

**Implementation of the
OSHA Hazard Communication Standard
for Small Businesses**

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IMPLEMENTATION OF THE OSHA HAZARD COMMUNICATION STANDARD FOR SMALL BUSINESSES

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INTRODUCTION

Why have a manual specifically for SMALL businesses?

The small employer places a high value on the health and well-being of his/her employees, especially since family members and personal acquaintances are frequently employed. Moreover, the size of the workplace can promote the closeness and concern for one another that is valued by small businesses. Because of the small workforce, it can be difficult to see patterns of occupationally-related conditions or illnesses. If only one worker develops dermatitis or cancer, it might be assumed to be an isolated event or not perceived as being work-related. When occupationally-related illness goes unrecognized, employees continue to work at risk to their health and safety, and health effects may become progressively more severe.

Small employers face several unique situations in complying with Hazard Communication Standard. Large purchasing capacity may enable the bigger company to deal directly with manufacturers in such things as obtaining information and pursuing alternative products with lesser hazards. In contrast, the small business must often deal through distributors and other middlemen, a process which may limit access to information. Information can slip through the cracks in the process of making its way from manufacturer through distributors to the end user. Small businesses may face less stable futures than their larger counterparts, and shorter product runs and lower production volume over which to amortize the costs of engineering controls or protective equipment. As a result, workers may fear losing their jobs due to such costs or in response to complaints about unhealthy conditions, and manager/owners may hesitate in taking necessary action to protect health. The reward for reducing workplace hazards can be obvious in reduced insurance costs, reduced injuries and compensation claims, reduced absenteeism, reduced illness and sick time, improved productivity and job satisfaction, reduced employee turnover/training/wage replacement costs. These are major expenses for all businesses. The tighter inventory control and pro-active planning which are the natural results of a compliance program can show immediate financial returns. Improved product and process awareness as a result of MSDSs and hazard assessments can have important impacts on process innovation as well as facilitating the selection of less hazardous substitute products.

The OSHA Hazard Communication Standard (HCS) places strong reliance on information availability and transfer. Information intensive regulations focus on prevention -- preventing work-related injury and illness by minimizing the chemical exposures in the first place. Greater access to information allows the employee to take a more active role in improving workplace safety and health. As employees become aware of the potential work-relatedness of an illness, they can be alert to preventing potential exposures, recognizing the early warning signs of chemical releases, and regularly using protective measures to safeguard their own health.

The HCS is one aspect of the "Information Society" which will increasingly impact on American business in the years to come. As the computer and related information technologies and their regulatory equivalents such as the HCS and SARA Title III, provide increasingly wide access to information in the workplace and in the community, managers may feel unnecessarily threatened. Increased information availability can allow pathways for channeling and acting on employee observations and concerns. Improved information access can increase satisfaction and participation through an understanding of processes and work rules and an understanding of why they must

operate in a specific fashion. Further, an increasingly aware workforce can make key observations and innovative suggestions which will improve operations and contribute significantly to an employer's competitive position.

Keeping a small business running takes considerable time and attention. This manual is written to provide straightforward information and strategies to help make implementation of the Hazard Communication Standard more efficient for the busy owner/operator who has many additional responsibilities.

The small business utilizes a single owner/operator or a small number of supervisors with multiple responsibilities. Small workforces, limited resources, limited time, and limited technical expertise can make implementation of a Hazard Communication Program difficult. The Hazard Communication Standard involves the use of technical and scientific information, and the small business can rarely justify full or part-time technical staff to implement the provisions of this regulation. This manual is organized in steps reflecting the sequence of tasks to be accomplished in order to comply with the Hazard Communication Standard.

Although this manual can be used by companies of all sizes, those who have organizations large enough to justify full time positions in employee relations, health and safety, or risk management should strongly consider more detailed custom programs and more extensive technical resources. Contact a reputable industrial hygiene consultant, or (in New York State) your regional Cornell NYSSILR Extension Office for referral or assistance in initiating such a program. There are limitations to the direction which a standardized manual can provide. Recognize that, where health risks, organizational or technical difficulties exist, it may well be to your advantage to seek further professional assistance.

**Step 1
Understanding the
OSHA Hazard Communication Standard (29 CFR 1910.1200)**

The OSHA Hazard Communication Standard (HCS) is a federal occupational safety and health standard which is in Chapter 29 of the Code of Federal Regulations (CFR) in Part 1910 @ paragraph 1200. The current text of the standard is included in full as Appendix 1. You can obtain additional copies by contacting your regional OSHA office (see Appendix 3: Resources).

The intent of this standard is to provide information on hazardous materials in the workplace to employers and employees. Enhanced awareness presumably results in reduced exposure to unnecessary risks and reduced injury and illness related to chemical use. This information is to be provided using:

- 1. Container labeling and other forms of warning**
- 2. Material safety data sheets**
- 3. Employee training**
- 4. Access to written records**

Without an awareness that hazardous chemicals are present in the workplace, the risk of illness and injury due to occupational chemical exposures is increased. Appropriate protective measures and work practices cannot be implemented when the presence of a hazard is unknown.

The meaning of the word "hazard" as it is used in this HCS is a substance, situation, or condition which is capable of doing harm. This addresses the **potential** of a chemical to do harm. Even if the harm is unlikely to occur when proper precautions are taken, the **potential** for harm is always present. You will find that many materials which are ordinarily thought of as harmless and inoffensive are classed as hazardous because of their potential. For example, handsoap used in the restroom may be considered hazardous because it is an eye irritant if it is splashed into the eyes. Most people consider this material harmless because it is unlikely to get in the eyes and, even if it does, the resulting injury is probably minor. This leads us to the concept of risk, and illustrates the importance of negative information. It is equally important to know what is relatively safe and what involves considerable risk.

When working with materials which have a hazard potential, evaluation of risk raises two questions:

1. How likely is it that harm may occur?, and;
2. How serious will the harm be if it does occur?

You answer these questions about your daily tasks all the time and decide whether or not you are going to do a particular task. If you decide to undertake the task, a judgement is made about how to do it safely and quickly. If you decide not to do the task because it is too "risky", it is because you have asked yourselves these two questions and have decided that you probably will get hurt badly and you are powerless to minimize the potential

for harm or the injury itself. In making risk decisions about familiar tasks, such as driving a car or smoking a cigarette, people consider whether or not to pursue a certain course based upon their knowledge of the risks and the perceived benefits (e.g., transportation or peer group acceptance). If they subsequently are hurt or become sick, they feel that the odds were known. The HCS guarantees employers and employees the information they need to make the same kinds of judgements about workplace exposure to chemicals by providing the warnings, health information, and training necessary to make such assessments and do a job safely. With this information in hand, the employee has the information necessary to decide if he wants to continue doing this job or look for other employment because he considers the risks unacceptable. On the job, it allows him to know what his risks are, how to do the job safely, and what may happen to him if he doesn't use the appropriate protective measures and procedures.

The information approach of this Standard deals with two basic problems:

1. Inappropriate work rules and practices. Knowing what the hazard potential is tends to encourage employers to design and construct engineering controls and enforce safe work practices and workers to use protective measures and procedures. Without knowing what the health or injury risks are, workers often decide that protective equipment is too uncomfortable or unnecessary, or that safe work procedures take too much time. "I won't wear my respirator today because its too hot and humid and one day without it won't kill me" or "I can't work rapidly with all these gloves and boots and protective clothing on" and other justifications workers make to themselves about not doing things safely. Man is a rationalizing animal and needs information and training to become a rational one.

2. Individual self-determination. People dislike it if others make decisions about what risks will be taken with their own health, no matter what decision they would make if asked. Employees need to know if the chemicals with which they are regularly required to work have devastating long-term (e.g., causes bladder cancer) or other health risks. People prefer to make their own decisions about what is "safe". Safety is not something which can be guaranteed, but is a judgement as to how acceptable each person finds the risks. With adequate information on chemical hazards, we can each take an active role in protecting our own health.

SCOPE, APPLICATION, AND EFFECTIVE DATES

Who is required to fulfill the requirements of this regulation? When OSHA originally drafted the Standard, they aimed first at the manufacturing sector since it has a disproportionately higher risk of chemically-related injuries and illnesses.

<p>As of November 25, 1985, chemical manufacturers and importers were required to label chemicals leaving the workplace and provide material safety data sheets to manufacturers in Standard Industrial Classifications (SIC) 20 - 39. As of May 25, 1986, employers in SIC 20 -39 were required to meet the entire Standard.</p>

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As the result of litigation initiated by employees who felt that they had been overlooked in terms of their workplace hazards and employers (some of whom preferred the Federal Standard over varied State Laws), a court settlement was reached on May 29, 1987, which required OSHA to extend the Hazard Communication Standard to all workplaces. The extension of the Standard occurred on August 24, 1987, as a result of that decision.

Chemical manufacturers, importers, and distributors must provide material safety data sheets with the next shipment after September 23, 1987. As of **May 23, 1988**, employers in **non-manufacturing industries** must also comply with all provisions of the Standard.

Thus, the Hazard Communication Standard applies to virtually all employers. However, pending the resolution of current litigation, enforcement is barred in the construction industry. Comparable regulations for mining industries (under the Mine Safety and Health Administration-MSHA) have been initiated but not completed.

Summary of the Requirements: OSHA Hazard Communication Standard

If your company has an existing health and safety program which complies with these requirements then you do not need to institute a new program.

A. Written Hazard Communication Program

The written hazard communication program is a written summary of how the employer is meeting the requirements of the HCS -- that is, describing how hazard evaluations, labels and other warnings, MSDSs, employee information and training are being accomplished. This plan should include only what the employer is actually doing to communicate hazard information. Planned future programs must clearly state implementation dates. This Plan must include:

1. A **chemical inventory**: This is a list of hazardous chemicals present in the workplace; the list may be for the workplace as a whole or categorized by work area. Each chemical on the inventory must be referenced to the appropriate material safety data sheet.
2. A description of the **hazard evaluation** and review process used in creating MSDSs and labels for products the employer manufactures or imports, for hazardous materials to which employees may be exposed which are created by processes conducted in the worksite (e.g., welding fume, effluent streams, etc.), or other hazard evaluations the employer chooses to conduct.
3. A description of how the employer will assure the proper **labeling** or placarding and maintenance of labels for all hazardous material containers, tanks, etc. in the worksite and all containers leaving the worksite.
4. A description of how the employer will maintain and update the file of material safety data sheets (**MSDSs**) and how employees will gain access to the MSDSs.
5. A description of how the employer will **train** the current and future employees in the hazards of the workplace, including informing employees of the hazards of unlabeled pipes and non-routine tasks (including potential exposures resulting from hazardous materials brought on site by other employers/contractors).
6. A description of how the employer will **retrain** its employees when new hazards are introduced into the workplace, or new hazard information is obtained.
7. A description of how the employer will provide information to **other employers** (e.g., contractors) to enable them to properly inform their employees which may be exposed to the chemicals on your worksite.

Your written hazard communication program must be available upon request to your employees, their representatives, and others (such as OSHA inspectors) as per 29 CFR 1910.20(e) "Access to employee exposure and medical records". This regulation requires employee access to be provided in a reasonable time, place, and manner; but in no event later than 15 days after the request for access is made.

B. Inventory of all Hazardous Materials indexed to MSDSs

C. Hazard Evaluation

Manufacturers and importers are required to evaluate the hazards of the chemicals they manufacture or import. They must document their hazard determination procedures. What references did they consult, what computer databases did they search? How do they intend to review such information in a continuing process to keep hazard evaluations current? Employers purchasing these products, however, are not required to reevaluate product hazards themselves unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer. Health hazard evidence which is statistically significant and based on at least one positive scientific study is sufficient to establish a hazardous effect.

Hazard determination is required for hazards known to be present in the workplace and to which employees may be exposed under normal conditions or in a foreseeable emergency. Intermediate process streams do not have to be analyzed, if they are part of a closed system.

D. Labels and Other Forms of Warning:

The labeling requirement pertains to both in-plant containers and shipping containers, although less information is required for the labeling of in-plant containers. Batch tickets, operating procedures, production sheets, etc., are acceptable but these must contain the same information as a label would contain and must be readily visible from the work area. This labeling requirement does not apply if a label is required by another Federal agency (e.g., pesticides).

The label must contain the following:

1. **Product NAME** or chemical identifier exactly as it appears on the material safety data sheet. This allows a clear association between the MSDS and the container.
2. **Appropriate hazard warning(s)**, including health and physical hazards.
Target-organ effect labeling must appear on shipped containers but is not needed on in-plant containers. Precautionary labels, rather than warning of specific hazards, are sufficient for in-plant containers provided they are used in combination with the hazard communication program to promote safe handling and use of hazardous chemicals in the workplace. If target-organ labeling is present on a container when it arrives in the plant, these labels should not be defaced or removed from the original containers.
3. **The name and address of the manufacturer** (not required for in-plant labeling).

Temporary transfer containers need not be labeled if they are for the immediate use of the employee who performs the transfer. However, the contents of the transfer container must be consumed by that employee during a work shift.

Labels and warnings must be written in English; but other languages may be used as well if appropriate to the workforce.

OSHA regulates some hazardous materials in substance-specific health standards. Where this is the case, chemical products having such components must have labels or warnings which conform with that specific standard. See 29 CFR 1910.1000.

E. MATERIAL SAFETY DATA SHEETS (MSDSs):

1. Manufacturers and importers shall obtain or develop a MSDS for each hazardous chemical they produce or import. Employers shall have an MSDS for each hazardous chemical for which possible exposure is foreseeable.
2. MSDSs must be written in English.
3. An MSDS shall contain [see Appendix 2 - MSDS in Detail]
4. An MSDS must be supplied with the initial shipment to a customer and with the first shipment after an MSDS has been updated. The MSDS may be sent with the container or shipped to the purchaser prior to or at the same time as the product shipment.
5. An employer must have a copy of the MSDSs for each hazardous chemical in the workplace and maintain these MSDSs in such a way that they are readily accessible during each work shift to employees when they are in their work area(s).
6. MSDSs may be in any form, including integrated into operating procedures, and may cover groups of chemicals in the work area where addressing a process as a whole is more appropriate.

F. EMPLOYEE TRAINING

Employees must be trained so that they are aware of chemical hazards before they are exposed to those chemicals. Training must be performed at the time of an employee's initial work assignment and whenever a new type of chemical hazard is introduced into the work area.

The content of training includes informing employees of:

1. The requirements of the Hazard Communication Standard.
2. Operations in their work area(s) where hazardous chemicals are present.
3. Identification of these materials and the location, availability, and interpretation of MSDSs and labels for these chemicals.
4. Training must include process or product specific information on:
 - a. Methods and observations an employee can use to detect the presence or release of hazardous chemicals in the workplace.

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- b. Hazards of chemicals and processes in the workplace (physical effects and immediate and long-term health effects).
 - c. Protective measures and proper work practices: What the employee can do to reduce his/her risk of occupational illness or injury related to chemical exposures, and measures the employer has taken to minimize such risks.
5. How the employee can obtain additional information on potentially hazardous materials.
 6. The hazards of non-routine tasks, such as tank cleaning or tasks which are performed at infrequent intervals.
 7. The hazards of chemicals in unlabeled pipes.

Step 2

Implementation in an Organization: Responsibility, Accountability, and Secondary Benefits

Although the technical problems may present an ominous first impression of the Hazard Communication Standard, the organizational and administrative roadblocks are often the most persistent. New and continuing responsibilities, tasks, and expertise must be integrated into the organizational structure. Hiring a consultant to "bring you into compliance" is often an ineffective procedure. First level supervisors must be able to understand, explain to new employees, and enforce safe and healthful work practices which minimize chemical exposures; just as they explain procedures which result in improved product quality or increased production. Managers and owner/operators must reinforce and reward these activities and plan proactively to address existing hazards and minimize the introduction of new hazards. Unions and worker representatives must continuously evaluate and assure adequate implementation, encourage active participation, and facilitate the flow of information and inquiries. Individual workers must come to see the chemicals they use in the same light as a tradesman views his tools; some may have the potential to cause burns or injury if mishandled, but if you learn to use them properly they are invaluable.

As individuals we must learn enough to develop **chemical common sense**, so that we can choose the path of least risk. Like the tradesman and his tools, we must choose practices and materials with reasonable risks relative to the task. We often use the chemical equivalent of a crane and wrecking ball to do tasks for which one man with a hammer would be more appropriate. An increased awareness of the chemical tools we work with is a critical step towards developing chemical common sense.

Supervisors and managers at all levels are commonly responsible for enforcing work rules and assuring that work is done in the proper fashion; however, the concept of explaining the logic behind their actions to their employees is often foreign. Employee hazard awareness does more than improve compliance with work rules through motivation, it empowers workers to observe the workplace environment and understand the implications of specific occurrences. The employees' observations and conclusions are valuable resources which are often underutilized by employers. The supervisor or manager cannot be everywhere all the time — utilizing the eyes and minds of employees to identify problems and possible solutions can produce significant benefits.

Consider the requirements of the HCS and related regulations and identify the individuals within your organization who will be responsible for various aspects of the program. Establish a preliminary outline of a written hazard communication program and schedule dates for intermediate task completion. In a larger organization it is useful to have managers meet to establish the roles of individuals and departments within the organization. Many of the required tasks may naturally fall onto the desks of specific individuals. Purchasing, individuals responsible for dealing with suppliers, or receiving could handle requesting and acquisition of MSDSs. Personnel may handle maintenance of training records, and perhaps new employee orientation. Those involved in contract negotiations should include boilerplate (standardized contract) language for obtaining MSDSs prior to bringing hazardous materials on site.

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Management or supervisors in each work area should be involved in inventory, assessment, training design, labeling as they have knowledge of the actual processes and individuals to be trained. Occupational injury and illness of those they supervise is already management's responsibility, as is educating workers to do their jobs properly. By integrating tasks into the business' structure, health and safety is not viewed as independent of normal operations. Technical experts and consultants should serve advisory roles; that of answering questions rather than being responsible for key components of the hazard communication program.

You may wish to consider the use of working groups which include employees, or a joint labor-management safety committee as a means of discussing chemical hazard questions which may arise in the future. The structure you develop should utilize to the extent possible the observations and innovative suggestions of employees to optimize operations. In the unionized workplace, worker representatives are often an excellent source of information on what hazards employees would like to see addressed in training.

Working with the union on health and safety issues can do much to reduce tensions and suspicions that management is concealing information on workplace hazards. A joint labor-management group can function as a forum for resolving issues without resorting to relatively burdensome grievance and arbitration procedures. Management benefits through this approach by facilitating the communication of constructive suggestions and valid complaints in a structured manner. Labor has an ongoing means of input on operational problems which affect employees, and gains an opportunity to show management that the union is a responsible organization with a constructive role. This kind of involvement is another way to help keep your Hazard Communication Program operating smoothly and consistently over the long term.

Consider establishing work rules which address safety; this enables the use of progressive discipline to enforce safe work practices. Making safe work practices a part of employee job descriptions enables employees to be evaluated and rewarded for following and enforcing them. Work rules should always be established with the involvement of those actually conducting the task. Often a rule sounds reasonable until you actually have to follow it. A minimum number of simple work rules which will be actively enforced should be considered. Work rules are useful to the new worker and supervisor in defining proper work practices, particularly for high risk operations (e.g., confined space entry, lockout/tagout for machine maintenance).

Secondary Benefits of Implementation

The primary benefit of a Hazard Communication Program is fewer occupational injuries and illness; resulting in reduced costs related to compensation, medical expenses, lost time, absenteeism, employee turnover and training, replacement wages, etc. Secondary benefits may also arise. Some of the work you perform to meet the HCS has other applications which may save you time and money or help you deal with other regulations. Chemical inventories should allow improved purchasing practices to minimize inventory costs. Getting rid of old or no longer used products now may save considerable expense and effort as restrictions on disposal and storage are tightened. As the properties of the chemical products in use become known, products can be chosen with reduced hazards and/or with easier disposal. You may wish to consider the use of work groups with employee representatives or a joint labor-management safety committee as a means of airing and discussing chemical hazard questions which may arise in the future.

System and Process Improvement

A well-functioning Program which achieves the Standard's goal of reducing occupational injury and illness should mean less downtime, less expense of emergency response, and less worker lost time. This could mean improved productivity for your plant. Increased employee awareness of production processes can also result in increased employee innovations and observations which improve production.

Chemical Inventory and MSDSs

A chemical inventory can be a valuable source of planning information. Consider using your chemical inventory for:

a. Streamlining your chemical product purchasing. Unnecessarily large inventories of some products can be reduced. Purchasing of similar products from multiple sources can be consolidated with resulting volume discounts. Once you become aware of product composition based on MSDSs you may find similar products that differ only in concentration. Many products are sold as dilutions of a concentrate; a detergent concentrate diluted with water may result in a general cleaner, floor cleaner, and a heavy duty cleaner. Purchasing concentrates may be far cheaper than buying each product individually. Alternative products may do the job as well but present fewer physical and health hazards. Not only can this make the workplace safer, it can also save you money by reducing or eliminating the necessity for engineering controls or protective equipment. It may even lower insurance rates. Substitute products might eliminate the need to handle wastes as hazardous, a big cost savings. Obtain product MSDSs before purchase to determine equipment or disposal needs. Don't buy products which require things your plant doesn't have, such as special storage cabinets, refrigeration, special ventilation systems, or respirator use and its attendant fitting and training requirements (as well as the problem of enforcing their use by your employees). Rather than the purchase price, consider the overall price of using a product including purchase, shipping, storage, equipment and engineering controls, employee training, disposal, and paperwork for hazardous materials and hazardous waste.

b. Housekeeping and streamlining your storage of chemical products. While conducting the inventory, keep track of products to be discarded and put them aside for proper disposal. Not only is it cheaper to arrange for the disposal of a large batch of products at one time, it also decreases the number of substances on which you must train your workforce. Note how materials are stored and correct any problems; this may also save you insurance costs as well as possible OSHA violations.

c. Fulfilling some of the chemical reporting requirements under the Superfund Amendment and Reauthorization Act (SARA) regulations. When performing your chemical inventory for the OSHA Hazard Communication Standard, include quantities and storage information as this will serve you well in meeting the new Superfund Regulations. Under SARA, any extremely hazardous chemicals and hazardous materials used over 10,000 pounds (soon to drop to 500 pounds) per year must be reported to your local emergency planning committee and fire department. Doing a single inventory to meet both the HCS and Superfund can reduce duplicative work. Reporting requirements under SARA may be reduced or eliminated if you find substitutes for or discontinue the storage and use of extremely hazardous chemical products in reportable quantities. Manufacturers and importers using over 10,000 or processing over 75,000 pounds per year of any hazardous material have additional requirements for reporting emissions. Call your county emergency response planning office (or see Appendix 3-Resources) for assistance and forms for SARA Title III reporting.

OSHA Inspections

Even with the limited number of inspectors and the tendency of inspections to be 80/20 in favor of larger businesses, inspections or investigations based upon employee complaints are always possible. Your program may not be perfect, but making a good attempt and documenting all you do will go a long way toward demonstrating a good faith effort at compliance. Since much of the Standard involves record-keeping, and since each OSHA violation costs money, record-keeping violations tend to be extremely expensive. It is an irony of the OSHA Act that each recordkeeping violation counts as one violation just as a human injury or death counts as one violation, so a company can total up more monetary fines for poor recordkeeping than for human injury.

Legal Liability

This could be considerable for product manufacturers and importers if downstream employees are injured as a result of inadequate or inaccurate MSDSs. In most states, Workers' Compensation Laws limit the ability of employees to sue their own employer. However, any errors which could be construed as intentional misinformation, misrepresentation, or intentional withholding of information from employees which result in injury or illness may be considered as willful, and therefore not limited as employer negligence suits. Under the Community Right to Know Act of 1986 (SARA Title III) employers are also liable for accurate reporting of hazardous chemical inventories and emissions or they may face significant administrative and civil penalties.

Smoking on-the-job

Needless to say, smoking can be a very hot issue. A common consequence of learning about chemical hazards is a determination that, due to health and/or physical hazard reasons it is found to be impossible to permit smoking in certain work areas. This could be due to flammability, hazardous breakdown products as vapors burn on passing through the cigarette, or the hand-to-mouth contact typical of smoking which can increase ingestion of hazardous chemicals. Yet it can be costly to provide separate smoking areas. The health risk factors for smoking are higher than for most occupational chemical exposures. In some instances this has led to "blame the smoker" attitudes by management and encouraged arguments such as, "if workers were really concerned about health, they would stop smoking". If smoking is not banned in the workplace, then the consideration of smokers as a sensitive group should be a part of hazard evaluations. It may be possible to soften the impact of this issue by helping workers to stop smoking with smoking-cessation programs. Prohibiting smoking in certain work areas may also provide cost savings on both health and fire insurance.

Step 3

WRITING A HAZARD COMMUNICATION PROGRAM

In the written hazard communication program, your company will set forth a description of how you intend to meet the Standard's requirements for labels and other forms of warning, material safety data sheets, and employee information access and training. The sample program shown below illustrates a suggested format for such a program and is accompanied by explanations and strategy in preparing each section.

EXPLANATIONS AND STRATEGY

I. INTRODUCTION

Although an introduction is not necessary, it is suggested so as to provide a brief summary of the Standard and a statement of your company's policy and commitment to comply. When read by employees (and others), they will have an understanding of the overall framework of the Standard and the role of the written program as well as an overview of the program's components.

Also included in this section is the location of the written program; where and how employees will obtain access to it. Outsiders (such as OSHA inspectors) reading the program will also need to know how employee access to information is arranged. For employers with multiple worksites, the written program must be maintained at each site.

II. LABELS

In this section, you will discuss how you intend to provide employee warnings: container labels, placards, signs, process sheets, batch tickets, operating procedures, or other written materials, so long as these alternatives provide the information which would be on a label.

State who is responsible for labeling; either by job title (such as "all receiving clerks shall assure the adequate labeling of incoming containers") or name and title of a specific individual. Once you have labeled all on-site containers, future labeling tasks actually involve three jobs: labeling incoming containers as they arrive on-site (where required), labeling break-down containers, and maintaining existing labels which become defaced or lost. As we progress through the Written Program, you will see provisions which deal with the handling of containers as they arrive at the plant; but someone is going to have to be responsible for maintaining labels. This task could be done by department, by work area, or whatever is appropriate.

The labeling described here meets the minimum requirements of the Standard; more could be put on the label if you wish. Chemical containers used on-site do not require the name and address of the manufacturer; this is needed only for containers leaving the site.

A provision was included concerning reviewing the labeling system for its adequacy because a new labeling system might not work out as planned and require more handling than desired. This provision gives you the option of scrapping it and trying something else.

Sample Written Hazard Communication Program

A suggested format which illustrates key organizational decisions and assignments of responsibility by the employer should be considered in order to meet the Standard's requirements for labels and other forms of warning, material safety data sheets, and employee information access and training. A sample program is boxed with discussion on opposing pages.

Sample Written Hazard Communication Program

I. INTRODUCTION

The U. S. Department of Labor Occupational Safety and Health Administration promulgated an occupational safety and health standard entitled "Hazard Communication" (29 CFR 1910.1200). The standard requires chemical manufacturers and importers to assess the hazards of chemicals which they produce or import, and all employers, Standard Industrial Classification (SIC) codes 1000 through 8999, to provide information to their employees concerning hazardous chemicals by means of hazard communication programs including:

- Hazard evaluation
- Written hazard communication program
- Labels
- Material safety data sheets
- Training
- Access to information and written records

Implementation of this final standard will reduce the incidence of chemically-related occupational illness and other injuries in employees of the manufacturing division. Increased availability of hazard information will assist employers in these industries to devise appropriate protective measures, and will give employees the information they need to take steps to protect themselves.

It is the intent of {OUR COMPANY} to comply with the provisions of this standard in our continuing effort to maintain a safe and healthful workplace for its employees. Written copies of this program are included in {the MSDS binders} discussed in Section III below.

II. LABELS

1. The {Receiving Clerk?} is responsible for required labeling of in-plant containers as these materials are delivered on-site by verifying that the required information is present on the container(s) or by affixing new labeling as required. Each {Department Supervisor?} is responsible for maintaining the appropriate labeling of chemicals in his/her department.

2. All chemical containers will:
- a. Be clearly labeled as to the contents
 - b. Note the appropriate hazard warning
 - c. List the name and address of the manufacturer.

3. During the annual update of the chemical inventory (see Section VII below), the company labeling system will be reviewed for adequacy and updated as required.

III. MATERIAL SAFETY DATA SHEETS (MSDS's)

1. Where are MSDS's located and how are they organized? To ensure employee access during each work shift, MSDS's are placed in looseleaf binders to facilitate additions and removals. A copy is placed in each process department of the plant, receiving and purchasing (whose roles in the program will be discussed shortly), and an office copy. The office copy can be used by office personnel and serve as a reference copy which is less likely to suffer damage than copies in the plant process area. You may wish to have one good copy which is only used as a source of originals. The smaller your facility, the fewer such copies will probably be needed. The key is employee access on all work shifts. Just make sure that you don't lock your MSDSs in an office or storeroom where access is not possible during every shift.

If you maintain your MSDSs on computer, make sure employees can get access themselves or someone is available on each work shift who knows how to access them and is responsible for providing this service.

2. You should request MSDSs at the time of product purchase to ensure that the MSDS does arrive with or before the chemical product. Obtaining MSDSs before purchasing is even better; evaluate a product before you buy it! The purchasing department or buyer is usually the best choice for this task as an MSDS request can be printed or stamped onto each purchase order as a regular part of the purchasing process. If a telephone order is placed, the MSDS should be verbally requested as well as being requested on any printed confirming order. You only need to request MSDS's for those products for which you do not already have an MSDS. However, to initiate your program you may prefer to request one for all products, rather than looking up each product in your file to determine if you have an MSDS.

3. How will you verify that chemicals which arrive at the plant are either preceded or accompanied by the MSDS? When an MSDS arrives, it should be reviewed to determine if it is a new MSDS, an update, or a duplicate of one you already possess. New MSDSs should be read and checked for completeness, copied and distributed to all concerned personnel or MSDS files in the plant. New training may also be needed. If the MSDS is an update, you will need to check it against the older MSDS for changes, bring these changes to the attention of your personnel, copy and distribute the new version, and be sure to remove older copies keeping one old copy for your archive file. Duplicates can be discarded.

4. How will you handle chemicals arriving on the plant site without an MSDS? Someone must initiate a(nother) MSDS request with a series of stopgaps to trigger successive letters or actions to obtain the MSDS. How you handle the problem of uncooperative distributors or manufacturers will depend upon the nature of your business. When dealing with sole sources of supply, it may be necessary to proceed carefully. In general, withholding payment and considering alternative sources are effective means of obtaining a prompt response.

Will you use chemical products for which you have no MSDS? If you cannot delay use of the product until you obtain the MSDS, you must generate an interim MSDS (generally not recommended - see hazard evaluation).

5. How will you deal with an MSDS which is unsatisfactory, incomplete, or lacks vital information? In the sample program, a letter is sent which points out the deficiencies. Frequently, such a letter results in the receipt of a newer MSDS. In the course of reviewing MSDSs for their completeness, important new information (if any) must be conveyed to those people working with the product.

III. MATERIAL SAFETY DATA SHEETS (MSDS's)

1. MSDS's are filed in {three-ring binders and are organized by manufacturer;} this file is maintained by {NAME.TITLE}. To enable employee access to MSDS's on all work shifts, MSDS binders are located in:

- a. {Department {Receiving}}
- b. {Department ??}
- c. {Department ??}
- d. {Office ??}
- e. {Purchasing ??}

2. {NAME.TITLE} is responsible for requesting MSDS's for chemicals at the time an order is placed. A request for an MSDS accompanies each purchase order for each chemical for which no MSDS is on file. For chemicals ordered by telephone, a request for an MSDS is made at the time of the order and is printed on the written purchase order which follows the phone order.

3. As chemicals are received at the plant, the {Receiving Clerk?} will check them against the current chemical inventory and MSDSs. If an MSDS arrives with the shipment, the MSDS will be sent to {NAME.TITLE} for review and distribution. If no MSDS accompanies the shipment, the {Receiving Clerk?} will check the chemical against the current inventory and MSDS file (binder) to verify if the chemical has been received on other occasions and if an MSDS is already on file.

4. If no MSDS is on file, the {Receiving Clerk?} will notify {NAME.TITLE} who will send a letter to the supplier requesting the MSDS (see sample letter) if Purchasing has not recently requested the MSDS. If the MSDS is not received within {two weeks,} a second request with stronger language (see sample letter) is sent to the supplier. If the MSDS is not received within two weeks as the result of this second request, alternative courses of action are taken such as, but not limited to, the following:

- a. The supplier is notified that payment of their account is delayed until the MSDS is received.
- b. The supplier is notified that alternative sources of supply are under consideration due to their failure to supply the MSDS.

Where a MSDS has not been received and work must progress, an interim MSDS (see form) will be filled out and use authorized by {NAME.TITLE} as described in Section VII.

5. As MSDS's are received, they are reviewed for content and completeness by {NAME.TITLE}. If an incomplete or otherwise unsatisfactory MSDS, is received, a letter is sent to the supplier (see sample letter) which describes the deficiency(s) and requests a more complete MSDS. When {NAME.TITLE} becomes aware of new and significant health information concerning a chemical used, the supervisor(s) whose employees use or are potentially exposed to the chemical are informed and they, in turn, inform their employees of this new information (See also Section VII below).

IV. TRAINING

Describe your employee training program. Generally, this involves several groups of employees: your current workforce, future newly hired workers, and employees exposed to new hazards introduced after their initial training.

1&2. The new employee will need to be trained in handling the chemicals associated with his job prior to being placed at risk of exposure. The HCS describes what specific topics must be covered in this training, however, the format and process of training must be designed to meet the needs of each workplace. The required topics have been divided into two tasks: general training before starting work on the plant site, and on-site training which is specific to a job assignment. The general training is typically similar for all employees and can use teaching aids such as videotapes and slides. Specific training requires a knowledge of actual processes and products in the work area and may be best handled within the employee's department. Any description of how to do a job should include how to do that job safely and with minimal health risk.

3. Retraining. The Hazard Communication Standard is a performance-based standard. There is no specific mandate for regular training, only the general requirement that employees must know the hazards, proper handling procedures, health effects, etc. of the chemicals they work with. Regular reinforcement of this information can be handled in a variety of ways: short, regular safety meetings; hour-long training sessions at regular intervals; annual re-training, etc. Public employers in New York State must conduct annual retraining for all employees potentially exposed to hazardous materials.

4. The Standard requires training concerning new chemical hazards introduced into the worksite. Employees must be trained in new types of hazards, not necessarily each new chemical or product. For example:

Your plant regularly uses solvents which cause adverse health effects to the nervous system and require the use of ventilation and protective gloves, etc. Your purchasing agent has found a substitute solvent for one of your metal parts degreasing operations which has a lower vapor pressure and is less of an inhalation hazard, but otherwise involves the same handling procedures as the product it will replace. You purchase it for regular use in the plant. It requires no new training.

In the same facility as above, the substitute degreasing product consists of a detergent and caustic solution which is different from any product which your employees use. The inhalation hazard is very low, but the solution is corrosive and will involve different handling procedures from the product which it will replace. You purchase it for regular use in the plant. It requires training.

5&6. Maintaining records of adherence to the HCS includes: a file which records the trainers' names, the workers who attended each training session, and a description of the content of the training. Such a description could be an outline of the topics covered, samples of handouts, titles and sources of films, slide presentations, etc. Since the Standard is performance-based, consider some kind of evaluation of the training to provide a measure of its effectiveness in retention of information on chemical hazards. This might include oral or written quizzes, the difference in scores between pre-tests and post-tests, evaluations asking for employees' input on how training was presented and whether it was adequate.

IV. TRAINING

1. Prior to starting work, each employee will attend a health and safety orientation and receives information and training on the following:
 - a. An overview of the requirements of the Hazard Communication Standard.
 - b. Location and availability of the written hazard communication program.
 - c. Physical and health effects of hazardous chemicals (general categories).
 - d. Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area
 - e. How to lessen or prevent exposure to hazardous chemicals through usage of control/work practices and personal protective equipment
 - f. Steps the company has taken to lessen or prevent exposure to chemicals
 - g. Emergency procedures to follow if he/she is exposed to chemicals
 - h. How to read labels and review MSDS's to obtain appropriate hazard information
 - i. Location and availability of MSDS files.

This training is the responsibility of {NAME, TITLE} and is accomplished by means of direct instruction, videotape, printed materials, and other methods as appropriate.

2. Upon assignment to a department, each new employee is trained by his immediate supervisor on the chemical hazards of that department and his work assignment, including but not limited to:

- a. Location and identification of all hazardous materials in the work area
- b. Understanding the information on MSDS's and labels of all chemicals used
- c. Use and function of engineering or administrative controls and steps the employer has taken to lessen or prevent exposure
- d. How to use and maintain any personal protective equipment involved
- e. Safe work practices and work rules in handling chemicals on the job
- f. What the employee should do in the event of an accident, injury, or spill.
- g. Access to additional information and who to ask.

This training is accomplished by direct instruction, printed materials, and any other methods as appropriate.

3. Existing employees are retrained annually by in-house personnel or outside contractors to review chemical hazard information.

4. Employees are trained concerning new chemical hazards when those hazards are introduced into the work area (see section III. 5. above).

5. A record is maintained in the Personnel Office of the content of training sessions, the name of the trainer, and the employees who attended (see sample form).

6. After training sessions, employees may receive brief oral, written tests or evaluations to assist in evaluating the effectiveness of the training.

V. Training on the Hazards of Non-Routine Tasks

Unusual or infrequent jobs may involve more or different hazards from routine work and thus may require special training, equipment, and information on hazards. Think about tasks performed at your worksite which will be done at intervals such as once a month or twice a year. For example: cleaning of storage tanks or reaction vessels; dismantling, cleaning, and servicing of process equipment; or perhaps using alternative processes to produce special runs or batches of specialty products.

The Standard requires training on specific topics. You may feel that the supervisor directly in charge of that task should do this training since he is most knowledgeable about the mechanics of the task. However, for specifics on health hazards or other technical information, you may wish to list here some in-plant resources who can assist in this training, or assist in obtaining outside advice or help.

VI. ON-SITE CONTRACTORS

This section deals with two aspects of the on-site contractor: (1) contractors who come onto your worksite may be exposed to your process chemicals and will need to know what those hazards are, and (2) contractors who bring their own chemicals onto your worksite to which your employees may be exposed and need to know about.

1. Who is responsible for providing the on-site contractor with information on chemicals his employees may be exposed to while on your plant site? For example:

You are having a problem with a motor control station for the chemical feeder pumps for one of your manufacturing processes and you call in an electrical contractor. In the course of performing the repair, the electricians will be exposed to solvent vapors and must work adjacent to the storage tanks, pumps, and piping for several of your processes' raw materials. The tanks are labeled, but the pumps and piping are not. There are chemicals on the floor due to leaking pump packing. You should inform the contractor that any of his employees coming onto your plant site will need to wear rubber boots and make available copies of the MSDSs for the chemicals in that area of the plant.

2. Who will make arrangements with contractors concerning the hazards of chemicals they bring on the plant site and pass on this information to your own employees who work in the vicinity of the contractor? For example:

You manufacture electronic components which are then wrapped in plastic for shipment and placed in cardboard cartons. To prevent damage during transportation, the void spaces in the cartons are then filled with polyurethane foam which is manufactured in place. Quarterly, the foam chemical manufacturer comes onto your plant site to service the foam system, using solvents to clean the chemical guns and clean the pressurized lines. Containers of these solvents are left on the site all the time, between service visits. Your employees will need to be aware of the hazards of the solvents since they are potentially exposed during the servicing, during initial use of the foaming system after each servicing, and in the event of an accidental spill or leak of the solvent containers. You should obtain MSDSs for these solvent cleaners, inform your employees of their hazards, and have the MSDSs in your file so that employees can refer to them in the event of a spill.

The Standard makes you responsible for training your own employees; otherwise you are only responsible for providing information, as discussed above, for contractors to train their own employees.

V. Training on the Hazards of Non-Routine Tasks

1. Prior to starting work on such projects, each affected employee will be given information about hazardous chemicals to which they may be exposed during such an activity. This information will include:

- a. Specific chemical hazards
- b. Protective/safety measures the employee can take
- c. Measures the company has taken to lessen the hazards including ventilation, respirators, presence of another employee, and emergency procedures.

2. Training on the hazards of non-routine tasks is the responsibility of the {employee's supervisor?}. This training is accomplished by means of direct instruction, printed materials, or other methods as appropriate. Examples of such non-routine tasks are:

- a. Cleaning the _____ (annually)
- b. Changing the _____ (once per week)
- c. Cleaning the _____ (every six months)
- d. Cleaning the _____ (every two - three months)

Responsible supervisors may seek assistance from {NAME.TITLE} in determining training content and responding to employee questions.

VI. ON-SITE CONTRACTORS

1. It is the responsibility of {NAME.TITLE} to provide contractors with access to the following information:

- a. MSDSs of hazardous chemicals to which employees may be exposed on the site
- b. Precautions employees may take to lessen the possibility of exposure by usage of appropriate protective measures.
- c. Where to find the posted telephone numbers of plant personnel who are to be contacted in the event of a chemical spill or accident.
- d. Emergency, fire, and spill procedures (alarms, equipment, evacuation, etc.)

2. {NAME.TITLE} will be responsible for establishing contract language requiring the provision of MSDSs prior to a contractor introducing hazardous materials onto the site, assuring compliance before work is started, and disseminating any information to our employees concerning significant chemical hazards that the contractor is bringing to our workplace. MSDSs will be obtained for all hazardous materials prior to bringing them on site. These MSDSs will be maintained as long as those materials are present.

It is the responsibility of the contractor to train his own employees.

On-site contractors are:

- a. Supplier/service representative of _____
- b. Custodial subcontractor _____

VII. CHEMICAL HAZARD EVALUATION PROCEDURES

As a manufacturer or importer of chemical products how do you evaluate the hazards of products or effluents? Even if you are not a chemical manufacturer, you may be involved in making products for your own use by reacting purchased chemicals. If you do this, you must generate an MSDS for such a product so that your employees can consult a single reference source and obtain information on such a product's hazards. If you do not manufacture chemicals regularly or incidentally, the Standard does not require you to evaluate chemical hazards yourself (although you may do so if you wish). You may accept the evaluations of the manufacturer, as presented in the MSDS. The hazard evaluation process is the area where small businesses are most likely to require the assistance of outside professionals or consultants.

1. The sample program specifically states acceptance of the manufacturer's evaluation as presented in the MSDSs. However, it also indicated an intention to consult other references when more detailed information is needed. For example:

One of your company's minor operations involves hand touch-up painting of metal cabinets after installing electronic motor control stations. The MSDS for one of the paints indicates that the pigment contains a component which can cause cancer but does not describe the type of cancer or the kind of exposure which might bring this about. Your employees want more information about this carcinogen. You seek additional information and find that that exposure to the carcinogen occurs only if they inhale paint spray or inhale dust or fumes from sanding or welding the painted metal. They do not perform any of these operations.

2. Review the MSDSs to evaluate the hazards of chemical products which are used. This identifies products of lesser hazard and considers substitute products. When acceptable safer substitutes are not available, work conditions such as ventilation, improved work practices, or as a last resort protective equipment should be utilized.

3. Evaluate what procedures are used to determine if the chemical products manufactured are considered hazardous as per the hazard definitions in the HCS. If they contain "hazardous" ingredients, an MSDS must be written. The HCS specifically designates certain materials as hazardous; these include chemicals listed in 29 CFR Part 1910.1000 Subpart Z, or the latest edition of ACGIH TLVs (see Appendix 3 - Resources). The physical hazard definitions are quite straightforward. A chemical is either flammable or it isn't, water-reactive or not, etc. Health hazards are not always as straightforward to determine. For a chemical product to be considered a carcinogen, it is necessary to consult the latest listings of: (1) NTP, Annual Report on Carcinogens (latest edition), (2) IARC, Monographs (latest editions), (3) 29 CFR Part 1910, Subpart z, (4) NIOSH Registry of Toxic Effects of Chemical Substances (RTECS).

For other acute and chronic health effects it is necessary to review reference texts (such as those listed in Appendix C of the HCS), to consult the technical literature directly or use computerized databases, or all of these. Moreover, MSDSs must be kept current, so manufacturers must review the current literature and modify MSDSs according to future findings.

VII. CHEMICAL HAZARD EVALUATION PROCEDURES

1. The MSDS provided by the manufacturer is used to evaluate chemical hazards. Other sources of information utilized for reference include, but are not limited to, the references listed at the end of 29 CFR 1910.1200, as well as MSDS's for similar products.
2. New MSDS's are reviewed as discussed above in Section III(5.). Every attempt will be made to use chemicals with minimal hazards: this will involve product substitution where possible, and/or the use of safe work practices and protective equipment.
3. Chemicals manufactured in-house are evaluated as per the Standard as described in Appendix B -- Hazard Determination:
 - a. Chemical or chemical products are considered carcinogens if they are listed by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or OSHA.
 - b. Human data, such as epidemiological studies and case reports of adverse health effects, are used wherever these are available.
 - c. Where human data are not available, animal studies are used to predict the health effects which may be experienced by humans.
 - d. The studies used in determining the health hazards reported on our MSDS's are derived from any studies which were designed and conducted according to established scientific principles and which reported statistically significant conclusions. If such studies refuted a hazard finding, these may also be reported on the MSDS.
 - e. The health studies and case histories which are used in performing our hazard determinations and updating our MSDS's are obtained by consulting the National Library of Medicine's MEDLARS On-line Databases and by using the most recent editions of standard reference texts listed in Appendix C of the Standard, such as Patty's Industrial Hygiene and Toxicology, the Clinical Toxicology of Commercial Products, Dangerous Properties of Industrial Materials, and others. The MEDLARS files are consulted on a monthly basis for updates and recent additions; revised MSDS's are issued within 3 months of our becoming aware of significant new information.

Such hazard determinations are the responsibility of {NAME.TITLE} .

4. When no MSDS is available for a product which is necessary for continued operation, a decision will be made by {NAME.TITLE} as to whether an interim MSDS (see form) will be created or the operation delayed. An interim MSDS will be created by {NAME.TITLE} based upon information from MSDS's of similar products and/or available references.

- One of the principal difficulties in health hazard evaluations is the lack of information on the effects of chemicals on humans. This is due to reasons such as:
- a. The chemical may be too dangerous for use in human studies; the health effects may be too severe,
 - b. Accidents involving human exposure to the chemical may not have occurred,
 - c. Accidents may have involved such overwhelmingly high exposures that is difficult to say what health effects may be caused by lesser exposures,

- d. It may have been impossible to determine what the actual exposure was during such an accident,
- e. Effects of acute exposure may be fairly well understood but effects of long-term low-level exposures are not. The chemical may not have been in use long enough for epidemiological studies or it may not have been studied long enough to draw conclusions about chronic exposure.

As a result, animal studies are usually the primary information source in predicting human health hazards. Unfortunately, humans may not always respond to chemicals in the same way or to the same extent as the animals used in such experiments. Humans may be more or less sensitive to a chemical, or may respond in different ways. In general, however, these animal effects are a good indicator of human responses.

It is important that you document how you determined your chemical products to be (or not to be) health hazards. Which books, technical publications, or databases did you consult? Explain your reasoning from these to make your conclusions. Who is responsible for making such determinations in your organization?

4. What is the procedure if a chemical product arrives at your facility, or you have a significant quantity of a material in storage and you have no MSDS? The conservative solution is to delay use of the product until you receive a manufacturer's MSDS, but this may not always be practical. Where necessary, you may create your own MSDS to use in the interim. This is only a reasonable option where the product can be characterized with certainty (e.g., you have an MSDS for mineral spirits from Company-X and you receive a similar shipment from Company-Y with no MSDS). Where the product composition is unknown or uncertain, use should be delayed. If you know the composition, you could start with OSHA's suggested MSDS form and fill in the required information by consulting MSDS's of similar products, standard reference texts, etc. Here you should indicate who is responsible for deciding whether you will wait for the MSDS or create your own MSDS and who is responsible for writing the interim MSDS. This is a serious decision as any misuse could result in significant liability.

Step 4

Chemical Inventory and Obtaining Material Safety Data Sheets

Performing the Chemical Inventory

Step 1. When performing the chemical inventory, walk through the plant, including its storerooms and outbuildings so as not to overlook potential hiding places.

Step 2. If this task must be delegated to others, be sure that their areas of responsibility are clearly defined in terms of buildings or rooms to be checked. The plant layout or blue prints of the buildings may aid in assigning specific areas to each supervisor. It is common for supervisors to think of the plant in terms of their own processes or tasks rather than strictly in terms of physical layout. As a result, storerooms and cabinets can be overlooked.

"When we were performing our plant chemical inventory, the only way I could get it done (our plant covers 64 acres) was to divide up the task among the department heads. When I received their individual lists, it looked as though they had done a really good job. So I walked through the plant myself, just as a quick check, to see if I could spot anything which didn't appear on someone's list. When I reached a large storeroom in Building #4, I found that materials stored there were not on anyone's list. I asked the Building #4 supervisor about the oversight and he told me, "those chemicals belong to the HVAC department". Then I asked the HVAC supervisor about the storeroom and he said, "that storeroom is located in Building #4, the Building #4 supervisor should inventory them". Considering the number of 55 gallon drums in that storeroom, it's a good thing I doublechecked the inventory with a quick walk-through; otherwise our inventory would have missed quite a few chemicals, including several corrosives."

Step 3. During the inventory, note:

- a. The manufacturer's name and address
- b. Product name or other identifiers (e.g., "solvent cement #SC1556")
- c. Quantity and container size

For example:

EQUIPMENT REPAIR AREA

1. Sprayway No. 945 Silicone Spray — 5 cans (6-oz ea.)
Sprayway, Inc.
484 Vista Ave.
Addison, IL 60101

2. Clover Compound Silicon Carbide — 1 can (8-oz ea.)
Clover Products Division
Fel-Pro Inc.
7450 N. McCormick Blvd.
Box C 1103
Skokie, IL 60076

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Step 4. To satisfy possible Superfund reporting requirements, review your products, eliminate duplicates, and consolidate quantities so that only one entry remains for any single product accompanied by its total quantity on site.

Step 5. A common problem with inventories is that items are omitted from the list because they do not fit someone's idea of what is a "hazardous chemical." So be as thorough as possible, eliminating only those items which are food, toiletries, or which employees bring from home for their own use. Don't forget soaps, cleaning agents, paint; office supplies such as glues, inks, correction fluids, and permanent markers.

Step 6. In the plant inspection, review the processes and by-products and list them for inclusion in employee training. Note dusts, fumes, off-gases, wastes.

Step 7. The inventory may use a format similar to the sample on the next page.

The sample format shows chemicals organized in alphabetical order by manufacturer because this particular plant uses very few pure chemicals, but rather mostly chemical products. An alternative organization lists products in alphabetical order by product name. Use multiple listings for a single product if employees call the product by a another name rather than the actual chemical or product name. (For example, "perc" for perchloroethylene; or "degreaser" for a freon solvent/refrigerant.)

If the plant uses many pure chemicals, but may change suppliers, alphabetize your inventory based upon the chemical names used most commonly. Organize your material safety data sheets by manufacturer under that chemical name as a heading.

Whatever the format, make sure the inventory is dated. For the date of the inventory, use the date on which the physical inspection was performed. Date of revision is used whenever adding or deleting products from the inventory based upon information received rather than a physical walk-through: for example, Receiving has a product delivered, a salesman left a new product to try out, or a new copy of the inventory is needed to reflect all the material safety data sheets recently received. An inventory organized by department or work area can simplify employee exposure records to meet the record-keeping requirements for public sector employers.

SAMPLE

Inventory By Manufacturer

Date of inventory: _____

Date of revision: _____

Performed by: _____

MANUFACTURER	MSDS ON FILE	MSDS REQ'D	BETTER MSDS REQ'D	PRODUCT NAME	QUANTITY/ SIZE
Air Products and Chemicals, Inc.	X			Oxygen	1 cyl.-10 lbs
	X			Acetylene	1 cyl.-10 lbs
Alcoa	X			No. 2 EJC Electric Joint Cmpd.	5 tubes-3 oz
Allied Chemical	X			Genesolv DES	2-55 gal
Alling & Cory	X			Padding Cement	3 qts.
Appleton Papers Nashua Inc. Fan-Apart Padding	X			Adhesive	2 qts.
Beecham Home Improvement Prod's.		X		Dap/Weldwood Cleaner/Thinner	1 can-2 qt
	X			Dap/Weldwood Contact Cement	1 can-8 oz
Bruning	X			Activator#28-0222	1-10 oz
Callahan's	X		X	Soldering Fluid	3-10 qt

Obtaining Material Safety Data Sheets

Following the inventory, a file of material safety data sheets must be created and checked to see whether a complete and current MSDS is present for each product. Where necessary, suppliers or manufacturers should be contacted to obtain MSDSs. After initiating a system for intercepting and directing new MSDSs, as outlined in the written plan, it is helpful to consolidate MSDSs which are already on site and seek out missing MSDSs. For high turnover items it may be easiest to simply get an MSDS with the next shipment. For old stock or low turnover items, MSDSs must be actively pursued. For greater detail on how to interpret and use the MSDSs see Appendix 2.

1. Ask all supervisors/employees for material safety data sheets. Often these sheets have arrived on the plant site, but in the absence of established handling procedures, MSDSs may have been stored or filed in a variety of places, if not discarded.

2. Compare the MSDSs you have to the inventory and see which MSDSs are missing. Send letters or call suppliers to request them. You may find this process progresses more quickly when dealing with distributors for which you are a major customer, rather than with manufacturers. Accompany written requests with a quick telephone call to the distributor to alert them that requests are on the way and request a prompt response.

Sample letters are shown on the following pages to illustrate requests for a material safety data sheets. Keep a copy of all correspondence and make a note on the inventory of the date of the MSDS request.

3. What if no MSDS is forthcoming? First, consider sending out a second letter with somewhat stronger language. Again, keep a copy of this correspondence and make a note of the date of the MSDS request on the inventory. It is important to document attempts to obtain this information.

4. What if no MSDS is forthcoming after this second request? When manufacturers/distributors are slow to respond; some alternative courses of action which could be taken are, but are not limited to, the following:

- a. Notify the supplier that the payment of his account will be delayed until the MSDS is received. Money does talk in this situation. However, this has limitations with a sole source supplier.

"We had been having quite a bit of difficulty getting an MSDS from this one supplier. We had written and telephoned and spoken to our local sales representative, but no MSDS. Then we realized what a large account we were and how much business we do with this distributor every year, so we asked our accounting department to call the distributor's office and tell them that we were delaying payment of his account until we received the MSDS. It was amazing. The salesman actually went to another customer, photocopied their MSDS, and brought the copy to us that afternoon."

For public employers in New York, the MSDS request must be on the initial purchase order or contract if necessary to delay payment without violating the Prompt Payment Laws. This procedure considers the MSDS as a component of the order which has not been delivered.

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- b. Notify the supplier that his failure to supply the MSDS will be strongly considered in doing future business with his company and alternative sources of supply may be used. Explore alternatives in terms of pricing and preview their MSDS's as a way of selecting the best product. However, this alternative has a disadvantage if the unresponsive manufacturer or distributor is a sole source supplier, or if no acceptable substitute products are available, or if your customers will not accept your product if it is made with any of the available substitutes.
- c. Complaint, or threat of complaint, to U. S. Department of Labor, OSHA.

5. Don't use a product until the MSDS is obtained. When the composition of the product is known with certainty and delaying the use of a product simply isn't feasible, obtain the necessary health, safety, and handling information from alternative sources such as:

- a. MSDSs from other similar products
- b. State Health Department fact sheets on the product's ingredients.
- c. Standard reference text information on the product's ingredients

These sources of information are then used to prepare an interim MSDS by filling in the blanks on the OSHA suggested MSDS format (see Appendix 2 for a copy of OSHA form 174). By preparing an interim MSDS, employees have a single place to look for information on a chemical product, rather than having to use these references themselves; this single information location satisfies the intent of the Standard. However, this action requires the employer to take on considerable liability. Unless you are quite certain of the hazards associated with a product (e.g., a pure chemical with information on file) then creating your own MSDS is inadvisable.

Sample Letter to Request A Material Safety Data Sheet

October 26, 1988

Yoyo-Dyne Industries, Inc.
Box 70 A 5427th St.
Ourtown, NY 00001

Dear Sir/Madam:

I am writing to request a material safety data sheet(s) for your product(s):

Our Very Best Solvent and Thinner

We are gathering this information for the purpose of training workers who use this product(s) with respect to handling chemicals and using safe working practices. Our records indicate that no material safety data sheet on this product(s) was received by us.

If you have any questions regarding this request for information, please call us. We would appreciate this information as soon as possible.

Thank you.

Sincerely,

NAME
TITLE

Hazard Communication for Small Businesses

November 30, 1988

Yoyo-Dyne Industries, Inc.
Box 70 A 5427th St.
Ourtown, NY 00001

Dear Sir/Madam:

I am writing to request a material safety data sheet(s) for your product(s):

Our Very Best Solvent and Thinner

This letter is the second request we have sent you in order to obtain a material safety data sheet. As of this date, we have not yet received the MSDS.

The data provided by the MSDS is required under the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200). This regulation states that: "a chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the manufacturing purchaser prior to or at the time of the shipment. If you have any questions regarding this request for information, please call us. We would appreciate this information as soon as possible. Your continued failure to comply with this federal law will force us to take further action and will be a factor in future sales to our company.

Thank you.

Sincerely,

NAME
TITLE

Step 5

Labeling

and Deriving a Label from a Material Safety Data Sheet

Essentially all containers of hazardous materials in the workplace must be labeled. These labels must include the product or chemical name (as it appears on the inventory and MSDS), "appropriate hazard warnings", and if it will leave the site of manufacture the label must include the name and address of the manufacturer. Labeling does not stand alone, but rather is part of the complete Hazard Communication Program in your workplace. Labeling procedures and content should be discussed in your written plan, and how to interpret labels should be a part of employee training. If your existing labeling system works well and satisfies the requirements of the Standard, it need not be changed. Manufacturers' labels should not be defaced or removed from original containers. If standardized labels are to be added they should not obscure the original.

Manufacturers will be looking at labeling the finished product for leaving the plant site. Non-manufacturer employers will probably be using labels to make up for the deficiencies of the original container labeling, as well as labeling transfer containers, or attempting to provide a uniform warning system throughout their facility. Both manufacturers and non-manufacturers will want warnings for process areas, storage tanks, etc.

Labeling must not conflict with the requirements of other federal regulations such as the Hazardous Materials Transportation Act (DOT shipping labels), the Fungicide, Insecticide and Rodenticide Act (pesticide labels), etc.

For products not leaving your plant site, the labeling requirements under the HCS, are quite minimal consisting of only of the product name as referenced to an MSDS and a listing of the applicable hazard warnings.

What should be on a Label?

How can we determine what hazard warnings should go on the label and what are the labeling options available?

Determining labeling for physical hazards of pure chemicals is straight-forward since these types of hazards as shown on the MSDS are well-defined with respect to temperature, concentrations in air, etc. and the chemical either possesses the required properties or it does not. With mixtures, this is somewhat more difficult, but generally the question of possessing a particular chemical property can be readily resolved by simple laboratory testing. To determine which physical hazard warnings should be on the label by consulting the MSDS, look at the sections on fire and explosion hazard data, reactivity data, and precautions for safe handling and use (see MSDS in Detail-Appendix 2).

Labeling for health hazards is often difficult since for many chemicals our knowledge is extremely limited. Adverse effects may not be known for humans, animal study results may be scarce, and resolving a question of what the health effects may be using

animal studies can be time-consuming and expensive. Similar difficulties are involved in writing the MSDS. Information for labeling for health hazards is located in the health hazard data section (see MSDS in Detail-Appendix 2).

An excellent reference guide for labeling is the precautionary labeling recommendations of the American National Standards Institute (ANSI Z129, 1988). This guide recommends the following information be put on a label. Related information can be found in the MSDS section on physical/chemical characteristics.

Name of substance
Signal word (Danger, Warning, Caution)
Statement of hazard (Strong Irritant, Flammable)
Precautionary measures (Avoid breathing dust, Do not allow to touch skin)
Instructions in case of accidental exposure
Instructions for handling (where appropriate)

The ANSI guide was recently revised and the proposed new edition for 1988 is now available. The history and evolution of various regulations which have dealt with labeling show that acute (short-term or rapid response) hazards on labels have received the most attention. This is not surprising, since information on delayed health effects has simply not been available, and for many substances remains unavailable. The guide recommends hazard statements which will deal with delayed or chronic effects, including carcinogenicity, teratogenicity, and target organ/system effects.

Labeling systems have their advantages and disadvantages, but certainly the major difficulty lies in summarizing a variety of acute and chronic health effects, often based upon animal rather than human data, and deriving brief warnings. The label is not a substitute for an MSDS, it can only warn. **At their best labels are able to inform as well as warn.** Warnings which involve numerical ratings of hazards where both acute and chronic exposure data are available and the worst effect must be used to develop a rating. Those numerical ratings may be particularly difficult to interpret. The problem of understanding and using labeling systems involves problems for the worker who changes employers since it can involve learning a different labeling system, (e.g., is 1 the worst hazard or the one with the least effect?).

The further removed a labeling system is from actual words, the more support it will require, both initially and as refresher training. For example, a system which uses numbers to express the degree of hazard needs employee training so that the type of acute or chronic health hazard associated with a particular number is understood and whether larger or smaller numbers indicate high or low degree of hazard. Also, to what does the number refer? For an allergen, does the number refer to the severity of the allergic reaction upon reexposure or to the potential of the allergen to cause an allergic reaction in the first place?

A similar case is true for picture warnings. Symbols may be very clearly understood when expressing the nature of the hazard, but may not be as useful for expressing the relative severity of the hazard. However, pictures do have the advantage of being easier to use than technical language, they reinforce written warnings and facilitate worker response, and can help bridge language and literacy gaps.

When you choose your labeling system, consider the nature of your workforce and the investment in training which will be required. If you want labels which require little educational support, you may need to use warnings in the form of single words or

simple phrases, perhaps assisted with pictures or symbols, which clearly state or depict the hazard. Training is then used so that workers know what to expect on a label as to the extent of information which they will see, what the terms and symbols mean, and when to read the MSDS to obtain greater detail. Numerical rating systems for flammability, health hazard, reactivity, etc. may require more training support to be used effectively, such as

Health hazard	2
Flammability	3
Reactivity	1

as compared with labels which state the specific nature of the hazard, such as:

<p>Warning! Toxic by inhalation. Overexposure may result in central nervous system effects including headache, dizziness, nausea, unconsciousness, death. Skin & eye irritant. Possible liver, kidney, cardiac effects. Protect from all sources of ignition. Avoid skin contact. Avoid using in confined spaces.</p>
--

If you recall, our suggested Written Program contained a clause which indicated that the labeling system would be reviewed annually and changed if necessary. You may wish to review your system after a trial period. You may try a system which looks great initially, but turns out to be difficult to maintain or difficult for workers to remember the meanings of terms, numbers, or symbols in an emergency. As a result you may want to investigate different systems.

The label which follows is provided as an example of an in-house labeling system. It provides only minimal route of entry information, but indicates the nature of the health hazards, both acute and chronic, and the physical hazards including incompatibility with common chemicals such as acids or alkalies and a warning concerning hazardous breakdown products in the event of contact with heat or fire. This label is intended to supplement and standardize the manufacturer's hazard warnings, especially in the area of chronic effects. You will require additional labeling for carcinogens, as per OSHA regulations, as described below.

This type of standardized label is easy to maintain since the label is standardized and since it requires only a checkmark or an "X" in the box adjacent to the warning to enable the use of the label with virtually any chemical product. The MSDS is used as a source from which to determine boxes to be checked off. In the case of "Incompatible with Acids/Alkalies," the word "Acids" or "Alkalies" may be circled as appropriate. Standardized labels are particularly useful when employees must regularly transfer label information onto secondary container labels such as spray bottles or containers of use dilutions.

Hazard Communication for Small Businesses

Name of Chemical Product:

HEALTH HAZARDS

- Δ Skin Irritant
- Δ Eye Irritant
- Δ Carcinogenic
- Δ Mutagenic
- Δ Teratogenic
- Δ Reproductive System
- Δ Respiratory System/Lungs
- Δ Corrosive
- Δ Highly Toxic
- Δ Toxic
- Δ Sensitizer
- Δ Liver
- Δ Kidneys/Bladder
- Δ Nervous System
- Δ Blood
- Δ Cardiovascular System
- Δ Digestive System

SAFETY HAZARDS

- Δ Flammable
- Δ Spontaneously Combustible
- Δ Explosive
- Δ Highly Volatile
- Δ Decomposes with Heat/Fire
- Δ Spontaneously Decomposes
- Δ Do Not Agitate
- Δ Incompatible with Acids/Alkalies
- Δ Reacts with Water
- Δ Corrosive to Metal
- Δ Compressed Gases
- Δ Oxidizers/Peroxides
- Δ Unstable

A standardized label works well in workplaces with a variety of chemical products. However, if your workplace has only a few substances in large quantities, specific pre-printed labels may better convey primary hazards.

Labeling systems are commercially available which use symbols and pictograms alone or in combination with warning phrases. The pictures are used to illustrate recommended protective equipment as well as the hazard itself.

Signs or placards may be more practical for conveying detailed warning statements for storage areas, tanks, buildings, fenced-in areas, doors, or processing machinery. Warning labels could then be used on the containers within the storage areas. Signs are probably the most effective ways to warn workers of immediate hazards in a work area; these should have detailed warnings and action statements because of the proximity and volume of any hazardous materials and their regular use.

Target-organ effect labeling is not required on in-plant containers but must appear on shipped containers. Precautionary labels, rather than warning of specific hazards, for in-plant containers are sufficient if they are used in combination with the hazard communication program to promote safe handling and use of hazardous chemicals. If target-organ labeling is present on a container when it arrives in the plant, these labels should not be defaced or removed from the original containers.

HEALTH HAZARDS

- Irritant
- Sensitizer
- Corrosive
- Highly toxic
- Toxic
- Carcinogen

Target organ effects:

Liver	Lungs
Kidneys	Reproductive toxins
Nervous system	Cutaneous (skin) hazards
Blood	Eye hazards

PHYSICAL HAZARDS

Combustible liquids	Oxidizers
Flammable	Pyrophoric materials
Aerosols	Compressed gases
Gases	Explosives
Liquids	Organic peroxides
Solids	Unstable materials
	Water-reactive materials

If your current MSDS for a chemical product has insufficient information on physical and/or health effects and you have sent for a better MSDS, be sure to update or revise your labeling when the better MSDS is received.

Hazard Communication for Small Businesses

For chemicals or work areas where carcinogens are used, additional labeling is required under OSHA regulations. For such, substances the warning labels should state:

DANGER CONTAINS

CANCER HAZARD

and warnings signs should state:

DANGER

CANCER HAZARD
AUTHORIZED PERSONNEL ONLY

See the attached sample of an MSDS and a hazard warning label derived from it.

(sample below is derived using ANSI Z129.1 - 1988 see attached MSDS)

<p>NAME OF CHEMICAL PRODUCT: Instapak Component A</p> <p>Warning! Causes eye irritation. Avoid contact with eyes. Avoid skin contact. Wash thoroughly after handling. May cause allergic skin reaction. Do not breathe vapors. May irritate respiratory tract.</p> <p>First Aid: In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician. In case of skin contact, immediately wash skin with soap and plenty of water.</p> <p>Reacts vigorously with water. Avoid water contamination in closed containers; carbon dioxide gas is evolved which can cause pressure build-up.</p> <p>In case of spill, do not use water. Soak up with loose absorbent material such as sawdust or vermiculite.</p> <p>Contact with heat or fire produces toxic and irritating vapors.</p>

Exemptions and Special Cases

Laboratories are exempted from the container labeling requirements and the preparation of material safety data sheets for materials used under the direct supervision of a knowledgeable individual.

Consumer products packaged and used as a consumer would use them do not require additional labeling. For example, a pint of household cleanser kept under the sink in the coffee room for occasional use by employees in keeping that area clean does not require additional labeling or MSDSs, while the identical product requires a label and MSDS if used by custodial personnel on a regular basis or if purchased in industrial containers.

Hazard Communication for Small Businesses

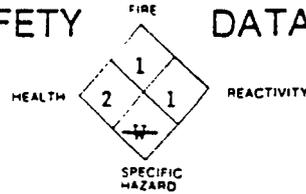
MSDS for INSTAPAK COMPONENT A-Front
For use in comparing label derived from it

MATERIAL SAFETY DATA SHEET



Sealed Air Corporation

Old Sherman Trpk Danbury, CT 06810. (203) 792-2360



ISSUE DATE Nov. 1985
SUPERSEDES ISSUE OF Sept. 1984

EMERGENCY TELEPHONE NO (203) 792-2360 CHEMTREC (For spill, leak, fire, exposure or accident) 1-800-424-9300	
PRODUCT NAME INSTAPAK® COMPONENT "A"	
CHEMICAL FAMILY Aromatic Isocyanates	CHEMICAL NAME & SYNONYMS Polymerhylene Polyphenylisocyanate
CHEMICAL FORMULA N.A.	TRADE NAME & SYNONYMS Crude MDI

HAZARDOUS INGREDIENTS

HAZARDOUS MIXTURES OF OTHER LIQUIDS SOLIDS OR GASES	CAS #	%	CURRENT TLV
4,4' Diphenylmethane Diisocyanate (MDI)	101-68-8	~50	0.02 ppm
Higher molecular weight oligomers of MDI	9016-87-9	~50	N.F.

PHYSICAL DATA

APPEARANCE (SOLID LIQUID GAS) Liquid	MOLECULAR WEIGHT Approx. 350	MELT POINT N.A.	SPECIFIC GRAVITY 1.24 @ 25°C
VAPOR DENSITY (AIR) 3.5	COLOR Dark Brown	BULK DENSITY 10.3 lbs/gal	BOILING POINT 625°F @ 760 mmHg
VAPOR PRESSURE <10⁻⁴ mmHg @ 25°C	SOLUBILITY (WATER) Reacts with water.	ODOR Slightly Aromatic	% VOLATILE BY VOLUME Nil

FIRE & EXPLOSION DATA

FLASH POINT (METHOD USED) 390°F P.M.C.C.	FLAMMABLE LIMIT Le1 N.E. Uel N.E.	EXTINGUISHING MEDIA CO₂, Chemical foam, dry chemical, water spray
SPECIAL FIRE FIGHTING PROCEDURES UNUSUAL FIRE OR EXPLOSION HAZARDS Firefighters must wear self-contained breathing apparatus to protect against toxic and irritating vapors; full protective clothing should also be worn. Avoid water contamination in closed containers; carbon dioxide gas is evolved which can cause pressure build-up.		
Caution: Reaction between water and hot isocyanate can be vigorous.		

TOXICITY DATA

LD50 ORAL (INGESTION) >20 g/Kg (Rats)	LD50 DERMAL (SKIN CONTACT) >15.8 g/Kg (Rabbits)	INHALATION (LC50) ~370 mg/M³ (Rats-4 hrs)
FISH LC50 (LETHAL CONCENTRATION) >500 mg/l	TLV (UNITS) (THRESHOLD LIMIT VALUE) 0.02 ppm (MDI)	SKIN IRRITATION Moderate. Skin sensitization possible in some people.
Daphnea Limnea, Invertebrates	EFFECTS TO LUNG Irritant of upper respiratory tract.	OTHER
EMERGENCY AND FIRST AID PROCEDURES EFFECTS OF OVER EXPOSURE Primary route of exposure is via inhalation. Over exposure may lead to mucous membrane irritation, tightness of chest, respiratory tract irritation, coughing, headache, shortness of breath. May lead to allergic sensitivity in some individuals resulting in asthma-like symptoms upon exposures below TLV. Sensitized persons should be removed from any further exposure. Persons with asthma-type conditions, or other chronic respiratory diseases should be excluded from working with MDI.		
EYE CONTACT: Flush with water 15 minutes. Consult physician.		
SKIN CONTACT: Wash area thoroughly with soap and water. Launder clothes before reuse.		
INGESTION: Drink water to reduce corrosivity, consult physician.		
INHALATION: Remove to uncontaminated area, administer oxygen if necessary. However, due to low vapor pressure, overexposure not expected under normal conditions unless material is heated or used in a poorly ventilated area.		

MSDS for INSTAPAK COMPONENT A-Back
For use in comparing label derived from it

REACTIVITY DATA

STABILITY Stable	CONDITIONS TO AVOID Avoid temperatures above 120°F or below 32°F
POLYMERIZATION May occur	CONDITIONS TO AVOID Contact with moisture and other materials which contain active hydrogen.
INCOMPATIBILITY (MATERIALS TO AVOID) Water, amines, strong bases, alcohols, surface-active materials.	
HAZARDOUS DECOMPOSITION PRODUCTS Oxides of carbon, oxides of nitrogen, traces of hydrogen cyanide.	

SPILL OR LEAK PROCEDURE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Spill should be covered with loose absorbent material (sawdust, vermiculite). Pour decontamination solution over spill area, allow to react at least 10 min., collect material in open containers and treat with additional decontamination solution, allow to stand 24-48 hrs. Wash area with decontamination solution. Respirator protection and ventilation recommended during spill clean-up. Decontamination Sol: 90% water, 8% conc. ammonia, 2% detergent.
WASTE DISPOSAL METHOD	Incinerate or dispose of in accordance with existing Federal, State, and Local environmental control regulations. See also "Recommendations for the Safe Use and Handling of Instapak® Foam-In-Place Chemicals."

SPECIAL PROTECTION DATA

RESPIRATOR TYPE	For short term emergency situations at concentrations below TLV canister-type masks equipped for organic vapors are acceptable; however, supplied air in areas where concentration exceeds TLV, self-contained units preferred.	
EYE PROTECTION	GOGGLES	Chemical resistant rubber or plastic
OTHER PROTECTIVE EQUIPMENT Safety shower, eye wash station, decontamination solution, ventilation to maintain isocyanate vapors below TLV of 0.02 ppm.		

SPECIAL PRECAUTIONS & STORAGE DATA

STORAGE TEMPERATURE (OPTIMUM)	AVERAGE SHELF LIFE
Min. 20°F Max. 100°F	6 months
SPECIAL SENSITIVITY (HEAT, LIGHT, MOISTURE) Reacts with moisture to produce carbon dioxide gas.	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Do not reseal containers unless it is certain that no moisture contamination has occurred. Do not breath vapors or allow skin contact.	

SHIPPING DATA

DOT SHIPPING NAME N.A.		TECHNICAL SHIPPING NAME Polymeric Diphenylmethane Diisocyanate	
DOT HAZARD CLASSIFICATION Non-Regulated	UN NA NO UN 2207	RD N.A.	
DOT LABELS REQUIRED None	LABEL N.A.	TSCA STATUS Listed	
REASON FOR ISSUE Periodic Update	FRT CLASS BULK FRT CLASS PKG	Isocyanate Chemical NOI (Isocyanate) NMFC 60000	
INITIATED BY Charles T. Story	TITLE Environ. Manager	APPROVED BY Dr. Mitchell Berger/Director, Chemical Oper	TITLE
DATE INITIATED November 1985		DATE APPROVED November 1985	

Y = NOT ESTABLISHED N = NOT APPLICABLE A = ACTIVE INGREDIENT

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates only to the specific material designated herein. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

NAME OF CHEMICAL PRODUCT:

INSTAPAK

COMPONENT "A"

Health Hazards

- Skin Irritant
- Eye Irritant
- Carcinogenic
- Mutagenic
- Teratogenic
- Reproductive System
- Respiratory System/Lungs
- Corrosive
- Highly Toxic
- Toxic
- Sensitizer
- Liver
- Kidneys/Bladder
- Nervous System
- Blood
- Cardiovascular System
- Digestive System

Safety Hazards

- Flammable
- Spontaneously Combustible
- Explosive
- Highly Volatile
- Decomposes with Heat/Fire
- Spontaneously Decomposes
- Do not Agitate
- Incompatible with Acids/Alkalies
- Reacts with Water
- Corrosive to Metal
- Compressed Gases
- Oxidizers/Peroxides
- Unstable



Step 6

Using the Material Safety Data Sheet

Looking at the Material Safety Data Sheet in detail is necessary for:

- Reading and understanding an MSDS
- Interpreting MSDS information in terms of workplace hazards
- Evaluating and critiquing manufacturer's MSDSs to determine deficiencies
- Considering substitutions and comparing products hazards
- Deriving hazard warning information for labels

The Hazard Communication Standard requires chemical manufacturers and importers to:

- Obtain or develop an MSDS for each hazardous chemical which they manufacturer or import, or for each chemical product which contains hazardous materials
- Update an MSDS when new information becomes available concerning hazards or protection against hazards. The manufacturer or importer has 3 months to add this new information to the MSDS and distribute it.

In turn, distributors must pass MSDSs onto commercial customers and employers must maintain an MSDS for each product containing hazardous chemicals.

Reading and Understanding the MSDS

The material safety data sheet format called the OSHA form #174 (see Appendix 2) is a suggested, but non-mandatory, form which manufacturers and importers can use to satisfy the Hazard Communication Standard. Manufacturers can write an MSDS in any form which includes all the information requested on the OSHA form. **CONTENT is important, not format.** Frequently you will see MSDSs of the old OSHA Form 20. **If a manufacturer fills out the old OSHA 20 form with only the information which the form requests, his MSDS will not meet the current Standard.** Health effects information, is required on an MSDS to meet the HCS. An OSHA 20 form can meet the HCS if the manufacturer adds to it all the information required on the new #174 form. An attempt to satisfy the Standard without printing a new form can mean a form crammed full of information, sometimes even written in the margins. If OSHA 20 forms are received from the manufacturer, request an updated sheet; perhaps new ones are available. If only OSHA 20 forms are being sent, scrutinize them carefully for content because they could be lacking:

1. A telephone number for information
2. Date of preparation for the MSDS
3. Signature of the preparer (optional but desirable)
4. Specific chemical identity information for the hazardous components
5. The OSHA permissible exposure level and other recommended limits for exposure to the hazardous components in the workplace
6. Melting point for the chemical product
7. Health hazard information such as:
 - a. Route(s) of entry: for adverse health effects to occur, must exposure to a chemical be by: Inhalation? Skin contact? Ingestion?

- b. Acute and chronic health effects
 - c. Carcinogenicity: does this product or its components cause cancer?
 - d. What existing medical conditions are generally aggravated by exposure to this product?
8. Recommended work/hygienic practices

The material safety data sheet is divided into 8 sections:

- 1. Manufacturer
- 2. Hazardous ingredients
- 3. Physical/chemical characteristics
- 4. Fire and explosion hazards
- 5. Reactivity
- 6. Health hazards
- 7. Precautions for safe handling and use
- 8. Control measures

It is clear that with these types of information, an MSDS is virtually a product specification. With an MSDS in hand, this information has other potential uses:

The MSDS for a product shows information on health hazards, flammability, and other hazards. It is an important starting point in shopping around for substitute products whose hazards or characteristics are preferable.

In looking for a product for a specific purpose, collecting MSDSs for potential products from salespeople and comparing them can help in choosing the product whose hazards match the plant's ability to cope with those hazards (e.g., using existing ventilation or protective equipment for which personnel are already trained). Shop around for other desirable characteristics, such as finding a product which does not require disposal as a hazardous waste.

Information on the MSDS can also help consolidate purchasing and save money. Many products have the same or similar formulation which are sold in a series of dilutions (various amounts of water or solvent added) for a variety of tasks. Cleaning solutions are often sold this way: a 2% solution may be sold for cleaning windows, a 10% solution for cleaning restrooms, and a concentrate for cleaning floors. Money can be saved by buying the concentrate only and making your own dilutions for other cleaning purposes. Consolidated purchasing from fewer suppliers can also result in volume discounts.

A detailed breakdown of how to interpret each entry on the MSDS is provided in Appendix 2 to assist in using this important source of product information effectively.

Exemptions and Special Cases

Laboratories are exempted from obtaining material safety data sheets for materials received prior to the HCS going into effect as long as they are used under the direct supervision of a knowledgeable individual.

Consumer products packaged and used as a consumer would use them do not require an MSDS on file. For example, window cleaner used by day care personnel to occasionally clean a mirror; while the identical product requires a label and MSDS if used by custodial personnel on a regular basis or if purchased in industrial containers.

Food products do not require material safety data sheets, however occupational hazards must be handled in training (e.g., biohazards in food processing).

Hazard Communication for Small Businesses

Pharmaceuticals regulated under the Food and Drug Act (FDA) do not require material safety data sheets, but they are required to have package inserts which are to include occupational hazard information in the future.

Articles do not require material safety data sheets. An article is a product in an end use form which does not present a hazard. A desk and chair are articles, however, the pressboard, lumber, glue, metal and plastic stock used to construct them are not articles and must have MSDSs. The hinges and locks on the desk are articles as they are not changed in form (sawed, burned, melted, aerosolized, etc.) but are only included in the larger article which is the desk, therefore no MSDSs are required.

Step 7

Employee Training: Guidelines and Comments

Step 1 summarized the training requirements under the Hazard Communication Standard and the Written Program included strategies for handling both existing and new employees. Further elaboration is required on establishing learning goals and objectives, training techniques, evaluating the success of your training, and problems which training may not solve. It is not necessary to design a new training program if an existing training program can be revised to meet the requirements of the Standard.

A good training program should do more than simply tell workers what they should know or do, it should also motivate them to learn what is required and then follow the procedures learned. Conveying information is the backbone of the Standard because it is assumed that managers and supervisors who understand hazards will actively pursue necessary corrective actions and enforce safe work practices; and workers who understand the health and physical hazards of the chemicals they work with are more likely to follow safe working procedures, take appropriate precautions, and properly use protective equipment. However, employees may be reluctant to take steps to protect themselves or enforce work rules unless they believe that workplace hazards are indeed serious problems and that workers are actually susceptible to ill effects. Moreover, for a training program to succeed it must have continued support from supervisors, co-workers, and worker representatives.

The basics of establishing a training program for Hazard Communication:

1. **Identify the training needs**
2. **Identify the goals and objectives**
3. **Develop the learning activities**
4. **Conduct the training**
5. **Evaluate the program effectiveness**
6. **Improve the program**

1. **Identifying the training needs**

Identify which of your workforce are routinely exposed to hazardous substances and therefore need training. Train people who are potentially exposed, even if they are not currently actually working with hazardous chemicals. Use your chemical inventory for each work area and compare it with the employees assigned to that area. Include maintenance workers for that area as well since they may well have exposure to the same types of chemicals. If your company is quite small, one class for all employees might be more efficient. Personnel transferred between departments may need retraining.

Determine the categories of hazardous products to which employees are exposed. Group these substances according to type of hazard (irritant, flammable, etc.). Generic training is satisfactory for similar compounds. This grouping may allow you to train more efficiently by identifying those employees with higher levels of risk. Targeting high risk workers with priority training needs might also be done by reviewing accident/injury reports.

Wherever possible, group employees which face similar hazards or similar severity of hazards; this makes training easier and more efficient. The information being covered should apply specifically to all employees present. Having participants in approximately the same job categories and keeping the subject matter pertinent to their activities prevents employees from having to sit through material which doesn't pertain to them. For example: Department 12 includes lathe operators, grinders, painters, degreasers, and office staff. An exposure related grouping would place all metalworkers together; painters and degreasers together (as many paints and degreasers contain solvents), and separate out Office staff since their risks tend to be minimal and quite different than production staff.

2. Identifying the goals and objectives

Clearly define the training objectives. What do you expect of workers who attend your training sessions? Objectives should be measurable whenever possible; this makes evaluation, documentation, and improvement of the program a lot easier. Broad goals might include:

Attitudes

- Reduced fear of technical information and MSDSs
- Objective perspective of risk in the workplace
- Desire to seek out additional information on specific products

Behavior

- Improved work practices
- Read and evaluate label, MSDS, and other sources of information prior to use
- Proper use of personal protective equipment
- Prompt reporting of releases or abnormal situations
- Prompt, effective response to emergencies and spills

Knowledge

- Requirements of the Hazard Communication Standard
- How hazard information will be handled in their work area
- Operations in their work areas where hazardous chemicals are present
- How to interpret labels and MSDSs
- The location and availability of MSDSs and written plan.
- Methods to detect the presence or release of hazardous materials
- Physical and health hazards of chemicals in their work areas
- Measures they can take to reduce risk, including appropriate work practices, emergency procedures, and personal protective equipment
- Where to find additional assistance, ask questions, or make suggestions

Speak with employees themselves and/or their union representatives; find out what they perceive as workplace chemical hazards and what they would like to have included in training. Treat employee concerns seriously and prepare responses to them, whether or not the perceived hazard is a significant risk. A joint labor-management safety committee often helps to improve the flow of information and decrease tension or suspicion which might arise around workplace chemical exposures.

Dealing with Employees' Reactions to Hazard Information

Workers who have unknowingly been handling hazardous chemicals for years may have strong reactions to some of the hazard information they receive. Despite the definition of "hazard" (including relatively minor hazards such as "irritant"), employees hearing about carcinogens and teratogens, etc. may overreact or they may deny their susceptibility, concluding that "you have to die from something, so why bother to take precautions now when I've been working with this stuff for years."

Employees may not respond rationally to technical assessments of risk. In today's society there is considerable "chemophobia". Some people believe that virtually any chemical will kill them. Occasionally you see the employee who believes that every health condition he develops is the result of something on the job or is fearful of working with all chemicals. He may sincerely feel that just about everything can make him ill, regardless of precautions or protective equipment. In handling these reactions, it is extremely important to address the employees' concerns with facts rather than your interpretations. Request employees to provide, in writing and in their own words (even if anonymously), what they think are hazardous operations or substances and what their fears are; for example:

Which chemicals do you think are hazardous?

What kind of health problems do you think can be caused by these chemicals?

What do you think are your chances that you might get some of these health problems if you are exposed to these chemicals?

In your training sessions, make a point of answering these questions. Be as realistic as possible. Sometimes workers uncover hazards you may not be aware of and sometimes nonexistent hazards are exaggerated. Whichever way it turns out, treat this area seriously because workers will sense attempts at concealment or amusement at their expense.

Even within a single industry, there are some employees who are at greater risk than others. Sometimes the degree of hazard is influenced by the conditions under which work is performed, such as excessive noise, heat or cold, or safety hazards in the surrounding area. Be on-the-level when presenting relative risks within the plant. Employees should understand why some areas require certain protective equipment, local ventilation, special clothing, etc., whereas their own area might not need them.

Behavior changes are often most difficult in the younger or older worker. Young people tend to feel that since they are strong and healthy, nothing can hurt them ("adolescent immortality"). This group is difficult to convince that they are susceptible to chronic health hazards which might take 5, 10, or 20 years to appear. The older worker may have worked with a health hazard for years and is still around and healthy, perhaps because of his own resistance. Sometimes you can see a version of "survival of the fittest". Employees may still be working in an area because they have had no ill effects; others who did experience health problems left for other jobs or work areas. Sometimes you can actually point to workers who died of occupational illnesses related to that work area, and fellow workers may insist that the deceased workers had other problems, that such illness can't happen to him or her, or that it was just fate. Change may be threatening and the status-quo may be the most desirable state for long term employees (the "30-year syndrome").

"Fred and I got to talking one day about why he never seemed to put on his respirator. He wore it around his neck every day, but never put it on his face and actually used it. I said to him that, even though I was young, I had no intentions of taking risks now that I could avoid, even if any health problems were 20 years or more in the future. He said to me, pointing at another older worker, 'I hate this thing, it never fit right, and it drives me crazy. Besides, look at Charlie! He's been working here for almost 40 years and he smokes all the time. He doesn't wear a respirator and he's O.K.' I asked him 'What about those friends of yours that use to work here and didn't live long enough to retire -- didn't they have lung problems like cancer and emphysema? I'll bet they didn't wear respirators either!'"

In dealing with resistance to change, it is necessary to show factual evidence of cases where occupational illness has actually been reduced by the use of proper procedures and protective equipment. You have to demonstrate susceptibility to injury and preventability. Just as when impressing people with the need to wear seat belts, you have to show that people who wear seat belts really do have better survival or fewer injuries than those who don't. Other arguments show how others, such as family members, depend upon you and you can't let them down by becoming ill or dying when the cause is preventable. Between the younger and older worker there frequently lies the employee whose obligations to his/her family are so important that the question of taking avoidable risks doesn't arise.

3. Developing the Learning Activities

Be sure to put the term "hazardous" in perspective. The Hazard Communication Standard defines as hazardous not only the corrosives and carcinogens, etc., but also substances which can only cause slight harm or irritation and with proper precautions, even that is unlikely. This is important because, when employees first hear of the health hazards from chemicals they have been working with for years, the terms can be frightening or appear unrealistic, hazards can be exaggerated out of proportion to risk, and chemical phobias or denial of real risks may result.

Use a good presenter to do training, not someone who considers this training unimportant and is doing it because he has to do it. Employees sense this mixed message. Keep the style of the presentation as informal as possible so attendees can contribute.

Types of training techniques

- Group lectures work well for employees with similar exposures. These may be assisted with black board and chalk, overhead transparencies, and other audio-visual aids. Training can equally well be in the workplace area. It can review the specific chemical hazards a group faces. Holding up the chemical containers as props can introduce the segments.
- Group and individual role plays are useful for simulating emergency procedures and making decisions based on real-life situations. By having the learning situation simulate the actual job as closely as possible, employees are more likely to transfer the information from the learning activity to the job.
- Emergency equipment demonstrations enable workers to examine and practice with the actual equipment they may need to use in an emergency. Hands-on training helps reinforce learning.
- Self-paced programmed instruction involves workers responding to written questions or situations at their own pace. This often works well, and may be less intimidating for approaching technical information.
- Charts and/or diagrams should be used whenever possible because they have a proven track record of reinforcing learning.
- Audiotape/slide presentations are useful for showing site-specific photographs, as well as enabling playback and review of materials whenever desired. This technique is useful for training new employees since the materials can be reused as new workers are hired.
- Films and videotapes make interesting programs. To enable immediate feedback for new behaviors playback and review are also useful for new worker training.
- Training aids: handout or display samples of MSDS's and labels, etc. so that employees can see what these look like for their own work area as they learn how to use them. As examples, use facility-specific and workarea-specific hazards for the employees whose work area is under discussion. Explain what to do in case an accident occurs involving each category of hazard.

Adults tend to learn better when irrelevant information is minimized. Allow workers to master the "need-to-know", basic information first, and keep the "nice-to-know" information for later. Enable workers to relate the training to practical experience whenever possible since this reinforces learning. For example, relate new information to past experiences and allow workers to operate equipment and practice emergency procedures. Use quizzes, even self-quizzes, to help employees practice recalling information. Break the learning into smaller chunks so that approaching and mastering it appears easier. Reinforce the learning with OSHA's primary goal -- protecting the worker.

4. Conducting the training

Set up your training room or area. Provide chairs, pencil and paper for notes and questions, and schedule enough time to properly present the program so that workers will not feel pressured to return to work. Schedule the program during normal working hours, not after work, or during meals or breaks. The training program must be accessible to all employees during working hours. Notify employees who will attend the training sessions, when and where they will be held, and that the general purpose of the training is to inform employees about the employer's plan to protect employee health and inform them about workplace hazards. Allow time for a question and answer session and group discussion of the implications and implementation of this new information. It is especially important to have a person(s) present to answer technical questions. Training should not be done solely with videos and paper handouts of information.

5. Evaluating the program's effectiveness

Once training has been done, it should be documented. Keep a record of who did the training, who attended, what topics were discussed, and any written information which was distributed. In the eyes of the law, without a record of training the workforce, it's as if you didn't train them at all.

• Since the Standard is performance-based, there is considerable flexibility in the type of training which can be provided to employees. Topics are mandatory but how training shall be done is not specified. As a result, judgement will probably play a major role in the acceptance of a training program by OSHA inspectors. Therefore, it is important to evaluate training to verify its effectiveness and to provide some record that employee knowledge has increased and is being implemented in the workplace, for example:

- Sign-in rosters and company documentation records are important. OSHA personnel could examine these records, review the training materials themselves, and question plant training or supervisory personnel about training content. However, by themselves, written materials do not demonstrate that learning occurred nor that workplace hazards are being handled safely.
- A true measurement of training may be obtaining feedback from employees using verbal or written questions, pre-tests and post-tests, or evaluations. These also can be documented and make good records of training success, as well as sources for identifying further training topics. Similarly, OSHA inspectors during a field visit could verbally quiz employees.
- Observe and document how training has made a difference in the way chemical hazards are handled. Observe employees' work practices to see if workers are following proper procedures.
- Review injury/illness lost workday reports to see if training has made a difference in reducing work-related injuries and illnesses.

6. Improving the program

Assess the results of training and amend the program accordingly. Periodic retraining may be needed to reinforce technical information or maintain skills in handling emergencies. Be flexible and understand that this is an evolving process. For this program to succeed in its goals of making a safer workplace, it needs the support of supervision. Supervision must always take safety seriously and not send mixed messages. Similarly, supervision must take responsibility for enforcing safe practices and must have the appropriate tools to do this -- such as:

- Making safe work practices a part of a worker's job description and therefore part of the annual evaluation process.
- Having an employee work rule on following safe procedures. This stresses the importance of safety and provides the means of enforcement using progressive discipline.
- Making job descriptions for supervisors which list enforcement of safe procedures as a responsibility of supervision. This stresses the importance of safety, provides a means of evaluating the supervisor, and enables rewarding the supervisor for his efforts in promoting a safe workplace. Too often such rewards are given for production or quality regardless of health and safety.

Training is not necessarily a "quick-fix" solution if the problem itself is not resolved. Training addresses lack of knowledge of a work process, how to operate equipment, or how to perform a task correctly. Training cannot compensate for:

- **Inadequate engineering controls** (such as excessive noise problems or the headaches, dizziness, and other symptoms caused by inadequate ventilation)
- **Inadequate protective equipment or supplies** (such as leaks or spills which are not cleaned up because the proper materials are unavailable)
- Repetitive patterns of accidents or near-misses in one plant operation.

Step 8

RECORDKEEPING AND ARCHIVES

Requirements and reasons for maintaining records and archives including outdated MSDS's have already been covered briefly. In this chapter we will illustrate some sample recordkeeping forms. Below is a sample index which might be useful if occasionally you switch back to using products which you used formerly. It is often useful to maintain an index to your MSDS file on a computer. If you have an extensive operation with many branches, it may even prove worth the data entry time to computerize the actual text of the MSDSs, or use a microform index of the actual manufacturer's MSDSs.

INDEX TO MSDS ARCHIVE FILE		
MANUFACTURER	PRODUCT	REVISION DATE (IF PRESENT)
3M Corp.	Spray Adhesive 77	04/10/86, 11/80
	Scotch Grip Solvent #2	07/08/87, 09/80
	Fixer	09/01/86
	Plastic Adhesive 4693	09/80
Allied Chemical	Genesolv DES	10/81
Ashland Chemical Co.	Xylene	08/86, 10/84, 03/79
J. T. Baker Chemical	Glacial Acetic Acid	04/17/78

Sample recordkeeping forms for training of current and new Employees, records of technical references used in preparing your program (so you always know where you got your information), and a sample training schedule follow. Each employer should customize records to best meet his needs and organizational structure. Public employers in New York are required to maintain training attendance and content records.

Hazard Communication for Small Businesses

Employee Training Sign In Sheet

TRAINER: _____

DATE OF SESSION: _____

SESSION DESCRIPTION: _____

I HAVE ATTENDED THE ABOVE SESSION:

NAME (PLEASE PRINT) SOCIAL SECURITY NUMBER (SIGNATURE)

NEW EMPLOYEE TRAINING -- HAZARD COMMUNICATION

TRAINER: _____ TITLE: _____

DATE OF TRAINING: _____

(Name of Employee)

1. Has read and understands the material safety data sheets of the chemicals involved in performing the position of _____.
(Job Description)
2. Has been trained in the use and maintenance of any protective equipment required for the proper use of those chemicals.
3. Has received information and/or training in what to do in the event of a chemical accident injury, or spill.

I HAVE RECEIVED THE TRAINING DESCRIBED ABOVE.

(SIGNATURE)

NEW EMPLOYEE TRAINING -- HEALTH AND SAFETY ORIENTATION

TRAINER: _____ TITLE: _____

DATE OF TRAINING: _____

(Name of Employee)

1. Has received an overview of the Federal OSHA Hazard Communication Standard.
2. Has been informed of the location and availability of the written hazard communication program.
3. Has received basic information on the physical and health effects of hazardous chemicals.
4. Has been informed of methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area.
5. Has been informed of how exposure to hazardous chemicals may be lessened or prevented through the usage of control/work practices and personal protective equipment.
6. Has been informed of steps the company has taken to lessen or prevent exposure to chemicals.
7. Has been informed of emergency procedures to follow if he/she is exposed to chemicals.
8. Has been trained to read labels and review material safety data sheets to obtain appropriate hazard information.
9. Has been informed of the location of the material safety data sheets file and the hazardous chemical inventory.

I HAVE RECEIVED THE TRAINING DESCRIBED ABOVE.

(SIGNATURE)

SAMPLE MEMO

TO: ALL EMPLOYEES
FROM: THE MANAGEMENT -- YOYODYNE ELECTRONICS INC.
DATE: 09/29/87
R.R.: EMPLOYEE TRAINING AS PER OSHA HAZARD COMMUNICATION STANDARD

The US Dept. of Labor OSHA has promulgated a standard entitled "Hazard Communication" which requires employers to provide information and training to their employees concerning the hazardous chemicals they work with. It is the intent of Yoyodyne Electronics to comply with this standard in our continuing effort to maintain a safe and healthful workplace. The schedule below lists the date and time of the employee training sessions. Painters and printers will attend all hourly personnel training except that on process hazards for which they will attend their specific process hazard sessions. Supervisors will attend the training sessions along with their employees. If you have any questions about the training, consult your supervisor or the industrial relations office.

HOURLY PERSONNEL

10/17/87	09:00 AM - 10:00 AM	Overview of OSHA Hazard Communication Standard
	10:15 AM - 11:15 AM	How Chemicals Affect the Body; Hazard Recognition
	12:30 PM - 01:45 PM	Using the Material Safety Data Sheet
	02:00 PM - 03:30 PM	Process Hazards Soldering; fumes Solvents; vapor degreasing TDI foam-in-place packaging Smoking at work station: Lead/solder Solvent vapor breakdown products What to do in an emergency
10/18/87	09:00 Am - 10:00 AM	Process Hazards - Painters Paint types and hazards: Alkyd, polyester, silicone, vinyl, epoxy, polyurethane, acrylic Pigments, binders, and additives Paint thinners, solvents, and reducers What to do in an emergency

OFFICE PERSONNEL

10/18/87	01:00 PM - 02:00 PM	OSHA Hazard Communication Standard How Chemicals Affect the Body Using the Material Safety Data Sheet Possible Hazards in Office Work VDTs Photocopying Tight building syndrome Correction fluid, solvents, glues What to do in an emergency
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Step 9

Maintaining the Program: Maintaining Involvement

To get this program off the ground and keeping it going, you must get everyone involved -- especially supervision. Before you begin doing anything else on this program, you should consider holding a supervisors' meeting and informing them of the existence of the OSHA Hazard Communication Standard, the company's commitment to meeting its provisions, what tasks need to be done, and how you will need their help. This group is important to the program's success, they can provide ideas on how to make it work and how their departments can interact on the issues of labeling, collecting MSDSs, and keeping track of chemicals. Moreover, as they become aware of hazard types and how to alter purchasing specifications to minimize hazards and hazardous waste disposal, the plant as a whole can have a more streamlined operation.

The chemical inventory itself may need to be divided among departments to be accomplished efficiently; if the department heads agree in advance on what areas are to be inventoried by each supervisor, chemical products are less likely to be overlooked. Above all, this program takes a team effort to get started. Once all the mechanisms of your Written Program have been put in place, maintaining the Program becomes a part of everyday routine: as MSDSs arrive, they automatically go to the right people for review and distribution; as products arrive, they receive appropriate labeling and training; when purchasing is done, MSDSs are requested and products explored before being brought on the plant site, and so forth.

As you accomplish aspects of the program, keep your supervision informed of the progress with memos or short meetings to keep everything running smoothly. The following final report illustrates how a Hazard Communication Program could progress.

SAMPLE MEMO

TO: M. MICHAELSON, PLANT MANAGER, YOYODYNE ELECTRONICS, INC.
FROM: R. ROBERTSON, SAFETY OFFICER
DATE: 08/13/87
R.E.: PROGRESS REPORT ON HAZARD COMMUNICATION PROGRAM

The following is a summary to date of our hazard communication program, as well as suggestions for maintaining the program and for handling related activities such as purchasing,

waste disposal, and others which I would like to discuss with you at our next meeting.

1. Met with supervision to discuss OSHA Hazard Communication Standard requirements and implementation (06/19/87).
2. Met with union steward to discuss employees' concerns on workplace chemical exposure and safety and health issues (06/19/87).
3. Performed chemical inventory: 230 chemical products as of 07/10/87. See attached inventory. A copy of the inventory was placed in the MSDS binders to enable employee access. Soon after we started the inventory, I discovered that the new Superfund legislation will require us to do inventories and reporting on several of our chemicals.

As a result, we started the inventory over again to note quantities on hand and rates of usage -- this should give us all the information we need to do the Superfund reporting (provided that the final reporting forms have similar requirements to the proposed forms).

4. Observed operations for process hazards to be discussed in employee training. Results as follows:

Process Hazards

- Soldering; fumes
- Solvents; vapor degreasing
- TDI foam-in-place packaging
- Smoking at work station:
 - Lead/solder
 - Solvent vapor breakdown products

Process Hazards - Painters

- Paint types and hazards:
 - Alkyd, ployester, silicone, vinyl, epoxy, polyurethane, acrylic
 - Pigments, binders, and additives
- Paint thinners, solvents, and reducers

Process Hazards -

- Offset printing
- Film processing
- Plate making
- Image transfer
- Delivery
- Inks: pigments, vehicles, solvents

Possible Hazards in Office Work

- VDTs
- Photocopying
- Tight building syndrome
- Correction fluid, solvents, glues

5. Reviewed file of material safety data sheets against chemical inventory.

MSDS's of file at start of project on 07/07/87: 64

Purchased additional reference texts on chemical hazards for plant library.

6. Organized MSDS's in alphabetical order by manufacturer. Placed MSDS's for current products in binder for copying and distribution to work areas in plant to enable employee access.

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7. Placed in archive file in alphabetical order by manufacturer:
 - a. MSDS's from products no longer used
 - b. MSDS's which have been superceded by revised MSDS'sPrepared index to archive file. See attached.
8. Prepared letters to suppliers requesting MSDS's for 166 chemical products. Sample letter included in written hazard communication program.
MSDS's on file as of 08/13/87: 154
9. Reviewed MSDS's for content
10. Prepared letters to suppliers requesting MSDS's with more complete information for 29 chemical products. Sample letter included in written hazard communication program.
of more complete MSDS's received as of 08/13/87: 21
11. Prepared written hazard communication program. See attached. A copy of program placed in MSDS binders to enable employee access.
12. Reviewed MSDSs for hazards and prepared list of products with suggested hazard warnings for labels. Designed label for printing by our in-house print shop. See attached list and sample label. Based upon what I have found, at the last weekly supervisors' meeting, I made suggestions for product substitution and/or disposal of products due to potential health hazards and asked for supervisors to consider what other chemical products in their departments that they would like to include in this list and get back to me about it at the next meeting.
13. Prepared sample letter to customers containing hazard information for captive products such as capacitors containing hazardous electrolytes. See written hazard communication program.
14. Met with supervision to review written hazard communication program and assignment of responsibilities and completion dates (where necessary) for each task in program implementation. We also assigned responsibilities and completion dates for some related safety tasks, including proper storage and grounding of solvent containers, etc.
15. Prepared audiovisual and written training materials.
16. Performed training with audiovisual aids and distributed printed materials (08/03-07/87). Training consisted of the following: Operations personnel: 1 hour/person; approx. 95 persons (4 sessions of 2 hours each for approx. 50 people/session)
Office personnel: 1 hour/person; approx. 105 persons (two sessions of 1 hour each for approx. 50 people/session)
Painters: 1 hour additional training; 3 persons
Printers: 1 hour additional training; 5 persons
Training was videotaped for use in training of new employees and those on vacation, etc.
17. Met with supervisors to finalize list of chemicals for product substitution and/or disposal.
18. Met with purchasing dept. to discuss suggestions for chemical product substitution, suggestions for future purchasing to avoid products with health hazards (furnished list of IARC/NTP/OSHA carcinogens to be avoided), and assist in selection of protective gloves, solvent storage cans, replacing air purifying respirators with supplied air respirators, etc.

19. We will be forming an in-plant spill response team which will be responsible for cleaning up and neutralizing spills, packing wastes for disposal, and regular maintenance of safety equipment. We have begun reviewing our current supplies and purchasing the necessary related materials/equipment, such as:

- a. Absorbents for solvent spills; gloves, respirators, etc. for handling spills.
- b. Safety cans, grounding wires, etc. for transferring and handling solvents as discussed above.
- c. Eyewashes, safety showers, fire extinguishers, spill kits, respirators, safety glasses.
- d. Screw-on manhole or drain covers to prevent chemical spills from entering sewer system.

RECOMMENDATIONS:

1. Form a joint labor-management safety committee. I have been considering this since meeting with the union on issues they would like to see addressed in Haz. Com. training. This may help to decrease any tension or suspicion which might arise on the topic of workplace chemical hazards and exposures. I would like to suggest that you, the plant manager, attend such a committee's meeting (perhaps a once/month regular session) so that any recommendations which the committee makes could be approved immediately and slated for action.

2. Safety meetings: for effective future safety training I am intending to change from our previous once/month hour-long programs to a shorter, more specific format. Our past meetings have always been held for all plant personnel at one time, yet the topics have only occasionally been relevant to everyone. Instead, we will:

- a. Have specific goals for a meeting
- b. Hold the meeting long enough to present desired information; such as ten minutes at the work station to discuss a work station problem.
- c. Keep assemblies small with attendees in approximately the same job categories - - this enables keeping the subject matter pertinent to their activities; employees do not have to sit through material which doesn't pertain to them.
- d. Use a good speaker (consultant or expert) or better films/videotapes. Our past reliance on in-house speakers often meant that the person was not someone who considered the meeting or the topic important and was doing it because he had to. Employees are easily turned off because they sense this double message.
- e. Keep the style as informal as possible so attendees can contribute.

3. Supervision must always take safety seriously and not send mixed messages due to the perception that the rules will not be enforced. Some of our supervisors are so production that they have employees take risks doing a job without adhering to the standard job operating procedures — this undermines our commitment to safety. When I spoke to them about this, they told me that, no matter what the safe procedures are, their jobs are being evaluated on cutting production costs, so they have to neglect the Standard Operating Job Procedures or they can't meet deadlines. Supervision must take responsibility for enforcing safe practices and must have the appropriate tools to do this — such as :

- a. Employee work rule on following safe procedures. This stresses the importance of safety and provides the means of enforcement.
- b. Supervision job descriptions which list enforcement of safe procedures as a responsibility of supervision. This stresses the importance of safety, provides a means of evaluating the supervisor, and enables regarding the supervisor for his efforts in promoting a safe workplace.

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4. Consider restricting smoking or eating in specific work areas due to potential health hazards; such as:
 - a. Paint booth area, polyurethane foaming area, vapor degreasing area: these should be nonsmoking areas due to hazardous thermal breakdown products formed by inhaling chemical vapors through hot end of cigarette.
 - b. Hand soldering areas: no smoking or eating at workstations due to potential ingestion of lead solder as result of hand-to-mouth contact.

Following is a list of tasks to be performed as per my recommendations:

A CHECKLIST OF THINGS TO DO

(*completed)

1. Print labels.
2. Fill out labels.
3. Apply labels to products.
- *4. Purchase transfer containers such as solvent cans and small chemical jars.
5. Print special labels for items in (4).
6. Apply labels for items in (4).
7. Special labels as required (see attachment of labeling suggestions).
- *8. Prepare copies of MSDS binders for distribution to departments.
- *9. Review chemical inventory for MSDS's not yet received; determine which products are for waste disposal; send out second MSDSs request letter for those products which are to be used.
10. Segregate products for waste disposal.
11. Arrange for waste disposal.
- *12. Perform training.
- *13. Prepare training records.
- *14. Organize MSDS's in archive file.
15. Provide outside contractors with information on chemicals on plant site.
- *16. Obtain information from contractors on chemicals which they bring onto plant site.
17. Find substitutes for chemicals with unacceptable health risks.
- *18. Obtain reference texts.

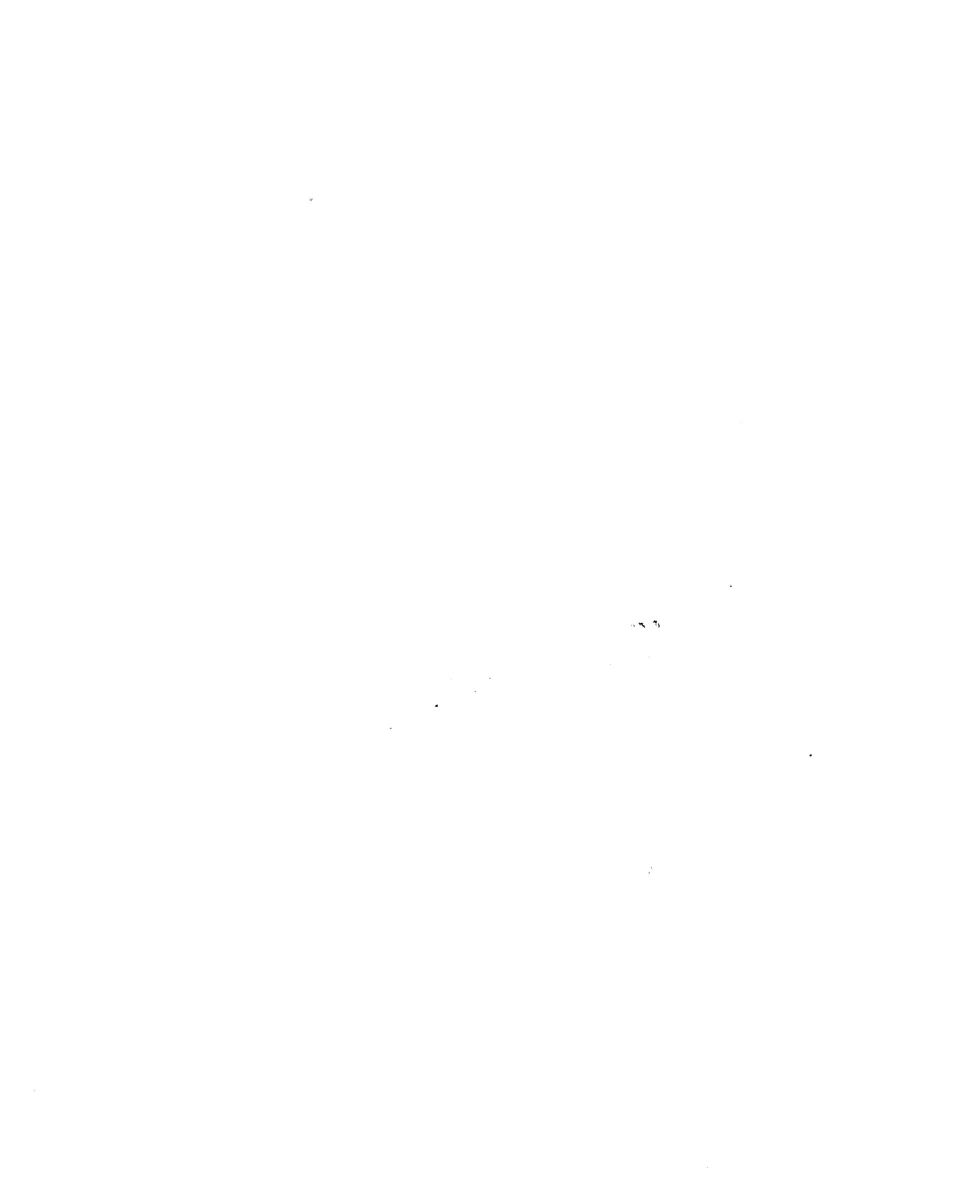
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**APPENDIX 1: OSHA Hazard Communication Standard
(Full Text - 29 CFR 1910.1200)**



OCCUPATIONAL SAFETY AND HEALTH STANDARDS
SUBPART Z — TOXIC AND HAZARDOUS SUBSTANCES
HAZARD COMMUNICATION STANDARD

(29 CFR 1910 — Subpart Z, Section 1910.1200; 48 FR 53280 November 25, 1983; Amended and corrected by 50 FR 48758, November 27, 1985; Amended by 51 FR 345297, September 30, 1986; Revised by 52 FR 31877, August 24, 1987; Amended by 52 FR 46080, December 4, 1987; 53 FR 15035, April 27, 1988; 54 FR 6888, February 15, 1989; 54 FR 24334, June 7, 1989; Revised by 59 FR 6169, February 9, 1994; Amended by 59 FR 17479, April 13, 1994; Corrected by 59 FR 65948, December 22, 1994)

TITLE 29—LABOR

Subtitle B—Regulations Relating to
Labor

Chapter XVII—Occupational Safety and
Health Administration, Department of
Labor

PART 1910—OCCUPATIONAL SAFE-
TY AND HEALTH

Authority: Sections 6, 8, Occupational Safety and Health Act, 29 U.S.C. 655, 657; Secretary of Labor's Order 12-71 (36 FR 8754), 9-76 (41 FR 25059), 9-83(48 FR 35736) or 1-90 (55 FR 9033), as applicable; and 29 CFR Part 1911.

All of subpart Z issued under section 6(b) of the Occupational Safety and Health Act, except those substances which have exposure limits listed in Tables Z-1, Z-2 and Z-3 of 29 CFR 1910.1000. The latter were issued under section 6(a) (29 U.S.C. 655(a)):

Section 1910.1000, Tables Z-1, Z-2 and Z-3 also issued under 5 U.S.C. 553. Section 1910.1000, Tables Z-1, Z-2 and Z-3 not issued under 29 CFR Part 1911 except for the arsenic (organic compounds), benzene, and cotton dust listings.

Section 1910.1001 also issued under Sec. 107 of the Contract Work Hours and Safety Standards Act, 40 U.S.C. 333.

Section 1910.1002 not issued under 29 U.S.C. 655 or 29 CFR Part 1911; also issued under 5 U.S.C. 553.

Section 1910.1025 also issued under 5 U.S.C. 553.

Section 1910.1043 also issued under 5 U.S.C. 551 *et seq.*

Sections 1910.1200, 1910.1499 and 1910.1500 also issued under 5 U.S.C. 553.

[Authority revised by 59 FR 6169, February 9, 1994; corrected by 59 FR 65948, December 22, 1994]

Subpart Z—Toxic and Hazardous Sub-
stances Hazard Communication Standard
§1910.1200 Hazard communication.

[1910.1200 revised by 59 FR 6169, February 9, 1994]

(a) *Purpose.*

(1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training.

(2) This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legal requirements of a state, or political subdivision of a state, pertaining to this subject. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce, through any court or agency, any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

(b) *Scope and application.*

(1) This section requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers. (Employers who do not produce or import chemicals need only focus on those parts of this rule that deal with establishing a workplace program and communicating information to their workers. Appendix E of this section is a general guide for such employers to help them determine their compliance obligations under the rule.)

(2) This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

(3) This section applies to laboratories only as follows:

(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(ii) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each workshift to laboratory employees when they are in their work areas;

(iii) Employers shall ensure that laboratory employees are provided information and training in accordance with paragraph (h) of this section, except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section; and,

(iv) Laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor under this rule, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with paragraph (D)(1) of this section, and that a material safety data sheet is provided to distributors and other employers in accordance with

[Sec. 1910.1200(b)(3)(iv)]

generally in large quantities over time and/or at costs that are below the regular retail price.

Common name means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.

Compressed gas means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 °F (21.1 °C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM D-323-72.

Container means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Designated representative means any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

Director means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Distributor means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

Employee means a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

Employer means a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure or *exposed* means that an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (e.g., accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (e.g., inhalation, ingestion, skin contact or absorption).

Flammable means a chemical that falls into one of the following categories:

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 °F (37.8 °C), except any mixture having components with flashpoints of 100 °F (37.8 °C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in §1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 °F (37.8 °C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100 °F (37.8 °C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Foreseeable emergency means any potential occurrence such as, but not limited to, equipment failure, rupture of contain-

ers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

Hazardous chemical means any chemical which is a physical hazard or a health hazard.

Hazard warning means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical and health hazard(s), including target organ effects, of the chemical(s) in the container(s). (See the definitions for "physical hazard" and "health hazard" to determine the hazards which must be covered.)

[1910.1200(c) "Hazard Warning" definition corrected by 59 FR 65948, December 22, 1994]

Health hazard means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.

Identity means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS.

Immediate use means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Importer means the first business within the Customs Territory of the United States which receives hazardous chemicals produced in other countries for the purpose of supplying them to distributors or employers within the United States.

Label means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Material safety data sheet (MSDS) means written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of this section.

Mixture means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

ployees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (c) include the following:

(i) The methods the employer will use to provide the other employer(s) on-site access to material safety data sheets for each hazardous chemical the other employer(s) employees may be exposed to while working;

(ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,

(iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

(3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).

(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.20(e).

(5) Where employees must travel between workplaces during a workshift, *i.e.*, their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.

(f) Labels and other forms of warning.

(1) The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:

(i) Identity of the hazardous chemical(s);

(ii) Appropriate hazard warnings; and

(iii) Name and address of the chemical manufacturer, importer, or other responsible party.

(2) (i) For solid metal (such as a steel beam or a metal casting), solid wood, or plastic items that are not exempted as articles due to their downstream use, or shipments of whole grain, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes;

(ii) The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment; and,

(iii) This exception to requiring labels on every container of hazardous chemicals is only for the solid material itself, and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the material and to which employees handling the items in transit

may be exposed (for example, cutting fluids or pesticides in grains).

(3) Chemical manufacturers, importers, or distributors shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked in accordance with this section in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (49 U.S.C. 1801 *et seq.*) and regulations issued under that Act by the Department of Transportation.

(4) If the hazardous chemical is regulated by OSHA in a substance-specific health standard, the chemical manufacturer, importer, distributor or employer shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard.

(5) Except as provided in paragraphs (f)(6) and (f)(7) of this section, the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the following information:

(i) Identity of the hazardous chemical(s) contained therein; and,

(ii) Appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

(6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.

(7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.

(8) The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.

(9) The employer shall ensure that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information

in their language to the material presented, as long as the information is presented in English as well.

(10) The chemical manufacturer, importer, distributor or employer need not affix new labels to comply with this section if existing labels already convey the required information.

(11) Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

(g) Material safety data sheets.

(1) Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet in the workplace for each hazardous chemical which they use.

(2) Each material safety data sheet shall be in English (although the employer may maintain copies in other languages as well), and shall contain at least the following information:

(i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets:

(A) If the hazardous chemical is a single substance, its chemical and common name(s);

(B) If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or,

(C) If the hazardous chemical is a mixture which has not been tested as a whole:

(1) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d) of this section shall be listed if the concentrations are 0.1% or greater; and,

(2) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than 1% (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees; and,

(3) The chemical and common name(s) of all ingredients which have

whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.

(2) *Information.* Employees shall be informed of:

(i) The requirements of this section;

(ii) Any operations in their work area where hazardous chemicals are present; and,

(iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.

(3) *Training.* Employee training shall include at least:

(i) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(ii) The physical and health hazards of the chemicals in the work area;

(iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

(iv) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

(i) *Trade secrets.* (1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that:

(i) The claim that the information withheld is a trade secret can be supported;

(ii) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed;

(iii) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and,

(iv) The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph.

(2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identi-

ty of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of paragraphs (i) (3) and (4) of this section, as soon as circumstances permit.

(3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if:

(i) The request is in writing;

(ii) The request describes with reasonable detail one or more of the following occupational health needs for the information:

(A) To assess the hazards of the chemicals to which employees will be exposed;

(B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;

(C) To conduct pre-assignment or periodic medical surveillance of exposed employees;

(D) To provide medical treatment to exposed employees;

(E) To select or assess appropriate personal protective equipment for exposed employees;

(F) To design or assess engineering controls or other protective measures for exposed employees; and,

(G) To conduct studies to determine the health effects of exposure.

(iii) The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representative, would not satisfy the purposes described in paragraph (i)(3)(ii) of this section:

(A) The properties and effects of the chemical;

(B) Measures for controlling workers' exposure to the chemical;

(C) Methods of monitoring and analyzing worker exposure to the chemical; and,

(D) Methods of diagnosing and treating harmful exposures to the chemical;

(iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and,

(v) The health professional, and the employer or contractor of the services of the health professional (i.e. downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional, employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (i)(6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.

(4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:

(i) May restrict the use of the information to the health purposes indicated in the written statement of need;

(ii) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and,

(iii) May not include requirements for the posting of a penalty bond.

(5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.

(6) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the chemical manufacturer, importer, or employer who provided the information shall be informed by the health professional, employee, or designated representative prior to, or at the same time as, such disclosure.

(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity, the denial must:

(i) Be provided to the health professional, employee, or designated representative, within thirty days of the request;

(ii) Be in writing;

(iii) Include evidence to support the claim that the specific chemical identity is a trade secret;

(iv) State the specific reasons why the request is being denied; and,

(v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.

(8) The health professional, employee, or designated representative whose request for information is denied under paragraph (i)(3) of this section may refer the request and the written denial of the request to OSHA for consideration.

(9) When a health professional, employee, or designated representative refers the denial to OSHA under paragraph (i)(8) of this section, OSHA shall consider the evidence to determine if:

skin of albino rabbits weighing between two and three kilograms each.

A chemical that has a median lethal concentration (LC₅₀) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

4. *Irritant*: A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for four hours exposure or by other appropriate techniques, it results in an empirical score of five or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

5. *Sensitizer*: A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

6. *Toxic*. A chemical falling within any of the following categories:

A chemical that has a median lethal dose (LD₅₀) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

A chemical that has a median lethal dose (LD₅₀) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

A chemical that has a median lethal concentration (LC₅₀) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

7. *Target organ effects*.

The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive.

- a. *Hepatotoxins*: Chemicals which produce liver damage
Signs & Symptoms: Jaundice; liver enlargement
Chemicals: Carbon tetrachloride; nitrosamines
- b. *Nephrotoxins*: Chemicals which produce kidney damage
Signs & Symptoms: Edema; proteinuria
Chemicals: Halogenated hydrocarbons; uranium

c. *Neurotoxins*: Chemicals which produce their primary toxic effects on the nervous system

Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions
Chemicals: Mercury; carbon disulfide

d. *Agents which act on the blood or hematopoietic system*: Decrease hemoglobin function; deprive the body tissues of oxygen

Signs & Symptoms: Cyanosis; loss of consciousness

Chemicals: Carbon monoxide; cyanides

e. *Agents which damage the lung*: Chemicals which irritate or damage pulmonary tissue

Signs & Symptoms: Cough; tightness in chest; shortness of breath

Chemicals: Silica; asbestos

f. *Reproductive toxins*: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis)

Signs & Symptoms: Birth defects; sterility

Chemicals: Lead; DBCP

g. *Cutaneous hazards*: Chemicals which affect the dermal layer of the body

Signs & Symptoms: Defatting of the skin; rashes; irritation

Chemicals: Ketones; chlorinated compounds

h. *Eye hazards*: Chemicals which affect the eye or visual capacity

Signs & Symptoms: Conjunctivitis; corneal damage

Chemicals: Organic solvents; acids

Appendix B to §1910.1200—Hazard Determination (Mandatory)

The quality of a hazard communication program is largely dependent upon the adequacy and accuracy of the hazard determination. The hazard determination requirement of this standard is performance-oriented. Chemical manufacturers, importers, and employers evaluating chemicals are not required to follow any specific methods for determining hazards, but they must be able to demonstrate that they have adequately ascertained the hazards of the chemicals produced or imported in accordance with the criteria set forth in this Appendix.

Hazard evaluation is a process which relies heavily on the professional judgment of the evaluator, particularly in the area of chronic hazards. The performance-orientation of the hazard determination does not diminish the duty of the chemical manufacturer, importer or employer to conduct a thorough evaluation, examining all relevant data and producing a scientifically defensible evaluation. For purposes of this standard, the following criteria shall be used in making hazard determinations that meet the requirements of this standard.

1. *Carcinogenicity*: As described in paragraph (d)(4) of this section and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section. In addition, however, all available scientific

data on carcinogenicity must be evaluated in accordance with the provisions of this Appendix and the requirements of the rule.

2. *Human data*: Where available, epidemiological studies and case reports of adverse health effects shall be considered in the evaluation.

3. *Animal data*: Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace. Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).

4. *Adequacy and reporting of data*. The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. *In vitro* studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.

The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

Appendix C to §1910.1200—Information Sources (Advisory)

The following is a list of available data sources which the chemical manufacturer, importer, distributor, or employer may wish to consult to evaluate the hazards of chemicals they produce or import:

- Any information in their own company files, such as toxicity testing results or illness experience of company employees.
- Any information obtained from the supplier of the chemical, such as material safety data sheets or product safety bulletins.
- Any pertinent information obtained from the following source list (latest editions should be used):

Condensed Chemical Dictionary

Van Nostrand Reinhold Co., 135 West 50th Street, New York, NY 10020.

The Merck Index: An Encyclopedia of Chemicals and Drugs

Merck and Company, Inc., 126 E. Lincoln Ave., Rahway, NJ 07065.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man

Geneva: World Health Organization, International Agency for Research on Cancer, 1972-Present (Multivolume work). Summaries are available in supplement volumes, 49 Sheridan Street, Albany, NY 12210.

Industrial Hygiene and Toxicology, by F. A. Patty

John Wiley & Sons, Inc., New York, NY (Multivolume work).

[Sec. 1910.1200, Appendix C]

however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this Section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

Appendix E to §1910.1200 (Advisory)—Guidelines for Employer Compliance

The Hazard Communication Standard (HCS) is based on a simple concept—that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring. The HCS is designed to provide employees with the information they need.

Knowledge acquired under the HCS will help employers provide safer workplaces for their employees. When employers have information about the chemicals being used, they can take steps to reduce exposures, substitute less hazardous materials, and establish proper work practices. These efforts will help prevent the occurrence of work-related illnesses and injuries caused by chemicals.

The HCS addresses the issues of evaluating and communicating hazards to workers. Evaluation of chemical hazards involves a number of technical concepts, and is a process that requires the professional judgment of experienced experts. That's why the HCS is designed so that employers who simply use chemicals, rather than produce or import them, are not required to evaluate the hazards of those chemicals. Hazard determination is the responsibility of the producers and importers of the materials. Producers and importers of chemicals are then required to provide the hazard information to employers that purchase their products.

Employers that don't produce or import chemicals need only focus on those parts of the rule that deal with establishing a workplace program and communicating information to their workers. This appendix is a general guide for such employers to help them determine what's required under the rule. It does not supplant or substitute for the regulatory provisions, but rather provides a simplified outline of the steps an average employer would follow to meet those requirements.

1. Becoming Familiar With the Rule.

OSHA has provided a simple summary of the HCS in a pamphlet entitled "Chemical Hazard Communication," OSHA Publication Number 3084. Some employers prefer to begin to become familiar with the rule's requirements by reading this pamphlet. A copy may be obtained from your local OSHA Area Office, or by contacting the

OSHA Publications Office at (202) 523-9667.

The standard is long, and some parts of it are technical, but the basic concepts are simple. In fact, the requirements reflect what many employers have been doing for years. You may find that you are already largely in compliance with many of the provisions, and will simply have to modify your existing programs somewhat. If you are operating in an OSHA-approved State Plan State, you must comply with the State's requirements, which may be different than those of the Federal rule. Many of the State Plan States had hazard communication or "right-to-know" laws prior to promulgation of the Federal rule. Employers in State Plan States should contact their State OSHA offices for more information regarding applicable requirements.

The HCS requires information to be prepared and transmitted regarding all hazardous chemicals. The HCS covers both physical hazards (such as flammability), and health hazards (such as irritation, lung damage, and cancer). Most chemicals used in the workplace have some hazard potential, and thus will be covered by the rule.

One difference between this rule and many others adopted by OSHA is that this one is performance-oriented. That means that you have the flexibility to adapt the rule to the needs of your workplace, rather than having to follow specific, rigid requirements. It also means that you have to exercise more judgment to implement an appropriate and effective program.

The standard's design is simple. Chemical manufacturers and importers must evaluate the hazards of the chemicals they produce or import. Using that information, they must then prepare labels for containers, and more detailed technical bulletins called material safety data sheets (MSDS).

Chemical manufacturers, importers, and distributors of hazardous chemicals are all required to provide the appropriate labels and material safety data sheets to the employers to which they ship the chemicals. The information is to be provided automatically. Every container of hazardous chemicals you receive must be labeled, tagged, or marked with the required information. Your suppliers must also send you a properly completed material safety data sheet (MSDS) at the time of the first shipment of the chemical, and with the next shipment after the MSDS is updated with new and significant information about the hazards.

You can rely on the information received from your suppliers. You have no independent duty to analyze the chemical or evaluate the hazards of it.

Employers that "use" hazardous chemicals must have a program to ensure the information is provided to exposed employees. "Use" means to package, handle, react, or transfer. This is an intentionally broad scope, and includes any situation where a chemical is present in such a way that employees may be exposed under normal conditions of use or in a foreseeable emergency.

The requirements of the rule that deal specifically with the hazard communication program are found in this section in paragraphs (e), written hazard communica-

tion program; (f), labels and other forms of warning; (g), material safety data sheets; and (h), employee information and training. The requirements of these paragraphs should be the focus of your attention. Concentrate on becoming familiar with them, using paragraphs (b), scope and application, and (c), definitions, as references when needed to help explain the provisions.

There are two types of work operations where the coverage of the rule is limited. These are laboratories and operations where chemicals are only handled in sealed containers (e.g., a warehouse). The limited provisions for these workplaces can be found in paragraph (b) of this section, scope and application. Basically, employers having these types of work operations need only keep labels on containers as they are received; maintain material safety data sheets that are received, and give employees access to them; and provide information and training for employees. Employers do not have to have written hazard communication programs and lists of chemicals for these types of operations.

The limited coverage of laboratories and sealed container operations addresses the obligation of an employer to the workers in the operations involved, and does not affect the employer's duties as a distributor of chemicals. For example, a distributor may have warehouse operations where employees would be protected under the limited sealed container provisions. In this situation, requirements for obtaining and maintaining MSDSs are limited to providing access to those received with containers while the substance is in the workplace, and requesting MSDSs when employees request access for those not received with the containers. However, as a distributor of hazardous chemicals, that employer will still have responsibilities for providing MSDSs to downstream customers at the time of the first shipment and when the MSDS is updated. Therefore, although they may not be required for the employees in the work operation, the distributor may, nevertheless, have to have MSDSs to satisfy other requirements of the rule.

2. Identify Responsible Staff

Hazard communication is going to be a continuing program in your facility. Compliance with the HCS is not a "one shot deal." In order to have a successful program, it will be necessary to assign responsibility for both the initial and ongoing activities that have to be undertaken to comply with the rule. In some cases, these activities may already be part of current job assignments. For example, site supervisors are frequently responsible for on-the-job training sessions. Early identification of the responsible employees, and involvement of them in the development of your plan of action, will result in a more effective program design. Evaluation of the effectiveness of your program will also be enhanced by involvement of affected employees.

For any safety and health program, success depends on commitment at every level of the organization. This is particularly true for hazard communication, where success requires a change in behavior. This will only occur if employers understand the program,

B. Material Safety Data Sheets

Chemical manufacturers and importers are required to obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Distributors are responsible for ensuring that their customers are provided a copy of these MSDSs. Employers must have an MSDS for each hazardous chemical which they use. Employers may rely on the information received from their suppliers. The specific requirements for material safety data sheets are in paragraph (g) of this section.

There is no specified format for the MSDS under the rule, although there are specific information requirements. OSHA has developed a non-mandatory format, OSHA Form 174, which may be used by chemical manufacturers and importers to comply with the rule. The MSDS must be in English. You are entitled to receive from your supplier a data sheet which includes all of the information required under the rule. If you do not receive one automatically, you should request one. If you receive one that is obviously inadequate, with, for example, blank spaces that are not completed, you should request an appropriately completed one. If your request for a data sheet or for a corrected data sheet does not produce the information needed, you should contact your local OSHA Area Office for assistance in obtaining the MSDS.

The role of MSDSs under the rule is to provide detailed information on each hazardous chemical, including its potential hazardous effects, its physical and chemical characteristics, and recommendations for appropriate protective measures. This information should be useful to you as the employer responsible for designing protective programs, as well as to the workers. If you are not familiar with material safety data sheets and with chemical terminology, you may need to learn to use them yourself. A glossary of MSDS terms may be helpful in this regard. Generally speaking, most employers using hazardous chemicals will primarily be concerned with MSDS information regarding hazardous effects and recommended protective measures. Focus on the sections of the MSDS that are applicable to your situation.

MSDSs must be readily accessible to employees when they are in their work areas during their workshifts. This may be accomplished in many different ways. You must decide what is appropriate for your particular workplace. Some employers keep the MSDSs in a binder in a central location (e.g., in the pick-up truck on a construction site). Others, particularly in workplaces with large numbers of chemicals, computerize the information and provide access through terminals. As long as employees can get the information when they need it, any approach may be used. The employees must have access to the MSDSs themselves—simply having a system where the information can be read to them over the phone is only permitted under the mobile worksite provision, paragraph (g)(9) of this section, when employees must travel between workplaces during the shift. In this situation, they have access to the MSDSs prior to leaving the primary worksite, and

when they return, so the telephone system is simply an emergency arrangement.

In order to ensure that you have a current MSDS for each chemical in the plant as required, and that employee access is provided, the compliance officers will be looking for the following types of information in your written program:

1. Designation of person(s) responsible for obtaining and maintaining the MSDSs;
2. How such sheets are to be maintained in the workplace (e.g., in notebooks in the work area(s) or in a computer with terminal access), and how employees can obtain access to them when they are in their work area during the work shift;
3. Procedures to follow when the MSDS is not received at the time of the first shipment;
4. For producers, procedures to update the MSDS when new and significant health information is found; and,
5. Description of alternatives to actual data sheets in the workplace, if used.

For employers using hazardous chemicals, the most important aspect of the written program in terms of MSDSs is to ensure that someone is responsible for obtaining and maintaining the MSDSs for every hazardous chemical in the workplace. The list of hazardous chemicals required to be maintained as part of the written program will serve as an inventory. As new chemicals are purchased, the list should be updated. Many companies have found it convenient to include on their purchase orders the name and address of the person designated in their company to receive MSDSs.

C. Employee Information and Training

Each employee who may be "exposed" to hazardous chemicals when working must be provided information and trained prior to initial assignment to work with a hazardous chemical, and whenever the hazard changes. "Exposure" or "exposed" under the rule means that "an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g., accidental or possible) exposure." See paragraph (h) of this section for specific requirements. Information and training may be done either by individual chemical, or by categories of hazards (such as flammability or carcinogenicity). If there are only a few chemicals in the workplace, then you may want to discuss each one individually. Where there are large numbers of chemicals, or the chemicals change frequently, you will probably want to train generally based on the hazard categories (e.g., flammable liquids, corrosive materials, carcinogens). Employees will have access to the substance-specific information on the labels and MSDSs.

Information and training is a critical part of the hazard communication program. Information regarding hazards and protective measures are provided to workers through written labels and material safety data sheets. However, through effective information and training, workers will learn to read and understand such information, determine how it can be obtained and used in their own workplaces, and understand the risks of ex-

posure to the chemicals in their workplaces as well as the ways to protect themselves. A properly conducted training program will ensure comprehension and understanding. It is not sufficient to either just read material to the workers, or simply hand them material to read. You want to create a climate where workers feel free to ask questions. This will help you to ensure that the information is understood. You must always remember that the underlying purpose of the HCS is to reduce the incidence of chemical source illnesses and injuries. This will be accomplished by modifying behavior through the provision of hazard information and information about protective measures. If your program works, you and your workers will better understand the chemical hazards within the workplace. The procedures you establish regarding, for example, purchasing, storage, and handling of these chemicals will improve, and thereby reduce the risks posed to employees exposed to the chemical hazards involved. Furthermore, your workers' comprehension will also be increased, and proper work practices will be followed in your workplace.

If you are going to do the training yourself, you will have to understand the material and be prepared to motivate the workers to learn. This is not always an easy task, but the benefits are worth the effort. More information regarding appropriate training can be found in OSHA Publication No. 2254 which contains voluntary training guidelines prepared by OSHA's Training Institute. A copy of this document is available from OSHA's Publications Office at (202) 219-4667.

In reviewing your written program with regard to information and training, the following items need to be considered:

1. Designation of person(s) responsible for conducting training;
2. Format of the program to be used (audiovisuals, classroom instruction, etc.);
3. Elements of the training program (should be consistent with the elements in paragraph (h) of this section); and,
4. Procedure to train new employees at the time of their initial assignment to work with a hazardous chemical, and to train employees when a new hazard is introduced into the workplace.

The written program should provide enough details about the employer's plans in this area to assess whether or not a good faith effort is being made to train employees. OSHA does not expect that every worker will be able to recite all of the information about each chemical in the workplace. In general, the most important aspects of training under the HCS are to ensure that employees are aware that they are exposed to hazardous chemicals, that they know how to read and use labels and material safety data sheets, and that, as a consequence of learning this information, they are following the appropriate protective measures established by the employer. OSHA compliance officers will be talking to employees to determine if they have received training, if they know they are exposed to hazardous chemicals, and if they know where to obtain substance-specific information on labels and MSDSs.

**OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
SAMPLE MATERIAL SAFETY DATA SHEET
(OSHA Form No. 174)**

**OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
SAMPLE MATERIAL SAFETY DATA SHEET
(OSHA Form No. 174)**

APPENDIX 2: The Material Safety Data Sheet in Detail

IDENTITY (AS USED ON LABEL AND LIST)

The name of the chemical product. This name must be consistently used for this product wherever it appears: that is, the product name must be the same on the MSDS as on the container labels, chemical inventory lists, and any other places where the chemical is identified so that it is clear what information goes with what chemical product.

BLANK SPACES ARE NOT PERMITTED ON A MSDS. If any entry is not applicable or no information is available, the entry must so state.

Wherever information is requested on an MSDS, it must be provided. However, there are cases where the requested information simply doesn't apply to the chemical — when this occurs, the space must be marked "not applicable" or abbreviated "N/A" or some similar variation. For example, the MSDS requires information on vapor density, but the chemical product doesn't give off a vapor, therefore vapor density is marked N/A.

It may happen that the information requested on the MSDS does not exist at this time; then the space should be marked to indicate that; such as, "no information is available at this time." For example, the MSDS requires information on the chronic (long-term) exposure to the chemical, but no scientific studies have been done on this substance to indicate what its long-term health effects may be.

In any event, without blank spaces, the reader of the MSDS is not left simply wondering whether the information is unknown and was omitted by accident or is truly unknown or not applicable.

SECTION I.

MANUFACTURER'S NAME AND ADDRESS

The complete address including street address, city, state, and zip code.

EMERGENCY TELEPHONE NUMBER

A number which could be called 24 hours a day for emergency information, such as advice to a physician in the event of a health emergency (such as accidental swallowing of the chemical or spilling it all over the body) or spill handling information. The emergency and first aid section of the MSDS is not intended to be detailed enough to provide all the information that a physician might need to handle administration of antidotes and other supportive medical aids.

TELEPHONE NUMBER FOR INFORMATION

A number which could be called simply to obtain more information on the chemical product, not in an emergency situation. Use this number to reach the manufacturer and speak to knowledgeable people about the information on the MSDS, to understand and interpret the MSDS, or to obtain more information on the product in order to use it properly. Also helpful to understand how material will behave if used improperly or if information from various sections on the MSDS appears to be inconsistent or contradictory.

DATE PREPARED

Extremely useful for determining the age of the information on the MSDS, whether this is an old MSDS or a recent update. People often wonder if they should discard an old MSDS when they receive an update. The Standard does not strictly require saving old MSDSs, but does require that information on the product and its manufacturer, etc., be retained. Actually, saving the MSDS itself is a good idea because it provides evidence that:

The employer used the best information at the time in using that product even if the new MSDS indicates more serious health effects than were previously known, or other such information.

The product may have contained ingredients with more serious health hazards, but now has a less hazardous formulation. Products change and ingredients with serious health hazards are often removed from a product. Old MSDSs document these changes.

SIGNATURE OF PREPARER (OPTIONAL)

The person responsible for preparing the MSDS — useful person to talk to about additional information on the product or about the contents of the MSDS.

"I once worked in a plant where one of the building had a damp, moist environment which tended to foster large populations of spiders. I was collecting MSDSs on pesticides trying to find one which would kill the spiders, but wouldn't enter the sewer system and kill fish in the receiving stream. I found one chemical which looked promising, but the MSDS had a contradiction in it. In the section marked "Hazardous Decomposition or Byproducts", such as in the case of a fire, one of the decomposition products listed was phosgene. Phosgene is a very poisonous gas used during World War I. Phosgene contains chlorine, but there were no hazardous ingredients in the product which were chlorinated -- so I couldn't figure out where the chlorine was coming from. I called the "telephone number for information" and got hold of the chemist who had worked on the formulation and he told me 'Lady, you don't have to worry about that because that's only going to happen if there's a fire.' I finally was able to get across to him that I realized it would happen if there was a fire; but what I wanted to know was how phosgene could be produced at all if there were no ingredients which contained chlorine. He asked me to look at the list of ingredients and tell him if methylene chloride was there. It wasn't and he said 'there's a good reason for that' we took methylene chloride out of the product a couple of years ago.' So I asked him why he had updated the front of the MSDS but hadn't updated the back. He didn't like that."

SECTION II: HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS

(SPECIFIC CHEMICAL IDENTITY; COMMON NAME(S))

Not all ingredients are required to be shown here; only those ingredients which are considered hazardous and only if those hazardous components make up 1% or more of the composition. There are exceptions to this: if the component is a carcinogen, then it must be shown here if it makes up 0.1% or more of the product's composition. A component making up <1% (or <0.1%) of the composition must also be listed if, in the workplace, it will bring about an exposure which exceeds the OSHA permissible exposure level for that substance or is otherwise a health hazard.

The manufacturer can avoid listing ingredients if he has his product tested for health

and physical hazards as a mixture and reports the test results for the product as a whole. This generally involves considerable expense for test animals to inhale, ingest, or have the product placed on their skin and determine the resulting effects and lethal doses. However, this option is one way for a manufacturer to keep his formulation a trade secret.

Since this is the section in which a manufacturer would claim his formulation is proprietary, it is appropriate to discuss the trade secret issue here. For a formulation to be considered a trade secret, the Standard has several requirements which boil down to two basic concepts:

The product's ingredients cannot be readily discovered by reverse engineering. That is, you can't simply analyze the product in the laboratory and readily discover what is in it. (If it's that easy, it's not much of a secret.)

Revealing the product's ingredients would cause the manufacturer considerable financial harm in the marketplace.

A manufacturer bears the burden of demonstrating that his trade secret claim is bona fide.

If the formulation is kept secret, the MSDS must still contain information on the properties and effects of the product and the specific chemical components must be available to health professionals in the event of a medical emergency. Provisions of the Standard also provide access during non-emergency situations by giving employees and their designated representatives access to trade secrets and also giving access to this information to occupational health professionals (physicians, industrial hygienists, toxicologists, epidemiologists, or occupational health nurses) providing medical or other occupational health services to exposed employees; or to engineers or other technical experts who are designing ventilation systems, etc.

As you might imagine, a manufacturer could avoid the trade secret issue entirely by having his product tested as a mixture for its health and physical hazards so that he could report these hazards for the product as a whole and not have to list the ingredients. Many manufacturers are doing just that, in spite of the expense involved, as a way of dealing with the problem of proprietary information.

The hazardous ingredients must be listed by specific chemical identity; this means the chemical name (such as that assigned by following the naming rules of the International Union of Pure and Applied Chemistry), Chemical Abstract Service registry number, or other listing which uniquely identifies that particular substance. Also, the common or trade names of the chemical must be shown.

For example:

Common name = perchloroethylene, "perc"
IUPAC name = 1,1,2,2-tetrachloroethene

Common name = caustic soda, lye
IUPAC name = sodium hydroxide

Common name = isopropyl alcohol
IUPAC name = 2-propanol

Some chemical substances are themselves mixtures which do not have a unique chemical composition, such as petroleum distillates or mineral spirits. These solvents

are obtained from a petroleum cracking tower at a given boiling point range and are composed of mixtures of chemical compounds. The exact chemical composition varies from one petroleum plant to another and depends upon the source of the crude oil; so unique identification is not possible for such materials.

What are hazardous ingredients? They fall into two categories: physical hazards and health hazards.

Physical hazards include substances which are flammable or otherwise subject to chemical reactions which could give off considerable heat or trigger fires. These include:

- Combustible liquids
- Flammable aerosols, gases, liquids, or solids
- Oxidizers
- Pyrophoric materials
- Compressed gases
- Explosives
- Organic peroxides
- Unstable materials
- Water-reactive materials

Health hazards include substances which could cause acute or chronic adverse health effects in doses resulting from normal use or predictable misuse. "Predictable misuse" can be difficult to assess. (As a corollary of Murphy's Law says: It's difficult to make things foolproof because those fools are so ingenious.) Misuse can mean mixing products together which should not be mixed (section on MSDS called Precautions to be taken on handling or storing). Health hazards include:

- Carcinogen - causes cancer
- Corrosive - causes tissue burns (not damage to metal)
- Highly toxic - refers to animal experiments in which low dosages fed, or inhaled, or applied to the skin killed off 50% of the test animals
- Toxic - similar to highly toxic but requiring higher dosages to produce a 50% kill
- Irritant - causes reversible inflammation
- Sensitizer - causes an allergic reaction (for example, skin rash, headaches, asthma)
- Target organ effects - known to cause damage to specific body organs or organ systems: liver, kidneys, nervous system or brain, blood or blood-forming organs, lungs, reproductive system (includes effects on fetus), skin, or eyes.

OSHA PEL, ACGIH TLV, AND OTHER RECOMMENDED LIMITS

Also in Section II are workplace limits such as the OSHA PEL, ACGIH TLV, and other limits recommended. These refer to the concentrations of chemicals, such as dusts, vapors, or gases, to which the average person could be exposed during an 8-hour day, 40-hour work week, which are considered "safe" exposures -- that is, unlikely to cause adverse effects.

The OSHA Permissible Exposure Level (PEL) is a legal limit in the workplace enforceable by OSHA. These limits may be found in the Code of Federal Regulations at 29 CFR 1910.1000 Subpart Z, Tables Z-1, Z-2, and Z-3. The ACGIH Threshold Limit Values (TLV) are recommended limits set by the American Conference of Governmental Industrial Hygienists, a private organization. The ACGIH publishes a booklet containing the TLVs annually. Other recommended limits could include those suggested by NIOSH,

the National Institute for Occupational Safety and Health, or by other organizations. With few exceptions, the OSHA PELs were the 1968-69 recommended limits of the ACGIH at the time the Occupational Safety and Health Act was passed in 1970 and may be outdated as to the health effects which could occur at those levels. The ACGIH revises its limits annually to take into account new information on adverse health effects.

These limits are intended to protect the "average" person and generally with respect to acute, not chronic, health effects. They are not intended to protect the person with a pre-existing health condition (such as an allergy or a lung or heart problem), the person who wishes to have or father children, or the pregnant or lactating worker.

These limits are usually expressed as parts per million (ppm) which are parts of gas or vapor in each million parts of air; or as mg/m³ which are milligrams of dust or vapor per cubic meter of air. To know what these levels are in the workplace, it is necessary to measure them.

% (OPTIONAL):

The manufacturer is not required to state the actual percentage of each ingredient present in the product, but many choose to do so. This was left as an option so as to help keep formulations proprietary as much as possible.

SECTION III: PHYSICAL/CHEMICAL CHARACTERISTICS

For some strange reason, people don't tend to like this section. Although we must spend some time defining terms, we will also look at some practical applications -- how these data could be used to provide information on physical or health hazards in the workplace.

BOILING POINT

This is the temperature at which a liquid is converted to a gas at standard atmospheric pressure. This can be used for assessing the proper storage of chemicals, such as solvents like the freons which have very low boiling points (which is why they are used as refrigerants). Products with low boiling points can build up considerable pressure in the container if they get too hot. Knowing that special storage or handling is necessary could be considered before purchasing, such as when writing a purchasing specification, so that your purchasing department (or buyer) does not look at chemicals for which you do not have the appropriate storage (such as solvent cabinets or refrigeration) as required or are unwilling to indulge in the expense of such storage.

VAPOR PRESSURE (mmHg)

This is a measure of how much vapor is given off by a chemical usually a liquid) (when the vapor is in equilibrium with its liquid) It is reported in units of millimeters of mercury also called a torr. For example, the atmosphere we breathe has a vapor pressure of 760 mmHg, that is, it exerts a pressure which (in a measuring device) can support a column of mercury which is 760 millimeters high. The higher the vapor pressure of chemical, the more vapor is present in the air for us to inhale. For comparison, let's look at some examples:

	<u>Vapor Pressure (mmHg)</u>
Atmosphere @ sea level @ 0° C	760
Stoddard solvent @ 20°C	3
1,1,1,2-tetrachloroethane @ 19.3°C	10
1,1,1-trichloroethane @ 20°C	100

So, if we are working near an open container of trichloroethane, at a temperature of about 20 degrees Celsius (68 degrees Fahrenheit), there is a lot of trichloroethane vapor for us to inhale. In fact, if we do a simple calculation

$$(100 \text{ mmHg}/760 \text{ mmHg}) \times 100 = 13 \%$$

We can see that about 13 % of the air we are breathing is trichloroethane. However, if we are working around stoddard solvent, there is considerably less vapor being given off to the air for us to inhale. By using vapor pressure information, we can compare products based upon potential inhalation exposure and try to substitute chemicals for those with lower vapor pressures where possible. When purchasing chemicals, you may wish to consider suggesting upper limits for vapor pressures for chemicals to your purchasing department or buyer. In this way, you can shop around for chemicals with lower potential hazards or whose ventilation or protective equipment requirements fit your current work practices to keep down your expenses for equipment and training.

Shortly, when we look at fire hazards, we will see that high vapor pressures also indicate high volatility; for flammable substances, this term gives us information about flammability potential as well.

VAPOR DENSITY (AIR = 1)

This is a comparison term: if the density of air is taken to be 1, is the vapor in question lighter-than-air (vapor density < 1) or heavier-than-air (vapor density >1)? A vapor which is lighter than air will rise to the ceiling and fill a room by displacing air from the ceiling and working its way toward the floor. A vapor which is heavier than air will sink to the floor and displace air from the floor, working its way toward the ceiling. For example:

	<u>Vapor Density (air = 1)</u>
Ammonia	0.59
Methane	0.6
Ethane	1.04
Hydrogen sulfide	1.89
Carbon dioxide	2.04
Chlorine	2.49
Gasoline	3.0 - 4.0
TCE (trichloroethylene)	4.45

As you can see, ammonia and methane rise to the ceiling; chlorine and gasoline vapors stay close to the floor. Vapor density information can help you to look at the work area in terms of vapors collecting in degreasing pits or other lower levels (such as stairwells) -- air will be displaced in these areas and therefore hazardous to breathe due to oxygen deficiency. Also, flammable vapors (such as gasoline or hydrogen sulfide) could move to lower levels and eventually reach an ignition source (such as a pilot light).

Vapor density information can also be used to evaluate existing ventilation and help plan future chemical purchases to fit into your current ventilation system. If you currently have ventilation which draws air from a location directly above your head, then chemical vapors will be pulled past your face (and your breathing zone) as you work before these vapors exit the work area. For vapors which are lighter than air,

ventilation should be located so that vapors are drawn away from you (even if the ventilation is located higher than your head). When vapors are heavier than air, ventilation is best located at the level of the work surface or below. This takes advantage of the natural downward movement of the vapor and draws the vapor away from your breathing zone.

SPECIFIC GRAVITY (H₂O = 1)

This is another comparative type of term. Specific gravity is a measure of density which compares the density of a substance with the density of water. A substance with a specific gravity greater than 1 is heavier than water and will sink in water. Substances with specific gravities lower than 1 are lighter than water and float on water. For example:

	<u>Specific Gravity (H₂O = 1)</u>
Tung oil	0.934
Caster oil	0.961
Fluorocarbon 12 (Freon 12)	1.311
White lead (paint pigment)	6.46

This is also useful information for firefighting since substances which float on water (such as oils) tend to have fires which cannot be quenched with water, but spatter and spread around if water is sprayed on them.

MELTING POINT

This is the temperature at which a solid becomes a liquid. This can be a useful term for assessing the proper storage of a chemical. Some chemical products may be unfit for use if stored at too high a temperature or allowed to melt and re-solidify. This information could be communicated to your purchasing department/buyer so as to make sure that you only purchase products which you can store properly, unless you are willing to engage in the expense of supplying the proper refrigeration or other storage, as necessary.

EVAPORATION RATE (BUTYL ACETATE = 1)

This is another comparative term which is used to compare the rate of vaporization of chemicals. This rate refers to the time required for a given quantity of the chemical to evaporate as compared to the same quantity of a known solvent. A solvent other than butyl acetate may be used for the comparison; but, if so, that solvent must be indicated on the MSDS. Since this term refers to the amount of time required for evaporation to take place, the larger the number, the longer the time needed to evaporate and therefore the slower the rate.

This term is useful when dealing with chemical products which are mixtures of one or more volatile components. Since the product is not a pure chemical, such as a single solvent, it is difficult to know how much vapor it would give off which could be inhaled (unless the vapor pressure was reported for the product as a whole rather than individual vapor pressures for each component). The evaporation rate helps you to compare the product with a reference solvent. This is useful information for determining how rapidly a spill would evaporate. For example:

	<u>Evaporation Rate</u>
A disinfectant cleaner containing sodium hydroxide	<1 (water = 1)
A black vinyl enamel paint	Slower than ether
Stoddard solvent	0.2 (n-butyl acetate = 1)

A brake parts cleaner	>1 (water = 1)
A synthetic turbo oil	<0.001 (n-butyl acetate = 1)

SOLUBILITY IN WATER

This term is just what it seems to be — how soluble in water a chemical substance is. Water solubility may be expressed in several ways by using:

- Actual test results of water solubility (reported in percent)
- Terms which relate to approximate ranges of water solubility
- Symbols (such as the infinity symbol, ∞).

For example:

	<u>Solubility in Water</u>
Fluorocarbon 12 (Freon 12)	0.028%
TCE (trichloroethylene)	immiscible
Sulfuric acid	∞
A floor wax stripper	complete
An insecticide for crawling insects	negligible
A disinfectant cleaner	100%
A carburetor cleaner	<1%

Terms and symbols relate to ranges of percent solubility as follows:

immiscible, insoluble	not soluble
negligible	<0.1 %
slight	0.1 - 1 %
moderate	1 - 10 %
appreciable	>10 %
complete, ∞ (infinite)	in all proportions

When a substance is completely soluble or infinitely soluble in water, this means that a solution of any concentration could be made from it; in other words, you could make a 5% solution, a 30% solution, a 95% solution, or whatever.

Water solubility can also be used to evaluate a substance in terms of its ability to penetrate intact skin. The human skin is normally slightly oily due to natural body oils secreted by the sebaceous glands. Because oil and water don't mix, the skin tends to naturally protect itself from penetration from substances which are highly soluble in water. However, chemicals which are of low or no solubility in water tend to be able to dissolve oils and enter the skin; once this defense is penetrated, these substances can enter the blood stream and gain access to the rest of the body, doing damage at other locations. Organic solvents fall into this low water solubility category. The exception to this water solubility rule is the family of chemicals called bases or caustics which can convert skin oils to soaps and thus the oils are of no defense.

Water solubility can also be used to predict the fate of a chemical once it enters the body (whatever the route of entry -- skin, inhalation, etc.). Substances which are water-soluble tend to be eliminated in the urine by the kidneys; but substances with little or no water solubility tend to associate with the fatty tissue or internal organs and can remain in the body or accumulate (and thus be able to do more damage).

Since organic solvents tend to have flammability hazards, health effects (usually effects on the brain and nervous system), and require special ventilation or protective equipment, you may wish to consider eliminating solvents in favor of water-based systems when possible. You could recommend to your purchasing department/buyer that

high solubility in water is an important characteristic of future chemical purchases.

APPEARANCE AND ODOR

This section is intended to provide a description of the product as a whole and can be useful for:

- Evaluating whether a product has spoiled, separated, or is otherwise past its useful life
- Identifying the contents of chemical containers when the labels are unreadable, defaced, or lost

This is also useful information in selecting products for purchasing because you know the form of the product (liquid, solid, powder, crystal, etc.) and can see if its handling procedures are appropriate for your workplace (such as dealing with dust inhalation from powders).

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)

This is the temperature at which a substance will give off sufficient flammable vapor to ignite if an ignition source is present. The temperature units (degrees Fahrenheit or Celsius) should be indicated as well as the method used (closed-cup, open-cup, etc.) to determine flash point. This term provides direct information on the flammability hazard of a chemical product. Substances with low flash points tend to have high vapor pressures as well; so, the substance gives off a lot of vapor which can quickly reach a concentration in air that is rich enough in fuel to burn. For product substitution, you may wish to consider purchasing products with as high a flash point as you can -- you want the chemical to have to get awfully hot before a fire is likely. For example:

	<u>Flash Point (° F)</u>
Acetone	0°
Ethanol	55°
Kerosene	100°

FLAMMABLE LIMITS

LOWER EXPLOSIVE LIMIT (LEL)

This is the lowest percentage of a vapor in air at which a fire could happen if an ignition source were present. Below this concentration, the fuel (vapor) mixture is too lean.

UPPER EXPLOSIVE LIMIT (UEL)

This is the highest percentage of a vapor in air at which a fire could happen if an ignition source were present. Above this concentration, the fuel (vapor) mixture is too rich.

Between these limits, a fire or explosion is possible. Where flammable or explosive gases are present in the workplace, it is possible to use sensing equipment to sample the atmosphere. The LEL (or a fraction such as 10% LEL) can be used as a set-point on sensing equipment so that when this concentration of vapor is measured, other devices could be triggered such as: automatic ventilators, automatic alarm systems, or automatic shutdown of electrical or other equipment or ignition sources.

EXTINGUISHING MEDIA

This describes what types of fire fighting procedures should be used and which types

of extinguishers, foams, etc. are appropriate -- also, whether using water is appropriate or not.

SPECIAL FIRE FIGHTING PROCEDURES

This describes whether special protective equipment or unusual techniques may be required to fight a fire of this product. For example, the wearing of self-contained breathing apparatus or the use of water to cool the outside of containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

This describes the unusual hazards associated with the chemical, such as the rupturing of containers from a pressure build-up, the generation of toxic vapors (which are described in the later section on hazardous decomposition products), the substance may react violently with water, or other hazards.

SECTION V: REACTIVITY DATA

This section describes the physical hazards, other than flammability, which may occur with this chemical product and how to avoid them. This does not necessarily mean that if the product is used improperly, then your plant site will become an empty patch of ground. Improperly handled chemical products may simply separate, or spoil, or become unfit for the use for which they were developed.

STABILITY: UNSTABLE, STABLE, CONDITIONS TO AVOID

This term deals with whether or not the chemical product has sensitivities to temperature or there are conditions under which the product becomes unfit for its intended use or otherwise dangerous or violently reactive. If the chemical is stable, then this will be indicated; if there are conditions under which instability can occur, then unstable is indicated and the conditions to avoid are described. For example:

"Unstable. Avoid shock from dropping."

"Unstable. Avoid temperatures above 150 F."

"Unstable. Use of organic solvents may cause cracking or crazing."

(This is a frequent warning for plastic coatings.)

INCOMPATIBILITY (MATERIALS TO AVOID)

This section deals with materials, other chemicals, or other factors which are not compatible with the chemical product. This could be for a variety of reasons, for example:

- | | |
|--------------------------|---|
| "Water" | Result could be spattering, heat generation, gas production, etc., such as isocyanate foam. |
| "Direct sunlight" | Result could be fostering of chemical reactions within the product to form new chemicals or breakdown products, heat, etc.
Acrylonitrile is sensitive to light and even when inhibited with aqueous ammonia, it can polymerize and give off heat; this could even lead to a runaway thermal explosion. |
| "Steel or copper piping" | (Result could be corrosion of metal, release of gases such as hydrogen, explosion, etc.)
Such as Violent reaction between acetylene and |

copper.

"Acids" (Result could be spattering, heat generation, evolution of poisonous or flammable gases, corrosion of metal, etc.), such as Cyanide salts which react with acid to release poisonous hydrogen cyanide gas.

"Alkalies or bases" (Result could be spattering, heat generation, corrosion of metal, etc.), such as the corrosion of aluminum

HAZARDOUS DECOMPOSITION OR BYPRODUCTS

This section deals with the breakdown of the product, either spontaneously or due to heat or fire. These decomposition products can also be produced by:

- Heating or welding of the metal to whose surface a chemical has been applied
- Smoking in an area containing chemical vapors which are pulled in through the hot end of the cigarette (then the decomposition products are introduced directly into the lungs)
- Changes in chemical composition upon aging of the product (such as autoxidation where a substance reacts with itself)

This section could include notations on shelf life.

For example:

Vinyl chloride plastics (PVC, CPVC)	----> heat or fire	Carbon dioxide (an asphyxiant) Carbon monoxide (interferes with body's use of oxygen) Hydrogen chloride (forms hydrochloric acid in lungs, tissue damage)
--	-----------------------------	---

Ethers such as diethylether (syn. ethoxyethane)	----> -upon standing in air (autoxidation)	Unstable peroxides such as 1-oxyperoxides (dangerously explosive)
--	---	---

HAZARDOUS POLYMERIZATION

(MAY OCCUR, WILL NOT OCCUR, CONDITIONS TO AVOID)

This section deals with chemical products which are packaged as monomers (chemical subunits) which can react together to form polymers (chemical coatings, plastics, solid resins, etc.). Generally, these products are formulated with a polymerization inhibitor so that the chemical reaction does not occur in the container. However, if the product is stored improperly (such as in an area which is too hot) or if the product contacts air or water or other chemicals, the polymerization reaction may occur spontaneously. When this happens, there may be spattering, a lot of heat may be generated, containers may rupture or burst, etc. If the product is stable, then this is indicated on the MSDS; if polymerization is a possibility, then this is indicated along with the conditions which should be avoided to prevent this chemical reaction. If a

polymerization inhibitor is present in the product, then the inhibitor lifetime should be indicated as well. For example;

An incident occurred in a manufacturing plant in which styrene and acrylonitrile were accidentally mixed with catalyst. When the error was discovered, a polymerization inhibitor was added to the vessel but not enough to stop the reaction completely and it slowly heated and eventually burst the container.

SECTION VI: HEALTH HAZARD DATA

In this section are discussed the health hazards associated with exposure to the chemical ingredients listed in the hazardous components section of the MSDS.

ROUTES(S) OF ENTRY

This term indicates the manner in which the chemical must come into contact with the body for the health hazard or toxic effect to occur. It doesn't matter how toxic a chemical is -- it must come into contact with us for it to hurt us. There are 4 basic routes of entry: inhalation, skin contact, ingestion, and injection; but only the first 3 are requested on the MSDS. Injection, which is entry to the skin by means of cuts or puncture wounds so that chemicals can directly enter the bloodstream, is not generally listed separately. This category enables you to see directly what kind of exposure you must have to experience the adverse health effects of the chemical. For example, ethylene glycol (a common ingredient in antifreeze) is highly toxic if ingested (eaten) - - so don't eat any -- but is otherwise a skin irritant and must be inhaled in particulate form, such as mist, to be toxic by inhalation.

When evaluating risks using route of entry information, remember that ingestion is a more common route than you might think. Hand-to-mouth contact via smoking or eating at the work station or without washing the hands and/or face can result in considerable amounts of chemicals being eaten.

HEALTH HAZARDS (ACUTE AND CHRONIC)

This section requires the discussion of the adverse health effects both for short term exposure (acute) and for long term or repeated exposure (chronic). Generally speaking, people experiencing acute effects, if these are not immediately fatal, tend to make a good recovery. Chronic effects, on the other hand, involve progressive damage over time and therefore tend to produce permanent irreversible damage. Chronic effects are a "chronic" omission on MSDS's, so scrutinize your MSDS's for this section. Unfortunately, the long-term, low-level exposure effects of a large number of chemicals are still virtually unknown -- so this section may indicate that the "effects of chronic exposure are unknown at this time."

For example:

2-Methoxyethanol:

(2-Methoxyethanol is a solvent used, among other things, as an antistall additive in gasoline. It has been estimated that as many as 100,000 workers in the U.S. are potentially exposed to 2-ME.)

Acute effects: irritation of the eyes, nose, and throat, drowsiness; weakness; and shaking.

Chronic effects: Prolonged or repeated exposure may cause headache, drowsiness, weakness, fatigue, staggering, personality change, and decreased mental ability. Although no clinically significant reproductive effects have been found yet in humans, in animals such effects appeared in both females and males. Pregnant female experimental

animals showed statistically significant increases in embryonic deaths and abnormalities, maternal deaths, and blood effects. Male animals showed effects on the testicles, infertility, and abnormally-shaped sperm. The route of entry for the animal studies was inhalation.

CARCINOGENICITY: NTP? IARC MONOGRAPHS? OSHA REGULATED?

This term means the ability to cause cancer. This section should describe the type of cancer and the internal organs or tissues affected, as well as discussing related effects such as mutagenicity (the ability to cause mutations) and teratogenicity (the ability to cause birth defects), although these effects might be discussed in Health Hazards section above.

Information must also be provided indicating the agency responsible for designating the chemical as a carcinogen. The NTP is the National Toxicology Program, part of the Centers for Disease Control of the U.S. Dept. of Health and Human Services. The NTP publishes an annual report on its findings. IARC is the International Agency for Research on Cancer, an agency of the World Health Organization. The IARC publishes reports called Monographs which represent the views of the IARC Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man. OSHA regulates some carcinogens; these are found in 29 CFR 1910.1000 and other sequential sections in Subpart Z.

SIGNS AND SYMPTOMS OF EXPOSURE

This section is intended to discuss how you would feel and look if you were exposed to this chemical product -- that is, the sensations you would experience, whether you become dizzy, nauseated, drowsy, flushed, pale, etc. With this information, you know what kinds of early warning signs to look for so that you can prevent excessive exposure to the chemical. For example:

"Prolonged or repeated skin contact causes mild irritation and possibly some blistering."

"Eye contact causes some pain and mild transient irritation. No corneal scarring."

"Inhalation of product vapors may cause chemical intoxication at high airborne concentrations."

"Burning sensation in eyes or nose, coughing, sneezing, rash on skin."

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

This is just what it seems to be -- what existing medical condition could you have which would be intensified or otherwise aggravated by exposure to this chemical product. This information is useful for looking at workers' existing health conditions and determining whether the purchase of this chemical product is appropriate, for example:

If this product tends to cause asthma or asthma-like conditions in exposed individuals, workers who already have asthma or respiratory problems will be at greater risk to have their symptoms intensified. These workers may need more ventilation or protective equipment when working with this chemical. The resulting health condition may be such that they simply can't work with the chemical at all.

If the product interferes with the body's ability to deliver oxygen to all of its parts, either due to effects on the lungs or on the hemoglobin in the blood, a worker with an existing lung condition or heart condition will be at much greater risk of a major health

problem. This is true for inhalation of methylene chloride vapor: the body attempts to detoxify (breakdown) methylene chloride, but only succeeds in converting it to carbon monoxide. Carbon monoxide ties up the hemoglobin in the blood, preventing it from carrying oxygen; when this happens, the heart must work harder to make up for the oxygen deficiency. An individual with an existing heart condition may not be able to tolerate this added stress on the heart and could have a heart attack.

For example:

(A polyisocyanate foaming agent for making polyurethane foams) — "May lead to allergic sensitivity in some individuals resulting in asthma-like symptoms upon exposures below the threshold limit value. persons with asthma-type conditions or other chronic respiratory diseases should be excluded from working with MDI."

EMERGENCY AND FIRST AID PROCEDURES

This section is intended to provide information on what you can do right away to handle emergencies such as splashing the chemical in the eyes, spilling it on the skin, accidental ingestion, overexposure to vapors, etc. Brief descriptions of procedures and possible antidotes should be provided; however, this section is not really intended to provide in-depth advice to the physician (call the emergency telephone number instead). For example:

a. Inhalation:

"If difficulty or discomfort in breathing is experienced, remove to fresh air and get medical attention."

b. Skin/eye contact:

"If eye contact occurs, flush eyes with water for 15 minutes, then get prompt medical aid."

"Flush skin with plenty of water and then wash with soap or mild detergent and water. If irritation persists, seek medical aid."

"If burned by contact with molten material, cool as quickly as possible with water and see a physician for treatment of burn. Burns should be treated as thermal burns. Product is a polymer of low toxicity; therefore, there is no need to remove it from the skin because of concern about toxicity. The polymer will come off as healing occurs."

c. Ingestion:

"If swallowed do not induce vomiting. Give large quantity of water. Call a physician if symptoms develop."

"If product is swallowed, drink large amounts of water or milk and seek medical aid."

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

This section deals with proper handling and storing of the chemical product, how to take care of or neutralize spills, and, finally, how to ultimately dispose of the product. This information is not intended to be the final work on the subject, since it is necessary for you to observe Federal, State, and local regulations regarding disposal, releases to the environment (air, water), or discharge to the local sewer manhole in the process of handling a spill or fire.

The training of personnel to deal with emergencies such as spills is a requirement under the Standard. (This was covered in the section on training.).

When purchasing chemicals, you may wish to consider looking at this section to determine whether a chemical you plan to bring on the plant site requires a very expensive method of ultimate disposal. An inexpensive chemical may suddenly become less of a bargain if its ultimate disposal method is very costly. Similarly, a chemical substitute may become much more attractive in price if it can be disposed of simply by flushing it down the drain or placing it in the ordinary trash can. Also consider the spill clean-up method when doing purchasing -- the price of a chemical product also involves purchasing spill clean-up or neutralization kits or equipment and the training of personnel to perform clean-up or the hiring of a consultant to perform the clean-up for you.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

This section covers cleaning up or neutralizing spills and the precautions to be observed while doing so. For example:

"Avoid breathing gases and vapors,"

(It may be necessary to evacuate the work area. Re-entry may require providing ventilation or increasing existing ventilation, or the use of protective equipment.)

"Remove ignition sources."

(This product produces flammable vapor, or dust. Vapors heavier than air will hug the floor and may travel quite some distance, possibly eventually meeting an ignition source. No smoking; extinguish flames, etc. in the area; also consider the nearby presence of electrical equipment, static electricity including not wearing nylon jackets, and nonexplosion-proof ventilation systems.)

"Clean up with glass or plastic scoop."

[Chemicals which are strong oxidizers (examples are peroxides and acids such as nitric or sulfuric acid) should not be cleaned up with combustible materials. Do not use paper towels, brooms, etc; — these could catch on fire. Use inert materials such as glass or plastic to pick up the chemical and place it in an appropriate receptacle for storage until final disposal can be arranged. Avoid placing in waste baskets or trash cans where paper products or other combustibles might be discarded.]

"Flush with water."

(With respect to chemical hazards, this chemical product is desirable for the worksite as far as its disposal method is concerned. This indicates that the chemical can be diluted with water and flushed down the drain. You should check with your local sewage treatment authority to verify that disposal to their facility is acceptable; there may be local regulations of which the author of the MSDS is unaware, especially if the product's manufacturer is not a local firm.)

"Neutralize with soda ash."

(Many chemicals can simply be neutralized or absorbed to make them less hazardous; such materials can be purchased separately or as spill clean-up kits. Neutralization with soda ash is common for acids; bases or caustics may be neutralized with boric acid or citric acid; solvents can be absorbed with activated carbon; and so on.)

WASTE DISPOSAL METHOD

This section deals with the final disposal of the chemical product, including old, unused material, and spilled material, as well as precautions about disposal of the used containers and prohibitions about container re-use for other purposes. For example:

"Sanitary landfill."

(With respect to chemical hazards, this chemical product is desirable for the worksite as far as its disposal method is concerned. You should check with your local garbage hauler or sanitary landfill/garbage dump to verify that disposal to their facility is acceptable; there may be local regulations of which the author of the MSDS is unaware, especially if the product's manufacturer is not situated locally.)

"Incineration."

(This chemical product must be completely destroyed by incineration; may require transport to a licensed waste disposal facility for destruction.)

"Do not let spilled material enter watercourse. May be toxic to aquatic life."

(Prohibitions such as this one indicate that this material cannot enter bodies of water or the sewer system; also consider that land disposal may involve runoff of the chemical or leaching through the ground to a drinking water source such as an aquifer or well. This kind of warning is common for chemicals such as pesticides.)

SECTION VIII: CONTROL MEASURES

This section deals with ventilation, protective equipment, and safe work practices to reduce, control, or eliminate exposure to chemical hazards, both physical and health hazards. Before using such control measures consider product substitution -- select chemical products with low or minimal hazards wherever possible. If this is not an option for your workplace or process, consider using engineering controls such as ventilation and the use of safe work practices. Where this is not possible, protective equipment becomes the next choice. Protective equipment may also be the method of choice when engineering controls are impossible (such as working outdoors where you cannot control the direction and speed of air movement). Sometimes protective equipment can provide an interim solution when budget constraints cannot allow ventilation or work area design changes to be performed right away.

The use and care of protective equipment is another aspect of training required for employees under the Standard.

RESPIRATORY PROTECTION (SPECIFY TYPE)

This section discusses whether a respirator is needed and the type of respirator recommended for use when handling this chemical product, as well as when performing spill clean-up, etc. It should be specified whether an air purifying respirator is recommended, and if so, what type of cartridge or canister should be used; or whether a supplied air respirator is needed, such as self-contained breathing apparatus or apparatus to which a hose supplies air from another area. For example, air purifying respirators which filter out the chemical cannot make up for oxygen deficiency as in the case of a vapor which displaces air. Respirator face masks should be fitted to the faces of the personnel who must wear them and tested for leakage so that the respirator can protect the workers as designed.

"I used to work in a place where certain work areas required the use of a respirator due to a cancer hazard in the air. I noticed that the supervisors in the area tended to wear their respirators hanging around their necks, but never over their faces. I always supposed that this was because supervision wasn't susceptible to the same kinds of health problems as the ordinary worker!"

VENTILATION: LOCAL EXHAUST, MECHANICAL (GENERAL), SPECIAL, OTHER

This section discusses the manufacturer's recommendations for whether ventilation should be used and, if so, what type. "Local exhaust" indicates that the ventilation should draw the chemical vapors in the immediate area of the work surface; that is, the intake should be located right where you are working. "Mechanical" or "general exhaust" indicates that the ventilation used for the work area as a whole is sufficient; for example, if you work in one area of a large room and the room itself is ventilated. "Special exhaust" indicates any special requirements which the ventilation should have such as spark-proof or explosion-proof ventilation for flammable solvents or corrosion-resistant materials for acidic or basic vapors.

"I used to work in a plant where an ammonia-containing vapor was formed as a by-product of the manufacturing process. The vapors were drawn-off by a ventilation system which consisted of 7 aluminum impeller blades in series. The system was in use for about a year when the engineers noticed that the system did not appear to be drawing well. When it was taken out of service and examined, it was discovered that 4 of the blades were completely eaten away and the other 3 looked rather moth-eaten. apparently, when the system was priced, the company was given a good deal on aluminum impeller blades, but nobody told purchasing that aluminum dissolves in bases like ammonia."

PROTECTIVE GLOVES

This section discusses whether the manufacturer recommends the wearing of protective gloves and, if so, what type of glove material. There is no single glove material which will hold up in all kinds of chemicals, especially solvents; and each material has its characteristic "break-through time." Supposedly impermeable protective gloves allow a certain amount of solvent to pass through -- it is important that the amount of time for which the glove provides protection is longer than the work shift. If not, then the gloves provide little or no protection at all as the work shift progresses. It may be possible to change gloves frequently, allowing the solvent to evaporate from each used pair of gloves before re-use, or to set gloves aside for cleaning for future re-use. It is important to follow the glove manufacturer's recommendations for which glove product will work with a particular chemical.

EYE PROTECTION

This section discusses whether the manufacturer recommends the use of protection equipment to guard against vapors, mists, dusts, or splashes, and, if so, what kind of protection should be worn. Safety glasses are shatter-resistant glasses designed to protect the eyes from direct impact -- not from mists, vapors, dusts, and splashes of liquids. Chemical goggles protect the eyes from chemical splashes but, due to their air vents to prevent fogging, are not designed to prevent vapor or gas entry. Unventilated goggles are needed to prevent exposure to vapors or gases. To further protect the eyes from splashes, use a full face shield; these may be purchased so as to attach to a helmet or hard hat. However, the face shield does not protect the eyes from vapors or dusts which can blow under or around the shield; for this kind of protection, goggles should be worn as well.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

This section discusses whether the manufacturer has any other recommendations for protective clothing and equipment other than those already discussed. These could be plastic aprons, hoods, boots (such as solvent- or acid-resistant, etc.), encapsulating suits, rubber-coated pants and jackets, acid-resistant or flame-resistant clothing, etc. The important factors are insulation and permeability; it is important to realize that all

protective clothing and equipment has its limitations and its leakage, so it is necessary to choose the items appropriately and work within their limits. For example:

"Neoprene coveralls are recommended."

"To prevent repeated or prolonged skin contact, wear impervious clothing and boots."

"Wear gloves and footwear impervious to solvents. Wash clothing before re-use."

"I used to work with a man who swore by his acid-resistant pants and shirts, he thought they were just the greatest. One day he came into the lab and hopped up to sit on the lab bench to eat his lunch. Some acid had been spilled on the bench; although it had been cleaned up, the bench top hadn't been neutralized, so some residue of the acid must have still been left. Anyway, when he went home that night he discovered that his acid-resistant clothing was fine. Of course, he had holes in his underwear and burns on his buns -- but his acid-resistant clothing was fine."

WORK/HYGIENIC PRACTICES

This section discusses safe work practices and any other recommendations for control measures which were not covered in the previous parts of Section VIII above. For example:

"Avoid contact with used solutions of this product, as these may also be hazardous."

"Eye wash stations should be readily available."

"Earth-ground and bond all lines and equipment associated with the system. All electrical equipment should be non-sparking or explosion proof."

"Good industrial hygiene practice should be followed which includes minimizing skin contact. A safety shower and washing facilities should be available."

"Follow normal good work practices such as washing hands before food contact."

Section V — Reactivity Data

Stability:	Unstable		Conditions to Avoid
	Stable		

Incompatibility (*Materials to Avoid*)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

Section VI — Health Hazard Data

Routes of Entry: Inhalation? Skin? Ingestion?

Health Hazards (*Acute and Chronic*)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)

Ventilation	Local Exhaust	Special
	Mechanical (<i>General</i>)	Other

Protective Gloves Eye Protection

Other Protective Clothing or Equipment

Work/Hygienic Practices



Voluntary Training Guidelines

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Training Requirements in OSHA Standards and Training Guidelines



U.S. Department of Labor
William E. Brock, Secretary

Occupational Safety and Health Administration
John A. Pendergrass, Assistant Secretary
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OSHA 2254 (Revised)



Introduction

Many standards promulgated by the Occupational Safety and Health Administration (OSHA) explicitly require the employer to train employees in the safety and health aspects of their jobs. Other OSHA standards make it the employer's responsibility to limit certain job assignments to employees who are "certified," "competent," or "qualified"—meaning that they have had special previous training, in or out of the workplace. The term "designated" personnel means selected or assigned by the employer or the employer's representative as being qualified to perform specific duties. These requirements reflect OSHA's belief that training is an essential part of every employer's program for protecting workers from accidents and illnesses. Many researchers conclude that those who are new on the job have a higher rate of accidents and injuries than more experienced workers. If ignorance of specific job hazards and of proper work practices is even partly to blame for this higher injury rate, then training may help to provide a solution.

The length and complexity of OSHA standards may make it difficult to find all the references to training. So, to help employers, safety and health professionals, training directors and others with a need to know, OSHA's training-related requirements have been excerpted and collected in this booklet. Requirements for posting information, warning signs, labels, and the like are excluded, as are most references to the qualifications of people assigned to test workplace conditions or equipment.

It is usually a good idea for the employer to keep a record of all safety and health training. Records can provide evidence of the employer's good faith and compliance with OSHA standards. Documentation can also supply an answer to one of the first questions an accident investigator will ask: "Was the injured employee trained to do the job?"

Training in the proper performance of a job is time and money well spent, and the employer might regard it as an investment rather than an expense. An effective program of safety and health training for workers can result in fewer accidents and illnesses, better morale, and lower insurance premiums, among other benefits.

Readers with questions concerning worker safety and health training should contact their OSHA Regional Office (see page 10).



Training of Supervisors
1960.55

(a) Each agency shall provide occupational safety and health training for supervisory employees that includes: supervisory responsibility for providing and maintaining safe and healthful working conditions for employees, the agency occupational safety and health program, section 19 of the Act, Executive Order 12196, this part, occupational safety and health standards applicable to the assigned workplaces, agency procedures for reporting hazards, agency procedures for reporting and investigating allegations of reprisal, and agency procedures for the abatement of hazards, as well as other appropriate rules and regulations.

(b) This supervisory training should include introductory and specialized courses and materials which will enable supervisors to recognize and eliminate, or reduce, occupational safety and health hazards in their working units. Such training shall also include the development of requisite skills in managing the agency's safety and health program within the work unit, including the training and motivation of subordinates toward assuring safe and healthful work practices.

Training of Safety and Health Specialists
1960.56

(a) Each agency shall provide occupational safety and health training for safety and health specialists through courses, laboratory experiences, field study, and other formal learning experiences to prepare them to perform the necessary technical monitoring, consulting, testing, inspecting, designing, and other tasks related to program development and implementation, as well as hazard recognition, evaluation and control, equipment and facility design, standards, analysis of accident, injury, and illness data, and other related tasks.

(b) Each agency shall implement career development programs for their occupational safety and health specialists to enable the staff to meet present and future program needs of the agency.

Training of Safety And Health Inspectors
1960.57

Each agency shall provide training for safety and health inspectors with respect to appropriate standards, and the use of appropriate equipment and testing procedures necessary to identify and evaluate hazards and suggest general abatement procedures during or following their assigned inspections, as well as preparation of reports and other documentation to support the inspection findings.

Training of Collateral Duty Safety and Health Personnel and Committee Members
1960.58

Within six months after October 1, 1980, or on appointment of an employee to a collateral duty position or to a committee, each agency shall provide training for collateral duty safety and health personnel and all members of certified occupational safety and health committees commensurate with the scope of their assigned responsibilities. Such training shall include: The agency occupational safety and health program; section 19 of the Act; Executive Order 12196; this part; agency procedures for the reporting, evaluation and abatement of hazards; agency procedures for reporting and investigating allegations of reprisal, the recognition of hazardous conditions and environments; identification and use of occupational safety and health standards, and other appropriate rules and regulations.

Training of Employees and Employee Representatives
1960.59

(a) Each agency shall provide appropriate safety and health training for employees including specialized job safety and health training appropriate to the work performed by the employee, for example: Clerical; printing; welding; crane operation; chemical analysis, and computer operations. Such training also shall inform employees of the agency occupational safety and health program, with emphasis on their rights and responsibilities.

(b) Occupational safety and health training for employees of the agency who are representatives of employee groups, such as labor organizations which are recognized by the agency, shall include both introductory and specialized courses and materials that will enable such groups to function appropriately in ensuring safe and healthful working conditions and practices in the workplace and enable them to effectively assist in conducting workplace safety and health inspections. Nothing in this paragraph shall be construed to alter training provisions provided by law, Executive Order, or collective bargaining arrangements.

Training Assistance
1960.60

(a) Agency heads may seek training assistance from the Secretary of Labor, the National Institute for Occupational Safety and Health and other appropriate sources.

(b) After the effective date of Executive Order 12196, the Secretary shall, upon request and with reimbursement, conduct orientation for Designated Agency Safety and Health Officials and/or their designees which will enable them to manage the occupational safety and health programs of their agencies. Such orientation shall include:

Hazard Communication
1910.1200(h)(2)

(2) Training. Employee training shall include at least:

(i) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(ii) The physical and health hazards of the chemicals in the work area;

(iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

(iv) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

Voluntary Training Guidelines

I. Introduction

The Occupational Safety and Health Act of 1970 does not address specifically the responsibility of employers to provide health and safety information and instruction to employees, although Section 5(a)(2) does require that each employer "... shall comply with occupational safety and health standards promulgated under this Act." However, more than 100 of the Act's current standards do contain training requirements.

Therefore, the Occupational Safety and Health Administration has developed voluntary training guidelines to assist employers in providing the safety and health information and instruction needed for their employees to work at minimal risk to themselves, to fellow employees, and to the public.

The guidelines are designed to help employers to: 1) determine whether a worksite problem can be solved by training; 2) determine what training, if any, is needed; 3) identify goals and objectives for the training; 4) design learning activities; 5) conduct training; 6) determine the effectiveness of the training; and 7) revise the training program based on feedback from employees, supervisors, and others.

The development of the guidelines is part of an agency-wide objective to encourage cooperative, voluntary safety and health activities among OSHA, the business community, and workers. These voluntary programs include training and education, consultation, voluntary protection programs, and abatement assistance.

A. Training Model

The guidelines provide employers with a model for designing, conducting, evaluating, and revising training programs. The training model can be used to develop training programs for a variety of occupational safety and health hazards identified at the workplace. Additionally, it can assist employers in their efforts to meet the training requirements in current or future occupational safety and health standards.

A training program designed in accordance with these guidelines can be used to supplement and enhance the employer's other education and training activities. The guidelines afford employers significant flexibility in the selection of content and training program design. OSHA encourages a personalized approach to the informational and instructional programs at individual worksites, thereby enabling employers to provide the training that is most needed and applicable to local working conditions.

Assistance with training programs or the identification of resources for training is available through such organizations as OSHA full-service Area Offices, State agencies which have their own OSHA-approved occupational safety and health programs, OSHA-funded State onsite consultation programs for employers, local safety councils, the OSHA Office of Training and Education, and OSHA-funded New Directions grantees.

B. Review Commission Implications

OSHA does not intend to make the guidelines mandatory. And they should not be used by employers as a total or complete guide in training and education matters which can result in enforcement proceedings before the Occupational Safety and Health Review Commission. However, employee training programs are always an issue in Review Commission cases which involve alleged violations of training requirements contained in OSHA standards.

The adequacy of employee training may also become an issue in contested cases where the affirmative defense of unpreventable employee misconduct is raised. Under case law well-established in the Commission and the courts, an employer may successfully defend against an otherwise valid citation by demonstrating that all feasible steps were taken to avoid the occurrence of the hazard, and that actions of the employee involved in the violation were a departure from a uniformly and effectively enforced work rule of which the employee had either actual or constructive knowledge.

In either type of case, the adequacy of the training given to employees in connection with a specific hazard is a factual matter which can be decided only by considering all the facts and circumstances surrounding the alleged violation. The general guidelines in this publication are not intended, and cannot be used, as evidence of the appropriate level of training in litigation involving either the training requirements of OSHA standards or affirmative defenses based upon employer training programs.

II. Training Guidelines

OSHA's training guidelines follow a model that consists of:

- A. Determining if Training is Needed
- B. Identifying Training Needs
- C. Identifying Goals and Objectives
- D. Developing Learning Activities
- E. Conducting the Training
- F. Evaluating Program Effectiveness
- G. Improving the Program

The model is designed to be one that even the owner of a business with very few employees can use without having to hire a professional trainer or purchase expensive training materials. Using this model, employers or supervisors can develop and administer safety and health training programs that address problems specific to their own business, fulfill the learning needs of their own employees, and strengthen the overall safety and health program of the workplace.

A. Determining if Training is Needed

The first step in the training process is a basic one: to determine whether a problem can be solved by training. Whenever employees are not performing their jobs properly, it is often assumed that training will bring them up to standard. However, it is possible that other actions (such as hazard abatement or the implementation of engineering controls) would enable employees to perform their jobs properly.

Ideally, safety and health training should be provided before problems or accidents occur. This training would cover both general safety and health rules and work procedures, and would be repeated if an accident or near-miss incident occurred.

Problems that can be addressed effectively by training include those that arise from lack of knowledge of a work process, unfamiliarity with equipment, or incorrect execution of a task. Training is less effective (but still can be used) for problems arising from an employee's lack of motivation or lack of attention to the job. Whatever its purpose, training is most effective when designed in relation to the goals of the employer's total safety and health program.

B. Identifying Training Needs

If the problem is one that can be solved, in whole or in part, by training, then the next step is to determine what training is needed. For this, it is necessary to identify *what* the employee is expected to do and in what ways, if any, the employee's performance is deficient. This information can be obtained by conducting a job analysis which pinpoints what an employee needs to know in order to perform a job.

When designing a new training program, or preparing to instruct an employee in an unfamiliar procedure or system, a job analysis can be developed by examining engineering data on new equipment or the safety data sheets on unfamiliar substances. The content of the specific Federal or State OSHA standards applicable to a business can also provide direction in developing training content. Another option is to conduct a Job Hazard Analysis (see OSHA 3071, same title, 1981). This is a procedure for studying and recording each step of a job, identifying existing or potential hazards, and determining the best way to perform the job in order to reduce or eliminate the risks. Information obtained from a Job Hazard Analysis can be used as the content for the training activity.

If an employee's learning needs can be met by revising an existing training program rather than developing a new one, or if the employee already has some knowledge of the process or system to be used, appropriate training content can be developed through such means as:

1. Using company accident and injury records to identify how accidents occur and what can be done to prevent them from recurring.
2. Requesting employees to provide, in writing and in their own words, descriptions of their jobs. These should include the tasks performed and the tools, materials and equipment used.
3. Observing employees at the worksite as they perform tasks, asking about the work, and recording their answers.

4. Examining similar training programs offered by other companies in the same industry, or obtaining suggestions from such organizations as the National Safety Council (which can provide information on Job Hazard Analysis), the Bureau of Labor Statistics, OSHA-approved State programs, OSHA full-service Area Offices, OSHA-funded State consultation programs, or the OSHA Office of Training and Education.

The employees themselves can provide valuable information on the training they need. Safety and health hazards can be identified through the employees' responses to such questions as whether anything about their jobs frightens them, if they have had any near-miss incidents, if they feel they are taking risks, or if they believe that their jobs involve hazardous operations or substances.

Once the kind of training that is needed has been determined, it is equally important to determine what kind of training is not needed. Employees should be made aware of all the steps involved in a task or procedure, but training should focus on those steps on which improved performance is needed. This avoids unnecessary training and tailors the training to meet the needs of the employees.

C. Identifying Goals and Objectives

Once the employees' training needs have been identified, employers can then prepare objectives for the training. Instructional objectives, if clearly stated, will tell employers what they want their employees to do, to do better, or to stop doing.

Learning objectives do not necessarily have to be written, but in order for the training to be as successful as possible, clear and measurable objectives should be thought-out before the training begins. For an objective to be effective it should identify as precisely as possible what the individuals will do to demonstrate that they have learned, or that the objective has been reached. They should also describe the important conditions under which the individual will demonstrate competence and define what constitutes acceptable performance.

Using specific, action-oriented language, the instructional objectives should describe the preferred practice or skill and its observable behavior. For example, rather than using the statement: "The employee will understand how to use a respirator" as an instructional objective, it would be better to say: "The employee will be able to describe how a respirator works and when it should be used." Objectives are most effective when worded in sufficient detail that other qualified persons can recognize when the desired behavior is exhibited.

D. Developing Learning Activities

Once employers have stated precisely what the objectives for the training program are, then learning activities can be identified and described. Learning activities enable employees to demonstrate that they have acquired the desired skills and knowledge. To ensure that employees transfer the skills or knowledge from the learning activity to the job, the learning situation should simulate the actual job as closely as possible. Thus, employers may want to arrange the objectives and activities in a sequence which corresponds to the order in which the tasks are to be performed on the job, if a specific process is to be learned. For instance, if an employee must learn the beginning processes of using a machine, the sequence might be: (1) to check that the power source is connected; (2) to ensure that the safety devices are in place and are operative; (3) to know when and how to throw the switch; and so on.

A few factors will help to determine the type of learning activity to be incorporated into the training. One aspect is the training resources available to the employer. Can a group training program that uses an outside trainer and film be organized, or should the employer personally train the employees on a one-to-one basis? Another factor is the kind of skills or knowledge to be learned. Is the learning oriented toward physical skills (such as the use of special tools) or toward mental processes and attitudes? Such factors will influence the type of learning activity designed by employers. The training activity can be group-oriented, with lectures, role play, and demonstrations; or designed for the individual as with self-paced instruction.

The determination of methods and materials for the learning activity can be as varied as the employer's imagination and available resources will allow. The employer may want to use charts, diagrams, manuals, slides, films, viewgraphs (overhead transparencies), videotapes, audiotapes, or simply blackboard and chalk, or any combination of these and other instructional aids. Whatever the method of instruction, the learning activities should be developed in such a way that the employees can clearly demonstrate that they have acquired the desired skills or knowledge.

E. Conducting the Training

With the completion of the steps outlined above, the employer is ready to begin conducting the training. To the extent possible, the training should be presented so that its organization and meaning are clear to the employees. To do so, employers or supervisors should: (1) provide overviews of the material to be learned; (2) relate, wherever possible, the new information or skills to the employees' goals, interests, or experience; and (3) reinforce what the employees learned by summarizing the program's objectives and the key points of information covered. These steps will assist employers in presenting the training in a clear, unambiguous manner.

In addition to organizing the content, employers must also develop the structure and format of the training. The content developed for the program, the nature of the workplace or other training site, and the resources available for training will help employers determine for themselves the frequency of training activities, the length of the sessions, the instructional techniques, and the individual(s) best qualified to present the information.

In order to be motivated to pay attention and learn the material that the employer or supervisor is presenting, employees must be convinced of the importance and relevance of the material. Among the ways of developing motivation are: (1) explaining the goals and objectives of instruction; (2) relating the training to the interests, skills, and experiences of the employees; (3) outlining the main points to be presented during the training session(s); and (4) pointing out the benefits of training (e.g., the employee will be better informed, more skilled, and thus more valuable both on the job and on the labor market; or the employee will, if he or she applies the skills and knowledge learned, be able to work at reduced risk).

An effective training program allows employees to participate in the training process and to practice their skills or knowledge. This will help to ensure that they are learning the required knowledge or skills and permit correction if necessary. Employees can become involved in the training process by participating in discussions, asking questions, contributing their knowledge and expertise, learning through hands-on experiences, and through role-playing exercises.

F. Evaluating Program Effectiveness

To make sure that the training program is accomplishing its goals, an evaluation of the training can be valuable. Training should have, as one of its critical components, a method of measuring the effectiveness of the training. A plan for evaluating the training session(s), either written or thought-out by the employer, should be developed when the course objectives and content are developed. It should not be delayed until the training has been completed. Evaluation will help employers or supervisors determine the amount of learning achieved and whether an employee's performance has improved on the job. Among the methods of evaluating training are: (1) Student opinion. Questionnaires or informal discussions with employees can help employers determine the relevance and appropriateness of the training program; (2) Supervisors' observations. Supervisors are in good positions to observe an employee's performance both before and after the training and note improvements or changes; and (3) Workplace improvements. The ultimate success of a training program may be changes throughout the workplace that result in reduced injury or accident rates.

However it is conducted, an evaluation of training can give employers the information necessary to decide whether or not the employees achieved the desired results, and whether the training session should be offered again at some future date.

G. Improving the Program

If, after evaluation, it is clear that the training did not give the employees the level of knowledge and skill that was expected, then it may be necessary to revise the training program or provide periodic retraining. At this point, asking questions of employees and of those who conducted the training may be of some help. Among the questions that could be asked are: (1) Were parts of the content already known and, therefore, unnecessary? (2) What material was confusing or distracting? (3) Was anything missing from the program? (4) What did the employees learn, and what did they fail to learn?

It may be necessary to repeat steps in the training process, that is, to return to the first steps and retrace one's way through the training process. As the program is evaluated, the employer should ask: (1) If a job analysis was conducted, was it accurate? (2) Was any critical feature of the job overlooked? (3) Were the important gaps in knowledge and skill included? (4) Was material already known by the employees intentionally omitted? (5) Were the instructional objectives presented clearly and concretely? (6) Did the objectives state the level of acceptable performance that was expected of employees? (7) Did the learning activity simulate the actual job? (8) Was the learning activity appropriate for the kinds of knowledge and skills required on the job? (9) When the training was presented, was the organization of the material and its meaning made clear? (10) Were the employees motivated to learn? (11) Were the employees allowed to participate actively in the training process? (12) Was the employer's evaluation of the program thorough?

A critical examination of the steps in the training process will help employers to determine where course revision is necessary.

III. Matching Training to Employees

While all employees are entitled to know as much as possible about the safety and health hazards to which they are exposed, and employers should attempt to provide all relevant information and instruction to all employees, the resources for such an effort frequently are not, or are not believed to be, available. Thus, employers are often faced with the problem of deciding who is in the greatest need of information and instruction.

One way to differentiate between employees who have priority needs for training and those who do not is to identify employee populations which are at higher levels of risk. The nature of the work will provide an indication that such groups should receive priority for information on occupational safety and health risks.

A. Identifying Employees at Risk

One method of identifying employee populations at high levels of occupational risk (and thus in greater need of safety and health training) is to pinpoint hazardous occupations. Even within industries which are hazardous in general, there are some employees who operate at greater risk than others. In other cases the hazardousness of an occupation is influenced by the conditions under which it is performed, such as noise, heat or cold, or safety or health hazards in the surrounding area. In these situations, employees should be trained not only on how to perform their job safely but also on how to operate within a hazardous environment.

A second method of identifying employee populations at high levels of risk is to examine the incidence of accidents and injuries, both within the company and within the industry. If employees in certain occupational categories are experiencing higher accident and injury rates than other employees, training may be one way to reduce that rate. In addition, thorough accident investigation can identify not only specific employees who could benefit from training but also identify company-wide training needs.

Research has identified the following variables as being related to a disproportionate share of injuries and illnesses at the worksite on the part of employees:

1. The age of the employee (younger employees have higher incidence rates).
2. The length of time on the job (new employees have higher incidence rates).
3. The size of the firm (in general terms, medium-size firms have higher incidence rates than smaller or larger firms).
4. The type of work performed (incidence and severity rates vary significantly by SIC Code).
5. The use of hazardous substances (by SIC Code).

These variables should be considered when identifying employee groups for training in occupational safety and health.

In summary, information is readily available to help employers identify which employees should receive safety and health information, education and training, and who should receive it before others. Employers can request assistance in obtaining information by contacting such organizations as OSHA Area Offices, the Bureau of Labor Statistics, OSHA-approved State programs, State onsite consultation programs, the OSHA Office of Training and Education, or local safety councils.

3. Training Employees at Risk

Determining the content of training for employee populations at higher levels of risk is similar to determining what any employee needs to know, but more emphasis is placed on the requirements of the job and the possibility of injury. One useful tool for determining training content from job requirements is the Job Hazard Analysis described earlier. This procedure examines each step of a job, identifies existing or potential hazards, and determines the best way to perform the job in order to reduce or eliminate the hazards. Its key elements are: (1) job description; (2) job location; (3) key steps (preferably in the order in which they are performed); (4) tools, machines and materials used; (5) actual and potential safety and health hazards associated with these key job steps; and (6) safe and healthful practices, apparel, and equipment required for each job step.

Material Safety Data Sheets (MSDS) can also provide information for training employees in the safe use of materials. These data sheets, developed by chemical manufacturers and importers, are supplied with manufacturing or construction materials and describe the ingredients of a product, its hazards, protective equipment to be used, safe handling procedures, and emergency first-aid responses. The information contained in these sheets can help employers identify employees in need of training (i.e., workers handling substances described in the sheets) and train employees in safe use of the substances. Material Safety Data Sheets are generally available from suppliers, manufacturers of the substance, large employers who use the substance on a regular basis, or they can be developed by employers or trade associations. MSDS are particularly useful for those employers who are developing training on chemical use as required by OSHA's Hazard Communication Standard.

IV. Conclusion

In an attempt to assist employers with their occupational health and safety training activities, OSHA has developed a set of training guidelines in the form of a model. This model is designed to help employers develop instructional programs as part of their total education and training effort. The model addresses the questions of who should be trained, on what topics, and for what purposes. It also helps employers determine how effective the program has been and enables them to identify employees who are in greatest need of education and training. The model is general enough to be used in any area of occupational safety and health training, and allows employers to determine for themselves the content and format of training. Use of this model in training activities is just one of many ways that employers can comply with the OSHA standards that relate to training and enhance the safety and health of their employees.

Glossary

- Absorbed dose** - The amount that actually enters the organism.
- Absorption** - Being drawn into or entering an organism or cell. Ingested materials are absorbed from the digestive tract. Solvents are often absorbed from the digestive tract. Solvents are often absorbed through the skin.
- ACGIH** - "American Conference of Governmental Industrial Hygienists" A private non-profit standard setting organization consisting of respected industrial hygienists primarily from private industry who develop and annually review recommended TLV'S.
- Acid** - See pH
- Acne** - (Folliculitis) Sebaceous glands form a keratin plug, which blocks the canal and results in local inflammation until gland can drain again. In oil folliculitis, as is common in machinists, canals may be physically blocked with oil or dirt.
- Acute** - Occurring immediately or soon after exposure - burns, vomiting, dizziness, etc.
- Adsorption** - Sticking or binding to a surface. Dioxin (TCDD) is strongly adsorbed to soil particles and heterocyclic hydrocarbons such as benz-anthracene are often adsorbed to fly ash particles from fires.
- Aerodynamic diameter** - The diameter of a sphere of density equal to water that would fall at the same rate as the particle in question.
- Aerosol** - Particles or droplets suspended in air, which often result from the dry transfer of materials (pouring, shoveling, sweeping) and from spraying, aeration or agitation of liquids. An aerosol is usually characterized by a mass median aerodynamic diameter (MMAD) and a geometric standard deviation (sg2), which tells how large the range of particle sizes is.
- Aliphatic hydrocarbons** - Straight chains of carbon atoms as opposed to rings (aromatic). Common aliphatic hydrocarbons are methane, propane, butane, heptane, etc.
- Alkali** - See pH
- Alpha radiation** - A helium nucleus that will usually deposit all its energy within less than 100 microns after entering tissue. It can therefore be stopped by a sheet of paper, but if you inhale or ingest a dust particle emitting alpha radiation, the few cells in the immediate neighborhood where it is deposited can get extremely high doses, resulting in cancer rates that appear to be higher than would be expected based only on total absorbed dosage. The Radon Daughters found in uranium mines, etc. are alpha emitters.
- Aqueous** - Consisting of mostly water; as in "aqueous solutions."
- Aromatic hydrocarbon** - Materials consisting of molecules in which the carbon-hydrogen chains form rings rather than being branched or straight chains (aliphatic). Common aromatic chemicals are benzene, toluene, phenol, xylene, etc.
- Asbestosis** - A pneumoconiosis due to asbestos fiber inhalation - this requires exposure levels much higher than is required to increase the risk of lung or pleural cancer.
- Asphyxia** - Suffocation due to lack of oxygen in the air as can occur when vapors displace normal room air.
- Asthma** - Constriction of the muscles around the airways when exposed to some substance. Shortness of breath, wheezing, tight chest.
- Ataxia** - Inability to control voluntary muscles.
- Axon** - The long finger of a neuron cell, which will often extend more than a meter from cell body (spinal cord to feet or hands).
- Axonopathy** - "dying back neuropathy" Progressive degeneration of nerve axons from the distal end (the end that is distant from the cell body). This is the common form of peripheral neuropathy caused by solvents such as MEK (methyl ethylketone) and heptane, and other agents such as acrylamide and carbon disulfide (CS₂).
- Azospermea** - Total absence of sperm in the semen.

Glossary

- Beta radiation** - Electrons or small, negatively charged atomic particles that deposit all their energy very rapidly as they pass through materials. Most beta radiation is therefore stopped by a plastic bottle or absorbed by the outer layers of the skin, however, ingestion or inhalation can lead to much more serious exposure.
- Bioaccumulation** - Whenever a material is absorbed at a rate which is greater than the combination of excretion and degradation, the material tends to accumulate in the body. Common examples of this would be PCB's that accumulate in the body fat and lead, which accumulates in the bone and teeth.
- Bioassay** - Any assay system that depends on organisms to produce the desired conclusion. Common ones are the Ames test (how many bacteria mutate?), Draize test for eye irritation (what happens when you put it in a rabbit's eye?), etc. Because of the inherent variability among organisms they are often more variable than chemical or physical assays, but they allow us to test the responses of systems that are not understood well enough to model in chemical or physical assay systems.
- Bioconcentration** - Life on our planet depends on what is called consumption - a pyramid in which large animals eat smaller ones and plants. If a material is bioaccumulated by several species in the food chain, then the material will tend to be concentrated in the upper levels of the food chain. DDT and PCB's are the classic examples of this. For each material the concentration in predators high in the food chain is much higher than in the general environment.
- Biodegradation** - Breakdown of a material into usually less harmful substituents by biological systems.
- Biotransformation** - Altering the structure of a material within a biological system. This may result in either a less toxic or a more toxic product, as the enzyme systems are obviously not intended for altering toxic chemicals. The interaction in the organism is the result of some portion of the toxin mimicking a normal cell constituent and thus fooling the organism into altering it in some way. The P-450 oxidative enzyme system in the liver is often the guilty party in such an interaction.
- Body burden** - The total amount of material in an organism at a given time. Normally used in the context of bioaccumulation or bioconcentration.
- Bronchitis** - A condition where the airways produce large volumes of mucous which is then coughed up. Normally called chronic bronchitis if it persists for more than 30 days.
- Carcinogen** - An agent that produces cancer. It was previously thought that all carcinogens would be mutagens (initiators of damage) but it now appears that promoters may be even more important as carcinogenic agents as there appears to be an abundance of potential initiators in the modern environment.
- Catabolism** - Building up molecules by forming additional chemical bonds. The result is usually a net energy loss by the organism.
- Caustic** - See pH.
- Ceiling limit** - Maximum instantaneous concentration permissible at any time, in the workplace, set by OSHA for some toxic substances.
- Chloracne** - Acne caused by chlorinated hydrocarbons, especially chlorinated naphthalenes and diphenyls and by Dioxin (TCDD). Primarily differentiated from acne by age distribution.
- Chronic** - Long term; persistent; chronic effects of a substance are those you see only after long exposures or long after the first exposure.
- Clastogenic agent** - Agents that cause actual breaks or loops in the chromosomes as opposed to point mutations, which affect only the local structure of the DNA. Cells affected by such agents may die on cell replication or produce daughter cells with more or less than a full complement of DNA.
- Clearance** - Elimination from the organ or organism by all possible pathways including

Glossary

- excretion, degradation, transformation, and redistribution.
- CNS** - (central nervous system) Essentially the brain and spinal cord.
- Co-carcinogens** - To complicate the initiator/promoter model of cancer, we have agents that are intermediate and require simultaneous exposure.
- Compliance** - A measure of the ease with which the lungs inflate; the opposite of elastance. Compliance generally goes down when the lungs are injured or pulmonary edema develops.
- CSF** - (cerebrospinal fluid) The fluid which bathes the spinal cord and fills the ventricles of the brain.
- Curie** - A measure of the amount of a radioactive material in which the number of disintegrations per second is 3.7×10^{10} . (millicurie = .001 curie, microcurie = .000001 curie)
- Cyclone** - This is a common way of sampling aerosols. The cyclone uses a pump to draw air in through a small nozzle creating a vortex such that large particles are impacted on the walls and smaller particles captured depends on the air flow, cyclone size, and nozzle size.
- Cytochrome P-450 (or P-448)** - Enzymes that tend to be very prevalent in the liver and are often involved in either detoxifying chemicals or altering them to form a more toxic active chemical form. (This process is called "activation" or biotransformation.) When rat liver microsomes are added to the bacteria cultures in the Ames test, the primary result is to expose the chemical to these oxidative enzymes.
- Deposition** - Transfer from a transient phase, such as suspension in air in the lungs or in the blood, to a more permanent location, such as the wall of the airway or a specific organ. All the particles that enter the lung are not deposited there, nor does all of an injected material usually reach the target organ. This is a component of the complex difference between target organ exposure and organism exposure.
- Dermatitis** - A skin condition that is not due primarily to physical injury like scrapes or cuts; rash; hives.
- DNA** - Deoxyribonucleic acid - the master code book that tells cells everything from how to make specific proteins to how to form organs and develop into a human. This molecule is usually the target for carcinogens, mutagens, and teratogens. If you damage the DNA, and the cell's repair processes are unable to fix it, the result is a mutation that may result in cancer. If the damaged DNA is in a germ cell (sperm or ova), the result can potentially be a defect in the child or spontaneous abortion.
- Dominant lethal** - A lethal trait that is expressed even if the gene defining it was only passed from one parent.
- Dose-effect** - The relationship of a given dose to a defined effect such as cell damage caused by the agent directly.
- Dose rate** - The average amount absorbed per unit of time. Not only the total amount absorbed, but how fast it is absorbed relative to excretion, transformation, and damage repair processes in the organism are vital in defining the toxicity of a material.
- Dose-response** - The relationship of a given dose to a defined response by the animal, such as inflammation, reduced activity, or anorexia.
- Dust** - A term used for any dry airborne material.
- Eczema** - Inflammatory skin condition characterized by redness, itching, and oozing vesicular lesions that become scaly and crusted.
- Edema** - (oedema, British) Swelling that results when fluid builds up in the tissue.
- Embryolethal agent** - Crosses the placenta to kill the embryo.
- Endogenous** - Produced or synthesized within the organism.

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- Excretion** - Eliminated from the organism by direct transfer to the environment. Urinary and fecal excretion predominate for most materials, but others may be excreted via the lungs or transpired across the skin.
- Exogenous** - Originating outside the organism in question.
- Exposure** - The characteristics of the environment such as air concentration, surface contamination, protective equipment, etc.
- Fetotoxic** - Crosses the placenta to produce toxic effects in the fetus.
- FEV1** - Forced Expiratory Volume in 1 second, or how much you can blow out in the first second of an expiration from total lung capacity. This parameter tells primarily about airway muscle tone or obstruction and is one of the primary results of doing a spirometry test.
- Flammable** - Will support combustion in air, and has low ignition temperature.
- Flash point** - Temperature at which vapors from a substance will ignite spontaneously - usually defined as "open" or "closed cup" flash point.
- Fractionated dose** - Because of clearance and repair of damage, the response to a dose that is broken into several smaller doses for administration is often significantly less severe.
- Fume** - Gases and dust or particles formed by condensation; as in welding fume formed as metal and slag vapors condense on cooling.
- Gamma radiation** - Energetic photons that, except for their high energies, are the same as visible light. They can be very penetrating because they are very slow to deposit their energy into a material as they go through it. The lower the energy, the shorter the distance they pass through before depositing all their energy. This results in an unusual situation in which high energy gamma rays are generally less harmful for a given exposure because they pass right through without interacting, while low energy photons, like hospital X-rays, are more dangerous because more of their energy is absorbed by the body.
- Gene** - A segment of the DNA or several discontinuous segments which define and control expression of a specific trait such as the structure of a particular protein and directions on how much of it to make, in which cells, to give blue eyes just like daddy's.
- Genotoxic** - A general term for agents that damage the DNA or chromosomes - this includes most carcinogens and teratogens.
- GRAS** - (generally recognized as safe) A designation for certain food additives that were in common use when the FDA began regulating additives. The FDA has conducted tests on a few of the GRAS list, but not all.
- Half-time** - The time required to reduce organ or body burden by half. This is the common way to state the rate of any exponential decay. For most materials, we are only concerned with the "biological half-time" (see clearance), but for radionuclides we must also consider the "physical half-time" or how fast the isotope itself is being transformed by disintegrations of its component atoms.
- Halogenated** - Materials that contain one or more halogen (iodine, chlorine, fluorine, bromine) as part of their molecular structure.
- Hazard** - A factor in the environment that has an unacceptable degree of risk associated with it.
- Hematopoietic system** - The blood forming organs such as bone marrow and, in the fetus and some animals, the spleen. This is a vital portion of your immune system, which fights infection and is a common target for direct acting carcinogens such as radiation, alkylating chemicals like nitrogen mustards, and many cancer chemotherapeutic drugs.
- HEPA or HIEP** - High Efficiency Particulate respirator or filter.
- Hepatic** - Of or related to the liver.
- Hydrophilic** - Latin for "water loving". These are water soluble materials that in

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general are excreted in the urine. The opposite of hydrophobic.

ICRP - International Congress on Radiological Protection. This organization in conjunction with the NCRP (National Congress) sets recommended procedures for occupational exposure, which have the effect of regulations in all facilities licensed by the federal government to handle radio isotopes.

IDLH - "Immediately Dangerous to Life or Health" A concentration defined by NIOSH.

Impactor (multistage) - An aerosol sampling device to let you estimate the range of particle sizes present in the sample. At each stage of the impactor the sample air is forced through smaller and smaller holes so as to impact smaller and smaller particles on the glass slides, which are a fixed distance from each hole. This type of measurement is especially important for materials that damage the lung directly rather than just using it as an entry into the body. Very small particles are often exhaled without depositing in the lung, and large particles deposit in the nose and upper airways so they may never reach the parenchyma of the lung.

Incidence - How often a particular occurrence is observed in a defined group, over a specified period of time. Such a number says nothing about the actual cause of the occurrence unless we can compare it to the incidence in other similar groups.

Ingestion - Taking by mouth; eating or drinking; swallowing.

Initiator - Carcinogenic agent most likely to be a mutagen, causing unrepaired damage, which may or may not proceed to a cancer. If the unrepaired damage is suitably located, exposure to a promoter will induce cancer without requiring additional exposure to the initiation agent. Most mutagens probably fall in this category.

Interrelating agent - Normally flat molecules that slip between the bases in a DNA spiral coil and confuse the replication process, resulting in mutations.

in vitro - In a test tube or artificial system.

in vivo - In a living organism.

LC 50 - The concentration (exposure, not dose) that is lethal in 50% of the animals exposed within the defined time period, usually 24 hours.

LD 50 - "Lethal Dose for 50% of those receiving it. Usually specified as Oral LD 50 taken by mouth, or i.v. LD 50, material injected.

Lethargy - Tiredness, sluggishness, stupor.

Lipophylic - Latin for "lipid (or fat) loving." Lipophylic agents concentrate in cell membranes and in fatty tissues, such as nervous tissue and body fat. These materials are oil soluble rather than water soluble, and may have very slow clearance rates from the body.

Mean concentration - See TWA

Metabolism - Breaking down of molecules by an organism, usually with a net gain in energy by the organism.

mg/M3 - "Milligrams per cubic meter." A one meter cube is about 39 inches on each side. A milligram is 1/1000 of a gram and there are about 454 grams in a pound. A milligram of an average material would be a particle about the size of the period at the end of this sentence.

MMAD - Mass Median Aerodynamic Diameter - The aerodynamic diameter of that particle for which half the total sample mass is made up of particles larger and half smaller than the stated median. This is almost always larger than the count median diameter (CMAD) as there is usually a large number of very small particles that contribute very little mass.

Molecular weight - A designation used by chemists to compare the relative size of the molecules of various substances.

MPPCF - "Millions of Particles Per Cubic Foot"

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Mutagen - An agent that causes mutations (changes or damage) in DNA. Usually such agents are also carcinogens.

Myelinopathy - ("segmental neuropathy") A type of neuropathy that presents a set of symptoms similar to an axonopathy, but instead of being caused by degeneration of the axon (the wire in an electrical analog of the nervous system), it is caused by degeneration of the cells which surround the axon and act as combination insulators and amplifiers for the axon. This can result from chronic adult lead poisoning, hexachlorophene, triethyltin exposure, etc.

Narcosis - Reduced reaction time, tiredness, decreased alertness.

NEPA - National Environmental Protection Act - The federal statute that requires environmental impact statements on all projects involving the federal government in any way (that effectively means all projects).

Neurons - The cells that carry control messages to your body and around your brain. Made up of a cell body with one long axon and several shorter dendrites, which make connections to other nerve cells. These can be called "nerve cells," but the nerves also depend on the Schwann or oligodendroglia cells that act as insulators and repeater amplifiers for the nerve signal.

NFPA - National Fire Protection Association

NIOSH - "National Institute of Occupational Safety and Health" a branch of the Center for Disease Control that does research on occupational hazards. It does not make or enforce any laws.

NY OSHA - New York State legislation providing for enforcement of federal OSHA regulations among public employees.

Olfactory threshold - The minimum concentration at which an average person can smell a material in the air.

Oligospermea - Reduced sperm count per volume of semen.

Organic solvents - A general name that includes almost any solvent except water; any petroleum or hydrocarbon based solvent.

OSHA - "Occupational Safety and Health Administration" The government agency that establishes and enforces regulations for workplace health and safety. Part of the Dept. of Labor.

OSH ACT - The written legislation that defines the responsibilities of the Occupational Safety and Health Administration of the Dept. of Labor.

Parasympathetic nerves - Nerves that have synapses (cell-cell junctions) between the innervated site and the spinal cord. Stimulation causes contraction of sphincter muscles and smooth muscles, such as the pupils of the eye, the bronchioles, urinary bladder, and intestine, slowed heart rate, and increased secretion of glands, such as the salivary glands. Target for cholinesterase inhibitors such as organophosphate pesticides.

Partition coefficient - The relative concentrations after mixing in the two phases of the solvent combination mentioned. The common comparisons are octanol:water and olive oil:water. The chemical is added to a container with equal quantities of each solvent, mixed well, and when the phases separate, each phase is sampled for chemical concentration. See hydrophylic.

Pathogenesis - The development and progression of injury or disease.

Peripheral neuropathy - Damage to the nerves that is most apparent in the hands and feet where distances from the spinal cord are greatest. Marked by reduced nerve conduction rates. Often results in a condition called "gloves and stockings syndrome" because of the numbness that develops. See also axonopathy and myelinopathy.

PEL - "Permissible Exposure Level" The TWA exposure level that OSHA allows in the workplace.

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Permeation - Passing through a barrier, as with the permeation rate of methylene chloride through latex gloves.

pH - A scale from 0 to 14 on which 7 is neutral, less than 7 is acid, and greater than 7 is called alkaline, caustic, or basic. Human tissue is about 7.4 and skin is usually slightly acid (6.8). Exposure to materials of pH's very different from this may result in burns or irritation unless they are washed away immediately.

Pneumoconiosis - A general description of a lung condition caused by the inhalation of dust.

Polymerization - The joining together of molecules into long chains or networks; the processing by which epoxy or plastic resins solidify.

Potentiation - An effect of one agent that increases the severity of the response on exposure to a second agent.

ppm - "Parts Per Million" - A concentration defined by relative proportions by mass or weight.

ppm V - "Parts Per Million by Volume"

Promoter - An agent that will not cause cancer; however, if a cancer has been "initiated" before exposure to the promoter, a cancer will develop. Exposure to an initiator after exposure to the promoter is discontinued will not result in cancer. Croton oil is the classic promoter, but cigarette smoke is also a prime candidate for this category.

Pyrophoric - Will ignite spontaneously - usually on contact with air.

rad - (radiation absorbed dose) - This is the concentration of energy absorbed from irradiation in the tissue (1 rad = 100 ergs/gram).

Reactivity - A general term used to describe the ability of a material to react with other materials - usually oxidizing or reducing agents.

RECRA - (Resource Conservation and Recovery Act) A federal statute that attempts

to regulate solid waste both toxic and non-toxic.

rem - (radiation dose equivalent) This is the number of rads (radiation absorbed dose) multiplied by empirical quality factors that take into account the biological effects of various radiations.

Renal - Of or related to the kidney.

Resorption - In rodents (rats, mice) reproduction is so prolific that they have developed the ability to resorb the embryo and part of the placenta of single kits out of a large litter. Unlike the higher mammals like man, they cannot afford to spontaneously abort the entire litter because of malformation in a single embryo, nor can they afford to use the energy required to bring a malformed kit to term. Resorption is the answer nature has come up with. Many agents cause increased resorption and reduce litter size without producing identifiable malformations in those that come to term.

Respirable fraction - That portion of the dust in the air that will reach the lungs or trachea if inhaled. Large particles are stopped by the nose and are not part of the respirable fraction. Usually compared to "Total Particulates."

Respiratory System - The lungs, and airways leading into them.

Risk - A combination of the probability that an unfavorable outcome will result from a given situation or exposure, the degree to which the outcome is undesirable, and the probability of the situation occurring.

Roentgen - (Units of radiation exposure = R) This unit is used only for X-rays and is defined relative to the number of air molecules that are ionized within a fixed volume within the beam. See rem and rad for units of radiation dose as opposed to exposure. The dose is what should concern all but physicists.

SCBA - "Self Contained Breathing Apparatus" - consisting of a tank and face mask without air hoses to another source of air.

Sensitization - Although you may inherit the predisposition towards a certain allergy,

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you cannot inherit an allergy. An allergy develops after you are exposed to the allergen or sensitizing agent for a period of time and become sensitized such that thereafter you are hyperreactive to the sensitizing agent.

Sensitizer - A material to which an allergic reaction is possible. Once a person has become "sensitized" to a substance, he or she will react at levels far lower than before sensitization and lower than non-sensitized coworkers - common responses are asthmatic symptoms or dermatitis; but in rare severe cases like threatening anaphalactic shock may occur.

Sham exposure - Subjecting a control test subject to the same procedures as the exposed subject will receive, except for the replacement of the toxic exposure with a harmless substitute such as air inhalation or saline injection. The parallel in a clinical trial would be the group receiving placebo or sugar pills instead of a test medication.

Siderosis - A pneumoconiosis due to tin ore inhalation.

Silicosis - A pneumoconiosis due to silica inhalation, prevalent in stone cutters, quarry workers, etc. Due largely to the lysis of lung macrophages on contact with crystalline silica. The disease is not caused by the relatively less dangerous silicates, such as mica and talc, unless they are contaminated with crystalline silica.

Spirometry - Measuring the flow and volume as you inhale maximally and then exhale as hard and as fast as you can. The results are compared to average results for your age, sex, height, and race. However, the effective use of the test depends on having a normal baseline test for the subject and then comparing later tests to that baseline.

Spontaneous abortion - Loss of the embryo and uterine lining, almost always within the first 3 to 4 weeks of pregnancy. Estimates of baseline levels of spontaneous abortion range from 40% to 60% of all conceptions and are known to include high incidences of chromosomal abnormalities. Although it is difficult to document, several agents causing reduced fertility may act by damaging the germ cells to such a degree

that the body aborts the embryo early on and the pregnancy is never recognized.

Spontaneous incidence - The incidence observed in the absence of the agent in question in a group similar to those exposed. The spontaneous incidence almost certainly includes other environmentally induced occurrences, so it should not be considered a baseline incidence below which a normal population cannot go.

STEL - "Short Term Exposure Limit" - A recommended maximum short term exposure level defined by ACGIH. Usually defined for a 15 minute time-weighted average.

"Superfund" - (Comprehensive Environmental Response, Compensation and Liability Act) - a federal statute to deal with securing existing toxic waste dumps that now pose environmental threats. This statute is specifically limited to resource and environmental damage and excludes personal liability.

Sympathetic nerves - Nerves that have no synapses (cell-cell junctions) between the innervated site and the spinal cord. Stimulation causes dilation of sphincter muscles, increased secretion of the sweat glands, etc.

Synergism - Occurs when the result of two or more different exposures is greater than would be expected from the sum of the responses to being exposed to each of the materials independently. An example might be the effect of a combination of methyl ethyl ketone and heptane in producing peripheral neuropathies at exposure levels below that which would be required for the individual solvents to cause the same effect.

Target organ - The organ or organ system whose failure actually results in death or impairment after exposure to a given material. This may be due to the sensitivity of cells in that organ to injury, or it may be due to higher concentrations of the toxin or active metabolite in that organ.

Teratogen - A substance that results in malformation in fetuses that come to term.

TLV - "Threshold Limit Value" - A recommended maximum TWA exposure

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defined by ACGIH as not producing adverse effects in most workers.

Tolerance - The ability to withstand higher exposure than the average person before demonstrating a defined response. Tolerance to some materials may develop with prolonged exposure, as with acid mist (H_2SO_4 or HCl), which seems intolerable on Monday morning or to a plant visitor, but is ignored by the workers. Other types of tolerance may be due to genetic or environmental factors outside the workplace.

TOSCA - (Toxic Substances Control Act) - a federal statute to regulate new chemicals being introduced into the marketplace.

Toxicokinetics - (or pharmacokinetics)
The mathematics describing the absorption, redistribution, and clearance of an agent.

TWA - "Time Weighted Average" - The concentration averaged over an 8-hour day and 40 hour week. If one hour per week a worker is exposed to 100 ppm of substance X, then the TWA is $1\text{hr} \times 100\text{ppm} / 40\text{hr} = 2.5\text{ppm}$

Vapor density - Air is defined to have a vapor density of 1.0. If the vapor density is greater than 1.0, the vapor will sink and may collect in pits or open tanks. If the vapor density is less than one, the vapor will rise and may increase exposure to a worker above an open container.

Vapor pressure - A measure of volatility - a measure of the fraction of the air that will be made up of the vapor of substance X under the specified conditions. Compared to a barometric pressure of 760 mm Hg for total air.

Volatility - An expression of the rate at which the material vaporizes or evaporates.

Xenobiotic - Any chemical or material that is not usually present within the organism. A fancy word for almost any chemical you put into an animal.



Suggested Readings in Industrial Safety and Health Training

"OSHA Publications and Audiovisual Programs," OSHA 2019, OSHA Publications Distribution Office, U.S. Department of Labor, Room N-3101, Washington, DC 20210

"OSHA Safety and Health Training Guidelines for General Industry" (PB-239-310/AS), National Technical Information Service, Springfield, VA 22161

"OSHA Safety and Health Training Guidelines for Maritime Employment" (PB-239-311/AS), National Technical Information Service, Springfield, VA 22161

"OSHA Safety and Health Training Guidelines for Construction" (PB-239-312/AS), National Technical Information Service, Springfield, VA 22161

Kirkpatrick, Donald L., "A Practical Guide for Supervisory Training and Development," Pages 158-161, 1983, Second Edition, Addison-Wesley Publishing Co., Reading, MA 01867

Mager, Robert F., "Preparing Instructional Objectives," 1984, Second Edition, David S. Lake Publishers, 19 Davis Drive, Belmont, CA 94002

"Supervisors Safety Manual," 1985, Sixth Edition, National Safety Council, Chicago, IL 60611

"1986 Reference List of Audiovisual Materials," National Audiovisual Center, Washington, DC 20409

Resources

Occupational Safety and Health Administration (OSHA) - enforces the Federal Occupational Safety and Health Act, which applies to private employers in New York State, and publishes limited information on toxic substances and health and safety hazards. You can obtain free copies of OSHA 1910 General Industry Standards, which apply in the public sector under the Public Employee Safety and Health Act.

Regional Office: Cathy Mannion

U.S. Department of Labor
Occupational Safety and Health Admin., Region II
Room 3445, One Astor Plaza, 1515 Broadway
New York, New York 10036
(212) 944-3426

Local Offices:

Albany

Leo W. O'Brien Federal Bldg.
Clinton Ave. & N. Peral St.
Room 132
Albany, NY 12207
(518) 472-6085

Manhattan

90 Church Street, Room 1405
New York, New York 10007
(212) 264-9840

Buffalo

5360 Genesee Street
Bowmansville, NY 14026
(716) 684-3891

Queens

136-21 Roosevelt Ave., 3rd Floor
Flushing, NY 11354
(718) 445-5005

Long Island

990 Westbury Road
Westbury, New York 11590
(516) 334-3344

Syracuse

100 S. Clinton Street, Rm 1267
Syracuse, New York 13260
(315) 423-5188

National Institute for Occupational Safety and Health (NIOSH) 1-800-35-NIOSH

Will respond to specific technical information requests. Can initiate workplace studies in response to observed health effects or specific hazards. Has a variety of publications including workplace hazard investigation reports. Reviews current literature and makes recommendations to OSHA concerning new occupational exposure limits ("Criteria Documents").

U.S. Environmental Protection Agency (information on specific toxic substances).

TSCA Office

Office of Pesticides and Toxic Substances
401 M. Street S.W.
Washington, D.C. 20460
(800) 424-9065

EPA Regional Asbestos Coordinators

On October 30, 1987, EPA published the final rule and notice on asbestos-containing materials in schools, as required by the Asbestos Hazard Emergency Response Act (AHERA). To assist Local Education Agencies, who are required to comply with AHERA and to assist others interested in this law, EPA stations Regional Asbestos Coordinators throughout the country. Below is a list of the Asbestos Coordinators.

REGION II

(New Jersey, New York, Puerto Rico, Virgin Islands)

Arnold Freiberger
Woodbridge Avenue
Edison, NJ 08837
(202) 321-6668

REGION III

(Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia)

Pauline Levin
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-9859

New York State and New York City also have regulations which apply to asbestos removal. These require certification of outside contractors involved in asbestos removal or use, and training of employees involved in occasional on-site asbestos abatement (*e.g.*, maintenance personnel removing asbestos from a steam line for repairs). This training is available through several community colleges and through private consultants (usu. around \$250-\$500 per person for a 5 day program).

For example, Niagara County Community College Industrial Training Center offers training once per month for Workers & Handlers; Supervisors & Contractors; Inspectors & Management/Planners; and Operations & Maintenance at \$100/day.

Contact: Mr. Eugene Zinni, Director Corporate Training
NCCC Industrial Training Center
160 Washburn, P. O. Box 70
Lockport, New York 14094
(716) 433-1856

New York State Department of Environmental Conservation

Provides information on environmental contamination and waste disposal of specific hazardous substances.

State Office:

New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233
(518) 457-3273

Regional Offices:

Region 1
DEC
Building 40, SUNY
Stony Brook, NY 11794
(516) 751-7900

Region 4
DEC
2176 Guilderland Ave.
Schenectady, NY 12306
(518) 382-0680

Region 7
DEC
7481 Henry Clay Blvd.
Liverpool, NY 13088
(315) 428-4483

Region 2
DEC
Two World Trade Ctr.
33rd Floor
New York, NY 10047
(212) 488-2799

Region 5
DEC
Hudson St., ext.
Box 220
Warrensburg, NY 12885
(518) 623-3671

Region 8
DEC
6274 East Avon-Lima Rd.
Avon, NY 14414
(716) 226-2466

Region 3
DEC
21 South Putt Corners Rd
New Paltz, NY 12561
(914) 255-5453

Region 6
DEC
State Office Building
317 Washington Street
Watertown, NY 13601
(315) 785-2515

Region 9
DEC
600 Delaware Avenue
Buffalo, NY 14202
(716) 847-4565

New York State Department of Labor

Division of Occupational Safety and Health
State Campus
Albany, New York
(518) 457-5508

New York State Dept of Health

Division of Occupational Health, Bureau of Toxic Substances Assessment
(518) 473-3793

The "Right to Know" Act creates an Article 48 in the Public Health Law, delegating a number of responsibilities to the Department of Health. Three major areas of responsibility emerge: to provide an outreach program to employers and employees, to provide an information program to employers, and to provide an investigation program for studying the health hazards of the work site. The Bureau of Toxic Substance Assessment of the Division of Environmental Health Assessment will undertake overall responsibility for the implementation of these programs.

University and Not-for-Profit Programs

Agricultural Safety Concerns - Engineering

John Pollock, Agricultural Engineering - Safety Office
Cornell University
Ithaca, New York 14853
(607) 255-3186

Agricultural Occupational Health and Safety Concerns - Medical

Davis S. Pratt, M.D., Bassett Farm Safety and Health Project
Mary Imogene Bassett Hospital
Cooperstown, New York 13326
(607) 547-3971

Chemical Hazard Information Program

James Platner, State Director
New York State School of Industrial and Labor Relations
Cornell University
146 State Street
Albany, New York 12207-1605
(518) 449-4161

Nellie Brown, Western Regional Director
New York State School of Industrial and Labor Relations
Cornell University
110 Pearl Street - 8th Floor
Buffalo, New York 14202
(716) 842-1124

Farmworker Occupational Health Concerns

James Schmidt, Farmworkers Legal Services of NYS, Health and Safety
Project
87 North Clinton Avenue
Rochester, New York 14604
(716) 325-3050

Pesticide Health Hazard Information

Your local county Cooperative Extension Association or:
Bill Smith, Sr. Extension Associate
Chemicals & Pesticides Program, Department of Entomology
Cornell University
Ithaca, New York 14853
(607) 255-1865

COSH Groups

Councils on Occupational Safety and Health (COSHs) consist of concerned professionals, individuals, and labor unions. They are excellent sources of information and training on occupational health.

Allegheny Council on Occupational Safety & Health

Linda Berlin, Project Director
100 E. 2nd Street
Jamestown, New York 14701
(716) 488-0720

New York Committee on Occupational Safety and Health

Joel Shufro, Director
275 7th Avenue, 25th Floor
New York, New York 10001
(212) 627-3900

Eastern New York Council on Occupational Safety and Health

Larry Rafferty, Chairman
121 Erie Blvd.
Syracuse, New York 12305

Central New York Council on Occupational Safety and Health

Sherry Slade
615 West Genesee Street
Syracuse, New York 13204
(315) 471-6187

Rochester Council on Occupational Safety and Health

Bridget Watts, Director
797 Elmwood Avenue
Rochester, New York 14620
(716) 244-0420

Western New York Council on Occupational Safety and Health

Roger Cook, Director
450 Grider Street
Buffalo, New York 14215
(716) 897-2110

Occupational Health Centers - Clinics

The New York State Department of Health, Division of Occupational Health administers state funding to assist and coordinate the establishment of a statewide network of occupational disease diagnostic centers. These clinics may be staffed by board certified occupational health physicians and associated support staff to assist in the diagnosis of occupationally related disease and injury. Several of the regional centers are still in the planning stage, others are fully operational.

Selikoff Occupational Health Center
Environmental and Occupational Medicine
Department of Community Medicine
Mount Sinai School of Medicine of CUNY
New York, New York 10029
(212) 241-6173

IL Occupational & Environmental Health Center
Suite #207
Medical Arts Building
625 Belle Terre Road
Port Jefferson, New York 11777
(516) 476-2719

Eastern New York Occupational Health Center
1201 Troy-Schenectady Road
Latham, New York 12110
(518) 783-1518

Central New York Occupational Health Clinical Center
6712 Brooklawn Parkway, Suite 204
Syracuse, New York 13211-2195
(315) 432-8899

Finger Lakes Regional Occupation Health Program
Box 644
University of Rochester Medical Center
Rochester, New York 14642
(716) 275-7171

Union Occupational Health Center
450 Grider Street
Buffalo, New York
(716) 894-9366

Other clinical centers receive no New York State Department of Health funding but provide occupational health services in specialized areas or work cooperatively with regional centers. This is a partial list.

Steven Cohen, M.D., M.P.H.
Environmental and Occupational Dermatology Unit, Division of Dermatology
Cornell University Medical College
1300 York Avenue
New York, New York 10021
(212) 472-5731

Karl Auerbach, M.D.
Rochester Occupational Center
St. Mary's Hospital
909 W. Main Street, Suite 203
Rochester, New York
(716) 464-3630

REGIONAL POISON CONTROL CENTERS

There are eight regional poison control centers in New York State. In an emergency, contact the regional poison control center serving your county.

HEALTH SERVICE AREAS			POISON CONTROL CENTER
Counties			
Area 1			
Allegany	Genesee		Western N. Y. Poison Control Center at Buffalo Buffalo Children's Hospital 219 Bryant Street Buffalo, NY 14222 (716) 878-7654
Cattaraugus	Niagara		
Cattaraugus	Orleans		
Erie	Wyoming		
Area 2			
Chemung	Seneca		Finger Lakes Poison Control Center, University of Rochester 601 Elmwood Avenue, Box 321 Rochester, NY 14642 (315) 275-5151
Livingston	Steuben		
Monroe	Wayne		
Ontario	Yates		
Schuyler			
Area 3			
Cayuga	Oneida		Central N. Y. Poison Control Center University Hospital SUNY Health Science Center 750 East Adams Street Syracuse, NY 13210 (315) 476-4766
Cortland	Onondaga		
Herkimer	Oswego		
Jefferson	St. Lawrence		
Lewis	Tompkins		
Area 4			
Broome			Southern Tier Poison Control Center Binghamton General Hospital Mitchell Street Binghamton, NY 13905 (607) 723-8929
Chenango			
Tioga			
Area 5			
Albany	Fulton	Saratoga	Ellis Hospital Poison Control Center 1101 Nott Street Schenectady, NY 12308 (518) 382-4039 (518) 382-4309
Clinton	Greene	Schenectady	
Columbia	Hamilton	Schoharie	
Delaware	Montgomery	Warren	
Essex	Otsego	Washington	
Franklin	Rensselaer		
Area 6			
Dutchess	Sullivan		Hudson Valley Poison Control Center Nyack Hospital North Midland Avenue Nyack, NY 10960 (914) 353-1000
Orange	Westchester		
Putnam	Ulster		
Rockland			
Area 7			
Bronx	Richmond		New York City Regional Poison Control Center New York City Department of Health 455 First Avenue, Room 123 New York, NY 10016 (212) POISONS, (212) 340-4494
Kings	Queens		
New York			
Area 8			
Nassau			Long Island Regional Poison Control Center Nassau County Medical Center 2201 Hempstead Turnpike (516) 542-2323
Suffolk			

HIV COUNSELING PROGRAM

Since July 1985, the AIDS Institute has conducted a counseling and antibody testing program to provide free and anonymous services for individuals concerned about their human immunodeficiency virus (HIV) antibody status. These alternate site services are currently available in 19 upstate New York counties and in New York City.

Between July 1985 and January 29, 1988, the program received 137,4100 hotline calls and made 43,866 pretest appointments during which HIV information was shared. To date, approximately 31,000 antibody tests have been conducted through the alternate site counseling and testing program.

Health care providers may advise patients who want information and referral regarding anonymous HIV antibody counseling and testing to call the hotline number in their public health region and ask for the HIV counselor.

Rochester Public Health Region.....	716-423-8081
Syracuse Public Health Region	315-428-4736
Buffalo Public Health Region	716-847-4520
Nassau County	516-535-2004
Suffolk County.....	516-348-2999
New Rochelle Public Health Region	914-632-4133
Albany Public Health Region	518-457-7152

New York City:

Bronx	212-716-3350
Brooklyn	718-797-9110
Queens	718-262-9100
Manhattan (Harlem).....	212-694-0884

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