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designated representative rights of access to potentially large numbers of duplicative records, specifically with regard to access to exposure records of other similarly exposed employees. This provision was intended only as an alternative when personally identified exposure records are inadequate to determine the amount and nature of toxic substances or harmful physical agents to which the employee is or has been subjected. The proposal therefore permits access to exposure records of other employees only in the absence of relevant personal exposure records, and only to the extent necessary to determine the subject employee's exposure.

As noted above in B.3., OSHA is proposing to narrow the definition of "employee exposure record" by excluding reference to "any other record which reveals the identity of a toxic substance or harmful physical agent." However, while these records no longer have to be retained or made available to employees, OSHA has decided to preserve the obligation for the employer to provide information on the identities of toxic chemicals currently in the workplace (paragraph (e)(2)(ii)). The requirement to provide such information would be subject to the trade secret provisions in paragraph (f). The paragraph (e)(2)(ii) obligation, combined with the limitation of "employee exposure record," will retain the occupational health benefits derived from informing workers of the identities of the substances to which they are exposed, while removing the burden on employers to retain these records for thirty years.

E. *OSHA Access.* The current regulation requires that each employer, upon request, provide "immediate" access to records for authorized OSHA employees. The proposal substitutes the word "prompt," which reflects OSHA's intent that the employer must not unduly delay providing the requested records to the requesting OSHA official, but, consistent with whatever legal protections are available to the employer, makes them available to OSHA as soon as possible. The phrase "without derogation of any constitutional and statutory rights that the employer chooses to exercise" is proposed to be added to make explicit OSHA's recognition that its access to records takes place against a background of Fourth Amendment law, particularly as explicated in *Marshall* v. *Barlow's Inc.*, 436 U.S. 307 (1978). Although issuance of this rule is designed to promote voluntary compliance with OSHA access requests, the Agency will seek a search warrant or subpoena, as appropriate, if an employer exercises his right to require that OSHA resort to legal process before obtaining such access.

F. *Union Access to Records.* The current rule grants recognized or certified collective bargaining agents automatic status as designated representatives, without requiring individual employee authorization, for purposes of access to exposure and analysis records. The purpose of this special status was to assure that unions would have ready access to exposure information so that they could better represent the interests of their members in the occupational safety and health area. Comparable special status was not granted with respect to medical records, however, because of the significantly greater privacy interests involved. Commenters have questioned whether, under the OSH Act, unions should be treated preferentially to other designated representatives who have to obtain written authorization to establish the agency relationship. Further, commenters have also complained that providing unions unconsented access to employee exposure records enables union officials to burden employers with large-scale records access requests and is best handled through traditional collective bargaining (Ex. 33, DuPont).

In three recent companion decisions concerning union access to exposure and analyses records, the National Labor Relations Board (NLRB) held that unions do have a right of access to these records since the information contained in the records is presumptively relative to the unions' role as collective bargaining agent for unit employees. *Minnesota Mining and Mfg. Co.* 261 NLRB No. 2 (April 9, 1982); *Colgate-Palmolive, Inc.* 261 NLRB No. 7 (April 9, 1982); *Borden Chemical, a Division of Borden, Inc.* 261 NLRB No. 6 (April 9, 1982).

In the *3M* case, for instance, the union requested: (1) Morbidity and mortality statistics on all past and present employees; (2) the generic names of all substances used and produced at the plant; (3) results of clinical and laboratory studies of any employee, including the results of experimental toxicological investigations regarding workplace substances; (4) certain health information derived from insurance and workmen's compensation records; (5) a listing of contaminants monitored by the company, including sampling protocols; (6) a description of the company's hearing conservation program, including noise level surveys; (7) radiation sources in the plant; and (8) an indication of plant work areas which exceed recognized heat standards.

In its final decision, the NLRB ordered the company to furnish to the union: (a) The information it requested concerning employee health and safety programs, monitoring and testing systems, devices and equipment, and statistical data related to working conditions to the extent that such information does not include individual medical records from which identifying data have not been removed; and (b) the generic names of all chemicals and substances used and produced in the company's plant and which do not constitute trade secrets. Further, the NLRB ordered the company to bargain collectively with the union regarding access to the generic names of trade secret chemicals and substances with the express hope that parties could agree on a method of providing the information with suitable protections for the trade secrets. *Accord: Colgate—Palmolive, supra; Borden Chemical, supra.*

The NLRB decisions apparently grant at least under most circumstances, unconsented rights of access for union representatives to exposure and analysis records that are equal to or greater than the rights provided by the current OSHA provision. If this is the case, the retention of such a provision in the agency's records access rule would appear to afford no additional assurance of ready access by unions to these types of records and data, and may therefore no longer be necessary. In addition, the deletion or revision of this provision by OSHA in light of the NLRB decisions may represent an appropriate accommodation of national safety and health policy and national labor relations policy. Under any modification of the rule, individual employees would still be free to specifically authorize a union to act as a designated representative for purposes of access to these records.

However, because of the importance of the issue to all parties, the need to be cautious and thorough in evaluating the impact of the NLRB decisions on the OSHA rule, and the possibility that, under limited circumstances, the retention of the special union access provision may not be duplicative of the rights now available in the collective bargaining context, OSHA has not altered the current union access provision in the proposed rule. Interested persons are encouraged to comment on whether modifications of the existing rule which would limit or delete the automatic status of unions as as designated representatives are appropriate in light of experience under

the current rule, the recent NLRB decisions, and considerations of safety and health. The agency will make its final determination concerning this issue once it has carefully evaluated the entire rulemaking record.

G. *Trade secret provisions.* The current regulation requires the disclosure of a toxic substance identity even if the employer considers the identity to be a trade secret. At the same time, the standard permits an employer to delete from requested records any trade secret information which discloses manufacturing processes, or discloses the percentage of a substance in a mixture. If the employer chooses to delete such information, he must notify the person requesting the records that such information was deleted on trade secret grounds. If the deletion of information adversely affects the ability to determine the nature of an employee's exposure, the employer must provide alternative information sufficient to allow adequate exposure evaluation.

The provision requiring toxic substance identity disclosure is troublesome to the flavor and fragrance industries and chemical industries, which maintain that the preservation of trade secrets is vital to corporate profitability, and that the standard's exclusive reliance on confidentiality agreements to protect trade secrets is inadequate (Ex. 44 (FEMA); Ex. 35 (CSMA)).

The purpose of the regulation is to provide employees with information on the chemical hazards to which they are potentially exposed. With this information they can better ensure that they are adequately protected against these hazards. Any barrier to disclosure between an employer and his employees can only serve to limit the effectiveness of the regulation. However, OSHA believes it necessary to modify the regulation so as to strike a better balance between providing employees with information unnecessary to maintain the benefits established by the standard and protecting legitimate trade secrets.

Unqualified trade secret protection can act as a significant barrier to the disclosure of exposure information. A trade secret can be anything which a business in fact keeps secret from its competitors and the public, provided it is minimally novel and commercially valuable. *Restatement of Torts*, s757 comment (b) (1939); Cavitch, *Business Organizations* s232.01 (1975). Absolute secrecy is not essential; information can be considered a trade secret even though it is divulged to employees or licensees with a "need to know," provided the holder of the secret had taken steps to restrict unnecessary access to, and the use of, this privileged knowledge. Cavitch, supra, s232.01(1). Trade secret protection entitles the holder of a trade secret to its commercial exploitation and to certain judicial remedies for a breach of confidence or dispossession of the trade secret through improper or unethical means (industrial theft, bribery, spying, ect.). The Supreme Court had identified the maintenance of standards of commercial ethics and the encouragement of invention as the broadly stated policies behind trade secret law. *Kewanee Oil Co.* v. *Bicron*, 416 U.S. 470 (1974). Unlike patents or copyrights, however, there is not comprehensive Federal law of trade secrets, as it is basically a state-created right.

The conflict between access to exposure and medical records and trade secret interests arises whenever an employer is asked to reveal information such as the identity of a chemical which the employer considers to be a trade secret. While most trade secrets relate to process information or formula or percentage mixture information, none of which is required to be disclosed by the regulation, the identity of a chemical or mixture ingredient may itself be considered a trade secret if its existence is unknown to a competitor (e.g. certain intermediates, catalysts) or cannot practically be "reverse engineered" by analytical techniques.

The same identity information, however, may be essential to the detection of occupational disease. Since exact chemical identity is the passkey to the scientific literature, this information must be available to an industrial hygienist or other health professional who is evaluating the hazards associated with a chemical. Likewise, it must be available to an epidemiologist who is attempting to link patterns of disease with exposure to a particular chemical and to a treating or consulting physician who suspects that a patient's health problems may be the result of chemical exposure. While not every employee needs the chemical identity, as distinct from hazardous effects and precautionary information, at all times, a primary goal of the regulation is to encourage employees to seek out advice and information about the chemicals in their workplaces. For this to happen effectively, they need to know the identities of the toxic substances they are exposed to.

In attempting to accommodate the competing interests between chemical identity disclosure and trade secret protection, OSHA has also taken into account the existence of several factors which contribute to the regulatory dilemma. First, a chemical is a trade secret in some contexts but not others, and it may be equally hazardous in either event. Second, whether or not a chemical's identity is a trade secret is basically a matter of an employer's self-definition; therefore, permitting non-disclosure of trade secret identity without any offsetting obligation could result in overclassification of chemicals as trade secrets.

Third, the value of a trade secret, once lost, cannot be fully recaptured, although private remedies for unathorized disclosures can result in the assessment of monetary damages and injunctive relief. And fourth, OSHA possesses neither the capacity nor expertise to act as a screen of all information which an employer is to disclose to employees and claims to be trade secret.

To accommodate these competing interests, OSHA initially proposed (August 7, 1981; 46 FR 40492) to strengthen the current trade secret protection provisions by permitting liquidated damages clauses in confidentiality agreements entered into by designated representatives. That proposal is now being merged into the current rulemaking, where it may receive broader consideration in the context of the interrelated issues raised by this general reconsideration.

OSHA is further proposing other modifications of the trade secret provisions to make them more protective of trade secrets. In general, these proposed provisions limit the requirements of disclosure to only certain categories of highly toxic chemicals (e.g., carcinogens) and make the confidentiality agreement authorization a more meaningful protection. More particularly, the proposal includes a provision which permits the employer to withhold precise chemical identity information of hazardous chemicals which constitute a trade secret, unless the chemical is a carcinogen, mutagen, teratogen, or a cause of significant irreversible damage to human organs or body systems and there is a need to know the precise chemical name. The "need to know" qualification is meant to limit access to employees or their representatives with a legitimate health purpose. A distinction is thus drawn between "high chronic hazard" chemicals, where identities must be disclosed, and all other hazardous chemicals, whose identities may be withheld (except from a treating or consulting physician) if they constitute a trade secret. With

respect to these latter chemicals, the employer is nevertheless required to:

(1) Be capable of substantiating that it is a trade secret;

(2) Identify the chemical by a generic chemical classification;

(3) Provide all other information on the properties and effects of the chemical; and

(4) In any event, release on a confidential basis the chemical identity to a treating or consulting physician who has stated in writing (except in an emergency) that a patient's health problems may be the result of occupational exposure. Since the employee's personal or treating physician may not be familiar with the toxic effects of workplace chemicals, the CAC recommended that trade secrets also be mandatorily disclosed to consulting physicians assisting in the treatment of disorders of suspect occupational causation. OSHA has adopted this recommendation.

With respect to the "high chronic hazards," the identities of which must be disclosed, and the other hazards which an employer may choose to disclose, the regulation permits the employer to condition access to such information by employees or their designated representatives upon the signing of a confidentiality agreement. The agreement may restrict use of the information to health purposes, prohibit redisclosure of the information to anyone not specified in the agreement other than a treating or consulting physician, and provide for compensation or other legally appropriate relief for competitive harm which may result from a breach of the agreement. The terms of such an agreement should be worked out between the employer and the requesting party and be governed by the applicable state law. Thus, for example, OSHA intends to be neutral on the kinds of damages provisions that may be included. OSHA believes that this provision, with its combination of requirements and authorizations, reflects the current practice of responsible employers and will serve to maximize the amount of necessary hazard-related information available to employees, protect the commercial value of trade secrets, and minimize the potential problem of employers overclassifying chemicals as trade secrets in order to avoid the need to disclose chemical identities to their employees.

This accommodation of trade secret interests has been arrived at after careful consideration of this issue. At this point in the rulemaking, OSHA believes that the proposed modifications provide an optimum solution to this difficult problem and are consistent with its mandate to protect the health of workers to the extent feasible. At the same time, OSHA is fully aware that opinions vary widely on this matter and that a number of other alternatives, ranging from total disclosure of chemical identity regardless of the trade secret interest to total protection of trade secrets regardless of the health consequences, are theoretically possible. OSHA invites comment on all such alternatives and the trade secret issue in general.

Other proposed changes to the regulation, such as the redefinitions of "exposure," "exposure record," and "toxic substance," will also greatly help alleviate the trade secrets problem by narrowing the regulation's scope. Because a significantly smaller set of records will be covered, many trade secret problems will be avoided at the threshold.

H. *X-ray microfilming.* Paragraph (d)(2) of the regulation states that "nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record so long as the information contained in the record is preserved and retrievable, except that X-ray films shall be preserved in their original state." The X-ray preservation requirement resulted from a finding by OSHA at that time that the diagnostic detail of certain X-rays could be lost when the original X-ray is microfilmed. X-rays related to a possible diagnosis of pneumoconiosis are particularly susceptible to this loss of detail. Pneumoconiosis is the accumulation of dust in the lungs and the tissue reaction to its presence. Inhalation of the dusts of coal, aluminum, beryllium, asbestos, aluminum oxide, silica, hematite (iron oxide), talc, kaolin, mica and cement are commonly associated with the development of pneumoconioses. The earliest diagnostic indications of pneumoconiosis are often barely perceptible changes in the chest X-ray.

Following promulgation of the standard, OSHA received comments from a number of interested parties concerning the requirement that X-rays be kept in their original state. (Exs. 3-5, 8, 10-15). They argued in general that modern microfilm processes can reduce X-rays for storage without an appreciable loss of diagnostic detail. Also, they maintain that microfilm storage is preferable for long-term X-ray preservation due to the fact that microfilm processes use archival materials (which are specially resistant to fading and decay). By contrast, original X-rays can fade and crack over time to the possible detriment of their diagnostic value.

After consideration of the available evidence, OSHA has decided to propose two modifications of the records access standard: (1) Exempt X-rays taken for the purpose of diagnosing broken bones from the definition of "employee medical record," and (2) allow the microfilm storage of remaining X-rays provided certain requirements are met.

As mentioned above in B.4., X-rays taken for the purpose of diagnosing bone fractures are not of value in the detection and prevention of occupational disease. The microfilm storage of the remaining X-rays will be allowed if performed under the supervision of a licensed radiologist who is a diplomate of the American Board of Radiology. In addition, for the microfilm storage of a chest X-ray where the subject worker has been exposed to a substance known to cause pneumoconiosis, the supervising radiologist shall consult with and obtain the written approval of the microfilm process from both: (a) A licensed physician who is a diplomate of the American Board of Internal Medicine certified in the subspecialty of pulmonary disease, and (b) a "B" reader certified by the National Institute for Occupational Safety and Health (NIOSH). Of course, approval by a single individual who meets both criteria is acceptable. OSHA believes that the microfilming of chest X-rays of workers exposed to toxic substances known to cause pneumoconiosis deserves separate consideration. In this case extremely fine shadings of image density are often required for proper analysis and diagnosis. Therefore there is an increased risk that diagnostic detail could be lost if current standard microfilm processes are used. The American College of Radiology's Task Force on Pneumoconioses concurs in this view (Ex. 66).

This proposal relies on the professional expertise of radiologists to ensure that X-rays are microfilmed with minimal loss of diagnostic detail. This requirement is performance oriented, since any microfilm process satisfactory to the supervising radiologist may be used.

Radiologists have the principal training and responsibility for the interpretation of X-rays, and it is therefore appropriate to have the microfilming performed under the direction of a licensed radiologist. The requirement that the radiologist be a diplomate of the American Board of Radiology adds further assurance that the microfilming will be of high quality.

This is of particular importance in that the future interpretation of X-rays or microfilm most likely would be performed by a physician not involved in the initial microfilming process.

The requirement for approval of a licensed physician who is a diplomate of ABIM and certified in the subspecialty of pulmonary disease is included since these physicians would be especially sensitive to the difficulties in the X-ray diagnosis of pneumoconiosis.

A NIOSH certified "B" reader has demonstrated proficiency in the use of the ILO–U/C classification for interpreting chest X-rays for pneumoconiosis and other chest diseases. (Ex. 2). The ILO–U/C system of chest X-ray standards is meant to improve the interpretation and reporting of X-ray abnormalities caused by pneumoconiosis-producing dusts.

The use of quantifiable standards (e.g. resolution, image density) to regulate the microfilming of X-rays was considered by OSHA. However, the lack of consensus by national microfilm industry associations in identifying meaningful standards, coupled with forseeable problems enforcing such standards, led OSHA not to include this approach in the proposal.

To further minimize the possibility that diagnostic information will be lost during the microfilm process, OSHA is considering the recommendation of the Advisory Committee for Construction Safety and Health requiring that existing interpretations of X-rays be microfilmed along with the original X-rays.

However, due to uncertainties with regard to the feasibility and medical acceptability of this procedure, OSHA has decided not to include this provision in the proposed Appendix. OSHA is interested in receiving comments from interested persons concerning the appropriateness of this recommendation.

1. *Duty to Inform Employees.* The current regulation in paragraph (g)(1) requires that "upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform employees exposed to toxic substances or harmful physical agents of (the regulation)." "Employees" was defined under paragraph (c)(4) as including former employees. Therefore, the regulation was susceptible to the interpretation that employers were required to inform former employees of the provisions of the regulation. Locating and informing large numbers of former employees would require a massive expenditure of resources. This was not OSHA's original intent. To clarify OSHA's intent, the word "current" has been inserted into paragraphs (g)(1) and (g)(2) to indicate that the employer's notification responsibility extends only to employees currently employed.

Preliminary Regulatory Impact Assessment and Regulatory Flexibility Certification

A. Introduction

Executive Order 12291 (46 FR 13197, February 19, 1981) provides for a "regulatory analysis" when a rule has major economic consequences for the general economy, individual industries, geographical regions or levels of government. E.O. 12291 replaced Executive Order 12044, which also had provided for regulatory analyses of major regulations.

OSHA issued the access to exposure and medical records regulation on May 23, 1980 (45 FR 35212–35303). At that time, OSHA concluded that this regulation would impose compliance costs below the Executive Order 12044 threshold of $100 million in annual costs for the economy. This is largely because the final rule would not require new records or reports, nor would impose any additional environmental or employee monitoring or medical surveillance requirements. Finally, the rule was performance-oriented, in that the content of exposure and medical records was left to the employer. As a result, OSHA determined that a regulatory analysis under E.O. 12044 was unnecessary.

The proposed revisions to the access regulation will further lower compliance costs. Also, the access regulation would not appear to exercise a significant impact on competition, productivity, domestic investment, employment, innovation, or foreign competition, which are criteria to be considered under the current executive order. For these reasons, this proposed regulation is not considered major under the new E.O. 12291.

Likewise, the Regulatory Flexibility Act of 1980 (Pub. L. 96–353, 94 Sta. 1164 (5 U.S.C. 60 *et seq.*)) requires that OSHA give special consideration to the economic impact of the proposed regulation on small entities. Such consideration should include a description of regulatory alternatives and estimates of the impact of reporting, recordkeeping, and other compliance requirements in order to minimize any significant impact of the proposed rule on small entities. The following analysis meets the requirements of the Regulatory Flexibility Act and addresses the economic implications of the changes proposed to the existing regulation and the bases for these determinations, and concludes that the proposed rule will not have a disproportionate economic impact on small entities.

B. Proposed Revisions

Several proposed modifications to the current access regulation have economic implications. The proposed changes include the following:

(1) Redefinition of employees covered by the proposal,

(2) Redefinition of "toxic substance,"

(3) Retention of records, and,

(4) Trade secret issues.

1. *Employee Coverage.* Currently, the regulation covers all employees who are exposed to toxic substances and harmful physical agents in the workplace, including those who experience incidental exposures, such as white collar employees who may make infrequent visits to production areas where toxic substances are present. The new proposal would limit employee coverage to those, "whose work directly involves the manufacture, processing, installation, handling, packaging, repackaging, transport, disposal, or use of toxic substances, or is subject to harmful physical agents including but not limited to production, maintenance, construction, and transport workers." This change will limit the access regulation to those workers who are more than casually exposed to toxic substances. Office workers, in general, will not be covered by the new proposal. This change will substantially reduce the costs and will target the regulation at those workers with exposures to toxic substances in the workplace.

2. *Redefinition of Toxic Substances for Medical and Exposure Records.* Another change to the rule is the redefinition of toxic substances. Under the existing regulation, toxic substances are defined to include the approximately 39,000 substances listed in the latest printed edition of the National Institute of Occupational Safety and Health's *Registry of Toxic Effects of Chemical Substances* (RTECS), many of which impose low health risks. Under the proposed regulation, toxic substances are more specifically defined to include only those substances that:

(a) Cause human toxicity;

(b) Cause cancer or harmful reproductive effects in animals;

(c) Have a median lethal dose of less than 500 milligrams per kilogram of body weight when administered orally to albino rats;

(d) Have a median lethal dose of less than 1000 milligrams per kilogram of body weight when administered by

continuous contact to the bare skin of albino rabbits; or

(e) Have a median lethal concentration in air of less than 2000 parts per million by volume of gas or vapor, or less than 20 milligrams per liter of mist, fume or dust when administered to albino rats.

This change limits recordkeeping requirements to those substances considered to be the most hazardous and reduces the number of toxic substances by approximately 90 percent. The corresponding number of records covered by the standard is probably reduced to a somewhat lesser extent because many of the workers experience exposures to multiple substances.

This modification, however, may cause some reduction in the benefits of the proposal because some substances that do not currently meet the proposed criteria may be found to be hazardous long after exposure has already occurred and the results have been discarded. Asbestos, for example, was long believed to be biologically inert, but has been proven to be a potent carcinogen. Also, the carcinogenicity of vinyl chloride was discovered through careful analysis of the medical records of exposed workers.

3. *Retention of Records.* The new proposal reduces the kinds of medical and exposure records that must be kept and provides for greater flexibility in the keeping of records, particularly X-rays. For example, many employee health records generated in industrial health units involve minor treatments of broken bones, cuts, bruises, or occasional headaches. These records are of little long-term value and need not be retained by the employer. Under the proposal, employers may summarize the results of continuous readouts and laboratory reports, rather than keep the full reports. This should result in reductions in the number of records being stored without any loss in essential information. Under the proposal, required material safety data sheets need only be maintained until replaced by a more recent copy. Also, X-rays of broken bones need not be kept, while X-rays of occupational health significance may be microfilmed under proper supervision. Microfilming could mean a potential cost savings to employers, because they could recover the silver content of X-rays, and the retention of information would require much less storage space.

Under the new standard, employers need not maintain records of short-term employees (i.e., those who have worked less than 1 year). Employers have the alternative of maintaining these records or of providing them to employees upon termination of their employment. This modification should substantially reduce the costs of compliance, especially for industries with higher than average turnover. At the same time, the employee receives his medical record so that no health information is lost. In the construction industry, this option is being adopted for all employees, regardless of the length of employment.

In the absence of formal exposure records (air contaminant measurements, biological monitoring data, and material safety data sheets), the current regulation treats any other record that reveals the identity of a toxic substance (e.g., and inventory record or a purchase record) as an "exposure record." The requirement to retain this information and make it available has been the source of much employer concern regarding costs due to the very large number of records that are included under this provision.

Under the proposed regulation these "other records" are no longer treated as exposure records, and therefore are not subject to access and retention requirements. However, the employer is still required to inform an employee upon request of the identity of a toxic substance to which the employee is exposed. These changes will significantly reduce employer costs and, at the same time, will ensure that workers will continue to have access to information on the toxic substances they are or could be working with.

Finally, the proposed regulation modifies the requirement that employee medical records be retained for 30 years after termination of employment to one of 30 years, or the length of employment, whichever is longer. This modification will result in some cost savings from the shorter retention periods.

Long-term recordkeeping is valuable for diagnosis in the treatment of latent diseases, including cancer and epidemiological research linking occupational illness to hazardous exposures. It is possible that shortening the time period for maintaining medical records may reduce some of the benefits of the access regulation, because latency periods for cancer may be greater than 30 years. However, this effect should not be significant, because in most cases, the retention of records for 30 years should be adequate.

4. *Trade Secrets Issues.* The proposed revision to the trade secret provision recognizes both the employer's rights with respect to proprietary information and the employee's need for exposure information. If the employee requests information on exposures to highly toxic substances involving a trade secret, the employer can provide the employee or his designated representative with access to the information on the basis of a confidentiality agreement. The proposed modifications of the trade secret provisions are more protective of trade secrets than the current rule. The likelihood of competitive harm resulting from trade secret disclosure under the rule should therefore be greatly reduced.

C. Summary of Costs

OSHA's Office of Regulatory Analysis estimates that the current access rule affects over 27 million workers. Eliminating coverage of casually exposed workers and turning records over to short-term employees will reduce the number of workers fully covered by the new proposal by more than 10 million.

The number of workers presently exposed to toxic substances was determined by calculating a growth rate in the labor force from 1970 to 1980 based on data in the Bureau of Labor Statistics, *Employment and Earnings, March, 1981* (Ex. 80). In addition, the number of short-term employees was estimated using figures from BLS *Job Tenure Declines As Work Force Changes* (Ex. 79). The 10 million figure was arrived at by eliminating casually exposed and short-term workers. Although both figures are further based upon results of the 8-year-old data presented in the *National Occupational Hazard Survey* (NOHS) (Docket H–112, Ex. 171) and may be somewhat outdated, a substantial reduction in the number of workers covered represents a lessening of the compliance burden on employers.

The number of records that must be kept by employers, as well as the related costs, will also be reduced by changes in the definitions of toxic substances for medical and exposure records and by changes in the requirements for retaining these records.

When assessing the costs of the access regulation, it must be noted that several states already require employers to provide employees with access to their medical records. Many major corporations have kept extensive exposure and medical records on employees, often beyond the period of employment, prior to the implementation of the access regulation, and many have provided considerable access to their employees. The storage and access costs of these firms should be subtracted from the total compliance costs of the proposed regulation. At present, other OSHA regulations require recordkeeping for exposures to some toxic substances and harmful physical

agents, such as noise, vinyl chloride, lead, and asbestos. The recordkeeping costs for these and other harmful physical agents and toxic substances that have recordkeeping requirements under other OSHA regulations should also be subtracted from the compliance costs of the access regulation.

Moreover, employee preemployment health information may be the only health information recorded by some employers. Where preemployment information is the only information kept, the cost of storage and access will be minimal.

D. Summary of the Benefits

Employee medical and exposure records are potentially important to the detection, treatment, and prevention of occupational disease. If workers and their representatives are to play a meaningful role in their own health management they must have an opportunity to look at their medical and exposure records. Access will enable workers and their personal physicians to uncover patterns of health impairment and disease. Access to exposure and medical records and long-term preservation of these records will also facilitate formal occupational health research.

The new regulation will maintain the benefits to occupational health in the current regulation and will reduce compliance burdens on employers. The number of records kept and the time they need to be stored will be reduced, but exposure records of substances considered most hazardous will still be retained for at least 30 years. Employers have been given increased flexibility as to the format of recordkeeping. This should reduce compliance burdens while maintaining essential health information.

Employers still also recieve increased protection from trade secret disclosure. The trade secret provisions will protect employers, but will give employees access to necessary exposure information.

E. Regulatory Flexibility Analysis

The impact of the 1980 access rule on small businesses was determined to be insignificant. According to the NOH survey, only 1.4 percent of all small firms (8–250 employees) regularly monitor workplace environmental conditions, while only 2.3 percent of these firms have a formally established health unit. Approximately one-half of all small firms collect some preemployment health information on new employees, but less than 10 percent provide periodical medical exams to workers. The U.S. Department of Commerce *County Business Patterns 1977* (Ex. 61) estimates that more than 68 percent of all employees work in firms of less than 250 employees.

To summarize the results of the NOH survey as it pertains to small entities.

(1) Most small firms do not collect health information beyond that of new employees,

(2) Few small firms provide formal or periodic health care, and

(3) Few small firms monitor workplace environmental conditions.

The vast majority of small entities will not be affected by the proposed regulation because medical surveillance and environmental monitoring are not required. The regulation, however, does require that firms creating medical and exposure records must keep them and grant employee access to them. Since small entities overwhelmingly do not either create such records or have them in large numbers, the economic impact of the regulation on these firms is relatively small. The effect of the proposed changes will further reduce any impacts of the access regulation on small entities, because proposed revisions to the current rule will lessen compliance burdens on employers. They will be of particular benefit to those employers, including many small businesses, who have many short-term employees.

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 September 14, 1982, and submitted in quadruplicate to the Docket Officer, Docket H–112E, 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 a public hearing to permit interested persons an opportunity to submit oral testimony concerning the issues raised by the proposed standard. The hearing is scheduled to begin on October 5, 1982 in Washington, D.C., at 9:30 a.m.

Notices of Intention to Appear

All persons wishing to participate in the public hearing must file a notice of intention to appear, in quadruplicate, on or before September 21, 1982, addressed to OSHA Division of Consumer Affairs, Docket No. H–112E, 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 and 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 September 21, 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 Hearing

The hearing will begin at 9:30 a.m. with resolution of any procedural matters relating to the proceeding. The hearing 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 hearing, 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.

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, N.W., Washington, D.C. 20210. Pursuant to Sections 6(b), 8(c) and 8(g) of the Act, it is hereby proposed to amend 29 CFR 1910.20 to read as set forth below.

List of Subjects in 29 CFR Part 1910

Occupational safety and health, Health, Health records.

(Secs. 6(b), 8(c) and 8(g). Pub. L. 91–596, 84 Stat. 1593, 1599,1600; 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 7th day of July, 1982.

Thorne G. Auchter,

Assistant Secretary for Occupational Safety and Health.

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

It is proposed to revise § 1910.20 of title 29 CFR to read as follow:

§ 1910.20 Access to employee exposure and medical records.

(a) *Purpose.* The purpose of this section is to provide employees and their designated representatives a right of access to relevant exposure and medical records; and to provide representatives of the Assistant Secretary a right of access to these records in order to fulfill responsibilities under the Occupational Safety and Health Act. Access by employees, their representatives, and the Assistant Secretary is necessary to yield both direct and indirect improvements in the detection, treatment, and prevention of occupational disease. Each employer is responsible for assuring compliance with this section, but the activities involved in complying with the access to medical records provisions can be carried out, on behalf of the employer, by the physician or other health care personnel in charge of employee medical records. Except as expressly provided, nothing in this section is intended to affect existing legal and ethical obligations concerning the maintenance and confidentiality of employee medical information, the duty to disclose information to a patient/employee or any other aspect of the medical-care relationship, or affect existing legal obligations concerning the protection of trade secret information.

(b) *Scope and application.* (1) This section applies to each general industry, maritime, and construction employer who makes, maintains, contracts for, or has access to employee exposure or medical records, or analyses thereof, pertaining to:

(i) Employees whose work directly involves the manufacture, processing, installation, handling, packaging, repackaging, transport, disposal, or use of toxic substances, or who is subject to harmful physical agents (e.g. noise, heat, cold, vibration, repetitive motion ionizing and non-ionizing radiation, hypo or hyperbaric pressure) in any manner different from typical non-occupational situations, and includes, but is not limited to, coverage of production, maintenance, construction, and transport workers; and

(ii) Employees accidentally exposed to a toxic substance or harmful physical agent to a degree sufficient to require medical attention.

(2) This section applies to all employee exposure and medical records, and analyses thereof, of such employees, whether or not the records are mandated by specific occupational safety and health standards.

(3) This section applies to all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis. Each employer shall assure that the requirements of this section are made known to physicians and others providing medical or industrial hygiene services under contract to the employer, and shall make a good faith effort to assure, by modification of the contract if necessary, that such persons comply with the preservation and access requirements of the section.

(c) *Definitions.* (1) "Access" means the right and opportunity to examine and copy.

(2) "Analysis using exposure or medical records" means any compilation of data or any statistical study based at least in part on information collected from individual employees exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.

(3) "Designated representative" means any individual or organization to whom an employee gives written authorization to exercise a right of access. For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

(4) "Employee" means an employee whose work directly involves the manufacturing, processing, installation, packaging, repackaging, transport, disposal, or use of toxic substances, or who is subject to harmful physical agents in any manner different from typical non-occupational situations. "Employee" includes, but is not limited to, production, maintenance, construction, and transport workers. "Employee" includes current employees, former employees, and employees being assigned or transferred to such work. "Employee" also includes any employee accidentally exposed to a toxic substance or harmful physical agent to a degree sufficient to require medical attention. In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section.

(5) "Employee exposure record" means a record containing any of the following kinds of information:

(i) Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

(ii) Biological monitoring results which are designated as exposure records by specific occupational safety and health standards; and

(iii) Material safety data sheets.

(6) (i) "Employee medical record" means a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel or technician, including:

(A) Medical and employment questionnaires or histories (including job description and occupational exposures);

(B) The results of medical examinations (pre-employment, pre-assignment, periodic, or episodic) and laboratory tests (including chest and other X-ray examinations taken for the purposes of establishing a base-line or detecting occupational illness, and all non-mandated biological monitoring);

(C) Medical opinions, diagnoses, progress notes, and recommendations;

(D) Descriptions of treatments and prescriptions; and

(E) Employee medical complaints.

(ii) "Employee medical record" does not include medical information in the form of:

(A) Physical specimens (e.g., blood or urine samples) which are routinely discarded as a part of normal medical practice;

(B) First-aid records (not including medical histories) if made on-site by a non-physician and if maintained separately from the employer's medical program and its records;

(C) Records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., social security number, payroll number, etc.);

(D) Records created solely in preparation for litigation, which are privileged from discovery under the applicable rules of procedures or evidence; or

(E) Records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.

(7) "Employer" means a current employer, a former employer, or a successor employer.

(8) "Record" means any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, X-ray film, or automated data processing).

(9) "Specific written consent" (i) means a written authorization containing the following:

(A) The name and signature of the employee authorizing the release of medical information;

(B) The date of the written authorization;

(C) The name of the individual or organization that is authorized to release the medical information;

(D) The name of the designated representative (individual or organization) that is authorized to receive the released information;

(E) A general description of the medical information that is authorized to be released;

(F) A general description of the purpose for the release of the medical information; and

(G) A date or condition upon which the written authorization will expire (if less than one year).

(ii) A written authorization does not operate to authorize the release of medical information not in existence on the date of written authorization, unless the release of future information is expressly authorized, and does not operate for more than one year from the date of written authorization.

(iii) A written authorization may be revoked in writing prospectively at any time.

(10) "Toxic substance" means any chemical substance or biological agent (bacteria, virus, fungus, etc.) which:

(i) Has yielded positive evidence of an acute or chronic health hazard (consistent with (c)(10)(iii)(A)–(E) below) in testing conducted by, or known to, the employer;

(ii) Is the subject of a material safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health; or

(iii) Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS), provided that the substance:

(A) Has been reported to cause human toxicity at any dose level;

(B) Has been reported to cause cancer or reproductive effects in animals at any dose level;

(C) Has a median lethal dose (LD50) of less than 500 milligrams per kilogram of body weight when administered orally to albino rats;

(D) Has a median lethal dose (LD50) of less than 1000 milligrams per kilogram of body weight when administered by continuous contact to the bare skin of albino rabbits; or

(E) Has a median lethal concentration (LC50) in air of less than 2000 parts per million by volume of gas or vapor, or less than 20 milligrams per liter of mist, fume or dust when administered to albino rats.

(d) *Preservation of records.* (1) Unless a specific occupational safety and health standard provides a different period of time, each employer shall assure the preservation and retention of records as follows:

(i) *Employee medical records.* The medical record for each employee shall be preserved and maintained for at least the duration of employment plus five (5) years, but in no event less than thirty (30) years, from the beginning of employment, except that:

(A) Health insurance claims records maintained separately from the employer's medical program and its records need not be retained for any specified period;

(B) The medical records of employees who have worked for less than one (1) year for the employer need not be retained beyond the term of employment if they are provided to the employee upon the termination of employment;

(C) The medical records of employees in the construction industry need not be retained beyond the term of employment if they are provided to the employee upon the termination of employment; and

(D) The medical records of employees covered solely due to accidental toxic substance or physical agent exposures do not have to be retained for any specific length of time.

(ii) *Employee exposure records.* (A) The following employee exposure records shall be preserved and maintained for thirty (30) years:

(*1*) Environmental (workplace) monitoring results;

(*2*) Summaries of continuous read-out data;

(*3*) Data relevant to the results obtained, including, but not limited to, name(s) of employee(s) monitored, date and location of the monitoring or measurement, and the collection and analytical methodologies used.

(B) Background data to environmental (workplace) monitoring or measuring, such as laboratory reports, calculations, worksheets, and continuous read-outs, shall be preserved and maintained for one (1) year.

(C) Material safety data sheets shall be preserved and maintained until replaced by a more recent copy.

(D) Biological monitoring results designated as exposure records by specific occupational safety and health standards shall be preserved and maintained as required by the corresponding standard.

(iii) *Analyses using exposure or medical records.* Each analysis using exposure or medical records shall be preserved and maintained for at least thirty (30) years.

(2) Nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record so long as the information contained in the record is preserved and retrievable. In the case of X-ray films, Appendix B shall apply.

(e) *Access to records.*—(1) *General.* Whenever an employee or designated representative requests access to a

record, the employer shall assure that access is provided in a reasonable time, place, and manner. If the employer cannot reasonably provide access to the record within fifteen (15) working days, the employer shall within the fifteen (15) working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record will be available.

(ii) The employer may require of the requester only such information as should be readily known to the requester and which may be necessary to locate or identify the records being requested (e.g. dates and locations where the employee worked during the time period in question).

(iii) Whenever an employee or designated representative requests a copy of a record, the employer shall assure that either:

(A) A copy of the record is provided without cost to the employee or representative,

(B) The necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record, or

(C) The record is loaned to the employee or representative for a reasonable time to enable a copy to be made.

(iv) In the case of an original X-ray, the employer may restrict access to on-site examination or make other suitable arrangements for the temporary loan of the X-ray.

(v) Whenever a record has been previously provided without cost to an employee or designated representative, the employer may charge reasonable, non-discriminatory administrative costs (i.e., search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record, except that:

(A) An employer shall not charge for an initial request for a copy of new information that has been added to a record which was previously provided; and

(B) An employer shall not charge for an initial request by a recognized or certified collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.

(vi) Nothing in this section is intended to preclude employees and collective bargaining agents from collectively bargaining to obtain access to information in addition to that available under this section.

(2) *Employee and designated representative access*—(i) *Employee exposure records.* Except as limited by paragraph (f) of this section, each employer shall, upon request, assure the access of each employee and designated representative to employee exposure records relevant to the employee. For the purpose of this section, an exposure record relevant to the employee consists of:

(A) A record which measures or monitors the amount of a toxic substance or harmful physical agent to which the employee is or has been subjected;

(B) In the absence of such directly relevant records, such records of other employees with past or present job duties or working conditions related to or similar to those of the employee as are necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents to which the employee is or has been subjected; and

(C) Any exposure record pertaining to workplaces or working conditions to which the employee is being assigned or transferred.

(ii) *Current identity information.* Except as limited by paragraph (f) of this section, the employer shall, upon request, inform each employee and designated representative of the identities (chemical name, if known) of the toxic substances and harmful physical agents to which the employee is subjected.

(iii) *Employee medical records.* (A) Each employer shall, upon request, assure the access of each employee to employee medical records of which the employee is the subject, except as provided in paragraph (e)(2)(iii)(D) of this section.

(B) Each employer shall, upon request, assure the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent. Appendix A to this section contains a sample form which may be used to establish specific written consent for access to employee medical records.

(C) Whenever access to employee medical records is requested, a physician representing the employer may recommend that the employee or designated representative:

(*1*) Consult with the physician for the purposes of reviewing and discussing the records requested;

(*2*) Accept a summary of material facts and opinions in lieu of the records requested; or

(*3*) Accept release of the requested records only to a physician or other designated representative.

(D) Whenever an employee requests access to his or her employee medical records, and a physician representing the employer believes that direct employee access to information contained in the records regarding a specific diagnosis of a terminal illness or a psychiatric condition could be detrimental to the employee's health, the employer may inform the employee that access will only be provided to a designated representative of the employee having specific written consent, and deny the employee's request for direct access to this information only. Where a designated representative with specific written consent requests access to information so withheld, the employer shall assure the access of the designated representative to this information, even when it is known that the designated representative will give the information to the employee.

(E) A physician, nurse, or other responsible health care personnel maintaining employee medical records may delete from requested medical records the identity of a family member, personal friend, or fellow employee who has provided confidential information concerning an employee's health status.

(iii) *Analyses using exposure or medical records.* (A) Each employer shall, upon request, assure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.

(B) Whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier (name, address, social security number, payroll number, etc.) or by information which could reasonably be used under the circumstances indirectly to identify specific employees (exact age, height, weight, race, sex, date of initial employment, job title, etc.), the employer shall assure that personal identifiers are removed before access is provided. If the employer can demonstrate that removal of personal identifiers from an analysis is not feasible, access to the personally identifiable portions of the analysis need not be provided.

(*3*) *OSHA access.* (i) Each employer shall, upon request, and without derogation of any constitutional and statutory rights that the employer chooses to exercise, assure the prompt access of representatives of the Assistant Secretary of Labor for Occupational Safety and Health to employee exposure and medical records and to analyses using exposure or

medical records. Rules of agency practice and procedure governing OSHA access to employee medical records are contained in 29 CFR 1913.10.

(ii) Whenever OSHA seeks access to personally identifiable employee medical information by presenting to the employer a written access order pursuant to 29 CFR 1913.10(d), the employer shall prominently post a copy of the written access order and its accompanying cover letter for at least fifteen (15) working days.

(f) *Trade secrets.* (1) An employer may delete from records requested by an employee or designated representative any trade secret which discloses manufacturing processes, or discloses the percentage of a chemical substance in a mixture, provided the employee or designated representative is notified that information has been deleted on trade secret grounds.

(2) An employer may withhold the precise chemical name of a chemical only 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; and

(iv) All other information on the properties and effects of the chemical contained in the requested record is disclosed.

(3) The withheld information shall be provided on a confidential basis to a treating or consulting physician who states in writing (except in an emergency situation) that a patient's health problems may be the result of occupational exposure. The employer shall inform the requesting employee or designated representative at the time of the trade secret claim that the withheld information will be made available to the treating or consulting physician on this basis.

(4) To the extent that names of trade secret chemicals are disclosed, the employer may condition employee and designated representative access to such information upon acceptance of a reasonable confidentiality agreement. The agreement may restrict use of the information to health purposes, prohibit redisclosure of the information to anyone not specified in the agreement other than a treating or consulting physician, and provide for compensation or other legally appropriate relief for competitive harm which may result from a breach of the agreement.

(g) *Employee information.* (1) Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform current employees covered by this section of the following:

(i) The existence, location, and availability of any records covered by this section;

(ii) The person responsible for maintaining and providing access to records; and

(iii) Each employee's rights of access to these records.

(2) Each employer shall keep a copy of this standard and its appendices and make copies readily available, upon request, to employees. The employer shall also distribute to employees any informational materials concerning this standard which are made available to the employer by the Assistant Secretary of Labor for Occupational Safety and Health.

(h) *Transfer of records.* (1) Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.

(2) Whenever an employer is ceasing to do business and there is no successor employer to receive and maintain the records subject to this standard, the employer shall notify affected current employees of their rights of access to records at least three (3) months prior to the cessation of the employer's business.

(3) Whenever an employer either is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty (30) years, the employer shall:

(A) Transfer the records to the Director of the National Institute for Occupational Safety and Health (NIOSH) if so required by a specific occupational safety and health standard; or

(B) Notify the Director of NIOSH in writing of the impending disposal of records at least three (3) months prior to the disposal of the records.

(4) Where an employer regularly disposes of records required to be preserved for at least thirty (30) years, the employer may, with at least (3) months notice, notify the Director of NIOSH on an annual basis of the records intended to be disposed of in the coming year.

(i) *Appendices.* The information contained in the appendices to this section is not intended, by itself, to create any additional obligations not otherwise imposed by this section nor detract from any existing obligation.

Appendix A to § 1910.20

Sample Authorization Letter for the Release of Employee Medical Record Information To a Designated Representative

I (full name of worker/patient), hereby authorize (individual or organization holding the medical records) to release to (individual or organization authorized to receive the medical information), the following medical information from my personal medical records: (Describe generally the information desired to be released)

I give my permission for this medical information to be used for the following purpose:

but I do not give permission for any other use or re disclosure of this information.

(Note: Several extra lines are provided below so that you can place additional restrictions on this authorization letter if you want to. You may, however, leave these lines blank. On the other hand, you may want to (1) specify a particular expiration date for this letter (if less than one year), (2) describe medical information to be created in the future that you intend to be covered by this authorization letter, or (3) describe portions of the medical information in your records which you do not intend to be released as a result of this letter.)

Full name of Employee or Legal Representative

Signature of Employee or Legal Representative

Date of Signature

Appendix B to § 1910.20

Microfilm Storage of X Ray

X-rays taken for the purpose of establishing a base line or detecting occupational illness shall be kept in their original state or microfilmed, provided that:

A. The microfilm storage of X-rays shall be performed under the supervision of a licensed radiologist who is a diplomate of the American Board of Radiology; and

B. For the microfilm storage of chest X-rays of employees exposed to a toxic substance

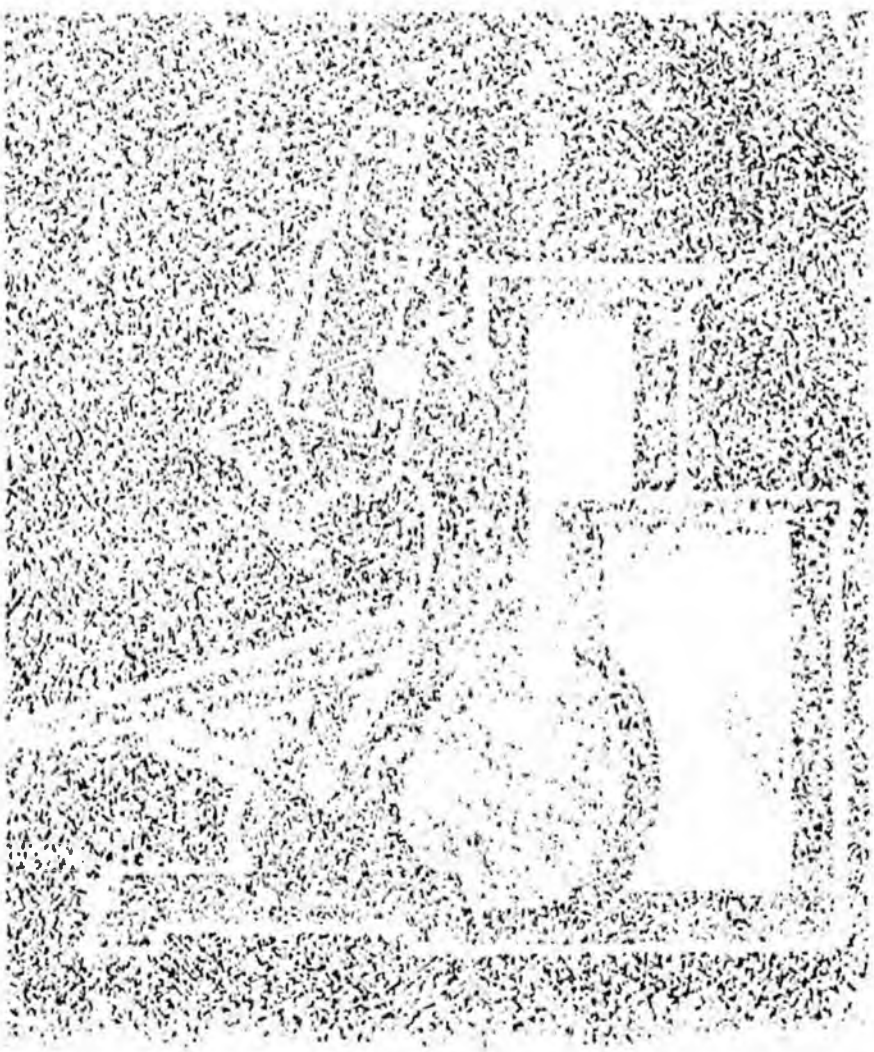
known to cause pneumoconiosis, the supervising radiologist shall consult with and obtain the approval of both a licensed physician who is a member of the American Board of Radiology certified in the subspecialty of chest disease, and a "B" reader certified by the National Institute for Occupational Safety and Health in accordance with § 1910.1045.51.

C. After the examination required by paragraph B, Appendix B, the supervising radiologist shall attach to the X-ray a summary of the interpretation of the X-ray. This summary shall be microfilmed along with the X-ray and made part of the employee's medical record.

[FR Doc. 82-18873 Filed 7-9-82, 8:45 am]
BILLING CODE 4510-26-M

NIOSH

1978 REGISTRY of TOXIC EFFECTS of CHEMICAL SUBSTANCES



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

1080 see: AH9100000
A 21 see: DO1750000
A-36 see: TA2100000
A 42 see: XN4550000
A 71 see: SB4725000
A-129 see: DK3325000
A 145 see: SO7000000
238A see: KM5425000
A 343 see: BP0315000
A 348 see: RP5800000
A 350 see: DM3315000
A 361 see: XY5600000
A 363 see: FC0175000
A 688 see: DP3500000
688A see: DP3750000
A 884 see: SH5075000
A-980 see: ED7700000
A 1093 see: XY9100000
A 1100 see: TX2100000
A 1141 see: TZ1225000
A-1348 see: YU0875000
A-1981-12 see: UY5625000
A 2079 see: XY5250000
A 2297 see: RQ2100000
A 3322 see: UT1400000
A 4077 see: TL9800000
5082A see: TB0700000
A 10749 see: XZ5475000
A-11025 see: ZG0875000
A 13397 see: RC2975000
A 17767 see: MV7175000
A18285 see: YT2E00000
A 19120 see: DP6650000
A-19757 see: GZ0875000
A 19931 see: CV0700000
A 33588 see: VA2200000
A-91033 see: SO6825000
AA see: BA5075000
AA see: CI7650000
9AA see: AR7300000
AAB see: BY8225000
AAF see: AB9450000
2-AAF see: AB9450000
AAFC see: HA5400000
AAFERTIS see: NO8750000
AAN see: MC1400000
9AAP see: RY4400000
AARANE see: DJ2380000
AARARRE see: DJ2380000
AAT see: XU8800000
AAT see: TF4550000
o-AAT see: XU8800000
AATECK see: LQ2800000
AATERRA see: XI3875000
AATP see: TF4550000
AATREX see: XY5600000
2-AB see: LO3325000
AB-15 see: DM3230000
AB-42 see: AG4200000
AB 100 see: EY8800000
AB-180 see: EY8650000
AB-181 see: EY8270000
AB-182 see: EY9350000
AB-183 see: EY8280000
ABADOL see: XJ2100000
ABADOLE see: XJ2100000
ABAR see: TB1720000
ABASIN see: YR6475000
ABAT see: TF6890000
ABATE see: TFAB90000
ABATHION see: TFA890000
ABAVIT see: OW+700000
ABBOCILLIN see: XH9403000
ABBOCILLIN-DC see: XH9450000
ABBOLEXIN see: OP 1350000
ABBOMEEN E-2 see: KK3538000
ABBOMEEN E-25 see: KK3530000
ABBOMEEN E-2 AEROSOL see: KK3542000
ABBOMEEN E-25 AEROSOL see: KK3534000
ABBOTT see: XZ5425000
ABBOTT-22700 see: LW3150000
ABBOTT-25794 see: UA5810000
ABBOTT-28440 see: NR9900000
ABBOTT-30360 see: EU2690000
ABBOTT 30400 see: RY1105000
ABBOTT-35616 see: DE8750000
ABBOTT 36581 see: LI5940000
ABBNSANIL see: AE4200000
ABICOVIROMYCIN see: GY8430000

AA4350000 ABIES ALBA OIL

Dif the coloring to pale yellow oil from the steam distillation of the crushed cones of ABIES ALBA Mill (FCTXAV 12,807,74)

Syn: OIL of ABIES ALBA * TEMPLIN OIL

IRDS: skin-rbt 500 mg/24H MOD — FCTXAV 12,807,74

ABIETIC ACID see: TP8580000
ABIETIC ACID, METHYL ESTER see: TP8590000
ABIGUANIL see: WO8575000
ABIKOVIROMYCIN see: GY8430000
ABIOL see: DH2450000

AA4725000 ABOBIOSIDE

TXDS: ivn-cat LD50 699 mg/kg — JPETAB 111,365,54

AA4900000 ABOMONOSIDE

TXDS: ivn-cat LD50 679 ug/kg — JPETAB 111,365,54

ABRACOL S.L.G. see: RG1975000
ABRAMYCIN see: DI8750000
2-ACETO-4'-CHLORO-3,5-DIIODOBENZANILIDE see: CV7450000

AA5250000 ABRIN

Dif A fractionation obtained from the seeds of jequirity, Abrus precatorius L. (leguminosae) (12VXAS 8,1,68)

CAS: 1393-62-0

Syn: AGGLUTININ * CRAB'S EYES * INDIAN LICORICE SEED * JEQUIRITY BEAD * PRAYER BEAD * TOXALBUMIN

TXDS:		
	orl-hmn LDLo 7 ug/kg	12VXAS 8,1,68
	orl-rat LDLo 300 mg/kg	AMIHAB 12,468,55
	orl-mus LD50 6838 mg/kg	ARZNAD 21,888,71
	ipr-mus LD50 20 ug/kg	12VXAS 9,1,76
	ivn-mus LD50 10 mg/kg	BJCAAI 34,418,76
	orl-rbt LDLo 21 mg/kg	AMIHAB 12,468,55
	orl-gpg LD50 299 mg/kg	ARZNAD 21,888,71

REVIEW: TOXICOLOGY REVIEW — BIPAAB 74(1),85,76

ABRODEN see: PB2250000
ABRODIL see: PB2250000
ABS see: DB7700000
ABS see: DB7875000
ABSENTOL see: RQ2100000
ABSETIL see: RQ2100000
ABSOLUTE ETHANOL see: KQ6300000
ABSOLUTE FRENCH ROSE see: VL0434000
ABSOLUTE MIMOSA see: PY7954000
ABS SODIUM SALT see: DU4375000
ABSTENSIL see: JO1225000
ABSTINYL see: JO1225000
ab-ABT see: UL8225000
AC 528 see: ID7525000
AC 1198 see: RP9100000
AC 3092 see: MH4970000
AC 3422 see: TF4550000
AC 3422 see: TF4550000
AC 3810 see: XH4500000
AC-3810 see: XH4920000
AC 3911 see: ID7450000
AC 5223 see: MF1750000
AC 18133 see: TF5775000
AC-18682 see: TE1750000
AC 18682 see: ID8225000
AC-18,737 see: TF8225000
AC 20,691 see: TF7525000
AC 38023 see: TF7650000
AC 47031 see: NJ6475000
AC-47300 see: TG0350000
AC 47470 see: JP1050000
AC 52160 see: TF6890000
AC 84777 FINAVEN see: UQ9920000
AC 92100 see: ID7740000
AC 92553 see: BX5470000
ACABLE see: IN5850000
ACACETINE see: DJ3050000

AA7680000 ACACIA (extract)

Dif Extracted from the flowers of Acacia baileyana (AROPAW 78,384,67)

IRDS: eye-rbt 36 mg/5H SEV — AROPAW 78,384,67

ACACIA MOLEISSIMA TANNIN see: PY7955000
ACACIA VILLOSA see: ZC0100000
ACADYL see: GN7875000
ACALMID see: EK1050000
ACALO see: EK1050000
ACAMOL see: AE4200000
ACAMYLOPHENINE see: MB9625000
ACAPRIN see: VC4022500
ACARABEN see: DD2275000
ACARACIDE see: WE2975000
ACARALATE see: DD2450000
ACARICYDOL E 20 see: DB5250000
ACARIN see: DC8400000
ACAPITHION see: IO5750000
ACAROL see: DD2100000
ACC-18133 see: TF5775000
ACCEL see: UO7510000
ACCELERATE see: GN8225000
ACCELERATOR 552 see: TM5850000
ACCELERATOR L see: ZH0525000
ACCELERATOR THIURAM see: JO1400000
ACCENT see: MA1575000
ACCO FAST RIO RB BASE see: XU5075000
ACCOTHION see: TF0350000
ACCROIBILE see: GL6940000
ACD 7029 see: EC5425000
ACD-10614 see: SB2160000
4,10-ACE-1,2-BENZANTHRACENE see: CU0700000
8,9-ACE-1,2-BENZANTHRACENE see: CU0885000
ACECARBROMAL see: YR6475000
ACECLIDINE see: VD6195000
ACECOLINE see: IZ9800000
ACECOLINE see: IZ9700000
ACEDE CRISYLIQUE (French) see: GO5950000
ACEDICON see: OH0955000
ACEDIST see: DV5200000
ACEDOXIN see: HI2275000
ACEDRON see: SI3400000
ACEGLATON see: LZ3C90000
ACEGLATONE see: LZ3990000
ACEMETHADONE HYDROCHLORIDE see: MJ3675000
1,2-2',3'-ACENAPHTENOCARBAZOLE (French) see: AB1130000
1,2-2',3'-ACENAPHTENO-3,4-DIHYDRO-7,8-BENZOCARBAZOLE (French) see: AB1090000
1,2-2',3'-ACENAPHTENO-6-METHYLCARBAZOLE (French) see: AB1170000
ACENAPHTHANTHRACENE see: CU1575000

AB0700000 5-ACENAPHTHENAMINE

CAS: 4657-93-6 MW: 169.24 MOLEM: C12 H11 N

Syn: 5-ACENAPHTHENEAMINE * 5-ACENAPHTHYLENAMINE, 1,2-DIHYDRO- * 5-AMINOACENAPHTHENE * 1,2-DIHYDRO-5-ACENAPHTHYLENAMINE

TXDS: ivn-mus LD50 56 mg/kg — CSINX* BX-01911, IARC** 16,243,78

REVIEW: CARCINOGENIC DETERMINATION INDEFINITE

5-ACENAPHTHENEAMINE see: AB0900000

AB1060000 ACENAPHTHENE, 5-NITRO-

CAS: 602-87-9 MW: 199.22 MOLEM: C12 H9 N O2

Syn: ACENAPHTHYLENE, 1,2-DIHYDRO-5-NITRO- * 1,2-DIHYDRO-5-NITRO-ACENAPHTHYLENE * 5-NAN * NITRO-5 * 5-NITRO-ACENAPHTHENE * 5-NITROACENAPHTHYLENE, DIHYDRO

TXDS: orl-rat TDLo 120 gm/kg/12W C — IIX CAR, IJCAH8 89,475,74

orl-ham TDLo:504 g/kg/24W-C TFX NEO BJCAAI 30,481,74
REVIEW: CARCINOGENIC DETERMINATION ANIMAL POSITIVE IARC** 16,319,78
STATUS: NCI CARCINOGENESIS BIOASSAY COMPLETED AS OF SEPT 1978

AB1080000 7-ACENAPHTHIPYRIDONE
MW: 168.20 MOLFM: C12 H8 O
TXDS: ivn-mus LD50:100 mg/kg CSLNX* NX#01783

AB1090000 16H-ACENAPHTHO(4,5-a)BENZO(i)CARBAZOLE, 6,7-DIHYDRO-
CAS: 6400-85-5 MW: 305.36 MOLFM: C24 H19 N
SYN: 1,2,2',3'-ACENAPHTHENO-3,4-DIHYDRO-7,8-BENZOCARBAZOLE (French)
TXDS: scu-mus LDLo:40 mg/kg BAFEAG 42,3,55

AB1130000 12H-ACENAPHTHO(4,5-a)CARBAZOLE
CAS: 213-32-1 MW: 293.38 MOLFM: C22 H15 N
SYN: 1,2,2',3'-ACENAPHTHENOCARBAZOLE (French)
TXDS: scu-mus LDLo:40 mg/kg BAFEAG 42,3,55

AB1170000 12H-ACENAPHTHO(4,5-a)CARBAZOLE, 9-METHYL-
CAS: 64047-40-1 MW: 307.41 MOLFM: C23 H17 N
SYN: 1,2,2',3'-ACENAPHTHENO-6-METHYLCARBAZOLE (French)
TXDS: scu-mus LDLo:40 mg/kg BAFEAG 42,3,55

12H-ACENAPHTHO(1,8-abc)HEXANTHRENE see: HN0175000

AB1235000 ACENAPHTH(1,2-d)OXAZOLE, 6b,9a-DIHYDRO-8-AMINO-, HYDROCHLORIDE
MW: 246.71 MOLFM: C13 H10 N2 O Cl H
SYN: 8-AMINO-6b,9a-DIHYDROACENAPHTHO(1,2-d)OXAZOLE HYDROCHLORIDE
TXDS: ipr-mus LD50:68 mg/kg JMCMAR 13,729,70

AB1240000 ACENAPHTH(1,2-d)OXAZOLE, 6b,9a-DIHYDRO-8-(DIMETHYLAMINO)-, MALEATE
MW: 354.33 MOLFM: C15 H16 N2 O C4 H4 O4
SYN: 6b,9a-DIHYDRO-8-(DIMETHYLAMINO)ACENAPHTH(1,2-d)OXAZOLE MALEATE
TXDS: ipr-mus LD50:82 mg/kg JMCMAR 13,729,70

AB1245000 ACENAPHTH(1,2-d)OXAZOLE, 6b,9a-DIHYDRO-8-IMINO-9-METHYL-, HYDROCHLORIDE
MW: 260.74 MOLFM: C14 H12 N2 O Cl H
SYN: 6b,9a-DIHYDRO-8-IMINO-9-METHYLACENAPHTH(1,2-d)OXAZOLE HYDROCHLORIDE
TXDS: ipr-mus LD50:55 mg/kg JMCMAR 13,729,70

AB1250000 ACENAPHTH(1,2-d)OXAZOLE, 6b,9a-DIHYDRO-8-(METHYLAMINO)-, HYDROCHLORIDE
MW: 260.74 MOLFM: C14 H12 N2 O Cl H
SYN: 6b,9a-DIHYDRO-8-(METHYLAMINO)ACENAPHTH(1,2-d)OXAZOLE HYDROCHLORIDE
TXDS: ipr-mus LD50:56 mg/kg JMCMAR 13,729,70

5-ACENAPHTHYLENAMINE, 1,2-DIHYDRO- see: AB0900000
ACENAPHTHYLENE, 1,2-DIHYDRO-5-NITRO- see: AB1060000
ACENOCOUMARIN see: GN1900000
ACENOCOUMAROL see: GN1900000
ACEOTHION see: TG0350000
ACEPHAT (German) see: TB4760000
ACEPHATE see: TB4760000
ACEPHAT-MET see: TB4970000
ACEPHENE see: AG0350000
ACEPROMAZINA see: CH2275000
ACEPROMAZINE see: CH2275000
ACEPROMAZINE MALEATE see: CH2450000
ACEPROMIZINA see: CH2275000
ACETAAL (Dutch) see: AB2800000
ACETACID RID B see: CH1225000
ACETACID RID 28R see: QI6550000
ACETACID RID J see: QI6925000
ACETAGISIC see: AF4200000
ACETAL see: AB2800000
ACETAL (DOT) see: AB2800000
ACETALDEHYD (German) see: AB1925000

AB1925000 ACETALDEHYDE
CAS: 75-07-0 MW: 44.05 MOLFM: C2 H4 O
SYN: ACETALDEHYD (German) * ACETALDEHYDE (DOT) * ACETIC ALDEHYDE * ALDEHYDE ACETIQUE (French) * ALDEHYDE ACETIQUE (Italian) * ETHANAL * ETHYL ALDEHYDE * OCTOWAY ALDEHYD (Polish)
IRDS: eye-hmn 50 ppm/15M JIHTAB 28,262,46
skn-rbt 500 mg open MLD UCDS** 12/13/63
eye-rbt 40 mg SEV UCDS** 12/13/63
IXDS: inl-hmn TCLo:134 ppm/30M TFX,IRR JAMAAP 165,1908,57
orl-rat LD50:1930 mg/kg AMIHBC 4,119,51
ihl-rat LCLo:4000 ppm/4H AMIHBC 10,61,54
ipr-rat LDLo:500 mg/kg JRCHAT 152,61,44
scu-rat LD50:660 mg/kg APTOA6 6,299,50
scu-mus LD50:660 mg/kg APTOA6 6,299,50
REVIEW: THRESHOLD LIMIT VALUE-air:100 ppm DHEW*: -,9,76
REVIEW: TOXICOLOGY REVIEW EVHPAZ 11,161,75
REGS: OSHA STANDARD-air TWA 200 ppm (SCP-V) FEREAC 39,23540,74
DOT FLAMMABLE LIQUID, LABEL FLAMMABLE LIQUID FEREAC 41,57018,76

ACETALDEHYDE (OXIME) see: AB1925000

AB1950000 ACETALDEHYDE, AMINE SALT
CAS: 75-39-8 MW: 61.10 MOLFM: C2 H4 O N3 H
SYN: ACETALDEHYDE AMMONIA (DOT)
REGS: DOT-ORM-A, LABEL NONE FEREAC 41,57018,76

ACETALDEHYDE AMMONIA (DOT) see: AB1950000

AB2100000 ACETALDEHYDE, BIS(2-METHOXYETHYL) ACETAL
CAS: 10141-67-8 MW: 178.24 MOLFM: C8 H18 O4
SYN: 1,1-DI(2-METHOXYETHOXY)ETHANE * 2,5,7,10-TETRAOXAUNDECANE, 6-METHYL-
IRDS: eye-rbt 500 mg AMIHBC 10,61,54
TXDS: orl-rat LD50:3260 mg/kg AMIHBC 10,61,54

AB2200000 ACETALDEHYDE, 2-BROMO-, 2,4-DINITROPHENYLHYDRAZONE
CAS: 5321-28-8 MW: 301.10 MOLFM: C8 H7 Br N4 O4
SYN: BROMOACETALDEHYDE 2,4-DINITROPHENYLHYDRAZONE
TXDS: ivn-mus LD50:18 mg/kg CSLNX* NX#01015

AB2450000 ACETALDEHYDE, CHLORO-
CAS: 107-20-0 MW: 78.50 MOLFM: C2 H3 Cl O
SYN: CHLOROACETALDEHYDE * 2-CHLORO-1-ETHANAL
TXDS: orl-rat LD50:21 mg/kg JPMSAE 61,19,72
ipr-rat LD50:2 mg/kg JPMSAE 61,19,72
orl-mus LD50:21 mg/kg JPMSAE 61,19,72
ipr-mus LD50:2 mg/kg JPMSAE 61,19,72
skn-rbt LD50:6* mg/kg JPMSAE 61,19,72
ipr-rbt LD50:1390 ug/kg JPMSAE 61,19,72
ipr-gpg LD50:636 ug/kg JPMSAE 61,19,72
REVIEW: THRESHOLD LIMIT VALUE-air:1 ppm DHEW*: 3,48,71
REGS: OSHA STANDARD-air:C 1 ppm (SCP-B) FEREAC 39,23540,74

AB2625000 ACETALDEHYDE, CHLORO-, (2,4-DINITROPHENYL)HYDRAZONE
CAS: 5135-80-8 MW: 259.61 MOLFM: C8 H5 Cl N4 O4
SYN: CHLOROACETALDEHYDE (2,4-DINITROPHENYL)HYDRAZONE * MONOCHLOROACETALDEHYDE 2,4-DINITROPHENYLHYDRAZONE * NSC 1763 * OM1783
TXDS: orl-rbt LD50:1460 mg/kg TXAPA9 8,472,66

AB2700000 ACETALDEHYDE, DIBUTYL ACETAL
CAS: 871-22-7 MW: 174.32 MOLFM: C10 H22 O2
SYN: 1,1-DIBUTOXYETHANE * DIBUTYL ACETAL * ETHANE, 1,1-DIBUTOXY-
IRDS: skn-rbt 10 mg/24H SEV AMIHBC 10,61,54
eye-rbt 500 mg AMIHBC 10,61,54
IXDS: orl-rat LD50:8790 mg/kg AMIHBC 10,61,54

AB2750000 ACETALDEHYDE, 2,2-DICHLORO-, 2,4-DINITROPHENYLHYDRAZONE
CAS: 19032-83-6 MW: 293.08 MOLFM: C8 H6 Cl2 N4 O4
SYN: DICHLOROACETALDEHYDE 2,4-DINITROPHENYLHYDRAZONE
TXDS: ivn-mus LD50:32 mg/kg CSLNX* NX#01014

AB2775000 ACETALDEHYDE, DICHLORO-, (1,3,7-TRIMETHYL-8-XANTHINYL)HYDRAZONE
MW: 319.18 MOLFM: C10 H12 Cl2 N6 O2
SYN: CAFFEINE 8-(2,2-DICHLOROETHYLIDENEHYDRAZINO) * DICHLOROACETALDEHYDE 8-CAFFEINE HYDRAZONE * 2,2-DICHLOROACETALDEHYDE (1,3,7-TRIMETHYL-8-XANTHINYL)HYDRAZONE * 8-(2,2-DICHLOROETHYLIDENE)HYDRAZINOCAFFEINE
TXDS: ivn-mus LD50:10 mg/kg CSLNX* NX#04396

AB2800000 ACETALDEHYDE, DIETHYL ACETAL
CAS: 105-57-7 MW: 118.20 MOLFM: C6 H14 O2
SYN: ACETAAL (Dutch) * ACETAL * ACETAL DIETHYLIQUE (French) * ACETAL (DOT) * ACETALE (Italian) * ACETOL * 1,1-DIAETHOXY-AETHAN (German) * 1,1-DIETHOXYETHAAN (Dutch) * 1,1-DIETHOXYETHANE * DIETHYL ACETAL * 1,1-DIETOSSIETANO (Italian) * ETHANE, 1,1-DIETHOXY- * ETHYLIDENE DIETHYL ETHER
IRDS: skn-rbt 10 mg/24H MLD JIHTAB 31,60,49
eye-rbt 500 mg JIHTAB 31,60,49
TXDS: orl-hmn LDLo:500 mg/kg 272TAP 3,7,69
orl-rat LD50:4600 mg/kg MDZEAK 8,244,67
ihl-rat LCLo:4000 ppm/4H JIHTAB 31,343,49
orl-rbt LC50:2582 mg/kg PSEBAA 29,730,32
REGS: DOT-FLAMMABLE LIQUID, LABEL FLAMMABLE LIQUID FEREAC 41,57018,76

AB2825000 ACETALDEHYDE, DIMETHYL ACETAL
CAS: 534-15-6 MW: 90.14 MOLFM: C4 H10 O2
SYN: 1,1-DIMETHOXYETHANE * DIMETHYLACETAL * DIMETHYL ALDEHYDE * ETHANE, 1,1-DIMETHOXY- * ETHYLIDENE DIMETHYL ETHER * METHYL FORMYL
IRDS: skn-rbt 10 mg/24H MLD JIHTAB 31,60,49
eye-rbt 20 mg JIHTAB 31,60,49
TXDS: ihl-rat LC50:3000 ppm/4H AMIHAB 12,623,55
orl-rbt LD50:4507 mg/kg PSEBAA 29,730,32
AQTX: AQUATIC TOXICITY RATING: TLm96:over 1000 ppm WQCHM* 3,-,74

AB2827500 ACETALDEHYDE, DIPHENYL-
CAS: 947-91-1 MW: 196.26 MOLFM: C14 H12 O
SYN: DIPHENYLACETALDEHYDE
TXDS: ivn-mus LD50:56 mg/kg CSLNX* NX#02088

ACETALDEHYDE, 2-(2-ETHOXYETHOXY)ETHYL-3,4-(METHYLENEDIOXY)PHENYL ACETAL see: DF4910000

ACETALDEHYDE, ETHYLMETHYL- see: ES3400000

AB2900000 ACETALDEHYDE, FLUORO-
CAS: 1544-68-3 MW: 62.05 MOLFM: C2 H3 F O
SYN: FLUOROACETALDEHYDE
TXDS: ipr-mus LD50:6 mg/kg JACSAT 78,4996,56
scu-mus LD50:4800 ug/kg JCSOA9 -,773,49
REVIEW: TOXICOLOGY REVIEW CHEIAY 48,225,51

AB2920000 ACETALDEHYDE, N-FORMYL-N-METHYLHYDRAZONE
DEA Toxic compound found in tobacco smoke. Cytotoxic activity (TCTXAV 15,575,77)
MW: 100.16 MOLFM: C4 H8 N2 O
TXDS: orl-rat LD50:320 mg/kg TCTXAV 15,575,77
orl-rbt LD50:70 mg/kg TCTXAV 15,575,77

AB2940000 ACETALDEHYDE, 2-METHOXY-
CAS: 10312-83-1 MW: 74.09 MOLFM: C3 H6 O2
SYN: METHOXYACETALDEHYDE * METHOXYETHANAL
TXDS: orl-rat LD50:2330 mg/kg 347IAG -,382,69
skn-rbt LD50:1170 mg/kg 347IAG -,382,69

AB2946500 ACETALDEHYDE, N-METHYLHYDRAZONE
MOLFM: C3 H8 N2
TXDS: orl-mus LD50:390 mg/kg TXAPA9 45(2),429,78

AB2955000 ACETALDEHYDE, METHYLTHIO-, O-(CARBAMOYL)OXIME
MW: 148.20 MOLFM: C4 H8 N2 O2 S
SYN: D 1843 * DU 27 611
TXDS: orl-rat LD50:60 mg/kg 28ZEAL 5,104,76
skn-rbt LD50:3400 mg/kg 28ZEAL 5,104,76

AB2962500 ACETALDEHYDE, 1-NITRO-, (p-CHLOROPHENYL)HYDRAZONE
CAS: 23787-35-2 MW: 213.66 MOLFM: C8 H8 Cl N3 O2
SYN: 1-NITRO-1-p-CHLOROPHENYLHYDRAZONOETHANE
TXDS: ivn-mus LD50:56 mg/kg CSLNX* NX#01702

AB2975000 ACETALDEHYDE OXIME
CAS: 107-29-9 MW: 59.08 MOLFM: C2 H5 N O
SYN: ACETALDOXIME * ALDOXIME * ETHYLIDENEHYDROXYLAMINE
TXDS: ipr-mus LD50:100 mg/kg NIIS** AD277,689

AB2990000 ACETALDEHYDE, PHENOXY-
MOLFM: C8 H8 O2
SYN: CORTEX ALDEHYDE * PHENOXYACETALDEHYDE
IRDS: skn-rbt 500 mg/24H MOD TCTXAV 14,659,76

AB3040000 ACETALDEHYDE, PHENYL-, DIMETHYL ACETAL
CAS: 101-48-4 MW: 166.24 MOLFM: C10 H14 O2
SYN: ETHANE, 1,1-DIMETHOXY-2-PHENYL- * PHENYLACETALDEHYDE DIMETHYL ACETAL * alpha-TOLYL ALDEHYDE DIMETHYL ACETAL * VIRIDINE
TXDS: orl-rat LD50:3500 mg/kg TCTXAV 13,681,75

AB3045000 ACETALDEHYDE SODIUM SULFITE
SYN: ACETALDEHYDBISULFITNATRIUM (German)
TXDS: orl-rbt LDLo:3220 mg/kg[SO2] AHYGAI 57,87,06

ACETALDEHYDE, TETRAMER see: XF9900000

AB3150000 ACETALDEHYDE, THIOSEMICARBAZONE
CAS: 3103-93-6 MW: 117.19 MOLFM: C3 H7 N3 S
SYN: CITA
TXDS: orl-rat LDLo:25 mg/kg NCNSA6 5,45,51

AB3325000 ACETALDEHYDE, TRIBROMO-, HYDRATE
CAS: 507-42-6 MW: 298.78 MOLFM: C2 H3 Br3 O2
SYN: BROMAL HYDRATE * 1,1,1-TRIBROMO-2,2-ETHANEDIOL * TRIBROMOACETALDEHYDE HYDRATE
TXDS: orl-rat LDLo:40 mg/kg JPETAB 63,453,38
ipr-rat LDLo:40 mg/kg JPETAB 63,453,38
ivn-rbt LDLo:30 mg/kg JPETAB 63,453,38

AB3340000 ACETALDEHYDE, 2,2,2-TRICHLORO-, 2,4-DINITROPHENYLHYDRAZONE
MW: 337.52 MOLFM: C8 H5 Cl3 N4 O4
SYN: TRICHLOROACETALDEHYDE 2,4-DINITROPHENYLHYDRAZONE
TXDS: ivn-mus LD50:5500 ug/kg CSLNX* NX#01013

AB3400000 ACETALDEHYDE, TRIFLUORO-, HYDRATE
CAS: 421-53-4 MW: 116.05 MOLFM: C2 H3 F3 O2
SYN: FLUORAL HYDRATE * FRAM * TRIFLUOROACETALDEHYDE HYDRATE
TXDS: ipr-mus LD50:650 mg/kg APTOA6 28,299,70

ACETALDEHYDE, TRIMER see: YK0525000
ACETAL DIETHYLIQUE (French) see: AB2800000
ACETALDOL see: ES3150000
ACETALDOXIME see: AB2975000
ACETALE (Italian) see: AB2800000
ACETALGIN see: AF4200000

REGISTRY of TOXIC EFFECTS of CHEMICAL SUBSTANCES

1978 EDITION

Richard J. Lewis, Sr.
Editor

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Assistant Editor

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
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Registry of Toxic Effects of Chemical Substances
1978 Edition

INTRODUCTION

...absence of evidence is not evidence of absence....*

The 1978 edition of the Registry of Toxic Effects of Chemical Substances, formerly known as the Toxic Substances List, is the seventh revision prepared in compliance with the requirements of Section 20(a)(6) of the Occupational Safety and Health Act of 1970 (Public Law 91-596). The original list was completed on June 28, 1971, and has been updated annually in book format. Beginning in October 1977, quarterly revisions have been provided in microfiche (see Appendix VIII). This Registry contains 124,247 listings of chemical substances: 33,929 are names of different chemicals with their associated toxicity data and 90,318 are synonyms. This edition includes approximately 7,500 new chemical compounds that did not appear in the 1977 Registry.

Statistics about selected data fields in the 1978 Registry are as follows:

Data Type	Number of Compounds	Number of Citations
Tumorigenesis	2,330	6,823
Mutagenesis	73	649
Teratogenesis	550	3,415
Primary Irritation		2,674
Human Toxic Effects		2,065
Chemical Abstract Service Registry Numbers	21,715	
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Recommended Standards from NIOSH Criteria Documents		942

(Note that as of January 1979, NIOSH has published 96 criteria documents, but some of these documents cover classes of compounds such as inorganic lead, many members of which are found in the Registry.)

The current estimate of the number of unique substances for which toxicity data may be available remains at approximately 100,000. The number of substances and types of toxicity information will be increased in subsequent revisions of the Registry.

The Registry's purposes are many, and it serves a variety of users. It is a single source document for basic toxicity information and for other data, such as chemical identifiers and information necessary for the preparation of safety directives and hazard evaluations for chemical substances. The various types of toxic effects linked to literature citations provide researchers and occupational health scientists with an introduction to the toxicological literature, making their own review of the toxic hazards of a given substance easier. By presenting data on the lowest reported doses that produce effects by several routes of entry in various species, the Registry furnishes valuable information to those responsible for preparing safety data sheets for chemical substances in the workplace. Chemical and production engineers can use the Registry to identify the hazards which may be associated with chemical intermediates in the development of final products, and thus can more readily select substitutes or alternate processes which may be less hazardous. Some organizations, including health agencies and chemical companies, have included the NIOSH Registry accession numbers with the listing of chemicals in their files to reference toxicity information associated with those chemicals. By including foreign language chemical names, a start has been made toward providing rapid identification of substances produced in other countries.

In this edition of the Registry, the editors intend to identify "all known toxic substances" which may exist in the environment and to provide pertinent data on the toxic effects from known doses entering an organism by any route described. Data may be used for the evaluation of chemical hazards in the environment, whether they be in the workplace, recreation area, or living quarters. The data has been assembled in accordance with the definitions and criteria presented below.

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*From The Dragons of Eden: Speculations on the Evolution of Human Intelligence by Carl Sagan. Reproduced by permission of Random House, Inc.

In offering this edition, the editors recognize its limitations in achieving the goal that they have set for it. It does not now include all chemicals for which toxic effects have been reported, and will not for some time. This cannot be achieved without the full cooperation of the scientific community. Cooperation in the form of personal contributions will become increasingly imperative as the Registry becomes more nearly complete.

The absence of a substance from the Registry does not imply that the substance is non-toxic, and thus non-hazardous, any more than the presence of a substance in the Registry indicates that the substance is hazardous in common use. A substance may not appear for a variety of reasons, e.g., (1) the test results could not be cited because the protocol of the study did not meet the RTECS selection criteria, (2) the substance has not yet been tested, or (3) the substance has been tested but the RTECS literature search has not yet uncovered the data.

The Registry includes substances which have been selected primarily for the toxic effect produced by single doses, some lethal and some non-lethal. However, the principal toxic effect of some substances results from exposure over a longer period of time, i.e., from the accumulation of a substance or its metabolites, or from the summation of continuing nonlethal, noxious insults which may eventually disable basic bodily functions. Although these substances are of concern, they may not be found in this edition due to our present selection criteria. However, when the toxic effect has been described by the author as carcinogenic, neoplastigenic, mutagenic, or teratogenic, even though the effect was produced by repeated exposure, the toxic dose data are reported.

It must be reemphasized that the entry of a substance in the Registry does not automatically mean that it must be avoided. A listing does mean, however, that the substance has the documented potential of being harmful if misused, and care must be exercised to prevent tragic consequences. Thus, the Registry lists many substances that are common in everyday life and are in nearly every household in the United States. One can name a variety of such dangerous substances: prescription and non-prescription drugs; food additives; pesticide concentrates, sprays, and dusts; fungicides; herbicides; paints; glazes; dyes; bleaches and other household cleaning agents; alkalies; and various solvents and diluents. The potential list is virtually unending because chemicals have become an integral part of our existence.

Drugs, or therapeutic chemicals, have been deliberately included in the Registry if they have been reported to produce a noxious effect. It is reasonable to expect to find such substances listed because they have been developed for their biologic effects. Some drugs achieve the desired effect when administered in a therapeutic quantity by supporting human physiologic activity; others may be beneficial to humans because they are toxic to human parasites. In any case, a quantity greater than the prescribed therapeutic dose may cause undesired toxic effects in humans. For some individuals, the normal therapeutic dose of a drug may produce toxic as well as therapeutic effects. Because drugs may be dangerous, our society has licensed certain practitioners, including physicians, dentists, and pharmacists, to handle the more potent substances intended for human therapeutic use. Similarly, other people are licensed, based on special training, for the handling of pesticides in a safe manner. It is wise to accept the direction of these experts in order to avoid undesirable consequences from misusing chemicals.

Other toxic substances in the environment have appeared there as a result of natural environmental reactions of waste products from modern technology, as distinct from the waste products themselves, or from naturally occurring substances. The products of these reactions may be found in the air we breathe and the water we drink. Even though these substances may be present in the environment in concentrations that are non-hazardous by themselves, their toxic potential must not be ignored, especially when additional exposure in the occupational or home environment may occur.

In general, toxic substances that appear in the home and community have been collected, processed, synthesized, packaged, and distributed by someone within the workplace. Some substances may be unwelcome cohabitants of the work environment. The safety and health of individuals in the workplace are the principal concerns of the Occupational Safety and Health Act of 1970. The Act addresses the problem of worker exposure to all toxic substances present in the workplace--not only those in the finished commercial product or in the intermediates used in its production, but also those which occur as waste products resulting from industrial processing.

Toxicity data in the literature are transformed into Registry format using the criteria presented in this Introduction and the Detailed File Description. In most cases no attempt is made to resolve any questions about published data. We rely on editing provided by the scientific community prior to publication in the scientific literature. One of the responsibilities of the RTECS Editorial Review Board, however, is to review a limited number of citations to resolve any ambiguities. Citations may be suggested for Board consideration by the data abstractors, the editors, or the Registry readership. The Board will review citations for resolution of ambiguities, but will not judge the relative merits of several publications which present contradictory data on the same substance. The Registry strives to accurately reflect the literature as it exists, leaving to others the problem of grappling with contradictory data.

It is not the purpose of the Registry to quantitate a hazard through the use of the toxic concentration or dose data that are presented with each substance. UNDER NO CIRCUMSTANCE CAN THE TOXIC DOSE VALUES PRESENTED WITH THESE CHEMICAL SUBSTANCES BE CONSIDERED DEFINITIVE VALUES FOR DESCRIBING SAFE VERSUS TOXIC DOSES FOR HUMAN EXPOSURE. Concentrations of chemical substances in the work environment which may be safely tolerated can be determined only by a critical evaluation of all available pertinent data by experienced investigators, data that include but are not limited to that listed in this Registry.

It is important to note the significant difference between classifying toxicity reports and evaluating the potential of a chemical to produce tumorigenic, mutagenic, or teratogenic effects in humans. In classifying reports, the editors of RTECS apply the technical criteria specified in the Detailed File Description to each report to allow extraction of data on a consistent basis. The evaluation of a substance's toxic potential is much more difficult and requires the collection, review, and analysis of all germane studies. The evidence must be correlated and judged by such parameters as appropriateness of the study to the decision process, relationship of the study design (e.g., animal model, route, and dose levels) to prediction of human response, the balance of positive and negative studies, purity of the substance tested, etc. The Registry makes no attempt to perform such a comprehensive analysis.

A critical evaluation of the hazard of a chemical in the workplace or environment involves much more than a determination of its toxic potency, no matter how complex that determination may be. A hazard evaluation must include such a determination, of course, but toxic potency and degree of hazard are not synonymous. Identifying and defining the hazard of a chemical must also include, among other factors, the evaluation of the amount and duration of exposure, the physical characteristics of the substance, the physical conditions under which exposure occurs, and the evaluation of interactions with other substances that may be present. All of these factors may significantly alter the toxic potency of a substance which, in turn, may alter the health of the person exposed.

The National Institute for Occupational Safety and Health, under its criteria development program, conducts critical reviews of occupational hazards. The resulting criteria document for a particular hazard provides a detailed rationale for the standard recommended by NIOSH to be used by the Department of Labor, Occupational Safety and Health Administration (OSHA) as a basis for a standard. A description of the criteria document program and related NIOSH activities appears in Appendix I.

The permissible exposure levels of hazardous substances which have been adopted by OSHA to provide a safe, healthful work environment for all persons are cited in this Registry under the appropriate compound. These standards may be formulated by the Department of Labor on its own initiative, in response to recommendations of the NIOSH criteria documentation program, or as a result of the Standards Completion Program. Approximately 500 such standards have been promulgated in Part 1910, as amended, of Title 29 of the Code of Federal Regulations (29 CFR 1910). They may also be found in the Federal Register, Volume 39, Number 125, June 27, 1974.

Section 20(a)(6) of the Occupational Safety and Health Act of 1970 directs that the Secretary of Health, Education, and Welfare "...shall determine following a written request by any employer or authorized representative of employees...whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found...." NIOSH responds to this legislative mandate by means of a Health Hazard Evaluation, as specified in 42 CFR 85, first published in the Federal Register, Volume 37, Number 215, pages 23639 through 23642, November 7, 1972. A Health Hazard Evaluation request will secure the assistance of NIOSH in determining the safety of a substance used in a specific occupational environment. Both the Federal Register reference and the forms to be used appear in Appendix IV.

To assist both employers and workers in attaining safe occupational environments, NIOSH has prepared a series of Health and Safety Guides and Employee Good Practices Manuals. A listing of the titles in each series and a brief description of their contents appear in Appendix III.

The editors request and will appreciate assistance from representatives of the industrial, academic, and governmental communities in supplying data for this Registry. Such assistance may be offered in the form of reprints of scientific publications, technical data sheets, sales or promotional material, other publicly available reference material, and data presented on unpublished studies. All material received will be considered in the public domain and as such may be made available to any persons or organizations. Data published in the Registry will be selected according to the criteria presented herein. Identification of errors in the file is also solicited, as are any general comments or recommendations. Those who have contributed to this year's publication are listed in the Acknowledgments. All correspondence should be addressed to:

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DETAILED FILE DESCRIPTION

SELECTION

1. Substances Included--For the purpose of this publication, the phrase "all known toxic substances" is interpreted by the editors to mean all mined, manufactured, processed, synthesized, and naturally occurring inorganic and organic compounds. The list of substances includes drugs, food additives, preservatives, ores, pesticides, dyes, detergents, lubricants, soaps, plastics, extracts from plant and animal sources, plants and animals which are toxic by contact or consumption, and industrial intermediates and waste products from production processes. Some of the information in the file thus refers to materials whose composition is not perfectly known. The chemical substances included in this list are assumed to exhibit the reported toxic effect in their pure state unless otherwise noted. However, even in the case of a supposedly "pure" substance, there is usually some degree of uncertainty as to its exact composition and the impurities which may be present. This possibility must be considered in attempting to interpret the data presented since the toxic effects observed could in some cases be caused by a contaminant.

2. Substances Excluded--Excluded from the Registry are trade name products representing compounded or formulated proprietary mixtures available as commercial products. These exclusions are necessary because of difficulties in assessing the contribution of each component of a mixture to that substance's toxicity and because a product's formulation is often changed by varying the components, their concentration, or the purity of the ingredients. Commercial product trade names are included, however, when they represent a single active chemical entity or a well-defined mixture of relatively constant composition. Radioactive substances are included but the effect reported is the chemically produced effect rather than the radiation effect.

FORMAT

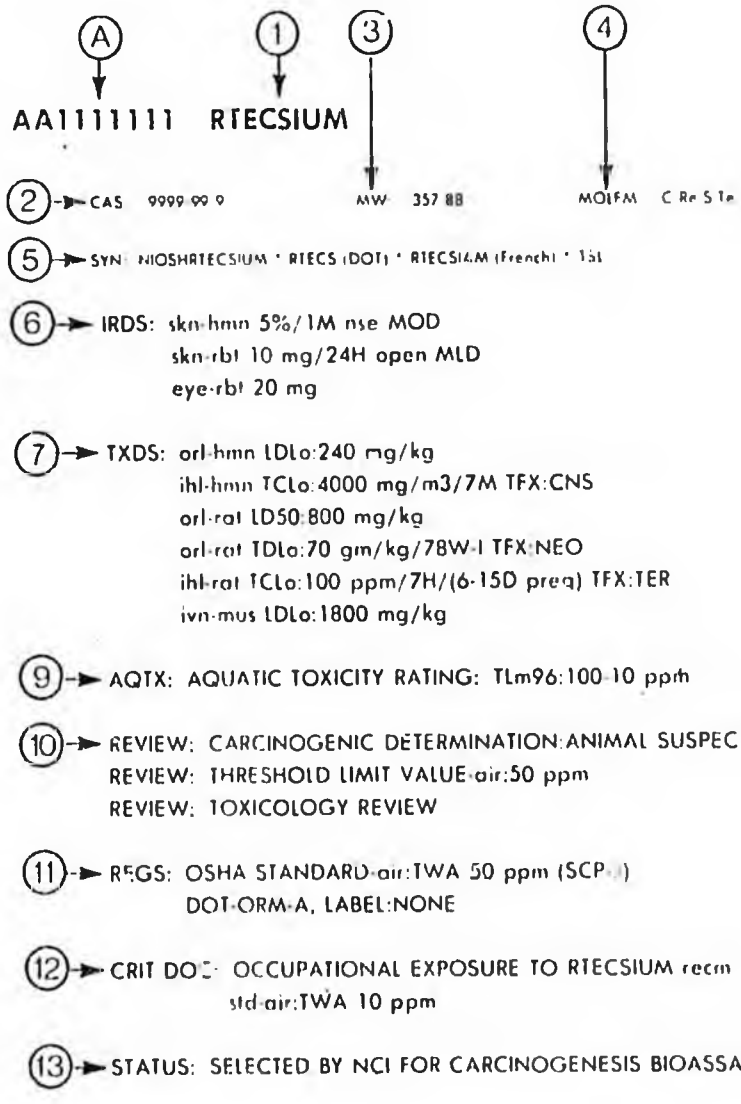
This edition of the Registry lists all substance prime names and synonyms in the file in alphabetical order, ignoring special characters such as numerals, Greek letters, and prefixes indicating substituent locations, and stereochemical or other structural features. These components are taken into account for secondary ordering in ascending alphabetical and numerical order.

Each substance prime name is identified by a unique nine-position RTECS accession number (two letters and seven numerals) which varies directly with the alphabetic sequence of the prime name, so that toluene, for example, has a higher number than benzene. Each synonym is cross-referenced to its appropriate prime name accession number. The accession number is simply an identifier assigned alphabetically to each substance in the Registry. It is not intentionally related to the compound's toxicity or structure, although compounds with alphabetically similar names and, in some cases therefore, similar structures are grouped together. For each prime name accession number the following data are provided when available: the substance prime name; a description of the substance (where necessary); synonymous names; CAS number; molecular formula; molecular weight; primary irritation and toxic dose data with references; and citations to aquatic toxicity ratings, to IARC reviews, to ACGIH Threshold Limit Values, to toxicological reviews, to existing federal standards, to the NIOSH criteria document program for recommended standards, and to the National Cancer Institute's Carcinogenesis Testing Program. Reference CODEN abbreviations and their respective titles are listed under Bibliographic References. A summary of standard abbreviations is located on the inside back cover. Sample data records are shown in Figures 1, 2, and 3.

1. Substance Prime Name. The prime name of each substance in the Registry is derived from the nomenclature used by the American Chemical Society's Chemical Abstracts Service (CAS) in the 8th Collective Index of Chemical Abstracts, which is in the inverted form. The names are modified by NIOSH for certain substances to provide convenience to the user in grouping substances of similar occupational pertinence, such as metallic salts. With each substance prime name, the reader will find the complete listing of the associated data.

Some entries, however, appear under the chemical or descriptive names used in the source material from which the toxic data were obtained. This is particularly true for those substances for which some aspects of their composition are in question, such as plant or animal extracts. These prime names are accompanied by a brief description or definition ("DEF") listing the source of the substance, a general statement of constituents, or other pertinent information, and the CODEN citation of the reference that contained the definition.

2. The Chemical Abstracts Service Registry Number ("CAS") is a numeric designation assigned by the American Chemical Society's Chemical Abstracts Service and uniquely identifies a specific chemical compound. This entry allows one to conclusively identify a substance regardless of the name or naming system used.



A. RTECS Accession Number, a sequence number assigned to each substance. See Format.
1. Substance Prime Name. See 1 in text.
2. Chemical Abstract Service Registry Number. See 2 in text.
3. Molecular Weight of this substance. See 3 in text.
4. Molecular or Elemental Formula of this substance. See 4 in text.
5. Synonyms, common names, trade names, and other chemical names. See 5 in text.
6. Skin and Eye Irritation Data. See 6 in text; also see Figure 2.
7. Toxicity Data. See 7 in text; also see Figure 3.
8. CODEN, an acronym for the reference from which the data were abstracted. See 8 in text; also see Figures 2 and 3.
9. Aquatic Toxicity Rating. See 9 in text.
10. Review of this substance. See 10 in text.
11. Standards and Regulations for this substance promulgated by a Federal agency. See 11 in text.
12. A Criteria Document supporting a recommended standard has been published by NIOSH. See 12 in text.
13. Current status of NCI Carcinogenesis Bioassay Program for this substance. See 13 in text.

FIGURE 1. AN EXAMPLE OF A TYPICAL SUBSTANCE ENTRY IN THE REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

6. An acronym which stands for "Irritation Dose."
6a. This is an abbreviation for the tissue upon which the irritation test was conducted, either skin (skn) or eyes (eye).
6b. This is an abbreviation for the test species. See Table II for other species listed in the Registry.
6c. This is the amount of substance used in the test for which results are reported, and may contain information about duration of exposure if different from the standard time of 72 hours.
6d. This is a descriptor to indicate differences in the test conditions from the standard protocol. Thus, "open" is used with skin irritation data to indicate an open Draize test. Other descriptors are "imm," "nse," and "rns."
6e. This is an abbreviation to indicate the severity of the irritation response as reported in the reference: mild (MLD), moderate (MOD), or severe (SEV).
8. This is the CODEN denoting the reference from which the irritation data were derived. The complete citation for this CODEN is listed under Bibliographic References.
8a. The volume number of the reference.
8b. The page number on which the reference starts.
8c. The last two digits of the year of publication, e.g., 54 = 1954.

FIGURE 2. A TYPICAL PRIMARY IRRITATION LINE FROM THE REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

(THIS FIGURE IS A FURTHER EXPLANATION OF ITEM 6 IN FIGURE 1)

7. An acronym which stands for "Toxic Dose."
7a. This is an abbreviation for the route of administration or entry. See Table I for other routes listed in the Registry.
7b. This is an abbreviation for the test species. See Table II for other species listed in the Registry.
7c. This is the type of dose reported. See 7c in text.
7d. This is the dose that caused the toxic effect. See 7c, 7e, and 7f in text.
7e. The first part of this notation, "TFX," is an acronym which stands for "Toxic Effects." The last part of this notation refers to the type of effect caused by the administered dose. See 7g in text.
8. This is the CODEN denoting the reference from which the toxic data were derived. The complete citation for this CODEN is listed under Bibliographic References.
8a. The report number of the reference.

FIGURE 3. A TYPICAL TOXIC DOSE LINE FROM THE REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

(THIS FIGURE IS A FURTHER EXPLANATION OF ITEM 7 IN FIGURE 1)

3. Molecular Weight ("MW") is calculated from the molecular formula.

4. Molecular Formula ("MOLFM") designates the elemental composition of the substance and is structured according to the Hill System (see Journal of the American Chemical Society, 22(8): 478–494, 1900) in which carbon and hydrogen (if present) are listed first, followed by the other elemental symbols in alphabetical order. The formula for compounds that do not contain carbon are ordered strictly alphabetically by element symbol. The formula is obtained from one of the cited references or a chemical reference text, or derived from the name of the substance.

5. Synonyms ("SYN") for the substance prime name are listed alphabetically according to the rule described under "FORMAT." Synonyms include other chemical names, trade names, common or generic names, foreign names (language), or codes, and are separated by asterisks. Some synonyms consist in whole or in part of registered trademarks. These trademarks are not identified as such in the RTECS file because of limitations in the computer and photocomposition character sets used to produce the Registry. The editors are aware of the problem of trademarks becoming generic trade names through common usage. While the Registry does not presently have a mechanism for noting trademarks, the lack of the appropriate registered trademark symbol does not imply that the trademarks contained herein are considered generic synonyms by NIOSH.

6. Skin and Eye Irritation Data (see Figure 2). All primary irritation data follow the header "IRDS." Each data line includes, in sequence, the tissue tested (skin or eye); the species of animal tested; the total dose and where applicable, the duration of exposure; for skin tests only, whether open or occlusive; an interpretation of the irritation response severity when noted by the author; and the reference from which the data were extracted. Only positive irritation test results are included in the Registry.

Substances that are applied topically to the skin or to the mucous membranes can elicit either (a) systemic effects of an acute or chronic nature or (b) local effects, more properly termed "primary irritation." A primary irritant is a substance that, if present in sufficient quantity for a sufficient period of time, will produce a non-allergic, inflammatory reaction of the skin or of the mucous membrane at the site of contact. Primary irritants are further limited by the editors to those substances that are not corrosive. Hence, concentrated sulfuric acid is not classified as a primary irritant.

a. Primary Skin Irritation. In experimental animals, a primary skin irritant is defined as a chemical substance that produces an irritant response on first exposure in a majority of the test subjects. However, in some instances compounds act more subtly and require either repeated contact or special environmental conditions (humidity, temperature, occlusion, etc.) to produce a response.

The most standard animal irritation test is the Draize procedure (Journal of Pharmacology and Experimental Therapeutics, 82: 377–419, 1944). This procedure has been modified and adopted as a regulatory test by the Consumer Product Safety Commission (CPSC) in 16 CFR 1500.41 (formerly 21 CFR 191.11). In this test a known amount (0.5 ml of a liquid or 0.5 gm of a solid or semisolid) of the test substance is introduced under a one square inch gauze patch. The patch is applied to the skin (clipped free of hair) of twelve albino rabbits. Six rabbits are tested with intact skin and six with abraded skin. The abrasions are minor incisions made through the stratum corneum, but are not sufficiently deep to disturb the dermis or to produce bleeding. The patch is secured in place with adhesive tape, and the entire trunk of the animal is wrapped with an impervious material, such as rubberized cloth, for a 24-hour period. The animal is immobilized during exposure. After 24 hours the patches are removed and the resulting reaction evaluated for erythema, eschar, and edema formation. The reaction is again scored at the end of 72 hours (48 hours after the initial reading), and the two readings are averaged. A substance producing any degree of positive reaction is cited in the Registry as an irritant.

As the modified Draize procedure described above has become the standard test specified by the U.S. government, nearly all of the primary skin irritation data either strictly adheres to the test protocol or involves only simple modifications to it. When test procedures other than those described above are reported in the literature, appropriate codes are included in the data line to indicate those deviations.

The most common modification is the lack of occlusion of the test patch, so that the treated area is left open to the atmosphere. In such cases the notation "open" appears in the irritation data line. Another frequent modification involves whole arm or whole body immersion in the test substance or, more commonly, in a dilute aqueous solution of the test substance. This type of test is often conducted on soap and detergent solutions. Immersion data are identified by the abbreviation "imm" in the data line.

The dose reported is based first on the lowest dose producing an irritant effect and second on the latest study published. The dose is expressed as follows:

(1) Single application by the modified Draize procedure is indicated by only a dose amount. If no exposure time is given, then the data are for the standard 72-hour test. For test times other than 72 hours, the dose data is given in mg (or an appropriate unit)/duration of exposure, e.g., 10 mg/24H.

(2) Multiple applications involve administration of the dose in divided portions applied periodically. The total dose of test substance is expressed in mg (or an appropriate unit)/duration of exposure, with the symbol "I" indicating intermittent exposure, e.g., 5 mg/6D-I.

The method of testing substances for primary skin irritation given in the Code of Federal Regulations does not include an interpretation of the response. However, some authors do include a subjective rating of the irritation observed. If such a severity rating is given, it is included in the data line as mild ("MLD"), moderate ("MOD"), or severe ("SEV"). The Draize procedure employs a rating scheme which is included here for informational purposes only, since other researchers may not categorize irritation response in this manner.

Category	Code	Skin Reaction
Mild	MLD	Well defined erythema and slight edema (edges of area well defined by definite raising)
Moderate	MOD	Moderate to severe erythema and moderate edema (area raised approximately 1 mm)
Severe	SEV	Severe erythema (beet redness) to slight eschar formation (injuries in depth) and severe edema (raised more than 1 mm and extending beyond area of exposure)

b. Primary Eye Irritation. In experimental animals, a primary eye irritant is defined as a chemical substance that produces an irritant response in the test subject on first exposure. Eye irritation study procedures developed by Draize have been modified and adopted as a regulatory test by CPSC in 16 CFR 1500.42. In this procedure, a known amount of the test material (0.1 ml of a liquid or 100 mg of a solid or paste) is placed in one eye of each of six albino rabbits; the other eye remains untreated, serving as a control. The eyes are not washed after instillation and are examined at 24, 48, and 72 hours for ocular reaction. After the recording of ocular reaction at 24 hours, any or all eyes may be further examined following the application of fluorescein. Any or all eyes may also be washed with a sodium chloride solution (U.S.P. or equivalent) after the 24-hour reaction has been recorded.

A test is scored positive if any of the following effects are observed: (1) ulceration (besides fine stippling); (2) opacity of the cornea (other than slight dulling of normal luster); (3) inflammation of the iris (other than a slight deepening of the rugae or circumcorneal injection of the blood vessel); (4) swelling of the conjunctiva (excluding the cornea and iris) with eversion of the eyelid; or (5) a diffuse crimson-red color with individual vessels not clearly identifiable. A substance is an eye irritant if four of six rabbits score positive. It is considered a nonirritant if none or only one of six animals exhibits irritation. If intermediate results are obtained, the test is performed again. For the purpose of RTECS, substances producing any degree of irritation in the eye are identified in the Registry as irritants. When an author has designated a substance as either a mild, moderate, or severe eye irritant, this designation is also reported.

The dose reported is based first on the lowest dose producing an irritant effect and second on the latest study published. Single and multiple applications are indicated as described above under "Primary Skin Irritation." Test times other than 72 hours are noted in the dose. All eye irritant test exposures are assumed to be continuous, unless the reference states that the eyes were washed after instillation. In this case, the notation "rns" (rinsed) is included in the data line.

c. Species Exposed. Since Draize procedures for determining both skin and eye irritation specify rabbits as the test species, most of the animal irritation data in the Registry are for rabbits, although any of the species listed in Table II may be used. The editors endeavor to include as much human data as possible, since this information is directly applicable to occupational exposure. Much of this data comes from studies conducted on volunteers (such as for cosmetic or soap ingredients) or from persons accidentally exposed. When an accidental exposure, such as a spill, is cited, the data line includes the abbreviation "nse" (non-standard exposure). In these cases it is often very difficult to determine the precise amount of the substance to which the individual was exposed. Therefore, for accidental exposures we have generally provided an estimate of the concentration or strength of the substance, rather than a total dose amount.

7. Toxicity Data (see Figure 3). All toxic dose data follow the header "TXDS." Each data line includes, in sequence, the route of exposure; the species of animal studied; the type of dose; the amount of substance per body weight or concentration per unit of air volume and, where applicable, the duration of exposure; a descriptive notation of the type of effect reported; and the reference source from which the information was extracted. Only positive toxicity test results are cited in this section. Each element of this toxic dose data line is discussed below.

All toxic dose data appearing in the Registry are derived from reports of the toxic effects produced by individual substances. A toxic effect is defined as any reversible or irreversible noxious effect on the body; any benign or malignant tumor; any in vivo mutagenic or teratogenic effect which includes fetal resorption or other disturbances to a normal gestation; or any death which has been reported to have resulted from

exposure to a substance via any route. For humans, a toxic effect is any effect that was reported in the source reference. There is no qualifying limitation on the duration of exposure or for the quantity or concentration of the substance, nor is there a qualifying limitation on the circumstances that resulted in the exposure. Regardless of the absurdity of the circumstances that were involved in a toxic exposure, it is assumed that the same circumstances could recur. The production of tumors (neoplastigenesis), benign or malignant (carcinogenesis), the production of changes in the offspring induced by germ cell mutation or acting on the fetus directly (teratogenesis), and death are the criteria that are used as the toxic effects for animal data. There is no limitation on the duration of exposure nor on the quantity or concentration of the dose of the substance reported to have caused these effects.

The report of the lowest total dose administered over the shortest time to produce the toxic effect was given preference, although some editorial license was taken so that additional references might be cited. No restrictions were placed on the amount of a substance producing death in an experimental animal nor on the time period over which the dose was given. By law, however, a toxic effect must be produced for the dose published. Therefore, terms suggesting that a toxic or lethal effect may exist at doses greater than those tried cannot be used.

a. Route of Exposure or Administration. Although many exposures to substances in the industrial community occur via the respiratory tract or skin, most studies in the published literature report exposures of experimental animals in which the test substances were introduced primarily through the mouth by pills, in food, in drinking water, or by intubation directly into the stomach.The abbreviations and definitions of the various routes of exposure reported in the Registry are found in Table I.

b. Species Exposed. Since the effects of exposure of humans are of primary concern, we have indicated, when available, whether the results were observed in man, woman, child, or infant. If no such distinction was made in the reference, the term "hmn" (human) is used. However, the results of studies on rats or mice are the most frequently reported and hence provide the most useful data for comparative purposes. The species and abbreviations used are listed alphabetically in Table II.

c. Description of Exposure. In order to better describe the administered dose reported in the literature, six abbreviations are used. These terms indicate whether the dose caused death (LD) or other toxic effects (TD) and whether it was administered as a lethal concentration (LC) or toxic concentration (TC) in the inhaled air. In general, the term "Lo" is used where the number of subjects studied was not a significant number from the population or the calculated percentage of subjects showing an effect was listed as 100. The definition of terms is as follows:

TDLo—Toxic Dose Low--the lowest dose of a substance introduced by any route, other than inhalation, over any given period of time and reported to produce any toxic effect in humans or to produce carcinogenic, neoplastigenic, teratogenic, or mutagenic effects in humans or animals.

TCLo--Toxic Concentration Low--the lowest concentration of a substance in air to which humans or animals have been exposed for any given period of time that has produced any toxic effect in humans or produced a carcinogenic, neoplastigenic, teratogenic, or mutagenic toxic effect in animals or humans.

LDLo—Lethal Dose Low--the lowest dose (other than LD50) of a substance introduced by any route, other than inhalation, over any given period of time in one or more divided portions and reported to have caused death in humans or animals.

LD50—Lethal Dose Fifty—a calculated dose of a substance which is expected to cause the death of 50% of an entire defined experimental animal population. It is determined from the exposure to the substance by any route other than inhalation of a significant number from that population. Other lethal dose percentages, such as LD1, LD10, LD30, and LD99, may be published in the scientific literature for the specific purposes of the author. Such data would be published in the Registry if these figures, in the absence of a calculated lethal dose (LD50), were the lowest found in the literature.

LCLo--Lethal Concentration Low--the lowest concentration of a substance in air, other than LC50, which has been reported to have caused death in humans or animals. The reported concentrations may be entered for periods of exposure which are less than 24 hours (acute) or greater than 24 hours (subacute and chronic).

LC50—Lethal Concentration Fifty—a calculated concentration of a substance in air, exposure to which for a specified length of time is expected to cause the death of 50% of an entire defined experimental animal population. It is determined from the exposure to the substance of a significant number from that population.

The following table summarizes the above information:

Category	Exposure Time	Route of Exposure	TOXIC EFFECTS Human	TOXIC EFFECTS Animal
TDLo	Acute or Chronic	All except Inhalation	Any Non-Lethal	CAR, NEO TER, MUT
TCLo	Acute or Chronic	Inhalation	Any Non Lethal	CAR, NEO TER, MUT
LDLo	Acute or Chronic	All except Inhalation	Death	Death
LD50	Acute	All except Inhalation	Not Applicable	Death (Statistically Determined)
LCLo	Acute or Chronic	Inhalation	Death	Death
LC50	Acute	Inhalation	Not Applicable	Death (Statistically Determined)

d. Units of Dose Measurement. As in almost all experimental toxicology, the doses given are expressed in terms of the quantity administered per unit body weight, or quantity per skin surface area, or quantity per unit volume of the respired air. In addition, the duration of time over which the dose was administered is also listed, as needed.

Milligrams (one thousandth of a gram) per kilogram (mg/kg) are preferred, but in some cases, because of dose size and its practical presentation in the file, grams per kilogram (gm/kg), micrograms (one millionth of a gram) per kilogram (ug/kg), or nanograms (one billionth of a gram) per kilogram (ng/kg) are used. Volume measurements of dose were converted to weight units by appropriate calculations. Densities were obtained from standard reference texts. Where densities were not readily available, all liquids were assumed to have a density of one gram per milliliter. Twenty drops of liquid are assumed to be equal in volume to one milliliter.

All body weights have been converted to kilograms (kg) for uniformity. For those references in which the dose was reported to have been administered to an animal of unspecified weight or a given number of animals in a group (e.g., feeding studies) without weight data, the weights of the respective animal species were assumed to be those listed in Table II and the dose is listed on a per kilogram body weight basis. Assumptions for daily food and water intake are found in Table II to allow approximating doses for humans and species of experimental animals where the dose was originally reported as a concentration in food or water. The values presented are selections which are reasonable for the species and convenient for dose calculations.

All concentrations of a gaseous substance in air are listed preferably as parts of vapor or gas per million parts of air by volume (ppm). However, parts per hundred (pph or per cent), parts per billion (ppb), or parts per trillion (ppt) may be used for convenience of presentation. If the substance is a solid or a liquid, the concentrations are listed preferably as milligrams per cubic meter (mg/m3) but may, as applicable, be listed as micrograms per cubic meter (ug/m3), nanograms per cubic meter (ng/m3), or picograms (one trillionth of a gram) per cubic meter (pg/m3) of air. For those cases in which other measurements of contaminants are used, such as fibers or particles, the measurement is spelled out.

Where the duration of exposure is available, time is presented as minutes (M), hours (H), days (D), weeks (W), or years (Y). Additionally, continuous (C) indicates that the exposure was continuous over the time administered, such as ad libitum feeding studies or 24-hour, 7-day per week inhalation exposures. Intermittent (I) indicates that the dose was administered during discrete periods, such as daily, twice weekly, etc. In all cases, the total duration of exposure appears first after the kilogram body weight and slash, followed by descriptive data; e.g., 10 mg/kg/3W-I means ten milligrams per kilogram body weight administered over a period of three weeks, intermittently in a number of separate, discrete doses. This description is intended to provide the reader with enough information for an approximation of the experimental conditions, which can be further clarified by studying the article cited.

e. Frequency of Exposure. Frequency of exposure to the test substance varies depending on the nature of the experiment. For the purpose of the Registry, frequency of exposure is given only in the case of an inhalation experiment.

f. Duration of Exposure. For assessment of tumorigenic effect, the testing period should be the life span of the animal, or until statistically valid calculations can be obtained regarding tumor incidence. In the toxic dose line, the total dose causing the tumorigenic effect is given. The duration of exposure is included to give an indication of the testing period during which the animal was exposed to this total dose. For teratogenic, in vivo mutagenic, and multigenerational studies, the time during gestation when the substance was administered to the mother is also provided.

g. Notations Descriptive of the Toxicology. The toxic dose line thus far has indicated the route of entry, the species involved, the description of the dose, and the amount of the dose. The next entry found on this line when a toxic exposure (TD or TC) has been listed is "TFX" (Toxic Effect). Following "TFX" will be one of the notations found in Table III. These notations indicate the organ system affected or, in the case of animal experiments, special effects that the substance produced, e.g., TER = teratogenic effect. No attempt was made to be definitive in reporting these effects because such definition requires much detailed qualification and is beyond the scope of the publication at this time. The selection of the dose was based first on the lowest dose producing an effect and second on the latest study published.

The importance attached to reports of the carcinogenic activity of substances necessitates a more detailed discussion of the criteria used to include this type of data in the Registry. Tumorigenic citations are classified according to the reported results of the study only to aid the reader in selecting appropriate references for in-depth review and evaluation. In past editions of the Registry, the two classifications used were CAR, indicating a positive carcinogenic finding, and NEO, indicating a study producing benign tumors or one lacking complete documentation. With this edition a third classification, ETA (equivocal tumorigenic agent), has been added to denote those studies reporting uncertain, but seemingly positive, results.

The following 9 technical criteria are used by RTECS to abstract the toxicological literature and classify studies that report positive tumorigenic responses. No attempts are made either to evaluate the various test procedures or correlate results from different experiments.

(1) A citation is coded "TFX:CAR" (carcinogenic) when review of an article reveals that all of the following criteria are satisfied:

(a) A statistically significant increase in the incidence of tumors in the test animals. The statistical test is that used by the author. If no statistic is reported, a Fisher's Exact Test is applied with significance at the 0.05 level, unless the author makes a strong case for significance at some other level.

(b) A control group of animals is used and the treated and control animals are maintained under identical conditions.

(c) The sole experimental variable between the groups is the administration or non-administration of the test substance (see (9) below).

(d) The tumors consist of autonomous populations of cells of abnormal cytology capable of invading and destroying normal tissues, or the tumors metastasize as confirmed by histopathology.

(2) A citation is coded "TFX:NEO" (neoplastic) when review of an article reveals that all of the following criteria are satisfied:

(a) A statistically significant increase in the incidence of tumors in the test animals. The statistical test is that used by the author. If no statistic is reported, a Fisher's Exact Test is applied with significance at the 0.05 level, unless the author makes a strong case for significance at some other level.

(b) A control group of animals is used, and the treated and control animals are maintained under identical conditions.

(c) The sole experimental variable between the groups is the administration or non-administration of the test substance (see (9) below).

(d) The tumors consist of cells that closely resemble the tissue of origin, that are not grossly abnormal cytologically, that may compress surrounding tissues, but that neither invade tissues nor metastasize; or

(e) The tumors produced cannot definitely be classified as either benign or malignant.

(3) A citation is coded "TFX:ETA" (equivocal tumorigenic agent) when some evidence of tumorigenic activity is presented, but one or more of the criteria listed in (1) or (2) above is lacking. Thus, a report with positive pathological findings, but with no mention of control animals, is coded "TFX:ETA." Reports in which the results are not interpretable are not cited in the Registry.

(4) Since an author may make statements or conclusions based on a larger context than that of the particular data reported, papers in which the author's conclusions differ substantially from the evidence presented in the paper are subject to review by the RTECS Editorial Review Board.

(5) All doses except those for transplacental carcinogenesis are reported in RTECS in one of the following formats.

(a) For all routes of administration other than inhalation:

cumulative dose in mg (or appropriate unit)/kg/duration of administration.

Whenever the dose reported in the reference is not in the above units, conversion to this format is made based on the information given in paragraph 7d above. The total cumulative dose is derived from the lowest dose level that produces tumors in the test group.

(b) For inhalation experiments:

concentration in ppm (or mg/m3)/total duration of exposure.

The concentration refers to the lowest concentration that produces tumors.

(6) Transplacental carcinogenic doses are reported in RTECS in one of the following formats.

(a) For all routes of administration other than inhalation:

cumulative dose in mg/kg/(time of administration during pregnancy).

The cumulative dose is derived from the lowest single dose that produces tumors in the offspring. The test chemical is administered to the mother.

(b) For inhalation experiments:

concentration in ppm (or mg/m3)/(time of exposure during pregnancy).

The concentration refers to the lowest concentration that produces tumors in the offspring. The mother is exposed to the test chemical.

(7) For the purposes of RTECS, all test chemicals are reported as pure, unless otherwise stated by the author. This does not rule out the possibility that unknown impurities may have been present.

(8) A mixture of compounds whose test results satisfy the criteria in (1), (2), or (3) above is included if the composition of the mixture can be clearly defined.

(9) For tests involving promoters or initiators, a study is included if the following conditions are satisfied (in addition to the criteria in (1), (2), or (3) above):

(a) The test chemical is applied first, followed by an application of a standard promoter. A positive control group in which the test animals are subjected to the same standard promoter under identical conditions is maintained throughout the duration of the experiment. The data are not used if no mention of positive and negative control groups is made in the reference.

A known carcinogen is first applied as an initiator, followed by application of the test chemical as a promoter. A positive control group

in which the test animals are subjected to the same initiator under identical conditions is maintained throughout the duration of the experiment. The data are not used if no mention of positive and negative control groups is made in the reference.

Substances with TFX:CAR, NEO, or ETA citations are included as part of the Tumorigenic Citations Index, along with those compounds having IARC reviews and/or NCI status lines.

Criteria similar to these were used in past editions of the Registry, but not published in such detail. These criteria have evolved over the years since the inception of the Registry. Therefore, it is possible that some of the CAR and NEO citations, especially those added to the file during its early years, may not conform exactly to the above rules. The reader is therefore urged to review for himself the specific tumorigenic references cited in the RTECS. Any incorrect citations should be brought to the attention of the editors at the address given in the Introduction.

8. Cited Reference. The final entry of both the irritation and toxicity data lines is the reference from which the information was extracted. All references cited are publicly available. No governmental classified documents have been used for source information. All references have been given a unique six-letter CODEN character code (derived from CODEN for Periodical Titles, Chemical Abstracts Service, Columbus, Ohio 43210) which identifies periodicals, serial publications, and individual published works. For those references for which no CODEN was found, the corresponding six-letter code includes asterisks (*) in the last one or two positions following the first four or five letters of an acronym for the publication title. Following the CODEN designation (for most entries) is the number of the volume, followed by a comma; the page number of the first page of the article, followed by a comma; and two numbers, indicating the year of publication. When the cited reference is a report, the report number is listed. Where contributors have provided information on their unpublished studies, the CODEN consists of the first three letters of the last name, the initials of the first and middle names, and a number sign (#). The date of the letter supplying the information is listed. All CODEN acronyms are listed in alphabetical order and defined in the Bibliographic References section.

9. Aquatic Toxicity Ratings ("AQTX") were extracted from Water Quality Characteristics of Hazardous Materials by Dr. Roy Hahn, Jr. and Paul Jensen, Texas A&M University, College Station, Texas 77843, 1974. This publication grew out of an extensive literature survey on aquatic pollution. The format of this line is shown in Figure 1. "TLm96" is defined as the concentration that will kill 50% of the exposed organisms within 96 hours. The bioassay may be conducted under static or continuous flow conditions. Because of the lack of test standardization and the wide variety of species investigated, ratings (ranges of toxicities), rather than a single toxic dose, are used to give an indication of the toxicity of substances to aquatic life.

10. Reviews. This section supplies additional information to enable the reader to make knowledgeable evaluations of potential chemical hazards. There are three types of reviews listed: (a) International Agency for Research on Cancer (IARC) monograph reviews, which are published by the United Nations World Health Organization (WHO); (b) Threshold Limit Values, which are recommended limits proposed by the American Conference of Governmental Industrial Hygienists (ACGIH); and (c) general toxicology review articles.

a. Cancer Reviews. In the U.N. International Agency for Research on Cancer (IARC) monographs, suspected environmental carcinogens are examined, and summaries of available data with appropriate references are presented. Included in these reviews are synonyms, physical and chemical properties, uses and occurrence, and biological data relevant to the evaluation of carcinogenic risk to humans. The 17 monographs in the series contain an evaluation of approximately 450 substances. Single copies of the individual monographs (specify volume number) can be ordered from WHO Publications Centre USA, 49 Sheridan Avenue, Albany, New York 12210, telephone (518) 436-9686.

The format of the IARC data line is shown in Figure 1. The entry "CARCINOGENIC DETERMINATION" indicates that some carcinogenicity data pertaining to a compound has been reviewed by the IARC committee. The Registry summarizes the committee's conclusion in two words. The first indicates whether the data pertains to humans or to animals. The second word indicates the results of the determination as positive, suspected, indefinite, or negative.

This cancer review reflects only the conclusion of the IARC committee based on the data available for the committee's evaluation. Hence, for some substances there may be disagreement between the IARC determination and the carcinogenicity information in the toxicity data lines.

b. Threshold Limit Value (TLV). The TLV is an ACGIH-recommended upper limit (ceiling) or time-weighted average concentration of a substance to which most workers can be exposed without adverse effect. This concentration may be designated as a ceiling ("CL") or time-weighted average concentration ("TWA"), or as a notation ("SKN"), indicating that even though the air concentration may be below the limit value, significant additional exposure to the skin may be

dangerous. The TLV's are taken from Documentation of the Threshold Limit Values for Substances in Workroom Air (third edition), Cincinnati: ACGIH, 1976, or its supplement, or from documentation appearing in ACGIH annual reports.

c. Toxicology Reviews. The entry "TOXICOLOGY REVIEW" indicates that the cited review article has been located in the literature. Each review is identified by its CODEN. These articles discuss the toxicology of the substance or the general class to which the substance belongs. Many of these references, however, do not contain specific toxic dose values that can be cited in the Registry as toxicity data (see paragraph 7) because of the RTECS selection criteria. Nevertheless, the reviews do provide valuable information about the toxicity of the substance or group of related substances.

11. Standards and Regulations. This section contains notations indicating that the substance is regulated by an agency of the United States Government. The heading of these lines is "REGS," followed either by "OSHA," "EPA," or "DOT." "OSHA" refers to standards promulgated under Section 6 of the Occupational Safety and Health Act of 1970. "EPA" refers to Worker Protection Standards for Agricultural Pesticides promulgated under the Federal Insecticide, Fungicide, and Rodenticide Act. "DOT" refers to substances regulated for shipment by the Department of Transportation. Because of frequent changes to and litigation of Federal regulations, it is recommended that the reader contact the applicable agency for information about the current standards for a particular substance. Omission of a substance or regulatory notation from the Registry does not imply any relief from regulatory responsibility.

OSHA air contaminant standards are noted with the entry "air" following "OSHA." "TWA" or "CL" refers to either time-weighted average or ceiling value, respectively. For some substances, TWA, CL, and Pk (peak) values are given in the standard. In those cases, all three are listed. Finally, some entries may be followed by the designation "(skin)." This designation indicates that the compound may be absorbed by the skin and, even though the air concentration may be below the standard, significant additional exposure through the skin may be possible.

Standards Completion Program--The entry "(SCP)" indicates that a draft technical standard has been developed for the substance under the joint NIOSH/OSHA Standards Completion Program. Upon promulgation by OSHA, this draft technical standard fulfills the requirements for a complete standard for the substance as required by Sections 6 and 8 of the Occupational Safety and Health Act (29 CFR 1910.1000). A draft technical standard includes requirements for apprising employees of all hazards to which they are exposed, acceptable personal protective equipment, engineering control procedures, air sampling and analytical procedures, medical surveillance, and recordkeeping. The letter entry following SCP, for example "(SCP-A)," refers to a specific set of draft standards for a group of compounds that were prepared concurrently. Acceptable methods for sampling and analysis have been developed by NIOSH for many of the substances covered by a draft technical standard. A list of those substances and instructions for obtaining the analytical methods appear in Appendix II.

The information following the DOT notation for a substance has been obtained from the Department of Transportation. This notation indicates (a) the hazard class, (b) the label(s) required, and (c) the proper shipping name(s), as specified for transportation. Except for certain export and import shipments, no person may offer or accept a hazardous material, as defined by the Code of Federal Regulations, Title 49, for transportation in commerce within the United States unless that material is properly classed, described, packaged, marked, labeled, and in the condition for shipment as specified by 49 CFR, Parts 100 to 189. For transportation purposes, a hazardous material means a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated.

Specific definitions are given for each hazard class addressed in 49 CFR; however, DOT reserves the right to regulate or deregulate materials whether or not they meet these definitions. The basic hazard classes include compressed gases, flammables, oxidizers, corrosives, explosives, radioactive materials, and poisons. Although a material may be designated by only one hazard class, additional hazards may be indicated by adding labels or by using other means directed by DOT.

It is essential, therefore, to know the hazard class of a substance and to use the proper label. Generally, a material meeting the DOT definition of a poison must always be labeled as a poison, regardless of the other labeling requirements to ensure adherence to the prohibition against shipping poisons with foodstuffs.

Specific shipping names are designated for hazardous materials listed in 49 CFR. Because of the presence of many nontechnical names or the use of archaic names for some materials, it is necessary to identify the DOT shipping names. The approved DOT shipping names are included as synonyms of the prime names and are identified by the addition of "(DOT)" to the name.

Substances not specifically identified in 49 CFR and not appearing in the Registry are not necessarily exempt from DOT regulations. The Registry contains only those substances specifically identified in 49 CFR. Generic names or general descriptive names such as "insecticide, liquid" are not included in the Registry.

Determination of the correct classification for transportation of materials not specifically identified in 49 CFR is the responsibility of the shipper.

12. Criteria Documents ("CRIT DOC"). This entry indicates that a NIOSH criteria document recommending a certain environmental (occupational) exposure has been published for this compound or for a class of compounds to which this substance belongs. Included are the title of the document and the recommended standard. The CODEN citation ("NTIS**") refers to the National Technical Information Service, U.S. Department of Commerce. Instructions for obtaining these documents appear in Appendix I.

13. Status. This entry indicates that the substance has been or is being tested by the National Cancer Institute (NCI) under its Carcinogenesis Testing Program. The following five different citations are used to reflect the current test status of the compound: selected for test, undergoing test, test results incomplete, test completed, or report available. These citations are updated as each bioassay progresses. Note that a compound originally scheduled for bioassay may be withdrawn from the NCI program before testing actually begins. This initial selection is cited in the Registry but is deleted when the compound is removed from the test. It is therefore important that the reader monitor the NCI status lines for changes. When the final report is released, the report number and test results are listed, and, where applicable, specific toxic dose lines (see paragraph 7) are generated. To obtain additional information about the NCI Bioassay Program or the status of a particular substance under test or to obtain copies of the final bioassay reports, contact the Technical Information Resourses Branch, Carcinogenesis Testing Program, National Cancer Institute, Landow Building, Room A306, National Institutes of Health, Bethesda, Maryland 20014, telephone (301) 496-1152.

(5) Other factors.

Other factors which may significantly affect the degree of probability of an illness (optional):

If there are mitigating circumstances, such as good training, warning signs and labels, or special procedures, a low point total would be assigned (0 to 2 points).

Similarly a high point count (7 to 8 points) should be assigned if there are additional contributing circumstances (see paragraph C.3.c.(3)(c) in Chapter XI of the FOM).

(6) To determine overall probability, the above factors must be averaged. Total the number of points for each factor and divide by the number of factors used. Fractions shall be rounded off to the next lowest number. This is the probability quotient. This calculation should be entered on the back of the OSHA-1B(IH) or OSHA-1B.

(b) *Severity Quotient — (for a serious violation only).*

(1) The severity quotient may be determined by the following ratings:

Temporary, reversible illness requiring minor supportive treatment	1 to 2 points
Temporary, reversible illness with a variable but limited period of disability	3 to 6 points
Permanent, irreversible illness or death	7 to 8 points

(2) This determination should be entered on the back of the OSHA-1B or OSHA-1B(IH).

(c) *Probability Rating and Determination of Penalty.*

(1) The probability rating is calculated by averaging the two previous quotients.

$$\frac{\text{probability quotient} + \text{severity quotient}}{2} = \text{probability rating}$$

(2) To determine the penalty, apply the probability rating to the applicable table in Chapter X of the FOM. This calculation is entered on item 19b of the OSHA-1B (IH) or OSHA-1B.

OSHA SUBSTANCE TOXICITY TABLE

In categorizing violations as either serious or other-than-serious, primary consideration is given to the toxicologic properties of the chemical substance. The health codes are listed below. When a listing for a substance contains multiple health codes, only the three most serious appear. (See paragraph D, Chapter II of the Industrial Hygiene Field Operations Manual for further explanation).

HEALTH CODE NUMBER	HEALTH EFFECT
1	Cancer---Currently regulated by OSHA as carcinogens; chiefly work practice standards.
2	Chronic (Cumulative) Toxicity---Suspect carcinogen or mutagen
3	Chronic (Cumulative) Toxicity---Long-term organ toxicity other than nervous, respiratory, hematologic or reproductive
4	Acute Toxicity---Short-term high hazard effects
5	Reproductive Hazards---Fertility impairment or teratogenesis
6	Nervous System Disturbances---Cholinesterase inhibition
7	Nervous System Disturbances---Nervous system effects other than narcosis
8	Nervous System Disturbances---Narcosis
9	Respiratory Effects Other Than Irritation---Respiratory sensitization (asthma)
10	Respiratory Effects Other Than Irritation---Cumulative lung damage
11	Respiratory Effects---Acute lung damage/edema
12	Hematologic (Blood) Disturbances---Anemias
13	Hematologic (Blood) Disturbances---Methemoglobinemia
14	Irritation-Eye, Nose, Throat, Skin---Marked
15	Irritation-Eye, Nose, Throat, Skin---Moderate
16	Irritation-Eye, Nose, Throat, Skin---Mild
17	Asphyxiants, Anoxiants
18	Explosive, Flammable, Safety (No Adverse Effects Encountered When Good Housekeeping Practices are Followed)
19	Generally Low Risk Health Effects---Nuisance particulates, vapors or gases
20	Generally Low Risk Health Effects---Odor

EXPLANATION OF TABLE HEADINGS

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m^3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
1	2	3	4	5		6	7	8	9	10

1. SUBSTANCE - The chemical name of the substance as cited by OSHA (e.g., 29 CFR 1910.1000, Tables Z-1, Z-2, or Z-3) or by the American Conference of Governmental Industrial Hygienists (ACGIH) (1977 Threshold Limit Values (TLVs®) list). A "skin" designation refer to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by airborne, or more particularly, by direct contact with the substance.

2. HEALTH CODE NUMBER - The number assigned reflects the most significant health hazard(s) posed by each substance (see page 2 for a complete description of each health code).

3. CODE NUMBER - The number currently assigned by OSHA to each compound for reporting specific violations in the field. Where substances do not have a code number, it means that they are new additions to the ACGIH TLV list or recommendations from NIOSH. A "C" preceding the code number indicates that the compound is regulated by OSHA as an occupational carcinogen.

4. PHYSICAL STATE OF SUBSTANCE AT STANDARD TEMPERATURE AND PRESSURE - S-solid; L-liquid; G-gas; FUM-fume; MIX-mixture; VAP-vapor; VAR-varies with individual compounds.

5. PEL - Permissible exposure limit as adopted by OSHA. A "C" in this column indicates a ceiling limit. An "NDS" in this column indicates that a citation under the OSHA nuisance dust standard (i.e., 29 CFR 1910.1000, Table Z-3) should be considered.

6. ADDITIONAL DATA - This column provides additional data to be considered in determining the classification of violation. "TLV" indicates that there is no OSHA PEL but that the ACGIH has recommended a Threshold Limit Value (TLV). "TLV-CHG" indicates that there is an OSHA PEL, but that the current TLV has been changed since the OSHA PELs were adopted from the 1968 ACGIH TLV values. "CD" indicates that a NIOSH Criteria Document has been prepared on this substance. "CIB" indicates that a National Institute for Occupational Safety and Health (NIOSH) Current Intelligence Bulletin has been issued for this substance. For certain substances additional data is provided in parenthesis to assist in locating the appropriate reference.

7. HEALTH EFFECTS - Principal effect(s) of exposure to each substance.

8. CLASSIFICATION OF VIOLATION - Ratings of violations as serious (S) or other-than-serious (O) are based upon data in the Documentation of Threshold Limit Values, ACGIH, Fourth Edition, 1977 (including supplements), a particular NIOSH Criteria Document or Current Intelligence Bulletin, the NIOSH Registry of Toxic Effects of Chemical Substances and other selected references.

9. WIPE SAMPLING - Substances which present a potential ingestion (I) hazard (H1), H-(G)(2) and G(H) and/or skin(S) absorption hazard (Abs.H) are identified in this column. For these substances wipe sampling should be considered when assessing employee exposure. Blanks indicate present infeasibility of wipe sampling due to physical state of substance; lack of potential for significant physical harm; and/or technological limitations. References: 1. Documentation of Threshold Limit Values, ACGIH, Fourth Edition, 1977 (including supplements); 2. Handbook of Toxicology, Vol 1, Acute Toxicities, W.S. Spector, editor, Philadelphia, 1956, W.B. Saunders Co. For additional information refer to Chapter VI in this manual.

10. PROLONGED WORK SCHEDULE CATEGORIES - This column indicates the code designation for prolonged work schedules which may require an adjustment to the PEL. (See Chapter XIII)

Category	Classification	Adjustment Criteria
A	Ceiling Standard	none
B	Irritants	none
C	Technologic Limitations	none
2	Acute Toxicants	Exposed > 8 hrs/day
3	Cumulative Toxicants	Exposed > 40 hrs/week
4	Both Acute & Cumulative	Exposed > 8 hrs/day and or Exposed > 40 hrs/week

Note: The health effects and classification of violation sections of this chapter have been reviewed by a panel of toxicologists and industrial hygienists from NIOSH using policy guidelines established by OSHA.

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Abate	6	0005	S	-----	-----	TLV	Cholinesterase Inhibition	S-Above 30 mg/m³	----	3
Acetaldehyde	14	0010	L	200	360	TLV-CHG	Marked Irritation Eye, Nose, Throat, Skin	S	-----	1 B
Acetic Acid	14	0020	L	10	25	-----	Marked Irritation Eye, Nose, Throat, Skin	0-Up to 30 ppm S-Above 30 ppm	-----	1 B
Acetic Anhydride	14	0030	L	5	20	TLV-CHG	Marked Irritation Eye, Nose, Throat, Skin	S	-----	1 B
Acetone	16,8	0040	L	1000	2400	-----	Mild Irritation-Eye, Nose, Throat/Narcosis	0-Up to 2000 ppm S-Above 2000 ppm	----- -----	1 B
Acetonitrile	16,4	0060	L	40	70	CD	Mild Irritation-Eye, Nose, Throat/ Acute Toxicity (Cyanosis)	0-Up to 50 ppm S-Above 50 ppm	-----	4
2-Acetylamino-fluorene	1	C 0065	S	STD 1910.1014		-----	Cancer	S	----	1 C
Acetylene	18,17	0070	G	----	----	TLV,CD	Explosive/ Simple Asphyxiation	S-Above 2500 ppm	-----	1 C
Acetylene Dichloride				(See 1,2 Dichloroethylene)						
Acetylene Tetrabromide	3,10	0080	L	1	14	-----	Cumulative Liver and Lung Damage	S	-----	4
Acrolein	14	0110	L	0.1	0.25	-----	Marked Irritation Eye, Nose, Throat, Lungs, Skin	S	-----	1 B
Acrylamide - Skin	7,3	0115	S	----	0.3	CD	Polyneuropathy, Dermatitis/Skin Eye Irritation	S	S,I	4
Acrylonitrile - Skin	2,5	C 0120	L	STD 1910.1045		CD,CIB	Suspect Carcinogen	S		
Aldrin - Skin	2,3	0125	S	----	0.25	-----	Suspect Carcinogen/ Cumulative Liver Damage	S	S,I	4
Allyl Alcohol - Skin	4,14	0130	L	2	5	-----	Eye Damage/Marked Irritation-Eye, Nose, Throat, Bronichi, Skin,	S	S	1 B
Allyl Chloride	3,14	0140	L	1	3	CD	Liver Damage/ Marked Irritation Eye, Nose, Throat	0-Up to 2 ppm S-Above 2 ppm	S	4
Allyl Glycidyl Ether (AGE) - Skin	14	0145	L	C 10	45	TLV-CHG, CD	Contact Skin Allergy/Marked Irritation-Eye, Nose, Throat, Bronichi, Skin	S	S	1 B
Allyl Propyl Disulfide	14	0150	L	2	12	-----	Marked Irritation Eye, Nose, Throat	S	-----	1 B

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Aluminum Oxide	18,19	0160	S	——	NDS	TLV	Nuisance Particulate	O	——	1 C
4-Aminodiphenyl-Skin	1	C 0162	S	STD 1910.1011		——	Cancer	S	S	1 C
2-Aminoethanol				(See Ethanolamine)						
2-Aminopyridine	4,7	0165	S	0.5	2	——	CNS Stimulation/ Headache/Increased Blood Pressure	S	——	4
Ammonia	11,14	0170	G	50	35	TLV-CHG, CD	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs	S	——	1 B
Ammonium Chloride (Fume)	16	0175	FUM	——	NDS	TLV	Mild Irritation Eye, Nose, Throat	O	——	1 B
Ammonium Sulfamate (Ammate)	16	0185	S	——	15	TLV-CHG	Mild Irritation Eye,	O	——	1 B
n-Amyl Acetate	15	0190	L	100	525	——	Moderate Irritation-Eye, Nose, Throat	O-Up to 200 ppm S-Above 200 ppm	——	1 B
sec-Amyl Acetate	15	0191	L	125	650	——	Moderate Irritatioin-Eye, Nose, Throat	O-Up to 250 ppm S-Above 250 ppm	——	1 B
Aniline - Skin	13,4	0220	L	5	19	——	Methemoglobinemia Acute Toxic Effects	S	S,I	4
Anisidine (o,p-isomers) - Skin	13,3	0225	L	——	0.5	TLV-CHG	Methemoglobinemia/ Cumulative Toxicity	S	S	4
Antimony & Compounds (as Sb)	3,2	0230	S	——	0.5	CD	Cumulative Heart Damage/Suspect Carcinogen	S	——	4
ANTU (alpha Naphthyl Thiourea)	3	0235	S	——	0.3	——	Cumulative Endocrine (Thyroid and Adrenal) Damage	S	S	4
Argon	17	0240	G	——	——	TLV	Simple Asphyxiation	S-If Oxygen Less Than 18% by Volume	——	1 A
Arsenic & Compounds (as As)	2,3	C 0260	S	STD 1910.1018		CD,CIB No. 14	Suspect Carcinogen/ Cumulative Systemic Poison	S	I	4
Arsine	4	0270	G	C 05	0.2	——	Acute Systemic Toxicity	S	——	4
Asbestos (all forms)	1,10	C 9020	S	STD 1910.1001		CD,CIB No. 5	Cancer/Asbestosis	S	——	3
Asphalt Fumes (Petroleum)	2	0290	FUM	——	——	LV,CD	Suspect Carcinogen/ Skin Irritant	S	——	4
Azinphos-Methyl-Skin	6	0300	S	——	0.2	——	Cholinesterase Inhibition	O-Up to 0.4 mg/m³ S-Above 0.4 mg/m³	S,I	3
Barium (Soluble Compounds)	3,10	0310	S	——	0.5	——	Cumulative Heart, Lung, and Brain Damage	S	——	3

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Baygon (Propoxur)	6	0318	S	----	----	TLV	Cholinesterase Inhibition	S-Above 1.5 mg/m³	I	3
Benzene - Skin	2,12	C 0320	L	STD 1910.1028		CD	Suspect Leukemogen/ Cumulative Bone Marrow Damage	S	S	1 C
Benzidine - Skin	1	C 0330	S	STD 1910.1010		----	Cancer of Bladder	S	S,I	1 C
Benzidine Derived Dyes				See NIOSH CIB No. 24						
p-Benzoquinone				(See Quinone)						
Benzoyl Peroxide	15	0335	S	----	5	CD	Moderate Irritation-Eye, Nose, Throat, Skin	S	----	1 B
Benzyl Chloride	2,4,11	0340	L	1	5	----	Suspect Carcinogen/ Marked Irritation-Eye, Nose, Throat, Skin/Lung Edema	S	----	4
Beryllium & Compounds	2,10	0360	S	STD 1910.1000, Z-2		CD	Suspect Carcinogen/ Cumulative Lung Damage (Berylliosis)	S	I	4
Biphenyl (Diphenyl)	15	1011	S	0.2	1	----	Moderate Irritation-Eye, Nose, Throat, Bronchi, Lungs	O-Up to 3 mg/m³ S-Above 3 mg/m³	----	1 B
Bismuth Telluride	10	0370	S	----	NDS	TLV	Accumulation in Lungs	O	----	1 C
Bismuth Telluride (Se-Doped)	10	0371	S	----	----	TLV	Cumulative Lung Damage	S-Above 10 mg/m³	----	3
Borates, Tetra, Sodium Salt, Anhydrous	15	0374	S	----	----	TLV	Moderate Irritation- Eye, Nose, Throat, Skin	S	----	1 B
Borates, Tetra, Sodium Salt, Decahydrate	15	0375	S	----	----	TLV	Moderate Irritation-Eye, Nose, Throat, Skin	S	----	1 B
Borates, Tetra, Sodium Salt, Pentahydrate	15	0376	S	----	----	TLV	Moderate Irritation Nose, Throat, Skin	S	----	1 B
Boron Oxide	16	0380	S	----	15	TLV-CHG	Mild Irritation Eye, Nose, Throat, Skin	S	----	1 B
Boron Tribromide	14	0381	L	----	----	TLV	Marked Irritation Eye, Nose, Throat, Lungs	S	----	1 B
Boron Trifluoride	11,14	0382	G	C 1	3	CD	Acute and Chronic Lung Irritation (Pneumonia)	S	----	1 A
Bromine	14,11	0390	L	0.1	0.7	----	Marked Irritation-Eye, Nose, Throat, Bronchi, Lungs	S	----	1 B
Bromine Pentaflouride	14,11	0391	L	----	----	TLV	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs	S	----	1 B

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Bromoform - Skin	14,3	0400	L	0.5	5	——	Marked Irritation Eye, Nose, Throat/ Cumulative Liver Damage	S	S	4
Butadiene (1,3-Butadiene)	16	0410	G	1000	2200	——	Mild Irritation Eye, Nose, Throat	O-Up to 3000 ppm S-Above 3000 ppm	——	1 B
Butane	17,8	0420	G	——	——	TLV	Asphyxiant/Narcosis	S-Above 1800 ppm	——	1 C
Butanethiol				(See Butyl Mercaptan)						
2-Butanone (MEK)	15,8	0430	L	200	590	CD	Moderate Irritation-Eye, Nose, Throat/Narcosis	S	——	1 B
2-Butoxyethanol - Skin (Butyl Cellosolve)	12,16	0435	L	50	240	——	Anemia/Mild Irritation-Eye, Nose, Throat	O-Up to 100 ppm S-Above 100 ppm	S	4
n-Butyl Acetate	15	0440	L	150	710	——	Moderate Irritation-Eye, Nose, Throat	S	——	1 B
sec-Butyl Acetate	15	0441	L	200	950	——	Moderate Irritation-Eye, Nose, Throat	O-Up to 300 ppm S-Above 300 ppm	——	1 B
tert-Butyl Acetate	15	0442	L	200	950	——	Moderate Irritation-Eye, Nose, Throat	O-Up to 300 ppm S-Above 300 ppm	——	1 B
Butyl Alcohol - Skin	15,7	0460	L	100	300	TLV-CHG	Moderate Irritation-Eye, Nose, Throat/Hearing Loss	S	S	2
sec-Butyl Alcohol	16	0461	L	150	450	——	Mild Irritation-Eye, Nose, Throat	O-Up to 300 ppm S-Above 300 ppm	——	2
tert-Butyl Alcohol	15,8	0462	L	100	300	——	Moderate Irritation-Eye, Nose, Throat/ Narcosis	O-Up to 200 ppm S-Above 200 ppm	——	2
Butylamine - Skin	2,14	0470	L	C 5	15	——	Suspect Carcinogen/Marked Irritation-Eye, Nose Throat, Lungs, Skin	S	S	4
tert-Butyl Chromate (As CrO_3) - Skin	2,14	0473	S	——	C 0.1	——	Suspect Carcinogen/ Marked Irritation-Eye, Nose, Throat, Skin	S	S,I	1 A
n-Butyl Glycidyl Ether (BGE)	2,16	0477	L	50	270	CD	Suspect Mutagen/ Mild Irritation-Eye, Nose, Throat, Skin	S	-------	4
n-Butyl Lactate	15	0478	L	——	——	TLV	Moderate Irritation-Eye, Nose, Throat, Bronchi, Lungs	S	-------	1 B

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Butyl Mercaptan	15,20	0480	L	10	35	TLV-CHG, CD	Moderate Irritation-Eye, Nose, Throat/ Odor	S	-------	1 B
p-tert-Butyltoluene	7,3	0485	L	10	60	-----	CNS Damage/ Cumulative Liver, Kidney Damage	S	------	3
Cadmium Dust (as Cd)	3,2	0490	S	STD 1910.1000, Z-2		TLV-CHG, CD	Suspect Carcinogen/ Cumulative Kidney and Lung Damage	S	I	4
Cadmium Fume (as Cd)	3,2	0491	FUM	STD 1910.1000, Z-2		TLV-CHG, CD	Cumulative Kidney and Lung Damage/ Suspect Carcinogen	S	I	4
Calcium Arsenate (as As)	2,3	0500	S	----	1	CD(As)	Suspect Carcinogen/ Cumulative Systemic Poisoning	S	I	4
Calcium Carbonate	19	0505	S	----	NDS	TLV*	Nuisance Particulate	0	------	1 C
Calcium Cyanamide	15,2	0510	S	----	----	TLV	Moderate Irritation-Eye, Nose, Throat, Skin/Suspect Carcinogen	S	------	4
Calcium Hydroxide	14	0515	S	----	----	TLV	Marked Irritation-Eye, Nose, Throat, Skin	S	------	1 B
Calcium Oxide	14	0520	S	----	5	TLV	Marked Irritation-Eye, Nose, Throat/ Skin	S	------	1 B
Camphor (synthetic)	15,4	0522	S			-----	Moderate Irritation-Eye, Nose, Throat/ Acute Toxicity	S	------	1 B
Caprolactam Dust	15	0523	S	----	----	TLV	Moderate Irritation-Eye, Nose, Throat, Skin	S-Above 2mg/m³	------	1 B
Caprolactam Vapor	16	0524	VAP		----	TLV	Mild Irritation-Eye, Nose, Throat, Skin	S-Above 10 ppm	------	1 B
Captafol (Difolatan®) - Skin	3,9,5	0528	S	----	----	TLV	Dermatitis/ Respiratory Sensitization (Asthma)/Teratogen	S	S,I	4
Captan	2,5	0529	S	----	----	TLV	Suspect Carcinogen, Mutagen, and Teratogen	S	------	4
Carbaryl (Sevin®)	6,5	0525	S	----	5	CD	Cholinesterase Inhibition/Teratogen	S	I	3
Carbofuran (Furadan®)	6	0526	S	----	----	TLV	Cholinesterase Inhibition	S	------	3
Carbon Black	2,3	0527	S	----	3.5	CD	Suspect Carcinogen/ Cumulative Heart Damage	S	------	4

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Carbon Dioxide	17	0530	G	5000	9000	CD	Simple Asphyxiation	0-Up to 10,000 ppm S-Above 10,000 ppm	-----	1 C
Carbon Disulfide-Skin	7,5	0540	L	STD 1910.1000, Z-2		CD	Cumulative CNS Damage/Reproductive Impairment	S	S	3
Carbon Monoxide	17	0560	G	50	55	CD	Chemical Anoxia, Asphyxiation	0-Up to 75 ppm S-Above 75 ppm	-----	2
Carbon Tetrabromide	3,14	0565	S	----	----	TLV	Liver Damage/ Potent Lachrymator	S	------	4
Carbon Tetrachloride - Skin	3,2,5	0570	L	STD 1910.1000, Z-2		CD	Cumulative Liver Damage/Suspect Carcinogen/Teratogen	S	S	4
Catechol Pyrocatechol)	14,3	0571	S	----	----	TLV	Eye and Skin Irritation/Kidney Damage	S	------	4
Cellulose (paper fiber)	19	0575	S	----	NDS	TLV	Nuisance Particulate	0	------	1 C
Cesium Hydroxide	15	0576	S	----	----	TLV	Moderate Irritation Eye, Nose, Throat, Skin	S-Above 4 mg/m3	------	1 B
1-chloro,2,3, epoxy - propane				(See Epichlorohydrin)						
Chlordane - Skin	3,2	0611	L	----	0.5	------	Cumulative Liver Damage/Suspect Carcinogen	S	S	4
Chlorinated Camphene (Toxaphene)- Skin	3	0612	S	----	0.5	----	Cumulative Liver Damage	S	S	3
Chlorinated Diphenyl Oxide	3	0613	S	----	0.5	----	Cumulative Liver Damage/Dermatitis	S	------	3

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Chlorine	11,14	0640	G	C 1	3	CD	Lung Injury/Marked Irritation-Eye, Nose, Throat, Bronchi	S	------	3
Chlorine Dioxide	11,14	0614	G	0.1	0.3	-----	Lung Injury/Marked Irritation-Eye, Nose, Throat, Bronchi	S	------	1 B
Chlorine Trifluoride	11,14	0615	G/L	C 0.1	0.4	-----	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs	S	------	1 A
Chloroacetaldenyde	14	0617	L	C 1	3	-----	Marked Irritation Eye, Nose, Throat, Lungs, Skin	S	------	1 A
alpha-Chloroaceto-phenone (Phenacyl chloride)	14	0618	L/S	0.05	0.3	-----	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs, Skin	S	------	1 B
Chlorobenzene (Monochlorobenze)	3,8	0620	L	75	350	-----	Cumulative Systemic Toxicity/Narcosis	S	------	4
o-Chlorobenzylidene Malonitrile-Skin	14	0623	S	0.05	0.4	-----	Marked Irritation-Eye, Nose, Throat, Skin	S	S	1 B
2-Chloro-1,3-butadiene				(See Chloroprene)						
Chlorobromomethane	3,8	0627	L	200	1050	-----	Cumulative Liver Damage/Narcosis	O-Up to ___ ppm S-Above 3[illegible] ppm	------	3
Chlorodi-fluoromethane (F-22)	18	0628	G	----	---	TLV	Good Housekeeping Practice	S-Above 5000 ppm	------	1 C
Chlorodiphenyl (42% Cl) - Skin	2,3	0630	L/S	----	1	CD(PCB) CIB No 7	Suspect Carcinogen/ Chloracne/ Cumulative Liver Damage	S	S,I	4
Chlorodiphenyl (54% Cl) - Skin	2,3	0631	L/S	----	1	CD(PCB) CIB No.7	Suspect Carcinogen/ Chloracne/Cumulative Liver Damage	S	S,I	4
1,Chloro 2,3-epoxypropane				(See Epichlorohydrin)						
2-Chloroethanol				(See Ethylene Chlorohydrin)						
Chloroethylene				(See Vinyl Chloride)						
Chloroform (Trichloromethane)	2,3,8	0670	L	C 50	240	TLV-CIG, CD, CIB No. 9	Suspect Carcinogen/ Cumulativ Liver and Kidney Damage.Narcosis	S	------	4
bis-Chloromethyl Ether	1	C 2630	L	STD 1910.1008		----	Cancer (Lung)	S	I	1 C
1-Chloro-1-Nitropropane	15	0660	L	20	100	-----	Moderate Irritation-Eye, Nose, Throat, Skin	O-Up to 60 ppm S-Above 60 ppm		1 B
Chloropicrin	14,11	0675	L	0.1	0.7	-----	Marked Irritation-Eye, Nose, Throat, Bronchi, Lungs, Skin	S	------	1 B

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Chloroprene - (2-chloro-1, 3 butadiene) Skin	5,3,2	0680	L	25	90	CD, CIB No. 1	Reproductive Hazard/Systemic Toxicity/Suspect Mutagen	S	S	4
Chloropyrifos (Dursban R) - Skin	6	0681	S	----	----	TLV	Cholinesterase Inhibition	S-Above 2 mg/m³	------	4
o-Chlorostyrene	3	0682	L	----	----	TLV	Cumulative Live, Kidney Damage	S	------	3
o-Chlorotoluene - Skin	2,15	0683	L	----	----	TLV	Mild Irritant-Eye, Skin	S-Above 150 ppm	------	1 B
2-Chloro-6-Trichloromethyl Pyridine (N-Serve R)	18	0684	S	----	----	TLV	Good Housekeeping Practice	S-Above 15 mg/m³	------	1 C
Chromates, metal and insoluble salts (as CR)	2,10,3	0685	S	----	1	TLV-CHG, CD,CIB No. 4	Suspect Carcinogen/ Cumulative Lung Damage/Dermatitis	S	S,I	4
Chromic Acid & Chromates (as Cr)	2,10,3	0686	L	----	0.1	TLV-CHG, CD, CIB	Suspect Carcinogen/ Cumulative Lung Damage/Nasal Preforation, Ulcerattion	S	S,I	4
Chromium, Soluble Chromic, Chromous Salts (as Cr)	10,3	0690	S	----	0.5	CD	Cumulative Lung Damage/Dermatitis	S	S,I	3
Clopidol (Coyden R)	18	0693	S	----	NDS	TLV	Good Housekeeping Practice	O	------	1 C
Coal Dust	10	0695	S	STD 1910.1000 z-3		----	Pneumoconiosis	S	------	3
Coal Tar Pitch Volatiles	2,10	0700	MIX	----	0.2	CD	Suspect Carcinogen/ Cumulative Lung Changes	S	------	4
Cobalt, Metal, Fume & Dust (as Co)	9,10,3	0720	S/FUM	----	0.1	------	Asthma/Cumulative Lung Changes/ Dermatitis	S	------	3
Coke Oven Emissions	1,3	0725	----	STD 1910.1029		CD	Cancer-Lungs, Bladder, Kidney/ Skin Sensitization	S		1 C
Copper Dusts & Mists (as Cu)	16	0730	S	----	1	------	Mild Irritation Eye, Nose, Throat, Skin	O-Up to 2 mg/m³ S-Above 2 mg/m³	------	4
Copper Fume (as Cu)	15,11	0731	FUM	----	0.1	TLV-CHG	Moderate Irritation-Eye, Nose, Throat, Lung	O-Up to 0.8 mg/m³ S-Above 0.8 mg/m³	------	4
Corundum (Al_2O_3)	19	1013	S	----	NDS	TLV	Nuisance Particulate	O	------	1 C
Cotton Dust (Raw)	9,10	0735	S	STD 1910.1043		TLV CD	Asthma/Cumulative Lung Damage (Bysinosis)	S	------	1C
Crag R herbicide	3	0737	S	----	15	TLV-CHG	Cumulative Liver Damage	S	------	3

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Cresol (All Isomers) - Skin	14,4,3	0760	S/L	5	22	CD	Marked Irritation Eye, Skin/Acute Toxicity (CNS) Liver and Kidney Damage	S	——	1 B
Cristobalite	10	9015	S	STD 1910.100		Z-3	Pneumoconiosis	S	——	3
Crotonalydehyde	14	0770	L	2	6	——	Marked Irritation-Eye, Nose, Throat, Lungs	S	——	1 B
Crufomate^R	6	0776	S	——		TLV	Cholinesterase Inhibition	S-Above 15 mg/m^3	——	3
Cumene - Skin	8,15	0780	L	50	245	——	Narcosis/Moderate Irritation-Eye, Skin	O-Up to 100 ppm	——	3
Cyanamide	14,4	0782	S	——	——	TLV	Marked Irritation-Eye, Nose, Throat, Skin/Acute Toxicity	S	——	2
Cyanides (as CN) - Skin	15	0790	S	——	5	CD	Marked Irritation-Skin, Eye, Nose, Throat	S	——	1 B
Cyanogen	15,4	0800	G	10	——	TLV	Moderate Irritation-Eye, Nose, Throat/ Acute Toxicity (Cyanosis)	S	——	2
Cyclohexane	15	0810	L	300	1050	——	Moderate Irritation-Eye, Nose, Throat	S	——	1 B
Cyclohexanol	16,3	0820	S	50	200	——	Mild Irritation-Nose, Throat/ Cumulative Liver and Kidney Damage	O-Up to 100 ppm S-Above 100 ppm	——	1 B
Cyclohexanone	15,3	0830	L	50	200	——	Moderate Irritation Eye, Nose, Throat/ Cumulative Liver and Kidney Damage	S	——	4

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Cyclohexene	15,3	0840	L	300	1050	----	Moderate Irritation Eye, Nose, Throat/ Cumulative Systemic Toxicity	S	----	4
Cyclohexylamine - Skin	14,2	0842	L	----	----	TLV	Marked Irritation Eye, Nose, Throat, Skin/Suspect Mutagen	S	I,S	4
Cyclopentadiene	15	0845	L	75	200	----	Moderate Irritation Eye, Nose, Throat	O-Up to 150 ppm S-Above 150 ppm	----	1 B
DBCP				(See 1,2, Dibromo-3-chloropropane)						
2,4-D (2,4 Dichloro-phenoxyacetic acid)	5	0846	S	----	10	----	Suspect Teratogen	S	----	3
DDT - Skin	7,2,3	0847	S	----	1	----	Cumulative Toxicity CNS Suspect Carcinogen and Mutagen	S	S,I	4
DDVP - Skin	6	0850	L	----	1	----	Cholinesterase Inhibition	S	S	3
Decaborane - Skin	4,7	0853	S	0.05	0.3	----	Acute and Chronic CNS Toxicity	S	S	4
Demeton® (Systox) - Skin	6,5	0857	L	----	0.1	----	Cholinesterase Inhibition/Suspect Teratogen	S	S	3
Diacetone Alchol (4-hydroxy-4 methyl-2 pentanone)	15,3	0860	L	50	240	----	Moderate Irritation Eye, Nose, Throat/ Cumulative Kidney Damage	O-Up to 100 ppm S-Above 100 ppm	----	1 B
1,2 Diaminoethane				(See Ethylenediamine)						
2,4-Diaminoanisole				See NIOSH CIB No. 19						
4,4 Diaminodiphenyl-methane (DDM)				See NIOSH CIB No. 8						
Diazinon - Skin	6,5	2720	L	----	----	TLV	Cholinesterase Inhibition Suspect Teratogen	S	S,I	3
Diazomethane	2,11,14	0861	G	0.2	0.4	----	Suspect Carcinogen/ Acute Lung Damage/ Marked Irritation-Eye, Nose, Throat	S	----	4
Diborane	11,7,14	0862	G	0.1	0.1	----	Acute Respiratory Damage, Irritation/ Nervous System Damage	S	----	4
Dibrom®	6	0932	S	----	3	----	Cholinesterase Inhibition	S	----	3
1,2-Dibromo-3-Chloropropane (DBCP)	5,2	0935	S	STD 1910.1044		----	Male Sterility/ Suspect Carcinogen	S	S,I	1 C
1,2-Dibromoethane (Ethylene Dibromide) - Skin	2,3,5	1140	L	STD 1910.1000, Z-2		CD,CIB No. 3 & 23	Suspect Carcinogne, Mutagen, Teratogen/ Cumulative Kidney Damage/Reproductive Hazard	S	S,I	4

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2-n-Dibutylamino-ethanol - Skin	15,3	0866	L	——	——	TLV	Moderate Irritation Eye, Nose, Throat, Lungs, Skin, Cumulative Liver	S-Above 6 ppm	S	4
Dibutyl Phosphate	16	0863	L	1	5	——	Mild Irritation-Eye, Nose, throat, Lungs	O-Up to 2 ppm S-Above 2 ppm	——	1 B
Dibutylphthalate	19,5	0864	L	——	5	——	Apparent Low Toxicity, Suspect Teratogen	O-Up to 10 mg/m³ S-Above 10 mg/m³	——	1 C
Dichloroacetylene	4,11,7	0865	L	——	——	TLV	Acute Toxicity - Nausea, Headache, Lung Edema/Cumulative CNS Effects	S	——	4
o-Dichlorobenzene	14,4	0867	L	C 50	300	——	Marked Irritation Eye, Nose, Throat/ Liver Damage	S	——	1 A
p-Dichlorobenzene	3,7	0868	S	75	450	——	Cumulative Systemic Toxicity/Cataracts	S	——	3
3,3'-Dichloro-benzidine-Skin	1	C 0869	S	STD 1910.1007		——	Cancer - Bladder	S	S,I	1 C
Dichlorodifluoro-methane (F-12)	18	0871	G	1000	4950	——	Good Housekeeping Practice	O	——	1 C
1,3-Dichloro-5, 5-Dimethylhydantion	14	0872	S	---	0.2	——	Mild Irritation Eye, Nose, Throat, Lungs	S	——	1 B
1,1-Dichloroethane	3	1160	L	100	400	TLV-CHG	Cumulative Liver Damage	S	S	3
1,2-Dichloroethane	3,7,2	0874	L	50	200	CD,CIB No. 25 & 27	Cumulative Liver, Kidney Damage/CNS Effects/Suspect Carcinogen	S	S	4
1,2-Dichloroethylene	8,7	0870	L	200	790	-----	Narcosis/CNS Effects	O-Up to 600 ppm S-Above 600 ppm	-----	2
Dichloromethyl Ether - Skin	14,2,11	0880	L	C 15	90	TLV-CHG	Marked Irritation Eye, Nose, Throat, Lungs/Suspect Carcinogen/Lung Edema	S	S	1 A
Dichloromethane				(See Methylene Chloride)						
Dichloromonofluoro-methane (F-21)	3	0887	G	1000	4200	-----	Cumulatfve Liver Damage	S	-----	1 C
1,1-Dichloro-1-nitroethane	4,11	0890	L	C 10	60	TLV-CHG	Acute Systemic Toxicity-Lungs, Heart, Liver, Kidneys	S	-----	1 A
1,2 Dichloropropane				(See Propylene Dichloride)						
Dichlorotetra-fluoroethane	18	0900	G	1000	7000	----	Good Housekeeping Practice	O	-----	1 C

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SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Dicrotophos (Bidrin®)	6	0902	L	----	----	TLV	Cholinesterase Inhibition	S	S	3
Dicyclopentadiene	3,16	0903	L	5	----	TLV	Cumulative Kidney Liver Damage/Mild Irritation-Eye, Nose, Throat	S	-----	3
Dicyclopentadienyl Iron	18	0904	S	----	NDS	TLV	Good Housekeeping Practice	O	-----	1 C
Dieldrin - Skin	2,3	0905	S	----	0.25	-----	Suspect Carcinogen/ Cumulative Liver Damage	S	S,I	4
Diethylamine	14,3	0910	L	25	75	-----	Marked Irritation Eye, Nose, Throat, Lungs, Skin/ Myocardial Degeneration	S	-----	1 B
Diethylaminoethanol Skin	14	0920	L	10	50	-----	Marked Irritation Eye, Nose, Throat	S	S	1 B
Diethylcarbamoyl Chloride (DECC)				See NIOSH CIB No. 12						
Diethylene Triamine	14,9	0921	L	----	----	TLV	Marked Irritation Eye, Nose, Throat, Lung, Skin	S	S	1 B
Diethyl Ether				(See Ethyl Ether)						
Diethyl Phthalate	16	0933	L	----	NDS	TLV	Mild Irritation Nose, Throat	S-Above 15 mg/m³	-----	1 B
Difluorodibromo-methane (F-12B2)	16,3	0922	L	100	860	-----	Respiratory Irritation/ Cumulative Liver and CNS Damage	O-Up to 200 ppm S-Above 200 ppm	-----	1 B
Diglycidyl Ether (DGE)	14,3,2	0923	L	C 0.5	2.8	-----	Marked Irritation Eye, Nose, Throat, Lungs, Skin/Cumulative Systemic Toxicity/ Suspect Mutagen	S	-----	1 A

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Dihydroxybenzene				(See Hydroquinone)						
Diisobutyl Ketone	16,8	0924	L	50	290	TLV-CHG	Mild Irritation Eye, Nose, Throat/ Narcosis	O-Up to 100 ppm S-Above 100 ppm	——	1 B
Diisopropylamine - Skin	7,15	0925	L	5	20	——	CNS Effects/ Moderate Irritation Eye, Nose, Throat, Lungs	O-Up to 10 ppm S-Above 10 ppm	S	1 B
Dimethoxymethane				(See Methylal)						
Dimethyl Acetamide-Skin	3,5	0927	L	10	35	——	Cumulative Liver Damage/Suspect Teratogen	S	S,I	3
Dimethylamine	14,3	0928	G	10	18	——	Marked Irritation Eye, Nose, Throat, Bronchi, Lung, Skin/ Cumulative Liver, Testicular Damage	S	——	4
Dimethylaminobenzene				(See Xylidene)						
4-Dimethylaminoazo-benzene	1	C 0929	S	STD 1910.015		——	Cancer-Liver	S	S,I	
Dimethylaminopro-pionitril				See ESN						
Dimethylaniline - Skin	13,7	0931	G	5	25	——	Methemoglobinemia CNS Effects	S	S	4
Dimethylbenzene				(See Xylene)						
Dimethyl Carbamoyl Chloride (DMCC)				See NIOSH CIB No. 11						
Dimethylformamide -	3,7	0930	L	10	30	——	Cumulative Liver Damage/CNS Effects	S	S	3
2,6 Dimethylheptanone				(See Diisobutyl Ketone)						
1,1-Dimethylhydrazine - Skin	2,7,12	0940	L	0.5	1	TVL	Suspect Carcinogen/ CNS Effects/ Anemia	S	S,I	4
Dimethylphthalate	5,16	0950	L	——	5	——	Suspect Teratogen/ Mild Irritation-Nose, Throat	S	——	4
Dimethyl Sulfate - Skin	2,4	0960	L	1	5	TLV-CHG	Suspect Carcinogen/ Acute Eye and Lung Effects	S	S,I	4
Dinitrobenzene (all isomers) - Skin	13,12,3	0970	S	——	1	TVL	Blood Disturbances/ Liver, Kidney Damage	S	S	4
Dinitro-o-Cresol - Skin	3	0975	S	——	0.2	CD, TVL	Cumulative Systemic (Metabolic) Toxin	S	S,I	3
3,5-Dinitro-o-Toluamide (Zoalene®)	3	0985	S	——	——	TLV	Cumulative Liver Damage	S	——	3
Dinitrotoluene - Skin	13,12,3	0990	S	——	1,5	TVL	Methemoglobinemia/ Anemia/Liver Damage	S	S	4

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Dioxane (Diethylene Dioxide) technical grade - Skin	2,3	1010	L	100	360	TLV-CHG, CD	Suspect Carcinogen/ Cumulative Liver, Kidney Damage	S	S,I	4
Dioxathion (Delnav®)	6	2740	L	----	----	TLV	Cholinesterase Inhibition	S	I,S	3
Diphenyl				(See Biphenyl)						
Diphenylamine	3,5	0926	S	----	----	TLV	Cumulative Liver, Kidney Bladder Damage/Suspect Teratogen	S	----	3
Diphenylmethane diisocyanate				(See Methylene Biphenyl Isocyanate)						
Dipropylene Glycol Methyl Ether - Skin	15,3	1014	L	100	600	-----	Moderate Irritation Eye,	S		4
Diquat	3,5	2681	S	----	----	TLV	Cumulative Effects (Cataracts)/Suspect Teratogen	S	I	4
Di-sec, Octyl Phthalate (Di- 2 ethylhexylphthalate)	16	1015	L	----	5	-----	Mild Irritation Eye, Nose, Throat	O-Up to 10 mg/m³ S-Above 10 mg/m³		1 C
Direct Black 38, Direct Blue 6, and Direct Brown 95 (Benzidine Derived Dyes) - See NIOSH CIB No. 24										
Disulfiram (Tetraethylthiuram Disulfide)	4,2	2682	S	----	----	TLV, CIB No	Acute Toxicity- Antabuse Effects with Alcohol/Suspect Carcinogen	S	-----	4
Disyston - Skin	6	2680	S	----	----	TLV	Cholinesterase Inhibition	S	S,I	3
2,6-Di-Tert-Butyl-p-Cresol	18	2683	S	----	NDS	TLV	Good Housekeeping Practice	O	-----	1 C
Diuron	19	2684	S	----	NDS	TLV	Apparent Low Toxicity	O	-----	1 C
Dyfonate	6	2685	S	----	----	TLV	Cholinesterase Inhibiton	S	I	3
Emery	19	1016	S	----	NDS	TLV	Nuisance Particulate	O	-----	1 C
Endosulfan (Thiodan®) - Skin	4,3,2	2425	S	----	----	TLV	Acute CNS Toxin/ Cumulative Kidney Damage/Suspect Carcinogen	S	S,I	4
Endrin - Skin	4	1017	S	----	0.1	-----	Acute Toxicity	S	I	4
Epichlorohydrin (1-Chloro,2,3-epoxypropane)-Skin	14,2,3	0645	L	5	19	CD,CIB No. 30	Marked Skin Irritation, Sensitization/ Suspect Carcinogen and Mutagen/ Kidney and Liver Damage	S	S	4
EPN - Skin	6	1019	L/S	----	0.5	-----	Cholinesterase Inhibition	S	S	3
1,2 - Epoxypropane				(See Propylene Oxide)						

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2,3 - Expoxy-1-propanol				(See Glycidol)						
ESW®				(See NIOSH CIB No. 26)						
Ethane	18,17	1025	G	----	----	TLV	Explosive/Simple Asphyxiation	S-If Oxygen Level is Less than 18% by Volume	------	1 C
Ethanethiol				(See Ethyl Mercaptan)						
Ethanolamine	14,3	1030	L	3	6	-----	Marked Irritation Skin/Cumulative Liver, Lung and Kidney Damage	O-Up to 6 ppm S-Above 6 ppm	------	3
Ethion (Nialate®) - Skin	6	2750	L	----	----	TLV	Cholinesterase Inhibition	S	S	3
2-Ethoxyethanol (Cellosolve) - Skin	15,12	1033	L	200	740	TLV-CHG CIB NO. 29	Moderate Irritation Eye, Nose/Cumulative Blood Disturbances	S	S	3
2-Ethoxyethyl Acetate (Cellosolve Acetate) - Skin	3,16	1037	L	100	540	----	Cumulative Liver, Kidney Damage/Mild Irritant-Eye, Nose, Throat	S	S	3
Ethyl Acetate	16,20	1040	L	400	1400	-----	Mild Irritation Eye, Nose, Throat, Lungs/Odor	O-Up to 800 ppm S-Above 800 ppm	------	1 B
Ethyl Acrylate - Skin	14,11	1050	L	25	100	----	Marked Irritation Eye, Nose, Throat, Lungs/Lung Edema	S	S	1 B
Ethyl Alcohol (Ethanol)	14,8	1060	L	1000	1900	----	Mild Irritation-Eye,Nose, Throat/ Narcosis	O-Up to 3000 ppm S-Above 3000 ppm	------	1 B
Ethylamine	14,3	1070	L	10	18	-----	Marked Irritation Eye, Nose, Throat, Lungs/Corneal Injury	S	------	4
Ethyl sec-Amyl Ketone (4-Methyl-3 heptanone)	15	1075	L	25	130	----	Moderate Irritation Eye, Nose, Throat	O-Up to 75 ppm S-Above 75 ppm	----	1 B
Ethyl Benzene	15	1080	L	100	435	----	Moderate Irritation Eye, Nose, Throat	O-Up to 200 ppm S-Above 200 ppm	----	1 B
Ethyl Bromide	8,3	1090	L	200	890	----	Narcosis/Cumulative Liver, Kidney and Heart Damage	S	----	4
Ethyl Butyl Ketone (3-Heptanone)	16,8	1100	L	50	230	----	Mild Irritation Eye, Nose, Throat/ Narcosis	O-Up to 150 ppm S-Above 150 ppm	----	
Ethyl Chloride	8	1110	G	1000	2600	CIB No. 27	Narcosis	O-Up to 5000 ppm S-Above 5000 ppm	----	2
Ethyl Ether	8,16	1200	L	400	1200	-----	Narcosis/Mild Irritation Eye, Nose, Throat	O-Up to 800 ppm S-Above 800 ppm	----	1 B

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Ethyl Formate	16,8	155	L	100	300	----	Mild Irritation Eye, Nose, Throat/ Narcosis	O-Up to 200 ppm S-Above 200 ppm	----	1 B
Ethyl Mercaptan	20,4	1220	L	C 10	25	TLV-CHG CD	Odor/Acute Systemic Toxicity	S	----	1 A
Ethyl Silicate	3,16	1230	L	100	850	----	Cumulative Kidney Damage Mild Irritation-Eye, Nose, Throat	S	----	4
Ethylene	17,18	1115	G	----	---	TLV	Explosive/Simple Asphyxiation	S-If Oxygen Less Than 18% By Volume	----	1 C
Ethylene Chlorohydrin-Skin	4	1120	L	5	16	TLV-CHG	Acute Toxicity (Local and Systemic)	S	S,I	4
Ethylenediamine	15,3,9	1130	L	10	25	----	Moderate Irritation Eye, Nose, Throat, Skin/Contact Dermatitis Asthma	S	----	2
Ethylene Dibromide				(See 1,2,-Dibromoethane)						
Ethylene Dichloride				(See 1,2,-Dichloroethane)						
Ethylene Glycol Dinitrate - Skin	3	1910	L	C 0.2	1.2	CD	Cumulative Blood Pressure Lowering/ Headache	S	S	1 A
Ethylene Glycol, particulate	15	1911	L	----	---	TLV	Moderate Irritation Eye, Nose, Throat	S	----	1 B
Ethylene Glycol, vapor	15	1913	VAP	----	---	TLV	Moderate Irritation Eye, Nose, Throat	S	----	1 B
Ethylene Glycol Monomethyl Ether Acetate				(See Methyl Cellosolve Acetate)						
Ethyleneimine - Skin	1	C 1175	L	STD 1910.1012		-----	Cancer	S	S,I	1 C
Ethylene Oxide	15,3,2	1190	G	50	90	----	Moderate Irritation Eye, Nose, Throat/ Cumulative Lung, Liver and Kidney Damage/ Suspect Mutagen	S	----	4
Ethylene Thiourea				See NIOSH CIB No. 22						
Ethylidene Chloride				(See 1,1-Dichloroethane)						
Ethylidene Norbornene	15,3,5	1161	S	----	---	TLV	Moderate Irritation Eye, Nose, Throat/ Cumulative Liver and Testicular Damage	S	----	3
N-Ethyl - morpholine - Skin	4,15	1225	L	20	94	-----	Acute CNS Effects/ Moderate Irritation-Eye, Nose, Throat	S	S	1 B
Fensulfothion (Dasanit®)	6	1251	S	----	---	TLV	Cholinesterase Inhibition	S	S,I	3
Ferbam	16,2	1263	S	----	15	TLV-CHG	Mild Irritation Eye, Nose, Upper Respiratory Tract/ Suspect Carcinogen	S	----	4

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Ferrovanadium Dust	16	1267	S	——	1	CD	Mild Irritation Upper Respiratory Tract	O	——	1 B
Fluoride (as F)	14,3	1280	S	——	2.5	CD	Marked Irritation Eye, Nose, Throat/ Cumulative Bone Damage	S	——	4
Fluorine	11,13	1270	G	0.1	0.2	TLV-CHG	Lung Edema/Kidney Damage	O-Up to 1 ppm S-Above 1 ppm	——	1 B
Fluoro-trichloromethane (F-11)	7	1285	L	1000	5600	———	Acute CNS Effects	S	——	2
Formaldehyde	14,2	1290	L	STD 1910.1000,Z-2		TLV-CHG, CD	Marked Irritation Eye, Lungs, Skin/ Suspect Carcinogen	S	I	4
Formamide	3	1292	L	——	——	TLV	Cumulative Systemic Toxicity	S	——	3
Formic Acid	14	1310	L	5	9	———	Marked Irritation- Eye, Nose, Throat, Lungs	S	——	1 B
Furfural - Skin	15	1325	L	5	20	———	Moderate Irritation Eye, Nose, Throat	S	S	1 B
Furfuryl Alcohol-Skin	15,8	1330	L	50	200	TLV-CHG	Moderate Irritation Eye, Lungs/Narcosis	S	I	2
Gasoline	16,7,18	1340	L	——	——	TLV	Mild Irritation Eye, Nose, Throat/ CNS Effects/Flammable	S-Above 500 ppm	——	4
Germanium Tetrahydride	4	1360	G	——	——	TLV	Acute Systemic Toxicity	S	——	2
Glass, Fibrous or Dust	15	1300	S	——	——	TLV,CD	Moderate Irritation Nose, Throat, Skin	S	——	1 B
Glycerin Mist	19	1363	L	——	NDS	TLV	Nuisance Particulate	O	——	1 C
Glycidol (2,3-Epoxy-1-propanol)	15,7	1365	L	50	150	———	Moderate Irritation Eye, Nose, Throat, Skin, CNS Effects	O-Up to 100 ppm S-Above 100 ppm	——	2
Glycol Monoethyl Ether				(See 2-Ethoxyethanol)						
Guthion				(See Azinphos Methyl)						
Glycidyl Ethers				See NIOSH CIB No. 29						
Graphite (natural)	10	9090	S	——	15 MPPCF	———	Cumulative Lung Damage (Pneumoconiosis)	S	——	3
Graphite (synthetic)	19	1366	S	——	NDS	TLV	Nuisance Particulate (Accumulation in Lungs)	O	——	1 C
Gypsum	19	1367	S	——	NDS	TLV	Nuisance Particulate (Accumulation in Lungs	O	——	1 C

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Hafnium	3	1368	S	---	0.5	-----	Cumulative Liver Damage	S	I	3
Helium	17	1369	G	---	---	TLV	Simple Asphyxiation	S-If Oxygen Less	-----	1 C
Heptachlor - Skin	2,3	1369	S	---	0.5	-----	Suspect Carcinogen/	S	S	4
Heptane	15,7,8	1371	L	500	2000	TLV,CD (Alkanes, C5-C8)	Moderate Irritation Eye, Nose, Lungs/ CNS Effects/Narcosis	S	-----	4
Hexachlorocyclo-pentadiene	14,11,3	1374	L	---	---	TLV	Marked Irritation Eye, Throat, Lungs/ Lung Edema/Cumulative Organ Damage	S	-----	4
Hexachloroethane - Skin	3,7	1372	S	1	10	CIB No. 27	Cumulative Organ Damage/CNS Effects	S	S	3
Hexachloro-naphthalene - Skin	3	1373	S	---	0.2	-----	Cumulative Liver Damage/Chloracne	S	S	3
Hexafluoroacetone	3,5	1375	L	---	---	TLV	Multiple Cumulative Organ Damage	S	-----	3
Hexamethylphosphoric triamide (HMPA)				See NIOSH CIB NO.6						
n-Hexane	7,8	1380	L	500	1800	TLV,CD (Alkanes C5-C8)	Polyneuropathy/ Narcosis	S	-----	4
2-Hexanone (MBK) - Skin	7,15	1696	L	100	410	TLV,CD	Polyneuropathy/ Moderate Irritation-Eye, Nose, Throat	S	S	4
Hexone (MIK) - Skin	15	1385	L	100	410	-----	Moderate Irritation Eye, Nose, Throat	O-Up to 200 ppm S-Above 200 ppm	S	1 B
sec-Hexyl Acetate	16	1387	L	50	300	-----	Mild Irriation-Eye, Nose, Throat	O-Up to 100 ppm S-Above 100 ppm	-----	1 B
Hexylene Glycol	16	1389	L	---	---	TLV	Mild Irritation Eye, Nose, Throat, Skin/Narcosis	O-Up to 50 ppm S-Above 50 ppm	-----	1 B
Hydrazine - Skin	14,3,2	1390	L	1	1.3	TLV-CHG, CD	Marked Irritation Respiratory Tract/ Cumulative Organ Damage/ Suspect Carcinogen	S	S,I	4
Hydrogen	17,18	1410	G	---	---	TLV	Explosive/Simple Asphyxiation	S-If Oxygen Less Than 18% By Volume	-----	1 C
Hydrogenated Terphenyls	3,10	1415	S	----	---	TLV	Cumulative Liver, Kidney, Lung Damage	S	-----	3

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Hydrogen Bromide	14,11	1420	G	3	10	----	Marked Irritation Nose, Throat/Acute Lung Damage	S	------	1 B
Hydrogen Chloride	14,11	1430	G	C 5	7	------	Marked Irritation Eye, Nose, Throat/ Lung Edema	S	------	1 A
Hydrogen Cyanide-Skin	4,3	1440	G	10	11	CD	Acute and Cumulative Systemic Toxicity (Cyanosis)	S	S	4
Hydrogen Fluoride	14,11,3	1460	G	3	2	CD	Marked Irritation Eye, Nose, Throat/ Acute Lung Damage/ Cumulative Bone Damage	S	------	4
Hydrogen Peroxide, (90%)	14,11,18	1470	L	1	1.4	----	Marked Irritation Eye, Nose, Throat, Skin/Acute Lung Damage/Explosive	S	------	1 B
Hydrogen Selenide	11,7,3	1475	G	0.05	0.2	----	Acute Lung Damage/ CNS Effects/Liver Damage	S	------	4
Hydrogen Sulfide	4,15,7	1480	G	STD 1910.1000,z-2		TLV-CHG, CD	Acute Systemic Toxicity/Moderate Irritation-Eye, (Conjunctivitis), Lungs/ CNS Effects	S	------	2
Hydroquinone	3,7	1490	S	------	2	CD	Cumulative Corneal Damage/CNS Effects	S	------	3
Indene	15,3	1500	L	------	------	TLV	Moderate Irritation Eye, Nose, Throat/ Cumulative Liver and Kidney Damage	S	------	4
Indium & Compounds (as In)	10,3,5	1510	S	------	------	TLV	Cumulative Lung, Other Organ Damage/ Suspect Teratogen ($InNO_3$)	S	------	3
Iodine	14,11	1515	S	C 0.1	1	-------	Marked Irritation Eye, Nose, Throat/ Lung Edema	S	------	1 A
Iodoform	15,4	1517	S	------	------	TLV	Moderate Irritation Eye, Nose, Throat, Lungs/Acute CNS Effects	S	------	2
Iron Oxide Fume	10	1520	FUM	------	10	TLV-CHG	Lung Changes (Siderosis)	O	------	3
Iron Pentacarbonyl	4,11	1521	L	------	------	TLV	Acute Toxicity CNS and Lungs)	S	------	2
Iron Salts, Soluble (as Fe)	15	1522	S	------	------	TLV	Moderate Irritation Upper Respiratory Tract, Skin	S-Above 2 mg/m^3	------	1 B
Isoamyl Acetate	15	1530	L	100	525	-------	Moderate Irritation Upper Respiratory Tract	O-Up to 200 ppm S-Above 200 ppm	------	1 B

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Isoamyl Alcohol	16,8,2	1532	L	100	360	———	Mild Irritation Eye, Nose, Throat/ Narcosis/Suspect Carcinogen	O-Up to 200 ppm S-Above 200 ppm	S	4
Isobutyl Acetate	15	1534	L	150	700	———	Moderate Irritation Eye, Nose, Throat	O-Up to 300 ppm S-Above 300 ppm	———	1 B
Isobutyl Alcohol	15,2	1536	L	100	300	TLV-CHG	Moderate Irritation Eye, Nose, Throat/ Suspect Carcinogen	S	———	4
Isophorone	14,7	1538	L	25	140	TLV-CHG	Marked Irritation Eye, Nose, Throat/ Chronic CNS Effects	S	———	4
Isophorone Diisocyanate- Skin	9,14	1539	L	———	———	TLV	Respiratory Sensitization/Marked Irritation-Eye, Nose, Throat, Lungs, Skin	S	S	4
Isopropyl Acetate	16	1540	L	250	950	———	Mild Irritation- Eye, Nose, Throat	O-Up to 500 ppm S-Above 500 ppm	———	1 B
Isopropyl Alcohol - Skin	16,8	1560	L	400	980	CD	Mild Irritation Eye, Nose, Throat/ Narcosis	O-Up to 800 ppm S-Above 800 ppm	S	4
Isopropylamine	14	1562	L	5	12	———	Marked Irritation- Eye, Nose, Throat, Lung	O-Up to 10 ppm S-Above 10 ppm	S	1 B
Isopropyl Ether	16	1565	L	500	2100	TLV-CHG	Mild Irritation Eye, Nose, Throat	S	———	1 B
Isopropyl Glydidyl Ether (IGE)	15,3	1567	L	50	240	CD	Moderate Irritation Eye, Nose, Throat, Skin, Skin Sensitization	O-Up to 100 ppm S-Above 100 ppm	———	4
Kaolin	19	1568	S	———	NDS	TLV	Nuisance Particulate Accumulation in Lungs	O	———	1 C
Ketene	11	1574	G	0.5	0.9	———	Marked Irritation, Edema-Lungs	S	———	2
Lead Arsenate (as Pb)	3,2	1590	S	———	0.15	CD (As, Pb)	Cumulative Organ Toxicity/Suspect Carcinogen	S	I	4
Lead, Inorganic Fumes & Dusts (as Pb)	12,7,5	1591	S	STD 1910.1025		TLV-CHG, CD	Cumulative Blood and Neurologic Effects/Reproductive Hazard	S	I	2
Limestone	19	1593	S	———	NDS	TLV	Nuisance Particulate Accumulation in Lungs	O	———	1 C
Lindane - Skin	7,3,2	1595	S	———	0.5	———	Cumulative CNS and Liver Damage/ Suspect Carcinogen	S	S,I	4

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Lithium Hydride	14,11,7	1503	S	—	0.025	—	Marked Irritation Eye, Nose, Throat, Skin/Lung Damage/CNS Effects	S	—	1 B
LPG (Liquified Petroleum Gas)	18,17,8	1803	G	1000	1800	—	Explosive/ Asphyxiant/Narcosis	O-Up to 2000 ppm S-Above 2000 ppm	—	2
Magnesite	19	1615	S	—	NDS	TLV	Nuisance Particulate/ Accumulation in Lungs	O	—	1 C
Magnesium Oxide Fume	11	1610	S	—	15	TLV-CHG	Lung Effects (Fume Fever)	S	—	2
Malathion - Skin	6	1616	L	—	15	TLV-CHG, CD	Cholinesterase Inhibition	O-Up to 30 mg/m³ S-Above 30 mg/m³	S	3
Maleic Anhydride	14,9,2	1618	S	0.25	1	—	Marked Irritation Eye, Nose, Throat, Lungs (Edema), Skin/ Asthma	S	I	2
Manganese & Compounds (as Mn)	7,10	1620	S	—	C 5	—	Cumulative CNS Damage/Lung Damage	S	—	1 A
Manganese Cyclopentadienyl Tricarbonyl (as Mn) Skin	4,7,3	1622	S	—	—	TLV	Acute CNS and Blood Effects/Cumulative Kidney Damage	S	S,I	4
Marble	19	1626	S	—	—	TLV	Nuisance Particulate Accumulation in Lungs	O	—	1 C
Mercury, (Organo) Alkyl Compounds, (as Hg) - Skin	7,3,14	1630	VAR	—	0.1	TLV-CHG	Acute and Cumulative CNS Damage/Marked Skin Irritation	S	S,I	4
Mercury, Inorganic (as Hg) - Skin	7,3,2	1631	VAR	—	0.1	TLV-CHG, CD	Acute and Cumulative CNS Damage/Gastro-intestinal Effects/Gingivitis/ Suspect Carcinogen	S	S,I	4
Mesityl Oxide	16	1635	L	25	100	—	Mild Irritation- Eye, Nose, Throat	O-Up to 50 ppm S-Above 50 ppm	—	1 B
Methane	18,17	1640	G	—	—	TLV	Explosive/Simple	S-If Oxygen	—	1 C
Methanethiol				(See Methyl Mercaptan)						
Methomyl (Lannate®) - Skin	L	1644	S	—	—	TLV	Cholinesterase Inhibition	S-Above 5 mg/m³	S	3
Methoxychlor	3	1646	S	—	15	TLV-CHG	Cumulative Kidney Damage	S	—	3
2 Methoxyethanol				(See Methyl Cellusolve)						
4-Methoxy-m-Phenylenediamine				(See 2,4-Diaminoanisole)						

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Methyl Acetate	16,8,7	1650	L	200	610	----	Mild Irritation-Eye Nose, Throat, Lungs/ Narcosis/CNS Effects	S	----	4
Methyl Acetylene (Propyne)	18,6	1651	G	1000	1650	----	Explosive/Narcosis	O-Up to 2000 ppm S-Above 2000 ppm	----	1 C
Methyl Acetylene - Propadiene Mix (MAPP)	18	1652	G/L	1000	1800	----	Flammable	O-Up to 2000 ppm S-Above 2000 ppm	----	1 C
Methyl Acrylate - Skin	14,4,3	1653	L	10	35	----	Marked Irritation-Eye, Nose, Throat, Skin/Acute Lung Damage/Cumulative Lung, Liver and Kidney Damage	O-Up to 30 ppm S-Above 30 ppm	S	1 B
Methyl Acrylonitrile - Skin	7,16	1654	L	----	----	TLV	Cumulative CNS Effects/Mild Irritation-Eye, Skin	S-Above 2 ppm	----	3
Methylal (Dimethoxymethane)	3	1655	L	1000	3100	----	Cumulative Systemic Toxicity	S	----	3
Methyl Alcohol - Skin	7,8,16	1660	L	200	260	CD	Narcosis/Cumulative CNS Effects/Mild Irritation-Eye, Nose, Throat,	O-Up to 400 ppm S-Above 400 ppm	S	4
Methylamine	14	1665	G	10	12	----	Marked Irritation-Eye, Nose, Throat, Skin	S	----	1 E
Methyl Amyl Alcohol				(See Methyl Isobutly Carbinol)						
Methyl n-Amyl Ketone (2-Heptanone)	15,8	1675	L	100	465	CD	Moderate Irritation-Eye, Nose, Throat/ Narcosis	O-Up to 300 ppm S-Above 300 ppm	----	1 B
Methyl Bromide - Skin	4,11,13	1680	G	C 20	80	TLV-CHG	Acute Lung Damage/ Cumulative CNS and Organ Damage	S	S	1 A
Methyl Butyl Ketone				(See 2-Hexanone)						
Methyl Cellosolve (2-methoxyethanol) - Skin	12,7	0590	L	25	80	----	Blood Disorders/ CNS Effects	S	S	3
Methyl Cellosolve Acetate (Ethylene Glycol Monomethyl Ether Acetate) - Skin	12,7,3	1170	L	25	120	----	Blood Disorders/ CNS Effects/Kidney Damage	S	S	3

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Methyl Chloride	4,7,3	1710	G	STD 1910.1000, Z-2		——	Acute and Chronic CNS Effects/Liver and Kidney Damage	S	——	4
Methyl Chloroform	16,8	1720	L	350	1900	CB, CIB No. 27	Mild Irritation Eye, Nose, Throat/Narcosis	S	——	1 B
Methyl Chloromethyl Ether	1	C 2640	L	STD 1910.1006		——	Cancer-Lung	S	——	1 C
Methyl 2-Cyanoacrylate	15	1735	L	——	——	TLV	Moderate Irritation Eye, Nose, Throat	S-Above 4 ppm	——	1 B
Methylcyclohexane	8	1740	L	500	2000	TLV-CHG	Narcosis	O-Up to 1000 ppm S-Above 1000 ppm	——	4
Methylcyclohexanol	16,8,3	1760	L	100	470	TLV-CHG	Mild Irritation-Eye, Respiratory Tract/Narcosis/ Cumulative Liver and Kidney Damage	S	——	4
o-Methylcyclohexanone-Skin	16,8	1765	L	100	460	TLV-CHG	Mild Irritation Eye, Nose, Throat/ Narcosis	S	S	2
Methylcyclopentadienyl Manganese Tricarbonyl (as Mn) - Skin	4,3,15	1767	S	——	——	TLV	Acute CNS Effects/ Cumulative Liver, Kidney Damage/ Moderate Eye Irritation	S	S	4
Methyl Demeton - Skin	6	1768	S	——	——	TLV	Cholinesterase Inhibition	S	S,I	3
4,4'-Methylene bis (2-Chloroaniline) (MOCA) - Skin	1	C 2650	S	STD 1910.1005		——	Cancer	S	S,I	1 C
Methylene Bis (4-Cyclohexylisocyanate)	14,3,9	2651	S	——	——	TLV	Marked Irritation Skin/Skin Sensitization/ Asthma	S	I	4
Methylene Bisphenyl Isocyanate (MDI)	9,14	1073	S	C 0.02	0.2	CD	Asthma/Marked Irritation-Eye, Nose,Throat, Skin	S	I	1 A
Methylene Chloride (Dichloromethane)	17,3,8	1730	L	STD 1910.1000, Z-2		TLV-CHG	Chemical Anoxia (Metabolic Conversion to CO)/ Chronic Liver Damage/ CNS Effects/Narcosis	S	——	4
Methyl Ethyl Ketone (MEK)				(See 2-Butanone)						
Methyl Ethyl Ketone Peroxide	14,3,2	1750	L	——	——	TLV	Marked Irritation Eye, Nose, Throat, Lungs/Cumulative Liver and Kidney Damage/ Suspect Carcinogen	S	I	4
Methyl Formate	8,15	1770	L	100	250	——	Narcosis/Moderate Irritation-Eye, Nose, Throat, Lungs	O-Up to 200 ppm S-Above 200 ppm	——	1 B

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Methyl Iodide - Skin	4,3,2	1772	L	5	28	-----	Acute and Cumulative CNS Effects/Suspect Carcinogen	S	S,I	4
Methyl Isoamyl Ketone	15,8	1776	L	----	----	TLV,CD	Moderate Irritation-Eye,	S-Above 200 ppm	-----	1 B
Methyl Isobutyl Carbinol - Skin	15,8	1670	L	25	100	CD	Moderate Irritation Eye, Nose, Throat/ Narcosis	O-Up to 50 ppm S-Above 50 ppm	-----	1 B
Methyl Isoamyl Ketone				(See Hexone)						
Methyl Isocyanate - Skin	9,14,11	1773	L	0.02	0.05	-----	Asthma/Marked Irritation-Eye, Nose, Throat, Skin/ Lung Edema	S	S,I	1 B
Methyl Mercaptan	20,15	1643	L	C 10	20	TLV-CHG,	Odor/Moderate Irritation-Eye, Nose, Throat	S	-----	1 A
Methyl Methacrylate	16,2	1774	L	100	410	-----	Mild Irritation-Eye, Nose, Throat/Suspect Carcinogen	S	-----	4
Methyl Propyl Ketone				(See 2-Pentanone)						
alpha Methyl Styrene	15,7,8	1782	L	C 100	480	-----	Moderate Irritation Eye, Nose, Throat/ CNS Effects/Narcosis	S	-----	2
Methyl Parathion - Skin	6,5	1775	S	----	----	TLV-CD	Cholinesterase Inhibition/Suspect Teratogen	S-Above 0.5 mg/m3	S,I	3
Methyl Silicate	4,14,3	1777	S	----	----	TLV	Severe Eye, Damage/ Marked Irritation-Eye, Nose, Throat, Lungs/Kidney Damage	S	I	4
Mica (less than 1% Quartz)	10	9075	S	20 MPPCF		-----	Accumulation in Lungs (Pneumoconiosis)	S	-----	3
Mineral Wool Fiber	15	1781	S	----	----	TLV	Moderate Irritation Nose, Throat, Skin	S	-----	1 B
Molybdenum (as Mo) (Insolubles)	3,16	1790	S	----	15	TLV-CHG	Cumulative Liver and Kidney Damage/ Blood Disorders/Mild Irritation-Eye, Nose, Throat, Lung	S	-----	3
Molybdenum (as Mo) (Solubles)	3,16	1791	S	----	5	-----	Cumulative Liver and Kidney Damage/ Blood Disorders/Mild Irritation-Eye, Nose, Throat, Lung	S	-----	3
Monocrotophos (Azodrin®)	6	2690	S	----	----	TLV	Cholinesterase Inhibition	S	-----	3
Monomethyl Aniline - Skin	13,12	1972	L	2	9	-----	Methemoglobinemia/ Anemia	S	S	3

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Monomethyl Hydrazine - Skin	4,2,5	1794	L	C 0.2	0.35	CD	Acute Lung/CNS and Blood Damage/ Suspect Carcinogen and Teratogen	S	S,I	1 A
Morpholine - Skin	15,3	1797	L	20	70	——	Moderate Irritation Eye, Nose, Throat/ Cumulative Liver and Kidney Damage	O-Up to 40 ppm S-Above 40 ppm	S	1 B
Naphtha (Coal Tar)	15,8	0710	L	100	400	CD	Moderate Irritation Eye, Throat/Narcosis	O-Up to 200 ppm S-Above 200 ppm	——	2
Naphthalene	14,3,2	1810	S	10	50	——	Marked Irritation-Eye, Nose, Throat/ Ocular Damage/Anemia/ CNS/Damage/Suspect Carcinogen	S	I	4
alpha-Napthylamine	1	C 1815	S	STD 1910.1004		——	Cancer-Bladder (Suspect)	S	I	1 C
beta-Napthylamine	1	C 1820	S	STD 1910.1009		CIB No. 16	Cancer-Bladder	S	I	1 C
Neon	17	1850	G	——	——	TLV	Simple Asphyxiation	S-If Oxygen Less Than 18% By Volume	——	1 C
Nickel (Soluble Compounds)	2,10,3	1840	S	——	1	TLV-CHG, CD	Suspect Carcinogen/ Cumulative Lung Damage/Dermatitis	S	I	4
Nickel Carbonyl	2,4	1841	L	0.001	0.007	TLV-CHG	Suspect Carcinogen/ Acute	S	I	4
Nickel, Metal & Insoluble Compounds	2,10,3	1842	S	——	1	CD	Suspect Carcinogen Cumulative Lung Damage/Dermatitis	S	I	4
Nicotine - Skin	4,7,5	1855	L	——	0.5	——	Acute Systemic Toxicity/CNS Damage Suspect Teratogen	S	S,I	3
Nitric Acid	4,14	1860	L	2	5	CD	Acute Lung Damage/ Marked Irritation Eye, Nose, Throat, Skin	O-Up to 4 ppm S-Above 4 ppm	——	2

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Nitric Oxide	13,7	1890	G	25	30	CD (Oxides of Nitrogen)	Methemoglobinemia/ CNS Effects	O-Up to 50 ppm S-Above 50 ppm	----	4
p-Nitroaniline - Skin	13,3	1865	S	1	6	----	Methemoglobinemia/ Cumulative Liver Damage	S	S	3
Nitrobenzene - Skin	13,12,7	1870	L	1	5	----	Methemoglobinemia/ Anemia/CNS Effects	O-Up to 3 ppm S-Above 3 ppm	S	3
4-Nitrobiphenyl	1	C 1875	S	STD 1910.1003		----	Cancer-Bladder	S	I	1 C
p-Nitrochlorobenzene Skin	13,12	1872	S	----	1	----	Methemoglobiemia/ Anemia	O-Up to 2 mg/m³ S-Above 2 mg/m³	S	3
Nitroethane	15,8	1880	L	100	310	----	Moderate Irritation Respiratory Tract/ Narcosis	O-Up to 300 ppm S-Above 300 ppm	----	2
Nitrogen	17	1900	G	----	----	TLV	Simple Asphyxiation	S-If Oxygen less than 18% By Volume	----	1 C
Nitrogen Dioxide	10,11	1903	G	C 5	9	TLV-CHG CD (Oxides of Nitorgen)	Cumulative Lung Damage (Bronchitis, Emphysema)/Lung Edema	S	----	3
Nitrogen Trifluoride	13,3	1907	G	10	29	----	Methemoglobinemia Cumulative Liver and Kidney Damage	S	----	3
Nitroglycerin - Skin	3	1912	L	C 0.2	2	CD	Cumulative Effect on Blood Pressure (Lowering) Headache	S	S	1 A
Nitromethane	16,8	1920	L	100	250	----	Mild Irritation-Eye, Nose, Throat/ Narcos2-Nitropropane	O-Up to 300 ppm S-Above 300 ppm	----	2
1-Nitropropane	15,3	1940	L	25	90	----	Moderate Irritation-Eye, Nose, Throat/ Cumulative Liver Damage	O-Up to 75 ppm S-Above 75 ppm	----	4
2-Nitropropane	3,2,15	1941	L	25	90	CIB	Cumulative Liver Damage/Suspect Carcinogen/Moderate Irritation-Eye, Nose, Throat	S	----	4
n-Nitrosodimethylamine - Skin	1	C 1942	L	STD 1010.1016		----	Cancer	S	S,I	1 C
Nitrotrichloromethane				(See Chloropicrin)						
Nitrotoluene - Skin	13	1945	L	5	30	----	Methemoglobinemia	S	S	3
Nitrous Oxide	5,7	1953	G	----	----	TLV,CD	Reproductive Hazard (Male and Female)/ CNS Effect	S-Above 100 ppm	----	3
Nonane	16,8	----	L	----	----	TLV	Mild Irritation-Eye, Nose, Throat/ Narcosis	S-Above 500 ppm	----	1 B

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Octachloronaphthalene - Skin	3	1955	S	——	0.1	——	Cumulative Liver Damage/Chlorance	S	S	3
Octane	16,8	1957	L	500	2350	TLV-CHG CD (Alkanes C5-C8)	Mild Irritation/	O-Up to 500 ppm S-Above 500 ppm	——	1 B
Oil Mist (Mineral)	18,10	5010	L	——	5	——	Good Housekeeping Practice/ Accumulation in Lungs (Pneumonitis)	O	——	1 C
Osmium Tetroxide (as Os)	14,11	1960	S	——	0.002	——	Marked Irritation-Eye, Nose, Throat, Brofchi, Lungs/Lung Edema	S	——	1 B
Oxalic Acid	14	1970	S	——	1	——	Marked Irritation-Eye, Nose, Throat, Skin	S	——	1 B
Oxygen Difluoride	14,11,3	1975	G	0.05	0.1	——	Marked Irritation-Respiratory Tract/ Marked Edema-Lungs/ Cumulative Kidney Damage	S	——	4
Ozone	14,11	1980	G	0.1	0.2	——	Marked Irritation-Respiratory Tract/ Lung Edema	S	——	4
Paraffin Wax Fume	16	2000	S	——	NDS	TLV	Mild Irritation-Eye, Nose, Throat	O	——	1 B
Paraquat - Skin	3,16,5	1982	S	——	0.5	——	Cumulative Systemic Lung Damage/Mild Irritation-Eye, Nose, Throat/Suspect Teratogen	S	I	3
Parathion - Skin	6,5	1984	L	——	0.1	CD	Cholinesterase Inhibition/Suspect Teratogen	S	S,I	3
Pentaborane	4,7	1986	L	0.005	0.01	——	Acute and Cumulative CNS Damage	S	——	4
Pentachloronaphthalene - Skin	3,14,2	1988	S	——	0.5	——	Acute Systemic Toxicity - Vascular and CNS Injury/ Marked Irritation-Eye and Nose/Suspect Carcinogen	S	S,I	4
Pentachlorophenol - Skin	4,3,7	1989	S	——	0.5	——	Acute Sytemic Toxicity/Vascular and Nervous System Injury/Chloracne	S	S,I	4
Pentaerythritol	19	1987	S	——	NDS	TLV	Nuisance Particulate	O	——	1 C
Pentane	18,8	1990	L	1000	2950	TLV-CHG, CD (Alkanes C5-C8)	Flammable/Narcosis	O-Up to 3000 ppm S-Above 3000 ppm	——	1 B

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2-Pentanone	15,8	2010	L	200	700	——	Moderate Irritation-Eye, Nose, Throat/ Narcosis	C-Up to 400 ppm S-Above 400 ppm	——	2
Perchloroethylene (Tetrachloroethylene) - Skin	3,8,2	2020	L	STD 1910.1000, Z-2		CD, CIB No. 20	Cumulative Liver and CNS Damage/ Narcosis/Suspect Carcinogen	S	S	4
Perchloromethyl Mercaptan	14,2	2030	L	0.1	0.8	-----	Marked Irritation-Eye, Nose, Throat/ Suspect Carcinogen	S	——	4
Perchloryl Flouride	13,12, 15	2033	G	3	13.5	——	Methemoglobinemia/ Anemia/Moderate Irritation-Eye, Nose, Throat	S	——	4
Perlite (less than 1% Quartz)	19%	2035	S	——	NDS	TLV	Nuisance Particulate - Accumulation in Lungs	O	——	1 C
Petroleum Distillates (Naphtha)	15,8	2037	L	500	2000	TLV-CHG, CD (Refined Petroleum Solvents)	Moderate Irritation Narcosis	S	——	1 B
Phenacylchloride				(See alpha-chloroacetophenone)						
Phenol - Skin	14,4,2	2040	S/L	5	19	CS	Marked Irritation-Eye, Nose, Throat, Lungs/Acute and Chronic Systemic Toxicity/Suspect Carcinogen	S	S,I	4
Phenothiazine - Skin	15,3	2041	S	——	——	TLV	Moderate Irritation-Skin/ Photosensitization-Skin	S-Above 10 mg/m3	S	2
Phenyl Ether (vapor)	7,16,3	2047	L	1	7	——	Nausea/Mild Irritation-Eye, Skin/Cumulative Liver and Kidney Damage	S	——	4
Phenyl Ether-Biphenyl Mix (vapor)	7,16,3	2053	L	1	7	——	Nausea/Mild Irritation-Eye, Skin/Cumulative Liver and Kidney Damage	S	——	4
p-Phenylene Diamine - Skin	9,3	2042	S	——	0.1	——	Respiratory Sensitization (Asthma)/Contract Skin Irritant Sensitizer	S	S	2
Phenylglycidyl Ether (PGE)	15,3,8	2057	L	10	60	CD	Moderate Irritation Eye, Nose, Throat, Skin/Skin Sensitization/Narcosis	S	——	2
Phenylhydrazine - Skin	12,3	2060	L	5	22	CD	Hemolytic Anemia/ Skin Irritation and Sensitization	S	S	4

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Phenylphosphine	12,7,5	2062	L	----	----	TLV	Hemolytic Anemia/ CNS Effects/ Testicular Damage	S	----	3
Phorate (Thimet®) - Skin	6	2064	L	----	----	TLV	Cholinesterase Inhibition	S	S,I	3
Phosdrin (Mevinphos®)	6	2065	L	----	0.1	----	Cholinesterase Inhibition	S	S,I	3
Phosgene (Carbonyl Chloride)	11,10	2070	G	0.1	0.4	TLV,CD	Marked Edema-Lungs Chronic Lung Disease	S	----	4
Phosphine	4,7,11	2080	G	0.3	0.4	----	Acute and Chronic Systemic Toxicity (CNS Effects, Lung Edema, Anemia)	S	----	4
Phosphoric Acid	14	2085	L	----	1	----	Marked Irritation- Eye, Nose, Throat	O-Up to 2 mg/m3 S-Above 2 mg/m3	----	1 B
Phosphorus (yellow)	3	2090	S	----	0.1	----	Cumulative Bone and Liver Damage	S	I	3
Phosphorus Penta-chloride	14,10,11	2091	S	----	1	----	Marked Irritation- Eye, Nose, Throat, Bronchitis/Lung Edema	S	----	2
Phosphorus Pentasulfide	14,4	2092	S	----	1	----	Marked Irritation- Respiratory Tract/ H_2S Hazard	S	----	1 B
Phosphorus Trichloride	14,10,11	2093	L	0.5	3	----	Marked Irritation- Eye, Nose, Throat, Bronchi, Lungs/ Bronchial Pneumonia	S	----	1 B
Phthalic Anhydride	14,9,3	2110	S	2	12	TLV-CHG	Marked Irritation- Eye, Nose, Throat, Lungs/Asthma/Contact Skin Irritant and Sensitizer	S	----	2
m-Phthalodinitrile	19	2015	S	----	NDS	TLV	Particulate (Apparent Low Toxicity)	S-Above 15 mg/m3	----	1 C
Picloram (Tordon®)	19	2017	S	----	NDS	TLV	Particulate (Apparent Low Toxicity)	O	----	1 C
Picric Acid - Skin	3	2120	S	----	0.1	----	Skin Irritant and Sensitizer Cumulative Liver, Kidney and Red Blood Cell Damage	S	S	3
Pival® (2 Pivalyl-1 3-indandione)	3	2125	S		0.1	----	Cumulative Anticoagulant Effect (Warfarin Analogy)	S	----	3
Plaster of Paris	19	2127	S	----	NDS	TLV	Nuisance Particulate	S	----	1 C
Platinum (soluble salts as Pt.)	9,3	2130	S	----	0.002	----	Respiratory Sensitization (Asthma/Dermatitis	S	----	1 B

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Polychlorinated Biphenyls (PCB)				(See Chlorodiephenyl)						
Polytetra-fluoroethylene Decomposition Products	4	2135	VAR	---	---	TLV,CD (Decomp. Prod. of Flourocarbon Polymers)	Acute Toxic Effects (Polymer Fume Fever)	S	---	2
Portland Cement (Less than 1% Quartz)	19,16	0577	S	---	50 MPPCF	TLV-CHG	Nuisance Particulate/Mild Irritation-Eye and Nose	O—If quartz content <1% S—Otherwise	---	2
Potassium Hydroxide	14	2140	S	---	---	TLV	Marked Irritation-Eye, Nose, Throat, Lungs Skin	S	---	1 B
Propane	18,7	2150	G	1000	1800	---	Explosive/CNS Effects	S	---	1 C
Propargyl Alcohol - Skin	14	C 2167	L	---	---	TLV	Marked Irritation-Eye Nose, Throat, Skin	S	S	1 B
Beta-Propiolactone	1	C 2163	L	STD 1910.1013	---	TLV	Marked Irritation-Eye, Nose, Throat, Skin	S	S	1 B
n-Propyl Acetate	16,8	2180	L	200	840	---	Mild Irritation-Eye, Nose Throat/Narcosis	O-Up to 600 ppm S-Above 600 ppm	---	1 B
Propyl Alcohol -Skin	16,8,2	2170	L	200	500	---	Mild Irritation-Eye, Nose, Throat/Narcosis/ Suspect Carcinogen	S	S	1 B
n-Propyl Nitrate	3,13	2185	L	25	110	---	Cumulative Systemic Effects (Methemoglobinemia.	S	S	3
Propylene Dichloride	3	2190	L	75	350	---	Cumulative Liver Damage	S	S	3
Propylene Glycol Monomethyl Ether	15,8	2210	L	---	---	TLV	Moderate Irritation Eye, Nose, Throat/ Narcosis	S-Above 200 ppm	---	2
Propylene Imine - Skin	15,4,	2213	L	2	5	---	Moderate Irritation Eye, Nose, Throat/ Acute Kidney and Lung Damage/Suspect Carcinogen	S	S,I	4
Propylene Oxide	15,3,2	2215	L	100	240	---	Moderate Irritation Eye, Nose, Throat, Lungs, Skin/ Cumulative CNS, Kidney and Liver Damage/Suspect Carciongen	S	I	4
Propyne				(See Acetylene)						
Pyrethrum	3,16	2216	S	---	5	---	Contact and Allergic Dermatitis Mild Irritation-Lungs	O-Up to 10 mg/m³ S-above 10 mg/m³	S	3
Pyridine	3,7	2220	L	5	15	---	Cumulative Liver, Kidney and Bone Marrow/Damage CNS Effects	S	S	3

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Quinone (p-Benzoquinone)	4,3,2	2222	S	0.1	0.4	-----	Acute and Cumulative-Eye (Corneal) Damage/ Suspect Carcinogen	S	I	4
Radon Daughters				See NIOSH CIB No. 10						
RDX (cyclotrimethylene Trinitramine) - Skin	7	2224	S	---	---	TLV	Chronic CNS Effects (Nausea, Convulsions)	S	S	3
Resorcinol	15,3	2221	S	---	---	TLV	Moderate Irritation-Eye, Nose, Throat, Skin/Cumulative Systemic Toxicity	S-Above 15 ppm	-----	4
[illegible], Metal Fume	9	2223	S	---	0.1	-----	Respiratory Sensitization	S	-----	1 B
Rhodium, Soluble Salts (Rh)	9,2	2225	S	---	0.001	-----	Respiratory Sensitization (Asthma) Suspect Carcinogen	S	-----	4
Ronnel	6	2226	S	---	10	TLV-CHG	Cholinesterase Inhibition	O-Up to 20 mg/m³ S-Above 20 mg/m³	-----	3
Rosin Core Solder . Pyrolysis Products (as Formaldehyde)	14	2227	VAR	---	---	TLV	Marked Irritation-Eye, Nose, Throat	S	-----	1 B
Rotenone (Commercial)	3,16,2	2228	S	---	5	-----	Cumulative Systemic Toxicity Mild Irritation-Nose, Throat Suspect Carcinogen	S	I	4
Rouge	19	2229	S	---	NDS	TLV	Nuisance Particulate-Accumulation in Lungs	O	-----	1 C
Rubber Solvent	7,8	2232	L	---	---	TLV,CD (Refined Petroleum Solvents)	Cumulative Central and Peripheral Nervous System Damage/Narcosis	S	-----	3
Selenium Compounds (as Se)	15,3,2	2230	S	---	0.2	-----	Moderate Irritation-Eye	S	I	4
Selenium Hexaflouride (as Se)	11	2231	G	0.05	0.4	-----	Lung Edema	S	-----	4
Silica (Amorphous)	19,10	9050	S	---	20 MPPCF	-----	Good Housekeeping Practice/Possible Pneumoconiosis	S	-----	3
Silica (Fused)	10	9013	S	Use Quartz Formula		-----	Pneumoconiosis	S	-----	3

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Silica (Quartz), Respirable	10	9010	S	$\frac{10mg/m3}{\%SiO_2+2}$		CD	Pneumoconiosis (Silicosis)	S	----	3
Silicon	19	2235	S	----	NDS	TLV	Nuisance Particulate-Accumulation in Lungs	0	----	1 C
Silicon Carbide	19	2235	S	----	NDS	TLV	Nuisance Particulate (Accumulation in Lungs)	0	----	1 C
Silicon Tetrahydride (Silane)	4	2237	G	----	----	TLV	Acute Systemic Toxicity by (Analogy with other Metal Hydrides)	S	----	2
Silver, Metal & Soluble Compound (as Ag)	3	2240	S	----	----	0.01	Cumulative Skin Pigmentation and Organ Accumulation	S	I	3
Soapstone	10	9085	S	----	20 MPPCF	----	Pneumoconiosis-	S	----	3
Sodium Azide	4,15	2243	S	----	----	TLV,CIB No. 13	Acute CNS and Blood Pressure Effects/ Mild Irritant-Eye	S	----	2
Sodium Fluoroacetate (1080) - Skin	4	2250	S	----	0.05	----	Acute Systemic Toxicity (Metabolic Poison)	S	I	2
Sodium Hydroxide	14	2260	S	----	2	TLV-CHG,	Marked Irritation-Eye, Nose, Throat, Lungs, Skin	S	----	1 B
Starch	19	2263	S	----	NDS	TLV	Nuisance Particulate	0	----	1 C
Stibine	4	2267	G	0.1	0.5	----	Acute Systemic Toxicity	S	----	4
Stoddard Solvent	16,8	2270	L	500	2900	TLV-CHG, CD - (Refined Petroleum Solvents	Mild Irritation-Eye Nose Throat/Narcosis	S	----	4
Strychnine	4	2275	S	---	0.15	----	Acute Systemic Toxicity, CNS (Convulsions and Paralysis)	S	S	4
Styrene monomer (Phenyethylene)	15,7,8	2280	S	STD 1900.1000,Z-2		TLV-CHG	Moderate Irritation Eye, Nose, Throat/CNS Effects/Narcosis	S	----	2
Subtilisins (Proteolytic Enzymes)	9,10,16	9220	S	----	----	TLV	Respiratory Allergy (Asthma and Lung Damage/) Mild Skin Irritant	S	----	2
Sucrose	19	2285	S	----	NDS	TLV	Nuisance Particulate	0	----	1 C
Sulfur Dioxide	14,4	2290	G	5	13	CD	Marked Irritation Eye Nose, Throat, Lungs/Broncho-constriction	S	----	1 B
Sulfur Hexafluoride	19	2300	G	1000	6000	----	Apparent Low Toxicity	0	----	1 C

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Sulfuric Acid	14,10,3	2310	L	——	1	CD	Marked Irritation Eye, Nose, Throat, Skin, Bronchi/Dental Erosion	S	——	1 B
Sulfur Monochloride	14	2320	L	1	6	——	Marked Irritation Eye, Nose, Throat, Lung	S	——	1 B
Sulfur Pentafluoride	11	2321	G	0.025	0.25	——	Marked Irritation Lung (Edema)	S	——	2
Sulfur Tetrafluoride	11	2322	G	——	——	TLV	Marked Irritation Lung (Edema)	S	——	2
Sulfuryl Fluoride	3,10,4	2323	G	5	20	——	Cumulative Kidney And Lung Damage/ Acute CNS Effects	S	——	3
Systox				(See Demeton)						
2,4,5-T (2,4,5-Trichlorophenoxyacetic Acid)	5,2	2324	S	——	10	——	Suspect Teratogen and Carcinogen	S	——	4
Talc (Total)	10	9030	S	20 mppcf		——	Pneumoconiosis (Talcosis)	0	——	3
Talc, fibrous Tremolite	1	9031	S	STD 1910.1001		——	Cancer (Lung)	S	4	3
Talc, fibrous non-Tremolite	1	9032	S	——	——	TLV-CIC	Cancer (Lung)	S	4	3
Tantalum	19	2325	S	——	5	——	Apparent Low Toxicity	0	——	1 C
TEDP - Skin	6	2327	S	——	0.2	——	Cholinesterase Inhibition	S	S,I	3
Teflon® Decomposition Products	4	2329	VAR	——	——	TLV,CD	Acute Systemic Toxicity (Polymer Fume Fever)	S	——	2
Tellurium	4,3	2330	S	——	0.1	——	Acute CNS Effects/ Cumulative Organ Damage	S	——	4
Tellurium Hexafluoride (as Te)	11	2332	G	0.02	0.2	——	Lung Edema	S	——	4
TEPP - Skin	6	2334	L	——	0.05	——	Cholinesterase Inhibition	S	S,I	3
Terphenyls	15	2335	S	C 1	9	——	Moderate Irritation Eye, Nose, Throat, Lungs	S	——	1 A
1,1,1,2-Tetrachloro-2,2-Difluoroethane	11,4	2337	L	500	4170	——	Lung Edema/ Respiratory Failure	S	——	4
1,1,2,2-Tetrachloro-1,2-Difluoroethane	3,12,11	2339	L	500	4170	——	Cumulative Liver Damage/Decreased White Blood Cell Count/Lung Edema	S	——	3
1,1,2,2-Tetrachloroethane - Skin	3	2340	L	5	35	CD,CIB No. 27	Cumulative Liver and Other Organ Damage	S	S	3
Tetrachloroethylene				(See Perchloroethylene)						

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Tetrachloromethane				(See Carbon Tetrachloride)						
Tetrachloro-napnthalene - Skin	3	2350	S	----	2	-----	Cumulative Liver Damage/Chloracne	S	S	3
Tetraethyl Lead (as Pb) - Skin	3,7,4	2360	L	----	0.075	TLV	Cumulative Liver, CNS and Kidney Damage/Acute CNS Effects	S	S,I	3
Tetrahydrofuran	15,8	2390	L	200	590	-----	Moderate Irritation Eye, Nose, Throat/ Narcosis	S	-----	2
Tetraethyl Lead (as Pb) - Skin	3,7,4	2370	L	----	0.07	TLV-CHC	Cumulative Liver, CNS and Kidney Damage/Acute CNS Effects	S	S	3
Tetramethyl Succinonitrile - Skin	4	2380	S	0.5	3	-----	Acute Systemic Toxicity (CNS)- Headache, Nausea, Convulsions	S	S	4
Tetranitromethane	14,4,3	2395	L	1	8	-----	Marked Irritation- Eye, Nose, Throat/ Acute CNS and Lung Effects (Edema)/ Cumulative Systemic Damage	S	-----	4
Tetryl (2,4,6-Trinitrophenyl methylnitramine) - Skin	3	2410	S	----	1.5	-----	Contact Dermatitis, Skin Sensitization/ Cumulative Systemic Toxicity	S	S	3
Thallium (Soluble Compounds) - Skin (as Tl)	3	2420	S	----	0.1		...ve Systemic Toxicity	S	S	3
4,4'-Thiobis (6-tert-butyl-m-cresol)	19	2422	S	----	NDS	TLV	Apparent Low Toxicity	0	------	1 C
Thiram[2]	4,5	2427	S	----	5	-----	Acute Systemic Toxicity (Antabuse-like Effects)/ Suspect Teratogen	S	------	4
Tin (Inorganic compounds, except Oxide) (as Sn)	4,3	2430	S	----	2	-----	Acute and Chronic Systemic Toxicity	S	-----	4
Tin (Organic Compounds) (as Sn)	4,3	2431	VAR	----	0.1	CD Organotin compounds)	Marked Irritation Skin/Cumulative Systemic Toxicity	S	S,I	3
Tin Oxide	10	2432		----	----	TLV	Pneumoconiosis (Stannosis)	S	------	3
Titanium Dioxide	19	2440	S	----	15	TLV-CHG	Nuisance Particulate - Accumulation in Lungs	0	-----	1 C
Toluene - Skin	15,8	2460	L	STD 1910.1000,Z-2		TLV-CHG, CD	Moderate Irritation Eye, Nose, Throat/ Narcosis	S	S	2

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Toluene-2,4-Diisocyanate (TDI)	9,14,3	2470	L	C 0.02	0.14	CD	Asthma/Marked Irritation-Eye, Nose, Throat, Bronchi, Lungs/Dermatitis	S	———	1 A
o-Toluidine - Skin	13,4,2	2475	L	5	22	———	Methemoglobinemia/ Acute Systemic Effects/ Suspect Carcinogen	S	S	4
Toxaphene				(See Chlorinated Camphene)						
Tributyl Phosphate	15,7	2477	L	----	5	———	Moderate Irritation Nose, Throat, Lungs/ Headache	S	———	4
1,1,1-Trichloroethane				(See Methyl Chloroform)						
1,1,2-Trichloroethane - Skin	3,8	2495	L	10	45	CIB No. 27	Cumulative Liver Damage/Narcosis	S	S	4
Trichloroethylene	8,3,2	2490	L	STD 1910.1000,Z-2		CD,CIB No. 2	Narcosis/Cumulative Systemic Toxic Effects/Suspect Carcinogen	S	———	4
Trichloromethane				(See Chloroform)						
Trichloronaphthalene - Skin	3	2483	S	----	5	-----	Cumulative Liver Damage/Chloracne	S	S	3
1,2,3-Trichloropropane	15,3	2510	L	50	300	———	Moderate Irritation Eye, Nose, Throat/ Cumulative Liver Damage	S	———	4
1,1,2-Trichloro-1,2,2 trifluoroethane (F-113)	19	2485	0	1000	7600	———	Apparent Low Toxicity	0-Up to 2000 ppm S-Above 2000 ppm	———	1 C
Tricyclohexyltin Hydroxide (Plictran®)	19	2520	S	——-	NDS	TLV	Apparent Low Toxicity	S-Above 15 mg/m³	------	1 C
Triethylamine	14,11,3	2480	L	25	100	----	Marked Irritation Eye, Nose, Throat, Lungs/Lung Edema/ Corneal Damage	S	------	4
Trifluoromono-bromomethane	19	2500	G	1000	6100	-----	Apparent Low Toxicity	0	------	1 C
2,4,6-Trinitrophenol				(See Picric Acid)						
2,4,6-Trinitrophenylmethylnitramine				(See Tetryl)						
Trimellitic Anhydride (TMA)		2502		See NIOSH CIB No. 21						
Trimethylbenzene	14,7	2505	L	----	----	TLV	Marked Irritation Lungs, Skin/ Cumulative CNS Effects	S	-----	4
Trinitrotoluene - Skin (TNT)	13,12,3	2530	S	----	1.5	———	Methemoglobinemia/ Aplastic Anemia/ Cumulative Eye (Cataracts) and Liver Damage	S	S	3

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Trior thocresyl Phosphate	7	2532	L	——	0.1	———	Polyneuropathy	S	———	3
Triphenyl Phosphate	6	2535	S	——	3	———	Cholinesterase Inhibition	O-Up to 5 mg/m³ S-Above 5 mg/m³	———	3
Tungsten & Compounds (Insoluble) (as W)	19	2536	S	——	NDS	TLV,CD	Lung Accumulation/ Apparent Low Toxicity	S-Above 15 mg/m³	———	1 C
Tungsten Compounds (Soluble) (as W)	4	2537	S	——	——	TLV,CD	Acute CNS Effects (Metabolic) Poison)	S	———	2
Turpentine	15,3	2540	L	100	560	———	Moderate Irritation, Eye, Nose, Throat, Bronchi, Lungs, Skin/Cumulative Kidney Damage	S	———	1 B
Uranium (Insoluble Compounds)	3	2560	S	——	0.25	TLV	Cumulative Kidney Damage/Lung Accumulation	S	I	3
Uranium (Soluble Compounds)	3	2561	S	——	0.05	———	Cumulative Kidney Damage	S	I	3
Vanadium (V_2O_5) Dust (as V)	14,11,10	2570	S	——	C 0.5	CD	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs, Skin/ Acute and Chronic Bronchial and Lung Damage	S	———	1 A
Vanadium (V_2O_5) Fume (as V)	14,11,10	2571	S	——	C 0.1	TLV-CHG, CD	Marked Irritation Eye, Nose, Throat, Bronchi, Lungs, Skin/ Acute and Chronic Bronchial Damage	S	——	1 A
Vinyl Acetate	16	2572	L	——	——	TLV,CD	Mild Irritation-Eye, Nose, Throat	S-Above 20 ppm	——	1 B
Vinyl Benzene				(See Styrene)						
Vinyl Bromide	3,2	2577	G	——	——	TLV,CIB No. 28, CD	Cumulative Bromide Intoxication (CNS Effects)/ Suspect Carcinogen	S	——	4
Vinyl Chloride	1	C 2580	G	STD 1910.1017		CIB, CD No. 28	Cancer-Liver	S	——	1 C
Vinyl Cyanide				(See Acrylonitrile)						
Vinyl Cyclohexene Dioxide	14,2	2581	L	——	——	TLV	Marked Irritation Skin/Suspect Carcinogen	S	S	4
Vinylidene Chloride	3,2	2583	L	——	——	TLV,CIB No. 28	Cumulative Liver and Kidney Damage/ Suspect Carcinogen	S	——	4
Vinyl Toluene	15	2582	L	100	480	——	Moderate Irritation Eye, Nose, Throat	O-Up to 200 ppm S-Above 200 ppm	——	1 B

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m3	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
VM & P Naphtha	16,8,3	2584	L	---	---	TLV,CD	Mild Irritation-Eye, Nose,	O-Above 700 ppm	------	1 B
Warfarin	3	2586	S	---	0.1	-----	Cumulative Anticoagulant Effect	S	I	3
Welding fumes (total particulate)	15,11,3	2587	FUM	---	---	TLV	Moderate Irritation Nose, Throat, Bronchi, Lungs/Acute and Chronic Toxicity From Metal Oxides	S	-----	4
Wood Dust, hardwood (nonallergenic)	10,3,2	9210	S	---	---	TLV	Lung Damage/ Dermatitis/Suspect Carcinogen	S	-----	4
Wood Dust, softwood	19	9211	S	---	NDS	TLV	Nuisance Particulate (Accumulation in Lungs)	O	-----	1 C
Xylene (o-,m-, and p-isomers) - Skin	15,8	2590	L	100	435	CD	Moderate Irritation Eye, Nose, Throat/Narcosis	O-Up to 200 ppm S-Above 200 ppm	S	2
m-Xylene, Alpha, Alpha'- Diamine	3,15	2592	L	---	---	TLV	Contact Skin Sensitizer/Moderate Irritation-Skin	S	------	2
Xylidene - Skin	13,4	2600	L	5	25	-----	Methemoglobinema/ Acute Systemic Toxicity	S	S	4
Yttrium	10	2602	S	---	1	-----	Pneumoconiosis (Diffuse Fibrosis)	S	------	3
Zinc Chloride Fume	14,11,2	2611	S	---	1	---	Marked Irritation-Eye, Nose, Throat, Lungs/Acute Lung Damage/ Suspect Carcinogen	S	------	4
Zinc Chromate (as Cr)	2	2612	S	---	---	TLV,CD (Chromium VI)	Suspect Carcinogen	S	I	4
Zinc Oxide Fume	4	2610	S	---	5	CD	Acute Systemic Toxicity (Metal Fume Fever)	S	-----	2
Zinc Stearate	19	2616	S	---	NDS	TLV	Nuisance Particulate - Accumulation in Lungs	O	------	4 C
Zirconium Compounds (as Zr)	10,3	2620	S	---	5	---	Pneumoconiosis/ Lung and Skin Granulomas	S	------	3

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[HM Chapter II]

SUBSTANCE	HEALTH CODE NO.	CODE NO.	PHYSICAL STATE	PEL ppm	PEL mg/m³	ADD. DATA	HEALTH EFFECTS	CLASSIFICATION OF VIOLATION	WIPE SAMPLING	WORK CATEGORY
Benzo Alpha Pyrene (BAP)		0726								
N-Butyraldehyde Oxime or N-Butyraldoxime		0487								
2,4-Dichlorophenol (DCP)		0895								
N,N-Diethylaminopropyl-amine		0859								
Dust (Nuisance)		9130								
Dust (Total)		9135								
Dimethylethylamine (DEMA)		0915								
Glutaraldehyde		1361								
Glutaraldehyde (Alkaline Activated)		1362								
Lead Chromate		0687								
a-Methyl Silicate		1778								
N-Nitrosodiethanol-amine (DENA)		0907								
N-Nitrosomorpholine		1943								
Pentec, Bis (Pentachloro-2, 4-cyclopentadien-1-yl)		1985								
Phenyl Isocynate		2132								
1,2-Propylene Glycol Dinitrate - Skin		2200								
Tetrachlorophenol		2355								
Tributylamine		2478								
1,2,4-Trichlorobenzene		2481								
Tridymite		1017								
Triphenylamine		2534								
Vydate (also Oxamyl)		2585								

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PARTS 100 TO 177

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News Miner 2/28/93

Do hazardous substances lurk in your workplace?

By MARGARET NELSON
Staff Writer

Why should you care if you're exposed to chemicals at work?

The U.S. Department of Labor estimates that nearly 60 percent of the total number of recorded occupational illnesses are related to chemical exposure.

Workers have a "right to know" what hazardous substances they are exposed to so they can take preventative health measures, says Steve Kadish of the Alaska Health Project.

Kadish is a prime force of right-to-know legislation pending in the state Legislature. The legislation requires that the use and ingredients of certain hazardous and toxic materials found in the work place are made known to workers.

The Alaska Health Project is a non-profit, research, education, information and referral organization that focuses on the health and safety of workers. Based in Anchorage, the organization also conducts research, policy and chemical analysis on hazardous materials.

Kadish was in Fairbanks Friday conducting a workshop on health and job safety, for shop stewards, business agents and others.

About 3,000 new chemicals are introduced into the work place each year, Kadish said.

"That's not to say chemicals are bad," Kadish said. "If they are in the workplace, employees need to be aware of them."

There are more than 150 industrial facilities in Alaska that generate more than 2,200 pounds of hazardous waste per month, he said. Alaska needs legislation because few companies presently inform workers about the identity of the chemicals they are exposed to, or about the possible hazards from these chemicals, Kadish said. The result is that workers are unknowingly exposed to substances that are hazardous to their health.

STEVE KADISH
Concerned about exposure to toxic substances

(Staff photo by Joe Correia)

With a "right-to-know" law, employees and employers could begin to take the necessary preventative measures to eliminate or reduce exposures to toxic and hazardous materials, Kadish said. In communities, residents and health officials could have access to information that would help them deal more effectively will illnesses and accidents resulting from hazardous substances.

Two right-to-know bills are pending in the Alaska Legislature. A senate bill was introduced by senators Bettye Fahrenkamp, Joe Josephson, Vic Fischer and Arliss Sturgulewski. The House Labor and Commerce Committee recently introduced a bill in the House.

People interested the legislation may comment at a public hearing in Fairbanks March 11. The hearing is from 4:30-6:30 p.m. at the borough assembly chambers.

Both bills require employers to supply employees with a "Material Safety Data Sheet." The data sheet lists the chemical and trade name of the substance, permissible exposure levels, chronic and short term health effects, safe use conditions, proper cleanup procedures and emergency medical treatment.

The bills also would require an employee training program provided by the employer on safe use of the substance.

For example, said Kadish, suppose a company works with an industrial solvent used to clean floors. The bills, if passed, would require a label on the cannister of the solvent detailing the ingredients of the substance and symptoms workers may have if they are poisoned. The employer would be required to give a data sheet to the employee and a brief training session would be required on the substance.

Kadish said the legislation is a result of labor, environmental, health and community groups action. The right to know issue dealing with toxic and hazardous substances is the biggest public health issue facing Americans today, he said. To date, nine states have passed right to know legislation.

For more information on right-to-know legislation or the Alaska Health Project, contact Kadish at P.O. Box 1037, Anchorage 99510 or call 272-8734.

House building

Pat - Here's something I thought might interest you — David Argyle

Work-related hazards still problem, official says

by Cary Virtue
Times Writer

A set of safety standards ought to be adopted nationwide to help reduce health hazards associated with the work place, a former chief of the U.S. Occupational Safety and Health Administration said Friday.

"I think it is absolutely essential that we begin to develop a guide to redress occupational hazards or we're going to enter the 21st century with the same problems," Eula Bingham told an all-day safety in the work place conference at Alaska Pacific University.

Bingham also urged the legislature to adopt pending "right-to-know" legislation which would require employers to provide information about hazardous chemicals they may use.

"We ought to be saying, 'Look fellow, we still have a big problem about occupational disease in this country,' " said Bingham. "Not only do you have deaths, but you have (non-fatal) diseases which are manyfold greater."

Nationally, she said about 100,0000 people die every year from occupational diseases. That figure includes 12,000 lung cancer deaths and 5,000 deaths from respiratory diseases.

There are also some 16,000 heart attacks annually associated with occupational disease, and 300,000 to 1 million people suffer diseases such as ulcers, neurological disaeses, back injuries and diseases of the hands and fingers.

"But if you look at the past two years it is apparent we are turning our backs on those injured in the work place," Bingham said. "We are turning our backs on the sick."

Bingham was referring to the Reagan administration's relaxation of existing controls by cutting funding for federal programs that monitor health standards. For example, she said health inspections have dropped from 15,000 to 12,000 annually since the Reagan administration commenced.

"In the last two years we haven't seen any standards," she said. "We've seen the dropping of standards."

Instead of ignoring health safety, Bingham said the nation should be working to improve it. She urged a strong federal role for enacting such legislation, but said local legislatures have a major part to play as well.

EULA BINGHAM
Wants 'safety net'

Currently, most health hazard legislation is adopted on a "case-by-case" basis. But Bingham would like to see generic standards tha would "cut across" brand names and apply to a wide range of chemicals or issues.

Such standards could be developed for handling hazardous materials, identifing toxic materials and medicines and enacting protective legislation for removing workers overexposed to hazardous chemicals. Also, health and safety standards could be drafted to guide the construction of new buildings.

Right-to-know legislation is another way to protect workers, Bingham said. There are two bills in the legislature which would require employers to issue a fact sheet on any toxic chemicals they use. The sheet would list information about chronic and short-term health efftects, risks involved in handling the substance, symptons of overexposure, proper handling techniques, emergency procedures for spills and disposal techniques.

"In the long run money would be saved by committing additional money to health and safety (programs)," Bingham said. "Let's stop cutting the heart out of these programs."