PROTECTING HAZ

A Multi-phase Process

It takes more than just gloves and boots to protect workers dealing with hazardous materials. A company must consider regs and contingency planning in its protection scheme.

by Patti Ziegler

Protecting personnel during hazardous substance releases is a process requiring several integrated elements. Managers must ensure the proper training has occurred and the appropriate personal protective equipment is available. They also must have a thorough understanding of applicable regulations, a well-defined contingency planning program, a ready inventory of air monitoring equipment and provisions for outside assistance.

Several regulations apply to an organization that could be responsible for an oil or hazardous substance spill. These have been issued by several regulatory agencies, primarily the U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). The Spill Prevention, Control and Countermeasures (SPCC) program established by EPA in 40 CFR 112.7(e)(10) regulates those who use or handle oil above certain quantities. Its focus is oil spill prevention.

For treatment, storage and disposal facilities and both large and small quantity generators under the jurisdiction of the Resource Conservation and Recovery Act (RCRA), several rules detail emergency planning and training requirements. Title II of the Superfund Amendments and Reauthorization Act of 1986 (SARA) established requirements that apply to nearly all industries mainly for emergency incident and chemical use notification. The goal of its provisions, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), is to enable states and communities to improve chemical safety and better protect public health and the environment.

Standards set forth by OSHA are the most relevant to protecting hazmat personnel. OSHA's Hazard Communication Standard (HazCom), 29 CFR 1910.1200, applies to all organizations that use, manufacture or process any type of chemical. The HazCom standard requires preparation of material safety data sheets (MSDS), as well as training on chemical handling and related topics.

OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, 29 CFR 1910.120, is considered the major law regarding personnel protection. It applies to workers responding to hazardous substance emergencies and those employed in cleanup operations at uncontrolled hazardous waste sites and at EPA-licensed treatment, storage and disposal facilities. It provides for employee protection and training applicable to these incidents and sites.

Paragraph (q), Emergency Response to Hazardous Substance Releases, is the main provision that applies to facilities or organizations whose internal personnel are to perform emergency responses. These personnel must receive specified training appropriate for the role they are to perform during the response.

Facility owners who plan to evacuate their facilities during an emergency and who do not plan to have their employees respond to the incident, but instead plan to call in a response contractor, can forego the above requirements.

When trying to understand which rules apply to incident response and cleanup, an important distinction is that between an incidental release, an emergency response and a post-emergency response (Table 1). In addition to HazCom and HAZWOPER standards, all other OSHA standards for general industry (29 CFR 1010) and construction (29 CFR 1926) apply to spill responders and hazardous waste workers.

Contingency planning

Any organization with a potential for an emergency release should evaluate and enhance its preparedness for such an incident. This review also will allow for institutions of controls to eliminate release potential. A step-by-step procedure is suggested.

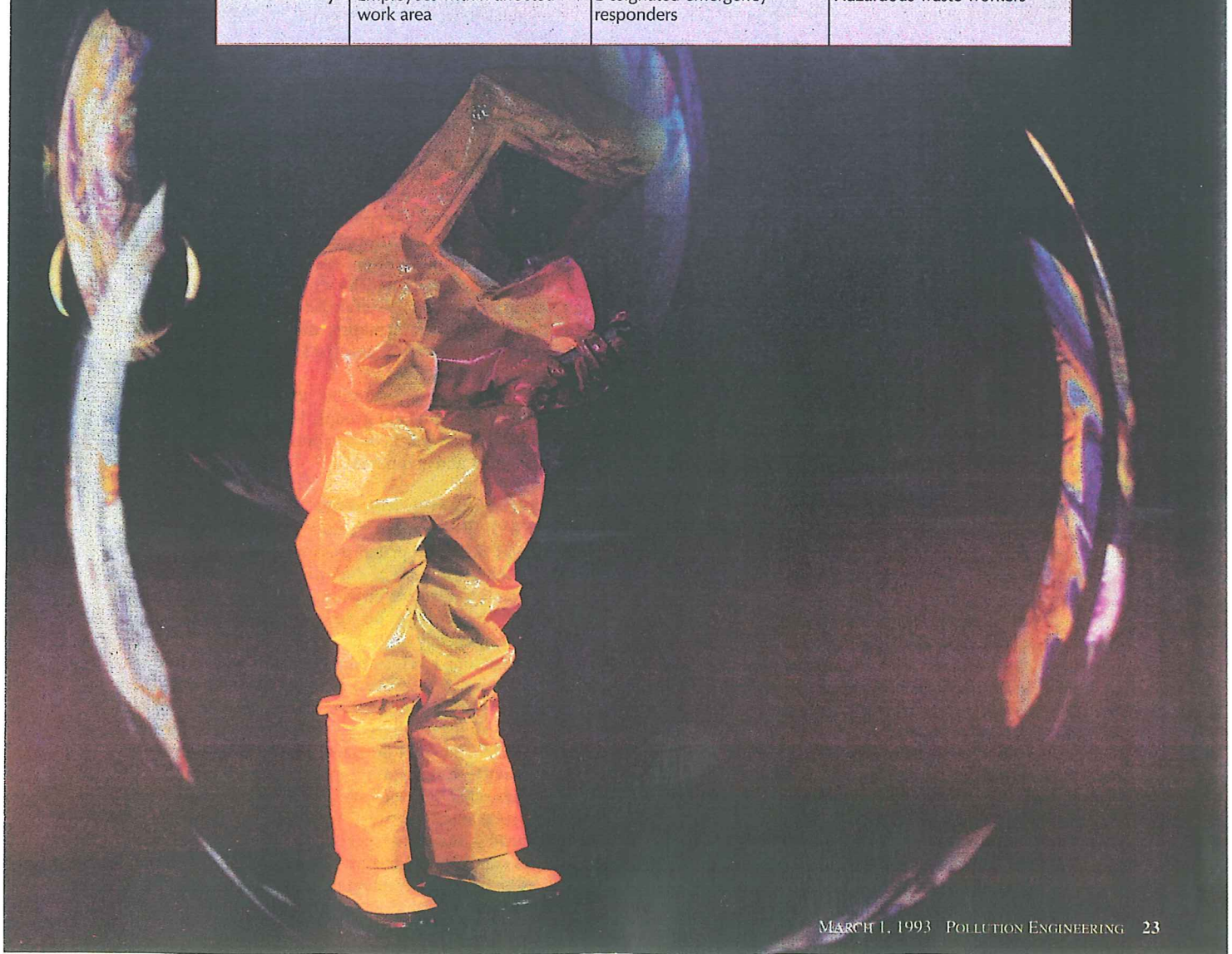
Evaluate spill potential, considering the following:

- Volumes, types and forms of products on hand, including those stored, used and produced.
- Methods of product transport in and out.
- Transfer points.
- Volume of product in/out per unit of time (day/week).
- Volume of process and waste material storage/piping.
- Containment in place.
- Uncontained areas.
- Location of sewers and other drains, ditches, etc.
- Proximity of nearby streams or other waterways or bodies of water.
- Number and location of groundwater wells in the vicinity.
- Past spills at the facility and spill history of similar facilities or operations.
- Proximity of sensitive, off-property populations.
- Materials handling methods.
- Information from workers regarding "near misses" and potential problems they have observed.
- All potential spill sources, including chemical storage areas, laboratories, process areas, waste storage areas, underground tanks, PCB transformers and capacitors, old

MAT PERSONNEL

Table 1
Release and Response Requirements

	Incidental Release 29 CFR 1910.1200	Emergency Response 29 CFR 1910.120 (q)	Post-Emergency Response 29 CFR 1910.120 (b-o)
Definition	Small spill that can be cleaned up by workers or maintenance personnel within the work area in which spill occurs; releases in which there is no potential safety or health hazard from fire, explosion, or chemical exposure	Response to spill from outside the work area or by designated response personnel (refer to definition in 29 CFR 1910.120 (a)(3)). Also includes cleanup phase, if performed by owner's own employees	Cleanup phase following the emergency response (after immediate threat has been stabilized or eliminated), including cleanup of soil and water, and decontamination of a site, performed by a group of people that are not the owner's employees
Plans needed	Hazard communication plan	Emergency response plan	Work plan, site safety plan
Activities	Containment, confinement, and control	Containment, confinement, and control	Cleanup and decontamination
Performed by	Employees within affected work area	Designated emergency responders	Hazardous waste workers



Conduct spill drills to familiarize all personnel with proper procedures.

• A hazmat worker collects samples wearing Level B personal protection.

heat transfer equipment and hydraulic equipment.

Reduce spill potential by doing the following:

- Redesigning materials handling and storage systems.
- Providing for secondary or tertiary containment.
- Limiting chemicals present to only those absolutely necessary.
- Educating employees about proper handling of hazardous materials.

Formulate emergency scenarios, for example:

- Storage tank rupture.
- Drum puncture.
- Tanker vehicle accident.
- Overflow of a transfer system.
- Leak into the ground.
- Violent process upset.

The key is to understand potential involvement in releases of hazardous materials. Pick several particular locations where these situations could occur and carefully assess where the spilled material would migrate. Once the emergency scenarios are defined, it is helpful to conduct both tabletop and actual spill drills to familiarize all personnel with proper procedures.

In addition, if employees of the facility are to respond, they must be trained in assessing the chemical and physical properties of chemicals released; appropriate equipment such as respirators, protective clothing and monitoring devices required; and appropriate spill containment, confinement and control methods.

Train personnel as required by HAZWOPER, and prepare an emergency response plan to provide guidance in the initial phases of a response. The plan should comply with 29 CFR 1910.120(q) by addressing preplanning, roles of personnel, safe distance, site security and control, medical surveillance, critique, personal protective equipment, emergency equipment and decontamination.

In addition, the following elements should be included in a comprehensive plan:

- Response priorities to address and prioritize protection of personnel, the public and the environment.
- Notification procedure to list specific procedures required by EPCRA along with the criteria mandating notification. Also address procedures for internal notification and provide names and phone numbers in all cases.
- Spill equipment location/inventory.
- Drainage plan to indicate potential direction of migration, general topography and location of sewer drainage, manholes, sumps and facility drain tie-ins to off-site drains.
- MSDSs to provide information on monitoring instruments, protective clothing, respirators, decontamination and neutralization.
- Outside assistance information about pre-negotiated agreements with mutual aid groups, local contractors and cleanup contractors and how to contact those parties to obtain personnel and equipment.

Specific training requirements

The HAZWOPER standard defines five distinct personnel roles and the appropriate training program for each (Table 2). First responders at the awareness level are those personnel likely to discover or witness an emergency. Their most crucial function is to properly notify others in order to begin the emergency response process.

At the operations level, an employee will be involved in the initial response to protect people, property and the environment. They are to respond defensively, instead of trying to actively stop the release at the source. A hazard materials technician will be trained to stop or prevent a release in an offensive response mode.

Those personnel with a more specific knowledge of the hazardous substances involved in the release can be designated hazardous materials specialists. As such, they will provide assistance to the hazardous materials technicians. Finally, as an on-scene incident commander, an employee

will be trained to assume control of the incident scene beyond the first responder awareness level.

Personal protective equipment

When an incident occurs, OSHA requires that a formal hazard assessment be conducted. Hazard assessment involves considering all potential chemical, physical and environmental hazards; determining how to best protect employees from those hazards; and implementing appropriate hazard control measures. The assessment must be communicated to all employees and subcontractors; for short-term response it can be verbal, but must be written for long-term response. Note that hazard assessment is a continuous process, since hazards may change as the spill progresses.

The choice of personal protective equipment (PPE) is dependent on the findings of the hazard assessment. PPE can be categorized into three main types: chemical protective clothing (CPC), traditional personal safety devices and respiratory protection.

Three basic considerations are important when selecting various items of CPC to be assembled into a protective ensemble:

- No single material offers protection from all chemicals. Compatibility or permeation charts are available for use by experienced personnel to choose appropriate CPC depending on the variables of toxicity, concentration and task to be undertaken.
- CPC may be bridged or affected by chemical agents in four ways: permeation or chemical movement of an agent through a material on the molecular level; degradation, the loss of or change in chemical resistance or physical properties through a breakdown of the material; penetration, movement of contaminants through openings in the garment such as seams or zippers; and flaws, or manufacturers' imperfections such as unbound seams or uneven coatings.
- CPC is not designed to be flame-resistant. Responders exposed to potential fire situations need to be properly trained and otherwise protected from those special hazards.

Additionally, individual performance requirements need to be evaluated for each construction material, manufacturing technique and garment design. These include toxicity, concentration, exposure route(s), contact potential/task, durability, flexibility, temperature resistance, service life, ease of decontamination, design/size, color, cost and compatibility with other equipment.

EPA has divided the ensemble components into four levels based primarily on respirator protection and secondarily on skin protection (Table 3).

Emergency response to chemical spills will require the use of other traditional forms of personal safety gear as well. Safety glasses, faceshields, goggles, hard hats and steel-toed shoes/boots should be standard equipment available for all such incidents.

The most common route of exposure to chemicals is through inhalation. Therefore, respiratory protection is required in situations where workers may be exposed to environments that contain hazardous concentrations of airborne contaminants and/or oxygen-deficient atmospheres where engineering controls are not technically feasible, while such controls are being installed or repaired, or when other temporary situations arise.

Respiratory protection can be divided into three classes: air-purifying respirators (APR), atmosphere or air-supplied respirators (ASR), and combination air-purifying and air-supplying devices.

APRs fit tightly to the face and remove contaminants from the air by use of filter cartridges. They can be half-face, full-face or full-face powered air-purifying respirators. ASRs can be either: self-contained breathing apparatus (SCBA) or egress/air line units. Combination devices provide protection in the event the air supply fails and are most popular in the asbestos abatement industry.

While PPE protects workers from chemical challenges, the situation necessitating its use presents hostile work conditions that can include heavy physical labor, extended work periods and chaotic conditions. PPE, when used under these conditions, can present additional hazards to responders, including heat and cold disorders, slip/trip/fall potential and visibility and maneuverability restrictions. New CPC materials being used and new garments being developed can help reduce some of these hazards.

Air monitoring equipment

The HAZWOPER standard requires that air monitoring be conducted during both emergency and post-emergency response activities. An air monitoring program can

Table 2.
HAZWOPER Training Requirements

Training Level	Expected Role	Training Time	Content
First Responder Awareness (q)(6)(i)	Witness release/ make notification	Not specified – competency	Recognition, notification
First Responder Operations (q)(6)(ii)	Respond defensively	8 hours	Above plus risk, assessment, control, decontamination
Hazardous Materials Technician (q)(6)(iii)	Respond to stop release	24 hours	Above plus containment, incident command system, PPE, selection chemical/toxicological terminology and behavior
Hazardous Materials Specialist (q)(6)(iv)	Respond to stop release	24 hours	Above plus emergency response plan, selection of PPE, selection of containment, radiological, air monitoring
Incident Commander (q)(6)(v)	Assume control of incident scene	24 hours	First Responder Operations plus ICS implementation, ER plan implementation, hazard/risks in PPE, local and state ER plans, decontamination requirements

HAZWOPER requires air monitoring during both emergency and post-emergency response.

Table 3
Protection and Recommended Equipment

US EPA Level	Recommended Equipment	Optional Equipment
A Highest level of protection for skin, eyes and respiratory system.	• Pressure-demand, full-facepiece SCBA or pressure-demand supplied air respirator with escape SCBA • Fully-encapsulating, chemical-resistant suit • Inner chemical-resistant gloves • Chemical-resistant safety boots/shoes • Two-way radio communications	• Cooling unit • Coveralls • Long cotton underwear • Hard hat • Disposal gloves and boot covers
B Highest level of respiratory protection, less skin protection as atmospheric contaminants on direct contact will not adversely affect any exposed skin.	• Pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA • Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit) • Inner and outer chemical-resistant gloves • Chemical-resistant safety boots/shoes • Hard hat •Two-way radio communications	• Coveralls • Disposable boot covers • Face shield • Long cotton underwear
C Same skin protection as level B but less respiratory protection as air contaminants have been identified and measured and a respirator cartridge to remove contaminant is available.	• Full facepiece, air purifying, canister-equipped respirator • Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit) • Chemical-resistant safety boots/shoes • Hard hat •Two-way radio communications	• Coveralls • Disposable boot covers • Face shield • Escape mask • Long cotton underwear
D Some form of skin protection and no respiratory protection	• Coveralls • Safety boots/shoes • Safety glasses or chemical splash goggles • Hard hat	• Gloves • Escape mask • Face shield

provide some key information useful in the hazard assessment. This information can aid in determining response priorities, directing recovery and remediation efforts, and preventing potential threats to the safety and health of the responders.

Common, direct-reading air monitoring instruments used in spill response can include combustible gas/oxygen meters (LEL/O_2), photoionization detectors, colorimetric indicator tubes and electrochemical gas detectors. Personnel performing air monitoring need to be well trained in the purpose of each instrument and in using the specific model available during an incident.

Conclusion

Being prepared for an environmental emergency requires a great deal of knowledge and effort. But with a clear understanding of applicable regulations, an increase in contingency planning, appropriate training and equipment, and the choice of a qualified contractor, an incident can be handled in a manner that will sufficiently protect personnel, the public and the environment.

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