ILLINOIS CENTER FOR TRANSPORTATION

DEVELOPMENT OF A HIGHWAY INCIDENT MANAGEMENT OPERATIONAL AND TRAINING GUIDE

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A report of the findings of
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Operational and Training Guide

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16. Abstract

Each year highway traffic incidents, such as crashes, place responders on and beside roadways with dangerous high-speed traffic. The unexpected conditions of an incident scene have the potential to surprise unsuspecting or inattentive drivers, possibly causing an additional crash, termed a secondary incident. Because responder safety is a key priority of the Illinois Department of Transportation (IDOT) and the Illinois Center for Transportation, and because secondary incidents are frequently more severe than the initial incident, ICT researchers, guided by a technical review panel (TRP) of members from multiple incident response agencies, studied ways to improve responder safety in Illinois through a training program. A survey of incident response agencies throughout Illinois was conducted to assess the current level and type of incident management training provided to each group of responders. The research team reviewed the current training materials at federal, state, regional, and organizational levels. Based on the statewide survey, comprehensive literature reviews, and inputs from the TRP members, a training program was developed. The training intends to provide the necessary inter-disciplinary knowledge to incident responders in Illinois. The main objective of the training is to keep responders safe, prevent secondary incidents, and reduce fatalities in Illinois, while reducing non-recurring congestion caused by the incidents. The training includes approximately 6.5 hours of classroom time and is divided into eight modules, each providing valuable training to incident responders. The training program was pilot tested in two regions of Illinois prior to finalization. The pilot training sessions received very positive feedback from over 50 participants.

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EXECUTIVE SUMMARY

Traffic incidents, such as crashes, place responders on and beside roadways with dangerous high-speed traffic. The unexpected conditions of an incident scene have the potential to surprise unsuspecting or inattentive drivers, possibly causing a secondary incident. Secondary incidents are those resulting from the congestion and unexpected conditions surrounding the first incident scene and can include severe crashes or merely a vehicle engine overheating. Because responder safety is a key priority of the Illinois Department of Transportation (IDOT) and the Illinois Center for Transportation (ICT), and because secondary incidents are frequently more severe than the initial incident, the research team, guided by a Technical Review Panel (TRP) of members from multiple incident response agencies, studied ways to improve responder safety in Illinois through a training program. A survey of over 1,300 incident responders and trainers in Illinois was conducted to assess the current level and type of incident response training provided by different agencies, including Illinois State Police (ISP), fire/emergency medical services (EMS), transportation (maintenance, operations, and service patrol), representatives from the towing industry, and emergency communications (911 dispatchers and traffic management center (TMC) personnel). The researchers then reviewed the current training materials at federal, state, regional, and organizational levels. Based on the reviews and input from the TRP members, a highway incident management training (HIMT) guide was developed. The training was intended to provide the necessary inter-disciplinary knowledge to incident responders in Illinois. The main objective of the training was to keep responders safe, prevent secondary incidents, and reduce fatalities, while reducing non-recurring congestion caused by the incidents. The training includes approximately 6.5 hours of classroom time and was divided into eight modules, each covering separate topics and providing valuable training to incident responders. The training program was pilot tested in two regions (Chicago and St. Louis) prior to finalization. Positive feedback was received from over 50 participants at the two pilot training sessions.

The modules in the HIMT program are briefly described below:
- Module 1 introduces highway incident management and defines the significance of the training. The instructors cover the impact that secondary incidents have on traffic and responders with interactive pictures. This module also presents the number of responders injured or killed in incidents in Illinois each year.

- Module 2 describes the roles and procedures of all incident management responders. For example, the role of law enforcement at an incident scene is clearly described. The same is done for each responder and aims to develop a mutual understanding of other responders' duties at the incident scene. Standards, policies, and laws affecting incident response in Illinois are also covered in this module.

- Module 3 focuses on the three C's of incident management: communication, coordination, and cooperation. These topics are reinforced with the video, "The Many Hats of Highway Incident Management," followed by a group discussion between all incident responders. The module ends by introducing unified command structure using an example.

- Module 4 introduces the eight parts of initial scene response. Participants are taken through a call step-by-step including: notification, response, arrival, size-up, command responsibilities, traffic management, patient care, and investigation. Initial

incident scene size-up and on scene reports are discussed in detail through several examples.

- Module 5 covers two incident classification methods: Manual on Uniform Traffic Control Devices (MUTCD) and Lake Michigan Interstate Gateway Alliance (LMIGA). The MUTCD method is based on the incident duration. The LMIGA model is based on the number of lanes blocked, location of incident, and time of day when an incident occurs. Examples of each incident level are discussed at the end of the module.

- Module 6 introduces responders to traffic management and teaches them how to create a MUTCD-compliant temporary traffic control zone. Warning sign placement and the correct use of channelizing devices are covered in this module.

- Module 7 describes incident clearance and termination procedures. This module includes a description of vehicle type provided by the Towing and Recovery Association of America (TRAA). Participants learn the clearance tasks each agency is responsible for. The termination process is discussed from clean-up, reopening traffic lanes, and final checks at the scene by each agency. The concept of incident progression is shown in a step-by-step animated example.

- Module 8 ends the training by giving responders a chance to work together in table-top exercises involving five different types of traffic incidents on freeways. A verbal, ungraded quiz concludes the training with a summary of the key learning objectives.

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LIST OF ABBREVIATIONS

3C's	Communication, Cooperation, and Coordination
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CoG	Council of Governments
DHS	Department of Homeland Security
DMS	Dynamic Message Sign
DNR	Department of Natural Resources
EMS	Emergency Medical Services
EOM	Emergency Operations Manual
EPA	Environmental Protection Agency
EPV	Emergency Patrol Vehicle
ERG	Emergency Resource Guide
ETP	Emergency Traffic Patrol
FAA	Federal Aviation Administration
FD	Fire Department
FDIC	Fire Department Incident Command
FEMA/IEMA	(Federal or Illinois) Emergency Management Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HAZMAT	Hazardous Material
HIMT	Highway Incident Management Training
IAP	Incident Action Plan
ICS	Incident Command System
IDOT	Illinois Department of Transportation
IM	Incident Management
IN-TIME	INdiana Traffic Incident Management Effort
I-REACH	Illinois Radio Emergency Assistance Channel (155.055 MHz)
ISP	Illinois State Police
ITS	Intelligent Transportation System
LTCM	Local Traffic Control Manual
LMIGA	Lake Michigan Interstate Gateway Alliance
MS	Microsoft
MUTCD	Manual on Uniform Traffic Control Devices
NFPA	National Fire Protection Association
NIMS	National Incident Management System
RTMS	Remote Traffic Monitoring Sensors
SIUE	Southern Illinois University Edwardsville
SOP	Standard Operating Procedure
SQC	Safe, Quick Clearance
TCD	Traffic Control Devices
TDOT	Tennessee Department of Transportation

TIM	Traffic Incident Management
TIMA	Traffic Incident Management Areas
TIS	Traveler Information Systems
TPO	Transportation Planning Organization
TRAA	Towing and Recovery Association of America
TRP	Technical Review Panel
TTC	Temporary Traffic Control
UC	Unified Command
VDOT	Virginia Department of Transportation

CHAPTER 1 NEEDS ASSESSMENT AND SURVEY

1.1 INTRODUCTION

Each year, motorists in the U.S. experience increasing traffic delays and over 55 percent of the delays are consistently caused by traffic incidents (Cambridge Systematics and Texas Transportation Institute 2004, Schrank and Lomax, 2004, Ozbay and Kachroo, 1999, and Cambridge Systematics 1990). Effective detection, verification, response and clearance of these incidents can significantly reduce this portion of delay. Additionally, these actions can reduce fuel consumption and emissions (Derr, 2004; Mathew et al. 1999).

To ensure effective incident response, it is important for agencies to focus on the concept of the "Three C's" (communication, coordination, and cooperation), since multiple agencies commonly respond to traffic incidents. Various resources are available to guide agencies toward improving their own incident management (Neudorff et al. 2003, Johnson and Thomas, 2000, FHWA 2008), and several others focus on effective incident management in certain regions of the country (The I-95 Corridor Coalition, 2005; Hagen and Zhou, 2005). It is unclear which part of each resource is best for the operational and institutional structure within the state of Illinois.

The objective of this section is to present the detailed results of interviews and a statewide survey of over 1,300 incident responders from different incident response agencies to assess the need for a statewide common incident management training program. This research will be of interest to traffic incident managers and trainers in traffic operations, law enforcement, emergency medical services, fire departments, freeway service patrols, and the towing industry in Illinois and throughout the country.

1.2 INTERVIEWS WITH KEY INCIDENT RESPONDERS AND TRAINERS

From May 2009 to April 2010, the research team conducted eleven interviews with key state incident managers, responders, and trainers. The main findings from these interviews include:

- Lack of common training materials for all incident responders. Different agencies have their own in-house training programs.
- Illinois State Police (ISP) training mainly focuses on the National Incident Management System (NIMS)/ Incident Command System (ICS).
- Local fire departments need training on coordinating traffic management with other incident responders.
- The concept of the "Three C's," tabletop exercises, procedures, laws and regulations need to be included in the training.
- One-day in-class training is requested. This could be supplemented with web-based training.
- IDOT District One (Chicago area) Emergency Traffic Patrol (ETP) was currently revising their standard operating procedures (SOP), which influences their in-house training.
- Training with other agencies will improve the coordination and cooperation between them.
- Most agencies have their own hazardous materials (HAZMAT) and NIMS/ICS training.
- The training should show different case-study examples for urban and rural areas.
- Very few agencies have ever trained with other agencies.

A more detailed review of the interview results is contained in Appendix A.

1.3 STATEWIDE SURVEY

1.3.1 Survey Method

A web-based survey was developed and hosted on the Civil Engineering Department's web server at the Southern Illinois University at Edwardsvile (SIUE). The survey web page user interface utilized ASP scripting, standard HTML controls, and was supported by a MySQL database backend. This format allowed researchers to easily add, change, or re-sequence questions during the development phases.

The survey questionnaire was developed based on previous literature and input from stakeholders in Illinois, particularly IDOT. The survey questionnaire is reproduced in Appendix B. A pilot test was conducted for this survey by asking participants at a state incident management training event to complete a paper copy of the survey. Combining all feedback, the survey was launched in fall 2009 and collected responses through the end of the year. Members of the project's technical review panel assisted in soliciting responses from incident responders, managers, and trainers throughout Illinois and the greater Midwest.

For analysis, the database was exported and reviewed using MS Excel. Simple formulas were written to help extract data from particularly complex questions.

1.3.2 Survey Findings

The survey resulted in over 1,300 responses. The primary demographic data collected was the job title of the respondents. As shown in Figure 1, a large percentage (77 percent) of survey respondents was field emergency response personnel. Of the emergency response personnel, a large percentage (90 percent) was law enforcement. Because of this large response, researchers separated the responses from several questions to evaluate responses by agency type.
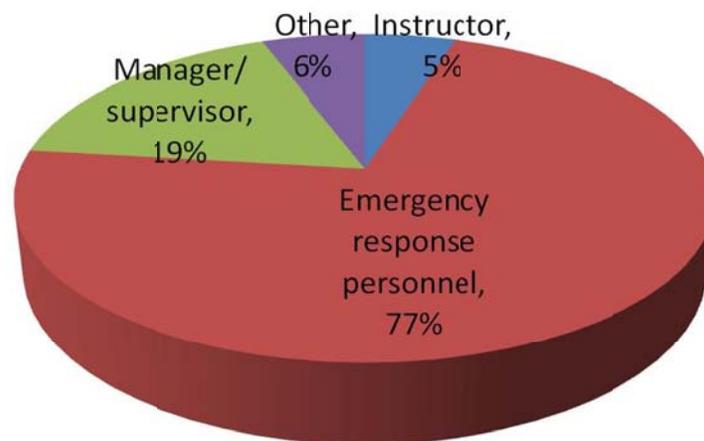
Figure 1. Survey respondents by job title.

Respondents revealed that most of them (54 percent) attend training at least once a year and another 22 percent trained at least every five years. Figure 2 shows the

length of incident management training programs for respondents. Although virtually no respondents (one percent) had training that was less than a full day, few (15 percent) had training that was longer than three days. Most respondents (62 percent) trained between one and three days. Although the frequency and duration of reported training was not what most incident managers would like to have, they indicated the need for effective and brief highway incident management training because of the budget constraints faced by most public agencies.
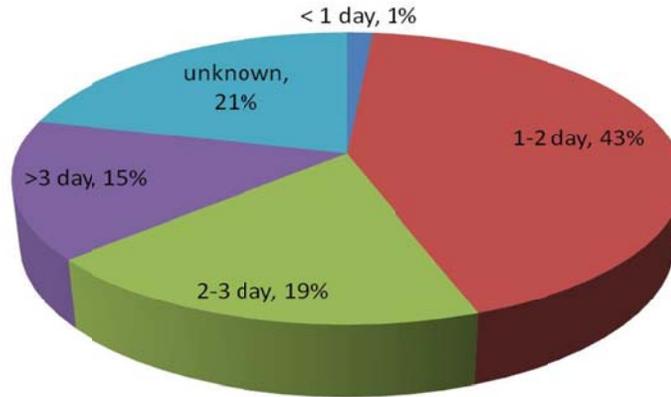
Figure 2. Responses to how long training lasts.

Some agencies train together because highway incident management commonly requires collaboration. As Figure 3 illustrates, 19 percent of respondents trained with another agency. Further, 16 percent trained with two or three other agencies, 12 percent trained with four or five other agencies, and 3 percent trained with more than five other agencies. While these numbers are promising, half of all respondents did not attend any multi-agency training events.
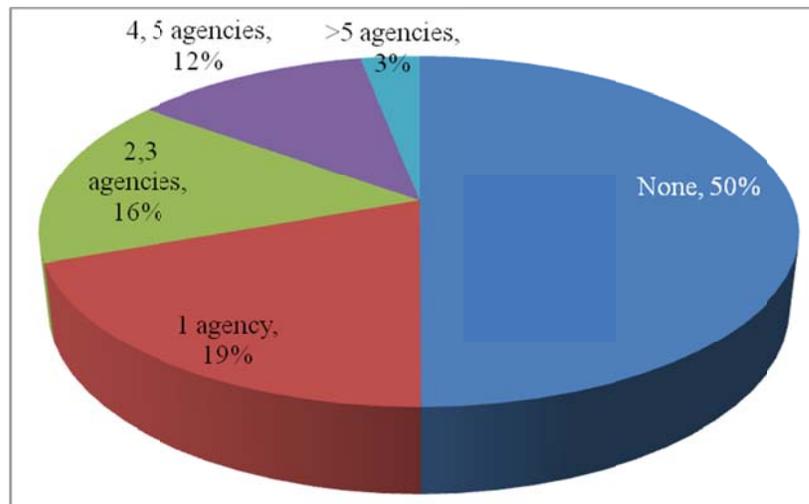
Figure 3. How many agencies participate in multi-agency training

To enhance insight into the findings on multi-agency training, the survey also asked which agencies train collaboratively. Results suggest that fire departments, emergency medical services, and law enforcement agencies commonly train collaboratively. Figure 4 displays the percentage of respondents from each agency that participated in multi-agency highway incident management training. When reading the next two figures, the definitions for following acronyms are: DHS=Department of Homeland Security, FEMA/IEMA=Federal (or Illinois) Emergency Medical Agency, FAA=Federal Aviation Administration, EMS=Emergency Medical Services. These numbers suggest that transportation agencies, service patrols, and towing operators have significant room for increased participation in multi-agency training events.
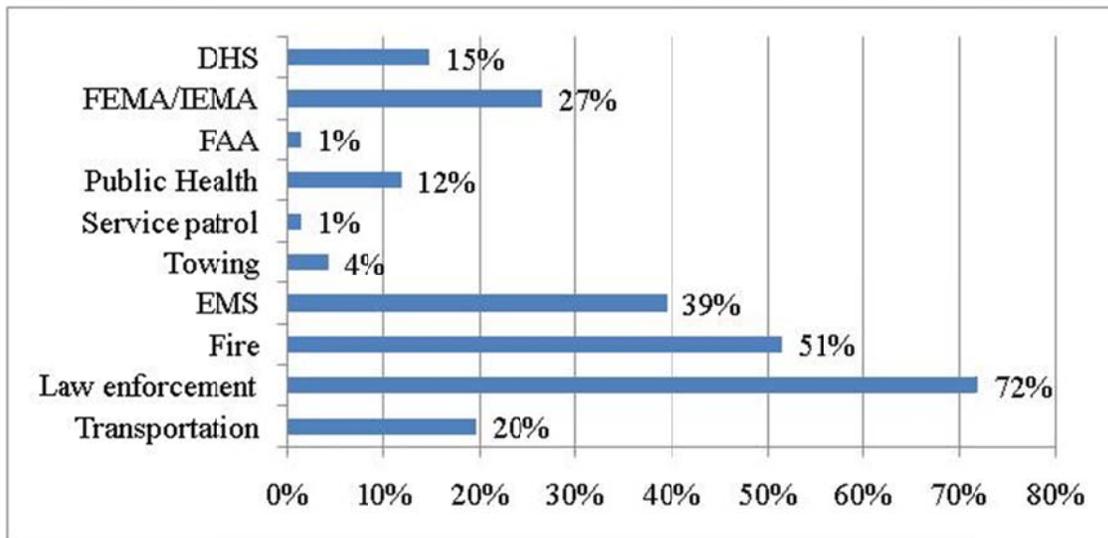
Figure 4. Details of which agencies collaboratively train with at least one other agency.

Figure 5 shows who the transportation agencies trained with when they trained with other agencies (20% of all transportation respondents). The data indicates that when transportation personnel attend multi-agency training, they are most likely to train with law enforcement, fire department, and emergency management personnel.
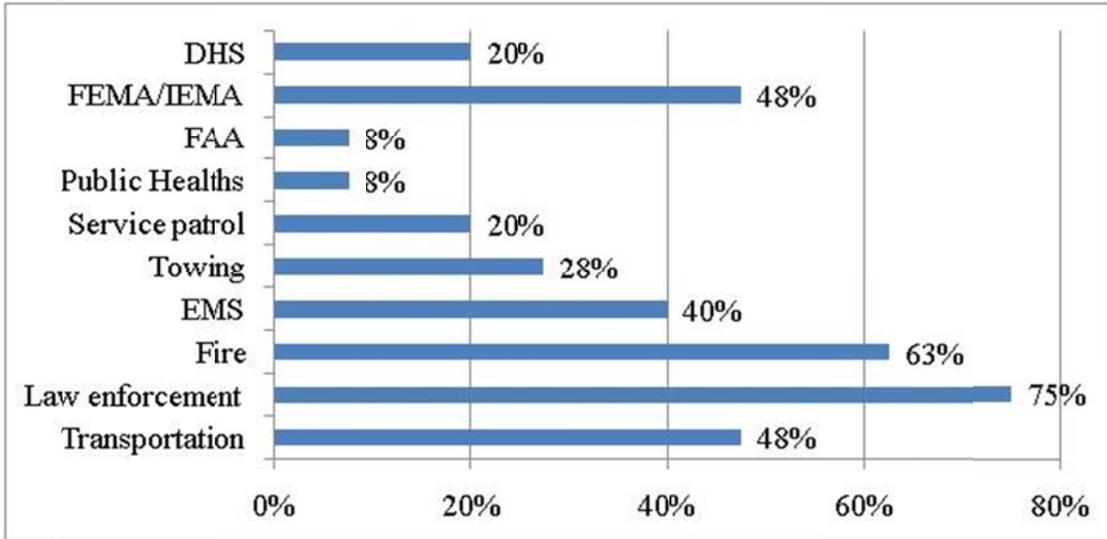
Figure 5. Training collaboration of transportation agencies.

For the training exercises surveyed, the top three situations were traffic incidents, natural disasters, and terrorist attacks. Figure 6 displays the distribution of responses by agencies. There was a clear correlation between the training taken by fire and law enforcement. Transportation agencies had a significant emphasis on traffic incident training. All agencies reported a similar amount of training (78-89 percent) for traffic incidents, with varied amounts for other types of training.
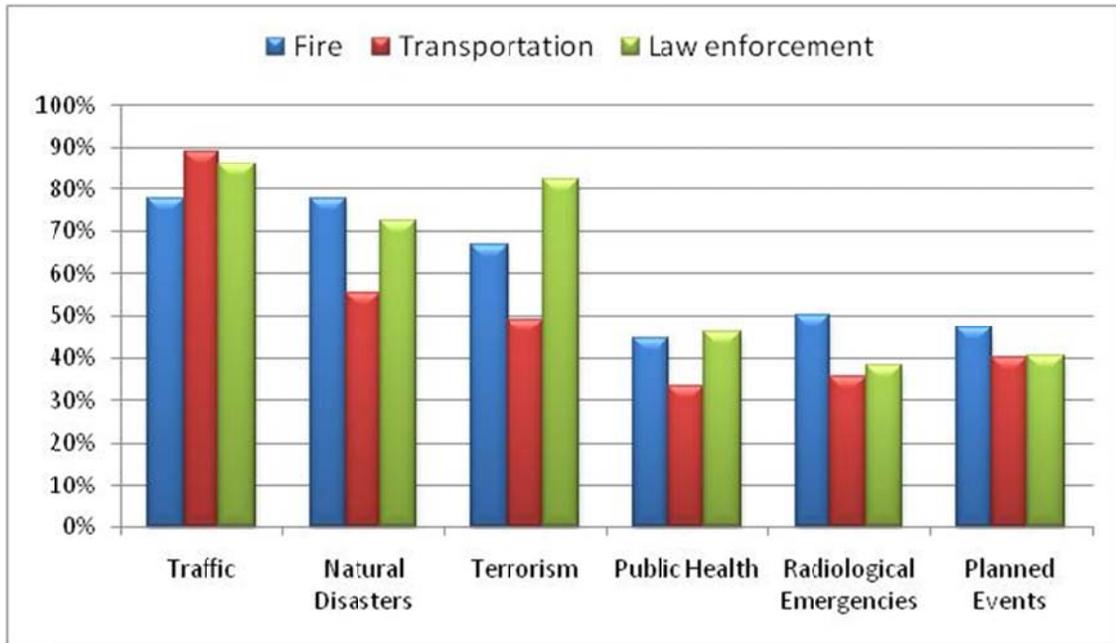
Figure 6. Types of incidents for which responders trained.

The next question sought to identify the types of resources used during training and the frequency they were used. The survey included the following training guides and standards: IDOT Emergency Operations Manual (IDOT EOM), the National Incident

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Management System (NIMS)/Incident Command System (ICS), a local/jurisdictional Service Patrol Handbook, the Manual on Uniform Traffic Control Devices (MUTCD), the Emergency Response Guidebook (ERG), the National Fire Protection Association (NFPA) standards, and/or a local/jurisdictional traffic control manual. The associated abbreviations and acronyms are used to simplify Figure 7.
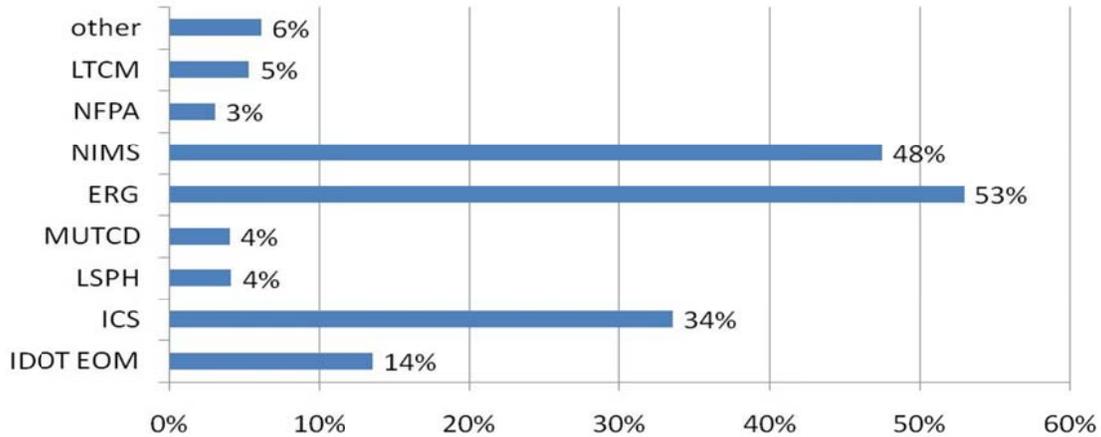
Figure 7. Training resources used.

Figure 7 illustrates that NIMS/ICS and the ERG were used significantly more than the other resources for training. This emphasis was influenced by the large number of law enforcement survey respondees who indicated they used these manuals extensively.

After identifying the primary characteristics of current state and regional highway incident management training, the survey focus shifted towards measuring which training topics incident managers and responders thought were essential for their training. Based on literature and feedback from the TRP members, the researchers assembled a list of 13 key topics. These topics were arranged by their question number on the survey, as displayed in Figure 8, including:

1. Crash history
2. Legal/liability issues
3. Incident response policies/procedures
4. Preview of incident command system
5. Basic maintenance of traffic (MOT) concepts
6. MOT through traffic incident management area
7. Communication, coordination, and cooperation (3C's) among responders
8. Safe responder vehicle parking
9. Hazardous material clearance procedures
10. Case study examples
11. Tabletop exercises
12. Policies and procedures for communication with traffic management centers
13. Application of intelligent transportation systems (ITS) for incident management

Survey respondents were asked to rate each of the topics from 1 to 5, where 5 indicated the most important topic to be included in training and 1 indicated the topic was irrelevant and not needed in training. Figure 8 displays the feedback received from the survey, where the question number corresponds to the above list of key topics. For example, Q1 corresponds to including crash history statistics into incident management training.
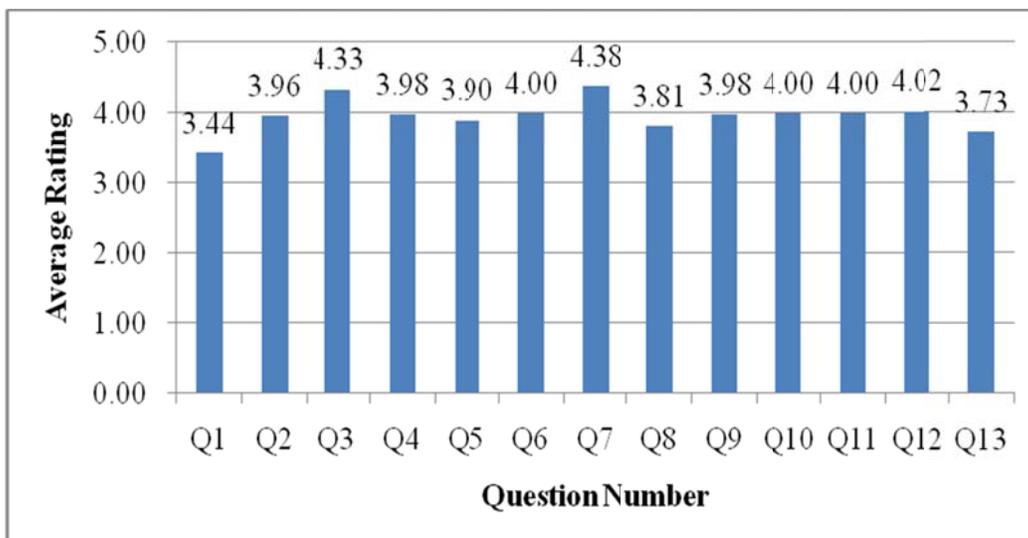
Figure 8. Importance of training topics.

The key findings from this question suggested that crash history and application of ITS had the lowest rating, but that incident response policies and procedures and 3C's among responders had the highest rating. Traffic management, communication with TMCs, tabletop exercises and a review of case examples were also useful topics to supplement the current training by individual agencies.

The end of the survey provided a space for open-ended comments and asked respondents if there were topics that should have been included in their existing training that were not. Almost 50 respondents indicated their desire for more training on the communication and coordination protocol between different agencies. Other common comments were that their training already included enough material (approximately 45 respondents), that more crisis management and emergency response training would be helpful (approximately 35), more information on traffic control, management, and safe parking could help them (approximately 30), and that training should include more examples and exercises of different types of incidents (approximately 15).

1.4 CONCLUSIONS

The interviews and survey results showed an urgent need for multi-agency training materials in the state of Illinois. Findings suggested that 50 percent of responders do not train for incident management with any other agencies, yet they are all trained for highway traffic incident management. Only 3 percent of survey respondents had training with at least five other agencies collaboratively. The lack of multi-agency training material was the key reason for the low percentage of multi-agency training sessions.

Thirteen potential topics were identified by reviewing previous training programs and a significant body of literature. The statewide survey of incident responders and managers in the state of Illinois and the greater Midwest helped refine this list further. The most important topics to include in a multi-agency highway incident management training course were: incident response policies and procedures, 3C's among responders, traffic management, tabletop exercises, and case examples. Respondents and previous research consistently reported that these common topics are important for

providing proper foundation for efficient on-scene collaboration among the different agencies that commonly work together on traffic incident response and management.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

Successful traffic incident management requires effective planning and consistent traffic management to ensure the safety of all incident responders and the mobility of the traveling public through incident locations. It is vital for all incident responders to have full communication, coordination, and cooperation during a traffic incident. All traffic incident responders, regardless of discipline, need to be properly trained on incident management in order to accomplish their tasks safely and efficiently in and near moving traffic. A highway incident management operational and training guide for multiple agencies will strengthen training efforts concerning the management of highway incidents. This chapter summarizes the results of a review of the existing training materials and courses for highway incident management covered at federal and state levels. The existing and future training needs will be assessed based on the literature review results of the different incident response agencies, including state DOTs, police departments, fire and emergency services, towing companies, and other agencies involved in incident response.

A significant body of knowledge has been built on the topic of incident management, particularly on urban interstate freeways. Researchers at SIUE developed an information DVD to include over 365 reports, training materials, and publications at national and state levels. The following sections present a brief review summary of the current training information and practice at the national and state levels.

2.2 NATIONAL LEVEL REVIEWS

At the national level, there are several agencies involved in the development and research of highway incident management. These agencies are U.S. DOT, National Traffic Incident Management Coalition (NTIMC), Federal Emergency Management Agency (FEMA), American Traffic Safety Services Association (ATSSA), National Fire Protection Association (NFPA), and the Towing and Recovery Association of America (TRAA). Highway incident management procedures and policies developed by these agencies focus on different aspects of incident management. The following subsection is an overview of some incident management training courses.

2.2.1 U.S. Department of Transportation

The U.S. DOT developed the Intelligent Transportation System Operations Resource Guide (Row 2007), which included transportation management centers (TMCs), security, the Manual on Uniform Traffic Control Devices (FHWA, 2009), traffic incident management (TIM), and training websites. The U.S. DOT developed the Service Patrol Handbook (FHWA 2008), giving a valuable training guide for service patrols to communicate to TMCs and convey important information to other responders. Training for service patrols includes the following topics: TIM, Full-Function Service Patrols, safety, radio, defensive driving, first aid, CPR, fire extinguishers, HAZMAT, MUTCD, and incident command systems (Service Patrol Handbook 2008).

The Federal Highway Administration (FHWA) offers a handbook on Freeway Management (Neudorf, 2003) that focuses on freeway management, operations, and technology applications. The document states that the concepts most important to freeway incident management are freeway management programs, traffic incident

management, freeway management during emergencies and evacuations, TMCs, and communications.

In 2005, representatives from the FHWA, State DOTs, fire, police, medical, trucking, and research communities traveled to Europe to learn from their incident response procedures. They found that worker safety, traffic safety, assistance to victims, maintaining flow, and salvaging cargo/vehicle were focus points of European traffic incident management programs. Training was consistent for all incident responders and regularly coordinated training was required for certification and accreditation. Safe practices were coordinated with incident command centers, communications, and technology. In Netherlands, they found that training consisted of virtual reality programs to provide realistic scenarios (FHWA 2005).

In 2006, the FHWA developed a simplified guide to the Incident Command System (ICS). This guide focused on ICS management characteristics, structure, unified command, preparedness through advanced planning and coordination, and implementation of the ICS (FHWA 2006).

The FHWA and U.S. DOT recently conducted a study on performance measures of incident management programs used by eleven states. This study focused on three performance measures: reducing roadway clearance times, incident clearance time, and reducing the number of secondary incidents. These reductions were achieved through coordinated traffic incident management, performance measurements, and integrated traffic incident management programs (Owens, 2009).

A current national research effort is underway to synthesize all of these sources and to establish the foundation for certifying the capability of responders to achieve the National Unified Goal (NUG) for traffic incident management. The project is titled, "Training and Certification of Traffic Incident Responders" and is funded through the Strategic Highway Research Program 2 (SHRP II Program 2010). Findings from this program have been used to steer the progress of this research project.

2.2.2 National Traffic Incident Management Coalition

The National Traffic Incident Management Coalition (NTIMC) developed the National Unified Goal (NUG) (NTIMC, 2007), which focuses on three areas: improved responder safety, safe and quick clearance, and prompt reliable interoperable communications. The NTIMC is focused on the development of multidisciplinary, multijurisdictional traffic incident management. Under the NUG, 18 strategies are identified. The first six include cross cutting strategies, strategies 7 through 9 are aimed at responder safety objectives, strategies 10 through 12 focus on safe, quick clearance, and the final six strategies focus on prompt, reliable incident communication. The strategies include 1) TIM partnerships and programs, 2) multidisciplinary NIMS and TIM training, 3) goals for performance and progress, 4) TIM technology, 5) effective TIM policies, 6) awareness and education partnerships, 7) recommended practices for responders safety, 8) move over/slow down laws, 9) driver training and awareness, 10) multidisciplinary TIM procedures, 11) response and clearance time goals, 12) availability, 13) multidisciplinary communications practices and procedures, 14) prompt, reliable responder notification, 15) interoperable voices and data networks, 16) broadband emergency communications systems, 17) prompt reliable traveler information systems, and 18) partnerships with news media and information providers (NTIMC, 2007)

2.2.3 Federal Emergency Management Agency (FEMA)

Federal Emergency Management Agency (FEMA) and the U.S. Department of Homeland Security (DHS) developed the National Incident Management System (NIMS) (Chertoff, 2008). NIMS was developed as part of the National Framework for incident management and was aimed toward emergency management, incident response, and communication between responders. Although NIMS does not specifically focus on highway incidents, it provides a set of preparedness concepts and principle rules for hazards at the incident scene with the goal of coordinating a multi-jurisdictional response. Because many incident responders, in particular law enforcement and fire/rescue professionals are already trained for NIMS, it is important for other incident responders to be familiar with this operational framework. Currently, FEMA uses the web-based training program for all levels of ICS training.

2.2.4 American Traffic Safety Services Association (ATSSA)

ATSSA has published multiple handbooks for traffic incident management for various types of responders. The training is intended for state DOTs, fire and rescue, law enforcement, EMS, towing and recovery, and HAZMAT contractors. There is one training course on incident traffic control for responders (ATSSA 2008), one handbook that covers flagging operations exclusively (ATSSA 2007), and one field guide for emergency traffic control (ATSSA 2005). Topics covered included in these handbooks are: incident management, traffic control, MUTCD chapter 6, and incident traffic control.

2.2.5 Towing and Recovery Association of America

The Towing and Recovery Association of America (TRAA) offers video training on an informational CD. The TRAA addresses communication, coordination, and cooperation among different agencies including: DOT's, law enforcement, EMS, towing and recovery, media, and fire departments. The TRAA also addresses quick clearance, traffic moving strategies, secondary incident reductions, and vehicle identification (America 2006). The *WreckMaster* training CD provides information to towing and recovery drivers. The use of a tool kit containing rigging is discussed and then several recovery methods are shown in detail. Towing and recovery are the only responder communities addressed in this training CD. The *WreckMaster* training program also offers a certificate for towing and recovery personnel that have completed their training courses (Cruse 2010).

2.2.6 I-95 Coalition

The I-95 Corridor Coalition supports the National Unified Goal (NUG) by implementing quick clearance procedures. The focus is to clear incidents quickly and prevent secondary incidents through the use of the quick clearance toolkit (see below) and "Move It" laws. "Move It" laws require motorists to remove their crashed vehicles from travel lanes if no one is injured and their vehicles are operational. Although similar in name, "Move Over" laws require motorists approaching an incident scene with responders to slow down or change lanes away from the incident. Thus, "Move It" laws and "Move Over" laws can be used together to reduce the clearance time of minor crashes and increase responder safety during all incident responses. In addition to supporting legislation, the I-95 Corridor Coalition also holds quick clearance workshops available to multidisciplinary responders in the 15 Coalition States. A quick clearance toolkit is available online at www.i95coalition.org, and addresses interdisciplinary and interagency responsibilities in quick clearance procedures. The online toolkit addresses

best practices for statutory, regulatory policy, administrative, and operations. Training for up to 500 responders at a time was available via computer gaming simulation technology (NTIMC, 2009).

The I-95 Corridor Coalition recently developed software to train Incident Management Center personnel. The computer-based training was combined with classroom training. The Traffic Incident Management Handbook, service patrols, and multi-jurisdiction events were the focus of the training (Venkatanarayana, 2007).

2.3 STATE LEVEL REVIEWS

Most state agencies have different training programs, each containing their own Standard Operating Procedure (SOP) and laws. Some state agencies include similar training topics presented in similar ways. The training materials in 15 lead states were reviewed, including California, Colorado, Florida, Georgia, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Missouri, Tennessee, Texas, Utah, Virginia, and Wisconsin. The review findings are summarized below.

2.3.1 California

The present California Highway Patrol Academy is one of the most modern and complete law enforcement training academies in the United States. It provides many specialized training courses. Local fire departments, such as Rialto Fire Department, also provide training for safe parking at incident scenes. The fire department training often covers advanced warnings, blocking the incident scene, buffer zones, and transition zone use. Personal safety of responders, apparatus and emergency vehicle positioning, the use of incident command at the scene, and an officer's safe parking checklist are covered in this lesson plan (Rialto 2005).

Traffic management center (TMC) simulation is being used for operations training also in California. The use of micro-simulation is a good tool to prepare operators for real life action without the risk of life (Chu, 2007).

The Mineta Transportation Institute in San Jose, CA recently performed a study on emergency management for state level agencies. The study was performed to provide advice on techniques for incident management, incident command centers, incident planning, and emergency operations centers for local agencies (Edwards, 2010).

2.3.2 Colorado

The Colorado Department of Transportation offers a guideline for traffic incident management plans in work zones. This guideline clearly defines goals, best practices, and an overview of existing traffic incident management programs in the state of Colorado. Topics covered in the manual include planning, multi-disciplinary approaches, response agency roles, communication between agencies, incident level identification, clearance laws, and effective scene management. The types of training include video, classroom, and briefings. Each responder is provided with a copy of the response manual to ensure they understand their roles at the incident scene (Pat Noyes and Associates, 2003).

2.3.3 Florida

Florida has implemented a new training program for all incident responders. Responders can be trained simultaneously with coverage of an emergency response

guide (ERG), levels of responder training, hazardous identification, emergency actions plan (EAP), and terrorist attacks. The training consists of classroom activities and video (USDOT, 2010). FDOT has recently sponsored a research project to develop a Maintenance of Traffic (MOT) Training for all incident responders (Lin and Zhou, 2009). This training material includes eight different modules and mainly focuses on the MOT near the incident area. And it has been used for Florida service patrol training (Road Ranger) program. Recently, this training material has been implemented in a web-based format by showing the slides with the audio instruction.

The Florida Division of Emergency Management uses a training manual to test students on their awareness level of hazardous materials training program. The manual offers note taking space and activities for emergency response. Students use the manual to answer questions taken from the DVD training, such as hazardous identification (Florida Division of Emergency Management, 2010).

The North Florida Transportation Planning Organization (TPO) uses video training to keep the incident responders up to date. The TPO offers five training modules that can be watched by responders as a part of their training. The five modules cover responder roles, safety, quick clearance, parking at incident scenes, unified command, keeping eyes on traffic, and using the Incident Management Handbook (North Florida TPO, 2010).

A tool box for incident responders to use when managing transit incidents has been developed for the FDOT by the National Center for Transit Research at the University of South Florida. This tool box included a training video on how to perform the investigation, system safety program plans (SSPP), incident notification forms, agency to agency communication information, and the use of an incident review board (Sapper, 2007).

2.3.4 Georgia

Georgia DOT has a training program for their Highway Incident Response Operators, named HEROs, that provides practical training to response personnel. The training consists of several modules. Topics include: TMC communication, establishment of command at the scene, HAZMAT, traffic management at the scene, CPR, basic auto repair, and towing and recovery. Incidents were classified using levels from one to four, with level one being the least severe (Bledsoe, 2007).

Georgia has launched a new campaign on incident management. The Metro Atlanta Task Force named the program Traffic Incident Management Enhancement (TIME). The program was developed to assist with the Atlanta congestion problems accounting for 75 percent of Georgia's daily congestion. Goals of TIME include: increased public awareness, common training for incident responders, and 3C's between regional agencies. The agencies included in the TIME are transportation agencies, fire, rescue, police, towing and recovery, emergency medical services, HAZMAT, media, and other concerned entities (Millsaps, 2006).

2.3.5 Illinois

Several different training programs are being implemented in Illinois. IDOT Bureau of Operations Maintenance Policy Manual discusses, among other things, incident management communication section (chapter 10). The use of two-way radios is permitted for communicating with other governmental agencies for support operations. The particular channels are preapproved by the Central Bureau of Operations (IDOT 2001).

The Illinois Tollway Authority has a well-defined incident management training program. The program consists of PowerPoint slides combined with video clips. The training focuses on Incident Management including improved safety, reduced traffic congestion, and reduced emissions with enhanced environmental conditions. The Illinois Tollway training gives specific information on how their agency is notified of incidents, how they confirm/verify incident locations, and how they communicate throughout the response process. The notification of an incident is done by cell phones, internal reports, television and radio media, dialing #999, traffic incident management systems (TIMS), closed-circuit television (CCTV) cameras, and computer aided dispatch (CAD). Verification plays a key role in incident response and is done by ISP, Tollway maintenance department, Tollway employees, CCTV cameras, traffic monitoring sensors, and/or remote traffic monitoring sensors (RTMS). Communication with the public is achieved through dynamic message signs (DMS), portable changeable message signs (PCMS), LMIGA website (www.travelmidwest.com), email alerts, television and radio media, and by cross-agency communication between the Tollway and abutting highway operators. Response is implemented by 11 maintenance locations offering 24-hour, 7-day-per-week coverage. Arrow board response units are used to direct traffic out of the closed lanes, and fire/ambulance services are pre-contracted to facilitate response times. Incident site management is done by establishing traffic flow quickly, protecting responders, and establishing a safe work space. The training stresses the importance of communication with IREACH radio, coordination with unified command center, and cooperation by using a team approach to promote effective incident clearance. The Illinois Tollway also uses Highway Emergency Lane Patrol (H.E.L.P.), a freeway service patrol, to assist in incident management and reduce congestion of the Tollways (Musser, 2007).

IDOT has a training material on incident management in PowerPoint format for in-house training. The training includes MUTCD chapter 6i, road closure authority, IDOT assistance and communication center, legislation, and legal question/answers. The MUTCD section on temporary traffic control covers the definition of incident levels, use of signage, emergency lighting to set up temporary traffic control zones (TTC), use of communication centers, Scott's Law ("Move Over" law), and the use of highly visible apparel at the scene. Road closure authority chain-of-command is also listed in the training, stating that IDOT has the final say, followed by Illinois State Police (ISP), but the ISP can close the road if deemed necessary. The ISP must immediately inform IDOT about the road closure (Royster, 2009).

The training used by ISP/Fire covers responder safety, problems at incident scenes, secondary incidents, reduction of congestion and delay, MUTCD, preplanning, coordination, best practices, and worker visibility. The training is intended for fire, EMS, police departments, towing and recovery, departments of transportation, and the media (Sprauge, 2008).

2.3.6 Indiana

The Indiana Department of Transportation (INDOT) has a manual on emergency response. The topics include: TMCs, safety, communications, traffic control at the scene, motorist assistance programs, and emergency operation procedures including HAZMAT (Wise, 2006). Indiana has implemented an effort to address incident management, with key topics of quick clearance and multidisciplinary approaches. The training is offered in PowerPoint format, and addresses multi-agency involvement, multi-agency training, open roads philosophy, safety, secondary incident reduction, and unified incident command. The INdiana Traffic Incident Management Effort, named IN-TIME, has a

monthly meeting and one member from each agency must be present to relay information to other members of their agency (www.indianatime.org 2009).

2.3.7 Kentucky

The Kentucky Transportation Cabinet offers training on highway crash site management. The training covers: agency coordination, clearance procedures, traffic incident management, highway crash site checklist, unified command, MUTCD chapter 6i, traffic control, quick clearance laws, and case studies. The training also offers a breakdown of duties per agency (University of Kentucky, 2001). The Kentucky Transportation Cabinet developed a PowerPoint format training material to train traffic incident responders. The training covers: incident management, types of incidents, delay, quick clearance laws, MUTCD chapter 6i, stopping distances, safety gear, traffic control devices, traffic control zones, and class examples of different scenes (Center 2006).

2.3.8 Maryland

The Maryland State Highway Administration approaches traffic control in work zones in a different manner. Each agency is only trained for their specific task, with no overlap in training. They clearly define each agency's role in traffic control zones. The focus in Maryland is on worker safety with additional attention given to the minimization of delay's, and crash reductions (Maryland State Highway Administration, 2006).

2.3.9 Massachusetts

The Incident Management Task Force of the Massachusetts Highway Department has developed a unified response manual for incident responders. Topics covered in this manual include: quick clearance, incident commander, unified command, response procedures, and responsibilities by agency. Agencies included in the training manual are: state police, incident command centers, fire departments, EMS, transportation agencies (DOT's), towing and recovery, media, and freeway service patrol (Incident Management Task Force, 2006).

2.3.10 Missouri

The Missouri Department of Transportation (MoDOT) classifies incidents in five categories with five being the worst type and one being minor incidents. Leadership is seen as key and is done by using an incident command system. The NIMS model is followed by the motorist assistance freeway service patrols (Hillis 2009).

MoDOT TIM training program focused on traffic crash investigation and traffic incident management study. The training is offered in PowerPoint format and focuses towards several of the objectives stated in the TIM National Unified Goals. TIM program elements include: strategic plans, inter agency cooperation, response plans, scene management, MUTCD compliance, motorist assist patrols, reconstruction, traffic management teams, and traffic control (MODOT, 2009).

2.3.11 Tennessee

The Tennessee DOT highway Incident management training includes ITS, effective barriers, detection and verification, response, site management, clearance, and traffic operations center. Special equipment training is also used, including effective lighting and push bumper use. Traffic management at incident scenes is covered, following MUTCD standards. Other topics include interagency support, first responder

training, and radio operation training. The team training is in video form and the rest of the training is in classroom form (TDOT, 2006).

2.3.12 Texas

The North Texas Council of Governments (CoG) offers 16 hours of training on Freeway Incident Management. The training is offered to fire departments, EMS, law enforcement, towing and recovery, and crash scene investigators. The training is a combination of classroom presentations and hands-on demonstrations. The hands-on training includes using schematics of roadways and placing toy cars on the schematic representing vehicles at the scene. With this training, incident responders learn how to position their vehicles at incident scenes with different roadway configurations (Moore 2007). The CoG also stresses the National Unified Goal. The three main objectives of the NUG are addressed. The training is offered in fifteen lessons in PowerPoint form in a classroom environment, and some video clips are included in the training to enhance learning (North Central Texas CoG, 2009).

2.3.13 Utah

The Utah DOT uses a different approach to traffic management. They send their operators to the Utah Traffic Lab for training prior to beginning work. The topics covered are: incident management, communication with other agencies, understanding transportation networks, freeway management handbook, intelligent transportation systems (ITS), travel trends, traveler information systems, and video control systems (Shepherd, 2009).

2.3.14 Virginia

The State of Virginia provides specific training to fire and rescue departments. This training covers operating procedures for highway incident management. The standard operation procedures cover: safe practices, response, communications, scene assessment, apparatus positioning, parking at the scene, effects of visibility at night, clearance, and incident scene management through multi-agencies (Northern Virginia Fire and Rescue Departments 2003). The Virginia Department of Transportation (VDOT) also uses a statewide Incident management manual for fire and rescue, police, VDOT, and towing. The training contains PowerPoint, video, and classroom exercises. The training focuses on traffic incident management; 4C's: command, communication, cooperation, and coordination; unified command; and the MUTCD (Fox, 2007).

2.3.15 Wisconsin

Wisconsin's TIM and Emergency Responders manual serve as a guideline for emergency response personnel in Wisconsin. It gives detailed steps on incident management through the use of an incident command system. Prevention of secondary crashes and safe clearance are also stressed. The first incident response vehicle arriving at the scene should provide a block. This can be done by parking at a 20-45 degree angle or straight on. All other vehicles should be on the same side of the road and only required vehicles should be in the Traffic Incident Management Area (TIMA). Personal vehicles are discouraged and if used should be parked downstream of the incident. The first responder should also size up the scene and report to the incident commander. The MUTCD should be followed to control traffic in the TIMA. Workers on the scene should follow FHWA rule 23 for wearing highly visible safety apparel. Alternate routes should be used when possible or if the road will be closed for an extended period

of time. Post-incident debriefings should be used to further enhance quick clearance and improve the safety of TIMAs (Wisconsin DOT, 2008).

2.4 CONCLUSIONS

The purpose of this review was to identify common topics and methods for training incident responders. Incident management trainers throughout the country have amassed a significant body of knowledge. Because of the dangers that highway incident responders face, there are both national and state-led efforts to formalize the training that incident responders receive. Thus, there are many examples of which topics to include into training programs of varying length. Unfortunately, programs are usually unique to the operational and institutional organization in each state.

Most agencies have their own training topics. Some leading agencies, I-95 corridor and FDOT, seem to be implementing the use of technology through computer gaming and online training, while other agencies only use classroom training. Online training has some advantages over traditional training methods. Responders can train at different times, but still receive the same training as other agencies. Online training prevents the need for training coordination between agencies, or different shifts. Online or video training can also be implemented at any time with little coordination effort between agencies. Most training programs do still include some hands-on procedures or classroom training; this can be replaced with online 3-D virtual training for incident command center personnel and incident responders. Simulations of incident scenes can be used with online training to practice safe parking, incident scene management, quick clearance, the 3C's, and multi disciplinary approaches to incident management. The use of online training could be used to get all responders to the same level before classroom coordinated training programs. This type of prerequisite training would allow all agencies to be familiar with key terms and practices, while limiting the classroom training time.

CHAPTER 3 DEVELOPMENT OF TRAINING MATERIAL

The training material was developed through identifying best practices, standards, and common training materials used nationwide. A technical review panel (TRP) was formed, consisting of members from each response agency. The purpose of the TRP was to give feedback throughout the development of the training, and ensure each agency would benefit from the final result. The TRP gave comments at meetings held quarterly, and the team made adjustments to the materials as needed. The TRP's goal was to obtain a training that could be implemented across the State of Illinois, was agreeable to all incident response agencies, and had a focus on the safety of responders and reduction of secondary incidents. The TRP members provided valuable and constructive suggestions on the development of training material,

A review of best practices defined by agencies across the nation was conducted. Through this review several topics were selected that have a great impact on responder safety and will decrease secondary crashes. The research team also conducted interviews of different agencies across the nation including Fire/EMS, State Police, Transportation, Towing and Recovery and other response agencies. The information obtained in the interview process identified the needs and current practices used by each agency. Surveys were also sent out to agencies in Illinois. The survey was intended to determine the level of response training each agency has and identify the important topics included in their existing training guides.

After reviewing the needs assessment and survey results, it was clear that most agencies do not train with others in Illinois. This lack of coordination causes problems when trying to work as a group at incident scenes. The number of incident responders involved in crashes in Illinois over a three-year period was also examined. That data showed that responders were involved in nearly fourteen-thousand incidents and had 23 fatalities over the three year period. The cause of the high number of crashes was determined to be a combination of several factors; the most common factor was the lack of advanced warning to motorists. Other factors included: blocking too many lanes of traffic, not wearing a safety vest, not keeping eyes on traffic, and a lack of proper training.

Based on the survey results, literature review and input from the TRP members, the final training program contains eight modules and is intended to be taught in a classroom environment in 6.5 hours with instructors from different sectors. The participants should also consist of personnel from all incident response agencies.

Module 1 consists of 19 slides, which provide responders with the training significance, an overview of the content, and initiates instructor and participant interaction. Detailed examples of secondary incidents are covered and the video "your vest won't stop this bullet" is used to get the attention of the audience. This module takes about 45 minutes to complete.

A best practice at the federal level, disclosing the roles and responsibilities of all response agencies, was determined to have benefit for the HIMT program. This new information benefits other agencies by allowing them to understand what each agency does at the scene. Policies on highway lane closure laws and procedures were also included in the training to enhance responders' understanding of existing policies effecting incident response. Module 2 contains 30 slides and takes about 45 minutes to complete. The focus is on the responders' roles, laws, guidelines, standards and procedures related to TIM. A video of the "Move Over" law was used to enhance the understanding.

The 3C's concept (communication, coordination, and cooperation) was found to be used in most of the leading agencies training materials, and was therefore included in the training plan produced by this project. Another important topic from the federal level was the unified command system and was determined to be beneficial to responders during multi-jurisdictional responses. Module 3 consists of 15 slides and is intended to provide responders with an understanding of the importance of the "Three C's" between agencies. This knowledge is then applied to a unified command example. The "Hats" video is used to strengthen the concepts of the 3C's. Module 3 takes about 45 minutes to complete.

From best practices at the National level it was determined that responders should follow eight steps when arriving at an incident scene. These eight steps are included in the training and are intended to be implemented by the first arriving unit. Module 4 provides responders the information necessary to improve the initial scene response process with a focus on responder safety. It takes 45 minutes to cover the 33 slides. To further promote the safe flow of traffic "move it" and "work it" scenes are discussed.

From the survey results the team found agencies commonly have differing methods for incident classification. This difference causes problems at the scene between responders. After reviewing current responder methods in Illinois and national methods the research team and the TRP decided to include both the MUTCD and the Lake Michigan Interstate Gateway Alliance (LMIGA) classification methods. Module 5 provides responders with necessary information to perform the two common incident classification methods in Illinois: MUTCD and LMIGA methods. The 34-slide module ends with many detailed examples. It takes about 30 minutes to complete.

Another focus of the training was to make all responders aware of highway terminologies, such as lane numbering methods. Properly using highway terminology will reduce confusion between agencies and improve responder safety. Personal safety was also found in most training or best practices. Safety vest requirements and stopping sight distances were covered to make responders aware of the dangers they face by not warning motorists properly. Safe vehicle placement was also found to be included in training at national and regional levels. Proper placement of vehicles will protect responders while helping to keep traffic flowing safely. At the national level it was found that the MUTCD must be followed by responders when altering the flow of traffic on roadways. Module 6 includes 52 slides and takes 75 minutes to complete. The purpose of this module is to describe highway terminology and safe principals that will aid responders in setting up proper traffic control zones. Traffic control devices and their proper use from the MUTCD are covered in this module. Four videos are used to show the sight difference between using a safety vest at an incident scene after dark, how emergency lights can distract drivers and cause secondary incidents, and a real-world example of congestion due to an incident on freeway.

The research team determined that a topic that few federal or state level agencies cover is towing vehicle classification. The TRAA provides agencies with vehicle classification that can be used to identify the correct towing vehicle. This information was included as part of the clearance and termination procedure presented in Module 7. This module walks responders through the clearance procedures determined from best practices across the nation. Much of the module focuses on identifying the vehicles involved so the proper towing and recovery vehicle will be summoned the first time. Agency specific tasks during the termination process are also described. The module ends with an incident scene evolution example. Module seven contains 29 slides and

takes 30 minutes to complete. Each agency's role in clearance and termination was again identified for this process.

One of the regional training approaches was found to incorporate hands-on table-top exercises. This was seen as a best practice because it gives responders an aerial view of the scene. Following several IDOT training manuals a quiz was included at the end of the training to encourage retention of the training material. Module 8 discusses the table top exercises and tests the class retention with a quiz. Table-top exercises are recommended to be conducted during the lunch break. This module can be done in 30 minutes plus some time for participants' feedback and course evaluation.

CHAPTER 4 PILOT TRAINING AND FINDINGS

The research team organized two pilot training sessions in Illinois. The first pilot training session was held at the IDOT District 8 headquarters in Collinsville, IL, on March 3, 2011. The second pilot training session was held at the Illinois Tollway headquarters in Downers Grove, IL, on April 22, 2011. The following sections discuss the feedback and course evaluations received from participants in these two pilot trainings.

4.1 PARTICIPANT BACKGROUND SURVEY

To establish the validity of agency feedback about the pilot training program, a background survey was distributed to the pilot training participants. The survey asked four questions to determine the participants' background, including:

1. What is your name and what agency are you with?

2. What is your primary role in Traffic Incident Management?

3. What kind of trainings have you had before this one? And who did you train with?

4. What's your expectation of this training?

The first question determined what agencies were participating in the pilot training. For the first pilot training, 14 background surveys were returned. The agencies present included: 3 fire department personnel, 1 towing agency member, 5 members representing transportation agencies, and 5 law enforcement members. The second pilot training had a total of 23 surveys completed. The agencies types include 4 fire department personnel, 3 members from towing and recovery, 10 members from transportation, 4 members from law enforcement, and 2 dispatchers.

The answers to the second questions showed that most participants clearly understood their roles in TIM. For the first pilot training, the fire department personnel reported their key incident management roles as safety, fire suppression, extraction, and patient care. Towing indicated their role as clearance. Transportation agency members' roles ranged from safety, incident management coordination, minimizing congestion, warning the public, and executing detours. Law enforcement roles included investigation, traffic control, and securing the scene. Similar results were obtained from the pilot training 2. Fire departments indicated fire suppression, and patient care as their primary role. Towing agency members reported recovery as their only role. Transportation agency members duties included: providing detours, traffic control, scene management, scene evaluation, communication with public, and incident clearance. Law enforcement agency members described their roles as crash reconstruction, investigation, and training of other officers. The dispatch members described their roles as communication only.

For the third question, the survey from the first pilot training concluded: (1) the fire department personnel indicated previously taking NIMS and FDIC training with law enforcement; (2) the towing representative had received Wreckmaster, TRAA, and flagger training; (3) Transportation members reported the most training, including: HAZMAT (all), work zone, traffic mitigation, ICS, NHI, safety, fist response, and ethics (cross training with law enforcement and fire was indicated); and law enforcement reported some basic traffic incident management training, and cross training with all agencies. The survey from the second pilot training indicated (1) half of the fire department personnel reported receiving training on incident management from the Illinois Tollway; (2)the towing members reported TRAA, HAZMAT, and recovery training

only; (3) transportation agencies reported the most training including: HAZMAT, NIMS, safety, unified command, communications, and flagger; (4) law enforcement reported road safety, traffic incident management, and crash investigation training; and (5)the dispatch agency members did not report any training.

Expectations for the two pilot trainings participants were similar for all agencies, including safer highway responses, forming working relationships with other agencies, improving clearance times, learning other responders' roles and duties, improving coordination and cooperation, and learning new techniques.

4.2 TRAINING EVALUATION

A course evaluation was conducted after each pilot training section to obtain inputs from the participants. The evaluations asked responders to give feedback on key areas of the training, including: overall training, module specific comments, time effectiveness of the training, suggested training length, and instructor performance. A copy of the course evaluation form is included in Appendix C.

The overall results from each pilot training event are summarized in Tables 1 and 2. Participants were asked to indicate the level of satisfaction they received from the training. The results indicate the majority of participates strongly agree with the quality and content included in the training material.

Table 1. Overall Evaluation of Training Session 1 (Collinsville)

Check only one box per question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training content increased my knowledge of the subject matter.	9	8			
The training material built on my previous knowledge of the material.	10	7			
The learning objectives of the course were clearly covered.	7	10			
The duration of the training allowed me to clearly understand the material covered.	4	12	1		
After completing the training I feel I can explain material to other responders.	10	6	1		
I would like to attend future training on this topic.	10	4	3		
The classroom environment was appropriately set.	1	6			
The training gave me a better perspective/career-awareness of my role in incident management.	7	10			
This training has identified ways that I would like to cooperate with other agencies more frequently.	10	6	1		
The training was well organized.	13	4			
A computer-based version of parts/all of this training would be useful to my agency.	12	4	1		
The content, number, and placement of video clips was appropriate (please explain if you disagree).	10	6		1	

Table 2. Overall Evaluation of Training Session 2 (Downers Grove)

Check only one box per question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training content increased my knowledge of the subject matter.	10	15	1		
The training material built on my previous knowledge of the material.	8	17	1		
The learning objectives of the course were clearly covered.	14	11	2		
The duration of the training allowed me to clearly understand the material covered.	13	10	3		
After completing the training I feel I can explain material to other responders.	10	9	5		
I would like to attend future training on this topic.	13	8	6		
The classroom environment was appropriately set.	19	13	1		
The training gave me a better perspective/career-awareness of my role in incident management.	12	10	4		
This training has identified ways that I would like to cooperate with other agencies more frequently.	13	14			
The training was well organized.	18	8			
A computer-based version of parts/all of this training would be useful to my agency.	10	11	4		1
The content, number, and placement of video clips was appropriate (please explain if you disagree).	12	12	2		

4.3 EVALUATION OF SPECIFIC COURSE MODULES

Module-specific comments were also solicited in the survey. The intent was to obtain specific recommendations about each individual module. Tables 3 and 4 show the results obtained from the two pilot training sessions, respectively. Several participants indicated they enjoyed all of the modules and no changes should be made. Overall, all agencies in attendance were accepting of the proposed training modules.

Table 3. Module-Specific Comments (Collinsville)

Highway Incident Management Training Modules 1-8
Module 1: Introduction Good training, well developed, videos are a great attention getter, should have more secondary crash examples.
Module 2: Role and Responsibilities Instructor was very knowledgeable, good training, very detailed and helpful, clearly defined roles.
Module 3: 3C's Good training, new information to some, good to involve all responders, instructor presented well.
Module 4:Initial Scene Response Good training, helps understand each job better, should discuss the placement of fire/rescue vehicles when extraction is needed.
Module 5: Incident Classification Good training, need to identify specific classifications used in local agencies, should keep it simple (KISS) use clear terminology.
Module 6: Traffic Management Good training, need more practical examples, very informative.
Module 7: Clearance/Termination Good training very informative should have more responders from the towing industry present.
Module 8: Case Studies and Table Top Exercises Good training, round table discussion was very helpful, need more feedback from instructor, and should use more specific examples with multiple scenarios.

Table 4. Module-Specific Comments (Downers Grove)

Module 1: Introduction Very Effective, setup class well, very good
Module 2: Role and Responsibilities Include acronym list, have FEMA ICS as pre course, go into more detail about rules, excellent
Module 3: 3C's Show hats at the end of module, excellent
Module 4:Initial Scene Response Good interaction with class, excellent
Module 5: Incident Classification, very good
Module 6: Traffic Management Examples of good and bad TTC zones, focus on responders only, good, too long, interesting
Module 7: Clearance/Termination Include helicopter parking, excellent
Module 8: Case Studies and Table Top Exercises Do different scenes then table top, more time on table tops, excellent, needs to be longer and include different types of incidents, very helpful, good interaction with trainers.

The training was also evaluated by participants with respect to its effective use of time. The goal was to determine any modules that would be more suitable for prerequisite online training program, which would reduce the amount of classroom training time. The results can be seen in Table 5. Modules 2 and 6 received the most recommendations for a prerequisite online training. A total of 3 participants recommended no online training.

Table 5. Effective Use of Time

	Collinsville	Downers Grove	Total
Module 1	3	7	10
Module 2	5	9	14
Module 3	6	4	10
Module 4	5	3	8
Module 5	6	4	10
Module 6	7	6	13
Module 7	6	6	12
Module 8	2	1	3
None online	2	1	3

Future time savings was also evaluated by participants to determine how much time the training would be saved by reducing the amount of information research.

Table 6 indicates the results, with most participants saving between 6 and 10 hours by attending the training.

Table 6. Time Savings Compared to Self Training

What time will this training save you in information research (i.e. reading manuals, researching protocols, etc.) Check only one box	>10 hours	6-10 hours	3-5 hours	0-2 hours
Collinsville	2	7	3	1
Downers Grove	3	7	6	5

4.4 INSTRUCTOR EVALUATIONS

The final question in the survey asked participants to rate the instructors. The results can be seen in Table 7. The majority of participates gave the instructors high ratings, with the exception of a few giving neutral.

Table 7. Instructors' Ratings (Collinsville and Downers Grove)

Check only one box per question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The instructors clearly explained the goals and objective of the training.	23	14	1		
The instructors clearly conveyed the material to the audience.	25	13			
The instructors' knowledge of the subject matter was appropriate.	28	11			
The instructor satisfactorily answered participant questions.	27	11			
The instructor satisfactorily used PowerPoint and other training aids to help participants understand the material.	23	14	1		
The provided course packet helped me understand and follow the training.	21	14	3		
The course instructors were dynamic.	21	15	2		
The agency background of the instructors was adequately diverse.	25	13			

4.5 FUTURE WORK

The training developed in this project will be released in summer 2011 for use by Illinois incident management agencies. Initial commitments indicated that approximately 14 trainings will be organized by different agencies in 2012.

A future phase of this project will develop online modules for participants to complete prior to attending the classroom training session. These online modules will be identified from the feedback listed above and guidance from a technical review panel of incident management training experts. The investigators will coordinate these efforts with current practices and state learning management software contracts.

The next phase will also likely include collaborative opportunities to encourage responders to refresh their skills frequently. Friendly and fun competition on incident management training knowledge through an online-gaming forum might provide that encouragement. Updates on this and other projects can be found via the Illinois Center for Transportation's website (http://ict.illinois.edu).

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APPENDIX A: IM MEETING FINDINGS SUMMARY

May 29, 2009: IDOT District 8 Meeting
   Present: Huaguo Zhou, Ryan Fries, Jeff Abel, Brian Sneed, Tom Moore
- Overall it was important to:
  - Emphasize on secondary crash reduction in rural areas
  - Focus on the traffic management aspects of these events
  - Include NIMS guidelines
    - Geno can assist with this
  - Table-top exercises are a good idea
  - Can include video as examples
    - Collected by Brian Sneed
  - Include a section on legal options
    - i.e. move it law
    - operational agreements around the state as examples

August 21, 2009: Field ride with IDOT district 8 ETP
   Present: Huaguo Zhou, Ryan Fries, Jiguang Zhao, Zhaofeng Tian, ETP
   operators
- Ride along with three ETP vehicles during morning peak period in the I-70, I-64, I-55 Complex east of St Louis.
- Observed ETP assist with a tire change and the removal of large debris (grease trap dumpster) from the roadway
- Discussed with drivers about day-to-day challenges of incident management

August 27, 2009: ISP District 11 Meeting
   Present: Jerry Culp: District 11 Commander, Ryan Fries, Huaguo Zhou
- Most incident management training is focused towards those managing the operations from the office
- ISP categorizes incidents by level of resources required
- Discussed differences in scope between ICS and NIMS

September 3, 2009: IDOT District 3 Meeting
   Present: Bruce Hucker: District Operations Engineer, Ryan Fries, Huaguo Zhou
- Liability is a significant issue

  - Must follow existing plans to be defendable in court

- Good to include ICS for traffic incident responders

  - At least 700, 100, and 200 levels

  - Refer to these, don't review them

- Also get a copy of the Work Site Protection Manual for operations activities and emergency callouts

  - Issue 8 is most recent

- Could present for non operations people

- His district has 160 maintenance people and 20 tech. staff

- No MOT through workzone training

- Their training has no 3Cs in training, but it is important

- Cell phones are the key communication for detection of incidents in district

- No safe parking training for local FD

  - Likely b/c they are volunteer

- District review basics for hazmats and no further

- State police are in charge of calling towing companies in district

- Key challenges to IM in rural areas

  - No 24hr staff so there is slow response time

    - Calls instead go to an answering service

  - Personnel do not always know each other

    - Sometimes familiarity and trust of other responders helps on IM scenes

  - Difficult to communicate with the public in a timely manner

    - Safetea-lu requires 20 minutes

    - No VMS or HAR in district

  - Local FD buy-in to IM training is a must

September 4, 2009: Meeting with Illinois Tollway
Traffic Operations Center
Present: Steve Musser: Incident Management Trainer; Abby Malloy: TOC Manager;
Ryan Fries; Huaguo Zhou
- Had conversation on the latest HERO program in Atlanta

- Tollway uses RTMS (sidefire radar) and IPASS travel time data together to estimate travel times

- Use automated incident detection algorithms

- Have a portable camera truck and cameras on all responder vehicles that operate through cellular technology

- IPASS data from incidents goes to website

    o GCM travel

    o Construction and DMS data too

- Discussed smartzone construction activities

    o Use counterflow to maintain capacity

- Use tower cameras (3 at 400' tall) at interchanges

    o Lower cameras along links (30-50')

- Noted that trust is key in interorganizational operations

    o Good relationships sets the ground for established dedicated lines of communication

    o They are a member of LMIGA (lake Michican gateway alliance)

- TOC operations not 24-7

    o Only during peak hours and storms and major events

    o Dispatch center takes over for the other times

- Use TIMS program

- Use Google maps cell phone probe data

- Future cameras are deployed based on need

    o Any incident that could not be assisted by a camera is noted and tabulated

Tour of Illinois Tollway Dispatch Center
    Present: Steve Musser: Incident Management Trainer; Ryan Fries; Huaguo Zhou
- They split the patrol operations between several dispatchers

- Dispatch handles both state police and maintenance/service patrol

- User fees fund all operations

- FDs are assigned to each stretch of freeway

    o Each has mutual aid agreements if they cannot respond

- Outreach helps make a great leap between individual agency training and into one integrated training

Discussion of Illinois Tollway IM Training Program
    Present: Steve Musser: Incident Management Trainer; Ryan Fries; Huaguo Zhou
- They have 11 maintenance yards and each covers the full operation of their own area including snow removal construction operations, and service patrols

- They have well-structured union contracts that all multiple tasks for maintenance drivers to be able to respond to incidents

- Have agreements with towing companies capable of removing vehicles larger than 8,000lbs

- HAZMATS

    o They have a guide for responders built into their CAD system

    o First secure scene, then notify dispatch, then gather information

- Their training guide follows MUTCD explicitly

- There is a need for building bridges between agencies

    o IREACH – statewide communications channel

Discussion of Illinois Tollway HELP Program
    Present: Steve Musser: Incident Management Trainer; Ron: HELP Driver, Ryan Fries; Huaguo Zhou, Rick: HELP Operator
- They require motorists to present a valid driver's license to perform service

- Responders have hands on training

    o Must first have 18months of experience at Tollway

- During the ride along, observed a vehicle towed by HELP vehicle

- Discussed daily challenges of incident management and personnel training needs

September 10, 2009: Meeting with Glen Carbon Fire Dept.
    Present: Carl Walton: Assistant Chief, Ryan Fries, Huaguo Zhou
- Discussed training and collaboration for a suburban FD along an interstate
- Identified little collaborative training for incidents
September 15, 2009: Meeting with MoDOT

St Louis TMC
    Present: Teresa Krenning: MoDOT TMC Manager, Ryan Fries, Huaguo Zhou
- MoDOT's in-house instructor varies

- Table top exercises are not very good for all learning styles as some participants are reluctant to participate

- There are different agency rules for responders and it is difficult to react to all agencies

  - FD rules

  - PD rules

  - Local ordinances

- Debriefings are standard within their office by not multiagency

- Follow-up calls sometimes include other agencies

Meeting with IM Coordinator
  Present: Bruce Pettus: IM Coordinator, Ryan Fries, Huaguo Zhou
- They are currently building an IM program for the I-270 corridor in MO

  - They divided up the interstate into three sections

  - Made managers in charge of each section for respective agencies

  - Matched the corridor goals with NUG

  - Recently signed a one-team agreement

  - Looking at data for each section of the road

  - Identifying tracker measures

- What MoDOT uses to measure performance for centers/Noted that they designed and built their own traffic arrows on service vehicles at approx. 20% of the cost of commercially available arrow boards.

- Mentioned that the FHWA assessment only works with an existing IM plan

  October 1, 2009: Meeting with IDOT District 1

Emergency Traffic Patrol
Present: Jim McKay, Steve Peters, Jeff Galas, Bob Duda, IDOT District 1, Ryan Fries, Huaguo Zhou
- District one ETP was currently revising their SOP which influences their in-house training
- ETP operators are still considered as highway maintainers by the state
- Coordination is site and incident-specific
- Work closely with FD for incident drills and for debriefings on larger incidents
- Coordinate the most with the state police

District 1 Comm. Center
  Present: Stephen Brink, Steve Peters IDOT District 1, Ryan Fries, Huaguo Zhou

- Offer speed contour maps to aid in identifying possible incidents
- Comm. center operator's describe their job as "hours of boredom followed by moments of terror" (Steve Peters)
- NIMS is trained in-house by Steve Peters
- Have had mock incident drills including a few agencies before
- Table top exercises are good only if they present realistic situations and focused towards specific level of incident responders
- Current training is both hands-on and bookwork
- Web-based training idea has merit

October 2, 2009: Meeting ISP District 5
      Present: Brad Sprague: ISP district 5 TIM training and crash reconstruction officers, Huaguo Zhou
- Discussed incident management training needs of ISP in an urban area
- Identified current training practices
- Made contacts for launching research survey

December 10, 2009: Meeting with Ron Moore from Dallas, Texas FD
      Present: Ron Moore: Fire department Incident Management Trainer, Huaguo Zhou
- Learned of SHRP II, finishing in May 2010
  - Will develop primary and secondary IM training competencies
  - Goal is to "Create a training program that could be used for certification of traffic incident responders"
- Currently Dallas uses a 12-hour training
  - Can be made into a one-day course
  - Noted that safe parking has been re-termed safe positioning
  - Many incident responders don't understand MOT concepts

January 11, 2010: Meeting about I-95 Corridor Coalition
      Present: Michael Pack, Huaguo Zhou
- Product available in Spring 2010
- Record and replay options available
- Good replacement of tabletop exercises
- Does not replace lecture training for common knowledge

February 12, 2010: Meeting about FDOT IM Training Program
      Present: Terry Hensley, FDOT district 7 TIM Manager, Huaguo Zhou, Pei-sung Lin, ITS program manager, University of South Florida
- The training materials developed by USF have been implemented by the district 7 and other districts.
- The field exercise was used to train the IM responders on the safe positioning vehicles.
- Cost to hire consulting firm is very high (Around $4,000 per day). Instructors from highway patrol and police department were hired to be trainer for more reasonable price.
- New video materials developed for the training.

- Web-based training material will be developed for the future training.

March 29- April 1 , 2010: SHPR 2 Pilot Train-the-Trainer workshop

       Present: Huaguo Zhou, about 50 Indiana TIM program manager and trainer, main instructor: Ron Moore

- Two-day training and certification of traffic incident responders covers many how to subjects from initial notification to final termination: notification and response, on-scene report, initial size-up, ICS, HAZMAT (ERG), patient care and investigation, traffic management(MUCTD), quick clearance, and terminations
- Hands-on activities include 5 different incident scenarios for table top exercise and safe position vehicles and placing cones on the road.
- Half day train the trainer course covers the legal guidelines and considerations, real-world scenarios, how to set-up hands-on activity, and exams.

APPENDIX B: SURVEY QUESTIONNAIRE

Highway Incident Management Training Survey   Questionnaire # _____

Highway Incident Management Training Survey for Illinois Department of Transportation (IDOT)

Southern Illinois University Edwardsville (SIUE) is conducting a survey of training practices for highway incident management in order to obtain the current state of practice and assess the needs from different responding agencies. This survey is one component of a research project funded by the IDOT to develop a comprehensive Highway Incident Management Operational and Training Guide. The survey will take between 5 and 10 minutes to complete, and is intended to gather information about your incident management training content.

Please be assured that names of individual respondents will remain confidential. If you would like to receive a copy of our survey findings, please provide your e-mail address. Thank you for contributing to this important study aimed at improving incident management training, your time and effort will help to make our highways operate safer and more efficiently.

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For each question please circle the appropriate answer(s).

1. Are you an instructor or incident response personnel?

Instructor   Emergency response personnel   manager/supervisor
other_____

2. Which incident management agency do you work for?

    a. Transportation
    b. Law enforcement
    c. Fire
    d. EMS(Emergency Medical Services)
    e. Towing
    f. Service patrol
    g. Public works
    h. Others _____

3. How frequently do you teach/are you taught the incident management training course?

    a. Typically one or more times per year
    b. Less frequently than one time per year. But at least once every five years
    c. Rarely(less than once every five years)
    d. Never(or have not done so yet)

If you have attended incident management training courses in the last five years, please complete questions 4-7; else go to question 8:

4. How many days/hours does your training take? _____ Days and _____ hours per day.

5.   Did you have any training course with cooperation with other agencies?

  Yes   No
If yes, which agencies were they?   _____

       a.   Transportation
       b.   Law enforcement
       c.   Fire
       d.   EMS(Emergency Medical Services)
       e.   Towing
       f.   Service patrol
       g.   Public health
       h.   FAA (Federal Aviation Administration)
       i.   FEMA/IEM (Federal or State Emergency Management Agency)
       j.   DHS (Department of Homeland Security)
       k.   Others _____

6.   What types of incidents were you trained for?

       a.   Traffic
       b.   Natural disasters
       c.   Terrorism
       d.   Public health
       e.   Radiological Emergencies
       f.   Planned events (i.e. concerts)
       g.   Other (please explain)_____

7.   What guide book/standard is used?
       a.   IDOT Emergency Operations Manual
       b.   Incident Command System
       c.   Local Service Patrol Handbook
       d.   MUTCD
       e.   ERG
       f.   NIMS
       g.   NFPA
       h.   Local traffic control manual
       i.   Other _____

8. Please rank the importance of including each of the following topics in an incident management training course and indicate if these topics are/were included in your training. Use the following scale of 1 to 5 (5 = definitely include, 4 = probably include, 3 = no opinion, 2 = probably do not include, 1 = definitely not include)

Crash History	1 2 3 4 5	☐
Legal/Liability Issues	1 2 3 4 5	☐
Incident Response Policies/Procedures.	1 2 3 4 5	☐
Preview of Incident Command System	1 2 3 4 5	☐
Basic Maintenance of Traffic (MOT) Concepts	1 2 3 4 5	☐
MOT through Traffic Incident Management Area.	1 2 3 4 5	☐
Communication, Coordination, and Cooperation (3C's) Among Responders	1 2 3 4 5	☐
Safe Parking	1 2 3 4 5	☐
Hazardous Material Clearance Procedure	1 2 3 4 5	☐
Case Examples	1 2 3 4 5	☐
Tabletop Exercises	1 2 3 4 5	☐
Policies and procedures for communicating with the Traffic Management Center	1 2 3 4 5	☐
Application of Intelligent Transportation System (ITS) for Incident management	1 2 3 4 5	☐
Others: _____	1 2 3 4 5	☐

9.	Approximately how many responders are in your agency_____.

10.	At your agency, over the most recent two-year period, about how many people attended incident management related training?

a. less than five
b. five to ten
c. ten to twenty
d. more than twenty

11.	What aspects of my job were learned as I went, yet should have been included in training?

_____
_____
_____
_____
_____
_____
_____

12.	When you were first trained in IM, would it have been helpful to learn more about the roles and responsibilities of other agencies?

  Yes		NO

If yes, Please discuss
_____
_____
_____
_____
_____
_____
_____

13.	Please give us any comments, suggestions, or additional information you feel will help this study.

_____
_____
_____
_____
_____

Thank you for your time and your responses. Please fill out the information below.

- Name

  _____

- Job title

  _____

- Agency

  _____

- Mailing address

  _____

  _____

  _____

- Phone number

  _____

- Facsimile number

  _____

- E-mail address

  _____

APPENDIX C: PILOT TRAINING EVALUATION FORM

<u>Highway Incident Management Training Course Evaluation Form</u>

Instructions: Please answer the following questions about the training program you just completed. Check one box for each question indicating your opinion of each statement. Space for additional comments may be provided after questions. Your responses will remain anonymous, so please provide honest feedback.

Circle Agency Type: Fire/Rescue   Police   Transportation   Towing   Other

   1. **Overall Training**

Check only one box per question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The training content increased my knowledge of the subject matter.					
The training material built on my previous knowledge of the material.					
The learning objectives of the course were clearly covered.					
The duration of the training allowed me to clearly understand the material covered.					
After completing the training I feel I can explain material to other responders.					
I would like to attend future training on this topic.					
The classroom environment was appropriately set.					
The training gave me a better perspective/career-awareness of my role in incident management.					
This training has identified ways that I would like to cooperate with other agencies more frequently.					
The training was well organized.					
A computer-based version of parts/all of this training would be useful to my agency.					
The content, number, and placement of video clips was appropriate (please explain if you disagree).					
Comments or explanations:					

2. **Module-Specific Comments:** Please list any specific concerns or recommendation for improving the training.

Highway Incident Management Training Modules 1-8
Module 1: Introduction
Module 2: Role and Responsibilities
Module 3: 3C's
Module 4:Initial Scene Response
Module 5: Incident Classification
Module 6: Traffic Management
Module 7: Clearance/Termination
Module 8: Case Studies and Table Top Exercises

3. **Time Effectiveness of Training:**

    To reduce the in-class training time to 4-6 hours, we are considering developing an on-line training module as a prerequisite for this in-class training. Please identify which topics in Modules 1-8 are suitable for on-line training and how the online module would be valuable to your agency:

4. **Future Time Savings**

Check only one box	>10 hours	6-10 hours	3-5 hours	0-2 hours
What time will this training save you in information research (i.e. reading manuals, researching protocols, etc.)				
Comments or explanations				

5. Instructors

Check only one box per question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The instructors clearly explained the goals and objective of the training.					
The instructors clearly conveyed the material to the audience.					
The instructors' knowledge of the subject matter was appropriate.					
The instructor satisfactorily answered participant questions.					
The instructor satisfactorily used PowerPoint and other training aids to help participants understand the material.					
The provided course packet helped me understand and follow the training.					
The course instructors were dynamic.					
The agency background of the instructors was adequately diverse.					
Comments or explanations					