Vol. 12 No. 4, September-October, 1984

Labor Occupational Health Program

MONITOR

In This Issue: • **HAZARDOUS WASTE —**
Public Health Threat, Worker Health Threat

On the Cover:

The scope of the hazardous waste problem in the U.S. has become increasingly evident in the past few years. This issue of Monitor focuses on an often-neglected aspect of the problem—the health and safety of workers involved with hazardous waste. See stories on pages 3-10. (Photo courtesy of University Extension, University of California, Davis.)

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LOHP Updates "Getting the Facts"

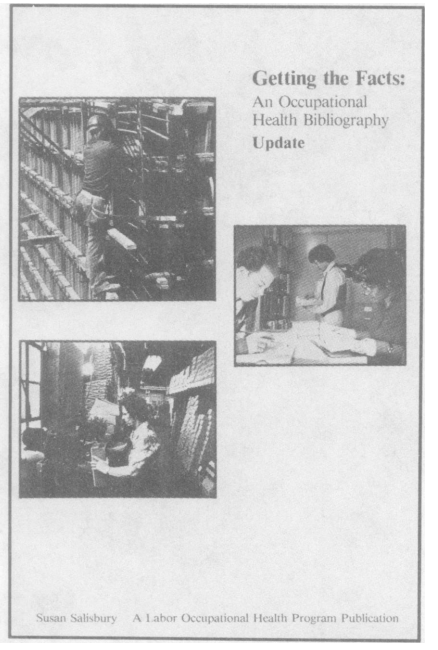
LOHP has just released a partial update to **Getting the Facts,** our popular reference publication originally issued in 1981.

Getting the Facts is both a guide to setting up a health and safety library, and an occupational health bibliography. The 85-page bibliography section lists hundreds of resources in the field, including books, pamphlets, periodicals, reporting services, films, videos, and slide shows. In response to the many new publications and materials issued since 1981, LOHP has prepared a supplement to this bibliography section.

The new 64-page **Getting the Facts: Update** includes current listings of materials under dozens of categories. New categories have been added as well, reflecting new areas of concern. Complete ordering information is included with each listing.

The **Update** is available now from LOHP for $3.00 (postage and handling included). Since listings from the 1981 edition have not been repeated, this new supplement will prove most useful as a companion to the original book. **Getting the Facts** and the **Update** may be purchased together for $9.00 (postage and handling included).

Order from: LOHP, 2521 Channing Way, Berkeley, CA 94720. Make checks payable to: The Regents of U.C.



This is a special expanded issue of* Monitor *for September-October, 1984. It is current as of December 1. There will be no November—December, 1984 issue. The next issue (January-February, 1985) will reach subscribers during February. Subscriptions will be automatically extended so that all subscribers receive the correct number of issues.

Joint EPA-NIOSH Program

LOHP Trains Hazardous Waste Workers

by Lela Morris, R.N., M.P.H.

LOHP Continuing Education Coordinator

(Photo: Patricia Quinlan.)

As more and more people become involved in the hazardous waste problem—from investigating abandoned sites, to planning remedial action, to emergency spill response—there is an ever-growing need for information on the dangers of these materials and how to minimize exposure. Protection against the toxics threat is needed not only by the general public, but also by hazardous waste workers themselves.

Together with the University's Northern California Occupational Health Center, LOHP presented a three-day introductory course on health and safety for hazardous waste workers at the U.C. Extension Center in San Francisco from August 21-23, 1984. Admission was free, due to financial support provided by the National Institute for Occupational Safety and Health (NIOSH). LOHP plans to repeat the course at least once, and possibly on a regular basis, in the future.

The 50 participants represented both public agencies and private firms involved in hazardous waste management and cleanup in Northern California. Agencies included the state Department of Health Services, several county health departments, the state Water Resources Control Board, park districts, the Federal Emergency Management Agency, Cal/OSHA, and the Port of San Francisco. Participants included rank-and-file workers, union stewards, and professionals with responsibilities for employee health and safety within their agencies or firms.

EPA-NIOSH CONTRACT

In 1980, the U.S. Congress passed the Comprehensive Environmental Response Compensation and Liability Act (popularly known as the "Superfund" law.) This legislation authorized $1.6 billion for a five-year nationwide toxic waste cleanup effort. A portion of the law calls for the Environmental Protection Agency, which administers the cleanup, to work with other agencies such as OSHA and NIOSH to study safety and health problems of workers at "Superfund" sites. (*See related article, page 4.*)

Another requirement of the "Superfund" law is that contractors working on the cleanup submit a Site Safety and Health Plan to EPA. The worker safety and health program should be a major component of any management plan for hazardous waste cleanup operations. Accordingly, the manager of such operations needs knowledge, information, and experience in worker safety and health. The manager will make safety and health decisions which are, in many cases, equal in complexity to the technical decisions that must be made on how to clean up the site. Each technical choice on how to carry out the cleanup operation will have to be matched with a companion choice for protecting the health and safety of workers that will be involved.

EPA and NIOSH have jointly addressed the manager's need for information by entering into an interagency contractual agreement.

When a training course and manual were completed recently, the NIOSH Office of Manpower Development introduced them in pilot sessions held throughout the U.S. in each of NIOSH's fifteen Educational Resource Centers (ERCs.) As a designated ERC, the Northern California Occupational Health Center and LOHP presented the NIOSH training format and manual to the 50 participants in San Francisco in August.

TOPICS

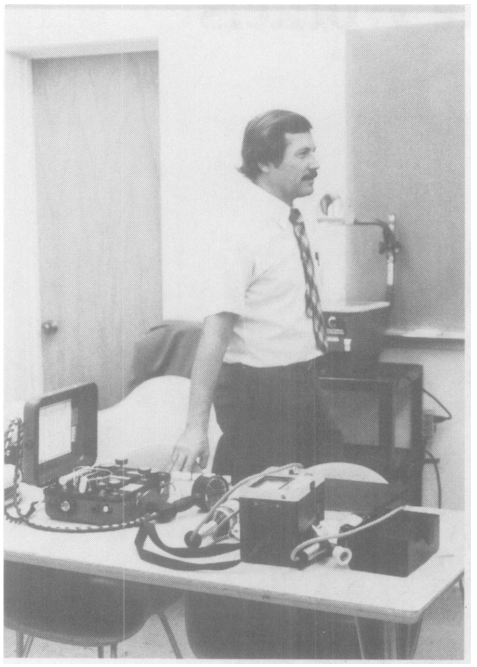
While the format and study materials were developed by NIOSH, an advisory committee and faculty composed of local professionals convened in advance to review and adapt the NIOSH course for California workers.

Topics included basic toxicology; flammable, explosive, and corrosive materials; radiation; emergency procedures; and decontamination. Participants were asked to submit detailed evaluations of the course and the materials. For information regarding future training of this type, please contact Lela Morris at LOHP, (415) 642-5507.

(See photos on p. 4)

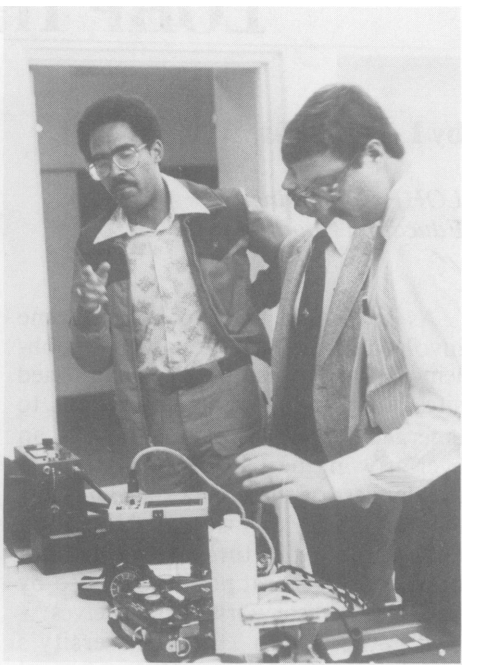
LOHP WASTE SITE TRAINING

continued from p. 3



Instructor Michael Ridosh, M.B.A., of Tetra Tech. (Photo: Patricia Quinlan.)

Molly Coye, M.D., Medical Officer of NIOSH Region IX, was also an instructor. (Photo: Patricia Quinlan.)



Instructor Matthew Monsees, M.S., of Roy F. Weston, Inc. (right in photo) demonstrates equipment to class participant. (Photo: Patricia Quinlan.)

HAZCAT Kit Can Identify Hazardous Substances

(Editor's Note: Cal/OSHA industrial hygienist Robert Turkington, who developed the HAZCAT kit described here, was an instructor at LOHP's August training course for hazardous waste workers, described in the article on p. 3 The information here was provided by Mr. Turkington, by Dianne Dienstein of Cal/OSHA News, and by Phil Croyle of the Federated Fire Fighters.)

A **Hazardous Materials Identification and Classification Kit for In-field Use** (HAZCAT) has been developed by Cal/OSHA industrial hygienist Robert Turkington. It can assist firefighters and others responding to spills, fires, and emergencies involving unknown and potentially dangerous substances.

Unknown substances are one of the most pressing problems facing emergency response workers. There is a critical need for quick identification. Is the powder in the street reactive? Will it burn? Or is it simply lime or flour? Is that liquid spilled on the highway an acid, a caustic, or merely corn syrup? HAZCAT can help answer such urgent questions.

Turkington developed the HAZCAT kit after surveying the kinds of substances which had been spilled or involved in emergencies throughout California during a one-year period. He then developed a battery of tests for categorizing most of these substances, and assembled them into the kit.

HAZCAT contains over twenty tests which enable the user to detect, in an orderly fashion, properties of an unknown substance such as reactivity, corrosiveness, flammability, solubility, oxidation potential, and to some extent toxicity., This information is useful in itself, and in some cases it is possible to go further and pinpoint the specific substance. This analysis is done in a matter of minutes, using only the simple materials in the kit: charts and diagrams, test tubes, water and acid, and a small torch.

The test procedures are in the form of a decision tree. Unknown substances are first separated into two basic divisions: solids and liquids. Next, for each of these divisions, there are questions about appearance and odor. If the material is a solid, is it a pellet, powder, crystal, or dust? If it is a liquid, is it viscous, fuming, or odorous? These answers lead to subsequent branches of the tree, where more questions are asked and answered.

According to Cal/OSHA, the HAZCAT procedure is invaluable for alerting emergency responders to a potential exposure hazard so that they can wear appropriate protective clothing and equipment, minimizing the hazard to themselves while they work to minimize the hazard to others.

Turkington has trained over 300 people in 14 California fire departments to use the kit. The intent is that they in turn will be able to train others. For more information on the HAZCAT kit, contact Robert Turkington, Division of Occupational Safety and Health, Research and Standards Development Unit, 525 Golden Gate Ave., 3rd floor, San Francisco, CA 94105. Phone: (415) 557-2037.

Public Health Threat, Worker Health Threat

Hazardous Waste Workers: New Concern for Protection

by Cathy Holt

LOHP Intern

Of all working environments, sites where hazardous wastes are stored may be the most dangerous. Workers there face risks involving heavy equipment, explosion and fire, oxygen deficiency, and heat stress. They may also suffer the health effects (both acute and long-range) of exposure to toxic chemicals.

But the workers threatened by hazardous wastes are not just those at waste storage sites. Others who may be affected are workers who transport the wastes, or fire and police personnel who deal with accidents and spills. When wastes are dumped down drains and sewers illegally, as they often are, sewage treatment plant workers may also face hazards.

Unsafe work practices in any hazardous waste operation endanger not only workers but also the surrounding community. Consequently, health and safety training for workers who are involved with hazardous wastes benefits everyone. New programs are now emerging to encourage such training.

What is hazardous waste?

Substances which are no longer useful and are also potentially harmful can be considered **hazardous wastes.** They include **corrosives** such as strong acids and caustics; **reactive chemicals** such as oxidizers and reducers; **explosives** such as organic peroxides; **flammables** such as alcohols and hydrocarbons; and **toxics** (substances which can cause either acute or long-term bodily damage.)

Any given chemical may pose multiple hazards. For instance, exposure to a small amount of benzene over a period of time may cause cancer years later. A higher amount may cause an immediate toxic reaction such as dizziness or coma. At a yet higher level, benzene may cause an explosion or fire.

Many hazardous wastes do not break down or biodegrade. If synthetic organic chemicals (such as PCBs or DDT) are released into the environment, they will accumulate and concentrate as they move up the "food chain"—so that a small amount in the water becomes a large amount in beef or fish consumed by humans. The same is true of heavy metals and radioactive wastes.

Where are the wastes found?

A hazardous waste site may be an illegally **dumped** substance on the ground or in water. It may be an emergency **spill** on a highway. It may be a **landfill** with drums full of wastes, marked or unmarked, intact or leaking. Or it may be a **lagoon,** with or without any lining to prevent liquid from escaping into the environment.

All of these types of waste sites pose a threat of seepage of wastes into groundwater, a very serious threat to public health. Yet it has been estimated that 75% of all landfills are in wetlands, on floodplains, or over aquifers.

Scope of the problem.

Prior to 1979, nearly 60 million metric tons of hazardous waste were generated in this country, of which only 10% were disposed of properly. The remaining 54 million tons were treated, transported, and stored in a manner which threatens human health and the natural environment. The federal Environmental Protection Agency (EPA) estimates that *80 billion pounds* of hazardous waste are now generated each year.

The EPA has identified 546 "priority" hazardous waste sites (19 of which are in California), and another 1700 sites posing immediate health threats. In addition, there are an estimated 14,000 others needing cleanup. According to the *Wall Street Journal*, more than 20 currently operating U.S. waste sites are suspected of leaking or using inadequate monitoring systems.

Legislation.

• **Federal:** The best-known federal legislation concerning hazardous waste is "Superfund," or the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA). The Superfund legislation provides for identification, investigation, and remedial action at sites such as abandoned dumps, spills, and improperly operated waste facilities. The law authorizes the government to seek reimbursement for cleanup from companies responsible for the waste, and it holds generators of waste liable for their handling of it. But to date, Superfund has cleaned up only seven sites; and it was allocated only $1.6 billion for its five-year life. Reauthorization of Superfund was defeated in the Senate in 1984, but it will be taken up again in 1985.

The Resource Conversation and Recovery Act of 1976 (RCRA) sets regulations for the proper transport, storage, and disposal of wastes; defines what constitutes hazardous waste; and sets civil and criminal penalties for violators. Thus is is designed to prevent the creation of more improper waste sites in the future. However, illegal dumping still exists; in fact, there is speculation that it may be on the rise due to the increased expense of disposing of waste properly under RCRAs guidelines. A bill extending RCRA's scope to include smaller quantity waste generators was recently passed.

Transportation of hazardous waste is regulated by EPA through both RCRA and Superfund, and by the Department of Transportation (DOT). EPA requires a "hazardous waste manifest" for each shipment, including identification of the generator, hauler, and storage or disposal facility. This manifest must also include a description of the waste and its quantity. The DOT requires specific kinds of packaging, as well as labeling of containers.

Under the Reagan administration, many federal regulations have been weakened. In 1981, acting under industry pressure, EPA deleted 100 substances from the original list requiring reporting under Superfund. EPA also loosened toxic spill reporting regulations, abandoned requirements for

continued on p. 6

CONCERN FOR PROTECTION

continued from p. 5

containers in landfills to be completely impervious, pushed back many deadlines, and decreased inspections.

• **State:** A recent trend at the state level has been increased attention to health problems associated with hazardous waste. For example, in California, a state "Superfund" law includes a Hazardous Substance Compensation Program which pays for financial losses from injuries or illnesses caused by exposure to hazardous substances. Several states are now considering bills which address the problems of torts regarding victim compensation.

Other state legislation around the U.S., either proposed or passed, deals with information gathering (for example, cancer registries); bans or restrictions on certain chemicals; chemical emergency provisions; siting; transportation; water contamination; and both worker and community "right to know". In California alone, over 80 such bills were introduced in 1984. But every law a legislature enacts must be converted into a regulation, and writing of regulations generally has not kept pace with lawmaking. This has hampered enforcement of toxics laws and processing of toxics cases.

Superfund and workers.

A section of the Superfund law calls for EPA, DOT, OSHA, and NIOSH to study together the safety and health problems of workers at Superfund sites. The agencies have collaborated, and adopted a set of recommendations:

- That OSHA regulations be applied to hazardous waste operations;
- That research, monitoring, and technical assistance by government and private agencies continue; and
- That all site personnel be comprehensively trained in health and safety.

There are problems in applying OSHA regulations to hazardous waste site operations. Most importantly, at abandoned sites toxic substances are likely not to be adequately marked or identified. Incompatible substances may be stored near each other, and leakage can cause mixing. Containers were probably not designed to withstand long-term outdoor storage. Many substances (especially mixtures) have no OSHA standard or Permissible Exposure Limit (PEL). And air monitoring to determine the concentration of a substance, required by many OSHA standards, may be almost meaningless except when done in enclosed spaces.

A provision of Superfund makes each regional EPA office responsible for establishing and implementing an overall safety and health program, to include: training of employees; medical surveillance; guidelines for work practices and selection of personal protection levels; provision of instruments for air monitoring; recordkeeping; and

RECOGNITION AND CONTROL OF HAZARDS AT WASTE SITES

Type of Hazard	Examples	Safety/Control Measures
Physical Hazards		
• **mechanical or electrical**	tools and moving parts of vehicles or machinery: gears, belts, chain drives, pulleys.	guarding; grounding.
• **fire, explosion**	explosive gases (*especially in a confined work space*); flammable liquids; mixing of incompatible chemicals.	monitoring for combustible gases; use of non-sparking and grounded equipment. No smoking. Correct handling and segregation of wastes.
• **heat stress heat exhaustion heat stroke heat cramps**	use of impermeable protective suits in warm weather, especially when working in direct sun.	well-designed protective clothing; rest and water breaks; work scheduling during cooler hours.
• **noise**	drilling; heavy equipment.	ear protection.
• **falling objects**	unstable drums, buildings, or other structures.	careful inspection and operation; use of remote operations; enclosed cabs.
• **slips and falls**	wet or unstable walking or working surfaces.	skid-resistant boots; safe work practices.
• **radiation**	radioactive waste; medical isotopes.	always check for radioactivity.
Chemical Hazards		
• **airborne contaminants**	toxic gases, vapors, and aerosols generated by leaking containers, drum sampling, excavation, etc. *A major problem in confined workspaces.* Oxygen deficiency may be a result of heavy gases replacing oxygen in a confined space.	repeated air monitoring; use respirators until concentration is known to be safe; use ventilation in confined workspaces if possible; have a rescue system; remote sampling in some cases.
• **dermal burns, rashes, etc.**	splashes; spills; absorption through gloves or shoes. Corrosives can burn the skin; solvents can cause rashes.	remote handling where possible; correct work practices for opening drums and sampling; proper personal protective equipment.

A *confined workspace* is any enclosed or semi-enclosed space, including a trench or unroofed building.

on-site inspection.

Also, Superfund contractors are required to submit a Site Safety and Health Plan which outlines personal protective equipment and work practices used, provides for medical surveillance and exposure monitoring, sets up access zones, and spells out emergency procedures.

However, these laws apply only to Superfund sites. Clearly a big gap is left.

Control measures.

The following general advice for waste sites represents good health and safety practice, although not all recommended measures here are required by law.

• **Work practices on site.** Remote operations may be used, such as grapplers for lifting drums or remote drum opening and sampling devices. Cabs of vehicles should be enclosed to protect workers from airborne contaminants, spills, falling objects, etc. Deteriorated drums may be either pumped out or placed in an overpack drum before removal from the site. Chemical compatibility must be considered when consolidating substances, planning storage areas, and flushing pump lines, so as to avoid mixing incompatibles which could react in a hazardous manner. Air monitoring for explosivity, for toxic substances, and for oxygen content is important, especially in any confined work space. The work site must have clearly demarcated zones based on degree of hazard, with decontamination facilities through which workers must pass before entering the zone where they may eat or smoke. Communication systems and emergency response procedures must be understood by all who work on the site.

• **Personal protective equipment.** Personal equipment is of great importance at hazardous waste sites. This includes hard hats for head protection, chemical resistant suits, boots and gloves for skin protection, and respirators for lung protection. (*For more information, see related article on personal protective equipment elsewhere in this issue.*)

• **Medical surveillance.** Medical testing of waste site workers is necessary in order to detect differences in individual exposure and/or susceptibility, to find unanticipated problems, and to identify corrective measures. Although there is no one specific testing protocol for all cases, baseline and periodic tests which may be appropriate are: pulmonary function tests; blood cholinesterase levels (if pesticide exposure is involved); and blood chemistry and hematology. Most important is a periodic physical exam, including respiratory, cardiac, neurological, endocrine, digestive and reproductive systems.

Worker training.

In an environment such as a waste site, the employer cannot completely control an employee's exposure to hazards. Employee awareness of the risks becomes vitally important so that prudent precautions can be taken. Even those making a brief and casual inspection of a hazardous waste site need this awareness. As the national problem of hazardous waste cleanup is tackled, more and more workers will become involved. Many may be experienced in operating equipment similar to that used at the site (for example, cranes and backhoes) but completely inexperienced in the special risks that accompany hazardous waste. To prevent tragedies, a vast effort must be mounted to train waste site workers in health and safety on the job.

Additional Information Available at the LOHP Library

Association of Bay Area Governments, **San Francisco Bay Area Hazardous Spill Prevention and Response Plan: Risk Assessment and Summary,** December 1982.

Code of Federal Regulations 49, parts 100–177: Transportation, November 1983. (Regulations governing transportation of hazardous materials.)

F. Mackison et al., eds., **NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards,** USDHHS (NIOSH) Publication No. 81-123, January 1981.

National Conference of State Legislatures, **Hazardous Waste Management: A Survey of State Legislation 1982.**

NIOSH Training Manual—Health and Safety for Workers at Hazardous Waste Sites, 1984. (Draft.)

Occupational Safety and Health Guidance Manual for Superfund Activities, USDHHS, Public Health Service, Center for Disease Control, NIOSH, May 1984. (Draft.)

R. D. Speer, **State Toxic Substance Legislation: Activities and Trends,** National Conference of State Legislatures, August 1983.

U.S. Department of Transportation, **1984 Emergency Response Guidebook for Hazardous Materials Incidents,** DOT Publication P 5800.3.

(Photo: Environmental Response Team, U.S. Environmental Protection Agency.)

Personal Protective Equipment for Hazardous Waste Site Workers

by Patricia Quinlan

LOHP Industrial Hygienist

(Photo: Environmental Response Team, U.S. Environmental Protection Agency.)

The hazards at a waste site are often unknown. Unlike a factory or construction site, where the substances present and their dangers are better understood, a waste site is a question mark. Thus it is practically impossible to institute engineering or administrative controls to reduce worker exposure at these sites, although in ordinary workplaces such controls are considered preferable to protective equipment like special clothing or respirators. At a waste site, workers must rely on personal protective equipment (PPE) as the major exposure control method during site cleanup.

The initial level of PPE recommended at hazardous waste sites is often based on preliminary site investigation data gathered before cleanup work begins. The level of exposure predicted, therefore, is often speculative. Corrective work at the site may create exposures which did not initially exist. For example, exhuming buried, disintegrating drums may release substances not detected during the preliminary investigation.

As work progresses on a site, we should be able to gain a better understanding of the degree of hazard present, through personal and area sampling and through chemical analysis of unknown wastes. With this new information we can assess whether we need to recommend changes in the levels of PPE required for particular tasks at the site. Altering levels of PPE, however, requires good judgment and should be formalized (in written procedures) to prevent errors or misunderstanding.

The unknown nature of the hazard therefore warrants erring on the side of overprotecting the workers until more data is available on the site. However, this approach creates its own problems. The physiological and psychological constraints of PPE can be "as limiting as armor." As one report stated, it's not enough to know that a worker has 30 minutes of breathing air left on a respirator, and 45 minutes left before his/her protective clothing becomes ineffective, if the worker meanwhile succumbs to heat-related problems due to this personal protective equipment.

Let's now look at some of the types of PPE recommended for hazardous waste sites, the problems associated with this equipment, and some components of a waste site PPE program.

TYPES OF PPE

Equipment for hazardous waste worksites includes head protection (hard hats); body and foot protection (gloves, boots, chemical suits); face and eye protection (goggles, face shields); hearing protection; and respiratory protection (air-purifying and supplied-air respirators as well as Self-Contained Breathing Apparatus). Selection of the type of equipment needed depends on a number of factors, including the following.

Characteristics of the Site and Operation

- Environmental conditions (temperature, amount of oxygen, whether the atmosphere is considered IDLH (Immediately Dangerous to Life or Health));
- Chemical properties of the contaminants (corrosivity, flammability, etc.);
- Physical properties of the contaminants (whether they are liquid, gas, vapor, aerosol, etc.);
- Work assignments and duration of work.

Characteristics of the Proposed PPE

- Supply of breathing gas/coolant provided;
- Insulating ability;
- Permeation and penetration rates of component materials.

Respiratory Protective Equipment

Respirators fall into three main categories: air purifying, air supplied, or Self-Contained Breathing Apparatus (SCBA). There are limitations associated with all of these. Using air purifying respirators assumes that there is sufficient oxygen; that we know the identity of the contaminant and possibly its concentration; that the concentration is not immediately dangerous to life or health; and that the contaminant has

adequate warning properties (odor, etc.) to alert workers if it begins to get through the respirator. If this is not the case, then we must resort to supplied-air respirators or SCBAs. Supplied-air respirators have certain limitations as well. The nature of the work on the site may require much moving, climbing, or entering and leaving certain areas; the air hose of the respirator may seriously hinder this movement. Additionally, the hose itself could become contaminated while lying in pools of spilled materials.

SCBAs, entirely worn by the worker, solve the problem of restricted movement and contaminated hoses. However, they are limited in their air supply (30–60 minutes for positive pressure, open-circuit models). The weight of the SCBA is also a problem. One study showed that just wearing a SCBA reduced the work output rate by 20%.

Protective Clothing

Protective clothing for use at waste sites should be selected on the basis of such considerations as: temperature, strength of material, flexibility needed to perform task, work duration, durability of material, chemical resistance, and ease of decontamination.

Protective body coverings can range from protective aprons to fully encapsulating suits (one-piece garments covering the entire body), depending upon the degree of hazard. The fully encapsulating suit offers the greatest protection and is recommended for highly toxic or corrosive materials. Special training (including training in escape from the suits themselves) is required for workers who will wear these suits. Non-encapsulating suits may be either one-piece or two-piece garments. The two-piece suits are often more comfortable.

Clothing may be disposable or non-disposable. Disposable clothing is usually less expensive and avoids the problem of decontamination. However, it is usually less sturdy and less protective than non-disposable garments.

Clothing comes in a variety of materials. No one type of material protects against all hazards.

Presently, there are no standards for protective clothing, but standards are being developed by the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI). Specifications for materials can be obtained from the manufacturers and suppliers of the materials. However, the information provided on chemical resistance usually refers to degradation of the materials, not to chemical penetration or permeation.

Foot and Head Protection

Footwear is used to protect the worker from both penetration of chemicals and injury due to falling objects, heavy equipment, or slips. Steel toes, shanks, and metatarsal guards are recommended, along with non-slip soles. The material should be resistant to chemical penetration; for example, if penetration is a possibility, leather boots are not recommended.

Hard hats provide protection for the head while goggles and face shields protect the eyes and face. Ear plugs are recommended for protection against excessive noise levels created by heavy equipment on sites.

PROBLEMS OF PPE

PPE creates a microenvironment which results in physical strain on the worker. This reduces the total amount of time the worker is able to perform his/her job duties. Pressurized suits can mean a two- to four-fold increase in the energy expenditure required. Weight of protective equipment also causes a burden and reduces work time.

Heat stress is a major problem with PPE, but several corrective measures can be taken. First, it may be possible to add cooling systems to remove excess heat generated by both the metabolism and the environment. There are several types of systems: (1) evaporative cooling by circulating cool dry air throughout the suit, enhanced by the use of Vortex tubes; and (2) a pack or vest with packets of ice. Secondly, provision of fluids for workers, frequent rest breaks, rescheduling of work shifts, and providing rest and lunch areas in cool spots away from the work area are critical. Also important is *acclimatization* of workers (a gradual increase in the amount of time spent in hot environments.)

EPA/NIOSH RECOMMENDED ENSEMBLES

Both EPA and NIOSH have recommended ensembles for various levels of protection at hazardous waste sites. EPA's ensembles are classified from "A" to "D", with A offering the highest level of respiratory, skin, and eye protection. Level A is recommended for situations where: (1) the total atmospheric concentration of unidentified gases is greater than 500 ppm.; (2) there is a known or potential presence of extremely hazardous chemicals; and (3) the atmosphere is either oxygen deficient or IDLH. The recommended PPE for Level A includes pressure-demand SCBAs, fully encapsulating suits, inner and outer chemically-resistant gloves, chemically-resistant boots with steel shanks and toes, and two-way radio communication.

At the other end of the spectrum is Level D. This is for situations where there is *potential* for the accidental release of hazardous substances, but where there is sufficient oxygen and the probability of splashes or inhalation of hazardous chemicals is very low. The equipment required at Level D is coveralls, leather or chemically-resistant boots with steel toe and shank, safety glasses or goggles, and an "escape" air tank with a five-minute air supply.

NIOSH recommendations for ensembles differ slightly from EPA's with regard to respiratory protection.

PPE PROGRAM FOR WASTE SITES

Protection of waste site workers is best achieved through a comprehensive PPE program. A successful PPE program contains these components: material identification; environmental and medical surveillance; selection of equipment; training of workers in PPE use; fit testing of PPE; decontamination of equipment; inspection, maintenance and storage of PPE; written procedures; and program evaluation and review.

• **Material Identification.** Chemical and physical analysis of the material at the site may be needed. If hazardous material cannot be identified, we must often resort to the "worst case" level of protective equipment.

• **Environmental Surveillance.** Ongoing environmental surveillance is necessary to determine proper levels of PPE. Instruments used may include detector tubes, direct reading instruments, or other quantitative methods

continued on p. 10

PROTECTIVE EQUIPMENT

continued from p. 9

for assessing chemical contamination. It is also necessary to take measurements of temperature, relative humidity, and wind speed.

• **Medical Surveillance.** This serves several purposes. Before a worker begins, it may detect individual differences in *susceptibility* to the chemicals at the site before damage occurs. It can also be the basis for determining work assignments by revealing individual physical and psychological limits to wearing PPE. Later, medical surveillance can be an evaluation tool for judging the effectiveness of the PPE that was used.

• **Equipment Selection.** Selection should be based on hazards present, work mission and duration, and individual characteristics of the worker. The major difficulty is the unknown nature of the chemicals present. For example, preliminary analysis may determine that organic chemicals are at the site; however, properties of various possible organics may vary widely and so will the appropriate protection. Choice of a tyvek/saranex suit may be appropriate if the substance is kerosene, but may be inappropriate if the substance is another organic chemical which could penetrate the garment.

• **Training and Fit-Testing.** Employees need training in the nature of the hazards present, emergency procedures, site plan PPE requirements, medical surveillance requirements, and selection of PPE for specific tasks. They need to be fit-tested and instructed in proper procedures for inspection, maintenance, and use of their equipment. Discussion of the capabilities and limitations of their assigned PPE is a very important part of the training, along with learning emergency escape from some kinds of PPE (such as fully encapsulating suits). There should be ample time allowed for simulated work sessions wearing PPE at mock sites, prior to actual use at the real sites.

• **Decontamination.** If non-disposable equipment is used, there must be procedures for decontamination of clothing at the end of work shifts, or more frequently if deemed necessary. There should also be procedures for decontamination of workers in situations where exposure has occurred. For disposable PPE, proper disposal methods should be used.

• **Written Program.** A written program, delineating all the above points, should be included in site safety plans. The program should include specifications for types of PPE to be used in each work area on the site, and work/rest regimes. There should also be written procedures for reevaluating and modifying existing protocols.

SUMMARY

Since personal protective equipment is a major control method for waste site workers and the potential for unanticipated exposure is great, it is critical that effective PPE programs be established. In order to avoid some of the problems discussed in this article, personal protection strategies need to be developed that protect against the actual, rather than imagined risk. NIOSH is currently conducting studies in using *qualitative* analysis methods to determine the degree of hazard present at the site. Additionally, research needs to be undertaken in the development of PPE which is more effective and less burdensome to the workers who use it.

(For more information on personal protective equipment for waste sites, see the *NIOSH Guidance Manual for Superfund Activities*, Vol. III: **Personal Protective Equipment.**)

(Photo: Environmental Response Team, U.S. Environmental Protection Agency.)

California Legislation

Hayden Plans New VDT Bill; Interim Hearings Held

California Assemblyman Tom Hayden (D.-Santa Monica) has announced that he will introduce new legislation on video display terminals in the State Assembly in 1985. The bill will again be sponsored by the California Labor Federation.

Hayden's 1984 VDT bill, AB 3175, failed to pass the Assembly in June.

In its June vote, the Assembly referred the issue of VDT health and safety to its Committee on Labor and Employment. The Committee has begun a series of interim hearings in various locations throughout the state during the current legislative recess. The first hearing was held October 19 in Burlingame, and others are planned before the end of the year in Los Angeles and Sacramento.

Several VDT users, along with nearly 80 others representing both labor and industry, attended the Burlingame hearing. The hearing was divided into three segments: expert testimony; the employee/union perspective; and industry presentations.

EXPERT TESTIMONY

Expert witnesses included Marvin Dainoff, Ph.D., a NIOSH consultant; David Thompson, Ph.D., of Stanford University's Industrial Engineering Dept.; Stan Taylor, Ph.D., a Human Factors psychologist for IBM; and Laura Stock of the Labor Occupational Health Program. Stock reported that the volume of information requests from VDT operators has increased dramatically over the last five years at LOHP, and that there is abundant scientific research validating workers' claims that VDT use can cause high levels of eyestrain, muscle aches, and stress. She added that severral European countries have adopted VDT legislation, and that over 20 states in the U.S. are considering it.

Dainoff, a psychologist, said that his studies have shown that an "ideal" VDT work station (incorporating the latest understanding of glare control, lighting, adjustability, and worker rest breaks) can not only decrease health complaints but also dramatically increases productivity. Thompson emphasized his view that workers who have less meaningful tasks and do not set their own pace suffer most from VDT problems. Stress, he suggested, is a more likely cause of VDT workers' pregnancy problems than radiation. Taylor of IBM reported on the efforts being made by the American National Standards Institute (ANSI) to develop standards for VDTs; he admitted, however, that there are no labor representatives on the panel drafting them.

LABOR AND INDUSTRY VIEWS

The employee perspective was presented by union representatives and by several rank-and-file VDT workers. Tom Rankin, research director of the California Labor Federation, emphasized that state legislation is necessary because the option of pushing for a Cal/OSHA VDT standard is not really practical. Cal/OSHA, said Rankin, now has only one person assigned to writing new standards, and the process would take approximately seven years.

Other union representatives who spoke included Janet Schneider of SEIU Local 660 and the Southern California VDT Task Force; James Gordon of the Communications Workers of America; Marcia Summers of "9 to 5"; Bill Davis of The Newspaper Guild, Local 89; and Alexis Rankin of SEIU Local 390/400. Ms. Rankin discussed her union's survey of radio dispatchers at the San Francisco Police Department, who attributed blurred vision and pain to the VDTs they use. "I doubt if any of you would want your emergency call taken by a dispatcher in that condition," she said.

VDT workers testified about their personal experiences and health problems; they included airline reservation agents, law office workers, and newsroom employees.

Industry representatives who attended were unanimously opposed to legislation on VDTs, at least until more studies are done. A spokesman for Bell Labs expressed skepticism that radiation from VDTs could be harmful, and a printing industry representative complained that mandatory rest breaks for VDT operators would have "devastating effects on California employers."

—Adapted from Video Views

VDT NEWS ROUNDUP

Claims processors at the **Equitable Life Assurance Society** in Syracuse, N.Y., signed a union contract with the company in early November. It is the first labor agreement in the company's history, and includes important language on VDTs.

The pact was signed with the Service Employees International Union, AFL-CIO, representing 54 claims processors. SEIU and the AFL-CIO had been boycotting Equitable nationally for 18 months because negotiations had stalled.

VDT provisions of the agreement include installation of glare screens, shades, adjustable chairs, rest breaks, and transfer rights for pregnant employees.

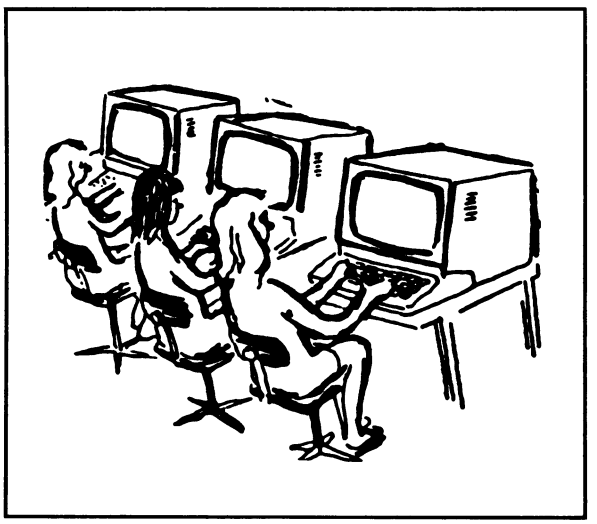
SEIU representative Denise Mitchell called the contract "pioneering" and said that it paves the way for worker protection in automated offices "in the insurance business and in private industry in general."

The **American Bar Association** has released findings of a study in which it examined legal implications for employers of disabling employee health problems linked to VDTs.

The findings appear in the ABA's *Mental and Physical Disability Law Reporter.* The authors conclude that existing law has not caught up with modern technology. Currently, they say, no federal or state legislation specifically governs VDT use, and VDT-related injuries and illnesses are covered by a "disjointed array" of provisions which include common law, workers' compensation statutes, unemployment compensation law, OSHA law, and sometimes collective bargaining agreements. All of these may be interpreted differently by different courts.

The present system, the authors suggest, does not serve either employers or employees well. Employees find financial recovery difficult. Workers' compensation laws usually prohibit separate lawsuits, and even if lawsuits are filed, causation is difficult to prove. Unemployment compensation is available to the VDT operator who is unable to work, or who quits under stress, only rarely. Similarly, unions have "not been particularly successful in convincing employers to incorporate VDT concerns into the bargaining process."

The authors urge that Congress undertake a comprehensive study to collect data and to make recommendations about desirable controls on VDT use and mechanisms which should be available to operators to redress legitimate VDT-related disabilities. They particularly emphasize that Congress should study VDT emissions such as low-frequency radiation.



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