

# Hazardous Materials and Terrorist Incident Prevention Curriculum Guidelines

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## Introduction

Since most hazardous materials accidents are caused by human activities, communities and employers can influence the probability of incidents and the magnitude of their effects by emphasizing prevention in hazardous materials emergency management. As defined here, prevention is a “proactive attitude, effort, and process for eliminating or reducing the effects of hazardous materials events in advance of occurrence.” In other words, prevention focuses on helping communities and citizens avoid becoming disaster victims in the first place, and reducing the impact of incidents when they occur.

Hazardous materials prevention includes efforts to eliminate or reduce risk due to either accidental releases of hazardous materials or exposure to toxic substances. Basic prevention strategies can be broadly summarized as follows:

- Improve methods and procedures for storing, transporting, handling, and processing hazardous materials.
- Promote compliance with safety codes, regulations, and statutes.
- Develop and enforce land use plans that regulate the location of sites with hazardous chemicals.
- Increase public and community awareness and support for prevention.

Well-designed prevention programs have been shown to reduce loss of life, property, and environmental damage from disasters. The Occupational Safety and Health Administration (OSHA) concludes that “a strong correlation (exists) between the application of sound management practices in the operation of safety and health programs and a low incidence of occupational injuries and illnesses. Where effective safety and health management is practiced, injury and illness rates are significantly less than rates at comparable worksites where safety and health management is weak or non-existent” (Safety and Health Program Management Guidelines; Issuance of Voluntary Guidelines).

As noted by the Federal Emergency Management Agency (FEMA), “experience has shown again and again that lives can be saved, damage to property can be reduced significantly, and economic recovery can be accelerated by consistently building safer and stronger buildings, strengthening existing infrastructures, enforcing building codes, and making the proper preparations BEFORE a disaster occurs. More important, mitigation investments by...businesses and citizens...will enhance and strengthen the economic structure, stability, and future of (the) community regardless of when a disaster may strike” (Project Impact Guidebook).

In recent years, both government and industry have made significant strides in hazardous materials prevention. However, more must be done to encourage a change from the traditional focus on disaster preparedness and response to a new emphasis on accident prevention. This shift in perspective by business leaders and emergency management professionals will require adjustments in corporate and community attitudes about prevention, improvements in safety management methods and technologies, better access to information and research, and a strengthened cooperation between government agencies and hazardous materials end users.

One of the most effective ways of promoting this transition is through prevention training and education programs. Training helps employees understand the nature and causes of potential

safety problems, apply safe work practices and procedures, and participate in the design of effective prevention programs. For this reason, federal and state agencies have consistently identified training as a critical component in all prevention activities.

This document identifies training requirements for public and private sector personnel who have a role in hazardous materials prevention. The information is organized into three sections:

- A narrative overview describing the nature of hazardous materials prevention, related programs, and training activities.
- A description of prevention training audience categories and training requirements presented in the form of detailed instructional objectives.
- Appendices that summarize prevention laws, regulations, programs, and other information helpful to training managers.

## The Philosophy of Prevention

Hazardous materials prevention is based on the concept that the majority of accidents don't just happen; they are caused. While the use of chemicals may involve risk, the factors that precipitate most accidents are at some point under an organization's or an individual's control. Therefore, most chemical accidents and the damage they cause are preventable by definition.

Hazardous materials prevention is not new. For many years, federal and state governments have issued regulations governing workplace safety, transportation safety, and environmental safety. Communities have assessed local hazards, managed land use, enforced safety codes, and conducted public education activities. Businesses have implemented safety programs to protect worker health and minimize the potential for accidental releases of and exposures to toxic substances.

The benefits to communities and employers of well-designed prevention programs have proven to be significant. These benefits include reductions in hazardous materials incidents and accidents; fewer deaths and injuries to workers and citizens; improvements in employee skills, productivity, and morale; lower insurance and operating costs; decreased damage and cleanup costs; elimination of regulatory penalties; and protection against litigation. As FEMA notes in its Strategic Plan (FY 1998-2007), "no other approach is as effective over the long term."

Although the concept of prevention is well established, the practice of making safety a primary focus of production and emergency management may be new to some organizations. Prevention requires identifying safety as a basic goal and priority of hazardous materials operations. The objective is accomplished through formal programs that incorporate a systematic analysis of potential hazards, a comprehensive effort to eliminate or minimize risk, and activities that foster a safety culture among workers and the public.

A key element of this new emphasis on prevention is the concept of a public/private sector partnership to promote hazardous materials safety. Increasingly, communities, businesses, and professional associations recognize the mutual benefits of cooperation and coordination in prevention program planning and development. For example, FEMA's concept of Disaster Resistant Communities aims to bring together private industry, insurance providers, mortgage lenders, the real estate industry, homebuilding associations, citizens, and others to create model communities in high-risk areas. Other federal initiatives strive to promote understanding and

cooperation between government and industry, and to simplify unnecessarily burdensome and confusing regulations.

Everyone who can affect hazardous materials prevention has a role in this partnership. The federal government establishes minimum safety standards, provides incentives and guidelines for compliance, conducts inspection and enforcement activities, and supplies assistance and resources, including training. State governments serve as a conduit for federal programs, and provide supplementary programs, regulations, and assistance. Local jurisdictions identify and assess hazards, develop prevention strategies and plans that address community needs, and implement programs to enforce safety standards and protect the public health.

Although government plays a key role in prevention, organizations that process, store, handle, and transport hazardous materials are in the best position to actually eliminate or mitigate against accidents. Employers in both the public and private sectors are ultimately responsible for the safety of chemical operations and for coordinating prevention activities within the community. They accomplish these goals through programs and activities that are appropriate to the hazards involved and in full compliance with legal requirements.

The general public also has a role in hazardous materials prevention. With adequate information, community groups, professional associations, and individual citizens can provide valuable support and resources to government prevention programs and initiatives. They also contribute to hazardous materials prevention by preparing individual and family preparedness plans that address household chemicals, and by maintaining safe homes and workplaces.

In addition to the concept of a public/private partnership, other aspects of this new philosophy on prevention include the following:

- A focus on safety must be evident during the complete life cycle of hazardous materials, from design and testing to production, storage, transportation, use, treatment, and disposal. This approach implies methods to systematically evaluate entire operations, as well as comprehensive programs that address all phases of production and transportation operations.
- Organizations that use hazardous materials should first attempt to eliminate the possibility of accidents or exposures by substituting inherently safer technologies or less hazardous substances in existing operations. If this approach is not feasible, other measures should be considered to reduce the probability or severity of accidents.
- Communities and employers should recognize that costs for prevention may not be extensive, and many measures will pay for themselves over time. Costs and benefits should be established early in the planning process, even though it may be difficult to estimate savings that accrue by avoiding accidents and exposures.
- Safety management techniques and technologies are continually evolving. When possible, communities and professional associations should promote activities that foster research, information sharing, technology transfer, and the development of a supportive regulatory and economic environment for organizational innovation.

## **Prevention Legal Authorities**

Hazardous materials safety efforts have expanded over the last two decades with the addition of numerous laws, regulations, and standards. These legal authorities address separate pieces of

the hazardous materials problem, and are administered by different agencies at all levels of government.

On the community level, planning for prevention is often considered a natural extension of state and local governments' responsibility for developing emergency operations plans. In effect, planning team members "piggyback" and expand on the hazards analysis conducted for response planning to prepare prevention strategies and plans. These materials are often incorporated as an annex to the community's emergency operations plan. A number of federal laws, regulations, and guidelines apply to this process. (For more information, see the Hazardous Materials Planning Curriculum Guidelines.)

- Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)
- OSHA Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
- Resource Conservation and Recovery Act (RCRA)
- FEMA Emergency Operations Plan Requirements (44 CFR Part 302)
- Guide for All-Hazard Emergency Operations Planning (FEMA SLG 101)
- Hazardous Materials Emergency Planning Guide (NRT-1)
- Technical Guidance for Hazards Analysis (EPA/FEMA/DOT)
- Handbook of Chemical Hazard Analysis Procedures (FEMA/DOT/EPA)

Public and private sector facilities that store, handle, or transport certain types and quantities of hazardous materials are also subject to federal contingency planning regulations. Although different requirements may apply to different facilities and operations, the National Response Team's Integrated Contingency Plan (ICP) Guidance provides a format for complying with the various planning regulations in one functional emergency response plan. Annex 7 of the ICP addresses prevention-based requirements that are specified in the regulations or that may impact response activities. (For more information, see the Hazardous Materials Planning Curriculum Guidelines.)

Federal statutes, regulations, and national codes that specifically address hazardous materials prevention safety are listed below and described further in Appendix A:

- Hazardous Materials Transportation Act
- Hazardous Materials Transportation Uniform Safety Act
- Hazardous Materials Regulations (49 CFR Parts 171-180)
- The Occupational Safety and Health Act of 1970
- OSHA Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119)
- OSHA Hazard Communication Standard (29 CFR 1910.1200/1926.59)
- OSHA Safety and Health Program Management Guidelines (Federal Register 54(18):3908-3916, January 26, 1989)
- The Clean Air Act Amendments of 1990 (Public Law 101-549)
- EPA Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act, Section 112(r)(7) (40 CFR Part 68)

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In addition to these authorities, the Occupational Safety and Health Act of 1970 encourages states to develop and operate their own job safety and health plans. States with plans approved under section 18(b) of the law must adopt standards and enforce requirements that are at least as effective as federal requirements. Many local jurisdictions also adopt specific policies, regulations, and codes that affect hazardous materials prevention requirements. As a result, agencies and facilities with a role in hazardous materials prevention are encouraged to thoroughly research state and local authorities during program analysis and planning.

Finally, jurisdictions adopt and enforce standards and codes that define safe practices and procedures in the use of hazardous materials. These codes may govern design and construction of buildings, fire prevention, land use planning (zoning and occupancy), employee safety, accident prevention, public health, environmental quality, and related areas. Several important national codes developed by cognizant professional associations are described in Appendix A.

## Prevention Programs

The key to prevention programs is improving the safety of methods used to store, transport, handle, and process hazardous materials. This is true whether the requirement exists in business and industrial operations or in government-managed facilities (water treatment plants, sewer systems, utilities, etc.). Broad strategies and methods for accomplishing this goal include:

- Use of less hazardous alternatives. Examples of this approach include the use of inherently safer technologies, substitution of non-toxic or less toxic materials, reassessment of plant layout to isolate hazardous substances, and reduction of chemical stockpiles through efficient management of inventory.
- Engineering controls. Examples of engineering controls commonly used in hazardous materials operations include ventilation systems, containment systems, detection and monitoring systems, robotic controls, physical barriers, isolation controls, electrical protection, sprinklers, and pollution control technologies.
- Safety information. Accurate safety information must be accessible to all end users, including secondary processors, distributors, transporters, contractors, and workers. Tactics used to accomplish this objective include employee training, labeling and placarding, and process safety information management systems. Establishing an effective labor-management dialogue on safety is also important.
- Standard operating guidelines (SOGs). These guidelines distill the analysis conducted during the hazard assessment, systems design, and safety planning phases into job-specific procedures and worker performance standards and expectations. Development and enforcement of SOGs define and implement safe working practices for each hazardous materials application.
- Administrative actions. Personnel management systems and procedures often have great potential for enhancing prevention, often at little cost. Examples include reducing employee shift length, cross-training, or rotating employees to keep them alert; improving security and access control systems; modifying maintenance and housekeeping schedules and procedures; identifying safety as a factor in organizational goals and objectives, worker performance reviews, and management incentives; and integrating planning with the community and local health care facilities.

- Personal protective equipment. When exposure is less controllable, adequate personal protective equipment (PPE) and related training must be made available. Examples of PPE include chemical resistant gloves, aprons, face shields, respiratory protection, etc.

Although prevention is first and foremost a responsibility of hazardous materials users, government oversight agencies, insurance companies, professional associations, community groups, and others can do much to promote safety. Examples of activities used to motivate and support facilities and transporters in prevention include:

- Legislation, regulations, and standards that clarify prevention requirements and programmatic guidelines
- Community right-to-know policies and information management systems
- Land use planning and zoning (set back, density, relocation, land acquisition, etc.)
- Plans review and permitting programs for building and operational systems designs
- Inspections and enforcement of hazardous materials and other safety codes
- Environmental and hazard monitoring systems
- Public education and information activities
- Disaster insurance (premium reductions, criteria for coverage, etc.)
- Tax incentives/disincentives and financial resources
- Methods to foster improved public/private sector coordination and cooperation
- Research and information dissemination

Obviously, the concept of prevention covers a broad spectrum of strategies and tactics conducted by many different types of organizations. The nature of prevention programs is equally diverse, depending on such factors as the mission of the organization, the types and quantities of chemicals involved, financial and personnel resources, legal requirements, etc. However, all prevention programs should be based on a thorough hazard assessment, and include a comprehensive and systematic program planning process appropriate to the organization's needs.

Exhibit 1, Prevention Program Model, identifies common functional elements of prevention programs. These elements are derived from a review of federal regulations and guidelines (see Appendix A), with emphasis on OSHA's Process Safety Management Standard. Although each organization will tailor this program model to its own needs, the exhibit demonstrates the potential scope of prevention activities. The model is also useful as a conceptual framework for program planning and for identifying training audiences and instructional requirements.

## Rationale for Prevention Training and Education

Of all prevention strategies, training and education programs may be the most effective. Well-designed training programs significantly reduce the number and severity of incidents arising from process operations, and assist in preventing small problems from leading to a catastrophic release. The Department of Transportation notes simply that "training is the best means of preventing hazardous materials accidents" (Training For the Safe Transportation of Hazardous Materials, RSPA, 1997).

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Appendix A: Haz Mat Prevention Authorities and Statutory Mandates
Appendix B: Haz Mat Prevention Training Requirements
Appendix C: Organizational Structure for Prevention
Appendix D: OSHA Standard 1910.119

Why is training so effective? Studies have identified some of the barriers to effective prevention programs, as follows:

- Inadequate information about chemical hazards and the causes of accidents, safer technologies, and the costs associated with those technologies.
- A lack of managerial awareness and expertise about preventive measures and regulatory requirements.
- Organizational obstacles based on corporate attitudes.
- Limited communications among public officials, employers, and workers.
- Inadequate employee and citizen knowledge about safety and prevention.

Training and education programs targeted to the various groups who can potentially contribute to prevention are an effective method for addressing these problems. Training programs increase employee awareness of hazards and help workers understand the nature and causes of potential problems. They provide opportunities for individuals to learn and practice safety systems and procedures in a risk-free environment. And they contribute to the development of a safety culture within the organization that motivates worker participation in hazard identification, program planning, safety audits, incident reviews, and other prevention activities.

Training is also critical for public officials, executives, managers, and others not directly involved in hazardous materials operations. Promoting change within organizations is most effective when the process starts at the top. Shifting the traditional focus from productivity and emergency preparedness to prevention requires changing the mindset of decision-makers in government, business, and industry. The same is true for design professionals and technical experts—architects, engineers, consultants, etc.—that plan operational systems and contribute to policy development.

Recognizing the importance and benefits of prevention training, OSHA, DOT, EPA, and other federal agencies have identified training requirements and guidelines for hazardous materials employers. General requirements are summarized in Appendix B; training managers may need to research more specific mandates for different industrial sectors and employer types.

## Prevention Training Challenges

Although hazardous materials prevention training is mandated by law, and the potential benefits are well established, too few organizations place an adequate emphasis on this safety strategy. Several reasons exist for this state of affairs:

- The benefits of prevention are often poorly understood and difficult to quantify. As a result, some organizations place a low priority on prevention initiatives, including training. This is especially true in smaller commercial operations, where safety information is limited and resources are tight.
- Traditionally, employee training has focused on improving productivity, with prevention viewed as an adjunct to workers' primary job responsibilities. Thus, prevention training is not usually identified as a separate requirement or curriculum area, with the attention and resources it deserves.

- Workplace safety is not identified as a separate competency in many professional schools of business management, architecture, engineering, public administration, etc. Opportunities to deliver prevention training to these key audiences may be limited.
- An emphasis on hazardous materials safety as a primary objective of training is relatively new. Few course materials exist, and instructional guidelines for training managers, course developers, and instructors may be lacking or inadequate.
- Prevention covers a very broad range of possible subject areas and audiences. The resulting scope of training program requirements can be overwhelming for some communities and facilities.
- Prevention training is often highly technical and complex. Opportunities should be provided for students to practice key skills in a realistic but safe environment. As a result, training delivery often benefits by the use of specialized facilities and equipment that are beyond the resources of some organizations.
- Recruitment for training activities can be difficult because organizations and audience members may place a low priority on prevention, or view prevention as an ancillary duty to primary work responsibilities.

How individual training managers deal with these challenges will depend on the organizational situation they face—management priorities, training requirements, safety concerns, resources, etc. However, three general principles can be stated: (1) educational activities designed to heighten the awareness of decision-makers about the organizational benefits of prevention should be considered early in program planning; (2) a comprehensive prevention training needs assessment should be prepared to identify priorities, appropriate training methodologies, and techniques for demonstrating competence; and (3) whenever possible, employee participation should be encouraged in the training development process.

## PREVENTION PROGRAM MODEL

### Exhibit 1

- 1.0 Prevention Program Analysis and Planning**
  - 1.1 Review of Authorities and Statutory Mandates
  - 1.2 Hazards Analysis
  - 1.3 Program Planning
  - 1.4 Program Implementation, Evaluation, and Maintenance
  - 1.5 Interagency Coordination and Cooperation
- 2.0 Employee Participation, Education, and Training**
  - 2.1 Employee Participation
  - 2.2 Employee Education and Training

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**3.0 Process Design, Plans Review, and Construction**

- 3.1 Facility and Systems/Process Design and Construction
- 3.2 Transportation and Storage Design and Construction
- 3.3 Plans Review and Permitting

**4.0 Safety Systems**

- 4.1 Pre-Startup Safety Reviews
- 4.2 Maintenance/Mechanical Integrity
- 4.3 Management of Change

**5.0 Process Operations**

- 5.1 Systems/Process Safety Information
- 5.2 Operating Guidelines and Practices
- 5.3 Contractor Safety

**6.0 Compliance**

- 6.1 Safety Inspections, Investigations, and Enforcement
- 6.2 Compliance and Safety Audits
- 6.3 Recordkeeping and Reporting

**7.0 Public Information and Education**

- 7.1 Public Awareness/Prevention Communication
- 7.2 Family and Individual Preparedness