An Integrated MOT Training Program for Incident Responders

Pei-Sung Lin, Huaguo Zhou, Enrique Gonzalez-Velez

Abstract: Most existing maintenance of traffic (MOT) training programs are designed for long-term roadway construction projects or specific incident responders. However, successful traffic incident management on interstate and access-limited highways requires a swift, consistent and practical MOT setup by all incident responders to ensure their safety and the mobility of motorists through incident locations. Sponsored by the Federal Highway Administration and the Florida Department of Transportation, the Center for Urban Transportation Research at the University of South Florida has developed a comprehensive and integrated MOT training program. The project team first obtained and reviewed available MOT and incident management training materials throughout the country. A preliminary and integrated MOT training program for incident responders was then developed. To meet practical needs among all incident responders, a MOT training advisory group for incident responders was assembled with representatives from major incident-responding agencies in Florida. Based on the active discussion and valuable input from advisory group members through three separate meetings, the MOT training program was developed with the full support of all incident-responding agencies. The MOT training program was further revised based on the feedback obtained from a pilot training class. This paper describes the importance of the MOT training program for incident responders. The process of program development and highlights of each training module are clearly presented. This MOT training program offers a comprehensive, integrated and practical MOT training material to improve the safety of incident responders and the mobility of motorists passing through incident locations.

INTRODUCTION

Most current maintenance of traffic (MOT) training programs are typically designed for long-term roadway construction projects. The training courses offered at different levels in Florida are targeted to either construction contractors or roadway designers. Some incident-responding agencies have their specific incident management training and site management, but the coverage of MOT varies significantly. It has been well recognized that successful traffic incident management on interstate and access-limited highways requires effective planning and consistent MOT setup to enhance the safety of both incident responders and motorists, and improve the mobility of travelers through incident locations. It is also vital for incident responders to have full communication, coordination, and cooperation during a traffic incident.

Through a USF UCITSS Phase II project sponsored by the Federal Highway Administration (FHWA), the Florida Department of Transportation (FDOT), and Florida Atlantic University, the Center for Urban Transportation Research (CUTR) at the University of South Florida has developed a comprehensive and integrated MOT training program specially tailored to the needs of incident responders such as law enforcement, fire and rescue, emergency medical service, transportation agencies, road ranger service, and towing service. In addition to the MOT training modules in PowerPoint Presentation format, instructor notes and a student handbook are produced via the development of this MOT training program for incident responders in Florida.
OBJECTIVES

The major objective of the project is to develop a comprehensive, integrated, and practical MOT training program to:

- enhance the safety of all incident responders and motorists,
- improve the mobility of travelers through incident locations, and
- obtain consensus, support, and utilization of the MOT training program from all incident-responding agencies.

It is essential to harmonize all incident-responding agencies to use an integrated MOT training program for all incident responders.

MOT PROGRAM DEVELOPMENT

To accomplish the major objectives on the development of a comprehensive and integrated MOT training program for all incident responders, the following tasks have been undertaken:

**Review literature and obtain input from incident-responding agencies**

The CUTR project team reviewed literature, solicited input from incident-responding agencies nationwide, gathered associated information, and determined the content and training materials for the development of the MOT training program. Valuable information was obtained from a variety of sources including the Manual on Uniform Traffic Control Devices (MUTCD), FDOT Roadway and Traffic Design Standards (Standard Index), I-95 Corridor Coalition, and MOT training courses as well as training resources utilized by law enforcement agencies, fire rescue and emergency medical services, and state departments of transportation. A resource CD was created containing all the information obtained through the development of the MOT training program for future reference.

**Develop a preliminary MOT training program**

Based on the comprehensive information obtained in the literature review and input from incident-responding agencies, a draft MOT training program was developed. The preliminary training program consists of 11 modules.

**Assemble a MOT training advisory group to provide guidance**

To obtain a consensus, support, and guidance on the development of the MOT training program for incident responders in Florida, representatives from many incident-responding agencies in Florida were selected, invited, and assembled. They exchanged their experiences and provided valuable input to the development of the MOT training program for incident responders. Three advisory group meetings took place at CUTR at the University of South Florida located in Tampa, Florida. Figure 1 includes two photographs taken during an advisory group meeting.
The first advisory group meeting took place on January 28th, 2008 from 8:00 AM to 4:30 PM. During the training, the representatives interacted and made suggestions regarding the first draft training modules to simplify several complicated MOT concepts and provide a practical approach. The second and third meetings took place from 8:00 AM to 12:00 PM on April 9th, 2008 and May 8th, 2008, respectively. In these two meetings, representatives discussed more details on the practices of their agencies, shared their specific experiences, and provided feedback on each revised module based on the input from the previous meeting.

Conduct a MOT pilot training

After the completion of three MOT advisory group meetings and the adoption of suggestions made at the meetings, all necessary training materials were developed, including an instructor’s note, student handbook, and PowerPoint modules. To obtain further feedback from incident responders in the field, a MOT pilot training was arranged for incident-responding agencies in the Tampa Bay area.

The one-day pilot training course was conducted at CUTR on August 5, 2008. Fifteen students participated in the training, which included classroom and tabletop exercises related to the proper setup of MOT for various types of incidents on interstate and access-limited highways. During the morning session, five of the nine modules were covered; in the afternoon, the remaining four modules were covered, including table top exercises. Figure 2 includes photographs taken during the pilot training.
For the tabletop exercise, participants were divided into two groups. Each group included at least one incident responder representing an incident-responding agency. The objective of the tabletop exercise was for each group to have the opportunity to apply the knowledge and skills obtained from the MOT training class on different incident scenarios. As part of the discussion, communication, coordination, and cooperation among agencies were experienced by the participants. Figure 3 includes photographs from the tabletop discussions.

![Figure 3 Tabletop Exercises during the Pilot Training](image1)

After completing the discussion, each group explained to the class their results related to their particular scenario. This discussion provided the opportunity for other responders to interact and make suggestions for improving the incident scene and the safety of the incident responders. Figure 4 shows photographs of the presentations.

![Figure 4 Presentations of Tabletop Exercise Results during the Pilot Training](image2)

**Finalize the MOT training modules**

After obtaining feedback from the participants of the pilot training and FDOT project managers, the MOT training program was finalized, resulting in eight modules:

- Module 1: Introduction & Crashes and Safety
- Module 2: Legal/Liability Issues and Safety Policies/Procedures
• Module 3: 3C’s among Incident Responders
• Module 4: MOT Concepts
• Module 5: Safe Parking
• Module 6: MOT through Traffic Incident Management Areas
• Module 7: MOT Examples
• Module 8: Tabletop Case Exercises

DESCRIPTION OF MOT TRAINING MODULES

Each training module in the MOT training program is described below.

Module 1- Introduction & Crash and Safety

This module first presents the objectives of the training course and describes the outline of the training modules. It emphasizes the need to develop a MOT training program to enhance the safety of both incident responders and motorists, and improve the mobility of travelers through incident locations. Two separate short videos (Video 1 - Your Vest Won’t Stop This Bullet and Video 2 - Seattle Wave: The Far-Reaching Impact of Traffic Incidents) are used in this module to convey the importance of proper incident response on safety and mobility to training participants, respectively. For crash and safety, this module presents the challenges that the state of Florida is facing through statistics on crashes and the incident responder “struck by” histories in Florida. It encourages participants to learn from the MOT training to enhance the safety of incident responders and improve the mobility of the traveling public.

Module 2 – Legal/Liability Issues and Safety Policies/Procedures

This module provides incident responders with basic information on tort liability and guidelines for protecting themselves from liability issues, as well as safety policies and procedures. It explains elements necessary for a tort action. The modules also highlight the Florida Statutes, policies and procedures related to incident response such as Move It – It’s the Law, Move Over Act, Good Samaritan Act, Standards of Care, Open Road Policy, and Non-Cargo Spills Mitigation.

Module 3 - Communication, Coordination, and Cooperation among Incident Responders

This module addresses the importance of understanding the differences that exist among incident responders and the roles of each incident-responding agency during a traffic incident. It uses “The Many HATS of Highway Incident Management” video to effectively present the topic. The design of the module is to make incident responders aware of the role of each incident-responding agency during an incident on interstates and expressways or access limited highways. With a good understanding of communication, coordination, and cooperation among all incident responders, incident responders can exchange essential information among agencies, decrease overlap and redundancy, and work together as a team to achieve their goals. The inclusion of the video of HATS makes the module interesting and effective. This video provides an opportunity for interaction among incident responders participating in the training, and helps participants understand the roles of other incident responders, and develop consensus among all incident responders.
Module 4 - MOT Concepts

This module first describes common highway terminology such as shoulders, median, lane referencing, and upstream & downstream, so incident responders can communicate effectively and operate efficiently during an incident. Then basic MOT concepts are presented including incident definition, types of incidents, highway standards, temporary traffic control zones, highway safety principles, personal protective equipments (PPE), traffic control devices, and emergency vehicle lighting.

During an incident on interstate or access-limited highways, the time allowed for incident responders to set up a MOT is much shorter than that for a work zone. However, the concept to set up the MOT for an incident is the same as that for a work zone. For temporary traffic control zones during an incident, four major zones are presented including advanced warning area, transition area, activity area, and termination area as shown in Figure 5. For highway safety principles, the stopping sight distance concept is illustrated, which can help incident responders understand the importance of a MOT setup during an incident. For PPE, this module shows three different types of highway safety vests (Class I, II and III) and explains the difference among them. Traffic control devices such as signs and channelizing devices (e.g. cone, barricade and flare) are clearly presented followed by emergency vehicle lighting and shadow vehicle. Emergency vehicle lighting is essential in the initial stage of a traffic incident. It can provide safety to incident responders and persons involved in the traffic incident, as well as road users approaching the traffic incident. To reduce adverse impact to motorists, incident responders should turn off unnecessary lights, avoid glare to motorists, and use amber instead of red.

Figure 5 Component Parts of a Temporary Traffic Control Zone
Module 5 - Safe Parking

This module presents safe parking practices, vehicle positioning, and principles for incident responders during a traffic incident on interstate and access-limited highways. The module is to instruct incident responders on the proper parking position of their vehicles in order to increase the safety of responders and improve the mobility of motorists through the incident location. The vehicles that should be positioned downstream of an incident are tow trucks and ambulance vehicles, and in the upstream area are fire truck, police, and road ranger vehicles as shown in Figure 6. The upstream configuration can vary with the arrival order and the need of responders. An example of vehicle positioning is shown in Figure 7. This module includes safe procedures for correct use of vehicle lights at the scene and vehicle exits. It also provides safety benchmarks for parking for incident responders. It is important to note that incident responders should avoid closing more lanes than necessary. Unnecessary lane closure can significantly reduce roadway capacity, prolong traffic congestion and increase the chances of secondary incidents. The basic principles on lane closure include:

- Consider closing the incident lane(s) only
- If necessary, plus one more lane
- Remove the lane closure as soon as possible when it is no longer necessary

Figure 6 Vehicle Positions Upstream and Downstream of an Incident
Module 6 - MOT through Traffic Incident Management Area

This module presents MOT setups for an effective temporary traffic control area for different scenarios based on Florida DOT Design Standards as illustrated in Figure 8. The figure provides incident responders with a quick reference of a MOT setup. These scenarios include:

- Shoulder lane closure
- One travel lane closure
- Double lane closure
- Partial exit ramp closure
- Curve setup, and
- Highway shutdown

Because the first incident responder may have limited resource for a MOT setup, the responder has to make the most out of the resource available in the vehicle. Other responders arriving subsequently to the scene should help set up a proper MOT if needed to protect all incident responders, victims and road users. This module provides incident responders with practical recommendations during a MOT setup as follows:

- Protect yourself and road users
- Make the most out of your limited resources
- Incident responders arriving after you could provide more resource to improve the MOT setting
- Avoid turning your back to traffic flow when you are placing the MOT devices
(a) Shoulder lane closure   (b) One travel lane closure            (c) Double lane closure

(d) Partial exit ramp closure     (e) Curve setup        (f) Highway shutdown

Figure 8 MOT Setups under Different Scenarios
Module 7 - MOT Examples

This module provides many examples on MOT setups and safe parking positioning depending on the incident scenario and arrival order of each responder. Five different scenarios listed below are used to illustrate the vehicle positioning and MOT setup. The examples of MOT setup for the first four scenarios are shown in Figure 9, and the last scenario is shown in Figure 10.

- Disable vehicle on shoulder
- Out-of-control vehicle crash with no injuries
- Minor rear-end crash on travel lane and both vehicles are movable
- Vehicle crash with one lane and shoulder closed
- Vehicle crash with two lanes and shoulder closed

The first scenario is a disable vehicle on shoulder. The example of MOT setup for Scenario 1 is shown in Figure 9(a). In this example the first responder in the incident scene was a Road Ranger. The Road Ranger parks his or her vehicle behind the incident area, keeping a safe separation distance from the scene approximately 50 ft or more. Based on the requirements of the MUTCD, the Road Ranger started to set up the MOT with cones within the first 15 minutes of arrival. A taper was used to close the shoulder to keep the work area safe. An advanced warning sign was also placed upstream. These cones and sign informed the oncoming drivers that something happened in front of those cones.

The second scenario is out-of-control vehicle crash with no injuries. The example of MOT setup for Scenario 2 is shown in Figure 9(b). In this example the first responder in the incident scene was a police officer. The police officer quickly set up the MOT on the shoulder. The police officer found there was no injury but the vehicle was not movable, so he stayed to protect the people involved in the incident and damaged vehicle until the arrival of a tow truck.

The third scenario is a minor rear-end crash on outside travel lane. Both vehicles involved in the crash are movable. In this example the first responder in the incident scene was a Road Ranger. The Road Ranger used an arrow board as its warning sign to the oncoming vehicles. The Road Ranger checked the vehicles and found both vehicles were movable. The Road Ranger helped move both vehicles to the outside shoulder to avoid unnecessary blocking of the travel lane. In this stage, the drivers involved in the incidents call their tow trucks and wait for the police to make the report. Shortly, the police officer and tow truck arrived to the scene. The police parked his/her vehicle behind the Road Ranger and MOT was set up upstream for the police’s vehicle. The tow trucks parked downstream of the damaged vehicles as shown in Figure 9(c).

The fourth scenario is a vehicle crash with one travel lane and shoulder closed. Both vehicles involved in the crash are not movable and injuries were reported. In this example Road Ranger, Florida Highway Patrol, fire truck and ambulance arrived almost at the same time. An example of a completed MOT setup and vehicle positioning for Scenario 4 is shown in Figure 9(d).

The fifth scenario is a vehicle crash with two travel lanes and shoulder closed. Both vehicles involved in the crash are not movable and injuries were reported. Scenario 5 is similar to Scenario 4. To illustrate detailed arrival sequence of incident responders, vehicle positioning and MOT setup during the incident, sequential diagrams from (a) to (e) are shown in Figure 10.
(a) Disable vehicle on shoulder  
(b) Out-of-control vehicle crash with no injuries  
(c) Minor rear-end crash on travel lane  
(d) Vehicle crash with one lane and shoulder closed  
(Both vehicles are movable)  

Figure 9 MOT Examples of Incidents on Interstate or Access-limited Highways
Figure 10 A MOT Example with Sequential Diagrams for Scenario 5
Module 8 - Tabletop Case Exercises

This module provides incident responders with several opportunities to apply what they have learned from the course and work as a team to set up proper MOT and safe parking using tabletop case exercises. The participants also have the opportunity to perform the roles and duties of other incident responders through the exercise. This module provides the opening of communication and discussion among incident responders through the exercise, so they learn how to work together as a team to successfully respond to different traffic incident scenarios.

CLOSING REMARKS

On-scene incident responders must be properly trained on MOT setup for accomplishing their tasks during an incident on interstate and access-limited highways. Incident responders need to be aware that although all incidents are not the same, the ability to quickly install an appropriate temporary traffic control (TTC) zone greatly enhances the safety of all incident responders and motorists. It also reduces the adverse effects of an incident, such as secondary crashes or excessive traffic delays. Procedures for establishing temporary traffic control zones may vary with traffic, roadway and environmental conditions, but the basic MOT concepts, temporary traffic control zones, safe parking positions, and MOT setup principles remain the same.

Incident responders need to make most out of available resources in their vehicles. As other responders arrive at the incident scene, they should provide help and support in developing the corresponding and appropriate TTC zone required for responding the incident. In addition to the MOT setup, incident responders always need to keep an eye on oncoming traffic, minimize response time (one minute of response delay can cause a four to five minute delay in traffic returning to normal), and respect the roles of other incident-responding agencies.

The MOT training program for incident responders includes eight major modules. These modules provide full coverage of introductory information, legal and liability issues, safety policy and procedures, the “3C’s” (communication, coordination, and cooperation) among incident responders, MOT concepts, safe parking, MOT through-traffic incident management, MOT examples, and tabletop case exercises. This MOT training program provides incident responders with necessary, effective, and practical tools to keep them safe, provides mobility to roadway users, and helps them understand the roles of other incident-responding agencies. It also provides an excellent opportunity for better communication, coordination, and cooperation among all incident-responding agencies.
ACKNOWLEDGMENTS

The authors would like to express their gratitude to FDOT project manager, Mr. Mike Akridge, for his strong support and guidance on the MOT training program development in Florida. Authors greatly appreciate continuous assistance from Mr. Patrick Odom and Mr. Terry Hensley with FDOT, and Mr. Charles Creel with PBS&J through the project period. The authors would like to especially acknowledge MOT Training Program Development Advisory Group members for their active participation and valuable inputs. With their help, the CUTR project team was able to develop a comprehensive, integrated and practical MOT training program for incident responders in Florida. Finally, the authors would also like to thank those state DOTs and incident responding agencies for providing their training materials, especially Mr. Ron Moore from the City of McKinney, Texas.

REFERENCES

Author Information

Pei-Sung Lin, Ph.D., P.E., PTOE, FITE
Program Director, ITS Traffic Operations and Safety
Center for Urban Transportation Research (CUTR)
University of South Florida
4202 E Fowler Avenue, CUT 100
Tampa, FL 33620
Ph: (813) 974-4910
Fax: (813) 974-5168
Email: lin@cutr.usf.edu

Huaguo Zhou, Ph.D., P.E.
Assistant Professor
Department of Civil Engineering
Southern Illinois University,
Edwardsville, IL 62026-1800
Ph: (618) 650-2815
Fax: (618) 650-2555
E-mail: hzhou@siue.edu

Enrique Gonzalez-Velez
Graduate Assistant, ITS Traffic Operations and Safety
Center for Urban Transportation Research (CUTR)
University of South Florida
4202 E Fowler Avenue, CUT 100
Tampa, FL 33620
Ph: (813) 974-9795
Fax: (813) 974-5168
Email: egonzal@cutr.usf.edu