

Unit Goal: Safely recognize the immediate hazard and effectively perform the first-responder role focusing on preservation of life safety.

The current approach to hazardous materials training and response is carried under the umbrella of “all hazards training”. This theory of training and response can be applied to nearly all situations caused by manmade hazards as well as many natural disaster scenarios. Although not intended to be a single, universal approach, it does provide a basic system of response that is of a far greater universal application than past approaches.

The basic guidelines can be applied to situations ranging from barricaded suspects to chemical leaks, the premise is the same; recognize the threat, avoid contact/contamination, isolate the affected area, notify the appropriate response unit. This approach, or RAIN will be discussed in more detail later in this chapter. Stress this is merely an overview of these emergency situations and is not intended to prepare students to do more than identify/recognize the threat and seek assistance from those agencies properly trained and equipped to control the threat.

This unit will also explain the standard command structure (National Incident Management System) used in incidents and how they fit into the system.

42.1. Define term “hazardous materials” or HAZMAT.

Define the term “hazardous material” or HAZMAT

- There are numerous definitions of hazardous materials or HAZMAT that should be reviewed and discussed by the instructor.
- The United States Department of Transportation (DOT) defines a hazardous material as: A substance or material capable of posing an unreasonable risk to health, safety, or property when transported in commerce. The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, and materials designated as hazardous in the Hazardous Materials Table (see 49 CFR 172.101).
- The DOT has also defined a system for classifying hazardous materials. A **hazard class** is a group of hazardous materials that share dangerous characteristics. The DOT has identified nine hazard classes based on the dangers posed in transportation.
- The instructor should review the nine hazard classes found in 49 CFR 171.8 under definition of “Class” and explain the significance of various classes of hazards to the law enforcement responder.

Reference to the most recent version of the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration Emergency Response Guidebook (ERG).

CBRNE and Its Components

- A simplified form of definition for hazardous materials is CBRNE, which breaks down the overall idea of hazardous materials to basic components, each of which has a shared hazard to human life. Those components are:
 - Chemical
 - Biological
 - Radiation
 - Nuclear

- Explosive
- This term takes the nine hazard classes and breaks them into groupings that are more useful to the first responder.

Instructor Note: The student still needs to understand the nine hazard classes used in the Emergency Response Guidebook (ERG) as they provide additional information that can be understood from the class name.

- These definitions purposely do not address the additional hazardous threat caused by human actions, such as active threat/shooter, suicide bombing, or other mass casualty situations caused by human action. It should be noted that in many of these cases, the response principals addressed here may be successfully applied.

42.2. Discuss chemical materials.

Toxic/Poisonous Substances- Manmade materials that may cause injury or death to living organisms. These may exist as solids, liquids, or gasses.

Examples include:

- Toxic Industrial Materials/Toxic Industrial Chemicals (Chlorine, Acetone, Benzene, Mercury, etc.) Agricultural Chemicals (Pesticides, Insecticides, Ammonia, etc.)
- Chemical Warfare Agents (Nerve Agents, Vesicants)
- Other Chemical Agents (Riot Control, Irritants, etc.)
- Some controlled substances (Fentanyl, Cocaine, Anesthetics, etc.)

Describe differences between acute and chronic exposures:

- Acute- Short term/high dose event with harmful consequences.
- Chronic- Long term/low dose exposure with harmful consequences.

Flammable Substances- Materials that have a high hazard due to ease of ignition, high burning temperature, or difficulty in extinguishment. These materials exist as solids, liquids, or gasses.

Examples include:

- Liquids- Gasoline, Diesel fuel, Alcohol.
- Gasses- Propane, Butane, Hydrogen
- Solids- Magnesium, Aluminum powder, Zinc, Sodium

Note: Some flammable solids react violently when in contact with water and may self-ignite if they become wet.

Oxidizers- A group of chemicals that do not burn on their own, but when in combination with other chemicals may cause them to burn or burn at a higher-than-normal temperature. These chemicals can cause materials that would not ordinarily catch fire to begin to burn readily.

Examples include:

- Oxygen, Hydrogen Peroxide, some Halogens

Corrosives/Acids- Chemical materials that may attack and destroy living tissue, such as skin. Some of these materials may also attack and destroy through chemical reaction - metals, glass, or plastics.

Examples include:

- Sulfuric Acid, Nitric Acid, Acetic Acid, Ammonium Hydroxide, Sodium Hydroxide

42.3. Discuss biological hazards.

- Biological Pathogens- Naturally occurring living organisms that cause injury or death to other living organisms.

Examples include:

- Human Pathogens (Define “Pathogen” - A disease-causing organism)
- Bacteria (Examples include Anthrax [Bacillus Anthracis], Plague [Yersinia Pestis], etc.)
- Viruses (Smallpox [Variola Major], Bird Flu [H5N1], etc.)
- Plant and Animal Pathogens
 - **Note:** Instructor should explain economic significance and need for avoiding the spread of plant and animal pathogens.
- Foot and Mouth Disease (FMD)
- Exotic Newcastle Disease (END)
- Classical Swine Fever (CSF)
- Boll Rot of Cotton
- Biological Toxins (Ricin, Botulinum Toxin, etc.)

Discuss infection control.

- Professionals must be ready to respond to external and internal HAZMAT incidents. Well-designed plans and staff education will prepare officers to reduce the probability of such incidents and to be able to respond appropriately and quickly.

Lecture Scenario: Instructor to bring an example of a departments HAZMAT “Infection Control” plan.

- Give copies of plan to students.
- Discuss components of plan.
- Discuss examples of situations when the plan was used.... and what happened.

42.4. Discuss radioactive materials/nuclear radiation and its types.

Instructor Note: Instructor should describe applications and uses of various ionizing radiation sources.

- Alpha Particles
- Beta Particles
- Gamma Rays
- X-Ray
- Neutron Particles

42.5. Discuss explosive materials.

- An explosive is generally a material that burns or decomposes quickly releasing a large amount of heat and gas in a short time resulting in a shock wave.

Common Explosives:

- Black Powder
- PETN
- TNT/Dynamite
- C4
- ANFO (Ammonium Nitrate Fuel Oil)

42.6. Define the following basic toxicology terms.

- Toxicology: study of adverse effects of chemicals or physical agents on living organisms.
- Threshold Limit Value (TLV): Level to which it is believed a worker can be exposed day after day for a working lifetime without adverse health effects.
- Immediately Dangerous to Life and Health (IDLH): Exposure to airborne contaminants that is “likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.”
- Lethal Concentration (LC₅₀): Measure of a lethal dose or toxin, radiation, or pathogen. The value of lethal dose (LD₅₀) for a substance is the dose required to kill half the members of a tested population after a specified test duration.
- Lethal Dose (LD₅₀): An indication of the lethality of a given substance or type of radiation.
- Material Safety Data Sheets (MSDS) Terminology: A document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling chemical products.
- Radioactive Exposure: The level of radiation flux to which material or living tissue is exposed.

42.7. Identify common routes of exposure for CBRNE materials.

Inhalation

- Describe aerosols (Dry and/or wet particles/droplets that behave like a gas)

Absorption

- Skin: Vulnerable to many chemicals but, not vulnerable to many biological threats unless there is an open wound (See Injection)
- Eyes
- Mucous Membranes: Nostrils, lips, etc.

Ingestion

- Primary: Eating/drinking contaminated product
- Secondary: Transferring contaminated product to mouth, usually through an inanimate object. Example: Ballpoint pen

Injection

- Puncture
- Cut/Abrasion
- Insect/Pest: Usually biological

42.8. Describe the potential effects of a CBRNE incident.

Health Impacts

- Death
- Temporary impairment
- Permanent disability
- Psychological stress
- Post-Traumatic Stress Disorders

Property and Environment Impacts:

- Damage to potable water sources

- Loss of productive lands
- Loss/destruction of food products
- Inability to occupy or inhabit structures

Infrastructure Impacts:

- Disruption of traffic and other modes of transportation
- Budget and resource strains on government and commercial entities
- Reduction in available services
- Overwhelmed health care system

42.9. Describe the basic procedures for safeguarding lives at a CBRNE event using the RAIN acronym.

Safeguarding Lives: RAIN Principle

- R: recognize the presence of a CBRNE threat.
- A: avoid contamination/exposure to the threat.
- I: isolate the threat and immediate area.
- N: notify the appropriate response agency.

Recognize the Presence of CBRNE Threat

- Observations (Odors, noises, wind direction, placards, signs, etc.)
- Assessment (Hazard level, casualties, need for additional resources, etc.)
- Plan (Response, exit strategy, precautions, etc.)
- Communicate (Dispatch, casualties, good Samaritans, etc.)
- Respond (Establish perimeter, first aid, enable Incident Command System (ICS), etc.)

Avoid Exposure

- Stay uphill, upwind from the incident.
- Use distance and physical barriers to protect yourself from exposure.
- Remain alert for changes in wind direction or the behavior of the material.

Isolate

- Set a perimeter around the exposed area.
- Be sure to communicate the location of the perimeter.
- Limit spread of contamination when moving people that are potentially contaminated.
- Establish safe travel routes for the public.
- Enforce perimeter security.

Notify the Appropriate Agency

- Stay outside of designated perimeter.
- Remain upwind.
- Wait for qualified assistance.

42.10. Identify sources to obtain on-site information about hazardous materials being transported.

Instructor Note: Have the Emergency Response Guidebook available for student reference dealing with placard and label information. Discuss with students.

On-Site Information

- Warnings and Indicators
 - Shipping manifests

- Placards
 - Labels
- Interviews
 - Driver, others involved in transportation of materials
 - Witnesses
 - Victims
- Communications
 - Texas Law Enforcement Telecommunications System (TLETS)
 - Shipper at point-of-origin

Lecture Scenario: Emergency Response Guidebook

- Use group activity to reinforce placard reading skills (ERG)

42.11. Discuss Personal Protective Equipment (PPE) and decontamination.

Instructor Note: This is only an overview of PPE and decontamination; students must be made aware that only those trained in the use of PPE should attempt to use it. At no time should anyone don PPE without having proper decontamination and doffing procedures in place.

Lecture Scenario: Instructor should prepare a display:

- of clothing that is effective at an event, and
- of self-contained breathing apparatus (SCBA), gloves, etc.

Also display articles that are NOT effective, e.g., lawn and garden dust mask, etc. and have class discuss differences and proper usage.

Personal Protection and Decontamination

Levels of Personal Protection

- Level D (Uniform, gloves, mask, etc.)
- Level C (Air-purifying respirator, chemical resistant clothing, double-layered gloves, etc.)
- Level B (SCBA + Level C)
- Level A (fully encapsulated)

Reasons for Changing Level of Personal Protection

- Moving Up (D to C, C to B, or B to A)
- Moving Down (A to B, B to C, or C to D)

Practical Guidelines for Law Enforcement First Responders

- Limitations of Personal Protective Equipment (PPE) availability and safe use. (Law enforcement responders should not use any PPE above gloves and particulate/droplet mask, except to escape from a hazardous situation or at the direction of incident command)
- Safe donning and doffing of Nitrile gloves and particulate/droplet mask
- Practical decontamination (Hand wipes, soap and water, antibacterial gels, antiviral wipes, etc.)
- Time, distance/direction, and shielding/barriers (Shorter times in a HAZMAT zone are ALWAYS better. Distance and upwind location from a HAZMAT zone are ALWAYS better. Shielding and barriers can be helpful.)

Decontamination Concepts

- “End the Exposure!”
- Remove
- Dilute
- Absorb
- Neutralize
- Isolate

42.12. Describe the National Incident Management System (NIMS) and Incident Command System (ICS) and their anticipated role in the management matrix.

National Incident Management System

- Purpose/Motivation (FEMA)
 - The National Incident Management System (NIMS) is a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work together seamlessly and manage incidents involving all threats and hazards—regardless of cause, size, location, or complexity—in order to reduce loss of life, property, and harm to the environment. The NIMS is the essential foundation to the National Preparedness System (NPS) and provides the template for the management of incidents and operations in support of all five National Planning Frameworks.
- Benefits: Unified approach, standardized command structure, emphasis on preparedness, mutual aid, and resource management.
- Flexibility and standardization
- Components
 - Command and Management
 - Preparedness
 - Resource Management
 - Communications and Information Management
 - Supporting Technologies
 - Ongoing Maintenance and Management

42.13. Describe the Incident Command System.

Management system designed to enable effective and efficient domestic incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.

- Purposes of the ICS: Used for agencies to be able to work together much more efficiently during an incident.
- Integrated organizational structure: A system used to coordinate emergency preparedness and incident management among various federal, state, and local agencies.
- ICS as a part of NIMS: A standardized on-scene emergency management of resources during incidents. The ICS model is used by jurisdictions and agencies, both public and private, to organize field-level incident-management operations.

Instructor Note: Instruct students to complete the following course as a self-paced activity during the BPOC:

<https://training.fema.gov/is/courseoverview.aspx?code=IS-100.c> (IS-100.C)

<https://training.fema.gov/is/courseoverview.aspx?code=IS-200.c> (IS-200.C)

<https://training.fema.gov/is/courseoverview.aspx?code=IS-700.b> (IS-700.B)

National Incident Management System (NIMS): <https://training.fema.gov/nims/>

Chapter Resources

FEMA National Domestic Preparedness Consortium: www.ndpc.us

Office of Domestic Preparedness Emergency Responder Guidelines: www.ojp.usdoj.gov/odp

Department of Homeland Security, Office of State and Local Law Enforcement:
www.dhs.gov/office-state-and-local-law-enforcement

Pipeline and Hazardous Materials Safety Administration, Emergency Response Guidebook:
www.phmsa.dot.gov

National Incident Management System, FEMA: <http://www.fema.gov/national-incident-management-system>



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Appendix A

National Incident Management System (NIMS) Fact Sheet

What is the National Incident Management System?

- Comprehensive, nationwide systematic approach to incident management
- Core set of doctrine, concepts, principles, terminology and organizational processes for all hazards
- Essential principles for a common operating picture and interoperability of communications and information management
- Standardized resource management procedures for coordination among different jurisdictions and organizations
- Scalable and applicable for all incidents

Key benefits of NIMS

- Enhances organizational and technological interoperability and cooperation
- Provides a scalable and flexible framework with universal applicability
- Promotes all-hazards preparedness
- Enables a wide variety of organizations to participate effectively in emergency management/incident response
- Institutionalizes professional emergency management/incident response practices

NIMS Audience:

NIMS is applicable to all incidents and all levels of stakeholders, including levels of government, private sector organizations, critical infrastructure owners and operators, nongovernmental organizations and all other organizations who assume a role in emergency management. Elected and appointed officials and policy makers, who are responsible for jurisdictional policy decisions, must also have a clear understanding of NIMS to better serve their constituency.

NIMS Components:

Built on existing structures, such as the Incident Command System (ICS), NIMS creates a proactive system to assist those responding to incidents or planned events. To unite the practice of emergency management and incident response throughout the country, NIMS focuses on five key areas, or components. These components link together and work in unison to form a larger and comprehensive incident management system.

NIMS Components include:

- Preparedness
- Communications and Information Management
- Resource Management
- Command and Management
- Ongoing Management and Maintenance

What NIMS is NOT

- A response plan
- Only used during large-scale incidents
- Only applicable to certain emergency management/incident response personnel
- Only the Incident Command System (ICS) or an organizational chart

For further information on the NIMS see the DHS/FEMA website at www.fema.gov/nims.
