CHEMICAL HYGIENE PLAN

BIOLOGY DEPARTMENT
HOBART AND WILLIAM SMITH COLLEGES

Plan Adapted from PARS Environmental Services in Hamilton Square New Jersey and Hobart William Smith Colleges Biology Department

Aug 2019

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1.0 INTRODUCTION & PURPOSE

The Occupational Safety and Health Administration (OSHA) established regulations for exposure to hazardous chemicals in laboratories. All college laboratories are covered by this law and must generate a Chemical Hygiene Plan (CHP). The CHP must include policies and procedures to ensure that employees are protected from hazardous chemicals. The rule also requires employee training, inspections, hazard identification, and in some cases, medical consultation and treatment. The purpose of the Hobart and William Smith Colleges (HWS) Biology Department CHP is to establish and implement policies, procedures and work practices intended to comply with the following OSHA and Code of Federal Regulations (CFR):

Inform students and employees working in laboratories (as defined by 29 CFR 1910.1450) of the potential health and safety hazards present in their workplace.

Minimize student and employee exposures to hazardous chemicals below the limits prescribed in 29 CFR 1910 Subpart Z.

Inform laboratory students and employees of the precautions and preventive measures that have been established by HWS to protect employees from a workplace illness or injury.

Inform laboratory students and employees of the required safety rules and procedures established by this organization to meet the requirements of 29 CFR 1910.1450 and 29 CFR 1910.1200.

The materials contained in the manual have been compiled to provide a basic safety manual for use in HWS's biology laboratories. It is intended to serve as a baseline for good practices and does not intend to serve as legal standards. Not all warning and precautionary measures are contained in this document and additional information or precautions may be required.

2.0 RESPONSIBILITIES

2.1 CHEMICAL HYGIENE OFFICER

HWS has one Chemical Hygiene Officer (CHO) from Campus Safety who is responsible for the development and implementation of the provisions of this CHP. Certain aspects of the program may be delegated to others as indicated throughout this document. However, the overall responsibility for the execution of the CHP rests with the CHO. All students and employees are also expected to actively participate in the program to ensure its success. The CHO for HWS is

Jason Woodruff, Chemical Hygiene Officer
Partners (formerly known as Greystone)
jwoodruff@partnersenv.com

2.2 CHEMICAL HYGIENE COMMITTEE

Our Chemical Hygiene Committee (CHC) is responsible for providing technical guidance in the development and implementation of the CHP for the Biology Department. The Committee is comprised of the following members of the Biology Department (except those on leave).

Patricia Mowery
207 Rosenberg
Geneva, NY 14456
mowery@hws.edu
(315) 781-3184

Patricia Wallace
002 Rosenberg
Geneva, NY 14456
wallace@hws.edu
(315) 781-3591

2.3 FACULTY RESPONSIBILITY

It is the Biology Department policy for all students and employees to follow the safe work practices and standard operating procedures described in the preceding sections of this CHP and any additional practices deemed necessary by the professor of the course. The person responsible for ensuring that students follow the established procedures is the professor of the course or research project. Faculty members are also responsible for ensuring that all hazardous materials submitted to laboratory technician Patricia Wallace for procurement or disposal have been identified for hazardous properties and characteristics.

3.0 CHP AVAILABILITY

The CHP and associated components are available to any Biology Department employee or student engaged in the laboratory use of hazardous chemicals and will be located on the Biology Department's HWS N-drive or pccommon. It is also required to be available upon request from the Assistant Secretary for OSHA and the Director of the National Institute for Occupational Safety and Health (NIOSH).

4.0 CHP REVIEW

The CHP will be reviewed and updated annually by members of the CHC. Members should initial in the appropriate place following their review of the plan.

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Carle							
Mowery							
Wallace	PGW	PGW	PGW	PGW	PGW	PGW	PGW
	2018	**2019**					
Mowery							
Wallace	PGW	PGW					

5.0 BIOLOGY DEPARTMENT LABORATORIES

It is the policy of the Biology Department to identify all areas that are engaged in laboratory use of hazardous chemicals. The areas covered by this CHP are listed in the following table.

Laboratory Supervisor	Location	General Activities
	Rosenberg 003	Labware-washing, autoclaving
	Rosenberg 004	Research laboratory
	Rosenberg 005	Research & teaching laboratory
	Rosenberg 010	Research & teaching Conviron lab
	Rosenberg 011	Stockroom
	Rosenberg 011.1	Prep room
	Rosenberg 112	Cold room
	Rosenberg 124	Cosentino/Deutschlander Research lab
	Rosenberg 212	Droney Fruit fly research lab
	Rosenberg 213	Kenyon & Carle Research lab
	Rosenberg 213.1	Research & teaching laboratory
	Rosenberg 214	Research & teaching laboratory
	Rosenberg 215	Research & teaching laboratory
	Rosenberg 216	Research & teaching laboratory
	Rosenberg 216.1	Research & teaching laboratory
	Rosenberg 217	Research & teaching laboratory
	Eaton 119	Brown & Cushman Research lab
	Eaton 121	Cosentino Research lab
	Eaton 202	Mowery Research lab
	Eaton 204	Research & teaching laboratory
	Eaton 209	Research & teaching laboratory
	Eaton 212	Research & teaching laboratory
	Eaton 218	Ryan & Straub Research laboratory
	Eaton 220	Research & teaching Conviron lab
	Eaton 227	Research&Teaching Microscope lab
	Eaton 303b	Animal laboratory
	Eaton 303c	Animal laboratory
	Eaton 303d	Animal laboratory
	Eaton 303e	Animal laboratory
	Eaton 303f	Animal laboratory
	Eaton 304 & 306	Research & teaching laboratory
	Eaton Greenhouse	Greenhouse

6.0 LABORATORY USE POLICY

The professor of the laboratory is responsible for determining whether or not work performed in a laboratory alone requires any special safety measures. Generally, individuals working alone with hazardous chemicals in laboratories should notify faculty or other responsible parties (in person, by telephone or e-mail) when they will be working with hazardous chemicals alone in a laboratory before commencing a project. Individuals working with hazardous chemicals and who are alone in separate laboratories should consider checking in on each other periodically.

7.0 LABORATORY CHEMICAL INVENTORY

It is the HWS Biology Department's policy to develop and maintain a list of chemicals used in each laboratory area.

The versions of the inventory are an Excel file and an Access database which have been made accessible on the N-drive in the Campus Chemical Inventory folder.

Patricia Wallace is responsible for maintaining the overall inventory and inventories for teaching labs. Each faculty member is also responsible for assisting Patricia with this task by informing her when chemicals are to be permanently transferred to another location.

Safety Data Sheets (SDS) are available in Patricia Wallace's office, Rosenberg 002; as links in the inventories; and on the World Wide Web (http://hazard.com/msds/).

8.0 HAZARDOUS MATERIALS

Even though HWS has been classified as a Conditionally Exempt Small Quantity Generator, the colleges have responsibilities similar to other large quantity waste generators. This section outlines the Biology Department's policies and the assigned responsibilities for hazardous waste determination, labeling containers, for obtaining and maintaining MSDSs handling procedures for chemicals developed in the laboratory and disposal practices. The requirements for hazard identification as described in the standard 29 CFR 1910.1450 (h) are also included. It is the Biology Department's policy to follow the safe work practices whenever particularly hazardous substances are used. The person responsible for identifying those procedures involving particularly hazardous substances is the professor of a course or research project. The person responsible for establishing the designated areas to be used for each procedure involving a particularly hazardous substance is also the professor of the course or research project.

8.1 IDENTIFYING HAZARDOUS MATERIALS

Hazardous materials are those substances with the Hazardous Material Identification System's or the National Fire Protection Association's diamond placard hazard code of four for health, reactivity, flammability depicted on a container or structure. They can also include carcinogens, cancer suspect agents, reproductive toxins, any chemical rated as highly toxic (acute or chronic), any explosive chemical and any chemical deemed particularly hazardous by the professor. A chemical may also be considered a hazardous waste if exhibits one of the following characteristics defined in 40 CFR Part 261 Subpart C: ignitability, corrosivity, reactivity and/or toxicity. Brief descriptions of these characteristics are included below.

Ignitable wastes can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F). Examples include waste oils and used solvents. Test methods that may be used to determine ignitability include the Pensky-Martens Closed-Cup Method for Determining Ignitability.

Corrosive wastes are acids or bases (pH < 2, or > 12.5) capable of corroding metal containers.

Reactive wastes are unstable and can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water.

Carcinogens are substances regulated by OSHA as carcinogenic, listed under the category "known carcinogen," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP), listed under Group one ("carcinogenic to humans") by the International Agency for Research on Cancer (IARC), or "reasonably anticipated to be carcinogens."

Reproductive toxins are chemicals which can cause chromosomal mutations and/or teratogenesis in gametes. Embryotoxins, which are substances that act during pregnancy to cause adverse effects on the fetus, are also included in this category. Faculty shall attempt to avoid need for these chemicals, and pre-approve and supervise the laboratory operation, procedure or activity involving these chemicals when they are unavoidable.

If the composition of the chemical substance produced exclusively for the laboratory's use is known, the professor shall determine if it is a hazardous chemical as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200. If the chemical is determined to be hazardous, the professor shall provide appropriate handling procedures. If the chemical produced is a byproduct whose composition is not known, the professor shall assume that the substance is hazardous and shall implement precautions recommended in the CHP. Proper labeling is the responsibility of the professor in whose lab the substance is stored, used, or generated. All laboratories will have a sign posted indicating the person responsible for the area.

8.2 ORDERING AND PROCUREMENT

Faculty or staff members are authorized to order chemicals for the department. Before any ordering takes place, individuals should examine the chemical inventory system to determine if the chemical is already available. If they wish to acquire new and unfamiliar hazardous chemicals, they should consider completing the chemical procurement form before placing the order. One should determine if the substance can be properly managed and stored on the campus. An appropriate waste disposal method must be identified before introducing a new chemical into HWS. No container of chemical will be accepted without an identifying label.

8.3 STOCKROOM

The Biology Laboratory technician, Patricia Wallace, Rosenberg 002, will be responsible for the Rosenberg 011 stockroom. Chemicals are stored in the stockroom, segregated by class. The stockroom must be locked at all times. Individuals accessing the stockroom will follow all the proper material handling techniques and use proper protective equipment. Storage is based on compatibility, and storage requirements. Food/beverage is not allowed in the stockroom or in any lab. All refrigerators used to store chemicals will have warning signs. Flammable chemicals will be stored in vented cabinets. Unknown substances shall be assumed toxic and must be stored accordingly.

8.4 DISTRIBUTION

When transporting chemicals outside the laboratory, individuals must avoid dropping or spilling chemicals. Appropriate carrying mechanisms such as a secondary container shall be used whenever chemicals are transported.

HWS BIOLOGY DEPARTMENT
CHEMICAL PROCUREMENT FORM

If the chemical is not new to the department, answer only questions 1-7. If the chemical is new to the department, answer all the questions.

1. Person responsible for this chemical._____
2. Name of chemical_____
3. CAS #_____ (unique identifier for this compound)
4. Supplier_____
5. Catalog # _____
6. Quantity to be ordered _____
7. Specific location in which it will be stored. _____
8. Attach the MSDS. Circle your answer to the following questions about the nature of this substance:

   Is it a strong corrosive? Yes No
   Is it highly flammable? Yes No
   Is it a strong oxidizer? Yes No
   Is it water reactive? Yes No
   Is it shock sensitive? Yes No
   Does it form peroxides? Yes No
   If ingested, inhaled or contacts skin, is it lethal? Yes No
   Is it a known or anticipated human carcinogen? Yes No
   Describe any other significant health or physical hazards associated with this chemical.

_____
_____
_____
_____
_____

9.0 MINIMIZING EXPOSURE

It is the HWS Biology Department policy to keep student and employee exposures to substances regulated by OSHA below the exposure limits established in 29 CFR 1910 subpart Z through the use of engineering controls and personal protective equipment. The exposure limits include Permissible Exposure Limits (PELs), Short Term Exposure Limits and Ceiling Values. The substances regulated by OSHA fall into one of the following lists:

List of Air Contaminants with a Permissible Exposure Limit (Table Z-1).

List of substances regulated by a specific standard (Table Z-2).

Both lists are included in Appendix A. Furthermore, the substances regulated by a specific standard, as well as listed as a known or suspected carcinogen are flagged in the inventory. For laboratory uses of OSHA regulated substances, the professor of a course shall assure that student exposure to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z. If the professor cannot be confident that engineering controls (e.g. fume hoods) and personal protective equipment will be effective, the procedure should be discontinued.

In order to use particularly hazardous substances, the student must be familiar with the associated MSDS. It is the responsibility of the professor to identify particularly hazardous substances used in coursework. The professor should make every effort to substitute a less hazardous substance or experiment whenever possible. Hazardous materials will only be handled inside fume hoods. All such materials outside of these hoods must be closed and clean. It is the responsibility of faculty members to guarantee that hazardous materials are handled inside fume hoods with appropriate personal protection during any coursework or research. Faculty are also responsible for ensuring that students and visitors wear appropriate personal protection equipment such as safety goggles, laboratory coats, gloves and proper footwear while working with chemicals that they have determined to be hazardous.

9.1 DESIGNATED AREAS FOR HAZARDOUS CHEMICALS

All faculty, students and staff who must work with select carcinogens, reproductive toxins or substances of acute toxicity must do so in an appropriately designated area. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood. All designated areas should be clearly marked. A sample label may be posted as follows:

DANGER:
DESIGNATED AREA
FOR CARCINOGENS, REPRODUCTIVE TOXINS AND
ACUTELY TOXIC CHEMICALS.
AUTHORIZED PERSONNEL ONLY

Hazardous waste containers are to be emptied through processing activities only. If a partially full hazardous waste container is no longer needed, please contact the Campus Safety Office for proper waste profiling and identification of offsite disposal options. The New York State Department of Environmental Conservation (NYSDEC) and the Resource Conservation and Recovery Act (RCRA) designate a container that has held hazardous materials as "empty" if:

- All material that can be removed from the container using practices commonly employed (e.g., pouring, pumping, aspirating) has been removed and;
- No more than one inch of residue remains in the bottom of the container or no more than 3 percent by weight of the total capacity of the container.

10.0 WASTE DISPOSAL

Patricia Wallace, Rosenberg 002, shall manage the Biology Department's laboratory waste stream until the CHO has been notified to pick up the waste for additional segregation and final disposal. All waste must be labeled as such and accompanied by the Biology Department's Hazardous Waste Disposal Request Form below. Original labels on incoming containers of hazardous chemicals are not to be removed or defaced. When anyone transfers chemicals to a new container, she/he must label the new container with name of chemical, concentration, date, and appropriate hazard warning(s). The container holding the hazardous waste should also be marked with the words "Hazardous Waste." The container must be in good condition. This means no cracks, no rust, and no leaks. It must be compatible with the waste and any waste mixtures in that container must also be compatible. The container holding the hazardous waste must also be closed at all times except when waste is being added to or removed from the container. Accumulation of hazardous waste in any satellite accumulation area must not exceed 55 gallons at any time.

Biohazard waste will be placed in biohazard containers and display the international biohazard waste symbol. All biohazard waste sent to the autoclave for decontamination shall be in leak-proof containers. Secondary containment for autoclave bags helps prevent spills of material from unexpected tears. Do not place plastic transport containers into the autoclave; use the stainless steel autoclave pans.

Animal waste such as cats or fetal pigs should be placed in biohazard bags and sent to the CHO for appropriate disposal. Certain wastes may be disposed of into municipal garbage after autoclaving with permission from the CHO.

The CHO is required to properly dispose of HWS waste at a permitted disposal facility before the satellite storage reaches 2,220 pounds, and ensure that laboratories do not generate more than 220 pounds per month to maintain its Conditionally Exempt Small Quantity Generator status.

Sharps disposal containers should be present for the proper disposal of laboratory sharps. When these are full, Pat Wallace will notify Campus Safety for removal.

Return Form To:
Patricia Wallace, Rosenberg 002

HWS BIOLOGY DEPARTMENT
HAZARDOUS WASTE
DISPOSAL REQUEST FORM

Responsible Facility / Staff Member:		Building, Room, Phone:		Location of Waste:
Identification / Description of Waste Chemicals	Solid Liquid Gas	pH	Number, Size and Type of Container i.e. 3x4L bottle	Volume or Weight in Container i.e. 1000ml / 850 gm

SPECIAL NOTES OR HANDLING INSTRUCTIONS:

GENERATORS CERTIFICATION: The undersigned hereby certifies that the above information is accurate and complete to the best of his/her knowledge and that the above named material is properly packaged, labeled and is in proper condition for transportation. No explosive, shock sensitive or extremely hazardous materials are listed above.

Signature: Date:

11.0 SPILL RESPONSE /FIRE

Spill response measures are based on recommendations in 29 CFR 1910.1450 App A subpart Z. Clean-up supplies should be determined by reviewing material safety data sheets. A spill kit is available on every floor: Eaton 304 (under sink on north wall), Eaton 220 (on top of acid cabinet), Eaton 121 (below fire extinguisher behind door), Rosenberg 216 (shelf above eye wash), Rosenberg 124 (on top of acid cabinet), and Rosenberg 011 (row 1 shelf 5). Spill supplies for flammable liquids shall have the capability to control the liquid portion of the spill and minimize the production of flammable vapors. In the event of a large chemical spill (generally over four liters), all personnel in the area should be either alerted or evacuated depending on the chemical involved. Faculty, employees and students should not attempt to handle extremely large releases of flammable or extremely hazardous liquids (e.g. over four liters of cyanide or sulfide solutions). Instead, they should turn off all ignition sources, vacate the laboratory immediately and call HWS Campus Safety [x3333 from a campus phone at a safe location or 315-781-3333] and the local fire department [911, or 315-789-2121] for assistance. The professor should also be notified immediately in the event of an accident or emergency. As you vacate the laboratory, activate the building's fire alarm by pulling the fire alarm pull station. Once outside, call Campus Safety(315-781-3333) to provide information regarding the incident.

HWS Campus Safety 3333
Geneva Fire Department 911

12.0 MEDICAL ATTENTION

12.1 EVALUATION FOLLOWING A HIGH EXPOSURE

HWS provides employees and students who work with hazardous chemicals an opportunity to receive free medical attention or, in some cases, surveillance if a student complains of symptoms resulting from an exposure after the professor or lab supervisor is advised of an abnormal exposure (e.g. spillage on skin) of a hazardous substance and deems a medical examination desirable. A Student or employee contaminated by a spill/exposure should avoid contact with others and immediately utilize an emergency eye wash station and/or emergency shower. Someone should activate the building's fire alarm system by pulling the fire alarm pull station and call Campus Safety (x3333 or 315-781-3333) to provide information regarding the incident. Remain in the area and await the arrival of Campus Safety, medical personnel and fire personnel. The student or employee will be transported to the emergency room at Geneva General Hospital for decontamination and treatment:

Finger Lakes Health
196 North Street
Geneva, NY 14456
315-787-4000

It is important to provide the physician with the following information:

The identity of the substance(s) to which the patient has been exposed. An MSDS sheet for each substance should be included.

A description of the conditions, time, and date of the exposure. This should include all pertinent information including quantity of hazardous substance, duration of exposure, location of injuries or sites of contact.

A description of the symptoms the student is experiencing. This should include an indication of the time elapsed from exposure for the first appearance of the symptoms.

This information should be provided by completing the following form to be given to the physician. A copy of this form should remain on file in The Biology Department for at least three years. The physician will be requested to provide a written report to the student/employee as well as to the Director of Campus Security. The student should be provided with the form "Physician's Written Opinion for Medical Consultation."

Students may schedule an appointment at Finger Lakes Health Center by calling 315-781-4530 or 315-781-3600 Monday-Friday, 9am-5pm.

HWS BIOLOGY DEPARTMENT
INITIAL INVESTIGATION OF
POSSIBLE OVER-EXPOSURE FORM
(Page 1 of 2)

Date of incident: _____ Date of interview: _____
Name of Student: _____ Telephone No.: _____
Course: _____ Faculty: _____
Name of chemical(s) in use: _____
_____
(Attach MSDS to this report)

Time of incident: _____
Duration of exposure: _____
Amount of chemical involved: _____
Control measures used at time of incident: _____
Personal protective equipment: _____
Description of incident: _____
_____
_____
_____
_____
_____

Witnesses: _____

Location of injuries or sites of contact, e.g. eyes, skin: _____
_____

Signs and symptoms developed, if any: _____
_____
_____

Elapsed time for signs and symptoms to develop: _____
_____
_____

Are signs and symptoms same as indicated on MSDS? _____
_____
_____

HWS BIOLOGY DEPARTMENT
INITIAL INVESTIGATION OF
POSSIBLE OVER-EXPOSURE FORM
(Page 2 of 2)

Conclusions of investigation: _____
_____
_____
_____

Medical examination recommended: _____
_____
_____
_____
_____
_____

_____	_____	_____
Name of Investigator	Signature	Date

NOTE: This information should be provided to the examining physician and returned to the Biology Department CHC.

HWS BIOLOGY DEPARTMENT
PHYSICIAN'S WRTTEN OPINION FOR
MEDICAL CONSULTATION

Physician's Name: _____
Student's Name: _____
Date of Visit: _____
Description of incident: _____
_____
_____
Results of medical examination and any associated tests: _____
_____
_____
Medical conditions revealed upon examination that may place the employee at increased risk as a result of exposure to a hazardous chemical/agent in his/her workplace:
_____
_____
_____

Additional recommended follow-up: _____
_____

Comments: _____
_____

The above referenced student has been informed by me of the results of this consultation and any medical condition that may require further examination or treatment.

_____
Date Physician's Signature

NOTE: This written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure. Return to the Biology Department, Hobart and William Smith Colleges, Geneva, NY 14456.

HWS BIOLOGY DEPARTMENT
ACCIDENT REPORT FORM

Student Name:_____
Professor Name:_____
Course:_____
Date:_____
Time:_____

Description of
Incident:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Chemical(s)/Agent(s)
involved:_____
_____
_____
_____

Physician consulted: Yes No

Corrective measures taken:_____
_____
_____
_____
_____
_____
_____
_____
_____

13.0 FUME HOODS

This section describes the HWS Biology Department Fume Hood Program. General principles for proper fume hood use and guidelines for establishing a chemical fume hood monitoring program are also included. The Chemical Hygiene Plan requires that fume hoods and other protective equipment are functioning properly and that specific measures shall be taken to ensure proper and adequate performance of such equipment as per 29 CFR 1910.1450 (e) (3) (iii). The CHO is ultimately responsible for maintenance and repair of fume hoods. All fume hoods have been inventoried and are inspected annually. The operating procedures and testing are as follows:

13.1 OPERATING PROCEDURES

Fume hoods must be turned on before use.

Students are required to wear lab coats when the need to do so has been determined by the professor of the course.

All students, professors, visitors and employees are required to wear eye protection when required by any professor.

All hazardous materials must be handled inside fume hoods to assure the PEL is not exceeded.

The person responsible for assessing the need for protective equipment is the professor of the course.

The professor of the course is also responsible for routine inspection of eyewash stations in his or her lab(s). CHOs are responsible for quarterly inspections and flushing of safety showers and eyewashes.

Training on the availability and proper use of the protective equipment is to be conducted by the professor of the course.

Familiarize yourself with the physical and chemical properties of the materials you plan to work with by consulting the Material Safety Data Sheets and other available references.

Do not assume that a fume hood is operating properly. Always review the results of the most recent fume hood survey by consulting the hood sticker or the survey report.

Check the continuous flow monitoring device on the hood face (e.g. static pressure gauge), and compare the current reading with the number recorded on the hood sticker or the survey report to confirm that the hood operation is consistent with the results of the latest survey. If there are questions about proper performance, resolve them before using the hood.

Cross drafts should be avoided because air currents may draw contaminants from the hood. Cross drafts can be created by wind from open windows, room fans, and doors, or by people walking too near the hood. Check supply air diffusers, open windows or doors, and avoid rapid movements in front of hood. Avoid cross drafts in front of the hood from supply air ducts or pedestrian traffic in the vicinity of the hood. Rapid movements by the user also tend to disrupt the airflow into the hood and reduce the containment provided.

The hood fan should be on high speed while in use.

Make sure there are no unnecessary objects inside the hood that can cause air turbulence and outflow of contaminants.

Based upon the hazards posed by the substances being manipulated and the results of the most recent hood survey, determine whether the hood is adequate for the work contemplated.

Perform all work and chemical manipulations at least six inches inside the hood face. A line drawn on the work surface six inches inside the face can be an effective reminder.

Locate all laboratory equipment as far back in the hood as practicable and make certain that hood exhaust slots are not blocked.

Elevate large pieces of equipment off the work surface to reduce turbulence and improve airflow characteristics, thus optimizing hood performance.

Minimize chemical storage in the fume hood to avoid impairing its effectiveness. This will also simplify spill cleanups and reduce any complications from a fire, minor explosion, or other incident.

Do not allow paper, disposable gloves, or other debris to be drawn into the slots at the rear of the hood. They can become trapped in the exhaust ductwork and adversely affect hood performance.

Avoid placing your head inside hood while performing chemical manipulations. Lowering the hood sash will provide some protection to the user in the event of splashes or a minor explosion.

It is the responsibility of the faculty to assure that his/her students use hoods properly.

Visual inspections by hood users and/or laboratory staff should be performed periodically using smoke or plastic ribbons.

To provide proper air flow across the fume hood face, adjust the internal slots until flow is distributed evenly.

13.2 FUME HOOD INSPECTION AND TESTING PROCEDURES

The CHOs are ultimately responsible for fume hood inspections and flow testing. They are also responsible for incorporating any new fume hoods into the CHP. Nonfunctional hoods should be reported immediately to the CHOs and not used until repaired. The CHOs, or subcontractors, shall follow the inspection and testing procedures outlined below.

Annual flow test and certification of fume hoods for proper exhaust airflow should be done and by a certified testing and balancing contractor.

Air flow readings should be taken at every ten square inches of hood face.

A measuring probe should be held by a ring stand in the plane of the sash perpendicular to opening, taking care not to stand in front of opening.

Each reading should be averaged over a period of at least five seconds or a minimum of four readings taken at each point.

Readings should be averaged and no reading should deviate +/-20% from average.

The acceptable average is 90 to 120 Feet Per Minute.

The sash position should be adjusted until an acceptable average is achieved. The final sash position is marked. For safe laboratory function, the hood sash must be lowered to the marked position while in use.

The fume hood will be labeled with test date, name of tester, sash position, & average.

Reports will be submitted to the CHOs and kept on file.

13.3 FUME HOOD MAINTENANCE PROCEDURES

The CHOs are ultimately responsible for fume hood maintenance and preventive maintenance should be performed on exhaust fans and controls. The CHOs or subcontractors shall follow the maintenance procedures outlined below.

Replace cracked/frayed belt.
Tighten motor fan, shaft, bearing lock devices.
Tighten vacuum fan, blade, and housing.
Check vibration elimination springs and bearings.
Tighten all bolts/fan housing/bearings.
Dry lube damper bearing/actuator shaft.
Check damper for proper closure.
Measure motor currents design amps.
Check vacuum motor cooling vents.
Check motor starter contracts.
Lube motor bearing if required.
Perform a visual inspection.

Before any work is performed on any fume hood during normal business hours, **especially if the power will be turned off!,** notify the appropriate Science Lab Technician. They will check with the responsible professor about any ongoing work taking place in the hood. They will provide access to any necessary MSDS.

After business hours, notify the responsible faculty member (names are posted at the doorway of each lab) and/or the Department Chair.

Any repair work that involves a loss of power must be done using all appropriate lock out/tag out procedures. After repair/service, verify that the hood fan is working properly and notify the lab technician that the work is complete.

In the event of an emergency (spill or hood failure): notify the responsible faculty member (names are posted at the doorway of each lab) and/or the Department Chair.

Do not attempt to clean up any spill until all appropriate personnel have been contacted.

14.0 GENERAL LABORATORY INSPECTIONS

It is the responsibility of the professor whose students are working in the lab to assure the lab has passed inspection. Preferably, the inspection should be done every three months. Inspection is done using a form posted in every laboratory. (If no form is posted, the professor should obtain a copy of the form from this CHP and post it.) If the laboratory does not pass inspection in every category, it may not be used until the problem is corrected.

Fire extinguishers are visually inspected monthly for broken seals, damage and low gauge pressure (depending on type of extinguisher). Proper mounting of the extinguisher and its ready accessibility should also be checked. The monthly inspections and annual maintenance checks of fire extinguishers as per 29 CFR 1910.157, are to be done by Campus Safety staff. Fire drills are to be performed at least three times each year. Campus Safety contracts the annual inspection and cylinder tests of fire extinguishers to Global Fire Protection, Rochester, NY. Fire inspections of the buildings are performed annually by the New York State Office of Fire Prevention and Control.

A sample inspection form for biology laboratories is included below.

HWS BIOLOGY DEPARTMENT
GENERAL LABORATORY INSPECTION FORM

Date															
Inspector															
Safety Glasses Stocked															
Gloves Stocked															
Chemicals Labeled															
Areas Organized															
Inventory Updated															
Cylinders Secured															
Hoods Functioning															
Volatiles Sealed															
Hazardous Materials Stored Properly															
Exit Accessible															
Eyewash & Shower Accessible															
Waste Labeled and Ready for Pickup															
No Food or Spills Present															

14.1 SAFETY SHOWER AND EMERGENCY EYEWASH TESTING

The CHO is responsible for maintaining and testing safety showers and emergency eyewash stations on the HWS campus at least every three months. Faculty and laboratory technicians must ensure that the stations are readily accessible and must never be blocked by furniture or equipment.

Safety Shower

Flush systems and check valves for proper operation.
Check entire unit for leaks.
Verify proper flow rates and adjustment of shower heads.
ANSI flow rates are minimum 30 gallons per minute at 30 PSI.

Emergency Eyewash (Fresh Water Type)

Flush systems and check valves for proper operation.
Check entire unit for leaks.
Verify proper flow rates and adjustment of spray heads.
ANSI flow rates are minimum 0.4 gallons per minute

Emergency Eyewash (Portable)

Make sure the units are properly stocked with fresh chemicals.
If expiration date has expired, replace bottles.
Check bottles for possible contamination due to physical damage.
Check mounting backboard for damage.

15.0 TRAINING

The purpose of this section is to outline the HWS Biology Department's program of student and employee education and training on hazardous chemicals. People authorized to address significant spills outside hoods or laboratories should receive initial and refresher spill response technician training such as recommended in 29 CFR 1910.1450 App A subpart Z (b). People authorized to use respiratory protection to manage such spills are also required to have respirator training, respiratory fit testing and medical surveillance. A description of how students are to be trained and the content of the training program are also provided. The faculty shall be considered the "competent persons" and will provide students and employees with information and training to ensure that they are apprised of the hazards of chemicals present in their laboratory work as mandated in 29 CFR 1910.1450 (f). Such information shall be provided at the time of a student's Introductory Biology course or at the time of an employee's hiring. The frequency of refresher instruction and training shall be determined by the faculty. For students, it is recommended that this training will occur each new biology course the student takes. Review, as well as discussion of hazards specific to the new course, will be covered. Additional training will be provided immediately prior to an experiment when deemed necessary by the professor. Faculty also must provide safety training and information to their research students. Instructors may utilize the training forms below, or if they choose to generate such materials they must submit them to the CHO for inclusion into the plan.

15.1 GENERAL STUDENT TRAINING REQUIREMENTS

Students shall be informed of the following components:

The contents of this CHP and its appendices.

The location and availability of the employer's CHP and how to use it.

The PEL for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard.

Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as visual appearance or odor of hazardous chemicals when being released, etc.).

The physical and health hazards of chemicals in the work area.

The measures students can take to protect themselves from these hazards, including specific procedures the faculty has implemented to protect students from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

Training varies according to the professor's estimation of need. Faculty should consider having students obtain the book titled, "Working Safely with Chemicals," and complete a worksheet to supplement a safety lecture if they work with hazardous chemicals on a routine basis. A quiz may be given in the second lab meeting. The worksheet must be completed accurately; the results of the worksheet and/or the quiz may be included in the course grade. The results (quiz and worksheet) will be filed in Patricia Wallace's office, Rosenberg 002, for at least three years. The content of training for each course can be found in the following course handouts and in "Working Safely with Chemicals in the Laboratory" (Genium Press). Whenever a new hazard is introduced into a course, students will be informed of the new hazard and receive the appropriate training. Students should receive refresher training as well as additional training every time they take a course. Additional training is provided immediately prior to every experiment when deemed advisable by the professor. Safety training for employees (e.g. maintenance, housekeeping) is the responsibility of the CHO. Sample worksheets for faculty to consider using as a template are included below.

HWS BIOLOGY DEPARTMENT
STUDENT SAFETY INFORMATION SHEET
(Page 1 of 2)

Federal regulations require training for all lab workers and retraining for any reassigned lab workers. These regulations give you the right to receive training and at the same time assign you the responsibility for learning and putting into practice the training you receive. You are required to read and understand the book Working Safely with Chemicals in the Laboratory, which describes safe laboratory practices. Pay particular attention to Chapters II, III, IV, and VI-IX. Additional sections will be emphasized depending on your course. A chemical hygiene plan (CHP) reviews your rights and responsibilities and can be found in Patricia Wallace's office, Rosenberg 002. The Plan documents safe lab practices, lists hazardous chemicals including their permissible exposure levels, includes an inventory of all hazardous chemicals in the Biology Department, and outlines student safety training.

Chemicals can be hazardous by being flammable, corrosive, explosive, at high pressures, toxic, or carcinogenic. Toxic chemicals can enter your body through inhalation, skin contact, eye contact or ingestion. Toxicity may be acute or chronic. Although symptoms of exposure are highly variable, they may include skin irritation or burning, respiratory tract irritation, nausea, impaired vision, and/or loss of consciousness. Symptoms specific to each chemical can be found in the Manufacturer Safety Data Sheets (see below). If there is reason to believe that you have been exposed to dangerous levels of a hazardous substance, you have the right to a free medical examination. Please alert your instructor immediately. It is your responsibility to learn about these hazards as well as to learn safe laboratory practices which minimize the hazards.

All chemicals should be labeled with a summary of their hazards. Read the labels. Further information can be found in the MSDS including toxicity, disposal practices, necessary personal protective gear, and proper storage. An MSDS for every hazardous chemical in the department is available in a red binder on top of the filing cabinet in Patricia Wallace's office, Rosenberg 002 or online.

Toxic or hazardous chemicals have maximum exposure levels mandated by the federal government. Safe lab practice will prevent you from being exposed to higher levels. Avoid skin contact with all chemicals in the laboratory, especially those which are corrosive or can be absorbed through skin. All hazardous organic chemicals should be handled in the ventilation hoods only.

HWS BIOLOGY DEPARTMENT
STUDENT SAFETY INFORMATION SHEET
(Page 2 of 2)

Upon arriving in the laboratory, review the room for the location of eyewashes, showers, fire extinguishers, and emergency exits. Locate each of these for any lab in which you will be working. Your professor will also review these with you the first day of lab.

Some experiments will require personal protective equipment (gloves and safety glasses are the most common example). You will be alerted to the need for additional protection by the labels and/or by your instructor.

Ultimately, informing yourself is necessary for safety in the lab. Come to lab understanding the experiment you will be doing. Common sense will usually allow you to recognize if you are being exposed to a hazardous chemical. Typically, you will smell it, feel symptoms (burning eyes or skin, dizziness, etc.), see it in a puddle, or notice it on your skin or on your clothes. However, some chemicals have no smell and have a latency period of years. Wash your hands after every experiment.

Dispose of all chemicals properly. While many substances are perfectly natural and can go down the drain, many must be put into labeled waste containers. Inform yourself before disposing of anything.

Appended to this list of general rules, you will find a list provided by your professor for the specific class.

I have read the safety rules and will observe them while doing research.

_____

Signature Date

Sign one copy and return to professor; keep the other copy.

HWS BIOLOGY DEPARTMENT
LABORATORY RULES
(1 of 2)

SAFETY GOGGLES: Safety goggles must be worn by students if deemed necessary by an instructor.

ACCIDENTS: Please alert the laboratory instructor immediately in the event of an accident. The following safety precautions must be followed: Be aware at all times. Make sure you understand the potential dangers associated with any chemicals, instrumentation or other facilities used in the lab. Don't panic. If an accident occurs involving yourself or a lab partner, a controlled response to the situation is the best response. Contact the instructor immediately. Report all injuries regardless of how small at once to the instructor.

FIRE HAZARDS: Solvents are to be handled in the hood. Many solvents are extremely flammable. Never use a flame near a solvent container. Never use an open flame in the lab without prior approval from the instructor.

SAFETY PRECAUTIONS: Know the locations of and how to use the fire extinguishers, fire blankets and eye wash stations in the laboratory.

Never work in a lab alone.
Be sure gas cylinders are securely attached to the wall or bench.
Be sure that gas cylinders are topped off with regulators or steel caps.
Never remove a regulator or cap from a cylinder without training and approval.
Be sure any tubing on equipment is securely attached.
Do not pour water on a flaming laboratory chemical.
No food or beverages in lab. Never drink lab water.
Don't clean up shards of broken glass with your hands.
No open-toe shoes.
Long hair must be tied back.
Be alert to potential fire hazards.
Do not touch things outside of lab (e.g. door handles) with lab gloves.

TOXIC MATERIALS: Every chemical substance should be treated as a potential hazard. Many compounds are toxic. Lethal exposure may occur by swallowing the substance, inhaling its vapors, or absorption through the skin.

HWS BIOLOGY DEPARTMENT
LABORATORY RULES
(2 of 2)

Clean spills on the skin; immediately wash it with large amounts of cold water.
Laboratory chemicals should never be tasted.
Immediately replace tops or stoppers on containers.
Never remove chemicals from designated storage and measurement areas.
Pour only non-hazardous liquid waste into the sink.
Pour directly into the drain and flush with large quantities of water.
Put water-insoluble solids in the waste crocks, not in the sink.
Immediately clean non-hazardous spills.

MECHANICAL HAZARDS: Tubing, thermometers, etc. when pushed into stoppers may break and the broken ends may become lodged in one's hand or arm. Take short holds on tubing, use lubricants, and keep the torque to a minimum. NEVER "shake down" a mercury thermometer; those used in the labs WILL break and spill its mercury. Safety goggles must be used with any operation involving an explosion hazard.

GENERAL: Unauthorized experiments are forbidden. If you need to work "over-time" in the laboratory, see your professor to arrange a time.

I have read the safety rules and will observe them while doing research.

_____

Signature Date

Sign one copy and return to professor; keep the other copy.

HWS BIOLOGY DEPARTMENT
LABORATORY SAFETY EXERCISE
(1 of 2)

Please complete the following tasks in your laboratory notebook:

Please sketch a diagram of the laboratory.
Make sure to note on your map the location of:
eye wash station
safety shower
fire extinguisher
first aid kit
exit doors
safety shield
fire alarm
accident reports

Please obtain an MSD sheet from Patricia Wallace, Rosenberg 002, and please answer the following questions:

Where can the Material Safety Data Sheets be found?

_____

Name four types of information that must be included on a MSDS.

_____
_____
_____
_____

Name and define three types of physical data given on a MSDS.

_____
_____
_____

Please answer the following questions based on your previous experience:

Name four basic types of personal protective gear used in a biology laboratory.

_____

What types of clothing should not be worn in the laboratory? Please explain why these items cannot be worn in the lab.

_____
_____

HWS BIOLOGY DEPARTMENT
LABORATORY SAFETY EXERCISE
(2 of 2)

Please answer the following questions based on your previous experience in biology laboratory environments or by refreshing your memory by consulting the Hugh B. Careful safety book:

Name four ways that hazardous substances can enter the body. Describe measures or equipment used to reduce exposure for each.

_____
_____
_____
_____

Describe the procedure one should follow in the event of a spill.

_____
_____
_____
_____

I have read the safety rules and will observe them while doing research.

_____

Signature Date

Sign one copy and return to professor; keep the other copy.

HWS BIOLOGY DEPARTMENT
RULES FOR INDEPENDENT, HONORS, and SUMMER SUDY

During research, you will encounter a wider range of hazardous chemicals over longer periods of time than in course work. The following rules are in addition to the practices you have learned in your biology courses.

Understand the general rules provided by OSHA mandates in the CHP available in Pat Wallace's office which describe many safety practices and policies. When using a new substance, read the label and MSDS carefully. The use of particularly hazardous chemicals requires the written permission of your instructor and a copy of the MSDS in that lab.

No eating or drinking in labs, no open shoes or sandals, no loose long hair.

Dispose of chemicals properly. Note the type and amounts of chemicals put into waste containers.

Clean up small spills immediately. For large spills or other accidents, call your professor, campus security, and/or the fire department (9-911).

When handling compressed gasses, explosives, corrosives, carcinogens, mutagens, any substance with a 4 in the NFPA Fire Diamond or other special hazards, inform yourself and obtain written permission from the professor before doing the experiment.

Wear lab gloves when appropriate and wash hands when done.

Know the locations of the eyewashs, showers, fire extinguishers, and telephones in and near your lab.

Independent study/research students may work alone in the lab from 8:00am-5:00pm Mon-Fri, notifying the instructor of their schedules. Outside of these times, notify the instructor and consider having a second person present or aware of your schedule. Any hazardous procedure, including the use of hazardous substances (carcinogens, suspected carcinogens, and chemicals with a rating of 4 in the NFPA Fire Diamond), must be done 8am-5pm Mon-Fri and the faculty member must be advised of the specific times.

I have read the safety rules and will observe them while doing research.

_____

Signature Date

Sign one copy and return to professor; keep the other copy.

Autoclave Instructions

Autoclaves use high temperatures and pressure to inactivate biologically active material to ensure it is non-viable prior to waste disposal. Hot mitts are kept on the shelf to the left of the autoclave. Bear in mind that the door, interior, and shelves are very hot and must not be touched.

Before use

1. Ensure that the Generator Controls power switch is on, the run switch is off, and that the jacket temperature indicator reads 20.
2. Ensure that the chamber pressure is zero before opening door and that no items were left inside by the previous user.
3. Loosen closures before loading to prevent containers from shattering. Liquids should not occupy more than ¾ of the volume of their container or they will boil over. Ensure that containers are free of cracks.
4. Ensure any plastic materials are compatible with the autoclave, so that they maintain their integrity with autoclave temperatures and pressure.
5. Place solids into an autoclave bag closed LOOSLY enough that the steam can freely enter it.
6. Place a solid metal drip pan underneath liquid and semi-solid items (such as agar) to catch spills.
7. Place autoclave indicator tape on every item autoclaved and check the tape to see if a color change has occurred after the run is complete. The indicator tape confirms that the run achieved the proper temperature and pressure to inactivate biological material.
8. Close the autoclave door tightly before starting.
9. Set the proper time for the material that is being autoclaved. Dry items and small volumes of liquids can be autoclaved for 15 minutes. Larger volumes of agars or liquids can be autoclaved for 20-30 minutes. Autoclave wastes for 30 minutes to properly inactivate biological material.
10. Select run type (Fast/Gravity exhaust for solids, or Slow/Liquids for semi-solids and liquids), and then press the On/Run button.

After use

1. Ensure that the chamber pressure is zero before opening door. Turn run switch off. Do not put hands, head, etc. into the steam cloud which may billow out and up as the door is opened. Use thermal protective gloves or mitts to handle the tray and/or the hot items.
2. Handle carefully: liquids can "bump" or suddenly erupt and spill when the container is moved.
3. Use the drip pan when removing the bags to avoid spills.
4. Clean up all spilled liquid inside or outside the autoclave. Rinse the drip pan thoroughly.

Dispose of autoclaved waste properly

1. Liquids can be disposed down the drain as long as no hazardous materials are present.
2. Do not drain-dispose agar, drosophila medium, or any material that can solidify and clog the drain. Solidify agar or other media in a bag, close, and put in the regular trash.

APPENDIX A

TABLE Z-1 LIMITS FOR AIR CONTAMINANTS

NOTE: Because of the length of the table, explanatory Footnotes applicable to all substances are given below as well as at the end of the table. Footnotes specific only to a limited number of substances are also shown within the table.

Footnote(1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote(2) See Table Z-2.

Footnote(3) See Table Z-3

Footnote(4) Varies with compound.

Footnote(5) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1026 are stayed or are otherwise not in effect.

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Acetaldehyde	75-07-0	200	360	
Acetic acid	64-19-7	10	25	
Acetic anhydride	108-24-7	5	20	
Acetone	67-64-1	1000	2400	
Acetonitrile	75-05-8	40	70	
2-Acetylaminofluorene; see 1910.1014	53-96-3			
Acetylene dichloride; see 1,2-Dichloroethylene.				
Acetylene tetrabromide.	79-27-6	1	14	
Acrolein	107-02-8	0.1	0.25	
Acrylamide	79-06-1	.....	0.3	X
Acrylonitrile; see 1910.1045	107-13-1			
Aldrin	309-00-2	.....	0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	
Allyl glycidyl ether (AGE)	106-92-3	(C)10	(C)45	
Allyl propyl disulfide.	2179-59-1	2	12	
alpha-Alumina	1344-28-1			
Total dust		.....	15	
Respirable fraction.		.....	5	
Aluminum Metal (as Al).	7429-90-5			
Total dust		.....	15	
Respirable fraction.		.....	5	
4-Aminodiphenyl; see 1910.1011	92-67-1			
2-Aminoethanol; see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	
Ammonia	7664-41-7	50	35	
Ammonium sulfamate	7773-06-0			
Total dust		.....	15	
Respirable fraction.		.....	5	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl acetate	626-38-0	125	650	
Aniline and homologs	62-53-3	5	19	X
Anisidine (o-,p-isomers)	29191-52-4	.....	0.5	X
Antimony and compounds (as Sb)	7440-36-0	.....	0.5	
ANTU (alpha Naphthylthiourea)	86-88-4	.....	0.3	
Arsenic, inorganic compounds (as As); see 1910.1018	7440-38-2			
Arsenic, organic compounds (as As)	7440-38-2	.....	0.5	
Arsine	7784-42-1	0.05	0.2	
Asbestos; see 1910.1001	(4)			
Azinphos-methyl	86-50-0	.....	0.2	X

Barium, soluble compounds (as Ba)	7440-39-3	.....	0.5	
Barium sulfate	7727-43-7			
Total dust		.....	15	
Respirable fraction		.....	5	
Benomyl	17804-35-2			
Total dust		.....	15	
Respirable fraction		.....	5	
Benzene; See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028(d)	71-43-2			
Benzidine; See 1910.1010	92-87-5			
p-Benzoquinone; see Quinone.				
Benzo(a)pyrene; see Coal tar pitch volatiles				
Benzoyl peroxide	94-36-0	.....	5	
Benzyl chloride	100-44-7	1	5	
Beryllium and beryllium compounds (as Be)	7440-41-7		(2)	
Biphenyl; see Diphenyl.				
Bismuth telluride, Undoped	1304-82-1			
Total dust		.....	15	
Respirable fraction		.....	5	
Boron oxide	1303-86-2			
Total dust		.....	15	
Boron trifluoride	7637-07-2	(C)1	(C)3	
Bromine	7726-95-6	0.1	0.7	
Bromoform	75-25-2	0.5	5	X
Butadiene (1,3-Butadiene); See 29 CFR 1910.1051; 29 CFR 1910.19(1)	106-99-0	1 ppm/5 ppm STEL		
Butanethiol; see Butyl mercaptan.				
2-Butanone (Methyl ethyl ketone)	78-93-3	200	590	
2-Butoxyethanol	111-76-2	50	240	X
n-Butyl-acetate	123-86-4	150	710	
sec-Butyl acetate	105-46-4	200	950	
tert-Butyl-acetate	540-88-5	200	950	
n-Butyl alcohol	71-36-3	100	300	
sec-Butyl alcohol	78-92-2	150	450	
tert-Butyl alcohol	75-65-0	100	300	
Butylamine	109-73-9	(C)5	(C)15	X
tert-Butyl chromate (as CrO(3)) see 1910.1026	1189-85-1			
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	
Butyl mercaptan	109-79-5	10	35	
p-tert-Butyltoluene	98-51-1	10	60	
Cadmium (as Cd);				

see 1910.1027.....	7440-43-9			
Calcium Carbonate.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium hydroxide.....	1305-62-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium oxide.....	1305-78-8	.....	5	
Calcium silicate.....	1344-95-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Calcium sulfate.....	7778-18-9			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Camphor, synthetic.....	76-22-2	.....	2	
Carbaryl (Sevin).....	63-25-2	.....	5	
Carbon black.....	1333-86-4	.....	3.5	
Carbon dioxide.....	124-38-9	5000	9000	
Carbon disulfide.....	75-15-0		(2)	
Carbon monoxide.....	630-08-0	50	55	
Carbon tetrachloride...	56-23-5		(2)	
Cellulose.....	9004-34-6			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Chlordane.....	57-74-9	.....	0.5	X
Chlorinated camphene...	8001-35-2	.....	0.5	X
Chlorinated diphenyl oxide.....	55720-99-5	.....	0.5	
Chlorine.....	7782-50-5	(C)1	(C)3	
Chlorine dioxide.....	10049-04-4	0.1	0.3	
Chlorine trifluoride...	7790-91-2	(C)0.1	(C)0.4	
Chloroacetaldehyde.....	107-20-0	(C)1	(C)3	
a-Chloroacetophenone (Phenacyl chloride)..	532-27-4	0.05	0.3	
Chlorobenzene.....	108-90-7	75	350	
o-Chlorobenzylidene malononitrile.....	2698-41-1	0.05	0.4	
Chlorobromomethane.....	74-97-5	200	1050	
2-Chloro-1,3-butadiene; See beta-Chloroprene.				
Chlorodiphenyl (42% Chlorine)(PCB)..	53469-21-9	.....	1	X
Chlorodiphenyl (54% Chlorine)(PCB)..	11097-69-1	.....	0.5	X
1-Chloro-2, 3-epoxypropane; See Epichlorohydrin.				
2-Chloroethanol; See Ethylene chlorohydrin				
Chloroethylene; See Vinyl chloride.				
Chloroform (Trichloromethane)...	67-66-3	(C)50	(C)240	
bis(Chloromethyl) ether; see 1910.1008.	542-88-1			
Chloromethyl methyl ether; see 1910.1006.	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	
Chloropicrin.....	76-06-2	0.1	0.7	
beta-Chloroprene.....	126-99-8	25	90	X
2-Chloro-6				

(trichloromethyl) pyridine	1929-82-4			
Total dust		.....	15	
Respirable fraction		.....	5	
Chromic acid and chromates (as CrO(3))	(4)		(2)	
Chromium (II) compounds (as Cr)	7440-47-3	.....	0.5	
Chromium (III) compounds (as Cr)	7440-47-3	.....	0.5	
Chromium (VI) compounds See 1910.1026(5)				
Chromium metal and insol. salts (as Cr)	7440-47-3	.....	1	
Chrysene; see Coal tar pitch volatiles				
Clopidol	2971-90-6			
Total dust		.....	15	
Respirable fraction		.....	5	
Coal dust (less than 5% SiO(2)), respirable fraction			(3)	
Coal dust (greater than or equal to 5% SiO(2)), respirable fraction			(3)	
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene	65966-93-2	.....	0.2	
Cobalt metal, dust, and fume (as Co)	7440-48-4	.....	0.1	
Coke oven emissions; see 1910.1029				
Copper	7440-50-8			
Fume (as Cu)		.....	0.1	
Dusts and mists (as Cu)		.....	1	
Cotton dust (e), see 1910.1043		.....	1	
Crag herbicide (Sesone)	136-78-7			
Total dust		.....	15	
Respirable fraction		.....	5	
Cresol, all isomers	1319-77-3	5	22	X
Crotonaldehyde	123-73-9	2	6	
	4170-30-3			
Cumene	98-82-8	50	245	X
Cyanides (as CN)	(4)	.....	5	X
Cyclohexane	110-82-7	300	1050	
Cyclohexanol	108-93-0	50	200	
Cyclohexanone	108-94-1	50	200	
Cyclohexene	110-83-8	300	1015	
Cyclopentadiene	542-92-7	75	200	
2,4-D (Dichlorophen-oxyacetic acid)	94-75-7	.....	10	
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox)	8065-48-3	.....	0.1	X
Diacetone alcohol				

(4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	
1,2-Diaminoethane; see Ethylenediamine				
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
1,2-Dibromo-3-chloropropane (DBCP); see 1910.1044	96-12-8			
1,2-Dibromoethane; see Ethylene dibromide				
Dibutyl phosphate	107-66-4	1	5	
Dibutyl phthalate	84-74-2	.....	5	
o-Dichlorobenzene	95-50-1	(C)50	(C)300	
p-Dichlorobenzene	106-46-7	75	450	
3,3'-Dichlorobenzidine; see 1910.1007	91-94-1			
Dichlorodifluoromethane	75-71-8	1000	4950	
1,3-Dichloro-5,5-dimethyl hydantoin	118-52-5	.....	0.2	
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	.....	1	X
1,1-Dichloroethane	75-34-3	100	400	
1,2-Dichloroethane; see Ethylene dichloride				
1,2-Dichloroethylene	540-59-0	200	790	
Dichloroethyl ether	111-44-4	(C)15	(C)90	X
Dichloromethane; see Methylene chloride				
Dichloromonofluoromethane	75-43-4	1000	4200	
1,1-Dichloro-1-nitroethane	594-72-9	(C)10	(C)60	
1,2-Dichloropropane; see Propylene dichloride				
Dichlorotetrafluoroethane	76-14-2	1000	7000	
Dichlorvos (DDVP)	62-73-7	.....	1	X
Dicyclopentadienyl iron	102-54-5			
Total dust		.....	15	
Respirable fraction		.....	5	
Dieldrin	60-57-1	.....	0.25	X
Diethylamine	109-89-7	25	75	
2-Diethylaminoethanol	100-37-8	10	50	X
Diethyl ether; see Ethyl ether				
Difluorodibromomethane	75-61-6	100	860	
Diglycidyl ether (DGE)	2238-07-5	(C)0.5	(C)2.8	
Dihydroxybenzene; see Hydroquinone				
Diisobutyl ketone	108-83-8	50	290	
Diisopropylamine	108-18-9	5	20	X
4-Dimethylaminoazobenzene; see 1910.1015	60-11-7			
Dimethoxymethane; see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	
Dimethylaminobenzene;				

see Xylidine.....				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene.....				
Dimethyl-1,2-dibromo-2, 2-dichloroethyl phosphate.....	300-76-5	.....	3	
Dimethylformamide.....	68-12-2	10	30	X
2,6-Dimethyl-4-heptanone; see Diisobutyl ketone....				
1,1-Dimethylhydrazine..	57-14-7	0.5	1	X
Dimethylphthalate.....	131-11-3	.....	5	
Dimethyl sulfate.....	77-78-1	1	5	X
Dinitrobenzene (all isomers).....			1	X
(ortho).....	528-29-0			
(meta).....	99-65-0			
(para).....	100-25-4			
Dinitro-o-cresol.....	534-52-1	.....	0.2	X
Dinitrotoluene.....	25321-14-6	.....	1.5	X
Dioxane (Diethylene dioxide).	123-91-1	100	360	X
Diphenyl (Biphenyl)....	92-52-4	0.2	1	
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate.....				
Dipropylene glycol methyl ether.....	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate).....	117-81-7	.....	5	
Emery.....	12415-34-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Endrin.....	72-20-8	.....	0.1	X
Epichlorohydrin.....	106-89-8	5	19	X
EPN.....	2104-64-5	.....	0.5	X
1,2-Epoxypropane; see Propylene oxide.....				
2,3-Epoxy-1-propanol; see Glycidol.....				
Ethanethiol; see Ethyl mercaptan.....				
Ethanolamine.....	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve).....	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate).	111-15-9	100	540	X
Ethyl acetate.....	141-78-6	400	1400	
Ethyl acrylate.....	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	
Ethylamine.....	75-04-7	10	18	
Ethyl amyl ketone (5-Methyl-3-heptanone).....	541-85-5	25	130	
Ethyl benzene.....	100-41-4	100	435	
Ethyl bromide.....	74-96-4	200	890	
Ethyl butyl ketone				

(3-Heptanone).....	106-35-4	50	230	
Ethyl chloride.....	75-00-3	1000	2600	
Ethyl ether.....	60-29-7	400	1200	
Ethyl formate.....	109-94-4	100	300	
Ethyl mercaptan.....	75-08-1	(C)10	(C)25	
Ethyl silicate.....	78-10-4	100	850	
Ethylene chlorohydrin..	107-07-3	5	16	X
Ethylenediamine.....	107-15-3	10	25	
Ethylene dibromide.....	106-93-4		(2)	
Ethylene dichloride				
(1,2-Dichloroethane).	107-06-2		(2)	
Ethylene glycol				
dinitrate.....	628-96-6	(C)0.2	(C)1	X
Ethylene glycol methyl				
acetate; see Methyl				
cellosolve acetate...				
Ethyleneimine;				
see 1910.1012.....	151-56-4			
Ethylene oxide;				
see 1910.1047.....	75-21-8			
Ethylidene chloride;				
see 1,1-Dichlorethane				
N-Ethylmorpholine.....	100-74-3	20	94	X
Ferbam.....	14484-64-1			
Total dust.....		.....	15	
Ferrovanadium dust.....	12604-58-9	.....	1	
Fluorides (as F).....	(4)	.....	2.5	
Fluorine.....	7782-41-4	0.1	0.2	
Fluorotrichloromethane				
(Trichloro-				
fluoromethane).....	75-69-4	1000	5600	
Formaldehyde;				
see 1910.1048.....	50-00-0			
Formic acid.....	64-18-6	5	9	
Furfural.....	98-01-1	5	20	X
Furfuryl alcohol.....	98-00-0	50	200	
Grain dust (oat, wheat				
barley).....	.....	.....	10	
Glycerin (mist).....	56-81-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Glycidol.....	556-52-5	50	150	
Glycol monoethyl ether;				
see 2-Ethoxyethanol..				
Graphite, natural				
respirable dust.....	7782-42-5		(3)	
Graphite, synthetic....				
Total dust.....		.....	15	
Respirable Fraction..		.....	5	
Guthion;				
see Azinphos methyl..				
Gypsum.....	13397-24-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Hafnium.....	7440-58-6	.....	0.5	
Heptachlor.....	76-44-8	.....	0.5	X
Heptane (n-Heptane)....	142-82-5	500	2000	
Hexachloroethane.....	67-72-1	1	10	X
Hexachloronaphthalene..	1335-87-1	.....	0.2	X
n-Hexane.....	110-54-3	500	1800	
2-Hexanone (Methyl				

n-butyl ketone).....	591-78-6	100	410	
Hexone (Methyl isobutyl ketone).....	108-10-1	100	410	
sec-Hexyl acetate.....	108-84-9	50	300	
Hydrazine.....	302-01-2	1	1.3	X
Hydrogen bromide.....	10035-10-6	3	10	
Hydrogen chloride.....	7647-01-0	(C)5	(C)7	
Hydrogen cyanide.....	74-90-8	10	11	X
Hydrogen fluoride (as F).....	7664-39-3		(2)	
Hydrogen peroxide.....	7722-84-1	1	1.4	
Hydrogen selenide (as Se).....	7783-07-5	0.05	0.2	
Hydrogen sulfide.....	7783-06-4		(2)	
Hydroquinone.....	123-31-9	.....	2	
Iodine.....	7553-56-2	(C)0.1	(C)1	
Iron oxide fume.....	1309-37-1	.....	10	
Isomyl acetate.....	123-92-2	100	525	
Isomyl alcohol (primary and secondary).....	123-51-3	100	360	
Isobutyl acetate.....	110-19-0	150	700	
Isobutyl alcohol.....	78-83-1	100	300	
Isophorone.....	78-59-1	25	140	
Isopropyl acetate.....	108-21-4	250	950	
Isopropyl alcohol.....	67-63-0	400	980	
Isopropylamine.....	75-31-0	5	12	
Isopropyl ether.....	108-20-3	500	2100	
Isopropyl glycidyl ether (IGE).....	4016-14-2	50	240	
Kaolin.....	1332-58-7			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Ketene.....	463-51-4	0.5	0.9	
Lead inorganic (as Pb); see 1910.1025.....	7439-92-1			
Limestone.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Lindane.....	58-89-9	.....	0.5	X
Lithium hydride.....	7580-67-8	.....	0.025	
L.P.G. (Liquified petroleum gas).....	68476-85-7	1000	1800	
Magnesite.....	546-93-0			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Magnesium oxide fume...	1309-48-4			
Total Particulate....		.....	15	
Malathion.....	121-75-5			
Total dust.....		.....	15	X
Maleic anhydride.....	108-31-6	0.25	1	
Manganese compounds (as Mn).....	7439-96-5	.....	(C)5	
Manganese fume (as Mn).	7439-96-5	.....	(C)5	
Marble.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Mercury (aryl and inorganic)(as Hg)....	7439-97-6		(2)	
Mercury (organo) alkyl compounds (as Hg)....	7439-97-6		(2)	

Mercury (vapor) (as Hg)	7439-97-6		(2)	
Mesityl oxide	141-79-7	25	100	
Methanethiol; see Methyl mercaptan.				
Methoxychlor	72-43-5			
Total dust		.....	15	
2-Methoxyethanol; (Methyl cellosolve)	109-86-4	25	80	X
2-Methoxyethyl acetate (Methyl cellosolve acetate)	110-49-6	25	120	X
Methyl acetate	79-20-9	200	610	
Methyl acetylene (Propyne)	74-99-7	1000	1650	
Methyl acetylene propadiene mixture (MAPP)		1000	1800	
Methyl acrylate	96-33-3	10	35	X
Methylal (Dimethoxy-methane)	109-87-5	1000	3100	
Methyl alcohol	67-56-1	200	260	
Methylamine	74-89-5	10	12	
Methyl amyl alcohol; see Methyl Isobutyl carbinol				
Methyl n-amyl ketone	110-43-0	100	465	
Methyl bromide	74-83-9	(C)20	(C)80	X
Methyl butyl ketone; see 2-Hexanone				
Methyl cellosolve; see 2-Methoxyethanol.				
Methyl cellosolve acetate; see 2-Methoxyethyl acetate				
Methyl chloride	74-87-3		(2)	
Methyl chloroform (1,1,1-Trichloro-ethane)	71-55-6	350	1900	
Methylcyclohexane	108-87-2	500	2000	
Methylcyclohexanol	25639-42-3	100	470	
o-Methylcyclohexanone	583-60-8	100	460	X
Methylene chloride	75-09-2		(2)	
Methyl ethyl ketone (MEK); see 2-Butanone				
Methyl formate	107-31-3	100	250	
Methyl hydrazine (Monomethyl hydrazine)	60-34-4	(C)0.2	(C)0.35	X
Methyl iodide	74-88-4	5	28	X
Methyl isoamyl ketone	110-12-3	100	475	
Methyl isobutyl carbinol	108-11-2	25	100	X
Methyl isobutyl ketone; see Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
Methyl mercaptan	74-93-1	(C)10	(C)20	
Methyl methacrylate	80-62-6	100	410	
Methyl propyl ketone; see 2-Pentanone				
alpha-Methyl styrene	98-83-9	(C)100	(C)480	

Methylene bisphenyl isocyanate (MDI)	101-68-8	(C)0.02	(C)0.2	
Mica; see Silicates				
Molybdenum (as Mo)	7439-98-7			
Soluble compounds		.....	5	
Insoluble Compounds				
Total dust		.....	15	
Monomethyl aniline	100-61-8	2	9	X
Monomethyl hydrazine; see Methyl hydrazine.				
Morpholine	110-91-8	20	70	X
Naphtha (Coal tar)	8030-30-6	100	400	
Naphthalene	91-20-3	10	50	
alpha-Naphthylamine; see 1910.1004	134-32-7			
beta-Naphthylamine; see 1910.1009	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds (as Ni)	7440-02-0	.....	1	
Nickel, soluble compounds (as Ni)	7440-02-0	.....	1	
Nicotine	54-11-5	.....	0.5	X
Nitric acid	7697-37-2	2	5	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-95-3	1	5	X
p-Nitrochlorobenzene	100-00-5	.....	1	X
4-Nitrodiphenyl; see 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	
Nitrogen dioxide	10102-44-0	(C)5	(C)9	
Nitrogen trifluoride	7783-54-2	10	29	
Nitroglycerin	55-63-0	(C)0.2	(C)2	X
Nitromethane	75-52-5	100	250	
1-Nitropropane	108-03-2	25	90	
2-Nitropropane	79-46-9	25	90	
N-Nitrosodimethylamine; see 1910.1016				
Nitrotoluene (all isomers)		5	30	X
o-isomer	88-72-2			
m-isomer	99-08-1			
p-isomer	99-99-0			
Nitrotrichloromethane; see Chloropicrin				
Octachloronaphthalene	2234-13-1	.....	0.1	X
Octane	111-65-9	500	2350	
Oil mist, mineral	8012-95-1	.....	5	
Osmium tetroxide (as Os)	20816-12-0	.....	0.002	
Oxalic acid	144-62-7	.....	1	
Oxygen difluoride	7783-41-7	0.05	0.1	
Ozone	10028-15-6	0.1	0.2	
Paraquat, respirable dust	4685-14-7 1910-42-5 2074-50-2	.....	0.5	X
Parathion	56-38-2	.....	0.1	X
Particulates not				

otherwise regulated (PNOR)(f)				
Total dust		.....	15	
Respirable fraction		.....	5	
PCB; see Chlorodiphenyl (42% and 54% chlorine)				
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8	.....	0.5	X
Pentachlorophenol	87-86-5	.....	0.5	X
Pentaerythritol	115-77-5			
Total dust		.....	15	
Respirable fraction		.....	5	
Pentane	109-66-0	1000	2950	
2-Pentanone (Methyl propyl ketone)	107-87-9	200	700	
Perchloroethylene (Tetrachloroethylene)	127-18-4		(2)	
Perchloromethyl mercaptan	594-42-3	0.1	0.8	
Perchloryl fluoride	7616-94-6	3	13.5	
Petroleum distillates (Naphtha)(Rubber Solvent)		500	2000	
Phenol	108-95-2	5	19	X
p-Phenylene diamine	106-50-3	.....	0.1	X
Phenyl ether, vapor	101-84-8	1	7	
Phenyl ether-biphenyl mixture, vapor		1	7	
Phenylethylene; see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	
Phenylhydrazine	100-63-0	5	22	X
Phosdrin (Mevinphos)	7786-34-7	.....	0.1	X
Phosgene (Carbonyl chloride)	75-44-5	0.1	0.4	
Phosphine	7803-51-2	0.3	0.4	
Phosphoric acid	7664-38-2	.....	1	
Phosphorus (yellow)	7723-14-0	.....	0.1	
Phosphorus pentachloride	10026-13-8	.....	1	
Phosphorus pentasulfide	1314-80-3	.....	1	
Phosphorus trichloride	7719-12-2	0.5	3	
Phthalic anhydride	85-44-9	2	12	
Picloram	1918-02-1			
Total dust		.....	15	
Respirable fraction		.....	5	
Picric acid	88-89-1	.....	0.1	X
Pindone (2-Pivalyl-1, 3-indandione)	83-26-1	.....	0.1	
Plaster of paris	26499-65-0			
Total dust		.....	15	
Respirable fraction		.....	5	
Platinum (as Pt)	7440-06-4			
Metal		.....	.....	
Soluble Salts		.....	0.002	
Portland cement	65997-15-1			
Total dust		.....	15	
Respirable fraction		.....	5	
Propane	74-98-6	1000	1800	

beta-Propriolactone; see 1910.1013	57-57-8			
n-Propyl acetate	109-60-4	200	840	
n-Propyl alcohol	71-23-8	200	500	
n-Propyl nitrate	627-13-4	25	110	
Propylene dichloride	78-87-5	75	350	
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	
Propyne; see Methyl acetylene				
Pyrethrum	8003-34-7	.....	5	
Pyridine	110-86-1	5	15	
Quinone	106-51-4	0.1	0.4	
RDX: see Cyclonite				
Rhodium (as Rh), metal fume and insoluble compounds	7440-16-6	.....	0.1	
Rhodium (as Rh), soluble compounds	7440-16-6	.....	0.001	
Ronnel	299-84-3	.....	15	
Rotenone	83-79-4	.....	5	
Rouge				
Total dust		.....	15	
Respirable fraction		.....	5	
Selenium compounds (as Se)	7782-49-2	.....	0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
Silica, amorphous, precipitated and gel.	112926-00-8		(3)	
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2		(3)	
Silica, crystalline cristobalite, respirable dust	14464-46-1		(3)	
Silica, crystalline quartz, respirable dust	14808-60-7		(3)	
Silica, crystalline tripoli (as quartz), respirable dust	1317-95-9		(3)	
Silica, crystalline tridymite, respirable dust	15468-32-3		(3)	
Silica, fused, respirable dust	60676-86-0		(3)	
Silicates (less than 1% crystalline silica) Mica (respirable dust)	12001-26-2		(3)	
Soapstone, total dust	.....		(3)	
Soapstone, respirable dust	.....		(3)	
Talc (containing asbestos): use asbestos limit: see 29 CFR 1910.1001			(3)	
Talc (containing no asbestos),				

respirable dust.....	14807-96-6		(3)	
Tremolite, asbestiform; see 1910.1001.....				
Silicon.....	7440-21-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Silicon carbide.....	409-21-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Silver, metal and soluble compounds (as Ag).....	7440-22-4	.....	0.01	
Soapstone; see Silicates.....				
Sodium fluoroacetate...	62-74-8	.....	0.05	X
Sodium hydroxide.....	1310-73-2	.....	2	
Starch.....	9005-25-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Stibine.....	7803-52-3	0.1	0.5	
Stoddard solvent.....	8052-41-3	500	2900	
Strychnine.....	57-24-9	.....	0.15	
Styrene.....	100-42-5		(2)	
Sucrose.....	57-50-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Sulfur dioxide.....	7446-09-5	5	13	
Sulfur hexafluoride....	2551-62-4	1000	6000	
Sulfuric acid.....	7664-93-9	.....	1	
Sulfur monochloride....	10025-67-9	1	6	
Sulfur pentafluoride...	5714-22-7	0.025	0.25	
Sulfuryl fluoride.....	2699-79-8	5	20	
Systox; see Demeton...				
2,4,5-T (2,4,5-tri-chlorophenoxyacetic acid).....	93-76-5	.....	10	
Talc; see Silicates...				
Tantalum, metal and oxide dust.....	7440-25-7	.....	5	
TEDP (Sulfotep).....	3689-24-5	.....	0.2	X
Tellurium and compounds (as Te)....	13494-80-9	.....	0.1	
Tellurium hexafluoride (as Te).....	7783-80-4	0.02	0.2	
Temephos.....	3383-96-8			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
TEPP (Tetraethyl pyrophosphaate).....	107-49-3	.....	0.05	X
Terphenylis.....	26140-60-3	(C)1	(C)9	
1,1,1,2-Tetrachloro-2, 2-difluoroethane.....	76-11-9	500	4170	
1,1,2,2-Tetrachloro-1, 2-difluoroethane.....	76-12-0	500	4170	
1,1,2,2-Tetrachloro-ethane.....	79-34-5	5	35	X
Tetrachoroethylene; see Perchloroethylene				
Tetrachloromethane; see Carbon tetrachloride.				

Tetrachloronaphthalene.	1335-88-2	.....	2	X
Tetraethyl lead (as Pb)	78-00-2	.....	0.075	X
Tetrahydrofuran.....	109-99-9	200	590	
Tetramethyl lead, (as Pb).....	75-74-1	.....	0.075	X
Tetramethyl succinonitrile.....	3333-52-6	0.5	3	X
Tetranitromethane.....	509-14-8	1	8	
Tetryl (2,4,6-Trinitro-phenylmethyl-nitramine).....	479-45-8	.....	1.5	X
Thallium, soluble compounds (as Tl)....	7440-28-0	.....	0.1	X
4,4'-Thiobis(6-tert, Butyl-m-cresol).....	96-69-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Thiram.....	137-26-8	.....	5	
Tin, inorganic compounds (except oxides) (as Sn).....	7440-31-5	.....	2	
Tin, organic compounds (as Sn).....	7440-31-5	.....	0.1	
Titanium dioxide.....	13463-67-7			
Total dust.....		.....	15	
Toluene.....	108-88-3		(2)	
Toluene-2, 4-diisocyanate (TDI).	584-84-9	(C)0.02	(C)0.14	
o-Toluidine.....	95-53-4	5	22	X
Toxaphene; see Chlorinated camphene.				
Tremolite; see Silicates.....				
Tributyl phosphate.....	126-73-8	.....	5	
1,1,1-Trichloroethane; see Methyl chloroform				
1,1,2-Trichloroethane..	79-00-5	10	45	X
Trichloroethylene.....	79-01-6		(2)	
Trichloromethane; see Chloroform				
Trichloronaphthalene...	1321-65-9	.....	5	X
1,2,3-Trichloropropane.	96-18-4	50	300	
1,1,2-Trichloro-1,2, 2-trifluoroethane....	76-13-1	1000	7600	
Triethylamine.....	121-44-8	25	100	
Trifluorobromomethane..	75-63-8	1000	6100	
2,4,6-Trinitrophenol; see Picric acid.....				
2,4,6-Trinitrophenyl-methyl nitramine; see Tetryl.....				
2,4,6-Trinitrotoluene (TNT).....	118-96-7	.....	1.5	X
Triorthocresyl phosphate.....	78-30-8	.....	0.1	
Triphenyl phosphate....	115-86-6	.....	3	
Turpentine.....	8006-64-2	100	560	
Uranium (as U).....	7440-61-1			
Soluble compounds....		.....	0.05	
Insoluble compounds..		.....	0.25	
Vanadium.....	1314-62-1			

Respirable dust (as V_2O_5))		.....	(C)0.5	
Fume (as V_2O_5)		.....	(C)0.1	
Vegetable oil mist:				
Total dust		.....	15	
Respirable fraction		.....	5	
Vinyl benzene; see Styrene				
Vinyl chloride; see 1910.1017	75-01-4			
Vinyl cyanide; see Acrylonitrile				
Vinyl toluene	25013-15-4	100	480	
Warfarin	81-81-2	.....	0.1	
Xylenes (o-, m-, p-isomers)	1330-20-7	100	435	
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-5	.....	1	
Zinc chloride fume	7646-85-7	.....	1	
Zinc oxide fume	1314-13-2	.....	5	
Zinc oxide	1314-13-2			
Total dust		.....	15	
Respirable fraction		.....	5	
Zinc stearate	557-05-1			
Total dust		.....	15	
Respirable fraction		.....	5	
Zirconium compounds (as Zr)	7440-67-7	.....	5	

Footnote(1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote(2) See Table Z-2.

Footnote(3) See Table Z-3

Footnote(4) Varies with compound.

Footnote(5) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1026 are stayed or are otherwise not in effect.

TABLE Z-2

Substance	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Benzene[a] (Z37.40-1969)	10 ppm	25 ppm	50 ppm	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970)	2 ug/m(3)	5 ug/m(3)	25 ug/m(3)	30 minutes.
Cadmium fume[b] (Z37.5-1970)	0.1 mg/m(3)	0.3 mg/m(3)	.....	
Cadmium dust[b] (Z37.5-1970)	0.2 mg/m(3)	0.6 mg/m(3)		
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 minutes.
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 3 hrs.
Chromic acid and chromates (Z37-7-1971)[c]	.....	1 mg/10 m(3)		
Ethylene dibromide (Z37.31-1970)	20 ppm	30 ppm	50 ppm	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min. in any 3 hrs.
Fluoride as dust (Z37.28-1969)	2.5 mg/m(3)	.....	.....	
Formaldehyde: see 1910.1048	.....	.....	.....	
Hydrogen fluoride (Z37.28-1969)	3 ppm	.....	.....	
Hydrogen sulfide (Z37.2-1966)	.....	20 ppm	50 ppm	10 mins. once only if no other meas. exp. occurs.
Mercury (Z37.8-1971)	.....	1 mg/10m(3)	.....	
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 mins. in any 3 hrs.

Methylene Chloride: see 1910.1052				
Organo (alkyl) mercury (Z37.30-1969)	0.01mg/m(3)	0.04 mg/m(3)	.....	
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 mins. in any 3 hrs.
Tetrachloroethylene	100 ppm	200 ppm	300 ppm	5 mins. in any 3 hrs.
Toluene (Z37.12-1967)	200 ppm	300 ppm	500 ppm	10 minutes
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 mins. in any 2 hrs.

Footnote[(a)] This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.
Footnote[(b)] This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.
Footnote[(c)] Footnote(c) This standard applies to any operations or sectors for which the exposures limit in the Chromium (VI) standard, Sec. 1910.1026, is stayed or is otherwise not in effect.
[62 FR 42018, August 4, 1997] as amended [71 FR 36009, June 23, 2006]