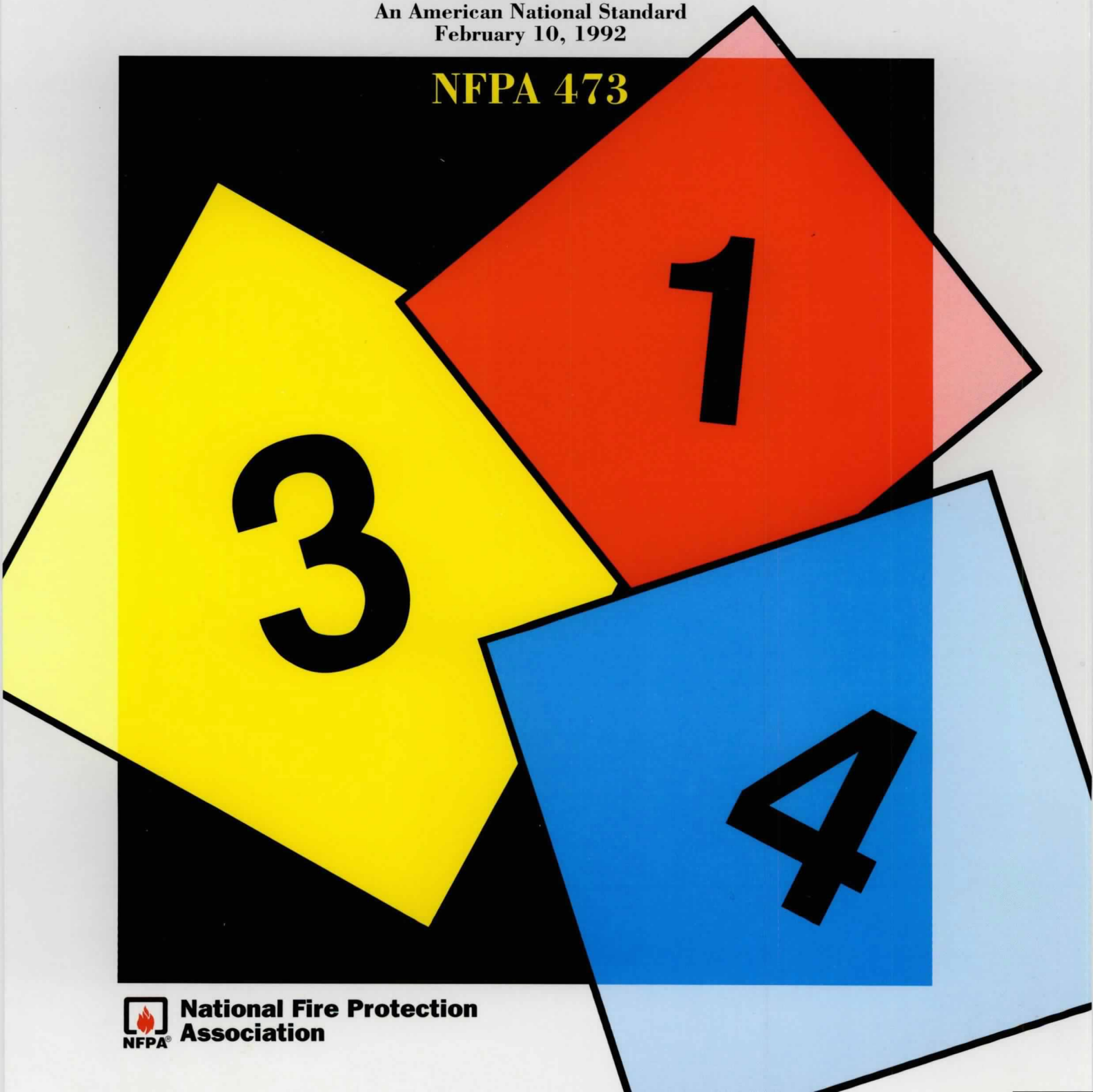


*Standard for Professional Competencies for EMS Personnel*

# **RESPONDING TO HAZARDOUS MATERIALS INCIDENTS**

**ANSI/NFPA 473**  
**An American National Standard**  
**February 10, 1992**

**NFPA 473**



**National Fire Protection  
Association**

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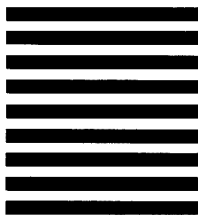
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**NFPA 473**

**Standard for**

**Competencies for EMS Personnel Responding to  
Hazardous Materials Incidents**

**1992 Edition**

This edition of NFPA 473, *Standard for Competencies for EMS Personnel Responding to Hazardous Materials Incidents*, was prepared by the Technical Committee on Hazardous Materials Response Personnel and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 18-20, 1991 in Montréal, Québec, Canada. It was issued by the Standards Council on January 17, 1992, with an effective date of February 10, 1992.

The 1992 edition of this document has been approved by the American National Standards Institute.

**Origin and Development of NFPA 473**

Following the development of NFPA 471 and NFPA 472, the Hazardous Materials Response Personnel Committee undertook the development of this standard relating to the professional competencies of emergency medical personnel who may be required to respond to hazardous materials incidents. The roles and responsibilities of EMS personnel at hazardous materials incidents had not been identified in the majority of emergency response systems. A subcommittee was appointed in 1989 to begin the development of this document.

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**NFPA 473**  
**Standard for**  
**Competencies for EMS Personnel**  
**Responding to**  
**Hazardous Materials Incidents**  
**1992 Edition**

NOTICE: An asterisk (\*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Chapter 4 and Appendix F.

## Chapter 1 Administration

**1-1 Scope.** This standard identifies the levels of competence required of emergency medical services (EMS) personnel who respond to hazardous materials incidents. It specifically covers the requirements for basic life support and advanced life support personnel in the prehospital setting.

**1-2 Purpose.** The purpose of this standard is to specify minimum requirements of competence and to enhance the safety and protection of response personnel and all components of the emergency medical services system. It is not the intent of this standard to restrict any jurisdiction from exceeding these minimum requirements. (See *Appendix B*.)

**1-2.1** The competency requirements for EMS personnel contained herein have been prepared to reduce the numbers of accidents, exposures, and injuries resulting from hazardous materials incidents.

### 1-3 Definitions.

#### Advanced Life Support (ALS).

*Emergency Medical Technician-Paramedic (EMT-P).* An individual who has successfully completed a course of instruction that meets or exceeds the requirements of the U.S. Department of Transportation National Standard EMT-Paramedic Curriculum and who holds an EMT-P certification from the authority having jurisdiction.

*Emergency Medical Technician-Intermediate (EMT-I).* (This category may include EMT-Cardiac.) An individual who has completed a course of instruction that includes selected modules of the U.S. Department of Transportation National Standard EMT-Paramedic Curriculum and who holds an intermediate level EMT-I or EMT-C certification from the authority having jurisdiction.

**Authority Having Jurisdiction.** The “authority having jurisdiction” is the organization, office or individual responsible for “approving” equipment, an installation, or a procedure.

NOTE: The phrase “authority having jurisdiction” is used in NFPA documents in a broad manner since jurisdictions and “Approval” agencies vary as do their responsibilities. Where public safety is primary, the “authority having jurisdiction” may be a federal, state, local or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the “authority having jurisdiction.” In many circumstances, the property owner or his designated agent assumes the role of the “authority having jurisdiction”, at government installation, the commanding officer or departmental official may be the “authority having jurisdiction”.

#### Basic Life Support (BLS).

*Emergency Medical Technician-Ambulance (EMT-A).* An individual who has completed a specified EMT-A course developed by the U.S. Department of Transportation and who holds an EMT-A certification from the authority having jurisdiction.

NOTE: This level in some jurisdictions may be recognized as EMT-Basic (EMT-B).

*Emergency Care First Responder (ECFR).* An individual who has successfully completed the specified Emergency Care First Responder course developed by U.S. Department of Transportation and who holds an ECFR certification from the authority having jurisdiction.

NOTE: In Canada the terminology used is: Emergency Medical Assistant-1 (EMA-1), Emergency Medical Assistant-2 (EMA-2), and Emergency Medical Assistant-3 (EMA-3).

**Cold Zone.** This area contains the command post and such other support functions as are deemed necessary to control the incident. This is also referred to as the clean zone or support zone in other documents.

**Competence.** Possessing knowledge, skills, and judgement needed to perform indicated objectives satisfactorily.

**Components of EMS System.** The parts of a comprehensive plan to treat an individual in need of emergency medical care following an illness or injury. These parts include:

- (a) First responders,
- (b) Emergency dispatching,
- (c) EMS agency response,
- (d) Hospital emergency departments,
- (e) Specialized care facilities.

**Contaminant/Contamination.** A substance or process that poses a threat to life, health, or the environment.

**Control.** The procedures, techniques, and methods used in the mitigation of a hazardous materials incident, including containment, extinguishment, and confinement.

**Control Zones.** The designation of areas at a hazardous materials incident based on safety and the degree of hazard. Many terms are used to describe the zones involved in a hazardous materials incident. For purposes of this standard, these zones shall be defined as the hot, warm, and cold zones.

**Decontamination (Contamination Reduction).** The physical and/or chemical process of reducing and preventing the spread of contamination from persons and equipment involved in a hazardous materials incident.

**Decontamination Area.** The area, usually located within the warm zone, where decontamination takes place.

**Demonstrate.** To show by actual use. This may be supplemented by simulation, explanation, illustration, or a combination of these.

**Describe.** To explain verbally or in writing using standard terms recognized in the hazardous materials response community.

**Gross Decontamination.** The initial phase of the decontamination process during which the amount of surface contaminant is significantly reduced. This phase may include mechanical removal and initial rinsing.

**Hazard/Hazardous.** Capable of posing an unreasonable risk to health, safety, or the environment; capable of doing harm.

**Hazardous Materials.\*** A substance (solid, liquid, or gas) capable of creating harm to people, property, and the environment.

**Class/Division.** The general category of hazard assigned to a hazardous material under the DOT regulations. The division is a subdivision of a hazard class.

#### Class 1 (Explosives)

- Division 1.1 — Explosives with a mass explosion hazard
- Division 1.2 — Explosives with a projection hazard
- Division 1.3 — Explosives with predominantly a fire hazard
- Division 1.4 — Explosives with no significant blast hazard
- Division 1.5 — Very insensitive explosives
- Division 1.6 — Extremely insensitive explosive articles

#### Class 2

- Division 2.1 — Flammable gas
- Division 2.2 — Nonflammable, non-poisonous compressed gas
- Division 2.3 — Poison gas
- Division 2.4 — Corrosive gas (Canadian)

#### Class 3 (Flammable Liquid)

- Division 3.1 — Flammable liquids, flashpoint  $< 0^{\circ}\text{F}$
- Division 3.2 — Flammable liquids, flashpoint  $0^{\circ}\text{F}$  & above but  $< 73^{\circ}\text{F}$
- Division 3.3 — Flammable liquids, flashpoint  $73^{\circ}\text{F}$  & up to  $141^{\circ}\text{F}$

#### Combustible Liquid

#### Class 4

- Division 4.1 — Flammable solid
- Division 4.2 — Spontaneously combustible material
- Division 4.3 — Dangerous when wet material

#### Class 5

- Division 5.1 — Oxidizer
- Division 5.2 — Organic peroxide

#### Class 6

- Division 6.1 — Poisonous material
- Division 6.2 — Infectious material

#### Class 7 (Radioactive material)

#### Class 8 (Corrosive material)

#### Class 9 (Miscellaneous hazardous material)

#### ORM-D material

**Hazardous Materials Response Team.** A group of trained response personnel operating under an emergency response plan and appropriate standard operating procedures to control or otherwise minimize or eliminate the hazards to people, property, or the environment from a released hazardous material.

**High Temperature-Protective Clothing.** Protective clothing designed to protect the wearer from short-term high temperature exposures. This type of clothing is usually of limited use in dealing with chemical commodities.

**Hot Zone.** Area immediately surrounding a hazardous materials incident, which extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone. This zone is also referred to as the exclusion zone or restricted zone in other documents.

**Identify.** To select or indicate verbally or in writing using standard terms to establish the identity of; the fact of being the same as the one described.

**Incident.** An event involving a hazardous material or a release or potential release of a hazardous material.

**Incident Commander.** The person responsible for the overall coordination and direction of all activities at the incident scene, as specified in NFPA 1561, *Standard on Fire Department Incident Management System*.

**Incident Management System.** An organized system of roles, responsibilities, and standard operating procedures used to manage emergency operations, as described in NFPA 1561, *Standard on Fire Department Incident Management System*. Such systems are often referred to as "Incident Command Systems."

**Local Area.** A geographic area that includes the defined response area and receiving facilities for an EMS agency.

**Local Emergency Planning Committee (LEPC).** (As mandated by SARA Title III.) The LEPC must include elected state and local officials, police, fire, civil defense,

public health professionals, environmental, hospital, and transportation officials as well as representatives of facilities, community groups, and the media.

**Medical Control.** The physician providing direction for patient care activities in the prehospital setting.

**Medical Surveillance.** The ongoing process of medical evaluation of hazardous materials response team members and public safety personnel who may respond to a hazardous materials incident.

**Objective.** A goal that is achieved through the attainment of a skill, knowledge, or both that can be observed or measured.

**Personal Protective Equipment.** The equipment provided to shield or isolate a person from the chemical, physical, and thermal hazards that may be encountered at a hazardous materials incident. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. Personal protective equipment includes both personal protective clothing and respiratory protection.

**Protective Clothing.** Equipment designed to protect the wearer from heat and/or hazardous materials contacting the skin or eyes. Protective clothing is divided into three types:

- (a) Structural fire fighting protective clothing,
- (b) Chemical-protective clothing, and
- (c) High temperature-protective clothing.

**Protocol.** A series of sequential steps describing the precise patient treatment.

**Region.** A geographic area that includes the local and neighboring jurisdiction for an EMS agency.

**Respiratory Protection.** Equipment designed to protect the wearer from the inhalation of contaminants. Respiratory protection is divided into three types:

- (a) Positive pressure self-contained breathing apparatus,
- (b) Positive pressure airline respirators, and
- (c) Air purifying respirators.

**Safely.** To perform the objective without injury to self or others, property, or the environment.

**Secondary Contamination.\*** The transfer of contaminants to personnel or equipment outside the hot zone.

**Shall.** Indicates a mandatory requirement.

**Should.** Indicates a recommendation or that which is advised but not required.

**Termination.** That portion of incident management in which personnel are involved in documenting safety procedures, site operations, hazards faced, and lessons learned from the incident. Termination is divided into three phases: debriefing the incident, post-incident analysis, and critiquing the incident.

**Understanding.** The process of gaining or developing the meaning of various types of materials or knowledge.

**Warm Zone.** The area where personnel and equipment decontamination and hot zone support takes place. It includes control points for access corridor and thus assists in reducing the spread of contamination. This is also referred to as the decontamination, contamination reduction, or limited access zone in other documents.

## Chapter 2 Competencies for EMS/HM Level I Responders

### 2-1 General.

**2-1.1 Introduction.** All EMS personnel at EMS/HM Level I, in addition to their BLS or ALS certification, shall be trained to meet at least the First Responder Awareness level as defined in NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*, and all competencies of this chapter.

**2-1.2\* Definition.** EMS personnel at EMS/HM Level I are those persons who, in the course of their normal duties, may be called on to perform patient care activities in the cold zone at a hazardous materials incident. EMS/HM Level I Responders shall provide care only to those individuals who no longer pose a significant risk of secondary contamination.

**2-1.3 Goal.** The goal of the competencies at EMS/HM Level I, shall be to provide the individual with the knowledge and skills necessary to safely deliver emergency medical care in the cold zone. Therefore the EMS/HM Level I Responder shall be able to:

(a) Analyze a hazardous materials emergency to determine what risks are present to the provider and the patient by completing the following tasks:

1. Determine the hazards present to the Level I Responder and the patient in a hazardous materials incident, and

2. Assess the patient to determine the risk of secondary contamination.

(b) Plan a response to provide the appropriate level of emergency medical care to persons involved in hazardous materials incidents by completing the following tasks:

1. Describe the role of the Level I Responder in a hazardous materials incident,

2. Plan a response to provide the appropriate level of emergency medical care in a hazardous materials incident,

3. Determine if the personal protective equipment provided is appropriate, and

4. Determine if the equipment and supplies provided are adequate.

(c) Implement the planned response by completing the following:

1. Perform the necessary preparations for receiving the hazardous materials patient and preventing secondary contamination,

2. Treat the hazardous materials patient, and
3. Transport the patient as appropriate.
- (d) Terminate the incident.

## **2-2 Competencies — Analyzing the Hazardous Material Incident.**

**2-2.1** Determine the hazards present to the Level I Responder and the patient in a hazardous materials incident. The Level I Responder shall, given an emergency involving hazardous materials, determine the hazards to the responder and the patient in that situation. The Level I Responder shall be able to:

(a) Assess the nature and severity of the incident (size-up) as they pertain to EMS responsibilities at a hazardous materials incident with evaluation of available resources and a request for any needed assistance.

(b) Evaluate the environmental factors as they affect patient care.

(c) Identify the information resources available and how to access the following:

1. Poison Control Center
2. Medical Control
3. Material safety data sheets
4. Reference guide books
5. Hazardous materials data bases
6. Technical information centers (CHEMTREC, NRC, etc.)
7. Technical specialists
8. Agency for Toxic Substances and Disease Registry (ATSDR).

(d) Given a pesticide label, identify and explain the significance of the following:

1. Name of pesticide
2. Signal word
3. EPA registration number
4. Precautionary statement
5. Hazard statement
6. Active ingredient.

**2-2.2** Assess the patient to determine the risk of secondary contamination. The Level I Responder shall, given a hazardous materials incident with a patient(s), determine the risk of secondary contamination. The responder shall be able to:

(a) Explain the basic toxicological principles relative to assessment and treatment of victims exposed to hazardous materials, including:

1. Acute and delayed toxicity
2. Routes of exposure to toxic materials
3. Local and systemic effects
4. Dose-response as it relates to risk assessment
- 5.\* Synergistic effects

6. Health hazard as determined by assessing toxicity, exposure, and dose.

(b) Describe how the chemical contamination of patients alters the principles of triage in hazardous materials incidents.

(c) Explain the need for patient decontamination procedures at hazardous materials incidents.

(d) Describe how the potential for secondary contamination determines the extent of patient decontamination required.

(e) Describe the way that personnel, personal protective clothing, apparatus, tools, and equipment become contaminated and the importance and limitations of decontamination procedures.

(f) Explain the decontamination procedures as defined by the authority having jurisdiction for patients, personnel, personal protective equipment, and apparatus at hazardous materials incidents.

## **2-3 Competencies — Planning the Response.**

**2-3.1** Describe the role of the Level I Responder in a hazardous materials incident. The Level I Responder shall, given a plan of action by the incident commander, describe their role in a hazardous materials incident as identified in the local emergency response plan or organization's standard operating procedures, including:

(a) Describe the emergency medical component for the hazardous materials incident response plan as developed by the authority having jurisdiction.

(b) State the Level I Responder's role within the hazardous materials response plan as developed by the authority having jurisdiction.

(c) State the Level I Responder's role within the hazardous materials Incident Management System.

**2-3.2** Plan a response to provide the appropriate level of emergency medical care to patients in a hazardous materials incident. The Level I Responder shall, given a hazardous materials incident, be able to plan the appropriate emergency medical care, including:

(a) Describe the standard operating procedures for the medical management of persons exposed to hazardous materials, as specified by the authority having jurisdiction.

**2-3.3** Determine if the personal protective equipment provided is appropriate. The Level I Responder shall, given the name of the hazardous material and the type, duration, and extent of exposure and decontamination process, determine if available personal protective clothing and equipment is appropriate to implement the planned response. The Level I Responder shall be able to:

(a) Describe the application, use, and limitations of the following:

1. Street clothing and work uniforms
2. Structural fire fighter protective clothing
3. Respiratory protective equipment
4. Chemical-protective clothing.

**2-3.4** Determine if the equipment and supplies provided are adequate for implementing the planned response. The Level I Responder shall, given a simulated hazardous materials incident, determine if available equipment and supplies are appropriate to implement the planned response. The Level I Responder shall be able to:

(a) Describe the equipment and supplies available to the Level I Responder for the care and transportation of the hazardous materials incident patient.

## **2-4 Competencies — Implementing the Planned Response.**

**2-4.1** Perform the preparations necessary to receive the patient for treatment and transport. The Level I Responder shall, given a plan for providing patient care at a hazardous materials incident, be able to:

(a) List the information that should be communicated to the Medical Control/Receiving facility regarding the hazardous materials incident, including:

1. Type and nature of the incident
2. Chemical involved and its physical state
3. Number of potential patients.

(b) Describe the procedure for preparing the vehicle and equipment for the patient.

(c) Demonstrate the proper donning, doffing, usage, and limitations of all personal protective equipment provided to the Level I Responder by the authority having jurisdiction for use in their hazardous materials response activities.

(d) Describe the concept of patient transfer from the incident site to the decontamination area and then to the treatment area.

**2-4.2** Treat the hazardous materials patient. The Level I Responder shall, given a patient from a hazardous materials incident, provide patient care consistent with the planned response and the organization's standard operating procedures. The Level I Responder shall be able to:

(a) Describe how chemical contamination alters the assessment and care of the hazardous materials patient.

(b) List the common signs and symptoms and describe the EMS treatment protocols for the following:

1. Corrosives (e.g., acid, alkali)
2. Pulmonary irritants (e.g., ammonia, chlorine)
3. Pesticides (e.g., organophosphates, carbamates)
4. Chemical asphyxiants (e.g., cyanide, carbon monoxide)
5. Hydrocarbon solvents (e.g., xylene, methylene chloride).

(c) Explain the potential risk with invasive procedures for hazardous materials patients.

(d) Demonstrate the ability to perform the following EMS functions within the Incident Management System on incidents involving multiple hazardous materials patients:

- 1.\* EMS control
2. Triage
3. Treatment
4. Disposition and transportation.

**2-4.3** Transport the patient. The Level I Responder shall, given a patient from a hazardous materials incident, transport the patient as specified in the local emergency response plan and the organization's standard operating procedures. The Level I Responder shall be able to:

(a) Identify the capabilities of the medical facilities available in the local area to receive hazardous materials patients.

(b) Identify the acceptable vehicles available to transport hazardous materials patients from the treatment area to a receiving facility.

(c) List the pertinent patient information that should be communicated to the receiving facility, including:

1. Estimated time of arrival
2. Age/sex
3. Patient condition/chief complaint
4. Associated injuries
5. Routes, extent, and duration of chemical exposure
6. Pertinent medical history
7. Signs and symptoms
8. Vital signs
9. Treatment, including decontamination and patient response
10. Pertinent chemical characteristics.

(d) Describe the actions necessary for the coordinated delivery of hazardous materials incidents patients to a receiving facility.

(e) Explain the special hazards associated with air transportation of patients exposed to hazardous materials.

## **2-5 Competencies — Terminating the Incident.**

**2-5.1** Perform the reporting, documentation, and follow-up required of the EMS component of the hazardous materials incident. The Level I Responder shall, upon termination of the hazardous materials incident, complete the reporting, documentation, and EMS termination activities as required by the local emergency response plan or the organization's standard operating procedures. The Level I Responder shall be able to:

(a) List the information to be gathered regarding the exposure of the patient and the EMS provider and describe the proper reporting procedures, including:

1. Product information
2. Routes, extent, and duration of exposure
3. Actions taken to limit exposure and contamination
4. Treatment rendered
5. Patient condition and disposition.

(b) Identify situations that may necessitate critical incident stress debriefing intervention.

(c) Describe the EMS provider's role in the post-incident critique.

## Chapter 3 Competencies for EMS/HM Level II Responders

### 3-1 General.

**3-1.1 Introduction.** All personnel at EMS/HM Level II shall be certified to the EMT-A level or higher and shall meet all competencies for EMS/HM Level I in addition to all the competencies of this chapter.

**3-1.2 Definition.** Personnel at EMS/HM Level II are those persons who, in the course of their normal activities, may be called upon to perform patient care activities in the warm zone at hazardous materials incidents. EMS/HM Level II Responder personnel may provide care to those individuals who still pose a significant risk of secondary contamination. In addition, personnel at this level shall be able to coordinate EMS activities at a hazardous materials incident and provide medical support for hazardous materials response personnel.

**3-1.3 Goal.** The goal of the competencies at EMS/HM Level II shall be to provide the Level II Responder with the knowledge and skills necessary to perform and/or coordinate patient care activities and medical support of hazardous materials response personnel in the warm zone. Therefore the Level II Responder shall be able to:

(a) Analyze a hazardous materials incident to determine the magnitude of problem in terms of outcomes by completing the following tasks:

1. Determine the hazards present to the Level II Responder and the patient in a hazardous materials incident, and

2. Assess the patient to determine the patient care needs and the risk of secondary contamination.

(b) Plan a response to provide the appropriate level of emergency medical care to persons involved in hazardous materials incidents and to provide medical support to hazardous materials response personnel by completing the following tasks:

1. Describe the role of the Level II Responder in a hazardous materials incident,

2. Plan a response to provide the appropriate level of emergency medical care in a hazardous materials incident, and

3. Determine if the personal protective equipment provided EMS personnel is appropriate.

(c) Implement the planned response by completing the following:

1. Perform the necessary preparations for receiving the patient,

2. Perform necessary treatment to the hazardous materials patient,

3. Coordinate and manage the EMS component of the hazardous materials incident, and

4. Perform medical support of hazardous materials incident response personnel.

(d) Terminate the incident.

### 3-2 Competencies — Analyzing the Hazardous Materials Incident.

**3-2.1** Determine the hazards present to the Level II Responder and the patient in a hazardous materials incident. The Level II Responder shall, given an emergency involving hazardous materials, determine the hazards to the responders and the patient in that situation. The Level II Responder shall be able to:

(a) Define the following chemical and physical properties and describe their importance in the risk assessment process:

1. Boiling point
2. Flammable (explosive) limits
3. Flash point
4. Ignition temperature
5. Specific gravity
6. Vapor density
7. Vapor pressure
8. Water solubility.

(b) Define the following terms:

1. Alpha radiation
2. Beta radiation
3. Gamma radiation.

(c) Define the following toxicological terms and explain their use in the risk assessment process:

1. Threshold limit value (TLV-TWA)
2. Lethal concentration and doses (LD<sub>50/100</sub>)
3. Parts per million/billion (ppm/ppb)
4. Immediately dangerous to life and health (IDLH)
5. Permissible exposure limit (PEL)
6. Short term exposure limit (TLV-STEL)
7. Ceiling level (TLV-C).

(d) Given a specific hazardous material and using the information sources available to the Level II Responder, demonstrate extracting appropriate information about the physical characteristics and chemical properties, hazards, and suggested medical response considerations for that material.

**3-2.2** Assess the patient and conditions to determine the risk of secondary contamination. The Level II Responder shall, given a hazardous materials incident with a patient(s), determine the risk of secondary contamination. The Level II Responder shall be able to:

(a) Identify sources of technical information for the performance of patient decontamination.

(b) Identify the factors that influence the decision of when and where to treat the patient and the extent of patient care, including:

1. Hazardous material toxicity
2. Patient condition
3. Availability of decontamination.

### 3-3 Competencies — Planning the Response.

**3-3.1** Describe the role of the Level II Responder at a hazardous materials incident. The Level II Responder shall, given a plan of action by the incident commander, describe his or her role in hazardous materials incident as identified in the local emergency response plan or the organization's standard operating procedures. The Level II Responder shall be able to:

(a) Describe the importance of coordination between various agencies at the scene of hazardous materials incidents.

**3-3.2** Plan a response to provide the appropriate level of emergency medical care to persons involved in hazardous materials incidents and to provide medical support to hazardous materials response personnel. The Level II Responder shall, given a hazardous materials incident, be able to develop the plan for EMS activities. The Level II Responder shall be able to:

(a) Given a simulated hazardous materials incident, assess the problem and formulate and implement a plan including:

1. EMS control activities
2. EMS component of an incident management system
3. Medical monitoring of personnel utilizing chemical-protective and high temperature-protective clothing
4. Triage of hazardous materials victims
5. Medical treatment for chemically contaminated individuals
6. Product and exposure information gathering and documentation.

(b) Describe the importance of pre-emergency planning relating to specific sites.

(c) Describe the hazards and precautions to be observed when approaching a hazardous materials incident.

(d) Describe the considerations associated with the placement, location, and setup of the patient decontamination site.

(e) Explain the advantages and limitations of the following techniques of decontamination and how they may or may not be applicable to patient decontamination:

1. Absorption
2. Chemical degradation
3. Dilution
4. Isolation.

(f) Describe when it may be prudent to pull back from a hazardous materials incident.

**3-3.3** Determine if personal protective equipment provided is appropriate. The Level II Responder shall, given the name of exposure, determine if the protective clothing and equipment available to EMS personnel is appropriate to implement the planned response.

(a) Identify the advantages and dangers of search and rescue missions at hazardous materials incidents.

(b) Identify the advantages and hazards associated with the rescue, extrication, and removal of a victim from a hazardous materials incident.

(c) Describe the types, application, use, and limitations of protective clothing used by EMS personnel at hazardous materials incidents.

(d) Demonstrate how to interpret a chemical compatibility chart for chemical-protective clothing.

### 3-4 Competencies — Implementing the Planned Response.

**3-4.1** Perform the preparations necessary to receive the patient for treatment and transport. The Level II Responder shall, given a plan for providing patient care at a hazardous materials incident, be able to:

(a) Demonstrate the proper donning, doffing, and usage of all personal protective equipment provided to the Level II Responder by the authority having jurisdiction.

**3-4.2** Perform the necessary treatment to hazardous materials patients. At the scene of a hazardous materials incident, the Level II Responder shall be able to provide or coordinate the patient care. The Level II Responder shall be able to:

(a) Given a simulated hazardous materials incident and using local available resources, demonstrate the implementation of the patient decontamination procedure. (*See Appendix E.*)

(b) Explain the principles of emergency decontamination and its application for critically ill patients.

(c) Demonstrate the ability to coordinate patient care activities including treatment, disposition, and transportation of patients.

**3-4.3** Coordinate and manage the EMS component of the hazardous materials incident. The Level II Responder shall be able to:

(a) Given a simulated hazardous materials incident, the Level II Responder shall be able to demonstrate the ability to establish and manage the EMS component of an incident management system.

**3-4.4** Perform medical support of hazardous materials incident response personnel. The Level II Responder shall be able to:

(a) Explain the components of pre-entry and post-entry assessment, including:

1. Vital signs
2. Body weight
3. General health
4. Neurological status
5. Electrocardiographic rhythm strip, if available.

(b) Explain the following factors and how they influence heat stress for hazardous materials response personnel, including:

1. Hydration
2. Physical fitness
3. Environmental factors
4. Activity levels
5. Level of PPE
6. Duration of entry.

(c) Explain the medical monitoring protocols and demonstrate medical monitoring procedures for personnel at the scene of a hazardous materials incident.

(d) Describe the criteria for site selection of a medical monitoring station.

(e) Demonstrate the ability to set up and operate a medical monitoring station.

(f) Demonstrate the ability to interpret and analyze data obtained from medical monitoring of hazardous materials response personnel.

(g) Given a simulated hazardous materials incident, demonstrate proper documentation of medical monitoring.

### 3-5 Competencies — Terminating the Incident.

**3-5.1** Perform the reporting, documentation, and follow-up required of the EMS component of the hazardous materials incident. The Level II Responder shall, upon termination of the hazardous materials incident, complete the reporting, documentation, and EMS termination activities as required by the local emergency response plan or the organization's standard operating procedures. The Level II Responder shall be able to:

(a)\* Describe the information regarding incident EMS activities that should be relayed through the chain of command to the incident commander.

(b) Describe the activities required in terminating the EMS component of a hazardous materials incident.

(c) Describe the process and demonstrate the ability to conduct the EMS portion of an incident critique.

(d) Explain the process of making revisions to EMS operating procedures and response capabilities as a result of information learned.

## Chapter 4 Referenced Publications

**4-1** The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**4-1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*, 1989 edition

NFPA 1561, *Standard on Fire Department Incident Management System*, 1990 edition.

## Appendix A

*This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.*

**A-1-3 Hazardous Materials.** There are many definitions and descriptive names being used for the term hazardous materials, each of which depends on the nature of the problem being addressed.

Unfortunately, there is no one list or definition that covers everything. The United States agencies involved, as well as state and local governments, have different purposes for regulating hazardous materials that, under certain circumstances, pose a risk to the public or the environment.

(a) *Hazardous Materials.* The United States Department of Transportation (DOT) uses the term hazardous materials, which covers eight hazard classes, some of which have subcategories called classification, and a ninth class covering other regulated materials (ORM). DOT includes in its regulations hazardous substances and hazardous wastes as an ORM-E, both of which are regulated by the Environmental Protection Agency (EPA), if their inherent properties would not otherwise be covered.

(b) *Hazardous Substances.* EPA uses the term hazardous substance for the chemicals that, if released into the environment above a certain amount, must be reported and, depending on the threat to the environment, for which federal assistance in handling the incident can be authorized. A list of the hazardous substances is published in 40 CFR Part 302, Table 302.4.

(c) *Extremely Hazardous Substances.* EPA uses the term extremely hazardous substance for chemicals that must be reported to the appropriate authorities if released above the threshold reporting quantity. Each substance has a threshold reporting quantity. The list of extremely hazardous substances is identified in Title III of Superfund Amendments and Reauthorization Act (SARA) of 1986 (40 CFR Part 355).

(d) *Toxic Chemicals.* EPA uses the term toxic chemical for chemicals whose total emissions or releases must be reported annually by owners and operators of certain facilities that manufacture, process, or otherwise use a listed toxic chemical. The list of toxic chemicals is identified in Title III of SARA.

(e) *Hazardous Wastes.* EPA uses the term hazardous wastes for chemicals that are regulated under the Resource, Conservation and Recovery Act (40 CFR Part 261.33). Hazardous wastes in transportation are regulated by DOT (49 CFR Parts 170-179).

(f) *Hazardous Chemicals.* The United States Occupational Safety and Health Administration (OSHA) uses the term hazardous chemical to denote any chemical that would be a risk to employees if exposed in the work place. Hazardous chemicals cover a broader group of chemicals than the other chemical lists.



(g) *Hazardous Substances.* OSHA uses the term hazardous substances in 29 CFR Part 1910.120, which resulted from Title I of SARA and covers emergency response. OSHA uses the term differently than EPA. Hazardous substances, as used by OSHA, cover every chemical regulated by both DOT and EPA.

**A-1-3 Secondary Contamination.** A substance is considered to pose a serious risk of secondary contamination if it is likely to be carried on equipment, clothing, skin, or hair in sufficient quantities to be capable of harming personnel outside of the hot zone.

**A-2-1.2** See Appendix D.

**A-2-2.2(a)5** As defined in Webster's Dictionary, the word synergism means "a cooperative action of discrete agencies such that the total effect is greater than the sum of the effects taken independently." In the context of hazardous materials, it is important to remember that the signs and symptoms of a given chemical are generally standard for that particular chemical. But when two or more chemicals are involved, the resultant signs and symptoms from an exposure may be dramatically different than what the EMS provider anticipates.

**A-2-4.2(d)1** EMS control activities at a hazardous materials incident include but are not limited to:

(a) Identification of EMS needs including appropriate level of protection for EMS personnel and equipment, resources for patient care, and decontamination of patient and EMS personnel.

(b) Securing of resources to meet EMS needs.

(c) Assignment of personnel, in the cold zone, to coordinate triage, treatment, disposition, and transport as required.

(d) Assignment of appropriately trained personnel to perform medical monitoring and other EMS support functions for hazardous materials response personnel in the cold zone.

(e) Assignment of appropriately trained personnel to provide patient care, assist with patient decontamination, and any other EMS support functions, as may be required in the warm zone.

**A-3-5.1(a)** The type of information that should be made available to the Incident Commander would include but not necessarily be limited to the following:

(a) Patients.

1. Number
2. Condition
3. Disposition.

(b) Hazardous materials response personnel.

1. Number of personnel screened
2. Adverse reactions noted
3. Personnel transported for further treatment
4. Completed records

5. Recommended medical, physical, and psychological needs for immediate rehabilitation

6. Recommended medical surveillance followup.

(c) Availability of EMS personnel and equipment.

## Appendix B Training

*This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.*

**B-1 General.** The Emergency Medical Services (EMS) personnel responding to hazardous materials incidents should be trained and should receive regular continuing education to maintain competency in three areas: emergency medical technology, hazardous materials, and specialized topics approved by the authority having jurisdiction.

**B-1.1 EMS Training.** Recognized US DOT, state, regional, or local training curricula should constitute the entry level EMS preparation for continuing hazardous materials training. At a hazardous materials incident it is desirable that all EMS BLS Provider personnel be trained to the US DOT EMT-A level or equivalent.

**B-1.2 Hazardous Materials Training.** The foundation for EMS response to a hazardous materials incident should be the competencies described in NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*.

**B-1.3 Specialized Training.** Following completion of approved EMS training and appropriate level of hazardous materials instruction described in NFPA 473, the authority having jurisdiction should stipulate additional specialized instruction that the EMS personnel responding to hazardous materials incidents must complete.

### B-2 Training Plan.

**B-2.1** The authority having jurisdiction should develop a formal training plan and provide a program to train EMS personnel to the level being utilized.

**B-2.2** A training plan should be developed and contain guidelines for the following functional categories:

- (a) Program management
- (b) Content development
- (c) Instructor competencies
- (d) Technical specialist competencies.

**B-2.3** The training plan should be criteria-based to maintain a consistent quality of curriculum and instruction.

**B-2.4** The training plan should specify entry knowledge and skill levels, training, and refresher training for both students and instructors.

**B-2.5** The training plan should define evaluation criteria for successful completion of knowledge and skill objectives of the training program.

**B-2.6** The training plan should provide for supervised field experience for EMS HAZMAT Responder and EMS HAZMAT Coordinator training levels.

**B-3 Training Program.** The training program should be a comprehensive competency-based guideline of the implementation and presentation of the required subject material. As a minimum it should address the following areas.

**B-3.1 Program Manager.**

**B-3.1.1** The Program Manager should have the authority and responsibility for the overall implementation of the program.

**B-3.1.2** The Program Manager should be able to demonstrate knowledge of the following:

(a) The content of NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*; NFPA 471, *Recommended Practice for Responding to Hazardous Materials Incidents*; and NFPA 473, *Standard for Competencies for EMS Responders to Hazardous Materials Incidents*,

- (b) EMS delivery systems,
- (c) Budgeting and financial planning, and
- (d) Processes used to develop instructional materials.

**B-3.1.3** The Program Manager should demonstrate the skill and ability to:

- (a) Coordinate the training program,
- (b) Evaluate program effectiveness, and
- (c) Identify instructors and technical specialists.

**B-3.2 Content.** The content of the training program should include the competencies of NFPA 473 as a minimum.

**B-3.3 Evaluation.** Recognizing the need for technically sound curricula and instruction to meet the competencies outlined in this standard, careful evaluation of all instructors' training, background, and experience should be made.

**B-3.3.1** The authority having jurisdiction should ensure that the training program meets the needs of the local area.

**B-3.3.2** The Program Manager should ensure that the training program meets the needs of the hazardous materials response team and the EMS providers.

**B-4 Instruction.** The need exists for technically sound curricula and delivery to meet the competencies outlined in this standard.

**B-4.1 Instructors.** The instructor should:

- (a) Have mastery of the material he/she presents,
- (b) Have an understanding of the training program objectives, and
- (c) Have the ability to teach and evaluate.

**B-4.2 Technical Specialist.** The technical specialist is a person who has technical expertise and practical knowledge in a specific area. This category is intended to support training activities by allowing individuals not otherwise qualified at the instructor level to present an essential segment for which they do have expertise.

**B-4.3 Final Evaluation.** Upon completion of the training program the student should demonstrate competency in all prescribed content areas. This evaluation should include written and practical testing as specified by the program manager and instructors.

## Appendix C Recommended Support Resources

*This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.*

**C-1 General.** Emergency medical service personnel who respond to hazardous materials incidents must operate within a network of support resources. This appendix addresses the general classes of these resources and presents a recommended minimum level of support necessary for adequate emergency medical response.

### C-2 Poison Control Centers (PCC).

**C-2.1 Goal.** In addition to providing support to the general hazardous materials response, the goal of the Poison Control Center is to provide the emergency medical personnel who respond to hazardous materials incidents with medical guidance, information, and advice during incidents involving toxic chemical releases and associated injuries. The PCC should regularly participate in the following activities together with the EMS component of the hazardous materials incident response:

#### C-2.2.1 Preplanning Assistance.

- (a) Training,
- (b) EMS HAZMAT standard operating procedures review,
- (c) EMS reference materials.

**C-2.2.2 Technical Advice.** The ability to coordinate decontamination, treatment, and transportation of injured persons. The PCC should be available to the EMS personnel who respond to hazardous materials incidents for emergency consultation around the clock and during the normal working hours for nonemergency consultation. Poison Control Centers should be capable of providing advice regarding:

- (a) Identify of ingredients,
- (b) Toxicity of substances involved and symptoms and signs of exposure,
- (c) Level of protective clothing recommended,
- (d) Potential for secondary contamination,
- (e) Recommended decontamination procedures, and
- (f) Specific treatment and or antidotes.

**C-2.2.3 Data Bases.** The PCC should supervise and review the EMS data bases used during hazardous materials incident response.

**C-2.2.4 Medical Surveillance.** The PCC should provide support for:

- (a) Surveillance quality assurance program design
- (b) Surveillance Q/A program review
- (c) Medical followup activities.

### **C-3 Chemical Injury Treatment Centers.**

**C-3.1 Goal.** The emergency medical responders to hazardous materials incidents should transfer chemically injured patients to facilities having adequate chemical injury treatment capability. All such facilities should have a minimum level of competency to receive those patients including:

#### **C-3.1.1 Patient Decontamination Capabilities.**

- (a) Decontamination area
- (b) Proper ventilation system
- (c) Restricted access
- (d) Runoff containment.

**C-3.1.2** A cadre of trained in-house hazardous materials incident injury treatment personnel.

**C-3.1.3** Personal protective clothing for hospital personnel that may treat HAZMAT patients.

**C-3.1.4** Formal hazardous materials incident response procedures directed to EMS providers and hospital personnel.

**C-4 Communications.** The network of emergency medical response resources to hazardous materials incidents should be linked by an adequate communication system within the incident command post. The following components are suggested as a minimum.

**C-4.1 Radiotelephone.** All mobile and fixed EMS components should be able to coordinate EMS hazardous materials incident response via at least one dedicated frequency. All fixed facilities shall have r-f emergency power capability for at least one radio channel.

**C-4.2 Telephone Service.** There should be telephone service within the Medical Section/Division; preferably a cellular telephone.

**C-4.3 Computer.** All components of the EMS hazardous materials incident response system should have an orientation to and direct or indirect access to computerized chemical databases, computerized preplans, and computerized operational command and control.

**C-4.3.1 Fixed Installation.** Computer generated information should be readily available to field and clinical EMS hazardous materials response personnel via at least two of the following:

- (a) Verbal transmission
- (b) Fax transmission
- (c) Modem transmission.

**C-4.3.2 Mobile.** On scene EMS response personnel should have immediate direct access to a field computerized highly toxic hazardous materials database and computerized command and control information.

### **C-4.4 Other Resources.**

- (a) CHEMTREC (CMA)
- (b) ATSDR (HHS)
- (c) Private resources.

## **Appendix D Medical Treatment Considerations**

*This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.*

**D-1** The assessment and prehospital care of patients involved in hazardous materials incidents, and who are potentially chemically contaminated, should include the following steps:

- (a) Provide for the safety of the EMS provider by securing the scene, ensuring appropriate decontamination of the patient, and protecting against exposure to communicable diseases and hazardous materials.
- (b) The patient's airway should be secure and regularly monitored.
- (c) The patient's breathing should be monitored and assisted when necessary.
- (d) Supplemental oxygen should be administered if the surrounding environment safely permits.
- (e) Bleeding should be controlled. This may be accomplished by the application of pressure bandages. Lower extremity bleeding may be controlled through the use of pneumatic anti-shock garments.
- (f) When trauma may have involved cervical spine injury, an appropriate stabilization, immobilization collar should be applied.
- (g) Cardiopulmonary resuscitation if indicated.
- (h) In general, avoid all prophylactic invasive procedures unless required by life-threatening conditions. This includes the establishment of intravenous lines.
- (i) Direct medical control should be established.

The authority having jurisdiction should ensure that a written prehospital medical standard operating procedures protocol is in place to provide direction to EMS personnel who respond to hazardous materials incidents.

## Appendix E

*This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.*

**E-1** Patient decontamination, if required, should be carried out in the warm zone by properly trained personnel wearing appropriate chemical protective clothing and respiratory equipment.

Protocol(s) should be written to address the following:

(a) Determination of the potential for secondary contamination and the necessity for and extent of decontamination.

(b) Selection of appropriate personal protective equipment to be worn by personnel in the warm zone who are assisting with or performing decontamination.

(c) Decontamination of patients when the exposure is to an unidentified gas, liquid, or solid material.

(d) Emergency decontamination of patients with critical injuries and illness requiring immediate patient care or transport.

## Appendix F Referenced Publications

**F-1** The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**F-1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 471, *Recommended Practice for Responding to Hazardous Materials Incidents*, 1989 edition

NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*, 1989 edition.

### F-1.2 Other Publications.

**F-1.2.1 US Government Publications.** US Government Printing Office, Superintendent of Documents, Washington, DC 20402.

Title 29 CFR Part 1910.120

Title 40 CFR Part 261.33

Title 40 CFR Part 302

Title 40 CFR Part 355

Title 49 CFR Parts 170-179

**F-2** The following documents are not referenced within this standard, but may be useful to the reader.

*Poisoning and Drug Overdose*, Kent R. Olson, M.D., ed, Appleton & Lange, Norwalk, CT, 1990.

*Hazardous Materials Exposure — Emergency Response and Patient Care*, Jonathan Borak, M.D., Michael Collan, William and Abbot, Brady, Englewood Cliffs, NJ, 1991.

*Emergency Care for Hazardous Materials Exposure*, Alvin C. Bronstein, M.D., FACEP, and Phillip L. Currance, EMT-P, The C. V. Mosby Co., St. Louis, MO, 1988.

## Index

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