FIREFIGHTER SAFETY STUDY

REVIEW OF THE ADEQUACY OF RESPONSE INFORMATION ON HAZARDOUS MATERIALS

Preliminary Report

October 1992

Firefighter Safety Study Act Working Group

Federal Emergency
Management Agency

This document was scanned from hard copy to portable document format (PDF) and edited to 99.5% accuracy. Some formatting errors not detected during the optical character recognition process may appear.

FIREFIGHTER SAFETY STUDY

Review of Adequacy of Response Information on Hazardous Materials

PRELIMINARY REPORT

October 1992

Submitted by the

Firefighter Safety Study Act Working Group

Contents

FOREWORD ..... **iv**

CONTEXT OF THE STUDY **1**

Objectives 1

Coordinating Committee 2
Technical Committee. 3
Field Applications Committee 3

Magnitude of the Problem 3

THE EVOLUTION OF PUBLIC CONCERN **5**

Cleanup of Hazardous Wastes 5

Hazardous Materials Transportation 6

India and West Virginia Incidents 7

Super-fund Amendments and Reauthorization Act 8

Federal Legislation Since Kansas City 10

Synopsis 10

EMERGENCY RESPONSE PROBLEM **11**

The First Responder 11

Hazardous Materials Problem 12

Role of the First Responder 14

First Responder Needs 16

Information Sources 17

ReferenceDocuments 17
Material Safety Data Sheets 18
Placards and Other Sources of Product Information 19

Training 20

First Responder Awareness 21
First Responder Operational 21
Hazardous Materials Technician 22
Hazardous Materials Specialist 22
On-Scene Incident Commander 22

Emergency Planning 22

FINDINGS 25

Existing Information 25

Data Collection 27

Training 27

Fiscal Considerations 29

SARA and Other Legislative Authorities 30

Response Plans 30

Material Safety Data Sheets 31

Product Identification 33

Placarding 33

Shipping Papers 34

Materials Not in Transit 34

RECOMMENDATION: AN IMPROVED FORMAT 35

Risk Management 36

Page Layout for Each Chemical 36

Ease of Use 37

SELECTED BIBLIOGRAPHY 39

GLOSSARY 41

FIREFIGHTER SAFETY STUDY ACT WORKING GROUP . . . 43

Foreword

This preliminary report is the result of the efforts of a group of experienced professionals from federal, state, and local governments and from the private sector who volunteered their time and experience over a 2-year period. The report focuses on the recommendations from the Technical and Field Applications Committees-the two principal working committees-with additional insight from the Coordinating Committee.

This report is not intended as a scientific analysis in the traditional sense. Instead, it largely represents the collective judgment of the experts who served on the three committees, backed by a review of literature and collection of data. These individuals occupy positions of responsibility and authority in the fields of hazardous materials, hazardous materials incidents, and the consequences of hazardous materials incidents. The committees worked independently, but reached similar conclusions, which were refined at a joint meeting.

The two committees, initially working independently, each developed their own analytical approach to the objectives of the study and eventually came to the same tentative conclusion, which was refined in a final joint meeting. The conclusion that a majority of the members of the two committees reached was that none of the existing data sources had been specifically designed to meet the needs of the first responder in the face of the full range of hazardous materials incidents, both transportation and fixed facility They proposed that a new format be developed on an experimental basis, and if it proved possible to develop along the lines suggested, that it be field tested to establish its utility

It is extremely important that the recommendations presented in this report be interpreted correctly All of the various sources examined are routinely used in the field and heavily relied upon, depending on the nature of the incident and the expertise of the individuals concerned. In terms of the training and experience of the responder, especially for those with limited training and experience, the *Computer Aided Management of Emergency Operations,* or CAMEO (for those first responders with some microcomputer experience and access to the necessary hardware and software), Association of American Railroads, *Emergency Handbook of Hazardous Materials in Surface Transportation,* and the Department of Transportation *Emergency Response Guidebook* (ERG) received high ratings in the field evaluation. The fact is that the ERG is the most up to date, widely used, and frequently relied upon field guide currently available to first responders. It is currently being revised to meet its S-year publication cycle.

This report does *not* recommend the replacement of any of the existing sources. Rather, it recommends that an attempt be made to develop material for a very narrowly defined audience -the first on-scene police officer, emergency medical technician, or fire company officer-across the full range of probable hazardous materials incidents they may face. Such a document, should it prove practical to develop, would be a supplement to existing data sources and training programs.

The problem that faces emergency response personnel, particularly fire department personnel, is preparing to deal with the high-risk, low-probability threats that face the communities they serve. When such incidents do occur, fire and public safety personnel will do their best to contain and mitigate the incident regardless ofwhether they are properly certified; in most cases, it is their sworn duty. Thus, since their dilemma will not be resolved simply by training or by providing them with technical information that they may not be equipped to utilize, field guides such as the ERG and the document proposed in this report represent essential aids to the personnel in the field.

This preliminary report is incomplete in that not all of the work of the Technical Committee has yet been documented. This supporting detail and associated work papers will be provided as appendices as they become available. Notwithstanding this omission, the findings and recommendations contained in this preliminary report are fully supported by the contents herein.

I wish to thank all the members of the committees, especially those outside the federal government, who contributed a large amount of their personal time to ensure that this work was performed thoroughly and accurately. I also wish to thank Mr. Tony Jover of EPA, Dr. Jean Snider of NOAA, and Chief Steven Bailey of the Seattle Fire Department without whose personal commitment this project could not have been undertaken. Finally, without the effort and support of my associate, Ms. Patricia Frazier, this report would not exist.

JOHN HART
Chairman, Firefighter Safety Study Act
Working Group
October 1992

Context of the Study

The Firefighter Safety Study Act of 1990 directed that the administrator of the U.S. Fire Administration (USFA)-

> *...conduct a review of existing response information used by emergency response personnel at the state and local levels to evaluate its accuracy and consistency and to determine whether it is properly expressed. Such information should clearly communicate to emergency response personnel the probable hazards which they must contend with in an emergency situation involving hazardous materials, and the appropriate response to those hazards.*

To accomplish this, the administrator was directed to establish a Working Group that would report its findings to him and to the Congress.

The act further directed that the Working Group include the appropriate federal regulatory agencies (Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and the Bureau of Alcohol, Tobacco and Firearms (BATF), representatives from chemical manufacturers, and representatives from state and local emergency response and firefighting organizations. Upon completion of the review, the Working Group is to submit a report that includes recommendations to ensure that response guidance available to emergency response personnel is appropriate for operational performance at the local level.

Objectives

The objectives of the study were to:

- Define the nature and role of first responders (i.e., those first on the scene of an emergency involving hazardous materials who have decisionmaking authority for the initial course of action).
- Clarify understanding of the needs that response guidance for first responder is intended to fulfill (i.e., the information that emergency responders require, the level of detail, and the best means of transmitting this information).
- Develop a practicable methodology for evaluating the technical accuracy of the existing response guidance and information sources.

- Evaluate the information available in light of the above, and comment on the appropriateness, clarity, and completeness of existing response information.
- Develop recommendations generally achievable within the constraints of existing resources and authorities.

To adequately address these objectives, the chairman of the Working Group established three committees: a Coordinating Committee and two working committees, the Technical Committee and the Field Applications Committee. In addition, a secretariat function or Steering Committee, composed of staff from the EPA, NOAA, and USFA, supported the work of these three committees.

Coordinating Committee

The Coordinating Committee reviewed the work of the Technical and Field Applications Committees, identified and addressed issues that surfaced during the period of the study, and made recommendations for both the scope of the study effort and the content of the final report, The committee was composed of representatives of federal agencies (DOT,EPA,USFA,OSHA,BATE and NOAA) , state and local officials (fire officials from Prince William County, Virginia; Seattle, Washington; Orange County, California; Kansas City, Missouri; Boston, Massachusetts; and New York State), and the chemical industry (representatives from the Chemical Manufacturers Association). All of these participants either develop or have the responsibility for the maintenance of guidance being used by first responders in hazardous materials incidents.

Technical Committee

The Technical Committee evaluated the accuracy and completeness of information and attempted to determine whether this information focused on the needs of first responders. The committee also identified the types of information about a chemical or hazardous material that would be necessary to make a safe response in an emergency situation. The Technical Committee worked in conjunction with the Field Applications Committee to determine what constitutes vital information and to recommend appropriate formats for this information. The committee was composed of technical representatives from federal agencies (NOAA, EPA, U.S. Coast Guard

(USCG), and the Centers for Disease Control (CDC), academia (Louisiana State University), industry (Monsanto Corporation), the private sector (Louisville Poison Control), and local officials (Bucks County (Pennsylvania) Emergency Management Agency, and the Wichita Fire Department).

Field Applications Committee

The Field Applications Committee evaluated the appropriateness of existing response guidance for first responders. It worked with the Technical Committee to identify, from the perspective of field use during emergencies, information needs and information presentation requirements of first responders. The committee was composed of fire and emergency service personnel from the New York State Fire Administrator's Office; the Illinois State Fire Marshal's Office; and the fire departments of Seattle, Chicago, and Boston-all users of response guidance in emergency situations.

Magnitude of the Problem

Defining, quantifying, and assessing the potential risks associated with hazardous materials is a substantial task. The DOT defines hazardous materials as substances or materials capable of posing an unreasonable risk to health, safety, property, and the environment when transported in commerce. The EPA divides them into four categories: extremely hazardous substances, hazardous substances, hazardous chemicals, and toxic chemicals. They range from the familiar to the exotic, from paint and paint strippers to gasoline and diesel fuel, to dimethylhydrazine and ethylene dibromide.

More than 575,000 chemical products are produced in an estimated 11,000 chemical plants in the country, many near major population centers. According to the Congressional Research Service, approximately 75 percent of Americans live in the vicinity of facilities that handle, treat, or store hazardous chemicals. Approximately 4 billion tons of regulated hazardous materials are transported each year throughout the United States. According to DOT estimates, there are about 500,000 hazardous materials shipments per day, or 183 million shipments per year. Two-thirds of all hazardous materials shipped in the United States is transported by rail, trucks, or pipelines, with barges traveling along rivers carrying the next largest amount.

The vast majority ofhazardous materials are manufactured, stored, and transported safely But because the potential for disaster is so great, public awareness of the need for safe handling of hazardous materials is high. So, too, is concern by firefighters, police, emergency medical personnel, and others who put their lives on the line as the first to respond to emergencies where hazardous materials may be present. In 1991, the most recent year for which data are available, the National Fire Protection Association reports that fire departments in the United States responded to more than 221,000 emergency incidents involving hazardous materials.

No event in recent memory more effectively underscored the potential danger to first responders in incidents where hazardous materials are present than the deaths of six Kansas City firefighters in November 1988. These deaths occurred when 45,000 pounds of ammonium nitrate/fuel oil (ANFO) exploded in a burning trailer at a construction site. In response to this tragedy, Congress passed the Firefighters' Safety Study Act (P.L. 101446) to improve the information available to emergency response personnel in the field.

The sections that follow synthesize the discussions, observations, and work of the committees that comprised the Working Group, which was established under the provisions of the act.

The Evolution of Public Concern

The first "hazardous materials" legislation was enacted prior to the turn of the century. Twenty years ago, however, most of the federal, state, and local laws and regulations that address hazardous materials safety issues today did not exist. The impetus for these laws was increased public concern arising from a series of events that raised awareness of the existence, extent, and risks posed by potentially hazardous materials. At the same time, heightened concern within the emergency response community led industry groups and fire departments to take actions to address these risks, which prompted enactment of numerous state laws regulating the transportation and handling of hazardous materials on site and in transport.

One of the first federal laws addressing materials that are hazardous to the environment was the Federal Water Pollution Control Act, which in 1974 established the National Response Center (NRC) under the National Oil and Hazardous Substances Pollution Contingency Plan. The NRC is a 24-hour point of contact service operated by the U.S. Coast Guard for the reporting of hazardous materials spills or other releases into the environment. The contingency plan also established (1) a National Response Team composed of representatives from 15 federal agencies having emergency preparedness and response responsibilities, and (2) 13 Regional Response Teams composed of federal agency and state emergency preparedness and response officials. These national and regional teams are not emergency responders in the traditional sense; their function is to identify state and federal resources and maintain a contingency plan for the coordinated use of those resources.

Cleanup of Hazardous Wastes

The 1980s saw a dramatic increase in public awareness and alarm about hazardous wastes and other hazardous materials, and numerous federal and state laws were enacted to address what seemed to be a constantly changing and growing problem. The public first began to learn about hazardous materials when the contamination of the Niagara Falls, New York, neighborhood of Love Canal focused attention on the health and safety dangers posed by unregulated disposal of hazardous wastes.

In response to Love Canal, Congress passed the Comprehensive Emergency Response, Compensation, and Liability Act of 1980 (CERCLA), or the "Superfund" program. Its primary purpose was to allow federal funds to be used to mitigate or clean up hazardous materials spills and compensate local and state government for their part in such cleanup activities. The act focused on long-term health dangers posed by hazardous wastes and contained little beyond its title that pertained to emergency response.

When Superfund was first passed, the cleanup program was believed to be a response to a relatively limited problem. Congress gave the EPA $1.5 billion to find and clean up 400 hazardous waste sites. Cleanup of a site was expected to be a relatively inexpensive operation involving the removal of a few containers or scraping a few inches of soil from the ground. Love Canal, originally thought to be an isolated incident, was joined by other communities including Times Beach, Missouri, and Woburn, Massachusetts.

By 1985, the idea that hazardous materials were confined to a few isolated sites had completely changed. The Congressional Office of Technology Assessment estimated that there were as many as 10,000 sites across the country requiring cleanup under the Superfund program. The total cost of such magnitude was estimated at over $100 billion. It was now clear that hazardous wastes were virtually everywhere, and the list of hazardous materials no longer included only exotic chemicals with unpronounceable names. Superfund sites ranged from industrial plants to riverbeds to community landfills where small businesses and households disposed of solvents, paints, and cleaning fluids.

Hazardous Materials Transportation

Attention was also being focused on the problems associated with the transport of hazardous materials. In 1971, the Chemical Manufacturers Association established the Chemical Transportation Emergency Center (CHEMTREC) to provide information to responders on handling chemical incidents. Incidents such as the one in 1975 that caused 43 Los Angeles firefighters to be hospitalized after exposure to a harmful pesticide at a tractor-trailer accident underscored the potential dangers faced by emergency responders encountering dangerous chemicals at accidental releases.

In 1975, supported by the DOT Highway Safety Programs, New York State started the first statewide firefighter training program to

teach firefighters how to control hazardous materials incidents. Also in 1975, the Michigan State Police developed a specialized hazardous materials training program and provided technical assistance to incident commanders at the sites of hazardous materials incidents. In 1976, the Los Angeles City Fire Department started to provide on-scene commanders technical assistance using their own mobile laboratory. By 1977, the first hazardous materials response teams were born, led by the Jacksonville (Florida) Fire Department.

By the 198Os, many fire departments were keenly aware of the need to gain technical knowledge on hazardous materials. It was during this period that many fire departments, regardless of size, began to develop hazardous materials response capabilities and to provide protective equipment for firefighters,

The Federal Hazardous Materials Transportation Act (HMTA), enacted in 1975, consolidated responsibilities previously dispersed among numerous agencies under the DOT; defined regulated materials; authorized regulation of labeling, placarding, packages and containers, and handling practices; continued enforcement powers; and preempted inconsistent state laws.

India and West Virginia Incidents

Until late 1984, public concern and government actions had been confined primarily to the cleanup of hazardous waste sites and to determining the long-term effects of exposure to hazardous wastes. That changed on December 3, 1984, when a cloud of methyl isocyanate from a Union Carbide manufacturing plant in Bhopal, India, killed more than 2,500 and injured an estimated 200,00 people. When the Bhopal tragedy was followed by an accidental chemical release on August 11, 1985, at another Union Carbide plant at Institute, West Virginia, public concern turned to alarm. Although the West Virginia release was not serious, it underscored for many Americans the lack of information about hazardous substances in their communities and about the health hazards associated with exposure. It also focused attention on the inadequacies of emergency response capabilities.

These tragedies triggered a chain of events that culminated with enactment of new federal legislation in late 1986. The EPA established the voluntary Chemical Emergency Preparedness Program (CEPP) to make state and local officials aware of the potential for

accidents involving extremely hazardous substances and to foster development of state and local emergency plans.

At about the same time, the Chemical Manufacturers Association, an industry group representing 90 percent of the productive capacity of basic industrial chemicals in the United States, established a voluntary program called Community Awareness and Emergency Response (CAER) to encourage plant managers to become more involved in their local community by explaining their plant's operations and participating in local emergency planning.

Environmental and labor groups became more active in working for local and national legislation to protect against chemical accidents, and more than 30 states passed laws (some before Bhopal) giving workers and citizens access to information about hazardous substances in workplaces and communities. Most of these laws required the reporting of toxic chemical releases and the presence of hazardous substances. In some cases, this information was made available to the public.

Superfund Amendments and Reauthorization Act

When President Reagan signed the Superfund Amendments and Reauthorization Act (SARA) into law on October 17, 1986, many of the voluntary programs dealing with hazardous materials were made mandatory. Although SARA was primarily an expansion of the Superfund hazardous waste cleanup program, two sections of the act provided guidance previously not addressed: Title I addressed training and training requirements for hazardous materials responders; and Title III contained a new authorization, the Emergency Planning and Community Right-to-Know Act (EPCRA), as a direct response to the Bhopal tragedy EPCRA provides for community-wide planning for chemical emergencies, emergency notification of chemical accidents and releases, reporting of hazardous chemical inventories, and reporting of chemical releases.

The comprehensive, mandatory training standards established by Title I for emergency response personnel who must deal with hazardous materials incidents are articulated in terms of hours of training and competency to be achieved. The content or nature of the mandatory training is not prescribed. The standards established five levels of hazardous materials training: first responder awareness, first responder operational, hazardous materials technician hazardous materials specialist, and on-scene incident commander.

For each level, there is a list of skills necessary to perform specific protective or mitigation functions, as appropriate at an incident. The standards can be met either by formally documented training or by the formal certification that an individual in the emergency response organization possesses the necessary skills based on experience or a combination of training and experience.

Title III establishes a new framework for improved community preparedness and notification around facilities that handle hazardous substances. Governors appoint state emergency response commissions (SERCS) that establish emergency planning districts and appoint, supervise, and coordinate local emergency planning committees (LEPCs). LEPCs develop local emergency response plans and review them at least annually Facilities are required to notify SERCs and LEPCs and the National Response Center of accidental releases of hazardous substances above “reportable quantities” that extend beyond the boundaries of the facility, and to submit written reports on actions taken and on medical effects. Covered substances include a list of 366 “extremely hazardous substances" and over 700 substances subject to the emergency notification requirements of the Superfund hazardous waste cleanup law.

Title III requires that information about specific chemicals used, stored, or produced at local facilities be submitted to fire departments and LEPCs and SERCs in the form of Material Safety Data Sheets (MSDSs) or lists of MSDs chemicals. Reporting for this part of Title III is not limited to a specific list of chemicals, but rather on a definition of a “hazardous chemical” defined by OSHA As many as 500,000 products can fit the definition and, if present in amounts above specified thresholds, must be reported. An estimated 4.5 million facilities nationwide are required to provide these reports and to submit annual inventories of these same hazardous chemicals to the LEPC, SERC, and local fire department.

These regulations cannot prevent hazardous materials incidents. They should, however, help provide the means of notifying the public of potential hazards and to help emergency planners and responders effectively manage potentially dangerous situations.

Federal Legislation Since Kansas City

Since 1988, at least two federal laws have been passed dealing with hazardous materials issues: the Firefighter Safety Study Act of 1990 (FSSA), which directed the activities described in this report, and the Hazardous Materials Transportation Uniform Safety Act of 1990 (HMTUSA). The latter is the first substantial revision to the federal transportation regulatory scheme since the 1975 HMTA.

One of the most important provisions of HMTUSA is the direction to DOT to establish a schedule of registration fees for shippers and carriers of hazardous materials. Of particular interest to local emergency response personnel is the creation of a national grant program to help prepare local communities to deal with hazardous materials incidents. This program, funded from the revenues generated by user fees, authorized $5 million for planning grants, of which 75 percent must be a pass-through to the local level, and $7.5 million for first responder training. In the training grant program, there is no requirement that the funds pass directly to the state and local level, although it is stipulated that 75 percent of program activities must benefit localities. This act is a positive response to state and local criticisms that the federal government has imposed significant burdens but has provided little or no tangible assistance.

Synopsis

The continued public awareness and concern about hazardous materials has resulted in the establishment of a number of mandatory requirements that are intended to assist local jurisdictions. These requirements have established training and operational standards, mandate the provision of information in different forms to identify specific hazards and appropriate response, and forced the development of response plans. Any assessment of the quality and appropriateness of response guidance used by first responders in the field must be made in the context of those measures that have been established to enhance local preparedness. The nature and effectiveness of these other measures provide the background against which the needs of the first responder must be established.

Emergency Response Problem

To adequately review and evaluate the existing response information available to emergency responders as required by the FSSA, it is necessary to address, at least in general, the arena of emergency response. Key to this is a complete understanding of the role of the first responder, how hazardous materials affect this role, and the information that first responders require. This section discusses these issues and provides the framework for the findings and recommendations of the FSSA Working Group.

The First Responder

As defined by the Working Group, the *first responder* is the individual first on the scene who is responsible for the decision for the initial course of action, This individual is a public safety official, most likely a fire company officer of a paid or volunteer fire department, a police officer, or emergency medical service (EMS) personnel. This first responder is generally responsible for determining that hazardous materials are involved and for initiating defensive procedures. There are three levels of first responders as defined by the NFPA / OSHA standards: those trained at the “awareness" level, those trained at the “operations” level, and those trained at the “technician” level. The first responder must be trained to or certified at the operations level in order to direct the initial course of action.

These individuals are usually high school graduates, many with further educational backgrounds or additional vocational training. By the nature of their chosen occupations as firefighters, policemen, or EMS personnel, these individuals tend to be risk takers. Firefighters, for instance, are trained to save lives and property-actions that are inherently risky And it is precisely the qualities that make a successful firefighter that do not necessarily make a cautious first responder.

The nature of emergency response operations is significantly different from most normal human activities in that it is, in a sense, a disciplined-learned form of panic. For most population groups, panic is a frenetic unthinking reaction to a dangerous or frightening stimulus. However, individuals who regularly face situations involving potential risk to themselves may be said to be engaging in disciplined panic-a series of carefully learned and rehearsed

reactions to instinctively recognized cues. Such professions include pilots, soldiers, seamen police officers, and fire fighters. Their behavior is the product of character, training, and experience, and their cumulative impulse is to act. Not unthinkingly, because the thought that links the appropriate action to the cue has been digested long before and honed by repetitive experience.

For firefighters engaged in fire suppression rescue, or emergency medical service activities, there is the additional impetus of not just surviving but accomplishing a positive end-saving the building, rescuing someone trapped by the fire, saving the life of a seriously injured victim. Communities generally expect their firefighters and EMS personnel to effectively mitigate a dangerous situation, whatever its nature, to protect lives and property. Almost universally, these individuals have the same expectation of themselves; it is their motivation in joining, the core of their personal and professional identity, and the impetus of their training and experience.

A successful hazardous materials incident response requires the responders to first stop, use caution, obtain as much information on the hazard as possible, and only then proceed. Therefore, the challenge in a hazardous materials environment is to convince or retrain individuals, who by nature of their experience, training, and the demands of their public responsibilities are driven to act, that a pause for reflection may be the best course of action. Put simply, the "if you think, you're dead" mentality must change to "if you don't think, you'll die."

Hazardous Materials Problem

Comprehensive data on hazardous materials incidents, other than casualty information are elusive. There are many sources for hazardous materials information: the EPA Acute Hazardous Events (AHE) and Accidental Release Information Program (ARIP) databases, the Chemical Manufacturers Association CHEMTREC database, the National Fire Protection Association (NFPA) Annual Survey of Fire Departments, the USFA National Fire Incident Reporting System (NFIRS) database and its associated HazMat module, and the DOT Research and Special Projects Administration's Incident Data, to name a few. Each of the sources, however, appears to be in response to a specific reporting, tracking, or program requirement or is not intended to capture the full range of hazardous materials incidents. The Center for Risk Management has attempted to develop a database for major industrial accidents, defined as those involving five or

more fatalities, but this definition in itself is limiting. Moreover, there is confusion among the sources as to "incidents" versus "releases. 99

Although the total picture of the national U.S. hazardous materials problem is unclear, the data that do exist may distort the actual situation. For example, NFPA estimates 221,000 emergency incidents that range from spilled gasoline to toxic chemical releases while the Center for Risk Management identifies only 118 major industrial accidents from 1947 to 1986. Clearly, many of the NFPA incidents are not of a serious environmental nature nor a major health and safety risk.

A similar data problem exists when assessing the risk of hazardous materials to first responders. The Kansas City tragedy is a graphic example of the risks faced by firefighters and other emergency responders, but there simply is no single comprehensive source of data on firefighter deaths or injuries in emergency incidents involving hazardous materials. DOT estimates that during the 1980s the number of fatalities resulting from accidents or releases related to transport of hazardous materials averaged 11 per year, but no emergency responders were among the fatalities in their records. The detailed information in the USFA Firefighter Fatality Analysis program, however, indicates that 27 firefighters died from December 1983 to September 1991 responding to hazardous materials incidents, approximately three per year. Of these deaths, two might be classified as "transportation related" because they involved pipeline gas leaks; one involved LP gas and the other natural gas. In 26 of the incidents, death resulted from either traumatic injury or burns directly caused by the hazardous material involved in the incident. The one exception was a firefighter killed in an accident at the scene that was unrelated to the hazardous material. The remaining 24 deaths appear to have resulted from incidents in fixed facilities.

These data tend to substantiate the observation that firefighters may be at a disadvantage when dealing with fixed-facility incidents because of their relative infrequency Fixed-facility incidents represent a unique circumstance within the probable experience of the average fire department as well as the average firefighter within that department. It is here that product-specific information proves valuable. Although firefighter deaths due to hazardous materials seem to be relatively small, the sheer volume of existing hazardous

materials and the number of incidents where hazardous materials are accidently released underscore the potential risks to emergency responders.

Role of the First Responder

Although the data are sparse, it appears that the role of the fast responder in many of the hazardous materials incidents is confined to the containment of the hazardous materials, protection of civilians, and use of emergency response resources. Some incidents have further consequences: environmental or property damage, evacuation or isolation of population groups, and psychological effects on the community. Any improvements that could help in the initial management of hazardous materials incidents and the availability of better tools for emergency responders would have significant benefits.

The NFIRS database represents the best source for ascertaining the role of the first responder in hazardous materials incidents. Although this database reflects only fire incidents from approximately one-third to one-half of the nation's fire departments and does not distinguish between first responders and other emergency responders, it nonetheless provides insight into the types of hazardous materials incidents and the level of personal risk that, at a minimum, firefighters face. Queries of the NFIRS database revealed that between 1986 and 1990 an average of 100,412 incidents (10.4 percent) involved hazardous materials as defined below:

- Petrocarbons:
  - Flammable, combustible gas
  - Class IB flammable liquids (includes JP-4 jet fuel)
  - Gasoline
  - Class II combustible liquid (includes kerosene, fuel oil, and diesel fuel).
- Other hazardous materials:
  - Class IA flammable liquids (flash point less than 73°F)
  - Combustible metals
  - Solid chemicals (including explosives)
  - Radioactive materials.

These incidents resulted in an average of 966 firefighter injuries (6.8 percent) and approximately three firefighter deaths (10.4 percent).

The injury rate for hazardous materials is 50 percent lower than for all fire incidents, indicating a higher degree of caution on the part of responders to hazardous materials incidents.

When these incidents are split into those involving petrocarbons and those involving other hazardous materials (or nonpetrocarbon incidents), the data clearly indicate that the latter place firefighters at substantially more risk. Also, the hazardous materials that firefighters mostly respond to appears to be gasoline, diesel fuel, and other petrocarbon fuels.

Both the injury and the death rates are lower for petrocarbon hazardous materials incidents than for the smaller set of incidents involving serious hazardous materials. The injury rate for nonpetrocarbons is 2.5 times higher than the rate for petrocarbons; the death rate is 4.7 times higher. Moreover, petrocarbon incidents have lower casualty-per-incident ratios, which indicates that the risk is lower for these incidents.

NFIRS Incident Data, 5-Year Average (1986-90)

	Hazardous Materials Incidents (percent)	**Total Incidents**
Incidents	100,412 (10.4)	**969,904**
Firefighter Injuries	966 (6.8)	14,144
Firefighter Deaths	3 (10.4)	27
Firefighter Injuries/ 1,000 Incidents	9.6	14.6
Firefighter Deaths/ 100,000 Incidents	2.8	2.8

NFIRS Hazardous Incident Data, & Year Average (1986-90)

	Petrocarbon Incidents	Non-petrocarbon Incidents	Total Hazardous Materials Incidents
Incidents	96,990	3,422	100,412
Firefighter Injuries	884	82	966
Firefighter Deaths	2.4	0.4	2.8
Firefighter Injuries/ 1,000 Incidents	9.1	24.0	9.6
Firefighter Deaths/ 100,000 Incidents	2.5	11.7	2.8

NFIRS Incidents Involving Hazardous Materials Casualties, 5-Year Average (1986-90)

	Petrocarbons	Nonpetrocarbons
Casualties* (Deaths and Injuries)	886	82
Incidents	648	43
Casualties/Incident	1.4	1.9

*Rounded

First Responder Needs

First responders face many risks when responding to hazardous materials incidents. They require resource materials that are easy to read and access under the severe conditions presented by hazardous materials incidents. Detailed knowledge of the hazardous material involved in the incident is essential in choosing the proper firefighting and containment methods. First responders must be able to identify hazardous materials not only by recognizing containers that are typically used for transportation and storage, but also by the shipping papers, placards, and other markings.

First responders must be aware of the risks associated with specific hazardous materials. They must be able to identify the appropriate course of action and know when it is prudent to take no action out of concern for personal safety and the safety of others. Knowing which type of personal protective equipment is appropriate for a particular chemical is absolutely essential. The first responder must also be able to recognize the point at which an accident escalates beyond the

scope of his training and resources, and when it is appropriate to call for assistance. The first responder needs to know the circumstances in which evacuation becomes an option because of the potential for exposure or toxic release. He must know what precautions need to be taken to prevent contamination when rendering first aid.

In short, managing hazardous materials incidents involves a complex interaction of appropriate information about the hazardous materials, specialized training and equipment, and a network of response resources. The following sections detail these needs and itemize the resources available.

Information Sources

The first responder has access to many sources of information from individuals at the scene of the incident to hazards data required by law; from personal experience to reference documents. Some sources are more germane to the first responder's needs than others. This study concentrated on the information available from reference documents, MSDSs, and product identification sources.

Reference Documents

A wide variety of reference documents and response guidance address both the hazardous materials and the appropriate responses to spills, fires, contaminations, or other emergencies. From these documents the working group investigated eight references that are commonly used by first responders:

- *Emergency Handling of Hazardous Materials in Surface Transportation,* Association of American Railroads
- *Computer Aided Management of Emergency Response Programs,* Environmental Protection Agency and National Oceanic and Atmospheric Administration
- *Chemical Transportation Emergency Center,* Chemical Manufacturers Association
- *Chemical Hazard Response Information System, Manual 2,* US. Coast Guard
- *Oil and Hazardous Materials Technical Assistance Data System,* Environmental Protection Agency and National Institutes of Health's Chemical Information System
- *Hazardous Materials Emergency Response Guidebook,* Department of Transportation

- *Fire Protection Guide on Hazardous Materials,* National Fire Protection Association
- *Pocket Guide to Chemical Hazards,* National Institute for Occupational Safety and Health

Each of these was prepared as a reference guide or information repository for a specific, targeted audience. These references, however, provide a wealth of information from which first responders to hazardous materials incidents may draw.

Material Safety Data Sheets

MSDSs are the manufacturer's authoritative description of a product's hazards and precautionary actions. They are mandated under OSHA'S Hazard Communication Standard (HCS) for all hazardous materials. MSDS were originally intended to be used by employees of the manufacturing sector, but are now available (by law under SARA Title III) to very large and diverse audiences, including firefighters, local emergency planning commissions (LEPCs), and the public.

MSDSs describe the hazards of a chemical and provide information on how it can be safely handled, used, and stored. This information includes chemical product and supplier information chemical or hazardous components, hazards identification, first aid, firefighting measures, accidental release measures, handling and storage, exposure controls and personal protection, physical and chemical properties, and reactivity There is no standard format for MSDS information, a situation that prevents their effective use by first responders. Although MSDSS cannot include information on every unique application of the material, they consider the hazardous exposures resulting from the customary and reasonably foreseeable occupational use, misuse, handling, and storage.

The MSDS is written for health and safety professionals, trained workers employed by chemical companies, and chemical customers. The expansion of federal and state right-to-know regulations has broadened this audience to include firefighters, emergency responders, state and local emergency planning groups, and members of the community Recognizing the information needs and diverse backgrounds of this expanded audience, a draft MSDS standard has been developed by a technical work group of the Chemical Manufacturers Association and is being submitted under the accredited canvass

procedures to the American National Standards Institute **(ANSI).** The standard is intended to assist MSDS preparers in developing consistent, understandable MSDSs. This draft standard includes a uniform format in which the data are to be presented. The information needed by emergency responders would be one of the first sections of the ***MSDS.*** Many organizations, companies, and constituencies were consulted, and the draft standards have incorporated many of their recommendations.

Placards and Other Sources of Product Information

A major concern from the perspective of the first responder is the lack of a uniform system of product identification for hazardous materials in both transportation and fried facilities. Placards are the primary and preferred means of identifying hazardous materials involved in accidents. If the placard is accurate, its information can be used to direct the responder to reliable sources of response guidance.

Several systems of placarding or hazard identification are used depending on the location of the material and the information that is meant to be conveyed. 0ne identification system in common use is the NFPA 704 Diamond. This system presents information on the hazard posed by the material in fixed installations. The information is intended to alert first responders to the risks encountered, and the precautions to be taken, in fighting a fire involving that material. The NFPA 704 Diamond conveys information on flammability, reactivity, and health risks plus special information such as reactivity with water (for fire suppression) or radioactivity. The information is very abbreviated. For example, numbers given in three corners of the diamond represent the level of flammability, health, and reactivity risk. Symbols are used to convey vital information such as water reactivity. Responders need to be trained in order to make optimum use of the information presented.

In transportation, the DOT placarding system is used for identifying hazardous materials. DOT requires placards on surface transport vehicles when certain classes and quantities of materials are transported. Vehicles carrying any amount of hazardous explosives, poison inhalation hazards (PIHs), dangerous when wet (DWW) materials, and radioactive materials (RAM) must display the appropriate placards.

DOT regulations require that each vehicle that transports more than the threshold quantity of hazardous material carry a placard with a four-digit number (UN number) on both sides and both ends. This number is based on the system adopted by the United Nations Committee of Experts on the Transportation of Dangerous Goods. Each four-digit UN number has the same meaning worldwide and identifies a unique material or type of material. These numbers can be interpreted with little training by responders. They provide (1) information about the chemical and (2) cross-references to manuals that contain response guidance.

Except for "Residue" placards, placarding requirements for rail cars are identical to those for highway vehicles. Bulk packages (including rail tank cars and highway cargo tanks) are required to carry placards on both sides and both ends.

In addition to placards on hazardous transport vehicles, DOT also requires warning labels on packages of hazardous materials that could cause a hazardous condition while being transported. These color-coded labels carry a hazard symbol and the name of the hazard class. The color codes are consistent over all modes of transportation. These labels carry no warning text. For certain materials, primary and secondary hazard labels are required.

Another source of information available at a transportation accident is the shipping papers that are required to accompany the operator carrying hazardous materials. These documents contain a variety of information: name of the material, hazard class, UN number, initial response information, and a 24-hour emergency telephone contact number.

Training

Training is a major consideration when addressing the needs of emergency response personnel. Fire departments, in particular, provide extensive training and retraining as part of their basic operations. Much of this training, of course, is devoted to provide supporting background and not necessarily to enhance operational skills. Such training gives general background regarding the behavior of hazardous materials as well as instruction in how to properly use the various field data sources in common use. To achieve some general level of consistency across the nation, Title I of SARA prescribed a formal structure of skill levels for first responders that are associated with an escalating level of functions to be performed.

Title III authorized the appropriation of funds to be used for emergency preparedness programs including training for hazardous materials incidents.

Under Title I, first responders are required to complete training based on the duties and functions to be performed by them. Training and competency levels for first responders to hazardous materials incidents are divided into five levels. These levels are built on the premise that first responders must achieve the previous levels of competency as they progress. OSHA 1910.120 sets minimum standards for first responders; response agencies can require additional competencies as they see fit.

First Responder Awareness

First responders at the awareness level are those who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. At this minimum level of training, first responders would be expected to take no further action. Police officers and EMS personnel most typically fall into this level. First responders at the awareness level must have sufficient training or experience to demonstrate competency in the basic areas. No established number of training hours are specified. This will depend on the prior experience levels of personnel and their comprehension of the material.

First Responder Operational

First responders at the operational level are those who respond to releases or potential releases of hazardous substances as part of the initial response at the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level must have received at least 8 hours of training or have had sufficient experience to objectively demonstrate competency.

Hazardous Materials Technician

Hazardous materials technicians respond to releases or potential releases. They assume a more aggressive role than a first responder at the operational level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. Hazardous materials technicians must have received at least 24 hours of training equal to the first responder operational level and demonstrate competency in additional areas.

Hazardous Materials Specialist

Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, those duties require a more directed or specific knowledge of the various substances that they may need to contain. The hazardous materials specialist also acts as the site liaison with federal, state, local, and other government authorities in regard to site activities. Hazardous materials specialists must have received at least 24 hours of training equal to the technician level, plus additional competencies as identified in the standard.

On-Scene Incident Commander

Incident commanders who will assume control of the incident beyond the first responder awareness level must receive at least 24 hours of training equal to the first responder operations level and, in addition, have competency in command systems, response plans and options, and other hazards and risks associated with hazardous materials.

Emergency Planning

The first responder is affected by his community's ability to cope with emergencies; a community's ability to cope with a potential emergency depends on its ability to plan for and respond to that incident. The ability to plan for and respond to any emergency depends in a large part on the resources that are available for these purposes. Fire departments, on whom the bulk of the burden falls, must be capable of assisting not only each and every facility that produces, processes, stores, or uses hazardous materials, but also

the various transportation modes (water, highway, rail, pipeline, air) should an incident arise.

The intention of the Emergency Planning and Community-Right-to-Know Act was to ensure that planning for chemical emergencies was carried out at the local level. Local elected officials and response professionals are in a unique position to gauge the risk presented to a community by the presence of hazardous chemicals.

The SERC, it was hoped, would represent the fire and police first responders, environmental concerns, commercial interests, and the state political leadership. The SERC would logically divide the state into local emergency planning districts (LEPDs). These divisions would be of a size that they would encompass the planning zones of a local community (i.e., large enough to contain chemical facilities that might affect the community in an emergency), but not so large that the districts become unwieldy. Having established the LEPD, the SERC would appoint members of the local community within the LEPD to the LEPC. The LEPC would mirror to some extent the makeup of the SERC The LEPC would encompass the emergency response community, political leadership, environmental concerns, and representatives of the local chemical industry, the media, and other interested parties. The LEPC would jointly assess the realistic risk to the community posed by hazardous chemicals and develop plans as to how these threats might be addressed.

These plans will be periodically reviewed by the SERCS and the federal government to ensure that they address all required elements and are updated periodically to keep them current with the real risks to the community. The plans would be exercised periodically to ensure that all elements activated in an emergency are familiar with them. In an actual emergency, theLEPC plan would be used to direct the community response to the incident.

Title III of SARA requires reporting responsibilities that are a key factor in determining the adequacy of both the LEPC's and the local fire department(s) response plans. As previously mentioned, facilities that use or store hazardous materials are required to submit the relevant MSDSs or lists of MSDSs chemicals to both the LEPC and the fire department having jurisdiction. Certain facilities are also required to submit their own internally developed response plan to both the LEPC and the fire department having jurisdiction

The objective of these measures is to put into the hands of first responders specific information about the hazards associated within fixed facilities and general guidance on the most probable transportation-related incidents that may occur in their jurisdiction.

Findings

First responder information needs are driven by the decisions emergency responders must make: Are hazardous materials involved and what are they? Is protective equipment needed and what kind? Is the danger of toxic exposure, fire, or explosion sufficient to warrant isolation or evacuation and over what area? Can water be used or what fire control chemicals are required? What is the best method for containing a spill or release? Is a rescue of injured personnel required and what is the best means for doing so? Better information ensures that actions can be taken to remove or protect civilians and firefighters from injury. Uncertainty obligates emergency responders to take the most cautious course of action; appropriate information and response networks can prevent unnecessary precautions, such as evacuations, and allow more efficient use of emergency response resources.

Existing Information

Accurate, timely, and product-specific information about the chemicals involved is a first priority for emergency personnel when responding to hazardous materials incidents. The currently available information and the response network are sufficient in most cases. The problems are not consistent across all hazardous materials incidents, however. It may be useful, therefore, to improve information in specific hazardous materials situations, such as incidents that involve mixed hazardous materials and those that involve fixed facilities. In situations where the existing response information and guidance do not work adequately, the failure is at least partially attributable to fundamental problems-inadequate training of emergency response personnel to use the guidance, failure to comply with or enforce regulations, or failure of regulatory requirements governing identification and need-to-know to address emergency responders' actual information needs.

The working committees evaluated the quantitative data presented in eight data sources. *(These documents are listed on pages 17-18.)* Generally, the data are quite good. Even though there were some inaccuracies compared to (1) the reference values, (2) an American Society of Chemical Engineers database, DIPPR, and (3) a German database, Verscheuern, these inaccuracies were small and unlikely to be significant in terms of field utility. The working committees

concluded that, although many of the resources were useful in the field, none adequately addressed the broad spectrum of hazardous materials incidents that first responders face.

For the most part, the resource guides addressed the targeted application, but did not target the average fire department company officer or police department patrol officer who first arrives on the scene. This individual needs information that is specific and brief, yet provides critical information for protecting him and others against a variety of hazardous materials. Several references are highly useful for transportation incidents. For fixed-site incidents, however, resource guides in current use across the country do not adequately address the problems faced by emergency personnel when responding to chemical emergencies. Overall, these documents do not satisfy the information needs set forth by the Working Group at the outset of the study.

The *Emergency Response Guidebook* (ERG) is the best existing tool for first responders to use at hazardous materials emergencies. It is small, easy to use, and, perhaps most importantly, well known in the emergency response field. This guide, however, was developed primarily to assist the emergency responders who handle incidents involving the transportation of hazardous chemicals. It is not intended to provide the *chemical-specific* information that the committees felt to be important and is not designed to provide guidance for incidents occurring inside fixed facilities.

The distinction between the first responder and other emergency personnel who may respond later is extremely important. This fact forced the working committees to conclude that none of the existing data sources was adequate. It was believed that first responders could easily be overwhelmed by the large volume of information that most sources contain before finding the precise information required. Numbers, as in parts per million (ppm), for example, are a particular problem. The background of many first responders makes the use of qualitative information much more useful than quantitative data.

The working committees concluded that the development of new response guidance was unavoidable. This decision was not easily reached. Such action will take time and involve additional cost. On the positive side, this provides an opportunity to tailor the new data

source to the special needs of the first responder. One of the major goals is the format-make the data source user friendly, using short, simple statements without numbers. *(This is further described in the next section, "Recommendation: An Improved Format.")*

In summary, the working committees began their work with the intent of reviewing existing data resources for technical accuracy, completeness, and usefulness to first responders in the field. During this process, it became clear that, although the current data sources were technically accurate, their overall problem lay in the scope and manner in which information was presented. None satisfies the needs of the first responder-they were either too limited in what they presented or too technical for the average individual with minimal training and experience in hazardous materials response.

Data Collection

The working group found that comprehensive data on the hazardous material problem in the United States were difficult to find. There is no single repository for this type of data. These data are being collected in a variety of forms and for a variety of purposes, but the basic incident data are not routinely collected in a uniform fashion that can lead to a characterization of the hazardous materials problem nationwide. It is unclear whether the paucity of existing material reflects the lack of incidents or the lack of data. Thus, the extent of the hazardous materials problem may not be fully understood. The capability to collect consistent data and information nationwide concerning hazardous materials incidents-release, spill, spill with fire, fire, rescue, casualties, property damage, mitigation, recovery-would certainly alleviate this uncertainty. This resulting picture of the overall hazardous material problem could better dictate the nature and type of first responder information necessary.

Training

Federal, state, and local hazardous materials programs have had both positive and negative effects on the nation's fire service. These programs have shown a genuine concern on the part of the Congress to protect members of the fire service and the communities they serve. They have also promoted public recognition of the risks every community faces from hazardous materials incidents. The growing number of new programs, however, has left fire departments across the country struggling to meet program requirements, especially in the area of training. Federal programs relating to first responder

training are of considerable concern to the fire service OSHA 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response,* attempts to define standards for safe work practices and training for emergency responders and cleanup workers.

Although there is a general consensus within the fire service that 8 hours of training is not enough for first responders to react safely and competently to hazardous materials incidents, any increased requirement would add to an already significant training burden on fire departments, especially volunteer fire departments. Fire chiefs want their personnel to receive proper training, but find it difficult to meet other existing training requirements with limited budgets. Training budgets include costs for course preparation, instructor training, instructors, travel costs, course materials, and, importantly, out-of-service time for the fire service. The out-of-service time is manifested by either increased overtime pay (a mechanism to reduce the out-of-service time) or increased staffing, with its associated overhead for employee-related benefits. Both approaches increase the training budgets at a time when many fire departments, along with other branches of local government, are being forced to reduce expenditures.

The 8-hour training requirement poses another problem. It encourages fire departments to train only to meet minimum hour requirements to avoid fines, instead of providing training to achieve minimum *competencies.* Section 1910.120 does not establish criteria for course content or provide a list of appropriate training programs. Because of this omission, the focus is switched from the intent of the program, which is to protect the health and safety of the first responder, to compliance to prevent citations. Many departments cannot afford to provide such training, but they also cannot afford to pay fines. Ironically, if they are fined, it is entirely possible that this could impact the amount of funds available for training. Section 1910.120 also places fire chiefs in the position of certifying that firefighters have met the training requirements with no guarantee that the programs they have committed time and resources to will meet the intent of Section 1910.120 or the fire departments' actual and operational needs. Eight hours of training does not qualify first responders at the operations level to attempt to stop a hazardous materials release.

Until recently, federal support of state and local hazardous materials training has been limited. The recent passage of the Hazardous Materials Transportation Uniform Safety Act clearly reflects Congress' expectation to begin sharing in the cost, nationally, of a comprehensive hazardous materials training and response program.

Fiscal Considerations

The training of first responders, which may include police officers, EMS, or other responders in addition to the fire service, requires a substantial financial investment that many communities may lack. Fiscal limitations are very real to communities of all sizes, but perhaps most apparent in small towns and communities. A small town may not appropriate funds or resources for hazardous materials response planning or operations because there has never been a hazardous materials accident nor is there likely to be one in their community To them, no "real" need exists. Thus, this type of community may not be in compliance with any of several regulations A possible solution to this fiscal problem is resource pooling. Under this concept, neighboring communities establish local "mutual aid'" hazardous materials response teams. This concept would alleviate, to a degree, the problem of cost and not only give the communities the access to response teams, but bring them into compliance with regulations. In fact, this appears to have been one of the intended outcomes of the establishment of LEPCs; however, the degree to which it has been accomplished varies significantly.

Fiscal constraints also suggest that the various legislated definitions of hazardous materials and hazardous materials incidents affect a community and its first responders' ability to deal with "incidents." A gallon of chlorine intended for use in a residential backyard pool, stored in a residential garage, that spills is technically a hazardous materials incident. The rupture of a gas tank of a pickup truck involved in a traffic accident (a spill of 20 gallons of gasoline) is technically a hazardous materials incident. To respond to these situations, the first responder must be "HazMat trained," or his department faces fines. The question posed by the members of the response community who participated in the Firefighter Safety Study was whether these somewhat routine incidents warranted inclusion as hazardous materials incidents and whether they justify the expense of specialized training. In the NFIRS database, 96.3 percent of the incidents responded to involved fuels. The training necessary to deal with these incidents should be, and usually is, part of basic firefighter qualifications.

SARA and Other Legislative Authorities

Every community faces the risk of a hazardous materials incident. The 1980s brought a heightened awareness of this possibility, and the response has been the enactment of legislation to help cope with hazardous materials when accidents occur. It is unclear, however, whether the requirements that have been imposed by all levels of government actually address the perceived problem. Communities, businesses, and first responders, to mention but a few of the parties, are affected by a variety of federal mandates from multiple agencies. It is beyond the scope of this preliminary report to enumerate these mandates; a forthcoming review of the existing federal hazardous materials authorities by the executive branch agencies concerned deals with this subject thoroughly A cursory review of SARA Titles I and III, the HMTUSA legislation, and the associated rulemakings, however, confirmed the initial observations by members of the Working Group that the hazardous materials arena is large and involves many regulatory requirements, some of which overlap or contradict each other. The clarification or elimination of conflicting or overlapping regulations that concern hazardous materials would certainly ease the administrative burden on emergency response entities.

Response Plans

Under Title III of SARA, LEPCS are required to develop hazardous materials response plans for the local emergency planning district for which they are responsible. This system works reasonably well where the LEPC's area of responsibility is contiguous with a strong, centralized government entity that provides the majority of available public services, including the police and fire departments. Very often the fire chief is the chairman of the LEPC and, if not, is at least represented. The result is usually a realistic response plan that represents what the response forces are willing and able to do in the event of an incident since the LEPC is, in effect, the local government with the authority, responsibility, and resources to respond.

In many parts of the nation, however, centralized county government is uncommon and many smaller municipalities may be contained within the geographic area for which the LEPC is responsible. Where this is the case, the basic objectives of Title III are not always well met. This is the result of the natural tendency toward independence, particularly in the absence of controlling authority. To exchange, share, and coordinate information across the multiplicity of

independent fire and police departments without any real authority requires time, effort, energy, and patience. Since many LEPCs meet infrequently (and may not even have one full-time staff person), response plans may often meet an administrative requirement but not be fully coordinated across a number of municipalities.

Another potentially very useful provision of Title III is the requirement that certain facilities develop their own internal response plans for dealing with an incident at their facility and provide such plans to the local fire department. Since the types and amounts of hazardous chemicals normally found in many fixed-site facilities tend to be somewhat consistent over time, it is reasonable to assume that planning an emergency response to these facilities should be possible. These pre-incident plans could include product-specific information for hazardous materials normally used or stored in each facility Where these plans have been developed, they are generally very helpful; however, compliance varies widely from jurisdiction to jurisdiction

Material Safety Data Sheets

Sections 311 and 312 of SARA Title III require the reporting of certain quantities of specific chemicals to the SERCs, LEPCs, and local fire departments. Facilities that meet these threshold quantities are required to send MSDSs or chemical inventory listings to their LEPC for distribution to the other agencies mentioned above. Required by statute, the MSDSs provide information that delineates the hazardous materials at fixed sites. The MSDSs, however, are not in a standard format and do not necessarily contain the appropriate first response emergency action information. Moreover, the information may not be immediately available to first responders-few sites have this information available in safe areas and the first responder must rely on a dispatcher to interpret and relay it.

This system has some flaws. Even if the reporting requirements are met and fire departments and other emergency response agencies receive copies of either MSDSs or hazardous materials inventories for all facilities, or both, in their jurisdiction, facilities are not required to report lower quantities of many hazardous materials and even larger quantities of many other only slightly less hazardous chemicals. This leads to the dangerous possibility that responders, believing the incident involves a hazardous material reported on an MSDS,

may encounter a hazardous material emergency involving a completely different chemical of which they have no knowledge. In addition, quality assurance is necessary to ensure the accuracy of the reported information. This appears to be not practical generally and, therefore, reliability is an issue in the use of the information. The draft standard MSDS will relieve these concerns considerably

A more significant problem stems from the sheer volume of information with which a fire department must contend, especially when existing reporting requirements are followed stringently Even if MSDSs were in a standard format and were prepared by only one organization so that language, level of detail, and type of information were consistent, the volume of information would be daunting. Even large metropolitan departments frequently lack the staff to reduce this mass of information to a focused and usable summary. Smaller departments, whether paid or volunteer, are simply overwhelmed when faced with this volume of information at this level of detail. As a result, MSDSs are often stacked in boxes and seldom referred to. Some departments enter this information into a database and, depending on the resources available to do this, may have at least created summary lists of quantities present by substance with some indication of the principal hazard involved. This, however, represents a best-case situation rather than the norm.

In short, the passage of SARA has undoubtedly focused the attention of state and particularly local governments to the fact that they may have a potential hazardous materials problem. This awareness has stimulated many jurisdictions to better prepare themselves to deal with hazardous materials incidents. Also, SARA has resulted in the availability of more information concerning hazardous materials at the local level, an increase in the number of trained response personnel, and greater attention paid to response planning.

All too often, these actions are no more than a paper response to an administrative requirement. Many plans do not accurately reflect the capabilities of response forces who may not be aware of their existence let alone be familiar with their content. And, perhaps most importantly from the perspective of this report, too much of the information provided to fire departments and other response agencies is, from a practical point of view, simply not usable.

Product Identification

Product identification is a recurring topic of significant concern particularly to the fire service members of the Working Group. It is, in a sense, the central issue being addressed in this study If emergency response personnel are able to accurately identify the hazardous material or materials with which they have to deal, they are well on their way to selecting the most appropriate course of action. If they are not able to accurately identify those materials, their job is made considerably more difficult and more dangerous. A number of existing mechanisms are in place that attempt to address this problem.

Placarding

The NFPA 704 placarding system for fixed facilities is intended to give the first responder warning that hazardous materials are on site. This system, although it has been adopted by some jurisdictions, is not universally used. Moreover, the hazard values are assigned by the facility. This latitude to assign hazard values acknowledges that some hazardous materials, in small quantities, present little danger while other less dangerous substances in large quantities can present significant hazards. The result is that a substance could be assigned significantly different hazard values within a single jurisdiction. In addition, the hazard values assigned by the facility are questionable because they represent the worst case for the combination of all materials present for all hazard categories-fire, health, reactivity, special information-and this information is carried together on one placard. These are potentially dangerous situations if the first responder is unaware of the relative quantities involved.

The DOT placard "Dangerous" also presents a problem. If a truck is carrying a mixed load of two or more classes of hazardous materials, a single "Dangerous" placard may be applied in place of individual placards for each hazard class. The exception to this rule is if the truck is loaded with 5,000 or more pounds of one hazardous material. Then, the placard of the material present in this quantity must be applied in addition to any other placards used. In a pending rulemaking (Docket No. HM-206), DOT is evaluating whether the "Dangerous" placard should or should not continue to be used, and DOT is actively seeking comments on alternatives to the "Dangerous" placard.

Docket HM-206 is a rulemaking that solicits comments on how to enhance the existing systems for identifying hazardous materials in transit. In addition to the "Dangerous" placard, other placarding issues are addressed, including PIH materials, a "Hot" placard for elevated temperature materials, and placard size and visibility

Stringent quality control programs need to be instituted by the chemical manufacturing and the transportation industries to ensure that the placards and labels applied to products convey accurate response information to emergency first responders. At the other end, training and awareness on the part of first responders about placards, labels, and hazard identification systems need to be improved. Often, the information that these identification systems are intended to convey is either not understood or misunderstood. Docket HM-206 should improve the current situation.

Shipping Papers

There are several problems associated with shipping papers. First, there is no standard format for shipping papers nor is there a uniform set of product identifiers. Finding or retrieving shipping documents at an accident site can also be difficult. Moreover, for multiple shipments in one cargo load, there is no overall manifest; rather, a separate set of shipping papers exists for each shipment. Such documents can be destroyed in an accident. Without an overall manifest, there is no complete accounting of the cargo, which can present a misleading and, therefore, a potentially dangerous situation.

Materials Not in Transit

A residual problem develops when hazardous materials are not in transit. There is no certainty that the material will be identified in a manner useful to the first responder-there may or may not be a UN number, a Chemical Abstract Service (CAS) number, or a trade name. This situation, which currently is not being addressed, poses serious problems for emergency response personnel.

Recommendation: An Improved Format

Both working committees conclude that *one* response guide should be available to first responders to hazardous materials incidents, since they generally do not have the time to consult multiple sources. The overwhelming recommendation from the Technical and Field Applications Committees was for an improved information format specifically targeted for the first responder audience. This recommendation was based on the following:

- Review of nearly 500 responses from the Field Applications Committee's field evaluation of the eight references.
- Determination by the majority of the members of both committees that none of the eight references adequately met the information needs of the first responder as defined by the Field Applications Committee.
- The observation that, although the information available was generally accurate and complete, it did not definitively and succinctly convey the most critical information to a first responder.
- The recognition that the format or presentation of the information was as important as the information itself.
- The collective judgment of members of the Field Applications Committee, who are highly experienced in understanding first responder difficulties.

Both working committees concurred on these issues; there were slight differences in the approach each committee chose to present, but these differences were easily reconciled.

This decision acknowledges the cost and effort that a new format would entail. Nevertheless, the opportunity to tailor a guide to the special needs of the first responder would have substantial benefits,

One of the major goals is the format: Make the guide chemical-specific, using short, simple statements without numbers. Another is the "expanding torrent" concept: Start with guidance for situations where the responder knows very little, followed by information for situations where the responder knows more. The resulting guide does not replace or compete with current materials. Instead, it

would be an amalgamation of existing information with a change in format. Essentially, this recommendation may simply result in a large editorial task.

There are three areas of recommendations for a guide with an improved format. First, the guide must help the first responder assess the risk to himself and to others. It must furnish enough information that, if the first responder decides to take a risk, he will be able to do so as safely as possible. It must also stress any limits to the risks a first responder can take. Second, the physical page must catch the reader's attention. Third, the information must be easy to access, use, and understand. The following specific recommendations assume a chemical-specific format.

Risk Management

The guide should be organized by the NFPA/OSHA levels: first responder awareness, first responder operational, and hazardous materials technician. The first responder awareness level would include some information on risks and warnings.

The bulk of the guide will be devoted to the awareness level, but the format should also include some recommendations for the operational level.

The guide should *clearly* define actions that are appropriate for first responders with awareness-level training. Awareness-level responsibilities include recognition of the presence of hazardous materials, self-protection, call for trained personnel, and securing the scene.

Page Layout for Each Chemical

The guide should be limited to one page per chemical.

Each page should attract the first responder's attention with bold large print to facilitate reading in poor light or under adverse conditions. Major hazards and the type of protective clothing required should be at the top.

Each chemical-specific page should have the common name of the chemical, the UN/DOT number, the most common synonyms, the NFPA diamond, and the DOT placard.

Response recommendations should be divided in two separate categories, awareness and operational, with a clear division of instructions.

The section headings should be very descriptive.

Chemical names should be spelled out-no abbreviations.

The statement *Call for Appropriate Help* should be on every page.

Ease of Use

Chemical-specific guidance is preferred to generic chemical guidance.

The guide should be indexed alphabetically by common name and cross-indexed by UN number. The alphabetical index should include synonyms.

The chemical-specific pages should be ordered alphabetically by common name.

"Warnings" should be reserved for especially dangerous properties. Not every chemical should have them.

Numerical values, such as concentrations, should not be used as these values will have little, if any, meaning to the average first responder.

Text should be succinct and precise.

A glossary of terms should be included.

A physical description of the chemical should be included as it gives the first responder an idea of what substance he is dealing with.

* * *

The working committees recommend that any response guidance should include explanations of the NFPA diamond and DOT placards. These markings are the most commonly encountered visual identifiers, and first responders need to be able to interpret them quickly. It

is also recommended that a section showing only the NFPA diamond for the less common chemicals be included.

The committees also recommended the inclusion of a series of scenarios that address potential situations. The working committees felt that scenarios are useful because they give information on special conditions. They would be included in the front or back of the guide, although some special, specific information may need to be provided on the chemical-specific pages. The working committees envisioned these scenarios as enhancements to the guidance format that could serve the dual purpose of conveying useful response information at the site and as a potential training tool. As a part of the scenario, silhouettes could be included on the appropriate scenario pages (e.g., rail car silhouettes). These silhouettes are visual identifiers that could provide quick and vital information to first responders.

To encourage interdepartmental and interagency coordination in hazardous materials incident response and reporting, the working committees recommended a simple, straightforward approach-include telephone numbers for informing appropriate local agencies (e.g., a sticker on the cover of the guide book).

If the proposed format proves practical to develop, it is recommended that it be field tested in a range of departments to verify its applicability and utility for first responders.

Selected Bibliography

_____ "Debate on the Conference Report on H.R. 2005, Superfund Amendments and Reauthorization Act of *1986." Congressional Record.* Washington, D.C. U.S. Government Printing Office. October 8, 1986.

_____"Debate on H.R. 2005, The Superfund Amendment and Reauthorization Act-Conference Report." *Congressional Record.* Washington, D.C. U.S. Government Printing Office. October 3, 1986.

_____ "Double Your Response-Abilty." *Fire Command.* December 1989:45.

Fire, Frank L. et al. *SARA Title III Intent and Implementation of Hazardous Materials Regulations.* New York: Van Nostrand Reinhold. 1990.

Glickman, Theodore S. et al. *Acts of God and Acts of Man,* Center for Risk Management, Washington, D.C. Resources for the Future. 1992.2

_____ *Hazardous Materials Uniform Safety Act* of *1990.* EL. 101-515. November 16, 199O.

Law, Daniel. "HazMat Safety: Where We Are and What We've Learned." *The California Fire Service.* February 1991:6-7:15.

National Governors' Association, Center for Policy Research. *Hazardous Materials Transportation Regulatory and Enforcement Programs, A Governor's Guide.* Washington D.C. Undated.

Perroni, Carolyn. "Response Is Our Middle Name." *Fire Command.* November 1989:56.

Solyst, James et al. *Emergency Planning and Community Right-to-Know Act: A Status of State Actions*-1990. Washington, D.C. National Governors' Association. 1991.

_____ *Superfund Amendments and Reauthorization Act* of 1986. Conference Report to Accompany H.R. 2005, H. Report 99-962. Washington, D.C. U.S. Government Printing Office. October 3, 1986.

Tokle, Gary L. and Henry, Martin F. "Where Do We Stand On Haz-Mat Response?" *NFPA Journal.* January/February 1992:36-45.

U.S. Environmental Protection Agency. *Chemicals in Your Community, A Guide to the Emergency Planning and Community Right-to-Know Act.* Washington, D.C. September 1988.

U.S. Fire Administration. *Six Firefighter Fatalities in Construction Site Explosion, Kansas City, Missouri (November* 29,1988). Report 024 of the Major Fires Investigation Program. Washington, D.C. Federal Emergency Management Agency. Undated.

U.S. House of Representatives. "Debate on H.R. 2817, The Superfund Amendments of 1985." *Congressional Record.* Washington, D.C. US. Government Printing Office. December 5-6, 10, 1985.

U.S. Senate Committee on Commerce, Science, and Transportation. *Hazardous Mate*rials *Transportation Safety Improvement Act of 1990. S.* Report 191-449 on S. 2936. Washington, D.C. U.S. Government Printing Office. August 30, 199O.

U.S. Senate Committee on Commerce, Science and Transportation Subcommittee on Surface Transportation. *Hazardous Materials Transportation. S.* Hrg. 101-955. Washington, D.C. U.S. Government Printing Office, July 25, 199O.

U.S. Senate. "Debate on S. 51, The Superfund Improvement Act of 1985." *Congressional Record*. Washington, D.C. U.S. Government Printing Office. September 18-20,23-24,1985.

Glossary

AHE	Acute Hazardous Events
ANFO	ammonium nitrate/fuel oil
ANSI	American National Standards Institute
ARIP	Accidental Release Information Program
BATF	Bureau of Alcohol, Tobacco, and Firearms
CAER	Community Awareness and Emergency Response
CAMEO	Computer Aided Management of Emergency Operations
CAS	Chemical Abstract Service
CDC	Centers for Disease Control
CEPP	Chemical Emergency Preparedness Program
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
CHEMTREC	Chemical Transportation Emergency Center
DOT	U.S. Department of Transportation
DWW	dangerous when wet
EMS	emergency medical service
EPA	Envirnomental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERG	Emergency Response Guidebook
FSSA	Firefighter Safety Study Act
HCS	Hazard Communication Standard
HMTA	Hazardous Materials Transportation Act
HMTUSA	Hazardous Materials Transportation Uniform Safety Act
LEPC	local emergency response commission
LEPD	local emergency planning district
MSDS	Material Safety Data Sheet
NFIRS	National Fire Incident Reporting System
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration
NRC	National Response Center
OSHA	Occupational Safety and Health Administration

PIH	poison inhalation hazard
PPM	parts per million
RAM	radioactive materials
SARA	Superfund Amendments and Reauthorization Act
SERC	state emergency response commission
U N	United Nations
USCG	U.S. Coast Guard
USFA	U.S. Fire Administration

Firefighters Safety Study Act Working Group

Coordinating Committee

John G. Hart III (Chair)
Assistant Administrator, U.S. Fire Administration

Mr. Hart supervises the data collection and analysis efforts in support of the National Fire Incident Reporting System (NFIRS). His office ensures the effective collection of fire data on a national basis and analyzes major and unusual fires. Mr. Hart is also responsible for assisting state and local governments in implementing fire and rescue service information management improvements.

Steven C. Bailey
Assistant Chief, Operations, Seattle (Washington) Fire Department

Assistant Chief Bailey is a 25 year veteran of the Seattle Fire Department. As Assistant Chief, he oversees the department's Operations Division, which provides fire suppression, emergency medical services, and hazardous materials incident response to the City of Seattle. Chief Bailey has also served in a volunteer capacity on the Board of Directors of the National Fire Information Council (NFIC) for 8 years, with 2 years as President. In addition, he is currently Vice President of the King County Fire Chiefs Association, with responsibility for coordination of all disaster and operational issues in the county

Michael L. Donahue
Associate Director, CHEMTREC Center, Chemical Manufacturers Association

Mr. Donahue is responsible for the CHEMTREC Outreach Program, the CHEMTREC Industrial Mutual Aid Network, and related nonemergency services of the center. He is a member of the NFPA Technical Committee on Hazardous Materials Emergency Response and holds a B.S. degree in fire and arson investigation.

Charles M. Fisher
Chief, Kansas City (Missouri) Fire Department

Chief Fisher has been a member of the Kansas City Fire Department for over 35 years. He was the senior suppression officer at the time of the Kansas City incident where six firefighters died in a hazardous materials explosion. Prior to his appointment to Fire Chief and Director, Chief

Fisher served as Deputy Chief of the Kansas City Fire Department Hazardous Materials Unit.

Larry J. Holms

Chief, Orange County (California) Fire Department

Chief Holms has been a member of the fire service for 33 years, serving as firefighter, chief engineer, and fire chief. Chief Holms has served as a fire chief since 1975, first with the City of Tustin and beginning in 1980, as the Orange County Fire Chief. He is a past President of the Orange Country Fire Chiefs Association and the Vice Chairman of the California Office of Emergency Services, Fire and Rescue Advisory Committee.

Selby C. Jacobs

Chief, Prince William County (Virginia) Department of Fire and Rescue

In addition to being Chief of the Prince William County Department of Fire and Rescue since 1971, Chief Jacobs is also the Coordinator of the Prince William County Office of Emergency Services. He has been a member of the fire service for 40 years, beginning his career as a firefighter for the Williamsburg (Virginia) Fire Department.

Tony Jover

Director, Information Management and Program Support, U.S. Environmental Protection Agency

[No biography available]

Francis A. McGarry

State Fire Administrator, New York State Department of State, Office of Fire Prevention and Control

Mr. McGarry is the President of the National Association of State Fire Marshals. Since 1975, he has been the chief fire official in the state of New York. In addition, Mr. McGarry is an 8 year veteran of the Buffalo (New York) Fire Department.

Nino V. Tramontozzi

Deputy Chief, Boston (Massachusetts) Fire Department

Deputy Chief Tramontozzi has been a member of the Boston Fire Department for 31 years. As Deputy Chief of Special Services, his responsibilities include the safety operational unit, coordinator of Title III regulations and requirements, and emergency medical services. He is also the Director of Emergency Management for the city of Boston. Chief Tramontozzi

is the coordinator of the LEPC and a member of the Executive Committee of the state of Massachusetts Emergency Response Commission. Deputy Chief Tramontozzi is the metro chairman of the National Fire Academy "Training Resources and Data Exchange" trade committee.

David L. Sargent

Director, Office of Hazardous Materials Initiatives and Training, U.S. Department of Transportation, DHM- 50

Mr. Sargent is responsible for state, local, and industry hazardous materials compliance enforcement and emergency response partnership programs. His office is also responsible for classroom hazardous materials training programs and materials.

Jean Snider

Chief, Program Development and Interagency Coordination, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Dr. Snider has responsibilities in the area of hazardous materials, emergency response, and program planning. Her division at **NOAA** was jointly responsible with EPA for the development of the Computer-Aided Management of Emergency Response Programs (CAMEO). Dr. Snider has a doctorate in oceanography.

Chris Cuyler

Division Operations Officer, Explosives Division, Office of Law Enforcement, Bureau of Alcohol, Tobacco, and Firearms, U.S. Department of the Treasury

Mr. Cuyler has 22 years of experience at **BATF** in the areas of fire arms, explosives, and arson, He oversees explosives and arms programs and is responsible for the Hazards Communication Program. He is a certified explosives specialist and has an M.S. in criminal justice.

Dan Crowley

Firearms and Explosives Specialist, Firearms and Explosives Operations Branch, Bureau of Alcohol, Tobacco, and Firearms, U.S. Department of the Treasury

Mr. Crowley is the BATF liaison between federal and state agencies and the explosives and high-explosives industry associations. He has 10 years of experience in the field of firearms and explosives.

Michael B. Moore
Senior Safety Engineer, Occupational Health and Safety Administration, US. Department of Labor

Mr. Moore is a fire protection engineer with 18 years of experience. He is responsible for safety standards in the areas of fire protection, hazardous materials, and emergency response. Mr. Moore is also a volunteer firefighter and emergency medical technician in Frederick County, Maryland.

Technical Committee

Jean Snider (Chair)
Chief, Program Development and Interagency Coordination, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

[See above]

Gary E. Curmode
Division Chief, Operations, Wichita (Kansas) Fire Department

As Division Chief, Chief Curmode is responsible for the overall command of hazardous materials incident response and fire suppression. He has been a training officer in hazardous materials and a member of the Wichita-Sedgwick County Hazardous Materials Task Force since 1981. Since 1984, Chief Curmode has been an adjunct instructor in hazardous materials and instructional methodology at the National Fire Academy in Emmitsburg, Maryland. Chief Cur-mode has 21 years of emergency response experience and 12 years of experience in hazardous materials response training. In addition, he is a graduate of the Hazardous Waste Management Program at Oklahoma State University.

Peter D. Ference
Emergency Management Specialist, Emergency Management Agency, Bucks County, Pennsylvania

Mr. Ference is responsible for the administration and implementation of the Emergency Planning and Community Right-to-Know Act in Bucks County as well as in the Commonwealth of Pennsylvania. In this position, he provides information management, computer support services, and technical recommendations for both the Hazardous Incident Response Team and the Country Emergency Management Agency. Mr. Ference serves on the Administration, Data Management, and Public Information subcommittees of the LEPC.

Edwin Kent Gray
Chief, Emergency Response Coordination Group, National Center for Environmental Health, Centers for Disease Control

[No biography available]

Charles B. Henry
Institute for Environmental Studies, Louisiana State University

Mr. Henry is a research associate at Louisiana State University. He is currently the senior scientist for the LSU support group that provides chemical hazard assessments to **NOAA's** Hazardous Materials and Response Division. In this position, Mr. Henry provides technical support, including on-scene response to chemical and oil spill incidents, and direct interaction with firefighters and fire department hazardous material teams. He has also been involved in the development of resources and equipment, such as **CAMEO** and field-portable analytical sensors, designed to aid spill responders.

Robert Jones
National Oceanic and Atmospheric Administration, U.S. Department of Commerce, **HMRAD**

Dr. Jones' areas of expertise are physical chemistry, thermodynamics, and pollutant modeling. His responsibilities at **NOAA** include field studies of oil spills and other field studies. His doctorate is in physical chemistry.

George Rodgers
Medical Director, Regional Poison Control Center, Louisville, Kentucky

Dr. Rodgers has both a Ph.D. in organic chemistry and an M.D. In addition, he is a board certified medical toxicologist. Dr. Rodgers is active in hazardous materials toxicology serving as a consultant to both an active local hazardous materials unit and to **ATSDR,** for whom he has been teaching hazardous materials medical response for several years. Dr. Rodgers also serves as a consultant to the **NATO/CCMS** project in hazardous materials toxicology. He is an Associate Professor of Pediatrics and Pharmacology, and Toxicology at the University of Louisville as well as an Adjunct Associate Professor of Toxicology at the University of Kentucky.

Alan L. Schneider
U.S. Coast Guard (G-MTH)

Dr. Schneider is a chemical engineer with the Hazardous Materials Branch of the Marine Technical and Hazardous Materials Division of the U.S. Coast Guard. His branch is responsible for the technical aspects of

water transportation of hazardous materials. Dr. Schneider is responsible for the expansion and maintenance of the Chemical Hazards Response Information System (CHRIS), a large, comprehensive data used by Coast Guard personnel along with technical workers throughout the world. He is also involved in the preparation and maintenance of the Coast Guard's Chemical Data Guide for Bulk Shipment by Water, including preparation of data sheets for new chemicals. Dr. Schneider has been working in hazardous materials safety for 18 years. He has broad experience in hazardous materials, including such areas as liquefied gases; deflagration, detonation, and BLEVE phenomena; modeling of chemical spills, vapor cloud spread, and combustion/explosion behavior; emergency response and casualty analysis; and short- and long-term health effects. His doctorate is in chemical engineering.

Jerry M. Schroy
Senior Fellow, Monsanto Company

Mr. Schroy is a chemical engineer with the Monsanto Corporation. He is a Senior Fellow in Monsanto's Engineering Technology Group with responsibilities for engineering technology development in the fields of environmental, safety, and health control. He is the principal developer and training resource at Monsanto for disaster consequence modeling and provides support for Monsanto's Safety and Property Protection Group in the area of modeling toxic releases, fires, and explosions. Mr. Schroy is a registered professional engineer in New York, Ohio, Illinois, Iowa, and Missouri. He is Chair of the American Institute for Chemical Engineers' Safety and Health Division and President of the International Society of Exposure Analysis.

Paul Tobin
U.S. Environmental Protection Agency

[No biography available]

Field Applications Committee

Steve C. Bailey (Chair)
Assistant Chief, Operations, Seattle (Washington) Fire Department

[See above]

James P. Brizzell
Deputy Chief, Hazardous Materials and Transportation Bureau, New York State Department of State, Office of Fire Prevention and Control

Mr. Brizzell has been a member of avolunteer fire department for 28 years and has served two terms as Chief of the department. For the New York

State Fire Marshal's Office, he supervises instructors who conduct hazardous materials training in the field. Mr. Brizzell has been with the New York State Fire Marshal's Office for 12 years.

John Eversole

Chief, Hazardous Materials, Chicago (Illinois) Fire Department

Chief Eversole is a 23-year veteran of the Chicago Fire Department and is the Hazardous Materials Coordinator, He is responsible for the Hazardous Materials Team and coordinates all the fire department's units that make up the Hazardous Incident Task Force. Chief Eversole is the Chairman of the Hazardous Materials Committee of the International Association of Fire Chiefs. He is a member of the Hazardous Materials Professional Competency Standards Committee of the National Fire Protection Association. He serves on the Extrication, Hazardous Materials, and Forcible Entry Committees of the International Fire Service Training Association. Chief Eversole is also a certified Master Instructor through the Office of the Illinois State Fire Marshal. He is an instructor of fire science programs for the Chicago City Colleges and the University of Illinois.

James A. Fossos

Firefighter, Hazardous Materials Technician,
Seattle (Washington) Fire Department

Mr. Fossos has been a Seattle firefighter for 23 years. He has 12 years of experience with the department's Hazardous Materials Unit and is a certified hazardous materials technician. He is also the former Executive Secretary of Seattle Firefighters Union, Local #27, IAFE and currently serves on the Union's Board of Directors.

Richard L. Hartnett

Captain, Boston (Massachusetts) Fire Department

Fire Captain Hartnett has been a member of the Boston Fire Department for 18 years. He has been the SARA Title III Special Hazards Inspector for the city of Boston since 1989. Captain Hartnett is an instructor in Hazardous Materials, SARA Title III, for the Boston Fire Academy and Boston Fire Officer's Fire College. He is the exercise design officer for the Boston LEPC. Currently, Fire Captain Hartnett is the fire service liaison officer to the Federal Emergency Management Agency, Region 1.

Dan L. Williams

Deputy Director, Office of the Illinois State Fire Marshal

Mr. Williams is responsible for the operating divisions of the State Fire Marshal's Office, which include Fire Prevention and Petroleum and

Chemical Safety He also serves as legislative liaison and manages the Public Information Office. He has served in both the executive and legislative branches of state government in Illinois since 1975. He is a member of the Petersburg, Illinois, Volunteer Fire Department. Mr. Williams has served on various national and state-level organizations, including a special Hazardous Materials Committee of the National Academy of Sciences, U.S. Fire Administration's Hazardous Materials Committee, Chairman of the Illinois Hazardous Materials Emergency Response Panel, and Member of the Illinois Hazardous Materials Advisory Board. Mr. Williams previously served as the National Emergency Response Liaison to DOT's Cooperative Hazardous Materials Enforcement Development organization and as Secretary of the National Task Force on Hazardous Materials Emergency Preparedness.