Section I. Emergency Medical Services Response to Hazardous Materials Incidents

HAZARD RECOGNITION

When dispatched to the scene of an incident, emergency response personnel may not be aware that the incident involves hazardous materials. As a result, emergency medical services personnel should always be alert to the possibility that they may be dealing with a chemically contaminated individual, and should ask the victims and dispatch personnel about the nature of the incident. Although an injury at a hazardous material incident need not invariably involve a chemical exposure (it could have resulted from a purely physical occurrence, such as slipping off a ladder), as a routine precaution, the involvement of hazardous materials should be considered a possibility in such situations. As outlined in the National Fire Academy/National Emergency Training Center Manual, *Recognizing and Identifying Hazardous Materials*, there are six clues that may confirm the presence of hazardous materials. These clues are included in this guidance document to facilitate and expedite prompt identification of any hazardous materials at the scene of the incident. Dispatch personnel, familiar with these clues, will subsequently find the communication with field personnel enhanced. For example, patient symptoms reported from the field—such as nausea, dizziness, burning eyes, or cyanosis—could suggest to the dispatch staff the presence of hazardous materials. Knowledgeable dispatch staff could then request field personnel to examine the site for these six clues:

- **Occupancy and Location.** Community preplanning should identify the specific sites that contain hazardous materials. In addition, emergency personnel should be alert to the obvious locations in their communities that use hazardous materials — for example laboratories, factories, farm and paint supply outlets, and construction sites.

- **Container Shape.** Department of Transportation (DOT) regulations dictate certain shapes for transport of hazardous materials. There are three categories of packaging: stationary bulk storage containers at fixed facilities that come in a variety of sizes and shapes; bulk transport vehicles such as rail and truck tank cars that can vary in shape depending upon the cargo; and smaller quantities of hazardous materials that may be packaged in fiberboard boxes, drums, or cylinders with labeling.

- **Markings/Colors.** Transportation vehicles must use DOT markings, including identification (ID) numbers. Identification numbers, located on both ends and both sides, are required on all cargo tanks, portable tanks, rail tank cars, and other small packages that carry hazardous materials. A marking system designed by the National Fire Protection Association (NFPA) identifies hazardous materials at terminals and industrial sites but does not provide product-specific information. This system uses a diamond divided into four quadrants. Each quadrant represents a different consideration: the left, blue section refers to health; the top, red quarter pertains to flammability; the right, yellow area is for reactivity; and the bottom, white quadrant highlights special information. In addition, a number from zero through four indicates the relative risk of the hazard with zero being the minimum risk.

- **Placards/Labels.** These convey information by use of colors, symbols, Hazard Communication Standard, American National Standard Institute (ANSI) Standards for Precautionary Labeling of Hazardous Industrial Chemicals, United Nations Hazard class numbers, and either hazard class wording or four-digit identification numbers. Placards are used when hazardous materials are in bulk such as in cargo tanks; labels designate hazardous materials on small packages.

- **Shipping Papers.** These can clarify what is labeled "dangerous" on placards. They should provide the shipping name, hazard class, ID number, and quantity, and may indicate "waste" or "poison." (Shipping papers must accompany all hazardous material shipments.)

- **Senses.** Odor, vapor clouds, dead animals or dead fish, fire, and irritation to skin or eyes can signal the presence of hazardous materials. Generally, if one detects the odor of hazardous materials, one should assume that exposure has occurred. Some chemicals, however, can impair an individual's sense of smell (i.e., hydrogen sulfide), and others have no odor at all (i.e., carbon monoxide).

Appendix A provides illustrations and greater detail on the National Fire Protection Association 704M system, the Department of Transportation hazardous materials marking, labeling, and placarding guide, and the Department of Labor Material Safety Data Sheet (MSDS). It is important that any and all available clues are used in the process of substance identification, especially the most obvious, such as the information provided on a label or in shipping papers (shipping papers should remain at the incident scene for use by other response personnel). The aim of the health provider should be to make a product-specific identification. Every effort should be taken to prevent exposure to chemicals. Identifying the hazardous material and obtaining information on its physical characteristics and toxicity are steps that are vital to the effective management of the hazardous materials incident. Since each compound has its own unique set of physical and toxicological properties, early and accurate identification of the hazardous material involved in the incident allows the emergency responders and emergency department staff to initiate appropriate scene management steps.

Many printed resources are available to provide information concerning response and planning for hazardous materials incidents. A selected bibliography is included at the end of each section; however, this is not a complete list of the materials available. Printed reference materials provide several advantages: they are readily available, can be transported in the response vehicle, are not dependent on a power source or subject to malfunction, and are relatively inexpensive. Disadvantages include the difficulty in determining a correct identity for an unknown chemical, materials are often out of date and cannot be easily updated, and no single volume is capable of providing all the information that may be needed.

There is also a vast array of telephone and computer-based information sources concerning hazardous materials. They can help you by describing the toxic effects of the chemical, its relative potency, and the potential for secondary contamination and by recommending decontamination procedures. They may also provide advice on the adequacy of specific types of protective gear. Exhibit I-1 is a partial listing of the many information resources available by telephone. Exhibit I-1A is a list of suggested telephone numbers that should be filled in for your community. Planning is an essential part of every response, and these resources will also provide guidance that can be used in forming an effective response plan. Exhibit I-2 provides a partial listing of the available computerized and on-line information sources. It should be noted that not all on-line databases are peer reviewed. Therefore, some medical management information may be based only on DOT or MSDS data. Care and planning should be used when selecting information sources.

Computerized information sources are basically two types: (a) call-up systems that are addressed via telephone lines and (b) database systems that are housed on a local computer disc. Each system contains large amounts of information on many hazardous materials and can be searched to help identify the material involved. They are updated frequently at no extra cost to the subscriber and are extremely portable with today's computer systems. Computer databases can be expensive, as can the initial cost of the equipment. Most systems will require the operator to have some knowledge of computer terms and search protocols. Also, mechanical equipment may fail and should not be counted on as a sole source of information.

Exhibit I-1
Telephone Information and Technical Support References

Resource	Contact	Services Provided
CHEMTREC (Chemical Transportation Emergency Center)	1-800-424-9300	24-hour emergency number. Connection with manufacturers and/or shippers who will provide advice on handling, rescue gear needed, decontamination considerations, etc. Also provides access to Chlorine Emergency Response Plan (CHLOREP)
ATSDR (Agency for Toxic Substances and Disease Registry)	1-404-639-0615	24-hour emergency number for health-related support in hazardous materials emergencies, including on-site assistance, if necessary
Bureau of Explosives	1-202-639-2222	24-hour emergency number for hazardous materials incidents involving railroads
Emergency Planning and Community Right-to-Know Information Hotline	1-800-535-0202	8:30 a.m.-7:30 p.m. (EST) Provides information on SARA Title III. Provides list of extremely hazardous substances and planning guidelines
EPA (Environmental Protection Agency) Regional Offices	Region I - (617) 565-3698 CT, ME, MA, NH, RI, VT Region II - (212) 264-0504 NJ, NY, PR, VI Region III - (215) 597-0980 DE, DC, MD, PA, VA, WV Region IV - (404) 347-3454 AL, FL, GA, KY, MS, NC, SC, TN Region V - (312) 886-7579 IL, IN, MI, MN, OH, WI Region VI - (214) 655-6760 AR, LA, NM, OK, TX Region VII - (913) 236-2850 IA, KS, MO, NE Region VIII - (303) 293-1720 CO, MT, ND, SD, UT, WY Region IX - (415) 974-7460 AM SAMOA, AZ, CA, GU, HI, NV, Trust Territory of the Pacific Isl., Marshall Isl., Palau, Ponape Region X - (206) 442-2782 AK, ID, OR, WA	Environmental response team available for technical assistance
National Animal Poison Control Center	1-217-333-3611	24-hour consultation concerning animal poisonings or chemical contamination. Provides an emergency response team to investigate incidents and perform laboratory analysis
National Response Center	1-800-424-8802	For reporting transportation incidents where hazardous materials are responsible for death, serious injury, property damage in excess of $50,000, or continuing danger to life and property

Exhibit I-1A
Local Telephone Information and Technical Support Resource Worksheet

Resource	Contact (fill in for future reference)	Services Provided (fill in for future reference)
EPA Regional Office		
Regional Poison Control Center		
State Emergency Response Commission		
State Health Department		
Community Fire Department		
Community Police Department		
Local Emergency Planning Committee		
Local Health Department		
State Department of Natural Resources		

Exhibit I-2
Computerized Data Sources of Information and Technical Support

Data System	Contact	Description
ANSWER	ANSWER Specialized Information Svcs National Library of Medicine Building 38A 8600 Rockville Pike Bethesda, Maryland 20894 (301) 496-6531	National Library of Medicine's Workstation for Emergency Response (ANSWER) – to advise emergency response health professionals on potential hazardous chemical emergencies
CAMEO	CAMEO Database Manager National Oceanic and Atmospheric Administration (NOAA) Hazardous Materials Response Branch, N/OMA-34 7600 Sand Point Way, N.E. Seattle, Washington 98115 (206) 526-6317	Computer-Aided Management of Emergency Operations available to on-scene responder Chemical identification database assists in: identifying substance involved, predicting downwind concentrations, providing response recommendations, and identifying potential hazards.
CHRIS	CIS, Inc Fein Management Associates 7215 York Road Baltimore, Maryland 21212 (800) 247-8737	Chemical Hazard Response Information System, developed by the Coast Guard and comprised of reviews on fire hazards, fire fighting recommendations, reactivities, physicochemical properties, health hazards, use of protective clothing, and shipping information for over 1,000 chemicals.
HAZARDTEXT	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	Assists responders dealing with incidents involving hazardous materials such as spills, leaks, and fires. Emergency medical treatment and recommendations for initial hazardous response are presented.
HMIS	David W. Donaldson Information Sys. Specialist Dept. of Trans./RSPA/OHMT 400 7th Street, S.W. Washington, D.C. 20590 (202) 366-5869	Hazardous Material Information Systems provides name and emergency phone number of manufacturer, chemical formula, NIOSH number, fire fighting, spill, and leak procedures
HSDB	Toxicology Data Network (TOXNET) National Library of Medicine Toxicology Information Program 8600 Rockville Pike Bethesda, Maryland 20894 (301) 496-6531	Hazardous Substances Data Bank, compiled by the National Library of Medicine, provides reviews on the toxicity, hazards, and regulatory status of over 4,000 frequently used chemicals.

Exhibit I-2 (cont.)
Computerized Data Sources of Information and Technical Support

Data System	Contact	Description
1st MEDICAL RESPONSE PROTOCOLS	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	For use in developing training programs and establishing protocols for first aid or initial workplace response to a medical emergency.
MEDITEXT	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	Provides recommendations regarding the evaluation and treatment of exposure to industrial chemicals.
OHMTADS	CIS, Inc. Fein Management Associates 7215 York Road Baltimore, Maryland 21212 (800) 247-8737	Oil and Hazardous Materials Technical Assistance Data Systems provides effects of spilled chemical compounds and their hazardous characteristics and properties, assists in identifying unknown substances, and recommends procedures for handling and cleanup.
TOMES	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	The Tomes Plus Information Systems is a series of comprehensive databases on a single CD-ROM disc. It provides information regarding hazardous properties of chemicals and medical effects from exposure. The Tomes Plus database contains Meditext, Hazardtext, HSDB, CHRIS, OHMTADS, and 1st Medical Response Protocols.
TOXNET	Toxicology Data Network (TOXNET) National Library of Medicine Toxicology Information Prog. Bethesda, Maryland 20894 (301) 496-6531	Computerized system of three toxicologically oriented data banks operated by the National Library of Medicine---the Hazardous Substances Data Bank, the Registry of Toxic Effects of Chemical Substances, and the Chemical Carcinogenesis Research Information System. TOXNET provides information on the health effects of exposure to industrial and environmental substances.

Exposure to hazardous chemicals may produce a wide range of adverse health effects. The likelihood of an adverse health effect occurring, and the severity of the effect, are dependent on the toxicity of the chemical, route of exposure, and the nature and extent of exposure to that substance. In order to better understand potential health effects, emergency department personnel should have an understanding of the basic principles and terminology of toxicology.

Toxicology is the study of the nature, effects, and detection of poisons in living organisms. Some examples of these adverse effects, sometimes called toxic end points, include carcinogenicity (development of cancer), hepatotoxicity (liver damage), neurotoxicity (nervous system damage), and nephrotoxicity (kidney damage). This is by no means a complete list of toxic end points, but rather a selection of effects that might be encountered (Exhibit I-3).

Exhibit I-3
Examples of Adverse Health Effects from Exposure to Toxic Chemicals

Toxic End Point	Target Organ Systems	Example of Causative Agent	Health Effect: Acute	Health Effect: Chronic
Carcinogenicity	Multiple Sites	Benzene	Dermatitis Tightness in Chest	Aleukemia Myeloblastic leukemia
Hepatotoxicity	Liver	Carbon Tetra-chloride	Vomiting Vesication Dizziness	Liver Necrosis Fatty Liver
Neurotoxicity	Nervous System	Lead	Nausea Vomiting Abdominal Pain	Wrist Drop IQ Deficits Encephalopathy
Nephrotoxicity	Kidney	Cadmium	Vomiting Diarrhea Chest Pain	Kidney Damage Anemia

Toxic chemicals often produce injuries at the site at which they come into contact with the body. A chemical injury at the site of contact with the body, typically the skin and the mucous membranes of the eyes, nose, mouth, or respiratory tract, is termed a *local toxic effect.* For example, irritant gases, such as chlorine and ammonia, can produce a localized toxic effect in the respiratory tract; corrosive acids and bases can produce a local damage to the skin. In addition, a toxic chemical may be absorbed into the blood stream and distributed to other parts of the body. These compounds may then produce *systemic effects*. For example, many pesticides are absorbed by the skin, distributed to other sites in the body, and produce adverse effects such as seizures or other neurological problems. It is important for medical providers to recognize that exposure to chemical compounds can result not only in the development of a single systemic effect but also in the development of multiple systemic effects or a combination of systemic and local effects.

Routes and Extent of Exposure

There are three main *routes of chemical exposure*: inhalation, skin contact, and ingestion. *Inhalation* results in the introduction of toxic compounds into the respiratory system. Most of the compounds that are commonly inhaled are gases or vapors of volatile liquids; however, solids and liquids can be inhaled as dusts or aerosols. Inhalation of toxic agents generally results in a rapid and effective absorption of the compound into the blood stream because of the large surface area of the lung tissue and number of blood vessels in the lungs. *Skin contact* exposure does not typically result in as rapid systemic dosage as inhalation, although some chemicals are readily absorbed through the skin. Many organic compounds are lipid (fat) soluble and can therefore be rapidly absorbed through the skin. Some materials that come in contact with the eyes can also be absorbed. *Ingestion* is a less common route of exposure for emergency response personnel at hazardous materials incidents. However, incidental hand-to-mouth contact, smoking, and swallowing of saliva and mucus containing trapped airborne contaminants can cause exposure by this route. In addition, emergency medical personnel in both hospital or prehospital settings will see chemical exposures in patients who have ingested toxic substances as a result of accidental poisonings or suicide attempts.

Compounds can also be introduced into the body by injection; however, injection exposure is an unlikely scenario involving spills or discharges of hazardous materials.

The route by which personnel are exposed to a compound plays a role in determining the total amount of the compound taken up by the body because a compound may be absorbed following exposure by one route more readily than by another. In addition to the route of exposure, the amount of the compound absorbed by the body depends on the duration of exposure to the compound and the concentration of the compound to which one is exposed. Therefore, a complex relationship exists between the total amount of the compound absorbed by the body (dose) and the concentration of that compound in the environment. This relationship is important for emergency response personnel to understand because the adverse effects produced by a toxic compound are often related to the dose of that compound received by a patient. However, because we usually only monitor the concentration of the toxic substance in the environment (e.g., parts per million (ppm) of a compound in air), the actual dose of the compound received by the patient is seldom known. Factors specific to the exposed patient, such as size of the skin surface area exposed, presence of open wounds or breaks in the skin, and rate and depth of respiration, are important in estimating the dose of the compound received by the patient.

Dose-Response Relationship

As mentioned above, the effect produced by a toxic compound is a function of the dose of the compound received by the organism. This principle, termed the dose-response relationship, is a key concept in toxicology. Many factors affect the normal dose-response relationship and should be considered when attempting to extrapolate toxicity data to a specific situation (Exhibit I-4).

Typically, as the dose increases, the severity of the toxic response increases. For example, humans exposed to 100 ppm of tetrachloroethylene, a solvent that is commonly used for dry-cleaning fabrics, may experience relatively mild symptoms, such as headache and drowsiness. However, exposure to 200 ppm tetrachloroethylene can result in a loss of motor coordination in some individuals. Exposure to 1,500 ppm tetrachloroethylene for 30 minutes may result in a loss of consciousness (Exhibit I-5). As shown in Exhibit I-5, the severity of the toxic effect is also dependent on the duration of exposure, a factor that influences the dose of the compound in the body.

Exhibit I-4
Classification of Factors Influencing Toxicity

Type	Examples
1. Factors related to the chemical.	Composition (salt, freebase, etc.); physical characteristics (size, liquid, solid, etc.); physical properties (volatility, solubility, etc.); presence of impurities; breakdown products; carriers.
2. Factors related to exposure.	Dose; concentration; route of exposure (inhalation, ingestion, etc.); duration.
3 Factors related to person exposed.	Heredity; immunology; nutrition; hormones; age; sex; health status; preexisting diseases.
4. Factors related to environment.	Media (air, water, soil, etc.); additional chemicals present; temperature; air pressure.

Exhibit I-5
Dose-Response Relationship for Humans
Inhaling Tetrachloroethylene Vapors

Levels in Air	Duration of Exposure	Effect on Nervous System
50 ppm		Odor threshold
100 ppm	7 hours	Headache, drowsiness
200 ppm	2 hours	Dizziness, uncoordination
600 ppm	10 minutes	Dizziness, loss of inhibitions
1,000 ppm	1-2 minutes	Marked dizziness, intolerable eye and respiratory tract irritation
1,500 ppm	30 minutes	Coma

Toxicity information is often expressed as the dose of the compound that causes an effect in a percentage of the exposed subjects, which are mostly experimental animals. These dose-response terms are often found in Material Safety Data Sheets (MSDS) and other sources of health information. One dose-response term that is commonly used is the lethal dose 50 (LD_{50}), the dose which is lethal to 50% of an animal population from exposure by any route other than inhalation when given all in one dose. Another similar term is the lethal concentration 50 (LC_{50}), which is the concentration of a material in air that on the basis of respiratory exposure in laboratory tests is expected to kill 50% of a group of test animals when administered as a single exposure (usually 1 hour). Exhibit I-6 lists a number of chemicals that may be encountered in dealing with hazardous materials incidents, and the reported acute LD_{50} values of these compounds when they are administered orally to rats.

Exhibit I-6
Acute LD_{50} Values for Representative Chemicals When Administered Orally to Rats

Chemical	Acute Oral LD_{50} (mg/kg)*
Sodium cyanide	6.4-10
Pentachlorophenol	50-230
Chlordane	83-560
Lindane	88-91
Toluene	2,600 - 7,000
Tetrachloroethylene	3,000-3,800

*Milligrams of the compound administered per kilogram body weight of the experimental animal.

From Exhibit I-6, it can be seen that a dose of 3,000-3,800 mg/kg tetrachloroethylene is lethal to 50% of rats that received the compound orally; however, only 6.4 to 10 mg/kg of sodium cyanide is required to produce the same effect. Therefore, compounds with low LD_{50} values are more acutely toxic than substances with larger LD_{50} values.

The LD_{50} values that appear in an MSDS or in the literature must be used with caution by emergency medical personnel. These values are an index of only one type of response and give no indication of the ability of the compound to cause nonlethal, adverse or chronic effects. Furthermore, LD_{50} values typically come from experimental animal studies. Because of the anatomical and physiological differences between animals and humans, it is difficult to compare the effects seen in experimental animal studies to the effects expected in humans exposed to hazardous materials in the field. Therefore, emergency medical personnel should remember that the LD_{50} and LC_{50} values are only useful for comparing the relative toxicity of compounds and should only be used to determine if one chemical is more toxic than another.

Responses to toxic chemicals may differ among individuals because of the physiological variability that is present in the human population. For example, an individual may be more likely to experience an adverse health effect after exposure to a toxic chemical because of a reduced ability to metabolize that compound. The presence of preexisting medical conditions can also increase one's susceptibility to toxic chemicals. Respiratory distress in patients or workers with asthma may be triggered by exposure to toxic chemicals at lower levels than might be expected to produce the same effect in individuals without respiratory disease. Factors such as age, personal habits (smoking, diet), previous exposure to toxic chemicals, and medications may also increase one's sensitivity to toxic chemicals. Therefore, exposure to concentrations of toxic compounds that would not be expected to result in the development of a toxic response in most individuals may cause an effect in susceptible individuals. Not all chemicals, however, have a threshold level. Some chemicals that produce cancer (carcinogens) may produce a response (tumors) at any dose level. Any exposure to these compounds may be associated with some risk of developing cancer. Thus, literature values for levels which are not likely to produce an effect do not guarantee that an effect will not occur.

Exposure Limits

The various occupational exposure limits found in the literature or in an MSDS are based primarily on time-weighted average limits, ceiling values, or ceiling concentration limits to which the worker can be exposed to without adverse effects. Examples of these are listed in Exhibit I-7.

The values listed in Exhibit I-7 were established to provide worker protection in occupational settings. Because the settings in which these values are appropriate are quite different than an uncontrolled spill site, it is difficult to interpret how these values should be used by emergency medical personnel dealing with a hazardous materials incident. At best, TLV, PEL, IDLH, and REL values can be used as a benchmark for determining relative toxicity, and perhaps assist in selecting appropriate levels of Personal Protective Equipment (PPE). Furthermore, these occupational exposure limits are only useful if the appropriate instrumentation is available for measuring the levels of toxic chemicals in the air at the chemical spill site. Of the above occupational exposure limit values, only the OSHA values are regulatory limits. The ACGIH values are for guidance only and are not regulatory limits. In addition, the ACGIH limits have certain caveats that may or may not affect the usefulness of the values. Some of these conditions are individual susceptibility or aggravation of a preexisting condition. Nevertheless, all emergency medical personnel responsible for the management of chemically contaminated patients should be familiar with these exposure limits because they will be encountered in various documents dealing with patient care or the selection of PPE.

This brief discussion highlights some fundamental concepts of toxicology. Emergency medical personnel responsible for managing chemically contaminated patients are encouraged to obtain further training in recognizing and treating health effects related to chemical exposure. Also, a list of general references in toxicology is provided at the end of this section that will allow emergency medical personnel to undertake a more in-depth examination of the principles of toxicology.

Exhibit I-7

Occupational Exposure Limits

	Value	Abbreviation	Definition
	Threshold Limit Value (3 Types) (ACGIH)*	TLV	Refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.
1)	Threshold Limit Value — Time-Weighted Average (ACGIH)*	TLV-TWA	The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
2)	Threshold Limit Value — Short-Term Exposure Limit	TLV-STEL	The concentration to which workers can be exposed continuously for a short period of time without suffer ing from: 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded.
3)	Threshold Limit Value — Ceiling (ACGIH)*	TLV-C	The concentration that should not be exceeded during any part of the working exposure.
	Permissible Exposure Limit (OSHA)**	PEL	Same as TLV-TWA.
	Immediately Dangerous to Life and Health (OSHA)**	IDLH	A maximum concentration (in air) from which one could to escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects.
	Recommended Exposure Limit (NIOSH)***	REL	Highest allowable airborne concentration that is not expected to injure a worker; expressed as a ceiling limit or time-weighted average for an 8- or 10-hour work day.

* American Conference of Governmental Industrial Hygienists

** Occupational Safety and Health Administration

*** National Institute for Occupational Safety and Health

This section is designed to provide those emergency medical personnel who receive a relatively large number of contaminated victims, because of their proximity to a chemical industrial area or transport corridor, with information on protective equipment and safety principles. However, in the vast majority of cases, EMS staff will not experience a large enough number of cases to keep them optimally trained or their equipment properly maintained. For example, respirators and their cartridges must be properly fitted, tested, and stored. Staff must be initially trained in the proficient use of PPE, specifically respiratory equipment, and must maintain that proficiency. Equipment must be maintained according to OSHA standards. Many EMS, given their workload mix, may not be able to expend the funds and time necessary to accomplish this task. In these cases, the EMS should make arrangements with the local fire department or hazardous materials (hazmat) team to be ready, if the situation warrants, to decontaminate patients, including those who are transported to a hospital before they are decontaminated. Considerations in determining what an EMS's capabilities should be include the number of incidents occurring locally (several per week versus only a few per year) and proximity to industries or transportation routes that have a potential for a hazardous materials incident (see Section III — SARA Title III).

Federal Regulations Pertaining to Use of Personal Protective Equipment (PPE)

The term Personal Protective Equipment (PPE) is used in this document to refer to both personal protective clothing and equipment. The purpose of PPE is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered at a hazardous materials incident.

Recent new OSHA standards mandate specific training requirements (8 hours of initial training or sufficient experience to demonstrate competency) for employees engaged in emergency response to hazardous substances incidents at the first responders operations level. Additionally, each employer must develop a safety and health program and provide for emergency response. These standards also are intended to provide additional protection for those who respond to hazardous materials incidents, such as firefighters, police officers, and EMS personnel. OSHA's March 6, 1989, 29 CFR 1910.120 final rule as it applies to emergency medical personnel states that: "Training shall be based on the duties and functions to be performed by each responder of an emergency response organization" (p. 9329).

Training Is Essential Before Any Individual Attempts To Use PPE.

No single combination of protective equipment and clothing is capable of protecting against all hazards. Thus, PPE should be used in conjunction with other protective methods. The use of PPE can