reduce delay and congestion caused by traffic incidents on freeways.

Objectives

Discernible outcomes of a traffic incident management program help define the opportunities for system improvement and provide specific results to be attained. Developing objectives to determine how well a goal is met includes identifying specific results such as reducing average

detection-clearance time for minor traffic incidents by 50 percent.

Performance Measures

Performance measures must be developed to determine how effective an application may be. This is most clearly applied in terms of quantification of an objective, but can be measured in less quantitative ways such as responder observation or public feedback. A performance measure for detection-clearance time could be monitoring detection-clearance time in minutes.

Strategies and Tactics

Strategies are specific approaches to a specific outcome or objective. If reduced delay is the goal, one approach might be to provide for quick-response clearance equipment during peak periods. Traffic incident management program development should also consider a number of tactical alternatives that address the specific objectives of the program. These include a variety of specific actions intended to deliver results. In the case of a quick-clearance strategy, a number of alternative tactics could be considered: towing contracts, public agency "relocation" tow trucks and drop sites, expanded peak period patrols with push bumpers, or contracted roving motorist assistance towing patrols.

Program Implementation

A traffic incident management program develops a combination of tactics and timeframes for implementation. This generally includes operational, procedural, and technical alternatives combined in a comprehensive system to support the program mission, goals and objectives.

Program Evaluation

An essential component of any good plan is evaluation - does it work? Evaluation applies the performance measures to the program through a scheduled review process. This can be achieved by incorporating tactics into

regularly scheduled evaluations, collecting before and after data on specific objectives, and building performance monitoring into service contracts.

Multi-disciplinary Approach

Successful traffic incident management programs depend on strong, inter-agency involvement and commitment. The nature of these incidents requires a high level of collaboration and coordination to meet the safety and mobility needs of all affected parties. All agencies responding to incidents must be involved in program planning to ensure that the program meets their needs and will be implemented in a coordinated partnership.

A planning process should be developed that involves representatives from transportation agencies, emergency response agencies, private sector interests and the media. The following is a sample list of agencies and organizations that may be involved in developing a traffic incident management program:

- Transportation agencies
 - Federal, state, and local
 - Construction and traffic engineering
 - Maintenance
- Law enforcement
 - State and local
- Fire/rescue
 - All districts affected by the project
- 911 dispatch
 - CSP
 - County
 - Other local
- Towing and recovery providers
- Emergency medical services
 - All districts affected by the project
- Hazardous materials
 - CSP
 - All affected DERAs
- Media
- Other response agencies (as needed for the project area)
 - State Office of Emergency Management
 - Local offices of emergency management
 - Coroner's office
 - Other

Representatives from these agencies should be brought together to discuss specific concerns and objectives and to consider a variety of strategies and tactics that might be implemented as part of the project's traffic incident management program. A number of strategies are provided below and throughout the section on key components of a traffic incident management program. Each is described and suggested considerations and examples are provided.

Alternative Strategies

A large number of strategies are available to support traffic incident management programs. Each has a range of applications and advantages and should be considered in light of the project needs and the cost of the strategy. Some devices, such as closed circuit television (CCTV) can be used for number of traffic incident management applications and in several stages. For example, CCTV in the project work zone can help detect and verify an incident, it can help dispatch the appropriate response equipment and apparatus, it can assist in scene management, and it can be used as part of a public information program with feeds to the internet or broadcast television. However, providing CCTV surveillance throughout the work zone can be very expensive; therefore, the application, cost, and benefit should all be considered in selecting the appropriate tools or strategies for traffic incident management.

**Example**

A list of strategies considered in the development of the T-REX Traffic Incident Management Program is provided in Appendix A.

Construction Phasing and Method of Handling Traffic

A critical aspect of planning for traffic incident management in work zones is accommodating emergency response through all phases of the construction project. This requires considering changes in access, capacity and detour routes. For each shift in lane closures, access restrictions, and availability of shoulders for emergency staging and parking, the contractor must have a process in place for emergency response agencies to review proposed changes and be notified when implemented. Similarly, a general process for review and notification should be in place for the work zone traffic management plans throughout the life of the project.

For example, the following process was developed for the T-REX Traffic Incident Management Program (2001):

**Example**

A number of planned activities to support MHT and public information will be coordinated with and support the T-REX Incident Management Program. As part of the MHT program, SECC will develop and furnish Traffic Management Strategy Reports (TMSRs) to identify, address and resolve traffic impact issues within the construction zones and other areas affected by construction activities. SECC will also develop and furnish Traffic Control Plans (TCPs) for work sites and detour routes. The T-REX Incident Management Program will be fully integrated with the TMSRs and TCPs through ongoing coordination meetings. SECC coordination with local and regional emergency service providers, law enforcement entities and other related corridor users will include advance communication of lane closure plans, detour plans and other project elements that may affect the delivery of time-sensitive services. Coordination will include, but not be limited to, the Colorado State Patrol, various county and municipal police and sheriff departments, the South Metro Fire Department, the City of Denver Fire Department, Aurora Fire and various ambulance/emergency service providers.

Because this large construction project will be completed in distinct phases, SECC will modify and implement the T-REX Incident

Management Program in conjunction with the planned construction phases. The T-REX Incident Management Program will be updated prior to the start of a new construction phase to accommodate actual and projected changes in the Corridor.

IV. Key Components of a Traffic Incident Management Program

The following section outlines key components of a traffic incident management program. It is the intent of this document to provide these elements for consideration for use in work zone management. It is not a requirement that each of the elements be incorporated in a program. Each of these elements can be adapted to the level of complexity of the project and the level of impact the project will have on the highway. It is helpful, however, to consider and discuss each of these in the planning process and identify those that should be formalized and documented to ensure clear understanding for all involved.

Response Agencies

One of the first and most critical activities in planning for traffic incidents in the work zone is to identify the affected jurisdictions and the agency responsibilities. Working with the agencies, the roles and responsibilities of each agency should be identified and documented, as well as existing protocols and agency information. In addition, response area boundaries can be clarified and mapped for the project.

Roles and Responsibilities

Each agency responding to an incident in the project area has specific priorities and responsibilities. On complex incidents, some of these roles may overlap and the priorities of some of some agencies may affect the ability of other agencies to perform their duties. Discussing and documenting these roles and responsibilities during the planning phase of traffic incident management will minimize the probability of conflicts or confusion during an actual incident.

The following example is from the US 36 Boulder Turnpike Incident Management Plan (2001):



Example

Agency Roles

Incident Management is oriented to the following operational agencies: CDOT, Law Enforcement, Fire/EMS, Local Jurisdictions, Coroners, and towing/recovery agencies. The typical role of each agency at the scene of an incident is briefly described below.

First Responder

- Determine severity of incident and condition of persons involved and relay to dispatch
- Identify if hazardous materials are involved
- Act as incident command leader until relieved

Law Enforcement

- Isolate and protect the scene
- Provide traffic control and implement alternate routes as needed
- Investigate the incident

- Release information related to activities at the scene

Fire/EMS

- Respond to fire and Contain the incident
- Rescue, remove and treat injured persons
- Request containment or clean-up resources
- Release information related to activities at the scene

CDOT

- Provide and place all required traffic control
- Provide sand or special equipment as requested
- Notify all agencies of incident as required
- Investigate and repair damages to roadway
- Release information related to activities at the scene

Local Jurisdiction

- Release information related to activities at the scene
- Assist with detour management

Coroner

- On scene investigation
- Release information related to activities at the scene

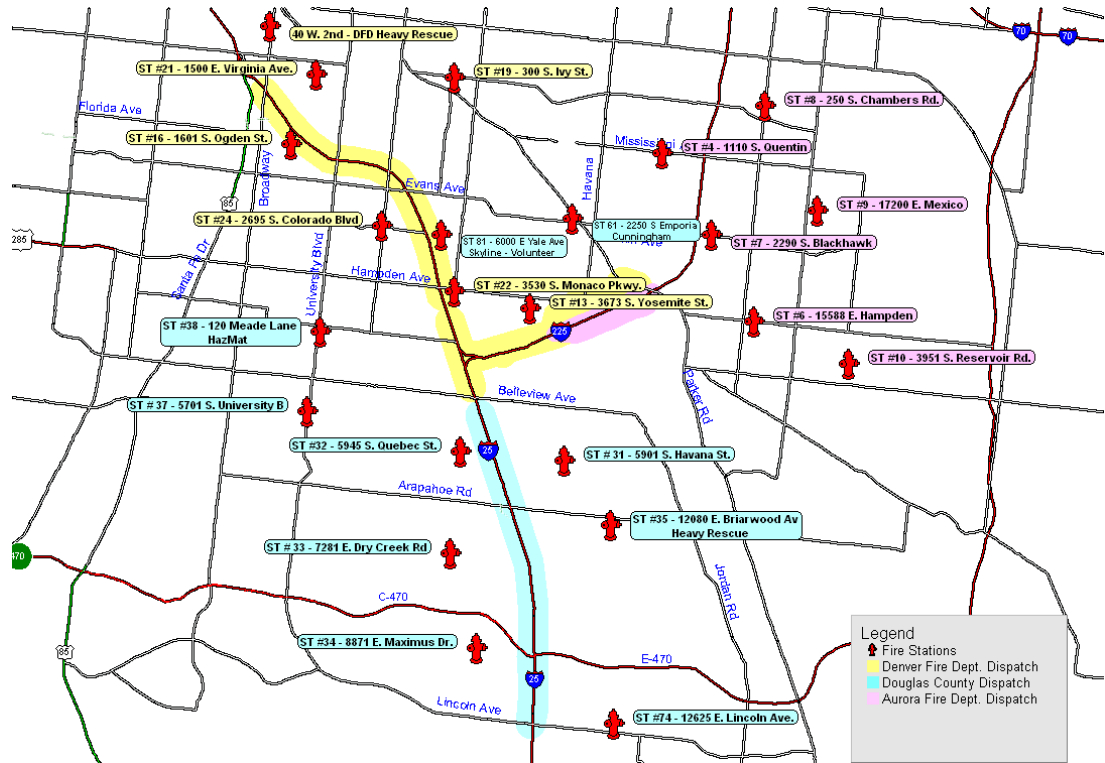
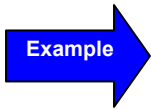
Towing/Recovery

- Respond quickly to incident when called
- Remove vehicle(s) in a safe manner

Response Area Boundaries

Response area boundaries may overlap a highway project area in multiple places for a single agency or may include a number of different agencies. Clarifying and documenting these boundaries may be helpful in managing traffic incidents in the project area.

The following map is from the T-REX Traffic Incident Management Program (2001):



Existing Protocols and Agreements

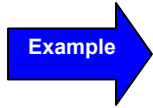
Agencies currently responding to incidents in the project area have protocols and procedures they use to guide their response. These may be in a formally adopted protocol manual or may be undocumented, common practices. In either case, identifying these practices and any additional guidelines necessary for the project is a key component of traffic incident management planning. In addition, a number of response agencies may have mutual aid agreements in place that outline how they will support each other in areas near their borders or when additional resources are needed. Understanding what agreements exist will help support traffic incident management efforts.

Contact Information

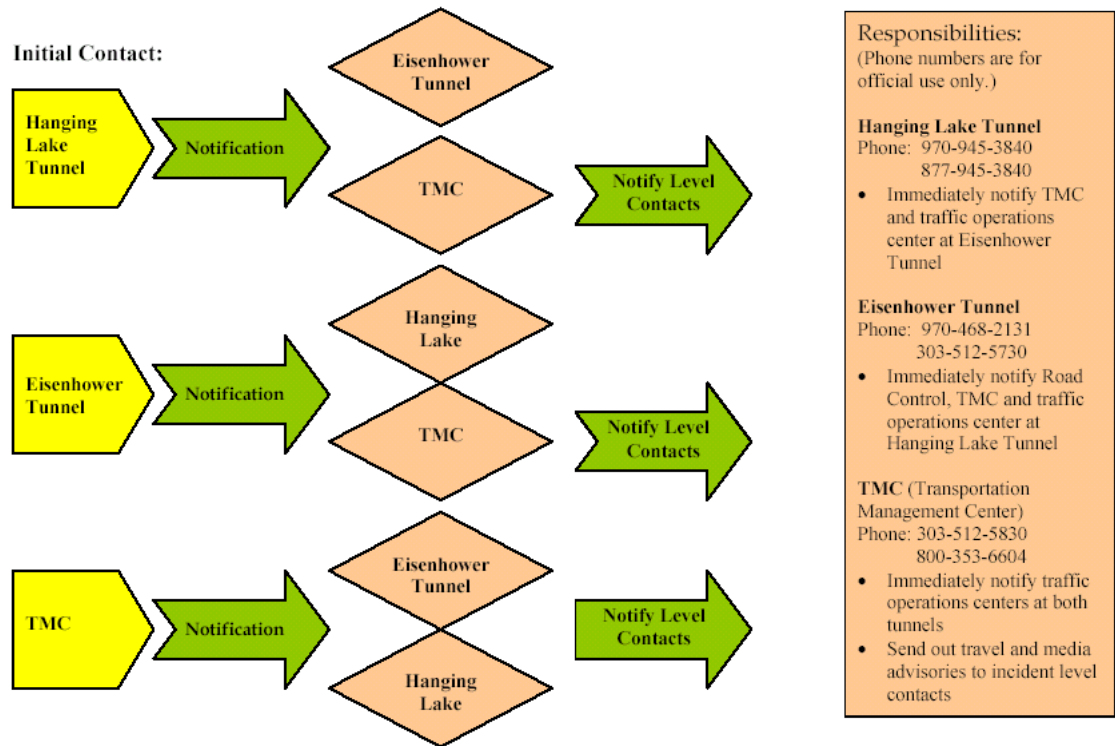
In the event of an incident, it is essential for response agencies to know how to contact one another for the most effective use of resources. Contact information should include contact numbers (such as phone numbers, pager information, dispatch information) as well as the preferred process for making those contacts. This will help in requesting additional resources on-scene.

Contact Procedures

It is important to establish preferred procedures for contacting agencies for additional response or resources during an incident. These procedures should reflect the current practices in the area and identify additional systems that would support incident management in the work zones. Below is an example of contact procedures implement for the I-70 Mountain Corridor Incident Management Program (2000):



I-70 Mountain Corridor Incident Management
CDOT Notification Flowchart



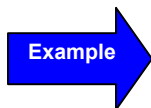
Incident Levels

All of the existing traffic incident management programs in Colorado have defined incident levels to help guide the response to traffic incidents. These levels are intended to simplify and guide consistent responses based on the level of impact to the roadway and the specific needs of the corridor.

Incident Level Definitions

Incident levels are defined by the extent and duration of the impact anticipated on the roadway. The purpose of defining levels is to help identify appropriate actions to be taken in response to the anticipated level of impact. Common use of levels also helps responders and those responsible for disseminating information immediately grasp the magnitude of the incident. The purpose of defining levels is not to create additional burden to the incident manager or initial responder but to provide consistent actions and support based on the level of impact. While an initial size-up may indicate a minor incident that could be cleared in less than 30 minutes, subsequent information, such as a hazardous materials situation or a fatality, may change what was initially thought to be a level 1 incident to a more complex response with more significant impacts to the roadway. The levels should reflect realistic response and clearance times for the area of the project.

The following example of incident levels is from the T-REX Traffic Incident Management Program (2001):

**Level 1:**

Impact to traveled roadway estimated to be less than 30 minutes with no lane blockage or the impact to traveled roadway is estimated to be less than 30 minutes with lane blockages.

Level 2:

Impact to traveled roadway estimated to be greater than 30 minutes, but less than 2 hours with lane blockages, but not a full closure of the roadway.

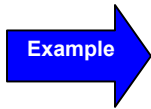
Level 3:

Congestive impact to traveled roadway is estimated to be greater than 2 hours or roadway is fully closed in any single direction.

Associated Actions

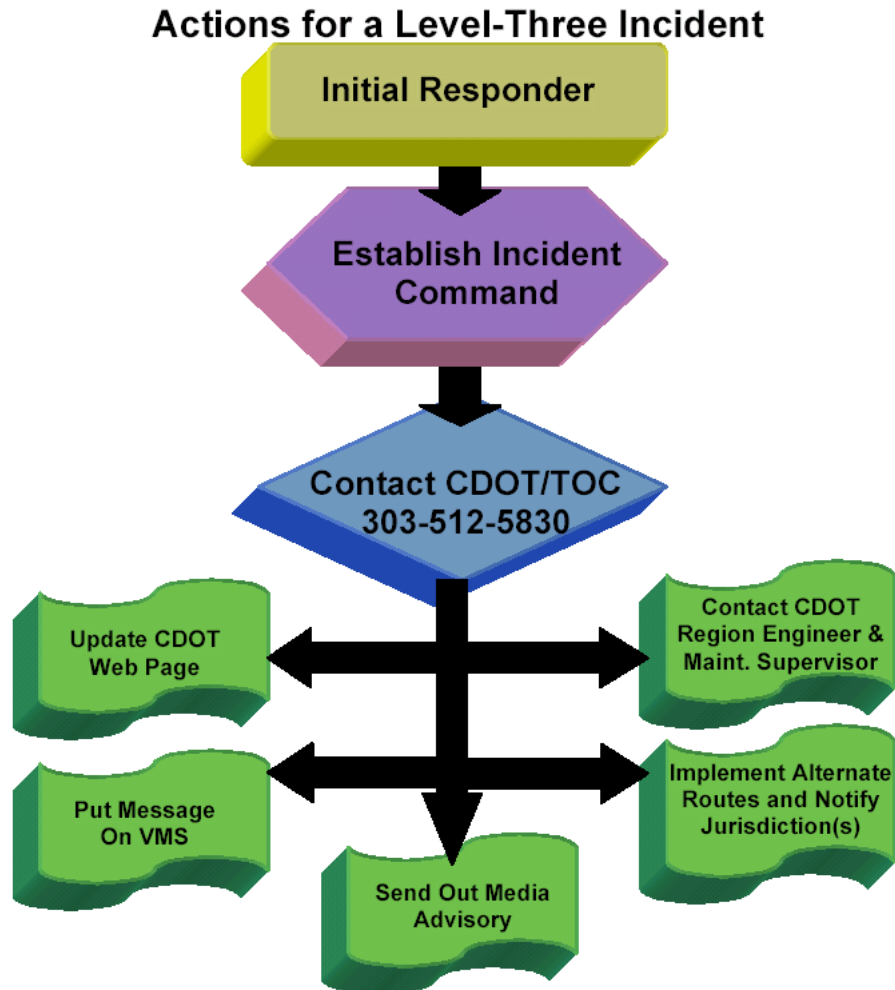
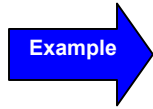
Actions associated with each level help define the roles and responsibilities of support agencies and provide a quick reference for the incident commander in terms of appropriate actions based on the level of impact to the roadway.

The following example of incident levels and associated actions is from the T-REX Traffic Incident Management Program (2001):



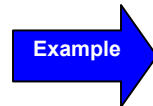
Level	Impact to Roadway	Actions to be Taken
1	Impact to traveled roadway estimated to be less than 30 minutes with no lane blockage. -- Or -- Impact to traveled roadway is estimated to be less than 30 minutes with lane blockages.	Follow agency protocols Contact the CDOT Traffic Operation Center (TOC) <i>The CDOT TOC will:</i> <ul style="list-style-type: none"> ➤ Contact CDOT Region 6 Maintenance Supervisors
2	Impact to traveled roadway estimated to be greater than 30 minutes, but less than 2 hours with lane blockages, but not a full closure of the roadway.	Establish Incident Command Consider designating staging areas Contact the CDOT Traffic Operation Center (TOC) <i>The CDOT TOC will:</i> <ul style="list-style-type: none"> ➤ Consider implementing alternate routes ➤ Update CDOT and T-REX web sites ➤ Activate Highway Advisory Radio (HAR) & signs ➤ Place messages on dynamic message signs (DMS) ➤ Fax out advisories to Level 2 contacts ➤ Contact: <ul style="list-style-type: none"> ➤ CDOT Region 1 and 6 Maint. Supervisors ➤ CSP and local communication centers ➤ E-470 Command Center ➤ CDOT Public Information Officer (PIO) ➤ SECC Public Information Officer
3	Congestive impact to traveled roadway is estimated to be greater than 2 hours or roadway is fully closed in any single direction.	Establish Command Center or Post Coordinate with CDOT to implement alternate routes Consider designating staging areas Contact the CDOT Traffic Operation Center (TOC) <i>The CDOT TOC will:</i> <ul style="list-style-type: none"> ➤ Update CDOT and T-REX web sites ➤ Activate Highway Advisory Radio (HAR) & signs ➤ Place messages on Dynamic Message Signs (DMS) ➤ Fax out advisories to Level 2 and Level 3 contacts ➤ Contact: <ul style="list-style-type: none"> ➤ CDOT Region 1 and 6 Maint. Supervisors ➤ CSP and local communication centers (303-239-4501) ➤ E-470 Command Center ➤ CDOT Public Information Officer (PIO) ➤ SECC Public Information Officer ➤ Denver OEM (303-640-9999) ➤ Aurora OEM ➤ Arapahoe County OEM ➤ Douglas County Emergency Management ➤ Signal jurisdictions on alternate route ➤ Request METS broadcast notification ➤ Request update to emsystem.com

The following example diagrams the actions taken for a level-three incident in the U.S. 36 Incident Management Plan (2001):



“Move-it Law” and Accident Alert

The Colorado Revised Statutes 42-4-1602, Section 2, commonly referred to as the “Move-it Law,” states that when an accident occurs on the traveled portion, median or ramp of a divided highway and each vehicle involved can be safely driven, each driver shall move such driver’s vehicle as soon as practicable off the traveled portion, median or ramp to a frontage road, the nearest suitable cross street or other suitable location to fulfill the requirement of 42-4-1603. This law applies to all crashes or other incidents on divided highways when no injuries, drugs, or alcohol are involved. This is very helpful in maintaining traffic flow on major highways and is particularly important in construction zones where lanes are often narrow and there are limited shoulders or other pullout areas.



In developing the T-REX Traffic Incident Management Program, representatives from state and local law enforcement worked with other

stakeholders to support the promotion of this law in the work zone. CDOT provided public support of the effort and the contractor posted signs in work zones as well as distributing flyers on the law.

The other situation that applies to the relocation of vehicles from the traveled way in the event of a crash is accident alert. The accident alert status is determined by law enforcement agencies in situations where the situation exceeds the available personnel, such as during severe snowstorms. In this situation, drivers involved in minor crashes with no involvement of injuries, drugs or alcohol are asked to move their cars from the roadway and file a report without response. The Colorado State Patrol now allows drivers to file the report on-line at <http://crash.state.co.us/splash.jsp>.

Application to Project Area

Both of these situations may have applicability to traffic incident management in work zones. If the project occurs on a divided highway, it is important to discuss the “Move-it Law” with all response agencies in the project area and address any concerns law enforcement agencies might have with promoting the law in that location. It is also very helpful to identify emergency pullout or crash investigation sites with signs to encourage motorists to proceed to those locations while waiting for an officer to arrive. The nature of the project and how significantly it will limit available shoulders and pull-offs is an important consideration in determining the appropriate level of use and public promotion.

If the project is in an area where accident alert is likely to be activated by law enforcement, providing information on accident alert, copies of instructions for completing a counter accident report, and information about the on-line reporting website may be very helpful in explaining appropriate actions to drivers involved in a crash during an accident alert period.

Procedural Guidelines for Scene Management

It is important to identify specific procedural guidelines for managing traffic incidents in the work zone that are compatible with current response agency practices and address the concerns and issues these agencies have with the project. A number of these have been used in various programs in Colorado and brief descriptions and examples are provided below.

Reporting Incidents

Reporting incidents efficiently and effectively is a critical step in incident detection and verification. The accuracy and type of information provided in the initial call and subsequent calls can greatly enhance the response and management of an incident. Below is an example from the T-REX Traffic Incident Management Program (2001) of the type of information that is helpful when reporting an incident:



Example

FIRST CALL

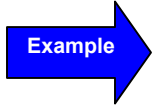
- Direction and location of closure (northbound or southbound)
- Extent of closure (# of lanes, from where to where)

- Anticipated duration of closure
- Hazardous materials involvement, if any

SECOND CALL

- PIO information (crime scene, type of crash, incident staging area, media staging area, etc...)
- Scene management (equipment needed, trailblazers, DMS, etc...)
- If needed, implement alternate routes

The South I-25 Corridor Incident Management Program (2001) developed guidelines specifically for contractor personnel who witness an incident:



Contractor Guidelines for Reporting an Incident

The following guidelines should be used for reporting incidents on I-25 through the construction zone. It is important to provide all appropriate information to ensure rapid response of appropriate agencies, maximize safety and minimize the impact to the public.

Notifying 911

Call 911 to report any incident that may include injuries, hazardous materials, fire or other life-safety threats. Provide the 911 operator with the following information, if known:

- Location – including milepost number and direction of travel
- Number and type of vehicles involved
- Extent of damage or injury
- Number of patients involved
- Any hazardous conditions
- The placard number on any hazardous materials placarded vehicles

The 911 operator may ask for additional information that will help responders, including your name and phone number as a contact.

Notifying CDOT

If there is no life-safety threat but there is roadway damage, a spilled load or other circumstances that require closing lanes or additional equipment, CDOT maintenance should be contacted. CDOT Region 1 Maintenance can provide equipment and traffic control by contacting Freddie Smith at 303-688-6230 during business hours, or through the CDOT Traffic Operations Center (TOC) during off-hours. If lane closures are required, the TOC should be contacted at 303-512-5830.

Providing Traffic Control

As appropriate, on-scene personnel should assist with traffic control and scene management to minimize secondary crashes and provide a safe environment for responders, victims and the motoring public. If lane closures occur prior to the arrival of emergency responders, 911 should be notified of the extent of closure and the reason for the closure.

Reporting Aggressive Driving

Colorado State Patrol maintains a special cellular phone number to report aggressive driving. If drivers in the construction zone are driving in an unsafe or aggressive manner, call *CSP and provide a vehicle description (including make, model, color and license plate number), location and direction of travel, and a description of the behavior you observed.

Incident Command System (ICS)

The Incident Command System (ICS) is a federally adopted system to manage all varieties of incidents. ICS provides clear procedures for coordinating between agencies and responders on-scene and outlines roles and activities assigned to those roles. Who fills the role of Incident Commander is usually dictated by the nature of the call. For example, on an injury accident scene that requires extrication of a patient, it is common for a fire/rescue officer to serve as the Incident Commander. On a spilled load or other incident that impacts traffic flow but does not involve life/safety threats, a law enforcement officer may perform the command function. On complex incidents with multiple response agencies, Unified Command is used to coordinate between the agencies and provide a management structure for the incident.

Many of the traffic incident management programs developed in Colorado specifically call for the use of standard ICS principles in managing highway incidents. The South I-25 Corridor Incident Management Program (2001) provides specific guidance on the use of ICS:

Example***Application of ICS***

- Follow standard Incident Command System (ICS) principles.
 - Unified command should be implemented during multi-agency responses.
- In ICS, Unified Command is a unified team effort which allows all agencies with responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating agency authority, responsibility, or accountability. When assigning ICS positions, consider the following excerpts from Firescope California:

Common Responsibilities

- a. Receive assignment from your agency
- b. Upon arrival at the incident, check in at designated Check-in location
- c. Receive briefing from immediate supervisor
- d. Acquire work materials
- e. Supervisors shall maintain accountability of their assigned personnel
- f. Organize and brief subordinates

- g. Know your assigned frequency(s) for your area of responsibility and ensure that communication equipment is operating properly
- h. Use clear text and ICS terminology (no codes) in all radio communications
- i. Complete forms and reports required
- j. Respond to demobilization orders and brief subordinates regarding demobilization

➤ **ICS Positions**

The Command Staff consists of the Information Officer, Safety Officer and Liaison Officer, who report directly to the Incident Commander. The General Staff is comprised of the Incident Commander, Operations Section Chief, Planning Section Chief, Logistics Section Chief, and the Finance/Administration Section Chief.

a. *Incident Commander*

The Incident Commander's responsibility is the overall management of the incident. On most incidents the command activity is carried out by a single Incident Commander. The Incident Commander is selected by qualifications and experience.

b. *Information Officer*

The Information Officer is responsible for developing and releasing information about the incident to the news media, to incident personnel, and to other appropriate agencies and organizations. Only one Information Officer will be assigned for each incident, including incidents operating under Unified Command and multi-jurisdictional incidents.

c. *Liaison Officer*

Incidents that are multi-jurisdictional, or several agencies involved, may require the establishment of the Liaison Officer position. Only one Liaison Officer will be assigned for each incident, including incidents operating under Unified Command and multi-jurisdictional incidents. The Liaison Officer is the contact for the personnel assigned to the incident by assisting or cooperating agencies. These are personnel other than those on direct tactical assignments or those involved in a Unified Command.

d. *Agency Representatives*

An Agency Representative is an individual assigned to an incident from an assisting or cooperating agency who has been delegated authority to make decisions on matters affecting that agency's participation at the incident. Agency Representatives report to the Liaison Officer or to the Incident Commander in the absence of a Liaison Officer.

e. *Safety Officer*

The Safety Officer's function is to develop and recommend measures for assuring personnel safety, and to assess and/or anticipate hazardous and unsafe situations. Only one Safety Officer will be assigned for each incident.

- f. Operations Section Chief*
The Operations Section Chief is responsible for the management of all operations directly applicable to the primary mission.
- g. Division/Group Supervisor*
A Division/Group Supervisor reports to the Operations Section Chief and is responsible for the implementation of the assigned portion of Incident Action Plan, assignment of resources within the Division/Group, and reporting on the progress of control operations and status of resources within the Division/Group. Groups are assigned by functional area, such as a medical group, a debris removal group, or a traffic control group. The creation and assignment of these groups is the role of the ICS General Staff.
- h. Staging Area Manager*
The Staging Area Manager is responsible for managing all activities within a Staging Area.
- i. Planning Section Chief*
The Planning Section Chief is responsible for the collection, evaluation, dissemination, and use of information about the development of the incident and status of resources.
- j. Multi-Casualty Branch Director*
The Multi-Casualty Branch Director is responsible for the implementation of the Incident Action Plan with the Branch. This Branch Director reports to the Operations Section Chief and supervises the Medical Group/Division and Patient Transportation Group Supervisors.
- k. Medical Group/Division Supervisor*
The Medical Group/Division Supervisor reports to the Multi-Casualty Branch Director and supervises the Triage Unit Leader, Treatment Unit Leader and Medical Supply Coordinator in order to assure the best possible emergency medical care to patients during a multi-casualty incident.
- l. Patient Transportation Group Supervisor*
Patient Transportation Group Supervisor reports to the Multi-Casualty Branch Director and supervises the Medical Communications Coordinator and the Air and Ground Ambulance Coordinators and is responsible for the coordination of patient transportation and maintenance of patient records.

Moving Vehicles

Guidelines for moving vehicles from the roadway can be very helpful in locations where it takes a while for law enforcement to reach the scene and there is no other reason to keep traffic lanes closed. In such situations, predetermined procedures can be implemented that support law enforcement's need to investigate and document the crash. These procedures should be consistent with CDOT Procedural Directive 1510.1 on Promptly Reopening Roadway to Traffic.

The I-70 Mountain Corridor Incident Response Manual (2000) provides an example of the procedures agreed to by all responding agencies:



Example

Rapid Vehicle Removal

- If practical before moving vehicles, final positions and points of impact should be found and marked. Mark tire and axle location of each vehicle and direction of vehicle if necessary.
- Every attempt should be made to confirm with CSP, or appropriate law enforcement agency, prior to moving vehicles.
- Crashed vehicles may be moved from traveled portions of roadways before CSP investigators arrive. Exceptions to this procedure would be fatal, serious injury, felony, drug or alcohol related crashes, or haz-mat crash scenes.

Emergency Traffic Control

Guidelines and provisions should be made for emergency traffic control. In the event of an incident that shuts down one or more travel lanes, the procedure for implementing emergency traffic control and guidelines for when to close and open lanes is important. This may include diagrams for typical traffic control for closures, lists of traffic control equipment available on-site, and guidelines for who has the authority to close or open lanes and the process for doing so.

The I-70 Mountain Corridor Incident Response Manual (2000) provides guidelines for lane closures and openings:



Example

Lane closures or openings

- The Incident Commander is responsible for lane closure or opening decisions
- Next to care for the injured and protection of emergency personnel, clearance of the traffic lanes should be a priority.
- Prior to any lane closure or opening, consider the safety of responders, patients, and the traveling public, and the ability to preserve evidence
- Any change in the status of the roadway with regard to opening or closing lanes requires notification of CDOT

The T-REX Traffic Incident Management Program (2001) provides guidelines on when and how to establish an alternate route:



Example

When to Establish an Alternate Route

- The use of alternate routes should only be considered when there is full closure of the interstate in either direction or when the Incident Commander deems it necessary for the safety of the traveling public and responders.
- In addition to the above, consideration must be given to the extent of roadway or structural damage, and the extent of bodily injury or fatalities.
- The final determination to use alternate routes will be made by the Incident Commander based on observation of the scene.
- Remember to *contact the CDOT TOC when lanes are reopened* to traffic.

Implementing the Alternate Routes

After determining that alternate routes should be implemented, the following actions should be taken to establish an alternate route:

1. CDOT TOC must be notified of any closures or implementation of alternate routes. Notification should include the following information:

FIRST CALL

- Direction of closure (northbound or southbound)
- Extent and location of closure (# of lanes, from where to where)
- Anticipated duration of closure
- Hazardous materials involved, if any

SECOND CALL

- PIO information (crime scene, type of crash, incident staging area, media staging area, etc...)
- Scene management (equipment needed, trailblazers, DMS, etc...)
- If needed, implement alternate routes

2. All agencies affected by the alternate route must be notified. The CDOT TOC will be responsible for notifying the appropriate agencies.

The following is a list of agencies that should be notified, as appropriate, in the event of an alternate route implementation.

Agency	Business Hours Phone	Non-Business Hours Phone
CDOT TOC	(303) 512-5830	(303) 512-5830
CDOT Region 6	(303) 757-9514	(303) 512-5830
CDOT Region 1	(303) 688-6230	(303) 512-5830
City of Denver (Traffic Operations)	(720) 865-4000	(720) 865-6855
City of Aurora	(303) 341-7552	(303) 341-7552
City of Greenwood Village	(303) 741-5960	(303) 741-5960
City of Englewood	(303) 762-2438	(303) 762-2438
City of Littleton	(303) 794-3809	(303) 794-3809
Arapahoe County	(303) 795-4640	(303) 795-4711
Douglas County	(303) 660-7490	(303) 891-7750

3. Upon notification, agencies that have signal systems or detour trailblazers on the alternate route should put the appropriate signal timing changes and trail blazers into effect to accommodate that particular alternate route.

If an agency is not capable of immediately changing the signal timing plans, traffic control personnel should be posted at critical intersections provided along the route. A map of the signal system jurisdictions and key intersections is shown in the back of this manual.

In the event of a long-term or full closure, traffic may need to be detoured using alternate routes. These routes may be the same as those developed for temporary work zone closures. All agencies impacted by the potential closure and resulting alternate route should be involved in planning these routes and the procedure for implementation. The T-REX Traffic Incident Management Response Manual (2001) included the following language:

Example**Implementation of Alternate Routes**

- The Incident Commander, in coordination with CDOT, will determine the need for implementation of alternate routes.
- The CDOT TOC will then follow the appropriate incident response level actions.
- The CDOT TOC will contact jurisdictions along the alternate routes and verify that traffic control devices are in place.

Each of the traffic incident management programs in use in Colorado include predetermined alternate routes for use during incidents that close the highway.

Use of Emergency Flashers

Emergency flashers are intended to enhance the safety of responders, victims and motorists in an emergency scene. Excessive use of emergency flashers can compromise safety by confusing drivers and reducing night vision. The appropriate use of emergency flashers should be discussed with emergency response agencies, particularly in work zones that already have numerous traffic control devices with flashers. Guidelines should be established to maximize safety for all involved. Below is an example of flashing light guidelines developed for the T-REX Traffic Incident Management Response Manual (2000):

Example**Flashing Lights**

- Overhead flashers on emergency response vehicles are used to enhance the safety of response personnel and incident victims.
- Excessive use of overhead flashers on scene can create unnecessary delay and confusion for motorists passing the scene, especially for traffic moving in the opposite direction.
- It is recommended that officer discretion (fire or law enforcement) be used to determine whether overhead flashers should be used when the vehicle is parked in a safe location with low traffic flow.
- Officers should consider the placement of vehicles to minimize impact to traffic, without compromising the safety of response personnel.
- The Incident Commander should shut down responding units to a non-emergency response as soon as it is appropriate to improve safety and reduce the impact on traffic. Their vehicles should be used to protect the scene when necessary.
- The focus should be on moving response vehicles and personnel out of lanes as quickly as possible to minimize the number of lanes closed.

Apparatus Parking and Staging

On incidents with a number of responding units or incidents within work zones with limited shoulders or lanes, it may be appropriate to implement staging areas

removed from the immediate scene. Staging areas can be predetermined for both response apparatus and for media responding to the scene. Apparatus staging areas should be on a flat, hard surface with adequate space and easy access to the highway. Media staging can be smaller and preferably removed from the apparatus staging area to minimize conflicts. The media will respond to the staging area if there is a designated spokesperson to provide information and there is an opportunity for camera shots of the scene.

The T-REX Traffic Incident Management Program (2001) developed guidelines and maps for possible staging areas within the project corridor:



Example

Staging Areas

- On Level 2 and Level 3 incidents, the Incident Commander should consider use of predetermined staging areas for responding units and media personnel.
- Maps of the predetermined staging areas are provided in this response manual.

Emergency response

The use of staging areas should be considered for Level 2 and 3 incidents. Staging areas are used to keep apparatus and response personnel safe and away from immediate the incident scene. The decision to use a staging area and the location of the staging area is the decision of the Incident Commander. The CDOT TOC should be notified of the location of the selected incident staging areas. The following map shows locations that were selected as potential incident staging areas.

Media

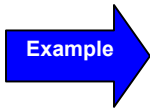
Special staging areas for the media have also been identified. These areas are separate from the emergency response areas and will be used to keep the media clear of the incident scene to ensure their safety and the safety of responders. Implementation of media staging areas should be at the direction of the Incident Commander and all Public Information Officers (PIO) responding to the incident should be sent to that location to coordinate with the press. The CDOT TOC should be notified of the location of the selected media staging area. The following map shows locations that were selected as potential incident staging areas.

Dedicated Response Teams

Dedicated teams of responders from each of the agencies in the project area may be helpful if there are specific personnel or apparatus needed within a work zone. These teams can be identified for response and for review and management of the overall traffic incident management program.

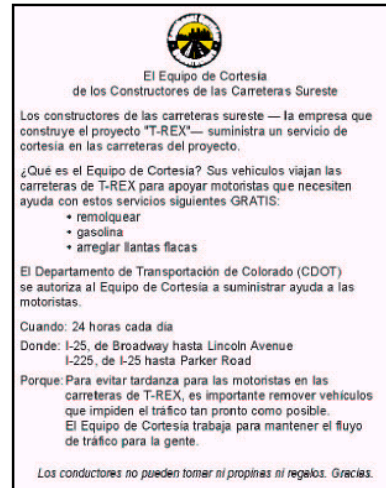
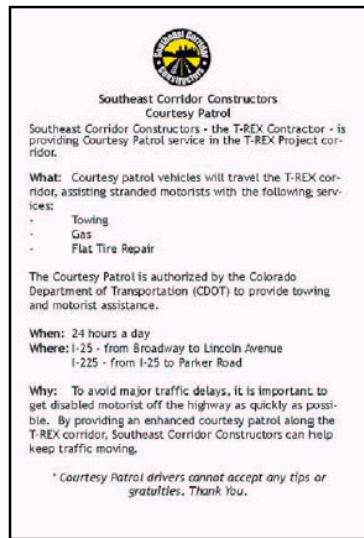
Dedicated Response Equipment

If there is a need for dedicated response equipment for a work zone, such as a dedicated tow truck or other rescue equipment, guidelines for operation and response should be established. The T-REX project required the contractor to provide a courtesy patrol during designated hours. The following guidelines were developed for the T-REX Traffic Incident Management Response Manual (2001):



Guidelines for Courtesy Patrol

- Patrol corridor for disabled vehicles or other traffic impediments.
- Assess project area traffic conditions and notify CDOT TOC of conditions.
- Inform motorists of the services performed by the courtesy patrol.
- During Accident Alerts, provide information to motorists involved in minor accidents of responsibilities for moving and reporting the accident.
- Courtesy Patrol Operator will maintain a response log, which will be turned into Segment Supervisor at the end of each shift (see attached).
- Level 1 Incidents:
 - Notify CDOT TOC dispatch
 - Incident to be cleared in within 10 minutes of arrival.
 - If non-injury incident (e.g. flat tire, out of gas, stall, debris), get the vehicle moving or push/tow to a drop site.
 - If minor accident and Colorado State Statute 42-4-1602 applies, take picture, inform motorists of ‘Move It’ law requirements, and encourage that the scene be cleared immediately.
- Level 2 and Level 3 Incidents
 - Notify CDOT TOC dispatch
 - Remain on scene until scene commander arrives (law enforcement, fire/rescue personnel or jurisdictional representative).
 - Provide assistance to scene commander as requested.
 - Monitor and pick up light debris on roadway.

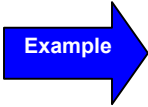


Communication/Interoperability

One of the key issues on any emergency scene is the ability for responding units to communicate with one another. Interagency interoperability is critical to effective scene management. Due to the range of agencies responding to highway incidents, there are often many different systems in use. Pre-planning for on-scene communication can include procedural guidelines as well as identification of frequencies and opportunities to address incompatibilities.

One tool that has been used on many of the Colorado traffic incident management plans is a frequency matrix provided in the response manual to help on-scene assignment of frequency use to various response activities or

sections. Below is a table developed for the T-REX Traffic Incident Management Response Manual (2001):



T-REX Incident Management Channel Access

Channel	Agency																				
	Arap.Cty.Road & Bridge	Arap.Cty.Sheriff	Aurora Fire	Aurora Police	Aurora Public Works	Castle Rock Fire	CDOT TOC	CDOT Region 6	CSP	Cunningham Fire	Denver Fire	Denver Paramedics	Denver Police	Denver Public Works	Doug.Cty. Road & Bridge	Doug.Cty. Sheriff	Greenwood Village Police	Parker Fire	Skyline Fire	South Metro Fire	
ACSO 1	X	X							X	X							X	X		X	X
ACSO EOC	X	X							X	X								X		X	X
CSP 1									X								X				
CSP 2									X								X				
CDOT TRAFFIC 1		X	X	X			X	X	X	X	X		X				X	X			X
CDOT TRAFFIC 2		X	X	X			X	X	X	X	X		X				X	X			X
CLEER		X	X	X						X	X		X					X			
DCSO A									X								X	X			
DCSO B									X								X	X	X		
DCSO C																	X	X	X		
DEC		X				X			X	X					X	X	X	X	X	X	X
DISP 1		X				X				X							X	X	X	X	X
FERN		X	X	X		X			X	X	X	X					X	X	X	X	X
GVPD 1		X								X								X		X	X
ICALL	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ITAC 1	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
ITAC 2	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
ITAC 3	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
ITAC 4	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
MAC 1		X				X		X	X	X	X		X	X	X	X	X	X	X	X	X
MAC 2		X				X		X	X	X	X		X	X	X	X	X	X	X	X	X
MAC3		X				X		X	X	X	X		X	X	X	X	X	X	X	X	X
SNOW			X	X	X																
STAC 5	X	X				X			X	X					X	X	X	X	X	X	X

All traffic control during incidents should be coordinated on CDOT Traffic 1
 RX frequency 822.2625, TX frequency 867.2625
 Courtesy Patrol operates on CDOT Traffic 2
 RX frequency 809.4625, TX frequency 854.4625

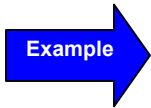
Emergency Access

Work zones create issues with emergency access to incidents that occur within the project area. Work zones typically limit the availability of shoulders and one or more travel lanes. Traffic is often shifted and access from and to highway ramps may be restricted. All of these create additional problems for emergency access to and from the work zone. Working with emergency response agencies in the project area can help identify concerns with proposed traffic control and allow modifications that can assist emergency response. This may include providing temporary turnarounds or access points. It may also include procedures that accommodate emergency access in the event of an incident. Working with response agencies, the contractor should review the proposed

phasing, any restrictions on access, and any construction-related needs they may have. If necessary, the response agencies and contractor should determine emergency access routes and locations. Together they should also determine the process to be used for notifying agencies of shifts in the traffic control that would affect their access and their response.

Accident Investigation Sites

In the event of limited shoulders through a construction zone, the use of accident investigation sites should be considered. These are locations that allow a motorist to pull out of the travel lanes to wait for law enforcement and provide a safe area out of traffic for law enforcement to fill out a report of the incident. These sites should be signed to encourage their use. The T-REX Traffic Incident Management Program provided accident investigation sites and included the following guidance in the Response Manual:

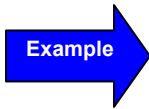


Accident Investigation Sites

Accident investigation sites will be provided in areas where there are no shoulders or there are other limitations on accident investigation. The locations for current accident investigation sites will be the Appendix of this manual with T-REX phasing information. These locations are subject to change as freeway phasing modifications are implemented. Accident investigation site changes are identified in the traffic phasing reports and will be distributed as they occur.

Resources

In the event of an incident that requires road closure or a specialized response, it is helpful to have procedures for requesting resources as well as lists of available equipment and personnel. Equipment lists may include traffic control devices or heavy equipment, as the contractor and response agencies find appropriate. Below is an example of an equipment list included in U.S. 6 Traffic Incident Management Response Manual (2001):



Typically Available Quantities	CDOT TOC*	CDOT Region 6*	City and County of Denver*	Jefferson County*	City of Lakewood*
<u>Electronic Devices</u>					
Portable VMS	2	4	4	2	1
Permanent VMS	0		2	0	0
Highway Advisory Radio	1		2	0	0
Arrow Panel	0		**	4	1
Actuated Warning Signs	0		**	0	0
<u>Barricade Devices</u>					
Cones	0	400	**	200	80
Drums	0		**	15	0
Vertical Panels	0		**	0	0
Type I Barricade	0		**	0	0
Type II Barricade	0		**	100	0
Type III Barricade	0		**	5	0
<u>Traffic Control Signs</u>					
Detour (M4-8)	0		**	5	0
Detour Arrow, L (M4-9L)	0		**	5	0
Detour Arrow, R (M4-9R)	0		**	5	0
End Detour (M4-8a)	0		**	0	0
Stop (R1-1)	0		**	10	0
Reduced Speed Ahead (R2-5a)			**	10	0
Lane Reduction Transition, L (W4-2L)		8	**	2	0
Lane Reduction Transition, R (W4-2R)		8	**	2	1
Road Closed (R11-2)	0		**	5	0
Road Closed to Thru Traffic (R11-4)			**	0	0
Detour 1000 ft (W20-2)	0		**	0	0
Advanced Flagger (W20-7a)	0		**	10	4
Stop Ahead (W3-1)	0		**	10	0
<u>Vehicles</u>					
Attenuator trucks		5			
Backhoe		1			
Bucket trucks		2			
Dump trucks		30			
Front-end loader		15			
Motor grader		2			
Sign trucks		4			
Tractor-trailer flatbed		2			

*Contact Information ** Denver has an annual contract with a barricade company.

CDOT TOC
(303) 512-5830

CDOT R6
Maint. Supervisor
(303) 757-9514

City and County of Denver
Traffic Operations
(720) 865-4000

City of Lakewood
Dispatch
(303) 987-7111

Jefferson County
Road & Bridge
(303) 277-0211

Personnel lists can also be developed that list key agency contacts. Specific lists such as utility companies or public information officers can be developed to aid contacting specific personnel needed for an incident.

Traveler Information

Traveler information is a critical component of effective traffic incident management. Tools to help inform travelers of an incident impacting their route include a range of intelligent transportation system (ITS) devices such as variable message signs (VMS) and highway advisory radio (HAR) as well as public education campaigns and broadcast media. It is important to notify drivers on the highway of current conditions to minimize frustration, increase compliance with alternate routes, and enhance safety through the work zone. It is also important to notify drivers who have not yet entered the system, for example those who are still at work or at home, so they can reconsider the time or route of their travel.

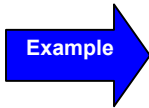
There are a number of tools for public information and it is helpful to determine which ones are most appropriate for the project. A list of tools used to inform the public is included in the strategy list in Appendix A.

Procedures for Informing Drivers

Beyond specific tools for informing motorists, there need to be procedures outlining responsibilities for updating and disseminating information. In many of the Colorado traffic incident management programs, the Colorado Transportation Management Center (CTMC) provides a key role in disseminating information to the public and the media. The CTMC is staffed 24-hours a day, 365 days a year, with staff who monitor traffic conditions throughout the state and update the Road Condition phone line, CDOT website, variable message signs, and highway advisory radio. They also send out press releases and fax notifications to predetermined recipients. They act as the point of contact for the media, who call the CTMC for updates on events. Procedures for how to coordinate with the CTMC should be established as well as procedures for additional information activities to be performed by the contractor or other response agencies.

Public Information Activities

Public information activities may include websites, press releases, or newsletters informing the public of planned construction and phasing activities. These provide an opportunity for the contractor to inform the public of procedures related to incidents in the work zones such the enforcement of the Move-it Law. The use of public education campaigns, press releases, and signs in the work zone can greatly enhance compliance with the Move-it Law and accident alerts. The following brochure was developed for the T-REX Traffic Incident Management Program (2001) and is an excellent example of public education and outreach:



Motorist Information Card

Name: _____
 Address: _____
 Phone Number: _____
 Driver's License Number: _____
 Insurance Carrier: _____
 Phone Number: _____
 Policy/Group Number: _____
 Make/Model: _____
 Year/Color: _____
 License Plate Number: _____

Motorist Information Card

Name: _____
 Address: _____
 Phone Number: _____
 Driver's License Number: _____
 Insurance Carrier: _____
 Phone Number: _____
 Policy/Group Number: _____
 Make/Model: _____
 Year/Color: _____
 License Plate Number: _____

The T-REX Project is constructing new light rail transit and making Highway Improvements on I-25 between Broadway in Denver and Lincoln Avenue in Douglas County and on I-225 from I-25 to Parker Road in Aurora.

MOVE-IT IT'S THE LAW!

For more information on the Move-It Program or on the T-REX Project, call 303-786-TREX (8739) or visit www.trexproject.com

State of Colorado, Revised Statutes
 42-4-1602, Section 2

When an accident occurs on the traveled portion, median or ramp of a divided highway and each vehicle involved can be safely driven, each driver shall move such driver's vehicle as soon as practicable off the traveled portion, median or ramp to a frontage road, the nearest suitable cross street or other suitable location to fulfill the requirement of section 42-4-1603.

TREX

7200 S. Alton Way, Suite 400
 Centennial, CO 80112

MOVE-IT. IT'S THE LAW!

MOVE ACCIDENTS FROM TRAFFIC

The Transportation Expansion (T-REX) Project is telling drivers that it's OK to get out of the way.

Move-It, it's not just a good idea. It's the law. Ever been involved in a minor traffic accident on the freeway? Rather than move your car off the road, you left it in a traffic lane until the police arrived? Don't feel bad if you have. Actually, it happens quite often in the metro Denver area. Unfortunately, it's against state law.

Studies show that moving accidents quickly from traffic lanes is key.

- Traffic accidents – not volume – account for as much as 60% of all traffic delays.
- For every minute an accident remains in a traffic lane, traffic is delayed for an average of five additional minutes.
- The longer traffic is delayed, the more likely that secondary and more serious accidents will occur.

Even a fender bender or flat tire that only takes 10 minutes to clear can delay traffic for an entire hour. When this happens in T-REX country, this leads to more congestion, more frustration and longer commutes.



It's OK to get out of the way. Police and insurance companies will not penalize you for moving your car off the road.

State law requires motorists involved in a minor accident on a divided highway – including the T-REX corridor – to move their vehicles off the highway when

- the vehicle is drivable
- no drugs or alcohol are involved and
- there are no injuries

Once at a safe location, drivers can notify law enforcement and exchange information.

What to do if you are involved in an accident. While T-REX wants to keep traffic moving as smoothly as possible, safety is our most important goal. If you are involved in an accident, follow these four steps:

- 1. Assess:**
 - Check for injuries – if anyone is injured, call 911 immediately
 - Determine whether vehicles are drivable
 - Determine whether drugs or alcohol are involved
- 2. Move-It:**
 - Move vehicles off the road to the nearest emergency pullout, highway shoulder or off-ramp shoulder
- 3. Notify:**
 - Call 911 to alert them of the accident and your location – they will send a response team or tell you what to do
- 4. Report:**
 - Exchange information including: name, address, phone number, driver's license number, make, model, color of vehicle, license plate number, insurance carrier and policy number using the attached cards
 - Report the incident as instructed by law enforcement and your insurance provider



MOVE-IT. IT'S THE LAW!

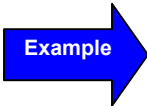
Procedures for Working with the Media

Working with the media includes both on-scene procedures to be used in the event of an incident as well as proactive information provided to help manage their response and inform the general public. It is important to define the roles of each player in working with the media to support existing agency protocols, traveler information dissemination, and incident command.

On-scene Procedures

On-scene procedures focus on the activities related to working with the media during an actual incident. Who should coordinate the information and provide it to the media should be established in advance. The designation of a Public Information Officer (PIO) for the project is very helpful and may include designating spokespersons for several different departments depending on the nature of the incident, which department is in command, and the types of questions anticipated. A table of agency PIOs with phone numbers and emergency access numbers (pagers, cell phones, etc.) can be included in the response manual.

On more complex incidents with a number of media responding, it can be very helpful to have a predetermined staging area. These locations should allow the media to set up their vehicles and obtain information from an on-site PIO. Procedures and locations can be determined in advance and provided in the response manual and in media packets provided to key media personnel. The following example is from the T-REX Traffic Incident Management Program (2001):

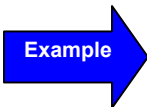


Media

Special staging areas for the media have also been identified. These areas are separate from the emergency response areas and will be used to keep the media clear of the incident scene to ensure their safety and the safety of responders. Implementation of media staging areas should be at the direction of the Incident Commander and all Public Information Officers (PIO) responding to the incident should be sent to that location to coordinate with the press. The CDOT TOC should be notified of the location of the selected media staging area. The following map shows locations that were selected as potential incident staging areas.

Information Dissemination

In addition to the activities outlined above for informing drivers of an incident, there are a number of activities that can be done with the media to prepare them to be active partners is disseminating information during an incident. Media packets can be provided to key media outlets in the project area. For example, the US 6 Incident Management Program (2001) developed a media packet for distribution to the local media. Below is an extract from that packet:



What is a Media Packet?

This media packet is intended to give the media a useful tool for obtaining information about how incidents are handled in the U.S. 6 corridor. In this booklet, you will find media contact phone numbers, maps showing where

media staging areas could occur and maps showing how traffic would be detoured in the event of a major road closure.

Other information that can be distributed to the media to disseminate to the public includes:

- How to call in a crash to 9-1-1
- Where to go for information during a traffic incident
- What is accident alert and what are your responsibilities as a driver
- What is the Move-it Law and what are your responsibilities as a driver

Other key messages specific to the project and the management of traffic incidents can be developed through the planning process.

V. Program Implementation and Management

The process of developing a program is an important step in clarifying and building relationships between CDOT, the contractor, and emergency response agencies in the project area. It is equally important that the program is implemented through field references, inter-agency training, debriefings, and updates.

Response Manual

A response manual should be provided to all field personnel with the critical information needed to respond to an incident. This should be tailored to the project's traffic incident management program and provide key information in simple to use formats (tables, charts, maps, etc.)

The information to consider for inclusion in the manual includes:

- Incident levels and associated actions
- Lists of response agencies
- Roles and responsibilities of response agencies
- Contact information and procedures
- Scene management guidelines
- Predetermined alternate routes
- Resource information
 - Personnel
 - Equipment
- Staging area locations
 - Apparatus
 - Media
- Radio frequency lists
- GPS coordinates or landing site lists
- Accident alert packet
- Project phasing information
- ICS terms and information
- VMS and video camera locations
- Typical lane closure information
- Flagging guidelines

Any information that could support field personnel who respond to and manage a traffic incident should be considered for a field reference or response manual.

Training

Training is critical to effective implementation. It can be as simple as including a review of the manual and guidelines during scheduled trainings and briefings, or as formal as tabletop exercises or video training programs. What is important is to be sure that all responding personnel are aware of the program and guidelines and understand their role in successful implementation. It is critical that responders are aware of agreements made during program development and the information provided in the response manual. Each responder should be provided a copy of the response manual.

Incident Debriefings

Incident debriefings provide an opportunity to review what worked and what could be improved for future incidents. A process for debriefings should be determined as part of the overall program and a commitment should be made by all agencies to participate in them. Below is an example of incident debriefing procedures developed for the I-70 Mountain Corridor Incident Management Program (2000):



Example

Incident Management Review

- Any agency may request that the Incident Commander schedule a debriefing for a specific incident. Requests should be made within 24 hours following the incident.
- Incident Commander will schedule the debrief and contact all responding agencies.
- The debrief should be held to constructively critique the decisions made and actions taken at an incident to determine if future responses need to be improved or if additional resources or procedures are needed.
- All State Patrol and other emergency agency reports should be obtained prior to scheduling an incident debriefing.

Evaluation and Updates

Evaluation and updates are vital to maintaining a dynamic and effective program. For projects that are relatively short in duration, they may require only minor changes in response to lessons learned from incident debriefings. Longer-term projects that last many months or even years will require a more extensive review and update process. For example, the T-REX Traffic Incident Management Program (2001) outlined the following update process:



Example

Update Process

The T-REX Project Incident Management Plan/Program (IMP) was developed in coordination with the existing DTC and South I-25 Plans and in conjunction with the City and County of Denver Public Works Department. The IMP for the T-REX project is recognized as an ongoing and interactive process. Two components of the IMP are the methodology for soliciting input on the effectiveness of the plan as implemented, and a process for periodic updating to the project IMP.

Input and review

Ongoing institutional input and review are important to ensure that the procedures of the IMP remain effective in meeting the objectives of:

- Incident detection and verification
- Timely response
- Effective site management
- Site clearance
- Motorist information

The forum for SECC to receive IMP input include:

1. Biannual IMP coordination meetings with IMP steering committee members. These meetings will begin in January of 2002 and will be held biannually through 2003 (or as determined by the committee).
2. At debriefings held within [7 days] of any major incident.
3. Solicited written comments received after the first Level 3 incident.
4. Ongoing communication with public information emergency responder liaison.

Updates

The IMP will be contained in three ring binders with each page inserted into individual clear plastic page holders. Input that leads to IMP changes or updates will be distributed as page revisions in the following manner:

- A “*T-REX IMP Update*” notification will be emailed or faxed to the contact person for each recorded IMP volume. An electronic copy of the revised page, along with replacement instructions will be attached to the email message or fax.
- A “*T-REX IMP Update Log*” with section, page number and revision date will be maintained and mailed as needed to each contact person along with an additional hard copy of the revised pages.
- Each biannual meeting will include a review of the previous period’s IMP page revisions.

In order to effectively evaluate and revise a program, performance measures should be developed that reflect the specific goals and objectives of the program. For example, if quick clearance is a program goal, performance objectives should reflect the goal and measures should be instituted to determine how long it takes to respond to and clear an incident. These measures can be built into the program as incentives to encourage the contractor to deliver and document effective incident management procedures. The following is an example of performance measures developed for the DTC Incident Management Program to measure the goal of reducing incident-related delay on I-25:



Example

Reduce incident detection and verification time - Review of accident reports will provide the length of time between an accident occurrence and detection. Incident reports maintained by the Courtesy Patrol can also provide information on non-accident incidents. The base year average time for detection was 8.2 minutes. Subsequent years should be compared to the base year, and to prior years as the program continues into the second year and beyond, to determine if improvements have been made to the detection time and if they continue to be made.

Reduce incident response time - Review of accident reports will provide the length of time between accident detection and the arrival time of the first response vehicle. Incident reports maintained by the Courtesy Patrol also provide information on non-accident incidents. The base year average time to respond to an incident after detection was 8.8 minutes. Subsequent years should be compared to the base year, and to prior

years as the program continues into the second year and beyond, to determine if improvements have been made to the response time and if they continue to be made.

Reduce incident clearance and service time - Incident clearance time can also be calculated from accident reports and the Courtesy Patrol's incident reports. Base year calculations should be made to determine improvements in clearance time. Service time is not available for the base year and should be documented for incidents occurring in subsequent years to determine if service time is being affected by the Incident Management Program. Service time is the time delay between clearance and return to normal traffic flow.

Reduce annual incident delay - The yearly delay should be calculated using 1) duration of each incident component or phase; 2) traffic demand approaching the incident location; 3) traffic carrying capacity during the incident; and 4) traffic carrying capacity after clearance of the incident to determine total delay. The base year yearly delay on I-25 through the Denver Tech Center is estimated to be about 241,275 hours. Subsequent years should be compared to the base year and to following years to determine the effectiveness of the Incident Management Program.

Traffic incident management plans and programs must be monitored and revised based on continuous review and evaluation. Debriefings of incidents provide opportunities to identify what is working well and what needs improvement. On longer-term projects, quarterly and annual reviews provide similar opportunities and insights. For the program to be effective, there must be a commitment by all stakeholders to develop and maintain an active management approach.

Appendix A: Sample Strategy Matrix

Sample Strategy Matrix

Strategy	Description	Application
<i>General cell phone</i>	Use of cell phones by motorists to report highway incidents to 911	Detection and verification
<i>Special incident cell phone</i>	A special cell phone number for reporting incidents helps keep general 911 lines open for other emergency calls	Detection and verification
<i>Volunteer spotters</i>	Volunteer spotters are those who are identified and trained to provide information by radio or cell phone regarding freeway incidents.	Detection and verification
<i>Agency and transit "probes"</i>	Transit and shuttle drivers would be trained to provide accurate and timely reports of incidents. Similar to volunteer spotters, they use cell phones, or relay information through their dispatchers.	Detection and verification
<i>Automated vehicle identifiers</i>	In-vehicle identifiers placed in vehicles that travel the corridor regularly. Locators along the corridor track their location and this information is compared against anticipated travel times to identify delay and potential incidents.	Detection and verification
<i>Weather stations</i>	Weather monitoring and forecasting equipment improves detection of and response to weather related incidents.	Detection and verification; response
<i>24 hour patrol</i>	Around the clock law enforcement patrol enhances detection, response and site management with dedicated officers available at all times in the corridor.	Detection and verification; response; site management
<i>Peak period motorcycle patrol</i>	Peak period motorcycle patrol provides accurate reporting of incidents; responsive site management; and more accurate requests for resources.	Detection and verification; response; site management
<i>Aircraft patrol</i>	Aircraft patrol provides another opportunity for surveillance of roadway conditions for incident detection, verification and response.	Detection and verification; response
<i>Dedicated service patrols</i>	Service patrols along I-25 provide early detection, verification and response. Patrol vehicles are equipped to help stranded motorists and quickly remove a disabled vehicle from the roadway.	Detection and verification; response; clearance
<i>Closely spaced milepost markers</i>	Closely spaced, clearly visible milepost markers increase the accuracy of incident reports by by-passers or others by increasing the opportunity to correctly identify the location of an incident. This improves incident verification and response, and needs to be linked to a public education program.	Detection and verification

Strategy	Description	Application
<i>Automated detection</i>	Detectors, including loops, microwave and video detection can be used to detect congestion on the freeway. Detection can be used with equipment to notify response agencies of changes in traffic flow that indicate congestion and a potential incident.	Detection and verification
<i>Video surveillance</i>	Video equipment, mounted along the freeway, provides detection, verification and improved response and site management. Video equipment can be combined with automated detection and reporting. Video can be used to verify the occurrence of an incident and identify the appropriate response equipment needed. Video surveillance is also useful in site management for incidents that restrict access, such as hazardous materials incidents.	Detection and verification; response; site management; motorist information
<i>Call boxes</i>	Call boxes are dedicated emergency phones located along the freeway to allow stranded motorists access to assistance and to provide phone service to witnesses or by-passers.	Detection and verification
<i>Public education program</i>	Comprehensive public education programs help the public understand the how incidents should be reported and responded to. An informed public is more helpful in allowing effective site management and clearance.	Detection and verification; response; clearance; motorist information
<i>Personnel resource list</i>	A prepared list of personnel resources improves the timely response of appropriate personnel for various incident types.	Response; clearance; site management
<i>Equipment/materials resource list</i>	A prepared list of equipment and materials resources improves the timely response of appropriate equipment for various incident types.	Response; clearance; site management
<i>Pre-planned alternate routes</i>	Alternate route planning is a key aspect of response, site management, clearance and motorist information. Pre-established detour routes provide quick removal of the traffic, allowing easier access to the site by emergency response personnel, easier and more effective site and incident management, and clear, definitive information to motorists to use an alternative route.	Response; clearance; site management; motorist information
<i>Emergency turnarounds</i>	Median breaks to allow emergency response and highway operations personnel to turnaround between interchanges.	Response
<i>Emergency access for light rail operations</i>	Locations for access to the light rail line for emergency response.	Response

Strategy	Description	Application
<i>Alternative emergency response access routes</i>	Emergency equipment that needs to reach the scene of an accident, get to another emergency, or gain access to an emergency treatment facility will need to be given alternative access when an incident closes or severely congests a facility. Alternative emergency response access routes and pre-planned routes provide this.	Response; clearance; site management
<i>Construction traffic control Protocols</i>	Predetermined protocols for changing lane configurations and detours that address minimum requirements and notification procedures	Response; clearance; site management; motorist information
<i>Incident Response Manual</i>	An Incident Response Manual, available to emergency response personnel, provides clear guidelines and information for responding to an incident, managing an incident, and informing the public. Much of the information necessary for quick response and incident management is predetermined, including guidelines, and pre-planned alternative routes, and general response information, reducing the time and resources needed to address these issues during an incident.	Response; clearance; site management; motorist information
<i>Communication protocols</i>	Radio communication between agencies is enhanced with predetermined frequency assignments, lists of agency channel access, and interagency communication protocols.	Response; clearance; site management; motorist information
<i>Interagency training program</i>	Training programs can reduce response and clearance time by ensuring that personnel are trained to respond quickly and effectively. They enhance site management by providing a common understanding of the incident command system and program guidelines. Personnel training can improve motorist information by assuring a pre-established information dissemination procedure and designated personnel.	Response; clearance; site management; motorist information
<i>Equipment storage sites</i>	Equipment storage sites provide quick access to necessary equipment, improving both incident response and site management.	Response; clearance; site management
<i>Defined traffic control techniques</i>	Defined traffic control techniques provide clear guidance for incident traffic control and allow safe and efficient deployment of closures, detours and alternative routes.	Response; clearance; site management; motorist information

Strategy	Description	Application
<i>Mobile command post</i>	A mobile command post provides a well-equipped incident command post on scene. Common radio frequencies with tactical and command channels should be available.	Site management; motorist information
<i>Identification vests</i>	Identification vests provide easy identification of various incident command and emergency response personnel. The vests can also be used for access limitations within certain perimetered areas.	Site management
<i>Flashing lights guidelines</i>	Flashing lights on equipment on-scene provide for the safety of personnel. They can also impact the flow of traffic through visual distractions and increased confusion. Flashing lights guidelines that minimize the use of flashing lights while maintaining a safe site for response personnel can improve safety for responders and the public.	Site management
<i>Pre-determined staging areas</i>	Pre-determined staging areas improve site management by establishing apparatus staging areas for each segment of freeway. These reduce confusion on staging and improve equipment response. Pre-determined staging areas can also be developed for media staging.	Site management
<i>Incident response teams</i>	Pre-determined incident response teams can be identified from the various response agencies to streamline site management and incident response.	Site management
<i>Incident management review team</i>	An Incident Review Team provides increased coordination and evaluation of each of the phases of an incident. A standing team of incident response professionals who are regularly involved in T-REX incidents would meet to review major incidents and identify opportunities to improve incident detection and verification, response, site management, clearance and motorist information.	Site management; detection and verification; response; clearance; motorist information
<i>Travel on shoulder guidelines</i>	The highway shoulders are available for emergency use for response vehicles and general traffic. Guidelines for their use can assist in site management, response and clearance.	Site management; response; clearance
<i>Closure and alternate route guidelines</i>	In addition to pre-determined routes and traffic control, guidelines should be determined for the implementation of these to ensure their appropriate and effective use.	Site management; clearance

Strategy	Description	Application
<i>Rapid vehicle removal guidelines</i>	Colorado State law requires immediate removal of vehicles from the highway if they are not involved in an injury or alcohol-related accident. Extended enforcement of this law would enhance incident clearance and return the roadway to traffic.	Clearance; site management
<i>Landing zone guidelines</i>	Established guidelines and predetermined landing sites for med-evac helicopters	Site management; clearance
<i>Air bag systems</i>	Inflatable air bag systems used for the rapid removal of overturned vehicles, including commercial vehicles.	Clearance; site management
<i>Total station surveying equipment</i>	Surveying equipment outfitted with global positioning equipment used to quickly document the location of critical accident reporting and reconstruction information and return the roadway to traffic.	Clearance; site management
<i>Push bumpers</i>	Emergency response vehicles equipped with push bumpers can quickly and easily push disabled vehicles to the side of the road without incurring additional damage to the vehicle.	Clearance
<i>Accident investigation sites</i>	Pre-established investigation sites provide an alternative to the travel way or shoulder for accident investigation and reporting. These areas should be identified in advance and allow adequate space for movable vehicles and investigation personnel. These can be designed with screening devices to further reduce impact on traffic.	Clearance; site management
<i>Traffic signal control plans</i>	Pre-established traffic signal control plans can be used to quickly implement alternative routes and close impacted lanes on the Interstate. Traffic responsive equipment will ensure the most efficient use of roadways for the existing traffic demand.	Clearance
<i>Ramp metering</i>	Ramp metering controls the access of vehicles to the interstate. These could be used in conjunction with alternate routes to encourage the use of other highways.	Clearance
<i>Incremental lane opening guidelines</i>	Guidelines for opening lanes quickly, as they become available and safe to open, encourage returning lanes to travel as soon as possible.	Clearance; site management
<i>Actuated or static trailblazers</i>	Pre-installed trailblazers with an actuated message/arrow can reduce the time necessary to set up detour routes.	Clearance; motorist information

Strategy	Description	Application
<i>Media interface guidelines</i>	One of the best sources of motorist information is the media. Improved media ties that provide fast, accurate information to the media will improve information dissemination to the traveling public.	Motorist information
<i>Traffic reporting services</i>	Traffic reporting services provide a link between agencies and the broadcast media. Protocols for interactions with these services should provide guidance for involving them in informing the public.	Motorist information
<i>Broadcast radio</i>	Agreements with broadcast radio stations can ensure that information is provided in a pre-established format within specific time frames. Cooperating radio station call numbers can be posted on actuated or variable message signs.	Motorist information
<i>Cable television</i>	Cooperative agreements can be developed with cable television stations to provide information to targeted populations (e.g. local government channels).	Motorist information
<i>Highway Advisory Radio</i>	AM stations that provide traveler information in the immediate vicinity of the transmitter. Activated signing is used to notify motorists that traffic/roadway information is being broadcast.	Motorist information
<i>Internet</i>	Internet and kiosk facilities inform the public of highway conditions before they leave. Internet sites and links to existing sites provide easy access.	Motorist information
<i>Mass fax</i>	The CDOT TOC currently faxes road closure information to truck stops, weigh stations, media outlets and others. The lists associated with I-25 incidents can be expanded and targeted based on incident level.	Motorist information
<i>Dedicated information phone number</i>	A publicized information phone number with project and incident information.	Motorist information
<i>Variable message signs</i>	Permanent and movable variable message signs are used to provide timely, accurate information in advance of, and at the scene of an incident.	Motorist information; clearance