Emergency Management Training for Transportation Agencies

MTI Report 12-70

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The Mineta Transportation Institute (MTI) was established by Congress in 1991 as part of the Intermodal Surface Transportation Equity Act (ISTEA) and was reauthorized under the Transportation Equity Act for the 21st century (TEA-21). MTI then successfully competed to be named a Tier 1 Center in 2002 and 2006 in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Most recently, MTI successfully competed in the Surface Transportation Extension Act of 2011 to be named a Tier 1 Transit-Focused University Transportation Center. The Institute is funded by Congress through the United States Department of Transportation's Office of the Assistant Secretary for Research and Technology (OST-R), University Transportation Centers Program, the California Department of Transportation (Caltrans), and by private grants and donations.

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REPORT 12-70

EMERGENCY MANAGEMENT TRAINING FOR TRANSPORTATION AGENCIES

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August 2016

A publication of
Mineta Transportation Institute
Created by Congress in 1991

College of Business
San José State University
San José, CA 95192-0219

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. CA-MNTRC-16-1280	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Emergency Management Training for Transportation Agencies		5. Report Date August 2016 6. Performing Organization Code
7. Authors Frances Edwards, MUP, PhD, CEM, Daniel Goodrich, MPA, CEM, MEP, CSS, and James Griffith, MPA		8. Performing Organization Report MTI Report 12-70
9. Performing Organization Name and Address Mineta Transportation Institute College of Business San José State University San José, CA 95192-0219		10. Work Unit No. 11. Contract or Grant No. DTRT12-G-UTC21
12. Sponsoring Agency Name and Address California Department of Transportation Division of Research, Innovation and Systems Information MS-42, PO Box 942873 Sacramento, CA 94273-0001 U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology University Transportation Centers Program 1200 New Jersey Avenue, SE Washington, DC 20590		13. Type of Report and Period Covered Final Report 14. Sponsoring Agency Code
15. Supplemental Notes		

16. Abstract

State transportation agencies have a variety of responsibilities related to emergency management. Field personnel manage events–from day-to-day emergencies to disasters–using the Incident Command System (ICS) as their organizational basis. At the headquarters level, the Emergency Operations Center (EOC) coordinates the use of resources across the department and its districts, with other state departments and agencies, and through the federal Emergency Support Function 1. District-level EOCs coordinate with the department. In extreme events, the transportation department may only be able to deliver limited essential services in austere conditions, so a continuity of operations/ continuity of government plan (COOP/COG) is essential. This research applied the principles of andragogy to deliver ICS field level training, EOC training and COOP/COG training to state transportation agency's staff in all districts and at headquarters. The data supports the need for adult-oriented methods in emergency management training.

17. Key Words	18. Distribution Statement		
Incident command system; Standardized emergency management system; Emergency support functions; Emergency management	No restrictions. This document is available to the public through The National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 63	22. Price $15.00

Form DOT F 1700.7 (8-72)

Library of Congress Catalog Card Number:
2016948775

To order this publication, please contact:

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ACKNOWLEDGMENTS

The Mineta Transportation Institute (MTI) research team has enjoyed a long relationship with the California Department of Transportation (Caltrans) as a research partner. This report is based on a two-year project to assist the Caltrans Office of Emergency Management (OEM) with the revision of the agency's Emergency Operations Plan, and to deliver training on emergency management systems to the headquarters and 12 districts that make up Caltrans. The MTI team was also working with the National Academy of Sciences (NAS) Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) to develop an Incident Command System course designed specifically for transportation field-level supervisors and workers under NCHRP 20-59 (30. This course is an adjunct to the Federal ICS-100 and ICS-200 courses, and is intended to put into operation the basic information from those courses. Caltrans OEM partnered with the MTI team and NCHRP as the pilot sites for this new training program. All 12 districts ultimately hosted offerings of this new customized ICS course, as well as staff training for the emergency operations center teams and the emergency relocation group in each district and headquarters.

The authors are grateful to Herby Lissade, our partner in a number of other research projects, for his continuing support of excellence in emergency management. Mr. Lissade's insight into the management of emergency operations for a State-level transportation agency has influenced the outcomes of this research project. We are also grateful to Ferdinand Melendes for assisting with the development of the communication display documentation, and to OEM staff members Rene Garcia, Colleen Catabran, Chris Smith, Durval Avila, and David Frame for their support of the offerings of the training programs throughout the districts.

Twelve of Caltrans' districts piloted the EOC training materials. The training officers in each district took the time to assist with the development of meaningful scenarios with the right route numbers, threats and impacts. They also made all the logistical arrangements for the delivery of the classes. We are very grateful to each of them for their professional insights and support.

The development of the ICS for Field-Level Transportation Supervisors and Personnel NCHRP 20-59 (30) would not have been possible without the encouragement and assistance of Stephan Parker of the TRB. We are also grateful to the American Association of State Highway Transportation Officials' Standing Committee on Terrorism, Security and Emergency Management (AASHTO SCOTSEM) for their support, and to NCHRP for the grant funding for course development support.

We are especially grateful to MTI for being our research home. Dr. Karen E. Philbrick, PhD, Executive Director and Research Director for MTI, provided guidance and encouragement throughout the development of the research program. Thanks to MTI staff including Executive Assistant Jill Carter and the San Jose State University Student Staff for their support.

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State transportation agencies have emergency management obligations under Federal and State laws and regulations. These entities also mandate specific emergency management strategies, including the National Incident Management System (NIMS) and the Incident Command System (ICS) for Federal compliance, and State-level systems such as the Standardized Emergency Management System (SEMS) in California. There is also a mandate to support the Federal and State continuity of operations and continuity of government (COOP/COG) activities, including the maintenance of all essential functions as defined at each level of government.

The California Department of Transportation (Caltrans) collaborated with Mineta Transportation Institute (MTI) researchers to develop an emergency planning and training program that is specific to the needs of transportation agency staff members. While the researchers had specific State-mandated planning and training elements to deliver, Caltrans also wanted the researchers to answer two questions.

a. What emergency management training do Federal and State laws and regulations mandate for State transportation agency employees who work in emergency management roles during real events? What emergency management training is recommended to support effective performance in those roles?

b. What training delivery methods are most likely to engender retention of the emergency management information in adult learners?

To ensure that the transportation agencies are able to fulfill their mandates, they must first have up-to-date emergency operations plans that comply with State emergency management systems and regulations. The transportation agency's plan was revised as part of this project. It must also have a COOP/COG plan, both for the headquarters roles and for district level implementation. A second element of this project was the awareness training and preparedness development for COOP/COG at all levels of the transportation agency.

In order to coordinate emergency response across the transportation agency, and with the Federal and State partner entities, the transportation agency maintains emergency operations centers (EOCs) at the district level, has a departmental operations center at the headquarters (DOC), and provides staff members to the State Operations Center (SOC). Staff members must be trained in the ICS/SEMS/NIMS precepts and receive operational implementation training for their specific EOC roles. The third element of this project was the delivery of this training at headquarters and in all 12 districts.

State transportation agency personnel are part of the emergency response system for events that occur on the highway. Because such events are usually multi-profession responses, staff members are required under the Homeland Security Presidential Directive-5 (HSPD-5) and the National Response Framework to use NIMS in order for their agency to receive emergency preparedness grant funds. The Federal Emergency Management Agency (FEMA) offers online independent study courses that fulfill the basic requirements of NIMS – IC 100, 200, 700 and 800 – but these courses are designed as a

general orientation for all professions. The examples in the online courses are oriented to public safety applications, so FEMA developed an ICS course specifically for public works professionals. It is focused on flooding, however, which is not the most difficult challenge for highway staff, who instead confront hazardous materials accidents, spilled loads and burning vehicles regularly as highway emergencies.

The American Association of State Highway Transportation Officials, the professional association for highway executives, recognized the need for a State transportation agency-specific ICS course. The Standing Committee on Terrorism, Security and Emergency Management (SCOTSEM) supported the development of a field-level transportation-personnel-specific ICS course, which was funded through the National Cooperative Highway Research Program as project NCHRP 20-59 (30). The contract was given to MTI researchers, who developed the course in conjunction with the members of SCOTSEM, and leaders in emergency management from the Washington State Department of Transportation, the Idaho State Department of Transportation, the Massachusetts State Department of Transportation, and Caltrans. Caltrans agreed to be the test bed for a series of pilot classes, which eventually led to pilot classes in all 12 districts. The customizing of this national ICS for transportation course was the fourth element of the research project with Caltrans.

Transportation agency field-level staff members are the first on the scene for many highway-related emergencies. There are existing protocols that guide the sharing of responsibility with the state highway patrol for highway events. There are also requirements for establishing or joining ICS, for operating safely in an emergency environment, and for ensuring that the agency is reimbursed for any work performed in response to State direction that is off the State highway system and out of the jurisdiction of the Federal Highway Administration (FHWA). The fifth element of this project was the delivery of the new NCHRP field-level course, with transportation-specific information developed in cooperation with Caltrans' OEM Staff. This course consisted of a PowerPoint-supported didactic refresher course on ICS and its transportation-specific applications, followed by an interactive discussion and class-participation exercise of ICS using the sandbox simulation method. This section used materials created by MTI researchers for field use, including an ICS forms display board and ICS Quick Start Cards packaged in a cardboard folder with an ICS Field Operations Guide (FOG) and supporting materials. The course delivery at every district plus two make-up offerings formed the last element of this research.

Class delivery was designed or redesigned using the principles of andragogy (teaching adult learners). Using research on adult knowledge retention, the researchers ensured that any didactic portions included written handout materials and supportive PowerPoint shows illustrated with relevant transportation photographs to create a three-mode learning element: hear, see and read. Classes incorporated active learning elements, such as small-group problem solving, practical application of materials, and workshops on resource development. They also included materials that students could use to teach others about elements of the class, such as home and personal preparedness and the management of events on the State highway system. If students chose to complete the class by teaching someone else some of the skills, this could lead to 90% information retention. The Learning Pyramid, Figure 4, illustrates these andragogy principles.

Survey research methods were used to collect quantitative and qualitative student responses to the offered courses to determine the value of the content and delivery methods. Surveys were delivered to every student during the final segment of each class. Not all students completed the surveys, and not all surveys that were returned were complete. However, in every class more than 50% of the students returned the surveys, and in most classes the return rate was above 75%. There were 118 student responses in the COOP/COG classes, 285 student responses in the EOC classes, and 300 student responses in the ICS classes.

The analysis established that the students in every class found the class useful for their work. As shown in Table 24, 90% of COOP/COG respondents, 88% of EOC respondents and 78% of ICS respondents rated the classes a 4 (agree) or 5 (strongly agree) when asked to rate the usefulness of the class for their Caltrans roles. As shown in Figures 9, 10 and 11, 5 (Strongly Agree) was the most frequently given response in every course.

Students were also invited to provide qualitative comments on each course, such as what was most useful, what should be added, and what should be eliminated. Responses are found in Tables 4 through 11 for aggregated COOP/COG responses, Tables 13 through 17 for aggregated EOC responses, and Tables 20 through 23 for aggregated ICS responses. The investigators researched course requirements to meet Federal and State mandates. While most transportation agencies may be meeting State and Federal minimum requirements, based on student feedback there is value in developing a regular cycle of planning, training and exercising. Such a cycle will ensure that even with employee turnover, there is an adequate supply of trained staff for each element of a transportation agencies' emergency management activities.

The second question was also answered through the course surveys. *Overall the results of the research suggest that emergency management training for adult learners benefits from the application of the principles of andragogy in course design and implementation*.

I. INTRODUCTION

The Caltrans Office of Emergency Management (OEM) retained staff from the National Transportation Safety and Security Center (NTSSC) of MTI at San Jose State University to provide planning and training services on a two-year contract.

The research questions posed to the NTSCC staff were

a. What emergency management training do Federal and State laws and regulations mandate for State transportation agency employees who work in emergency management roles during real events? What emergency management training is recommended to support effective performance in those roles?

b. What training delivery methods are most likely to engender retention of the information in adult learners?

Since emergency management training is based for the most part on roles described in the agency's emergency operations plan (EOP), the NTSSC team worked with the transportation agency's OEM staff to update their existing EOP, developing a comprehensive set of checklists to guide staff in their EOC roles.

NTSSC delivered three courses –Continuity of Operations/Continuity of Government (COOP/COG), Standardized Emergency Management System Emergency Operations Center (SEMS EOC),[1] and the new Incident Command System (ICS) for Transportation Professionals, which had been created by this same NTSSC team under a grant from the NCHRP 20-59 (30) through the TRB.[2] The SEMS EOC and COOP/COG courses were delivered at the headquarters and in all 12 districts. The ICS course was delivered in all 12 districts. Two sets of make-up classes were offered at the end of the training cycle. The project concludes with this report, which includes the compilation and analysis of the feedback for 42 class sessions.

This final report will describe the context for emergency management in an example State-level transportation agency, under ICS, SEMS and the National Incident Management System (NIMS); explain the work done by the NTSSC team; and present survey responses from the students about the classes in the 12 districts of Caltrans. The report also discusses the unique requirements of andragogy (delivering training for adults) and techniques for course deliveries expected to enhance information retention.

II. BACKGROUND

Emergencies can occur at any time in any community. They may be natural, such as hurricanes; technological, such as power outages or other events that may be based on aging infrastructure or lack of investment; or human-caused, such as car accidents and other events resulting from inattention or failure of judgement. In recent years, intentional human-caused events, like the specter of international terrorism, have been added to the list of threats that communities might face. The Department of Homeland Security (DHS) and the Federal Emergency Management Agency (FEMA) have developed a set of five frameworks to guide Local, State and Federal management of such events.[3] FEMA and the California Governor's Office of Emergency Services (OES) have developed Approved Courses of Instruction for emergency response personnel and emergency planning and management staff. There are Federal laws, regulations, and executive directives that guide the work of emergency management at the Federal level and for organizations receiving preparedness grant funding from Federal sources. There are State laws, regulations, and Governor's orders that direct the work of emergency management in the states. State transportation agencies must operate within these laws, regulations, and orders.

Emergencies, Disasters, and Catastrophes

Emergency management is the system of activities designed to manage and resolve the emergency, regardless of its cause or magnitude. Emergencies, regardless of their cause, can result in localized events that require a community public safety response and, perhaps, nonprofit organization assistance to victims. In small events such as a house fire, one family suffers a financial loss.[4] Such events happen on an unfortunately regular basis and are handled by "local standard operating procedures."[5]

A fire in a chemical plant may result in a disaster. The fire may affect a large area downwind and downhill from the plant and smaller areas within a radius around the plant. It may require evacuation of neighboring occupancies, opening of shelters managed by local nonprofit organizations, declaration of shelter-in-place for areas downwind from the event, and response by specialized teams trained in hazardous materials management. Financial losses may be borne by the chemical plant, its immediate neighbors, local businesses forced to close due to the danger from the plant, and individuals forced to shelter in place who may have missed work.[6] The local government may declare a local emergency and ask the state for assistance.[7]

A wildland interface fire that burns into an urbanized area may be a catastrophe, causing loss of life, significant property and environmental damage, and widespread disruption. Thousands of people may have to be evacuated, businesses may be closed, and areas of the urban space may be reduced to ashes and require long term recovery efforts, which further results in a loss of tax revenues to the local governments.[8] Local public safety agencies may be overwhelmed, requiring mutual aid from neighboring jurisdictions. Local nonprofits providing shelter, replacement of personal necessities, and case management services may require financial support from their national organizations. Financial losses are borne by thousands of direct victims and hundreds more whose place of work has been destroyed. Businesses are affected when their customers move away from their

destroyed neighborhoods. The local government may declare a local emergency and ask the State for assistance. The Governor may declare a state of emergency and ask the President for financial assistance, either for a state of emergency to provide specified goods or for a major disaster declaration that allows FEMA to provide a variety of financial aid and Federal resources to the damaged community.[9]

When an airplane is deliberately flown into an office tower, resulting in a fire that kills thousands and destroys the building, or when an airplane is deliberately flown into a government building killing hundreds and doing major damage to a significant command and control center, that is a catastrophe of national significance. People and businesses are evacuated for miles around the event. The event has an impact on the national and international economy, with losses to businesses and individuals. Even before local officials are able to evaluate their losses, the President can begin a Federal response in aid of the damaged community under the National Response Framework.[10]

Incident Command System (ICS)

The Incident Command System (ICS) had its beginnings in a series of southern California wildland fires in the 1970s. Fires burned for 13 days, resulting in 16 deaths and the destruction of 700 homes at a cost of $18 million per day, leading Congress to mandate the development of a better system for communication and coordination. The US Forest Service, the California Division of Forestry and Fire Protection, the Governor's Office of Emergency Services and three County fire departments formed FIRESCOPE. "The FIRESCOPE ICS is primarily a command and control system delineating job responsibilities and organizational structure for the purpose of managing day-to-day operations for all types of emergency incidents."[11]

ICS is based on five functions: incident command, operations, logistics, planning, and finance. The Incident Commander (IC) is in overall charge of the tactical response to the event. The IC creates an Incident Action Plan (IAP) with the advice of the general staff – the section chiefs – that guides the work of all the sections but is principally focused on the operations section's activities. The IC is assisted by a Public Information Officer (PIO) to manage media relations; a Safety Officer to ensure that everyone operates safely and with appropriate protective equipment; and a Liaison Officer who works with outside agency representatives, such as the power company. The operations section is responsible for carrying out the tactics laid out in the IAP. The logistics section obtains the resources needed to support operations. The planning section oversees check-in and checkout of all personnel, documents the IC's direction by writing the IAP, creates maps of the event, and develops all situation status boards and required reports. The finance section tracks costs and collects financial documentation related to the response to the event.[12]

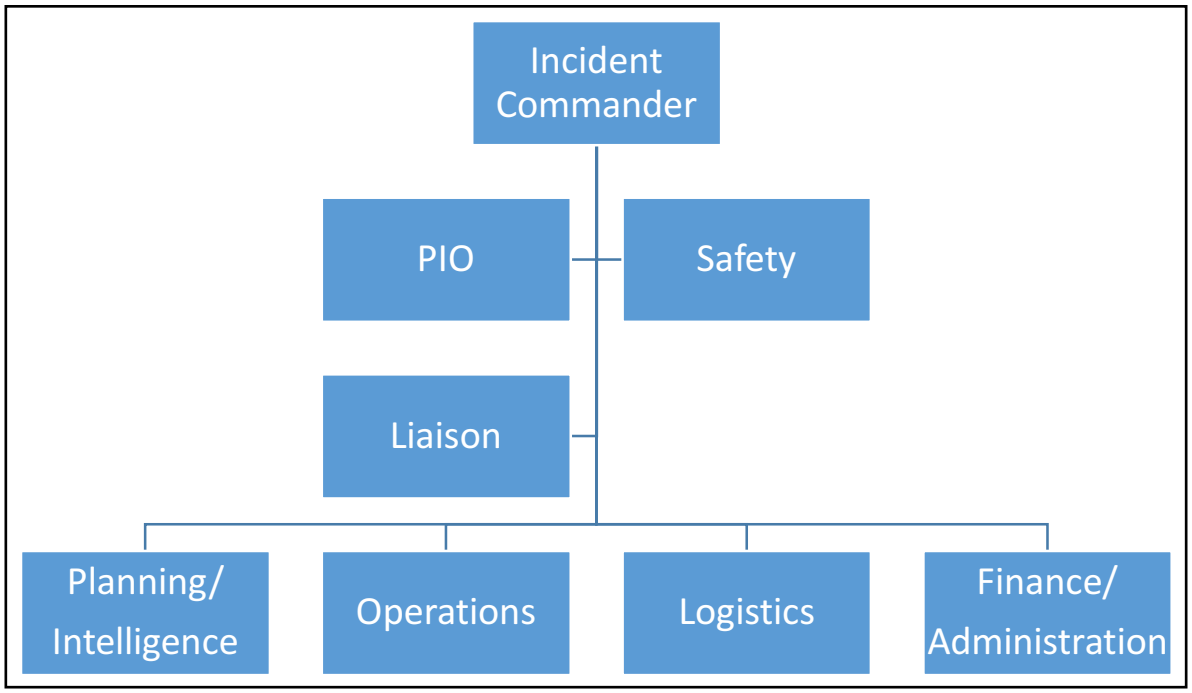


Figure 1. ICS Organization Chart

Source: Edwards and Goodrich, 2012.

By 1981, ICS was widely adopted in southern California and in the newer cities throughout the State, but older fire service management systems remained in use in older cities like San Francisco and Oakland.[13] When the Oakland and Berkeley foothills caught fire on October 19 and 20 in 1991, many communities sent fire department mutual aid to assist, but the lack of an established and well-understood coordination system led to some inefficiencies and loss of effective communication. This fire represented the most expensive fire in US history up to that time – 25 people died and over three thousand structures were destroyed.[14] The size and speed of the fire resulted in a shortage of senior officers trained in ICS and multiple commands developed, causing some confusion among responders.[15]

Standardized Emergency Management System (SEMS)

Following the Oakland Hills Fire Storm of 1991, the California legislature mandated the development and implementation of the Standardized Emergency Management System (SEMS) to be used by all State agencies in managing disasters.[16] SEMS has a variety of elements, but operationally it mandates the use of ICS in the field by all emergency response agencies. The use of SEMS in emergency operations centers (EOCs) is required at all levels: local governments, operational areas (Counties), regions and the State. The State's transportation agency is required to use SEMS "to coordinate multiple jurisdictions or multiple agency emergency and disaster operations,"[17] meaning SEMS must be used for all emergency response in the field and all emergency management in EOCs.[18]

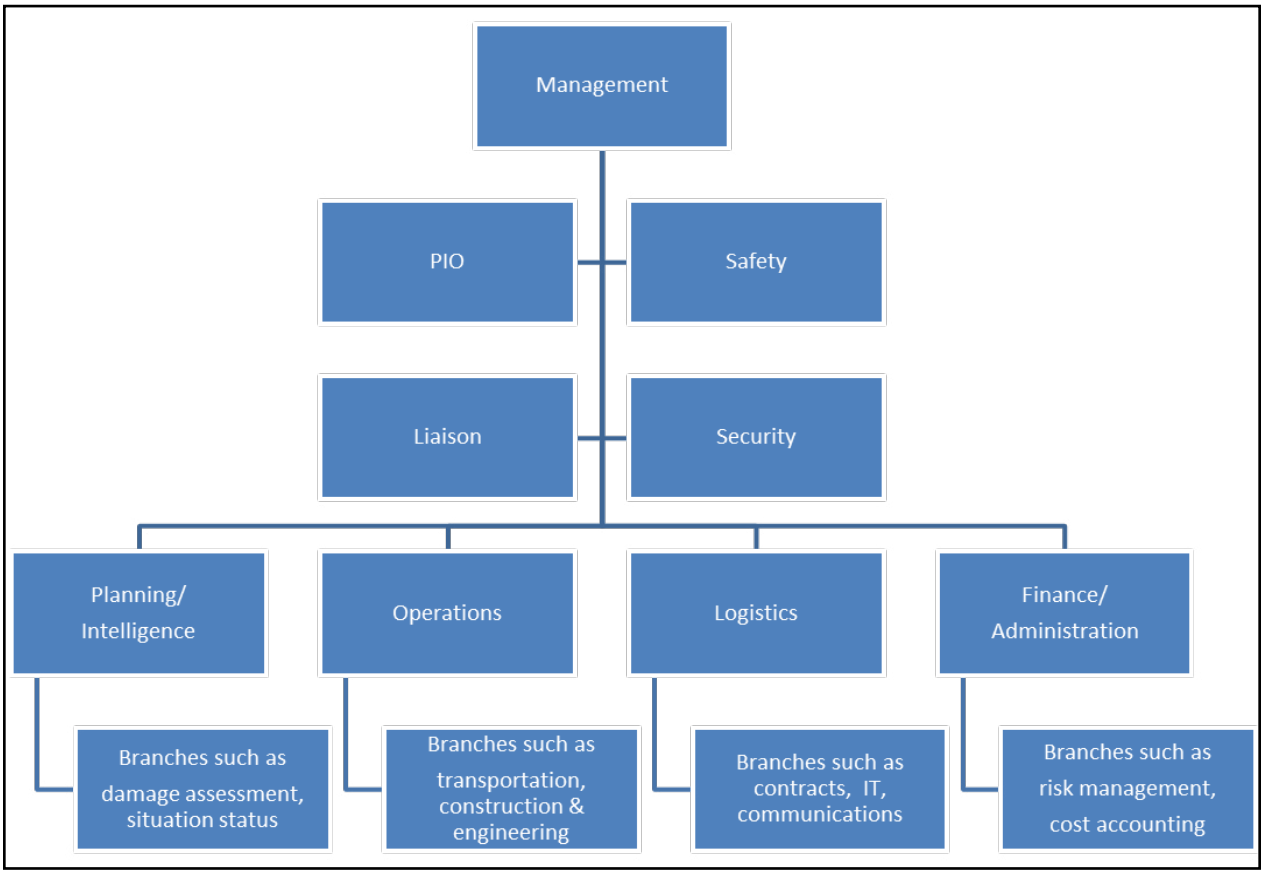


Figure 2. SEMS Organization Chart of the EOC

Source: Edwards and Goodrich, 2012.

The ICS structure is the basis for SEMS, which was created by taking the ICS concept indoors in order to manage the EOCs at all levels, changing its focus from tactical to strategic. The lead for SEMS is called the EOC Director or Management Section Chief. As with ICS, he is assisted by a PIO, a Safety Officer, and a Liaison Officer. Rather than focusing on the field activities, which are the responsibility of the IC, the Management Section Chief is responsible for the strategic management of the event, balancing the ongoing needs of the wider community or organization with the need for disaster resolution. To guide the work of the EOC, the Management Section Chief holds action-planning meetings with the EOC General Staff and Command Staff to develop an Action Plan for the next operational period. The Operations Section Chief in the EOC collaborates with the Operations Section Chief in the field to ensure adequate support for the tactical operations, and to provide a communications link between the field and the EOC. The Planning/Intelligence Section Chief in the EOC documents the event and files all required forms. The Logistics Section Chief supports the EOC staff and assists the field Logistics Section Chief to support the field's needs. The Finance/Administration Section collects and documents all information related to costs, damage, and liability.[19]

ICS is required in the field, and SEMS is required at all other levels of emergency management in California, including the State transportation department's operations center (DOC), the district EOCs, and the State transportation department's role in the State Operations Center (SOC).

National Incident Management System (NIMS)

Following the 9/11 attacks on the World Trade Center and the Pentagon, President George W. Bush issued Homeland Security Presidential Directive-5 (HSPD-5) that created a "comprehensive National Incident Management System" (NIMS) based on ICS.[20] ICS was selected as the basis for the new system because of the success of the response to the Pentagon attack, where the Arlington Fire Department used ICS to manage this complex, multi-jurisdictional, multi-profession event successfully.[21] Furthermore, California's success with SEMS led to the recommendation to use ICS as the basis for the new NIMS. Dr. Richard Andrews was the Director of California's OES when SEMS was created.[22] He testified to California's Little Hoover Commission that

> SEMS is the foundation of the National Incident Management System (NIMS) developed by the federal Department of Homeland Security."[23]

> … the National Incident Management System (NIMS), is based substantially on the Incident Command System (ICS), the Multi-Agency Coordination System (MACS) and the Standardized Emergency Management System (SEMS), each of which originated in California.[24]

HSPD-5 mandated a national adoption of NIMS, which includes multiple elements.

> "To provide for interoperability and compatibility among Federal, State, and local capabilities, the NIMS will include a core set of concepts, principles, terminology, and technologies covering the incident command system; multi-agency coordination systems; unified command; training; identification and management of resources (including systems for classifying types of resources); qualifications and certification; and the collection, tracking, and reporting of incident information and incident resources."[25]

While the President can only issue mandates to Federal entities, those entities can create requirements for other organizations wishing to receive Federal financial support. HSPD-5 mandates that

> "…[b]eginning in Fiscal Year 2005, Federal departments and agencies shall make adoption of the NIMS a requirement, to the extent permitted by law, for providing Federal preparedness assistance through grants, contracts, or other activities. The Secretary shall develop standards and guidelines for determining whether a State or local entity has adopted the NIMS."[26]

Therefore, transportation agencies and organizations receiving Federal financial assistance for preparedness must train their staff on and use ICS.

NIMS was first published on March 1, 2004.[27] It included the use of the ICS for all multi-jurisdictional and multi-profession emergency responses, development of interoperable communications systems, and resource management based on qualifications and certifications. It was designed for use in all phases of emergency management: preparedness, prevention, response, recovery and mitigation.[28]

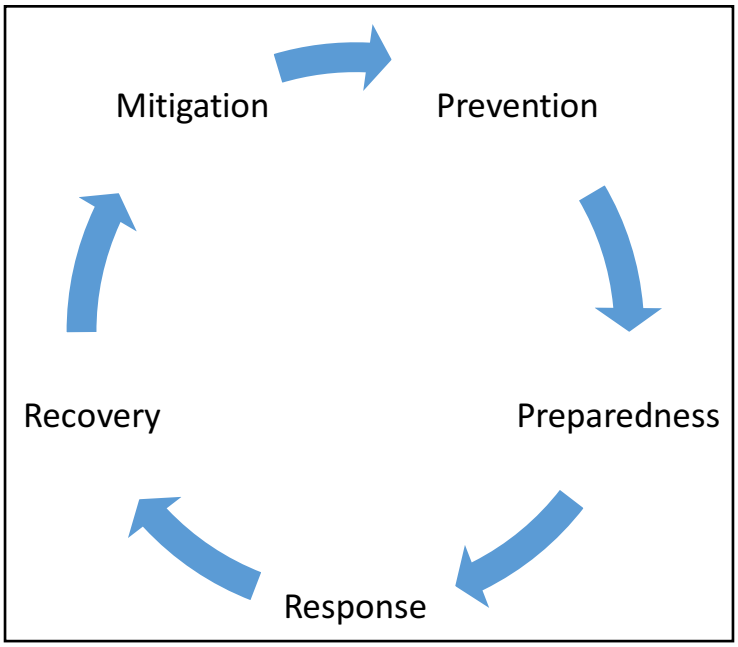


Figure 3. Comprehensive Emergency Management Cycle

Source: DHS, 2011.

To that end, NIMS includes planning, equipping, training and exercising in its mandates. Training leads to qualifications and certifications for individuals and organizations. Exercising enables organizations to test their plans through simulated disasters to evaluate the effectiveness of the plans and the completeness of the equipment caches for specific disasters. Exercise evaluators work with the exercise director and chief controller to identify areas where the participants are successful in their use of the plans and equipment, deficiencies in the way the plan is executed or the equipment is used, and whether needed training or equipment is missing.[29]

Following an exercise or an actual use of ICS, an organization develops an After Action Report (AAR) that captures the "lessons learned" during the management of the simulated or real disaster. When areas are identified that need improvement, they are placed into a management matrix that includes a description of the deficiency, the specific steps needed to remedy the deficiency, a realistic date by which the deficiency may be remedied, and the name of a specific individual who is responsible for leading the actions to eliminate or mitigate the deficiency.[30]

In 2006, a five-year training plan was issued by DHS that mandated extensive — and expensive — training for most public employees who had any role in emergency management, whether in the field or in an EOC.[31] After the passage of the Post-Katrina Emergency Management Reform Act of 2006, which mandated a new National Incident Management System Training Program, and the issuing of Presidential Policy Directive 8 – National Preparedness,[32] a new training plan was published that superseded the earlier five-year training plan and gave more control over the extent of training to local entities.[33] "A basic premise of NIMS is that all incidents begin and end locally."[34] Most significant, the onerous burden of training large numbers of employees on advanced NIMS courses

has been altered. “Federal, State, tribal, and local and private sector stakeholders’ responsibilities include: Identifying appropriate personnel to take NIMS training,”[35] meaning that State and Local entities can use their threat analysis and knowledge of local needs to define who shall take which levels of the NIMS curriculum. This extends to “[p]roviding course descriptions and training guidance”[36] for all emergency management personnel and using lessons learned from actual events in their course materials.[37]

Table 1. 2011 Core Capabilities

Cross Cutting	**Mitigation**
Planning	Community Resilience
Public Information and Warning	Long-Term Vulnerability Reduction
Operational Coordination	Risk & Disaster Resilience Assessment
	Threats & Hazard Identification
Prevention	
Forensics & Attribution	**Response**
Intelligence & Information Sharing	Critical Transportation
Interdiction & Disruption	Environmental Response/Health & Safety
Screening, Search & Detention	Fatality Management Services
	Infrastructure Systems
Protection	Mass Care Services
Access Control & Identity Verification	Mass Search & Rescue Operations
Cyber Security	On-Scene Security and Protection
Intelligence & Information Sharing	Operational Communications
Interdiction & Disruption	Public & Private Services & Resources
Physical Protective Measures	Public Health & Medical Services
Risk Management for Protection Programs & Activities	Situational Assessment
Screening, Search and Detection	
Supply Chain Integrity and Security	**Recovery**
	Economic Recovery
	Health & Social Services
	Housing
	Infrastructure Systems
	Natural & Cultural Resources

Source: Edwards and Goodrich, 2014, p. 27.

Another significant revision to the NIMS training program that resulted from PPD-8 was the cancelling of the complex Target Capability List (TCL) mandate, which required the development of specific skills and equipment caches even though they were not related to the emergency response needs of every local government. For example, earthquake preparedness is not a concern in Miami while hurricane preparedness is not a concern in San Francisco, yet the TCL did not take these differences into account.[38] Of greater concern was the mandate for extensive training and equipment cache development for relatively exotic types of terrorism, such as nuclear and radiological events, which drained local resources that were needed for more likely local occurrences, such as flooding or tornadoes. These TCL activities were replaced by the new Core Capabilities List[39] that permitted local governments to select from among the 32 capabilities those that they would emphasize to increase the preparedness of their communities for likely as well as catastrophic events. While there was no reference to transportation in the old TCL, Critical Transportation is now one of the 32 Core Capabilities, in recognition of its support of evacuation, emergency response and accessible transportation.[40]

Like SEMS, NIMS includes the management of the EOC at every level of government. Under SEMS, State transportation agency employees are required to learn the systems for providing strategic support to the field through the five functions in the EOC: management, operation, planning/intelligence, logistics and finance/administration. Under NIMS, this system is called the Emergency Support Function (ESF) approach, although some simpler options are offered for other states with less complex emergency management systems.[41]

Continuity of Operations/Continuity of Government

Continuity of operations/continuity of government (COOP/COG) goes back further than ICS. It was part of Cold War plans to maintain governmental operations and services even in the event of a nuclear explosion. Its importance was recognized on 9/11 when the Port Authority of New York and New Jersey lost much of its leadership in the collapse of the World Trade Center, where it was headquartered. While the enthusiasm for COOP/COG had waned after the fall of the Berlin Wall, when FEMA ceased requiring cities to develop a response plan for a war or nuclear attack, the reality of potential terrorist attacks on US government entities engendered a new interest in COOP/COG.[42,43] Hurricane Katrina provided another incentive for effective COOP/COG as the City of New Orleans was drowned by Lake Pontchartrain.

> Continuity of Operations planning is an effort within individual departments and agencies to ensure the *continued performance of minimum essential functions* during a wide range of potential emergencies. Essentially, it is the capability of maintaining the business of government under all eventualities. This is accomplished through the development of plans, personnel, resources, continuity communications, and vital records/databases.
>
> Continuity of Government planning is the *preservation, maintenance or reconstitution of the institution of government*. It is the ability to carry out an organization's constitutional responsibilities. This is accomplished through succession of leadership, the pre-delegation of emergency authority and active command and control.[44]

The State transportation departments play a significant role in COOP and COG. As the organizations responsible for mobility in the state, they are responsible for not only the roadways and freeways, but also generally for other modes of transportation. The transportation departments generally have a role in the SOC, which is to coordinate the provision of mobility solutions with Local, State and Federal agencies during a disaster.[45] At the district level, these mobility functions provide tactical support to all emergency response. From expedient road repairs to debris removal to public emergency notification through its changeable message signs and highway alert radio systems, the transportation agency is a crucial link in rapid rescue and response for communities experiencing an emergency.[46] Therefore, these essential functions must continue under even the most austere circumstances.

In its capacity as the transportation lead in the SOC, the State transportation department also must coordinate requests for and receipt of Federal assistance from the FEMA Emergency Support Function #1: Transportation (ESF-1) element led by the US Department of Transportation (US DOT).[47] ESF-1's role is critical to all emergency response. "The ability to sustain transportation services, mitigate adverse economic impacts, meet societal needs, and move emergency relief personnel and commodities will depend on effective transportation decisions at all levels."[48] It must also report on the status of all eight sectors of the transportation systems sector of the critical infrastructure element as defined by DHS: aviation, highway and motor carrier, maritime transportation system, mass transit and passenger rail, pipeline systems, freight rail, and postal and shipping.[49]

The State transportation agency director generally serves as a critical information conduit to the Governor's cabinet on mobility and circulation in the state. State level transportation assets include major ports, bridges, highways, rail system nodes and pipeline terminals that support the global supply chain and serve as a major contributing link in the national economy. These activities relate directly to the maintenance of government.[50]

It is crucial that transportation department employees at headquarters and the districts are prepared to fulfill the State's designated essential functions regardless of the disaster that is occurring, as transportation assets are the key to all response and to most recovery.[51] The COOP/COG functions support Federal mission-essential functions (MEFs) as well.[52,53] Plans and systems must therefore be in place to continue the provision of services even in austere conditions.

Adult Education for ICS, SEMS and COOP/COG

Educational researchers have discovered that adult learners have different learning priorities and styles than children. Most educational methods courses are based on pedagogy, or educational methods for children. In contrast, andragogy — education for adults — must focus first on learners and their motivations for obtaining the training or education. Knowles developed this theory, which recognized key features of training to motivate adults: recognize the options available to the adult, acknowledge the adult's life experience, engender or build on the adult's readiness to learn the material being presented, and focus the training on real-world problems that the adult can immediately apply to daily life.[54]

The Challenge of Knowledge Retention

Zmeyov noted that the most effective adult learning occurs when three additional circumstances are met. The adult's "life context" determines the willingness and ability to learn.[55] The adult learner has to voluntarily participate in the learning process and must have a clear partnership with the instructor. "If adult learning is largely self-directed and needs to be based on experiences and have obvious applications to the learner's 'real world,' a classroom plan grounded in practice is essential."[56] Class discussion, case studies of real events, and group problem solving are key methods for successful andragogy. Furthermore, exercises offer opportunities for "practice by doing" giving students real world experiences through scenarios.[57]

FEMA's train-the-trainer classes focus on adult learners' maturity, preexisting knowledge, and motivation.[58] Courses should be designed to "identify the relevance of the course to the student's work environment" and "provide opportunities to critically reflect upon and immediately apply new learning in order to transfer that learning into habitual practice."[59]

Students taking emergency management courses in the State-level transportation department work environment are already specialists in their own areas; many have had extensive field experience. In fact, one ICS class of Caltrans field staff was found to represent hundreds of years of practical knowledge of field-level emergency response. In addition, most of the Caltrans' staff in the ICS course worked in active, outdoor environments, not in office locations. Thus, the standard didactic course methodology had to be modified to create motivation, build on existing knowledge, and provide practical applications of the new knowledge.

Educational researchers have developed the Learning Pyramid to provide a visual representation of the teaching methods that lead to greatest retention of knowledge for adults.[60] Their findings on retention closely parallel the precepts of Knowles, Zmeyov, and FEMA training specialists.[61] The Learning Pyramid shows that listening to a lecture alone results in retention of only five percent of the information. Reading training materials alone only results in 10 percent retention of information. Clearly something more is needed if adult students are to retain and be able to use new information from emergency management classes.

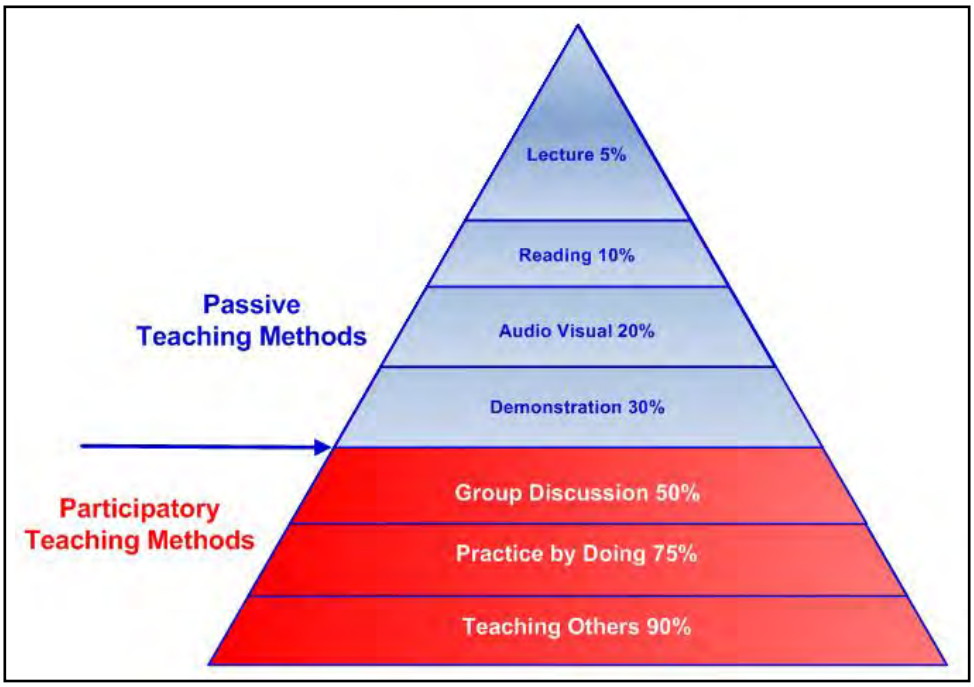


Figure 4. The Learning Pyramid

Source: Peak Performance Center, n.d.

Recognizing transportation's critical role in all emergency response, the US DOT issued a guidebook to assist State transportation agencies in integrating ICS into their existing emergency response systems. The *Simplified Guide to the Incident Command System for Transportation Professionals* was intended

> …to introduce the ICS to stakeholders who may be called upon to provide specific expertise, assistance, or material during highway incidents but who may be largely unfamiliar with ICS organization and operations. These stakeholders include transportation agencies and companies involved in towing and recovery, as well as elected officials and government agency managers at all levels.[62]

It was also intended to assist public safety personnel to understand the role of transportation personnel in disaster management. The written material outlined the structure and function of ICS, but it did not offer real training in how to use the system. It also employed a passive learning method that has not been proven to engender retention of knowledge.[63,64]

FEMA's Emergency Management Institute created a series of ICS-related courses for delivery through its Independent Study (IS) program online.[65] This system enables students to take courses from anywhere using the Internet. IS-700 introduces students to NIMS; IS-800 introduces students to the National Response Framework (the Federal plan for disaster assistance to State and Local entities); and IS-100 is the online version of an ICS-100 classroom course, Introduction to the Incident Command System. These three courses provide a foundation for all emergency response personnel to operate in the field together under NIMS. Because the classes are computer-based, they eliminate the cost of sending people to training and limit the amount of overtime needed to complete the classes.

It was anticipated that computer-based learning would move beyond the paradigm of passive listening and reading into an active environment with video clips of real events, interspersed with discussion questions that required students to provide individual answers before being able to move to the next segment of the course. Unfortunately, none of these methods offered participatory training, so (according to the principles of andragogy) the likelihood of information retention was not enhanced.

Furthermore, the computer-based classes did not necessarily completely address the cost of training. FEMA's original five-year training plan assumed that workers would be able to take the three ICS Independent Study classes during normal business hours in their work offices. Unfortunately, this alternative to classroom training did not take into account that many transportation employees — road maintenance workers and landscape maintenance workers, for example — do not work in an office, and have little or no access to computers at work. Many may have little experience using a computer as a learning tool, although they may use it for shopping, playing games, or other purposes. Some transportation personnel may have limited English literacy, so computer-based learning may not be effective for them. Since many transportation personnel are unionized, there is a limit to the amount of time that they can be required to take courses outside of the workday without receiving overtime pay, which increases the costs for the agency. Lastly, requiring workers to do the training on their own computers at home may not be an option.

Adult education specialists have noted that adults retain only10 percent of what they read. This is increased to only 20 percent with audiovisual aids.[66] Therefore, it cannot be assumed that students using computer-based courses alone will retain enough information about ICS over the long term to function effectively in the rare emergency situations that exceed their normal operations systems. In fact, students in the Caltrans courses often acknowledged

that they had received ICS-100 training, but except for hazardous materials staff members that use that training regularly, employees often did not remember the concepts.

One Approach to Improved Knowledge Retention

In 2016, NCHRP 20-59 (30) *ICS Training for Field-Level Transportation Supervisors and Staff* was published, incorporating a different approach to teaching ICS to transportation field-level personnel.[67] The course is designed to move students up the learning pyramid by beginning with an audiovisual, illustrated lecture with stories and examples that are (where possible) specific to transportation personnel, and to the district in which the course is taught. The course then switches to a format where students interact with the instructor employing the military "sandbox" method of exercises, using small cars and highway signs to illustrate the response to a hazardous materials accident in the field that requires multi-jurisdiction and multi-profession cooperation. This allows for an immediate application of the didactic material to a practical situation. The demonstration increases the expected retention rate to 30 percent, while the interactive group discussion among the students and the instructor on the resolution of the accident moves anticipated retention to 50 percent.

Students are given a set of learning aids, including a set of guidance cards and a cardboard folder of forms. The interactive portion takes students through the first 15 minutes of the event, following the guidance on the cards. The student who is the Incident Commander distributes cards to others who become the Safety Officer, Logistics Chief and Planning Chief. Several sets of students simulate Incident Command and discuss with the larger group the steps to the solution of the event. This discussion inevitably leads to students sharing information on actual events in which they participated that are similar to elements of the accident depicted by the cars and signs in the "sandbox." The cardboard folder contains a set of forms for initiating ICS in protective zip-lock pockets; the folder is designed to become a situation status board that can be taped to a vehicle for display. The Planning/Intelligence Section Chief uses the board for his documentation, which allows other workers to update themselves on the progress of the event. The description of the event, the roll-out of the guidance cards, and the explanation of the folder allow students to practice by doing, which moves the expected retention rate to 75 percent.

The NCHRP 20-59 (30) includes scenarios that can be used for 15-minute refresher discussions during morning briefings.[68] Those attending the ICS class then become instructors for their work colleagues, moving their expected retention through teaching to ninety percent. There are also discussion-based scenarios that can be used for longer training periods. The book given to each student includes two briefing training scenarios to facilitate the transfer of information to co-workers.[69]

III. METHODOLOGY

The methodology for this research was an iterative program evaluation of the Caltrans emergency management training cycle. The NTSSC researchers used the participant/ observer approach.

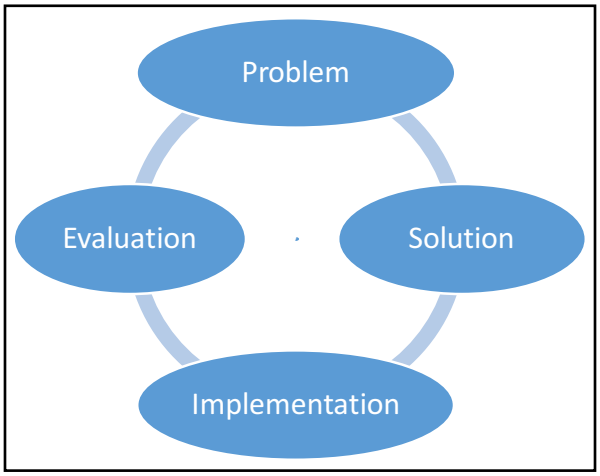


Figure 5. Emergency Management Training Program Evaluation

Problem Statement

Caltrans' OEM staff identified that there was a need for more training on emergency management among headquarters and district staff members. Although some Caltrans staff members had received earlier training on EOC management, there was a need for refresher training. COOP/COG planning was underway at the district level, so awareness level training was appropriate. With the high level of Baby Boomer retirements and related promotions, there were many people in new positions who may not have received the earlier training classes. OEM leadership determined that new course offerings could benefit the incumbents in the EOC and COOP/COG positions.[70]

In addition, the Caltrans field personnel in the 12 districts needed some customized ICS training about how to work in an ICS-driven emergency response. They had received basic ICS training, but often had not used the information for several years; retention of the information was a challenge. The original DHS training materials had not provided any tools for self-study or refresher training. The need for ICS and NIMS training customized to transportation field personnel was recognized nationally among transportation professionals. The TRB's NCHRP sponsored research by Nakanishi and Auza on available transportation-specific NIMS and ICS classes for field personnel, but none was found.[71] There was also a need to incorporate material on California's reimbursement requirements and regulations into the training, as well as information about the new Caltrans communications assets that had been acquired to support field ICS responses.

Solution

A new ICS course designed specifically for transportation personnel was under development by a team from MTI's NTSSC. The NCHRP, managed by the TRB of the NAS, sponsored the course development. The same team had created a COOP/COG course for transportation personnel as part of a U.S. DOT project that Caltrans had cosponsored.[72] The team had also offered a SEMS EOC course for Caltrans previously and had some insights into the challenges to information retention that might be overcome by applying the principles of adult education.

As a first step, the NTSSC team reviewed and updated the existing Caltrans EOP, ensuring that checklists were available to support the headquarters and district EOC teams in their assignments. These checklists would also be used in the SEMS EOC training classes. Once the plan was updated, the three courses were customized for Caltrans. Building on a generic base course developed in 2011,[73] the COOP/COG class incorporated the Caltrans essential functions, offered a Caltrans-specific threat analysis for headquarters and each district, and included a customized getaway kit content list designed specifically to support transportation personnel in their essential functions roles. The issues of family preparedness were also addressed, because employees who are worried about their families' ability to remain safe during the disaster without them are unlikely to remain at work to function as Disaster Service Workers (DSWs) for the State.[74]

The SEMS EOC Approved Course of Instruction was customized for Caltrans' staff, focusing on the specific roles of transportation agencies in emergency response. Scenarios used in the workshop elements of the class were developed for each district based on actual emergency events in that district. Transportation EOC-specific checklists were provided to every student, and home and personal preparedness were similarly discussed in the SEMS EOC classes.

The ICS for Field-Level Transportation Supervisors and Personnel course was customized for California. All of the photos in the PPT set were updated with California-based photos where appropriate, the SEMS environment was addressed, and mission tasking was emphasized. A segment on communications and field response assets was added to the standard NCHRP model, culminating in a tour of the assets in a field display at each district and at the META. In addition, the student manual included California-specific scenarios for use in practicing the application of ICS with colleagues or subordinates and provided suggested kit items for a work or work-related getaway kit. Again, family preparedness and the DSW role were emphasized. The Joint Operational Policy Statement (JOPS) between Caltrans and the California Highway Patrol (CHP) was included in the student manual to ensure that everyone who attended the training had access to the agreed-upon protocols for emergency management on the state's highways.[75] In most cases this was the first time that students had seen these policies.

Implementation

The NTSSC staff partnered with Caltrans OEM staff members to offer COOP/COG and SEMS EOC courses at headquarters and in every district. Caltrans also agreed to be the

pilot location for the NCHRP 20-59(30) ICS training program. The classes were offered from January 2015 through January 2016: a total of 44 individual classes with fourteen offerings each of COOP/COG and SEMS EOC and thirteen offerings of ICS. (Headquarters does not have a field element and was not trained on ICS.)

Evaluation

The NTSCC staff provided evaluation sheets to each student at the end of each class. Their responses were collected and read; the information was used to continuously improve the course offerings. At the end of the training cycle, the answers were put into figures and tables to support analysis of the program. Individual tables and bar charts were created for each district for the numerical and qualitative responses. The figures for the grand totals, across Caltrans, for each set of questions for each course appear in abbreviated form in the Findings of this report. Results for the individual district totals for each set of questions were provided to Caltrans.

IV. FINDINGS

Continuity of Operations/Continuity of Government

Course Description

Table 2. COOP/COG Course Elements

Segment	Length	Method
Didactic Overview	2 hours	Lecture and PowerPoint
Break	0.25 hours	
ERG Role Checklist	0.75 hours	Workshop, small group discussion, report to group
ERG Get Away Kit	0.75 hours	Workshop, small group discussion, report to group
Evaluation	0.25 hours	Questionnaire

The Continuity of Operations/Continuity of Government (COOP/COG) course is four hours long. It includes a didactic portion of about two hours, supported by a PowerPoint presentation (PPT), and a student handbook with several handouts, including the PPT printout and the exercise materials.[76] The course covers the circumstances under which a COOP/COG activation might be required; the development and roles of the Emergency Relocation Group (ERG); and how this is different from the Emergency Operations Center (EOC) and its staffing. Two different trainers teach the course. At the two-hour point there is a 15-minute break.

After the break the first interactive workshop is conducted, which focuses on developing a checklist for COOP/COG roles to be played by the students during an activation. Students work individually and in small groups to develop their checklists using the supporting materials provided: position descriptions, completed example checklists, and checklist templates. At the end of the development period, the students report to the group on their checklist development. This segment lasts about 45 minutes.

The third segment is the development of a personal getaway kit to support work in the COOP/COG facility as part of the Emergency Relocation Group (ERG). Students work individually to develop a personal kit from a master list, which they then customize based on the specific ERG role each will play. At the end of the development period, the students report to the group on any items they added to their lists that were not on the master list, and the group evaluates the value and appropriateness of the item for inclusion on the master list and their individual lists. This segment lasts about 45 minutes. The last 15 minutes are used for the course evaluation.

Course Evolution

At the end of each course, response was solicited from the students using a standard evaluation form. The instructors read each response and incorporated the students' suggestions into the next iteration of the class, where possible. Note that during June,

when there were four offerings in one month, there were no updates to the written materials between classes. Lecture material was updated in response to suggestions.

The main evolutions of the class were the addition of more explanation of the roles in COOP/COG/ERG and the addition of more information about how the State selected the essential functions, with explanation of how that impacted the State transportation agency. The verbal instructions for the two exercises were also increased, and instructors worked with the students throughout the two workshops as coaches.

Course Evaluation

At the end of each delivery, students were given an evaluation sheet with eleven questions. Three questions asked for a numerical response, while the others asked for a qualitative response. Figure 6 below is an example of the evaluation sheets. The responses for each numerical question are also presented by district below. The first delivery at headquarters is not included. The responses for the qualitative questions are grouped across all districts for simplicity.

Listed below are the numbers of surveys that were returned to the instructors. Most students answered only some of the questions, and several students provided more than one answer to each of the qualitative questions, so the answer totals do not match the number of surveys collected. Since not all students answered the surveys, the numbers do not reflect a full count of attendance, which was collected by the Caltrans OEM staff through sign-in sheets at each class. All district information is reported in the order that the classes were offered, because the courses evolved at each iteration through student feedback.

Table 3. COOP/COG Responses Received

Districts (by Date)	Number of Surveys Returned
District 3	7
District 10	7
District 7	11
District 5	15
District 4	1
District 1	11
District 2	4
District 8	16
District 12	5
District 11	11
District 9	12
District 6	8
District 8r	5
HQ	5
Grand Total	**118**

COOP/COG Seminar
Date
Evaluation

PLEASE COMPLETE BOTH SIDES

PLEASE USE NUMERICAL SCORE FOR 1, 4, & 7

1= Completely disagree 5= Completely agree
Please rate each question 1 to 5 (see both sides)

1. The COOP ERG **seminar** was useful for me in my ERG role: ____

2. The most useful thing I learned at today's **seminar** was:

_____
_____
_____

3. One thing I still need more information on regarding my ERG role is:

_____
_____
_____

4. The **checklist** building activity was useful to my ERG role: ____

5. The most useful information in the **checklist** building activity was:

_____
_____

6. One thing I still need more information on regarding the development of my **checklist** is:

_____
_____

7. The **professional drive-away kit** building activity was useful to my ERG role: ____

8. The most useful information in the **professional drive-away kit** building activity was:

_____
_____

9. One thing I still need more information on regarding the development of my **professional drive-away kit** is:

_____
_____
_____

10. Important thing (s) that was (were) missing from today's training:

_____

_____

_____

11. What should be eliminated from future training?

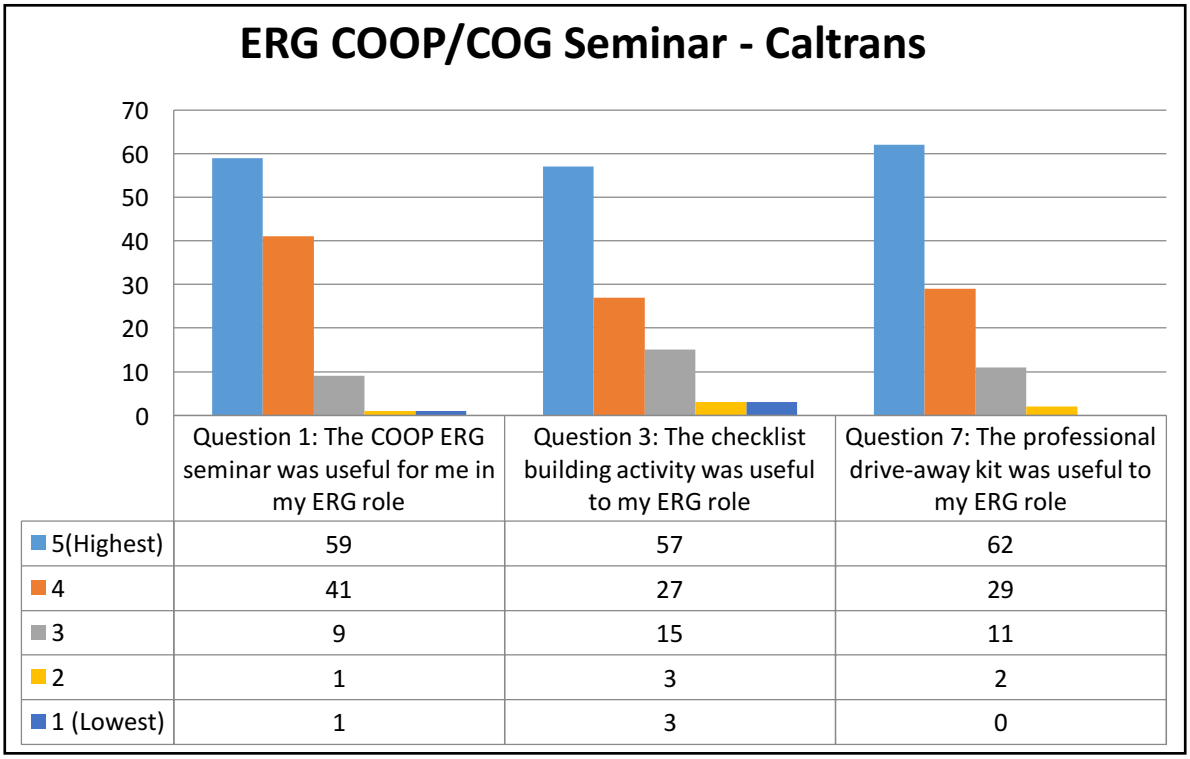
_____

_____

_____

Figure 6. COOP/COG Seminar Evaluation Form Example

Participants' responses to the numerical questions are documented in the chart below. The number of responses to a question does not necessarily equal the number of survey participants, because participants did not always answer each individual question.



	Question 1: The COOP ERG seminar was useful for me in my ERG role	Question 3: The checklist building activity was useful to my ERG role	Question 7: The professional drive-away kit was useful to my ERG role
5(Highest)	59	57	62
4	41	27	29
3	9	15	11
2	1	3	2
1 (Lowest)	1	3	0

Figure 7. COOP/COG Seminar Responses

Participants' responses to the qualitative questions are documented in the following question-specific tables.

Table 4. COOP/COG Question 2

Q. 2: Most Useful Thing Learned at Seminar	Respondents
Overview	21
Preparing for Disasters	18
Differences between COG and ICS	17
COG Position Roles/Organization	15
Kits/Personal preparedness	11
Checklists	4
Individual roles	4
Training as a Whole	4
How COG and EOC relate	3
How COG is structured	3
Other= 2 or fewer	18
Grand Total	**118**

Table 5. COOP/COG Question 3

Q. 3 I Need More Information On	Respondents
Individual roles	28
Real Events	3
Interagency collaboration	3
Action Plan Development	2
Other= 2 or fewer	21
Grand Total	**57**

Table 6. COOP/COG Question 5

Q. 5. The Most Useful Information About the Checklists Was	Respondents
Overview of Checklists	15
Building Checklists	9
Individual Roles	5
Group Coordination	4
Roles	4
Planning for an Event	3
Technology Needed to do Work	3
All of It	3
Building Kits	3
Order of Operations	2
Personal Preparedness	2
Importance of Backup Personnel	2
Other – 1 Each	11
Grand Total	**66**

Table 7. COOP/COG Question 6

Re: Checklists I Need More Information On	Respondents
Individual Roles Undefined	7
Interagency Coordination	3
Kit Building	3
District-Specific Plan	2
Water Filtration	2
Differences between COG and EOC	2
Nothing	2
Alternate Site Locations	2
Other- 1 Each	10
Grand Total	**33**

Table 8. COOP/COG Question 8

Q. 8 The Most Useful Information About Go-Kits Was	Respondents
Item List	25
All of It	7
Preparation	5
Power Sources	5
Discussion	3
Water	2
Other	9
Grand Total	**56**

Table 9. COOP/COG Question 9

Q. 9 Re: Go-Kits I Need More Information On	Respondents
Longer Item List	4
Creating Personal Kits	7
Other – 1 Comment Each	7
Grand Total	**18**

Table 10. COOP/COG Question 10

Q. 10 Items That Need to be Added to Course	Respondents
Nothing	6
Role-Specific Training	2
More Interactive Exercises	2
Define All Acronyms	2
Other – 1 Each	13
Grand Total	**25**

Table 11. COOP/COG Question 11

Q. 11 Items That Should Be Eliminated from the Training	Respondents
Nothing	9
PowerPoint Presentation	2
Other	5
Grand Total	**16**

SEMS Emergency Operations Center

Course Description

Table 12. SEMS EOC Course Elements

Segment	Length	Method
Introductions, Didactic Overview	2 hours	Lecture and PowerPoint
Break	0.25 hours	
Modules 1 and 2- Management Section Initial Reports	1 hour	Workshop, small group discussion, report to group
Module 3 – Planning/Intelligence Section Situation Status	1 hour	Workshop, small group discussion, report to group
Lunch Break		
Module 4 – Action Planning Lecture	0.75 hours	Lecture and PowerPoint
Break	0.25 hours	
Module 4 – Action Planning Workshop	1.5 hours	Small group discussion, simulation, report to group
Module 5 – Resource Management	0.5 hours	Ordering and managing resources
Module 6 – Financial Management	0.5 hours	
Evaluation	0.25 hours	

The Standardized Emergency Management System Emergency Operations Center (SEMS EOC) course is eight hours long. It was condensed from an original Approved Course of Instruction of sixteen hours. This condensed version assumed that all participants had taken the 2.5 hours SEMS Introduction Approved Course of Instruction that provides a history of SEMS and the basic structure of the system. Not all students may have had this background before taking SEMS EOC. The course could be used by any State transportation agency for EOC training as it is closely related to the Emergency Support Function EOC model promoted by FEMA in its Independent Study Course IS-775.[77]

Because cities and counties in California did not have the capacity to financially support such a long training course for every EOC staff member, OES regional staff members compressed the didactic portions of the class to two sessions: two hours in the morning and one and a half hours in the afternoon. They also developed abbreviated interactive workshop elements that allowed students to use the remaining time to practice various EOC systems and roles, notably Action Planning, in a workshop format that included elements of a tabletop exercise. The compressed version of the EOC training was designed with one 15-minute break in the morning, one in the afternoon, and a 15-minute break

before a working lunch, for a total of eight hours and 15 minutes of instructional time in a standard workday (eight hours plus a one-hour lunch break). Due to Caltrans' work rules, the working lunch had to be eliminated, which reduced the total class time with breaks to seven-and-a-half hours. This is relevant because a number of students requested a longer instructional period in their responses to the questionnaire, as shown in Table 16.

The SEMS EOC course relies on a PowerPoint presentation for the didactic instruction and a student handbook with handouts to guide student activities in the workshop portion.[78] The instructors provide two scenarios for students to use in the workshops. To enhance the reality of the training, the scenarios are based on actual emergencies that have occurred in that district.

The students are split into two EOC staff groups, and the instructors act as coaches as the students work through the problems in their assigned scenarios. If the group is too small the students are kept in one EOC workshop. Students play the role of their EOC assignment in an enhanced tabletop exercise environment. At the end of each iteration, the participants report back to each other on the scenario and their actions to resolve it. The class incorporates discussion and doing, as well as a teach-back element in providing a briefing to counterparts in the other workshop. These elements should enhance retention of the information.

The course builds toward an action-planning session where students simulate preparing for and holding an Action-Planning Meeting in the EOC. Each EOC section uses its checklists to play its role. At the end of the meeting, a report-out is prepared for presentation to the other team. This report-out enables students to practice documentation of the Action Plan and its elements. Photos of Action Planning elements are found in Appendix 1.

As time permits, an interactive group discussion is held on some resource management and financial management issues. Groups with experience in an EOC generally complete all course modules. Those with little experience generally only complete four of the modules, culminating in the Action-Planning Meeting. Some of the questions and comments from students reflect the need for a longer EOC course. This would allow more time for students' questions to be addressed while at the same time finishing all six modules of the course. Since all students have a complete notebook they can learn the material from the last two modules independently.

Course Evolution

Even in sessions where not all modules were completed, the students were asked to complete evaluation sheets to assist with the continuous improvement of the course. The instructors read each response and incorporated the students' suggestions and comments into the succeeding offerings of the course where appropriate.

The main evolutions in the class were related to condensing the initial planning elements of the class to reserve more time for the Action-Planning Workshop. This was based on both student feedback about the value of the Action-Planning Workshop for their EOC role, and the instructors' understanding of the value of that element of the training, which

they believe is central to the management of the EOC. Rather than having the students randomly divided and forming an EOC staff from whoever was in the room, as directed by the course of instruction, the instructors worked with the district training officer to identify two groups with EOC assignments that made up a workable EOC staff. This eliminated the first workshop. The second and third workshop elements that provide details on the scenario and the media coverage of the event were combined into one session. This change saved time by having one report-out instead of two.

Even with these evolutions, some districts did not get beyond the Action-Planning Workshop because of the large number of questions about the EOC and its role from the students. Since the instructors believe in student-centered teaching, they tried to ensure that all students were able to move forward together rather than keeping to a strict timetable. They also offered significant coaching when students did not seem comfortable with managing the problems posed by the scenarios in order to engender a safe, learn-by-doing environment where all questions were respected and addressed. More experienced groups were able to move at a faster rate and complete all six modules. Less experienced groups nevertheless learned key elements of EOC management and are now better equipped to use the checklists to guide their future EOC activations.

Course Evaluation

Even in sessions where not all modules were completed, the students were asked to complete evaluation sheets with five questions and one two-part question in order to assist with the continuous improvement of the course. Three questions asked for a numerical response, while four asked for a qualitative comment. Figure 8 is an example of the evaluation sheet. The responses for each question are provided in Tables 14 through 17. The first delivery at Headquarters is not included. The abbreviated responses for the qualitative questions are grouped across all districts here for convenience in evaluating the Caltrans-wide impact. District counts were given to Caltrans.

Listed below is the number of surveys that were returned to the instructors. Students did not always answer all the questions, and students often provided more than one response to the qualitative questions, so the answer totals do not match the number of surveys collected. The numbers do not reflect a full count of attendance, which was collected by Caltrans OEM staff through sign-in sheets at each district. All district information is reported in the order that the classes were offered, because the courses evolved at each iteration through student feedback.

Table 13. EOC Surveys Received

District (By Date)	Number of Surveys Returned
District 3	39
District 10	9
District 7	23
District 5	27
District 4	10
District 1	21
District 2	20
District 8	38
District 12	23
District 11	18
District 9	14
District 6	17
District 8r	12
HQ	14
Grand Total	**285**

8-Hour SEMS EOC Training
Date
Evaluation

1= Completely disagree 5= Completely agree

Please rate questions 1,3 and 5 on a 1 to 5 scale

Use the back side for extra space for any question, or for additional comments

1. The EOC seminar was useful for me in my EOC role: ____

2. The most useful thing I learned at today's seminar was:

_____
_____
_____

3. The Action Planning Briefing training was useful for me in my EOC role: _____

4. The most useful information in the Action Planning training was:

_____
_____
_____

5. Today's exercise and training provided adequate information for me to work effectively in the EOC. ____

Important thing (s) that should be added for future training:

_____
_____
_____

6. What should be eliminated from future training?

_____
_____

Figure 8. SEMS EOC Training Evaluation Form Example

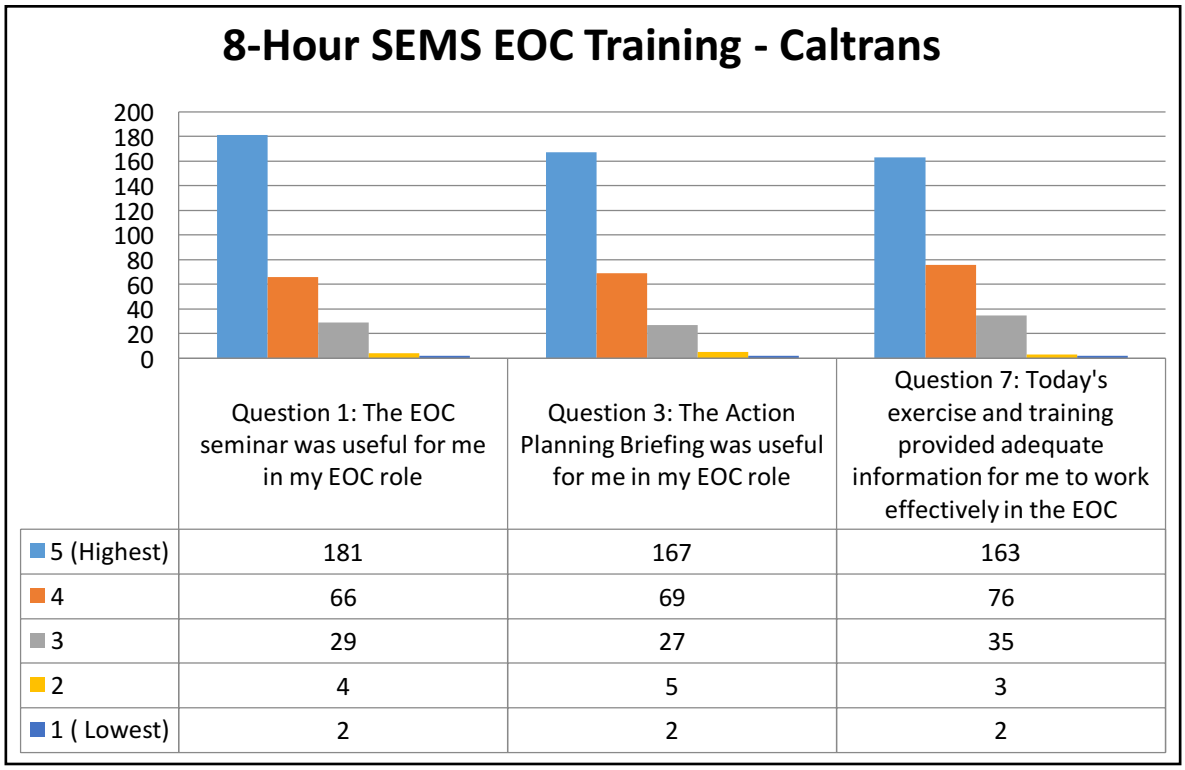


Figure 9. EOC Training Responses

Table 14. EOC Question 2

Q. 2 The Most Useful Thing Learned	Respondents
EOC Roles	70
EOC Processes	33
Action Plan Development	24
Info on Respondent's Role	22
EOC Organization	16
Communication	16
Exercises	15
All	14
Teamwork	12
Mission Tasking Numbers	8
Briefing Methods	7
Documentation	7
SEMS	6
Resource Management	4
Interagency Relationships	3
Time Management	3
Other – 2 or Fewer	36
Grant Total	**296**

Table 15. EOC Question 4

Q. 4 The Most Useful information re: Action Planning	Respondents
EOC Roles	35
Action Plan Development	26
Briefing Methods	25
Exercises	25
Teamwork	16
EOC Processes	13
Communication	10
Info on Respondent's Role	10
EOC Organization	8
Task Prioritization	8
Checklists	7
Delegation	6
All	6
Time/Resource Management	9
Documentation	5
Other – 2 or fewer	23
Grand Total	**232**

Table 16. EOC Question 5

Q. 5 Something to Add to Future Trainings	Respondents
More Breaks	16
More Exercises	12
Spread across Two days	18
Better Define Individual roles	7
Use More Challenging Exercises	10
Show Video of EOC in Action	4
Identify Individuals' Roles in Advance	3
Fewer Breaks	3
Other – Two or Fewer	63
Grand Total	**136**

Table 17. EOC Question 6

Q. 6 Eliminate from Future Trainings	Respondents
Nothing	12
PowerPoint	9
Lecture	5
Spread over Two Days	4
Other – Two or Fewer	15
Grand Total	**45**

Incident Command System for Field-Level Transportation Supervisors and Personnel

Course Description

Table 18. ICS Field Personnel Course Elements

Segment	Length	Method
Didactic Overview	1 hour	Lecture and PowerPoint
Break	0.25 hours	
ICS Field Implementation	1.5 hour	Workshop, sandbox simulation, role discussions
Break	0.25 hours	
Didactic Overview of Equipment	0.25 hours	Lecture and PowerPoint
Supporting Equipment, Display	0.75 hours	Guided tour of supporting equipment

The Incident Command System for Field-Level Transportation Supervisors and Personnel course was developed by a team from the NTSSC with funding from the NCHRP, Project NCHRP 20-59 (30). It was designed for a national audience of State transportation agency field staff members who, under NIMS, will be working under ICS in a multi-jurisdiction, multi-profession emergency response. Using the concepts of andragogy, the course was designed to build on ICS-100 and ICS-200 courses by adding practical application elements.[79]

The course uses methods described by the Learning Pyramid with the goal of enhancing retention of the material. Students see and hear the course introduction, which is enhanced with a PowerPoint presentation using transportation agency-specific photos. A student handbook that includes the PPT slides and a glossary of terms supports the lecture. This means that the students see, hear, and read the instruction. This should result in 30 percent retention of the material. The handbook includes handout materials that extend elements of the instruction, such as Disaster Service Worker, home and personal preparedness, and the Caltrans/CHP JOPS.

The lecture was designed to highlight the aspects of ICS that Caltrans personnel will use, such as check-in and checkout for safety, and the use of Mission Tasking numbers when providing services off the State highway system. The PPT slides show actual events and examples of forms and materials that Caltrans personnel would use.

After a break, the course becomes an interactive discussion/demonstration/ “doing” session, which should lead to a 75-percent retention rate. The interactive portion uses a supervisor’s folder and a set of ICS Quick Start Cards customized for transportation as part of the NCHRP project. The cards are laminated to be weatherproof, are in different colors for quick identification, and are on a ring to allow them to be distributed and then reassembled. The supervisor’s folder is a cardboard packing box that has been cut and folded into a holder for a set of management tools. Attached to the cardboard is the set of basic ICS forms in clear zip-locked shipping pouches. There are an ICS Field Operations Guide, pens, and pads of paper in the folder along with the cards.[80] The package was designed to fit behind the front seat of a typical transportation agency supervisor’s truck for easy access.

The instructor has set up in advance a series of mock traffic accidents on the students' tables using engineer's tape, small cars, emergency vehicles and road signs. They are used to envision the scene of an event, and students may move the vehicles and signs during the discussion to simulate the progress of the event resolution. This is known as the "sandbox" method of training and practice, borrowed from the military.

After the break, the instructor asks about 10 students to take the card sets that have been placed on the tables and read the first card in turn. The cards instruct them how to take the role of initial Incident Commander (IC) when an emergency occurs. They distribute the different colored cards to individuals: the Safety Officer, the Logistics Section Chief and the Planning/Intelligence Section Chief, making the point that with the card, anyone can fill those roles to establish ICS. By the time that the four cards have been distributed by the 10 students, most of the class members have an ICS role. Appendix 1 contains photos of the teaching materials.

The instructor guides the discussion about what each role would do at that point in the management of the emergency. Everyone is invited to be part of the discussion as the role players read their cards and say exactly what they would do to resolve the event at that point. Issues like available resources, the arrival of law enforcement, the arrival of a fire department, and the functions of other probable players are integrated into the discussion of transportation agency personnel's roles.

ICS elements discussed and demonstrated during the second part of the class include starting an ICS event, joining an ICS in various roles (Operations Section Chief, technical specialist, field resource) and assuming or passing the command to another entity. Examples of real events are given to show how these roles work. The PPT continues during the interactive portion to provide additional visual clues and includes field crews at actual events and photos of disasters. Information from the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD), Section 61, page 726, is included to show the universality of ICS applications under NIMS, and the designations for major, intermediate and minor traffic events used nationally. This provides context for students to consider how important this information is and how they might be using it. Photos of the materials are found in Appendix 1.

There are also guides in the student handbook that (it is hoped) will lead to action, such as building a professional getaway kit and a personal support kit for the work vehicle, which should lead to a 75-percent information retention rate if the students act on them after class. There are also two scenarios that students can use as a refresher exercise on their own or with co-workers. It is hoped that this leads to a teach-back environment, which should generate ninety percent retention of the material.

The third segment of the Caltrans class is a visit to a display of Caltrans communications assets. After a break, the students watch a brief PPT presentation that describes the communications assets and field support materials that are available in each district and as statewide assets. They then have a guided tour of the assets. Similar displays of field support equipment could be added to the course by any State transportation agency.

Course Evolution

At the end of each class, evaluation forms were used to collect student feedback. The instructors read each response and evaluated each for inclusion in elements of the course. The main change was to provide two breaks in the class instead of the single break at the two-hour point that was programmed in the NCHRP course. Since the students were field personnel, they were unused to sitting still indoors for hours at a time. Providing the extra break seemed to enhance attention.

The MUTCD information was added at the midpoint of the trainings as a result of knowledge gained during a research trip. Some students in the early classes expressed the belief that ICS was not for transportation field personnel, so seeing it specified in a FHWA publication added weight to the value of ICS training. It also showed that highway events could be viewed in three categories, and that longer events are not “business as usual,” which was an early criticism of the ICS training.

Course Evaluation

At each delivery, the students were given a course evaluation with five questions and one two-part question. Figure 10 shows the form. Three questions requested a numerical response, as shown in Figure 11. The responses to the qualitative questions are in Tables 20-23. This course was not delivered at the Caltrans Headquarters because it is only for field personnel.

Listed below are the numbers of surveys that were returned to the instructors. Most students answered only some of the questions, and several students provided more than one answer to each of the qualitative questions, so the answer totals do not match the number of surveys collected. Since not all students answered the surveys, the numbers do not reflect a full count of attendance, which was collected by the Caltrans OES staff through sign-in sheets. All district information is reported in the order that the classes were offered, because the courses evolved at each iteration through student feedback.

Table 19. ICS Responses Received

District (By Date)	Number of Surveys Returned
District 3	13
District 10	9
District 7	25
District 5	32
District 4	29
District 1	25
District 2	17
District 8	38
District 12	17
District 11	32
District 9	15
District 6	30
Southern Make-Up	12
Northern Make-Up	6
Grand Total	**300**

ICS for Transportation Field Personnel Training
Date
Evaluation

1= Completely disagree 5= Completely agree

Please give a number to questions 1, 2 & 5

1. The ICS seminar was useful for me in my Caltrans role: ____

2. The most useful thing I learned at today's ICS seminar was:

_____
_____
_____

3. The sandbox exercise was useful for me in my Caltrans role: _____

4. The most useful information in the sandbox exercise was:

_____
_____
_____

5. Today's ICS seminar and exercise provided adequate information for me to work effectively in an ICS event. ____

6. Important thing (s) that should be added for future training:

_____
_____
_____

7. What should be eliminated from future training?

_____
_____
_____

Use the back side for extra space for any question, or for additional comments

Figure 10. ICS Training Evaluation Form Example

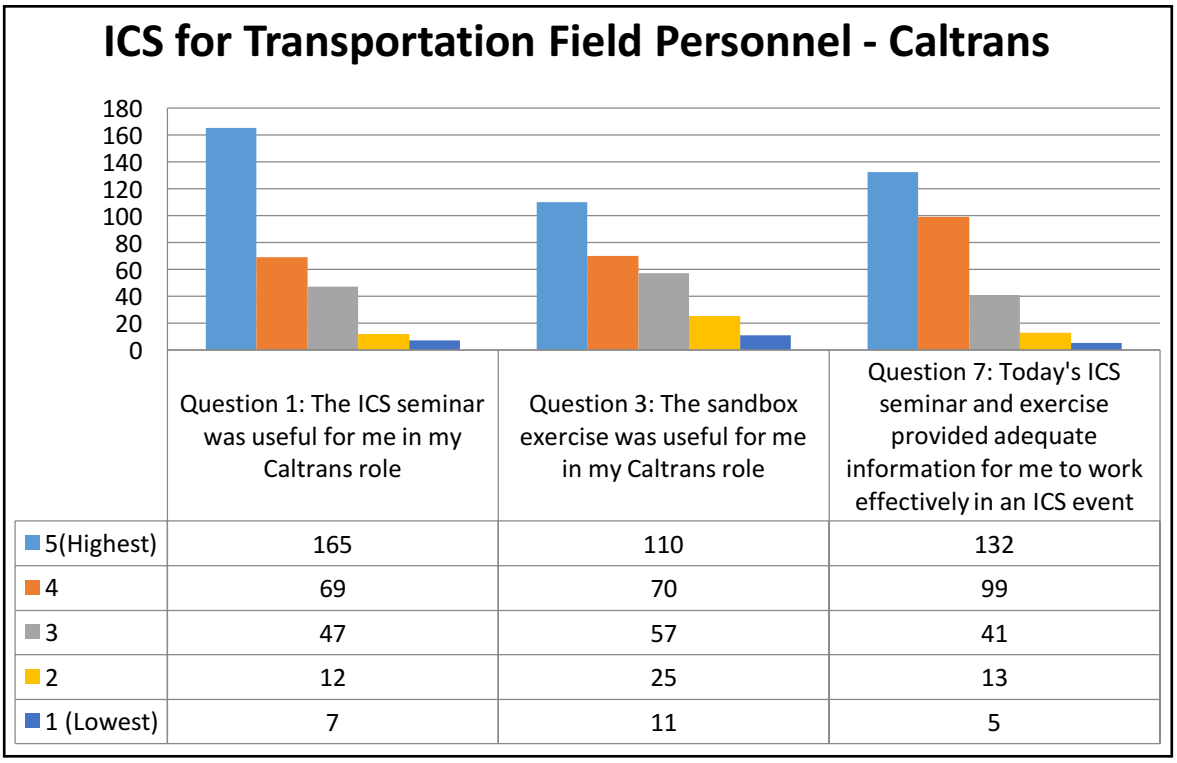


Figure 11. ICS Training Responses

Table 20. ICS Question 2

Q 2 The Most Important Thing I Learned	Respondents
ICS Roles/First Responder	53
ICS Organization	35
ICS Processes	21
Communication	19
ICS Structure	21
Documentation	19
All of It	17
ICS Setup	10
Safety	10
Field Kits	9
Delegation	9
Personal Preparation	9
Check-In and Checkout	7
When to Use ICS	5
Resource Management	4
Other – Two or Fewer	13
Grant Total	**261**

Table 21. ICS Question 4

Q 4 The Most Useful Thing in Sandbox	Respondents
Role Cards	20
Field Kits	19
All of It	19
Delegation	15
Exercises	15
ICS Roles	14
Documentation	10
ICS Progression	15
FOG	6
Chain of command	4
First Response Role	4
Safety	9
Other- Three or Fewer Each	17
Grand Total	**167**

Table 22. ICS Question 5

Q 5 Should Be Added to Future Trainings	Respondents
More Exercises	29
Multi-Agency Training	25
Highway Patrol Interaction	12
Train Field Crews	10
Use Videos	7
Do Regular Trainings	9
More Time	4
Supervisors Should Attend	4
ICS-Specific Issues – FOG, Roles	4
How To Do Paperwork	4
Recent Disasters	3
Other = Less than Three Each	18
Grand Total	**138**

Table 23. ICS Question 6

Q 6 Should Be Eliminated from Future Trainings	Respondents
Nothing	28
Presentation	21
Other- One Comment Each	10
Grand Total	**59**

V. ANALYSIS

COOP/COG

The COOP/COG course was intended as an awareness-level orientation course. Few of the students who attended the classes had received any previous training on COOP/COG or had thought about such a role for the district. District plans were evolving, so the class served as a developmental point for COOP/COG discussions.

COOP/COG is a difficult concept for most students. They find it unrealistic to imagine solutions to the problems driving the COOP/COG activation. Using solar flares and electro-magnetic pulse (EMP) events as examples created hopelessness; destruction of headquarters by fire was not daunting because of redundancy at the districts and access to information in the cloud. The class did engender a high level of interaction among the students. However, it was clear that most students needed more time to consider the purpose of COOP/COG to see how it might be a district role.

Since there has never been a community COOP/COG event in California, it is difficult to get students to accept that the need for an ERG is realistic. Although the class used the real-world example of the impact on Caltrans of mold found in the materials testing lab, many students thought that there were plenty of alternatives to keep a State transportation agency going without COOP/COG. The size of the state, the size of the transportation agency with its 12 districts, and the availability of resources made it difficult to appreciate the value of COOP/COG. In other parts of the country with more frequent damaging events, staff members might be less resistant to the need to plan for maintaining essential functions across all threats.

The biggest challenge for students was a lack of information about COOP/COG. Students were unsure of what their COOP/COG roles might be. Individuals were curious about COOP as reflected in the qualitative responses in the question tables in the Findings section. Students were interested in their positions, but they would have benefitted from having a copy of a complete COOP/COG plan to better understand the expectations of them in a COOP/COG event. The checklists that were provided by the instructors did not have adequate context.

The presence and active participation of senior executives was beneficial. Their questions and interests encouraged students to take COOP/COG seriously. The checklist development exercise was frequently a discussion of what kinds of roles the students might play and how that related to the possible ERG roles rather than actual product development. Working from personal ERG job descriptions instead of the generic Facilities example provided by the instructors would have enhanced the success of checklist development. Even after discussion of the kind of work that students were likely to do, it was challenging to think of checklist items to guide their ERG work. Pre-assigned roles for class purposes might have provided more context for both learning and checklist development.

In many cases, students could not envision a scenario that would require activation of the ERG. Even though instructors proposed examples, such a reality was beyond

the imagination of some students. Therefore, they could not imagine an operational environment where all resources needed for emergency response could be compromised or unavailable. This made it difficult for them to create a checklist for their ERG position that would be functional in such an austere environment.

Students also participated in a workshop to create getaway kit checklists to support their ERG response. This allowed students to consider the specialized tools and resources that they would need in an ERG alternate facility to carry out their roles in support of State essential functions.[81] The student notebook contains a collection of guidance materials on home and personal preparedness that may help to enhance development of disaster self-sufficiency.

The most effective training is based on district-specific scenarios. COOP/COG has to be based on the worst-case scenarios. This will require some support from the district training officer who is familiar with the local threat analysis. A Bay Area earthquake on the Hayward Fault, requiring District 4 to relocate, might be a meaningful exercise base for them, and the Cascadia Subduction Zone's impending 9.0 Moment Magnitude (9 MM) earthquake event did provide some serious discussion in District 1. However, the other districts did not envision anything that would truly drive COOP/COG in their areas, and supporting a COOP/COG event like downtown flooding in the capital in support of the headquarters seemed routine.

Future classes would benefit from advanced role identification for each student. It would also be desirable to have a COOP/COG plan and a personnel assignment chart available in the classroom. This would help students relate to the training through the lens of their specific potential roles.

EOC

Students in the EOC course were generally more aware of their roles and the potential for EOC activation. Because of the condensed nature of the eight-hour course, some students felt rushed through the new material. There were comments by some students on extending the length of the course, and on seeing a video on how an EOC functioned.

To help students develop an understanding of interrelationships in the EOC, the instructor developed an analogy with a shovel, showing how each EOC section would participate in the identification, acquisition, and use of a shovel to complete a task. This resonated with students because it tied what they were learning in the class to a reality that they understood.

Action planning was new to many students, but they were able to use the system to create effective documentation and presentations. Several commented that action planning would be useful for budget meetings as a decision tool, demonstrating that they saw value in using the approach.

ICS for Field Personnel

ICS was a new topic for many of the students, reflecting the turnover in field-level leadership positions in recent years. Seventy-eight percent of students rated the course as useful for their Caltrans work, affirming the value of practical application elements in the sandbox exercise and quick start cards.

Students expressed an interest in the ICS process. Table 20 shows that field-level application of ICS principles was the most important information to students, They were interested in the ICS process for managing field events. The list is long but closely ties to the basic features of the system, such as change of command, documentation, and communication. The class members succeeded in providing a tie to their work experiences.

Another theme was the value of the scenarios and the desire for follow-up exercises. This follows the research stating that adults prefer training they can immediately apply to their own work. Scenario-based training engendered discussion; students noted the value of guidance on working within the ICS, such as check-in/checkout and chain of command, especially the need for face-to-face meetings. Most were interested in the JOPS and the roles of the transportation agency and law enforcement at highway emergencies.

VI. CONCLUSIONS AND RECOMMENDATIONS

The success of the set of training classes suggests that State transportation agency employees are receptive to training in their emergency services roles. As shown in Table 24, those who completed the surveys were generally very satisfied with the usefulness of the classes for their Caltrans roles. The table shows how many (and what percentage of) students rated the class a 5 or 4 for usefulness for their Caltrans role. The qualitative comments suggested that students need more training and practice. Refresher courses and exercises would enhance retention of information on the roles students would play within the ICS/SEMS/NIMS.

Table 24. District Responses to Courses

District	COOP/COG Total Surveys	Total 5s	Total 4s	EOC Total Surveys	Total 5s	Total 4s	ICS Total Surveys	Total 5s	Total 4s
3	7	5	1	38	17	15	13	6	4
10	6	3	3	9	6	3	9	5	4
7	9	3	6	23	15	6	25	12	7
5	13	5	6	27	18	8	32	18	10
4	1	1		10	8	1	29	14	8
1	10	6	3	21	11	5	25	10	6
2	4	1	2	20	9	5	17	2	5
8	16	7	7	38	26	7	38	25	7
12	5	3	2	23	19	2	17	7	4
11	10	3	5	18	15	1	32	27	3
9	12	7	3	14	7	4	15	8	4
6	8	6	2	17	11	5	30	19	5
D-8 make-up	5	4	1	12	7	3	12	6	2
META makeup	5	5	0	12	12	0	6	6	0
TOTALS	**111**	**59**	**41**	**282**	**181**	**65**	**300**	**165**	**69**
	5 or 4 = 90%			**5 or 4 = 88%**			**5 or 4 = 78%**		

The conclusion drawn from this material is that State transportation agencies would benefit from a regular planning, training and exercise cycle to support staff readiness for emergency management. Federal or State laws and regulations mandate some of the training. Other training is prudent to ensure that agencies' essential functions can be continued under all circumstances, including catastrophes. Because DHS no longer mandates the delivery of NIMS courses to as many staff members, there is now an opportunity to customize the training and exercise cycle to transportation's risk-based needs. As shown in the Learning Pyramid, Figure 4, research in andragogy has shown that "practice by doing" raises information retention by adult learners to 75 percent. Exercises are therefore critical to raise retention of emergency management knowledge, skills and abilities. A suggested cycle appears in Table 25.

Table 25. Proposed Training and Exercise Cycle for State Highway Agencies

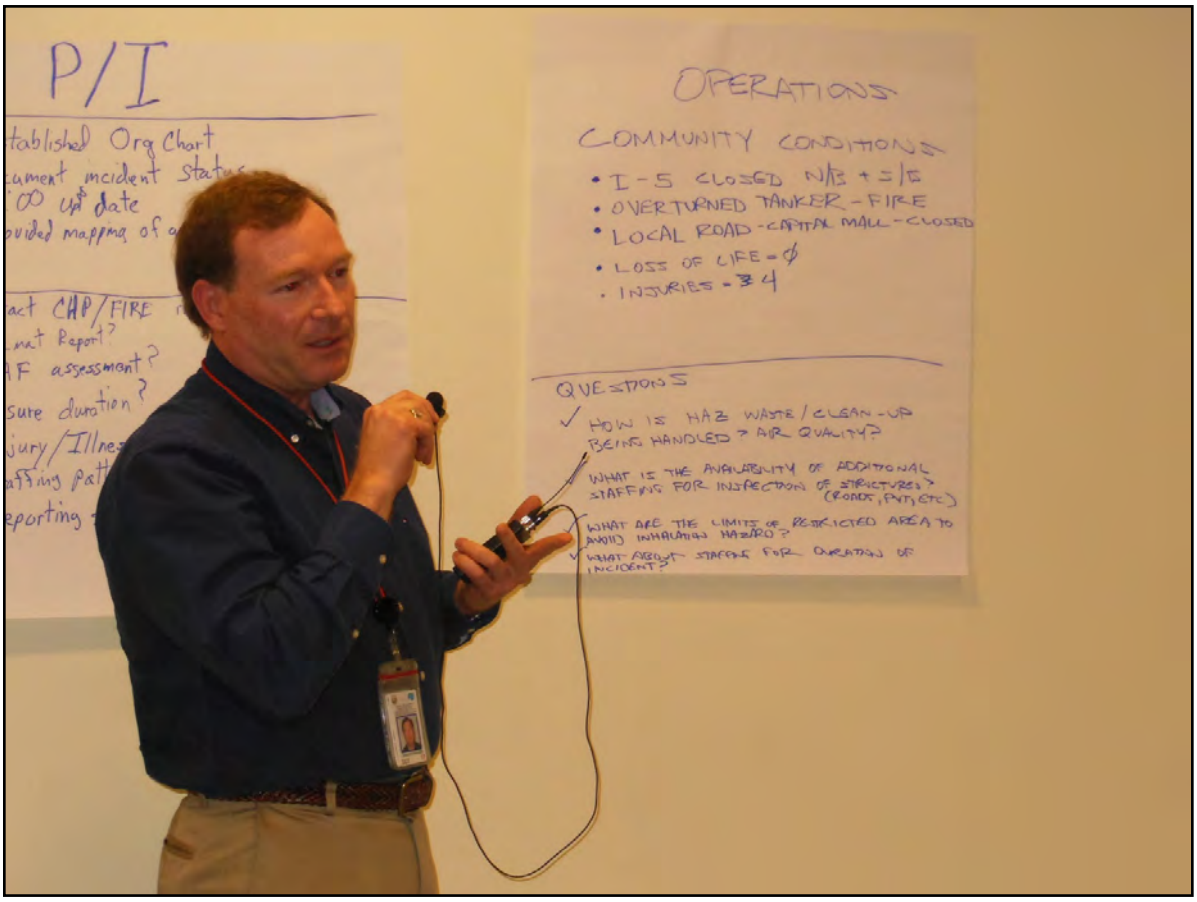
Course	Type	Mandate?	Frequency	Objective	Who?
Disaster Service Worker	Training	State	At hire	Inform all employees of their potential roles in an emergency	All
ICS 100/ ICS 200/IS 700/IS 800 (online)	Overview	Federal/ State	Within first year of hire	Inform all employees of the potential roles and of the operating systems for emergency management	All
SEMS/NIMS (2.5 hour)	Overview	Federal/ State	Within first year of hire	Inform employees of the potential roles and of the operating systems for emergency management	Assigned to EOC/DOC, COOP/COG ERG, others as selected by OEM
State EOC management system (8 hours)	Training	State	Upon assignment	Train EOC staff for their roles	EOC staff, all 3 levels
COOP/COG (4 hours)	Training	Recommended	Upon assignment	Train ERG members for their roles	COOP/COG ERG members
ICS for Field Personnel (4 hours)	Training	Recommended	Within first year of hire	Train field staff on ICS implementation	All field staff
ICS Refresher (15-20 minutes)	Training	Recommended	Quarterly	Refresh ICS knowledge	All field staff
ICS exercise (30 minutes)	Exercise	Recommended	Annual	Practice enhances knowledge retention	All field staff
EOC TTX (time 2 hours to 4 hours)	Exercise	Recommended	Annual	Practice enhances knowledge retention, supports update of EOP	EOC staff, all 3 levels
COOP/COG TTX (time TBD)	Exercise	Recommended	Annual	Practice enhances knowledge retention, supports development of COOP/COG plan and facility	COOP/COG ERG members
EOC/COOP/COG ERG Functional (typically 4 hours including After Action Meeting)	Exercise	Recommended	Alternate years unless there is an activation	Enables the EOC and COOP/COG ERG teams to interact and better understand their roles	EOC staff, all 3 levels; COOP COG ERG members

APPENDIX ONE: PHOTOS OF CLASS ELEMENTS

SEMS EOC: Action Planning, Charts, and Presentations

EOC Planning/Intelligence Section Presentation

EOC Section Meetings



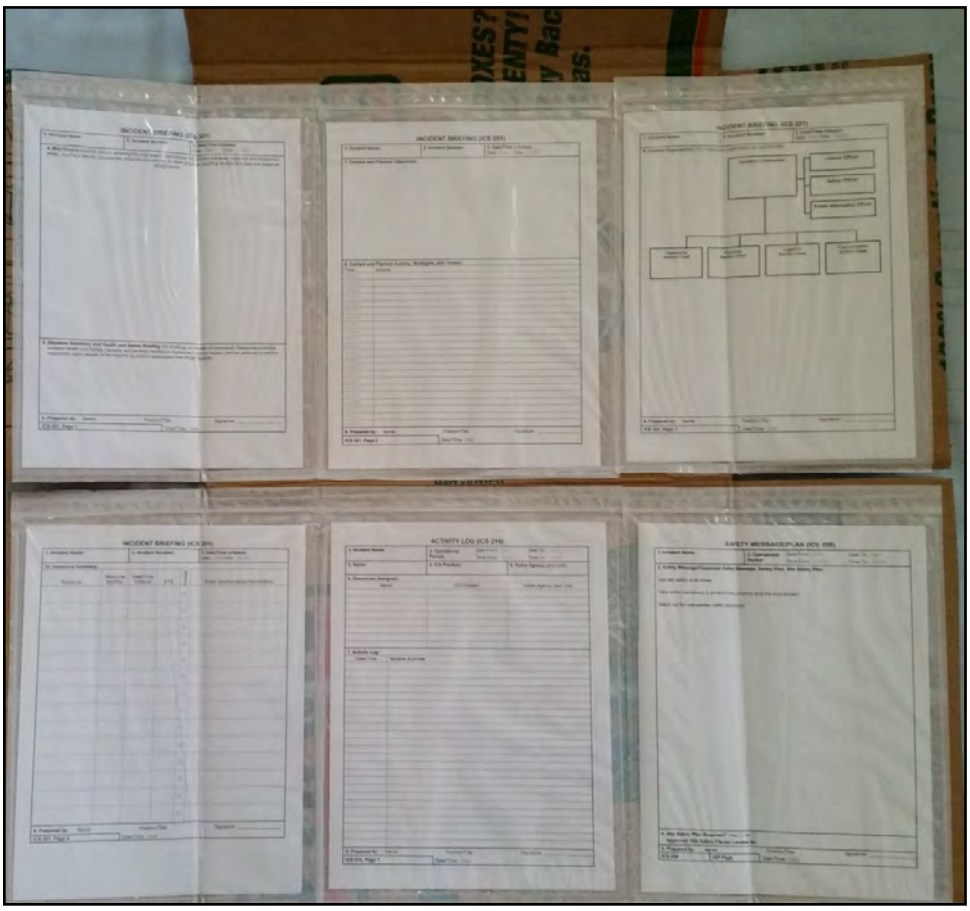
EOC Operations Section Report

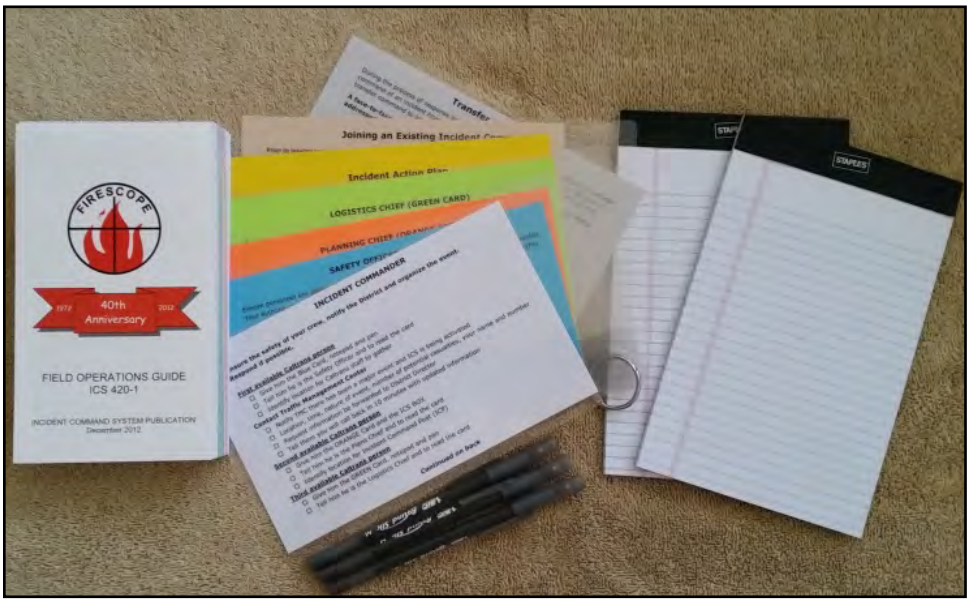
ICS for Field Level Transportation Supervisors and Personnel Course

ICS Forms Display using Supervisor's Folder

ICS Sandbox Simulation with Student Book and Quick Start Cards

Photos of Supervisor's Folder Elements: ICS Forms. FOG, Quick Start Cards





ABBREVIATIONS, ACRONYMS AND GLOSSARY

AAR	After Action Report
AO	Administrative Orders
Caltrans	California Department of Transportation
CHP	California Highway Patrol
CMS	Changeable Message Signs
COOP/COG	Continuity of Operations/Continuity of Government
CT SAT COMM	Caltrans Satellite Communications Vehicle
DHS	Department of Homeland Security
DHHS	Department of Health and Human Services
DOC	Department Operations Center
DSW	Disaster Service Worker
EF	Emergency Function (California)
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
ERG	Emergency Relocation Group
ESF	Emergency Support Function (Federal)
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRESCOPE	Firefighting Resources of Southern California Organized for Potential Emergencies
FOG	Field Operations Guide (ICS Field Operations Guide)
HAR	Highway Alert Radio System
HSPD	Homeland Security Presidential Directive (Bush Era)
IAP	Incident Action Plan (Field-Level)
IC	Incident Commander
ICS	Incident Command System
IS	Independent Study (FEMA)
JOPS	Joint Operational Policy Statement
MEF	Mission Essential Function
META	Maintenance Equipment Training Academy (Caltrans)
MTI	Mineta Transportation Institute
MUTCD	Manual of Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NIMS	National Incident Management System
NTSSC	National Transportation Safety and Security Center
OEM	Office of Emergency Management (Caltrans)
OES	Office of Emergency Services (State of California)
PIO	Public Information Officer, in the field (ICS) or EOC (SEMS)
PMEF	Primary Mission Essential Function
PPD	Presidential Policy Directive (Obama Era)
PPT	PowerPoint
SEMS	Standardized Emergency Management System
SOC	State Operations Center

TRB	Transportation Research Board
US DOT	United States Department of Transportation
VTC	Video teleconference (Caltrans' system)

Glossary	
9-11	September 11, 2001, the date of terrorist attacks on the World Trade Center in New York City and the Pentagon in Washington, DC.
Action Plan	The plan developed to guide the work of the EOC during a specified period of time.
Andragogy	The study of education of adults.
El Niño	A condition when the southern Pacific Ocean water temperature rises, affecting weather conditions in the Western Hemisphere; also known as the Southern Oscillation.
Essential Function	A task that must continue even under the most austere circumstances.
FIRESCOPE	The California-based organization that oversees the development and documentation of ICS.
Incident Action Plan	The plan developed to guide the work of the ICS field response during a specified period of time.
Mission Essential Function	A task that must continue, even under the most austere circumstances, in support of Federal COOP/COG activities.
Mission Tasking	A system for assigning California State agencies to provide assistance out of their normal work areas, and to receive reimbursement from the jurisdiction receiving the help.
Pedagogy	The study of education of children.
Primary Mission Essential Function	A task that is the basis of COOP/COG at the Federal level, and must be continued under even the most austere circumstances.

ENDNOTES

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