Hazardous Materials: Developing Transportation Safety Programs on a Limited Budget

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ABSTRACT

The importance of moving hazardous materials safely requires that practical, low-cost ways be found to minimize the expense of transportation safety programs for such materials. Ideas are provided on how state and local officials can perform risk assessments, develop emergency response capabilities, establish vehicle inspection programs, and provide hazardous materials training programs economically. Emphasis is given to such practical solutions as maximizing the use of available federal, state, and local resources; consolidating hazardous materials transportation activities with other state and local programs; expanding the use of mutual aid arrangements; and encouraging greater local industry involvement in hazardous materials transportation safety programs. Examples are provided of how different state and local agencies can share the costs of providing labor, equipment, and materials. Ways in which private industry has supported state and local hazardous materials transportation safety programs are also illustrated. State and local officials concerned with hazardous materials movements and their jurisdictions are encouraged to translate the cost-cutting measures and management practices identified here into practical solutions for their problems.

The responsibility for and cost of providing hazardous materials transportation safety programs have always been shared by a partnership of federal, state, and local government and industry. Historically, the federal government has provided the bulk of the resources for incident prevention, whereas local government and private industry have taken the lead in emergency preparedness activities and actual response to spills. State agencies provide some hazardous materials inspection and enforcement resources, targeted primarily at hazardous materials tank truck carriers. States also play a major role in coordinating the emergency response resources provided by others and (most recently) in providing for the cleanup of spills when federal and industry resources are not available.

Rapidly rising personnel and equipment costs, however, now jeopardize the combined ability of the public and private sectors to provide these important services. Public pressure to reduce the size of existing program budgets also threatens the existence of numerous federal, state, and local hazardous materials transportation safety efforts. No level of government or type of hazardous materials transportation safety program is immune from the effects of the shrinking dollar. These same economic pressures are preventing the establishment of new or expanded safety programs to address the growing concern with hazardous materials transportation.

The importance of moving hazardous materials (including waste) safely requires that practical, low-cost ways be found to offset rising costs. Considerable savings can result from:

1. Maximizing the use of all available federal, state, and local agency resources;
2. Consolidating hazardous materials transportation activities with other state and local programs;
3. Expanding the use of mutual aid arrangements;
4. Maximizing the use of part-time or volunteer staff; and
5. Encouraging greater local industry involvement in hazardous materials incident prevention and emergency response activities.

Performing a Hazards Assessment and Risk Analysis on a Limited Budget

A hazards assessment and risk analysis is intended to provide an awareness of the problems that may arise during the transportation of hazardous materials. The preparation of a risk analysis requires (a) obtaining information on hazardous materials movement, population density, and environmentally sensitive areas; (b) mapping the data collected; (c) determining the types of hazards present; (d) identifying vulnerable areas; and (e) calculating the risks.

Typically, few data are available to indicate the amount of hazardous materials movement into, through, or from a region. Exhaustive surveys of transporters and of industries known to use hazardous materials are extremely expensive and time consuming. Few states or municipalities have conducted such extensive surveys. Where data are available, they usually relate to special materials moved frequently in small quantities (e.g., radioactive shipments) or movements of hazardous materials by select modes (e.g., rail).

Although there is often the temptation to try to prepare for every kind of hazardous materials emergency, valuable resources should not be committed until a hazards assessment has been performed and the problem is really understood. Moreover, risk analyses do not need to be extremely detailed and costly to be useful. Collecting precise information on every chemical and every movement in a region can easily exhaust a budget. Complicated risk analyses that rely on complex mathematical models and result
in estimates of probabilities are expensive to perform because they require detailed data and (sometimes) the services of safety experts. A rough analysis or assessment can be as valuable in determining what to expect and where to look for potential problems with hazardous materials. In preparing such an assessment, local officials should

1. Focus on the general classes of materials (e.g., flammable liquids, corrosives, radioactive materials) being transported and not become overly concerned with specific chemicals unless large quantities are stored, shipped, or generated in the region;

2. Identify the major transport corridors and not become overly concerned with identifying the specific routes used by different modes, particularly movements by truck (local authorities may be able to supply this information);

3. Describe the risks in subjective terms (e.g., low, moderate, high) and not become overly concerned with estimating precise probabilities based on a complex mix of different factors; and

4. Use all of the information available from federal, state, and local agencies (Table 1 summarizes the type of information that can be provided by different agencies and organizations).

Adhering to these general guidelines will keep the costs of performing a hazards assessment low.

Costs can also be minimized by integrating a hazardous materials inventory effort with other ongoing data-collection or inspection programs. Although existing information is likely to provide all that is needed to identify the movements of hazardous materials by rail, air, water, and pipeline, additional information may be necessary on hazardous materials truck movements. A limited survey of the users and transporters of hazardous substances may need to be conducted.

To conduct this survey as inexpensively as possible, existing administrative structures and personnel should be used whenever possible. Local fire department personnel, for example, routinely inspect businesses and industries for compliance with state and local safety codes. Given the proper authority, the inspection of select industries could include the collection of transportation-related hazardous materials data, perhaps as part of an existing permit process. It may be possible to obtain detailed information if a nondisclosure agreement is established, which simply states that none of the detailed information collected will be released on a firm-by-firm basis. These agreements permit the use of the data collected in statistical summaries only. Officials should be aware, however, that some state or local statutes prevent the consolidation of certain program activities. Collective bargaining agreements may also prove to be a stumbling block.

If existing staff are unavailable to determine hazardous materials truck movements, the use of part-time or volunteer staff to conduct limited surveys should be explored. Volunteers can easily count the number of trucks traveling a particular roadway that display different hazardous materials placards. If volunteers cannot be found, local employment agencies or skill bureaus can provide relatively inexpensive labor who, with a minimum of training, can also perform truck counts.

Local industry may also be willing to provide funding and support. Private industry is well aware of the importance of a good hazards assessment. Many companies will offer to support efforts of this kind because they do not want

1. Scarce public monies wasted,
2. Taxes increased,
3. The public unnecessarily alarmed, or
4. State or local prenotification regulations enacted.

In addition, industry involvement in such programs enhances their public image. In Santa Clara, California, for example, local businesses pay a fee to support a special chemical division in the Santa Clara Fire Department. This chemical division in turn is responsible for implementing the Chemical Hazards Assistance Program, which includes conducting a chemical survey of every business in the city. Instead of contributing directly to a public agency, local industry could alternatively form an independent, nonprofit corporation to perform the hazards assessment. This approach has the advantage of overcoming the mistrust that the public may have of the industry.

MOBILIZING EMERGENCY RESPONSE RESOURCES WITH LIMITED FUNDS

First responders at the scene of a hazardous materials transportation spill require significant train-

<table>
<thead>
<tr>
<th>TABLE 1 Hazards Information Commonly Available from Government Agencies and Industry</th>
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<tr>
<td><strong>Source</strong></td>
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<tr>
<td>Materials Transportation Bureau, U.S. Department of Transportation</td>
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<tr>
<td>National Transportation Safety Board of Accident Investigation</td>
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<tr>
<td>U.S. Army Corps of Engineers</td>
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<tr>
<td>Civil Security Division, Federal Aviation Administration; also U.S. Air Transport Association</td>
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<tr>
<td>U.S. Environmental Protection Agency</td>
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<tr>
<td>Nuclear Regulatory Commission</td>
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<td>U.S. Geological Survey Distribution Branch; also U.S. Defense Mapping Agency</td>
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<tr>
<td>Bureau of the Census, U.S. Department of Commerce</td>
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<td>State agencies responsible for overseeing public utilities</td>
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<td>State environmental protection agency</td>
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<td>State office of planning</td>
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<td>State department of transportation (highway)</td>
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<td>State motor vehicle department</td>
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<tr>
<td>State department of environmental protection or ecology, public health department, department of agriculture, pesticide board, fish and game department</td>
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<tr>
<td>Local industry directories</td>
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Hazardous materials (disaster) emergency response plan Type and location of major storage sites of hazardous materials and waste
ing, need specialized equipment and materials, and must exercise more coordination than typically required in other emergency situations. Although large urban areas with full-time fire departments may have special teams and elaborate emergency response and communication vehicles, small volunteer fire departments often cannot afford such luxuries. Similarly, some departments may have ample supplies of a variety of chemical suppressants, whereas others have few or none.

It is not feasible or practical for every local fire, police, and emergency service organization to be fully equipped and staffed to respond to every conceivable hazardous materials emergency. In addition, it is difficult to justify spending large sums of money for special equipment and materials that are used infrequently. Nevertheless, a high level of emergency preparedness is desirable so that the potential destruction and injury from a spill can be minimized. There are a number of ways to supplement existing resources and maintain an adequate level of emergency response preparedness without spending large sums of money.

Federal, state, and local governments, as well as private industry, already have many programs in operation for responding to hazardous materials incidents. These programs may be able to fill the gaps in a community's emergency response effort. Knowing the capabilities of other agencies and industry also prevents wasteful duplication of effort. Table 2 summarizes the type of emergency response assistance commonly available from different agencies and organizations.

Local agencies are able to provide most of the equipment and materials necessary to respond to small spills of the most common hazardous materials. If a specific piece of equipment or material is not available in house, however, it can usually be obtained from other nearby sources. Having identified these sources, local officials should strive to set up a mutual aid arrangement to ensure that the necessary resources are in fact made available at the scene of a spill. A mutual aid program is an agreement among industries or government agencies or among both to share specific equipment, materials, or personnel in the event of a spill. Mutual aid programs have long been used to stretch emergency response resources and they take many different forms. The following are characteristics of mutual aid programs:

1. They can be among public agencies or private companies or among both.

Example: The Berkshire County (Massachusetts) Mutual Aid System is an informal mutual aid agreement between 28 police departments and 14 fire departments. As the result of this agreement, a communications center has been established to coordinate the notification of, and response to, emergencies in Berkshire County (population approximately 150,000).

2. They can be established to serve any size geographic area.

Example: The Northern Ohio River Industrial Mutual Assistance Conference (NORIMAC) consists of industries and utilities located along the Ohio River between Moundsville, West Virginia, and New Martinsville, West Virginia.

3. They can be concerned only with a certain kind of spill (e.g., oil) involving a specific transport mode (e.g., barge).

Example: The Channel Industries Mutual Aid (CIMA) organization was formed in 1955 to coordinate emergency response capabilities in the general vicinity of the Houston (Texas) Ship Channel. Composed of the Houston Fire Department, local industry, the Port Authority, the U.S. Coast Guard, the Harris County Sheriff Department, and various volunteer fire departments in the Ship Channel region, CIMA membership now totals 84, all of whom must agree to a number of conditions before being allowed to join the organization.

4. They can be formal (written) or informal.

Example: The Mississippi Gulf Coast Regional Disaster Services Mutual Aid Agreement exists as a formal, written mutual aid arrangement made between city and county officials to deal with hazardous materials and other disasters in the Gulf Coast region. Under the terms of this agreement, the involved parties agree to loan each other equipment and personnel and waive all claims for compensation that may arise from losses or damages incurred in providing assistance.

For a mutual aid arrangement to be successful, the participating parties should first agree—preferably in writing—on the financial terms. Mutual aid can be established on a cost-reimbursement basis or on a free-service basis. The issue of liability is also important (§). Unless otherwise specified, a

| TABLE 2 Response Aid Commonly Available from Government Agencies and Industry |
|---|---|
| **Source** | **Information** |
| U.S. Coast Guard | Emergency resources for coastal incidents involving hazardous materials |
| U.S. Environmental Protection Agency | Emergency assistance for inland releases of hazardous materials |
| State departments of emergency services, civil defense, and environmental protection or state police | Various emergency response equipment, personnel, and materials |
| Local fire, police, public works, civil defense, and public health departments | Various emergency response equipment, personnel, and materials |
| Local chemical companies | Equipment and personnel to respond to chemical spills |
| Oil refining and storage facilities | Capabilities to assist at spills of oil or gasoline |
| Construction companies | Heavy earth-moving equipment and operators |
| Transportation companies | Trained personnel and specialized equipment to deal with the hazardous materials they transport |
| Pollution cleanup contractors | Specialized equipment and trained cleanup experts |
| Chemical Transportation Emergency Center (CHEMTREC) | Advice on how to handle spills; liaison with shipper of materials involved |
| National Agricultural Chemicals Association (NACA), Pesticides Safety Team | Advice for incidents involving pesticides; on-site assistance if necessary |
| Chlorine Emergency Plan | Advice on how to handle chlorine emergencies; on-scene assistance if necessary |
mutual aid responder if found to be negligent in some way can be held liable for the assistance lent during a hazardous materials incident. The participants in the agreement should also agree on the communications system and procedures to be employed in notifying one another. Regular meetings and mock drills are typically used to maintain the readiness of the participants. Although mutual aid agreements often temporarily expand emergency response capabilities, their limitations should be known. Some firefighter unions are now using their bargaining powers to neutralize mutual aid pacts. For example, although most union contracts allow the use of apparatus belonging to other members of the mutual aid agreement, others will not allow apparatus to be used by volunteer or call departments unless it is their own.

A mutual aid agreement may not provide the pieces of equipment desired (or in the best location). If the proper equipment is still not available, converting currently underutilized equipment and outfitting it with inexpensive materials should be considered. The equipment and vehicles used to respond to a hazardous materials spill do not need to be new, elaborate, and expensive. The only essential requirement is that they be functional. Older, surplus equipment can often serve as well as new, custom-made equipment.

Many communities have used their know-how to develop an emergency response vehicle without large sums of money. The greatest cost savings have been realized through the purchase or conversion of a surplus vehicle. Additional smaller savings have been realized by adapting other pieces of equipment not originally designed for use in emergency situations, as in the following examples:

1. In Mt. Pleasant, South Carolina, a reserve pumper was converted into a foam truck with storage space for hazardous materials equipment, and an Army surplus jeip was purchased and repainted for use as a mobile command post.

2. In Normal, Illinois, the fire department modified a 1972 reserve pumper into a specialized response vehicle, using the town's public works department facilities to complete body work on the pumper and repaint it a high-visibility chrome yellow. Special care was taken in this case to modify the vehicle so that it could retain its certification as a pumper while also serving as the emergency response vehicle.

3. In Denver, Colorado, the fire department hazardous materials emergency response vehicle was fashioned from a 3/4-ton van customized by fire department repair and carpentry shop workers with shelving, insulation, and other adjustments.

4. The Springfield, Illinois, fire department converted a 1957 Ward LaFrance pumper with 4,000 miles of service into what is now known as Foam 1. The apparatus was completely rebuilt in the fire department shops and outfitted for less than $6,000 plus labor.

5. In St. Johns County, Florida, the hazardous materials team's chlorine kits actually belong to the local water department and are kept on the team's vehicle rather than at the waterworks. Patches and gaskets are made from scrap rubber, and a set of vice grips with a welded extension is used to close off leaking hose lines.

Local authorities can also save money by pooling resources with other communities and purchasing items in bulk quantities. To initiate this process, officials should meet with representatives of other participating agencies and make a list of the basic items that need to be purchased. These may include such items as breathing apparatus, uniforms, hose, tools, and first aid kits. Agreement should be reached on what the standards or specifications of the equipment should be. This has the advantages of (a) making the equipment interchangeable among all the communities, (b) making loans easier to obtain, and (c) ensuring that a person trained on one community's equipment is familiar with that of the next.

Metrofire, a mutual aid association made up of 25 communities and Massport in Greater Boston, Massachusetts, began its joint purchasing program with fire hose. Based on the success of that program, specifications and common purchase procedures were developed for turnout coats, helmets, rubber boots, gloves, and night hitches. Metrofire has also jointly purchased quantities of foam. These are stored in foam banks at centrally located member fire stations. Emergency supplies of foam can be quickly delivered to any emergency in any part of the district through the Metrofire Control Center.

Local expenses can be cut, in addition, by using volunteers and nonprofessionals to handle certain tasks (6). An emergency response team, for example, can be staffed with in-house firefighters. Engine or ladder personnel can be trained in hazardous materials problems, control techniques, and equipment. This is cost effective when the expense of a full-time team would be prohibitive. Members of the community at large may also be willing to become members of the hazardous materials response team, either on a volunteer or salaried basis. Volunteer operations are increasingly attractive as the cost of paid firefighters rises. Volunteer dispatchers can be used to supplement full-time paid staff. Volunteers can also assist in setting up and administering a mutual aid system. Some firefighter unions, however, are now using their bargaining power to discourage use of volunteer services. The willingness of persons to assist on a volunteer basis should be taken advantage of, but only if they receive the proper training, are able to train regularly as a team, and do not upset current unionized operations. Also, one potential problem with the use of volunteers is that such personnel work when they want to, which makes scheduling difficult. Nonprofessionals can also reduce costs by serving as emergency medical technicians, clerks, or dispatchers.

If the foregoing measures fail to provide the needed equipment or materials, local industry assistance or loans can be sought. Industry is often willing to provide material or equipment donations. Their assistance promotes public safety, enhances their image in the community, and helps to keep tax rates down. Arrangements for loans of equipment are quite common, as shown by the following examples:

1. In Guilford County, North Carolina, the county department of emergency services (DES) has direct access to a trailer loaded with absorbent material owned by Colonial Pipeline. Although the pipeline company has its own emergency response team, all of its equipment is available to the DES by simply hitching up Colonial's trailer and towing it to whet it is needed.

2. In Memphis, Tennessee, the fire department's hazardous materials squad has the keys to the warehouse of a local distributor of fire and safety supplies. When materials are needed, squad members can enter the warehouse and take the materials needed. The company is reimbursed later. The team is spared the expense of keeping expensive inventory.

Local industry may also be willing to donate certain equipment items, particularly if the donation is tax deductible. If there is a question as to the
tax status of a donation, a nonprofit tax-deductible charitable corporation can be set up to accept donations of emergency materials or funds. Donations have stretched the budgets of many hazardous materials teams.

PERFORMING HAZARDOUS MATERIALS INSPECTIONS WITH LIMITED RESOURCES

To prevent hazardous materials transportation incidents, the U.S. Department of Transportation (DOT) has developed a comprehensive regulatory program. Although most businesses affected by the federal hazardous materials transportation regulations—or by similar state regulations—comply with them, the complexity and changing nature of such regulations make it difficult for many to keep informed of all the requirements that affect them. A broad and continuing education program is needed to inform industry of the requirements it must meet. A good education program that reaches all of those potentially affected by the regulations will reduce the need for large inspection staffs. The threat of stiff penalties for noncompliance will also reduce the number of careless businesses. However, only a good inspection program backed by a strong enforcement program will minimize the number of hazardous materials safety violations.

The enormous size of the hazardous materials industry makes it virtually impossible for the federal government to carry out all hazardous materials inspection and enforcement activities. The federal government's inspection resources are most efficiently used if they focus on container manufacturers and shippers and those transportation modes that are predominantly interstate in nature—air, rail, barge, and pipeline (2).

State and local efforts are most efficiently directed toward the inspection of highway carriers of hazardous materials (2,8). State and local officials know best the traffic patterns and truck routes used in their regions. They can more efficiently mobilize inspection and enforcement forces than can the federal government. Some states may already have motor carrier safety or weight inspection personnel or some combination of the two in the field.

It is not necessary to regularly inspect every vehicle carrying hazardous materials on every roadway. Extensive inspection surveys are impractical, unnecessary, and an inefficient use of resources. To save on inspection costs, state and local officials should consider the following measures.

First, inspection costs can be kept low by concentrating on bulk shipments of hazardous materials. Inspections can also be limited to a single high-risk hazardous material or restricted to a subset of hazardous materials (e.g., hazardous waste).

Second, the size of the inspection staff can be minimized by conducting inspections at terminals and limiting the number of on-the-road inspections. Also, it is not necessary to inspect every vehicle at each terminal. Of course, inspections at terminals are aimed at the hazardous materials carriers domiciled in the region. Limited on-the-road inspections, therefore, are necessary to monitor the conditions of other carriers.

Third, officials should consider inspecting only a select list of critical hazardous materials safety items rather than performing a full inspection of every vehicle. From the standpoint of safety, it may be more effective to inspect a larger number of vehicles rather than a smaller number of items (more effective to safety). A critical item inspection technique makes on-the-road and terminal inspections more efficient. It also increases respect by the carrier for the inspection process by minimizing the inconvenience caused by the inspection.

Finally, the inspection staff can be stretched by performing the hazardous materials inspections periodically and limiting the geographic regions—or roadways—that are covered. For example, only those vehicles that travel a given stretch of roadway could be inspected, and the inspection staff could be rotated to cover different regions throughout the year.

Inspection costs can also be minimized by integrating the hazardous materials inspection program with other ongoing inspection programs. In many states, truck hazardous materials inspections can be conducted in conjunction with, and using the facilities of, state weighing programs. The weigh stations provide a convenient, safe spot for pulling trucks over and inspecting them. In Utah, for example, 20 highway patrol officers work in two-person teams with a portable scale, weighing and inspecting trucks. These inspections concentrate on vehicle condition, proper placarding, and driver qualifications. A hazardous materials inspection program can also be combined with existing truck weighing or safety inspection programs. In Maryland, for example, the state's hazardous materials inspection activities have been integrated with the Maryland Truck Enforcement Division's truck weighing program, which both use personnel from the same department. Fire department personnel might also be trained to perform inspections at major truck terminals in the region.

There are deterrents to consolidation, however. Some state statutes prevent the consolidation of certain program activities. Collective bargaining agreements may also prove to be a stumbling block. Some fear that the use of existing fire or police personnel to conduct hazardous materials inspections will compromise their ability to perform their primary responsibilities.

To stretch inspection resources and eliminate the duplication of effort that typically results with the inspection of interstate carriers, state officials can consider coordinating inspection activities with those of neighboring states. For example, agencies in Oregon, Washington, Idaho, Colorado, Alaska, California, Utah, and Montana and in Alberta, Canada, have formed the Commercial Vehicle Safety Alliance (CVSA). Under the terms of this alliance, members agree to conform with minimum truck inspection criteria and to honor the inspection activities of one another. CVSA members inspect vehicles on highways and in terminals for compliance with a minimum number of critical items. Vehicles that pass the inspection are issued a CVSA decal valid for 3 months. All participating states and provinces use the same decals, which are color coded to denote the period in which they were issued. The system is a simple one: A vehicle inspected in one state that goes to another state or province with a valid decal is not reinspected, unless a costly defect is clearly visible. This coordination of inspection programs eliminates unnecessary duplication of effort, increases significantly the number of inspections that can be performed, and minimizes the costs and delays that inspections impose on the regulated industry.

State and local agencies should also consider using part-time and volunteer staff to increase inspection staff but should exercise caution. Because hazardous materials regulations are complex and continually changing, personnel who are less than full time are better prepared to see the latest knowledge and skills up to date. This potential problem can be minimized, however, if (a) the part-time worker or volunteer is trained to deal with hazardous materi-
als regulations only and (b) training and responsibilities focus on inspection requirements only and not on administrative and enforcement procedures as well.

The development of industry self-inspection programs can also be encouraged. Industry self-inspection programs can ease considerably the burden placed on state and local inspection and enforcement teams (9-12). They require little government oversight to administer and reduce the need for large (and expensive) inspection staffs. Under the self-audit concept, firms are allowed to police themselves with a minimum of government supervision. To participate, firms must have good safety records and demonstrate that they can satisfy government-prescribed criteria. By incorporating industry self-audit programs as part of a formal inspection program, regulatory agencies can utilize their limited inspection resources more efficiently. Regulatory agencies also benefit from the improved relations that result from recognizing the self-inspection programs already ongoing in many companies.

Industry also benefits substantially from a self-inspection program. The loss of valuable personnel increases company insurance costs. A spill also raises the possibility of criminal or civil liability claims and significant litigation costs. A self-inspection program lessens the likelihood of these occurrences. Industry audit programs also result in the compilation of cause-and-effect data valuable in management planning and in complying with current Securities and Exchange Commission (SEC) regulations. SEC regulations require that publicly held companies disclose the cost of complying with existing regulations. A sound audit program also improves a company's public image.

Many large companies already inspect their vehicles and monitor their drivers carefully. A formal or voluntary industry self-inspection program gives their efforts the recognition they deserve. Other businesses, however, may not have the motivation or resources to establish self-inspection programs independently. If this is the situation, industry associations are urged to pool their resources and become involved in the administration of such programs. Industry and government agencies located in the region of the Houston Ship Channel have, in fact, included such a feature in their mutual aid arrangement. To belong to CIMA every member company must comply with a minimum number of conditions. As one of these conditions, each member agrees to perform an annual self-inspection, complete a CIMA self-inspection form, and file that form with the CIMA inspection officer. Further, each member agrees to cooperate fully with authorized inspections by the CIMA inspection officers.

**OBTAINING HAZARDOUS MATERIALS TRAINING ON A LIMITED BUDGET**

Training and education lie at the heart of every effective carrier inspection and enforcement program. Without proper training, hazardous conditions can go undetected and uncorrected. Training for response to hazardous materials transportation spills is equally important. Inadequate or improper training can destroy the best intentions and render the most up-to-date response equipment ineffective.

Many training courses and manuals have been developed by a variety of public and private groups. Yet proper training does not always reach those who need it, for a number of reasons:

1. The expense of sending staff to appropriate courses may be beyond an agency's budget.
2. Other job-related responsibilities may prohibit the attendance at training sessions. Part-time and volunteer personnel often cannot afford to take the time to attend training sessions.
3. The courses and materials available may not meet specific training needs. For example, some courses may not match a particular individual's actual job responsibilities. Similarly, many courses either do not provide field training drills or may use equipment and procedures that are quite different from those available in that region.

These obstacles can be overcome by taking a number of simple actions. First, local officials need to define their training needs carefully. It is not advisable (or possible) to try to become an expert on everything. The hazardous materials training courses currently available differ significantly in their content and quality. To decide which (if any) of them is best, it is necessary to have a clear idea of what should be known and what skills should be acquired. To define training needs, matrices similar to those developed by the Puget Sound Council of Governments are helpful; they relate a number of different subjects and skills to a total of 48 different positions or occupations (13).

Second, officials should strive to attend only those training courses that are offered locally. The hazardous materials training opportunities offered by state fire academies and other state agencies should be considered only after the training opportunities offered locally have been investigated thoroughly. The hazardous materials training programs offered on a nationwide basis should only be considered if the local companies provide specialized training and facilities desired. If it is necessary to travel a sizable distance, one person should be sent and that person should share the course material with other members of the agency, team, or company on his return. It is a highly efficient practice to train the trainer and then establish a training network that builds on the trained individual's knowledge. If the available budget cannot cover travel expenses, the costs can be split with other communities, industries, or organizations.

If the cost of sending personnel to training courses is still too high, officials should actively search out ways to inexpensive bring the training to them. There are several ways to accomplish this, depending on the kinds of skills that need to be acquired. If a good understanding of hazardous materials regulations and emergency response techniques is needed, the possibility of sponsoring a commercially available training course should be explored. Under certain conditions, course sponsors may be willing to conduct a hazardous materials course or seminar in a locality. Once again, contributions from others can be solicited if resources are not sufficient to cover instructor expenses, the cost of materials, and room rental fees. Other communities or organizations may be more willing to share expenses under this kind of arrangement than if, say, a firefighter, not trained as a teacher, were to be sent to an available course.

Other inexpensive ways to bring specialized hazardous materials training to a particular area include the use of videoteleconferences, self-produced videotapes (14), cable television (5), in-house computers (15), and commercially produced films, slide programs, and videocassettes (16). These communications technologies are useful but often under-utilized tools. They are particularly beneficial for training volunteer inspectors and emergency response personnel because they offer the...
freedom to schedule the training sessions. They also (a) eliminate transportation costs, (b) standardize training by assuring that the same information is presented to every student, and (c) allow for the training of new personnel quickly whenever there is a turnover in staff or change in responsibility.

Of course, computer simulations, commercial films, and video tapes cannot teach the fundamentals of teamwork. They also cannot provide the hands-on experience necessary to properly use the available equipment. Only facilities capable of simulating real-life emergency situations can provide this kind of training. Many state fire academies or training institutes have, or are developing, facilities where real-life drills for first responders can be conducted. These same state training programs are also providing their students with the tools necessary for intercommunity teamwork. In Massachusetts, for example, the state fire academy's training programs traditionally instructed firefighters on how to work with their own departments. There was little reason to teach intercommunity teamwork. Even when one community's apparatus went to the aid of another, firefighters tended to stay with their own departments. With recent manpower and equipment cutbacks, however, recruits are now being taught how to work with the firefighters and equipment from other communities. Conducting simulated drills and training medical personnel properly are also extremely important. Many of the injuries and deaths that occurred from toxic fumes and radiation require skills and procedures not routinely used. The Joint Commission on Accreditation of Hospitals requires every hospital to perform two disaster drills every year in order to be accredited. If staged around mock hazardous materials incidents, these drills offer the opportunity to train medical personnel.

If there are no facilities capable of providing simulation-type training in a community, resources can be pooled and a regional training center can be established. A regional training center that teaches the foregoing skills and provides basic instruction may be a highly cost-effective way to provide hazardous materials training programs.

Designated emergency response personnel can economize further by relying heavily on self-help materials. There are a variety of self-help guides available from DOT, other federal agencies, and industry organizations.

Guest speakers from local universities and industries are often willing to lecture or give free classes. Local industries (chemical, trucking, etc.) are usually quite willing to donate their time and expertise to familiarize their neighbors with the hazardous materials they use, manufacture, and transport.

Finally, communities should explore the possibility of local industry funding and support. Many companies now provide their employees with comprehensive hazardous materials training as part of broader safety training programs. Local officials should determine what hazardous materials training programs available at industrial facilities in their locality and ask that their staff be allowed to attend. Industries that sponsor such training programs generally welcome the opportunity to:

1. To educate firefighters and other first responders on the types of chemicals they use and the hazards posed by these chemicals.
2. To familiarize local firefighters with their operations, and
3. To familiarize local emergency response personnel with specialized emergency equipment they have.

Communities can also encourage local industries to pool their resources and provide needed hazardous materials training. Several local industry associations have arisen across the country for the primary purpose of providing hazardous materials training, particularly for emergency responders. The South County Industrial Emergency Council (SCIEC) in California is a nonprofit educational organization dedicated to promoting cooperation between industry and emergency services. SCIEC is funded by membership fees, seminar fees, and donations. It provides its more than 160 member organizations with a variety of workshops, seminars, training sessions, and staged disaster drills designed to improve safety practices and emergency response capabilities.

CONCLUSION AND FUTURE DIRECTIONS

There is a tendency to view increased federal assistance as the cure-all for many hazardous materials transportation problems. However, the ideas presented in this paper—with their focus on how states and municipalities can help themselves—are as important a form of assistance as outright federal grants. DOT, EPA, the Federal Emergency Management Agency, or any one of a number of state and local advocacy organizations should initiate an outreach effort that actively promotes the widespread application of cost-saving measures and resource-sharing activities. Consideration could be given to the following:

1. A newsletter that identifies and describes recent examples of resource-sharing and cost-saving measures could be periodically prepared, published, and distributed and ultimately form the basis for a larger catalogue of practical ideas;
2. A film, videotape, or slide-tape show stressing the foregoing ideas could be produced and distributed to state and local officials via teleconferencing or other inexpensive communication methods; or
3. State and local demonstration projects—with the prime objective of applying as many resource-sharing ideas and cost-saving practices as possible—could be authorized and funded.

As part of a broader effort to provide state and local officials with the technical and other assistance they need, consideration might also be given to establishing a regional network or directory of hazardous materials transport experts. These experts would come from both the public and private sectors, would be versed in how to handle specific hazardous materials transportation problems, and would generally be available on request to assist state and local governments with their unique problems.

Last, it is timely to take steps now to examine more closely the potential for self-produced videotapes, videoteleconferences, cable television, and microcomputers as relatively inexpensive media for providing specialized hazardous materials training. Despite their potential, the application of these technologies to hazardous materials training has been quite limited to date. State and local public safety officials would benefit greatly from a study of the training and communications technologies available and their comparative costs and benefits. Demonstration or pilot projects that require the application and evaluation of alternative communications technologies to hazardous materials training...
could be used as the vehicle to gather the necessary information. Or detailed case studies of existing applications could be conducted based on the reconnaissance-level material contained in the Fire Service Resource Directory for Microcomputers prepared by the National Fire Protection Association, Inc. Guidance materials could then be prepared and provided to local fire, police, and emergency service organizations describing the resources necessary to bring these important training tools to their communities.

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REFERENCES