# CHEMICAL HYGIENE PLAN

**Laboratory covered under this Plan:** West Virginia Water Science Center Laboratory

**Responsible Supervisors:**

Mark R Bennett, Director, West Virginia Water Science Center (804-261-2643)

Shaun M. Wicklein, Hydrologic Investigations and Surveillance Section Chief (804-261-2605)

**Chemical Hygiene Officer:**

Douglas B. Chambers, Biologist (304-347-5130 x231)

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**Approved By s/Mark Bennett/_____ , Director Date: April 17, 2014**

**Reviewed By s/Douglas B. Chambers/, Chemical Hygiene Officer Date: April 21, 2014**

## CHEMICAL HYGIENE PLAN

A. Standard Operating Procedures for Handling Hazardous Chemicals

1. Protective apparel and equipment.

1.1 Eye and face protection

Safety glasses or adequate eye protection are required when working with chemicals. If employees do not wear eye protection when using chemicals, they are subject to disciplinary action.

All eye protection must meet American National Standards Institute (ANSI) Z87.1-1989 and 29 CFR 1910.133 requirements. The West Virginia Water Science Center requires that safety glasses be equipped with safety shields, as flying objects are a possible hazard. Eye Protection must be kept in good repair, fit properly, must be easily cleanable, and must be adequate to protect from the present hazard.

If more protection is required, goggles or face shields should be used. These should be used if conditions produce more flying objects than safety glasses can effectively stop or where chemical splashes can occur. Check ANSI standards for their requirements.

Contact lenses should not be worn in the laboratory. Any employee who finds it necessary to wear contact lenses should be aware of the dangers involved with the type they wear and hazards posed by the work situation. Your personal physician should be consulted and his/her advice sought. If contacts are deemed necessary, then the supervisor and coworkers should be made aware of the situation in case of an accident.

If flying or splashing materials are present in a work area, a face shield is required. The shield should cover the face and neck area as well as possible. The shield should be made of shatter-proof material and should be able to withstand any expected impact. The shield must be kept in good repair, fit properly, must be easily cleanable, and must be able to protect from the hazard present.

A face or body shield should be used during any experiment that produces endo- or exothermic reactions (either due to mixing or addition of an energy source). Always remember to add acid to water and never in reverse order.

Long hair must be confined when working with chemicals, hot items, and machinery with moving parts in the laboratory.

## 1.2 Ear protection

Hearing protection must be worn in areas having noise in excess of 80 decibels. See the table below for noise levels and permissible exposure times. No lab areas have been identified as exceeding any of these noise levels.

OSHA standards for noise level vs. permissible exposure times (1981)

| Noise Level dB(A)[1] | Permissible Time in Hours per Day |
|---|---|
| Below 80 | not applicable |
| 80 | 32[2] |
| 85 | 16 |
| 90 | 8 |
| 95 | 4 |
| 100 | 2 |
| 105 | 1 |
| 110 | 1/2 |
| 115 | 1/4 |
| >130 | none |
| 140 | maximum permissible impact noise |

1 Decibels (dB) measured on the "A" scale of a standard sound level meter at slow response.

2 Continuous or cumulative for the extended period listed.

## 1.3 Body protection

Lab coats should be worn in the laboratory, and are required if shorts, cut-offs, or apparel that offers no protection to the legs is worn. Do not clean lab coats at home. Washing lab coats with personal clothing may cause other clothing to be contaminated and cause injury to family members.

When working with acids, solvents, spills, or in areas where special protection is needed, aprons or protective suits may be required.

## 1.4 Hand protection

The selection of gloves is an important task. In determining the type of glove to use for an activity, the following must be considered:

glove size
type of hazard (chemical, thermal, physical)
dexterity
amount of coverage
thickness and permeation of glove material
porous or non-porous gloves
gripping surface
cuff type

In chemical handling, the glove material is of top priority. Gloves should be selected to withstand permeation of the work material. Examine glove permeation and degradation information while selecting gloves.

1.5 Foot protection

Footwear should protect the wearer's feet from the hazards present. Sandals, open-toe, open-heel, and porous footwear should be avoided.

2. Signs and labels.

All containers present in and received by the laboratory will have the following information:

Original label which has not been defaced, removed or altered.
Name of chemical or chemicals in containers
Date received
Chemical and physical hazard data
Expiration dates for sensitive and dated materials
Name of responsible employee
Any other labeling required by 29 CFR 191.1200

The location of the safety shower, eyewash, fire extinguishers and other safety equipment will be clearly labeled. Areas containing special hazards (acid cabinet, flammable cabinet, hoods) will have appropriate signs detailing safe operating procedures, needed protective equipment, and hazard information. Additionally, waste receptacles will be appropriately marked.

3. Spills and accidents.

3.1 Chemical spill procedure

In the event of a hazardous chemical spill or release greater than an "incidental or small release", all employees must evacuate the affected area as required by 29 CFR 1910.38. An incidental or small or minor spill is defined as less than 18 inches in diameter. The Charleston Fire Department HAZMAT team (911) will be called to clean up any spill other than a minor incidental spill greater than 18 inches in diameter.

Minor spills will be cleaned up immediately by the person responsible for the spill with possible assistance from Doug Chambers (304-347-5130 x231) or Melvin Mathes (304-347-5130 x225).

3.2 Biohazard spill: A spill of possible biohazard containing material will be contained and wiped up. Materials used to absorb the spill will be autoclaved before disposal. Area of spill will be wiped down with either a 70 percent v/v ethanol/water solution or commercially available bleach.

3.3 Medical Emergency Procedure

Medical emergencies will be handled in accordance with the West Virginia Water Science Center medical emergency procedure. Nearest hospital is CAMC General Division, 501 Morris Street, Charleston, WV 25301 (911 – for emergencies) general CAMC phone (304-388-5432).

4. Laboratory storage.

Chemicals are stored in accordance with the instructions on their label or Safety Data Sheet (SDS) for the chemical, grouped according to reactivity (not alphabetically), and stored in an area with proper ventilation for the material. General guidelines for storage can be found in Laboratory Safety Handbook (USGS OFR 83-131), Consult Chapter 8.1 in 445-1-H for information on compatibility. Chemicals that require special storage such as refrigeration should be clearly marked.
The maximum quantity of flammable chemicals to be stored within the laboratory is 15 gallons.

5. Waste disposal.

Acids: Before an acid solution can be discharged to the sewer system, it must be neutralized. This is done by the addition of sodium bicarbonate ($NaHCO_3$) to the acid solution for neutralization and by checking the pH of the solution with pH paper after neutralization and before discharge. The pH of the discharged solution cannot be less than 5 nor greater than 10. PH paper is located above the main sink in the lab, and $NaHCO_3$ is located in a drum in the lab. The date, time, pH before and after neutralization, and quantity of neutralized solution discharged must be recorded in the log located next to the acid cabinet.

Organic wastes: Organic wastes will be collected in safety cans kept in the stand-alone flammable cabinet. Once the bottles are full, their contents will transferred to 10-gallon metal carboys stored in the flammables cabinet located at the West Virginia Water Science Center warehouse. All containers must be properly labeled as waste containers and must list the contents, concentrations of collected wastes, hazards of collected wastes, and protective equipment used in handling the waste as outlined in 29 CFR 1910.1200.

A laboratory manifest of the material is completed. This information details the name, concentration, hazards, and any identifying waste codes for the material. All manifesting is done in accordance with USEPA regulations.

Waste is transferred to an assigned contractor for inventory, packaging, documentation, laboratory analysis, transportation, and disposal.

Biological hazards: Fecal bacteria samples and culture plates will not be stored in the laboratory. Once plates have been counted they will be placed in a “biohazard” bag and autoclaved as soon as possible. Plates will not be stored overnight or stockpiled to fill a bag.

6. Working alone.

No one will be allowed to work alone when using extremely toxic or highly flammable chemicals, such as Class 1A flammables.

7. Unattended operations.

Any operations which are left unattended must be reported to your section chief. The following information must be provided to the section chief.

Emergency contact numbers of individuals responsible
Possible consequences of utility failure
Hazards presented by failure of utilities

8.General rules or procedures.

* No horseplay, suctioning by mouth, eating, drinking, or smoking will be permitted in the laboratory. (If drinking or eating is allowed, then specify where the practices will be permitted.) Report all unsafe practices or conditions to the responsible supervisor. Food storage is not allowed in laboratory refrigerators or freezers.
Laboratory housekeeping will be performed as often as once per week, depending upon the amount of use the lab receives. All lab users must participate.

Minor spills must be handled immediately.

Trash receptacles will be placed outside the lab for emptying at the end of each day.

All walkways must be free of obstructions and hazards.

All hoods should be kept in good order and free of clutter.

No pipetting should be done by mouth.

All chemical containers should be clearly marked as to contents, hazards, expiration date (if required), date received, and needed personal protective equipment. All labels must be intact and not defaced.

B. Criteria to be Used for Implementation of Measures to Reduce Exposures

1. Procurement and distribution.

Before an extremely hazardous substance (e.g., high acute or chronic toxicity, class 1A flammable liquid, highly reactive chemical) is ordered, the supervisor will inform those who will be using the material on proper handling, storage, and disposal. Request a Safety Data Sheet (SDS) each time a different chemical is ordered.

Chemical purchase orders must be routed through the Center Chemical Hygiene Officer . Items exempt from this requirement are as follows:

pH buffers
Conductance standards
Turbidity standards
Reference electrode standards
Blank water
Acid in ampoules

For all other chemical purchases, please provide a DI-1 requisition form to the Chemical Hygiene Officer. In addition to the routine information required on the requisition, complete a brief statement of need for the compound and final disposition of the waste, i.e. location of waste or residue. The requisition will be reviewed and checked against on-hand chemical stocks. As well as be a means for making best use of available chemical resources, review of chemical requisitions will provide a mechanism for updating the Center's SDS library.

Accept no container without an identifying label. If not in their original shipping containers, chemicals will be transported using a container such as a rubber acid bucket or other suitable device.

No chemical shall be brought into the lab unless all necessary storage, handling, and engineering controls are in place to properly utilize the material.

All unpacking and transfer of chemicals shall be conducted by personnel who are familiar with chemical and physical hazards and shall be conducted in areas suitable for the procedures taking place there.

2. Environmental monitoring.

In the event of a mechanical failure of the exhaust hood(s) or after any uncontrolled release of a hazardous chemical an assessment or environmental monitoring will be conducted by or D. Chambers or M. Mathes.

3. Chemical inventories.

The chemical hygiene officer will conduct annual inventories of chemical stocks. The inventory will include the chemical name, quantity, custodian, and location. The chemicals inventory will be reviewed quarterly to identify chemicals that are out of date or approaching their expiration date so they can be disposed of appropriately. These reviews will be logged per date and time on a signature sheet posted in the outer lab (Area 51) laboratory. A copy of the inventory will be kept in the laboratory, and copies will be distributed to the Chemical Hygiene Officer and the Safety Officer.

The Chemical Hygiene Officer will be provided an inventory of all hazardous waste on site.

C. Fume Hood Performance

1. Use of laboratory hoods.

There are two fume hoods located in the West Virginia Water Science Center Lab; the flammables/organics hood, located over the flammable storage cabinet, and the acid/base hood, located over the acid/bases storage cabinet.

1.1 Flammables/organics hood: This hood is intrinsically safe and is approved for use with flammable materials. Perchloric acid will not be used in this hood.

1.2 Acid/base hood: THIS HOOD IS INOPERATIVE AND IS NOT TO BE USED.

2. Recommended hood face velocity.

* Determine hood face velocities no less than once per year. Average face velocities should be between 60 and 100 linear feet per minute (LFM); however, velocities up to 150 LFM are acceptable. Averages are determined by measuring the flow at the face, using no less than 3 uniform quadrants. Record on the hood the average LFM, date, and the initials of the person making the determination.

* Hoods with average face velocities of less than 60 LFM will not be used for any toxic chemical. If hood averageface velocities exceed 150 LFM, then smoke tubes or equivalent smoke generators will be used to determine if air turbulence exists within the hood. Unacceptable hood performance is when the smoke is thrown back into the breathing zone of the user. When unacceptable turbulence is noted, identify the reason for the turbulence and take steps to improve the hood's performance.

3. Special ventilation areas. N/A

D. Employee Information and Training

1. Frequency of training.

* Conduct training on a regular basis, integrating the training into the overall safety program. Employees using hazardous laboratory equipment or extremely hazardous chemicals will receive specialized training.

All lab users will be given a safety orientation not later than thirty days from the start of work. The orientation covers any hazardous operations in which they are involved, protective equipment needed for the job, chemical and physical hazards, locations of emergency equipment, emergency procedures, and general lab rules. It is the responsibility of the immediate supervisor of the employee to make sure all training is completed, even if the training is done by others.

Records of safety training must be kept to verify employees have received training.
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2. Chemical Hygiene Plan.

A copy of the Chemical Hygiene Plan is posted in the laboratory, on the main office bulletin board, and on the WSC's internal web page. The CHP and employee responsinbilites will be discussed will be discussed during the Center's "Safety Week".

3. Hazard Communication.

* Provide each laboratory employee information regarding both chemical and physical hazards. The employee will be made aware of available resources (SDS's, container labels, reference books, permissible exposure limits) and their location. Provide training that describes methods and observations for detecting the presence of hazardous chemicals and for signs and symptoms of overexposure. Discuss first-aid treatment for exposure. The employee will receive this information before being allowed to work with chemicals.

Hazard communication training is to be conducted each year as part of the WV WSC's "Safety Week".

4. Emergency procedures.

* Conduct annual fire drills and other emergency evacuations.

5. Personal Protective Equipment (PPE) and laboratory safety devices.

* Discuss specific procedures in effect to provide employee protection, including engineering controls, work practices, and personal protective equipment. Employees required to wear PPE will receive instruction on the proper use, inspection, wearing,

cleaning, maintenance, and limitations of equipment before wearing such equipment. Employees will also know the location and use of eyewashes, deluge showers, and fire extinguishers. Discuss the operation of any specialized safety devices before allowing the employee to work in the laboratory.

E. Requirements for Prior Approval of Laboratory Activities

Specify when supervisory approval is necessary before an employee is allowed to work with especially dangerous chemicals or equipment, such as when a known embryotoxin is used by a female employee of childbearing age. Another example would be when employees use chemicals with a high degree of chronic toxicity. (See attached select carcinogens list.)

F. Medical Consultation and Surveillance

* Seek medical consultation when an employee is exposed to a hazardous chemical due to failure of a laboratory hood or personal protective equipment, spill or other release, or environmental monitoring has determined the presence of an airborne contaminant above the recommended permissible exposure limit.

* When medical consultation is required, provide the physician with specific information on the identity of the chemical, conditions under which the exposure occurred, and a description of the signs and symptoms of exposure. Ask the attending physician to provide a written opinion for recommended follow-up examination and test results; any detected medical conditions of the employee that place the employee at increased risk; and a statement that the employee was informed of the results.

* A medical surveillance program will be established for an employee when any employee is exposed to any chemical regulated by the Occupational Safety and Health Administration (see attached list) and the employee's exposure was deemed to be above the chemical's permissible exposure limit. (Specify if any voluntary medical surveillance programs are available to the employee.)

G. Chemical Hygiene Plan (CHP) Responsibilities

1. Laboratory supervisor (Douglas Chambers 304-347-5130 x231).

The laboratory supervisor is assigned and has overall responsibility for chemical safety in the laboratory. The supervisor has the following specific responsibilities, as a minimum:

(a) Ensures that a CHP is prepared for the laboratory, employees know and follow the Plan, appropriate and proper personal protective equipment is available and used, and training has been conducted.

(b) Ensures that regular inspections are conducted and that substandard or hazardous acts or conditions are corrected.

(c) Ensures that good housekeeping practices are in effect and that equipment such as showers and eyewashes are in working order.

(d) Knows the current legal requirements of regulated chemicals and ensures that hazardous wastes are disposed of properly.

2. Chemical Hygiene Officer (Douglas Chambers 304-347-5130 x231).

(a) Ensures that a chemical inventory is completed annually for those areas assigned.

(b) Periodically inspects chemical inventory for expired chemicals. Inspection form posted in the lab is signed and dated for each inspection. Expired chemicals are promptly disposed of properly.

(c) Reviews the Chemical Hygiene Plan annually to ensure that the Plan is up to date.

(d) Assists employees in obtaining Safety Data Sheets.

(e) Identifies all unattended, overnight laboratory operations, reviewing and recommending fail-safe devices or procedures designed to prevent an accident in the event of a component failure.

(f) Reviews all laboratory accidents involving hazardous materials and recommends steps to prevent recurrence of similar accidents.

3. Laboratory employee.

(a) Plans and conducts all laboratory operations in accordance with the Chemical Hygiene Plan for the laboratory.

(b) Participates in the completion of the annual chemical inventory.
(c) Ensures partially filled bottles of buffers and standards are not returned to chemical storage cabinets and are used prior to expiration.

(d) Practices good personal hygiene when working with hazardous chemicals, using required personal protective equipment

H. Special Precautions for Work with Particularly Hazardous Substances

Specify any special procedures for working with any chemical that meets the following: (1) the chemical is an allergen or embryotoxin (e.g., organomercurials, lead compounds, formamide); (2) the chemical has a moderate chronic or a high acute toxicity (e.g., hydrofluoric acid, hydrogen cyanide); or (3) the chemical has a high chronic toxicity (e.g., select carcinogens - see attached list). Any of those particularly hazardous chemicals must be used in designated areas that are clearly marked. Complete a written job hazard analysis and standard operating procedures for each operation that uses any of those substances. Describe decontamination procedures in the event of a spill or other release, as well as the safe removal of the contaminated waste.

Appendix A

Definitions

a. Flammable Liquid, Class 1A - any chemical with a flashpoint below 73 degrees Fahrenheit and a boiling point below 100 degrees Fahrenheit.

b. Flashpoint - the minimum temperature at which a liquid gives off a vapor in sufficient concentration to burn in the presence of any ignition source.

c. Hazardous Chemical - any chemical that, upon exposure, is known or can reasonably be expected to produce acute or chronic physiological harm.

d. Incidental, small, or minor spill – any spill with a diameter less than 18 inches.

e. Laboratory - any workplace where relatively small quantities of chemicals are used in a nonproduction basis, multiple chemical procedures or chemicals are used, and protective practices and equipment are available and in common use to minimize exposure to chemicals.

f. Permissible Exposure Limit (PEL) - the concentration of a chemical that one can be exposed for 8 hours per day, 40 hours per week. (See 29 CFR 1910.1000 for existing PEL's.)

g. Select Carcinogen - any chemical or substance that is known or reasonably expected to cause cancer in humans as recognized by the National Toxicology Program (Department of Health and Human Services) or the International Agency for Research Cancer Monographs.

SELECT CARCINOGENS

Acetaldehyde
Acetamide
2-Acetylaminofluorene
Acrylamide
Acrylonitrile
o-Aminoazotoluene
4-Aminobiphenyl
o-Anisidine Hydrochloride
1-Amino-2-methylanthraquinone
Arsenic and Certain Arsenic Compounds (See Chemical's SDS) Asbestos
Asbestos
Benzene
Benzidine
Benzotrichloride
Beryllium and Certain Beryllium Compounds (See Chemical's SDS)
Bis(chloromethyl)ether and Technical Grade
1,3-Butadiene
Cadmium and Certain Cadmium Compounds (See Chemical's SDS)
Carbon-black extracts
Carbon tetrachloride
Chlorendic Acid
Chlorinated Paraffins ($C_{12,\ 60\%\ Chlorine}$)
Chloroform
Chloromethyl Methyl Ether
3-Chloro-2-methylpropene
4-Chloro-o-phenylenediamine
Chromium and Hexavalent Chromium Compounds
C.I. Basic Red 9 Monohydrochloride
Citrus Red No.2
para-Cresidine
Cupferron
Dacarbazine
DDT
2,4-Diaminoanisole Sulfate
2,4-Diaminotoluene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane (EDB)
3,3'-Dichloro-4,4'-diaminodiphenyl ether
1,4-Dichlorobenzene
1,2-Dichloroethane
Dichloromethane (Methylene Chloride)
1,3-Dichloropropane (Technical Grade)
Di(2-ethylhexyl)phthalate
Diepoxybutane

1,2-Diethylhydrazine
Diethyl Sulfate
Diglycidyl Resorcinol Ether
3,3'-Dimethoxybenzidine
4-Dimethylaminoazobenzene
3,3'-Dimethylbenzidine
Dimethylcarbamoyl Chloride
1,1-Dimethylhydrazine
Dimethyl Sulfate
1,4-Dioxane
Direct Black 38
Direct Blue 6
Epichlorohydrin
Ethyl Acrylate
Ethylene Dibromide
Ethylene Oxide
Ethylene Thiourea
Formaldehyde (Gas)
Hexachlorobenzene
Hydrazine and Hydrazine Sulfate
Lead Acetate and Lead Phosphate
Lindane and Other Hexachlorocyclohexane Isomers
Mirex
2-Naphthylamine
Nickel and Certain Nickel Compounds (See Chemical's SDS)
Nitrilotriacetic Acid
Nitrofen
Nitrogen Mustard Hydrochloride
2-Nitropropane
N-Nitrosodi-n-butylamine
N-Nitrosodiethanolamine
N-Nitrosodiethylamine
N-Nitrosodimethylamine
Polybrominated Biphenyls
Polychlorinated Biphenyls
Polycyclic Aromatic Hydrocabons
    Benz(a)anthracene
    Benzo(b)fluoranthene
    Benzo(j)fluoranthene
    Benzo(k)fluoranthene
    Benzo(a)pyrene
    Dibenz(a,h)acridine
    Dibenz(a,j)acridine
    Dibenz(a,h)anthracene
    7H-Dibenzo(c,g)carbazole
    Dibenzo(a,e)pyrene

Dibenzo(a,h)pyrene
Dibenzo(a,i)pyrene
Dibenzo(a,l)pyrene
Indeno(1,2,3-cd)pyrene
5-Methylchrysene
Potassium bromate
Propylene Oxide
Reserpine
Selenium Sulfide
Silica, crystalline
Sodium ortho-phenylphenate
Soots, Tars, and Mineral Oils
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
Tetranitromethane
Thioacetamide
4,4'-Thiodianiline
Thiourea
Thorium Dioxide
Toluene Diisocyanate
o-Toluidine and o-Toluidine Hydrochloride
2,4,6-Trichlorophenol
Trypan blue
Uracil mustard
Urethane
Vinyl Chloride

LIST OF OSHA REGULATED SUBSTANCES

Asbestos, tremolite, anthophyllite, and actinolite. (1910.1001)
Coal tar pitch volatiles; interpretation of term. (1910.1002)
4-Nitrobiphenyl. (1910.1003)
alpha-Naphthylamine. (1910.1004)
Methyl chloromethyl ether. (1910.1006)
3,3'-Dichlorobenzidine (and its salts) (1910.1007)
Bis-Chloromethyl ether. (1910.1008)
Beta-Naphthylamine. (1910.1009)
Benzidine. (1910.1010)
4-Aminodiphenyl. (1910.1011)
Ethyleneimine. (1910.1012)
Beta-Propiolactone. (1910.1013)
2-Acetylaminofluorene. (1910.1014)
4-Dimethylaminoazobenzene. (1910.1015)
N-Nitrosodimethylamine. (1910.1016)
Vinyl chloride. (1910.1017)
Inorganic arsenic. (1910.1018)
Lead. (1910.1025)

Benzene. (1910.1028)
Coke oven emissions. (1910.1029)
Cotton dust. (1910.1043)
1,2-dibromo-3-chloropropane. (1910.1044)
Acrylonitrile. ( 1910.1045)
Ethylene oxide. (1910.1047)
Formaldehyde. (1910.1048)
Asbestos.(1910.1101)