Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 1: The Hazardous Materials Management System

Chief Concepts

- The primary target audience for this text includes HMTs, the On-scene Incident Commander, the Hazmat Officer (aka Group Supervisor or Branch Director) and members of organized HMRTs.

- Hazardous materials: Any substance that jumps out of its container when something goes wrong and hurts or harms the things it touches (Benner).

- A hazardous materials incident can then be defined as the release, or potential release, of a hazardous material from its container into the environment (Benner).

- SARA, Title III is the primary federal legislation that directly affects the local hazardous materials emergency preparedness program. Responders should identify the local agency responsible for the coordination of the LEPC, as well as who represents the emergency response community.

- OSHA Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) is the primary federal law that directly affects hazmat emergency response and training activities in both the public and private sector.

- OSHA 1910.120 is the LAW of the land. NFPA 472 is a VOLUNTARY consensus standard. However, if you meet the requirements of NFPA 472 you will exceed the OSHA HAZWOPER emergency response training requirements (paragraph q.6).

- The NFPA publishes a number of voluntary consensus standards that directly influence hazmat/WMD emergency response, training, and certification throughout North America. These include:
  - NFPA 472 (training)
  - NFPA 473 (EMS training)
  - 1991 (chemical vapor protective clothing)
  - 1992 (chemical splash protective clothing) and
  - 1994 (chemical protective clothing—CBRNE terrorism scenarios).

- Standard of Care represents the minimum accepted level of hazardous materials emergency service that should be provided regardless of location or situation. It is established by existing laws and regulations, and is also influenced by legal findings and case law precedents.

- The two key elements of planning and preparedness activities are the hazards analysis and contingency planning processes.
• Hazmat prevention activities include:
  o (1) hazmat process, container design, and construction standards
  o (2) inspection and enforcement
  o (3) public education
  o (4) handling, notification, and reporting requirements

• Hazardous Materials Response Teams (HMRT) are defined as an organized group of trained response personnel, operating under an emergency response plan and applicable standard operating procedures, who perform hazardous material technician-level skills at hazardous materials/WMD incidents. The HMRT members respond to releases for the purpose of control or stabilization of the incident. Among the specialized equipment carried by an HMRT are reference libraries, computers and communications equipment, personal protective clothing and equipment, direct-reading detection and monitoring equipment, control and mitigation supplies and equipment, and decontamination supplies and equipment (NFPA 472).

• Although emergency responders are typically not responsible for clean-up and recovery operations, they are responsible to ensure there is a safe and effective transfer of command to the lead agency responsible for post-emergency response operations.
Chief Concepts

- Personnel protection is the number one priority at any hazmat incident. Toxicology is the health and safety concern of every emergency responder, including study of chemical and physical agents that produce adverse responses in the biological systems with which they interact. Chemical agents include gases, vapors, fumes, and dusts, while physical agents include radiation, hot and cold environments, noise, and so forth.

- Toxicity is defined as the ability of a substance to cause injury to a biological tissue. In humans this generally refers to unwanted effects produced when a chemical has reached a sufficient concentration at a particular location within the body.

- Exposure + Toxicity = Health Hazard

- Chemical exposures and their health effects are commonly described as acute or chronic. Acute exposures describe an immediate exposure, while chronic exposures are low exposures repeated over time.

- Common methods of exposure are inhalation, ingestion, skin absorption, direct contact, or injection.

- Health effects of a hazardous material can be described in terms of how a hazmat attacks the body. A local effect implies an effect at the point of contact—for example, a corrosive burn to the skin, eye irritation, etc. A systemic effect occurs when a chemical enters the bloodstream and attacks target organs and other internal areas of the human body.

- The human body can be subject to seven types of harm events—thermal, mechanical, poisonous, corrosive, asphyxiation, radiation, and etiological.

- Units of measurement for determining the relative toxicity and health exposure of a chemical substance or compound are lethal dose and lethal concentration.

- Exposure values are only guidelines and interpretations—NOT absolute boundaries between safe and dangerous conditions. Examples of common exposure values are threshold limit value (TLV), permissible exposure limit (PEL), immediately dangerous to life and health (IDLH), and emergency response planning guidelines (ERPG).
• Radiation that doesn’t hit anybody doesn’t hurt anybody! Always keep the acronym “ALARA” in mind when considering radiation exposures—keep the exposure As Low As Reasonably Achievable.

• Heat stress is a significant concern when wearing any type of impermeable protective clothing. Physical reactions to heat include heat rash, heat cramps, heat exhaustion, and heat stroke. Heat stroke is a true medical emergency.

• Heat stress can be managed through both administrative controls (e.g., acclimatizing or conditioning the body to working in hot environments, work/rest scheduling, rehab, and fluid replacement) and the use of PPE cooling options.

• Medical surveillance is the cornerstone of an effective employee health and safety management system and site safety practices and procedures. Objectives include to determine whether an individual can perform his or her assigned duties (i.e., “fit for duty”), including the successful use of personal protective clothing and equipment; and (2) to detect any changes in body system functions caused by physical and/or chemical exposures.

• A written PPE program is required under OSHA 1910.120(q) (5) and should include hazard assessment; medical monitoring; equipment selection and use; training; and inspection, maintenance, and storage. A written respiratory protection program is also required under OSHA 1910.134(c)(1).

• Safety is an attitude, a behavior, and a culture, and MUST be an inherent part of all operations from the development of SOPs to the selection of PPE. The fundamental operating philosophy of every emergency response organization should be, “If we cannot do this safely, then we will not do it at all.”

• Establishing an Incident Safety Officer and developing a written Site Safety Plan are key elements in ensuring the health and safety of personnel operating at a hazmat incident.

• Medical monitoring is defined as an ongoing, systematic evaluation of individuals at risk of suffering adverse effects from stress and/or exposure to heat, cold, or hazardous environments. The objectives of medical monitoring are (1) to obtain baseline vital signs, and (2) to identify and preclude from participation all individuals at increased risk for sustaining injury or illness. It is one element of a comprehensive medical surveillance program that starts with a baseline and periodic “fit for duty” medical examination.
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 3: Managing the Incident: Problems, Pitfalls, Solutions

Chief Concepts

- The successful management of a hazmat incident is directly linked to the rapid development of an effective incident management process and organization. From the arrival of the first emergency responder, the IC must match and balance the size and structure of the ICS organization with the number of units and organizations present on the incident scene. A functional hazmat command system must allow the IC to use the standard ICS elements to establish and maintain control, to be responsive to the unique hazards and risks of each incident, and, finally, to apply the same ICS system and process to every incident, regardless of its nature and size.

- A variety of different players will respond to a working hazmat incident. Therefore, what occurs during the planning and preparedness phase will establish the framework for how the emergency response effort will operate.

- There is no single organization that can effectively manage a major hazmat incident. Organizations that attempt to maintain their usual structure or bureaucracy while managing a major event will have inherent problems in implementing a timely and effective emergency response.

- Emergency response programs can be categorized as being either “people-dependent” or “system-dependent.” Special operations teams are often very people-dependent when they are initially formed. These organizations rely on the experience of a few key individuals and can result in failed emergency response efforts if these key individuals are not present at an incident.

- If ICS is not used for all routine emergencies, don’t expect the ICS structure to function and adapt effectively and safely when a major emergency occurs. The routine establishes the foundation on which the non-routine must build. The more routine decisions made prior to a major emergency, the more time the IC will have to make the critical decisions during the emergency.

- The Hazardous Materials Group is normally under the command of a senior Hazmat Officer (often known as the Hazardous Materials Group Supervisor), who, in turn, reports to the Operations Section Chief or the IC. The Hazardous Materials Group is directly responsible for all tactical hazmat operations that occur in the hot and warm zones of an incident.
• The Hazardous Materials Group Supervisor is responsible for the management and coordination of all functional responsibilities assigned to the Hazardous Materials Group, including safety, site control, research, entry, and decontamination.

• The ASO/Hazardous Materials is responsible for coordinating safety activities within the Hazardous Materials Group but also has certain responsibilities that may require action without initially contacting the normal chain of command. The ISO is responsible for the safety of all personnel operating at the incident, while the ASO/Hazardous Materials is responsible for all operations within the Hazardous Materials Group and within the hot and warm zones. This includes having the authority to stop or prevent unsafe actions and procedures during the course of the incident.

• Your emergency response performance will be evaluated on two interrelated factors: (1) the implementation of a timely, well-trained and equipped emergency response effort in the field, and (2) the effective management of the interpersonal, organizational, and external impacts created by the incident. An effective response effort can be compromised or completely negated by poor management of the political and external issues.
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 4: The Eight Step Process© An Overview

Chief Concepts

- Emergency response operations at incidents involving hazardous materials must always be based on a structured and standardized system of response protocols and procedures. Regardless of the nature of the incident, the nature of the response, or the personnel involved, a reliance on standardized procedures will bring consistency to the tactical operation and facilitate the delivery of a risk-based operational response capability. If the situation potentially involves hazardous materials or WMD agents, this reliance on standardized tactical response procedures will help minimize the risk of exposure to all responders.

- The Eight Step Process© is a tool used for the tactical management of hazardous materials emergencies. It serves as an example of a structured system that can be used by response personnel at incidents involving hazardous substances and materials.

- Although the level of equipment, training, and personnel may vary among organizations, there are fundamental functions and tasks that must be evaluated and implemented on a consistent basis. The Eight Step Process© provides a necessary framework to translate planning and preparedness into the delivery of an effective system for responding to and investigating incidents where hazardous materials and WMDs may be involved.

- The eight functions within the Eight Step Process© are:
  1. Site Management and Control
  2. Identify the Problem
  3. Hazard Assessment and Risk Evaluation
  4. Select Personal Protective Clothing and Equipment
  5. Information Management and Resource Coordination
  6. Implement Response Objectives
  7. Decon and Clean-Up Operations
  8. Terminate the Incident
Chief Concepts

- Site Management is the first step in the Eight Step Incident Management Process. Its major focus is on establishing control of the incident scene by assuming command of the incident and isolating people from the problem by establishing an Isolation Perimeter and Hazard Control Zones.

- Site management and control provide the foundation for the response. Responders cannot safely and effectively implement an IAP unless the playing field is clearly established and identified for both emergency responders and the public.

- Safe approach and positioning by the initial emergency responders is critical to how the incident will be managed. Emergencies that start bad because of poor positioning sometimes stay bad.

- Staging procedures facilitate safety and accountability by allowing for the orderly, systematic, and deliberate deployment of responders. The Staging Area is the designated location where emergency response resources (people, equipment, and supplies) are assigned until they are needed.

- The isolation perimeter is the designated crowd control line surrounding the incident scene to maintain the safety and security of the spectators and the responders. Designating and establishing the isolation perimeter is an IC's responsibility.

- Hazard Control Zones are designated restricted areas within the isolation perimeter based upon their degree of hazard. Hazard Control Zones are designated from the most hazardous to least hazardous as Hot, Warm, and Cold. (Hot = Greatest Risk and Cold = Least Risk.)

- Safe operating procedures should strictly control and limit the number of personnel working in the Hot Zone. Most Hot Zone operations can be accomplished with a minimum of four personnel working for specified time periods using the Buddy System following the OSHA Two-In/Two-Out Rule.

- Public Protective Actions (PPAs) are the strategy used by the IC to protect the general population from the hazardous material by implementing either:
  - (1) Protection-in-Place
  - (2) Evacuation
  - (3) Combination of Protection-in-Place and Evacuation
Chief Concepts

- The evaluation of hazards and the assessment of the risks build on the timely identification and verification of the hazardous materials involved. A problem well defined is half-solved.

- Among the most critical tasks in managing a hazmat incident are surveying the incident scene to detect the presence of hazmats, identifying the nature of the problem and the materials involved, and identifying the type of hazmat container and the nature of its release.

- The identification process is built on the basic elements of (1) recognition, (2) identification, and (3) classification of the materials involved.

- Identification and verification of the hazmats involved are critical to the safe and effective management of a hazmat incident. The seven basic clues for recognition:
  - Identification, and classification are:
    - Occupancy and location
    - Container shapes
    - Markings and colors
    - Placards and labels
    - Shipping papers and facility documents
    - Monitoring and detection equipment
    - Senses

- All hazardous materials are controlled as long as they remain within their container. Hazmat responders should be able to recognize the various container profiles and know the general hazmat class/division of materials that may be found within each type of container.

- Markings and colors on hazmat packaging or containment systems may include color codes, container specification numbers, signal words, or the content’s name and associated hazards. At facilities, clues may include Hazard Communication markings, piping color code systems, and specific signs and/or signal words.

- Shipping papers are required to accompany each transport vehicle. Responders must be familiar with the information noted on shipping papers, their location on each transport vehicle, and the individual responsible for them.

- Various types of facility documents are available to assist in the information process and can be a source for hazmat recognition, identification, and classification at an emergency. Examples
include hazmat inventory forms, shipping and receiving forms, Risk Management Plans and supporting documentation, MSDSs, and SARA, Title III Tier II reporting forms.

- Monitoring and detection equipment can provide data concerning the overall nature of the problem responder’s face as well as the specific materials involved. They are also critical tools for evaluating real-time data and developing a risk-based response.
Chief Concepts

- Hazards refer to a danger or peril. In hazardous materials response operations, hazards generally refer to the physical and chemical properties of a material. Risks refer to the probability of suffering harm or loss. Although the risks associated with hazmat response will never be completely eliminated, they can be successfully managed. The objective of response operations is to minimize the level of risk to responders, the community, and the environment.

- Hazard and risk assessment is the most critical function in the successful management of a hazardous materials incident. The key tasks in this analytical process are:
  1. identifying the materials involved
  2. gathering hazard information
  3. visualizing hazmat behavior and predicting outcomes
  4. based on the evaluation process, establishing response objectives. The system that ties these elements together is the General Hazardous Materials Behavior Model.

- You must know how to use reference materials before the incident in order to use them effectively. Evaluate reference materials before use and make sure your references use the same definitions for hazard terms. A good guidebook should have a well-written “How to Use” section.

- Although reference guidebooks contain data on those chemicals most commonly encountered during hazmat incidents, they are usually not a complete listing of all the chemicals found in your community. There is no replacement for hazard analysis and contingency planning at both the plant and community levels.

- Each information specialist has their own strengths and limitations. It’s a good idea to remove the term expert from your vocabulary; be wary of self-proclaimed experts without first verifying their background and knowledge.

- Networking and relationships are everything! Local responders and facility personnel must get out into their communities and establish personal contacts and relationships with response partners. These include state, regional, and federal environmental response personnel, law enforcement, clean-up contractors, industry representatives, wrecking and rigging companies, and so on.

- There is no single detection/monitoring device on the market that can do everything. Make sure you understand how an instrument will fit into your standard operating procedures and...
emergency response strategies. Anyone can use an instrument; the challenge is interpreting what the instrument is (and isn’t) telling you and then making risk-based decisions to make the problem go away!

- The nature of the incident and the intent of the monitoring mission will drive the selection of monitoring technologies most appropriate for the incident.

- Emergency responders must understand the operating principles of the detection and monitoring equipment, its application and limitations, and the manner in which the instrument fits into existing response procedures.

- Unknowns will create the greatest challenge for responders. The nature of the incident (e.g., credible threat scenario involving WMD agents), the location of the emergency (e.g., outdoors, indoors, confined space), and the suspected physical state of the unknown (i.e., solid, liquid, or gas) will influence the monitoring strategy. In scenarios involving unknowns, the role of hazmat responders is much like that of a detective. At the conclusion of the testing process, responders may still be unable to specifically identify the material(s) involved; however, they should be able to rule out a number of hazard classes and shorten the list of possibilities.

- Initial air monitoring efforts should be directed toward determining if IDLH concentrations are present. Decisions regarding protective clothing recommendations, establishing hazard control zones, and evaluating any related public protective actions should be based on defined action levels for radioactivity, flammability, oxygen deficiency and oxygen enrichment, and toxicity.

- As a general rule, samples collected for product identification during emergency response operations should not be used for evidentiary purposes—collect a separate sample for evidence.

- An accurate evaluation of the real and potential problems will enable response personnel to develop informed and appropriate strategic response objectives and tactical decisions.

- To visualize likely hazardous materials behavior, five basic questions must be addressed:
  1. Where will the hazardous material and/or its container go when released?
  2. How will the hazardous material and/or its container get there?
  3. Why are the hazardous material and/or its container likely to go there?
  4. What harm will the hazardous material and/or its container do when it gets there?
  5. When will the hazardous material and/or its container get there?

- Strategic goals are the broad game plan developed to meet the incident priorities (life safety, incident stabilization, environmental and property conservation). Essentially, strategic goals translate into “what are you going to do to make the problem go away?”
Tactical objectives are specific and measurable processes implemented to achieve the strategic goals. In simple terms, tactical objectives come down to “how are you going to do it?”

If you are unsure of the container damage or how the container is likely to breach, get assistance from product or container specialists. This may include railroad personnel, gas industry representatives, and cargo tank truck specialists.

When petroleum products or chemicals are released into the ground, their behavior will depend on their physical and chemical properties (e.g., liquid versus gas, hydrocarbon versus polar solvent), the type of soil (e.g., clay versus gravel versus sand), and the underground water conditions (e.g., location and movement of the water table).

Remember—your job is to be a risk evaluator, not a risk taker. Bad risk takers get buried; effective risk evaluators go home.
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 8: Selecting Personal Protective Clothing and Equipment

Chief Concepts

- Personal protective clothing and equipment is critical to the success of an organization’s hazardous materials response program. They are an integral element of the health and safety program and facilitate the ability of emergency responders to respond and control hazmat releases in a safe, efficient, and effective manner.

- An effective and comprehensive personal protective clothing program should address six fundamental elements: hazard identification, PPE selection and use, medical monitoring, training, inspection, and maintenance.

- Using a risk-based approach is critical when selecting personal protective clothing and equipment. All decisions should be well thought out and realistic, taking into account both the positive and negative effects of the tactical options being pursued.

- Emergency responders should be familiar with the policies and procedures of the Authority Having Jurisdiction (AHJ) so as to ensure a consistent approach for the selection and use of PPE.

- Chemicals may attack and pass through protective clothing materials via three methods: degradation, penetration, and permeation. Barrier compatibility charts are primarily based upon penetration and permeation testing.

- CPC materials are classified as either limited-use (disposable) garments or reusable garments.


- Chemical resistance data is described in terms of either
  (1) chemical permeation/breakthrough times and rates
  (2) cumulative permeation for a given test duration; or
  (3) as “pass/fail” chemical penetration testing results.

Remember that the longer the breakthrough time or the lower the cumulative permeation value, the better the level of protection.
• The glove, boot, visors, and garment components of CPC will often be constructed of different materials or laminates. Be aware of which of these materials form the basis for the chemical barrier data provided by the manufacturer.

• Air purification devices should not be used at hazmat releases unless qualified personnel have first monitored the environment and determined that such devices can be safely used (per OSHA 29 CFR 1910.120[q][3][iv] and 1910.134). As a general rule, they should not be used for initial response operations at hazmat incidents and for emergency response operations involving unknown substances.

• Three basic types of protective clothing may be used at hazmat incidents:
  o Structural firefighting clothing is designed to protect against extremes of temperature, steam, hot water, hot particles, and the typical hazards of firefighting.
  o CPC is designed to protect skin and eyes from direct chemical contact. There are two basic types of CPC used: chemical splash protective clothing and chemical vapor protective clothing.
  o High temperature protective clothing is designed to protect against short-term exposures to high temperatures, such as proximity and fire entry suits.

• The EPA/OSHA levels of protection (A, B, C, D) reflect the design of the protective clothing ensemble and the respiratory protection provided, but do NOT provide an accurate description of the protection provided.

• Although SFC may offer sufficient protection to the wearer who is fully aware of the hazards being encountered and the limitations of the protective clothing, it is not designed to provide chemical splash or chemical vapor protection.

• Hazmat emergency responders are more likely to be injured as a result of heat stress than a chemical exposure. Many response agencies use some form of cooling technology to reduce the potential for heat stress injuries.

• Manufacturers’ guidelines for maintenance, testing, inspection, storage, and documentation should be followed for all PPE provided by the AHJ.
Chapter 9: Information Management and Resource Coordination

Chief Concepts

- Failure to get the right information to the right people at the right time can jeopardize both the safety of responders and the overall success of the emergency response effort.

- The way other agencies and the public perceive how the incident was handled generally depends on the way information was managed.

- Information and resources must be managed within the framework of the Incident Command System.

- The key to successfully managing and retrieving hazmat information under emergency conditions is good organization and simplicity. If it doesn’t work on the street it is useless.

- Information management systems must be user-friendly and durable.

- Coordinating information in the field becomes particularly important as the IC, Hazmat Group Supervisor, and others evaluate options concerning protective clothing, decon requirements, and public protective actions.

- Coordinating information is a dynamic process that must adjust its scale over time to provide the correct and credible information to the right people at the right time. The larger and more complex the incident, the larger the command organization needed to manage the incident. The larger the command organization, the more need there is for a formal structure to manage the data and information that will flow between Command and the various individuals and organizations at the emergency scene. Information must also flow freely to and from the incident scene to off-site support facilities, such as the EOC, CHEMTREC®, and elected officials. In addition, accurate and timely information to the public and the media must be well managed.

- The checklist system is one of the most effective tools for ensuring that information and resources are effectively coordinated both internally and externally.

- Extended incidents or incidents involving multiple chemicals may require that an Information Unit be formed within the Hazmat Group.

- Resources are the people, equipment, and supplies required to manage a hazardous materials emergency. Within the command structure, the Logistics Section is typically organized into two subgroups that include a Resources Branch and a Support Branch.
• A good Logistics Section Chief doesn’t wait until the Operations Section Chief needs a resource; they anticipate what will be needed and then arrange for the resource to go to the Staging Area or a Support Base.

• Coordinating resource requirements within the internal structure of the emergency response organization can be an easy process if your organization understands and regularly operates within the requirements of the National Incident Management System (NIMS).
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 10: Implementing Response Objectives

Chief Concepts

- The Incident Commander (IC) is responsible for determining the best strategic goals and tactical objectives which will produce the most favorable outcome of the incident.

- The operational strategy for an incident is developed based upon the IC’s evaluation of the current conditions and a forecast of future conditions. The effectiveness of this phase of the incident is directly related to how well the hazards were identified and the risks evaluated. The IC’s hazmat strategic goals include rescue, public protective actions, spill control (confinement), leak control (containment), fire control, and transfer and recovery.

- Tactics are the specific objectives the IC uses to achieve strategic goals. Tactics are normally decided at the section or group/division levels in the command structure. Strategy and tactics can be implemented by the IC in the offensive, defensive, or nonintervention mode. Usually, the IC uses a combination of tactics to manage the problem.

- Saving lives is the IC’s number one mission! Life safety should always be the IC’s highest priority, but remember that in some cases doing nothing and letting the incident run its course is the smartest and safest strategy. As emergency responders we cannot save everyone, and time often works against the responders and the people you are trying to rescue. The IC must weigh the chance for a successful rescue against the hazards and risks.

- Product removal and recovery operations usually begin after the emergency has run its course (e.g., all leaks have been controlled). Product removal and recovery operations should not begin until after the incident site is stabilized and the area has been re-evaluated for hazards and risks. Stabilization means that all fires have been extinguished, ignition sources have been secured, and all product releases have been controlled.

- Product removal and transfer operations involve moving the contents from the damaged or overloaded cargo tank(s) into an undamaged and compatible receiving tank(s), such as a tank car, cargo tank truck, intermodal tank, or fixed tank.

- Product transfer and removal operations are typically performed by either product/container specialists or environmental contractors working on behalf of the carrier or shipper. Public safety responders will often continue to be responsible for site safety and will oversee the implementation of all product transfer and removal.
• Understanding our emergency response culture and history provides perspective. Stated a different way, understanding where we have been in the past helps you better understand where you need to go in the future. Doing it better and safer in the future is our goal!

• As a hazmat professional it is not good enough to simply know what the regulations and standards require; you should understand how and why these standards evolved. Many fire fighters and law enforcement officers gave their lives to help keep their communities safe from hazardous materials. Others have suffered debilitating injuries. Learn from their lessons!
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 11: Decontamination

Chief Concepts

- Decontamination is the process of making people, equipment, and the environment safe from hazardous materials contaminants. The more you know about how contamination occurs and spreads, the more effective decontamination will be.

- The basic concepts of decontamination are relatively simple. If contact with the contaminant can be controlled and minimized, the need for decontamination can be reduced.

- Decon needs to be an adaptive and flexible process that respects the hazards and the behavior of the contaminants, as well as human behavior under stress. The hazards and risks presented by the incident will define the scope, nature, and complexity of decon operations.

- Contamination is any form of hazardous material (solid, liquid, or gas) that physically remains on people, animals, or objects.

- Direct contamination occurs when a person comes in direct physical contact with a contaminant or when a person comes into contact with any object that has the contaminant on it (e.g., contaminated clothing or equipment).

- Cross-contamination occurs when a person who is already contaminated makes contact with a person or object not contaminated. Cross-contamination is typically the result of poor site management and control, inadequate decon and site safety procedures, or a failure to follow safety procedures.

- Exposure means that a person has been subjected to a toxic substance or harmful physical agent through any route of entry into the body (e.g., inhalation, ingestion, injection, or by direct contact [skin absorption]).

- The safety and health hazards of the contaminants at any incident will define how complex decon operations will be.

- The best field decontamination procedures emphasize the need to confine contaminants to a limited area. Establishing a designated decontamination corridor and decontamination area are the first steps in limiting the spread of contaminants.
There is no universal decon method that will work for every hazmat incident or release. Regardless of the number of decontamination steps required, decontamination is most effective when it is carried out by a trained Decontamination Team using multiple cleaning stations.

The pathway is from the Hot Zone into the decon area, with the exit point near the Warm Zone/Cold Zone interface. The decontamination corridor should be clearly marked.

Decon is a labor-intensive operation. When setting up the decon area, consideration must be given to the staffing of the decon operation and the safety of the Decon Team.

Multistep decon operations can be broken into two broad phases: gross decon and secondary decon. Gross decon is the initial rinse and secondary decon is the follow-up process that removes the contaminants to a safe and acceptable level.

Emergency decontamination is the physical process of immediately reducing contamination of individuals in potentially life-threatening situations with or without the formal establishment of a decontamination corridor.

Emergency decon can be innovative, but the most important concept is to clean the contaminated person as soon as possible. Remember the basics—FLUSH—STRIP—FLUSH. Soap and water is a near-universal solution and should be applied in large quantities. When acids or bases have contacted bare skin, the minimum amount of time for a water flush is at least 20 minutes.

Technical decon is a multistep process in which contaminated individuals are cleansed with the assistance of trained personnel.

Mass decontamination is established when large numbers of people (i.e., civilians or responders) need to be decontaminated at the scene of a hazmat emergency. The general goal is to provide the greatest good to the greatest number of people in the shortest amount of time.

A debriefing should be held for those involved in decontamination and clean-up as soon as practical. Responders and contractors involved in the operation should be provided with as much information as possible about any delayed health effects of the hazmats.
Hazardous Materials: Managing the Incident, Fourth Edition

Chapter 12: Terminating the Incident

Chief Concepts

- Termination is the final step in the Eight Step Process©. It is important that every hazmat incident be formally terminated following a formal procedure.

- Terminating the incident usually consists of five distinct activities:
  1. declaring that the incident is “Terminated” either by radio or in a face-to-face meeting,
  2. officially transferring responsibility of the incident scene to another agency or contractor,
  3. incident debriefing,
  4. postincident analysis, and
  5. critique.

- The incident debriefing is done at the incident scene, lasts less than 15 minutes, and focuses on safety and health exposure issues.

- When the decision has been made to terminate the emergency response phase and additional work is still required at the scene for restoration and recovery, the IC should meet with the senior representatives from the agencies or contractors taking over to formally hand off the incident scene.

- The post-incident analysis is conducted after the incident is over. It is a focused effort to gather information concerning what actually happened, why it happened, and who the responsible parties are. It also provides a record of resources and events, which may affect the public health, financial resources, and political well-being of a community.

- The critique is usually conducted within several weeks after the incident is terminated. It is designed to emphasize successful, as well as unsuccessful, operations and to improve the emergency response system. To be successful, management must support the critique process and action items must be tracked to ensure they are implemented.

- The critique process can reveal critical information about our weaknesses and vulnerabilities that can be exploited by criminals and terrorists. A strong critique program designed to improve the emergency response system reduces potential liability by helping to ensure that the organization is committed to constant improvement and meeting the highest standards in the industry.