REVISED, SECOND EDITION

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RESPONSE AND CONTROL

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Published in the Western Hemisphere by
Technomic Publishing Company, Inc.
851 New Holland Avenue
Box 3535
Lancaster, Pennsylvania 17604 U.S.A.

Distributed in the Rest of the World by
Technomic Publishing AG

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

Main entry under title:
Hazardous Materials Emergencies: Response and Control – Revised, Second Edition

A Technomic Publishing Company book
Bibliography: p.

Library of Congress Card No. 88-50464
ISBN No. 87762-544-1

Introduction

ON DECEMBER 3, 1984, a release of MIC (methyl isocyanate) at a Union Carbide plant in Bhopal, India, killed more than 2,500 persons and seriously injured an estimated 150,000 more. This incident generated intense media and government interest throughout the world due to the massive loss of life. However, there was almost no outside interest just 19 days before the Bhopal incident when on November 15, 1984, 30 to 50 gallons of the very same material was spilled on the ground at an FMC Corporation plant in Middleport, New York. In Middleport, the MIC vaporized and was carried by a light breeze to an elementary school located less than 500 yards away. Approximately 500 students were in class as the school's ventilation system sucked MIC into the building.

Similar problems must be dealt with by hazardous materials response teams: (HMRT) trained, teamed and equipped specialists employed by government agencies, commercial response contractors, and industrial corporations. Although the federal government has preempted the regulation of hazardous materials and hazardous wastes in transportation, response to and control of incidents involving such materials has been left to local government. In the United States, methods and procedures for professional response to hazardous materials emergencies have been developed at the local level.

All states are now in the process of implementing "S.A.R.A." (Superfund Amendments And Reauthorization Act of 1986) signed into law on October 17, 1986. Title III of "S.A.R.A.,"—Emergency Planning And Community Right-To-Know—has direct and substantial impact on state and local emergency planning for hazardous materials/wastes/substances emergencies. By April 17, 1987, each state governor was required to appoint a state emergency response commission; by July 17, 1987, each state emergency response commission had to designate emergency planning districts; by August 17, 1987, state commissions were to appoint a local emergency planning committee for each emergency planning district with members to be drawn from elected officials and representatives of law enforcement/civil defense/firefighting/first aid/health/environment and transportation organizations plus media and community representatives, as well as owners and operators of facilities subject to the regulations. Each local committee is required to prepare an emergency plan prior to October 17, 1988; the plan must be reviewed at least once each year.

Another brand new law, "CFR 1910—Hazardous Waste Operations & Emergency Response: Interim Final Rule," now being implemented by OSHA requires that all responders to hazardous materials/wastes/substances incidents be properly trained and equipped. OSHA is mandating that all employers—including fire departments, emergency medical and first aid squads, and industrial fire brigades—conduct monthly training sessions for their employees totaling 24 hours annually. Additional requirements call for use of the Incident Command System, an on-scene command post, and an Incident Commander. Beyond these minimum requirements now being applied to any organization that may be called upon to respond to hazardous materials incidents, OSHA is requiring employers—including fire departments, law enforcement agencies and commercial response

contractors—who utilize specially trained teams involved in intimate contact with controlling or handling hazardous substances to provide special training in such areas as care and use of chemical protective clothing, techniques and procedures for stopping or controlling leaking containers, and decontamination of clothing and equipment.

These two new laws alone will mean a vast broadening of the potential audience for proven-in-practice tactics/procedures/methods/protocols and "lessons learned" pertaining to response to and control of hazardous materials emergencies. The "hands-on" expertise that currently exists in this country rests with an estimated 600 hazardous materials response teams, so-called "first responders" whose mission it is to isolate, contain and stabilize hazardous materials released from their normal containerized environment by leak, spill, rupture, derailment, accident or other unplanned event.

JOHN R. CASHMAN
Barre, Vermont

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Bringing Hazardous Materials Incidents Under Control: On-Site With a Hazardous Materials Team

IN THE STILLNESS just before dawn, Fountain, Colorado lay asleep and unsuspecting as 13 miles to the north in Colorado Springs five improperly secured railroad cars, including a tankcar of flammable naphtha and a boxcar of dynamite, started rolling backwards. Slowly at first, then with ever-increasing momentum, the runaway cars headed down the long incline into Fountain. Within minutes, they entered the Fountain depot with a rush and impacted with the Kansas City Express carrying 34 passengers. The tankcar of naphtha split open, and the highly flammable liquid ignited spreading flames throughout the depot. The dynamite car exploded with a resounding concussion, showering debris for hundreds of yards. Three persons died, and 28 were injured in the holocaust. By mid-morning, 2500 people were milling about the site of the hazardous materials incident asking each other and officials: "How could this happen? Can it happen again?"

Catastrophies involving hazardous materials are not a recent phenomenon; the Fountain, Colorado incident described above occurred May 14, 1888. Anyone reading a newspaper today can easily answer the two questions raised by anguished citizens of Fountain 100 years ago. "It can happen in many, many ways," *and* "It will happen again, and again, and again."

The Department of Transportation defines hazardous materials as—"A substance or materials which has been determined by the secretary to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce."

The National Solid Waste Management Association defines hazardous wastes as—"Any wastes or combination of wastes which because of its quantity, concentration, or chemical characteristics poses a substantial present or potential hazard to human or animal health or the environment because such wastes are bioconcentrative, highly flammable, extremely reactive, toxic, irritating, corrosive, or infectious."

The National Fire Protection Association has identified the fire hazard properties of 1300 flammable liquids, gases, and volatile solids and has defined the fire explosion, and toxicity hazards for 416 hazardous materials. The Department of Transportation requires that 1600 different materials be placed as hazardous when transported in commerce.

The Association of American Railroads has estimated that there are 1600 different commodities classified as hazardous transported on the nation's railroads today compared to 30 or 40 different products classified as hazardous carried by rail at the turn of the century.

The National Institute of Occupational Safety and Health has listed 28,000 *toxic* chemicals and identified 2200 of that number as suspected carcinogens.

A rapidly expanding volume of hazardous materials being manufactured, processed, stored, transported, and disposed of, coupled with an increase in incidents and spills that invariably followed has resulted in the formation of highly trained, fully experienced, and specially equipped "Hazardous Materials Incident Response Teams." Although no two such teams are alike, they can be roughly divided into three basic types: industrial teams, commercial teams, and public safety agency teams.

Nearly every major chemical manufacturing and processing firm in this country; such as Union Carbide, FMC, Monsanto, Air Products Company, DuPont, and many others have company personnel who are on call at all times to respond to incidents involving their company's products. Dick Heinze, for example, is chief chemist for FMC Corporation yet responds to pesticide emergencies around the country as a member of the National Pesticide Emergency Team Network. Similarly, L. J. Hudson responds to pressurized tankcar emergencies throughout the southeast as a member of the Air Products Corporation Response Team.

Commercial response teams are a relatively recent phenomenon: private-for-profit firms that respond to hazardous materials incidents, or provide related services, for any employer. Safety Systems, Inc. of Jacksonville, Florida (ramrodded by Captain Ron Gore, commander of the Jacksonville Fire Department's Hazardous Materials Team) specializes in "hands-on" hazardous materials training for industry and government as well as incident prevention, control, and investigative consultation. Hazardous Materials Technology and Services, Inc. is the "Red Adair of Hazardous Materials Incidents and Spills" within 500 miles of Jacksonville. (Its incorporators are all members of the Jacksonville Fire Department Hazardous Materials Team.) Ryckman's Emergency Action & Consulting Team (R.E.A.C.T.) based in St. Louis operates a nationwide network of hazardous materials response personnel. Other major firms in this field are O.H. Materials, Inc. of Ohio and Illinois (oil and hazardous materials spill containment and clean-up); Hulcher's Emergency Services of Illinois (nationwide track rebuilding and derailment clean-up for railroads); and Peabody Clean Industry (spill control and clean-up, hazardous materials clean-up, and waste oil disposal). There are also a few individual freelancers in the field; probably the best known is Jerry Cook, a chemist in Biloxi, Mississippi who specializes in on-site chemical analysis and pollution consultation for various railroads.

In January, 1977 the Jacksonville (Florida) Fire Department initiated one of the first "hands-on" hazardous materials incident response teams of any public safety agency in the United States. The unit is composed of three teams staffed by one officer and three men. Each team is on duty 24 hours and off 48. All members are volunteers with a minimum of two years and a maximum of 18 years experience as combat firemen with the Jacksonville department. The team's stationhouse is located in a central area providing quick and easy access to the expressway system, the port area, industrial and storage areas, and extensive railyards.

In its first 60 months of operation, the Jacksonville team responded to more than 1000 hazardous materials incidents within Jacksonville city and surrounding Duval County. To develop and maintain the expertise necessary to successfully respond to a wide variety of incidents, team members stress three critical areas: training, continuous preplanning, and acquisition and maintenance of an adequate inventory of specialized equipment.

Training, both academic and "hands-on," is never-ending. On any given day, team personnel are either undergoing training or providing it. There is in-service training; out-service training at schools, seminars, and workshops throughout the southeast; the provision of hazardous materials training to combat firemen throughout the Jacksonville department; and nearly continuous interaction with "visiting firemen" representing industrial and public safety organizations throughout the United States and Canada who spend from a day to two weeks living and working with the team in order to learn the tools, techniques, and disciplines developed in Jacksonville.

Captain Ron Gore initiated, trained, and currently directs the three shift, 15-man Jacksonville team. "With an increasing number of incidents, and a proliferation of hazardous chemicals, compounds, and products being manufactured, transported, stored, and processed within the city," recounted Ron Gore, "Wesly Yarborough, chief of the Jacksonville department at that time, gave his blessing to formation of a specially trained, highly knowledgeable, and well-equipped hazardous materials team. The team was recruited from volunteers within the combat fire companies and placed in a centrally located station with easy access to the expressway system, the port, the storage complex area, and the railyards. As soon as we had the men we wanted, we began to beg, borrow, and . . . well, not quite steal . . . the specialized tools and equipment needed to deal with hazardous materials."

Such tools and equipment are as basic as a 13 volume reference library built into the cab of the

team's remodeled pumper and as esoteric as a pH meter for determining the acidic or alkaline quality of a product. There are extensive patch and leak kits and materials. These include chlorine kits, precut rubber patches of various sizes and shapes, pointed wooden dowels and plugs that can be hammered into ruptured pipe openings and other leaks, hydraulic jacks and chains for clamping patches to tanks of all dimensions, and enough assorted pipe fittings, sleeves, brackets, compression plates, valves, elbows, and joints to make a plumber turn green with envy. Team members often work under frighteningly dangerous conditions, but their basic stock in trade is the ability to patch any leak in any vessel, container, cylinder, or tank.

"We've become quite expert in stopping leaks," agreed 18 year veteran firefighter, Bob Masculine, "although we don't claim to be repair people, and we don't want to gain a reputation for being in the repair business. We are a first aid company for leaks involving hazardous materials as a Rescue company is to victims. Our primary objective is to control the situation."

Additional equipment includes explosimeters, dosimeters, sorbent materials for pickup and disposal of small spills, dispersants, an infrared viewer for identifying heat patterns through walls, decks, floors and bulkheads; as well as foam, foam, and more foam.

"Most fire companies carry 15 to 20 gallons of foam," noted Captain Core.

"Our two companies together carry 300 gallons."

Asked about rumors that he recruits team members like a Big Ten Conference coach recruits football players, Ron Gore laughed, then added: "Firemen establish a reputation. It's really eagerness that we look for, a desire to learn, a motivation to go out and train. Our people are like racehorses; you have to hold them back. We just can't use a man who thinks a fireman's most important duties are to polish the checkerboard and feed the Dalmatian.

"Although we train all the time," explained Captain Ron Gore, "we are still barely to the top of our boots as far as knowledge of hazardous materials is concerned. We average one hazardous materials call every other day; we would probably have double that number had we not trained all firefighters in the city to handle the most common types of hazardous materials incidents. Jacksonville is blessed in having a caliber of firefighters who, once they are trained, can easily handle the more routine alarms. Some calls they can't handle, often because they don't have the special tools and equipment we carry.

"First we train ourselves," continued Captain Gore, "with as much help from industry and government agencies as we can solicit. By ten each day we are in the field visiting chemical companies, railyards, the port area, and transportation centers. We practice on different types of vessels, vehicles, tanks, and cylinders used to store and transport hazardous materials. We study chemicals at the different storage areas; when we see things that are wrong, we ask people in charge to correct the situation. The industrial people train us in their particular products, vehicles, and storage tanks. They freely provide us with a great deal of expertise on how to handle potential incidents involving their products. We already know the philosophies, the basics, but we constantly talk with industrial people about the specifics: 'If that stuff spilled, what would be the proper way to handle it?' We spend a lot of time on top of railcars and inside oil storage tanks. There are close to 100 different railcar designs; we have to be able to shut off valves, apply patches, and plug broken pipelines by touch. When you are wearing an acid-gas-entry suit and there is a corrosive or poisonous product pouring over you, drenching you, you can't see or hear a thing. You have to be able to make the repair by touch alone. We spend a lot of time practicing: turning shut-off valves, playing with pipes and couplings, and applying patches to damaged tanks just for drill.

"We spend over eight hours a day in the field on preplanning, practice and training. In some fire departments, you have to beat the people into submission to go out and train. Here, it's the other way around. They are always asking – 'Where are we going today? Let's go out and look at something.' "

"The hazardous materials incidents we are coming in contact with are so serious that there is no time for learning after we arrive on the scene," added Lieutenant Mark Chambers. "Either we know what to expect and how to respond to it *before* we get there, or the potential for disaster is very great."

"We have done preplanning with every facility in this area that handles hazardous materials,"

noted senior fireman, Bob Masculine. "On each subsequent visit, we pull out the existing preplan sheet for a particular facility and review it with the people there. We ask them to make suggestions, or point out considerations we might never identify on our own. You have to lead them. The average industrial person is more interested in what his operation does rather than in what will happen when things suddenly go wrong. Without guidance, they will talk to you all day about how many widgets a certain machine can make in a day. We need to know where the light switches are located, how we shut down the ventilating system, what is located in that vat over there? What was the last incident you had, and what product was involved? What problem do you have most often? How much hazardous product do you normally have stored in the plant? Where is it? What products in what amounts are we likely to find sitting at the rear of the plant? After awhile, they begin to think like we do and start pointing out the things we need to know. When we complete a preplanning visit, there isn't much we don't know about a facility. All critical information goes on a preplanning sheet and is filed in a book that remains on the apparatus."

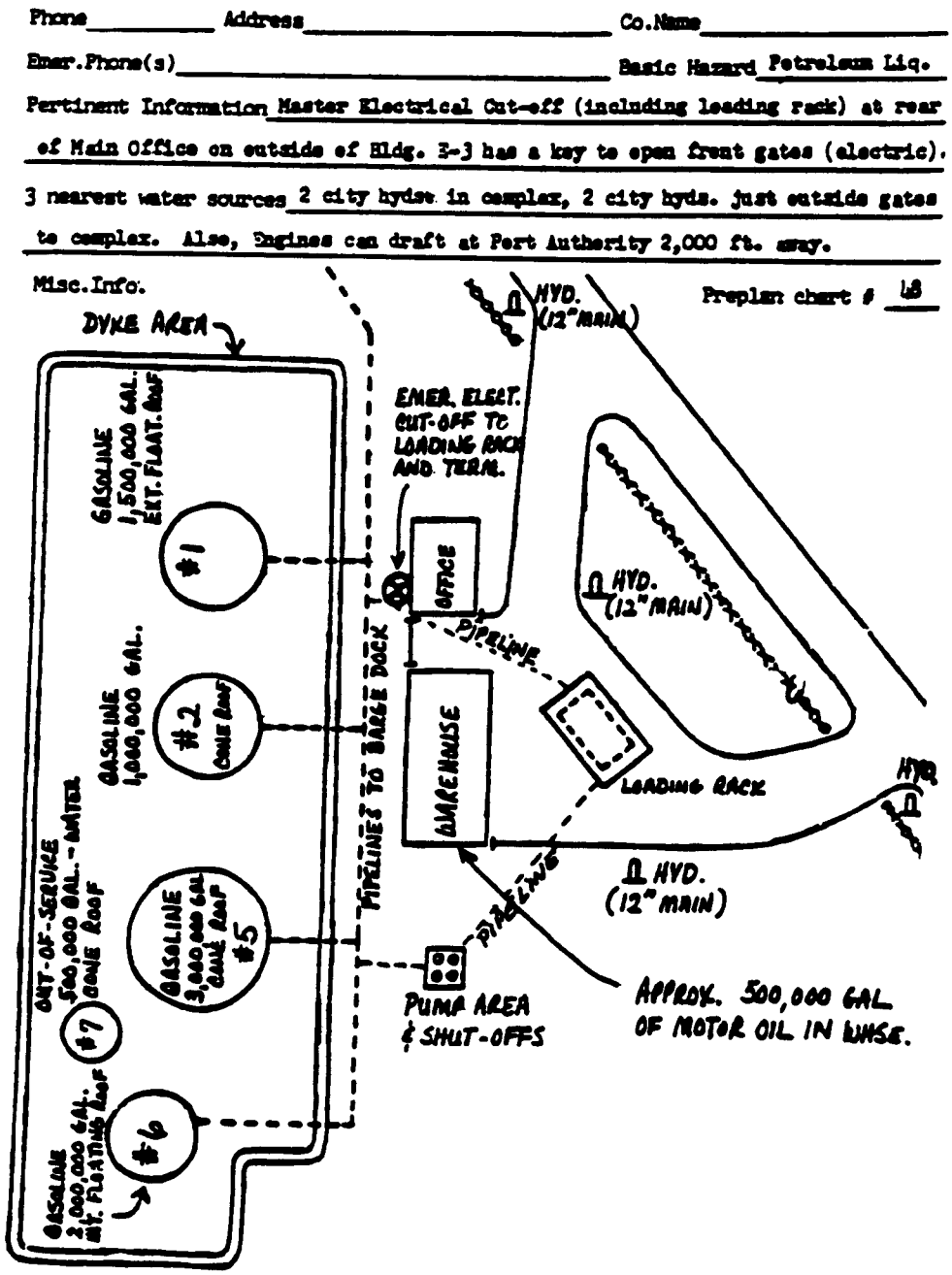
Jacksonville team members repeatedly stress the importance of maintaining and updating an adequate inventory of specialized tools and equipment. "The one item we could not do without," mused Bob Masculine, is the self-contained breathing apparatus. These are an absolute must. Since we end up working in fumes, toxic vapors, and corrosive liquids so often, the acid-gas-entry suits are critical. We also have a four-hour mask; this is not a positive pressure mask, but it allows the wearer time to stage his preparation without having to come back for a new air bottle. We also have extension lines for our regular 30-minute air masks that supply an unlimited amount of air without being weighed down with the bulkiness of a tank. These are expensive items, but we have important materials that didn't cost a dime," added Masculine rummaging through a sizable collection of precut rubber patching material of all shapes and sizes. "We apply a tremendous number of patches on both pressurized and nonpressurized containers. This patching material looks expensive, but we get all we carry from a local rubber dealer who lets us scrounge around in his scrap heap whenever we run short."

"We have two pumpers that we altered a bit to accept our specialized gear," explained lieutenant Dick Morphew. "There is a library in a cab of each unit for the technical manuals we can't do without: tankcar manuals and schematic diagrams, chemical abstracts, tank truck manuals, service bulletins, various emergency services guides for hazardous materials, emergency preparedness plans for radiological and poison incidents, a guide to chemical hazards and reactions—a total of 13 manuals that receive pretty heavy usage. Even though we study such materials all the time, we often end up reviewing specific sections as we drive to an incident.

"We have explosimeters for monitoring air, fumes, and vapors," continued Morphew, "dosimeters to measure radiation accumulation; pH meters to determine the alkaline or acidic level of run-off; and an infrared scanner to detect heat patterns through metal and wood. Our two companies have on hand 300 gallons of foam, and all our foam nozzles and eductors are color-coded. Oftentimes we are spread pretty thin at an incident; we sometimes have to rely on whatever manpower is available. If we need A-FFF foam, we can just holler: 'Get the yellow nozzle and yellow eductor.' For high-expansion foam, we call for the red nozzle and red eductor.

"We have A and B chlorine kits," added Morphew, "and a number of other tools and materials for patching leaks, such as, hydraulic jacks and chains, compression plates, plugs and dowels. A few of our tools are nonsparking aluminum, bronze, or beryllium copper. We have to think constantly of potential chemical reactions—will the product react to the equipment and material we are using? Is the frangible disc we are using to repair on L.P.G. tank correct for the pressure of the tank we are working on? Will this rubber patch react with the product? We have rolls of sorbent materials for picking up small spills, particularly on highways; plastic trashbags, funnels, mops, brooms and brushes. We have plastic drums for catching chemicals that react to metal, and siphon hoses for draining over-filled tankcars. A regular firehose filled with air from the air bottles makes a good floating boom for containing oil spills, and we can build a temporary dike to contain many fluids using ladders and canvas off the apparatus. You name it, we've got it," laughed Morphew coming up with a bottle of soap solution used for locating leaks.

To successfully answer any hazardous materials alarm, team members must identify the prod-



Basic hazard—Petroleum liquid. **Pertinent Information**—Master electrical cut-off (including loading rack) at rear of main office on outside of Bldg. E-3 has a key to open front gates (electric). **3 nearest water sources**—2 city hyds. in complex, 2 city hyds. just outside gates to complex. Also, engines can draft at Port Authority 2,000 ft. away.

FIGURE 1. Preplan diagram of industrial facility.

uct, understand the product, know the environment surrounding the product, and know the proper response. Immediate and positive identification of the product involved in an accident can be critical. Many times the team must identify a product after they arrive on the scene. Oftentimes bystanders or facility personnel know only that "something" is causing a Hell of a problem. Team personnel may identify a product by placards, tankcar or truck identification numbers, or configuration of tanks or cylinders. They often call CHEMTREC or CHLOREP for guidance in understanding the reactive characteristics of a product and the proper response technique.

Team members must fully understand any product they are dealing with in order to plan their attack. By review of manuals, texts, guides; through experience and training; and by study of preplanning data they evaluate the threat. Is the product lighter or heavier than air? Is it water soluble or miscible? How does it react to other products? Is it an oxidizer? They consider flashpoints, boiling points, vapor expansion ratios, and tank pressures.

Team members must fully understand the mechanical environment in which hazardous materials are most often found. The valves, gauges, and piping of railcars, tank trucks, and loading racks must have been imprinted in their memory through experience and training so they can locate them while stumbling around in a vapor cloud or caustic spray wearing bulky acid-gas-entry suits. They must be able to look at an oil storage tank for one second and know the manner in which the tank operates, the type of petroleum product it is likely to contain, and be able to estimate the volume of product contained in the tank.

And lastly, team members must know the proper response or all their training, experience, specialized equipment, and preplanning will be wasted. They feel a fast response time is important, but they are careful to first evaluate the potential consequences of each action they plan to take.

They identify the type and degree of hazard(s) present. Is the product dangerous in terms of burns or frostbite? Is there a threat from inhalation, absorption, or ingestion? Is there a radiation hazard? Does the product pose a carcinogenic or biological danger? Such concerns may seem a bit far-out to regular fire service personnel, but the Jacksonville team deals with such products *all the time*. That's how they earn their pay.

They identify the product characteristics. Is it water reactive? Is it corrosive? Is it acidic or alkaline in case the product or run-off has to be neutralized? If vapor is present, they monitor constantly with exposimeters to determine danger of ignition or explosion, the boundaries of a vapor concentration, and to locate unsuspected pockets of vapor.

The team must relate products found at an incident to conditions on-site. They often erect windsocks as soon as they arrive at an incident, particularly if gases or vapors are present. They consider the temperature; does it pose a threat to pressurized tanks? Is fire or radiant heat endangering the product or its container? They check geographical conditions. Can the product, or run-off from the product be left uncontained; or is it flammable, poisonous, corrosive, acidic, alkaline and in danger of entering a water supply, sewer, or waterway? Can they boom it, dike it, absorb it, neutralize it, or disperse it?

While hundreds of product-related decisions are being made, team members must often simultaneously consider evacuation requirements and fire control techniques. Needless to say, the average team member doesn't become rattled too easily and loves to work under pressure.

After a hundred decisions, the team *may* be able to move in to patch, plug, or seal a leak or stabilize the situation in other ways. They may be able to dike or boom a simple spill, or use dispersants to "defuse" a spill of highly flammable liquids. They may use sorbents to pick up small spills, or call in a contractor with vacuum trucks or skimmers to handle larger spills.

Once the threat has been stabilized, the team is super careful to maintain incident vigilance and discipline. With hazardous materials, secondary incidents can be devastating. A flammable liquid washed down a sewer, or pesticide contaminated run-off entering a water supply, can pose a far more serious threat to public safety than the initial incident.

The Jacksonville hazardous materials team has developed certain disciplines that guide their response to any hazardous materials incident.

1. Decrease Effective Response Time Through Knowledge and Preparedness: "Once you have a spill, it is too late to learn about the product, the vehicle it is transported in, or the container

in which it is normally stored," explained Ron Gore. "You must have gathered the maximum possible amount of usable information beforehand. That's why we stress *both* academic *and* 'hands-on' experience. It doesn't help you much to know a particular product can kill you by inhalation, ingestion, and absorption if you don't know where the emergency shut-off valve is located on the type of vehicle normally used to transport that product."

2. Team Concept: A Highly Trained, Fully Experienced, Specially Equipped Group: "Any emergency service personnel can be trained to handle any type of emergency, including those related to hazardous materials," emphasized Captain Gore, "but it just stands to reason that people who have had extensive training and continuous experience in hazardous materials are going to be better prepared to answer such alarms than people who respond just occasionally. All fire personnel should have a good grasp of what is required to respond successfully to common, everyday incidents, but a highly qualified team can be of invaluable assistance to an incident commander when there is a threat of significant life or property loss. A team will have been to so many incidents, dealt with so many chemicals and other hazardous substances, that they can relate better to the really hairy situations than the fellow who can merely say: 'We went to one incident a few weeks ago, and the product reacted this way.' That isn't good enough."

"When the adrenalin starts to flow, teamwork becomes super critical," agreed Bob Masculine. "When you are groping around under a tankcar in an acid-gas-entry suit with a toxic product cascading over you, you have to *know* that if you take off this part, without fail, without being assigned, your partner is going to pick up the piece you need next."

One inflexible discipline related to teamwork is that team members never, ever work alone. The old "boy scout buddy system" has proven to be effective time and time again. Although all team members have been in the emergency room at one time or another, no one has yet been seriously injured. Terry Daniels was wearing an acid-gas-entry suit while working atop a gushing tankcar when he got hit on the leg with a stream of cryogenic liquid that cracked the leg of his butyl suit like glass. Raising both arms in the designated signal of distress, he was carried off the tankcar and hosed-down by his partner. Bob Masculine ran out of air in a gas-acid-entry suit and had to be extricated by his partner. Another team member stepped into a hidden, three-foot deep sump filled with a corrosive product and had to be pulled out and hosed-down by other team personnel. "The product soaked my feet, legs, and thighs," admitted Ron Gore ruefully, "but it was my face that was red for three weeks afterwards."

3. Evaluate Before You Act: "Our primary objective is to control the situation," noted Lieutenant Dick Morphew. "We have learned from experience not to rush in. We lay back, analyze the situation, and attempt to evaluate the whole scene. We decide our tactics from a distance, sometimes with the aid of field glasses. We want to solve the problem; we don't want to become part of it.

"You can't take anything for granted," added Bob Masculine. "We arrived at one incident described as 'a chlorine leak' to find 11 different hazardous materials all jumbled together in layers. We first evaluate the situation, identify the product and its characteristics, consider evacuation requirements, and only then do we move ahead to stabilize the situation and achieve control."

4. Preplanning: Like any good salesman, team members know their territory. There is not a single major tank farm, railyard, storage area, port area, or warehouse containing hazardous materials that team members have not reconnoitered in depth. "We need to know what we are likely to find when we roll up to the main gate at three in the morning," stressed Ron Gore. On any preplanning visit, team members develop a diagram of each location visited that provides information that would be crucial in an emergency, such as, location of emergency shut-off electrical switches and mechanical valves; descriptions of tanks, cylinders, vessels, vehicles, and facilities encountered; location of nearest water supplies; and storage locations for various hazardous materials. All such preplanning data sheets are numbered and stored in a book on the apparatus. An alphabetical cross-index permits immediate location of the needed data sheet when a call is received. On each subsequent preplanning visit, the preplanning data sheet is updated as necessary.

"When we go to a facility to preplan, people there begin to view us as helpers, advisors, as a

resource," noted Captain Gore. "They come to respect our knowledge and abilities. They also want to impress us that they are competent, knowledgeable people; and perhaps with our assistance and guidance they become able to operate their facility in a safer fashion. Also, we learn the problems under which they operate. They learn our techniques and we learn theirs. When they do have a serious situation develop, they call us *at once*. We visit plants *every day*. We definitely feel we keep the number of incidents to a minimum by constant and continuous preplanning with all handlers of hazardous materials located in the city."

5. Establish a Command Post: "You cannot know everything about a product or a situation," explained Captain Gore, "but you must be able to surround yourself with people who have the necessary knowledge and expertise. There must be one location at a site where these people can interact with the incident commander. At any major incident, an incredible number of people can become involved and be quite necessary to successful control of the situation."

At one recent incident, it was estimated that 27 different knowledgeable persons were involved in addition to the hazardous materials team. It is not unusual to have on hand representatives of the police, Civil Defense, E.P.A., the manufacturer of the chemical involved, the designer of the tankcar, the military, various federal-state-municipal agencies, private clean-up companies, earth moving concerns, the media, and disposal contractors. For an incident commander to maintain control and utilize these various skilled people to the maximum degree possible, a command post is an absolute necessity.

6. Nonessential People Out of the Area: If a person does not need to be at the scene, if his experience is not necessary to stabilize the threat, get him out of there. This applies to response personnel every bit as much as it applies to curious bystanders. Once they have done their thing, see that they remove themselves to a safe distance. People want to be helpful. You have to control their access to the scene or you may find a guy in cut-offs and sunglasses looking over your shoulder as you crawl up the side of a methyl bromide car in your acid-gas-entry suit and airpack. It happens all the time. Don't let it happen to you. Beware of the guy who thinks he is immune.

7. Have Knowledge of all Special Equipment and Expertise Available in Your Area: Few fire departments are likely to have on hand bulldozers or other earth moving equipment, empty tankcars and tank trucks necessary to transfer a product, specially trained and equipped track rebuilding crews, chemists, experts in pesticides and poisons, explosives and demolition people, vacuum trucks for scooping up spills, or similar equipment and expertise often needed during a major hazardous materials incident. You must know where you can obtain such assistance at three in the morning or on Sunday afternoon of a three day weekend. An itemized cardfile identifying all such equipment and services, the location where they can be obtained, and the name and number of the contact person is a must. For each item, an alternate source of supply should be identified if at all possible.

8. Hazardous Materials Incident Control Checklist: The Jacksonville team maintains a "Hazardous Materials Incident Control Checklist" for every incident they respond to. Such checklists are invaluable for subsequent training of response personnel, subsequent preplanning visits to similar facilities, for providing continuity when one site commander and team goes off-duty and is replaced by another, to enable follow-up on contacts of a crucial nature, and to provide factual and timely basic data and information for any reports or testimony that may later have to be developed. This checklist is normally initiated as soon as an alarm is received, maintained and updated at the on-site command post throughout the duration of the incident, and ultimately filed at the hazardous materials team's stationhouse.

"What we have learned is quite transferrable," noted Captain Gore. "For any industrial organization, community, public safety agency, or consortium of various agencies concerned about potential hazardous materials incidents in their area, I recommend development of a "Hazardous Materials Incident Preparedness Plan' as a crucial first step."

The Jacksonville team developed the following 11-step guide to creation of such a plan.

1. Gather Data: Preplan community, shippers, and transporters as well as industrial and storage complexes; gather from them information concerning hazardous materials they handle, and discuss incident prevention and control procedures. Obtain hazardous materials reference

material that will aid in determining correct handling procedures, and construct an emergency response and preplan book that will aid you at emergencies.

2. **Develop an Action Plan:** Develop an emergency plan for the firefighter and police officer who usually are first to arrive at the hazardous materials incident. Organize and develop an action plan for medical personnel, chemists, scientists, technical personnel, earth-moving and wrecking contractors, special hazardous materials incident contractors, as well as others, and have definite prior commitments from them.

3. **Establish a Communications System:** Assign incident leadership and/or command post responsibilities prior to emergencies. Assign certain persons or groups to notify various special agencies, such as, Chemical Manufacturers Association (CHEMTREC) Environmental Protection Agency, State Civil Defense Headquarters, U.S. Coast Guard, or others that are equipped or needed. Designate a public relations or news media communicator.

4. **Provide Training:** Attend various hazardous materials seminars, conferences, and schools for training purposes as well as to obtain information to aid your own hazardous materials training program. Train all local groups that may be involved in responding to incidents. Develop for the public a hazardous materials awareness program. Provide special tools and equipment for hazardous materials incidents. Develop a special hazardous materials response team, or make prior arrangements to obtain a hazardous materials incident contractor. Have periodic mock hazardous materials incidents in your community.

5. **Retrain and Update:** *Never* become complacent concerning the possibility of a hazardous materials incident occurring in your community. *It can happen to you*. Continue retraining and updating hazardous materials incident prevention and control efforts in your community.

6. **Size Up:** Preplanning considerations? Incident location? What's involved? (type of hazardous material and its inherent nature) Incident conditions? (leaking, spilled, burning?) Time of day and weather conditions? Rescue and firefighting resources? Other considerations.

7. **Call for Help:** Additional rescue and firefighting forces. Police and Civil Defense assistance. Special agencies (EPA, CMA, USCG). Earth moving contractors. Product removal contractors. Hazardous materials incident control contractors. Other considerations.

8. **Rescue:** Immediate rescue. Intermediate evacuation. Major evacuation. Other considerations.

9. **Exposures:** Life—people. Priority property—product containers, explosives, etc. Secondary property—structures, woods, etc. Systems—water, communications, electric, highways, etc.

10. **Extinguishment or Control:** Water control. Foam agent control. Inert gas or dry chemical control. Let it burn or leak down.

11. **Overhaul: (Salvage and Restoration) Use precautions.** Allow necessary personnel involvement only; keep other emergency personnel on remote standby. Allow no citizenry at scene until product transfer and clean-up is completed. *Again, use precaution*. Maintain incident vigilance and discipline.

Sooner or later, someone will always ask the Jacksonville Hazardous Materials Team the inevitable question: "With all the training, preplanning, and specialized equipment, what *Really* happens when the world comes apart—when you are called in to stabilize an absolute catastrophe?"

At approximately 1:50 a.m. on Sunday, February 26, 1978—90 years after naphtha and dynamite had obliterated much of Fountain, Colorado—Bay County Deputy Sheriff, Tom Loftin, pulled a U-turn on highway U.S. 231 in the darkened village of Fountain, Florida and headed south on 231 to continue his routine patrol. As he passed Brown's Grocery north of Youngstown, Loftin saw a flicker of light in his rearview mirror. Suspecting a burglary was in progress, he whipped his cruiser around to find a dozen persons sitting and lying about Brown's Grocery—retching and gasping for air, screaming of excruciating pain in the groin, armpits, and lungs. Virgil Holman, a brakeman for the Atlanta and St. Andrews Bay Railroad, reported to Deputy Loftin. A train had derailed a mile away, rupturing a pressurized tank car of liquid chlorine; the chlorine had expanded to gas at a 460 to one ratio as it left the car causing a vapor cloud of greenish-yellow chlorine to drift over the nearby highway, killing eight and injuring 88 within minutes. Loftin simultaneously parked his cruiser across the southbound lane of Highway U.S. 231 and used his