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OCCUPATIONAL
SAFETY & HEALTH

OSHA Action Needed
to Improve Compliance
With Hazard
Communication
Standard



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United States
General Accounting Office
Washington, D.C. 20548

Human Resources Division

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November 26, 1991

The Honorable Dale L. Bumpers
Chairman, Committee on
Small Business
United States Senate

The Honorable Norman Sisisky
Chairman, Subcommittee on Exports,
Tax Policy, and Special Problems
Committee on Small Business
House of Representatives

In response to your request, this report provides information on employer compliance with the Hazard Communication Standard, the Occupational Safety and Health Administration's efforts to inform small employers about the standard, and the accuracy and clarity of material safety data sheets required by the standard.

We are sending copies of the report to interested congressional committees, the Secretary of Labor, the Administrator of the Small Business Administration, and other interested parties. Copies also will be made available to others on request.

This report was prepared under the direction of Franklin Frazier, Director, Education and Employment Issues, who may be reached on (202) 275-1793 if you or your staff have any questions. Other major contributors are listed in appendix VIII.

Lawrence H. Thompson
Assistant Comptroller General

Executive Summary

Purpose

Millions of workers are exposed while on the job to some of over 650,000 different chemical products. If mishandled, many of these chemicals can cause serious illness and injury. The results are substantial medical costs and lost production to the American economy annually, as well as pain and suffering to workers and their families. The Hazard Communication Standard (HCS), established by the Occupational Safety and Health Administration (OSHA) to address these effects, requires that employees receive information and training concerning chemical hazards in their workplaces.

Because of their concern over HCS's economic impact on the operations of small businesses, the Chairmen of the Senate Committee on Small Business and the House Subcommittee on Exports, Tax Policy, and Special Problems requested that GAO assess the (1) extent of compliance with HCS, particularly among small employers and employers in nonmanufacturing industries, (2) adequacy of OSHA's efforts to inform small employers about their responsibilities under HCS, and (3) adequacy of OSHA's strategy in overseeing the informational accuracy and clarity of material safety data sheets (MSDSS) required by the standard.

To answer these questions, GAO conducted a national survey of construction, manufacturing, and personal services employers. GAO also obtained and analyzed OSHA inspection data for fiscal years 1989 and 1990, and reviewed OSHA's inspection policies and procedures for ensuring the informational quality of MSDSS.

Background

OSHA is the principal federal agency governing workplace health and safety, setting mandatory safety and health standards, inspecting work-sites, and citing employers for violations. The HCS, issued by OSHA in 1983, requires the identification of workplace chemical hazards and the communication of this information to employees. Initially, the standard applied only to manufacturing industries, but in August 1987, OSHA extended HCS to nonmanufacturing industries.

Under HCS, chemical manufacturers and importers must perform a hazard evaluation—evaluate each chemical substance they produce or import to determine if it is hazardous. For a chemical determined to be hazardous to workers if used in the workplace, the firm must prepare an MSDS detailing its properties and hazards and precautions for its safe use and handling. HCS allows considerable latitude in preparing data sheets, including the language and format used, but specifies the information to be included.

Manufacturers and importers also must label the chemical's container and provide the MSDS with the initial shipment of the chemical to employers. Employers using hazardous chemicals are required to develop a written hazard communication program describing how they will meet HCS's requirements. They must maintain a current file of MSDSS for the chemicals they use in their business and make this file accessible to employees. In addition, they are responsible for training employees in the safe handling and use of hazardous chemicals.

Typically, OSHA reviews MSDSS for their accuracy after the chemical manufacturer has distributed them to employers. When it detects an inaccurate MSDS at a worksite, OSHA generally sends a letter to the manufacturer requesting correction. If the manufacturer fails to do so, OSHA then inspects the manufacturer, limiting the inspection to the hazard evaluation process for the specific MSDS.

OSHA plans to ask for public comment in 1992 on the need for HCS revisions. The agency also is considering establishing a toll-free HCS information hot line some time in fiscal year 1992.

Results in Brief

Both OSHA and GAO found a substantial number of employers out of compliance with HCS, especially small employers—those with fewer than 20 employees. OSHA inspections of worksites selected because of accidents, complaints, or the hazardousness of their industry found 26 percent of all inspected worksites out of compliance with at least one HCS requirement. Small employers had the highest out-of-compliance rate within each major industry group analyzed. In surveying a random sample of employers, GAO found 58 percent of small employers and 52 percent of all employers to be out of compliance with key requirements of HCS.

Many small employers know little or nothing about HCS. About 29 percent of all small employers indicated little or no awareness of HCS. Of those small employers who were aware of HCS, 39 percent did not know that employers with 10 or fewer employees had to comply with it.

Small employers may be unaware because they have less contact with OSHA, the primary HCS information source of large employers—those with 500 employees or more. OSHA's small-employer outreach strategy makes use of trade associations. Although small employers cited trade associations as a primary source of HCS information, many do not belong to these groups. Small employers said better distribution of OSHA printed materials would increase small employer awareness of HCS.

OSHA rarely reviews hazard evaluations performed by chemical manufacturers and importers, although studies suggest that many MSDSS contain inaccurate information. Moreover, 55 percent of employers who received MSDSS said that most are too technical for the typical worker to understand.

Principal Findings

Small Employers More Likely to Be Out of Compliance

From its own survey data, GAO estimates that 52 percent of all employers in construction, manufacturing, and personal services did not comply with the training, data sheet, or labeling requirements of HCS. Among small employers, about 58 percent were out of compliance, compared with 20 percent of large employers (see p. 18). OSHA's inspection data for fiscal years 1989 and 1990 also show that small worksites are more likely to be out of compliance. For example, small manufacturing worksites, at 41 percent, had the highest out-of-compliance rate of any group, compared with 19 percent for large manufacturing worksites (see p.16).

Small Employers Less Likely to Be Aware of HCS

Among small employers, some 29 percent reported little or no awareness of HCS, compared with about 2 percent of large employers. Lack of familiarity with OSHA may be the cause—about 45 percent of all small employers reported no contact with OSHA, compared with 7 percent of large employers (see p.23).

Small Employers Identify Helpful Outreach Options

About 57 percent of small employers believed that better distribution of printed HCS information from OSHA would be very helpful in informing employers about HCS. The single most important source of such information for small employers was trade associations, which OSHA uses to distribute information on HCS. However, employer representatives estimate that up to 50 percent of all small employers are not members of trade associations and OSHA may find it difficult to identify nonmember employers (see p.22). One way to facilitate better outreach to small employers would be to add to the MSDS itself information about OSHA and HCS requirements and how to obtain more printed material about them.

OSHA Procedures to Monitor MSDSSs Weak

When OSHA reviews MSDSS, it is generally after their distribution to employers. Thus, the agency is unlikely to detect systemic problems in the way manufacturers and importers perform hazard evaluations and prepare MSDSS on hazardous chemicals. Some such problems may exist, recent studies show. For example, an OSHA-contracted report of September 1988 concluded that most of the 196 data sheets sampled were either incomplete or inadequate, especially regarding information on certain types of health hazards (see p.32).

MSDSSs Seen as Too Complicated

Fifty-five percent of all employers who received MSDSS told GAO that they believe all or almost all of them were too technical for the typical employee (p.28). This is consistent with studies finding that many MSDSS are written in language far above the average worker's reading ability.

Recommendations

GAO recommends that the Secretary of Labor direct OSHA to revise the Hazard Communication Standard to

- specify that developers of MSDSS include on each data sheet a brief description of employer responsibilities under the standard, and
- address the problem of employers' and employees' inability to understand the MSDSS by clearly specifying the language and presentation of information to be used on MSDSS.

If OSHA establishes a toll-free hot line for HCS, GAO recommends that it require the hot-line number to be included on the MSDSS.

To improve the accuracy of MSDSS, GAO also recommends that OSHA develop a more effective strategy for inspecting the hazard evaluation process used by manufacturers and importers. GAO has identified approaches OSHA should consider to accomplish this (see pp.34-35).

Agency Comments

Although GAO requested written comments from the Department of Labor, none were provided. However, GAO met with agency officials to obtain their views, which are addressed in the report as appropriate. In addition, GAO requested written comments from the Small Business Administration, which also did not provide them.

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Abbreviations

HCS	Hazard Communication Standard
IMIS	Integrated Management Information System
OSHA	Occupational Safety and Health Administration
MSDS	Material Safety Data Sheet
SBA	Small Business Administration
SIC	Standard Industrial Classification
USEEM	United States Employment and Enterprise Microdata

Introduction

Millions of workers are exposed while on the job to some of over 650,000 different chemical products. If mishandled, many of these chemicals can cause serious illness and injury. The results are substantial medical costs and lost production to the American economy annually, as well as pain and suffering to workers and their families. To address these problems, the Occupational Safety and Health Administration (OSHA) established in 1983 the Hazard Communication Standard (HCS), which requires that employees receive information and training on the chemical hazards in their workplaces.

As currently designed, however, HCS has been criticized as inappropriate for achieving these objectives. Some business representatives contend that workers often cannot readily understand or use the information disseminated under the standard. In addition, business representatives have alleged that OSHA has not effectively reached out to the employer community, especially small employers, to inform them of their responsibilities under the standard. In recognition of these objections, the Chairmen of the Senate Committee on Small Business and the Subcommittee on Exports, Tax Policy, and Special Problems, House Small Business Committee, asked that we assess OSHA's Hazard Communication Standard.

Background

The Congress enacted the Occupational Safety and Health Act of 1970 with the goal of assuring "so far as possible every working man and woman in the Nation safe and healthful working conditions." The act marked the first comprehensive, nationwide regulatory program to prevent workplace injuries and illnesses.

Under the law, employers in the private sector must furnish employment and a place of employment free from recognized hazards that cause or are likely to cause serious physical harm or death to workers, and to follow occupational safety and health standards. Also, each worker is required to follow occupational safety and health standards, as well as all regulations and orders issued under the act that are applicable to the worker's own action and conduct.

To administer the act, the Secretary of Labor established the Occupational Safety and Health Administration. Today, OSHA is the principal federal agency governing workplace health and safety, setting mandatory safety and health standards, inspecting worksites, and citing employers for violations. It covers over 85 million workers in about 6 million worksites.

The act also authorizes the states to develop and operate their own safety and health programs; currently 21 states and 2 territories do so. In two additional states, state-operated programs cover state public employees, with the federal OSHA responsible for private-sector enforcement (see fig. 1.1). OSHA approves, monitors, and evaluates the state programs and may fund up to 50 percent of the cost of their operations. In total, about 2,100 federal and state compliance officers conduct more than 135,000 safety and health inspections annually.

information to employees began almost with its establishment as an agency.

In 1975, an OSHA advisory committee recommended that the agency classify and rank chemical hazards as well as make stipulations for labels, material safety data sheets (MSDSS), and training programs for all workers. OSHA proposed a regulation governing the labeling of hazardous chemicals in 1981, but it was soon withdrawn. In 1983, OSHA promulgated HCS on the premise that workers have both a need and a right to know the identities and hazards of chemicals they work with, as well as the associated protective measures. Initially, the standard applied to only employers in the manufacturing industries. However, in 1985 the U.S. Court of Appeals ruled that OSHA could not exclude workers in non-manufacturing industries. In addition, the court directed OSHA to modify the standard so that it applied to nonmanufacturing industries as well, unless OSHA could show that it was not feasible to do so. In September 1987, OSHA did so, requiring all covered employers in the nonmanufacturing industries to be in compliance with HCS by May 1988.

Requirements of the Hazard Communication Standard

HCS first requires the identification of chemical hazards by chemical producers. Under HCS, chemical manufacturers/importers must perform a hazard evaluation of each chemical substance they produce or import. For each chemical deemed hazardous to workers if used in the workplace, the firm must prepare an MSDS providing details on its properties and hazards and its safe use and handling. In addition, manufacturers and importers must label the chemical's container and provide an MSDS with the initial shipment of the chemical to employers.

For employers who use hazardous chemicals in the workplace, HCS also specifies responsibilities. They must (1) develop a written hazard communication program describing how they will meet the standard's requirements, (2) maintain a file of MSDSS for the chemicals they use in their business and make it accessible to workers, and (3) train workers about HCS and precautions in the safe handling and use of hazardous chemicals. OSHA compliance officers are required to monitor worksites for HCS compliance in every inspection they conduct.

Objectives, Scope, and Methodology

Our objectives, based on the congressional committees' request, were to determine (1) the extent of compliance with HCS, particularly among small employers and employers in nonmanufacturing industries; (2) the adequacy of OSHA's efforts to inform small employers about their

responsibilities under HCS; and (3) the adequacy of OSHA's strategy in overseeing the informational accuracy and clarity of material safety data sheets required by the standard.

To meet our review objectives, we conducted a national survey of construction, manufacturing, and personal services employers. We also obtained and analyzed OSHA inspection data for the fiscal years 1989 and 1990 and reviewed OSHA's inspection policies and procedures for ensuring the informational quality of MSDSS.

For the national survey, we randomly selected employers to be nationally representative of employers in each industry group and in each of three size categories.¹ We mailed 1,984 questionnaires to employers throughout the United States. After adjustments for employers not meeting our criteria, such as those no longer in operation, those self-employed with no employees, or those in incorrect industries, we tallied 1,120 responses for a 77-percent response rate (see app. I).

We compiled and analyzed the responses to determine the out-of-compliance rate for employers of different sizes. The responses also permitted insight into the effect of OSHA's outreach efforts and the quality and usefulness of MSDSS. Appendix I provides more detail on our sampling methodology and the techniques used in analyzing the data. Appendix II shows the entire questionnaire and appendix III, the questions we used to obtain data for the figures used throughout the report.²

In addition, we analyzed OSHA state safety and health inspection data for fiscal years 1989-90 for employers out of compliance. These data were obtained from OSHA's Integrated Management Information System (IMIS), which contains information from various OSHA and state documents, including individual worksite inspection reports. IMIS includes data on the name, industry, and location of each establishment; size of the workforce; characteristics of inspections, violations, and associated penalties; and workplace accidents.³ We selected fiscal years 1989 and 1990 to review as they are the first full years that all nonmanufacturing employers covered by OSHA had to comply with HCS. For these years, the

¹Small employers having fewer than 20 employees; medium-sized employers, between 20 and 499 employees, and large employers, 500 or more employees. We used the same definitions of employer worksite size in analyzing OSHA inspection data.

²Responses not summarized in this report will be discussed in a subsequent report to the requestors.

³Lacking complete data for seven states (Alaska, California, Hawaii, Minnesota, Oregon, Washington, and Wyoming), we excluded them from our analysis.

IMIS data base records over 200,000 inspections for federal OSHA and the state-operated health and safety programs included in our analysis. (For further information on the IMIS data base, see app. IV.)

Addressing the requestors' concerns about OSHA outreach efforts, we examined agency materials and interviewed OSHA officials and knowledgeable state and non-OSHA federal agency officials. To determine OSHA's efforts to inform small employers about HCS, we reviewed agency correspondence, outreach materials, and other documents concerning OSHA's outreach activities. Among those we interviewed were

- officials from OSHA's Philadelphia Regional Office and Office of Information and Consumer Affairs and Labor's Office of the Solicitor;
- the director of Pennsylvania's Consultation Program, which provides assistance, under OSHA auspices, to employers on a variety of health and safety issues, including HCS; and
- officials from state safety and health agencies (New Jersey, Maryland, Washington, and Oregon), federal agencies (the Environmental Protection Agency and the Immigration and Naturalization Service), and several trade associations to determine the types of HCS outreach programs conducted by other organizations.

To assess how OSHA determines the informational quality of MSDSS, we reviewed agency procedures regarding HCS enforcement and literature on "right-to-know" issues,⁴ and interviewed agency officials and outside experts. After reviewing OSHA's inspection policies and procedures to determine how it maintains oversight of the preparation and distribution of MSDSS, we analyzed these procedures to identify potential problems. We interviewed OSHA officials in regulatory compliance, regulatory analysis, and standard-setting activities, as well as several officials who helped develop and promulgate the standard. In addition, we consulted with an industrial hygienist and a research chemist having experience dealing with HCS issues. We conducted our review from March 1990 to July 1991 in accordance with generally accepted government auditing standards.

⁴The Hazard Communication Standard is sometimes referred in the media as OSHA's right-to-know regulation. Except in our survey questionnaire and where otherwise noted, we refer to the regulation as the Hazard Communication Standard or HCS.

Substantial Number of Employers Found To Be Out of Compliance With Hazard Communication Standard

A substantial number of employers, especially small employers, is out of compliance with the Hazard Communication Standard, both our analysis of OSHA inspection data for fiscal years 1989 and 1990 and our 1991 national survey show. About one-fourth of all inspected worksites were out of compliance, according to OSHA, with small worksites having the highest out-of-compliance rate within each major industry group. Our survey of employers in three industry groups found over 58 percent of the small employers out of compliance with key HCS requirements.

One-Fourth of Inspected Worksites Out of Compliance, OSHA Finds

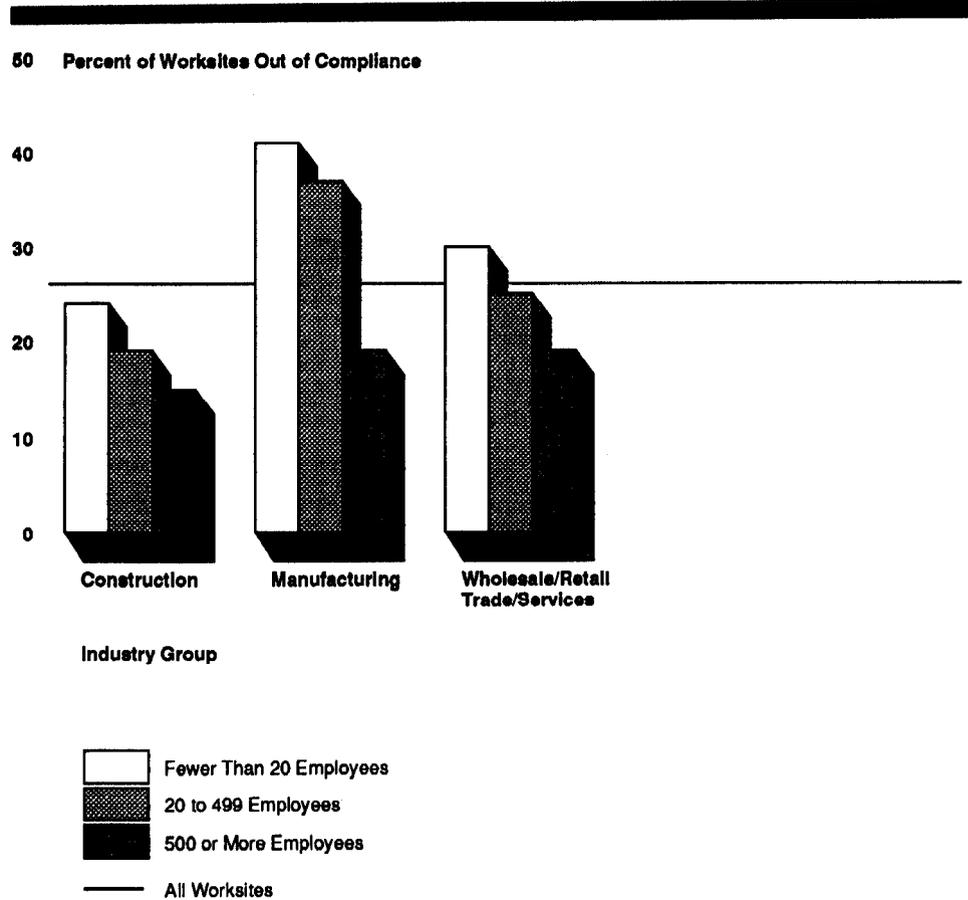
Of the worksites inspected in fiscal years 1989 and 1990, 26 percent were out of compliance with HCS, according to OSHA safety and health inspection data.¹ Across industries, the manufacturing sector had the highest out-of-compliance rate at 36 percent, while rates for construction (23 percent) and retail trade/wholesale trade/services (27 percent) were lower.²

Within the three major industry groups, small worksites had the highest out-of-compliance rate, large worksites the lowest. Small manufacturing worksites had the highest out-of-compliance rate (41 percent) compared with 19 percent for large manufacturing worksites and a low of 15 percent for large construction worksites (see fig. 2.1).

¹We define the out-of-compliance rate as the number of inspections where OSHA or state-operated health and safety programs detected at least one violation of any provision of HCS, as a percentage of all federal OSHA and state inspections.

²These three industry groups comprise 87 percent of all inspections conducted during FY 1989-90. Because personal services worksites alone accounted for less than 3 percent of all inspections, we used the broader category of wholesale/retail trade/services, which accounted for 14 percent of all inspections. The remaining "other" category includes inspections of government sites and those in industries such as transportation and communications.

Figure 2.1: Worksites Out of Compliance With HCS, by Industry Group and Worksite Size, OSHA Inspection Data (FY 1989-90)



Higher Out-Of-Compliance Rates Detected by GAO Survey

Consistent with OSHA inspection data, our survey of employers in three industries—construction, manufacturing, and personal services³—found substantial numbers of employers out of compliance with HCS, especially among small employers. However, our data—based on a scientifically selected random sample of employers—showed greater numbers out of compliance than OSHA detected. This difference may be explained in part by the differences in the two groups of data.

³Although OSHA definitions for construction and manufacturing employers and ours are identical, our definition of personal services—which comprises employers from Standard Industrial Classification (SIC) codes 73 and 75-76—is narrower than the OSHA category of wholesale/retail trade/services. See app. I and IV.

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We defined the out-of-compliance rate as the percentage of employers who said they had received an MSDS,⁴ yet described being out of compliance with one or more of the three HCS requirements about which we asked.⁵ These were requirements to

- maintain a hard copy or computerized file of MSDSS on most or all products that contain hazardous substances the (the MSDS requirement);
- provide training on the safe handling and use of hazardous chemicals (the HCS training requirement), and
- maintain container labels that clearly indicate the identity of the substance and warn of its hazards for most or all of the products for which the employer has an MSDS (the labeling requirement).

Of small employers who reported receiving MSDSS, almost 58 percent failed to comply with at least one requirement, compared with about 20 percent of large employers and about 52 percent of all employers with MSDSS (see fig. 2.2). As in the OSHA inspection data, small employers had the largest out-of-compliance rate within each industry group (see fig. 2.3).

Our analysis of employer survey data shows greater out-of-compliance rates than OSHA detected. This difference may be explained in part by the differences in the two groups of data. Our survey is a scientifically selected random sample of employers in three industry groups. OSHA, in contrast, does not randomly select employers for inspections. Instead, it directs inspections primarily towards worksites (not employers) where there has been (1) the hospitalization of five or more employees or accidents causing a fatality, or (2) employee complaints, and towards worksites that are in "high hazard" industries. OSHA also tends not to inspect worksites with fewer than 10 employees unless there is an accident or complaint.⁶ (See apps. I and IV for additional information.)

⁴About half of all employers reported that they had received no MSDSS. As many of these employers reported the presence of one or more likely workplace chemical hazard groups, their inclusion would increase the rate of noncompliance. See apps. I and III.

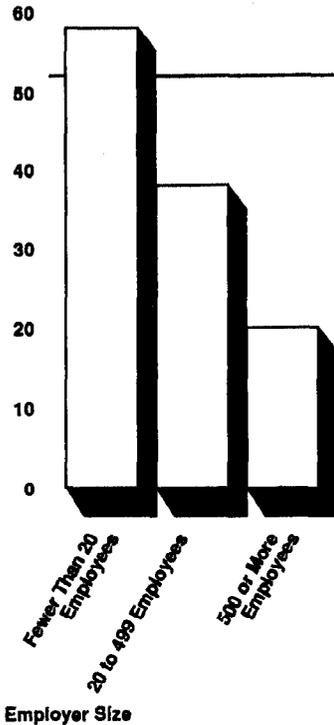
⁵We did not collect information as to whether employers maintained a written hazard communication program, a fourth HCS requirement. See apps. I-III.

⁶An annual appropriations provision prevents OSHA from doing programmed safety inspections on employers with 10 or fewer employees if the employer is in an industry that has a lost-workday incident rate below the national average. OSHA has expanded this restriction to any nonconstruction employer with 10 or fewer workers.

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Hazard Communication Standard

Figure 2.2: Employers Out of Compliance With HCS, by Employer Size, GAO Survey Data (1991)

Percent of Employers Out of Compliance

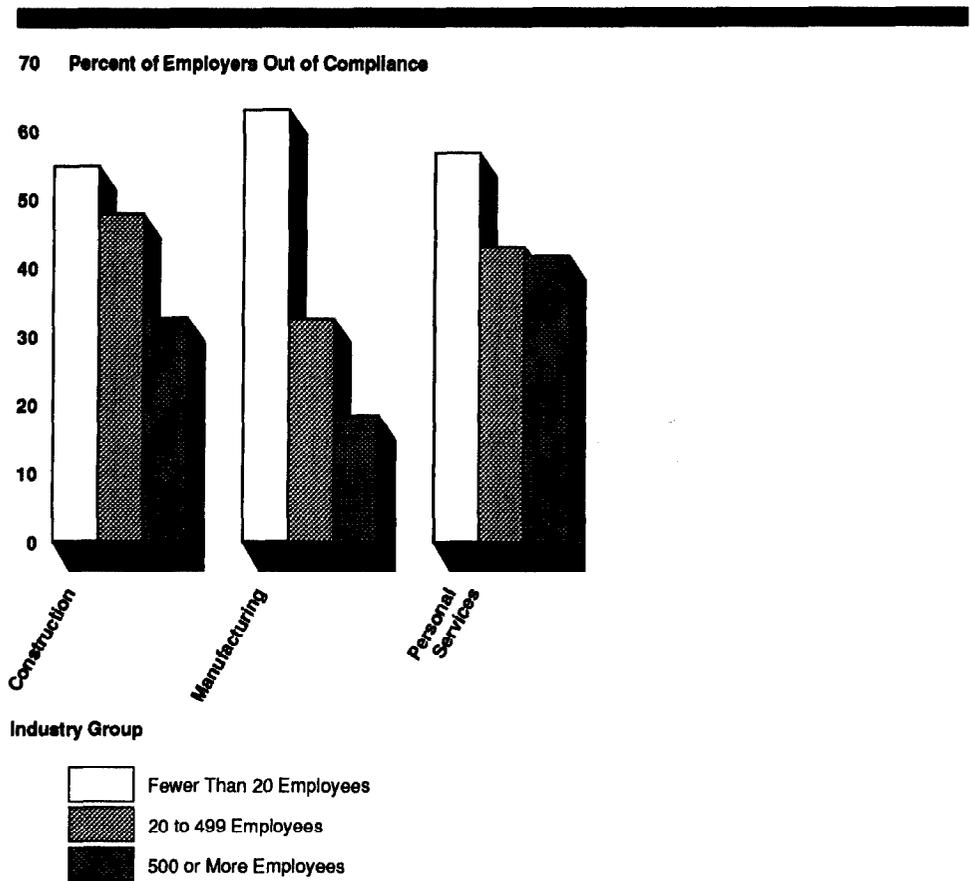


Employer Size

— All Employers

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Figure 2.3: Employers Out of Compliance With HCS, by Industry Group and Employer Size, GAO Employer Survey (1991)



OSHA Outreach Efforts Need to Be Expanded

Millions of the nation's employers, including a substantial number of small employers, have chemicals in the workplace. Yet many employers are uninformed about and out of compliance with the Hazard Communication Standard. Although OSHA conducts many outreach activities that include information about HCS, small employers may be unaware of HCS because they have little contact with OSHA. Conceding the problem, OSHA officials agree that better ways to inform employers about HCS are needed.

OSHA Outreach Strategy Involves Trade Organizations

OSHA understood that the initial implementation of HCS's requirements could appear overwhelming to many employers and that many, especially small employers, needed help in complying. Rather than contacting employers directly, OSHA adopted a general outreach strategy that makes use of existing trade associations and professional societies to distribute information on HCS to the broad business community. By providing press releases, speeches, and presentations to interested organizations, OSHA expects that information about HCS will filter down to the individual employers.

Within this broad strategy, some OSHA outreach activities do focus on HCS specifically but most incorporate information about HCS into various forms of communication about other health and safety issues, as follows:

- Federal Register/press releases—OSHA publishes official notice of its proposed and final regulations, including those involving HCS, in the Federal Register, with final regulations subsequently printed in the Code of Federal Regulations. In conjunction with this notice, OSHA distributes a press release to approximately 6,000 newspapers, trade journals, labor groups, and other interested parties.
- Printed material—OSHA has prepared several booklets to inform businesses of their obligations under HCS. Beginning in 1983, the agency issued a summary of HCS's requirements (OSHA Publication #3084), which is revised periodically as necessary. In 1988, OSHA issued a booklet (OSHA Publication #3111) containing nonmandatory HCS guidelines to help employers, especially small businesses, comply with HCS.
- Compliance kit—OSHA's compliance kit is a step-by-step reference guide for sale to employers and others who request information on complying with HCS. The kit contains sample hazard communication programs, training records, formats for MSDSS, and instructions for making an inventory of hazardous chemicals.
- Grants—OSHA provides annual targeted training grants to help selected organizations develop programs to educate employers and employees

about OSHA standards, including HCS, and workplace hazards and their abatement.

- Consultation programs—The consultation programs provide free on-site services primarily to small businesses in high-hazard industries who request assistance on health and safety issues, including HCS. The programs help firms identify and correct specific hazards, and provide guidance in establishing or improving an employer safety and health program. OSHA spends approximately \$24 million annually for the consultation programs.
- HCS personnel—In 1985, OSHA established a regional HCS coordinator for each federal region, to help employers comply with HCS. Coordinators provide training and presentations to the public on HCS.

Many Employers Remain Uninformed About HCS Despite OSHA Outreach Efforts

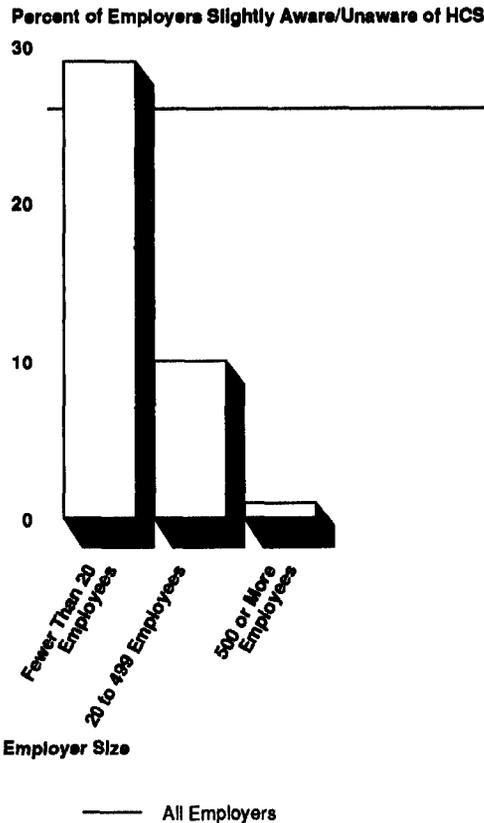
However, OSHA's outreach efforts may fail to reach many employers, especially small employers. Representatives from the residential construction, pharmaceutical distribution, and other industry associations have criticized OSHA on this point, and our survey data provide confirmation. Because up to 50 percent of all small employers do not belong to trade associations and professional societies, they are missed by OSHA outreach activities, group representatives point out. Without at least some prior awareness of HCS and OSHA, small employers do not request assistance or take advantage of other OSHA information sources, such as the consultation programs described above.

Our survey data show that many employers, especially small employers, do not know about HCS. Even many small employers who reported awareness of it are uninformed about key provisions and requirements. Most employers who are aware of HCS get their information from non-OSHA sources, such as chemical manufacturers and trade associations. However, employers having contact with OSHA or using OSHA-based materials indicated greater knowledge about HCS and more compliance with it. Small employers reported that better distribution by OSHA of printed material informing them about HCS would be most helpful in increasing employer awareness of HCS.

About one-fourth of all employers told us they had little or no awareness about HCS. Small employers were less aware of HCS than large

employers—about 29 percent versus fewer than 2 percent reporting a lack of awareness (see fig. 3.1).¹

Figure 3.1: Level of Employer Awareness Concerning HCS, by Employer Size, GAO Employer Survey (1991)



Small employers have less contact with OSHA than other employers. About 45 percent of all small employers reported no contact with OSHA, compared with less than 7 percent of large employers. Of small employers who were unaware of HCS, about 75 percent reported no contact with OSHA.

Among small employers who reported at least some awareness of HCS, many appeared uninformed about key features of the standard. For

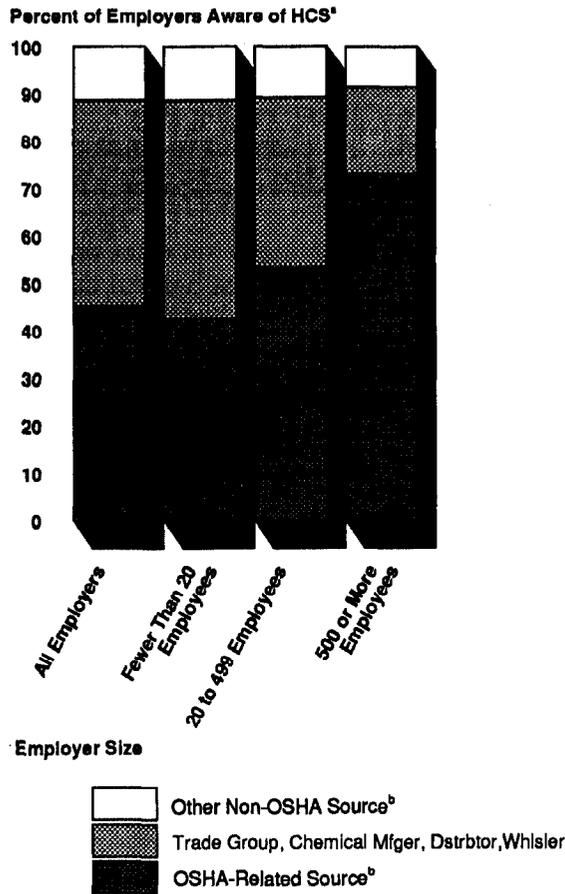
¹Personal services employers generally were less likely to be aware of HCS than employers in manufacturing and construction. About 23 percent of all construction and 20 percent of all manufacturing employers reported little or no awareness about HCS, while 33 percent of personal service employers were unaware of the standard.

example, 61 percent of all small employers in construction and 53 percent of those in personal services did not know that HCS requires employers in these industries to maintain a written plan describing how they will comply with HCS. Furthermore, over 39 percent of all small employers did not know that employers with 10 or fewer employees had to comply with HCS.²

Small employers typically get information from sources other than OSHA. While over 72 percent of large employers reported using OSHA or OSHA material as the primary source to learn about their rights and responsibilities under HCS, only about 42 percent of small employers did so. In contrast, 46 percent of small employers used chemical manufacturers, wholesalers, suppliers, distributors, and trade associations as their primary HCS source, compared with about 19 percent of large employers (see fig. 3.2).

²Most small employers had four or fewer employees. These employers may know little about OSHA, not just HCS.

Figure 3.2: Sources of Information on HCS, by Employer Size, GAO Employer Survey (1991)



^aPercent of all employers who said that they were at least "somewhat aware" of HCS.

^bOSHA sources include OSHA's HCS regulation and OSHA pamphlets, inspections, and consultation programs. Other non-OSHA sources include public agencies other than OSHA, the Small Business Administration, and other unnamed sources.

Of the small employers who were aware of HCS, those using non-OSHA-based materials indicated less knowledge about HCS. Among small employers who did not know key HCS provisions, 61 percent used chemical manufacturers, wholesalers, distributors, and trade associations as their primary source to learn about their rights and responsibilities under HCS. Small employers who have tried to obtain information on HCS reported more difficulties obtaining information than large employers. About 26 percent of small employers reported some difficulty getting information compared with 12 percent of large employers.

Better Outreach Needed to Inform Small Employers About HCS

Both the significant lack of employer awareness about HCS, especially among small employers, and employers' inability to get information could be remedied by improving OSHA's outreach efforts. Most employers report that better distribution of OSHA printed materials would be very helpful in improving awareness about HCS. Using the MSDS itself as a vehicle to reach out to employers could facilitate better distribution of OSHA material.

Receiving printed material was the option most employers aware of HCS said would be most helpful in getting information about the standard. Improved distribution of printed HCS information from OSHA would be extremely or very helpful in informing employers about HCS, according to about 57 percent of all employers and 56 percent of small employers—a much higher approval rate than for any other information source. Among those employers who did not know key HCS provisions, over half would find improved distribution of printed OSHA material “extremely helpful or very helpful.”

While most employers would prefer receiving HCS information directly from OSHA, before OSHA can do this it needs to locate them. This is difficult because of the turnover in small employer operations.⁵ State-operated occupational health and safety programs in Washington and Oregon try to overcome the problem by distributing HCS material through state licensing agencies. But in states in which OSHA inspects, this option might be difficult for it to carry out as it has no authority over the state agencies. However, OSHA could still make HCS information available to them.

⁵Over 25 percent of the small employers we sent a questionnaire were no longer in business.

Another way to inform employers about HCS is through use of the MSDS itself.³ Although HCS requires the chemical manufacturer or distributor to send an MSDS to all employers using a particular chemical, the MSDS now contains no information about HCS or the employer's responsibility under the standard. Employers unacquainted with HCS may not know what to do with the MSDSs. Putting a brief notice specifying employers' HCS responsibilities on the data sheets themselves may improve employer awareness of HCS.⁴

Additionally, OSHA could enhance its outreach effectiveness by setting up toll-free hot lines, which would provide information to employers, and requiring MSDS developers to place the hot-line number on the data sheets. Forty-two percent of all employers and small employers said that a 24-hour information hot line, staffed by OSHA personnel would be very helpful.⁶ Federal agencies such as the Immigration and Naturalization Service, the Internal Revenue Service, and the Environmental Protection Agency maintain toll-free hot lines to provide information to employers.⁷

OSHA officials agreed on the difficulty of reaching employers that do not belong to an association and the need to identify sources of information for small employers and redirect outreach efforts accordingly.

³Obviously, using the MSDS to inform employers about HCS would not help the estimated 50 percent of all employers who do not receive MSDSs. However, the number of employers who report receiving no MSDSs may be overstated; many of them are unaware of the standard and may be receiving MSDSs without knowing what they are.

⁴For example, the MSDS could include the following notice:

"This MSDS is being provided to assist you in complying with OSHA's Hazard Communication Standard. As an employer you are responsible for

- identifying and listing hazardous chemicals in your workplace,
- obtaining MSDSs and labels for each hazardous chemical,
- developing and implementing a written hazard communication program, and
- communicating hazard information to your employees. For additional information, see OSHA publication no. 3084."

⁶OSHA is considering the establishing a toll-free HCS hot line in FY 1992, OSHA officials told us.

⁷The Environmental Protection Agency's toll-free environmental hazards hot line costs approximately \$8,000 annually plus salary and benefits for two full-time staff members.

Material Safety Data Sheets Need to Be More Informative and Accurate

The Hazard Communication Standard itself provides only general guidance about the format and content of material safety data sheets, allowing manufacturers and importers considerable latitude in their preparation, our assessment of OSHA's efforts to determine MSDS quality shows. As a result, many MSDSS are too technical for workers and managers, affecting their usefulness in informing employers and employees about workplace hazards.

Furthermore, many MSDSS contain inaccurate or incomplete information, our survey and other recent studies suggest. OSHA's system for verifying the accuracy and completeness of MSDSS fails to focus on their point of origin, which is the manufacturer's or importer's hazard evaluation process; rarely does OSHA review such hazard evaluations. Hence, we believe that OSHA's ability to detect inaccurate MSDSS is limited.

HCS Guidance for MSDS Preparation

HCS requires chemical manufacturers and importers to identify certain characteristics of a chemical, including its hazards, as well as recommended handling precautions and emergency treatment. Within these guidelines, MSDSS can vary by the format, sequence, language used, and amount of information presented. (See app. VI for more details regarding HCS requirements for MSDSS and examples of the variation in language and format on MSDSS.) Although OSHA has developed a nonmandatory MSDS format, OSHA officials say it is widely ignored by chemical manufacturers and importers who develop and distribute MSDSS.¹

MSDSs Criticized as Hard to Understand

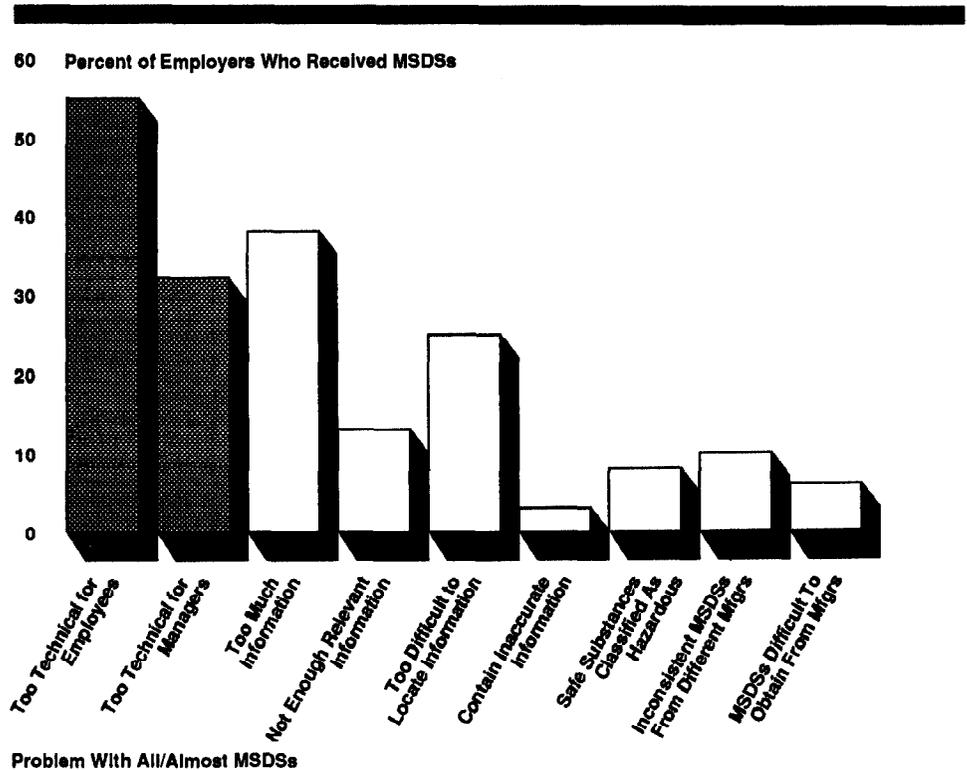
Material safety data sheets are hard for both employees and employers to understand, they contain too much information, and the important information is difficult to pinpoint. These were the most common complaints made about MSDSS by employers responding to our survey. Several recent studies, including one done on contract for OSHA, confirm our findings that MSDSS present problems related to readability, format, jargon, and consistency.

Fifty-five percent of employers receiving MSDSS reported that they believed most MSDSS were too technical for employees to use, and about 32 percent said most were too technical for management to use as well (see fig. 4.1). In general, medium-size and large employers—employers who normally receive a larger number of MSDSS—were more likely to

¹One OSHA official said that chemical producers have not used the OSHA MSDS form because they cannot fit on it all the information they believe necessary to comply with HCS.

report that MSDSS were too technical for employees and management. Of the large employers, over 60 percent said that most MSDSS were too technical for employees (see app. III).

Figure 4.1: Employer Views of Material Safety Data Sheets, GAO Employer Survey (1991)



Note: Responses are for all or almost all MSDSS received by employers.

Employers were critical of MSDSS in other ways as well. For example, 68 percent told us that at least some MSDSS contained too much information while 60 percent said that pertinent information was difficult to locate on the sheets.

In written comments, responding employers expressed these concerns:

“ . . . Make MSDSS understandable to the average person. Most of them are written in such a technical manner that you have to be a chemist or physicist to understand them . . . ” (small manufacturing employer).

“ . . . The average person cannot read and understand MSDSSs . . . for it (the MSDS) to be of real use to these people, it has got to be less complicated and written in high school terms . . . ” (medium-sized manufacturing employer).

“ . . . One way to improve understanding of chemical hazards is to make the MSDS format and terminology more uniform and understandable. In conjunction, explanations should be provided for the technical terms used in the MSDS.” (a large construction employer).

Several recent studies suggest these same conclusions:

- The Printing Industries of America² found that a sample of master printers, averaging an educational level of 3 years of college, could comprehend accurately only about 66 percent of the information presented on the MSDSS. Among other recommendations, the industry group suggested that the MSDS format and the signs and symbols for vital information used in MSDSS be standardized and that the reading level of MSDSS be no higher than 12th grade.
- Another study³ found MSDSS too lengthy and laden with technical terms unfamiliar to most workers and said that many MSDSS fail to include information on chronic health effects. Also, MSDSS produced by different manufacturers on the same chemical have different information, leaving workers to determine which is accurate.
- Kearney-Centaur,⁴ testing four different MSDS formats for OSHA, found many workers unable to understand important information on each MSDS format tested. It concluded that MSDSS’ readability, format, and structure, in combination with workers’ general literacy and grade reading levels, are important factors in workers’ understanding of MSDSS.

Informational material can be made more readable. In a 1989 report addressing similar problems, we listed a number of ways to improve the language and design of forms, including the use of “plain English” and avoiding the passive voice and jargon.⁵

²Comments of the Printing Industry of America on OSHA’s Hazard Communication Standard, Docket H-022G, Aug. 13, 1990.

³Hadden, S.G., “Providing Citizens With Information About Health Effects of Hazardous Chemicals,” Journal of Occupational Medicine, Vol. 31, No. 6, June 1989, pp. 528-534.

⁴Kearney-Centaur, The Comprehensibility of Material Safety Data Sheets, prepared for OSHA under contract no. J-9-F-8-0019, Mar. 1991.

⁵Private Pensions: Spousal Consent Forms Hard to Read and Lack Important Information (GAO/HRD-90-20, Dec. 27, 1989).

In May 1990, OSHA solicited through the Federal Register comments on methods to improve information transmitted on MSDSS and labels. About 65 percent of the respondents, a substantial portion of them small employers and individual workers, favored standardizing the MSDS format, a program official said preliminary analysis showed. Working from this input and other data, OSHA recently announced that it will reevaluate the entire HCS process and ask for public comment beginning in January 1992.

Accuracy and Completeness of MSDSs Also an Issue

Hazard information that is inaccurate or incomplete is useless—and possibly dangerous to both employers and employees. However, OSHA's system for verifying the accuracy and completeness of MSDSS is vulnerable, in part because it fails to focus on the point of origin—the hazard evaluation process used by chemical manufacturers and importers. Our survey and other studies suggest problems with the accuracy of many MSDSS.

For each hazardous chemical they produce or import, HCS requires chemical manufacturers and importers to obtain or develop MSDSS that reflect accurately the information and scientific evidence used in making a hazard determination for that chemical. If it becomes aware of any new information regarding the hazards of a chemical substance, the manufacturer or importer must revise any MSDS it developed. To enforce compliance with HCS, OSHA relies on its inspections of both producers of hazardous chemicals and employers to provide oversight of the hazard evaluations and MSDS accuracy and completeness. (App. V describes OSHA's MSDS inspection procedures.)

OSHA's Inspection Procedures Fail to Track Originators of Erroneous MSDSS

Although MSDS accuracy may be at issue, OSHA lacks an effective process for detecting inaccuracies. Rather than overseeing the accuracy of hazard information at the point where the MSDS originates—the MSDS hazard evaluation process used by chemical manufacturers and importers—OSHA generally inspects MSDSS after the manufacturer or importer has distributed them to employers. When OSHA inspects a chemical manufacturer, the inspection includes only a limited review of the MSDSS. In most cases, a compliance officer examines a sample of MSDSS at the worksite for obvious inaccuracies.

And if OSHA does detect an wrong or incomplete MSDS at a worksite, it rarely cites the manufacturer or importer that developed it for a violation. Rather, typically it contacts the manufacturer by letter, asking it to

modify the MSDS. If the letter results in a corrected MSDS—and it often does—there is no citation. Nor does OSHA maintain or record these letters in a central depository. Therefore, the agency cannot identify the manufacturers or importers who consistently prepare and distribute erroneous MSDSS. Only if the manufacturer or importer fails to correct the MSDS does OSHA inspect it. Even then, OSHA limits its inspection to the hazard evaluation associated with the specific data sheet, rather than inspecting the entire hazard evaluation process. This process is unlikely to detect systemic problems in the way manufacturers and importers conduct hazard evaluations. OSHA issues very few citations for improper evaluation processes or inaccurate MSDSS.⁶

Our survey indicates there may be problems with the accuracy of many MSDSS. Of the employers who received MSDSS, about 10 percent believed that at least some contained inaccurate information. Also, about 18 percent of the employers believed the information on at least some MSDSS was inconsistent from manufacturer to manufacturer.

Two studies done for OSHA raise questions about the informational adequacy of MSDSS:

- A 1988 study of 196 MSDSS concluded “material safety data sheets received were, in general incomplete or inadequate, especially concerning information on chronic toxicity.”⁷ Many of the sheets were in violation of one or more of the requirements of the Hazard Communication Standard. For example, of 16 companies that submitted MSDSS for products containing a chemical known to have caused cancer in animals—a fact that must be disclosed on the MSDS—only 6 reported this information on their MSDSS.
- A Kearney-Centaur study for OSHA raised similar questions about MSDS accuracy and reliability.⁸ While MSDSS provide a good starting point for workers and health professionals to obtain information on hazards for specific substances, only 11 percent of 134 MSDSS reviewed were adequate in all informational areas, the study found. In particular, the health effects information on the MSDSS was vague and information about first aid and personal protective equipment was not useful to the chemical user. Further, of the 134 MSDSS reviewed only 49 had correct

⁶OSHA officials said that the reason for few citations involving hazard evaluations or MSDS accuracy is that chemical manufacturers are not inspected under the current inspection target system.

⁷Harvard School of Public Health, Report On How Well Material Safety Data Sheets Are Prepared, by Myra Karstadt, final report prepared for OSHA, Sept. 30, 1988.

⁸Kearney/Centaur, The Accuracy of Material Safety Data Sheets, prepared for OSHA, Jan, 1991.

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health effect information and only 63 adequate information on personal protective equipment.

Conclusions and Recommendations

Eight years after initial promulgation of the Hazard Communication Standard and 4 years after its extension to nonmanufacturing industries, hundreds of thousands of employers, especially small employers, remain both unaware of and out of compliance with it.

Despite OSHA's outreach efforts, the agency's failure to inform small employers about their responsibilities under HCS is at least partially the cause of their noncompliance and unfamiliarity with HCS. To remedy this, OSHA could develop alternative outreach programs, such as conveying information about HCS on the material safety data sheet and providing information through a toll-free hot-line number available to employers.

The potential for HCS to reduce occupational injury and illness by informing employees of workplace chemical hazards is diminished if workers cannot comprehend the information they are given. Under existing provisions of HCS, developers of MSDSS have considerable latitude regarding the language and format they use to make data sheets helpful to workers. Lacking a standard format, terminology, and sequencing of information, MSDSS are difficult for many workers and employers to understand and interpret. Several studies echo the most common complaint reported by employers of all sizes about MSDSS—they are too technical, both for workers and management.

Information on chemical hazards that is inaccurate or inconsistent is useless—and possibly dangerous. Studies and our evaluation have shown that the MSDSS are potentially vulnerable to inaccuracies, incompleteness, and inconsistencies. Most reviews of MSDSS now occur after shipment of the chemical, at worksites where the chemical is in use. This strategy is unlikely to detect systemic problems in the way manufacturers and importers perform hazard evaluations and prepare data sheets. OSHA's inspection strategy should be directed to effectively reviewing the hazard evaluation and MSDS preparation processes of chemical manufacturers and importers.

Recommendations

We recommend that the Secretary of Labor direct the Occupational Safety and Health Administration to revise the Hazard Communication Standard to

- specify that developers of material safety data sheets include on each sheet a brief description of employer responsibilities under the standard and

- address the inability of employers and employees to understand the MSDSS by clearly specifying the language and presentation of information to be used on them.

Should OSHA implement its plans to establish a toll-free hot line for HCS, we recommend that it require that this number be included on the MSDSS.

To improve the accuracy of MSDSS, we also recommend that OSHA develop a more effective strategy for inspecting the hazard evaluation processes of manufacturers and importers. Approaches OSHA should consider include:

- Identify and target hazard evaluation inspections to manufacturers and importers that consistently prepare and distribute erroneous MSDSS. OSHA could identify such parties by collecting in a central location and analyzing for trends the notification letters OSHA inspectors currently transmit to manufacturers and importers asking that they revise an inaccurate MSDS.
- Establish a special inspection program to review hazard evaluations being conducted by manufacturers and importers.

GAO's Employer Survey on OSHA's Hazard Communication Standard: Methodology, Sampling, and Analysis

We gathered data on employers' experience with OSHA's Hazard Communication Standard through a mail survey conducted from October 1990 through July 1991. The survey was designed to collect information on the extent of employer awareness and knowledge of and compliance with HCS; employers' perceived costs, benefits, and difficulties in complying with HCS; and sources of employers' information on HCS. In this report, we present information on employer awareness and knowledge of and compliance with HCS, and suggestions to improve OSHA's informational outreach on HCS.

Questionnaire Design

Our survey questionnaire was designed to ensure that the data collected were consistent (see app. II for a copy of the questionnaire). We pretested the questionnaire in person with representatives of seven employers in the Washington, D.C., area, including a small and a medium-sized construction employer; a small manufacturing employer; and one small, two medium-sized, and one large personal services businesses. We gave OSHA officials copies of the draft questionnaire for review. Guided by the results of the pretest and OSHA officials' comments, we revised the questionnaire to ensure that all questions were fair, relevant, and easy to understand and answer. In addition, we tested the questionnaire to ensure that the task of completing it would not place too great a burden on the respondent.

Initial and Adjusted Universe and Sample Sizes

We mailed questionnaires to a random sample of employers, stratified by industry and employer size and selected from a July 1990 United States Employment and Enterprise Microdata (USEEM) file database obtained from the U.S. Small Business Administration (SBA).¹

The USEEM file includes information on different types of business organizations. We included in our population only employers representing (1) employer headquarters with a single establishment, (2) employer headquarters with multiple establishments and (3) subsidiary headquarters. For employers who maintained operations in several industries or sectors, our questionnaire included instructions to help ensure that answers were provided for what they considered their most typical or common operation.

¹SBA modified an employer data base obtained from the Dun and Bradstreet corporation. We chose USEEM because SBA's modifications improved the file's reliability and SBA frequently updates the information to improve its accuracy. The USEEM file also includes employer phone numbers and addresses, as well as names of employer representatives, to facilitate additional contact if necessary. Finally, we were able to obtain and access the file with minimal difficulty.

We chose our sample from three different industry groups (see table I.1.):

- The manufacturing sector, because it was the first major industrial group covered by HCS, beginning in 1985;
- The construction sector, because it was not covered by HCS until 1987, and although it is an industry with considerable experience with OSHA, a number of construction industry representatives have reported difficulties in complying with HCS;² and
- The personal services sector, a combination of various service industry operations, including personal services, automotive, and other repair service operations where employees are very likely to come into contact with hazardous chemicals. An industry sector not covered by HCS until 1987, it appears to have less experience with OSHA than some others.³ Representatives of various segments of the personal services sector also have reported problems complying with HCS.

²In FY 1989-90, almost half of all inspections reported in our OSHA inspection data involved construction worksites. See app. IV.

³In FY 1989-90, only about 3 percent of all inspections reported in our OSHA inspection data base involved worksites in SIC codes 72, 75, and 76. See app. IV.

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GAO's Employer Survey on OSHA's
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Table I.1: Standard Industrial Classification Codes for Selected Industry Groups, GAO Employer Survey (July 1991)

Industry group	SIC code	Description
Manufacturing	2000-3900	All durable and nondurable manufacturing industries
Construction	1500-1700	All construction industries
Personal services	7211	Power laundries, family and commercial
	7212	Garment pressing and agents for laundries and dry cleaners
	7213	Linen supply
	7216	Dry-cleaning plants, except rug cleaning
	7217	Carpet and upholstery cleaning
	7218	Industrial launderers
	7219	Laundry and garment services
	7221	Photographic studios, portrait
	7231	Beauty shops
	7241	Barber shops
	7251	Shoe repair shops and shoeshine parlors
	7261	Funeral services and crematories
	7501-7599	Automotive repair services, garages ^a
7601-7699	Miscellaneous repair services	

^aThese industries include, among other activities, automotive rental and leasing and general automotive repair; top, body, and upholstery repair and paint shops; tire retreading and repair; and other automotive services.

To obtain information about the experiences of various size employers, we stratified our sample accordingly, defining employers with fewer than 20 employees as small, those with 20 to 499 employees as medium-sized, and those with 500 or more employees as large (see tables I.2 and I.3).⁵

Table I.2: Number of Employers Identified in Selected Industry and Employer Groups, by Size, GAO Employer Survey (July 1991)

Employer size	Industry group			Total
	Construction	Manufacturing	Personal services	
Small	742,255	346,103	693,250	1,781,608
Medium	51,374	99,329	14,390	165,093
Large	634	6,758	207	7,599
All	794,263	452,190	707,847	1,954,300

⁵We classified employers by size and industry according to the initial SBA/Dun and Bradstreet size and industry classification rather than the employers' survey response.

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Table I.3: Number of Employers Sampled by Industry Group and Employer Size Strata, GAO Employer Survey (July 1991)

Employer size	Number of employers, by industry group			Total
	Construction	Manufacturing	Personal services	
Small	300	300	285	885
Medium	215	215	203	633
Large	160	215	94	469
Total	675	730	582	1,987

Adjusted Sample Size and Response Rate

We mailed 1,987 questionnaires to employers throughout the United States. After adjustments for employers not meeting our criteria, such as no longer being in operation, being self-employed with no employees, or classified in the incorrect industry, our count was 1,120 responses for a 77-percent response rate (see table I.4). In addition, we assumed that any employer whose questionnaire was returned to us by the U.S. Postal Service as undeliverable and had no forwarding address and no current telephone listing was no longer in operation. Most employers classified as no longer in operation were in the small employer (fewer than 20 employees) stratum.

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Table I.4: Adjusted Sample and Response Rate, by Industry Group and Employer Size Strata, GAO Employer Survey (July 1991)

Industry group/ employer size	Sample size	Adjusted size	Number received	Percent received
Construction				
Small	300	137	97	70.8%
Medium	215	194	155	79.9
Large	160	148	120	81.1
Total	675	479	372	77.7
Manufacturing				
Small	300	159	113	71.1
Medium	215	207	160	77.3
Large	215	198	173	87.4
Total	730	564	446	79.1
Personal services				
Small	285	149	102	68.5
Medium	203	177	128	72.3
Large	94	81	72	88.9
Total	582	407	302	74.2
Total employers				
Small	885	445	312	70.1
Medium	633	578	443	76.6
Large	469	427	365	85.5
Total	1987	1450	1120	77.2

As HCS, like OSHA regulations generally, applies only to employers with employees, we excluded employers who reported themselves as self-employed with no employees. In addition, we excluded employers with operations exclusively outside of our designated industries as specified in the SIC codes in table I.1. Finally, we excluded employers that were financial holding companies and had no actual operations or employees in any of the industries we were surveying.

Measures to Reduce Number of Nonrespondents

To maximize our response rate, we conducted two mail and two telephone follow-ups. The lowest response rates were for the small employer strata, with small personal services employers having the lowest at 69 percent. Scientifically selecting our sample enabled us to use the results to represent employers in the universe. To reflect the employers in the entire universe, we weighted each of the employers in our sample (see table I.5).

To obtain the estimated number in the adjusted universe, we multiplied the adjusted sample of respondents by the corresponding assigned industry weight. Our estimates represent employers in the universe that probably would have responded had they been sent a questionnaire.

Table I.5: Determination of Adjusted Universe, GAO Employer Sample
 (July 1991)

Industry group/ employer size	Number of employers		Adjusted universe
	Adjusted respondents	Assigned weight	
Construction			
Small	97	2,474.18	239,996
Medium	155	238.95	37,037
Large	120	3.96	476
Manufacturing			
Small	113	1,153.68	130,365
Medium	160	462.00	73,919
Large	173	31.43	5,438
Personal services			
Small	102	2,432.46	248,111
Medium	128	70.89	9,074
Large	72	2.20	159

Sampling Errors

Because we surveyed a sample rather than the universe of employers, each reported estimate has an associated sampling error (shown in app. VII). The size of the sampling error reflects the precision of the estimate; the smaller the error, the more precise the estimate. Sampling errors for estimates from this survey were calculated at the 95-percent confidence level. This means that the chances are about 19 out of 20 that the actual number or percentage being estimated falls within the range defined by our estimate, plus or minus the sampling error. For example, if we have estimated that 30 percent of a group has a characteristic and the sampling error is 6 percentage points, there is a 95-percent chance that the actual percentage is between 24 and 36.

Generally, the sampling errors for employer characteristics did not exceed 7 percentage points at the 95-percent confidence level. However, for the number of employers in certain combined industry and size strata (for example, small construction employers) and certain other characteristics, the sampling errors were higher. Sampling errors are stated in percentage points for employer characteristics, because this is generally how the size estimates are presented in the report.

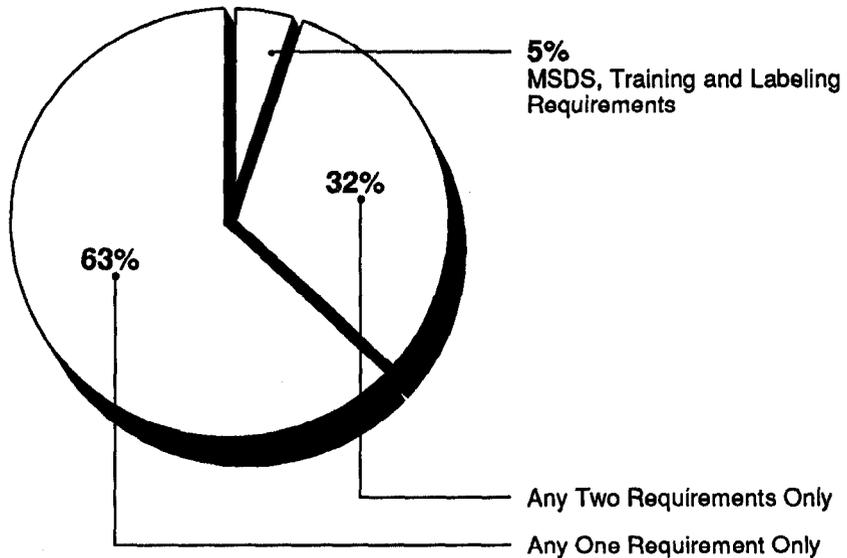
Analysis of GAO Survey Data on Employer Compliance and the Distribution of MSDSs

About one-third of the employers out of compliance with HCS failed to comply with more than one HCS requirement, and over half failed to comply with the training requirement alone. Our compliance statistics excluded employers who reported nonreceipt of MSDSs. However, 85 percent of these employers reported the presence of a chemical hazard in their workplace.

Most out-of-compliance employers failed to comply with only one of the three HCS requirements we asked about. Our survey showed that about 37 percent of the employers who were out of compliance failed to comply with two or more requirements of HCS (see fig. I.1).⁶ Of the three requirements we asked about, the highest out-of-compliance rate involved training (about 53 percent) compared with noncompliance regarding MSDS (46 percent) and labeling (41 percent). Small employers who were out of compliance were most likely to be out of compliance with the training requirement; manufacturing employers, with the MSDS requirement.

⁶We did not clearly measure noncompliance with HCS's requirement to maintain a written communication program. Although OSHA inspection data shows that lack of a written hazard communication program is the most common violation cited, OSHA officials have said that this violation is often cited when the employer is out of compliance with all of the other major HCS requirements (training, MSDS, labeling) as well.

Figure I.1: Employers Out of Compliance With HCS, by Requirement, GAO Employer Survey (1991)



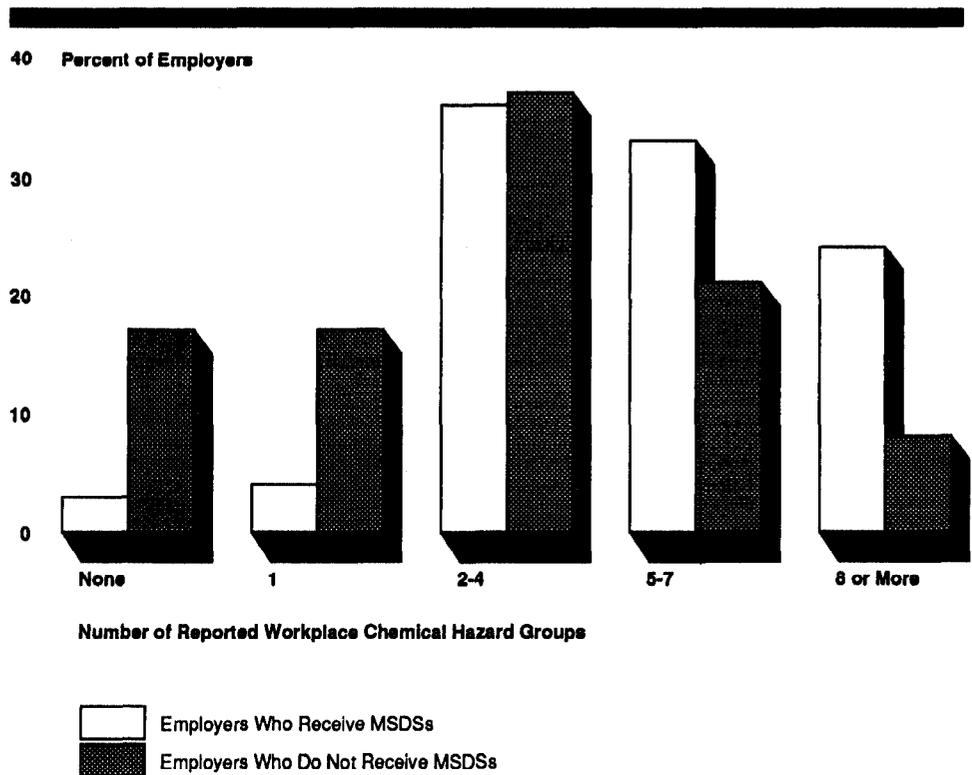
Note: The survey did not identify employers that were out of compliance with the written hazard communication program requirement of HCS.

Characteristics of Employers Who Reported No MSDSs

We exclude from our definition of employers out of compliance those who reported that they had received no MSDSs, about half of all employers. However, about 83 percent of these employers reported at least one likely workplace chemical hazard, and 29 percent reported five or more (see fig. I.2). Of those who reported at least one likely workplace hazard, over 90 percent were small employers, and about 70 percent were personal service employers. Including employers who did not have an MSDS but reported one or more likely hazards the out-of-compliance rate would increase.⁷

⁷Out of compliance in the GAO survey varied by industry and employer size combined but not substantially by industry group alone. This may be due to the wide variation across industry in the percentage of employers that did not receive an MSDS. Only 28 percent of all manufacturing employers but over 59 percent of all construction and personal services employers reported that they had never received an MSDS.

Figure I.2: Employers Reporting Workplace Chemical Hazards, GAO Employer Survey (1991)



Note: Employers could report the presence of up to 18 workplace chemical hazards.

Differences in the GAO Employer Survey and OSHA Inspection Data Out-Of-Compliance Rates

Our survey is a scientifically selected sample of employers from three industries. We based the out-of-compliance rate upon self-reported employer responses for three of the four main requirements of HCS, while OSHA's inspection data are not from a random sample of employers. Rather, OSHA inspections are generally directed toward worksites with fatalities, catastrophes causing the hospitalization of 5 or more workers, and complaints; worksites in "high hazard" industries; and worksites with more than 10 employees.⁸ Additionally, OSHA inspection data are based on worksites rather than individual employers as in our survey. Thus, some inspections of small worksites may actually

⁸As indicated in chapter 2, an annual appropriations provision prevents OSHA from doing programmed safety inspections on employers with 10 or fewer employees in an industry having a lost-workday incident rate below the national average. OSHA has expanded this restriction to any nonconstruction employer with 10 or fewer workers.

Appendix I
GAO's Employer Survey on OSHA's
Hazard Communication Standard:
Methodology, Sampling, and Analysis

involve large employers.⁹ OSHA bases its out-of-compliance rate on the number of inspected worksites with a detected violation of any section of HCS as a percentage of all federal OSHA and state health and safety program worksite inspections.

OSHA conducts almost 75 percent of all its inspections in the construction and manufacturing industries alone. Although OSHA inspection data show that over 60 percent of all of its inspections are conducted at worksites with fewer than 20 employees, over 70 percent of these are at construction industry worksites. Many such inspections are conducted at larger, often commercial construction projects where many small construction subcontractors may be in operation under the direction of a larger employer, OSHA officials say. To the extent that such inspections are typical, OSHA is focusing on only a portion of the small construction industry for the bulk of its inspections and excluding other industry sectors, for example, home construction and remodeling. In addition, small contractors employed at such large projects are more likely aware of HCS because of their contact with larger employers.

⁹For example, OSHA may inspect a small pumping station worksite with only 15 employees that is owned by a large multinational oil corporation with thousands of employees. Such a worksite would be in the small category in the OSHA inspection data, while the employer would be in the large category in our employer survey.

GAO Employer Survey on OSHA's Hazard Communication or Right-To-Know Standard

Survey of OSHA's Regulation on Right-to-Know

The U.S. Congress has asked the General Accounting Office (GAO) to conduct a study of the Occupational Safety and Health Administration's (OSHA's) Hazard Communication regulation, commonly known as the Right-to-Know. This regulation was established to help assure that information on hazardous substances used in the American workplace was available to employers and employees. The purpose of this study is to provide Congress with information about how businesses are affected by the regulation.

This questionnaire should take about 15 minutes to complete. We will keep your responses strictly confidential. No person or individual business will be identified. No one outside of GAO will have access to the responses of an individual business. We will report your answers only in summary with those of other businesses that respond to this questionnaire.

This questionnaire should be completed by the person(s) most familiar with your business's practices and procedures as they relate to hazardous substances. Please identify one primary person we may call if additional information or clarification is needed.

Name of primary person to call:

Official title (position):

Telephone number: () _____

If you have any questions, please call collect either Dave Toner at (215) 574-4072 or Michelle Walker at (215) 574-4000. Please return this questionnaire within 2 weeks of receipt in the enclosed business reply envelope. If the envelope is misplaced, please send your completed questionnaire to

Dave Toner
United States General Accounting Office
841 Chestnut Street, Suite 760
Philadelphia, PA 19107

Thank you for your help.

Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard

I. Background

1. About how many employees (full-time and part-time) does your business currently employ? (Enter number.) (If you are self-employed and have no employees, check the box below.)

_____ Total employees

00. Self-employed with no employees

2. What industry listed below best represents your primary business operation? (Check one.)

1. Construction
2. Manufacturing (e.g., chemical production, automotive assembly, steel making, printing, etc.)
3. Service (e.g. dry cleaning plants and shops, beauty shops, carpet and upholstery cleaning, shoe, automotive and electrical repair services, etc.)
4. Other (Please specify.)
- _____

3. Does your business have more than one plant or work site? (Check one.)

1. Yes

2. No

II. Hazard Communication (Right-to-Know)

4. Now we would like to ask you a series of questions about the Hazard Communication regulation or the Right-to-Know. Before you received this questionnaire, how aware, if at all, were you of OSHA's regulation? (Check one.)

1. Extremely aware

2. Very aware

3. Moderately aware

4. Somewhat aware

5. Slightly or not aware --> (Skip to question 16.)

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

5. As a way of determining how familiar employers are with the provisions of OSHA's regulation concerning the Right-to Know, we would like to know whether or not you believe the following provisions are included in the regulation. (Check one box for each provision.)

Provision	Included in the regulation?		
	Yes (1)	No (2)	Don't know (3)
1. Employers should have containers of hazardous substances labeled or otherwise marked by name.			
2. Employers may substitute descriptive labels of hazardous substances for material safety data sheets (MSDSs) ¹ .			
3. Employers should maintain a written list of the hazardous substances in the workplace.			
4. Employers should train employees who may be exposed to hazardous substances prior to their initial assignment.			
5. Employers in non-manufacturing industries do not have to have a written plan describing how the employer will follow the regulation.			
6. Employers with 10 or fewer employees are exempt from the regulation.			

¹An information sheet from chemical manufacturers providing in-depth information on the chemical substance.

Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard

6. Of the following sources of information, indicate the **primary** source you initially used to learn about the rights and responsibilities identified in the regulation? (Check one.)

1. OSHA's regulation on the Right-to-Know
OSHA's pamphlets or other assistance:
2. requested by your business,
3. provided by OSHA without a request, or
4. provided by some other source
5. OSHA inspection
6. OSHA Consultation Program assistance
7. Trade association or professional society contact/ materials
8. Public agencies other than OSHA
9. Small Business Administration (SBA)
10. Chemical manufacturer
11. Wholesaler, distributor, or supplier
12. Other (Please specify.) _____

7. Overall, how satisfied or dissatisfied are you with OSHA's efforts to inform you of the rights and responsibilities identified in the Right-to-Know? (Check one.)

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
6. Not applicable -- No contact with OSHA

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

8. Have you had any questions or needed information about the Right-to-Know?

- 1. Yes
- 2. No -->(Skip to question 11.)

9. Whenever you have had questions or needed information about the Right-to-Know,

(Check one box for each row.)

have you ever.....	Yes (1)	No (2)
1. referred to OSHA's regulation on the Right-to-Know?		
2. referred to OSHA's pamphlets?		
3. consulted the OSHA Consultation Program representative?		
4. consulted your trade association or professional society?		
5. consulted OSHA directly?		
6. called the chemical manufacturer?		
7. called the distributor, supplier, or wholesaler?		
8. consulted public agencies other than OSHA?		
9. consulted a health and safety professional?		
10. consulted a personal physician or other medical personnel?		
11. other? <i>(Please specify.)</i> _____		

10. Overall, how easy or difficult has it been for you to get information about the Right-to-Know?
(Check one.)

- 1. Very easy
- 2. Somewhat easy
- 3. Neither easy nor difficult
- 4. Somewhat difficult
- 5. Very difficult

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

11. Listed below are additional sources of information on the Right-to-Know that an employer might find helpful. In your opinion, how helpful, if at all, would you find each of the following if it was available?

(Check one box for each source.)

Source	Extremely helpful (1)	Very helpful (2)	Moderately helpful (3)	Somewhat helpful (4)	Not helpful at all (5)	Don't know (6)
1. Publicly advertised OSHA 24 hour information hotline staffed by OSHA personnel						
2. Improved distribution to businesses of printed information from OSHA on the general requirements of the Right-to-Know						
3. State or local health and safety professional contact person (e.g., industrial hygienist, medical personnel)						
4. Improved access to the OSHA Consultation Program						
5. Videos from OSHA on the particular hazards common in your industry						
6. Videos from OSHA on the <u>general</u> requirements of the Right-to-Know						
7. OSHA operated computer database available to the public containing material safety data sheet (MSDS) information						
8. Public service announcements on the Right-to-Know						
9. Other <i>(Please specify.)</i> _____						

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

12. Overall, do you believe that OSHA's regulation on Right-to-Know has had a positive or negative effect on employers and employees? (Check one box for each row.)

	Very positive effect (1)	Somewhat positive effect (2)	Effect was equally positive and negative (3)	Somewhat negative effect (4)	Very negative effect (5)	No effect (6)	Don't know/ No opinion (7)
1. Employers							
2. Employees							

13. Listed below are things that might or might not be improved as a result of the regulation. In your opinion, to what degree, if at all, has the regulation improved each of the following?

(Check one box for each row.)

	Very greatly improved (1)	Greatly improved (2)	Moderately improved (3)	Somewhat improved (4)	Slightly improved (5)	Did not improve (6)
1. Quality of your employees' formal/ on-the-job training in avoiding workplace hazards						
2. Your employees' awareness of workplace hazards						
3. Your employees' care in handling and use of hazardous substances						
4. Availability of information on hazardous substances in your workplace						
5. Your management's awareness of workplace hazards						
6. Other (Please specify.) _____						

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

14. Consider ways the regulation on Right-to-Know has affected your business. To what extent, if any, has each of the following increased in your business? (Check one box for each row.)

	Not at all (1)	A little (2)	Somewhat (3)	Moderately (4)	Greatly (5)	Very greatly (6)
1. Clerical costs due to the regulation's paperwork requirements						
2. Overhead costs due to:						
(a) Storing and maintaining information on hazardous substances						
(b) Developing a written training document						
(c) Following the regulation's labeling requirements						
3. Equipment costs due to the purchase of additional safety equipment						
4. Employee training costs due to the regulation's training requirements						
5. Other (Please specify.) _____						

15. As a result of the regulation, to what extent, if any, has each of the following increased or decreased in your business? (Check one box for each row.)

	Greatly increased (1)	Somewhat increased (2)	Remained about the same (3)	Somewhat decreased (4)	Greatly decreased (5)
1. Morale -- management					
2. Morale -- employee					
3. Productivity -- employee					
4. Workplace-related injuries -- employee					
5. Workplace-related illnesses -- employee					

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

16. Now we would like you to think about the chemical substances that are often found in the workplace. For your business's primary operation, indicate whether or not each substance is found in your typical plant or work site. (Check one box for each substance.)

Substance	Found in your workplace?		
	Yes (1)	No (2)	Don't know (3)
1. Paints and thinners (e.g., varnishes, primers, strippers, lacquers, etc.)			
2. Pesticides (e.g., agricultural and structural pesticides, etc.)			
3. Silica (e.g., sand, quartz)			
4. Caustics (e.g., lime, lye, sodium hydroxide)			
5. Benzene (found in gasoline and solvents derived from petroleum)			
6. Organic solvents and degreasers (e.g., petroleum distillates, naphtha, kerosene, gasoline)			
7. Fiber glass, mineral and rock wool			
8. Chlorinated hydrocarbons (e.g., methylene chloride, perc, and methyl chloroform)			
9. Asbestos in any form			
10. Acids (e.g., sulfuric, nitric, acetic and hydrochloric acids)			
11. Dyes/ inks (e.g., industrial inks, textile dyes, and hair color products)			
12. Compressed gases/ aerosol products (pressurized container products used in your operations)			
13. Formaldehyde			
14. Adhesives, composite plastics, polyester resins, sealers			
15. Lead			
16. Photographic chemicals and paper			
17. Highly flammable or explosive products			
18. Other (Please specify.) _____			

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

III. Material Safety Data Sheet

17. Have you ever received a material safety data sheet (MSDS), that is, an information sheet from chemical manufacturers providing in-depth information on the chemical hazards for each substance?

- 1. Yes -->(Skip to question 19.)
- 2. No

18. Did you check "yes" for any substances used in your workplace in question 16?

- 1. Yes -->(Skip to question 28.)
- 2. No, I did not check "yes " in question 16. -->(Skip to question 32.)

19. Currently, what is the approximate number of MSDS's at your business's typical plant or work site? (Enter number.)

_____ MSDSs

20. Is a file (hard copy or computerized) of MSDSs maintained in your business's typical plant or work site for products which contain hazardous substances? (Check one.)

- 1. A file is maintained for all products.
- 2. A file is maintained for most products.
- 3. A file is maintained only for some products.
- 4. A file is not maintained.

21. When your business receives products containing hazardous substances, or substances you believe to be hazardous,

(Check one box for each row.)

how often is the MSDS.....	All or almost all of the time (1)	Most of the time (2)	About half of the time (3)	Some of the time (4)	None or almost none of the time (5)	Don't know (6)
1. with the initial shipment?						
2. with every subsequent shipment?						
3. received whenever a manufacturer updates the MSDS?						
4. received after you request the MSDS from the manufacturer or distributor?						
5. other? (Please specify.) _____						

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

22. Now we would like you to think about experiences employers may have had in using MSDSs. How many of the MSDSs you have.....

(Check one box for each row.)

	All (1)	Most (2)	About half (3)	Some (4)	Few or none (5)	Don't know (6)
1. are too technical for the typical <u>employee</u> ?						
2. are too technical for the typical <u>manager</u> ?						
3. contain too much information on them?						
4. don't have enough relevant information on them?						
5. contain relevant information that is difficult to locate?						
6. contain inaccurate information?						
7. are classified as hazardous substances which you feel are not hazardous?						
8. are not consistent from manufacturer to manufacturer?						
9. are difficult to obtain from the manufacturer, distributor, or supplier?						
10. other? <i>(Please specify.)</i> _____						

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

23. For all the MSDSs you have received, how easy or difficult are they for you

(Check one box for each row.)

	Very easy (1)	Somewhat easy (2)	Neither easy nor difficult (3)	Somewhat difficult (4)	Very difficult (5)
1. to maintain and keep up-to-date.					
2. to ensure employee access to them at each work site.					

24. In your opinion, generally how useful, if at all, are the MSDSs in providing information

(Check one box for each row.)

	Extremely useful (1)	Very useful (2)	Moder- ately useful (3)	Somewhat useful (4)	Not useful at all (5)	Don't know (6)
1. about the hazards of the substances?						
2. about the safe use and handling of hazardous substances?						
3. for training your employees?						
4. in case of emergencies?						
5. other? <i>(Please specify.)</i> _____						

Appendix II
GAO Employer Survey on OSHA's Hazard
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25. At your business, have you ever replaced a more hazardous substance with a less hazardous substance because of information received from a MSDS? *(Check one.)*

1. Yes

2. No

26. Listed below are possible reasons why a business might not replace a more hazardous substance for a less hazardous substance. Which is the primary reason why your firm does not replace its hazardous substances? *(Check one.)*

1. Can't determine from the MSDS how hazardous the substance is

2. Don't know whether or not a replacement exists

3. No replacement exists

4. Replacement costs are too high

5. Other (Please specify.) _____

27. Consider the products for which your business has MSDSs. About how many of these products have labels clearly indicating the identity of the substance and warning of its hazards? *(Check one.)*

1. All or almost all of the products

2. Most of the products

3. About half of the products

4. Some of the products

5. None or almost none of the products

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

IV. Training

28. Are any employees in your business's typical plant or work site who may be exposed to hazardous substances provided any formal (e.g., classroom, video, group lectures) or on-the-job training on the safe use and handling of hazardous substances? (Check one.)

- 1. Yes, formal training only
- 2. Yes, on-the-job training only
- 3. Yes, both formal and on-the-job training
- 4. No --> (Skip to question 31.)

29. Listed below are problems that might be encountered by businesses in providing training to employees on the safe use and handling of hazardous substances. To what extent, if any, do you believe the following problems have been encountered at your business? (Check one box for each problem.)

Problem	Little or no extent (1)	Some extent (2)	Moderate extent (3)	Great extent (4)	Very great extent (5)	Don't know/ Not applicable (6)
1. Insufficient expertise in training						
2. High employee turnover/ transfer						
3. MSDSs too difficult to use in the training program						
4. Employees located at more than one work site						
5. Employees having variable work schedules						
6. High cost of training						
7. Other (Please specify.) _____						

**Appendix II
 GAO Employer Survey on OSHA's Hazard
 Communication or Right-To-Know Standard**

30. How useful, if at all, would the following be in training your employees on the safe use and handling of hazardous substances? (Check one box for each row.)

	Extremely useful (1)	Very useful (2)	Moder- ately useful (3)	Somewhat useful (4)	Not useful at all (5)	NA Not ap- plicable (6)
1. More detailed labels on hazardous products						
2. MSDSs or similar information on hazardous substances which are easy to understand						
3. More specific pamphlets or written materials targeted to the hazardous substances used in your workplace						
4. Training videos targeted to the hazardous substances used in your industry						
5. Other (Please specify.) _____						

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

31. Listed below are documents relating to hazardous substances that might be kept at a business. Is each of the following kept at your business's typical plant or work site?

(Check one box for each document.)

Document	Yes (1)	No (2)	NA/ Not Ap- plicable (3)
1. A listing of all the hazardous substances used at your plant or work site			
2. A listing of the physical location of all your MSDSs			
3. A written summary describing the training provided to employees for the safe handling and use of hazardous substances			
4. Other <i>(Please specify.)</i> _____			

V. Occupational Health and Safety Issues

32. Now we would like you to consider occupational health and safety issues, in general. Overall, how satisfied are you with the information received from OSHA when there are questions or when information is needed about occupational health and safety issues? *(Check one.)*

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
6. Not applicable -- No contact with OSHA

**Appendix II
GAO Employer Survey on OSHA's Hazard
Communication or Right-To-Know Standard**

33. **If you have any suggestions or comments about the Right-to-Know regulation or any comments related to these questions, please write them in the space provided below.**

Thank you for your help.

**HRD/SLS/11-90
(205176)**

Information on Responses to Selected Survey Questions

This appendix includes response information on selected questions from our survey questionnaire. The questions chosen are those relating to issues discussed in this report and used in the figures throughout the text. Percent totals may not add to 100 percent because of rounding. See appendix II for a complete copy of the questionnaire. We will present information related to survey questions regarding employer costs, benefits, and difficulties in complying with HCS in a forthcoming report.

Question 4

Now we would like to ask you a series of questions about the hazard communication regulation or the right-to-know. Before you received this questionnaire, how aware, if at all, were you of OSHA's regulation?

Employer size/ industry group ^a	Percent of all employers				
	Extremely aware	Very aware	Moderately aware	Somewhat aware	Slightly or not aware
Small employers					
Construction	12.0%	23.9%	29.3%	9.8%	25.0%
Manufacturing	9.2	13.8	32.1	18.3	26.6
Services	7.2	17.5	22.7	18.6	34.0
Total	9.5	19.2	27.3	15.1	29.0
Medium-sized employers					
Construction	22.4	33.6	22.4	12.5	9.2
Manufacturing	18.5	37.6	24.8	9.6	9.6
Services	18.9	28.3	23.6	12.6	16.5
Total	19.7	35.6	24.0	10.7	10.0
Large employers					
Construction	57.6	30.5	5.9	1.7	4.2
Manufacturing	53.5	31.8	11.2	2.4	1.2
Services	41.7	25.0	26.4	2.8	4.2
Total	53.5	31.5	11.2	2.3	1.5
Industry group					
Construction	13.5	25.2	28.3	10.1	22.8
Manufacturing	13.6	22.7	29.0	14.8	19.9
Services	7.7	17.9	22.7	18.3	33.4
Total	11.5	22.0	26.6	14.3	25.6

^aSmall employers are those with fewer than 20 employees, medium-size have 20 to 499 employees, and large have 500 or more employees.

Question 5

As a way of determining how familiar employers are with the provisions of OSHA's regulation concerning the right to know, we would like to know whether or not you believe the following provisions are included in the regulations:

(5.5) Employers in nonmanufacturing industries do not have to have a written plan describing how the employer will follow the regulation.

Employer size/ industry group	Percent of employers aware of HCS		
	Correct answer (no)	Incorrect answer (yes)	Don't know
All employers	45.0%	13.1%	41.9%
Small employers			
Construction	38.5	18.5	43.1
Services	46.7	11.7	41.7
Total	42.4	15.2	42.4
Medium-sized employers			
Construction	64.0	7.9	28.1
Service	52.9	14.4	32.7
Total	62.0	9.1	28.9
Large employers			
Construction	80.9	10.4	8.7
Services	77.9	4.4	17.6
Total	80.2	9.1	10.9
Total nonmanufacturing employers			
Construction	42.9	16.6	40.4
Services	47.0	11.8	41.2
Total	44.7	14.5	40.8

**Appendix III
Information on Responses to
Selected Survey Questions**

(5.6) Employers with 10 or fewer employees are exempt from the regulations.

Industry group	Percent of small employers aware of HCS		
	Correct answer (no)	Incorrect answer (yes)	Don't know
Construction	66.7%	6.1%	27.3%
Manufacturing	46.2	10.3	43.6
Services	63.3	13.3	23.3
Total	60.8	9.7	29.5

Question 6

Of the following sources of information, indicate the primary source you initially used to learn about the rights and responsibilities identified in the regulation:

Industry group/ employer size	Percent of employers aware of HCS				
	OSHA sources		Non-OSHA sources		
	Regs ^a	Other ^b	Trade assns. ^c	Chemical manufacturer, distributor, etc. ^d	Other ^e
Construction					
Small	26.3%	22.8%	28.1%	15.8%	7.1%
Medium	20.2	21.7	37.9	8.9	11.3
Large	49.5	12.7	28.2	1.9	7.8
Total	25.3	22.5	29.8	14.5	7.7
Manufacturing					
Small	14.5	24.5	23.2	28.9	8.6
Medium	32.6	28.7	17.1	10.9	10.9
Large	62.6	11.5	15.5	1.9	8.4
Total	23.6	25.8	20.4	20.6	9.5
Services					
Small	16.3	20.3	30.6	14.3	18.4
Medium	15.7	19.0	39.3	19.1	6.7
Large	40.3	13.5	26.9	4.5	14.9
Total	16.3	20.3	31.0	14.5	17.7

(continued)

**Appendix III
Information on Responses to
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Industry group/ employer size	Percent of employers aware of HCS				
	OSHA sources		Non-OSHA sources		
	Regs ^a	Other ^b	Trade assns. ^c	Chemical manufacturer, distributor, etc. ^d	Other ^e
Total					
Small	20.0	22.4	27.8	18.4	11.4
Medium	27.6	25.9	25.0	10.8	10.7
Large	61.0	11.7	16.7	2.0	8.5
Total	22.2	23.0	27.1	16.5	11.2

^aIncludes employers who responded yes to question 6.1.

^bIncludes employers who responded yes to questions 6.2 through 6.6.

^cIncludes employers who responded yes to question 6.7.

^dIncludes employers who responded yes to questions 6.10 and 6.11.

^eIncludes employers who responded yes to question 6.8, 6.9, and 6.12.

Question 10

Overall, how easy or difficult has it been for you to get information about the right to know (HCS)?

Employer size	Percent of employers aware of HCS who tried to obtain information about it				
	Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult
Small	11.2%	26.5%	36.1%	19.3%	7.0%
Medium	20.8	31.4	29.1	18.0	0.6
Large	26.8	42.3	18.7	11.4	0.7
Total	14.5	28.3	33.6	18.7	4.9

**Appendix III
Information on Responses to
Selected Survey Questions**

Question 11

Listed below are additional sources of information on the right to know (HCS) that an employer might find helpful. In your opinion, how helpful, if at all, would you find each of the following if it was available?

(11.1) A publicly advertised OSHA 24-hour information hot line staffed by OSHA personnel.

Employer size	Percent of employers aware of HCS					
	Extremely helpful	Very helpful	Moderately helpful	Somewhat helpful	Not helpful	Don't know
Small	17.4%	24.9%	12.7%	15.6%	7.2%	22.1%
Medium	11.2	27.8	18.0	18.8	8.2	16.0
Large	12.3	23.9	20.5	20.6	10.4	12.4
Total	16.1	25.5	13.9	16.4	7.5	20.7

(11.2.) Improved distribution to businesses of printed information from OSHA on the general requirement of the right to know (HCS).

Employer size	Percent of employers aware of HCS					
	Extremely helpful	Very helpful	Moderately helpful	Somewhat helpful	Not helpful	Don't know
Small	26.6%	30.4%	14.2%	14.3%	3.9%	10.7%
Medium	22.1	39.9	17.0	10.4	3.8	6.9
Large	20.3	36.0	25.0	13.7	2.1	2.8
Total	25.6	32.5	14.9	13.4	3.8	9.8

Employer size	Percent of aware employers not knowing HCS requirements ^a					
	Extremely helpful	Very helpful	Moderately helpful	Somewhat helpful	Not helpful	Don't know
Small	25.0	27.6	15.1	14.6	3.6	14.1
Medium	20.5	41.5	15.1	10.8	4.1	8.0
Large	21.8	33.5	23.3	16.1	2.2	3.1
Total	24.0	30.7	15.2	13.8	3.7	12.6

^aThis is the percent of employers who did not know the correct answer or answered either question 5.5 or question 5.6 incorrectly.

Question 17

Have you ever received a material safety data sheet; that is, an information sheet from a chemical manufacturer providing in-depth information on the chemical hazards for each substance?

Industry group/ employer size	Percent of all employers	
	Yes	No
Construction		
Small	34.4%	65.6%
Medium	82.0	18.0
Large	91.7	8.3
Total	40.7	59.3
Manufacturing		
Small	62.3	37.7
Medium	87.3	12.7
Large	97.1	2.9
Total	72.3	27.7
Services		
Small	39.4	60.6
Medium	80.3	19.7
Large	82.9	17.1
Total	40.9	59.1
Total		
Small	42.1	57.9
Medium	85.1	14.9
Large	96.3	3.7
Total	49.5	50.5

Question 20

Is a file (hard copy or computerized) of MSDSs maintained in your business's typical plant or worksite for products which contained hazardous substances? (Check one.)

Industry group/ employer size	Percent of employers receiving MSDSs			
	All	Most	Some	None
Construction				
Small	44.8%	27.6%	10.3%	17.2%
Medium	48.7	32.5	9.4	9.4
Large	55.8	38.5	2.9	2.9
Total	46.0	29.0	10.1	15.0
Manufacturing				
Small	54.0	25.4	11.1	9.5
Medium	65.9	22.7	6.1	5.3
Large	81.3	17.5	1.3	0.0
Total	60.2	23.9	8.5	7.3
Services				
Small	36.8	28.9	13.2	21.1
Medium	47.3	35.5	5.4	11.8
Large	67.3	20.0	9.1	3.6
Total	37.6	29.4	12.6	20.4
Total				
Small	44.5	27.4	11.7	16.4
Medium	59.6	26.5	7.0	7.0
Large	79.1	19.1	1.5	0.3
Total	49.3	27.0	10.2	13.4

Question 22

Now we would like you to think about experiences employers may have had in using MSDSS:

(22.1) How many of the MSDSS you have are too technical for the typical employee?

Employer size	Percent of employers with MSDSSs					
	All	Most	About half	Some	Few or none	Don't know
Small	16.5%	33.8%	4.0%	18.0%	19.2%	8.6%
Medium	21.4	44.9	8.5	13.6	10.5	1.2
Large	12.0	51.1	16.1	16.2	4.4	0.1
Total	17.8	37.2	5.4	16.7	16.5	6.4

(22.2) How many of the MSDSS you have are too technical for the typical manager?

Employer size	Percent of employers with MSDSSs					
	All	Most	About half	Some	Few or none	Don't know
Small	9.1%	19.7%	11.1%	21.7%	28.8%	9.6%
Medium	7.6	31.2	11.5	28.0	20.2	1.5
Large	2.6	25.4	1.0	33.7	18.7	0.6
Total	8.6	23.0	11.4	23.7	26.2	7.2

(22.3) How many of the MSDSS you have contain too much information on them?

Employer size	Percent of employers with MSDSSs					
	All	Most	About half	Some	Few or none	Don't know
Small	17.4%	19.8%	11.3%	18.4%	24.4%	8.7%
Medium	12.7	28.8	9.1	22.2	19.3	8.0
Large	7.6	17.4	11.6	29.4	30.8	3.2
Total	15.9	22.3	10.7	19.6	23.0	8.4

**Appendix III
Information on Responses to
Selected Survey Questions**

(22.5) How many of the MSDSS you have contain relevant information that is difficult to locate?

Employer size	Percent of employers with MSDSs					
	All	Most	About half	Some	Few or none	Don't know
Small	5.1%	18.5%	7.7%	25.7%	29.3%	13.8%
Medium	6.3	22.2	11.1	27.7	22.2	10.5
Large	3.8	16.7	14.0	36.8	25.7	3.2
Total	5.4	19.5	8.8	26.4	27.2	12.7

(22.6) How many of the MSDSS you have contain inaccurate information?

Employer size	Percent of employers with MSDSs					
	All	Most	About half	Some	Few or none	Don't know
Small	0.0%	2.5%	0.0%	7.3%	47.4%	42.8%
Medium	1.3	2.1	0.5	5.6	39.4	51.0
Large	0.0	0.1	1.7	27.1	34.2	37.0
Total	0.5	2.3	0.2	7.2	44.1	45.6

Question 27

Consider the products for which your business has MSDSs. About how many of these products have labels clearly indicating the identity of the substance and warning of its hazards?

Industry group/ employer size	Percent of employers with MSDSs				
	All or almost all	Most	About half	Some	None
Construction					
Small	45.2%	29.0%	6.5%	19.4%	0.0%
Medium	24.1	44.0	10.3	18.1	3.4
Large	27.5	45.1	13.7	10.8	2.9
Total	39.5	33.0	7.5	19.0	0.9
Manufacturing					
Small	50.0	25.0	8.3	10.0	6.7
Medium	44.3	30.5	9.9	10.7	4.6
Large	43.4	41.5	8.8	6.3	0.0
Total	47.2	28.1	9.1	10.2	5.5
Services					
Small	47.2	44.4	0.0	8.3	0.0
Medium	40.4	36.2	7.4	12.8	3.2
Large	45.5	21.8	20.0	9.1	3.6
Total	46.7	43.8	0.6	8.6	0.2
Total					
Small	47.4	33.6	4.6	12.4	2.0
Medium	38.1	34.9	9.9	13.0	4.2
Large	42.3	41.3	9.4	6.7	0.3
Total	44.7	34.1	6.2	12.5	2.6

Question 28

Are any employees in your business's typical plant or worksite who may be exposed to hazardous substances provided any formal training (e.g., classroom, video, group lectures) or on-the-job training on safe use and handling of hazardous substances?

Industry group/ employer size	Percent of employers providing training			
	Formal	On-the-job	Formal and on-the-job	None
Construction				
Small	3.1%	28.1%	37.5%	31.2%
Medium	5.8	43.0	31.4	19.8
Large	9.2	36.7	51.4	2.8
Total	3.9	32.1	35.9	28.1
Manufacturing				
Small	6.3	40.6	23.4	29.7
Medium	6.0	44.8	35.8	13.4
Large	5.5	17.6	74.5	2.4
Total	6.1	41.6	30.8	21.5
Services				
Small	5.6	47.2	19.4	27.8
Medium	3.0	44.6	30.7	21.8
Large	8.8	17.5	63.2	10.5
Total	5.4	47.0	20.4	27.3
Total				
Small	5.0	38.9	26.6	29.5
Medium	5.7	44.2	34.1	15.9
Large	5.8	19.0	72.6	2.6
Total	5.2	40.1	29.5	25.2

**Appendix III
Information on Responses to
Selected Survey Questions**

Question 32

Overall, how satisfied are you with the information received from OSHA when there are questions or when information is needed about occupational safety and health issues?

Employer size	Percent of all employers					
	Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Very dissatisfied	Not applicable ^a
Small	16.5%	13.0%	17.7%	3.5%	3.9%	45.4%
Medium	15.3	21.9	30.0	7.1	5.2	20.5
Large	12.1	40.3	25.6	12.3	3.0	6.8
Total	16.3	14.7	19.8	4.2	4.1	40.9

Percent of employers who were slightly or not aware of HCS						
Small	9.8	5.0	7.1	0.7	1.4	75.9
Medium	12.8	14.4	19.1	0.0	3.4	50.3
Large	8.9	35.2	49.0	0.0	0.0	6.9
Total	10.0	5.6	7.9	0.6	1.5	74.3

^aNo contact with OSHA.

GAO Analysis of OSHA's Integrated Management Information

System Inspection Data Base

To obtain one measure of the number of employers out of compliance with the Hazard Communication Standard, we analyzed fiscal years 1989-90 OSHA and state safety and health inspection data from OSHA's Integrated Management Information System inspection data base. The IMIS data base, which is maintained by OSHA's Office of Management Data Systems, includes information obtained from OSHA inspection reports and other documents. For each employer establishment inspected, the information includes its name and location, number of employees at the worksite, type of inspection (health or safety), violations (including HCS), accidents, and current status of abatement of detected violations. As IMIS data for seven states (Alaska, California, Hawaii, Minnesota, Oregon, Washington, and Wyoming) were incomplete, we excluded them from our analysis.

We reviewed inspection data for fiscal years 1989 and 1990, the first full years all employers were required to comply with HCS. For those years, the IMIS data base contains over 201,000 inspections of worksites with one or more employees for federal OSHA and the state-operated health and safety programs included in our analysis. OSHA's procedures require that inspectors check for employer's HCS compliance on every inspection.

IMIS Data on Worksites Out of Compliance With HCS Analyzed

From IMIS, we obtained the total number of inspections and the number of inspections where OSHA detected a violation of HCS. We calculated an out-of-compliance rate by dividing the total number of inspections where at least one HCS violation was detected by the total number of inspections conducted by federal OSHA and the states during fiscal years 1989 and 1990. In analyzing OSHA's compliance data, we then compared out-of-compliance rates across industry groups and worksite sizes.

OSHA's inspection data base for fiscal years 1989 and 1990 was over 201,000 inspections, divided roughly equally between federal OSHA and state operated programs.¹ About 50 percent of the inspections were in the construction industry and almost 24 percent were in manufacturing

¹In comparing the inspection characteristics of federal OSHA and the combined state health and safety programs, we note that each conducts about half of its inspections in the construction industry. However, on a percentage basis, federal OSHA did about 60 percent more manufacturing industry inspections than did the state programs.

**Appendix IV
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industries (see table IV.1).² About 14 percent of the inspections were in retail/wholesale trade/services and only 3 percent of all inspections were in personal services industries.³

Table IV.1: Distribution of Inspections, by Worksite Size and Industry Group, OSHA Inspection Data (FY 1989-90)

Industry group	Distribution by worksite size (no. of employees)					Total
	1-19	20-99	100-249	250-499	500 and over	
Construction	43.1%	5.2%	0.6%	0.2%	0.1%	49.2%
Manufacturing	6.3	9.5	3.9	1.9	2.2	23.8
Retail/wholesale trade/services	5.8	5.0	1.6	0.5	1.1	14.0
Other	5.8	4.5	1.1	0.6	0.9	12.9
Total	61.0	24.2	7.2	3.2	4.3	100.0^a

^aDoes not add up to 100 percent because of rounding. There were 201,378 inspections in total.

Over 60 percent of the inspections involved worksites with fewer than 20 employees. However, of all inspections involving worksites of fewer than 20 employees, over 70 percent were in the construction industry.

OSHA's inspection data indicates that 26 percent of the worksites inspected were out of compliance with HCS. However, the out-of-compliance rate varied significantly across industry groups. The manufacturing sector had the highest out-of-compliance rate at 36 percent, while the "other" industry group had the lowest rate at 13 percent (see fig. IV.1).⁴

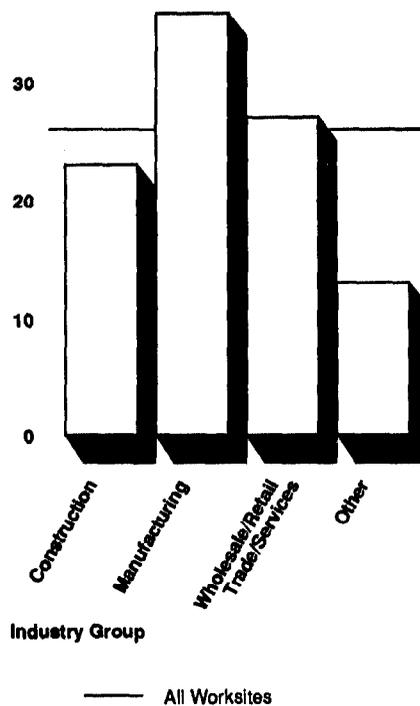
²We defined construction inspections as inspected worksites with SIC codes 15-17; manufacturing inspections, SIC codes 20-39; and retail/wholesale trade/services inspections, SIC codes 50-79. We defined personal services inspections, a subset of retail/wholesale trade/services, as SIC codes 72, 75, and 76. We placed all remaining inspections—for example inspections in the communication and transportation industry and all government inspections—in the "other" category.

³The total number of inspections in personal services (defined as SIC codes 73, 75, and 76) for FY 1989-90 was 5,911.

⁴The "other" category includes government and industries such as transportation and communication.

Figure IV.1: Worksites Out of Compliance
With HCS, by Industry Group, OSHA
Inspection Data (FY 1989-90)

40 Percent of Worksites Out of Compliance



Type of Violation

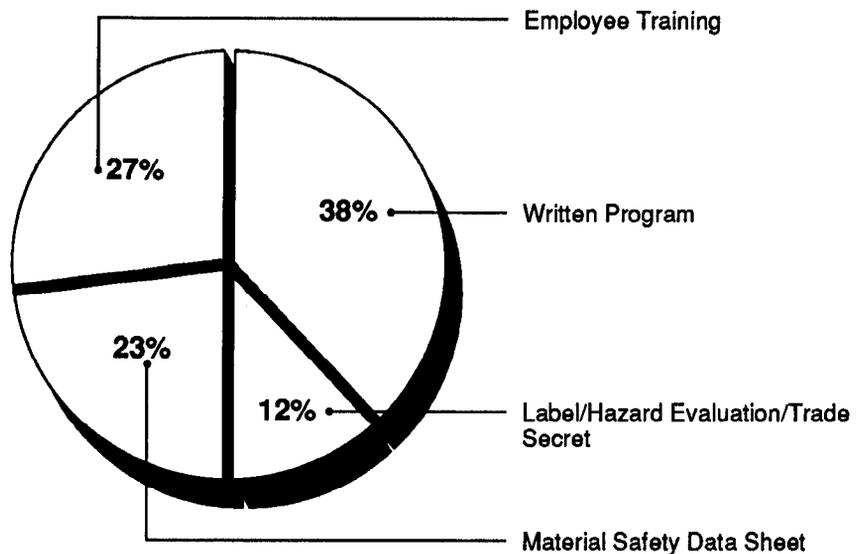
Inspectors can cite employers for the following violations of HCS:

- No written HCS program (this category also often indicates employers that are out of compliance with most other requirements),
- Inadequate or no training of employees in hazard prevention,
- Inadequate or inaccurate MSDSS,
- Inadequate or no label on the container of hazardous chemical,
- Inadequate or no hazard evaluation, or
- Improper use of trade-secret designation on a MSDS.⁵

⁵HCS provides that the chemical manufacturer, importer, or employer who prepares an MSDS may withhold certain information from the MSDS, including the specific identity of the chemical, if (1) the claim that the information is a trade secret can be supported; (2) information on the MSDS concerning the chemical's properties and effects is disclosed; (3) the MSDS indicates that the specific chemical identity is being withheld because it is a trade secret; and (4) the specific chemical identity is made available to health professionals, employees, and designated representatives according to certain conditions.

Across all industries and worksite size groups, the most common violation of HCS concerned the failure of an employer to have a written HCS program (see figs. IV.2 to IV.4). The next most common violation was inadequate or no training of employees in handling the hazardous chemical. The only exception consisted of large worksites with 500 or more employees, which were cited more often for failure to properly label the hazardous chemical (see fig. IV.4).⁶

Figure IV.2: Distribution of HCS
Violations, by Requirement Cited, OSHA
Inspection Data (FY 1989-90)



⁶Violations involving improper hazard evaluations or violations of the trade secret requirements are extremely rare, accounting for less than 1.0 percent of all violations.

Figure IV.3: Distribution of HCS Violations, by Industry Group and Requirement Cited, OSHA Inspection Data (FY 1989-90)

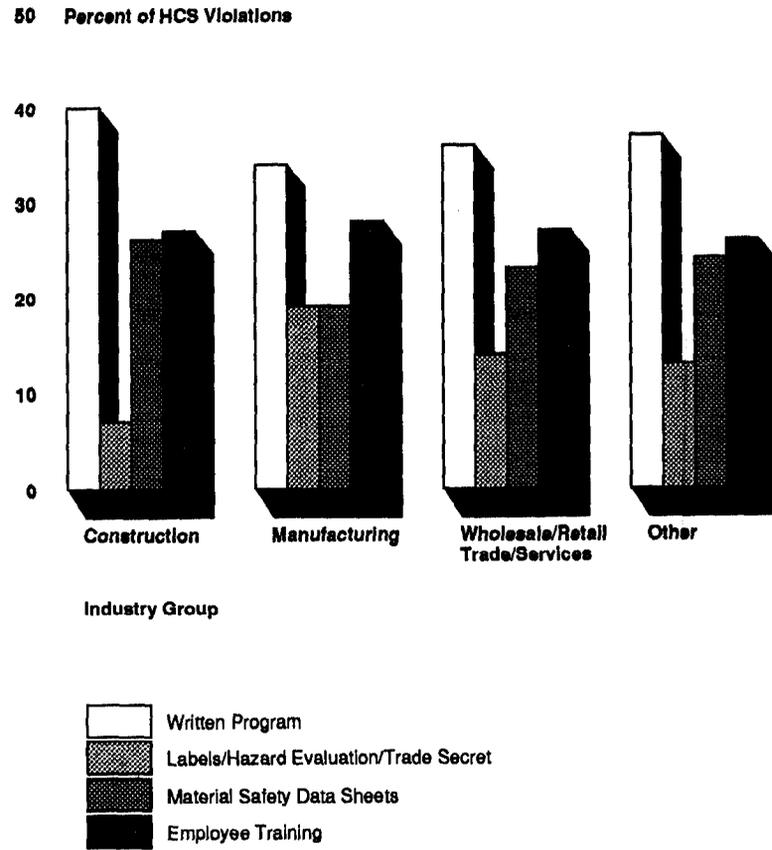
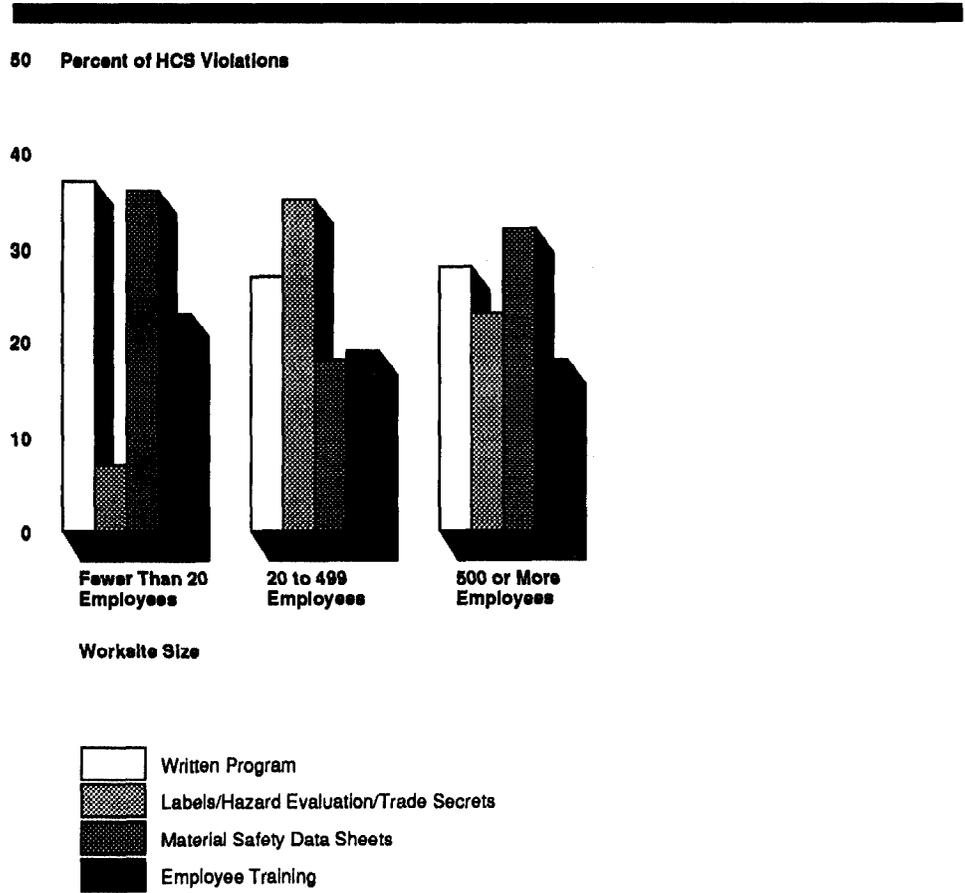


Figure IV.4: Distribution of HCS Violations, by Worksite Size and Requirement Cited, OSHA Inspection Data (FY 1989-90)



Severity of Violation

In citing violations, inspectors can designate the violation as other-than-serious, serious, repeat, or willful.⁷ About 40 percent of the 131,740 detected violations were serious, repeat, or willful compared with the less significant “nonserious” violations.⁸ Manufacturing, at 45 percent, had the highest percentage of serious, repeat, or willful violations. The highest percentage of serious, repeat, and willful violations also occurred in the largest worksites with 500 or more employees (see figs. IV.5 and IV.6).

⁷As part of the FY 1991 budget legislation, the Congress gave Labor the authority to assess a maximum civil monetary penalty of up to \$70,000 for each willful or repeated occupational safety and health violation, up to \$7,000 for each serious, nonserious, failure to abate, and “failure to post” violation. The change represents a seven-fold increase in the maximum penalties.

⁸For purposes of this study and in this report, we use the designation “serious” to include OSHA’s violation categories serious, willful, and repeat.

**Figure IV.5: "Serious" HCS Violations, by
Industry Group, OSHA Inspection Data
(FY 1989-90)**

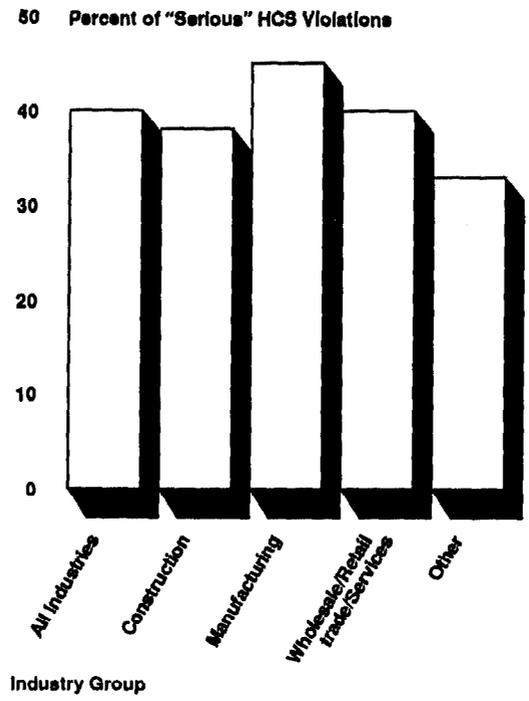
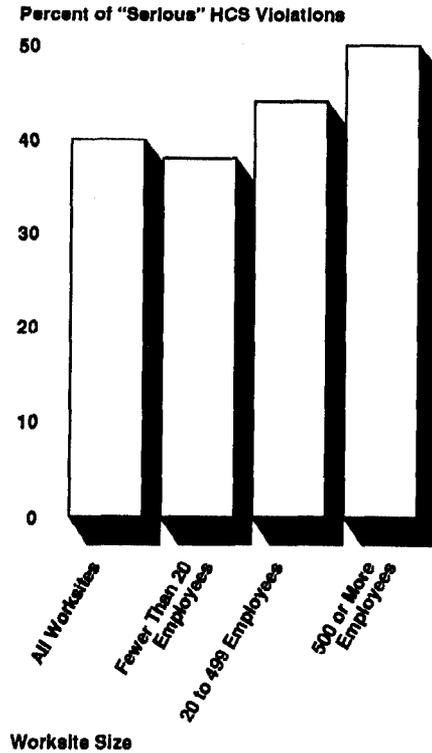


Figure IV.6: "Serious" HCS Violations, by
Worksite Size, OSHA Inspection Data
(FY 1989-90)

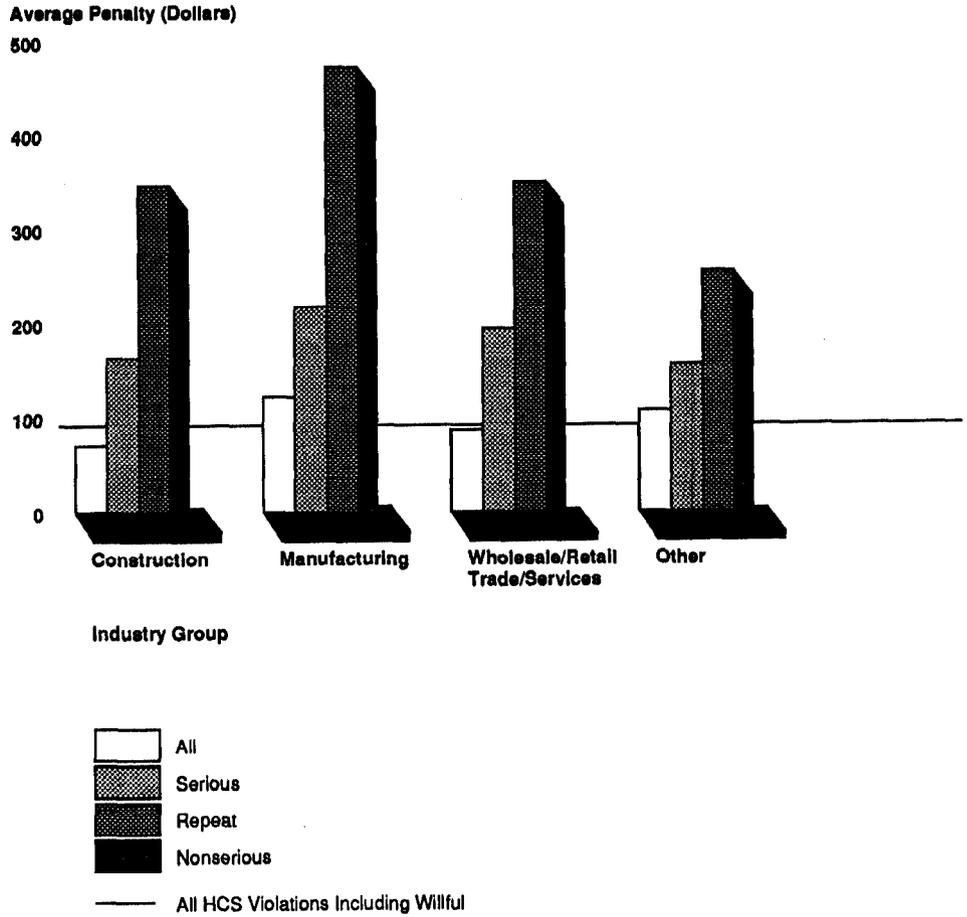


Penalties

OSHA and the state-operated programs proposed civil monetary penalties for detected HCS violations, the average penalty for all such violations being \$92. For willful violations, OSHA inspectors levied far higher penalties (\$4,171), but such violations were very few in relation to other violation types. Within broad industry groups, the highest average penalties were assessed for violations in the manufacturing sector (\$122). Employers with small worksites received the lowest average monetary penalty (\$68), while the largest worksites received the highest (\$201) (see figs. IV.7 and IV.8).⁹

⁹OSHA considers the employer's size in proposing penalties and reduces the proposed penalty if it has 250 or fewer employees.

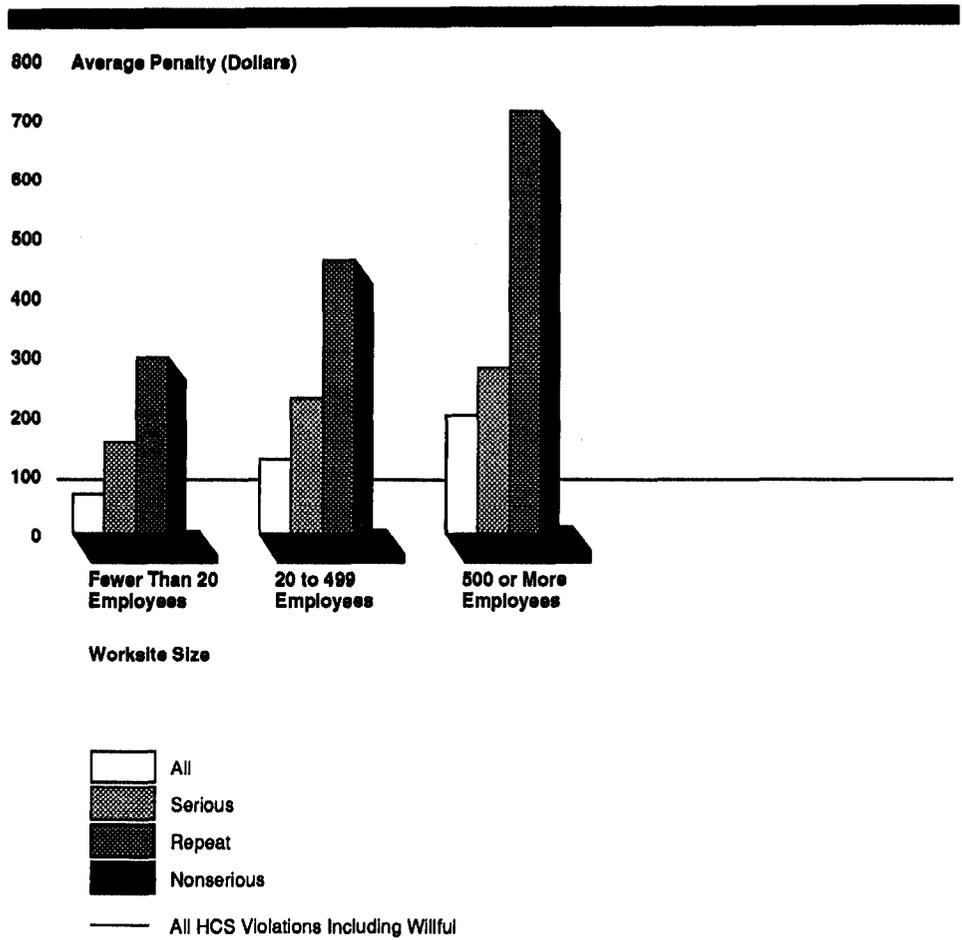
Figure IV.7: Average Penalty for HCS Violations, by Industry Group, OSHA Inspection Data (FY 1989-90)



Note: "Serious" violations include serious, willful, and repeat violations. Of all HCS violations, willful violations were 0.3 percent, serious violations were 37.9 percent, repeat violations were 1.9 percent, and other violations were 60 percent.

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Figure IV.8: Average Penalty for HCS
 Violations, by Worksite Size, OSHA
 Inspection Data (FY 1989-90)



Examples of Material Safety Data Sheets

Under the Hazard Communication Standard, chemical manufacturers and importers must obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers must have an MSDS for each hazardous chemical they use. HCS requires that MSDSS be written in English and contain at least the following information:

- If the hazardous chemical is a single substance, the substance's chemical and common names;
- If the hazardous chemical is a mixture that has been tested, the chemical and common names that contribute to the known hazards and the common name of the mixture itself;
- If the hazardous chemical is a mixture that has not been tested as a whole, the chemical and common names of (1) all identified carcinogens with concentrations 0.1 percent and greater, (2) all other substances that are determined to be health hazards that comprise 1 percent or greater of the composition, (3) all ingredients that have been determined to be health hazards but comprise less than 1 percent of the mixture if there is evidence that (a) the ingredients could be released in concentrations greater than that specified in OSHA's permissible exposure limit or the American Conference of Governmental Industrial Hygienists' threshold limit value or (b) could pose a health hazard to employees, and (4) all substances that are determined to cause a physical hazard when present in the mixture;
- (a) the physical and chemical characteristics of the hazardous substance (for example, vapor pressure); (b) the physical hazards of the hazardous chemical (for example, the potential for fire and explosion); and (c) the health hazards of the hazardous chemical, including signs and symptoms of exposure and any medical conditions that are generally recognized as being aggravated by exposure to the chemical;
- The chemical's primary route(s) of entry into the body;
- OSHA's permissible exposure limit and the American Conference of Governmental Industrial Hygienists' threshold limit value and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer when preparing the data sheets;
- Whether the hazardous chemical is listed in the National Toxicology Program's Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen listed in the International Agency for Research on Cancer Monographs (latest edition) or by OSHA;
- Any generally applicable precautions for safe handling and use known to the chemical manufacturer, importer, or employer preparing the MSDS (for example, appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for cleanup of spills and leaks);

- Any generally applicable control measures known to the chemical manufacturer, importer, or employer preparing the MSDS (for example, appropriate engineering controls, work practices, or personal protective equipment);
- Emergency and first aid procedures;
- The date of preparation of the MSDS or the last change to it; and
- The name, address, and telephone number of the chemical manufacturer, importer, or employer who prepared the MSDS, and who can provide additional information on the hazardous chemical and appropriate emergency procedures if necessary.

If no relevant information was found in any given category on a MSDS, the chemical manufacturer, importer, and employer must mark that category to so indicate.

Within these guidelines, MSDSS can vary in terms of the format chosen to present information, the sequence in which information is presented, the language used to present the information, and the amount of information presented. HCS does not prohibit chemical manufacturers, importers, or employers from preparing MSDSS on substances that may not be hazardous.

For examples of MSDSS with different formats, sequences of presentation, and language, as well as variation in the amount of information presented, see figures V.1 through V.5. An example of a data sheet that may be too technical for some employees appears in figure V.1. To determine the particular chemicals in each product, an employee must cross-reference the chemical stock number on page 1 of the MSDS with the table on page 3. Figure V.2 is another example of a technical data sheet that requires an employee to be familiar with terms such as chemical pneumonitis and aspiration.

Figure V.3 illustrates the amount of information disclosed before one identifies the chemical's health hazards. To illustrate the variation in the information presented on the same substance, figures V.4 and V.5 cite the same active substance, benzoyl peroxide, but are prepared by two different companies. The MSDS in figure V.4 states that the substance is harmful or fatal if swallowed and that benzoyl peroxide is a toxic substance. However, the MSDS in figure V.5 states that the health effects due to chronic overexposure to the largely benzoyl peroxide product are unknown.

**Appendix V
Examples of Material Safety Data Sheets**

Figure V.1: Material Safety Data Sheet—Aerosol Cleaners (Crest Industries)

MATERIAL SAFETY DATA SHEET									
1/26/90									
AEROSOL CLEANERS									
PRODUCTS COVERED: AA-S, AB-C, AB-K, AC-C, AC-J, AE-C, AG-C, AG-D, AH-S, AK-B, AN-S, AP-S, AR-A									
SECTION I—MANUFACTURER									
Crest Industries, Inc., 3841 13th Street, Wyandotte, MI 48192 TELEPHONE (All calls): (313) 283-4100									
SECTION II—PRODUCTS									
Stock Number	Product Name on Label	Numbers of Ingredients in Products	HMIS RATINGS			Appearance and Odor	Solubility Volatile % in Water Volume %		
			H	F	R				
AA-S	Acry-Solv Solvent Cleaner	6,8,17,20,21	2	4	0	Clear liquid, mild solvent	<1		100
AB-C	Battery Terminal Cleaner	8	1	3	0	White foam, no odor	90 to 95		5 to 10
AB-K	Brake Kleener	4,16,19	3*	0	0	Clear liquid, mild solvent	<1		100
AC-C	Muscle Carb & Choke Cleaner	1,6,11,17,19,21	3	4	0	Clear liq., strong solvent	5 to 10		100
AC-J	Jet Blast Choke & Carb Cleaner	1,5,6,8,11,13,17,18,21	3	4	0	Clear liq., strong solvent	10 to 15		100
AE-C	Electrical Contact Cleaner	4,19	3	0	0	Clear liquid, mild solvent	<1		100
AG-C	Glass Cleaner	3,8	2	4	0	White foam, ammonia odor	95		5 to 10
AG-D	Paint, Gasket & Decal Stripper	11,12,17	3*	4	0	Clear gel, mild solvent	5 to 10		95
AH-S	Ki-Solv Super Strength Solvent Cleaner	6,8,9,17,20,21	2	4	0	Clear liq., mild solvent	5 to 10		100
AK-B	Brake Kleener	4,16,19	3*	0	0	Clear liquid, mild solvent	<1		100
AN-S	Never Sand	6,7,8,12,17,21	3*	3	0	Clear liq., strong solvent	<1		100
AP-S	Plasti-Solv	2,6,8,9,10,14,17,19,21	3	4	0	Clear liq., strong solvent	35 to 40		85 to 95
AR-A	Release All Spray Solvent	8,9,12,15,17	3*	4	0	Clear liq., mild solvent	30 to 35		100

*Chronic health effects may occur from ingredients 12 and 16. See Notes in SECTION VI.

SECTION III—HAZARDOUS INGREDIENTS

Ingredients	CAS No.	Exposure Limits* in ppm (parts per million)	Flash Point ° F ° C	Vapor Pressure at 20 ° C	Pres. sure (mm Hg)	Evap. Rate (n-Butyl Acetate=1)	Boiling Point ° F ° C	Flammable Limits in %		Autoigni- tion Pt. ° F ° C
								Lower	Upper	
1. Acetone	67-64-1	750 A, O	-4 -20	185		7.7	132 56	2.6	12.8	869 455
2. Aromatic Petroleum Solvent	64742-95-6	50 E	106 41	<10	0.2	306 152	0.9 7.0			880 471
3. 2-Butoxyethanol	111-76-2	25 A (Skin)	165 74	0.9	0.1	340 171	-NA-			Unk
4. Carbon Dioxide	124-38-9	5000 A	None	NA	NA	-NA-	None			None
5. Diacetone Alcohol	123-42-2	50 A	146 63	1.0	0.14	295 146	1.8 6.9			Unk
6. Ethyl Benzene	100-41-4	100 A	59 15	7	0.5	277 136	1.0 6.7			810 432
7. Glycol Ether EP	2807-30-9	Unknown	120 49	1.0	0.2	301 149	Unk			Unk
8. Isobutane	75-28-5	1000 E	<-40 <-40	>760	Unk	11 -12	1.8 8.4			860 460
9. Isopropyl Alcohol	67-63-0	400 A, O	53 12	31	1.7	180 82	2.0 12.0			750 399
10. Isopropyl Amine Alkyl Lauryl Sulphonate	26264-05-1	Unk	>200 >93	<0.1	<0.1	Unk	-NA-			Unk
11. Methyl Alcohol	67-56-1	200 A (Skin)	54 12	96	3.5	147 64	6.7 36.0			725 385
12. Methylene Chloride**	75-09-2	50 A, 25 O**	None	340	14.5	104 40	-NA-			1224 662
13. Methyl Ethyl Ketone	78-93-3	200 A, O	16 -9	85	4.6	174 79	1.8 10.0			759 404
14. Methyl Isobutyl Ketone	108-10-1	50 A, 100 O	60 16	16	1.6	237 114	1.2 Unk			854 457
15. Mineral Spirits	64742-89-8	500 E	104 40	3	0.2	318 159	0.7 6.0			>394 >201
16. Perchloroethylene**	127-18-4	50 A, 25 O**	None	13	2.1	250 121	None			None
17. Propane	74-98-6	1000 E	<-40 <-40	>760	Unk	-44 -42	2.1 9.5			842 450
18. Toluene	108-88-3	100 A, 200 O	45 7	38	1.5	230 110	1.2 7.0			896 480
19. 1,1,1-Trichloroethane	71-55-6	350 A, O	None	100	6.0	165 74	6.7 17.2			856 458
20. VMFP Naphtha	8032-32-4	300 A	45 7	40	2.0	233 112	0.9 7.0			480 249
21. Xylenes	1330-20-7	100 A, O	80 27	10	0.8	281 138	1.0 6.4			810 432

*A means ACGIH TLV, O means OSHA PEL. Other abbreviations: CE means Crest Estimate, E means Suppliers Number, > means greater than, < means less than, NA means Not Applicable, Unk means Unknown. **See NOTES in SECTION VI.

SECTION IV—PHYSICAL DATA

Pressure of Can Contents: Maximum pressure less than 140 PSI GAUGE at 130° F (54° C)

SECTION V—FIRE AND EXPLOSION DATA

Flammability Class: Extremely Flammable Aerosol (AB-C, AB-K, AE-C, AG-C, AK-B Non-Flammable Aerosol)

Flash Point (Tag Closed Cup Method): See SECTIONS II, III

Approximate Flammable Limits: See SECTIONS II, III

Autoignition Temperature: See SECTIONS II, III

Extinguishing Media: Foam, carbon dioxide, dry chemical

Appendix V
Examples of Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

6/26/83

AEROSOL LUBRICANTS

PRODUCTS COVERED: AB-D, AB-S, AG-R, AG-W, AR-4, AR-B, AS-H, AS-P, AT-L

SECTION I - MANUFACTURER

Crest Industries, Inc., 3841 13th Street, Wyandotte, MI 48192 **TELEPHONE (All calls): (313) 283-4100**

SECTION II - PRODUCTS

Stock Number	Product Name on Label	Numbers of Ingredients in Product	HHS RATING			Appearance and Odor	Solubility		Volatility
			H	F	R		% in Water	Volume %	
AB-D	Silencer Belt Dressing	3,4,6,8,12,17	2*	4	0	Clear liquid, mild solvent	<1		80 to 90
AB-S	Red Battery Terminal Protector	12,17	2	4	0	Red liquid, mild solvent	<1		35 to 45
AG-R	Red Lube	1,17	2	0	0	Red liquid, chlorinated solv.	<1		90 to 95
AG-W	White Lithium Grease	4,5,12,17	2	4	0	White grease, mild solvent	<1		65 to 75
AR-4	Rustek Plus 4	11,12,13	2*	4	0	Amber liquid, mild solvent	<1		80 to 90
AR-B	Rustek Penetrant Lubricant	2,4,7,9,12,14,18	2*	4	0	Gray liquid, mild solvent	5	to 10	55 to 65
AS-H	Hi-Viscosity Silicone Spray	3,4,6,8,10,17	2*	4	0	Clear liquid, mild solvent	<1		90 to 95
AS-P	All Purpose Silicone Spray	3,4,6,8,10,17	2*	4	0	Clear liquid, mild solvent	<1		90 to 95
AT-L	Dry Lubricant	3,6,8,12,15,16	2*	4	0	Cloudy liquid, mild solvent	<1		>99

*Chronic health effects may occur from ingredients 3, 7, 11. See SECTION VI.

SECTION III - HAZARDOUS INGREDIENTS

Ingredients	CAS No.	Exposure Limits* in Air (parts per million)	Flash Point °F °C	Fume Conc. (mg/m ³)	Evap. Rate (g/hr)	Boiling Point (°F °C)	Flammable Limits in Air Lower Upper	Autoflammability Pt. °F °C
1. Carbon Dioxide	124-38-9	5000 A	None	>760	NA	-108 -78	NA	None
2. 2-(2-Ethoxyethoxy)ethanol	111-90-0	NE	130 54	1.7	0.2	293 145	1.7	Unk
3. n-Hexane**	110-54-3	50 A, 500 O**	-7 -22	140 E	8.1 E	156 69	1.2 7.4	437 225
4. Isobutane	75-28-5	1000 E	<-40 <-40	>760	Unk	11 -12	1.8 8.4	860 460
5. Light Petroleum Dist.	64742-89-8	400 E	<20 <-7	60	3.9	206 97	1.2 6.8	536 280
6. Methylcyclopentane	96-37-7	500 A, 0	-20 -29	140 CE	8 CE	161 72	1.2CE 7.5	496 258
7. Methylene Chloride**	75-09-2	50 A, 500 O**	None	340	14.5	104 40	NA	1224 662
8. Methylpentane	43133-95-6	500 A, 0	-20 -29	140 CE	8 CE	140 60	1.2CE 7.5	507 264
9. Mineral Seal Oil	64742-06-9	5mg/m ³ A oil mist	129 265	<0.01	<0.1	278 532	Unk	Unk
10. Mineral Spirits	64742-88-7	500 E	104 40	3	0.2	318 159	0.7 6.0	>394 >201
11. Perchloroethylene**	127-18-4	50 A, 25 O**	None	13	2.1	250 121	None	None
12. Propane	74-98-6	1000 E	<-40 <-40	>760	Unk	-44 -42	2.1 9.5	919 493
13. Solvent Petroleum Naphtha	64742-88-7	100 E	105 41	0.21	0.3	315 157	1.0 6.0	>394 >201
14. Stoddard Solvent	8052-41-3	100 A, 500 O	104 40	3	0.2	318 159	0.7 6.0	>394 >201
15. Tetrafluoroethane Polymer	9002-84-0	NE	NA	NA	NA	NA	NA	NA
16. 1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1000 A	None	Unk	>1	115 46	NA	NA
17. 1,1,1-Trichloroethane	71-55-6	350 A, 0	None	100	6.0	165 74	NA	NA
18. Nitrogen	1330-20-7	100 A, 0	80 27	10	0.8	281 138	1.0 7.0	810 432

*A means ACGIH TLV, O means OSHA PEL. Other abbreviations: E means Suppliers Number, CE means Crest Estimate, > means greater than, < means less than, NA means Not Applicable, NE means Not Established, Unk means Unknown.
**See NOTES in SECTION VI.

SECTION IV - PHYSICAL DATA

Pressure of Can Contents: Maximum pressure less than 160 PSI GAUGE @ 130°F (54°C). **Evaporation Rate:** See SECTIONS II, III. **Vapor Density:** Heavier than air. **Solubility in Water (Wt%):** See SECTION II. **Volatility:** See SECTION II. **Approximate Boiling Point:** See SECTIONS II, III. **Product Density (Water=1):** Less than 1 (AND, AG-R, AG-W, ARS all >1). **Ingredients (except 7, 11, 15, 16, 17):** Less than 1. **Appearance and Odor:** See SECTION II.

SECTION V - FIRE AND EXPLOSION DATA

Flammability Class: Extremely Flammable Aerosol (AG-R Non-Flammable Aerosol). **Flash Point (Dry Closed Cup Method):** See SECTIONS II, III. **Approximate Flammable Limits:** See SECTIONS II, III. **Autoflammability Temperature:** See SECTIONS II, III. **Stabilizing Agents:** Foam, carbon dioxide, dry chemical. **Special Fire Fighting Procedures:** Full protective equipment, including self-contained breathing apparatus, is recommended because highly toxic gases may be generated by combustion or thermal decomposition. Water from fire nozzles may be used to cool closed containers to prevent pressure build up (containers may leak or burst when heated).

Usual Fire and Explosion Hazards: Vapors are heavier than air and may travel along the ground or be moved by ventilation and ignited by pilot lights, other flames, sparks, heaters, electric motors, smoking or other ignition sources at locations far from material handling point (except AG-R which is non-flammable). At elevated temperatures [130°F (54°C) or over] containers may vent, rupture or burst.

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, Skin contact, Eye contact.

SIGNS AND SYMPTOMS OF EXPOSURE:

IRRITATION: **Acute Exposure:** Solvent vapors at concentrations above the TLV can irritate the respiratory tract (nose, throat, lungs) causing a burning sensation, runny nose, sore throat, coughing, chest discomfort (tightness). May cause central nervous system depression with the following progressive symptoms:

headache, dizziness, nausea, staggering gait, confusion, unconsciousness, cessation of breathing and death.

NOTE: Do not smoke while using AT-L Dry Lube. Wash hands thoroughly before smoking. Heating 15. Tetrafluoroethane Polymer particles in burning tobacco will result in fumes which when inhaled with the tobacco smoke can cause a temporary influenza-like condition called polymer fume fever.

Chronic Exposure: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Symptoms include: loss of memory, loss of intellectual ability and loss of coordination.

NOTE: Prolonged and/or repeated overexposure to 3. n-Hexane (AB-D, AS-H, AS-P, AT-L) may cause Peripheral Neuropathy (damage to nerve tissue of the arms or legs) resulting in muscular weakness and loss of sensation in some or all of the following: fingers, hands, arms, legs, feet or toes.

NOTE: INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING ANY SOLVENT VAPORS MAY BE HARMFUL OR FATAL!

SKIN CONTACT:

Acute Exposure: Repeated or prolonged skin contact with solvents can result in dry, defatted and cracked skin causing increased susceptibility to infection.

Chronic Exposure: Exposure to small amounts of solvent over long periods of time may cause some or all of the symptoms as in acute exposure to solvents.

EYE CONTACT:

Acute Exposure: Irritation of the eyes with itching, burning, redness and even permanent tissue damage if sprayed directly into the eyes and not flushed out immediately.

Chronic Exposure: Irritation of the eyes with itching, burning, redness.

**Appendix V
Examples of Material Safety Data Sheets**

INCOMPATIBILITY (Materials to Avoid): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: By high heat and fire: carbon dioxide, carbon monoxide, hydrocarbon vapors, smoke. Hydrogen chloride, chlorine, phosgene and chlorinated hydrocarbon vapors also will be produced from AB-K, AC-C, AE-C, AG-D, AK-B, AN-S, AP-S and AR-A.

SECTION X-SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
 Put on protective equipment including respiratory protection. Prevent further spillage. Evacuate nonessential personnel. Remove all sources of ignition (except for AB-K, AE-C, AK-B) and ventilate the area. Keep spill from reaching sewers and waterways. Cover the spill with sawdust, vermiculite, Fuller's Earth or other absorbent material. Collect material with non-sparking tools (except for AB-K, AE-C, AK-B) and put in a tightly sealed container. Remove container to a safe place.

WASTE DISPOSAL METHOD: Follow all federal, state and local environmental control regulations. Incineration is the preferred method.
DO NOT PUT AEROSOL CONTAINERS IN A HOME TRASH COMPACTOR!

AEROSOL CLEANERS P.1

DO NOT INCINERATE (OR BURN) AEROSOL CONTAINERS EVEN WHEN EMPTY! Containers may become pressurized and burst even if they will not spray. Containers must be handled with care due to toxic, flammable and/or pressure producing residue.
RCRA STATUS: Since these products are ignitable (except AB-K, AE-C, AK-B which are toxic only) and toxic, they are hazardous when discarded.

SECTION XI-SPECIAL PRECAUTIONS & STORAGE DATA
STORAGE TEMPERATURE
 MINIMUM/MAXIMUM: 50°F (10°C) / 120°F (49°C)
RECOMMENDED SHELF LIFE: One year

PRECAUTIONS TO BE TAKEN IN HANDLING, STORAGE AND USE:
 Keep away from heat, sparks and open flame. Do not store in temperatures above 120°F (49°C) or in direct sunlight. Do not inhale vapors or spray mist. Avoid contact with skin and eyes. Wash hands after use and before eating, drinking, smoking or using the toilet. Employee education and training in the safe use and handling of these materials are required under the OSHA Hazard Communication Standard (29 CFR 1910.1200).
KEEP OUT OF THE REACH OF CHILDREN!

SECTION XII-ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATORY INFORMATION

The following percentage table is to be used to meet Environmental Protection Agency (EPA) Regulations:
 1. 40 CFR Part 370 Emergency and Hazardous Chemical Inventory Forms and Community Right-to-Know Reporting Requirements.
 2. Title III Section 313 Toxic Chemical Release Reporting Requirements.
Note: All the chemicals listed must be considered for 1. above. Only the ones marked with an asterisk (*) fall under 2.

The numbers in the following table are good for all shipments beginning 1/26/90 and until further notice.

HAZARDOUS INGREDIENTS IN AEROSOL CLEANERS

Ingredients (Chemicals)	CAS No.	APPROXIMATE PERCENTAGES OF INGREDIENTS BY WEIGHT													
		AB	AC	AK	AG	AE	AG	AG	AG	AG	AG	AG	AG	AG	AG
* 1. Acetone	67-64-1	-	-	-	20	11	-	-	-	-	-	-	-	-	-
2. Aromatic Petroleum Solvent	64742-95-6	-	-	-	-	-	-	-	-	-	-	-	-	-	10
3. 2-Butoxyethanol	111-76-2	-	-	-	-	-	-	05	-	-	-	-	-	-	-
4. Carbon Dioxide	124-38-9	-	-	04	-	-	04	-	-	-	-	-	04	-	-
5. Diacetone Alcohol	123-42-2	-	-	-	04	-	-	-	-	-	-	-	-	-	-
* 6. Ethyl Benzene	100-41-4	05	-	-	09	03	-	-	-	-	04	-	10	01	-
7. Glycol Ether EP	2807-30-9	-	-	-	-	-	-	-	-	-	-	-	04	-	-
8. Isobutane	75-28-5	06	10	-	14	-	-	-	-	06	-	10	05	06	-
9. Isopropyl Alcohol	67-63-0	-	-	-	-	-	-	-	-	10	-	-	30	33	-
10. Isopropyl Amine Alkyl Lauryl Sulphonate	26264-05-1	-	-	-	-	-	-	-	-	-	-	-	-	05	-
*11. Methyl Alcohol (Methanol)	67-56-1	-	-	-	03	07	-	-	06	-	-	-	-	-	-
*12. Methylene Chloride (Dichloromethane)	75-09-2	-	-	-	-	-	-	66	-	-	-	25	-	13	-
*13. Methyl Ethyl Ketone	78-93-3	-	-	-	07	-	-	-	-	-	-	-	-	-	-
*14. Methyl Isobutyl Ketone	108-10-1	-	-	-	-	-	-	-	-	-	-	-	-	05	-
15. Mineral Spirits	64742-89-8	-	-	-	-	-	-	-	-	-	-	-	-	-	42
*16. Perchloroethylene (Tetrachloroethylene)	127-18-4	-	-	48	-	-	-	-	-	-	-	48	-	-	-
17. Propane	74-98-6	06	-	-	20	14	-	-	18	06	-	10	05	06	-
*18. Toluene	108-88-3	-	-	-	29	-	-	-	-	-	-	-	-	-	-
*19. 1,1,1-Trichloroethane (Methylchloroform)	71-55-6	-	-	48	10	-	96	-	-	-	-	48	-	30	-
20. VM&P Naphtha	8032-32-4	63	-	-	-	-	-	-	-	-	56	-	-	-	-
*21. Xylenes	1330-20-7	20	-	-	36	11	-	-	18	-	40	04	-	-	-
Physical Hazard-Fire		100	10	-	88	100	-	09	24	100	-	74	60	87	-
Physical Hazard-Pressure Release		12	10	04	20	28	04	04	18	12	04	20	10	15	-
Health Hazard-Acute		100	10	100	98	100	100	09	90	100	100	99	95	100	-
Health Hazard-Chronic		-	-	48	-	-	-	-	72	-	48	25	-	13	-
Physical Hazard-Reactivity		None of the Aerosol Cleaners have this hazard.													

**Appendix V
Examples of Material Safety Data Sheets**

Figure V.2: Material Safety Data Sheet—Brake Cleaner (Penray Company)

Material Safety Data Sheet											
PENRAY COMPANY 440 DENNISTON COURT WHEELING, ILLINOIS 60090		MSDS No: PEN / 49 4720 BRAKE GARD Revision: 6 Date: July 25, 1989									
National Paint and Coatings Association Hazardous Material Identification System	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">HEALTH HAZARD</td> <td style="text-align: center;">2 - Moderate</td> </tr> <tr> <td style="text-align: center;">FLAMMABILITY HAZARD</td> <td style="text-align: center;">1 - Slight</td> </tr> <tr> <td style="text-align: center;">REACTIVITY HAZARD</td> <td style="text-align: center;">0 - Minimal</td> </tr> <tr> <td style="text-align: center;">PERSONAL PROTECTION</td> <td style="text-align: center;">G - Glasses, Gloves, Vapor Resp</td> </tr> </table>			HEALTH HAZARD	2 - Moderate	FLAMMABILITY HAZARD	1 - Slight	REACTIVITY HAZARD	0 - Minimal	PERSONAL PROTECTION	G - Glasses, Gloves, Vapor Resp
HEALTH HAZARD	2 - Moderate										
FLAMMABILITY HAZARD	1 - Slight										
REACTIVITY HAZARD	0 - Minimal										
PERSONAL PROTECTION	G - Glasses, Gloves, Vapor Resp										
SECTION I. MATERIAL IDENTIFICATION											
Trade/Material Name: 4720 BRAKE GARD											
Description: BRAKE CLEANER											
Chemical Name: CHLORINATED HYDROCARBON											
Manufacturers: PENRAY COMPANY		24 HR. MEDICAL EMERGENCY									
Phone: 708-459-5000		Phone: 800-942-5969									
SECTION II. INGREDIENTS AND HAZARDS											
Ingredient Name:	CAS Number:	Percent:	Hazard:								
1,1,1-TRICHLOROETHANE *	71-55-6	75-85	PEL:350 PPM; TLV:350 PPM; STEL:450 PPM								
XYLENE *	1330-20-7	10-20	PEL:100 PPM; TLV:100 PPM; STEL:150 PPM								
CARBON DIOXIDE PROPELLANT	124-38-9	5	PEL:10000 PPM; TLV:500 PPM; STEL:30000 PPM								
SARA (TITLE III): THIS PRODUCT DOES NOT CONTAIN INGREDIENTS LISTED AS EXTREMELY HAZARDOUS UNDER SECTION 302. IF STORED IN EXCESS OF THE THRESHOLD QUANTITY, THIS PRODUCT SHOULD BE REPORTED UNDER SECTION 311 AND 312 AS A(N):											
- SUDDEN RELEASE HAZARD		- DELAYED (CHRONIC) HEALTH HAZARD									
- IMMEDIATE (ACUTE) HEALTH HAZARD											
Page 1 ---	MSDS 49 continues on page 2		--- Page 1								

Appendix V
Examples of Material Safety Data Sheets

Material Safety Data Sheet

PENRAY COMPANY
440 DENNISTON COURT
WHEELING, ILLINOIS 60090

MSDS No: PEN / 49
4720 BRAKE GARD
Revision: 6
Date: July 25, 1989

SECTION III. PHYSICAL DATA

Appearance & Odor: COLORLESS LIQUID - CHLORINATED SOLVENT ODOR

boiling point: 162-288° F
vapor pressure: 90-100 PSI
water solubility (%): 0
vapor density (air=1): 4-5

Specific gravity (H₂O=1): 1.2115
% volatile by volume: 100

THIS PRODUCT IS IN AEROSOL FORM. INFORMATION PROVIDED DOES NOT APPLY TO THE PROPELLANT PORTION (124-38-9) OF THE FORMULA.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): OVER 140° F Limits: LEL %: NOT UEL %: NOT
ESTABLISHED ESTABLISHED

NFPA Flammable/Combustible Liquid Classification: IIIA

NFPA Fire Hazard Symbol Codes: Flammability: 1 Health: 3 Reactivity: 0 Special:

Extinguishing Media: WATER FOG

Unusual fire or explosion hazards: VAPORS ARE HEAVIER THAN AIR AND MAY COLLECT IN LOW AREAS. CANS WILL RUPTURE FROM INTERNAL PRESSURE AT APPROXIMATELY 190° F AND DISCHARGE CONTENTS.

Special fire-fighting procedures: WEAR POSITIVE PRESSURE, SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS PRODUCT. WATER SPRAY MAY BE USED TO COOL FIRE-EXPOSED CONTAINERS PREVENTING PRESSURE BUILD-UP AND EXPLOSION.

FLASH POINT INFORMATION IS FOR THE NON-PROPELLANT PORTION OF THE FORMULA ONLY.

SECTION V. REACTIVITY DATA

Material IS stable Hazardous polymerization CANNOT occur

Chemical incompatibilities: STRONG OXIDIZING AGENTS

Conditions to avoid: HIGH TEMPERATURES

Hazardous decomposition Products: CARBON MONOXIDE, HYDROGEN CHLORIDE VAPORS, AND SMALL AMOUNTS OF PHOSGENE.

Appendix V
Examples of Material Safety Data Sheets

Material Safety Data Sheet

PENRAY COMPANY
440 DENNISTON COURT
WHEELING, ILLINOIS 60090

Product: 4720 BRAKE GARD
MSDS No: PEN / 49
Revision: 6
Date: July 25, 1989

HEALTH HAZARD INFORMATION continued from page 2

Chronic effect(s): OVEREXPOSURE TO THE INGREDIENTS OF THIS PRODUCT HAS BEEN SUGGESTED AS A CAUSE OF ANESTHETIC/NARCOTIC EFFECTS, CENTRAL NERVOUS SYSTEM EFFECTS AND LIVER OR KIDNEY ABNORMALITIES. ASPIRATION INTO LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL. (SEE COMMENTS)

Signs & symptoms of overexposure:

Eye contact: REDNESS, TEARING, BLURRED VISION.

Skin contact: REDNESS, DRY SKIN.

Inhalation: DIZZINESS, HEADACHE, NAUSEA, UNCONSCIOUSNESS AND ASPHYXIATION ARE POSSIBLE.

Ingestion: NAUSEA, VOMITING, CRAMPS

First aid:

Eye contact: FLUSH WITH CLEAR WATER FOR 15 MINUTES, LIFTING EYELIDS OCCASIONALLY. GET MEDICAL ATTENTION.

Skin contact: WASH WITH SOAP AND WATER. IF IRRITATION DEVELOPS, SEE A PHYSICIAN.

Inhalation: REMOVE TO FRESH AIR. RESTORE NORMAL BREATHING. GET MEDICAL ATTENTION.

Ingestion: CALL A PHYSICIAN OR LOCAL POISON CONTROL CENTER IMMEDIATELY FOR INSTRUCTIONS.

ASPIRATION OF MATERIAL INTO LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS WHICH CAN BE FATAL.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: SMALL SPILL - CONTAIN AND COLLECT PRODUCT WITH INERT ABSORBENT.

LARGE SPILL - VENTILATE AREA. PERSONS NOT INVOLVED IN THE CLEAN-UP, AND NOT WEARING PROTECTIVE EQUIPMENT, SHOULD BE EVACUATED. CONTAIN AND COLLECT PRODUCT WITH INERT ABSORBENT. PLACE IN CLOSED CONTAINERS FOR DISPOSAL. KEEP PRODUCT FROM ENTERING WATER SUPPLY.

Waste management / Disposal: DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: CHEMICAL SPLASH GOGGLES

Page 3 --- SPECIAL PROTECTION INFORMATION continues on page 4 --- Page 3

**Appendix V
Examples of Material Safety Data Sheets**

Material Safety Data Sheet

PENRAY COMPANY
440 DENNISTON COURT
WHEELING, ILLINOIS 60090

Product: 4720 BRAKE GARD
MSDS No: PEN / 49
Revision: 6
Date: July 25, 1989

SPECIAL PROTECTION INFORMATION continued from page 3

Gloves: NITRILE OR PVA

Respirator: AIR-SUPPLIED MASK IN CONFINED AREA OR IN EMERGENCY SITUATIONS.

Workplace considerations:

Ventilation: PROVIDE SUFFICIENT MECHANICAL (GENERAL AND/OR LOCAL) VENTILATION TO MAINTAIN EXPOSURE BELOW TLV.

Safety stations:
EYE WASH STATIONS.

Contaminated equipment:
LAUNDER BEFORE RE-USE.

PERSONAL PROTECTIVE EQUIPMENT SUGGESTIONS PERTAIN MAINLY TO EMERGENCY SITUATIONS INVOLVING A LARGE QUANTITY OF PRODUCT. EYE PROTECTION AND CLOTHING TO PREVENT PROLONGED SKIN CONTACT IS SUFFICIENT UNDER CONDITIONS OF NORMAL USE.

SECTION IX. SPECIAL PRECAUTIONS

Special handling / storage: AVOID BREATHING VAPORS. VAPORS ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW AREAS. DO NOT ENTER THESE AREAS WITHOUT PROPER RESPIRATORY PROTECTION. (SEE SECTION VIII)

Other precautions: ALUMINUM IS NOT AN ACCEPTABLE MATERIAL FOR STORAGE VESSELS.

Prepared/revised by: R.W. KLUG

April 11, 1990

THIS PRODUCT MATERIAL SAFETY DATA SHEET PROVIDES HEALTH AND SAFETY INFORMATION. THE PRODUCT IS TO BE USED IN APPLICATIONS CONSISTENT WITH OUR PRODUCT LITERATURE. INDIVIDUALS HANDLING THIS PRODUCT SHOULD BE INFORMED OF THE RECOMMENDED SAFETY PRECAUTIONS AND SHOULD HAVE ACCESS TO THIS INFORMATION. FOR ANY OTHER USES, EXPOSURES SHOULD BE EVALUATED SO THAT APPROPRIATE HANDLING PRACTICES AND TRAINING PROGRAMS CAN BE ESTABLISHED TO ENSURE SAFE WORKPLACE OPERATIONS. PLEASE CONSULT YOUR LOCAL SALES REPRESENTATIVE FOR ANY FURTHER INFORMATION.

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End of MSDS 49

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**Appendix V
Examples of Material Safety Data Sheets**

Figure V.3: Material Safety Data Sheet—Brake Cleaner (3m Company)



3M General Offices
3M Center
St. Paul, Minnesota
55144-1000
612/733-1110
Duns No.: 00-617-3082

**MATERIAL SAFETY
DATA SHEET**

DIVISION: ADHESIVES, COATINGS AND SEALERS

TRADE NAME:
3M Brake Cleaner Part No. 08906

U.S. I.D. NUMBER: 62-4900-9909-0 62-4970-4909-B 62-4970-9909-3
CS-0406-1920-0

ISSUED: March 15, 1990
EXPIRES: December 30, 1989
DOCUMENT: 10-9129-7

INGREDIENTS	C.A.S. #	PERCENT	EXPOSURE LIMITS			
			VALUE	UNIT	TYPE	AUTH
1,1,1-trichloroethane	71-55-6	40 - 50	350	ppm	TWA	ACGIH
perchloroethylene	127-18-4	40 - 50	25	ppm	TWA	OSHA
propane	74-98-6	10 - 20	1000	ppm	TWA	OSHA
1,4-dioxane	123-91-1	0.1 - 1	25	ppm	TWA	ACGIH

SOURCE OF EXPOSURE LIMIT DATA:
ACGIH: American Conference of Governmental Industrial Hygienists
OSHA: Occupational Safety and Health Administration

THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICAL OR CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 AND 40 CFR PART 372:
1,1,1-trichloroethane
perchloroethylene
1,4-dioxane

2. PHYSICAL DATA

BOILING POINT: Compressed gas
VAPOR PRESSURE: Compressed gas
VAPOR DENSITY (AIR = 1): ca. 5
EVAPORATION RATE (ETHER = 1): .. < 5
SOLUBILITY IN WATER: Very slight
SPECIFIC GRAVITY: N/A
PERCENT VOLATILE: 100 % by weight

Abbreviations: N/D - Not Determined N/A - Not Applicable

Appendix V
Examples of Material Safety Data Sheets



MS: 3M Brake Cleaner Part No. 08906
r-15-1990

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PHYSICAL DATA (cont.)

VOLATILE ORGANICS: 659 gm/liter
PH: N/D
VISCOSITY: N/A

APPEARANCE AND ODOR: Colorless, liquid, sweet odor

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: -50 F
FLAMMABILITY LIMIT - LEL: N/A
FLAMMABILITY LIMIT - UEL: Flammable Gas
AUTOIGNITION TEMPERATURE: N/D

EXTINGUISHING MEDIA:
CO₂, foam, dry chemical

SPECIAL FIRE FIGHTING PROCEDURES:
Fire fighters should be equipped with self-contained breathing apparatus when fighting fires involving this material.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Extremely Flammable. Overheated, closed containers adjacent to fire could explode due to pressure buildup. (Treat as a pressurized product.)

NFPA HAZARD CODES: HEALTH: 3 FIRE: 4 REACTIVITY: 0

REACTIVITY DATA

STABILITY: Stable

INCOMPATIBILITY - MATERIALS TO AVOID:

N/A

CONDITIONS TO AVOID: Do not puncture or incinerate. Do not store at temperatures above 120F.

HAZARDOUS POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS:

CO, CO₂, HF, HCl and possible trace amounts of chlorine and phosgene when subjected to excessive heat or flame.

Abbreviations: N/D - Not Determined N/A - Not Applicable



SDS: 3M Brake Cleaner Part No. 08906
Mar-15-1990

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5. ENVIRONMENTAL DATA

SPILL RESPONSE:

If cans rupture, observe precautions from other sections. Extinguish all ignition sources and ventilate area. Use inorganic absorbent to absorb spill, place absorbed product and partially full cans in a U.S. Dept. of Transportation approved metal container and seal.

RECOMMENDED DISPOSAL:

Incinerate absorbed product and partially full cans in a hazardous waste facility. Dispose of empty cans in a sanitary landfill or incinerate in a commercial facility capable of handling aerosol cans. Consult applicable regulations or authorities before disposal as the product contains halogens. U.S. EPA HAZARDOUS WASTE NO.: D001 (Ignitable).

ENVIRONMENTAL DATA:

CAS #71-55-6 is listed as a priority pollutant by USEPA. Clean Water Act, section 307.
Volatile Organic Compound (VOC):
Maximum VOC = 659 grams/liter.
Maximum VOC minus Water minus Exempt Solvents = 1005 grams/liter.
VOC's were calculated according to Rule 443.1 of the South Coast Air Quality Management District (SCAQMD).

SARA HAZARD CLASS:

FIRE HAZARD: YES PRESSURE: YES REACTIVITY: NO ACUTE: YES CHRONIC: YES

6. SUGGESTED FIRST AID

EYE CONTACT:

Immediately flush eyes with large amounts of water for at least 10 minutes, while holding eyelids open. Call a physician. Flushing with water may not prevent eye injury.

SKIN CONTACT:

Wash affected area with soap and water.

INHALATION:

Move affected person to fresh air at once. If breathing difficulties persist, call a physician.

INGESTION:

Do not induce vomiting. Immediately call a physician or poison control center.

NOTE TO PHYSICIANS: Exposure to 1,1,1-trichloroethane may increase "myocardial irritability." Do not administer sympathomimetic drugs

Abbreviations: N/D - Not Determined N/A - Not Applicable

**Appendix V
Examples of Material Safety Data Sheets**



DS: 3M Brake Cleaner Part No. 08906
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. SUGGESTED FIRST AID (cont.)

(i.e. adrenaline) unless absolutely necessary. No specific antidote. Supportive care and treatment based on judgement of physician in response to the patient recommended.

. PRECAUTIONARY INFORMATION

Keep away from all sources of ignition. The vapors released by the product can be ignited easily and burn explosively. Use only in areas with sufficient ventilation to maintain vapor and spray concentrations below the recommended exposure limits. Provide local exhaust ventilation, if necessary. Avoid prolonged breathing of vapor and mist. Avoid vapor contact with open flame, welding arcs or other high temperature sources which can cause vapor decomposition and harmful gases. Prevent contact with eyes and skin; wear appropriate eye protection such as chemical goggles and impervious gloves when handling the product. Keep out of the reach of children. Do not take internally. Deliberate concentration and inhalation or swallowing may be harmful or fatal. Do not puncture or incinerate can. Do not store at temperatures above 120F.

ADDITIONAL EXPOSURE LIMITS

INGREDIENTS	EXPOSURE LIMITS			
	VALUE	UNIT	TYPE	AUTH
1,1,1-trichloroethane	1900	mg/m3	TWA	ACGIH
1,1,1-trichloroethane	450	ppm	STEL	ACGIH
1,1,1-trichloroethane	2450	mg/m3	STEL	ACGIH
1,1,1-trichloroethane	350	ppm	TWA	OSHA
1,1,1-trichloroethane	1900	mg/m3	TWA	OSHA
1,1,1-trichloroethane	450	ppm	STEL	OSHA
1,1,1-trichloroethane	2450	mg/m3	STEL	OSHA
perchloroethylene	50	ppm	TWA	ACGIH
perchloroethylene	335	mg/m3	TWA	ACGIH
perchloroethylene	200	ppm	STEL	ACGIH
perchloroethylene	1340	mg/m3	STEL	ACGIH
perchloroethylene	170	mg/m3	TWA	OSHA
propane	1800	mg/m3	TWA	OSHA
1,4-dioxane	90	mg/m3	TWA	ACGIH
1,4-dioxane	25	ppm	TWA	OSHA
1,4-dioxane	90	mg/m3	TWA	OSHA

Abbreviations: N/D - Not Determined N/A - Not Applicable

Appendix V
Examples of Material Safety Data Sheets



SDS: 3M Brake Cleaner Part No. 08906
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7. PRECAUTIONARY INFORMATION (cont.)

ADDITIONAL EXPOSURE LIMITS (cont.)

INGREDIENTS	[---- EXPOSURE LIMITS ----]			
	VALUE	UNIT	TYPE	AUTH

SOURCE OF EXPOSURE LIMIT DATA:

- ACGIH: American Conference of Governmental Industrial Hygienists
- OSHA: Occupational Safety and Health Administration

8. HEALTH HAZARD DATA

EYE CONTACT: Spray particulate may cause severe eye irritation and vapor may cause eye irritation.

SKIN CONTACT: May cause skin irritation on prolonged or repeated contact. Perchloroethylene may be absorbed through the skin in harmful amounts.

INHALATION: Overexposures to vapor concentrations exceeding recommended exposure limits may cause respiratory system irritation and temporary nervous system impairment (light-headedness). Prolonged or repeated overexposures to 1,1,1-trichloroethane vapors may cause mild liver and kidney injury and heart rhythm disturbances. Prolonged or repeated overexposures to perchloroethylene vapors may cause liver and kidney injury. Symptoms of overexposure may include headache, dizziness, weakness, fatigue, and on extreme overexposure, unconsciousness. Deliberate misuse by concentration and inhalation of vapor may cause sudden death.

INGESTION: Accidental swallowing is not an anticipated route of exposure due to the aerosol nature of the product. Intentional concentration and ingestion may cause digestive system irritation and light-headedness. Ingestion of large amounts of 1,1,1-trichloroethane may cause burns, nausea, vomiting, lowered blood pressure, heart rhythm disturbances and mild liver and kidney damage. Ingestion of perchloroethylene may cause lung damage and liver disorders.

NOTE: 1,1,1-trichloroethane contains stabilizers, including 1,4-dioxane, a potential cancer hazard. No carcinogenic potential was revealed from studies in which laboratory animals were exposed by inhalation or ingestion to 1,1,1-trichloroethane containing 2.0% 1,4-dioxane. No birth defects or reproductive disorders were observed among exposed laboratory animals.

Abbreviations: N/D - Not Determined N/A - Not Applicable



4SDS: 3M Brake Cleaner Part No. 08906
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8. HEALTH HAZARD DATA (cont.)

NOTE: Perchloroethylene is a potential cancer hazard causing liver tumors and leukemia by the oral and inhalation routes of exposure in laboratory animal studies (IARC possible human exposure 2B).

SECTION CHANGE DATES

The FIRST AID SECTION has been changed since December 30, 1989

The information on this Data Sheet represents our current data and best opinion as to the proper use in handling of this material under normal conditions. Any use of the material which is not in conformance with this Data Sheet or which involves using the material in combination with any other material or any other process is the responsibility of the user.

**Appendix V
Examples of Material Safety Data Sheets**

Figure V.4: Material Safety Data Sheet—Cream Hardener (Fibre Glass-Evercoat Company)

MATERIAL SAFETY DATA SHEET			
This form complies with 29 CFR 1910.1200 (The Hazardous Communication Standard)			
		Fibre Glass-Evercoat Co., Inc. 6600 Cornell Rd., Cincinnati, Ohio 45242 513-489-7600 Emergency Telephone: 1-800-543-4530	
Section I Product Information			
Product Name:	Cream Hardener	Product Class:	Benzoyl Peroxide Paste
Part Number:	351-361,386,860	Date Prepared	8-4-88
Section II Hazardous Ingredients			
Ingredient	Cas No.	Exposure Limit	%
* Benzoyl Peroxide	94-36-0	5mg/m ³ *	<50
Refined Oil Blend	64741-88-4	None	<15
Inorganic Oxide Pigments	N/A	None	< 5
Water	N/A	None	<20
Refer to 29 CFR 1910.1000, Subject z. Also see TLV for Chemical Substances and Physical Agents in the work environment (ACGIH).			
* All ingredients marked with an asterisk (*) are toxic chemicals subject to reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.			
Section III Physical Data			
Boiling Point: Water	100° C	Evaporation Rate (Butyl Acetate = 1):	Slower VOC=0
Vapor Pressure (mm Hg.)	N/A	Vapor Density (Air = 1):	>1
Specific Gravity:	1.2	Melting Point:	Decomposes
Appearance and Odor: Red, White, or Blue. Mild Odor. Solubility in Water: Insoluble			
Section IV Fire and Explosion Hazard Data			
Flash Point:	180° F T.C.C.	Flammable Limits:	LEL N/A UEL N/A
Extinguishing Media: CO ₂ , Dry Chemical or Foam			
Special Fire Fighting Procedures: Evacuate area and fight fire from a distance. Cool surrounding area with water.			
Unusual Fire and Explosion Hazards: When confined during exposure to a fire an explosive decomposition may occur.			
Hazardous Decomposition Products: Flammable gases. Can form explosive mixture with air.			
Section V Health Hazard Data			
Permissible Exposure Level: N/E (See Hazardous ingredients for Component TLV data)			
Primary Routes of Entry: Skin and Ingestion			
Effects of Overexposure: Harmful or fatal if swallowed. Irritant when in contact with eyes or with open abraded skin.			
First Aid: Skin-Wash with soap and water. Eye-Flush with water for 15 minutes. Get medical attention. Ingestion-Induce vomiting and get medical attention.			

Appendix V
Examples of Material Safety Data Sheets

Health Hazard Data - Cont.

Effects of Chronic Overexposure: Not established

Carcinogenicity: Not listed as carcinogen

Section VI Reactivity Data

Stability: Unstable

Hazardous Polymerization: Will not occur

Incompatibility: Strong acids, Alkalis, Reducing Agents, Oxidizers, Metal Salts

Conditions to Avoid: Exposure to temperature above 105°F

Section VII Spill or Leak Procedures

Steps to be taken in case of Spill or Leak:

Absorb on vermiculite or perlite. Wash area with soap and water.

Waste Disposal Method: Incinerate in accordance with federal, state and local regulations.

CAUTION: Do not incinerate in closed containers.

Section VIII Special Protection Information

Respiratory Protection: No special requirements.

Ventilation: Fan or forced air

Protective Gloves: Plastic or rubber.

Eye Protection: Safety glasses

Other: Eye wash station

Section IX Special Precautions

Storing and Handling: Keep away from heat flame or sources of ignition.

Store below 100°F

NFPA Classification: Health- 2 Fire- 2 Reactivity- 2 Special Hazard- oxidizer

Other:

D.O.T. Class: Consumer Commodity ORM-D
D.O.T. I.D. No.: Putty N.O.T. Item No. 150110
IATA Name: Organic Peroxide
IATA Hazard Class: 5.2 Packaging Group 2
IMO NO. UN2089

Appendix V
Examples of Material Safety Data Sheets

Figure V.5: Material Safety Data Sheet—Cream Hardener (Clausen Company)

MATERIAL SAFETY DATA SHEET					
(Approved by U. S. Department of Labor "Essentially Similar" to Form L89-005-1) 846-4500 NPVLA 6-70					
Section I					
MANUFACTURER'S NAME THE CLAUSEN COMPANY					
STREET ADDRESS 1055 KING GEORGE ROAD, POST OFFICE DRAWER 140					
CITY, STATE, AND ZIP CODE FORDS, NEW JERSEY 08863					
EMERGENCY TELEPHONE NO. (201) 738-1166					
CHEMICAL NAME AND SYNONYMS BPO Paste-Cream Hardener			TRADE NAME CREAM HARDENER - 50% BPO		
CHEMICAL FAMILY Benzoyl Peroxide Paste			FORMULA Mixture		
Section II - HAZARDOUS INGREDIENTS					
PAINTS, PRESERVATIVES, & SOLVENTS					
PIGMENTS	%	TLV (Units)	SOLVENTS	%	TLV (Units)
CATALYST			ADDITIVES		
Benzoyl Peroxide	50				
VEHICLE			OTHERS		
HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES				%	TLV (Units)
Water emulsifiers, plasticizer and stearate are not considered hazardous materials				50	
Section III - PHYSICAL DATA					
BOILING POINT (°F.)	N/A		SPECIFIC GRAVITY (H ₂ O = 1)	.906	
VAPOR PRESSURE (mm Hg.)	N/A		PERCENT VOLATILE BY VOLUME (%)	9 to 16%	
VAPOR DENSITY (AIR = 1)	Heavier than air		EVAPORATION RATE (Ethyl Ether = Slower)		
SOLUBILITY IN WATER	Insoluble				
APPEARANCE AND ODOR	White or pigment paste				
Section IV - FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (METHOD USED)	180°F open cup		FLAMMABLE LIMITS	Lel	Uel
			Not Established		
EXTINGUISHING MEDIA	Foq nozzle, water, CO ₂ dry chemical foam				
SPECIAL FIRE FIGHTING PROCEDURES	Should quantities become ignited, spray surrounding material to avoid spreading.				
UNUSUAL FIRE AND EXPLOSION HAZARDS	When confined during exposure to a fire, an explosive decomposition may occur.				
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**Appendix V
Examples of Material Safety Data Sheets**

Section V - HEALTH HAZARD DATA	
THRESHOLD LIMIT VALUE	Not available for wet product.
EFFECTS OF OVEREXPOSURE	Unknown
EMERGENCY AND FIRST AID PROCEDURES	For eye contact - flush with water.
	For skin contact - wash with soap and water.
	If swallowed - rinse mouth, drink water/milk consult with physician.

Section VI - REACTIVITY DATA			
STABILITY	UNSTABLE	X	CONDITIONS TO AVOID Avoid exposure to open flame, or temperature above 105° - Contact with combustible material can cause decomposition.
	STABLE		
INCOMPATIBILITY (Materials to avoid)	Strong oxidizing or reducing agents, mineral acids, amines, accelerat		
HAZARDOUS DECOMPOSITION PRODUCTS	Decomposition products are flammable.		
	Flammable Gases - can form explosive mixtures with air.		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	XX	

Section VII - SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Either wet down spill further, or mix spilled material with non-flammable absorbent material such as vermiculite or perlite and sweep up using non-sparking tools.
WASTE DISPOSAL METHOD	Any disposal must comply with local, state and federal regulations.

Section VIII - SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify Type) Ventilate with air flow to keep vapor concentration below TLV.			
VENTILATION Fan or forced air	LOCAL EXHAUST	None required	SPECIAL See Section IX
	MECHANICAL (General)	Acceptable	OTHER
PROTECTIVE GLOVES	If desired	EYE PROTECTION	Yes /Safety Goggles
OTHER PROTECTIVE EQUIPMENT			

Section IX - SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Do not store near heat sources or ignition such as radiators or steampipes.
OTHER PRECAUTIONS	Store below 100°F to maintain active oxygen content. Keep away from extreme heat, open flame.
DANGER:	If swallowed! Combustible! Avoid breathing of vapors. Do not flame cut, braze or weld...

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OSHA's Inspection Procedures for Material Safety Data Sheets

Employer Responsibilities

Procedures for inspection of material safety data sheets begin with the chemical manufacturer or importer responsible for originating, modifying, and distributing the MSDS to other employers who use the chemicals. Under the Hazard Communication Standard, chemical manufacturers and importers must

- obtain or develop MSDSS for each hazardous chemical they produce or import if it is used by workers in the workplace,
- ensure that the information recorded accurately reflects information and scientific evidence used in making a hazard determination for the chemical,
- modify any MSDS they developed when they become aware of any new information regarding the hazards of a chemical, and
- ensure that distributors and employers are provided the MSDS with the initial chemical shipment and the initial shipment after any revision.

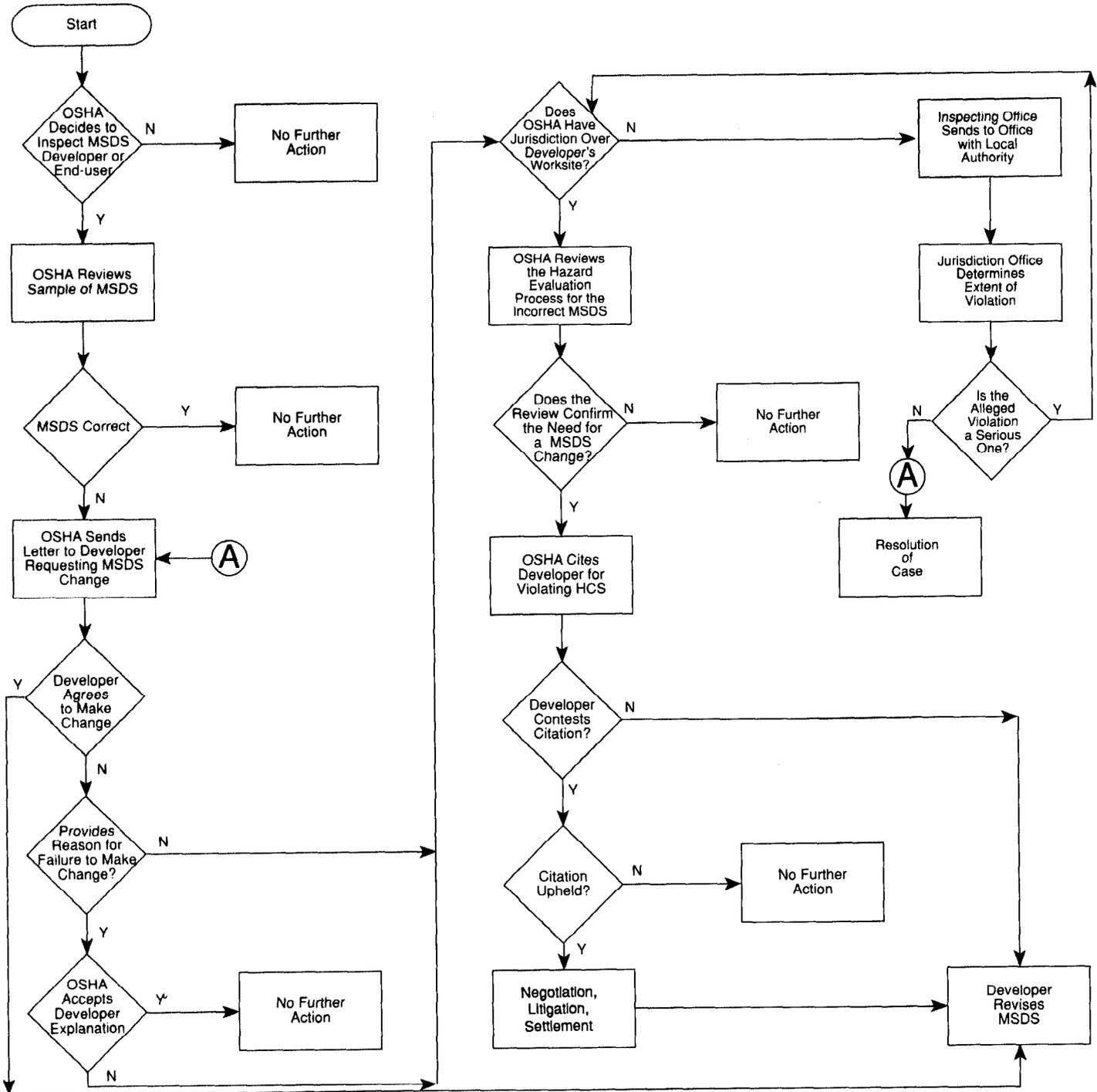
While OSHA requires employers to maintain MSDSS on file for the chemicals they use in their business, they are not held responsible for inaccurate information on the MSDS unless they prepare their own sheets.¹ To enforce compliance, OSHA relies on its inspections of both producers of hazardous chemicals and employers to provide oversight of the hazard evaluations and MSDS accuracy and completeness.

OSHA Inspection Process

OSHA inspects or examines MSDSS at the site of either the developer of the MSDS or an employer using hazardous substances, normally by reviewing a sample of the sheets (see fig. VI.1). If an obvious problem is found, the inspector brings the MSDS into the OSHA area office, which first writes to the MSDS developer requesting corrective action within 30 days. If the developer fails to respond, OSHA sends a referral to the state program or federal area office within whose jurisdiction the manufacturer or importer does business. Subsequently, the office with jurisdiction must then conduct an abbreviated review to confirm the need for a modification in the MSDS and to determine the extent of the violation.

¹HCS permits an employer to perform its own hazard evaluation and to prepare its own MSDS on a hazardous chemical in lieu of the MSDS received from the manufacturer or importer. In this case, the employer is treated like a chemical manufacturer or importer and is responsible for the accuracy of the information.

Figure VI.1: OSHA's Procedure for Inspecting Chemical Manufacturers' and Importers' Hazard Evaluation Process



Data Supporting Figures in Report

Data for Figures in Chapters 1 - 5

Table VII.1: Data for Figure 2.1

Industry group	Percent of employers out of compliance with HCS		
	1	2	3
Construction	24%	19%	15%
Manufacturing	41	37	19
Wholesale/retail trade/services	30	25	19

Table VII.2: Data for Figure 2.2

Employer size	Percent of employers out of compliance with HCS
Fewer than 20 employees	58%
20-499 employees	38
500 or more employees	20

Note: Sampling errors range from +/-9 percentage points for employers with fewer than 20 employees to +/-5 points for employers with 500 or more employees.

Table VII.3: Data for Figure 2.3

Industry group	Percent of employers out of compliance with HCS		
	1	2	3
Construction	55%	48%	33%
Manufacturing	63	33	18
Personal services	57	43	42

Note: Sampling errors range from +/-12 to +/-18 percentage points for employer groups with fewer than 20 employees, from +/-8 to +/-10 points for employer groups with 20 to 499 employees, and +/-6 to +/-10 points for employer groups with 500 or more employees.

Table VII.4: Data for Figure 3.1

Employer size	Percent of employers slightly aware/unaware of HCS
Fewer than 20 employees	29
20-499 employees	10
500 or more employees	2

Note: Sampling errors range from +/-5 percentage points for employers with fewer than 20 employees to +/-1 point for employers with 500 or more employees.

**Appendix VII
Data Supporting Figures in Report**

Table VII.5: Data for Figure 3.2

Employer size	Percent of employers aware of HCS		
	1	2	3
All employers	45%	44%	11%
Fewer than 20 employees	42	46	11
20-499 employees	53	36	11
500 or more employees	72	19	9

Note: Sampling errors range from +/-4 percentage points to +/-6 points for all employers, +/-5 points to +/-7 points for employers with fewer than 20 employees, +/-4 points to +/-6 points for employers with 20 to 499 employees, and +/-4 points to +/-7 points for employers with 500 or more employees.

Table VII.6: Data for Figure 4.1

Problems with all/ almost all MSDSs	Percent of employers who receive MSDSs
Too technical for employees	55%
Too technical for managers	32
Too much information	38
Not enough relevant information	13
Too difficult to locate information	25
Contain inaccurate information	3
Safe substances classified as hazardous	8
Inconsistent MSDSs from different manufacturers	10
MSDSs difficult to obtain from manufacturers	6

Note: Sampling errors range from +/-7 percentage points for "too technical for employees" to +/-2 percentage points "for inaccurate information."

Data for Figures in Appendix I

Table VII.7: Data for Figure I.1

HCS requirements violated	Percent of employers out of compliance with HCS
MSDS, training, and label requirements	5%
Any two requirements only	32
Any one requirement only	63

Note: Sampling errors range from +/-9 percentage points for "any one requirement" only to +/-4 percentage points for MSDS training and "labeling requirements."

**Appendix VII
Data Supporting Figures in Report**

Table VII.8: Data for Figure I.2

Number of chemical hazards	Percent of employers who receive MSDSs	Percent of employers who do not receive MSDSs
None	3%	17%
1	4	17
2-4	36	37
5-7	33	21
8 or more	24	8

Note: Sampling errors range from +/-2 percentage points for employers who receive MSDSs reporting no hazards to +/-7 percentage points for employers who do not receive MSDSs reporting 2 to 4 hazards.

Data for Figures in Appendix IV

Table VII.9: Data for Figure IV.1

Industry group	Percent of worksites out of compliance with HCS
Construction	23%
Manufacturing	36
Wholesale/retail trade/services	27
Other	13

Note: In all industries, OSHA found 26 percent of worksites to be out of compliance with HCS.

Table VII.10: Data for Figure IV.2

HCS requirement	Percent of all HCS violations
Written program	38%
Label/hazard evaluation/trade secret	12
Material Safety Data Sheet	23
Employee training	27

Table VII.11: Data for Figure IV.3

Industry group	Percent of HCS violations			
	1	2	3	4
Construction	40%	7%	26%	27%
Manufacturing	34	19	19	28
Wholesale/retail trade/services	36	14	23	27
Other	37	13	24	26

**Appendix VII
Data Supporting Figures in Report**

Table VII.12: Data for Figure IV.4

Worksite size	Percent of HCS violations			
	1	2	3	4
Fewer than 20 employees	37%	13%	23%	27%
20-499 employees	35	18	19	28
500 or more employees	23	32	18	27

Table VII.13: Data for Figure IV.5

Industry group	Percent of "serious" violations
All industries	40%
Construction	38
Manufacturing	45
Wholesale/retail trade/services	40
Other	33

Table VII.14: Data for Figure IV.6

Worksite size	Percent of "serious" violations
All worksites	40%
Fewer than 20 employees	38
20-499 employees	44
500 or more employees	50

Table VII.15: Data for Figure IV.7

Industry group	Average penalty			
	1	2	3	4
Construction	\$71	\$164	\$346	\$5
Manufacturing	122	218	472	6
Wholesale/retail trade/services	87	195	350	3
Other	107	157	254	3

Table VII.16: Data for Figure IV.8

Worksite size	Average penalty			
	1	2	3	4
Fewer than 20 employees	\$68	\$155	\$298	\$4
20-499 employees	126	230	460	7
500 or more employees	201	281	714	12

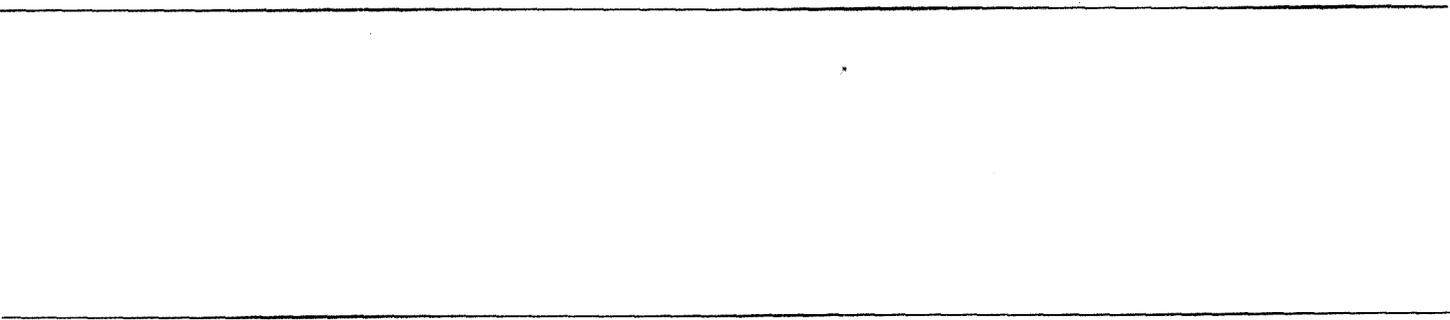
Major Contributors to This Report

Human Resources Division, Washington D.C.

Carlotta C. Joyner, Assistant Director,
Charles A. Jeszeck, Assignment Manager
Susan L. Sullivan, Evaluator, Computer Science
Virginia Douglas, Reports Analyst

Philadelphia Regional Office

David J. Toner, Regional Management Representative
James A. Slaterbeck, Evaluator-in-Charge
Michelle Walker, Senior Evaluator
Marilyn R. Fisher, Computer Programmer Specialist
Harry S. Shanis, Design Methodology Specialist



Related GAO Products

OSHA's Oversight of Federal Agency Safety and Health Programs
(GAO/T-HRD-91-31, May 16, 1991).

Occupational Safety & Health: OSHA Policy Changes Needed to Confirm That Employers Abate Serious Hazards (GAO/HRD-91-35BR, May 8, 1991).

Occupational Safety & Health: Options For Improving Safety and Health In the Workplace (GAO/HRD-90-66BR, Aug. 24, 1990).

How Well Does OSHA Protect Workers From Reprisal: Inspector Opinions
(GAO/T-HRD-90-8, Nov. 16, 1989).

Occupational Safety & Health: OSHA Contracting for Federal Rulemaking Activities (GAO/HRD-89-102BR, June 16, 1989).

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