Hazardous Materials: Managing the Incident

CHAPTER 1
The Hazardous Materials Management System
Learning Objectives Overview

- Knowledge Objectives
- Skills Objectives
Introduction

• Role of the Hazmat Technician
• Laws, Regulations, and Standards
• Hazmat Management System
Role of the Hazardous Materials Technician

- Respond
- Analyze
- Select applicable decontamination procedures
- Control
- Scene safety
What is a Hazardous Material?
(1 of 3)

**Hazardous materials**—Any substance or material in any form or quantity that poses an unreasonable risk to safety, health, and property when transported in commerce (Source: U.S. Department of Transportation [DOT], 49 Code of Federal Regulations (CFR) 171).

**Hazardous materials**—A substance (either matter—solid, liquid, or gas—or energy) that when released is capable of creating harm to people, the environment, and property, including WMD as defined in 18 U.S. Code, Section 2332a, as well as any other criminal use of hazardous materials, such as illicit labs, environmental crimes, or industrial sabotage (Source: NFPA 472).

**Hazardous substances**—Any substance designated under the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as posing a threat to waterways and the environment when released (Source: U.S. Environmental Protection Agency [EPA], 40 CFR 302). Note: Hazardous substances as used within OSHA 1910.120 refers to every chemical regulated by EPA as a hazardous substance and by DOT as a hazardous material.

**Extremely Hazardous Substances (EHS)**—Chemicals determined by the EPA to be extremely hazardous to a community during a spill or release as a result of their toxicities and physical/chemical properties (Source: EPA 40 CFR 355).

**Hazardous chemicals**—Any chemical that would be a risk to employees if exposed in the workplace (Source: OSHA, 29 CFR 1910).


**Dangerous goods**—In international transportation, hazardous materials are commonly referred to as “dangerous goods.”

**Weapons of Mass Destruction (WMD)**—(1) Any destructive device, such as any explosive, incendiary, or poison gas bomb, grenade, rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than one quarter ounce (7 grams), mine, or device similar to the above; (2) any weapon involving toxic or poisonous chemicals; (3) any weapon involving a disease organism; or (4) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life (Source: 18 U.S. Code, Section 2332a).
What is a Hazardous Material?
(2 of 3)

• Hazardous materials can be found almost anywhere.
  – Industry
  – Transportation
  – Workplace
  – Home

• Hazardous materials can also be used as a weapon for criminal or terrorist purposes.
What is a Hazardous Material?
(3 of 3)

• Ludwig Benner, Jr. a former specialist with the National Transportation Safety Board (NTSB) developed a definition of hazardous materials:
  – Any substance that jumps out of its container when something goes wrong and hurts or harms the things it touches.

Courtesy of Don Sellers
Hazmat Laws, Regulations, and Standards (1 of 16)

• Hazmat operations involving the manufacture, transport, use, and incident response are affected by:
  – Laws
    • Federal
    • State
  – Regulations
  – Consensus standards
• Federal hazmat laws
  – Enacted by Congress to regulate everything from finished products to hazardous waste
  – RCRA, CERCLA, SARA, CAA, OPA
Hazmat regulations

- Laws delegate certain details of implementation and enforcement to federal, state, or local agencies.
  - These agencies are then responsible for writing the actual regulations.

- Regulations will either:
  - Define the broad performance required to meet the letter of the law, or
  - Provide very specific and detailed guidance on satisfying the regulation
Hazmat Laws, Regulations, and Standards (4 of 16)

• Federal regulations
  – Hazardous Waste Operations and Emergency Response (HAZWOPER; 29 CFR 1910.120)
  – “Non-OSHA” states
  – Community Emergency Planning Regulations (40 CFR parts 300 through 399)
  – State Emergency Response Commission (SERC)
Federal regulations (cont’d)

- LEPC membership are representatives from the following groups:
  - Elected state and local officials
  - Fire Department
  - Law Enforcement
  - Emergency Management
  - Public health officials
  - Hospital
Federal regulations (cont’d)

• Industry personnel, including facilities and carriers
• Media
• Community organizations
  – LEPC is specifically responsible for developing and/or coordinating the local emergency response system and capabilities.
  – A primary concern is the identification, coordination, and effective management of local resources.
• Federal regulations (cont’d)
  – In several communities, the LEPC has expanded its scope and responsibilities to adopt an all-hazards approach to emergency planning and management.

• Risk management programs consist of three elements:
  – Hazard assessment of the facility
  – Prevention program
  – Emergency response considerations
  – Federal regulation that requires hazardous materials manufacturers and handlers to develop written material safety data sheets (SDS) on specific types of hazardous chemicals
  • Examples of information on SDSs:
    – Known health hazards
    – Physical and chemical properties of the material
Hazmat Laws, Regulations, and Standards (9 of 16)

  - First aid, firefighting, and spill control recommendations
  - Protective clothing and equipment requirements
  - Emergency telephone contact numbers
Hazmat Laws, Regulations, and Standards (10 of 16)

- Hazardous materials transportation regulations (49 CFR 100–199)
  - Comprehensive regulations issued and enforced by the U.S. DOT that strictly govern how all hazardous materials are transported by highway, railroad, pipeline, aircraft, and water
  - Hazardous materials transportation regulations govern:
    - Container design
    - Chemical compatibility
• Hazardous materials transportation regulations (49 CFR 100–199) (cont’d)
  • Packaging and labeling requirements
  • Shipping papers
  • Transportation routes and restrictions
Pipeline regulations (49 CFR Part 190–199)
- Issued by the DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) and establishes rules and regulations governing the design, construction, operation, safety, and maintenance of interstate pipelines
- Regulate oil, gas, liquefied natural gas (LNG), and other hazardous liquid pipelines and facilities
- Part 194
Hazmat Laws, Regulations, and Standards (13 of 16)

• National Contingency Plan (NCP; 40 CFR 300, Subchapters A through J)
  – Outlines the policies and procedures of the federal agency members of the National Oil and Hazardous Materials Response Team (also known as the National Response Team, or the NRT)
    • The NRT is chaired by the EPA.
    • Each of the 10 federal regions also has a Regional Response Team (RRT).
National Contingency Plan (NCP; 40 CFR 300, Subchapters A through J) (cont’d)

- If the incident is a terrorism-related event, the Federal Bureau of Investigation (FBI) will assume the role as federal OSC during the emergency response phase.

- Facility and modal security regulations were enacted in the aftermath of the terrorist attacks of September 11, 2001.
• State and local regulations
  – Each of the 50 states and the U.S. territories maintains an enforcement agency that has responsibility for hazardous materials.
  – Three key players in each state:
    • State fire marshal
    • State Occupational Safety and Health Administration
    • State Department of the Environment
State and local regulations (cont’d)

- Some state and local governments have a special set of codes and regulations that apply to pipeline operations.
Voluntary Consensus Standards (1 of 8)

• Standards developed that play an important role in increasing both workplace and public safety

• Provides a way for individual organizations and corporations to self-regulate their businesses
Several standards development organizations have developed consensus standards:

- The National Fire Protection Agency (NFPA)
- The American Society of Testing and Materials (ASTM)
- The National Institute of Justice (NIJ)
Voluntary Consensus Standards (3 of 8)

- NFPA Technical Committee on Hazardous Materials Response Personnel
  - Responsible for documents on:
    - Requirements for professional qualifications
    - Professional competence
    - Training and procedures
    - Equipment for emergency responders to hazardous materials/WMD incidents
    - NFPA 472, 473, 475, and 1072
• NFPA 472
  – Purpose is to specify minimum competencies for those who will respond to hazardous materials/WMD incidents
  – Overall objective is to reduce the number of accidents and prevent exposure to hazmats
  – Commonalities and differences with OSHA
  – Includes a number of additional levels of training that are optional in scope and have been developed to meet specific hazardous materials training and response needs
Voluntary Consensus Standards (5 of 8)

- **NFPA 473**
  - Purpose is to specify minimum requirements of competence and to enhance the safety and protection of response personnel and all components of the EMS system
  - Overall objective is to reduce the number of EMS personnel accidents, exposures, injuries, and illnesses resulting from hazmat incidents
Voluntary Consensus Standards (6 of 8)

  - Responsible for the development of standards and documents pertaining to the use of personal protective clothing and equipment (excluding respiratory protection) by emergency responders at hazardous materials incidents
Voluntary Consensus Standards (7 of 8)

  - Committee scope includes personal protective equipment (PPE) selection, care, and maintenance.
Other standards organizations

- The American National Standards Institute (ANSI)
- The American Society for Testing and Materials (ASTM)
- The Compressed Gas Association (CGA)
- The Safety Equipment Institute (SEI)
- The American Petroleum Institute (API)

Each of these organizations approves or creates standards ranging from hazardous materials container design to personal protective clothing and equipment.
The standard of care represents the *minimum* accepted level of service.

The standard of care is established by:

- Existing laws and regulations
- Voluntary consensus standards and recommended practices
- Local protocols and practices
The Hazardous Materials Management System

• Effective hazmat commanders view issues from a systems perspective.

• Elements of a hazardous materials management systems approach:
  – Planning and preparedness
  – Prevention
  – Response
  – Clean-up and recovery
Hazards analysis is the foundation of the planning process. It should be conducted for every location designated as having a moderate or high probability for a hazmat incident. In addition to risk evaluation, vulnerability—what is susceptible to damage should a release occur—must also be examined. A hazards analysis provides numerous benefits.
There are four components of a hazards analysis program:

- Hazards identification
- Vulnerability analysis
- Risk analysis
- Emergency response resource evaluation
Hazards Analysis (3 of 7)

- Hazards identification is initially based on a review of the history of incidents. Information should include:
  - Chemical identification
  - Location of facilities
  - Type(s) and design(s) of chemical container
  - Quantity of material
Hazards Analysis (4 of 7)

• Hazards identification is initially based on a review of the history of incidents. Information should include: (cont’d)
  – Nature of the hazard associated with the hazmat release
  – Presence of any fixed suppression
  – Level of physical security
Hazards Analysis (5 of 7)

- **Vulnerability analysis:**
  - The size/extent of vulnerable zones
  - Equipment
  - The population
  - Private and public property that may be damaged
  - Environment that may be affected

- **Risk analysis:**
  - The probability or likelihood of an accidental release
  - The actual consequences that might occur
Emergency response resources are evaluated based upon the potential risks and considers resource requirements including:

- Personnel
- Equipment
- Supplies necessary for hazmat control and mitigation
- EMS
- Protective actions
Emergency response resources are evaluated based upon the potential risks and considers resource requirements including: (cont’d)

- Traffic control
- Inventories of available equipment and supplies and their functional status
• Emergency management planning process includes:
  – Forming a collaborative planning team
  – Understanding the situation
  – Determining goals and objectives
Contingency and Emergency Operations Planning (2 of 2)

- Emergency management planning process includes: (cont’d)
  - Plan development
  - Plan preparation, review, and approval
  - Plan implementation and maintenance
Other Planning Documents

• Documents that support the emergency preparedness process include:
  – Pre-incident plans
  – Standard operating procedures/guidelines (SOP/SOG)
  – Field operations guides (FOG)
  – Job aids are checklists or other materials that help users perform a specific task.
CAER and TRANSCAER

- Public and private sector planning programs include:
  - Community awareness and emergency response (CAER) programs
  - Transportation community awareness and emergency response (TRANSCAER) programs
Prevention

• Public and private sectors share responsibility for the prevention of hazmat releases.
• Regulatory and enforcement capabilities provide public sector agencies “the biggest stick.”
Hazmat Process, Container Design, and Construction Standards

• Almost all hazardous materials facilities, containers, and processes are designed and constructed to some standard.
  – Engineering standards and guidelines
  – Voluntary consensus standards including:
    • NFPA
    • ASTM
    • Government regulations
Inspection and Enforcement

(1 of 2)

• Fixed facilities are inspected by:
  – State and federal OSHA and EPA inspectors
  – State fire marshals and local fire departments

• Inspections focused on fire and life safety issues

• May not adequately address either the environmental or process safety issues
Inspection and Enforcement
(2 of 2)

• Transportation vehicle inspection is generally based upon Title 49 CFR.
• Enforcing agencies include:
  – State police
  – U.S. DOT agencies
    • Federal Railroad Administration (FRA)
    • Federal Aviation Administration (FAA)
    • U.S. Coast Guard (USCG)
Public Education
(1 of 2)

• Hazmat safety is a concern for the community.
• Improper disposal of substances used in the home contributes to this problem.
  – Used motor oil
  – Paints, solvents
  – Batteries
  – Other chemicals
• Pipeline operators must provide regular training to emergency responders.

• Pipeline operators have extensive public education programs pertaining to the use of the One Call System and the DigSafely program.
Handling, Notification, and Reporting Requirements

• Key federal regulations:
  – CERCLA (Superfund)
  – RCRA
  – SARA Title III

• Many state regulations are similar in scope or often exceed the federal standard requirements.
Response

- Response activities and operational capabilities should be based on the risk-based information and probabilities identified during the planning process.
- Every community should have access to a technician-level hazmat response capability.
Response Groups

- The emergency response community consists of various agencies and individual hazmat responders categorized based upon their:
  - Knowledge
  - Expertise
  - Resources
Levels of Incident

- The National Incident Management System (NIMS) categorizes incidents into five types.
- Based on the scope, impact, and resource requirements of the incident
  - Type 1 incident is the most significant.
  - Type 5 incidents are the smallest, most common.
To respond effectively and efficiently to hazmat emergencies, many facilities and communities have established HMRTs. The purpose of the HMRT is to control or stabilize the incident.
• In evaluating the need for an HMRT, consider that an HMRT will not necessarily solve the hazmat problem.
• Remember the hazardous materials management system—planning, prevention, response, and recovery.
Hazmat Response Team (HMRT)

(3 of 4)

• HMRT constraints and requirements:
  – Legal
  – Insurance
  – Political issues
  – Initial and continuing funding sources
  – Resource determination and acquisition
  – Personnel and staffing
  – Initial and continuing training
Hazmat Response Team (HMRT)
(4 of 4)

- HMRTs typically function as a group or branch within the Incident Command System.
- The final decision always remains with the incident commander.
Levels of Hazardous Materials Incidents: Community & Petrochemical Industry

Potential Emergency Conditions

Limited Emergency Conditions

Full Emergency Conditions

Facility Incident

Serious Facility Incident

Facility Crisis Situation
Clean-Up and Recovery (1 of 4)

• Clean-up and recovery operations are designed to:
  – Clean up or remove the hazmat release
  – Restore the facility and/or community back to normal as soon as possible

• Clean-up activities can be classified as follows:
  – Short term
  – Long term
Clean-Up and Recovery  (2 of 4)

- Local government and political leaders may contribute to clean-up and recovery discussions.
- Recovery operations focus on restoring the facility, the community, and/or emergency response organization to normal operating conditions.
Clean-Up and Recovery (3 of 4)

- Recovery operation tasks include:
  - Restocking all supplies and equipment
  - Compilation and documentation of resources purchased and/or used
  - Financial restitution, where appropriate

- Post-incident issues:
  - Identifying a responsible party (RP)
  - Recovering allowable costs associated with the incident response
Hazmat incident cost recovery options may include:

- Establishment of a local cost recovery ordinance/legislation and supporting fee structures
- Voluntary efforts through the RP’s insurance carrier
- EPA Local Government Reimbursement (LGR) Program
Role of Emergency Responders During Clean-Up Operations (1 of 4)

• Many plant-level industrial responders are responsible for the clean-up of minor spills and releases.
• Public safety response personnel are usually not directly responsible for the final clean-up and recovery of a hazardous materials release.
• Public safety response personnel may continue to be responsible for site safety until risks are stabilized and emergency phase is terminated.
Role of Emergency Responders 
During Clean-Up Operations (3 of 4)

• Short-term operations immediately following an incident
  – Incident commander should ensure that the work area is closely controlled.

• Long-term clean-up and recovery operations
  – Do not normally require the continuous presence of the fire service
Role of Emergency Responders During Clean-Up Operations (4 of 4)

- Emergency responders should be familiar with the clean-up operation, including:
  - Organizational structure
  - OSC/RPM
  - Work plan
  - Time schedule
  - Site safety plan
• Hazardous materials key terms include:
  – Hazardous materials
  – Hazardous substances
  – Extremely hazardous substances
  – Hazardous chemicals
  – Hazardous wastes
  – Dangerous goods
  – Weapons of mass destruction
The hazardous materials incident response can be regulated by federal, state, and/or local laws and regulations.

Professional organizations and trade associations can establish voluntary consensus standards that can affect the administrative and operational elements of an hazardous materials incident response program.
• A systems approach to hazardous material management includes:
  – Planning and preparedness
  – Prevention
  – Response
  – Clean-up and recovery