Set Up for a Safe Space: A Chemical Hygiene Plan

A Special Insert Contributed by

Michael Grey White,
General Partner and Training Director
HGW and Associates
and the
Health and Safety Committee

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American Institute for Conservation of Historic & Artistic Works
1717 K Street, NW • Suite 200 • Washington, DC 20006
(202) 452-9545; Fax: (202) 452-9328; info@aic-faic.org; http://aic.stanford.edu

All employers who potentially expose workers to hazardous substances in a laboratory setting are required to have a formal, written Lab Safety Plan, and all employees who work with hazardous substances must be protected by such a document. For the purposes of this discussion, the definition of employee includes unpaid volunteers or students, consultants, or colleagues working on contract, or temporary workers brought in for special projects (see *AIC News*, vol. 25, no. 1, 14). The only exemptions from the requirements are if all workers in a studio are the owners of the business (sole proprietor, partners, or corporate officers), and if the studio never has individuals on the premises as described above. This is hardly ever the case, so nearly every conservator will need to be familiar with a Lab Safety Plan, either from the perspective of the employer, responsible for establishing the plan, or as an employee covered by such a plan.

The safe handling of "toxic and hazardous substances" in the workplace falls under the jurisdiction of the Department of Labor's Occupational Safety and Health Administration (OSHA). The codified regulations administered by the Department of Labor are found in Chapter 29 of the Code of Federal Regulations (commonly cited as 29 CFR), specifically 29 CFR Part 1910 "Occupational Safety and Health Standards," and subpart Z, "Toxic and Hazardous Substances." Other sections deal with specific toxins with their own set of regulations, such as lead and asbestos. The two sections pertinent to communicating chemical hazards to workers are 29 CFR 1910.1200, "Hazard Communication" and 29 CFR 1910.1450, "Occupational exposure to hazardous chemicals in laboratories."

In general, "Hazard Communication" applies to industrial workplaces and includes a written program, labels and appropriate warnings, a complete inventory and set of material safety data sheets (MSDS) and employee training of associated hazards and proper handling skills.

The conservation studio, or, as defined by OSHA, the (conservation) laboratory, is covered by 29 CFR 1910.1450. Laboratory in this standard is defined as, "a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis." Specifically, "laboratory scale" is defined as "...work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person..." and "...excludes those workplaces whose function is to produce commercial quantities of materials."

Under 29 CFR 1450, laboratories are required to:

(1) keep labels on containers they receive,

(2) maintain MSDS's for each hazardous chemical, and

(3) inform and train employees in accordance with paragraph (h) of this section.

(4) maintain a written "Chemical Hygiene Plan"

A written "Hazard Communication Program" can act as a beginning to a "Chemical Hygiene Plan." Much of the same information is found in both, but a "Chemical Hygiene Plan" encompasses much more discussion about the hazards associated with hazardous chemicals and their safe handling.

Chemical Hygiene Plans are discussed only in one paragraph of 29 CFR 1910.1450, but the plan is designed to encompass the intent of the entire standard. Many topics included in other sections are required topics for discussion in a chemical hygiene plan, such as paragraph (f), "Employee information and training." For this reason, the rest of our discussion of this standard will only include what is required to go in a Chemical Hygiene Plan and some suggestions for fulfillment of those requirements. It would be a good idea for conservators who work with hazardous materials and their employers to read and study the full standard, as this is a requirement under paragraph (f) [(f)(3)(I)].

There are four requirements associated with a "Chemical Hygiene Plan":

- The Chemical Hygiene Plan that must be capable of protecting employees of chemical hazards and keeping exposures below the limits specified in this section [(e)(1)].
- The Chemical Hygiene Plan must be readily available [(e)(2)].
- The Chemical Hygiene Plan is required to have certain basic elements that indicate specific measures to ensure employee protection [(e)(3)].

These elements should organize a basic "table of Contents" for a "Chemical Hygiene Plan." The fourth requirement is that the Chemical Hygiene Plan be reviewed, evaluated for its effectiveness, and updated as needed—at least every year.

A Chemical Hygiene Plan must include discussion of eight basic elements that will indicate specific measures to ensure employee protection, as specified by the standard. Individual descriptions of each element depend very much on how the specifics in the standard relate to the specifics associated with the work and hazardous chemicals in your laboratory or studio.

ELEMENT ONE

"Standard Operating procedures" (e)(3)(i)

The standard states that a plan must include a full description of standard operating procedures "...relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals." The standard is not very specific about the details pertaining to operating procedures because different types of laboratories will use varying quantities of chemicals in a variety of ways. For a conservation studio, obvious standard operating procedures to be included in a plan would describe how hazardous chemicals are used, stored and handled in the studio or workplace. These operating procedures can be created as stand-alone documents, or can be directly incorporated into an extant system for conservation procedures.

The general portion of the plan should include a section that describes general rules for working with chemicals. This

section would discuss safe handling measures for all chemicals, with generic operating procedures that cover groupings of chemicals with the same hazards such as, potential allergens (mold contamination), strong acids or bases, or chemicals of high chronic toxicity or known or suspected carcinogens. Standard operating procedures should include instructions for handling, use and disposal. For example, use of particular chemicals with "high chronic toxicity" would warrant the use of special engineering controls such as fume extractors and/or the use of specialized personal protective equipment. In addition, disposal of these chemicals would probably necessitate special containers and procedures. Each chemical in inventory must be evaluated for its exposure potential, and method of use in correlation with its toxicity, threshold level values and ratings for corrosiveness, flammability and combustibility to determine if it warrants special stipulations. Some examples of chemicals which might deserve a separate provision include acetone (highly flammable), ethyl ether (peroxide formation, highly flammable)DMF (TLV below the odor threshold), hexanes (acute toxicity at low TLV, less toxic alternative - heptane).

Other suggestions for topics that should be addressed as standard operating procedures might include:

"Laboratory Facilities: Design, Maintenance, and Usage"

"Procurement, Distribution, and Storage of Laboratory Chemicals"

"Housekeeping and Inspections of the Laboratory"

"Laboratory Employee's Medical Program"

"Laboratory Protective Apparel and Equipment"

"Signs and Labels"

"Spills and Accidents"

"Waste Disposal Program"

"Laboratory Record keeping"

Other topics for discussion might include procedures for chemical use while visitors are present, a fire evacuation plan, sources for additional information (e.g., locations for emergency telephone numbers such as the fire department, poison control, the nearest hospital). As you sit down and begin to think of the things you need to do to fulfill the mission of a Chemical Hygiene Plan, you will come up with specific procedures that deal with each laboratory situation.

ELEMENT TWO

"Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals" (e)(3)(ii)

This element has two parts. The first part of the plan is to discuss measures that "determine" the potential for employee exposure to the hazardous chemicals they will be working with. The standard does not mention anything specific in this part of the paragraph to help guide this discussion; however, two other paragraphs in this standard need to be considered while writing this section of the plan. Paragraph (c) of this standard discusses the permissible exposure limits, which will be used to set standards to determine if employees have been or will be exposed.

Paragraph (d) discusses the requirements for employee exposure determination. In this paragraph, are descriptions of what is required in order to establish a monitoring program, including "initial monitoring," "periodic monitoring," "termination of monitoring," and "Employee notification of monitoring results." The second part of this element is to discuss how the employer will "implement control measures to reduce employee exposure to hazardous chemicals," and describes three measures, including engineering controls, the use of personal protective equipment, and hygiene practices. A discussion of how the laboratory or studio uses these three measures of control must be included in this section of the plan, although additional sections for other control measures can be included.

Please note that under OSHA there are three types or groups of control measures used to reduce employee exposure, including engineering controls (local exhaust systems, hoods, spray booths), administrative controls (standard operating procedures, hygiene practices, etc.), and personal protective equipment (gloves, goggles, respirators, etc.). OSHA requires that a facility look at using engineering controls and administrative controls first before putting people in personal protective equipment. In other words, personal protective equipment should be the last line of defense against employee exposure and discussion in this section of the laboratory plan should reflect this attitude. It would also be a good practice in this section to refer to any procedures that would apply (remember they are administrative controls), because it shows how the sections are interconnected and that the plan is meant to be implemented as a whole. (See references at the end of this article for more information on types of administrative, engineering and PPE controls)

ELEMENT THREE

"fume hoods and other protective equipment" (e)(3)(iii)

This section should include a discussion that requirements have been established to show this equipment is "functioning properly" and that "specific measures" be taken to ensure proper and adequate performance. Some suggestions for materials you can use in writing this section can be your own standard operating procedures; materials from the manufacturer; Appendix to 29 CFR 1910.1450 entitled "National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)" and *Prudent Practices in the Laboratory Handling and Disposal of Chemicals* (1995, National Research Council, National Academy Press), as well as other references cited in the Health and Safety Comm. Technical Resources for the Conservator Guide (AIC News Vol. 23, no. 4), and references listed at the end of this article. For example, the plan might include instructions and/or contracts to insure that equipment is functioning, and/or a schedule for medical monitoring, fit testing and training to insure proper use of personal protective

equipment.

ELEMENT FOUR

"Provisions for employee information and training" (e)(3)(iv)

This part of paragraph (e) refers you to all four parts of paragraph (f) for requirements that should be discussed in this section of your plan. This part of the plan may simply include a listing of types of training and information sources that the employee must be informed of, as well as the locations for this information within the laboratory or studio. Please note that this training requirement is relevant to all individuals who work in your laboratory, such as full-time or part-time staff, students, apprentices, interns, assistants, or volunteers.

Part one states, "The employer shall provide employees with information and training to ensure that they are appraised of the hazards of chemicals present in the work area." This might include training on how to read and understand MSDS's for all the chemicals in the work place; training on how to read signs, symbols and warnings found in the work place; and passing out information sheets about new chemicals that are brought into the work place.

Part two gives the requirements for the frequency of training for your employees. Each employee must be given an initial training given to the employee at his "initial assignment to the work area." Then, additional training must be provided "prior to assignments involving new exposure situations." And finally, some type of refresher training or information should be given at a frequency that is to be "determined by the employer."

Part three provides a list of information and locations that employees should receive from the employer. The information should include a copy of the "chemical hygiene plan" and its appendices, as well as a description of its location and availability. In addition, permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals for which there is no applicable OSHA standard should also be provided to the employee. The employer is also required to provide the employee with information concerning signs and symptoms associated with the hazardous chemicals found in the work place. Employees must also be informed of the location and availability of reference materials associated with the hazards, safe handling practices, storage, and disposal of hazardous chemicals in the work place. These reference materials should include the manufacturer's MSDS's, as well as any other reference books, web-sites, charts, telephone numbers etc. that are available in the laboratory or studio.

Part four discusses what should be included in training that is provided to the employee, and the plan might describe how this training will take place. The standard states that training should include methods and observations that can be used to detect the presence or release of a hazardous chemical, an understanding of the physical and health hazards of the chemicals in the workplace, measures available for employee protection from chemical hazards and measures the employer has implemented to protect the employee from those hazards.

ELEMENT FIVE

"prior approval from the employer" (e)(3)(v)

This part of paragraph (e) refers specifically to the use of extremely hazardous chemicals that may be used in a procedure requiring approval prior to use. Any circumstance that would require this approval to occur should be noted and detailed in a separate standard operating procedure within the chemical hygiene plan. This includes any special provisions or precautions for individuals working alone.

ELEMENT SIX

"Provisions for medical consultation and medical examinations" (e)(3)(vi)

This part of paragraph (e) refers you to paragraph (g) for requirements that should be discussed in this section of your plan. A discussion of all four parts of paragraph (g) and how the employee will implement this should be included in your "chemical hygiene plan." Please note that this element was discussed in the "Biological Monitoring in the Workplace", a Health and Safety guide in AIC News vol. 24, no. 6.

Part one discusses the circumstances under which the employer shall provide the employee who works with hazardous chemicals "an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary." There are three circumstances discussed. When writing a "chemical hygiene plan," the three circumstances included in the standard must be listed, although others may be added.

- "Whenever an employee develops signs or symptoms associated with a hazardous chemical,"
- "Where exposure monitoring reveals an exposure level routinely above the action level,"
- "Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure."

Part two discusses the conditions required for the medical consultations or examinations. The medical examination should be performed by or under the direct supervision of a licensed physician, within a reasonable time frame, and at a reasonable place. The examination shall be provided to the employee at no cost to the employee, including no loss of pay. A list of occupational and environmental health clinics was included in the Health and Safety guide published in the *AIC News*, vol. 24, no. 6.

Part three discusses the information that should be provided to the physician by the employer, including information about the hazardous chemical to which the employee was exposed, a description of the conditions under which the exposure occurred, and a description of the signs and symptoms the employee is experiencing.

Part four states that the employer can obtain a written opinion from the examining physician with information

including any recommendations for follow-up, the results of the examination and any associated tests, any condition revealed that would put the employee at increased risk of any other exposure from any other chemical, and a statement from the physician that the employee has been informed of the results and any requirement for further evaluations. The opinion cannot reveal any specific findings to the employer of diagnoses unrelated to the occupational exposure.

ELEMENT SEVEN

"Designation of personnel responsible" (e)(3)(vii)

This part of paragraph (e) establishes that certain personnel be appointed responsibility for the implementation of the Chemical Hygiene Plan. This section of the plan should discuss the assignment of a Chemical Hygiene Officer. Paragraph (b) gives the definition of a "Chemical Hygiene Officer" as "an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan." This part also suggests that, if appropriate, a Chemical Hygiene Committee should be established. A discussion of the assignment of the person or persons responsible for the implementation of the Chemical Hygiene Plan and a listing of their duties and responsibilities should be included in the writing of this section.

ELEMENT EIGHT

"Provisions for additional employee protection for work with particularly hazardous substances" (e)(3)(viii)

Three groups of substances are mentioned in this part of paragraph (e), including select carcinogens, reproductive toxins, and substances which have a high degree of acute toxicity. Lists of these chemicals can be found, for example in the IARC list of carcinogens or the OSHA specific standard 29 CFR 1001. Most of the chemicals on these lists do not apply to conservation practices, but some examples of chemicals requiring special procedures include lead, hydrofluoric acid, methylene chloride, perchloroethane, and thiourea. For a more complete list of chemicals that are considered particularly hazardous, see the appended list. The standard requires that specific considerations shall be given to four provisions concerning these types of substances, including:

(1) establishment of a designated area
(2) use of containment devices such as fume hoods or glove boxes
(3) procedures for safe removal of contaminated waste
(4) decontamination procedures.

Summary

The above eight elements are required topics for a "chemical hygiene plan." The plan can include other topics that will help complete the mission of reducing employee exposure to hazardous chemicals. Although the task may seem daunting, the completed plan will provide a record of how chemicals are handled, used, and disposed in your conservation laboratory, will help to codify procedures needed for employee education and safety, and can help guide both employers and employees in the event of a situation where medical intervention is required. For additional help in putting together a laboratory plan, see the suggested references included in this guide, consult with others who have written one, and refer to the OSHA regulations themselves.

—Michael Grey White, General Partner and Training Director, HGW and Associates, LLC, 12832 Broken Saddle Road, Farragut, TN 37922; (865)671-3689; Fax: (865)777-0839; Whitemg@hgwllc.com

RESOURCES

• The full 29 CFR Part 1910.1450 standard is available at: http://www.osha-slc.gov/OshStd_data/1910_1450.html

• For help in preparing your Chemical Hygiene Plan, the following are very helpful:

Additional information from OSHA is available from Appendix A of 1910.1450, "National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)," located at: http://www.oshaslc.gov/OshStd_data/1910_1450_APP_A.html

Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. 448 pages. 1995. by the National Research Council and is available from the National Academy Press, 2101 Constitution Ave., NW. Washington, DC 20418. (http://books.nap.edu/catalog/4911.html, web discount price $55.96)

CRC Handbook of Laboratory Safety. 5th ed. A. Keith Furr, ed., 808 pages. 2000. Published by CRC Press, LLC; 2000 NW Corporate Blvd, Boca Raton, FL 33431-9868

• Examples of Chemical Hygiene Plans that are available online.

The University of Illinois Urbana-Champaign has posted model plans that are designed to serve as the basis for more detailed and specific plans within the University. These model plans are at:

UIUC Model Chemical Hygiene Plan
http://www.ehs.uiuc.edu/~chem/CHyP/CHyP.html

UIUC Model Hazard Communication Plan
http://www.ehs.uiuc.edu/~chem/hazcom/hazcom99.html

UIUC Chemical Safety Guide
http://www.ehs.uiuc.edu/~chem/safety/safety.html (chapter 3 contains the Standard Operating Procedures for the Model Chemical Hygiene Plan)

National Institute of Environmental Health Standards
http://www.niehs.nih.gov/odhsb/manual/home.htm

Michigan State University Chemical Hygiene Plan
http://www.orcbs.msu.edu/Chemical/chp/toc-2.html

Selected, Sample Standard Operating Procedures for a Chemical Hygiene Plan

From the Michigan State University Chemical Hygiene Plan (http://www.orcbs.msu.edu/Chemical/chp/toc-2.html)

Note: this material has been copied directly. There are a few items that do not apply to conservators and could be removed from your Chemical Hygiene Plan.

2.0 STANDARD OPERATING PROCEDURES

The ORCBS has developed generic standard operating procedures relevant to safety and health considerations when laboratory work involves the use of hazardous chemicals. Where the scope of hazards are not adequately addressed by this general document, units and/or P.D.s must develop written standard operating procedures for work area specific operations. Standard operating procedures must be provided to all affected laboratory employees. The Standard Operating Procedures in this document specify minimum regulations and recommendations.

Note: "Prudent Practices for Handling Hazardous Chemicals in Laboratories" (National Research Council, 1981) was used as the basis for the standard operating procedure guidelines.

2.1 GENERAL SAFETY PRINCIPLES

The following guidelines have been established to minimize hazards and to maintain basic safety in the laboratory.

A. Examine the known hazards associated with the materials being used. Never assume all hazards have been identified. Carefully read the label before using an unfamiliar chemical. When appropriate, review the Material Safety Data Sheet (MSDS) for special handling information. Determine the potential hazards and use appropriate safety precautions before beginning any new operation.

B. Be familiar with the location of emergency equipment—fire alarms, fire extinguishers, emergency eyewash and shower stations and know the appropriate emergency response procedures.

C. Avoid distracting or startling other workers when they are handling hazardous chemicals.

D. Use equipment and hazardous chemicals only for their intended purposes.

E. Always be alert to unsafe conditions and actions and call attention to them so that corrective action can be taken as quickly as possible.

F. Wear eye and face protection when appropriate.

G. Always inspect equipment for leaks, tears and other damage before handling a hazardous chemical. This includes fume hoods, gloves, goggles, etc.

H. Avoid tasting or smelling hazardous chemicals.

2.2 HEALTH AND HYGIENE

The following practices have been established to protect laboratory employees from health risks associated with the use of hazardous chemicals:

A. Avoid direct contact with any hazardous chemical. Know the types of protective equipment available and use the proper type for each job.

B. Confine long hair and loose clothing and always wear footwear which fully covers the feet.

C. Do not mouth pipette.

D. Use appropriate safety equipment whenever exposure to gases, vapors or aerosols is suspected and ensure exhaust facilities are working properly.

E. Wash thoroughly with soap and water after handling chemicals, before leaving the laboratory and before eating or drinking.

F. Contact lenses are prohibited when using hazardous chemicals.

G. Replace personal protective equipment as appropriate.

H. Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.

2.3 FOOD AND DRINK IN THE LABORATORY

The following statement is the accepted practice on food and drink in laboratories and should be followed at all times:

"There shall be no food, drink, smoking or applying cosmetics in laboratories which have radioactive materials, biohazardous materials or hazardous chemicals present. There shall be no storage, use or disposal of these 'consumable' items in laboratories (including refrigerators within laboratories). Rooms which are adjacent, but separated by floor to ceiling walls, and do not have any chemical, radioactive or biohazardous agents, present, may be used for food consumption, preparation, or applying cosmetics at the discretion of the project director responsible for the areas."

2.4 HOUSEKEEPING

Safety follows from good housekeeping practices. Use the following guidelines to maintain an orderly laboratory:

A. Keep work areas clean and uncluttered with chemicals and equipment. Clean up work areas upon completion of an operation or at the end of each work day, including floors.

B. Dispose of waste as per the Michigan State University Waste Disposal Guide.

C. A separate waste receptacle must be designated for non-contaminated glass. Follow guidelines established in the

MSU Waste Disposal Guide for disposal of contaminated glass.

D. Clean spills immediately and thoroughly, as per the guidelines established in section 4.0 of this document. Ensure a chemical spill kit is available and that employees know how to use it.

E. Do not block exits, emergency equipment or controls or use hallways and stairways as storage areas.

F. Assure hazardous chemicals are properly segregated into compatible categories (see section 5.1.4 and Appendix C of this document).

2.5 CHEMICAL HANDLING AND STORAGE

The decision to use a hazardous chemical should be a commitment to handle and use the chemical properly from initial receipt to disposal.

A. Information on proper handling, storage and disposal of hazardous chemicals and access to related Material Safety Data Sheets should be made available to all laboratory employees prior to the use of the chemical.

B. Always purchase the minimum amount necessary to maintain operations.

C. Chemical containers with missing or defaced labels or that violate appropriate packaging regulations should not be accepted.

D. Chemicals utilized in the laboratory must be appropriate for the laboratory's ventilation system.

E. Chemicals should not be stored on high shelves and large bottles should be stored no more than two feet from floor level.

F. Chemicals shall be segregated by compatibility.

G. Chemical storage areas must be labeled as to their contents (see section 5.1.4)

H. Storage of chemicals at the lab bench or other work areas shall be kept to a minimum.

I. Any chemical mixture shall be assumed to be as toxic as its most toxic component.

J. Substances of unknown toxicity shall be assumed to be toxic.

2.6 TRANSFERRING OF CHEMICALS

When transporting chemicals outside the laboratory, precautions should be taken to avoid dropping or spilling chemicals.

A. Carry glass containers in specially designed bottle carriers or a leak resistant, unbreakable secondary container.

B. When transporting chemicals on a cart, use a cart that is suitable for the load and one that has high edges to contain leaks or spills.

C. When possible, transport chemicals in freight elevators to avoid the possibility of exposing people on passenger elevators.

In addition, your Standard Operating Procedures should include specific information for especially hazardous materials. An example from the National Institute of Environmental Health Standards Chemical Hygiene Plan can be found at: http://www.niehs.nih.gov/odhsb/manual/home.htm and contains the following (which has been edited):

I. ETHYL ETHER

1. Policy

Ethyl ether shall be stored in a manner that provides appropriate control of hazards resulting from its flammability, volatility, and potential formation of explosive peroxides.

2. Storage

Any laboratory using ethyl ether will limit its supply to the smallest amount necessary for uninterrupted research. Cans should be dated when opened and disposed of if not used within 12 months.

Selected "Extremely Hazardous Chemicals" and "Particularly Hazardous Substances"

The following lists have been complied from a number of sources. The full lists of chemicals are much longer, but the AIC Health and Safety Committee has edited the various lists to include materials that might be found in a conservation laboratory. Anyone working in a conservation facility with a full chemical laboratory should check the full lists for additional extremely hazardous materials not present on this selected list.

Selected Chemicals listed on OSHA's "List of Highly Hazardous Chemicals, Toxics and Reactives (Mandatory). - 1910.119 App A" (http://www.oshaslc.gov/OshStd_data/1910_0119_APP_A.html)

Chlorine Dioxide
Diethylzinc
Ethylene Oxide
Formaldehyde (Formalin)
Hydrogen Fluoride (hydrofluoric acid)

Selected Materials known (http://ntpserver.niehs.nih.gov/htdocs/8_RoC/Known_list.html) or reasonably anticipated (http://ntpserver.niehs.nih.gov/htdocs/8_RoC/RAHC_list.html) to be human carcinogens:

Aroclor (polychlorinated biphenyl)
inorganic arsenic
asbestos
benzene
cadmium compounds (selected)
carbon tetrachloride
chloroform
ethylene dichloride (1,2-Dichloroethane)
lead and lead compounds
methylene chloride
perchloroethane
thiourea

Selected Additional chemicals found on California's Proposition 65's List of Chemicals Known by the State to Cause Cancer or Reproductive Toxicity (http://www.oehha.org/prop65/prop65_list/Newlist.html).

Carbon disulfide
Ethylene glycol monoethyl ether
Ethylene glycol monoethyl ether acetate
Ethylene glycol monomethyl ether
Ethylene glycol monomethyl ether acetate
Mercury and mercury compounds
Toluene