

**HARVARD INSTITUTES OF MEDICINE/  
NEW RESEARCH BUILDING  
CHEMICAL HYGIENE PLAN  
FOR HARVARD MEDICAL SCHOOL TENANTS**

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EH&E Report 17893

February 2008

Reviewed January 2009

Reviewed May 2010

Reviewed September 2011

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### **LIST OF ABBREVIATIONS AND ACRONYMS**

|       |  |
|-------|--|
| BFD   | Boston Fire Department                             |
| CAS#  | Chemical Abstract Service Number                   |
| CFR   | Code of Federal Regulations                        |
| CHO   | Chemical Hygiene Officer                           |
| CHP   | Chemical Hygiene Plan                              |
| EH&S  | Environmental Health and Safety                    |
| ESCO  | Environmental Safety and Compliance Officer        |
| IARC  | International Agency for Research on Cancer        |
| HIM   | Harvard Institutes of Medicine                     |
| LD    | lethal dose  |
| mg/kg | milligrams per kilogram                            |
| MSDS  | material safety data sheet                         |
| NFPA  | National Fire Protection Association               |
| NTP   | National Toxicity Program                          |
| NRB   | New Research Building                              |
| OSHA  | U.S. Occupational Safety and Health Administration |
| PEL   | permissible exposure limit                         |
| PI    | Principal Investigator                             |
| PPE   | personal protective equipment                      |
| ppm   | parts per million                                  |
| ROM   | Research Operations Officer                        |
| SAA   | Satellite Accumulation Area                        |
| SOP   | standard operating procedures                      |
| TLV   | threshold limit value                              |

# PART I—CHEMICAL HYGIENE PLAN GUIDELINES

## 1.0 POLICY AND PURPOSE

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### 1.1 POLICY

It is the policy of the Harvard Institutes of Medicine (HIM) and New Research Building (NRB) to provide a safe and healthy workplace in compliance with the Occupational Safety and Health Act of 1970 and with regulations of the Department of Labor, including 29 Code of Federal Regulations (CFR) 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories* (known as the “Laboratory Standard”). The full standard, along with other U.S. Occupational Safety and Health Administration (OSHA) regulations pertaining to laboratory work, can be found by clicking on “Laboratories” at the following link: <http://www.osha.gov/comp-links.html>.

### 1.2 PURPOSE

This document presents the Chemical Hygiene Plan (CHP) required by the above mentioned regulations. The purpose of the CHP is to describe proper practices, procedures, equipment, and facilities for staff members, students, visitors, or other persons working in each laboratory of HIM/NRB to protect them from potential health hazards presented by chemicals used in the laboratory workplace and to keep exposures below specified limits. It is the responsibility of administration, research, and supervisory personnel to know and to follow the provisions of this plan. The Chemical Hygiene Officer (CHO) is responsible for developing, implementing, monitoring, and updating the plan annually. Affected departments are all those maintaining laboratories that contain and use hazardous chemicals, as defined by the regulations. A copy of the HIM/NRB CHP can be found on the HIM/NRB Environmental Health and Safety (EH&S) website: <http://www.himnrbehs.com/himnrbehs/chemicalSafety.asp>

## PART I—CHEMICAL HYGIENE PLAN GUIDELINES

### 2.0 ROLES AND RESPONSIBILITIES

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#### 2.1 ENVIRONMENTAL AND SAFETY COMPLIANCE OFFICERS

Under the authority delegated by the Deans and Senior University Administration, the Environmental and Safety Compliance Officer (ESCO) for each school or administrative unit is responsible for promoting and maintaining a safety, healthful, and environmentally responsible workplace. Specific responsibilities include:

- Ensuring the adequacy of technical and financial resource to conduct compliance programs in accordance with Harvard standards and regulatory requirements.
- Identifying personnel affected by specific compliance requirements.
- Communicating compliance program requirements to administration and faculty.
- Securing faculty and administration input for the development and implementations of compliance management programs.
- Communicating, periodically, compliance program status to the Harvard community, including program results, effectiveness, and agendas.

#### 2.2 DEPARTMENTS

Each department is responsible for supporting and promoting safe and compliant work practices in the laboratory. Department faculty and administration are responsible for facilitating the implementation of the CHP within each department.

**Department Chairs** have overall responsibility for ensuring that all work performed within their department complies with applicable health, safety, and environmental requirements. The department chairs may implement this responsibility through delegation to principal investigators (PIs), other faculty, department administration, or other departmental staff deemed appropriate.

##### 2.2.1 The Department Faculty is responsible for:

- Collaborating with the administration, Environmental Health and Safety (EH&S) and others to identify effective means to implement the CHP in the laboratory.
- Providing feedback to administration regarding compliance status.

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- Ensuring that personnel receive required training, to implement the CHP, effectively.
- Coordinating and facilitating exchange of information regarding chemical hygiene issues with research and teaching community.

### **2.2.2 Department Administration/Laboratory Directors are responsible for:**

- Facilitating compliance with the CHP requirements.
- Ensuring the appointment of a Chemical Hygiene Officer.
- Ensuring compliance responsibilities are assigned and implemented for all areas and operations in the Department. These responsibilities include training, recordkeeping, reporting, program evaluation, and plan revision.

### **2.2.3 Research Operations Managers (ROMs) are responsible for:**

- Communicating EH&S programs to the laboratories, PIs, and their appointed Safety Coordinators.
- Serving as the primary liaison between the EH&S Department and their basic science department.
- Monitoring compliance and safety issues within their department.

## **2.3 PRINCIPAL INVESTIGATORS (PIs)**

Each PI plays a critical role in the implementation of the CHP. The PI has primary responsibility for chemical hygiene and EH&S compliance in his or her laboratory. These responsibilities include ensuring that:

- Laboratory personnel have adequate knowledge and information to recognize and control chemical hazards in the laboratory.
- Hazardous operations are defined and safe practices and protective equipment are designated and provided.
- Safe work practices, personal protective equipment and engineering controls are used to reduce the potential for exposure to hazardous chemicals.
- Laboratory personnel are informed of the potential hazards of the chemicals they use and are trained in safe laboratory practices, controls, and emergency procedures.

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- Laboratory personnel are informed of the signs and symptoms associated with exposures to hazardous chemicals used in their laboratory.
- Chemical waste is managed properly.
- Action is taken to correct work practices and conditions that may result in the release of hazardous chemicals.
- He or she grants approval, where required, prior to the use of particularly hazardous substances in the laboratory.
- Laboratory operations are supervised to ensure that the CHP is being followed.
- Compliance with the CHP is maintained and documented.

### **2.4 CHEMICAL HYGIENE OFFICER**

The CHO (e.g., Laboratory Supervisor, Safety Coordinator) is critical to the effective implementation of the CHP. The CHO, working with the PI is responsible for the adaption and implementation of the CHP in his or her laboratory, thus maintaining a safe work environment and ensuring compliance with regulatory requirements. The duties of the CHO include ensuring that:

- Appropriate training is provided to new and current laboratory personnel and is properly documented.
- Workers know and follow established safe work procedures and emergency procedures.
- Safety equipment and engineering controls are utilized.
- Appropriate personal protective equipment is utilized.
- Laboratory practices and safety and control equipment inspections are routinely conducted and properly documented.
- Copies of the up-to-date CHP and chemical hazard reference materials (e.g., Material Safety Data Sheets [MSDSs]) are available to laboratory personnel.
- Procedures for new or particularly hazardous substances or operations are coordinated with input from the CHO and HIM/NRB EH&S Office.
- Accidents and other potential exposure conditions are reported to the CHO and HIM/NRB EH&S Office for further investigation.
- Recommended actions are taken to correct any unsafe condition.

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### **2.5 LABORATORY PERSONNEL**

Laboratory personnel are responsible for:

- Participating in laboratory safety training sessions.
- Being aware of the hazards of the chemicals they are working around or with, and safe storage, handling, and disposal procedures.
- Planning and conducting each operation or experiment in accordance with established chemical hygiene procedures.
- Using appropriate safe work practices, personal protective equipment, and engineering controls at all times.
- Reporting unsafe conditions to their supervisor or CHO.

Laboratory personnel and PIs share responsibility for chemical safety in their laboratory, as well as informing visitors entering their laboratory of the potential hazards and safety precautions to be taken.

### **2.6 ENVIRONMENTAL HEALTH AND SAFETY OFFICE**

The primary responsibility of the HIM/NRB EH&S Office Staff is to provide technical support and guidance to laboratory personnel for the development and management of EH&S programs. The HIM/NRB EH&S Office is responsible for reviewing and updating the common (non-laboratory specific) portions of the CHP on an annual basis and distributing any required changes to the appropriate University personnel. The HIM/NRB EH&S Office offers the following services relating to chemical hygiene:

- Development and evaluation of safety procedures
- Laboratory inspections and audits
- Fume hood evaluation and inspection.
- Training and information dissemination.
- Hazardous waste disposal.
- Hazard and exposure assessments.
- Accident investigation.
- Emergency assistance.

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For further information concerning the HIM/NRB EH&S Office, please call 617-432-2762 or go to the HIM/NRB EH&S webpage at: <http://www.himnrbehs.com/himnrbehs/>.

## **PART I—CHEMICAL HYGIENE PLAN GUIDELINES**

### **3.0 DEVELOPMENT, IMPLEMENTATION, AND UPDATE**

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The CHO oversees the preparation of the CHP, specifically the SOPs for the laboratory. The CHO is responsible (per OSHA regulation) for ensuring that the plan meets the requirements set forth in the 29 CFR 1910.1450 and is fully implemented.

The CHO is responsible for ensuring that the CHP is reviewed on an annual basis and updated as necessary to accommodate changes in OSHA standard 29 CFR 1910.1450, departmental procedures, and personnel policy. In addition, the CHO will ensure that the CHP update includes procedures regarding new hazards and new processes as they are introduced.

The CHO will ensure that the CHP and updates are distributed or made available to those affected by the changes.

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### 4.0 EDUCATION AND TRAINING

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The CHO or appointed individual(s) shall provide information and training concerning the handling of hazardous chemicals in the laboratory. The HIM/NRB EH&S Office staff is available to assist in developing and implementing training procedures and policies.

Staff members shall be informed of the presence of hazardous chemicals when assigned to a work area and prior to new exposure situations. This information must include the following:

1. Contents of the OSHA *Laboratory Standard*.
2. Applicable details and location of the CHP.
3. Emergency and personal protective equipment training.
4. Physical and chemical properties of hazardous substances used in the workplace.
5. Proper handling of hazardous chemicals to minimize exposure.
6. Signs and symptoms of exposure associated with hazardous chemicals used in the workplace.
7. Availability of reference material, including MSDSs.

Training should be provided immediately for new staff members in the affected work area and annually thereafter for all personnel. The name of each person trained shall be recorded together with the training contents, date, and the trainer. For training options, go to the HIM/NRB EH&S Webpage at:

<http://www.himnrbehs.com/himnrbehs/training.asp>

It is the responsibility of the Department Administrator and the PI to assure that all staff members attend the required training sessions. It is the Department Administrator's responsibility to alert the HIM/NRB EH&S Office and the CHO of a new staff member. Further, if English is not the primary language spoken by a staff member, the Department Administrator should ensure that an interpreter accompanies the non-English speaking staff.

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### 5.0 MONITORING AND PERSONAL ASSESSMENT

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The HIM/NRB EH&S Office will perform exposure monitoring, when appropriate, in accordance with Paragraph (d) of OSHA 29 CFR 1910.1450. Other qualified consulting service providers may be employed by the HIM/NRB EH&S Office to conduct such monitoring. All monitoring results will be kept on file in the HIM/NRB EH&S Office. A report summarizing the results of the exposure monitoring will be provided to the HIM/NRB EH&S contact for the laboratory and made available to the person who participated in the exposure monitoring.

#### 5.1 STAFF EXPOSURE DETERMINATION

- **Initial monitoring** will be performed if there is reason to believe that those exposure levels for a substance could routinely exceed the action level (or permissible exposure limit [PEL] in the absence of an action level).
- **Periodic monitoring** will be performed if the initial monitoring performed discloses staff member exposure over the action level (or PEL in the absence of an action level). The staff member's institution shall immediately comply with the exposure monitoring provisions of the relevant standard.
- Monitoring may be terminated in accordance with the relevant standard.
- Within 15 working days after the receipt of any monitoring results, the staff members will be notified in writing of these results either individually or by posting the results in an appropriate location accessible to staff members.

Anyone with a reason to believe that exposure levels for a substance routinely exceed the action level, or PEL in the absence of an action level, may request that the HIM/NRB EH&S Office initiate the monitoring process.

It will be the responsibility of the CHO to ensure that periodic monitoring requirements are satisfied, when necessary.

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The HIM/NRB EH&S Office and the CHO will maintain records in accordance with the record-keeping requirements of OSHA 29 CFR 1910.1450.

Individual hospitals shall establish and maintain, for each staff member, an accurate record of any measurements taken to monitor staff member exposures and any medical consultation and/or examinations including tests or written opinions required by this standard. The individual hospitals shall ensure that such records are kept, transferred, and made available in accordance with OSHA 29 CFR 1910.20.

Records from monitoring done by other qualified services must be maintained by the CHO and the HIM/NRB EH&S Office.

### **5.2 MEDICAL SURVEILLANCE**

Medical consultations/examinations are coordinated for HIM/NRB staff through the Institution's Occupational Health Services and the HIM/NRB EH&S Office under the following circumstances:

1. Whenever a staff member develops signs or symptoms potentially associated with a hazardous chemical to which the staff member may have been exposed in the laboratory.
2. Where exposure monitoring reveals an exposure level routinely above OSHA's action level or permissible exposure limit for an OSHA-regulated substance requiring such medical monitoring and medical surveillance.
3. Whenever an event occurs, such as a chemical spill, leak, or explosion that results in the likelihood of a hazardous exposure. First aid issues are handled by the Institution's Occupational Health Services during business hours or through the Emergency Room during off-hours.
4. Whenever a staff member is exposed to blood or visibly bloody fluids by a needle-stick, open cut, or splash to the face.

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### **5.3 EXPOSURE REPORTING**

Staff who believe they have had an exposure should contact the CHO or the HIM/NRB EH&S Office for evaluation.

If staff members exhibit adverse health effects, they should report immediately to the Institution's Occupational Health Services or the Emergency Room. The HIM/NRB EH&S Office will evaluate the situation and conduct air sampling, if necessary, to determine actual exposures. The results of all hazard evaluations and any air sampling data will be available to all occupants of the affected areas. The CHO or the HIM/NRB EH&S Office can be contacted directly for information. In addition, the results of any personal air sampling will be given to the individual and kept on file in the HIM/NRB EH&S Office.

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### 6.0 OVERSIGHT, ANNUAL REVIEW, RECORDKEEPING, COMPLIANCE, AND ENFORCEMENT

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The **HIM/NRB EH&S Office** is responsible for establishing and maintaining records for staff member training, staff member and environmental monitoring, and quantity of chemicals stored in the workplace. In practice, the CHO may assist with this work.

The **Principal Investigator and Department Administrator** enforce the CHP by making sure that the chemical hygiene rules are known and followed. The CHO advises and assists in this work and helps with documentation.

The **Chemical Hygiene Officer** will assist with chemical hygiene and housekeeping inspections. When there are significant changes in existing policies or work practices, an inspection will be conducted soon after the new process is implemented.

The **HIM/NRB EH&S Office** assists the CHO in the inspection process and in all related matters.

## PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION

### 7.0 IDENTIFICATION AND CLASSIFICATION OF HAZARDOUS CHEMICALS

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All laboratories must submit an inventory of their hazardous chemicals to the HIM/NRB EH&S Office on an annual basis as part of the Boston Fire Department's Emergency Signage (National Fire Protection Association [NFPA] 704 Diamond) program. Based on these lists, the HIM/NRB EH&S Office provides laboratory contacts with electronic copies of their laboratory's appropriately labeled NFPA Diamonds for placement at entrance doors into the laboratories (see Appendix A).

Hazardous chemicals can be classified into various categories (e.g., corrosive, reactive, flammable, toxic, etc.) and are labeled on the primary container as such. The definitions associated with these categories can be found at the following link:

[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10100](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10100)

Alternate means of classifying and identifying hazardous chemicals include the following:

- Lists of known or suspect human carcinogens, prepared by the International Agency for Research on Cancer and the National Toxicology Program, are available through the HIM/NRB EH&S Office.
- The NFPA has categorized a wide variety of chemicals found in industrial settings. This list is available through the HIM/NRB EH&S Office.
- Material safety data sheets (MSDSs) are available by contacting the HIM/NRB EH&S Office. MSDSs are filed for reference by the HIM/NRB EH&S Office and are also available on the Internet. Laboratories should also maintain a complete file of MSDSs for chemicals used in the area. Each person working in the laboratory must be familiar with the MSDSs for chemicals used in the area prior to working in the area.
- When the human or animal median lethal dose (LD<sub>50</sub>) for any given substance is less than 50 milligrams per kilogram (mg/kg) or if the PEL is less than 10 parts per million

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(ppm), and if the substance is not on the list in Appendix B,<sup>1</sup> then the CHO and PI or Department Administrator or designee will have to develop a specific standard operating procedure for this chemical.

- Manufacturers and manufacturers' associations have valuable information. See Appendix C for a list of Chemical Information Resources.

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<sup>1</sup> For these compounds, a copy of the MSDS is sent to and filed in the EH&S Office. The PI is required to fill out a form outlining special precautions to be taken when this extremely hazardous substance is used (see Appendix B).

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### 8.0 SELECTION OF REQUIRED CONTROL METHODS AND AUTHORITY FOR CHEMICAL USE

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MSDSs for many chemicals used in laboratories indicate recommended limits (e.g., threshold limit value or TLV), OSHA-mandated limits (e.g., PEL, short-term exposure limit, and action limit), or both, as exposure guidelines.

When such limits are stated, they will be used in the laboratories by the CHO and the HIM/NRB EH&S Office staff to assist in determining the safety precautions and control measures necessary when handling toxic materials.

A chemical fume hood certified by the HIM/NRB EH&S Office must be used when the following occurs:

- When working with a compound that has a reported TLV or PEL less than 50 ppm.
- If the LD<sub>50</sub> is less than 500 mg/kg or the median inhalation dose, LC<sub>50</sub>, is less than 200 ppm.<sup>2</sup>
- When working with or handling toxic or malodorous materials (e.g., 2-mercaptoethanol) with moderate or high vapor pressure.

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<sup>2</sup> These values should be used if a TLV or PEL is not available for the substance in question.

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### **9.0 SPECIAL PROVISIONS FOR PARTICULARLY HAZARDOUS SUBSTANCES (CARCINOGENS, REPRODUCTIVE TOXINS, AND ACUTELY AND EXTREMELY TOXIC CHEMICALS)**

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When performing work with any carcinogen, reproductive toxin, substance with a high degree of acute toxicity, or chemical whose toxic properties are unknown, researchers are encouraged to consider the use of designated areas as a method of controlling personal exposures as well as minimizing the spread of contamination throughout the laboratory.

A designated area is a specific area within which use of particularly hazardous substances is restricted in order to minimize the potential for contamination and exposure to other areas of the laboratory. An appropriate designated area could be a chemical fume hood, a glove box, a designated portion of a laboratory such as a taped off area of bench space, or an entire room if it is specifically dedicated for that purpose.<sup>3</sup> A designated area must be clearly posted with signs warning that a specific, extremely hazardous material is in use and that only those trained to work with it are allowed to enter the area while procedures using it are ongoing. The boundaries of the designated area must be clearly defined.

The smallest amount of a chemical that is required by a procedure should be used, purchased, and stored. Whenever possible, material should be ordered in amounts equal to that required in a given procedure to avoid unnecessary weighing out of the material.

Spill procedures must be developed and posted in the designated area. Staff should be familiar with and have available materials that will inactivate the chemical.

Long-sleeved clothing and gloves known to be impermeable to the material must be worn whenever working in designated areas. Because decontamination of jewelry may be difficult, it is recommended that jewelry not be worn when working in a designated area.

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<sup>3</sup> A designated area may be posted with a removable sign if work with extremely hazardous agents is not continuous in the laboratory.

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The designated area must be decontaminated when work is completed.

Chemical waste generated in a designated area should be disposed of via a satellite accumulation area (SAA) situated within the designated area (please contact the HIM/NRB EH&S Office to set up an SAA). Liquid wastes must be put into screw-top containers that are compatible with the chemical. Contaminated solids may be collected in either screw-top containers or plastic bags, provided that the container remains sealed when waste is not being added to it. The container must be labeled with a hazardous waste label (available from the HIM/NRB EH&S Office), filled out with the chemical name(s), the type of hazard(s) (toxic, ignitable, corrosive, and/or reactive), and dated only when full. Hazardous waste must be removed from the lab within three days after filling the container; pickups should be requested immediately upon filling and dating the waste container. Pickup request instructions are written on the SAA sign provided by the HIM/NRB EH&S Office.

The HIM/NRB EH&S Office is available to assist in all aspects of setting up and maintaining designated areas, as well as decontamination of the areas once their use has ceased.

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### 10.0 ELIMINATION OR SUBSTITUTION

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The first step in evaluating the safety of a new experiment, process, or operation is to investigate the possibility of eliminating hazardous materials or substituting with less hazardous materials.<sup>4</sup> When selecting alternate products, care must be taken that one hazard is not being substituted for another.

The particular process, experiment, or operation may also be modified to reduce the quantity of the hazardous material(s) necessary or limit the potential emission release rate or exposure time.<sup>5</sup> The use of a secondary containment device, such as a pan, can also be helpful in preventing or minimizing the effects of chemical spills. The HIM/NRB EH&S Office should be consulted for advice at 617-432-2762.

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<sup>4</sup> As an example, instead of using an organic solvent or chromic acid-based material for washing glassware, one should substitute an aqueous-based detergent. Aromatic compounds (i.e., benzene) and chlorinated hydrocarbons (i.e., methylene chloride) in some experiments should be replaced with aliphatic compounds or non-chlorinated hydrocarbons.

<sup>5</sup> For example, the use of micro scale techniques may be applicable in measuring boiling points of a material. Another example is the substitution of closed systems for open vessels.

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### **11.0 ENCLOSURE, ISOLATION, AND REGULATED AREAS**

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Reducing the potential for exposure to particularly hazardous chemicals can be achieved by restricting the use of the material to a designated area equipped with the proper control devices. This designated area can be a glove box, fume hood, bench, or an entire laboratory depending on the manipulations required. Hazardous substances are stored, used, and prepared for disposal only in designated areas. The designated area is identified by signs to alert others of the presence of a particularly hazardous material. For example:

Over balance area:

**CAUTION: ACRYLAMIDE BALANCE**

On glove box:

**CAUTION: AFLATOXIN IN USE**

Radiation signs are available from the Radiation Protection Office at 617-495-2060. Biohazard signs are available from the HIM/NRB EH&S Office at 617-432-2762.

In addition to establishing the physical boundaries that define the designated area, procedures used in a designated area have special provisions. These include storage, use of protective equipment, containment, equipment disposal, and decontamination procedures.

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### 12.0 GENERAL WORK PRACTICES AND STANDARD OPERATING PROCEDURES FOR CHEMICALS OR CLASSES OF CHEMICALS

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Before developing general work practices and standard operating procedures, it is important to consult the MSDS for the chemical. The following are general guidelines to be followed.

#### 12.1 GENERAL WORK PRACTICES—SPILLS

1. **Eye Contact:** Eyes should be promptly flushed with water for 15 minutes. Medical help should be sought immediately after flushing.
2. **Skin Contact:** Contaminated clothing should be removed as quickly as possible and the affected area flushed with water for 15 minutes. Medical attention should be sought immediately after flushing.
3. **Clean up with no injury:** If no one is injured, the clean up of the spill should begin immediately. For assistance or advice, call the Operations Center at 617-432-1901.
4. **Clean up with injury:** If someone is injured, that person should seek medical assistance immediately. Clean up should be initiated by someone other than the injured person. For assistance or advice, call the Operations Center at 617-432-1901.

#### 12.2 GENERAL WORK PRACTICES—AVOIDANCE OF ROUTINE EXPOSURE

1. Work with hazardous substances should be conducted in a chemical fume hood whenever possible.
2. Smelling chemicals to determine their identity should be avoided.
3. **Never** place your head inside of a chemical fume hood to check on an experiment.
4. Inspect gloves before use.<sup>6</sup>

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<sup>6</sup> Up to 5% of all new and unused gloves have holes or tears in them.

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5. Release of toxic chemicals, dry ice, or compressed gases in cold or warm rooms must be avoided; these rooms contain recirculated atmospheres, and a hazardous breathing environment can quickly result.
6. Exhaust from an apparatus (e.g., vacuum pumps) that may discharge toxic chemicals should be vented into a fume hood or filter.
7. When transporting hazardous chemicals, use one or more of the following:
  - Carts designed to prevent bottles from spilling;
  - Secondary containment; or
  - Bottle carriers.

### **12.3 GENERAL WORK PRACTICES—CHOICE OF CHEMICALS**

1. Less toxic substances should be substituted in place of more toxic ones wherever possible.
2. Only those amounts necessary for immediate work should be ordered.

### **12.4 GENERAL WORK PRACTICES—PERSONAL HYGIENE**

1. No eating (including chewing gum), drinking, smoking, or applying cosmetics is allowed. The use of contact lenses in the laboratory should be avoided.
2. Mouth pipetting of **any** substance is prohibited.
3. Hands must always be washed before leaving the laboratory. Solvents must never be used to wash hands.
4. Laboratory coats and safety glasses should be worn in the laboratory whenever there is a potential for exposure to infectious, chemical, or radiological hazards. Appropriate gloves must be worn when handling chemicals. Refer to Appendix D, "Effective Use of Gloves." This equipment should not be worn in cafeterias, bathrooms, and conference areas to avoid cross contamination.
5. Personal protective equipment should be disposed of or laundered (in the case of laboratory coats) as appropriate, given the frequency and degree of contamination that it is subjected to.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **12.5 GENERAL WORK PRACTICES—APPROPRIATE STORAGE OF CHEMICALS**

1. Incompatible chemicals must be segregated (see Appendix E for Chemical Storage Guidelines).
2. Glass bottles must not be stored on high shelves or on the floor.
3. Chemicals should be stored in containers with which they are compatible.
4. All bottles must be labeled with the correct chemical name in English and using no abbreviations. Bottles should be dated upon receipt and again upon opening.

### **12.6 GENERAL WORK PRACTICES—PROCEDURES FOR FLAMMABLE CHEMICALS**

1. General Use and Handling
  - a. Flammable liquids are defined as those liquids with a flash point of 140 degrees Fahrenheit (°F) or less and having an absolute vapor pressure of not more than 40 pounds per square inch at 100 °F. Some examples commonly found at HIM/NRB are acetone, ethanol, ether, and xylene. All flammable liquids should be handled carefully.
  - b. Flammable substances should be handled only in areas free of ignition sources (e.g., away from electric ovens, burner flames, and hot surfaces).
  - c. Flammable substances should never be heated using an open flame. Heating mantles, oil baths, safety hot plates, and steam baths should be used. When heating either by steam bath or hot plate, use a filter or distilling flask as a receiver. Such distillations must be carried out in a fume hood.
  - d. Smoking is not permitted within the HIM/NRB.
  - e. Boiling chips or glass beads are helpful in distilling or evaporating flammable substances to prevent superheating and bumping.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

- f. Ground cylinders or equipment when transferring flammables from one container to another. Contact the Operations Center at 617-432-1901, if there are questions about proper grounding.

### **2. Storage**

- a. Bottles of volatile liquids should not be stored near heat sources or in direct sunlight.
- b. Quantities of flammable solvents stored in the laboratory should be kept to a minimum. The Boston Fire Department limits storage based on the type of liquid, the floor, where the solvents are stored, and the size of the laboratory (control area). Contact the HIM/NRB EH&S Office regarding the storage limits for your control area.
- c. Whenever possible, flammable liquids including spray and squeeze bottles should be stored in approved storage cabinets. Flammable liquids must never be stored on the floor.
- d. Adequate ventilation must be provided where flammable liquids are used.
- e. When flammable liquids are stored in a refrigerator, it must be a *Laboratory-Safe Refrigerator* (as defined in NFPA 45). These are approved for storing flammable liquids and have all electrical equipment mounted on the outside surface of the refrigerator.
- f. Flammable liquids must not be stored with chemicals that are considered to be incompatible with them (e.g., oxidizers, oxidizing acids, etc.).

### **12.7 GENERAL WORK PRACTICES—PROCEDURES FOR REACTIVE CHEMICALS**

Reactive materials include oxidizers, organic peroxides, explosives, air sensitive, shock sensitive, temperature sensitive, and those ranked 3 or 4 for reactivity by the NFPA (Appendix F). These materials are known as unstable materials by the Boston Fire

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

Department. Each laboratory is responsible for disposing of unstable materials prior to them becoming potentially explosive.

For peroxide-forming chemicals (e.g., ethyl and isopropyl ethers, tetrahydrofuran), containers should be dated upon opening and disposed of as hazardous waste by the expiration date or within six months, whichever is sooner.

All reactive materials must be handled with caution, personal protective equipment must be used, and, where possible, work should be done in a chemical fume hood.

### **12.8 GENERAL WORK PRACTICES—PROCEDURES FOR CORROSIVE CHEMICALS**

1. Extreme care must be exercised in handling and pouring corrosive materials. This includes: approved gloves, a laboratory coat, and safety glasses or a face shield as appropriate.
2. Corrosive chemicals should not be stored above laboratory bench level.
3. Corrosive materials should not be heated or handled in large, fragile containers (e.g., four-liter beakers) without providing a secondary containment to catch the contents in case of breakage.
4. Porcelain dishes should not be used as cleaning baths.
5. Strong alkalis should not be stored next to strong acids.
6. Oxidizing acids (e.g., nitric, sulfuric) and organic acids should be segregated from each other.
7. If strong acids or alkalis come in contact with skin or clothing, affected parts should be washed quickly and thoroughly with large quantities of water. If such materials are splashed in the eyes, they should be flushed thoroughly with a continuous stream of cold water for at least 15 minutes. In either case, medical attention should be sought immediately.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **12.9 SPECIAL PROCEDURES: WORK WITH FORMALDEHYDE**

OSHA's formaldehyde standard, *Occupational Exposure to Formaldehyde*, 29 CFR 1910.1048 states that the eight-hour PEL time-weighted average for people working with formaldehyde is 0.75 ppm. The short-term exposure limit time-weighted average for 15-minute exposure is 2.0 ppm.

The Hazard Warning for formaldehyde, including labeling requirements, falls under the OSHA *Hazard Communication Standard*. If formaldehyde is to be used by any individual in the laboratory, all staff should be informed of the health hazards of formaldehyde upon initial orientation to the work site.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **13.0 PERSONAL PROTECTIVE EQUIPMENT**

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Personal protective equipment (PPE) is designed to prevent personal injury. Examples of PPE include safety glasses or goggles, face shields, safety shields, gloves, rubber aprons, laboratory coats, and protective creams. It is the responsibility of the Department Administrator and/or PI to ensure that laboratory staff is using necessary safety equipment.

The type and level of equipment can be determined with the aid of the CHO and the HIM/NRB EH&S Office. Use of PPE should only be considered after exercising all options for reducing the hazards. If in doubt about the potential danger of an experiment or activity, all available safety devices should be employed. Information on such devices can be obtained from the HIM/NRB EH&S Office upon request.

#### **13.1 RESPIRATORS**

Required use of a respirator is the responsibility of the Department Administrator, the PI (or their designee), the CHO, and the HIM/NRB EH&S Office. The HIM/NRB respirator policy must be followed when respiratory protection is required. All staff must follow these elements.

1. Less hazardous materials should be substituted for more hazardous materials.
2. Laboratory fume hoods or other engineering controls should be employed to control exposure.
3. If items 1 and 2 above have been considered but added protection is still deemed necessary, respirator type shall be selected on the basis of type of chemical exposure, level of exposure, and user medical examination.
4. Selection of a respirator type must be performed in consultation with the HIM/NRB EH&S Office.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

5. A medical clearance is required for each staff member before a respirator is used routinely. A medical clearance can be obtained through the host institution's Occupational Health Services.
6. Appropriate fit testing and training shall be performed under the direction of the host institution for all negative pressure respirators before use.
7. The respirator user must regularly maintain and clean the respirator.
8. The respirator user must perform a negative and positive pressure check before each use.

### **13.2 EYE PROTECTION**

Eye protection must be worn in the laboratory whenever there is a potential for eye contact with hazardous liquids and/or particulates. The type of eye protection to be used shall be stated in the SOPs for the laboratory.

Goggles are recommended when working with volatile substances that irritate the eyes (e.g., chlorine, strong ammonia, irritating dusts) as well as for protection against spattering or splashing of hazardous materials. It is also advisable to wear a safety shield when distilling at high temperatures, under reduced pressures, or when distilling corrosive liquids. Safety glasses and goggles have only a limited application and do not offer full protection against all hazards. For particularly dangerous operations, full-face shields of an approved type are to be worn in addition to the eye protection discussed above.

### **13.3 PROTECTIVE CLOTHING**

The use of protective clothing, including gloves, shall be determined by the HIM/NRB EH&S Office. When working with a potential hazardous material, protective clothing is required.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

1. Protective clothing is chosen, with the aid of the Department Administrator or PI, with assistance from HIM/NRB EH&S Office as needed, on the basis of the chemical exposure and medical condition of the user.
2. Contaminated protective clothing must be disposed of properly.
3. Open-toed shoes or sandals shall not be worn in the laboratory.
4. Skin exposure should be minimized when working with hazardous materials.
5. Contaminated laboratory coats shall not be worn.

### **NOTE: Laboratory coats should not be worn in common areas**

(Cafeterias, bathrooms, kitchen areas, outside, conference rooms, break rooms, etc.)

### **13.4 PROTECTIVE GLOVES**

When handling toxic or hazardous chemicals, protective gloves are required. To protect against accidental spills or contamination, workers should refer to glove manufacturers' glove charts to select a glove appropriate for use with the reagent in question (see Appendix D for glove selection). There is no glove currently available that will protect against all chemicals for all types of tasks. If the gloves become contaminated, they should be removed and discarded as hazardous waste as soon as possible.

Staff members must remove at least one glove before leaving the immediate work site to prevent contamination of public areas (e.g., doorknobs, light switches, telephones, etc.).

**Latex Alert:** Latex (i.e., several protein antigens) has been shown to be a sensitizer. In order to best protect workers from becoming sensitized, powdered latex exam gloves are PROHIBITED in the HIM/NRB laboratories. Powder-free latex gloves may be used where appropriate.

**NOTE: Latex gloves do not protect against every hazardous material.**

### **13.5 OTHER PERSONAL PROTECTIVE EQUIPMENT**

Other personal protective equipment shall be used as needed.

Safety shields are recommended for use whenever solvent or vacuum distillations are being run in glass equipment or whenever large glass vessels are subjected to a

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

vacuum. Safety shields should also be used during reactions involving unknown characteristics or that contain toxic or radioactive materials (e.g., high-energy emitters such as  $^{125}\text{I}$  or  $^{32}\text{P}$ ).

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **14.0 VENTILATION, FUME HOODS, AND PROPER OPERATIONS**

Local exhaust ventilation is the primary method used to control inhalation exposures to hazardous substances. Other types of local exhaust include vented enclosures for large pieces of equipment or chemical storage and snorkel types of exhaust for capturing contaminants near the point of release.

A laboratory fume hood should be used when working with hazardous substances. A properly operating and correctly used fume hood will control the vapors released from volatile liquids, as well as unpropelled dusts and mists.

Do not make any modifications to hoods or ductwork without first calling the HIM/NRB EH&S Office at 617-432-2762.

A fume hood should not be used for large pieces of equipment unless the fume hood will be dedicated for this use since it will change airflow patterns and render the fume hood unsafe for other uses. It is generally more effective to install a specially designed enclosure for large equipment so that the hood can be used for its intended purpose.

A fume hood should not be used for chemical or other miscellaneous storage, this also restricts airflow. Chemicals should be stored in a sealed (following NFPA 45 requirements) chemical storage cabinet. All freestanding cabinets should have bungs in place and the doors should close properly.

The HIM/NRB EH&S Office oversees the fume hood program. Before you begin using a fume hood, check to see that the hood is labeled appropriately for use with toxic chemicals and has been certified within the last year. If a fume hood requires certification or if you have questions regarding fume hood operation, contact the HIM/NRB EH&S Office at 617-432-2762.

Some of the basic guidelines for working safely in a chemical fume hood include the following:

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

1. Work at least six inches behind the sash.
2. If it is necessary to store materials in a fume hood, they should be elevated so that air can pass under them.
3. Never put your head (or face) inside an operating fume hood to check on an experiment.
4. Work with the sash in the lowest position possible. The sash will act as a barrier and provide containment should a problem arise with the reaction.
5. Do not clutter the hood with bottles or equipment. Only materials actively in use should be in the fume hood.
6. Clean the grille along the bottom slot of the back of hood regularly so it does not become clogged with paper and dirt.
7. Do not dismantle or modify the physical structure of the hood or exhaust system in any way without first consulting the HIM/NRB EH&S Office.
8. Report any suspected hood malfunctions to the facilities operations center at 617-432-1901 and the HIM/NRB EH&S Office at 617-432-2762.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **15.0 HOUSEKEEPING**

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It is essential for both safety and efficiency that the facilities be kept neat and orderly. Floors, shelves, and benches should be free from excessive storage and evidence of spills.

Care should be exercised when disposing of materials. Flammable or toxic materials should be collected for disposal as hazardous waste and, therefore, should not be placed in the regular waste stream.

General guidelines for good housekeeping include the following:

1. Storage or equipment must never block access to emergency equipment such as showers, eyewashes, fire extinguishers, fire alarm strobes, and exit routes.
2. Label all chemical containers with the identity of the contents and list the appropriate hazards.
3. All work areas should be kept clear of clutter.
4. All aisles, hallways, and stairs must be kept clear.
5. All chemicals should be returned to their proper storage area at the end of the day.
6. Liquid wastes should be kept in spill-proof containers and stored off the floor in an appropriate storage area.
7. ALWAYS BE PREPARED FOR SPILLS. Small spills should be cleaned up promptly using the spill kits located in the hallways. All clean up materials must be collected for disposal as hazardous waste.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **16.0 SIGNS AND LABELS AND MATERIAL SAFETY DATA SHEETS**

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#### **16.1 EMERGENCY SIGNAGE**

The Boston Fire Department (BFD) requires that each laboratory have appropriate signage to indicate the level of the hazard with respect to the chemicals stored in the laboratory. This signage takes the form of a diamond (NFPA 704 diamond), which is comprised of four smaller diamonds. Each smaller diamond is color-coded to represent a specific hazard classification: blue for health hazards, red for flammability hazards, yellow for reactivity hazards, and white for special classes of hazards. For more information on NFPA diamonds, refer to Appendix A.

Each small diamond contains a number from 0 to 4. A hazard level of 0 on the NFPA diamond represents no hazard while a hazard level of 4 on the NFPA diamond represents the highest hazard in that category. Fires and other emergencies may be dealt with more effectively and safely if the BFD is informed of the level of hazards in a specific area. The names and emergency phone numbers of the current Department Administrator or PI responsible for each laboratory area, including shared spaces, should also be posted. Laboratories are responsible for keeping their contact information current.

Signs are inspected annually by the HIM/NRB EH&S Office and are based upon the chemical inventories received from the laboratories. It is extremely important that contact names and chemicals are kept current. The BFD may choose not to enter a laboratory if the information provided appears to be out-of-date.

#### **16.2 OTHER SIGNS**

1. Radioactive or biohazardous substances used in laboratories require the posting of special signs.
2. *Eye Protection Required* signs are recommended at entrances to laboratories using acids and corrosive chemicals. Safety glasses for visitors must be provided.
3. Signs indicating the location of fire blankets, eyewash units, safety showers, fire extinguishers, and other safety devices are required.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

4. Entrances to laboratories, storage areas, and associated facilities must have signs as necessary to warn emergency personnel and custodians of unusual or severe hazards.<sup>7</sup>

### **16.3 CHEMICAL CONTAINER LABELING**

All containers must be labeled with the chemical contents. The labels must be in English and have no abbreviations on them. Chemicals received from outside vendors or from internal stockrooms must have labels indicating the name, along with other physical and chemical data. Toxicity warning signs or symbols should be prominently visible on the labels.

All chemical containers that have been decanted from an original container must be labeled with the chemical name, the primary hazard(s), the name of the responsible person, their PI, and the date. The HIM/NRB EH&S Office can be contacted for further information regarding labels for this purpose.

All chemical waste containers must be labeled with the words *Hazardous Waste*, the full chemical name(s), the type of hazard (i.e., toxic, ignitable, corrosive, or reactive), the responsible person, and the date the container became full. Labels are available from the HIM/NRB EH&S Office. Labeling must be provided for chemicals synthesized in the laboratory or prepared by other processes, such as distillation or extraction. For information about obtaining hazard labels, please contact the HIM/NRB EH&S Office.

Chemicals developed in the laboratory must be assumed to be toxic if no data on toxicity are available. Suitable handling procedures must be prepared and implemented, including training of users in controls necessary to handle a material safely. If the substance is produced for another user outside of the laboratory, a MSDS and labels must be prepared and provided to such users in accordance with the OSHA *Hazard Communication* standard 29 CFR 1910.1200.

For information on the labeling of biohazardous materials, as required by the OSHA *Bloodborne Pathogen* standard 29 CFR 1910.1030, refer to Appendix G.

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<sup>7</sup> Examples of severe or unusual hazards that may require signs are unstable chemicals, toxic or carcinogenic materials, water reactive chemicals, and radioactive materials.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **16.4 MATERIAL SAFETY DATA SHEETS**

MSDSs are bulletins prepared by manufacturers to summarize the health and safety information associated with their products. The manufacturer or supplier should provide MSDSs for each chemical. A complete file of MSDSs should be maintained in the laboratory and must be accessible to any staff member or visiting professional. MSDSs may also be obtained from the MSDS tab on [www.himnrbehs.com](http://www.himnrbehs.com).

The following information is required by OSHA to be included in all MSDSs:

- Product identity
- Reactivity hazards
- Hazardous ingredients
- Spill clean-up
- Physical/chemical properties
- Protective equipment
- Fire and explosion hazards
- Special precautions
- Health hazards

A user's guide to MSDSs can be found in Appendix H. Consult with the HIM/NRB EH&S Office to apply this general information to your work situation.

## PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION

### 17.0 WASTE DISPOSAL

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Every effort should be made to dispose of hazardous waste in a proper, safe, and efficient manner. It is the responsibility of the individual generating the waste to properly identify and handle waste chemicals within the HIM/NRB facility.

The HIM/NRB EH&S Office maintains a “Main Accumulation Area” for the storage of chemical hazardous wastes transported from the laboratories.

The HIM/NRB EH&S Office maintains Satellite Accumulation Areas (SAAs) in the laboratories for the storage of chemical hazardous waste. Refer to Section 3 of the HIM/NRB EH&S Manual for information regarding the establishment of an SAA. The following guidelines must be followed at all SAAs.

- Once a waste container has been filled in the laboratory, it must be transported to the main accumulation area within three days.
- Waste chemicals stored in containers of one gallon or larger sizes shall be **break-resistant** whenever possible.
- Waste chemicals stored in breakable containers of one gallon or larger sizes shall be kept in **approved secondary containers**.
  - Break-resistant shall mean a container made of metal, plastic, plastic-coated glass or metal overpacks of glass.
  - An approved secondary container is a bottle carrier made of rubber, metal, or plastic with carrying handle(s) which is of large enough volume to hold the contents of the chemical container. Rubber or plastic should be used for acids/alkalines, and metal, rubber, or plastic for organic solvents.
- Wastes must be packaged and placed in containers in a manner that will allow them to be transported without the danger of spillage, explosion, or hazardous vapors escaping. Wastes that have not been properly packaged and identified will not be accepted for disposal.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **17.1 UNKNOWN WASTE CHEMICALS**

Every effort should be made by the Department Administrator or PI to identify unknown waste. It is the responsibility of the department to identify all chemicals. The Department Administrator or PI may need to question laboratory personnel, students, and volunteers, or send a sample to an analytical laboratory, to ascertain the contents of unknown wastes. All charges associated with the identification of an unknown waste will be paid by the laboratory/institution. Laboratory personnel must be constantly reminded to identify and label all wastes and project products. If unknown waste has been discovered and cannot be identified, immediately contact the HIM/NRB EH&S Office.

**NOTE: Never mark a container “UNKNOWN.”**

**Label unknown waste streams with the words “Pending Analysis.”**

### **17.2 TRANSPORTATION**

All hazardous waste will be collected from the laboratories and transported to the Main Accumulation Area by a representative of the HIM/NRB EH&S office.

### **17.3 GUIDELINES FOR WASTE REDUCTION/MANAGEMENT**

Procedures for waste disposal should be prepared **before** beginning a project. Waste must be labeled properly. Each department, group, or researcher must properly identify waste materials prior to disposal; inadvertent mixing of incompatible materials could have serious consequences.

Waste minimization is very important to protect the environment and also to reduce the disposal costs charged to the laboratory. The following suggestions should be considered in an effort to minimize the amount of waste generated by the laboratory.

- Order only and store the amount of material needed for the project or experiment. The BFD has severe restrictions on flammable liquid storage in laboratories.
- Use only the amount of material that is needed for conclusive results.
- Date containers upon receipt and again upon initial opening.

## PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION

- Before disposing of unwanted, unopened, or uncontaminated chemicals, check with others at HIM/NRB who may be able to use them.
- On termination of a research project, all unused chemicals to be kept by the laboratory shall be labeled and dated. All chemicals for disposal must be in proper containers and labeled with the words *Hazardous Waste*, the chemical name, type of hazard (toxic, ignitable, corrosive, or reactive), and the date.

### 17.4 TYPES OF CHEMICALS AND THEIR DISPOSAL

Regulations prohibit the discharge of most organic solvents into the sewer system. Small amounts of water-soluble, non-flammable materials may be discharged down the drain. The HIM/NRB EH&S Office must be consulted to determine which chemicals can be disposed in this manner.

| Chemical Class   | Disposal  |
|--|---|
| Organic solvents   | <ul style="list-style-type: none"> <li>✓ Paced in suitable containers that prevent vapors or liquids from escaping.</li> <li>✓ Tightly cap</li> <li>✓ Prominently label containers</li> <li>✓ Disposed as hazardous waste</li> </ul>  |
| Mixtures of organic solvents                             | <ul style="list-style-type: none"> <li>✓ If compatible they can be combined in one container</li> <li>✓ Container must have estimated percentages of each solvent in the mixture.</li> </ul>  |
| Ether (di-ethyl) in cans                                 | <ul style="list-style-type: none"> <li>✓ Do not move if over a year beyond the expiration date or beyond six months from the date of opening</li> <li>✓ The HIM/NRB EH&amp;S Office must be contacted immediately at 617-432-2762.</li> </ul>   |
| Acids and alkaline solutions                             | <ul style="list-style-type: none"> <li>✓ Concentrated acids and caustics must be treated as hazardous waste</li> <li>✓ Store in tightly capped and labeled containers</li> </ul>  |
| Inorganic and organic solids                             | <ul style="list-style-type: none"> <li>✓ If in original containers may be sent to the HIM/NRB hazardous waste room.</li> </ul>  |
| Mercury  | <ul style="list-style-type: none"> <li>✓ Contact HIM/NRB EH&amp;S Office to dispose of mercury containing equipment.</li> <li>✓ Put broken mercury thermometers into a jar or secondary container for disposal as hazardous waste.</li> <li>✓ Mercury spills must be cleaned up with assistance from the HIM/NRB EH&amp;S Office in order to ensure that contamination is not left behind. Contact the Operations Center at 617-432-1901 for assistance.</li> </ul> |
| Cyanide compounds, arsenic, lead, and heavy metal wastes | <ul style="list-style-type: none"> <li>✓ Place in bottles or containers</li> <li>✓ Seal tightly</li> <li>✓ Label, and place in the hazardous waste accumulation area</li> </ul>   |

## PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION

| Chemical Class  | Disposal  |
|---|---|
| Alkali metals (e.g., sodium and potassium)  | <ul style="list-style-type: none"><li>✓ Place in a suitable container</li><li>✓ Cover with Nujol® (mineral oil)</li><li>✓ Label properly, seal and dispose as hazardous waste</li></ul> |
| Pyrophoric metals (e.g., magnesium, strontium, thorium, zirconium, and other pyrophoric chips and fine powders) | <ul style="list-style-type: none"><li>✓ Place in a metal container</li><li>✓ Seal tightly</li><li>✓ Label, and send out as hazardous waste</li></ul>                                    |
| Waste oil (e.g., vacuum pump oil or lubricating oils)   | <ul style="list-style-type: none"><li>✓ Collect in one-gallon containers or less</li><li>✓ Dispose of as toxic hazardous waste</li></ul>  |

The HIM/NRB EH&S Office may be consulted if there is any question concerning the toxicity or packaging of any toxic wastes.

### 17.5 OTHER TYPES OF WASTES—SPECIAL PROCEDURES REQUIRED

- **Gas cylinders** are to be returned to the proper vendor. Some small lecture bottles are of the non-returnable type and become a disposal problem when empty or near empty with a residual amount of gas. When ordering gases in lecture bottle size, be sure to order the gases in a returnable cylinder.
- **Controlled drugs** to be disposed of as waste **must not be sent to the waste accumulation area**. The handling, records, and disposal of controlled drugs are the responsibility of the department and must be conducted within Drug Enforcement Agency regulations.
- **Radioactive material** disposal is handled in accordance with procedures established by the Radiation Protection Office at 617-495-2060.
- **Biological waste and physically dangerous waste (sharps) must be placed in proper containers**. Contact the HIM/NRB EH&S Office, 617-432-2762, for proper disposal procedures.
- **Polychlorinated biphenyls** found in capacitors, transformers, equipment, and oil is the responsibility of the department. Information on possible disposal contractors can be obtained by calling the HIM/NRB EH&S Office.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **18.0 EMERGENCY SITUATIONS**

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Emergencies that may occur in a laboratory include fire, explosion, chemical spill or release, or medical or other health threatening accidents. General procedures to be followed in any emergency are the following.

1. Assist person(s) involved. Remove person(s) from exposure to further injury or a life-threatening situation, if it can be done safely.
2. Notify nearby persons who may be affected and call the Operations Center at 617-432-1901 to report the emergency and seek assistance.
3. Evacuate the area until help arrives.
4. Wait for emergency responders and assist them in handling the emergency.
5. Assist in the follow-up investigation of the emergency.

For specific emergencies that may occur in the laboratory space (i.e., chemical spills, fire, explosion, etc.), refer to the specific procedures established by the laboratory and to the EH&S Procedures and Response Guidelines (flip charts) posted in your area.

## **PART II—CHEMICAL HYGIENE PLAN LABORATORY PRECAUTIONS AND HAZARD PREVENTION**

### **19.0 EMERGENCY EQUIPMENT**

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In any emergency, it is critical that all staff members are familiar with the use and location of emergency equipment. These include fire extinguishers, fire alarms, safety showers, and eyewash stations.

All emergency equipment is on a preventive maintenance schedule. Fire alarms are tested periodically and extinguishers are inspected monthly by the building management entity. Safety showers on a quarterly basis and eyewash stations on a monthly basis are tested by the HIM/NRB EH&S Office.

## **PART III—LABORATORY STANDARD OPERATING PROCEDURES**

### **20.0 LABORATORY STANDARD OPERATING PROCEDURES**

Each laboratory inserts their individual SOPs in this section.

**APPENDIX A**  
**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**  
**SIGNAGE**

# NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) LABELING SYSTEM

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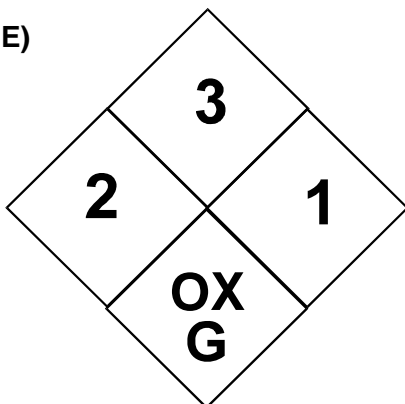
Signage based on the NFPA labeling system has been posted at the entrances to all laboratories and laboratory related facilities at HIM. Also, many chemical manufacturers include the NFPA rating system in the labeling of chemical containers. The following is an example of the NFPA labeling system.

## FIRE HAZARD (RED)

- 0—will not burn
- 1—will ignite if preheated
- 2—will ignite if moderately heated
- 3—will ignite at most ambient conditions
- 4—burns readily at ambient conditions

## HEALTH HAZARD (BLUE)

- 0—no more than ordinary combustibles in a fire
- 1—slightly hazardous
- 2—hazardous
- 3—extreme danger
- 4—deadly



## REACTIVITY (YELLOW)

- 0—stable and not reactive with water
- 1—unstable if heated
- 2—violent chemical change
- 3—shock and heat may detonate
- 4—may detonate

## SPECIFIC HAZARD

- OX—oxidizer
- ACID—acid
- ALK—alkali
- COR—corrosive
- W—use no water
- G—gas cylinder
- LN2—liquid nitrogen

**APPENDIX B**

**LIST OF CARCINOGENS, TERATOGENS,  
EXTRAORDINARILY HAZARDOUS SUBSTANCES**

# LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES

## LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES

| Chemical Name                                   | CAS #       | Alternate Name                                  | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| AF-2[2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide] | 003688-53-7 | AF-2[2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide] |      | 2B   |     |
| ANTU  | 000086-88-4 | ANTU  |      | 3    |     |
| Acetaldehyde                                    | 000075-07-0 | Acetaldehyde                                    |      | 2B   | 2   |
| Acetamide                                       | 000060-35-5 | Acetamide                                       |      | 2B   |     |
| 2-Acetylaminofluorene                           | 000053-96-3 | Acetylaminofluorene                             | X    |      | 2   |
| Aciclovir                                       | 059277-89-3 | Aciclovir                                       |      | 3    |     |
| Acidine orange                                  | 000494-38-2 | Acidine orange                                  |      | 3    |     |
| Acriflavium chloride                            | 008018-07-3 | Acriflavium chloride                            |      | 3    |     |
| Acrolein  | 000107-02-8 | Acrolein  |      | 3    |     |
| Acrylamide                                      | 000079-06-1 | Acrylamide                                      |      | 2A   | 2   |
| Acrylic acid                                    | 000079-10-7 | Acrylic acid                                    |      | 3    |     |
| Acrylic fibres                                  | --          | Acrylic fibres                                  |      | 3    |     |
| Acrylonitrile                                   | 000107-13-1 | Acrylonitrile                                   | X    | 2B   | 2   |
| Acrylonitrile-butadiene-styrene copolymers      | --          | Acrylonitrile-butadiene-styrene copolymers      |      | 3    |     |
| Actinomycin D                                   | 000050-76-0 | Actinomycin D                                   |      | 3    |     |
| Adriamycin                                      | 023214-92-8 | Adriamycin                                      |      | 2A   | 2   |
| Adriamycin (Doxorubicin hydrochloride)          | 025316-40-9 | Adriamycin                                      |      |      | 2   |
| Aflatoxin B1                                    | 001162-65-8 | Aflatoxin B1                                    |      | 1    |     |
| Aflatoxin M1                                    | 006795-23-9 | Aflatoxin M1                                    |      | 2B   |     |
| Aflatoxins                                      | 001402-68-2 | Aflatoxins                                      |      | 1    | 1   |
| Agaricine                                       | 002757-90-6 | Agaricine                                       |      | 3    |     |
| Alcoholic beverages                             | --          | Alcoholic beverages                             |      | 1    | 1   |
| Aldicarb  | 000116-06-3 | Aldicarb  |      | 3    |     |
| Aldrin  | 000309-00-2 | Aldrin  |      | 3    |     |
| Allyl chloride                                  | 000107-05-1 | Allyl chloride                                  |      | 3    |     |
| Allyl isothiocyanate                            | 000057-06-7 | Allyl isothiocyanate                            |      | 3    |     |
| Allyl isovalerate                               | 002835-39-4 | Allyl isovalerate                               |      | 3    |     |
| Aluminium production                            | --          | Aluminium production                            |      | 1    |     |
| Amaranth  | 000915-67-3 | Amaranth  |      | 3    |     |
| 1-Amino-2-methylantraquinone                    | 000082-28-0 | Amino-2-methylantraquinone                      |      | 3    | 2   |
| 4-Amino-2-nitrophenol                           | 000119-34-6 | Amino-2-nitrophenol                             |      | 3    |     |
| 2-Amino-4-nitrophenol                           | 000099-57-0 | Amino-4-nitrophenol                             |      | 3    |     |
| 2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole   | 000712-68-5 | Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole     |      | 2B   |     |
| 2-Amino-5-nitrophenol                           | 000121-88-0 | Amino-5-nitrophenol                             |      | 3    |     |
| 2-Amino-5-nitrothiazole                         | 000121-66-4 | Amino-5-nitrothiazole                           |      | 3    |     |
| Amino-alpha-C (2-Amino-9h-pyrido[2,3-b]indole)  | 026148-68-5 | Amino-alpha-C (2-Amino-9h-pyrido[2,3-b]indole)  |      | 2B   |     |
| 5-Aminoacenaphthene                             | 004657-93-6 | Aminoacenaphthene                               |      | 3    |     |
| 2-Aminoanthraquinone                            | 000117-79-3 | Aminoanthraquinone                              |      | 3    | 2   |
| para-Aminoazobenzene                            | 000060-09-3 | Aminoazobenzene                                 |      | 2B   |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name                             | CAS #       | Alternate Name                            | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| ortho-Aminoazotoluene                     | 000097-56-3 | Aminoazotoluene                           |      | 2B   | 2   |
| para-Aminobenzoic acid                    | 000150-13-0 | Aminobenzoic acid                         |      | 3    |     |
| 4-Aminodiphenyl                           | 000092-67-1 | Aminodiphenyl                             | X    | 1    | 1   |
| 2-Aminonaphthalene                        | 000091-59-8 | Aminonaphthalene                          |      |      | 1   |
| 11-Aminoundecanoic acid                   | 002432-99-7 | Aminoundecanoic acid                      |      | 3    |     |
| Amitrole                                  | 000061-82-5 | Amitrole                                  |      | 2B   | 2   |
| Ampicillin                                | 000069-53-4 | Ampicillin                                |      | 3    |     |
| Amsacrine                                 | 051264-14-3 | Amsacrine                                 |      | 2B   |     |
| Analgesic mixtures containing phenacetin  | --          | Analgesic mixtures containing phenacetin  |      | 1    | 1   |
| Androgenic (anabolic) steroids            | --          | Androgenic (anabolic) steroids            |      | 2A   |     |
| Anesthetics, volatile                     | --          | Anesthetics, volatile                     |      | 3    |     |
| Angelicin polus ultraviolet A radiation   | 000523-50-2 | Angelicin polus ultraviolet A radiation   |      | 3    |     |
| Aniline                                   | 000062-53-3 | Aniline                                   |      | 3    |     |
| ortho-Anisidine                           | 000090-04-0 | Anisidine                                 |      | 2B   |     |
| para-Anisidine                            | 000104-94-9 | Anisidine                                 |      | 3    |     |
| o-Anisidine hydrochloride                 | 000134-29-2 | Anisidine hydrochloride                   |      | 2B   | 2   |
| Anthanthrene                              | 000191-26-4 | Anthanthrene                              |      | 3    |     |
| Anthracene                                | 000120-12-7 | Anthracene                                |      | 3    |     |
| Anthranilic acid                          | 000118-92-3 | Anthranilic acid                          |      | 3    |     |
| Antimony trioxide production              | 001309-64-4 | Antimony trioxide production              |      | 2B   |     |
| Antimony trisulfide                       | 001345-04-6 | Antimony trisulfide                       |      | 3    |     |
| Apholate                                  | 000052-46-0 | Apholate                                  |      | 3    |     |
| para-Aramid fibriis                       | 024938-64-5 | Aramid fibriis                            |      | 3    |     |
| Aramite                                   | 000140-57-8 | Aramite                                   |      | 2B   |     |
| Aroclor (under Polychlorinated Biphenyls) | --          | Aroclor (under Polychlorinated Biphenyls) |      |      | 2   |
| Aroclor 1254                              | 011097-69-1 | Aroclor 1254                              |      |      | 2   |
| Aroclor 1260                              | 011096-82-5 | Aroclor 1260                              |      |      | 2   |
| Arsenic acid, calcium salt                | 010103-62-5 | Arsenic acid, calcium salt                |      | 1    |     |
| Arsenic acid, calcium salt (2:3)          | 007778-44-1 | Arsenic acid, calcium salt (2:3)          |      | 1    |     |
| Arsenic and compounds                     | 007440-38-2 | Arsenic and compounds                     | X    | 1    |     |
| Arsenic compounds, inorganic              | --          | Arsenic compounds, inorganic              |      |      | 1   |
| Arsenic trioxide                          | 001327-53-3 | Arsenic trioxide                          |      | 1    |     |
| Arsenious acid, monosodium salt           | 007784-46-5 | Arsenious acid, monosodium salt           |      | 1    |     |
| Asbestos                                  | 001332-21-4 | Asbestos                                  | X    | 1    | 1   |
| Asbestos, Actinolite                      | 077536-66-4 | Asbestos, Actinolite                      | X    | 1    |     |
| Asbestos, Amosite                         | 012172-73-5 | Asbestos, Amosite                         |      | 1    |     |
| Asbestos, Anthophyllite                   | 077536-67-5 | Asbestos, Anthophyllite                   | X    | 1    |     |
| Asbestos, Chrysotile                      | 012001-29-5 | Asbestos, Chrysotile                      |      | 1    |     |
| Asbestos, Crocidolite                     | 012001-28-4 | Asbestos, Crocidolite                     |      | 1    |     |
| Asbestos, Tremolite                       | 077536-68-6 | Asbestos, Tremolite                       | X    | 1    |     |
| Atrazine                                  | 001912-24-9 | Atrazine                                  |      | 3    |     |
| Auramine (technical-grade)                | 000492-80-8 | Auramine (technical-grade)                |      | 2B   |     |
| Auramine, manufacture of                  | --          | Auramine, manufacture of                  |      | 1    |     |
| Aurothioglucose                           | 012192-57-3 | Aurothioglucose                           |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name                     | CAS #       | Alternate Name                         | OSHA | IARC | NTP |
|-----------------------------------|-------------|--|------|------|-----|
| Azacitidine                       | 000320-67-2 | Azacitidine                            |      | 2A   | 2   |
| Azaserine                         | 000115-02-6 | Azaserine                              |      | 2B   |     |
| Azathioprine                      | 000446-86-6 | Azathioprine                           |      | 1    | 1   |
| Aziridine                         | 000151-56-4 | Aziridine                              |      | 2B   |     |
| 2-(1-Aziridinyl)ethanol           | 001072-52-2 | Aziridinyl)ethanol                     |      | 3    |     |
| Aziridyl benzoquinone             | 000800-24-8 | Aziridyl benzoquinone                  |      | 3    |     |
| Azobenzene                        | 000103-33-3 | Azobenzene                             |      | 3    |     |
| BCNU                              | 000154-93-8 | BCNU                                   |      |      | 2   |
| Benz[a]acridine                   | 000225-11-6 | Benz[a]acridine                        |      | 3    |     |
| Benz[a]anthracene                 | 000056-55-3 | Benz[a]anthracene                      |      | 2A   | 2   |
| Benz[c]acridine                   | 000225-51-4 | Benz[c]acridine                        |      | 3    |     |
| Benzal chloride                   | 000098-87-3 | Benzal chloride                        |      | 2B   |     |
| Benzene                           | 000071-43-2 | Benzene                                | X    | 1    | 1   |
| Benzidine                         | 000092-87-5 | Benzidine                              | X    | 1    | 1   |
| Benzidine-based dyes              | 000092-87-5 | Benzidine-based dyes                   |      | 2A   |     |
| Benzo(g,h,i)perylene              | 000191-24-2 | Benzo(g,h,i)perylene                   |      | 3    |     |
| Benzo[a]fluorene                  | 000238-84-6 | Benzo[a]fluorene                       |      | 3    |     |
| Benzo[a]pyrene                    | 000050-32-8 | Benzo[a]pyrene                         |      | 2A   | 2   |
| Benzo[b]fluoranthene              | 000205-99-2 | Benzo[b]fluoranthene                   |      | 2B   | 2   |
| Benzo[b]fluorene                  | 000243-17-4 | Benzo[b]fluorene                       |      | 3    |     |
| Benzo[c]fluorene                  | 000205-12-9 | Benzo[c]fluorene                       |      | 3    |     |
| Benzo[c]phenanthrene              | 000195-19-7 | Benzo[c]phenanthrene                   |      | 3    |     |
| Benzo[e]pyrene                    | 000192-97-2 | Benzo[e]pyrene                         |      | 3    |     |
| Benzo[ghi]fluoranthene            | 000203-12-3 | Benzo[ghi]fluoranthene                 |      | 3    |     |
| Benzo[j]fluoranthene              | 000205-82-3 | Benzo[j]fluoranthene                   |      | 2B   | 2   |
| Benzo[k]fluoranthene              | 000207-08-9 | Benzo[k]fluoranthene                   |      | 2B   | 2   |
| Benzofuran                        | 000271-89-6 | Benzofuran                             |      | 2B   |     |
| para-Benzoquinone dioxime         | 000105-11-3 | Benzoquinone dioxime                   |      | 3    |     |
| Benzotrichloride                  | 000098-07-7 | Benzotrichloride                       |      | 2A   | 2   |
| Benzoyl chloride                  | 000098-88-4 | Benzoyl chloride                       |      | 3    |     |
| Benzoyl peroxide                  | 000094-36-0 | Benzoyl peroxide                       |      | 3    |     |
| Benzyl acetate                    | 000140-11-4 | Benzyl acetate                         |      | 3    |     |
| Benzyl chloride                   | 000100-44-7 | Benzyl chloride                        |      | 2A   |     |
| Benzyl violet 4B                  | 001694-09-3 | Benzyl violet 4B                       |      | 2B   |     |
| Beryl Ore                         | 001302-52-9 | Beryl Ore                              |      |      | 2   |
| Beryllium Phosphate               | 013598-15-7 | Beryllium Phosphate                    |      |      | 2   |
| Beryllium aluminum alloy          | 012770-50-2 | Beryllium aluminum alloy               |      |      | 2   |
| Beryllium and beryllium compounds | 007440-41-7 | Beryllium and beryllium compounds      |      | 1    |     |
| Beryllium chloride                | 007787-47-5 | Beryllium chloride                     |      |      | 2   |
| Beryllium fluoride                | 007787-49-7 | Beryllium fluoride                     |      |      | 2   |
| Beryllium hydroxide               | 013327-32-7 | Beryllium hydroxide                    |      |      | 2   |
| Beryllium oxide                   | 001304-56-9 | Beryllium oxide                        |      | 1    | 2   |
| Beryllium oxide carbonate         | 066104-24-3 | Beryllium oxide carbonate              |      | 1    |     |
| Beryllium sulfate                 | 013510-49-1 | Beryllium sulfate                      |      | 1    | 2   |
| Beryllium sulfate tetrahydrate    | 007787-56-6 | Beryllium sulfate tetrahydrate (1:1:4) |      | 1    | 2   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| (1:1:4)   |             |   |      |      |     |
| Beryllium zinc silicate                                   | 039413-47-3 | Beryllium zinc silicate                                   |      | 1    | 2   |
| Betel quid with tobacco                                   | --          | Betel quid with tobacco                                   |      | 1    |     |
| Bis (2-chloroethyl) ether                                 | 000106-46-7 | Bis (2-chloroethyl) ether                                 |      | 3    |     |
| Bis(1-aziridinyl) morpholinophosphine sulfide             | 002168-68-5 | Bis(1-aziridinyl)morpholinophosphine sulfide              |      | 3    |     |
| Bis(2,3-epoxycyclopentyl)ether                            | 002386-90-5 | Bis(2,3-epoxycyclopentyl)ether                            |      | 3    |     |
| N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine)   | 000494-03-1 | Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine)       |      | 1    |     |
| Bis(2-chloroisopropyl)ether                               | 000108-60-1 | Bis(2-chloroisopropyl)ether                               |      | 3    |     |
| Bis(2-ethylhexyl) phthalate                               | 000117-81-7 | Bis(2-ethylhexyl) phthalate                               |      |      | 2   |
| 2,2-Bis(bromomethyl)propane-1,3-diol                      | 003296-90-0 | Bis(bromomethyl)propane-1,3-diol                          |      | 2B   |     |
| 1,2-Bis(chloromethoxy)ethane                              | 013483-18-6 | Bis(chloromethoxy)ethane                                  |      | 3    |     |
| 1,4-Bis(chloromethoxymethyl)benzene                       | 056894-91-8 | Bis(chloromethoxymethyl)benzene                           |      | 3    |     |
| Bischloroethyl nitrosourea (BCNU)                         | 000154-93-8 | Bischloroethyl nitrosourea (BCNU)                         |      | 2A   | 2   |
| Bisphenol A diglycidyl ether                              | 001675-54-3 | Bisphenol A diglycidyl ether                              |      | 3    |     |
| Bisulfites  | --          | Bisulfites  |      | 3    |     |
| Bitumens, extracts of steam-refined and air-refined       | 008052-42-4 | Bitumens, extracts of steam-refined and air-refined       |      | 2B   |     |
| Bitumens, steam-refined, cracking-residue and air-refined | 008052-42-4 | Bitumens, steam-refined, cracking-residue and air-refined |      | 3    |     |
| Bleomycins  | 011056-06-7 | Bleomycins  |      | 2B   |     |
| Blue VRS  | 000129-17-9 | Blue VRS  |      | 3    |     |
| Boot and shoe manufacture and repair                      | --          | Boot and shoe manufacture and repair                      |      | 1    |     |
| Bracken fern  | --          | Bracken fern  |      | 2B   |     |
| Brilliant blue FCF, disodium salt                         | 003844-45-9 | Brilliant blue FCF, disodium salt                         |      | 3    |     |
| Bromochloroacetonitrile                                   | 083463-62-1 | Bromochloroacetonitrile                                   |      | 3    |     |
| Bromodichloromethane                                      | 000075-27-4 | Bromodichloromethane                                      |      | 2B   | 2   |
| Bromoethane   | 000074-96-4 | Bromoethane   |      | 3    |     |
| Bromoform   | 000075-25-2 | Bromoform   |      | 3    |     |
| 1,3-Butadiene   | 000106-99-0 | Butadiene   | X    | 2A   | 1   |
| 1,4-Butanediol dimethanesulfonate (Busulphan;Myleran)     | 000055-98-1 | Butanediol dimethanesulfonate (Busulphan;Myleran)         |      | 1    | 1   |
| n-Butyl acrylate  | 000141-32-2 | Butyl acrylate  |      | 3    |     |
| Butylated hydroxyanisole (BHA)                            | 025013-16-5 | Butylated hydroxyanisole (BHA)                            |      | 2B   | 2   |
| Butylated hydroxytoluene (BHT)                            | 000128-37-0 | Butylated hydroxytoluene (BHT)                            |      | 3    |     |
| beta-Butyrolactone  | 003068-88-0 | Butyrolactone   |      | 2B   |     |
| gamma-Butyrolactone                                       | 000096-48-0 | Butyrolactone, gamma                                      |      | 3    |     |
| C.I. Acid Red 114   | 006459-94-5 | C.I. Acid Red 114   |      | 2B   |     |
| C.I. Basic Red 9  | 000569-61-9 | C.I. Basic Red 9  |      | 2B   | 2   |
| C.I. Direct blue 15                                       | 002429-74-5 | C.I. Direct blue 15                                       |      | 2B   |     |
| CCNU  | 013010-47-4 | CCNU  |      |      | 2   |
| CI Acid Orange 3  | 006373-74-6 | CI Acid Orange 3  |      | 3    |     |
| CI Pigment Red 3  | 002425-85-6 | CI Pigment Red 3  |      | 3    |     |
| Cadmium   | 007440-43-9 | Cadmium   |      | 1    | 1   |
| Cadmium chloride  | 010108-64-2 | Cadmium chloride  |      |      | 1   |
| Cadmium compounds   | 007440-43-9 | Cadmium compounds   |      | 1    | 1   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|--|-------------|---|------|------|-----|
| Cadmium oxide  | 001306-19-0 | Cadmium fume (as Cd)  |      |      | 1   |
| Cadmium sulfate (1:1)  | 010124-36-4 | Cadmium sulfate (1:1)   |      |      | 1   |
| Cadmium sulfide  | 001306-23-6 | Cadmium sulfide   |      |      | 1   |
| Caffeic acid   | 000331-39-5 | Caffeic acid  |      | 2B   |     |
| Caffeine   | 000058-08-2 | Caffeine  |      | 3    |     |
| Cantharidin  | 000056-25-7 | Cantharidin   |      | 3    |     |
| Caprolactam  | 000105-60-2 | Caprolactam   |      | 4    |     |
| Captafol   | 002425-06-1 | Captafol  |      | 2A   |     |
| Captan   | 000133-06-2 | Captan  |      | 3    |     |
| Carbaryl   | 000063-25-2 | Carbaryl  |      | 3    |     |
| Carbazole  | 000086-74-8 | Carbazole   |      | 3    |     |
| 3-Carbethoxypsoralen   | 020073-24-9 | Carbethoxypsoralen  |      | 3    |     |
| Carbon black   | 001333-86-4 | Carbon black  |      | 2B   |     |
| Carbon tetrachloride   | 000056-23-5 | Carbon tetrachloride  |      | 2B   | 2   |
| Carmoisine   | 003567-69-9 | Carmoisine  |      | 3    |     |
| Carpentry and joinery  | --          | Carpentry and joinery   |      | 2B   |     |
| Carrageenan, degraded  | 009000-07-1 | Carrageenan, degraded   |      | 2B   |     |
| Carrageenan, native  | 009000-07-1 | Carrageenan, native   |      | 3    |     |
| Catechol   | 000120-80-9 | Catechol  |      | 2B   |     |
| Ceramic fibres   | --          | Ceramic fibres  |      | 2B   | 2   |
| Chloral  | 000075-87-6 | Chloral   |      | 3    |     |
| Chloral hydrate  | 000302-17-0 | Chloral hydrate   |      | 3    |     |
| Chlorambucil   | 000305-03-3 | Chlorambucil  |      | 1    | 1   |
| Chloramphenicol  | 000056-75-7 | Chloramphenicol   |      | 2A   |     |
| Chlordane  | 000057-74-9 | Chlordane   |      | 2B   |     |
| Chlordecone (Kepone)   | 000143-50-0 | Chlordecone (Kepone)  |      | 2B   | 2   |
| Chlordimeform  | 006164-98-3 | Chlordimeform   |      | 3    |     |
| Chlorendic acid  | 000115-28-6 | Chlorendic acid   |      | 2B   | 2   |
| Chlorinated drinking-water   | --          | Chlorinated drinking-water  |      | 3    |     |
| Chlorinated paraffins (C12, 60% Chlorine)  | 108171-26-2 | Chlorinated paraffins (C12, 60% Chlorine)   |      | 2B   | 2   |
| Chlorinated paraffins of average carbon chain length C12 and average degree of chlorination approximately 60%            | --          | Chlorinated paraffins of average carbon chain length C12 and average degree of chlorination approximately 60% |      | 2B   |     |
| alpha-Chlorinated toluenes (Benzal chloride, Benzyl chloride, Benzotrichloride)and bonzoyl chloride (combined exposures) | --          | Chlorinated toluenes (Benzyl chloride, Benzal chloride, Benzotrichloride)                                     |      | 2A   |     |
| 2-Chloro-1,1,1-trifluoroethane (HCFC-133a)   | 000075-88-7 | Chloro-1,1,1-trifluoroethane (HCFC-133a)  |      | 3    |     |
| 1-Chloro-2-methyl propene  | 000513-37-1 | Chloro-2-methyl propene   |      | 2B   | 2   |
| 3-Chloro-2-methylpropene   | 000563-47-3 | Chloro-2-methylpropene  |      | 3    | 2   |
| 4-Chloro-metaphenylenediamine  | 005131-60-2 | Chloro-metaphenylenediamine   |      | 3    |     |
| 4-Chloro-o-toluidine hydrochloride   | 003165-93-3 | Chloro-o-toluidine hydrochloride  |      | 2A   | 2   |
| 4-Chloro-ortho-phenylenediamine  | 000095-83-0 | Chloro-ortho-phenylenediamine   |      | 2B   | 2   |
| para-Chloro-ortho-toluidine  | 000095-69-2 | Chloro-ortho-toluidine  |      |      | 2   |
| para-Chloro-ortho-toluidine  | 000095-69-2 | Chloro-ortho-toluidine  |      | 2A   |     |
| 5-Chloro-ortho-toluidine   | 000095-79-4 | Chloro-ortho-toluidine  |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| para-Chloro-ortho-toluidine and its strong acid salts                           | 000095-69-2 | Chloro-ortho-toluidine and its strong acid salts                           |      | 2A   |     |
| Chloroacetonitrile  | 000107-14-2 | Chloroacetonitrile   |      | 3    |     |
| para-Chloroaniline  | 000106-47-8 | Chloroaniline  |      | 2B   |     |
| Chlorobenzilate   | 000510-15-6 | Chlorobenzilate  |      | 3    |     |
| Chlorodibromomethane  | 000124-48-1 | Chlorodibromomethane   |      | 3    |     |
| Chlorodifluoromethane   | 000075-45-6 | Chlorodifluoromethane  |      | 3    |     |
| Chloroethane  | 000075-00-3 | Chloroethane   |      | 3    |     |
| 1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosoarea (Methyl-CCNU; Semustine) | 013909-09-6 | Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosoarea (Methyl-CCNU; Semustine) |      | 1    | 1   |
| 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosoarea (CCNU)                             | 013010-47-4 | Chloroethyl)-3-cyclohexyl-1-nitrosoarea (CCNU)                             |      | 2A   | 2   |
| Chlorofluoromethane [HCFC-31]   | 000593-70-4 | Chlorofluoromethane [HCFC-31]  |      | 3    |     |
| Chloroform  | 000067-66-3 | Chloroform   |      | 2B   | 2   |
| Chloromethyl methyl ether (technical-grade)                                     | 000107-30-2 | Chloromethyl methyl ether (technical-grade)                                | X    | 1    | 1   |
| Bis(chloromethyl)ether (technical grade)  | 000542-88-1 | Chloromethyl)ether (technical grade)                                       | X    | 1    | 1   |
| Chloronitrobenzenes   | 000088-73-3 | Chloronitrobenzenes  |      | 3    |     |
| Chloronitrobenzenes   | 000100-00-5 | Chloronitrobenzenes  |      | 3    |     |
| Chloronitrobenzenes   | 000121-73-3 | Chloronitrobenzenes  |      | 3    |     |
| Chlorophenoxy herbicides  | --          | Chlorophenoxy herbicides   |      | 2B   |     |
| Chloroprene   | 000126-99-8 | Chloroprene  |      | 2B   | 2   |
| Chloropropham   | 000101-21-3 | Chloropropham  |      | 3    |     |
| Chloroquine   | 000054-05-7 | Chloroquine  |      | 3    |     |
| Chlorothalonil  | 001897-45-6 | Chlorothalonil   |      | 2B   |     |
| Chlorozotocin   | 054749-90-5 | Chlorozotocin  |      | 2A   | 2   |
| Cholesterol   | 000057-88-5 | Cholesterol  |      | 3    |     |
| Chromate(1-), Hydroxyoctaoxidizincatedi-, Potassium                             | 011103-86-9 | Chromate(1-), Hydroxyoctaoxidizincatedi-, Potassium                        |      | 1    |     |
| Chromium (III) compounds  | --          | Chromium (III) compounds   |      | 3    |     |
| Chromium (VI) chloride  | 014986-48-2 | Chromium (VI) chloride   |      | 1    |     |
| Chromium (VI) compounds   | --          | Chromium (VI) compounds  |      | 1    |     |
| Chromium (VI) dioxychloride   | 014977-61-8 | Chromium (VI) dioxychloride  |      | 1    |     |
| Chromium (III) oxide  | 001308-38-9 | Chromium 99(III) oxide   |      |      |     |
| Chromium hexavalent compounds (under Chromium and Certain Chromium Compounds)   | --          | Chromium hexavalent compounds  |      |      | 1   |
| Chromium(VI) oxide (1:3)  | 001333-82-0 | Chromium(VI) oxide (1:3)   |      | 1    | 1   |
| Chromium, metallic  | 007440-47-3 | Chromium, metallic   |      | 3    |     |
| Chrysene  | 000218-01-9 | Chrysene   |      | 3    |     |
| Chrysoidine   | 000532-82-1 | Chrysoidine  |      | 3    |     |
| Ciclosporin   | 079217-60-0 | Ciclosporin  |      | 1    |     |
| Ciclosporin   | 059865-13-3 | Ciclosporin  |      |      | 1   |
| Cimetidine  | 051481-61-9 | Cimetidine   |      | 3    |     |
| Cinnamyl anthranilate   | 000087-29-6 | Cinnamyl anthranilate  |      | 3    |     |
| Cinnamyl anthranilate   | 000087-29-6 | Cinnamyl anthranilate  |      | 3    |     |
| Cisplatin   | 015663-27-1 | Cisplatin  |      | 2A   | 2   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name                                   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| Citrinin   | 000518-75-2 | Citrinin   |      | 3    |     |
| Citrus red no.2  | 006358-53-8 | Citrus red no.2                                  |      | 2B   |     |
| Clofibrate   | 000637-07-0 | Clofibrate                                       |      | 3    |     |
| Clomiphene citrate   | 000050-41-9 | Clomiphene citrate                               |      | 3    |     |
| Clonorchis sinensis (infection with)   | --          | Clonorchis sinensis (infection with)             |      | 2A   |     |
| Coal dust  | --          | Coal dust  |      | 3    |     |
| Coal gasification  | --          | Coal gasification                                |      | 1    |     |
| Coal tar pitches   | 065996-93-2 | Coal tar pitches                                 |      | 1    |     |
| Coal tars  | 008007-45-2 | Coal tars  |      | 1    | 1   |
| Cobalt and cobalt compounds  | 007440-48-4 | Cobalt and cobalt compounds                      |      | 2B   |     |
| Coffee (urinary bladder) (NB: There is some evidence of an inverse relationship between coffee drinking and cancer of the large bowel; coffee drinking could not be classified as to its carcinogenicity to other organs.) | --          | Coffee   |      | 2B   |     |
| Coke oven emissions  | --          | Coke oven emissions                              | X    |      | 1   |
| Coke production  | --          | Coke production                                  | X    | 1    |     |
| Conjugated Estrogens   | 016680-47-0 | Conjugated Estrogens                             |      |      | 1   |
| Continuous glass filament  | --          | Continuous glass filament                        |      | 3    |     |
| Copper 8-hydroxyquinoline  | 010380-28-6 | Copper 8-hydroxyquinoline                        |      | 3    |     |
| Coronene   | 000191-07-1 | Coronene   |      | 3    |     |
| Coumarin   | 000091-64-5 | Coumarin   |      | 3    |     |
| Coumarin   | 000091-94-5 | Coumarin   |      | 3    |     |
| Creosote (coal)  | 008001-58-9 | Creosote   |      | 2A   | 1   |
| para-Cresidine   | 000120-71-8 | Cresidine  |      | 2B   | 2   |
| Cresoate, wood   | 008021-39-4 | Cresoate, wood                                   |      |      | 1   |
| Cristobalite (under Silica, Crystalline (Respirable Size))   | 014464-46-1 | Cristobalite                                     |      |      | 1   |
| Crotonaldehyde   | 004170-30-3 | Crotonaldehyde                                   |      | 3    |     |
| Cupferron  | 000135-20-6 | Cupferron  |      |      | 2   |
| Cycasin  | 014901-08-7 | Cycasin  |      | 2B   |     |
| Cyclamates (Sodium cyclamate)  | 000139-05-9 | Cyclamates (Sodium cyclamate)                    |      | 3    |     |
| Cyclochlorotine  | 012663-46-6 | Cyclochlorotine                                  |      | 3    |     |
| Cyclohexanone  | 000108-94-1 | Cyclohexanone                                    |      | 3    |     |
| Cyclopenta(cd)pyrene   | 027208-37-3 | Cyclopenta(cd)pyrene                             |      | 3    |     |
| Cyclophosphamide   | 000050-18-0 | Cyclophosphamide                                 |      | 1    | 1   |
| Cyclophosphamide   | 006055-19-2 | Cyclophosphamide                                 |      | 1    |     |
| Cyclosporin A  | 059865-13-3 | Cyclosporin A                                    |      | 1    | 1   |
| Cyclosporine A   | 059865-13-3 | Cyclosporine A                                   |      |      | 1   |
| D & C red no. 9  | 005160-02-1 | D & C red no. 9                                  |      | 3    |     |
| DDT  | 000050-29-3 | DDT  |      | 2B   | 2   |
| DEHP   | 000117-81-7 | DEHP   |      |      | 2   |
| DEN  | 000055-18-5 | DEN  |      |      | 2   |
| DMN  | 000062-75-9 | DMN  |      |      | 2   |
| Dacarbazine  | 004342-03-4 | Dacarbazine                                      |      | 2B   | 2   |
| Danthron (Chrysazin; 1,8-Dihydroxyanthraquinone)   | 000117-10-2 | Danthron (Chrysazin; 1,8-Dihydroxyanthraquinone) |      | 2B   | 2   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name                                      | CAS #       | Alternate Name                      | OSHA | IARC | NTP |
|--|-------------|-------------------------------------|------|------|-----|
| Dapsone  | 000080-08-0 | Dapsone                             |      | 3    |     |
| Daunomycin   | 020830-81-3 | Daunomycin                          |      | 2B   |     |
| Decabromobiphenyl (Under Polybrominated Biphenyls) | 013654-09-6 | Decabromobiphenyl                   |      |      | 2   |
| Decabromodiphenyl oxide                            | 001163-19-5 | Decabromodiphenyl oxide             |      | 3    |     |
| Deltamethrin                                       | 052918-63-5 | Deltamethrin                        |      | 3    |     |
| Di(2-ethylhexyl) adipate                           | 000103-23-1 | Di(2-ethylhexyl) adipate            |      | 3    |     |
| Di(2-ethylhexyl) phthalate                         | 000117-81-7 | Di(2-ethylhexyl) phthalate          |      | 2B   | 2   |
| Di(2-ethylhexyl) phthalate                         | 000117-81-7 | Di(2-ethylhexyl) phthalate          |      | 3    |     |
| Di-2-ethylhexyl adipate                            | 000103-23-1 | Di-2-ethylhexyl adipate             |      | 3    |     |
| Diacetylaminoazotoluene                            | 000083-63-6 | Diacetylaminoazotoluene             |      | 3    |     |
| N,N'-Diacetylbenzidine                             | 000613-35-4 | Diacetylbenzidine                   |      | 2B   |     |
| Diallate   | 002303-16-4 | Diallate                            |      | 3    |     |
| 1,4-Diamino-2-nitrobenzene                         | 005307-14-2 | Diamino-2-nitrobenzene              |      | 3    |     |
| 1,2-Diamino-4-nitrobenzene                         | 000099-56-9 | Diamino-4-nitrobenzene              |      | 3    |     |
| 2,4-Diaminoanisole (and its salts)                 | 000615-05-4 | Diaminoanisole (and its salts)      |      | 2B   |     |
| 2,4-Diaminoanisole sulfate                         | 039156-41-7 | Diaminoanisole sulfate              |      |      | 2   |
| 4,4'-Diaminodiphenyl ether                         | 000101-80-4 | Diaminodiphenyl ether               |      | 2B   | 2   |
| 2,4-Diaminotoluene                                 | 000095-80-7 | Diaminotoluene                      |      | 2B   | 2   |
| 2,5-Diaminotoluene                                 | 000095-70-5 | Diaminotoluene                      |      | 3    |     |
| Diazepam   | 000439-14-5 | Diazepam                            |      | 3    |     |
| Diazomethane                                       | 000334-88-3 | Diazomethane                        |      | 3    |     |
| Dibenz(a,h)acridine                                | 000226-36-8 | Dibenz(a,h)acridine                 |      | 2B   | 2   |
| Dibenz[a,c]anthracene                              | 000215-58-7 | Dibenz[a,c]anthracene               |      | 3    |     |
| Dibenz[a,h]anthracene                              | 000053-70-3 | Dibenz[a,h]anthracene               |      | 2A   | 2   |
| Dibenz[a,j]acridine                                | 000224-42-0 | Dibenz[a,j]acridine                 |      | 2B   | 2   |
| Dibenzo-para-dioxin                                | --          | Dibenzo-para-dioxin                 |      | 3    |     |
| Dibenzo[a,e]fluoranthene                           | 005385-75-1 | Dibenzo[a,e]fluoranthene            |      | 3    |     |
| Dibenzo[a,e]pyrene                                 | 000192-65-4 | Dibenzo[a,e]pyrene                  |      | 2B   | 2   |
| Dibenzo[a,h]pyrene                                 | 000189-64-0 | Dibenzo[a,h]pyrene                  |      | 2B   | 2   |
| Dibenzo[a,i]pyrene                                 | 000189-55-9 | Dibenzo[a,i]pyrene                  |      | 2B   | 2   |
| Dibenzo[a,l]pyrene                                 | 000191-30-0 | Dibenzo[a,l]pyrene                  |      | 2B   | 2   |
| 7H-Dibenzo[c,g]carbazole                           | 000194-59-2 | Dibenzo[c,g]carbazole               |      | 2B   | 2   |
| Dibenzo[h,rst]pentaphene                           | 000192-47-2 | Dibenzo[h,rst]pentaphene            |      | 3    |     |
| 1,2-Dibromo-3-chloropropane (DBCP)                 | 000096-12-8 | Dibromo-3-chloropropane (DBCP)      | X    | 2B   | 2   |
| Dibromoacetonitrile                                | 003252-43-5 | Dibromoacetonitrile                 |      | 3    |     |
| 1,2-Dibromoethane                                  | 000106-93-4 | Dibromoethane                       |      |      | 2   |
| 2,3-Dibromopropan-1-ol                             | 000096-13-9 | Dibromopropan-1-ol                  |      | 2B   |     |
| 3,3'-Dichloro-4,4'-diaminodiphenyl ether           | 028434-86-8 | Dichloro-4,4'-diaminodiphenyl ether |      | 2B   |     |
| 2,6-Dichloro-para-phenylenediamine                 | 000609-20-1 | Dichloro-para-phenylenediamine      |      | 3    |     |
| Dichloroacetic acid                                | 000079-43-6 | Dichloroacetic acid                 |      | 3    |     |
| Dichloroacetonitrile                               | 003018-12-0 | Dichloroacetonitrile                |      | 3    |     |
| Dichloroacetylene                                  | 007572-29-4 | Dichloroacetylene                   |      | 3    |     |
| ortho-dichlorobenzene                              | 000095-50-1 | Dichlorobenzene                     |      | 3    |     |
| m-Dichlorobenzene                                  | 000541-73-1 | Dichlorobenzene, m                  |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name                                       | CAS #       | Alternate Name                                 | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| para-Dichlorobenzene                                | 000106-46-7 | Dichlorobenzene, para                          |      | 2B   | 2   |
| 3,3'-Dichlorobenzidene                              | 000091-94-1 | Dichlorobenzidene                              | X    | 2B   | 2   |
| 3,3'-Dichlorobenzidine dihydrochloride              | 000612-83-9 | Dichlorobenzidine dihydrochloride              |      |      | 2   |
| Trans 1,4-dichlorobutene                            | 000110-57-6 | Dichlorobutene                                 |      | 3    |     |
| Dichlorodiphenyl trichloroethane                    | 000050-29-3 | Dichlorodiphenyl trichloroethane               |      |      | 2   |
| 1,2-Dichloroethane                                  | 000107-06-2 | Dichloroethane                                 |      | 2B   | 2   |
| Dichloromethane                                     | 000075-09-2 | Dichloromethane                                |      | 2B   | 2   |
| 1,2-Dichloropropane                                 | 000078-87-5 | Dichloropropane                                |      | 3    |     |
| 1,3-Dichloropropene (technical-grade)               | 000542-75-6 | Dichloropropene (technical-grade)              |      | 2B   | 2   |
| Dichlorvos  | 000062-73-7 | Dichlorvos                                     |      | 2B   |     |
| Dichromic acid, Diammonium salt                     | --          | Dichromic acid, Diammonium salt                |      | 1    |     |
| Dicofol   | 000115-32-2 | Dicofol  |      | 3    |     |
| Didanosine  | 069655-05-6 | Didanosine                                     |      | 3    |     |
| N,N-Diehtyldithiocarbamic Acid 2-Chloroallyl Ester  | 000095-06-7 | Diehtyldithiocarbamic Acid                     |      |      | 2   |
| Dieldrin  | 000060-57-1 | Dieldrin                                       |      | 3    |     |
| Diepoxybutane                                       | 001464-53-5 | Diepoxybutane                                  |      |      | 2   |
| Diesel exhaust                                      | --          | Diesel exhaust                                 |      | 2A   |     |
| Diesel exhaust particulates                         | --          | Diesel exhaust particulates                    |      |      | 2   |
| Diesel fuel marine                                  | --          | Diesel fuel marine                             |      | 2B   |     |
| Diesel fuels, distillate (light)                    | --          | Diesel fuels, distillate (light)               |      | 2B   |     |
| Diethanolamine                                      | 000111-42-2 | Diethanolamine                                 |      | 3    |     |
| Diethyl sulfate                                     | 000064-67-5 | Diethyl sulfate                                |      | 2A   | 2   |
| 2,6-Diethylaniline                                  | 000579-66-8 | Diethylaniline (2,6-)                          |      |      |     |
| 1,2-Diethylhydrazine                                | 001615-80-1 | Diethylhydrazine                               |      | 2B   |     |
| Diethylnitrosamine                                  | 000055-18-5 | Diethylnitrosamine                             |      |      | 2   |
| Diethylstilbesterol (DES)                           | 000056-53-1 | Diethylstilbesterol (DES)                      |      | 1    | 1   |
| Diglycidyl resorcinol ether                         | 000101-90-6 | Diglycidyl resorcinol ether                    |      | 2B   | 2   |
| Dihydrosafrole                                      | 000094-58-6 | Dihydrosafrole                                 |      | 2B   |     |
| 1,8-Dihydroxyanthraquinone                          | 000117-10-2 | Dihydroxyanthraquinone                         |      |      | 2   |
| Dihydroxymethylfuratrizine                          | 000794-93-4 | Dihydroxymethylfuratrizine                     |      | 3    |     |
| Diisopropyl sulfate                                 | 002973-10-6 | Diisopropyl sulfate                            |      | 2B   |     |
| Dimethoxane   | 000828-00-2 | Dimethoxane                                    |      | 3    |     |
| 3,3'-Dimethoxybenzidine (ortho-Dianisidine)         | 000119-90-4 | Dimethoxybenzidine (ortho-Dianisidine)         |      | 2B   | 2   |
| 3,3'-Dimethoxybenzidine-4,4'-diisocyanate           | 000091-93-0 | Dimethoxybenzidine-4,4'-diisocyanate           |      | 3    |     |
| Dimethyl formamide                                  | 000540-73-8 | Dimethyl formamide                             |      | 3    |     |
| Dimethyl hydrogen phosphite                         | 000868-85-9 | Dimethyl hydrogen phosphite                    |      | 3    |     |
| Dimethyl sulfate                                    | 000077-78-1 | Dimethyl sulfate                               |      | 2A   | 2   |
| bis(Dimethylamino)benzophenone                      | 000090-94-8 | Dimethylamino)benzophenone                     |      |      | 2   |
| para-Dimethylaminoazobenzene                        | 000060-11-7 | Dimethylaminoazobenzene                        | X    | 2B   | 2   |
| 4-Dimethylaminoazobenzene                           | 000060-11-7 | Dimethylaminoazobenzene                        | X    | 2B   | 2   |
| para-Dimethylaminoazobenzenediazosodium sulfonate   | 000140-56-7 | Dimethylaminoazobenzenediazosodium sulfonate   |      | 3    |     |
| 4,5'-Dimethylangelicin plus ultraviolet A radiation | 004063-41-6 | Dimethylangelicin plus ultraviolet A radiation |      | 3    |     |

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| Chemical Name   | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| 4,4'-Dimethylangelicin plus ultraviolet A radiation                           | 022975-76-4 | Dimethylangelicin plus ultraviolet A radiation                            |      | 3    |     |
| N,n-Dimethylaniline   | 000121-69-7 | Dimethylaniline   |      | 3    |     |
| 3,3'-Dimethylbenzidine (o-Tolidine)   | 000119-93-7 | Dimethylbenzidine (o-Tolidine)  |      | 2B   | 2   |
| Dimethylcarbamoyl chloride  | 000079-44-7 | Dimethylcarbamoyl chloride  |      | 2A   | 2   |
| 1,1-Dimethylhydrazine   | 000057-14-7 | Dimethylhydrazine   |      | 2B   | 2   |
| Dimethylnitrosamine   | 000062-75-9 | Dimethylnitrosamine   |      |      | 2   |
| 1,4-Dimethylphenanthrene  | 022349-59-3 | Dimethylphenanthrene  |      | 3    |     |
| Dimethylvinyl chloride  | 000513-37-1 | Dimethylvinyl chloride  |      |      | 2   |
| 3,7-Dinitrofluorantene  | 105735-71-5 | Dinitrofluorantene  |      | 2B   |     |
| 3,9-Dinitrofluoranthene   | 022506-53-2 | Dinitrofluoranthene   |      | 3    |     |
| 1,6-Dinitropyrene   | 042397-64-8 | Dinitropyrene   |      | 2B   | 2   |
| 1,8-Dinitropyrene   | 042397-65-9 | Dinitropyrene   |      | 2B   | 2   |
| Dinitrosopentamethylene tetramine   | 000101-25-7 | Dinitrosopentamethylene tetramine   |      | 3    |     |
| 2,4-Dinitrotoluene  | 000121-14-2 | Dinitrotoluene  |      | 2B   |     |
| 3,5-Dinitrotoluene  | 000618-85-9 | Dinitrotoluene  |      | 3    |     |
| 1,3-Dinitropropylene  | 075321-20-9 | Dinitropropylene  |      | 3    |     |
| 1,4-Dioxane   | 000123-91-1 | Dioxane   |      | 2B   | 2   |
| 2,4'-Diphenyldiamine  | 000492-17-1 | Diphenyldiamine   |      | 3    |     |
| Direct black 38   | 001937-37-7 | Direct black 38   |      |      | 1   |
| Direct blue 6   | 002602-46-2 | Direct blue 6   |      |      | 1   |
| Disperse blue 1   | 002475-45-8 | Disperse blue 1   |      | 2B   | 2   |
| Disperse yellow 3   | 002832-40-8 | Disperse yellow 3   |      | 3    |     |
| Disulfiram  | 000097-77-8 | Disulfiram  |      | 3    |     |
| Dithranol   | 001143-38-0 | Dithranol   |      | 3    |     |
| Doxefazepam   | 040762-15-0 | Doxefazepam   |      | 3    |     |
| Doxorubicin hydrochloride (Adriamycin)  | 025316-40-9 | Doxorubicin hydrochloride (Adriamycin)                                    |      |      | 2   |
| Droloxifene   | 082413-20-5 | Droloxifene   |      | 3    |     |
| Dry cleaning, (occupational exposures in)                                     | --          | Dry cleaning, (occupational exposures in)                                 |      | 2B   |     |
| Dulcin  | 000150-69-6 | Dulcin  |      | 3    |     |
| Dyes that Metabolize to Benzidine   | --          | Dyes that Metabolize to Benzidine   |      |      | 1   |
| ENU   | 000759-73-9 | ENU   |      |      | 2   |
| Electric fields (extremely low-frequency)                                     | --          | Electric fields (extremely low-frequency)                                 |      | 3    |     |
| Electric fields (static)  | --          | Electric fields (static)  |      | 3    |     |
| Endrin  | 000072-20-8 | Endrin  |      | 3    |     |
| Engine exhaust, gasoline  | --          | Engine exhaust, gasoline  |      | 2B   |     |
| Environmental Tobacco Smoke   | --          | Environmental Tobacco Smoke   |      |      | 1   |
| Eosin   | 015086-94-9 | Eosin   |      | 3    |     |
| Epichlorohydrin   | 000106-89-8 | Epichlorohydrin   |      | 2A   | 2   |
| 3,4-Epoxy-6-methylcyclohexylmethyl-3,4-epoxy-6-methylcyclo-hexane carboxylate | 000141-37-7 | Epoxy-6-methylcyclohexylmethyl-3,4-epoxy-6-methylcyclo-hexane carboxylate |      | 3    |     |
| 1,2-Epoxybutane   | 000106-88-7 | Epoxybutane   |      | 2B   |     |
| Cis-9, 10-epoxystearic acid   | 002443-39-2 | Epoxystearic acid   |      | 3    |     |
| Epstein-Barr virus  | --          | Epstein-Barr virus  |      | 1    |     |
| Erionite  | 066733-21-9 | Erionite  |      | 1    | 1   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| Estazolam  | 029975-16-4 | Estazolam  |      | 3    |     |
| Estra-1,2,5(10),7-tetraen-17-one, 3-(sulfooxy)-, sodium salt   | 016680-47-0 | Estra-1,2,5(10),7-tetraen-17-one, 3-(sulfooxy)-, sodium salt   |      |      | 1   |
| Estrogens (not conjugated)   |             | Estrogens (not conjugated)   |      |      |     |
| Estradiol-17 beta  | 000050-28-2 | Estradiol-17beta   |      |      | 2   |
| Estrogens (not conjugated) Estrone   | 000053-16-7 | Estrogens (not conjugated) Estrone   |      |      | 2   |
| Estrogens (not conjugated)   |             | Estrogens (not conjugated)   |      |      |     |
| Ethinylestradiol   | 000057-63-6 | Ethinylestradiol   |      |      | 2   |
| Estrogens (not conjugated)   |             | Estrogens (not conjugated)   |      |      |     |
| Mestranol  | 000072-33-3 | Estrogens (not conjugated) Mestranol   |      |      | 2   |
| Ethionamide  | 000536-33-4 | Ethionamide  |      | 3    |     |
| Ethyl acrylate   | 000140-88-5 | Ethyl acrylate   |      | 2B   |     |
| Ethyl carbamate  | 000051-79-6 | Ethyl carbamate  |      |      | 2   |
| Ethyl methanesulfonate   | 000062-50-0 | Ethyl methanesulfonate   |      | 2B   | 2   |
| Ethyl selenac  | 005456-28-0 | Ethyl selenac  |      | 3    |     |
| Ethyl tellurac   | 020941-65-5 | Ethyl tellurac   |      | 3    |     |
| n-Ethyl-N-nitrosourea  | 000759-73-9 | Ethyl-N-nitrosourea  |      | 2A   | 2   |
| Ethylbenzene   | 000100-41-4 | Ethylbenzene   |      | 2B   |     |
| Ethylene   | 000074-85-1 | Ethylene   |      | 3    |     |
| Ethylene dibromide   | 000106-93-4 | Ethylene dibromide   |      | 2A   | 2   |
| Ethylene dichloride  | 000107-06-2 | Ethylene dichloride  |      |      | 2   |
| Ethylene oxide   | 000075-21-8 | Ethylene oxide   | X    | 1    | 1   |
| Ethylene sulfide   | 000420-12-2 | Ethylene sulfide   |      | 3    |     |
| Ethylene thiourea  | 000096-45-7 | Ethylene thiourea  |      | 2B   | 2   |
| Ethyleneimine  | 000151-56-4 | Ethyleneimine  | X    |      |     |
| 2-Ethylhexyl acrylate  | 000103-11-7 | Ethylhexyl acrylate  |      | 3    |     |
| Etoposide  | 033419-42-0 | Etoposide  |      | 2A   |     |
| Etoposide in combination with cisplatin and bleomycin  | 033419-42-0 | Etoposide in combination with cisplatin and bleomycin  |      |      | 1   |
| Eugenol  | 000097-53-0 | Eugenol  |      | 3    |     |
| Evans blue   | 000314-13-6 | Evans blue   |      | 3    |     |
| Fast green FCF   | 002353-45-9 | Fast green FCF   |      | 3    |     |
| Fenvalerate  | 051630-58-1 | Fenvalerate  |      | 3    |     |
| Ferbam   | 014484-64-1 | Ferbam   |      | 3    |     |
| Ferric oxide   | 001309-37-1 | Ferric oxide   |      | 3    |     |
| Firemaster BP-6 (under Polybrominated Biphenyls)   | --          | Firemaster BP-6  |      |      | 2   |
| Firemaster FF-1  | 067774-32-7 | Firemaster FF-1  |      |      | 2   |
| Flat-glass and specialty glass (manufacture of)  | --          | Flat-glass and specialty glass (manufacture of)  |      | 3    |     |
| Fluometuron  | 002164-17-2 | Fluometuron  |      | 3    |     |
| Fluoranthene   | 000206-44-0 | Fluoranthene   |      | 3    |     |
| Fluorene   | 000086-73-7 | Fluorene   |      | 3    |     |
| Fluorescent lighting   | --          | Fluorescent lighting   |      | 3    |     |
| Fluorides (inorganic, used in drinking-water]  | --          | Fluorides (inorganic, used in drinking-water]  |      |      | 3   |
| 5-Fluorouracil   | 000051-21-8 | Fluorouracil   |      | 3    |     |
| Foreign bodies, implanted in tissues; Metallic chromium or titanium, cobalt-based, chromium-based and titanium-based alloys, | --          | Foreign bodies, implanted in tissues; Metallic chromium or titanium, cobalt-based, chromium-based and titanium-based alloys, stainless steel and |      |      | 3   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| stainless steel and depleted uranium   |             | depleted uranium   |      |      |     |
| Foreign bodies, implanted in tissues; Metallic cobalt, metallic nickel and an alloy powder containing 66-67% nickel, 13-16% chromium and 7% iron | --          | Foreign bodies, implanted in tissues; Metallic cobalt, metallic nickel and an alloy powder containing 66-67% nickel, 13-16% chromium and 7% iron |      | 2B   |     |
| Foreign bodies, implanted in tissues; Metallic, prepared as thin smooth films  | --          | Foreign bodies, implanted in tissues; Metallic, prepared as thin smooth films  |      | 2B   |     |
| Foreign bodies, implanted in tissues; Polymeric, prepared as thin smooth films (with the exception of poly (glycolic acid )                      | --          | Foreign bodies, implanted in tissues; Polymeric, prepared as thin smooth films (with the exception of poly (glycolic acid )                      |      | 2B   |     |
| Formaldehyde (gas)   | 000050-00-0 | Formaldehyde (gas)   | X    | 2A   | 2   |
| 2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole  | 003570-75-0 | Formylhydrazino)-4-(5-nitro-2-furyl)thiazole   |      | 2B   |     |
| Fowler's solution  | 001332-10-1 | Fowler's solution  |      | 1    |     |
| Fuel oils, distillate (light)  | --          | Fuel oils, distillate (light)  |      | 3    |     |
| Fuel oils, residual (heavy)  | --          | Fuel oils, residual (heavy)  |      | 2B   |     |
| Furan  | 000110-00-9 | Furan  |      | 2B   | 2   |
| Furazolidone   | 000067-45-8 | Furazolidone   |      | 3    |     |
| Furfural   | 000098-01-1 | Furfural   |      | 3    |     |
| Furniture and cabinet making   | --          | Furniture and cabinet making   |      | 1    |     |
| Furosemide (Frusemide)   | 000054-31-9 | Furosemide (Frusemide)   |      | 3    |     |
| Gasoline   | 008006-61-9 | Gasoline   |      | 2B   |     |
| Gasoline   | --          | Gasoline   |      | 2B   |     |
| Gemfibrozil  | 025812-30-0 | Gemfibrozil  |      | 3    |     |
| Glass filaments  | --          | Glass filaments  |      | 3    |     |
| Glasswool  | --          | Glasswool  |      |      | 2   |
| Glu-P-1 (2-Amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole)   | 067730-11-4 | Glu-P-1 (2-Amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole)   |      | 2B   |     |
| Glu-P-2 (2-Aminodipyrido[1,2-a:3',2'-d]imidazole)  | 067730-10-3 | Glu-P-2 (2-Aminodipyrido[1,2-a:3',2'-d]imidazole)  |      | 2B   |     |
| Glycidaldehyde   | 000765-34-4 | Glycidaldehyde   |      | 2B   |     |
| Glycidol   | 000556-52-5 | Glycidol   |      |      | 2   |
| Glycidol   | 000556-52-5 | Glycidol   |      | 2A   |     |
| Glycidyl oleate  | 005431-33-4 | Glycidyl oleate  |      | 3    |     |
| Griseofulvin   | 000126-07-8 | Griseofulvin   |      | 2B   |     |
| Guinea green B   | 004680-78-8 | Guinea green B   |      | 3    |     |
| Glycidyl stearate  | 007460-84-6 | Glycidyl stearate  |      | 3    |     |
| Gyromitrin   | 016568-02-8 | Gyromitrin   |      | 3    |     |
| HC blue 1  | 002784-94-3 | HC blue 1  |      | 2B   |     |
| HC blue no. 2  | 033229-34-4 | HC blue no. 2  |      | 3    |     |
| HC red no. 3   | 002871-01-4 | HC red no. 3   |      | 3    |     |
| HC yellow no. 4  | 059820-43-8 | HC yellow no. 4  |      | 3    |     |
| Haematite  | 001317-60-8 | Haematite  |      | 3    |     |
| Haematite mining, underground, with exposure to radon  | 001317-60-8 | Haematite mining, underground, with exposure to radon  |      | 1    |     |
| Hair coloring products (personal use of)   | --          | Hair coloring products (personal use of)   |      | 3    |     |
| Hairdresser or barber (occupational  | --          | Hairdresser or barber (occupational  |      | 2A   |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| exposure as a)   |             | exposure as a)   |      |      |     |
| Helicobacter pylori (infection with)                             | --          | Helicobacter pylori (infection with)                             |      | 1    |     |
| Hematite mining (underground) with exposure to radon             | --          | Hematite mining (underground) with exposure to radon             |      | 1    |     |
| Hepatitis B virus (chronic infection with)                       | --          | Hepatitis B virus (chronic infection with)                       |      | 1    |     |
| Hepatitis C virus (chronic infection with)                       | --          | Hepatitis C virus (chronic infection with)                       |      | 1    |     |
| Hepatitis D virus (chronic infection with)                       | --          | Hepatitis D virus (chronic infection with)                       |      | 3    |     |
| Heptachlor   | 000076-44-8 | Heptachlor   | 2B   |      |     |
| Hexabromobiphenyl  | 067774-32-7 | Hexabromobiphenyl  |      |      | 2   |
| Hexachlorobenzene  | 000118-74-1 | Hexachlorobenzene  | 2B   |      | 2   |
| gamma-Hexachlorobenzene  | 000058-89-9 | Hexachlorobenzene, gamma   |      |      | 2   |
| Hexachlorobutadiene  | 000087-68-3 | Hexachlorobutadiene  | 3    |      |     |
| Hexachlorocyclohexane (all isomers)                              | 000608-73-1 | Hexachlorocyclohexane (all isomers)                              | 2B   |      | 2   |
| alpha-Hexachlorocyclohexane                                      | 000319-84-6 | Hexachlorocyclohexane, alpha                                     |      |      | 2   |
| beta-Hexachlorocyclohexane                                       | 000319-85-7 | Hexachlorocyclohexane, beta                                      |      |      | 2   |
| Hexachlorocyclohexanes   | --          | Hexachlorocyclohexanes   | 2B   |      | 2   |
| Hexachloroethane   | 000067-72-1 | Hexachloroethane   | 2B   |      | 2   |
| Hexachlorophene  | 000070-30-4 | Hexachlorophene  | 3    |      |     |
| Hexamethylphosphoramide  | 000680-31-9 | Hexamethylphosphoramide  | 2B   |      | 2   |
| Hot mate   | --          | Hot mate   | 2A   |      |     |
| Human T-cell lymphotropic virus type I                           | --          | Human T-cell lymphotropic virus type I                           |      | 1    |     |
| Human T-cell lymphotropic virus type II                          | --          | Human T-cell lymphotropic virus type II                          |      | 3    |     |
| Human immunodeficiency virus type 1 (infection with)             | --          | Human immunodeficiency virus type 1 (infection with)             |      | 1    |     |
| Human immunodeficiency virus type 2 (infection with)             | --          | Human immunodeficiency virus type 2 (infection with)             |      | 2B   |     |
| Human papillomavirus type 16                                     | --          | Human papillomavirus type 16                                     |      | 1    |     |
| Human papillomavirus type 18                                     | --          | Human papillomavirus type 18                                     |      | 1    |     |
| Human papillomavirus type 31                                     | --          | Human papillomavirus type 31                                     | 2A   |      |     |
| Human papillomavirus type 33                                     | --          | Human papillomavirus type 33                                     | 2A   |      |     |
| Human papillomaviruses : some types other than 16, 18, 31 and 33 | --          | Human papillomaviruses : some types other than 16, 18, 31 and 33 |      | 2B   |     |
| Hycanthone mesylate  | 023255-93-8 | Hycanthone mesylate  | 3    |      |     |
| Hydroxyurea  | 000127-07-1 | Hydroxyurea  | 3    |      |     |
| Hydrazine  | 000302-01-2 | Hydrazine  | 2B   |      | 2   |
| Hydrazine sulfate  | 010034-93-2 | Hydrazine sulfate  |      |      | 2   |
| Hydrazobenzene   | 000122-66-7 | Hydrazobenzene   |      |      | 2   |
| Hydrochloric acid  | 007647-01-0 | Hydrochloric acid  | 3    |      |     |
| Hydrochlorothiazide  | 000058-93-5 | Hydrochlorothiazide  | 3    |      |     |
| Hydrogen peroxide  | 007722-84-1 | Hydrogen peroxide  | 3    |      |     |
| Hydroquinone   | 000123-31-9 | Hydroquinone   | 3    |      |     |
| 4-Hydroxyazobenzene  | 001689-82-3 | Hydroxyazobenzene  | 3    |      |     |
| 8-Hydroxyquinoline   | 000148-24-3 | Hydroxyquinoline   | 3    |      |     |
| Hydroxysenkirkine  | 026782-43-4 | Hydroxysenkirkine  | 3    |      |     |
| Hypochlorite salts   | --          | Hypochlorite salts   | 3    |      |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| IQ (2-Amino-3-methylimidazo[4,5-f]quinoline)                     | 076180-96-6 | IQ (2-Amino-3-methylimidazo[4,5-f]quinoline)                     |      | 2A   |     |
| Indeno[1,2,3-cd]pyrene   | 000193-39-5 | Indeno[1,2,3-cd]pyrene   |      | 2B   | 2   |
| Inorganic-acid mists, containing Sulfuric Acid                   | --          | Inorganic-acid mists, containing Sulfuric Acid                   |      | 1    |     |
| Insulation glass wool  | --          | Insulation glass wool  |      |      |     |
| Iron and steel founding  | --          | Iron and steel founding  |      | 1    |     |
| Iron sorbitol-citric acid complex                                | 001338-16-5 | Iron sorbitol-citric acid complex                                |      | 3    |     |
| Iron-dextran complex   | 009004-66-4 | Iron-dextran complex   |      | 2B   | 2   |
| Iron-dextrin complex   | 009004-51-7 | Iron-dextrin complex   |      | 3    |     |
| Isatidine  | 015503-86-3 | Isatidine  |      | 3    |     |
| Isonicotinic acid hydrazide (Isoniazid)                          | 000054-85-3 | Isonicotinic acid hydrazide (Isoniazid)                          |      | 3    |     |
| Isophosphamide   | 003778-73-2 | Isophosphamide   |      | 3    |     |
| Isoprene   | 000078-79-5 | Isoprene   |      | 2B   | 2   |
| Isopropanol manufacture (strong acid process)                    | 000067-63-0 | Isopropanol manufacture (strong acid process)                    |      | 1    |     |
| Isopropanol or Isopropyl alcohol                                 | 000067-63-0 | Isopropanol or Isopropyl alcohol                                 |      | 3    |     |
| Isopropyl alcohol manufacture, strong-acid process               | 000067-63-0 | Isopropyl alcohol manufacture, strong-acid process               |      | 1    |     |
| Isopropyl oils   | --          | Isopropyl oils   |      | 3    |     |
| Isosafrole   | 000120-58-1 | Isosafrole   |      | 3    |     |
| Jacobine   | 006870-67-3 | Jacobine   |      | 3    |     |
| Jet fuel   | --          | Jet fuel   |      | 3    |     |
| Kaempferol   | 000520-18-3 | Kaempferol   |      | 3    |     |
| Kamachlor® 500   | 037317-41-2 | Kamachlor® 500   |      |      | 2   |
| Kaposi's sarcoma herpesvirus/human herpesvirus 8                 | --          | Kaposi's sarcoma herpesvirus/human herpesvirus 8                 |      | 2A   |     |
| Kepone®  | 000143-50-0 | Kepone®  |      |      | 2   |
| Lasiocarpine   | 000303-34-4 | Lasiocarpine   |      | 2B   |     |
| Lauroyl peroxide   | 000105-74-8 | Lauroyl peroxide   |      | 3    |     |
| Lead acetate   | 000301-04-2 | Lead acetate   |      |      | 2   |
| Lead and lead compounds  | 007439-92-1 | Lead and lead compounds  | X    | 2B   |     |
| Lead chromate (as Cr)  | 007758-97-6 | Lead chromate (as Cr)  |      |      | 1   |
| Lead phosphate   | 007446-27-7 | Lead phosphate   |      | 2B   | 2   |
| Lead, organo   | 000075-74-1 | Lead, organo   |      | 3    |     |
| Lead, organo   | 000078-00-2 | Lead, organo   |      | 3    |     |
| Leather goods manufacture  | --          | Leather goods manufacture  |      | 3    |     |
| Leather tanning and processing                                   | --          | Leather tanning and processing                                   |      | 3    |     |
| Light green SF   | 005141-20-8 | Light green SF   |      | 3    |     |
| d-Limonene   | 005989-27-5 | Limonene   |      | 3    |     |
| Lindane  | 000058-89-9 | Lindane  |      |      | 2   |
| Lindane and other hexachlorocyclohexane isomers                  | --          | Lindane and other hexachlorocyclohexane isomers                  |      |      | 2   |
| Lumber and sawmill industries (including logging)                | --          | Lumber and sawmill industries (including logging)                |      | 3    |     |
| Luteoskyrin  | 021884-44-6 | Luteoskyrin  |      | 3    |     |
| MBOCA  | 000101-14-4 | MBOCA  |      |      | 2   |
| MOPP and other combined chemotherapy including alkylating agents | --          | MOPP and other combined chemotherapy including alkylating agents |      | 1    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| Magenta (containing CI basic red 9)   | 000632-99-5 | Magenta (containing CI basic red 9)                        |      | 2B   |     |
| Magenta, manufacture of   | --          | Magenta, manufacture of                                    |      | 1    |     |
| Malathion   | 000121-75-5 | Malathion  |      | 3    |     |
| Maleic hydrazide  | 000123-33-1 | Maleic hydrazide   |      | 3    |     |
| Malonaldehyde   | 000542-78-9 | Malonaldehyde  |      | 3    |     |
| Maneb   | 012427-38-2 | Maneb  |      | 3    |     |
| Mannomustine dihydrochloride  | 000551-74-6 | Mannomustine dihydrochloride                               |      | 3    |     |
| MeCCNU (see 1-(2-Chloroethyl)-3-(4-methylhexyl)-1-nitrosourea)  | 013909-09-6 | MeCCNU   |      |      | 1   |
| Mea-alpha-c (2-Amino-3-methyl-9H-pyrido[2,3-b]indole)   | 068006-83-7 | Mea-alpha-c (2-Amino-3-methyl-9H-pyrido[2,3-b]indole)      |      | 2B   |     |
| Medphalan   | 013045-94-8 | Medphalan  |      | 3    |     |
| Medroxyprogesterone acetate   | 000071-58-9 | Medroxyprogesterone acetate                                |      | 2B   |     |
| MelQ (2-Amino-3,4-dimethylimidazo[4,5f]quinoline)   | 077094-11-2 | MelQ (2-Amino-3,4-dimethylimidazo[4,5f]quinoline)          |      | 2B   |     |
| MelQx (2-Amino-3,8-dimethylimidazo[4,5-f]quinoxaline)   | 077500-04-0 | MelQx (2-Amino-3,8-dimethylimidazo[4,5-f]quinoxaline)      |      | 2B   |     |
| Melamine  | 000108-78-1 | Melamine   |      | 3    |     |
| Melphalan   | 000148-82-3 | Melphalan  |      | 1    | 1   |
| 6-Mercaptopurine  | 000050-44-2 | Mercaptopurine   |      | 3    |     |
| Mercury and inorganic mercury compounds   | 007439-97-6 | Mercury and inorganic mercury compounds                    |      | 3    |     |
| Merphalan   | 000531-76-0 | Merphalan  |      | 2B   |     |
| Mestranol (under Estrogens (not conjugated))  | 000072-33-3 | Mestranol  |      |      | 2   |
| Meta-cresidine  | 000102-50-1 | Meta-cresidine   |      | 3    |     |
| Meta-phenylenediamine   | 000108-45-2 | Meta-phenylenediamine                                      |      | 3    |     |
| Metabisulfites  | --          | Metabisulfites   |      | 3    |     |
| Methotrexate  | 000059-05-2 | Methotrexate   |      | 3    |     |
| Methoxychlor  | 000072-43-5 | Methoxychlor   |      | 3    |     |
| 5-Methoxypsoralen   | 000484-20-8 | Methoxypsoralen  |      | 2A   |     |
| 8-Methoxypsoralen (Methoxsalen) plus UV radiation   | --          | Methoxypsoralen (Methoxsalen) plus UV radiation            |      | 1    |     |
| Methoxsalen (under Methoxsalen plus ultraviolet A radiation (PUVA))(methoxsalen not carcinogenic alone) | 000298-81-7 | Methoxypsoralen (Methoxsalen) plus ultraviolet A radiation |      | 1    | 1   |
| Methyl acrylate   | 000096-33-3 | Methyl acrylate  |      | 3    |     |
| 2-Methyl aziridine (Propyleneimine)   | 000075-55-8 | Methyl aziridine (Propyleneimine)                          |      | 2B   | 2   |
| Methyl bromide  | 000074-83-9 | Methyl bromide   |      | 3    |     |
| Methyl carbamate  | 000598-55-0 | Methyl carbamate   |      | 3    |     |
| Methyl chloride   | 000074-87-3 | Methyl chloride  |      | 3    |     |
| Methyl chloromethyl ether   | 000107-30-2 | Methyl chloromethyl ether                                  | X    | 1    | 1   |
| Methyl iodide   | 000074-88-4 | Methyl iodide  |      | 3    |     |
| Methyl mercury compounds  | --          | Methyl mercury compounds                                   |      | 2B   |     |
| Methyl methacrylate   | 000080-62-6 | Methyl methacrylate  |      | 3    |     |
| Methyl methanesulfonate   | 000066-27-3 | Methyl methanesulfonate                                    |      | 2A   | 2   |
| Methyl parathion  | 000298-00-0 | Methyl parathion   |      | 3    |     |
| Methyl red  | 000493-52-7 | Methyl red   |      | 3    |     |
| Methyl selenac  | 000144-34-3 | Methyl selenac   |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name                                    | CAS #       | Alternate Name                                 | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| Methyl tert-butyl ether (MTBE)                   | 001634-04-4 | Methyl tert-butyl ether                        |      | 3    |     |
| 2-Methyl-1-nitroanthraquinone (uncertain purity) | 000129-15-7 | Methyl-1-nitroanthraquinone (uncertain purity) |      | 2B   |     |
| n-Methyl-N'-nitro-N-nitrosoguanidine (MNNG)      | 000070-25-7 | Methyl-N'-nitro-N-nitrosoguanidine (MNNG)      |      | 2A   | 2   |
| n-Methyl-N-nitrosourea                           | 000684-93-5 | Methyl-N-nitrosourea                           |      | 2A   | 2   |
| n-Methyl-N-nitrosourethane                       | 000615-53-2 | Methyl-N-nitrosourethane                       |      | 2B   |     |
| n-Methyl-n,4-dinitrosoaniline                    | 000099-80-9 | Methyl-n,4-dinitrosoaniline                    |      | 3    |     |
| 5-Methylangelicin plus ultraviolet A radiation   | 073459-03-7 | Methylangelicin plus ultraviolet A radiation   |      | 3    |     |
| Methylazoxymethanol acetate                      | 000592-62-1 | Methylazoxymethanol acetate                    |      | 2B   |     |
| Methylazoxymethanol and its acetate              | 000590-96-5 | Methylazoxymethanol and its acetate            |      | 2B   |     |
| 1-Methylchrysene                                 | 003351-28-8 | Methylchrysene, 1-                             |      | 3    |     |
| 2-Methylchrysene                                 | 003351-32-4 | Methylchrysene, 2-                             |      | 3    |     |
| 3-Methylchrysene                                 | 003351-31-3 | Methylchrysene, 3-                             |      | 3    |     |
| 4-Methylchrysene                                 | 003351-30-2 | Methylchrysene, 4-                             |      | 3    |     |
| 5-Methylchrysene                                 | 003697-24-3 | Methylchrysene, 5-                             |      | 2B   | 2   |
| 6-Methylchrysene                                 | 001705-85-7 | Methylchrysene, 6-                             |      | 3    |     |
| 4,4'-Methylene bis(2-chloroaniline)(MBOCA)       | 000101-14-4 | Methylene bis(2-chloroaniline) (MOCA)          |      | 2A   | 2   |
| 4,4'-Methylene bis(2-methylaniline)              | 000838-88-0 | Methylene bis(2-methylaniline)                 |      | 2B   |     |
| 4,4'-Methylene bis(n,n-dimethyl)benzenamine      | 000101-61-1 | Methylene bis(n,n-dimethyl)benzenamine         |      | 3    | 2   |
| Methylene chloride                               | 000075-09-2 | Methylene chloride                             | X    |      | 2   |
| Methylene chloride, see Dichloromethane          | 000075-09-2 | Methylene chloride, see Dichloromethane        | X    |      | 2   |
| 4,4'-Methylenedianiline                          | 000101-77-9 | Methylenedianiline                             | X    | 2B   | 2   |
| 4,4'-Methylenedianiline dihydrochloride          | 013552-44-8 | Methylenedianiline dihydrochloride             |      |      | 2   |
| 4,4'-Methylenediphenyl diisocyanate              | 000101-68-8 | Methylenediphenyl diisocyanate                 |      | 3    |     |
| 3-Methylfluoranthene                             | 001706-01-0 | Methylfluoranthene                             |      | 3    |     |
| 2-Methylfluoranthene                             | 033543-31-6 | Methylfluoranthene                             |      | 3    |     |
| Methylglyoxal                                    | 000078-98-8 | Methylglyoxal                                  |      | 3    |     |
| n-Methylolacrylamide                             | 090456-67-0 | Methylolacrylamide                             |      | 3    |     |
| 1-Methylphenanthrene                             | 000832-69-9 | Methylphenanthrene                             |      | 3    |     |
| Methylthiouracil                                 | 000056-04-2 | Methylthiouracil                               |      | 2B   |     |
| Metronidazole                                    | 000443-48-1 | Metronidazole                                  |      | 2B   | 2   |
| Michler's ketone                                 | 000090-94-8 | Michler's ketone                               |      |      | 2   |
| Mineral oil                                      | 008012-95-1 | Mineral oil                                    |      |      | 1   |
| Mineral oils, highly refined                     | --          | Mineral oils, highly refined                   |      | 3    |     |
| Mineral oils, untreated and mildly treated       | --          | Mineral oils, untreated and mildly treated     |      | 1    |     |
| Mirex  | 002385-85-5 | Mirex  |      | 2B   | 2   |
| Mitomycin C                                      | 000050-07-7 | Mitomycin C                                    |      | 2B   |     |
| Mitoxantrone                                     | 065271-80-9 | Mitoxantrone                                   |      | 2B   |     |
| Modacrylic fibres                                | --          | Modacrylic fibres                              |      | 3    |     |
| Monocrotaline                                    | 000315-22-0 | Monocrotaline                                  |      | 2B   |     |
| Monuron  | 000150-68-5 | Monuron  |      | 3    |     |
| Morpholine                                       | 000110-91-8 | Morpholine                                     |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|--|-------------|---|------|------|-----|
| 5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone | 003795-88-8 | Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone |      | 2B   |     |
| Musk embrette  | 000083-66-9 | Musk embrette   |      | 3    |     |
| Musk xylene  | 000081-15-2 | Musk xylene   |      | 3    |     |
| Mustard gas  | 000505-60-2 | Mustard gas   |      | 1    | 1   |
| Myleran® (see 1,4-Butanediol Dimethylsulfonate)                      | 000055-98-1 | Myleran®  |      |      | 1   |
| NNK  | 064091-91-4 | NNK   |      |      | 2   |
| Nafenopin  | 003771-19-5 | Nafenopin   |      | 2B   |     |
| 1,50 Naphthalene diisocyanate  | 003173-72-6 | Naphthalene diisocyanate  |      | 3    |     |
| 2-Naphthylamine  | 000091-59-8 | Naphthylamine   | X    | 1    | 1   |
| alpha-Naphthylamine  | 000134-32-7 | Naphthylamine   | X    | 3    |     |
| b-Naphthylamine  | 000091-59-8 | Naphthylamine, b-   |      |      | 1   |
| 1,5-Naphthalenediamine   | 002243-62-1 | Naphthalenediamine  |      | 3    |     |
| Neutrons   | --          | Neutrons  |      | 1    |     |
| Nickel acetate (under Nickel and certain Nickel compounds)           | 000373-02-4 | Nickel acetate  |      |      | 2   |
| Nickel carbonate (under Nickel and certain Nickel compounds)         | 003333-67-3 | Nickel carbonate  |      |      | 2   |
| Nickel carbonyl  | 013463-39-3 | Nickel carbonyl   |      |      | 2   |
| Nickel hydroxide under Nickel and certain Nickel Compounds)          | 012054-48-7 | Nickel hydroxide  |      |      | 2   |
| Nickel hydroxide (under Nickel and certain Nickel Compounds)         | 011113-74-9 | Nickel hydroxide  |      |      | 2   |
| Nickel oxide (under Nickel and certain Nickel compounds)             | 001313-99-1 | Nickel oxide  |      |      | 2   |
| Nickel, metallic and alloys  | 007440-02-0 | Nickel, metallic and alloys                                       |      | 2B   | 2   |
| Nickelocene (under Nickel and certain Nickel compounds)              | 001271-28-9 | Nickelocene   |      |      | 2   |
| Niridazole   | 000061-57-4 | Niridazole  |      | 2B   |     |
| Nithiazide   | 000139-94-6 | Nithiazide  |      | 3    |     |
| Nitrilotriacetic acid and its salts                                  | 000139-13-9 | Nitrilotriacetic acid and its salts                               |      | 2B   | 2   |
| Nitrilotriacetic acid disodium salt monohydrate                      | 023255-03-0 | Nitrilotriacetic acid disodium salt monohydrate                   |      | 2B   |     |
| Nitrilotriacetic acid monosodium salt                                | 018994-66-6 | Nitrilotriacetic acid monosodium salt                             |      | 2B   |     |
| Nitrilotriacetic acid sodium salt                                    | 010042-84-9 | Nitrilotriacetic acid sodium salt                                 |      | 2B   |     |
| Nitrilotriacetic acid trisodium salt monohydrate                     | 018662-53-8 | Nitrilotriacetic acid trisodium salt monohydrate                  |      | 2B   |     |
| Nitrilotriacetic acid, disodium salt                                 | 015467-20-6 | Nitrilotriacetic acid, disodium salt                              |      | 2B   |     |
| Nitrilotriacetic acid, trisodium salt                                | 005064-31-3 | Nitrilotriacetic acid, trisodium salt                             |      | 2B   |     |
| n-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide                         | 000531-82-8 | Nitro-2-furyl)-2-thiazolyl]acetamide                              |      | 2B   |     |
| 5-Nitro-o-anisidine  | 000099-59-2 | Nitro-o-anisidine   |      | 3    |     |
| 5-Nitro-o-toluidine  | 000099-55-8 | Nitro-o-toluidine   |      | 3    |     |
| 5-Nitroacenaphthene  | 000602-87-9 | Nitroacenaphthene   |      | 2B   |     |
| o-Nitroanisole   | 000091-23-6 | Nitroanisole  |      |      | 2   |
| 2-Nitroanisole   | 000091-23-6 | Nitroanisole  |      | 2B   |     |
| 9-Nitroanthracene  | 000602-60-8 | Nitroanthracene   |      | 3    |     |
| 7-Nitrobenz(a)anthracene   | 020268-51-3 | Nitrobenz(a)anthracene  |      | 3    |     |
| Nitrobenzene   | 000098-95-3 | Nitrobenzene  |      | 2B   |     |
| 6-Nitrobenzo(a)pyrene  | 063041-90-7 | Nitrobenzo(a)pyrene   |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name                                     | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| 4-Nitrobiphenyl   | 000092-93-3 | Nitrobiphenyl                                      | X    | 3    |     |
| 6-Nitrochrysene   | 007496-02-8 | Nitrochrysene                                      |      | 2B   | 2   |
| Nitrofen, (technical-grade)                             | 001836-75-5 | Nitrofen, (technical-grade)                        |      | 2B   | 2   |
| 3-Nitrofluoranthene                                     | 000892-21-7 | Nitrofluoranthene                                  |      | 3    |     |
| 2-Nitrofluorene   | 000607-57-8 | Nitrofluorene                                      |      | 2B   |     |
| Nitrofural (Nitrofurazone)                              | 000059-87-0 | Nitrofural (Nitrofurazone)                         |      | 3    |     |
| Nitrofurantoin  | 000067-20-9 | Nitrofurantoin                                     |      | 3    |     |
| 1-[(5-Nitrofurfurylidene)amino]-2-imidazolidinone       | 000555-84-0 | Nitrofurfurylideneamino]-2-imidazolidinone         |      | 2B   |     |
| Nitrogen mustard  | 000051-75-2 | Nitrogen mustard                                   |      | 2A   |     |
| Nitrogen mustard N-oxide                                | 000126-85-2 | Nitrogen mustard N-oxide                           |      | 2B   |     |
| Nitronmethane   | 000075-52-5 | Nitromethane                                       |      | 2B   |     |
| 1-Nitronaphthalene                                      | 000086-57-7 | Nitronaphthalene                                   |      | 3    |     |
| 2-Nitronaphthalene                                      | 000581-89-5 | Nitronaphthalene                                   |      | 3    |     |
| 3-Nitroperylene   | 020589-63-3 | Nitroperylene                                      |      | 3    |     |
| 2-Nitropropane  | 000079-46-9 | Nitropropane                                       |      | 2B   | 2   |
| 1-Nitropyrene   | 005522-43-0 | Nitropyrene  |      | 2B   | 2   |
| 4-Nitropyrene   | 057835-92-4 | Nitropyrene  |      | 2B   | 2   |
| 2-Nitropyrene   | 000789-07-1 | Nitropyrene  |      | 3    |     |
| n-Nitroso-N-methyl-Urea                                 | 000684-93-5 | Nitroso-N-methyl-Urea                              |      |      | 2   |
| n-Nitroso-n-ethylurea                                   | 000759-73-9 | Nitroso-n-ethylurea                                |      |      | 2   |
| n'-Nitrosoanabasine                                     | 037620-20-5 | Nitrosoanabasine                                   |      | 3    |     |
| n'-Nitrosoantabine                                      | 071267-22-6 | Nitrosoantabine                                    |      | 3    |     |
| n-Nitrosobutylbutanolamine                              | 003817-11-6 | Nitrosobutylbutanolamine                           |      |      | 2   |
| n-Nitrosobutylcarboxypropylamine                        | 038252-74-3 | Nitrosobutylcarboxypropylamine                     |      |      | 2   |
| n-Nitrosodi-n-butylamine                                | 000924-16-3 | Nitrosodi-n-butylamine                             |      | 2B   | 2   |
| n-Nitrosodi-n-propylamine                               | 000621-64-7 | Nitrosodi-n-propylamine                            |      | 2B   | 2   |
| n-Nitrosodiethanolamine                                 | 001116-54-7 | Nitrosodiethanolamine                              |      | 2B   | 2   |
| N-Nitrosodiethanolamine                                 | 001116-54-7 | Nitrosodiethanolamine                              |      | 2B   |     |
| n-Nitrosodiethylamine                                   | 000055-18-5 | Nitrosodiethylamine                                |      | 2A   | 2   |
| n-Nitrosodimethylamine                                  | 000062-75-9 | Nitrosodimethylamine, n-                           | X    | 2A   | 2   |
| p-Nitrosodiphenylamine                                  | 000156-10-5 | Nitrosodiphenylamine                               |      | 3    |     |
| n-Nitrosodiphenylamine                                  | 000086-30-6 | Nitrosodiphenylamine, n-                           |      | 3    |     |
| n-Nitrosofolic acid                                     | 029291-35-8 | Nitrosofolic acid                                  |      | 3    |     |
| n-Nitrosoguvacine                                       | 055557-01-2 | Nitrosoguvacine                                    |      | 3    |     |
| n-Nitrosoguvacoline                                     | 055557-02-3 | Nitrosoguvacoline                                  |      | 3    |     |
| n-Nitrosohydroxyproline                                 | 030310-80-6 | Nitrosohydroxyproline                              |      | 3    |     |
| 4-(n-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK) | 064091-91-4 | Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK) |      | 2B   | 2   |
| 4-(n-Nitrosomethylamino)-4-(3-pyridyl)-1 butanal (NNA)  | 064091-90-3 | Nitrosomethylamino)-4-(3-pyridyl)-1 butanal (NNA)  |      | 3    |     |
| 3-(n-Nitrosomethylamino)propionaldehyde                 | 085502-23-4 | Nitrosomethylamino)propionaldehyde                 |      | 3    |     |
| 3-(n-Nitrosomethylamino)propionitrile                   | 060153-49-3 | Nitrosomethylamino)propionitrile                   |      | 2B   |     |
| n-Nitrosomethylethylamine                               | 010595-95-6 | Nitrosomethylethylamine                            |      | 2B   |     |
| n-Nitrosomethylvinylamine                               | 004549-40-0 | Nitrosomethylvinylamine                            |      | 2B   | 2   |
| n-Nitrosomorpholine                                     | 000059-89-2 | Nitrosomorpholine, n-                              |      | 2B   | 2   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| n'-Nitrosornicotine  | 016543-55-8 | Nitrosornicotine   |      | 2B   | 2   |
| n-Nitrosopiperidine  | 000100-75-4 | Nitrosopiperidine, n-                                      |      | 2B   | 2   |
| n-Nitrosoproline   | 007519-36-0 | Nitrosoproline   |      | 3    |     |
| n-Nitrosopyrrolidine   | 000930-55-2 | Nitrosopyrrolidine   |      | 2B   | 2   |
| n-Nitrososarcosine   | 013256-22-9 | Nitrososarcosine   |      | 2B   | 2   |
| Nitrotoluene   | 000099-08-1 | Nitrotoluene   |      | 3    |     |
| Nitrotoluenes  | 000085-72-2 | Nitrotoluenes  |      | 3    |     |
| Nitrotoluenes  | 000099-99-0 | Nitrotoluenes  |      | 3    |     |
| Nitrovin   | 000804-36-4 | Nitrovin   |      | 3    |     |
| Non-arsenical insecticides (occupational exposures in spraying and application of) | --          | Non-arsenical insecticides                                 |      | 2A   |     |
| Norethisterone   | 000068-22-4 | Norethisterone   |      |      | 2   |
| Nylon 6  | 025038-54-4 | Nylon 6  |      | 3    |     |
| Ochratoxin A   | 000303-47-9 | Ochratoxin A   |      | 2B   | 2   |
| Oestradiol mustard   | 022966-79-6 | Oestradiol mustard   |      | 3    |     |
| Oestrogen therapy, postmenopausal  | --          | Oestrogen therapy, postmenopausal                          |      | 1    |     |
| Oestrogen-progestogen therapy, postmenopausal                                      | --          | Oestrogen-progestogen therapy                              |      | 2B   |     |
| Oestrogens, nonsteroidal   | --          | Oestrogens, nonsteroidal                                   |      | 1    |     |
| Oestrogens, steroidal  | --          | Oestrogens, steroidal                                      |      | 1    |     |
| Oil gas, compressed  | --          | Oil gas, compressed  |      | 3    |     |
| Oil orange SS  | 002646-17-5 | Oil orange SS  |      | 2B   |     |
| Opisthorchis felinus (infection with)  | --          | Opisthorchis felinus (infection with)                      |      | 3    |     |
| Opisthorchis viverrini (infection with)  | --          | Opisthorchis viverrini (infection with)                    |      | 1    |     |
| Oral contraceptives, combined  | --          | Oral contraceptives, combined                              |      | 1    |     |
| Oral contraceptives, sequential  | --          | Oral contraceptives, sequential                            |      | 1    |     |
| Orange G   | 001936-15-8 | Orange G   |      | 3    |     |
| Orange I   | 000523-44-4 | Orange I   |      | 3    |     |
| Orthophenylphenol  | 000090-43-7 | Orthophenylphenol  |      | 3    |     |
| Oxazepam   | 000604-75-1 | Oxazepam   |      | 2B   |     |
| 4,4-Oxydianiline   | 000101-80-4 | Oxydianiline   |      |      | 2   |
| Oxymetholone   | 000434-07-1 | Oxymetholone   |      |      | 2   |
| Oxyphenbutazone  | 000129-20-4 | Oxyphenbutazone  |      | 3    |     |
| PAHs (see Polycyclic aromatic hydrocarbons)  | --          | PAHs   |      |      | 2   |
| PBBs (see Polybrominated biphenyls)  | --          | PBBs   |      |      | 2   |
| PCBs, see Polychlorinated biphenyls  | 001336-36-3 | PCBs, see Polychlorinated biphenyls                        |      |      |     |
| Paint manufacture (occupational exposure in)                                       | --          | Paint manufacture (occupational exposure in)               |      | 3    |     |
| Painter (occupational exposure as a)   | --          | Painter (occupational exposure as a)                       |      | 1    |     |
| Palygorskite (attapulgate) (long fibres, > 5 micrometers)                          | 012174-11-7 | Palygorskite (attapulgate) (long fibres, > 5 micrometers)  |      | 2B   |     |
| Palygorskite (attapulgate) (short fibres, < 5 micrometers)                         | 012174-11-7 | Palygorskite (attapulgate) (short fibres, < 5 micrometers) |      | 3    |     |
| Panfuran S (containing dihydroxymethylfuratrizine)                                 | 000794-93-4 | Panfuran S (containing dihydroxymethylfuratrizine)         |      | 2B   |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| Paracetamol (acetaminophen)   | 000103-90-2 | Paracetamol (acetaminophen)  |      | 3    |     |
| Parasorbic acid   | 010048-32-5 | Parasorbic acid  |      | 3    |     |
| Parathion   | 000056-38-2 | Parathion  |      | 3    |     |
| Patulin   | 000149-29-1 | Patulin  |      | 3    |     |
| Penicillic acid   | 000090-65-3 | Penicillic acid  |      | 3    |     |
| Pentachloroethane   | 000076-01-7 | Pentachloroethane  |      | 3    |     |
| Pentachloronitrobenzene   | 000082-68-8 | Pentachloronitrobenzene  |      | 3    |     |
| Perchloroethylene, see<br>Tetrachloroethylene   | 000127-18-4 | Perchloroethylene, see<br>Tetrachloroethylene  |      |      | 2   |
| Permethrin  | 052645-53-1 | Permethrin   |      | 3    |     |
| Perylene  | 000198-55-0 | Perylene   |      | 3    |     |
| Petasitenine  | 060102-37-6 | Petasitenine   |      | 3    |     |
| Petroleum refining (occupational<br>exposures in)   | --          | Petroleum refining (occupational<br>exposures in)  |      | 2A   |     |
| Petroleum solvents  | --          | Petroleum solvents   |      | 3    |     |
| Phenacetin  | 000062-44-2 | Phenacetin   | 2A   |      | 2   |
| Phenanthrene  | 000085-01-8 | Phenanthrene   |      | 3    |     |
| Phenazopyridine hydrochloride   | 000136-40-3 | Phenazopyridine hydrochloride  |      | 2B   | 2   |
| Phenelzine sulfate  | 000156-51-4 | Phenelzine sulfate   |      | 3    |     |
| Phenicarbazide  | 000103-03-7 | Phenicarbazide   |      | 3    |     |
| Phenobarbital   | 000050-06-6 | Phenobarbital  |      | 2B   |     |
| Phenol  | 000108-95-2 | Phenol   |      | 3    |     |
| Phenolphthalein   | 000077-09-8 | Phenolphthalein  |      |      | 2   |
| Phenolphthalein   | 000077-09-8 | Phenolphthalein  | 2B   |      |     |
| Phenoxybenzamine hydrochloride  | 000063-92-3 | Phenoxybenzamine hydrochloride   |      | 2B   | 2   |
| Phenyl glycidyl ether   | 000122-60-1 | Phenyl glycidyl ether  |      | 2B   |     |
| n-Phenyl-2-naphthylamine  | 000135-88-6 | Phenyl-2-naphthylamine   |      | 3    |     |
| Phenylbutazone  | 000050-33-9 | Phenylbutazone   |      | 3    |     |
| para-Phenylenediamine   | 000106-50-3 | Phenylenediamine   |      | 3    |     |
| Phenytoin   | 000057-41-0 | Phenytoin  |      | 2B   | 2   |
| PhIP (2-Amino-1-methyl-6-phenyl-<br>imidazo[4,5-b]pyridine)                                     | 105650-23-5 | PhIP (2-Amino-1-methyl-6-phenyl-<br>imidazo[4,5-b]pyridine)                                    |      | 2B   |     |
| Pickled vegetables (traditional in<br>Asia)   | --          | Pickled vegetables (traditional in Asia)   |      | 2B   |     |
| Picloram  | 001918-02-1 | Picloram   |      | 3    |     |
| Piperazine estrone sulfate (under<br>Conjugated Estrogens)                                      | 007280-37-7 | Piperazine estrone sulfate   |      |      | 1   |
| Piperonyl butoxide  | 000051-03-6 | Piperonyl butoxide   |      | 3    |     |
| Polyacrylic acid  | 009003-01-4 | Polyacrylic acid   |      | 3    |     |
| Polybrominated biphenyl (FF-1)  | 067774-32-7 | Polybrominated biphenyl (FF-1)   |      | 2B   | 2   |
| Polybrominated biphenyl<br>(Firemaster BP-6)  | --          | Polybrominated biphenyl (Firemaster BP-<br>6)  |      | 2B   | 2   |
| Polybrominated biphenyls (PBBs)   | 059536-65-1 | Polybrominated biphenyls (PBBs)  |      | 2B   | 2   |
| Polychlorinated biphenyl (Aroclor<br>1254)  | 011097-69-1 | Polychlorinated biphenyl (Aroclor 1254)  |      | 2A   | 2   |
| Polychlorinated biphenyl (Aroclor<br>1260)  | 011096-82-5 | Polychlorinated biphenyl (Aroclor 1260)  |      |      | 2   |
| Polychlorinated biphenyls [PCBs]  | 001336-36-3 | Polychlorinated biphenyls [PCBs]   |      | 2A   | 2   |
| Polychlorinated dibenzo-para-<br>dioxins (other than 2,3,7,8-<br>Tetrachlorodibenzo-para-dioxin | --          | Polychlorinated dibenzo-para-dioxins<br>(other than 2,3,7,8-Tetrachlorodibenzo-<br>para-dioxin |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| Polychlorinated dibenzofurans                              | --          | Polychlorinated dibenzofurans                              |      | 3    |     |
| Polychlorophenols and their sodium salts (mixed exposures) | --          | Polychlorophenols and their sodium salts (mixed exposures) |      | 2B   |     |
| Polychloroprene  | 009010-98-4 | Polychloroprene  |      | 3    |     |
| Polycyclic aromatic hydrocarbons                           | --          | Polycyclic aromatic hydrocarbons                           |      |      | 2   |
| Polyethylene   | 009002-88-4 | Polyethylene   |      | 3    |     |
| Polymethyl methacrylate                                    | 009011-14-7 | Polymethyl methacrylate                                    |      | 3    |     |
| Polymethylene polyphenyl isocyanate (PAPI)                 | 009016-87-9 | Polymethylene polyphenyl isocyanate (PAPI)                 |      | 3    |     |
| Polypropylene  | 009003-07-0 | Polypropylene  |      | 3    |     |
| Polystyrene  | 009003-53-6 | Polystyrene  |      | 3    |     |
| Polytetrafluoroethylene                                    | 009002-84-0 | Polytetrafluoroethylene                                    |      | 3    |     |
| Polyurethane foams   | 009009-54-5 | Polyurethane foams   |      | 3    |     |
| Polyvinyl acetate  | 009003-20-7 | Polyvinyl acetate  |      | 3    |     |
| Polyvinyl alcohol  | 009002-89-5 | Polyvinyl alcohol  |      | 3    |     |
| Polyvinyl chloride   | 009002-86-2 | Polyvinyl chloride   |      | 3    |     |
| Polyvinyl pyrrolidone                                      | 009003-39-8 | Polyvinyl pyrrolidone                                      |      | 3    |     |
| Ponceau 3R   | 003564-09-8 | Ponceau 3R   |      | 2B   |     |
| Ponceau MX   | 003761-53-3 | Ponceau MX   |      | 2B   |     |
| Ponceau SX   | 004548-53-2 | Ponceau SX   |      | 3    |     |
| Potassium bis(2-hydroxyethyl)dithiocarbamate               | 023746-34-1 | Potassium bis(2-hydroxyethyl)dithiocarbamate               |      | 3    |     |
| Potassium bromate  | 007758-01-2 | Potassium bromate  |      | 2B   |     |
| Potassium chromate (VI)                                    | 007789-00-6 | Potassium chromate (VI)                                    |      | 1    |     |
| Potassium dichromate (VI)                                  | 007778-50-9 | Potassium dichromate (VI)                                  |      | 1    |     |
| Prazepam   | 002955-38-6 | Prazepam   |      | 3    |     |
| Prednimustine  | 029069-24-7 | Prednimustine  |      | 3    |     |
| Prednisone   | 000053-03-2 | Prednisone   |      | 3    |     |
| Printing inks  | --          | Printing inks  |      | 3    |     |
| Printing processes (occupational exposures in)             | --          | Printing processes (occupational exposures in)             |      | 2B   |     |
| Procarbazine hydrochloride                                 | 000366-70-1 | Procarbazine hydrochloride                                 |      | 2A   | 2   |
| Proflavine salts   | --          | Proflavine salts   |      | 3    |     |
| Progesterone   | 000057-83-0 | Progesterone   |      |      | 2   |
| Progestins   | --          | Progestins   |      | 2B   |     |
| Progestogen-only contraceptives                            | --          | Progestogen-only contraceptives                            |      | 2B   |     |
| Pronetalol hydrochloride                                   | 000051-02-5 | Pronetalol hydrochloride                                   |      | 3    |     |
| 1,3-Propane sultone  | 001120-71-4 | Propane sultone  |      | 2B   | 2   |
| Propham  | 000122-42-9 | Propham  |      | 3    |     |
| beta-Propiolactone   | 000057-57-8 | Propiolactone  | X    | 2B   | 2   |
| b-Propiolactone  | 000057-57-8 | Propiolactone, b-  | X    | 2B   | 2   |
| n-Propyl carbamate   | 000627-12-3 | Propyl carbamate   |      | 3    |     |
| Propylene  | 000115-07-1 | Propylene  |      | 3    |     |
| Propylene oxide  | 000075-56-9 | Propylene oxide  |      | 2B   | 2   |
| Propylenimine  | 000075-55-8 | Propylenimine  |      |      | 2   |
| Propylthiouracil   | 000051-52-5 | Propylthiouracil   |      | 2B   | 2   |
| Ptaquiloside   | 087625-62-5 | Ptaquiloside   |      | 3    |     |
| Pyrene   | 000129-00-0 | Pyrene   |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name                           | OSHA | IARC | NTP |
|---|-------------|--|------|------|-----|
| Pyridine  | 000110-86-1 | Pyridine                                 |      | 3    |     |
| Pyrido(3,4-c)psoralen   | 085878-62-2 | Pyrido(3,4-c)psoralen                    |      | 3    |     |
| Pyrimethamine   | 000058-14-0 | Pyrimethamine                            |      | 3    |     |
| Quartz (under Silica, Crystalline (Respirable Size))  | 014808-60-7 | Quartz (under Silica,                    |      |      | 1   |
| Quercetin   | 000117-39-5 | Quercetin                                |      | 3    |     |
| para-Quinone  | 000106-51-4 | Quinone                                  |      | 3    |     |
| Quintozene  | 000082-68-8 | Quintozene                               |      | 3    |     |
| Radon and its decay products  | 010043-92-2 | Radon and its decay products             |      | 1    | 1   |
| Reserpine   | 000050-55-5 | Reserpine                                |      | 3    | 2   |
| Resorcinol  | 000108-46-3 | Resorcinol                               |      | 3    |     |
| Retrosine   | 000480-54-6 | Retrosine                                |      | 3    |     |
| Rhodamine 6G  | 000989-38-8 | Rhodamine 6G                             |      | 3    |     |
| Rhodamine B   | 000081-88-9 | Rhodamine B                              |      | 3    |     |
| Riddelliine   | 023246-96-0 | Riddelliine                              |      | 3    |     |
| Rifampicin  | 013292-46-1 | Rifampicin                               |      | 3    |     |
| Ripazepam   | 026308-28-1 | Ripazepam                                |      | 3    |     |
| Rock (stone) wool   | --          | Rock (stone) wool                        |      | 3    |     |
| Rockwool  | --          | Rockwool                                 |      | 2B   |     |
| Rubber industry   | --          | Rubber industry                          |      | 1    |     |
| Rugulosin   | 023537-16-8 | Rugulosin                                |      | 3    |     |
| Saccharated iron oxide  | 008047-67-4 | Saccharated iron oxide                   |      | 3    |     |
| Saccharin and its salts   | 000081-07-2 | Saccharin and its salts                  |      | 3    |     |
| Safrole   | 000094-59-7 | Safrole                                  |      | 2B   | 2   |
| Salted fish (Chinese style)   | --          | Salted fish (Chinese style)              |      | 1    |     |
| Scarlet red   | 000085-83-6 | Scarlet red                              |      | 3    |     |
| Schistosoma haematobium (infection with)  | --          | Schistosoma haematobium (infection with) |      | 1    |     |
| Schistosoma japonicum (Infection with)  | --          | Schistosoma japonicum (Infection with)   |      | 2B   |     |
| Schistosoma mansoni (infection with)  | --          | Schistosoma mansoni (infection with)     |      | 3    |     |
| Selenium and selenium compounds   | 007782-49-2 | Selenium and selenium compounds          |      | 3    |     |
| Selenium sulfide  | 007446-34-6 | Selenium sulfide                         |      |      | 2   |
| Semicarbazide hydrochloride   | 000563-41-7 | Semicarbazide hydrochloride              |      | 3    |     |
| Seneciophylline   | 000480-81-9 | Seneciophylline                          |      | 3    |     |
| Senkirkine  | 002318-18-5 | Senkirkine                               |      | 3    |     |
| Sepiolite   | 015501-74-3 | Sepiolite                                |      | 3    |     |
| Shale-oils  | 068308-34-9 | Shale-oils                               |      | 1    |     |
| Shikimic acid   | 000138-59-0 | Shikimic acid                            |      | 3    |     |
| Silica, Crystalline (Respirable Size)   | 014464-46-1 | Silica, Crystalline (Respirable Size)    |      |      | 1   |
| Silica, Crystalline (Respirable Size)   | 014808-60-7 | Silica, Crystalline (Respirable Size)    |      |      | 1   |
| Silica, amorphous   | 007631-86-9 | Silica, amorphous                        |      | 3    |     |
| Silica, crystalline (inhaled in the form of quartz or cristobalite from occupational sources) | 014808-60-7 | Silica, crystalline                      |      | 1    |     |
| Simazine  | 000122-34-9 | Simazine                                 |      | 3    |     |
| Slag wool   | --          | Slag wool                                |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name                       | OSHA | IARC | NTP |
|--|-------------|--------------------------------------|------|------|-----|
| Slagwood   | --          | Slagwood                             |      | 2B   |     |
| Smokeless Tobacco  | --          | Smokeless Tobacco                    |      |      | 1   |
| Sodium Equilin Sulfate (under Conjugated Estrogens)  | 016680-47-0 | Sodium Equilin Sulfate               |      |      | 1   |
| Sodium Estrone Sulfate (under Conjugated Estrogens)  | 000438-67-5 | Sodium Estrone Sulfate               |      |      | 1   |
| Sodium chlorite  | 007758-19-2 | Sodium chlorite                      |      | 3    |     |
| Sodium diethyldithiocarbamate  | 000148-18-5 | Sodium diethyldithiocarbamate        |      | 3    |     |
| Sodium ortho-phenylphenate   | 000132-27-4 | Sodium ortho-phenylphenate           |      | 2B   |     |
| Solar Radiation and Exposure to Sunlamps and Sunbed  | --          | Solar Radiation                      |      |      | 1   |
| Solar radiation  | --          | Solar radiation                      |      | 1    |     |
| Soots  | --          | Soots                                |      | 1    | 1   |
| Spirolactone   | 000052-01-7 | Spirolactone                         |      | 3    |     |
| Sterigmatocystin   | 010048-13-2 | Sterigmatocystin                     |      | 2B   |     |
| Streptozotocin   | 018883-66-4 | Streptozotocin                       |      | 2B   | 2   |
| Strong Inorganic Acid Mists Containing Sulfuric Acid   | --          | Strong Inorganic Acid Mists          |      |      | 1   |
| Strontium Chromate (under Chromium Hexavalent Compounds)   | 007789-06-2 | Strontium Chromate                   |      |      | 1   |
| Styrene  | 000100-42-5 | Styrene                              |      | 2B   |     |
| Styrene-7,8-oxide  | 000096-09-3 | Styrene-7,8-oxide                    |      | 2A   |     |
| Styrene-acrylonitrile copolymers   | 009003-54-7 | Styrene-acrylonitrile copolymers     |      | 3    |     |
| Styrene-butadiene copolymers   | 009003-55-8 | Styrene-butadiene copolymers         |      | 3    |     |
| Succinic anhydride   | 000108-30-5 | Succinic anhydride                   |      | 3    |     |
| Sudan I  | 000872-07-9 | Sudan I                              |      | 3    |     |
| Sudan II   | 003118-97-6 | Sudan II                             |      | 3    |     |
| Sudan III  | 000085-86-9 | Sudan III                            |      | 3    |     |
| Sudan brown RR   | 006416-57-5 | Sudan brown RR                       |      | 3    |     |
| Sudan red 7B   | 006368-72-5 | Sudan red 7B                         |      | 3    |     |
| Sulfafurazole (Sulfisoxazole)  | 000127-69-5 | Sulfafurazole (Sulfisoxazole)        |      | 3    |     |
| Sulfallate   | 000095-06-7 | Sulfallate                           |      | 2B   | 2   |
| Sulfamethoxazole   | 000723-46-6 | Sulfamethoxazole                     |      | 3    |     |
| Sulfites   | --          | Sulfites                             |      | 3    |     |
| Sulfur dioxide   | 007446-09-5 | Sulfur dioxide                       |      | 3    |     |
| Sulfuric acid  | 007664-93-9 | Sulfuric acid                        |      | 1    |     |
| Sunset yellow FCF  | 002783-94-0 | Sunset yellow FCF                    |      | 3    |     |
| Surgical implants, orthopaedic implants and devices, of complex composition, cardiac pacemakers, dental materials, ceramic materials | --          | Surgical implants                    |      | 3    |     |
| Surgical implants, female breast reconstruction, silicone  | --          | Surgical implants                    |      | 3    |     |
| Symphytine   | 022571-95-5 | Symphytine                           |      | 3    |     |
| TCDD   | 001746-01-6 | TCDD                                 |      |      | 1   |
| Talc (containing asbestos fibers)  | --          | Talc (containing asbestos fibers)    |      | 1    |     |
| Talc (containing no asbestos fibers)   | 014807-96-6 | Talc (containing no asbestos fibers) |      | 3    |     |
| Talc containing asbestiform fibres   | --          | Talc containing asbestiform fibres   |      | 1    |     |
| Tamoxifen  | 010540-29-1 | Tamoxifen                            |      | 1    | 1   |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name  | CAS #       | Alternate Name   | OSHA | IARC | NTP |
|--|-------------|--|------|------|-----|
| Tannic acid and tannins  | 001401-55-4 | Tannic acid and tannins  |      | 3    |     |
| Tars   | --          | Tars   |      |      | 1   |
| Tea  | --          | Tea  |      | 3    |     |
| Temazepam  | 000846-50-4 | Temazepam  |      | 3    |     |
| Teniposide   | 029767-20-2 | Teniposide   |      | 2A   |     |
| Terpene polychlorinates (Strobane)   | 008001-50-1 | Terpene polychlorinates (Strobane)   |      | 3    |     |
| 2,2',5,5'-Tetrachlorbenzidine  | 015721-02-5 | Tetrachlorbenzidine  |      | 3    |     |
| 2,3,7,8-Tetrachlorodibenzo-para-dioxin (TCDD)                              | 001746-01-6 | Tetrachlorodibenzo-para-dioxin (TCDD)                                      |      | 1    | 1   |
| 1,1,1,2-Tetrachloroethane  | 000630-20-6 | Tetrachloroethane  |      | 3    |     |
| 1,1,2,2-Tetrachloroethane  | 000079-34-5 | Tetrachloroethane  |      | 3    |     |
| Tetrachloroethylene  | 000127-18-4 | Tetrachloroethylene  |      | 2A   | 2   |
| Tetrachlorvinphos  | 022248-79-9 | Tetrachlorvinphos  |      | 3    |     |
| Tetrafluoroethylene  | 000116-14-3 | Tetrafluoroethylene  |      | 3    | 2   |
| Tetrakis(hydroxymethyl)phosphonium salts                                   | --          | Tetrakis(hydroxymethyl)phosphonium salts                                   |      | 3    |     |
| Tetranitromethane  | 000509-14-8 | Tetranitromethane  |      | 2B   | 2   |
| Textile manufacturing industry (work in)                                   | --          | Textile manufacturing industry (work in)                                   |      | 2B   |     |
| Theobromine  | 000083-67-0 | Theobromine  |      | 3    |     |
| Theophylline   | 000058-55-9 | Theophylline   |      | 3    |     |
| Thioacetamide  | 000062-55-5 | Thioacetamide  |      | 2B   | 2   |
| 4,4'-Thiodianiline   | 000139-65-1 | Thiodianiline  |      | 2B   |     |
| Thioruracil  | 000141-90-2 | Thioruracil  |      | 3    |     |
| Thiotepa   | 000052-24-4 | Thiotepa   |      | 1    | 1   |
| Thiourea   | 000062-56-6 | Thiourea   |      | 2B   | 2   |
| Thiourea, 1-naphthalenyl-  | 000086-88-4 | Thiourea, 1-naphthalenyl-  |      | 3    |     |
| Thiram   | 000137-26-8 | Thiram   |      | 3    |     |
| Thorium dioxide  | 001314-20-1 | Thorium dioxide  |      |      | 1   |
| Titanium dioxide   | 013463-67-7 | Titanium dioxide   |      | 3    |     |
| Tobacco Smoke, Environmental   | --          | Tobacco Smoke, Environmental   |      |      | 1   |
| Tobacco products, smokeless  | --          | Tobacco products, smokeless  |      | 1    | 1   |
| Tobacco smoke  | --          | Tobacco smoke  |      | 1    | 1   |
| Toluene  | 000108-88-3 | Toluene  |      | 3    |     |
| Toluene diisocyanate   | 026471-62-5 | Toluene diisocyanates  |      | 2B   | 2   |
| ortho-Toluidine  | 000095-53-4 | Toluidine  |      | 2A   |     |
| o-Toluidine hydrochloride  | 000636-21-5 | Toluidine hydrochloride  |      |      | 2   |
| ortho-Toluidine  | 000095-53-4 | Toluidine, ortho   |      | 2B   | 2   |
| Toremifene   | 089778-26-7 | Toremifene   |      | 3    |     |
| Toxaphene (Polychlorinated camphenes)                                      | 008001-35-2 | Toxaphene (Polychlorinated camphenes)                                      |      | 2B   | 2   |
| Toxins derived from Fusarium graminearum, F. culmorum and F. crookwellense | --          | Toxins derived from Fusarium graminearum, F. culmorum and F. crookwellense |      | 3    |     |
| Toxins derived from Fusarium moniliforme                                   | --          | Toxins derived from Fusarium moniliforme                                   |      | 2B   |     |
| Toxins derived from Fusarium sporotricoides                                | --          | Toxins derived from Fusarium sporotricoides                                |      | 3    |     |
| Treosulphan  | 000299-75-2 | Treosulphan  |      | 1    |     |
| Triaziquone  | 000068-76-8 | Triaziquone  |      | 3    |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| Trichlorfon   | 000052-68-6 | Trichlorfon   |      | 3    |     |
| Trichlormethine (trimustine hydrochloride)              | 000817-09-4 | Trichlormethine (trimustine hydrochloride)            |      | 2B   |     |
| Trichloroacetic acid                                    | 000076-03-9 | Trichloroacetic acid                                  |      | 3    |     |
| Trichloroacetonitrile                                   | 000545-06-2 | Trichloroacetonitrile                                 |      | 3    |     |
| 1,1,1-Trichloroethane                                   | 000071-55-6 | Trichloroethane                                       |      | 3    |     |
| 1,1,2-Trichloroethane                                   | 000079-00-5 | Trichloroethane                                       |      | 3    |     |
| Trichloroethylene                                       | 000079-01-6 | Trichloroethylene                                     | 2A   |      | 2   |
| 2,4,6-Trichlorophenol                                   | 000088-06-2 | Trichlorophenol                                       |      |      | 2   |
| 1,2,3-Trichloropropane                                  | 000096-18-4 | Trichloropropane                                      | 2A   |      | 2   |
| Tridymite (under Silica, Crystalline (Respirable Size)) | 015468-32-3 | Tridymite   |      |      | 1   |
| Triethanolamine   | 000102-71-6 | Triethanolamine                                       |      | 3    |     |
| Trimustine hydrochloride                                | 000817-09-4 | Triethylamine (Trimustine hydrochloride)              |      | 2B   |     |
| Triethylene glycol diglycidyl ether                     | 001954-28-5 | Triethylene glycol diglycidyl ether                   |      | 3    |     |
| Trifluralin   | 001582-09-8 | Trifluralin   |      | 3    |     |
| 2,4,6-Trimethyl aniline                                 | 000088-05-1 | Trimethyl aniline                                     |      | 3    |     |
| 4,4',6-Trimethylagnelicin plu ultraviolet A radiation   | 090370-29-9 | Trimethylagnelicin plu ultraviolet A radiation        |      | 3    |     |
| 2,4,5-Trimethylaniline                                  | 000137-17-7 | Trimethylaniline                                      |      | 3    |     |
| 4,5',8-Trimethylpsoralen                                | 003902-71-4 | Trimethylpsoralen                                     |      | 3    |     |
| 2,4,6-Trinitrotoluene (TNT)                             | 000118-96-7 | Trinitrotoluene (TNT)                                 |      | 3    |     |
| Triphenylene  | 000217-59-4 | Triphenylene  |      | 3    |     |
| 2,4,6-Tris(1-aziridinyl)-s-triazine                     | 000051-18-3 | Tris(1-aziridinyl)-s-triazine                         |      | 3    |     |
| Tris(1-aziridinyl)phosphine Sulfide (Thiotepa)          | 000052-24-4 | Tris(1-aziridinyl)phosphine Sulfide                   |      |      | 1   |
| Tris(1-aziridinyl)phosphine oxide                       | 000545-55-1 | Tris(1-aziridinyl)phosphine oxide                     |      | 3    |     |
| Tris(2,3-dibromopropyl)phosphate                        | 000126-72-7 | Tris(2,3-dibromopropyl)phosphate                      | 2A   |      | 2   |
| Tris(2-methyl-1-aziridinyl)phosphine oxide              | 000057-39-6 | Tris(2-methyl-1-aziridinyl)phosphine oxide            |      | 3    |     |
| 1,2,3-Tris(chloromethoxy)propane                        | 038571-73-2 | Tris(chloromethoxy)propane                            |      | 3    |     |
| Tris-(2-chloroethyl) phosphate                          | 000115-96-8 | Tris-(2-chloroethyl) phosphate                        |      | 3    |     |
| Tris-(aziridinyl)-para-benzoquinone                     | 000068-76-8 | Tris-(aziridinyl)-para-benzoquinone                   |      | 3    |     |
| Trp-P-1 (3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole)   | 062450-06-0 | Trp-P-1 (3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole) |      | 2B   |     |
| Trp-P-2(3-Amino-1-methyl-5H-pyrido[4,3-b]indole)        | 062450-07-1 | Trp-P-2(3-Amino-1-methyl-5H-pyrido[4,3-b]indole)      |      | 2B   |     |
| Trypan blue   | 000072-57-1 | Trypan blue   | 2B   |      |     |
| UDMH  | 000057-14-7 | UDMH  |      |      | 2   |
| Ultraviolet radiation A                                 | --          | Ultraviolet radiation A                               | 2A   |      |     |
| Ultraviolet radiation B                                 | --          | Ultraviolet radiation B                               | 2A   |      |     |
| Ultraviolet radiation C                                 | --          | Ultraviolet radiation C                               | 2A   |      |     |
| Uracil mustard  | 000066-75-1 | Uracil mustard  |      | 2B   |     |
| Urethane  | 000051-79-6 | Urethane  |      | 2B   | 2   |
| Vat yellow 4  | 000128-66-5 | Vat yellow 4  |      | 3    |     |
| Vinblastine sulfate                                     | 000143-67-9 | Vinblastine sulfate                                   |      | 3    |     |
| Vincristine sulfate                                     | 002068-78-2 | Vincristine sulfate                                   |      | 3    |     |
| Vinyl acetate   | 000108-05-4 | Vinyl acetate   |      | 2B   |     |
| Vinyl bromide   | 000593-60-2 | Vinyl bromide   |      | 2A   |     |

**LIST OF CARCINOGENS, TERATOGENS, EXTRAORDINARILY HAZARDOUS SUBSTANCES**

| Chemical Name   | CAS #       | Alternate Name  | OSHA | IARC | NTP |
|---|-------------|---|------|------|-----|
| Vinyl chloride  | 000075-01-4 | Vinyl chloride  | X    | 1    | 1   |
| Vinyl chloride-vinyl chloride copolymers  | 009003-22-9 | Vinyl chloride-vinyl chloride copolymers  |      | 3    |     |
| 4-Vinyl cyclohexene   | 000100-40-3 | Vinyl cyclohexene   |      | 2B   |     |
| Vinyl fluoride  | 000075-02-5 | Vinyl fluoride  |      | 2A   |     |
| Vinyl toluene   | 025013-15-4 | Vinyl toluene   |      | 3    |     |
| n-Vinyl-2-pyrrolidine   | 000088-12-0 | Vinyl-2-pyrrolidine   |      | 3    |     |
| 4-Vinylcyclohexene diepoxide  | 000106-87-6 | Vinylcyclohexene diepoxide  |      | 2B   | 2   |
| 4-Vinylcyclohexene diepoxide  | 000107-87-6 | Vinylcyclohexene diepoxide  |      | 2B   |     |
| Vinylidene chloride   | 000075-35-4 | Vinylidene chloride   |      | 3    |     |
| Vinylidene chloride-vinyl chloride copolymers   | 009011-06-7 | Vinylidene chloride-vinyl chloride copolymers   |      | 3    |     |
| Vinylidene fluoride   | 000075-38-7 | Vinylidene fluoride   |      | 3    |     |
| Vitamin K substances  | 012001-79-5 | Vitamin K substances  |      | 3    |     |
| Welding fumes   | --          | Welding fumes   |      | 2B   |     |
| Wollastonite  | 013983-17-0 | Wollastonite  |      | 3    |     |
| Wood dust   | --          | Wood dust   |      | 1    |     |
| X- and Gamma-Radiation  | --          | X- and Gamma-Radiation  |      | 1    |     |
| Xylene  | 001330-20-7 | Xylene  |      | 3    |     |
| 2,3-Xylidine  | 000095-68-4 | Xylidine  |      | 3    |     |
| 2,5-Xylidine  | 000095-78-3 | Xylidine  |      | 3    |     |
| 2,4-Xylidine  | 000095-68-1 | Xylidine  |      | 3    |     |
| 2,6-Xylidine (2,6-Dimethylaniline)  | 000087-62-7 | Xylidine (2,6-Dimethylaniline)  |      | 2B   |     |
| Yellow AB   | 000085-84-7 | Yellow AB   |      | 3    |     |
| Yellow OB   | 000131-79-3 | Yellow OB   |      | 3    |     |
| Zalcitabine   | 007481-89-2 | Zalcitabine   |      | 2B   |     |
| Zectran   | 000315-18-4 | Zectran   |      | 3    |     |
| Zeolites other than erionite (clinoptilolite, phillipsite, mordenite, non-fibrous Japanese zeolite, synthetic zeolites) | 001318-02-1 | Zeolites other than erionite (clinoptilolite, phillipsite, mordenite, non-fibrous Japanese zeolite, synthetic zeolites) |      | 3    |     |
| Zidovudine (AZT)  | 030516-87-1 | Zidovudine  |      | 2B   |     |
| Zinc chromate (VI) hydroxide  | 015930-94-6 | Zinc chromate (VI) hydroxide  |      | 1    |     |
| Zinc chromate (VI) hydroxide  | 013530-65-9 | Zinc chromate (VI) hydroxide  |      | 1    | 1   |
| Zineb   | 012122-67-7 | Zineb   |      | 3    |     |
| Ziram   | 000137-30-4 | Ziram   |      | 3    |     |
| Zirconium tetrachloride   | 010026-11-6 | Zirconium tetrachloride   |      | 2A   |     |

**APPENDIX C**  
**CHEMICAL INFORMATION RESOURCES**

## CHEMICAL INFORMATION RESOURCES

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Laboratory workers requiring health and safety information regarding substances they plan to use or are using, may obtain this information from the following sources:

- Container label
- HIM EH&S Office, Department Administrator or Principal Investigator
- Material Safety Data Sheet (obtained from the chemical manufacturer)
- Manufacturer's technical service department
- American Chemical Society  
(800) 227-5558  
1155 Sixteenth Street, NW  
Washington, DC 20036  
[www.acs.org](http://www.acs.org)
- American Petroleum Institute  
(202) 682-8000  
1220 L Street, NW  
Washington, DC 20005  
[www.api.org](http://www.api.org)
- American Chemistry Council  
(703) 741-5000  
1300 Wilson Blvd.  
Arlington, VA 22209  
[www.americanchemistry.com](http://www.americanchemistry.com)
- Compressed Gas Association  
(703) 788-2700  
4221 Walney Road, Fifth Floor  
Chantilly, VA 20151  
[www.cganet.com](http://www.cganet.com)
- U.S. Department of Labor  
Occupational Safety and Health Administration (OSHA)  
(800) 321-OSHA  
200 Constitution Avenue, NW  
Washington, DC 20210  
[www.osha.gov](http://www.osha.gov)

- Occupational Safety and Health Administration (OSHA), Region I  
(617) 565-9860  
JFK Federal Building Room E340  
Boston, MA 02203  
[www.osha.gov](http://www.osha.gov)
- Massachusetts Executive Office of Labor and Workforce Development  
Division of Occupational Safety  
(617) 969-7178  
1001 Watertown Street, Second Floor  
West Newton, MA 02165  
[www.mass.gov/dos](http://www.mass.gov/dos)
- Massachusetts Department of Public Health  
Bureau of Environmental Health  
(617) 624-5757  
250 Washington Street, Seventh Floor  
Boston, MA 02108  
[www.mass.gov/dph/environmental\\_health](http://www.mass.gov/dph/environmental_health)
- Massachusetts Department of Environmental Protection  
(617) 292-5568  
One Winter Street  
Boston, MA 02108  
Regional Department  
(978) 694-3200  
205B Lowell Street  
Wilmington, MA 01887  
[www.mass.gov/dep](http://www.mass.gov/dep)
- National Institute for Occupational Safety and Health (NIOSH)  
Education and Information Division  
(800) 232-8328  
4676 Columbia Parkway  
Cincinnati, OH 45226  
[www.cdc.gov/niosh](http://www.cdc.gov/niosh)  
  
NIOSH Recommendations for Chemical Protective Clothing Webpage:  
<http://www.cdc.gov/niosh/ncpc/ncpc2.html>

The HIM EH&S Office is available to all staff.

**APPENDIX D**  
**EFFECTIVE USE OF GLOVES**

## **EFFECTIVE USE OF GLOVES**

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### **REASONS FOR WEARING GLOVES**

The hands are the part of the body most likely to come into contact with chemicals. Skin contact can result in dermatitis that is caused by a chemical or allergic irritation of the skin. In addition, some chemicals penetrate the skin and can cause illness in other parts of the body. Wearing gloves protects workers from skin irritation and other effects of chemical exposure.

### **CHOOSING THE RIGHT GLOVES**

Material safety data sheets detail appropriate gloves for use with each chemical. In addition, chemical compatibility charts for specific glove materials can be obtained from the glove manufacturer. The chart at the end of this appendix is an example of a compatibility chart. Choosing the proper gloves includes selecting the right thickness, heavy gloves for more protection and light gloves for delicate work.

### **EFFECTIVE USE OF GLOVES**

Improper removal of gloves can be a source of contamination. The procedure, which works for thin gloves that may have to be changed often, is as follows.

1. Using the fingers of one gloved hand, pinch the material of the other glove at the base of the palm and peel off the glove.
2. Continue to hold the glove.
3. With the ungloved hand, reach about an inch under the other glove on the palm side of the wrist, pinch, and peel off the other glove.
4. Both gloves have now been removed without skin contact and the contaminated sides of the gloves are facing in.
5. Gloves used with highly toxic materials should be disposed as hazardous waste before leaving the work area.

Studies have shown that up to 5% of new gloves have holes in them. Substances leaking through gloves are held in contact with skin, increasing absorption into the body. Gloves that have been improperly selected or have holes in them can sometimes be worse than no gloves at all. Gloves used for dangerous chemicals can be tested for leaks by filling them with air and immersing them in water. This should not be done with PVA laminated gloves, since they may not be water-resistant. If certain types of gloves consistently leak, the manufacturer should be notified.

## **EFFECTIVE USE OF GLOVES RESOURCES**

NIOSH Recommendations for Chemical Protective Clothing Webpage:

<http://www.cdc.gov/niosh/ncpc/ncpc2.html>

# CHEMICAL RESISTANCE CHART

The degree of protection required on a given job is known only by you. This chemical resistance or permeation chart developed by our laboratory or from data published by manufacturers of resins, rubber or polymers can only serve as a guide.

Degradation or permeation will occur at some time depending on the degree of exposure. You must determine this by testing. That is why we offer our Performance Rated Order (PRO) Program. Ask your distributor for complete details.

| CHEMICAL                            | NITRILE | NATURAL RUBBER | PVC | NEOPRENE |
|-------------------------------------|---------|----------------|-----|----------|
| Acetaldehyde                        | F       | F              | F   | E        |
| Acetic Acid                         | G       | G              | G   | E        |
| Acetone                             | P       | G              | P   | G        |
| Acrylonitrile                       | P       | F              | P   | P        |
| Aluminum Chloride                   | E       | E              | E   | E        |
| Ammonium Fluoride 40%               | E       | E              | E   | E        |
| Ammonium Hydroxide                  | F       | G              | E   | E        |
| Amyl Acetate                        | P       | F              | P   | NR       |
| Amyl Alcohol                        | G       | G              | -   | E        |
| Aniline                             | P       | P              | G   | G        |
| Animal Fats                         | E       | P              | G   | E        |
| Aqua Regia                          | F       | G              | G   | G        |
| Battery Acid                        | S       | G              | E   | E        |
| Benzaldehyde                        | P       | F              | F   | NR       |
| Benzene                             | F       | P              | P   | NR       |
| Benzyl Alcohol                      | P       | P              | -   | E        |
| Benzyl Chloride                     | P       | P              | -   | P        |
| Bkzane                              | E       | P              | P   | E        |
| Butyl Acetate                       | P       | P              | P   | NR       |
| Butyl Alcohol                       | E       | E              | G   | E        |
| Butyl Cellosolve*                   | E       | E              | -   | F        |
| Butyraldehyde                       | P       | P              | G   | -        |
| Calcium Hypochlorite                | G       | G              | -   | F        |
| Carbolic Acid                       | P       | P              | -   | F        |
| Carbon Disulfide                    | G       | NR             | NR  | NR       |
| Carbon Tetrachloride                | G       | P              | P   | NR       |
| Caster Oil                          | E       | E              | F   | E        |
| Cellosolve* Acetate                 | F       | G              | -   | F        |
| Cellosolve* Solvent                 | G       | E              | -   | E        |
| Chlorine (dry)                      | P       | P              | -   | F        |
| Chlorine (wet)                      | F       | F              | -   | NR       |
| Chloroacetone                       | P       | P              | -   | NR       |
| Chloroform                          | P       | P              | P   | NR       |
| Chloroacetylene                     | P       | NR             | NR  | NR       |
| Chlorothene* VG                     | F       | NR             | P   | NR       |
| Chromic Acid                        | P       | P              | G   | NR       |
| Citric Acid                         | E       | E              | E   | E        |
| Cottonseed Oil                      | E       | P              | G   | G        |
| Cresote                             | G       | P              | G   | F        |
| Cutting Oil                         | E       | F              | F   | E        |
| Cyclohexane                         | E       | P              | F   | NR       |
| Cyclohexanol                        | G       | P              | F   | E        |
| Diacetone Alcohol                   | P       | P              | P   | G        |
| Dibenzoyl                           | P       | P              | -   | NR       |
| Dibutyl Phthalate                   | P       | P              | -   | F        |
| Diethylamine                        | F       | F              | F   | P        |
| Di-Isobutyl Ketone                  | P       | G              | P   | P        |
| Di-Isocyanate                       | G       | P              | F   | P        |
| Dimethyl Formamide                  | F       | P              | P   | G        |
| Dimethyl Sulfoxide, DMSO            | E       | E              | F   | E        |
| Dioxane                             | P       | P              | P   | NR       |
| Dyesulf                             | S       | E              | E   | E        |
| Electroless Copper (MacDermid 9048) | E       | E              | E   | E        |

Chlorothene\* is a registered trademark of the Dow Chemical Corp.

Select the coating with the highest rating in the Physical Properties Chart on the right, then check the Chemical Resistance Charts below.

### Key to chart:

- E Excellent
- G Good
- F Fair
- P Poor
- Blank (-) Insufficient data
- NR Not recommended

| CHEMICAL                              | NITRILE | NATURAL RUBBER | PVC | NEOPRENE |
|---------------------------------------|---------|----------------|-----|----------|
| Electroless Nickel (MacDermid V60/61) | E       | E              | E   | E        |
| Epoxy Resins                          | E       | E              | E   | E        |
| Ethyl Acetate                         | P       | P              | P   | E        |
| Ethyl Alcohol                         | E       | E              | G   | E        |
| Ethyl Ether                           | F       | P              | P   | E        |
| Ethyl Formate                         | P       | P              | P   | G        |
| Ethylene Dichloride                   | P       | P              | P   | NR       |
| Ethylene Glycol                       | E       | F              | F   | F        |
| Ethylene Trichloride                  | P       | P              | -   | NR       |
| Fluorine                              | F       | F              | -   | NR       |
| Formaldehyde                          | F       | F              | G   | E        |
| Formic Acid 90%                       | F       | E              | E   | E        |
| Freon TF                              | E       | NR             | NR  | G        |
| Furfural                              | P       | P              | P   | G        |
| Gasoline                              | F       | P              | P   | NR       |
| Glycerin                              | E       | E              | F   | E        |
| Hexane                                | E       | P              | F   | E        |
| Hydraulic Fluid-Petroleum Base        | E       | P              | G   | G        |
| Hydraulic Fluid-Ester Base            | P       | P              | P   | NR       |
| Hydrazine 65%                         | E       | G              | E   | E        |
| Hydrobromic Acid                      | P       | E              | -   | -        |
| Hydrochloric Acid 38%                 | G       | G              | G   | E        |
| Hydrochloric Acid 10%                 | E       | E              | E   | E        |
| Hydrofluoric Acid 46%                 | F       | F              | F   | E        |
| Hydroper Peroxide 30%                 | F       | F              | F   | E        |
| Hydroquinone                          | F       | G              | F   | E        |
| Insecticides                          | S       | E              | E   | E        |
| Isobutyl Alcohol                      | G       | E              | G   | E        |
| Iso-Octane                            | E       | P              | P   | E        |
| Isopropyl Alcohol                     | G       | E              | G   | E        |
| Kerosene                              | E       | P              | F   | E        |
| Lacquer Thinner                       | G       | NR             | F   | F        |
| Lactic Acid                           | E       | E              | G   | E        |
| Lard                                  | E       | P              | -   | F        |
| Laurel Acid 36% EtOH                  | E       | G              | F   | E        |
| Linoleic Acid                         | E       | P              | G   | E        |
| Linseed Oil                           | E       | P              | F   | E        |
| Lubricating Oils (Petroleum)          | E       | P              | -   | G        |
| Maleic Acid                           | P       | P              | G   | E        |
| Methyl Acetate                        | P       | P              | -   | G        |
| Methyl Alcohol                        | E       | E              | E   | E        |
| Methyl Bromide                        | G       | F              | P   | NR       |
| Methyl Cellosolve                     | F       | P              | -   | E        |
| Methylene Chloride                    | P       | P              | P   | NR       |
| Methyl Ethyl Ketone (M.E.K.)          | P       | G              | P   | P        |
| Methyl Formate                        | P       | P              | -   | NR       |
| Methyl Isobutyl Ketone                | P       | F              | F   | NR       |
| Methylamine                           | F       | F              | F   | E        |
| Methyl Methacrylate                   | P       | P              | F   | NR       |
| Mineral Oil                           | E       | P              | F   | G        |
| Mineral Spirits, Rule 66              | E       | NR             | F   | G        |
| Monoethanolamine                      | P       | G              | G   | E        |
| Morpholine                            | P       | F              | G   | P        |
| Muriatic Acid                         | G       | G              | G   | G        |

| PHYSICAL PROPERTIES        | NITRILE | NATURAL RUBBER | PVC | NEOPRENE |
|----------------------------|---------|----------------|-----|----------|
| Abrasion Resistance        | E       | G              | G   | G        |
| Cut Resistance             | E       | E              | P   | E        |
| Puncture (snag) Resistance | E       | E              | G   | E        |
| Flexibility                | E       | E              | G   | G        |
| Heat Resistance            | G       | F              | P   | G        |
| Ozone Resistance           | F       | P              | E   | E        |
| Tensile Strength           | E       | E              | F   | E        |
| Dry Grip                   | E       | E              | E   | E        |
| Wet Grip                   | G       | E              | E   | F        |

NOTE: Products in these categories vary in capabilities. Laboratory tests are necessary for specific recommendations.

| CHEMICAL                       | NITRILE | NATURAL RUBBER | PVC | NEOPRENE |
|--------------------------------|---------|----------------|-----|----------|
| Naphtha                        | E       | P              | P   | G        |
| Nitric Acid - Concentrated 70% | P       | P              | F   | G        |
| Nitric Acid - Diluted 10%      | F       | F              | G   | E        |
| Nitric Acid - Red Fuming       | P       | P              | P   | NR       |
| Nitric Acid - White Fuming     | NR      | NR             | P   | NR       |
| Nitrobenzene                   | F       | P              | P   | NR       |
| Nitromethane                   | P       | P              | P   | G        |
| Nitropropane 95.5%             | NR      | E              | NR  | G        |
| Octyl Alcohol                  | G       | G              | F   | E        |
| Oleic Acid                     | F       | P              | F   | E        |
| Olive Oil                      | E       | P              | F   | G        |
| Oxalic Acid                    | G       | G              | G   | E        |
| PCB's                          | F       | P              | P   | -        |
| Paint Remover                  | G       | F              | P   | F        |
| Palmitic Acid Saturated        | G       | G              | G   | E        |
| Paraffins                      | F       | P              | NR  | F        |
| Perchloric Acid 60%            | P       | P              | P   | E        |
| Perchloroethylene              | F       | P              | P   | NR       |
| Peutla                         | E       | F              | E   | G        |
| Phenol                         | P       | P              | G   | E        |
| Phosphoric Acid                | G       | G              | P   | E        |
| Pickling Solution              | P       | P              | G   | F        |
| Picric Acid                    | G       | G              | G   | E        |
| Pine Oil                       | G       | P              | F   | P        |
| Plating Solutions - Chrome     | E       | G              | E   | -        |
| Potassium Hydroxide 50%        | G       | G              | E   | E        |
| Printing Ink                   | E       | G              | F   | E        |
| Propane                        | E       | P              | F   | E        |
| Propyl Acetate                 | P       | P              | F   | P        |
| Propyl Alcohol                 | E       | E              | G   | E        |
| Propylene Oxide                | P       | P              | -   | NR       |
| Rubber Solvent                 | E       | NR             | NR  | G        |
| Silicon Etch                   | NR      | NR             | F   | G        |
| Skydrol 500                    | P       | P              | P   | NR       |
| Sodium Hydroxide 50%           | G       | E              | E   | E        |
| Sodium Hypochlorite            | G       | G              | -   | G        |
| Soybean Oil                    | E       | P              | -   | E        |
| Stearic Acid                   | G       | G              | G   | G        |
| Standard Solvent               | E       | P              | F   | E        |
| Styrene                        | P       | P              | P   | NR       |
| Sulfuric Acid (diluted)        | G       | G              | G   | G        |
| Sulfuric Acid (conc.) 95%      | P       | P              | F   | F        |
| Tannic Acid 65%                | F       | F              | F   | F        |
| Tetrahydrofuran                | P       | P              | P   | NR       |
| Toluene                        | F       | P              | P   | NR       |
| Toluene Di-isocyanate          | P       | P              | P   | NR       |
| Trichloroethylene              | F       | P              | P   | NR       |
| Triethanol Amine               | F       | G              | G   | E        |
| Trinitrotoluene                | P       | P              | F   | G        |
| Tung Oil                       | E       | P              | F   | E        |
| Turbine Oil                    | G       | P              | P   | G        |
| Turpentine                     | E       | P              | F   | NR       |
| Vegetable Oil                  | E       | P              | F   | E        |
| Vinyl Chloride                 | -       | -              | -   | NR       |
| Xylene                         | F       | P              | P   | NR       |

Cellosolve\* is a registered trademark of the Union Carbide Corp.

**APPENDIX E**  
**CHEMICAL STORAGE GUIDELINES**

## CHEMICAL STORAGE GUIDELINES

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The following information is designed to aid in proper chemical storage in the HIM/NRB laboratories. Chemicals are to be stored according to the following hazard classes. Storing all classes together alphabetically is prohibited. Chemicals may be organized alphabetically once they are segregated according to hazard class.



**Oxidizers:** Incompatible with **flammables** and organics.

Common Oxidizers—Ammonium persulfate, silver nitrate, silver nitrite, hydrogen peroxide, potassium permanganate, sodium dichromate.



**Toxic:** Poisons

Common Toxics—Arsenic compounds, cyanides, osmium tetroxide, formaldehyde, formalin, naphthalene, chloroform, acrylamide.



**Flammables:** Incompatible with **oxidizers**. Ignitable/flammable chemicals must be stored in a **flammable cabinet**. Flammable chemicals requiring refrigeration must be stored in a refrigerator rated for flammable storage.

Common Flammables—Ethanol, methanol, acetone, benzene, ethyl acetate, butanol, alcohols, furans, toluene, Sigmacote, TEMED, paraformaldehyde (flammable solid)



**Corrosive:** Three kinds of Corrosives: **Bases, Organic Acids, and Inorganic Acids**. All 3 of these corrosives have this pictogram; however, must be separated from each other.

Common Bases—sodium hydroxide, potassium hydroxide, developer.

Common Organic Acids—acetic acid, glacial acetic acid, phenol, formic acid.

Common Inorganic Acids—sulfuric acid, hydrochloric acid, perchloric acid, nitric acid, chromic acid.



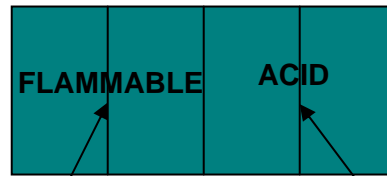
**Irritants:** chemicals producing irritation. Often, the majority of chemicals in a dry chemical storage area in HIM/NRB laboratories.

Common Irritants—Sodium carbonate, sodium bicarbonate, Trizma, putrescine, antifoam.

#### Chemical Storage Shelving

|           |
|-----------|
| Irritants |
| Oxidizers |
| Toxic     |
| Corrosive |

#### Chemical Fume Hood



Flammable

Corrosive Storage –  
Segregate inorganic acids, organic acids, and bases.

**APPENDIX F**  
**LIST OF UNSTABLE CHEMICALS**



## Reactive Material Services

---

### AZIDE COMPOUNDS

Azide compounds (RN<sub>3</sub>) are derivatives of hydrogen azide (HN<sub>3</sub>). There are both inorganic and organic derivatives. They vary widely in their stability and some members of both classes are unstable and potentially explosive. Azide compounds also display significant human toxicity, primarily due to the evolution of hydrogen azide.

|  |   |
|--|---|
| Ammonium azide                                   | Diazonium nitrates (dry)                        |
| Azido guanidine picrate (dry)                    | Diazonium perchlorates (dry)                    |
| 5-Azido-1-hydroxy tetrazole                      | Diphenyl Phosphoryl Azide                       |
| Azido hydroxy tetrazole (mercury & silver salts) | 1,3-Diazopropane                                |
| 3-Azido-1,2-propylene glycol                     | N,N'-Dichlorazodicarbonamidine (salts of) (dry) |
| dinitrate  | Hydrazine azide                                 |
| Azidodithiocarbonic acid                         | Hydrazoic acid solutions >10%                   |
| Azidoethyl nitrate                               | Hydrogen azide                                  |
| Azidotrimethyltin                                | Iodine azide (dry)                              |
| Azotetrazole (dry)                               | Lead Azide (dry)                                |
| Benzoyl Azide                                    | Mercuric azide                                  |
| Benzyl Azide                                     | Mercurous azide                                 |
| Bromine azide                                    | Nitrobenzoyl Azide                              |
| Chlorine azide                                   | Silver azide (dry)                              |
| Copper amine azide                               | Sodium Azide                                    |
| Cupric azide                                     | Tert-butoxy Carbonyl Azide                      |
| Cuprous azide                                    | Tetraazido benzene quinone                      |
| p-Diazidobenzene                                 | Tetrazoyl azide (dry)                           |
| 1,2-Diazidoethane                                | Tosyl Azide                                     |
| 1,1'-Diazoaminonaphthalene                       | Trimethylsilylazide                             |
| Diazoaminotetrazole (dry)                        | Tri-n-butyl ammonium azide                      |
| Diazodinitrophenol (dry)                         | p-Xylyl diazide                                 |
| Diazidiphenylmethane                             |   |

**The above list is not a complete listing of all unstable azides. In addition, even stable azides can become unstable under certain conditions.**

### MONO AND DINITRO COMPOUNDS

The main issues associated with mono and dinitro compounds are that some are considered potentially explosive or shock sensitive when dry and/or need to be wetted

- dinitroglycoluril or dingui
- dinitronaphthalene
- dinitrophenol
- dinitrophenolates, alkali metals
- dinitrophenyl hydrazine
- dinitroresorcinol
- dinitroaminophenol or picramic acid
- dinitrosobenzene
- N,N-dinitroso-N,N-dimethylterephthalamide
- N,N-dinitrosopentamethylenetetramine

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**This list is not all inclusive of all chemicals which could be highly hazardous. The listed chemicals are substances which Clean Harbors as a matter of its own health & safety protocols have analyzed handling in the context of its particular facilities and processes. The List is not intended to be utilized or relied upon by others for any other purpose and is a representation of specific materials Clean Harbors has determined to be materials which require special handling by its personnel only or as a company we will not accept**



## Reactive Material Services

nitrocellulose  
nitroguanidine or picrite  
nitrosoguanidine  
nitrostarch  
nitrourea  
sodium dinitro-o-cresolate  
sodium picramate  
urea nitrate

### TRI AND MULTINITRATED COMPOUNDS

The main issue with these compounds is that **all are considered potentially explosive or shock sensitive under various conditions** (e.g., dry, contaminated, etc.)

ammonium picrate  
hexanitrodiphenylamine or dipicrylamine or hexyl  
hexanitrostilbene  
trinitro-m-cresol  
trinitroaniline or picramide  
trinitroanisole  
trinitrobenzene  
trinitrobenzenesulfonic acid or picrylsulfonic acid  
trinitrobenzoic acid  
trinitrofluorenone  
trinitronaphthalene  
trinitrophenetole  
trinitrophenol or picric acid  
trinitrophenylmethylnitramine or tetryl  
trinitroresorcinol or styphnic acid  
trinitrotoluene or TNT  
various picrates

### PEROXIDE FORMING MATERIALS

#### GROUP I MATERIALS

These materials form peroxides that may explode even without being concentrated.

| CHEMICAL              | SYNONYMS                                    | DESCRIPTION              |
|-----------------------|---|--------------------------|
| Isopropyl ether       | Diisopropyl Ether, Diisopropyl Oxide        | Colorless Liquid         |
| Diethyl Ketene        | 2 ethyl 1 butene 1 one                      | Liquid                   |
| Divinyl Ether         | Vinyl Ether, Divinyl Oxide                  | Liquid                   |
| Potassium Metal       | Potassium                                   | Silver White Metal       |
| Potassium Amide       |   | Solid                    |
| Sodium Amide          | Sodamide                                    | White crystalline powder |
| Sodium Ethoxyacetylde |   |                          |
| Vinylidene Chloride   | 1,1,-dichloroethylene<br>1,1-dichloroethane | Colorless Liquid         |

**This list is not all inclusive of all chemicals which could be highly hazardous. The listed chemicals are substances which Clean Harbors as a matter of its own health & safety protocols have analyzed handling in the context of its particular facilities and processes. The List is not intended to be utilized or relied upon by others for any other purpose and is a representation of specific materials Clean Harbors has determined to be materials which require special handling by its personnel only or as a company we will not accept**



## Reactive Material Services

### GROUP II MATERIAL

Peroxide hazard on concentration. Distillation or most likely evaporation.

| CHEMICAL                         | SYNONYMS                                | DESCRIPTION             |
|----------------------------------|---|-------------------------|
| p- dioxane                       | 1,4 dioxane, diethylene dioxide         | Colorless liquid        |
| Ethyl ether                      | Ether, diethyl ether, ethoxyethane      |                         |
| Tetrahydrofuran                  | Butylenes oxide, diethylene oxide       |                         |
| Acetal                           | 1,1 diethoxyethane, diethyl acetal      |                         |
| Cumene                           | Isopropyl benzene                       |                         |
| Cyclohexene                      | 1,2,3,4 tetrahydrobenzene               |                         |
| Cyclopentene                     |   |                         |
| Diacetylene                      | Beacetylene                             | Gas                     |
| Ethylene glycol dimethyl ether   | 1,2, dimethoxy ethane, glyme, monoglyme | Liquid                  |
| Furan                            | Divinylene oxide                        | Water white liquid      |
| Methyl actylene                  | Allylene, propyne                       | Colorless gas or liquid |
| Methyl cyclopentane              |   |                         |
| Tetrahydronaphthalene            | Tetraline                               |                         |
| Vinyl ethers                     | Ethyl vinyl ether, methyl vinyl ether   |                         |
| Other unlisted ethers            | Call in for evaluation                  |                         |
| Diethylene glycol dimethyl ether | Diglyne                                 |                         |
| Acetaldehyde                     | Ethanal, ethyl aldehyde                 |                         |

### GROUP III MATERIALS

Peroxide hazard due to peroxide initiation of polymerization. All materials in Group III with the exception of material stored as a liquid (the peroxide forming potential increase and certain of these monomers, especially butadiene, chloroprene, and tetrafluoroethylene). These materials should be considered a Group I material.

| CHEMICAL                | SYNONYMS                               | DESCRIPTION             |
|-------------------------|--|-------------------------|
| 1,3 butadiene           | Vinylethylene, divinyl                 | Colorless gas           |
| Chlorobutadiene         | Chloroprene                            | Colorless liquid        |
| Chlorotrifluoroethylene | Trifluorochloroethylene, genetone 1113 | Gas                     |
| Tetrafluoroethylene     | Perfluoroethylene                      | Colorless gas           |
| Vinyl acetate           |  | Colorless liquid        |
| Vinyl acetylene         | Buten-3-yne                            | Colorless gas or liquid |
| Vinyl chloride          | Chloroethylene, ethylene monochloride  | Colorless gas or liquid |
| Vinyl pyridine          |  | Colorless liquid        |

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## Reactive Material Services

### NFPA CLASS 4 OXIDIZER

Oxidizers that fall under the Class 4 NFPA (National Fire Prevention Association) oxidizer category require special evaluation consideration due to their potential for reactivity and shock sensitivity when contaminated or exposed to thermal or physical shock.

- Tetranitromethane
- Ammonium Perchlorate
- Guanidine Nitrate
- Hydrogen Peroxide >90%
- Ammonium Permanganate

### ORGANIC PEROXIDES

Organic peroxides can be highly reactive and dangerous compounds if mistreated or mishandled. The main hazard associated with organic peroxides is decomposition. The main causes of peroxide decomposition are Heat, Fire, Friction, Shock and Contamination. Many organic peroxides require temperature controls (e.g., refrigerated vehicle) per DOT regulations when being transported or have been classified as subsidiary explosive compounds per DOT.

|   |
|---|
| 2,5-Dimethyl-2,5-Di(2-ethylhexanoylperoxy) Hexane                             |
| 2,5-Bis(tert-butylperoxy)_2,5-dimethyl-3-hexyne                               |
| tert-butyl peroctoate w/ 1,1-di(tert-butyl-peroxy)-3,3,5-trimethylcyclohexane |
| Tert Amyl-Peroxy-2-ethylhexanoate   |
| Benzoyl peroxide  |
| tert-butyl peroxy-2-ethylhexanoate (50%)                                      |
| D-(4-tert-butylcyclohexyl) peroxydicarbonate                                  |
| Dicumyl Peroxide  |
| MEK Peroxide (45%)  |
| MEK Peroxide  |
| Di-tert-Butyl Peroxide  |
| tert-Butyl peroxybenzoate   |
| 1,1 Di(tert-butylperoxy)-3,3,5 trimethylcyclohexane in Dibutyl Phthalate      |
| Di-tert-butyl peroxide  |
| Di-Butylcyclohexyl peroxydicarbonate  |
| t-butyl peroxybutane  |
| Di-t-Amyl peroxy-cyclohexane  |
| t-Amyl peroxyethylhexanoate   |
| t-Amyl peroxyneoheptanoate  |
| t-Amyl peroxy-pivalate  |
| t-Amyl peroxyneodecanoate   |
| t-Butyl Cumyl Peroxide  |
| t-Butyl peracetate  |
| Methyl Ethyl Ketone Peroxide  |
| t-Butyl peroctoate  |

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## Reactive Material Services

|                                       |
|---------------------------------------|
| Amyl Peroxyacetate                    |
| t-Butyl hydroperoxide                 |
| Dimethyl dibenzoylperoxyhexane        |
| Ethyl amyloperoxybutyrate             |
| t-Butyl peroxyethylhexanoate          |
| t-Butyl peroxyisopropylcarbonate      |
| t-Butylperoxytrimethylcyclohexane     |
| Dimethylhexane diperoxyethylhexanoate |
| Dimethyl butylperoxyhexane            |
| Butyl peroxydiisopropylbenzene        |
| Cyclohexanone Peroxide                |
| Butyl hydroxyethylperoxide            |

### PERCHLORIC ACID

Perchloric acid (HClO<sub>4</sub>) is a highly corrosive and oxidizing material. It is also a highly reactive material if in contact with incompatibles. Perchloric acid can explode on contact with many organics and can form potentially explosive metal perchlorates if mixed with metals. It is also forbidden to transport in concentrations >72%.

Perchloric Acid >72%

Contaminated Perchloric Acid

Decontamination Perchloric Acid fume hoods and spill type releases

### AZO COMPOUNDS

Azo compounds have a wide variety of hazards. These hazards include:

- temperature sensitive
- flammable solids
- shock and friction sensitive
- poisonous solids.

The only way to determine the hazard associated with each type of compound is to review each on a case by case basis using MSDS's and/or chemical references.

Azobisisobutyronitrile (VAZO 64)

2,2-azobis(2,4-dimethyl-4-methoxyvaleronitrile)

2,2-azobis(2-methylbutyronitrile)

2,2-azobis(2,4-dimethylvaleronitrile)

### ADDITIONAL DOT FORBIDDEN MATERIAL

Azotetrazole (dry)

Benzene diazonium chloride (dry)

Benzene diazonium nitrate (dry)

Benzoxidiazoles (dry)

p-Diazidobenzene

1,2-Diazidoethane

1,1'-Diazoaminonaphthalene

Diazoaminotetrazole (dry)

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## Reactive Material Services

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Diazodinitrophenol (dry)  
Diazidiphenylmethane  
Diazonium nitrates (dry)  
Diazonium perchlorates (dry)  
1,3-Diazopropane  
N,N'-Dichlorazodicarbonamidine (salts of) (dry)  
Hexanitroazoxy benzene  
Hexanitrodiphenylamine  
Mercuric Oxycyanide  
Methazoic acid  
Naphthalene diazonide  
Nitrates of diazonium compounds  
6-Nitro-4-diazotoluene-3-sulfonic acid (dry)  
m-Nitrobenzene diazonium perchlorate  
2,4,6-Trinitro-1,3-diazobenzene  
p-Xylyl diazide

## OTHER DOT EXPLOSIVES

Acetylides of heavy metals  
Ammonium Nitrate explosive mixtures  
Ammonium Perchlorate  
Black Powder  
Cyclonite  
Cyclotetramethylenetetranitamine (HMX)  
Cyclotrimethylenetrinitamine (RDX)  
Dipicrylamine  
Erythritol Tetranitrate  
Fulminates of heavy metals  
Lead Styphnate  
Mannitol Hexanitrate  
Nitroglycerine  
Organic Nitramines  
Perchlorate explosive mixtures  
Pentaerythritol tetranitrate  
Picrate explosives  
Picryl chloride  
Tetranitrocarbazole  
Tetrazole explosives  
Trinitrobenzoic acid  
Unknown Explosives

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**APPENDIX G**

**BIOHAZARDOUS LABELING REQUIREMENTS**

## BIOHAZARD LABELING GUIDELINES

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The following minimum instructions and/or guidelines are to be used in implementing the labeling or color coding requirements set forth by the U.S. Occupational Safety and Health Administration (OSHA) *Bloodborne Pathogens Standard*.

Warning labels must be predominantly fluorescent orange or orange-red against contrasting background colors and contain the Biohazard Symbol and the word *biohazard*.

| Item   | Biohazard Label                    | Red Container | See Exemptions |
|--|------------------------------------|---------------|----------------|
| Regulated waste container (sharps and/or non-sharps)   | X                                  | X             |                |
| Reusable contaminated sharps Container (i.e., surgical tools in soaking tray)                                | X                                  | X             |                |
| Refrigerators, freezers, centrifuges, etc. holding blood or other potentially infectious materials           | X                                  |               |                |
| Specimens and regulated wastes shipped from the laboratories to other facilities for service or disposal     | X                                  | X             |                |
| Contaminated Laundry   | X                                  | X             | X              |
| Contaminated laundry sent to another facility that does not use Standard Precautions                         | X                                  | X             |                |
| Containers used to store, transport, or ship blood   | X                                  | X             |                |
| Individual specimen containers of blood or other potentially infectious material that remains within the lab | X                                  | X             | X              |
| Blood or blood products for clinical use   |                                    |               | X              |
| Contaminated equipment that needs service (i.e., dialysis equipment or suction device)                       | X<br>(on the contaminated portion) |               |                |

## BIOHAZARD LABELING EXEMPTIONS

As a general rule, further labels are not required under the following circumstances.

1. Blood, blood components, or products labeled as to contents and released for transfusion or other clinical use.
2. Red bags or red containers are used instead.
3. Individual containers of blood or other potentially infectious material (OPIM) placed within a labeled container for shipping, storage, transport, or disposal.
4. Regulated wastes that have been decontaminated.
5. Specimen containers retained within a facility that observes Standard Precautions (i.e., HIM/NRB).
6. Alternate labeling or color-coding for contaminated laundry containers within a facility that observes Standard Precautions (i.e., HIM/NRB).
7. For drawn blood or during lab procedures on blood samples, individual containers of blood or OPIM do not require labels **provided** the larger containers into which they are placed for storage, transport, shipment, or disposal are labeled (i.e., test tube racks, trays, or holders).

**APPENDIX H**

**USER'S GUIDE TO MATERIAL SAFETY DATA SHEETS**

## **USER'S GUIDE TO MATERIAL SAFETY DATA SHEETS**

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Material safety data sheets (MSDSs) are prepared by manufacturers to summarize the health and safety information about their products.

### **TO OBTAIN MSDSs**

- Ask your Department Administrator, Principal Investigator, or Chemical Hygiene Officer for the location of the MSDS file.
- Call the Harvard Institutes of Medicine/New Research Building (HIM/NRB) Environmental Health and Safety (EH&S) Office at 617-432-2762.
- Call the manufacturer.
- Consult the HIM/NRB EH&S Website:  
<http://www.himnrbehs.com/himnrbehs/msds.asp>

Listed below is the most important information that U.S. Occupational Safety and Health Administration (OSHA) requires on MSDSs. For assistance with interpreting and applying this information, consult with the HIM/NRB EH&S Office.

### **COMPONENTS OF AN MSDS**

#### **Identity**

- Trade name used on the label and inventory list.
- Manufacturer's name, address, and emergency telephone number.
- Preparation and revision dates.

#### **Hazardous Ingredients**

- CHEMICAL and COMMON NAMES of all the hazardous components
- MAXIMUM OCCUPATIONAL LIMITS OF EXPOSURE

*OSHA PEL:* Permissible exposure limit (PEL)—eight-hour time-weighted average (TWA); this is an upper limit, enforceable by law, above which no worker can be exposed.

*OSHA STEL*: 15 – 60 minutes, a regulatory upper short-term exposure limit (STEL).  
*ACGIH TLV*: (American Conference of Governmental Industrial Hygienists threshold limit value) Eight-hour TWA; usually equal to or lower than the PEL, but a recommended upper limit only; also more current in terms of toxicological data.

These are not proven safe levels of exposure. If the exposure limit is not listed, do not assume that a chemical is safe. Contact the EH&S Office.

- PERCENTAGE OF THE MIXTURE (optional). The percentages do not usually add up to 100%, since only the hazardous ingredients have to be listed. This is NOT a trade secret recipe.

### **Physical/Chemical Characteristics**

- VAPOR PRESSURE—a measure of a liquid's tendency to evaporate.
- VAPOR DENSITY—a vapor or gas that is lighter or heavier than air.
- APPEARANCE AND ODOR—depending upon your senses to detect or identify hazardous materials can be very dangerous.

The EH&S Office considers these properties as well as how you work with a hazardous material to evaluate the risk.

### **Fire and Explosion Hazard Data**

- FLASH POINT—the lowest temperature at which a liquid gives off enough vapors, which when mixed with air, can be easily ignited by a spark. The lower the flash point, the greater the risk of fire or explosion. Remember that it is the vapors that burn, not the liquid.

### **Reactivity Data**

- Reactivity, in this context, is the tendency for a material to chemically change or breakdown and to become more dangerous. Precautions include:

- CONDITIONS TO AVOID—such as light or heat.
- MATERIALS TO AVOID—for example, sodium and water will react vigorously to generate hydrogen, creating a fire hazard.

### **Health Hazard Data**

- If you need health hazard information that is not on an MSDS, contact the HIM/NRB EH&S Office.
- ROUTES OF ENTRY—how a hazardous material can enter your body (e.g., inhalation, skin absorption, and ingestion).
- SHORT-TERM HEALTH EFFECTS (ACUTE)—symptoms may be felt immediately after the first brief contact (e.g., burns, watery eyes, sore throat).
- LONG-TERM HEALTH EFFECTS (CHRONIC)—symptoms may be felt after repeated contact with the same hazardous material over a long period of time.
- REFERENCES that list a chemical as a carcinogen or potential carcinogen.
- SIGNS AND SYMPTOMS OF EXPOSURE.
- MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE.
- EMERGENCY AND FIRST AID PROCEDURES.

If you are concerned about a chemical exposure you may have had, notify the HIM/NRB EH&S Office.

### **Precautions for Safe Handling and Use**

- SPILL AND LEAK PROCEDURES—The HIM/NRB EH&S Office can advise you on specific procedures and proper protective equipment.
- WASTE DISPOSAL—Contact the HIM/NRB EH&S Office for information on the disposal of a particular chemical. To schedule a pick up of hazardous waste, call the HIM/NRB EH&S Office at 617-432-2762.

### **Control Measures**

- The HIM/NRB EH&S Office can answer specific questions regarding ventilation and personal protective equipment for normal working conditions and emergencies. Suitable control measures are based on how a material is used.