

# NFPA 473

## Standard for Competencies for EMS Personnel Responding to Hazardous Materials Incidents

### 2002 Edition



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An International Codes and Standards Organization

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## **NFPA 473**

### **Standard for**

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

### **2002 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 NFPA at its November Association Technical Meeting held November 10–14, 2001, in Dallas, TX. It was issued by the Standards Council on January 11, 2002, with an effective date of January 31, 2002, and supersedes all previous editions.

This edition of NFPA 473 was approved as an American National Standard on January 31, 2002.

### **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.

The first edition subsequently was released in 1992. In the 1997 edition the committee reviewed the first edition and updated it for consistency with the related NFPA 471 and NFPA 472 and for clarity of the competencies.

In 1998 the committee processed a Tentative Interim Amendment (TIA) to address concerns related to the unique challenges of responding to hazardous materials incidents that could be caused by criminal or terrorist activity. These concerns were motivated by incidents such as the bombing of the Murrah Building in Oklahoma City and other national and international incidents.

The TIA added paragraphs on recognizing criminal and terrorist activities, differentiating between chemical and biological agents, actions to take when criminal or terrorist activity is suspected, providing patient care at incidents resulting from chemical and biological agents, and other similar competencies.

In this 2002 edition the TIA material was updated and moved into the body of the text, along with other updates to coordinate with a similar TIA and other new material in NFPA 472 related to weapons of mass destruction and incidents involving radioactive materials. Additional changes in wording and format were made in conformance to the 2000 edition of the *NFPA Manual of Style*.

The Committee would like to dedicate this standard to the fallen heroes of the terrorist attack of September 11, 2001. Many lives were saved because of their efforts. These individuals gave the ultimate sacrifice in the line of duty and stand alone in their bravery and dedication to their jobs and their country. Our thoughts and prayers are with their families, friends, and co-workers. Let us never forget these brave individuals and the other emergency responders who have died in the line of duty. The Committee especially wishes to honor Committee member John J. Fanning, FDNY, who died in the line of duty on September 11.

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*This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.*

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

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## NFPA 473

## Standard for

# Competencies for EMS Personnel Responding to Hazardous Materials Incidents

## 2002 Edition

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

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet between the paragraphs that remain.

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Information on referenced publications can be found in Chapter 2 and Annex G.

## 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 Annex B.*)

## Chapter 2 Referenced Publications

**2.1 General.** The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

**2.2 NFPA Publication.** 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*, 2002 edition.

**2.3 Other Publications. (Reserved)**

## Chapter 3 Definitions

**3.1 General.** The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply.

### 3.2 NFPA Official Definitions.

**3.2.1\* Authority Having Jurisdiction (AHJ).** The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

**3.2.2 Shall.** Indicates a mandatory requirement.

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

### 3.3 General Definitions.

**3.3.1 Advanced Life Support (ALS).** Emergency medical treatment beyond basic life support level as defined by the medical authority having jurisdiction. [1500:3.3]

**3.3.1.1\* Emergency Medical Technician-Intermediate (EMT-I).** 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.

**3.3.1.2 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.

**3.3.2 Basic Life Support (BLS).** Emergency medical treatment at a level as defined by the medical authority having jurisdiction. [1500:3.3]

**3.3.2.1\* 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.

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

**3.3.3 Body Substance Isolation.** Procedures and equipment, including the use of gloves, goggles, masks, and fluid-impervious gowns/coveralls, used to protect the EMT from communicable diseases.

**3.3.4 Competence.** The possession of knowledge, skills, and judgment needed to perform indicated objectives satisfactorily.

**3.3.5\* Components of Emergency Medical Service (EMS) System.** The parts of a comprehensive plan to treat an individual in need of emergency medical care following an illness or injury.

**3.3.6 Confinement.** Those procedures taken to keep a material, once released, in a defined or local area. [471:3.3]

**3.3.7 Contaminant.** A hazardous material that physically remains on or in people, animals, the environment, or equipment.

ment, thereby creating a continuing risk of direct injury or a risk of exposure.

**3.3.8 Control.** The procedures, techniques, and methods used in the mitigation of a hazardous materials incident, including containment, extinguishment, and confinement. [472:3.3]

**3.3.9 Control Zones.** The areas at a hazardous materials incident that are designated based upon safety and the degree of hazard. [471:3.3]

**3.3.9.1 Cold Zone.** The control zone of a hazardous materials incident that contains the command post and such other support functions as are deemed necessary to control the incident. [472:3.3]

**3.3.9.2 Hot Zone.** The control zone immediately surrounding a hazardous materials incident, which extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone.

**3.3.9.3\* Warm Zone.** The control zone at a hazardous materials incident site where personnel and equipment decontamination and hot zone support takes place. [472:3.3]

**3.3.10 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.

**3.3.10.1\* Gross Decontamination.** The initial phase of the decontamination process during which the amount of surface contaminant is significantly reduced. [471:3.3]

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

**3.3.12\* Demonstrate.** To show by actual performance. [472:3.3]

**3.3.13 Describe.** To explain verbally or in writing using standard terms recognized in the hazardous materials response community. [472:3.3]

**3.3.14 Emergency Medical Technician–Ambulance (EMT–A).** See 3.3.2, *Basic Life Support (BLS)*.

**3.3.15 Emergency Medical Technician–Intermediate (EMT–I).** See 3.3.1, *Advanced Life Support (ALS)*.

**3.3.16 Emergency Medical Technician–Paramedic (EMT–P).** See 3.3.1, *Advanced Life Support (ALS)*.

**3.3.17 Emergency Care First Responder (ECFR).** See 3.3.2, *Basic Life Support (BLS)*.

**3.3.18 EMS Hazardous Materials (EMS/HM) Responder.**

**3.3.18.1 EMS/HM Level I Responder.** EMS personnel at EMS/HM Level I are those persons who, in the course of their normal duties, might 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.

**3.3.18.2 EMS/HM Level II Responder.** Personnel at EMS/HM Level II are those persons who, in the course of their normal activities, might be called upon to perform patient care activities in the warm zone at hazardous materials incidents. EMS/HM Level II responder personnel might be required to provide care to those individuals who still pose a

significant risk of secondary contamination. In addition, personnel at this level are able to coordinate EMS activities at a hazardous materials incident and provide medical support for hazardous materials response personnel.

**3.3.19\* Exposure.** The process by which people, animals, the environment, and equipment are subjected to or come in contact with a hazardous material. [472:3.3]

**3.3.20 Hazard/Hazardous.** Capable of posing an unreasonable risk to health, safety, or the environment; capable of causing harm. [471:3.3]

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

**3.3.22\* Hazardous Materials Response Team.** The hazardous materials response team is an organized group of trained response personnel, operating under an emergency response plan and appropriate standard operating procedures, who handle and control actual or potential leaks or spills of hazardous materials requiring possible close approach to the material.

**3.3.23 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. [472:3.3]

**3.3.24 Incident.** An emergency involving the release or potential release of a hazardous material, with or without fire.

**3.3.25\* Incident Commander.** The person who is responsible for all decisions relating to the management of the incident and is in charge of the incident site. [472:3.3]

**3.3.26\* Incident Management System (IMS).** A system that defines the roles and responsibilities to be assumed by personnel and the operating procedures to be used in the management and direction of emergency operations.

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

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

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

**3.3.30 Objective.** A goal that is achieved through the attainment of a skill, knowledge, or both, that can be observed or measured. [472:3.3]

**3.3.31\* Personal Protective Equipment.** The equipment provided to shield or isolate a person from the chemical, physical, and thermal hazards that can be encountered at a hazardous materials incident. [472:3.3]

**3.3.32\* Protective Clothing.** Equipment designed to protect the wearer from heat and/or hazardous materials contacting the skin or eyes. [472:3.3]

**3.3.32.1\* High Temperature–Protective Clothing.** Protective clothing designed to protect the wearer for short-term high temperature exposures. [472:3.3]

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

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

**3.3.35\* Respiratory Protection.** Equipment designed to protect the wearer from the inhalation of contaminants. [472:3.3]

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

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

**3.3.38\* 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. [472:3.3]

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

## Chapter 4 Competencies for EMS/HM Level I Responders

### 4.1 General.

**4.1.1 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.

**4.1.2 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 and meet the following requirements:

- (1) Analyze a hazardous materials emergency to determine what risks are present to the provider and the patient by completing the following tasks:
  - (a) Determine the hazards present to the Level I responder and the patient in a hazardous materials incident.
  - (b) Assess the patient to determine the risk of secondary contamination.
- (2) Plan a response to provide emergency medical care to persons involved in hazardous materials incidents by completing the following tasks:
  - (a) Describe the role of the Level I responder in a hazardous materials incident.
  - (b) Plan a response to provide emergency medical care in a hazardous materials incident.
  - (c) Determine if the personal protective equipment provided is appropriate.
  - (d) Determine if the equipment and supplies provided will meet the patient care needs.
- (3) Implement the planned response by completing the following tasks:
  - (a) Perform the necessary preparations for receiving the hazardous materials patient and preventing secondary contamination.
  - (b) Treat the hazardous materials patient.
  - (c) Transport the patient as appropriate.
  - (d) Perform medical support of hazardous materials incident response personnel.
- (4) Terminate the incident.

### 4.2 Competencies — Analyzing the Hazardous Materials Incident.

**4.2.1** Given an emergency involving hazardous materials, the Level I responder shall determine the hazards to the responder and the patient in that situation and shall meet the following requirements:

- (1) 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.
- (2) Evaluate the environmental factors as they affect patient care.
- (3)\*Identify the information sources available and how to access them.

**4.2.2** Given a hazardous materials incident with a patient(s), the Level I responder shall determine the risk of secondary contamination and shall meet the following requirements:

- (1) Explain the basic toxicological principles relative to assessment and treatment of victims exposed to hazardous materials, including the following:
  - (a) Acute and delayed toxicity
  - (b) Routes of exposure to toxic materials
  - (c) Local and systemic effects
  - (d) Dose response as it relates to risk assessment
  - (e)\*Synergistic effects
  - (f) Health hazard as determined by assessing toxicity, exposure, and dose
- (2) Describe how the chemical contamination of patients alters the principles of triage in hazardous materials incidents.
- (3) Describe how priorities for care of chemically contaminated patients differ from those of radiological contamination.
- (4) Explain the need for patient decontamination procedures at hazardous materials incidents.
- (5) Describe how the potential for secondary contamination determines the extent of patient decontamination required.
- (6) Describe the way that personnel, personal protective clothing, apparatus, tools, and equipment become contaminated and the importance and limitations of decontamination procedures.
- (7) Explain the decontamination procedures as defined by the authority having jurisdiction for patients, personnel, personal protective equipment, and apparatus at hazardous materials incidents.

**4.2.3\*** Given a description of a typical community, the Level I responder shall identify at least four types of locations that could become targets for criminal or terrorist activity using hazardous materials.

**4.2.4\*** The Level I responder shall describe the difference between a chemical and a biological incident.

**4.2.5\*** The Level I responder shall identify at least four indicators of possible criminal or terrorist activity involving chemical agents.

**4.2.6\*** The Level I responder shall identify at least four indicators of possible criminal or terrorist activity involving biological agents.

### 4.3 Competencies — Planning the Response.

**4.3.1** Given a plan of action by the incident commander, the Level I responder shall describe his or her role in a hazardous

materials incident as identified in the local emergency response plan or organization's standard operating procedures, including the following:

- (1) Describe the emergency medical component for the hazardous materials incident response plan as developed by the authority having jurisdiction.
- (2) State the Level I responder's role within the hazardous materials response plan as developed by the authority having jurisdiction.
- (3) State the Level I responder's role within the hazardous materials incident management system.

**4.3.2** Given a hazardous materials incident, the Level I responder shall be able to plan a response to provide emergency medical care, including the standard operating procedures for the medical management of persons exposed to hazardous materials, as specified by the authority having jurisdiction.

**4.3.3** Given the name of the hazardous material and the type, duration, and extent of exposure and decontamination process, the Level I responder shall determine if available personal protective clothing and equipment are appropriate to implement the planned response.

**4.3.4** The Level I responder shall be able to describe the application, use, and limitations of the following:

- (1) Street clothing and work uniforms
- (2) Structural fire-fighting protective clothing
- (3) Respiratory protective equipment
- (4) Chemical-protective clothing
- (5) Body substance isolation protective clothing

**4.3.5** Given a simulated hazardous materials incident, the Level I responder shall determine if available equipment and supplies are appropriate to implement the planned response.

**4.3.6** The Level I responder shall be able to describe the equipment and supplies available to the Level I responder for the care and transportation of the hazardous materials incident patient.

#### **4.4 Competencies — Implementing the Planned Response.**

**4.4.1** Given a plan for providing patient care at a hazardous materials incident, the Level I responder shall be able to perform the preparations to receive the patient for treatment and transport and shall meet the following requirements:

- (1) List the information that needs to be communicated to the Medical Control/Receiving facility regarding the hazardous materials incident, including the following:
  - (a) Type and nature of the incident
  - (b) Name of the material involved, with correct spelling and its physical state
  - (c) Number of potential patients
  - (d) Extent of decontamination accomplished
- (2) Describe the procedure for preparing the vehicle and equipment for the patient.
- (3) Demonstrate the donning, doffing, and usage, and describe the limitations of all personal protective equipment provided to the Level I responder by the authority having jurisdiction for use in his or her hazardous materials response activities.
- (4) Describe the concept of patient transfer from the incident site to the decontamination area and then to the treatment area.

**4.4.2** Given a patient from a hazardous materials incident, the Level I responder shall provide patient care consistent with the planned response and the organization's standard operating procedures and shall meet the following requirements:

- (1) Describe how chemical contamination alters the assessment and care of the hazardous materials patient.
- (2) List the common signs and symptoms and describe the EMS treatment protocols for exposure to the following:
  - (a) Corrosives (e.g., acid, alkali)
  - (b) Pesticides (e.g., organophosphates, carbamates)
  - (c) Chemical asphyxiants (e.g., cyanide, carbon monoxide)
  - (d) Hydrocarbon solvents (e.g., xylene, methylene chloride)
  - (e) Nerve agents (e.g., tabun, sarin, soman, V agent)
  - (f) Vesicants (blister agents, e.g., mustard, distilled mustard)
  - (g) Blood agents (e.g., hydrogen cyanide, cyanogen chloride)
  - (h) Choking agents (pulmonary agents, e.g., ammonia, chlorine, diphosgene, phosgene)
  - (i) Irritants [riot control agents, e.g., CS (orthochlorobenzalmalononitrile), CN (chloroacetophone), CR (dibenzoxazepine), MACE (phenylchloromethylketone), OC (pepper spray)]
  - (j) Biological agents and toxins (e.g., anthrax, mycotoxin, plague, viral hemorrhagic fevers, smallpox, and ricin)
  - (k) Incapacitating agents (e.g., BZ, LSD)
  - (l) Radiological materials (e.g., uranium, plutonium, cesium, iridium, technesium)
- (3) Identify the potential risk for patients exposed to hazardous materials from the use of invasive medical procedures.
- (4) Demonstrate the following EMS functions within the incident management system during incidents involving multiple patients exposed to hazardous materials:
  - (a)\*EMS control
  - (b) Triage
  - (c) Treatment
  - (d) Disposition and transportation

**4.4.3** Given a patient from a hazardous materials incident, the Level I responder shall transport the patient as specified in the local emergency response plan and the organization's standard operating procedures and shall meet the following requirements:

- (1) Identify the capabilities of the medical facilities available in the local area to receive hazardous materials patients.
- (2) Identify the vehicles available to transport hazardous materials patients from the treatment area to a receiving facility.
- (3) List the pertinent information that needs to be communicated to the receiving facility, including the following:
  - (a) Estimated time of arrival
  - (b) Age/sex
  - (c) Patient condition/chief complaint
  - (d) Associated injuries
  - (e) Routes, extent, and duration of exposure to the material involved
  - (f) Pertinent medical history
  - (g) Signs and symptoms
  - (h) Vital signs

- (i) Treatment, including decontamination and patient response
- (j) Pertinent characteristics of the material involved
- (4) Describe the actions necessary for the coordinated delivery of hazardous materials incidents patients to a receiving facility.
- (5) Explain the special hazards associated with air transportation of patients exposed to hazardous materials.

**4.4.4** Given a simulated hazardous materials incident, the Level I responder shall perform medical support of hazardous materials incident response personnel and shall meet the following requirements:

- (1) Explain the components of pre-entry and post-entry assessment, including the following:
  - (a) Vital signs
  - (b) Body weight
  - (c) General health
  - (d) Neurological status
  - (e) Electrocardiographic rhythm strip, if available
- (2) Explain the following factors and how they influence heat stress for hazardous materials response personnel:
  - (a) Hydration
  - (b) Physical fitness
  - (c) Environmental factors
  - (d) Activity levels
  - (e) Level of PPE
  - (f) Duration of entry
- (3) Explain the medical monitoring protocols and demonstrate medical monitoring procedures for personnel at the scene of a hazardous materials incident.
- (4) Describe the criteria for site selection of a medical monitoring station.
- (5) Demonstrate the ability to set up and operate a medical monitoring station.
- (6) Demonstrate the ability to interpret and analyze data obtained from medical monitoring of hazardous materials response personnel.
- (7) Given a simulated hazardous materials incident, demonstrate documentation of medical monitoring.

**4.4.5\*** The Level I responder shall identify at least four specific actions necessary when an incident is suspected to involve criminal or terrorist activity.

**4.4.6** Given either a facility or transportation scenario of hazardous materials, with or without criminal or terrorist activities, the Level I EMS/HM responder shall identify the appropriate initial notifications to be made and how to make them, consistent with the local emergency response plan or the organization's standard operating procedures.

**4.4.7** Given an incident involving the suspicion of a biological warfare agent, the Level I responder shall identify each of the following:

- (1) Correct body substance isolation procedures to be followed
- (2) Proper decontamination procedures in accordance with standard operating procedures or guidelines
- (3)\*Necessary post-exposure reporting

#### **4.5 Competencies — Terminating the Incident.**

**4.5.1** Upon termination of the hazardous materials incident, the Level I responder shall complete the reporting, documentation, and EMS termination activities as required by the local

emergency response plan or the organization's standard operating procedures and shall meet the following requirements:

- (1) List the information to be gathered regarding the exposure of the patient and the EMS provider and describe the reporting procedures, including the following:
  - (a) Product information
  - (b) Routes, extent, and duration of exposure
  - (c) Actions taken to limit exposure and contamination
  - (d) Treatment rendered
  - (e) Patient condition and disposition
- (2) Identify situations that can necessitate critical incident stress debriefing intervention.
- (3) Describe the EMS provider's role in the post-incident critique.

## **Chapter 5 Competencies for EMS/HM Level II Responders**

### **5.1 General.**

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

### **5.1.2 Goal.**

**5.1.2.1** 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.

**5.1.2.2** The Level II responder shall be able to perform the following:

- (1) Analyze a hazardous materials incident to determine the magnitude of the problem in terms of outcomes by completing the following tasks:
  - (a) Determine the hazards present to the Level II responder and the patient in a hazardous materials incident.
  - (b) Assess the patient to determine the patient care needs and the risk of secondary contamination.
- (2) Plan a response to provide 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:
  - (a) Describe the role of the Level II responder in a hazardous materials incident.
  - (b) Plan a response to provide emergency medical care in a hazardous materials incident.
  - (c) Determine if the personal protective equipment provided to EMS personnel is appropriate.
- (3) Implement the planned response by completing the following tasks:
  - (a) Perform the preparations for receiving the patient.
  - (b) Provide treatment to the hazardous materials patient.
  - (c) Coordinate and manage the EMS component of the hazardous materials incident.
- (4) Terminate the incident.

### **5.2 Competencies — Analyzing the Hazardous Materials Incident.**

**5.2.1** Given an emergency involving hazardous materials, the Level II responder shall determine the hazards to the re-

sponders and the patient in that situation and shall meet the following requirements:

- (1) Define the following chemical and physical properties and describe their importance in the risk assessment process:
  - (a) Boiling point
  - (b) Flammable (explosive) limits
  - (c) Flash point
  - (d) Ignition temperature
  - (e) Specific gravity
  - (f) Vapor density
  - (g) Vapor pressure
  - (h) Water solubility
- (2) Define the following radiological terms and explain their use in the risk assessment process:
  - (a) Alpha radiation
  - (b) Beta radiation
  - (c) Gamma radiation
  - (d) Radiological measurement units
- (3) Define the following toxicological terms and explain their use in the risk assessment process:
  - (a) Threshold limit value (TLV-TWA)
  - (b) Lethal concentration and doses ( $LD_{50/100}$ )
  - (c) Parts per million/billion (ppm/ppb)
  - (d) Immediately dangerous to life and health (IDLH)
  - (e) Permissible exposure limit (PEL)
  - (f) Short-term exposure limit (TLV-STEL)
  - (g) Ceiling level (TLV-C)
- (4) Given a specific hazardous material and using the information sources available to the Level II responder, demonstrate extracting information about the physical characteristics and chemical properties, hazards, and suggested medical response considerations for that material.

**5.2.2** Given a hazardous materials incident with a patient(s), the Level II responder shall assess the patient's conditions to determine the risk of secondary contamination and shall meet the following requirements:

- (1) Identify sources of technical information for the performance of patient decontamination.
- (2) Identify the factors that influence the decision of when and where to treat the patient and the extent of patient care, including the following:
  - (a) Hazardous material toxicity
  - (b) Patient condition
  - (c) Availability of decontamination

**5.2.3** Given an emergency scenario involving potential criminal or terrorist activity, the Level II responder shall identify the basic tools for identification of the substance, detection devices appropriate to the substance, and where these detection devices are available locally.

**5.2.4** Given an emergency scenario involving potential criminal or terrorist activity, the Level II responder shall describe procedures, such as those listed in the local emergency response plan or the organization's standard operating procedures, to preserve evidence at hazardous materials incidents involving suspected criminal or terrorist acts.

### 5.3 Competencies — Planning the Response.

**5.3.1** Given a plan of action by the incident commander, the Level II responder shall describe his or her role in a hazardous

materials incident as identified in the local emergency response plan or the organization's standard operating procedures.

**5.3.2** The Level II responder shall be able to describe the importance of coordination between various agencies at the scene of hazardous materials incidents.

**5.3.3** Given a hazardous materials incident, the Level II responder shall plan a response to provide emergency medical care to persons involved in hazardous materials incidents and to provide medical support to hazardous materials response personnel and shall meet the following requirements:

- (1) Given a simulated hazardous materials incident, assess the problem and formulate and implement a plan including the following:
  - (a) EMS control activities
  - (b) EMS component of an incident management system
  - (c) Medical monitoring of personnel utilizing chemical-protective and high temperature-protective clothing
  - (d) Triage of hazardous materials victims
  - (e) Medical treatment for chemically contaminated individuals
  - (f) Product and exposure information gathering and documentation
- (2) Describe the importance of pre-emergency planning relating to specific sites.
- (3) Describe the hazards and precautions to be observed when approaching a hazardous materials incident.
- (4) Describe the considerations associated with the placement, location, and setup of the patient decontamination site.
- (5) Explain the advantages and limitations of the following techniques of decontamination and how they are or are not applicable to patient decontamination:
  - (a) Absorption
  - (b) Chemical degradation
  - (c) Dilution
  - (d) Isolation
- (6) Describe when to pull back from a hazardous materials incident.
- (7) Describe the impact that time, distance, and shielding have on exposure to radioactive materials specific to the expected dose rate.
- (8) Describe the prioritization of emergency medical care and removal of victims from the hazard area relative to exposure and contamination concerns.

**5.3.4** Given the name of the hazardous material and the type, duration, and extent of exposure, the Level II responder shall determine if the protective clothing and equipment available to EMS personnel is appropriate to implement the planned response and shall meet the following requirements:

- (1) Identify the advantages and dangers of search and rescue missions at hazardous materials incidents.
- (2) Identify the advantages and hazards associated with the rescue, extrication, and removal of a victim from a hazardous materials incident.
- (3) Describe the types, application, use, and limitations of protective clothing used by EMS personnel at hazardous materials incidents.
- (4) Demonstrate how to interpret a chemical compatibility chart for chemical-protective clothing.

## 5.4 Competencies — Implementing the Planned Response.

**5.4.1** Given a plan for providing patient care at a hazardous materials incident, the Level II responder shall perform the preparations necessary to receive the patient for treatment and transport.

**5.4.2** The Level II responder shall be able to demonstrate the proper donning, doffing, and usage of all personal protective equipment provided to the Level II responder by the authority having jurisdiction.

**5.4.3** At the scene of a hazardous materials incident, the Level II responder shall be able to provide or coordinate the patient care and shall meet the following requirements:

- (1) Given a simulated hazardous materials incident and using local available resources, demonstrate the implementation of the patient decontamination procedure (*see Annex E*).
- (2) Explain the principles of emergency decontamination and its application for critically ill patients.
- (3) Demonstrate the ability to coordinate patient care activities, including treatment, disposition, and transportation of patients.

**5.4.4** 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.

**5.5 Competencies — Terminating the Incident.** Upon termination of the hazardous materials incident, the Level II responder shall complete the reporting, documentation, and EMS termination activities as required by the local emergency response plan or the organization's standard operating procedures and shall meet the following requirements:

- (1) \*Describe the information regarding incident EMS activities that needs to be relayed through the chain of command to the incident commander.
- (2) Describe the activities required in terminating the EMS component of a hazardous materials incident.
- (3) Describe the process and demonstrate the ability to conduct the EMS portion of an incident critique.
- (4) Explain the process of making revisions to EMS operating procedures and response capabilities as a result of information learned.

## Annex A Explanatory Material

*Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.*

**A.1.2** 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.

**A.3.2.1 Authority Having Jurisdiction (AHJ).** The phrase "authority having jurisdiction," or its acronym AHJ, 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 preven-

tion bureau, labor department, or 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 or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

**A.3.3.1.1 Emergency Medical Technician-Intermediate (EMT-I).** This category can include EMT-Cardiac.

**A.3.3.2.1 Emergency Medical Technician-Ambulance (EMT-A).** This level in some jurisdictions may be recognized as EMT-Basic (EMT-B).

**A.3.3.2.2 Emergency Care First Responder (ECFR).** 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).

**A.3.3.5 Components of Emergency Medical Service (EMS) System.** These components include the following:

- (1) First responders
- (2) Emergency dispatching
- (3) EMS agency response
- (4) Hospital emergency departments
- (5) Specialized care facilities

**A.3.3.9.3 Warm Zone.** The warm zone includes control points for the decontamination corridor, thus helping to reduce the spread of contamination.

**A.3.3.10.1 Gross Decontamination.** This phase can include mechanical removal and initial rinsing.

**A.3.3.12 Demonstrate.** This performance can be supplemented by simulation, explanation, illustration, or a combination of these.

**A.3.3.19 Exposure.** The magnitude of exposure is dependent primarily upon the duration of exposure and the concentration of the hazardous material. This term is also used to describe a person, animal, the environment, or a piece of equipment. The exposure can be external, internal, or both.

**A.3.3.22 Hazardous Materials Response Team.** The team members respond to releases or potential releases of hazardous materials for the purpose of control or stabilization of the incident.

**A.3.3.25 Incident Commander.** This term is equivalent to the on-scene incident commander.

**A.3.3.26 Incident Management System (IMS).** The system is also referred to as an incident command system (ICS).

**A.3.3.31 Personal Protective Equipment.** Personal protective equipment includes both personal protective clothing and respiratory protection. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and ears.

**A.3.3.32 Protective Clothing.** Protective clothing is divided into three types: (1) Structural fire-fighting protective clothing; (2) High temperature-protective clothing; (3) Chemical-protective clothing: (a) Liquid splash-protective clothing; (b) Vapor-protective clothing.

**A.3.3.32.1 High Temperature–Protective Clothing.** This type of clothing is usually of limited use in dealing with chemical commodities.

**A.3.3.35 Respiratory Protection.** Respiratory protection is divided into the following three types:

- (1) Positive pressure self-contained breathing apparatus
- (2) Positive pressure air line respirators
- (3) Air purifying respirators

**A.3.3.37 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.3.3.38 Termination.** Termination is divided into three phases: debriefing the incident, post-incident analysis, and critiquing the incident.

**A.4.2.1(3)** Information sources might include the following:

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

**A.4.2.2(1)(e)** 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 can be dramatically different from what the EMS provider anticipates.

**A.4.2.3** The following are some examples of potential criminal or terrorist targets:

- (1) Public assembly
- (2) Public buildings
- (3) Mass transit systems
- (4) Places with high economic impact
- (5) Telecommunications facilities
- (6) Places with historical or symbolic significance
- (7) Military installations
- (8) Airports
- (9) Industrial facilities

**A.4.2.4** A chemical incident is characterized by a rapid onset of medical symptoms (minutes to hours) and can have observed signatures such as colored residue, dead foliage, pungent odor, and dead insect and animal life.

With biological incidents, the onset of symptoms usually requires days to weeks and there are typically no characteristic signatures because biological agents are usually odorless and colorless. The area affected can be greater due to the migration of infected individuals because of the delayed onset of symptoms. An infected person might transmit the disease to another person.

**A.4.2.5** The following are some examples of indicators of possible criminal or terrorist activity involving chemical agents:

- (1) The presence of hazardous materials or laboratory equipment that is not relevant to the occupancy.
- (2) Intentional release of hazardous materials.
- (3) Unexplained patterns of sudden onset of similar, non-traumatic illnesses or deaths. The pattern might be geographic, by employer, or associated with agent dissemination methods.
- (4) Unexplained odors or tastes that are out of character with the surroundings.
- (5) Multiple individuals exhibiting unexplained signs of skin, eye, or airway irritation.
- (6) Unexplained bomb/munitions-like material, especially if it contains a liquid.
- (7) Unexplained vapor clouds, mists, and plumes.
- (8) Multiple individuals exhibiting unexplained health problems such as nausea, vomiting, twitching, tightness in chest, sweating, pinpoint pupils (miosis), runny nose (rhinorrhea), disorientation, difficulty breathing, convulsions, or death.
- (9) Trees, shrubs, bushes, food crops, and/or lawns that are dead, discolored, abnormal in appearance, or withered (no current drought or not just a patch of dead weeds).
- (10) Surfaces exhibiting oily droplets/films, unexplained oily film on water surfaces.
- (11) Abnormal number of sick or dead birds, animals, and/or fish.
- (12) Unusual security, locks, bars on windows, covered windows, and barbed wire.

**A.4.2.6** The following are some examples of indicators of possible criminal or terrorist activity involving biological agents:

- (1) Unusual number of sick or dying people or animals. Any number of symptoms might occur. The time required before symptoms are observed is dependent on the agent used, but usually requires days to weeks.
- (2) Health care facilities reporting multiple casualties with similar signs or symptoms.
- (3) Unscheduled or unusual spray being disseminated, especially if outdoors during period of darkness.
- (4) Abandoned spray devices. Devices will have no distinct odors.

**A.4.4.2(4)(a)** EMS control activities at a hazardous materials incident include, but are not limited to, the following:

- (1) 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
- (2) Securing of resources to meet EMS needs
- (3) Assignment of personnel, in the cold zone, to coordinate triage, treatment, disposition, and transport as required
- (4) Assignment of appropriately trained personnel to perform medical monitoring and other EMS support functions for hazardous materials response personnel in the cold zone
- (5) Assignment of appropriately trained personnel to provide patient care, assist with patient decontamination, and perform any other EMS support functions, as may be required in the warm zone

**A.4.4.5** The following are some examples of actions to be taken:

- (1) Take the appropriate actions to protect yourself and other responders.

- (2) Communicate the suspicion during the notification process.
- (3) Isolate potentially exposed people or animals.
- (4) Document the initial observation.
- (5) Attempt to preserve evidence while performing operational duties.
- (6) Be alert for booby traps and/or explosive devices.
- (7) Establish control zones and access control points.
- (8) Prevent secondary contamination, including from handling patients.

**A.4.4.7(3)** This is important to facilitate post-exposure prophylaxis when available.

**A.5.5(1)** The type of information that should be made available to the incident commander would include, but not necessarily be limited to, the following:

- (1) Patients
  - (a) Number
  - (b) Condition
  - (c) Disposition
- (2) Hazardous materials response personnel
  - (a) Number of personnel screened
  - (b) Adverse reactions noted
  - (c) Personnel transported for further treatment
  - (d) Completed records
  - (e) Recommended medical, physical, and psychological needs for immediate rehabilitation
  - (f) Recommended medical surveillance follow-up
- (3) Availability of EMS personnel and equipment

## Annex B Training

*This annex is not a part of the requirements of this NFPA document but is included for informational 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 U.S. Department of Transportation (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 DOT EMT-B 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 this standard, 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:

- (1) Program management
- (2) Content development
- (3) Instructor competencies
- (4) 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 supervised field experience for EMS hazardous materials responder and EMS hazardous materials 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. At a minimum, it should address the areas discussed in this section.

#### 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:

- (1) 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 this standard
- (2) EMS delivery systems
- (3) Budgeting and financial planning
- (4) Processes used to develop instructional materials

**B.3.1.3** The program manager should demonstrate the skill and ability to perform the following tasks:

- (1) Coordinate the training program
- (2) Evaluate program effectiveness
- (3) Identify instructors and technical specialists

**B.3.2 Content.** The content of the training program should include the competencies of this standard as a minimum.

**B.3.3 Evaluation.** In recognition of 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 have the following skills:

- (1) Mastery of the material he or she presents
- (2) An understanding of the training program objectives
- (3) 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.

## Annex C Recommended Support Resources

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

**C.1 General.** Emergency medical service personnel who respond to hazardous materials incidents should operate within a network of support resources. This annex 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.

**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.2.1.1 Preplanning Assistance.** Poison Control Centers should provide preplanning assistance, including the following:

- (1) Training
- (2) EMS hazardous materials standard operating procedures review
- (3) EMS reference materials

**C.2.1.2 Technical Advice.** Poison Control Centers should have 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 the following areas:

- (1) Identity of ingredients
- (2) Toxicity of substances involved and symptoms and signs of exposure
- (3) Recommended level of protective clothing
- (4) Potential for secondary contamination
- (5) Recommended decontamination procedures
- (6) Specific treatment and/or antidotes

**C.2.1.3 Databases.** The PCC should supervise and review the EMS databases used during hazardous materials incident response.

**C.2.1.4 Medical Surveillance.** The PCC should provide support for the following:

- (1) Surveillance quality assurance program design
- (2) Surveillance Q/A program review
- (3) Medical follow-up activities

### C.3 Contaminated Injury Treatment Centers.

**C.3.1 Goal.** The emergency medical responders to hazardous materials incidents should transfer contaminated injured patients to facilities having adequate contaminated injury treatment capability. All such facilities should have a minimum level of competency to receive contaminated injured patients, including the following provisions.

**C.3.1.1** Facilities should have the following resources in order to perform patient decontamination:

- (1) Decontamination area
- (2) Proper ventilation system
- (3) Restricted access
- (4) Runoff containment

**C.3.1.2** Facilities should provide a cadre of trained in-house hazardous materials incident injury treatment personnel.

**C.3.1.3** Chemical injury treatment centers should have personal protective clothing on hand for hospital personnel who treat hazardous materials patients.

**C.3.1.4** All treatment centers should have 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 should have RF emergency power capability for at least one radio channel.

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

**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:

- (1) Verbal transmission
- (2) Fax transmission
- (3) 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.** Additional response resources available to hazardous materials incidents include the following: