Update: Laboratory Safety

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Introduction

Good afternoon ladies and gentlemen. During the next twenty minutes, I will attempt to update you on Laboratory Safety. This updating will take place by highlighting Occupational Health and Safety Administration requirements that pertain to laboratory situations. Additionally, we will mention briefly some of the Environmental Protection Agency regulations emanating from the Resource Conservation and Recovery Act and the Toxic Substances Control Act and the National Fire Protection Association standard for laboratories using chemicals.

Emphasis, however, will be placed on OSHA and laboratory safety requirements.

OSHA—Who is Covered?

Provisions of OSHA apply to every employer engaged in a business affecting commerce and who has employees. Thus, all private laboratories are covered. If the state has an OSHA-approved state plan, laboratories operated by state or local government, those at public colleges or universities for example, are subject to standards "as effective as" OSHA. It should be noted that OSHA plans administered by a state are equivalent to federal plans since they must be approved by the Occupational Safety & Health Administration. If the state does not have an approved plan, the aforementioned laboratories are not covered by OSHA or OSHA equivalent standards. Nonetheless, they must conform to the state's safety and health requirements.

Students in classrooms are not covered; OSHA applies only to employers and their employees. Students are neither, in an academic environment. A national labor relations board judgment indicates that they view graduate students as students even though they may be recipients of stipends.

Federal laboratories are covered by a separate section of the Act that requires federal agencies to provide working conditions consistent with OSHA standards. This requirement has been promulgated through Executive Order 1187 dated September 28, 1974.

The *employer* must provide a hazard-free workplace.

The *employees* are expected to comply with OSHA standards that are applicable to their jobs, read OSHA posters, follow the employer's safety and health standards and rules and wear and use protective equipment. In fact, an employer has a legal right to dismiss anyone that refuses to comply with OSHA regulations and all other mandated safety and health standards and rules.

Administration

Administration and enforcement of Public Law 91-596 is vested primarily in the Secretary of Labor and the Occupational Safety & Health Review Commission, a quasi judicial board appointed by the President having no connection with the Department of Labor. A National Advisory Committee advises, consults and makes recommendations.

Research and related functions are vested in the Secretary of Health, Education & Welfare. These functions are carried out by the National Institute of Occupational Safety & Health (NIOSH) establishing within HEW. NIOSH has been given the task of developing and establishing Occupational Safety & Health Standards. They have also been given the task to do research and experiment in the development of new and improved standards. NIOSH does publish a list of toxic substances on an annual basis. This list is called "The Registry of Toxic Effects of Chemical Substances" and contained 98,993 listings in 1977. 26,478 listings are of different chemicals, the other 72,515 listings are synonymous chemicals. There were 4700 new chemical compounds which did not appear in the 1976 edition.

NIOSH also studies the potentials for industrial illness, disease, or loss of functional capacity and determines the toxic effects of any workplace substance.

Standards

Standards are legally enforceable workplace regulations governing conditions, practices or operations to assure safe and healthful workplaces. OSHA adopts standards for compliance by employer and employee. Standards have been divided by OSHA into three major categories: General Industry, Marine, and Construction. Surprisingly, under the Construction Standards, we find those covering lasers. All standards are published in the Federal Register along with amendments, corrections, insertions or deletions.

As an interesting aside, it should be noted that the Federal Register was established in 1937 and in that year it covered 5,000 pages. Through 1975 it carried 80,000 pages!

In 1968, OSHA adopted the threshold limit values (TLV) list

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of the American Conference of Governmental Industrial Hygienists as one of its beginning regulations. This list amounts only to the daily time-waited average (TWA) permissible exposure to approximately 400 chemical species. OSHA and NIOSH began a joint project to make this list into a series of complete standards fitting the requirements of the Act. This means in general: adding requirements for monitoring levels of the air borne material; physical examinations and recordkeeping; employee observation and monitoring; access to records; personal protective equipment; warning signs and labels.

Standards Related to General Industry

When a compliance officer inspects a place of employment, he has to determine what National Safety & Health Standards apply and whether the employer and/or the employee is complying. The standards we will discuss from the Occupational Safety & Health Act are contained in the Code of the Federal Register, Title 29, Part 1910. The Federal Register Provides the uniform system for making available to the public regulations and legal notices issued by federal agencies.

After the OSH Act went into effect, the Secretary of Labor assumed the right to promulgate new standards and to modify or revoke existing ones.

If the Secretary of Labor determines that employees are in grave danger and an emergency standard is needed, he issues an emergency temporary standard (ETS) which then becomes effective as soon as it is published in the Federal Register. Thereafter, the normal procedure for issuing federal OSHA standards is followed with the emergency standards serving until superceded by the permanent standard.

Two of the earliest temporary emergency standards were health standards. These standards covered asbestos and monomeric vinyl choloride. Asbestos was suspected of causing lung cancer and monomeric vinyl chloride was suspected of causing angiosarcoma, a form of liver cancer. Since then, temporary emergency health standards were issued to cover 14 chemicals suspected of being carcinogens. These chemicals include: 2-acetylaminoflourine; 4-aminodiphenyl; benzidine and its salts; bis-chloromethyl ether; chloromethyl methy ether; 3,3'-dichlorobenzidine; 4-dimethylamino-azobenzene; ethyleneimine; 4,4'-methylene-bis (2-chloroaniline); alpha-naphthylamine; beta-naphthylamine; 4-nitrobiphenyl; 4-nitrosodimethylamine; beta-propiolactone. The suspected carcinogens were then later covered by permanent health standards. However, since the issuance of the permanent health standards covering the 14 suspected carcinogens, a court order has caused the entire standard for 4,4'-methylene-bis(2-chloroaniline) to be vacated along with the laboratory handling provisions of all the carcinogen standards. This is illustrative of the state of flux of the Occupational Safety & Health Act.

Other chemicals that were covered at one time or another by proposed and/or temporary standards include: ammonia, beryllium, lead (inorganic), sulfur dioxide, toluene, trichloroethylene, 2-dibromo-3-chloropropane, acrylonitrile, and benzene. Monomeric vinyl chloride, and as mentioned, the 14 suspected carcinogens, and, most recently, benzene elicited an extreme amount of controversy which necessitated litigation in the courts.

Despite OSHA's authority to issue emergency temporary standards, in its first six years of existence OSHA issued only four emergency temporary standards—asbestos in December of 1971, 21 pesticides in May 1973, 14 carcinogens in May 1973, and vinyl chloride in March 1974. The result was that past OSHA administrators, convinced that emergency temporary standards (ETS) were extremely vulnerable in court, eschewed ETS in favor of the normal standards setting process. After the vinyl chloride emergency temporary standard, over three years passed before another emergency temporary standard was issued.

On September 9, 1977, OSHA issued an emergency temporary standard for the pesticide dibromochloropropane (DBCP) setting an exposure level of 10 parts per million over an 8 hour time waited average at a 15 minute ceiling level of 50 parts per billion. On March 15, 1978, OSHA adopted a final DBCP standard of 1 part per billion. The standard became effective April 17, 1978.

On January 16, 1978, OSHA issued its most recent emergency temporary standard reducing worker exposure to acrylonitrile from 20 parts per million to 2 parts per million over an 8 hour time-waited average concentration and setting a 15 minute limit of 10 parts per million.

General Requirements

All places of employment are to be kept clean, orderly and in a sanitary condition. Aisles and passageways must be kept clear and in good repair with no obstructions across or in aisles that could create hazards. Permanent aisles and passageways are to be appropriately marked.

What about means of egress? Every building and structure, new or old, designed for human occupancy must have sufficient exits to permit the prompt escape of occupants in case of fire or other emergency. Any door, passage or stairway that is not an exit but could be mistaken for an exit has to be marked NOT AN EXIT.

Hazardous Materials

In the area of compressed gases, OSHA relies heavily on the Compressed Gas Association pamphlets.

Flammable and Combustible Liquids

Regulations covering flammable and combustible liquids have serious implications not only in laboratories but also in manufacturing plants where a wide variety and large quantity of flammable liquids are employed. Whether it's turpentine to thin paints, solvents for washing parts, adhesives for assembly operations, or simply gasoline to fuel a lawnmower, hundreds of different flammable and combustible liquids are in common day-to-day use. They consitute a growing fire hazard!

A significant percentage of flammable liquid fires probably occurs in the transfer of these liquids to points of use in the plant or laboratory. Typically in industry, each worker handles his own supply requirements of flammable liquids. If the job requires fresh solvent, the employees will probably take a container to the drum storage room or to a storage cabinet, as

needed, and carry it back to the work station. Because the route to and from flammable liquid supply points differs, the transfer container used and the type and quantity of flammable liquid required differs; there are no standardized routines for transferring flammables safely from storage point to use point. The storing and handling of flammable liquids, therefore, is highly susceptible to fire risk.

Because the combustible and flammable liquids regulations are quite extensive, only certain points will be highlighted to help clarify these regulations.

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

Class IA includes liquids having flashpoints below 73°F. (22.8°C.) and a boiling point below 100°F. (37.8°C.). Under flammable liquids, n-pentane and ethyl ether are examples of Class IA liquids. It should be noted that flammable aerosols are considered Class IA in flammable liquids.

Class IB includes liquids having flashpoints below 73°F. (22.8°C.) and a boiling point at or above 100°F. (37.8°C.). Ethanol and ethyl acetate are examples of IB liquids.

Class IC includes liquids having flashpoints at or above 73°F. (22.8°C.) and below 100°F. (37.8°C.). Acetone is an example of a Class IC liquid.

Combustible liquids have a flashpoint at or above 100°F. (37.8°C.) and are divided into two classes. Class II liquids; those with flashpoints at or above 100°F. (37.8°C.) and below 140°F. (60°C.), except any mixture having components with flashpoints of 200°F. (93.3°C.) or higher, the volume of which make up 99% or more of the total volume of the mixture. Acetic acid and isoamyl alcohol are examples of Class II combustible liquids. Class III liquids: those with flashpoints at or above 140°F. (60°C.), are divided into two sub-classes. Class IIIA liquids include those with flashpoints at or above 140°F. (60°C.) and below 200°F. (93.3°C.) except any mixture having components with flashpoints of 200°F. (93.3°C.), or higher, the total volume of which makes up 99% or more of the total volume of the mixture. Class IIIB liquids include those with flashpoints at or above 200°F. (93.3°C.).

This section does not cover the Class IIIB liquids. When the term Class III liquids is used in this section, it shall mean only Class IIIA liquids. Butyl cellosolve falls into Class IIIA and 2-butyl lactone fits into the Class IIIB combustible liquids classification.

Let's take a good look at the size restrictions of flammable and combustible liquid containers as put forth by OSHA. Table H-12, which is shown as a slide spells out the maximum allowable size of containers and portable tanks.

Table H-12 has been modified in order to relate the various classes of liquids to their flashpoint requirements and the boiling point requirements are in parentheses. These numbers are not found in the original Table H-12 printed in the Federal Register.

There are two exceptions which allow for storage of Class IA or IB flammable liquid in glass or plastic containers of no more than one gallon capacity: if the Class IA or IB liquid would be rendered unfit for its intended use or would excessively corrode a metal container so as to create a leakage hazard or, the user's process would require more than one pint of the Class IA or more than one quart of the Class IB liquid of any single assay lot to be used at one time. Under this second exception, we also find that if the quality of an otherwise analytical standard liquid is not met by liquids available and the quantity required exceeds 1/16th the capacity of the container allowed under Table H-12, then the one gallon glass or plastic container exception is allowed.

A third exception from the requirement of Table H-12 is if the containers are intended for direct export outside the United States. The latter standard is one of many which have been proposed for revocation because they have no direct or immediate relation to employee safety or health. These revocations have been proposed by the Occupational Safety & Health Administration in the Federal Register, Volume 42, No. 239-Tuesday, December 13, 1977. Thus, no more than one pint of normal pentane can be stored in glass or approved plastic container. With ethanol, one quart may be stored in glass or approved plastic. From the table you can also see the

Table H-12 (Modified) Maximum Allowable Size of Containers and Portable Tanks

	(F.P.< 73°F. B.P.<100°F.)	*(F.P.< 73°F. B.P.>100°F.)*	*(F.P.>73°F. but below 100°F.)*	*(F.P.>100°F.)*	*(F.P.>140°F.) Combustible Liquids*
	Class IA	*Class IB*	*Class IC*	*Class II*	*Class III*
Glass or approved plastic	1 pt.	1 qt.	1 gal.	1 gal.	1 gal.
Metal (other than DOT drums)	1 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Safety cans	2 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Metal drums (DOT spec.)	60 gal.	60 gal.	60 gal.	60 gal.	60 gal.
Approved portable tanks	660 gal.	660 gal.	660 gal.	660 gal.	660 gal.

Container exemptions: (a) Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of 1910.106(d) (2) (i) and (ii).

advantage of storing flammable and combustible liquids in a safety can whenever possible, especially if you do not meet the exceptions which were mentioned previously.

From the standard on design, construction and capacity of storage cabinets, it becomes apparent that knowledge of the classification of combustible and flammable liquids is necessary to comply with OSHA storage standards. OSHA says, "not more than 60 gallons of Class I or II liquids; no more than 120 gallons of Class III liquids shall be stored in a storage cabinet."

Storage cabinets to be designed and constructed to limit the internal temperature to not more than 325° when subjected to a 10 minute fire test using the standard time temperature curve as set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251-1969. All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Cabinets shall be labeled in conspicuous lettering, "FLAMMABLE – KEEP FIRE AWAY."

Fire Protection

OSHA presents the following series of definitions which are applicable to this subpart!

"Class A Fires" are fires in ordinary combustible materials such as wood, cloth, paper and rubber.

"Class B Fires" are fires in flammable liquids, gases, and greases.

"Class C Fires" are fires which involve energized electrical equipment where the electrical non-conductivity of the extinguishing media is of importance (when electrical equipment is de-energized, extinguishers for Class A or B fires may be used safely).

"Class D Fires" are fires in combustible metals such as magnesium, titanium, zirconium, sodium and potassium.

General requirements for portable fire extinguishers are as follows. Portable extinguishers shall be maintained in a fully charged and operable condition and kept in their designated places at all times when they are not being used. Extinguishers should be conspicuously located where they will be readily accessible and immediately available in the event of fire. They should be located along normal paths of travel. Extinguishers should not be obstructed or obscured from view. In large rooms and in certain locations where visual obstruction cannot be completely avoided, means should be provided to conspicuously indicate the location and intended use of extinguishers.

Medical and First Aid

The employer has to ensure the ready availability of medical personnel for advice and consultation on matters of plant health. In the absence of an infirmary, clinic or hospital in near proximity to the workplace which is used for the treatment of all injured employees, a person or persons should be adequately trained to render first aid. First aid supplies approved by the consulting physician should be readily available.

Where the eyes or body of any person may be exposed to injurious, corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body should be provided within the work area for immediate emergency use. Remember, all emergency equipment should be readily accessible at all times.

Machine Guarding

One or more methods of machine guarding must be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips, and sparks. An OSHA compliance officer would make out a citation for this obvious violation of the machine guarding standard.

When the periphery of the blades of a fan is less than 7 feet above the floor of the working level, the blades have to be guarded. The guard should have openings no larger than one-half inch.

Personal Protective Equipment

Protective equipment, including personal protective equipment for eyes, face, head and extremities, protective clothing, respiratory devices, and protective shields and barriers, must be provided, used and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards, of processes, or environment, chemical hazards, radiological hazards, or chemical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact. All personal protective equipment has to be of safe design and construction for the work to be performed.

Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed and employees shall use such protectors. No unprotected person shall knowingly be subjected to a hazardous environmental condition. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation or a combination of these hazards.

In this standard, OSHA states: Design, construction, testing and use of devices for eye and face protection shall be in accordance with the American National Standard for Occupational & Educational Eye and Face Protection, Z87.1-1968, Practice for Occupational and Educational Eye and Face Protection.

This standard specifies that anyone working in an area in which there is a reasonable probability of eye or face injury should wear proper protection. It specifies that such devices shall be durable, uninhibiting of movement and capable of repeated disinfection. The standard specifies rigid tests that safety eye wear must pass.

Electrical

General—Section 1910.309 adopts as a national concensus standard the National Electrical Code, NEPA 70-1971; ANSI C1-1971 (Rev. of C1-1968) which is incorporated by reference in this subpart.

The purpose of the Code is the practical safeguarding of any persons and of buildings and of contents from hazards

arising from the use of electricity or light, heat, power, radios, signaling, and for other purposes. The standards contained therein are Occupational Safety & Health Standards to the extent that they safeguard any person who is an employee of an employer. The National Electrical Code contains basic minimum provisions considered necessary for safety.

Radiation—Ionizing

Radiation includes alpha rays, beta rays, gamma rays, x-rays, neutrons, high speed electrons, high speed protons and other atomic particles but does not include sound or radio waves or visible light or infrared or ultraviolet light.

Employers utilizing ionizing radiation must comply with OSHA regulations 1910.96 which established, among other requirements, specific limits of exposure of individuals to radiation in restricted areas, precautionary procedures and concentrations and damage to property.

Nonionizing radiation is electromagnetic radiation and is restricted by OSHA standards to that portion of the spectrum defined as the radio frequency region which includes the microwave frequency region. It has varying effects on the body depending largely on the particular wavelength of the radiation involved. Nonionizing radiation is covered in detail by OSHA regulations under 1910.97.

Occupational Health and Environmental Control

In Subpart Z, Section 1910.1000, entitled "Air Contaminants," OSHA has standards on the books establishing threshold limit values for 400 chemical substances. Three tables are presented: Table Z-1 (Threshold Limit Values of Airborne Contaminants for 1970—American Conference of Governmental Industrial Hygienists); Table Z-2 (Threshold Limit Values of Airborne Contaminants—American National Standards Institute); and Table Z-3 (Mineral Dusts).

Threshold limit values refer to airborne concentration of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

Section 1910.1000 with its three tables is not only of extreme relevance to us as chemists, it has also elicited more activity to date than any other section of the Occupational Safety & Health Act.

Threshold limit values (TLV) from the 1968 list were adopted as official federal requirements for industrial air for publication in the Federal Register. There have been some 250 values changed or added to the 1968 list of TLV's. But because they have not been adopted by OSHA, they are not yet STANDARDS.

Carcinogens (14 Chemicals)

Federal regulations, effective February 11, 1974, restricted occupational exposure to 14 chemicals known to cause cancer. Laboratories using the chemicals are required to post warning signs at entrances to regulated areas, control access or label containers, maintain an inventory, and incinerate or inactivate waste. Glove boxes are required for experiments or procedures which could produce aerosols or laboratory hoods with an average linear face velocity of 150 feet per minute and a minimum of 125 feet per minute. Air exhausted from the laboratory must be decontaminated.

The standards adopted by OSHA require medical surveillance of employees, indoctrination and training on the nature of carcinogenic hazards in the laboratory, record-keeping and reports of the use of the carcinogen. Release of a carcinogen in an area where employees may be exposed must be reported with information on the incident resulting in the release.

The standards covering the suspected 14 carcinogens have specific provisions for laboratory activities based on safety guidelines drafted by the Cancer Research Safety Committee of the National Cancer Institute.

All areas in which the following chemicals are stored, handled, processed, repackaged, or released, must comply with standards:

1) Solid or liquid mixtures containing one-tenth percent or more by weight or volume; Benzidine (and its salts); beta-Naphthylamine, bis-Chloromethyl ether, Methyl chloromethyl ether, 4-Aminodiphnyl, 4-Nitrobiphenyl;
2) Solid or liquid mixtures containing one percent or more by weight or volume: Beta-Propiolactone; Ethyleneimine; 2-Acetylaminofluorene. 3,3'-Dichlorobenzidine (and its salts), 4-Dimethylaminozobenzene, 4,4'-Methylene bis (2-chloroaniline), alpha-Naphthylamine, N-Nitrosodimethylamine.

Tentative Carcinogen List

OSHA issued a tentative list of chemicals that may be regulated under its proposed generic carcinogen policy. The policy published in the October 4, 1977 Federal Register classifies chemicals into one of four categories based on the substances known or suspected carcinogenicity.

Category I would list 269 chemicals which are confirmed carcinogens based on human data or based on tests in two mammalian species or in one species if the tests have been replicated. Category II would list 218 chemicals whose carcinogenicity has been reported but for which the evidence is only suggestive or is positive in only one species and not replicated. Category III would list 396 substances with no, or at most meager, evidence of carcinogenic risk.

The July 31, 1978 issue of Chemical & Engineering News has an article beginning on page 20 which discusses OSHA's tentative carcinogen list and lists the chemicals.

Summation

Because the work-a-day life of the chemist and the chemist employer has been and most likely will continue to be affected by new standards promulgated by OSHA, a copy of the Federal Register should be obtained as a source book. Additional help can be obtained from regional or area OSHA offices.

Even though it was not the original intent of Congress to specifically cover chemical professionals, OSHA standards will definitely improve the safety of chemical intensive work.

Nat'l. Fire Protection Association Standard for Laboratories Using Chemicals-NFPA 45-1975

This standard on fire protection for laboratories using chemicals was prepared during 1969-1974 by the NFPA sectional committee on chemistry laboratories. It has the objective of achieving a comprehensive laboratory fire protection program. It is mentioned here because it could some day be adopted by OSHA. Although OSHA does not directly spell out general standards for chemical laboratories, your lab may have to comply on the basis of possible adoption by the fire authorities in your locale. Additionally, the Laboratory Operation and Apparatus section provides an excellent review of safe laboratory techniques and the safe use of laboratory apparatus.

The Environmental Protection Agency

The Environmental Protection Agency has been given the responsibility of managing two different programs related to chemicals. These programs are: The Federal Resource and Recovery Act and the Toxic Substance Control Act.

The Federal Resource Conservation and Recovery Act (RCRA) requires promulgating seven regulations providing comprehensive control of hazardous waste from its generation to its final disposal. The Agency has proposed a conditional exclusion of persons who generate and dispose of 100 kilograms per month of hazardous waste.

The act is a "cradle to grave" management control system for hazardous chemical waste. These chemicals can be categorized or defined by using eight parameters or characteristics:

(1) corrosiveness
(2) reactivity
(3) ignitability
(4) toxicity
(5) radioactivity
(6) infectiousness
(7) phytotoxicity
(8) teratogenicity & mutagenicity

Today EPA proposes to rely only on consideration of the first four characteristics because those are the only ones for which the Agency believes confidently that test protocols are available.

There are manifest regulations that must be heeded. These manifests are to document the movement of the chemical hazardous wastes from generator to transporter to recipient. Other additional reports are necessary—quarterly, especially for manifest reports not received; as well as annual reports.

It is also hoped that these record-keeping practices will be used to identify the waste stream's constituents and quantities; the disposition of the waste; labeling the waste for storage, transport or disposal identification; use of "appropriate" containers; and furnishing information to treatment facilities, storage or disposal facilities on the chemical composition of the waste.

The Toxic Substances Control Act (TOSCA) authorizes EPA to obtain from industry data on the production, use, health effects, and other matters concerning chemical substances and mixtures. If warranted, EPA may regulate the manufacture, processing, distribution in commerce, use, and disposal of a chemical substance or mixture. Pesticides, tobacco, nuclear material, firearms and ammunition, food, food additives, drugs, and cosmetics are exempted from the Act. These products are currently regulated under other laws.

The EPA Administrator may require manufacturers or processors of potentially harmful chemicals to conduct tests on the chemicals. Testing may be directed to evaluate the characteristics of a chemical, such as persistence or acute toxicity, or to clarify its health and environmental effects, including carcinogenic, mutagenic, behavioral, and synergistic effects. The manufacturers or processors of a chemical must bear costs of testing chemicals.

Manufacturers of new chemical substances must give the Administrator 90 days notice before the manufacture of the chemicals. Any chemical which is not listed on an inventory of existing chemicals to be published by the Administrator will be considered "new" for purposes of the premanufacture notice requirement.

The Administrator may designate a use of an existing chemical as a significant new use, based on consideration of the anticipated extent and type of exposure to human beings or the environment. Any person who intends to manufacture or process a chemical for such a significant new use must also report 90 days before manufacturing the chemical for that use.