



Interoffice Communication

To Safety Directors

From Tom Grumbles

Date March 26, 1982

Subject OSHA ANPR for Hazard Communication

Enclosed is a copy of the proposed labeling standard promulgated March 19. It does not appear to be too burdensome in view of our current practices. However we will be asked to comment, so please review in time for discussion at the industrial hygiene meeting May 12 and 13.

A handwritten signature in black ink, appearing to read "Tom", with a long horizontal stroke extending to the right.

Tom Grumbles

TG:pf

CCR 000002231

Containers. Washington, D.C.: Government Printing Office, 1979 and previous years.

35. Discher, David P., Kleinmann, G.G., and Foster, F.J., National Occupational Hazards Survey—Pilot Study for Development of an Occupational Disease Surveillance Method. Report No. NIOSH-75-162/Sponsored by the National Institute for Occupational Safety and Health. Department of Environmental Health. Seattle: University of Washington, May 1975.

36. U.S. Department of Labor, Bureau of Labor Statistics. Occupational Injuries and Illnesses, 1977. Report 561: Washington, D.C.: Government Printing Office, 1979.

37. U.S. Department of Labor, Supplementary Data System. Subfile on Chemical Injuries and Illnesses, 1976-77. (Computerized Information Retrieval).

38. U.S. Department of Labor, Assistant Secretary for Policy, Evaluation, and Research. An Interim Report to Congress on Occupational Diseases, 1980.

39. Analysis prepared by U.S. Department of Labor, Assistant Secretary for Policy, Evaluation, and Research. 1972 Survey of Disabled and Nondisabled Adults Ages 20-64. SSA/HEW, 1979.

40. Dorothy Rice, et al. "Social and Economic Implications of Cancer in the United States." Paper presented to Expert Committee on Cancer Statistics of the World Health Organization, June 20-26, 1978.

41. Council on Environmental Quality, Toxic Substances Strategy Committee. Toxic Chemicals and Public Protection: Washington, D.C.: U.S. Government Printing Office, 1980.

42. The relationship is extrapolated to entire turnover rates and is based on evidence in W. Kip Viscusi, Employment Hazards: An Investigation of Market Performance. Cambridge: Harvard University Press, 1979.

43. Provided by the Federal and Industrial Applications Division, National Fire Data System.

VII. Public Participation

Interested persons are invited to submit written data, views, and arguments on this proposed standard. These comments must be received on or before May 18, 1982, and submitted in quadruplicate to the Docket Officer, Docket H-022, U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW., Room S-6212, Washington, D.C. 20210; (202) 523-7894. Written submissions must clearly identify the provisions of the proposal which are addressed, and the position taken on each issue.

Under section 6(b)(3) of the Act, OSHA is scheduling public hearings in several locations to permit interested persons an opportunity to submit oral testimony concerning the issues raised by the proposed standard, including the economic and environmental impacts. The hearings will begin on June 15, 1982, in Washington, D.C. A future notice will provide hearing dates in other cities.

Notices of Intention To Appear

All persons wishing to participate in the public hearings must file a notice of intention to appear, in quadruplicate, on or before May 18, 1982 addressed to Mr. Tom Hall, OSHA Division of Consumer Affairs, Docket No. H-022, Room N-3635, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, D.C. 20210; (202) 523-8024.

The notices of intention to appear must contain the following information:

- (1) The name, address and telephone number of each person to appear;
- (2) The capacity in which the person will appear;
- (3) The approximate amount of time requested for the presentation;
- (4) The specific issues that will be addressed;
- (5) A detailed statement of the position that will be taken on each issue addressed; and
- (6) Whether the party intends to submit documentary evidence and if so, a brief summary of that evidence.

Filing of Testimony and Evidence Before Hearing

Any party requesting more than 15 minutes for a presentation at the hearing, or submitting documentary evidence, must provide in advance the complete text of the testimony or documentary evidence to be presented. These texts shall be submitted in quadruplicate to the OSHA Division of Consumer Affairs, at the above address, and must be submitted by June 1, 1982.

These submissions will be available for inspection and copying at the OSHA Docket Office, Room S6212, at the above address.

Each submission received will be reviewed to ascertain if the amount of time requested in the notice of intention to appear is appropriate. In those instances where the information contained in the submission does not justify the amount of time requested, a more appropriate time allocation will be made and the participant will be notified of the change. Any party who has not substantially complied with this requirement may be limited to a 15 minute presentation, and may be requested to return for questioning at a later time.

Conduct of Hearings

The hearings will begin at 9:30 a.m. with resolution of any procedural matters relating to the proceeding. The hearings will be conducted in accordance with 29 CFR Part 1911, allowing full development of the record and permitting all parties to exercise their rights of participation.

The hearing will be presided over by an Administrative Law Judge who will have all the powers necessary or appropriate to conduct a full and fair informal hearing as provided in 29 CFR Part 1911. Following the close of the hearing or of any post hearing comment period, the presiding Administrative Law Judge will certify the record to the Assistant Secretary of Labor for Occupational Safety and Health.

All written and oral submissions, as well as other information gathered by the Agency, will be considered in any action taken. The record of this rulemaking, including written comments and materials submitted in response to this notice and notices of intention to appear at the public hearings, will be available for inspection and copying in the Docket Office, Room S-6212, at the above address, between the hours of 8:15 a.m. and 4:45 p.m.

VIII. Authority and Signature

This document was prepared under the direction of Thorne G. Auchter, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, D.C. 20210. Pursuant to sections 6(b) and 8(q) of the Act, it is hereby proposed to amend 29 CFR by adding a new § 1910.1200 as set forth below.

(Sec. 6(b), 8(c) and 8(q). Pub. L. 91-596, 84 Stat. 1593, 1599, 1990; 29 U.S.C. 655, 657; 29 CFR Part 1911; Secretary of Labor's Order No. 8-76 (41 FR 25059))

Signed at Washington, D.C. this 17th day of March 1982.

Thorne G. Auchter,
Assistant Secretary for Occupational Safety and Health.

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

It is proposed to amend 29 CFR by adding a new § 1910, 1200 to read as follows:

§ 1910.1200 Hazard communication.

(a) *Scope and application.* (1) This section requires chemical manufacturers to assess the hazards of chemicals which they produce, and all employers in SIC Codes 20 through 39 (Division D, Standard Industrial Classification Manual) to provide information to their employees about the hazardous chemicals which they use by means of a hazard communication program, labels, placards, material safety data sheets, and information and training.

(2) This section applies to any chemical which is known to be present in the workplace in such a manner that

employees may be exposed under normal conditions of use or in a foreseeable emergency.

(3) Any mixture which is comprised at least one (1) percent (by weight or volume) of any chemical determined to be hazardous shall also be considered hazardous for purposes of this section unless the mixture has been evaluated as a whole and the data indicates it is not hazardous.

(4) If employee protection necessitates disclosure of hazardous chemicals comprising less than one (1) percent (by weight or volume) of a mixture, the Assistant Secretary may lower or eliminate this concentration exemption by a rulemaking notice in the Federal Register.

(5) This section does not apply to chemicals being developed and used only in research laboratories.

(6) This section does not apply to chemicals which are foods, drugs, cosmetics or tobacco products intended for personal consumption by employees while in the workplace.

(b) **Definitions.** "Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

"CAS number" means the unique identification number assigned by the Chemical Abstracts Service to chemicals.

"Chemical" means any element, chemical compound or mixture of elements and/or compounds.

"Chemical manufacturer" is an establishment where chemicals are produced for use or distribution.

"Chemical name" is the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS).

"Flashpoint" means any liquid having a flashpoint at or above 100° F (37.8° C).

(c) Combustible liquids shall be divided into two classes as follows:

(i) Class II liquids shall include those with flashpoints at or above 100° F (37.8° C) and below 140° F (60° C) except any mixture having components with flashpoints of 200° F (93.3° C) or higher, the volume of which make up 99 percent or more of the total volume of the mixture;

(ii) Class III liquids shall include those with flashpoints at or above 140° F (60° C). Class III liquids are subdivided into two subclasses:

(A) Class IIIA liquids shall include those with flashpoints at or above 140° F (60° C) and below 200° F (93.3° C), except any mixture having components with flashpoints of 200° F (93.3° C), or

her, the total volume of which make up 99 percent or more of the total volume of the mixture;

(B) Class IIIB liquids shall include those with flashpoints at or above 200° F (93.3° C). This section does not cover Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids;

(iii) When a combustible liquid is heated for use to within 30° F (16.7° C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

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

"Compressed gas" means:

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

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

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

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

"Designated representative" means any individual or organization to whom an employee or former employee gives written authorization to exercise such employee's rights under this section.

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

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which may or does result in an uncontrolled release of a hazardous chemical into the workplace.

"Employee" means a worker who may be exposed under normal operating conditions or foreseeable emergencies to hazardous chemicals in a covered workplace, including, but not limited to production workers, line supervisors, and repair or maintenance personnel. Office workers, grounds maintenance personnel, security personnel or non-resident management are generally not included, unless their job performance routinely involves potential exposure to hazardous chemicals.

"Employer" means an establishment in SIC Codes 20-39 that manufactures or uses hazardous chemicals.

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

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

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

(ii) "Liquid, flammable" means:

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

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

(C) Gaseous ammonia;

(iii) "Liquid, flammable" means any liquid having a flashpoint below 100° F (37.8° C), except any mixture having components with flashpoints of 100° F (37.8° C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

(A) Class IA shall include liquids having flashpoints below 73° F (22.8° C) and having a boiling point below 100° F (37.8° C);

(B) Class IB shall include liquids having flashpoints below 73° F (22.8° C) and having a boiling point at or above 100° F (37.8° C); and

(C) Class IC shall include liquids having flashpoints at or above 73° F (22.8° C) and below 100° F (37.8° C);

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

"Flashpoint" means the minimum temperature at which a liquid gives off a

vapor in sufficient concentration to ignite when tested as follows:

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

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

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

Note.—For mixtures, if the result of any test method described in paragraphs (i)–(iii) is above 100° F (37.8° C), evaporate a fresh sample to ninety (90) percent of the original volume and retest. The lower of the two values shall be taken as the flash point.

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

"Hazardous chemical" means any chemical which is combustible, a compressed gas, explosive, flammable, a health hazard, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

"Hazard warning" means any words, pictures, symbols, or combination thereof which convey the hazards of the chemical(s) in the container.

"Health hazard" means a chemical which, upon exposure, may result in the occurrence of acute or chronic health effects in employees. For further explanation, see Appendix A, Health Hazards, of this section.

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

"Organic peroxide" means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

"Oxidizer" means a chemical other than a blasting agent or explosive as defined in § 1910.106(a), that initiates or

promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

"Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130° F (54.4° C) or below.

"Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

"Use" means handle, react, process, package or repackage, or transport.

"Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

"Work area" means a room or defined space in an establishment where hazardous chemicals are produced or used, and where employees are present.

"Workplace" means an establishment at one geographical location containing one or more work areas.

(c) **Hazard determination and communication program.** (1) Each chemical manufacturer shall evaluate the chemicals produced in his/her workplace to determine if they are hazardous. See Appendix B for guidelines.

(2) Each employer shall develop and implement a hazard communication program for his/her workplace which at least meets the criteria specified in paragraphs (d), (e), and (f) of this section for labels and placards, material safety data sheets, and employee information and training, and which includes the following:

(i) The procedures the employer will use to determine the hazards of the chemicals which he/she produces;

(ii) A list of the hazardous chemicals known to be present in the workplace (using an identity that is referenced on the appropriate material safety data sheet); and

(iii) The methods the employer will use to inform employees of the hazards of non-routine tasks, for example, repair and maintenance of unlabeled pipes or the cleaning of reactor vessels.

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

(4) The required list of hazardous chemicals shall be made available to employees or their designated representatives, the Assistant Secretary and the Director.

(d) **Labels and placards.** (1) The employer shall ensure that each container of hazardous chemicals in the

workplace is labeled, tagged or marked with the following information:

(i) Identity of the hazardous chemical(s) contained therein; and
(ii) Hazard warnings.

(2) When stationary containers in a work area have similar contents and hazards, the employer may post signs or placards to convey the required information rather than affixing labels to each individual container.

(3) The employer shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:

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

(ii) Hazard warnings; and

(iii) Name, address and telephone number of the manufacturer.

(4) The employer need not affix new labels to comply with this standard if existing labels already convey the necessary information.

(5) The employer is not required to label containers of ten gallons (37.8 liters) or less in volume, into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer.

(e) **Material safety data sheets.** (1) Each employer shall obtain or develop a material safety data sheet for each hazardous chemical which he/she produces or uses.

(2) Each material safety data sheet shall reflect the information contained in the sources consulted by the chemical manufacturer in his/her hazard determination under paragraphs (c)(1) and (c)(2) of this section, and shall contain at least the following information:

(i) The chemical and common name(s), CAS Number(s) and the identity used on the label for all hazardous ingredients which comprise greater than one (1) percent of the chemical (except as provided by paragraph (g) of this section on trade secrets);

(ii) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);

(iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;

(iv) Known acute and chronic health effects of exposure to the hazardous chemical, including signs and symptoms of exposure, and medical conditions which may be aggravated by exposure to the chemical;

(v) The primary route(s) of entry and permissible exposure limit (for those hazardous chemicals for which OSHA has promulgated a permissible exposure limit);

(vi) Precautions for safe handling and use, including appropriate hygienic practices, procedures for decontaminating equipment prior to performing repairs and maintenance, and procedures for clean-up of leaks or spills;

(vii) Engineering controls recommended;

(viii) Work practices recommended;

(ix) Personal protective equipment recommended;

(x) Emergency and first aid procedures;

(xi) The date of preparation of the material safety data sheet or the last change to it; and

(xii) The name, address and telephone number of the manufacturer preparing the sheet.

(3) If no information is found for any given category on the material safety sheet, the employer shall mark it to indicate no information was found.

Blank spaces on existing material safety data sheets will be considered to indicate that information was sought but not found. It is the chemical manufacturer's responsibility to ensure that this interpretation is accurate. As the MSDSs are updated, the blanks shall be marked as required.

(4) If the employer becomes aware of any information which is both new and significant regarding the health hazard of a chemical, this shall be added to the material safety data sheet within a reasonable period of time.

Chemical manufacturers shall ensure that manufacturing purchasers of hazardous chemicals are provided an appropriate material safety data sheet with their initial shipment, and with the first shipment after a material safety data sheet is updated. If the material safety data sheet is not provided with shipment, the purchasing manufacturing employer shall obtain it from the chemical manufacturer as soon as possible.

(6) The employer shall maintain copies of the required material safety data sheets for each hazardous chemical in the workplace, and shall ensure that they are readily accessible.

(7) Material safety data sheets for the hazardous chemicals they are exposed to shall be made available to employees and their designated representative, and upon request, to the Assistant Secretary and the Director.

(f) *Employee information and training.* The employer shall provide employees with information and training on

hazardous chemicals in the workplace at the time of their initial assignment, and whenever a new hazardous chemical is introduced into their work area.

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

(i) The requirements of this regulation;

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

(iii) The location and availability of the list of hazardous chemicals and material safety data sheets required by this section.

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

(i) Methods and observations the employee may use to detect the presence or release of a hazardous chemical in the workplace;

(ii) The hazards of the chemicals in the workplace;

(iii) The measures employees can take to protect themselves from the hazards; and

(iv) The details of the hazard communication program developed by the employer and how employees can obtain and use the appropriate hazard information.

(g) *Trade secrets.* (1) An employer may withhold the precise chemical name of a chemical if:

(i) The employer can substantiate that it is a trade secret;

(ii) The chemical is not a carcinogen, mutagen, teratogen, or a cause of significant irreversible damage to human organs or body systems for which there is a need to know the precise chemical name;

(iii) The chemical is identified by a generic chemical classification which would provide useful information to a health professional;

(iv) All other information on the properties and effects of the chemical required by this section is contained in the material safety data sheet;

(v) The material safety data sheet indicates which category of information is being withheld on trade secret grounds; and

(vi) In any event, the withheld information is provided on a confidential basis to a treating physician who states in writing (except in an emergency situation) that a patient's health problems may be the result of occupational exposure. A statement to this effect with the name of the manufacturer and an emergency telephone number shall be included in the material safety data sheet.

(2) To the extent that names of trade secret chemicals are disclosed, the employer may condition employee, designated representative, and

downstream employer access to such information upon acceptance of a reasonable confidentiality agreement. The agreement may restrict use of the information to health purposes, prohibit disclosure of the information to anyone other than a treating physician without the consent of the originating employer, and provide for compensation or other legally appropriate relief for any competitive harm which results from a breach of the agreement.

(h) *Effective dates.* Employers shall be in compliance with this section within the following time periods:

Employer number of employees	Pure substances	Mixtures
Chemical manufacturers:		
More than 250	1 year	2 years
25 to 250	1 1/2 years	2 1/2 years
Fewer than 25	2 years	3 years
Other employers	3 1/2 years	3 1/2 years

Appendix A—Health Hazards

Although safety hazards related to the physical characteristics of a chemical can be objectively defined in terms of testing requirements (e.g. flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body—such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees—such as shortness of breath, a non-measurable, subjective feeling. Employees exposed to such hazards should be apprised of both the change in body function and the signs and symptoms that may occur to signal that change.

The determination of occupational health hazards is complicated by the fact that many of the effects or signs and symptoms occur commonly in non-occupationally exposed populations, so that effects of exposure are difficult to separate from normally occurring illnesses. Occasionally, a substance causes an effect that is rarely seen in the population at large, such as angiosarcomas caused by vinyl chloride exposure, thus making it easier to ascertain that the occupational exposure was the primary causative factor. More often, however, the effects are common, such as lung cancer. The situation is further complicated by the fact that most chemicals have not been adequately tested to determine their health hazard potential, and data does not exist to substantiate these effects.

There have been many attempts to categorize effects and to define them in various ways. Generally, the terms "acute" and "chronic" are used to delineate between effects on the basis of severity or duration. "Acute" effects usually occur rapidly as a result of short-term exposures, are of short duration, and generally reversible. "Chronic" effects occur as a result of long-term exposure, are of long duration, and may be irreversible. Neither of these terms gives

sufficient guidance to those attempting to define a health hazard.

The acute effects referred to most frequently are those defined by the American National Standards Institute (ANSI) standard for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1978)—irritation, corrosivity, sensitization and lethal dose. Although these are important health effects, they do not adequately cover the considerable range of acute effects which may occur as a result of occupational exposure, such as, for example, narcosis.

Similarly, the term chronic effect is often used to cover only carcinogenicity, teratogenicity, and mutagenicity. These effects are obviously a concern in the workplace, but again, do not adequately cover the area of chronic effects, excluding, for example blood dyscrasias (anemia).

Although the goal of defining precisely, in measurable terms, every possible health effect that may occur in the workplace as a result of chemical exposures cannot realistically be accomplished, this does not negate the need for employers to be protected from such effects when they are known, and to be informed of all types of health hazards. Consequently, in assessing the health hazard potential of a chemical for purposes of compliance with this standard, the employer shall consider the scientifically well-established evidence of any type of health effect which may occur in any body system of his/her employees. Some sources of information which the employer may wish to consult in conducting the hazard evaluation are listed in Appendix B.

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

1. Hepatotoxic agents: Chemicals which produce liver damage. Signs & Symptoms: Jaundice; hepatitis. Chemicals: Carbon tetrachloride; nitrosamines.

2. Nephrotoxic agents: Chemicals which produce kidney damage. Signs & Symptoms: Decreased elimination of wastes. Chemicals: Halogenated hydrocarbons; uranium.

3. Neurotoxic agents: Chemicals which produce their primary toxic effects on the nervous system. Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions. Chemicals: Mercury; carbon disulfide.

4. Agents which act on the blood or hematopoietic system: Lower blood pressure; deprive the body tissues of oxygen. Signs & Symptoms: Leukemia; anemia. Chemicals: Carbon monoxide; cyanides.

5. Agents which damage the lung: Chemicals which irritate or damage the pulmonary tissue. Signs & Symptoms: Cough; tightness in chest; fibrosis. Chemicals: Silica; asbestos.

6. Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects

on fetuses (teratogenesis). Signs & Symptoms: Birth defects; sterility. Chemicals: Lead; DBCP.

7. Cutaneous hazards: Chemicals which affect the dermal layer of the body. Signs & Symptoms: Defatting of the skin; rashes; irritation. Chemicals: Ketones; chlorinated compounds.

8. Eye hazards: Chemicals which affect the eye or visual capacity. Signs & Symptoms: Conjunctivitis; corneal damage. Chemicals: Organic solvents; acids.

Appendix B—Hazard Determination Guidelines

The quality of a hazard communication program is largely dependent upon the adequacy and accuracy of the hazard determination. The hazard determination requirement is performance-oriented. Chemical manufacturers are not required to follow any specific methods for determining hazards, but it is incumbent upon them to demonstrate that they have adequately ascertained the scientifically well-established hazards of the chemicals produced. This Appendix is intended to provide employers, who may desire to use it, with a list of some basic sources of reference for the hazards of chemicals.

Sources

Any information employers have in their own company files such as toxicity testing results or illness experience of company employees.

Any information obtained from the supplier of the chemical, such as material safety data sheets or product safety bulletins.

Any information obtained from the following source list (latest editions should be used):

Condensed Chemical Dictionary, by A. and E. Rose

Reinhold Publishing Corporation, 450 West 33rd Street, New York, NY 10001

The Merck Index: An Encyclopedia of Chemicals and Drugs

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

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man
Geneva: World Health Organization, International Agency for Research on Cancer, 1972-1977 (Multivolume work)

American Industrial Hygiene Association Hygienic Guides

American Industrial Hygiene Association, 66 South Miller Road, Akron, OH 44313

Industrial Hygiene and Toxicology, by F.A. Patty

John Wiley & Sons, Inc., New York, NY (Five volumes)

Toxicology: The Basic Science of Poisons, by Louis J. Casarett and John Doull

Macmillan Publishing Co., Inc., New York NY

Industrial Toxicology, by Alice Hamilton and Harriet L. Hardy

Publishing Sciences Group, Inc., Acton, MA

Toxicology of the Eye, by W. Morton Grant

Charles C. Thomas, Springfield, MO

Handbook of Chemistry and Physics

Chemical Rubber Company, 18901 Cranwood Parkway, Cleveland, OH 44128

Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes

American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, OH 45202

Dangerous Properties of Industrial Materials, by N. Irving Sax

Reinhold Publishing Corporation, 450 West 33rd Street, New York, NY 10001

Note.—The following documents are on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

Occupational Health Guidelines

NIOSH/OSHA (Available Fall 1981).

NIOSH/OSHA Pocket Guide to Chemical Hazards

NIOSH Pub. No. 78-210

Registry of Toxic Effects of Chemical Substances

U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health

The Industrial Environment—Its Evaluation and Control

U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health

Miscellaneous Documents—National Institute for Occupational Safety and Health

1. Criteria for a recommended standard * * * Occupational Exposure to "_____"
2. Special Hazard Reviews
3. Occupational Hazard Assessment
4. Current Intelligence Bulletins

BIBLIOGRAPHIC DATA BASES

Service provider	File name
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