Abridgment

Hazardous Materials Emergencies in Railyards: Preparedness Guidance for Railroads and Adjacent Communities

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This guidance being developed by the Federal Emergency Management Agency (FEMA) to improve the emergency preparedness of railroad yards that handle shipments of hazardous materials and the communities adjacent to those yards is summarized in this paper. Compared with the volume of hazardous materials that pass through railyards, comparatively few accidents have occurred. However, several of those accidents have had severe consequences, and there is potential for truly catastrophic consequences. Thus, the National Transportation Safety Board has recommended that FEMA develop emergency preparedness guidance for operators of railroad yards and the communities adjacent to those yards. The guidance focuses on planning for potential emergencies, pre-positioning equipment and other necessary resources, training personnel, and periodically testing plans and procedures to ensure their effectiveness and timely deployment.

Three issues prompted the Federal Emergency Management Agency (FEMA) to develop guidance for railyards and adjacent communities:

1. Despite carriers' extensive efforts to prevent accidents and attendant releases of hazardous materials, serious incidents can and do occur. Each year, approximately 1,000, or 40 percent, of all railroad accidents occur in railyards (*1*). Although comparatively few of these accidents involved release of hazardous materials (between 1984 and 1988, the annual number ranged from 10 to 22), serious property damage, injuries, and social and economic disruption can result. In a study conducted in response to one such accident, the National Transportation Safety Board (NTSB) concluded that increasing emergency preparedness is the most practical way to reduce harm from large-scale releases of hazardous materials in railyards. NTSB also recommended that FEMA develop emergency planning and response guidance for use by communities and operators of railyards that handle bulk shipments of hazardous materials, and incorporate that guidance into pertinent FEMA-sponsored training programs and manuals (*2*).

2. Large numbers of people are at risk from hazardous material emergencies in railyards. Although many railroads originally located their yards away from densely populated areas, urban and suburban development has encroached on them. Between 1984 and 1988, leaks of hazardous materials from railcars in railyards required 19 evacuations which affected 8,948 persons (*2*).

3. Guidance has been developed to improve the emergency preparedness of railroad mainlines (*3*), and fixed facilities like chemical plants (*4–9*), but no comparable guidance exists for railyards. The hazards posed by shipments of explosive, toxic, corrosive, or flammable materials present railyards with a set of emergency preparedness needs that differ from those faced by either (a) mainlines or (b) other fixed-site facilities. Like railyards, mainlines transport a variety of hazardous materials in an equally diverse variety of cars. However, once blocks of cars have been assembled, their locations within the train consist are fixed and the forces on them are more predictable than in railyards. Railyards are similar to mainlines in terms of the variety of hazardous materials handled, but different from both mainlines and other fixed facilities in terms of exposure duration. Normal railyard operations involve a wider range of cars containing an even wider range of hazardous materials than typically found at fixed-site facilities. Cars can be of different sizes, types, ages, designs, and conditions. In railyards, cars are also more likely to be moved over greater distances and at higher speeds than comparable vessels in fixed storage facilities.

Not only do in-yard movements increase the possibility of tank car damage, they also shift hazardous materials to different locations within the railyard. Yard personnel are responsible for detecting changes in car condition and location. Such monitoring is crucial because early detection can avert many emergencies and accurate location information is critical for responders likely to be faced with logistical problems greater than those found either at fixed-site facilities or along mainlines. Typical logistical problems include crossing several sets of tracks to reach the immediate hazard scene; promptly and correctly identifying the specific hazard; and combatting the release of toxic, explosive, corrosive, or flammable materials in a location not specifically designed for this purpose.

Special emergency procedures, equipment, and supplies, have been developed by railroads and communities to meet the needs of railyards in hazardous materials emergencies.

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For the most part, these measures are used by railroads with heavy or diverse hazardous materials traffic and, thus, more advanced emergency preparedness programs. Summarized in the following and discussed further in the full report, some of these measures are relatively simple; others are more elaborate. They include

- Designating a yard tower or other structure as an emergency command center and equipping it with a telescope or high-powered binoculars, meteorological instruments, and tape for sealing doors and windows.
- Designating an isolation area (away from air intakes for buildings, tunnels, or other facilities) where damaged railcars can be moved.
- Positioning support locomotives at each end of the yard so workers relocating railcars can stay upwind of any potentially toxic plume.
- Constructing containment ditches or pits along isolation tracks, and installing oil retention booms and skimmers to prevent materials from migrating farther into the environment.
- Installing fixed overhead trays or small culverts so fire hoses, cables, and other equipment can be routed over or under tracks.
- Spot-checking hazardous material intermodal shipments for proper blocking and bracing.
- Installing automated or manual controls to prevent consists from leaving the yard if any railcars containing hazardous materials violate U.S. Department of Transportation (U.S. DOT) placement rules.
- Providing local response organizations with maps showing the locations of yard access points, rendezvous points inside or at the edge of the yard, and fire hydrants inside or adjacent to the yard.

FEMA contracted with Argonne National Laboratory to perform the field work needed to develop emergency preparedness guidance for railyards and adjacent communities. Field work consisted of a series of site visits and detailed interviews with a cross-section of nine railroads and nine adjacent communities to characterize current emergency preparedness practices. The railroad sample included four Class I, three regional (predominantly Class II), and two belt or terminal carriers (one of which served a large industrial concentration). The community sample included three large urban areas, three suburbs of large urban areas, and three small to mid-sized communities some distance from major metropolitan areas. Along with plan reviews and the authors' experience in radiological emergency planning (much of which is applicable to other hazardous materials emergencies), these formed the data base for the guidance.

RAILROAD AND COMMUNITY GUIDANCE

Emergency preparedness planing and response for hazardous material emergencies in railroad yards can be grouped into 11 functional areas, which are summarized in the following. Although targeted to situations and events likely to be encountered in railyards, guidance also includes certain general actions that are indispensable to effective planning and response or to incident mitigation. Although railroads and communities have some measure of accountability for each of the activities listed, some are primarily railroad (or community) responsibilities while others (e.g., planning) are joint responsibilities. The guidance combines the discussion of these activities to promote mutual understanding, and help identify opportunities for increasing organizational cooperation.

Roles and Responsibilities for Planning and Response

1. Identify laws and regulations that require and authorize the plans that could be activated in an emergency and the local, state, and federal agencies and officials empowered to act.
2. Identify planning responsibilities of government agencies, railroads, manufacturers, and shippers; and develop, review, and update coordinated plans and procedures specific to railyards.
3. Identify government and industry response organizations, and meet regularly with official liaisons.
4. Assign responsibilities to public and private responders, and designate (by title) the individuals responsible for coordinating and directing the response. Prepare organization charts showing the chain of command and other relationships among response units (including the railroad and the incident commander from the designated civil authority).
5. Arrange for supplemental resources, preferably by means of written agreements with clear activating conditions.
6. Identify qualified contractors for the safe and timely cleanup and disposal of debris and contaminated media, and arrange for their services. Inform them they will be under the direction of the incident commander (who will coordinate with responsible railroad officials) until the emergency is completely over.

Acquisition and Deployment of Emergency Facilities and Resources

1. Develop a hazard information system (preferably online) to quickly identify hazardous materials and determine their railyard location, quantity, hazard class, and properties.
2. Maintain and update contact lists for manufacturers of the hazardous materials most frequently handled at the railyard.
3. Designate off-site support facilities to direct railroad activities, to coordinate public and private response efforts, and to provide public information. Establish criteria for activating these facilities.
4. Establish an on-scene command post, equip it with additional communications links, and assign responsibility for 24-hr maintenance, security, and the staffing of communications links.
5. Designate primary and backup communications links to contact other railroads (if tracks are shared), shippers, and chemical experts. Designate at least one dedicated radio band for emergency communications and response coordination. Provide responders with mobile communications equipment tunable to local frequencies.
6. Inventory and classify by U.S. Environmental Protection Agency hazard category all emergency equipment and sup-

plies on-hand at the railyard or jurisdiction or available through supplemental support agencies, jurisdictions, or private organizations. Regularly update inventories, verifying equipment location and readiness. Coordinate with railroad or community staff to avoid duplication.

7. Regularly inspect and perform maintenance on stored equipment and facilities. Maintain records.

8. Establish procedures for the deployment of personal protective equipment, containment equipment, emergency monitoring devices, detoxification agents, and cleanup and disposal equipment.

9. Evaluate water supplies and the hookup needs of fire and rescue equipment. Add or upgrade on-site hydrants and provide safe connections to off-site hydrants. Install properly lined ditching systems and/or containment pits to avoid contaminating underground water.

Planning Analyses

1. Conduct hazards analyses, identifying the hazardous materials most frequently stored or handled at the railyard, likely emergency sequences and consequences, and overall risk.

2. Establish emergency classification levels with corresponding response actions. Coordinate with railroad and community emergency response officials to ensure compatibility.

Alert and Notification

1. Establish procedures and methods for 24-hr notification of local civil authorities and for verifying such notifications with the railyard. Use standardized messages and include chemical-specific information.

2. Establish procedures, methods, and priorities for 24-hr alert, notification, and mobilization of additional responders (including those from neighboring jurisdictions and facilities, and railroad, shipper, and industry response teams), second-shift personnel, and cognizant government agencies.

3. Establish procedures and means (e.g., sirens) for alerting the public that an emergency has occurred and for issuing emergency instructions.

4. Where faulty responses can have dire consequences, (e.g., all incidents involving Class A poisons, Class A and B explosives, or flammable liquid or gas), require that yard personnel promptly notify adjacent communities and request (at least) backup support.

Population Protective Actions

1. Establish guidelines and criteria for deciding if on-site actions, sheltering, or evacuation are needed.

2. Establish procedures for implementing sheltering and evacuation recommendations.

3. Designate one or more buildings in the railyard as shelters, indicate them on site maps and emergency plans, and stock them with appropriate supplies and instructions for their use as emergency shelters.

4. Establish procedures for reentering the railyard and/or evacuated adjacent areas. Designate (by title) the official responsible for recommending reeentry, and set criteria for determining when it is safe.

5. Establish procedures for handling long-term physical and psychological effects on victims.

Responder Safety

1. Keep copies of key hazardous materials references (*10–12*) at the railyard and in response vehicles to help responders select appropriate protective gear and limit exposures. Send relevant information to the hospital with all contaminated or injured individuals.

2. Develop standard operating procedures specific to railyards yet parallel to generally applicable procedures for hazardous materials emergencies (e.g., procedures for monitoring release concentrations, donning and removing protective clothing, recording the presence of personnel in the hazard zone, relocating containers exposed to heat and flame, etc.).

3. Conduct regular training sessions on personal safety.

4. Establish a warning system for emergency evacuation of response teams in the hazard zone.

5. Structure response and repair operations for maximum personnel safety (e.g., obtain assessment data upwind and from a safe distance; have enough respirators in vehicles used for public notification; keep an explosimeter on hand if pressurized materials are handled).

6. Inform responders of the hazardous materials involved, exposure symptoms and hazard limits. Monitor exposures and relieve personnel at intervals appropriate to limits. Locate monitoring (and decontamination) near the checkout point.

Incident Assessment and Analysis

1. Improve incident detection by installing commercially available stationary devices to monitor toxic, corrosive, and flammable gases.

2. Provide the incident commander with clear and concise information, including rosters of available railroad personnel qualified to assist with mitigation and recovery, inventories of available equipment and supplies, data already obtained (from placards, shipping papers, standard references, the Chemical Transportation Emergency Center (CHEMTREC), etc.), and response actions already taken.

3. Improve incident assessment by automating and expanding hazard information systems with important firefighting information (e.g., site maps, floor plans, and the locations of stored supplies), maintaining comprehensive records of train consists, computerizing hazardous materials inquiries, and developing the capability to obtain hard copies from CHEMTREC or other data bases.

4. Obtain site-specific meteorological data to track airborne releases and support dispersion models.

5. Establish procedures for containing releases (e.g., with dikes and absorbent pads) or otherwise restricting the spread and intensity of emergency consequences, and for collecting environmental samples to monitor the success of those procedures.

6. Establish procedures for undertaking environmental assessment, biological monitoring, and contamination surveys, and for deploying field teams to monitor the size, concentration, and movement of hazardous materials releases.

7. Identify and initiate actions to restore the railyard and, if necessary, the surrounding environment. Monitor the success of those actions, and assign long-term responsibility for site control.

Emergency Worker Training

1. Familiarize fire and rescue personnel with railyard layout, access points, and possible points of unauthorized entry, the railroad's standard operating procedures for handling involved railcars, and railroad information and response resources and capabilities.

2. Instruct yard personnel and civil responders in the proper use of basic references (e.g., waybills, shipping papers, decision flowcharts, AAR and U.S. DOT guides, and CHEMTREC) for identifying involved materials, determining their physical properties and potential hazard, and indicating appropriate response measures. Maintain training records.

3. Take advantage of available courses and other training resources. Assemble a library of videotapes applicable to hazardous materials emergencies at railyards or borrow tapes through lending libraries.

4. Where gaps exist, develop programs and materials to supplement and enhance available resources. Emphasize the importance of efficiently locating information on specific chemicals, assessing container damage, and minimizing responder exposure, and the danger of railcars with empty or residue placards. Designate (by title) the individual responsible for emergency worker training.

5. Create opportunities for railyard personnel to train with local civil responders.

6. Conduct critiques as soon as possible after the emergency is over.

Emergency Preparedness Exercises

1. In conjunction with training activities, conduct an initial tabletop exercise to verify workers' understanding of their roles and responsibilities, and test their ability to perform assigned tasks.

2. Develop a regular program of internal, teamwork-oriented exercises (tabletop, functional, and full-scale) to systematically evaluate the plan, response skills, and coordination.

3. Develop a system to evaluate how well exercises meet prespecified objectives.

4. Establish guidelines for participating in safe joint exercises, and work with involved agencies to periodically conduct joint functional or full-scale exercises.

5. Use exercise results to identify shortcomings and suggest revisions to emergency preparedness plans, procedures, and training programs.

Public Education and Risk Communication

1. Participate in public meetings to develop plans for protective actions.

2. Improve public education. Provide public speakers and information that explain potential hazards and the planning and response measures that are in place for hazardous materials emergencies. Tell local media what to expect, how to get additional information, and which locations will be off-limits.

3. Plan for and standardize as much public information as possible. Develop pre-scripted messages in several languages, if appropriate, to convey standard information and assistance. Enter into formal emergency broadcast system agreements that include regular broadcast of test messages.

4. Develop plans and procedures to alert and communicate with special needs populations such as the vision- and hearing-impaired, the handicapped, and foreign-language speakers.

5. Develop a rumor-control program and train personnel. Designate (by title) an official spokesperson.

Post-Incident Documentation

1. Maintain detailed, chronological logs of events, conversations, and activities undertaken during the emergency, including reentry and recovery phases.

2. Evaluate response effectiveness. Identify necessary changes to plans and procedures, and additional needs for training and public information.

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